JAGUAR

Workshop Manual

X351 - XJ

TDV6 3.0 Litre Diesel

2010 to 2012

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Front Seat Track Motor
Front Seat Head Restraint
Front Seat Head Restraint Motor
Front Seat Tilt Motor
Front Seat Backrest Blower Motor
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Passenger Seat Cushion
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Rear Seat Backrest
Rear Seat Backrest Blower Motor
Rear Seat Backrest Cover
Rear Seat Backrest Heater Mat
Rear Seat Control Switch
Rear Seat Cushion
Rear Seat Cushion Blower Motor
Rear Seat Cushion Cover
Rear Seat Cushion Heater Mat
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Published: 11-May-2011

General Information - About This Manual

Description and Operation

Introduction

This manual covers diagnosis and testing and repair procedures.

It is structured into groups and sections, with specific system sections collected together under their relevant group.

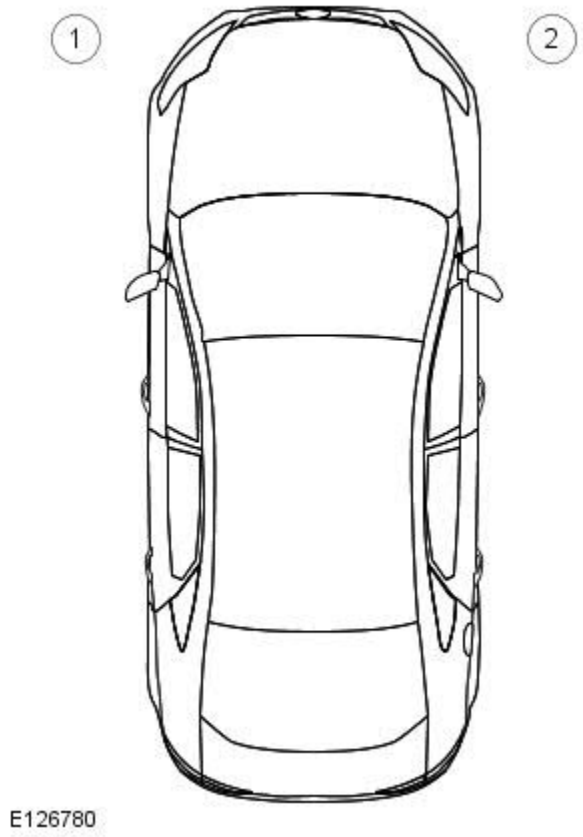
A group covers a specific portion of the vehicle. The manual is divided into five groups, General Information, Chassis, Powertrain, Electrical and Body and Paint. The number of the group is the first number of a section number.

Within Etis, the navigation tree will list the groups. After selecting a group the navigation tree will then list the sections within that group. Each section has a contents list detailing Specifications, Description and Operation, Diagnosis and Testing, General Procedures, Disassembly and Assembly, Removal and Installation.

References to LH (left-hand) and RH (right-hand)

All LH and RH references to the vehicle are taken from a position sitting in the driver seat looking forward.

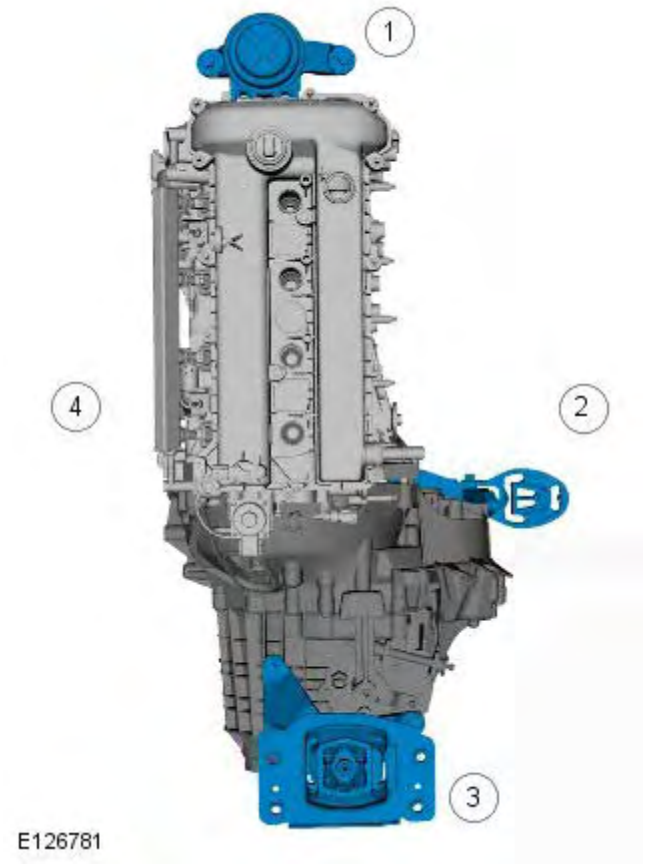
Vehicle LH and RH definition



Item	Part Number	Description
1	-	LH
2	-	RH

All LH and RH references to the engine are taken from a position at the flywheel looking towards the crankshaft front pulley.

Powertrain LH and RH definition



Item		Description
1		front
2		right
3		rear
4		left

How to use Repair Procedures

This manual has been written in a format that is designed to meet the needs of technicians worldwide. It provides general descriptions for accomplishing repair work with tested and effective techniques.

Important Safety Instructions

Appropriate service methods and correct repair procedures are essential for the safe, reliable operation of all motor vehicles as well as the personal safety of the individual carrying out the work.

Anyone who departs from the instructions provided in this manual must first establish that personal safety or vehicle integrity is not compromised by the choice of method, tools or components.

Warnings, Cautions and Notes in This Manual

WARNING: Warnings are used to indicate that failure to follow a procedure correctly may result in personal injury.

CAUTION: Cautions are used to indicate that failure to follow a procedure correctly may result in damage to the vehicle or equipment being used.

NOTE: Notes are used to provide additional essential information required to carry out a complete and satisfactory repair.

Generic warnings or cautions are in their relevant description and operation procedure within section 100-00. If the generic warnings or cautions are required for a procedure, there will be a referral to the appropriate description and operation procedure.

If a warning, caution or note only applies to one step, it is placed at the beginning of the specific step.

Trustmark Authoring Standards (TAS) Repair Procedur

NOTE: TAS style procedures can be identified by steps that have no accompanying step text and the magenta color of the electrical connectors and fasteners such as nuts, bolts, clamps or clips.

A TAS removal and installation procedure uses a sequence of color illustrations to indicate the order to be followed when removing/disassembling or installing/assembling a component.

Many of the TAS procedures will have the installation information within the removal steps. These procedures will have the following note at the beginning of the procedure:

NOTE: Removal steps in this procedure may contain installation details.

Reuse of fasteners and seals and gaskets

The following list details the general policy for the reuse of fasteners and seals and gaskets.

Types of self-locking nuts and bolts

NOTE: There are more types of self-locking fasteners available than shown in following illustration.

E126782

Item		Description
1		Completely coated self-locking bolt
2		Partially coated self-locking bolt
3		Self-locking bolt with a locking washer
4		Self-locking nut with a plastic locking insert
5		Self-locking nut with thread deformation (3 dents)
6		Self-locking nut with thread deformation (squeeze of thread to oval shape)
7		Self-locking nut with integrated locking ring

- All types of seals and gaskets must be discarded and new seals and gaskets installed unless otherwise stated within the procedure.
- Nuts and bolts with a chemical coating for locking and/or sealing and/or antiseize must be discarded unless the procedure advises to reapply the coating with a specified material.
- Nuts and bolts with a mechanical locking such as thread inserts, thread deformation or locking washers must be discarded and new nuts and bolts installed unless otherwise stated within the procedure.

- Torque to yield bolts must be discarded and new torque to yield bolts installed unless otherwise stated within the procedure, recognizable by a tightening torque with more than one stage together with a torque angle.

Specification data

Specification procedures will only contain technical data that is not already part of a repair procedure.

Sequence of tasks

If components must be removed or installed in a specific sequence, the sequence will be identified numerically in a graphic and the corresponding text will be numbered accordingly.

Special Tools, Equipment, Materials and Torque Figures

Special tools will be shown with the tool numbers in the illustration. The special tool numbers, general equipment, materials and torque figures used for the procedure step will be shown in the text column.

TAS Graphics

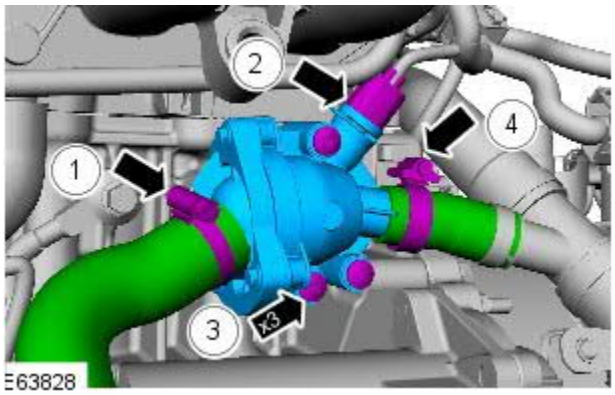
Colors used in the graphic are as follows:

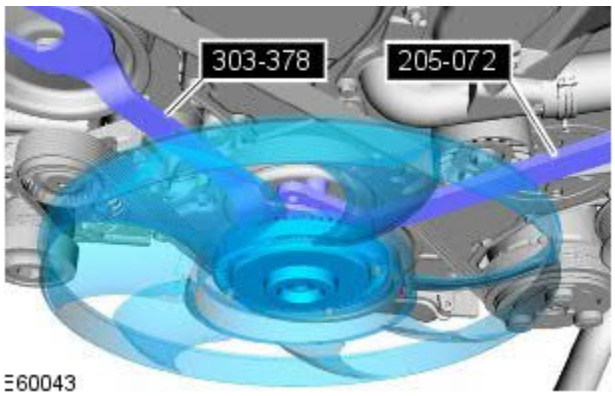
- Blue - Component to be removed/installed or disassembled/assembled.
- Green and Brown - Additional components that need to be removed/installed or disassembled/assembled prior to the target component.
- Yellow - Component that is touched or affected in a way but remains in the vehicle. It may be detached, attached, moved, modified, checked, adjusted etc.
- Magenta - Electrical connectors and fasteners such as nuts, bolts, clamps and clips.
- Pale Blue - Special tool(s) and general equipment.

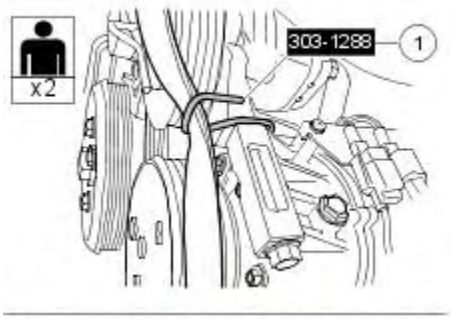
One illustration may have multiple steps assigned to it.

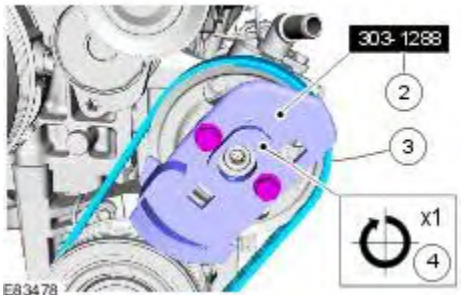
Numbered pointers are used to indicate the number of electrical connectors and fasteners such as nuts, bolts, clamps and clips.

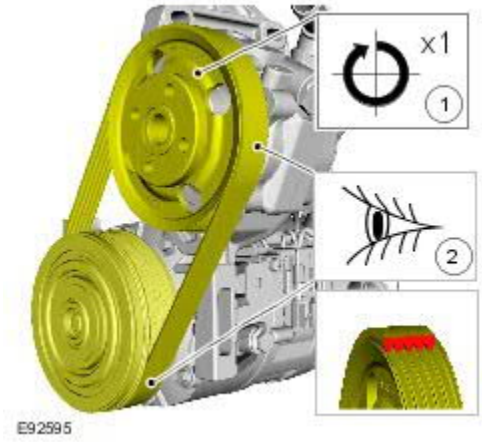
Items in the illustration can be transparent or use cutouts to show hidden details.







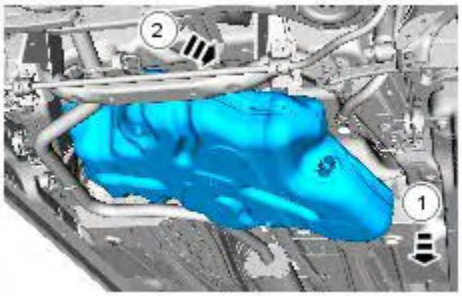




TAS Symbols

Symbols are used inside the graphics and in the text area to enhance the information display. The following paragraphs describe the various types and categories of symbols.
For additional information, refer to: Symbols Glossary (100-00 General Information, Description and Operation).

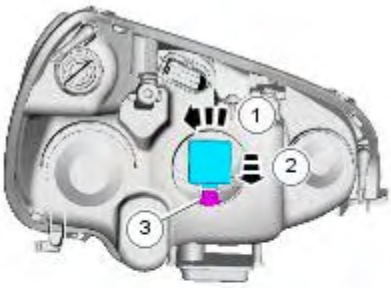
Prohibition symbols advise on prohibited actions to either avoid damage or health and safety related risks. These symbols are



4.

E85026

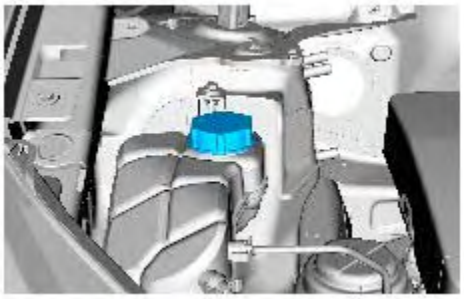
Health and Safety symbols recommend the use of particular protection equipment to avoid or at least reduce the risk or severity of possible injuries.



2.

E85027

Warning symbols are used to indicate potential risks resulting from a certain component or area.



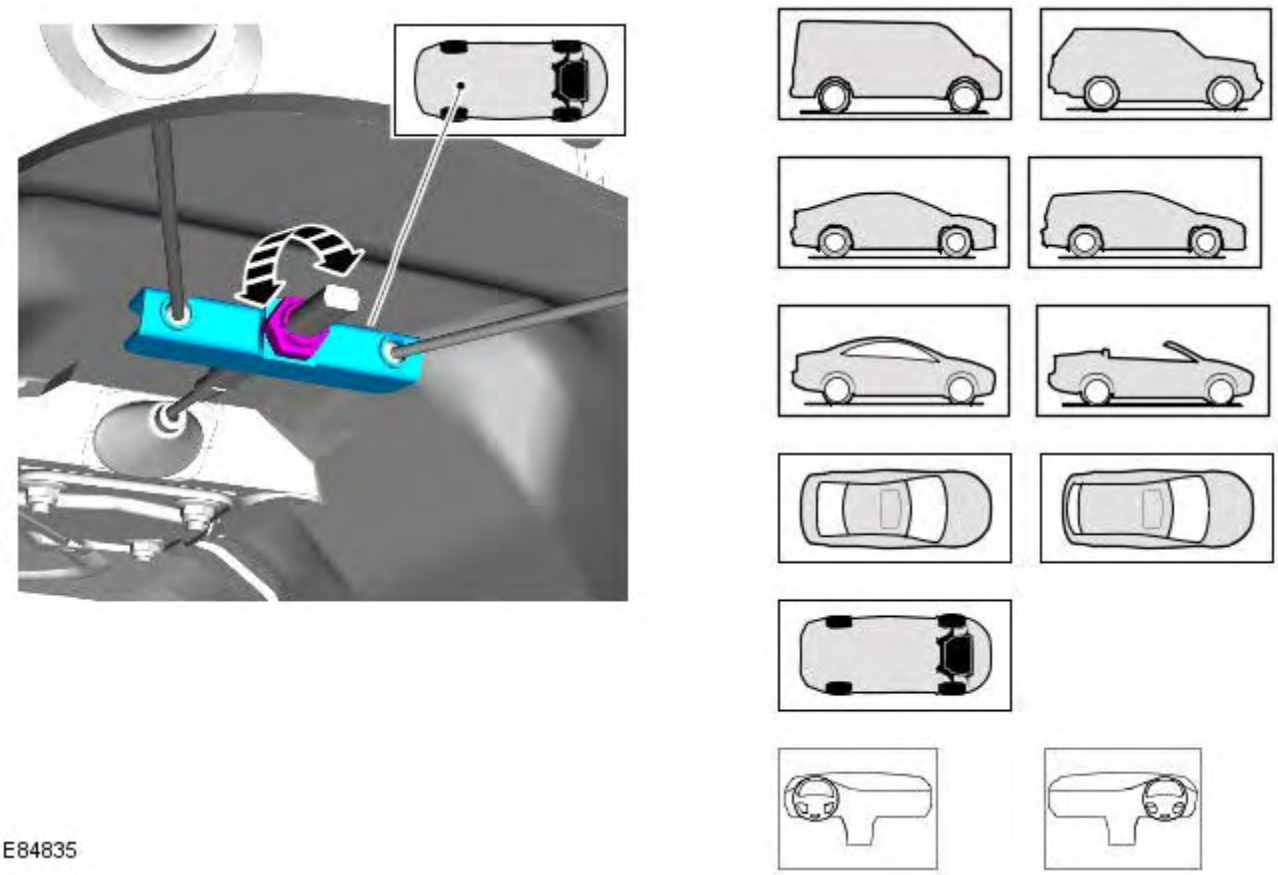
3.

E85028

Instruction symbols are used to apply sealer, lubricant, weight, tape or cleaning detergent to a component.

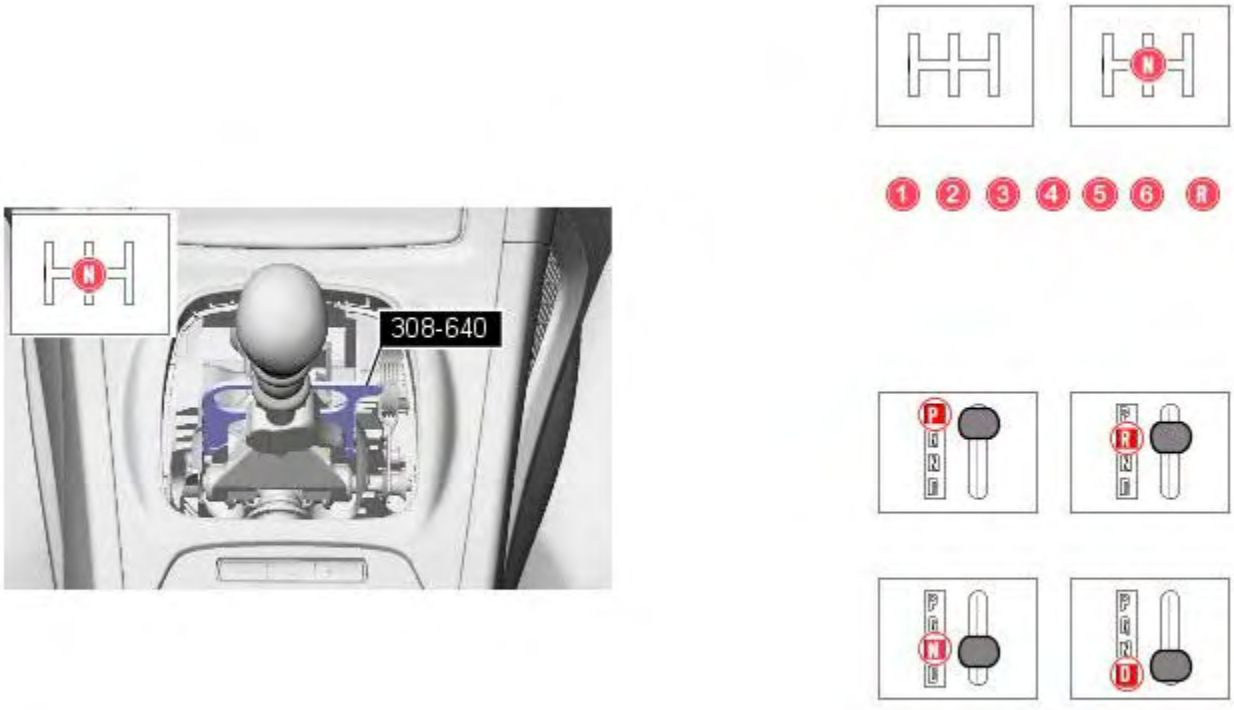
E84834

Location symbols are used to show the location of a component or system within the vehicle.



E84835

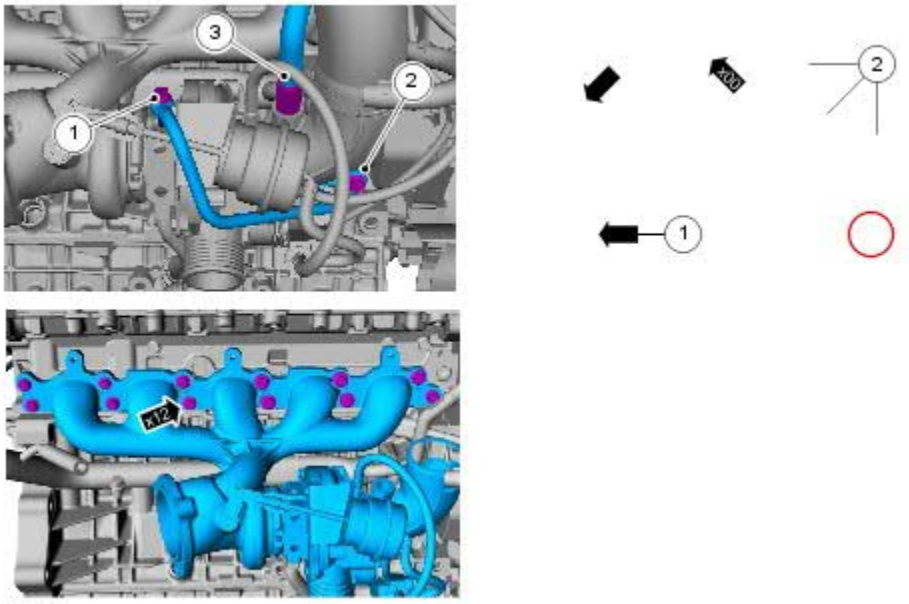
Gearshift lever or selector lever position symbols are used to show which gearshift lever or selector lever position is to be set.



E84836

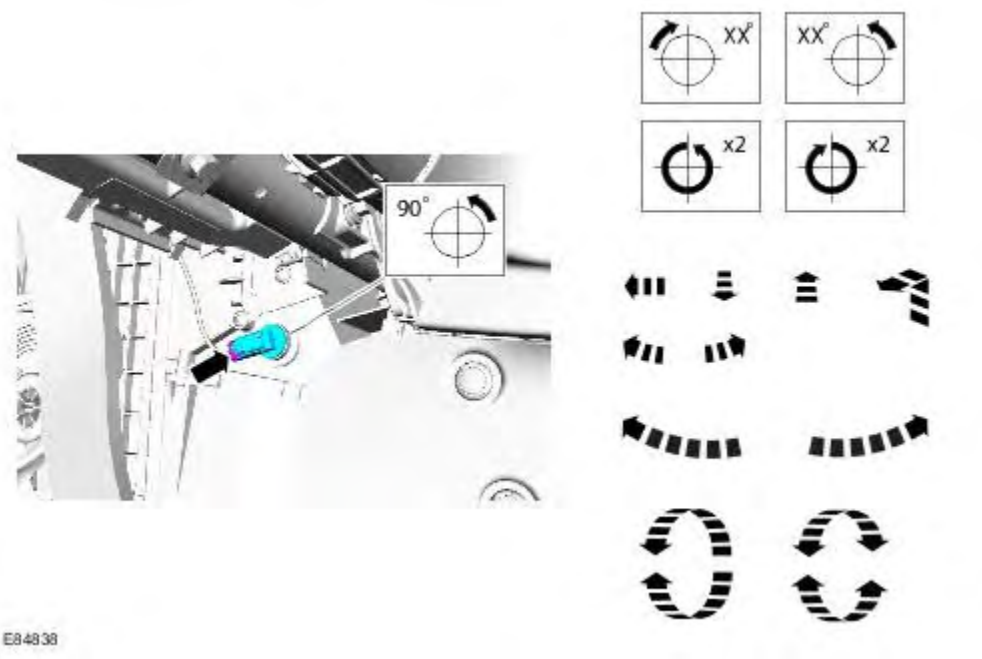
Pointer symbols are used to draw attention to components and give special instructions such as a required sequence or number of components. The number of components is reflected by the value inside the luty arrow. A sequence number is located inside

the circle. Numbers inside circles are also used to allocate special information such as tightening torques or chemicals to a particular component.



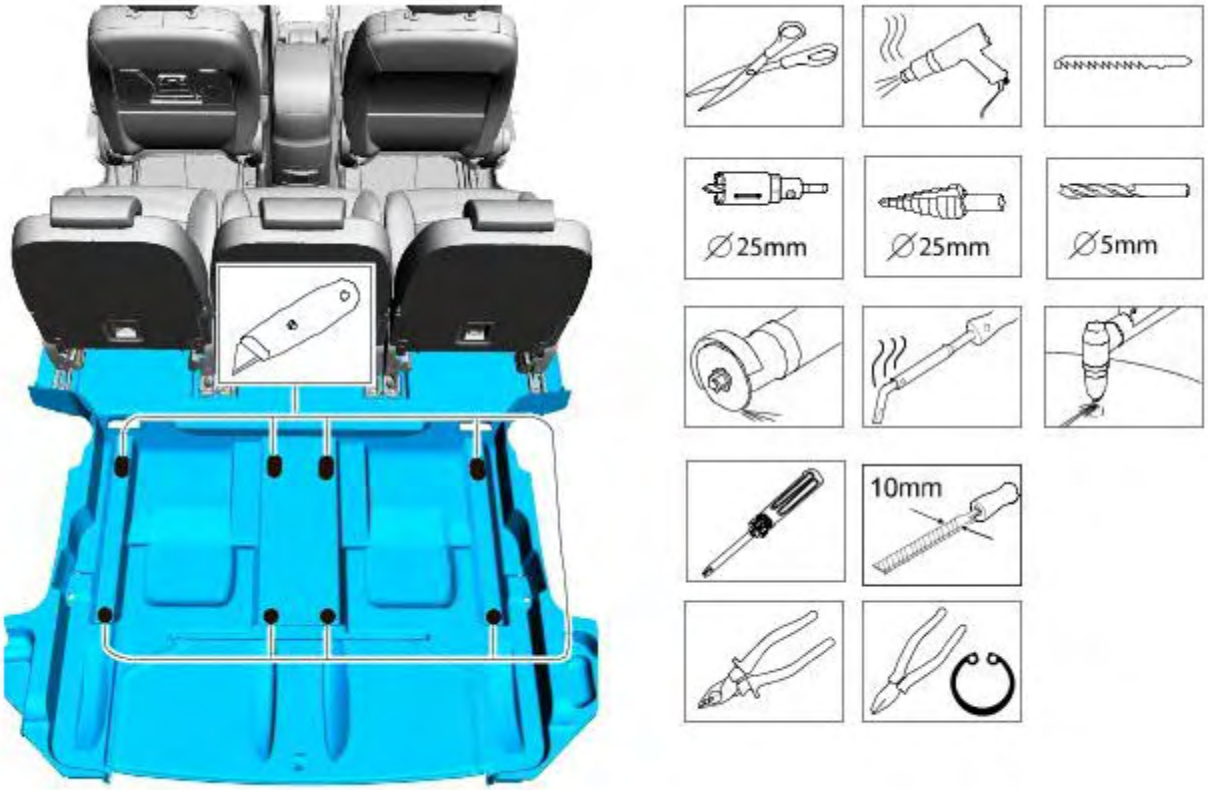
E84837

Movement arrows are used to show three dimensional or rotational movements. These movements can include specific values inside the symbol if required.



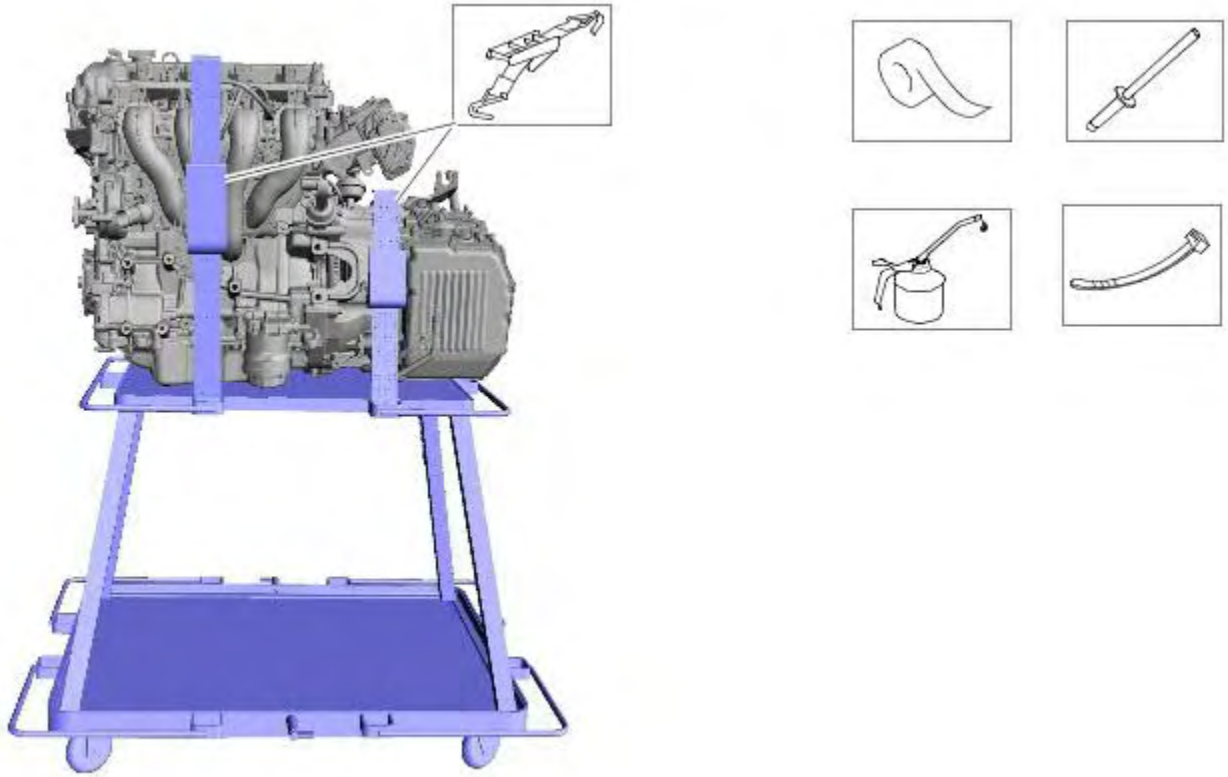
E84838

Standard tool symbols recommend the use of certain standard tools. These tools can include dimension values if required.



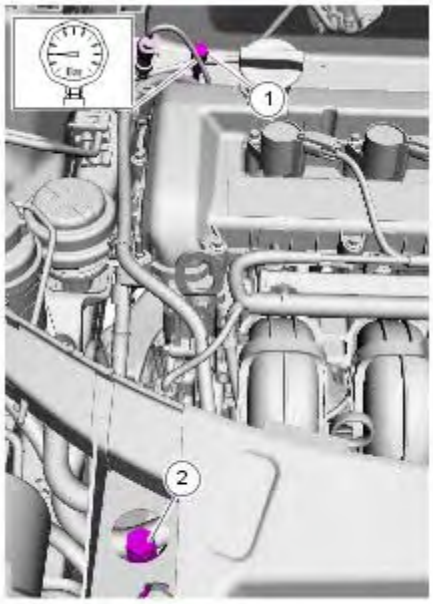
E84839

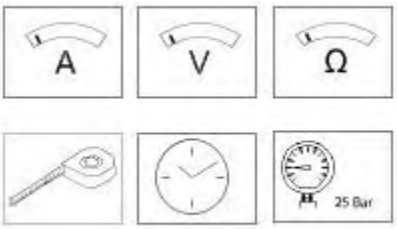
The following graphic illustrates a set of symbols that are used to provide detailed information on where to apply a material.



E84840

Measurement symbols provide detailed information on where to carry out a specific measurement. These symbols can include specific values if required.





E84841

How to use Diagnosis and Testing procedures

Inspection and Verification

Visual Inspection Charts, Symptom Charts and other information charts (such as diagnostic routines) or supplement test procedures with technical specifications will navigate the user to a specific test procedure.

Symptom Chart

The symptom chart indicates symptoms, sources and actions to address a condition.

Pinpoint Tests

For electrical systems, pinpoint test steps are used to identify the source of a concern in a logical, step-by-step manner. Pinpoint tests have two columns: CONDITIONS and DETAILS/RESULTS/ACTIONS.

The CONDITIONS column is used exclusively for graphics and icons (with or without captions) and the DETAILS/RESULTS /ACTIONS column provides direction to another test step or specific corrective actions.

The boxed numbers indicate the order in which the described action is to be carried out.

Component Tests

A component test is used when a component is tested in multiple pinpoint tests, or if a procedure is too complicated to be formatted within a single page of the pinpoint test.

Graphics

Test graphics show the measurement or test to be carried out in a test step.

A representative tester graphic is used for voltmeters and ohmmeters.

If multiple measurements are made in a single graphic, the test leads are drawn with a solid line until the test lead splits to indicate the multiple measurements, at which point dashed lines are used.

Breakout box type testers are represented by a double circle test pin. Test pins are labeled with the pin number.

Published: 11-May-2011

General Information - Application and Use of Specifications

Description and Operation

Torque Specifications

Torque specifications are shown in the torque specifications chart located at the front of the relevant section.

Published: 11-May-2011

General Information - Battery and Battery Charging Health and Safety Precautions

Description and Operation

WARNINGS:

Batteries contain sulphuric acid, avoid contact with skin, eyes or clothing. Wear safety goggles when working near the battery to protect against possible splashing of the acid solution.

EYE CONTACT: If acid comes into contact with the eyes, flush immediately with plenty of running water for a minimum of 15 minutes. Seek immediate medical attention.

SKIN CONTACT: If acid comes into contact with the skin, flush immediately with plenty of running water for a minimum of 15 minutes. Seek immediate medical attention.

SWALLOWED: If acid is swallowed, rinse the mouth with plenty of water and then drink plenty of water or milk. Do not induce vomiting. Seek immediate medical attention.

Batteries normally produce explosive gases. Do not allow naked flames, sparks or lighted substances to come near the battery.

When charging the battery shield your face and wear safety goggles. Provide adequate ventilation.

CAUTION: Boost charging with excessive current or voltage above 16 volts will damage the battery.

Published: 11-May-2011

General Information - Brake System Health and Safety Precautions

Description and Operation

WARNINGS:

EYE CONTACT: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with the eyes. Wash hands thoroughly after handling. If brake fluid comes into contact with the eyes, flush the eyes with plenty of cold running water for 15 minutes. Seek medical attention for any persistent eye irritation or abnormality.

SWALLOWED: Brake fluid contains polyglycol ethers and polyglycols. If swallowed, drink plenty of water. Seek immediate medical attention.

INHALED: Dust from friction materials can be harmful if inhaled.

Only use new specified brake fluid from airtight containers.

CAUTION: If brake fluid is spilled on the paintwork, the affected area must be immediately washed down with cold water.

Published: 20-Apr-2014

General Information - Diagnostic Trouble Code (DTC) Index DTC: Active Safety Belt Module (SPMA/SPMB)

Description and Operation

Active Safety Belt Module (SPMA/SPMB)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Active Safety Belt Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Safety Belt System (501-20A Safety Belt System, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
U1A14-00	CAN Initialization Failure - No sub type information	• Power distribution fault to control module • CAN network fault	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network. After installing a new control module, updating software or repairing a wiring harness perform an On Demand Self Test and Retract and Release Self Test using the manufacturers approved diagnostic system
U2001-68	Reduced System Function - Event information	• Seat belt retractor mechanism has exceeded the design limit for the durability	NOTE: If required, it is only necessary to install a new component on the side affected by the DTC. • Confirm the Safety belt retractor mechanism has exceeded the design limit for durability by interrogating the Active Safety Belt Module. Using the manufacturer approved diagnostic system check the Dynamic Safety belt Health Status at PID5824, if the Safety belt status is confirmed as 'not healthy' (01) install a new retractor mechanism as required. If the Safety belt status is 'healthy' (00) clear the DTC and Refer to the workshop manual section 501-20A and perform the Retract and Release Self Test using the manufacturers approved diagnostic system. Refer to the Warranty Policy and Procedures manual if a module/component is suspect

DTC	Description	Possible Causes	Action
U2101-00	Control Module Configuration Incompatible - No sub type information	• The control module is not compatible with the vehicle	• Check the vehicle configuration file to ensure the vehicle configuration is correct for the installed hardware. The Active Safety Belt Control Modules are handed (connector shell is different between LH and RH sides) and cannot be installed on another vehicle as they store VIN data. Using the manufacturer approved diagnostic system run the routine RID 0402h to clear self learnt data (except VIN). Cycle the ignition and the module should re-learn the correct configuration. clear the DTC and Refer to the workshop manual section 501-20A and perform the Retract and Release Self Test using the manufacturers approved diagnostic system. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
U3000-45	Control Module - Program memory failure	• Component internal memory failure	• Install a new control module, refer to the Warranty Policy and Procedures manual if a module/component is suspect. After installing a new control module, updating software or repairing a wiring harness perform an On Demand Self Test and Retract and Release Self Test using the manufacturers approved diagnostic system
U3000-49	Control Module - Internal electronic failure	• Component internal electronic failure	• Install a new control module, refer to the Warranty Policy and Procedures manual if a module/component is suspect. After installing a new control module, updating software or repairing a wiring harness perform an On Demand Self Test and Retract and Release Self Test using the manufacturers approved diagnostic system
U3000-4B	Control Module - Over temperature	• Belt retraction motor has exceeded the design operating temperature	• During 'aggressive' cornering or braking the belt mechanism will operate to ensure the occupant is correctly positioned in the seat. This DTC is set when the belt retraction motor has exceeded the temperature threshold and functionality is inhibited until the motor has cooled. Allow the motor to cool and then clear the DTC. If the DTC resets refer to the Warranty Policy and Procedures manual if a module/component is suspect. After installing a new control module, updating software or repairing a wiring harness perform an On Demand Self Test and Retract and Release Self Test using the manufacturers approved diagnostic system
U3002-81	Vehicle Identification Number - Invalid serial data received	• Vehicle identification number not stored • New module configuration routine not completed	• Using the manufacturer approved diagnostic system carry out the new module configuration routine
U3003-62	Battery Voltage - Signal compare failure	• Power distribution fault to control module • CAN network fault	• This DTC is set when the control module registers a difference of more than 2 volts between the CAN reference battery voltage and the module supply voltage. Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network. After installing a new control module, updating software or repairing a wiring harness perform an On Demand Self Test and Retract and Release Self Test using the manufacturers approved diagnostic system
U3006-16	Control Module Input Power "A" - Circuit voltage below threshold	• Vehicle battery discharged • Power distribution fault to control module causing volt drop on supply circuits • Internal control module fault	• This DTC is set when the measured supply voltage is below 9 volts. Refer to the battery care manual and confirm vehicle battery is fully charged and serviceable. Refer to the relevant section in the workshop manual and check the charging system is performing correctly. Refer to the electrical circuit diagrams and check the power and ground connections to the module. If no faults are found suspect the control module, refer to the Warranty Policy and Procedures manual if a module/component is suspect

DTC	Description	Possible Causes	Action
U3006-17	Control Module Input Power "A" - Circuit voltage above threshold	• Vehicle charging system fault • Internal control module fault	• This DTC is set when the measured supply voltage is above 16 volts. Refer to the battery care manual and confirm vehicle battery is fully charged and serviceable. Refer to the relevant section in the workshop manual and check the charging system is performing correctly. Refer to the electrical circuit diagrams and check the power and ground connections to the module. If no faults are found suspect the control module, refer to the Warranty Policy and Procedures manual if a module/component is suspect
U0452-29	Invalid Data Received From Restraints Control Module - Signal invalid	• Supplementary Restraints System fault • Restraints Control Module fault	• Check the Restraints Control Module for related DTCs and refer to the relevant DTC index
U0452-31	Invalid Data Received From Restraints Control Module - No signal	• Supplementary Restraints System fault • Restraints Control Module fault	• Check the Restraints Control Module for related DTCs and refer to the relevant DTC index
U0415-29	Invalid Data Received From Anti-Lock Braking System (ABS) Control Module - Signal invalid	• Anti-Lock Braking System fault • Anti-Lock Braking System control module fault	• Check the Anti-Lock Braking System Control Module for related DTCs and refer to the relevant DTC index
U0415-31	Invalid Data Received From Anti-Lock Braking System (ABS) Control Module - No signal	• Anti-Lock Braking System fault • Anti-Lock Braking System control module fault	• Check the Anti-Lock Braking System Control Module for related DTCs and refer to the relevant DTC index
U0422-29	Invalid Data Received From Body Control Module - Signal invalid	• Central Junction Box system fault	• Check the Central Junction Box for related DTCs and refer to the relevant DTC index
U0422-31	Invalid Data Received From Body Control Module - No signal	• Central Junction Box system fault	• Check the Central Junction Box for related DTCs and refer to the relevant DTC index
U0423-29	Invalid Data Received From Instrument Panel Control Module - Signal invalid	• Instrument Panel Control Module system fault	• Check the Instrument Panel Control Module for related DTCs and refer to the relevant DTC index
U0423-31	Invalid Data Received From Instrument Panel Control Module - No signal	• Instrument Panel Control Module system fault	• Check the Instrument Panel Control Module for related DTCs and refer to the relevant DTC index
U0001-88	High Speed CAN Communication Bus - Bus off	• Power distribution fault to control module • CAN network fault	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network. After installing a new control module, updating software or repairing a wiring harness perform an On Demand Self Test and Retract and Release Self Test using the manufacturers approved diagnostic system
U0104-00	Lost Communication With Cruise Control Module - No sub type information	• Power distribution fault to control module • CAN network fault	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Active Safety Belt Module and Speed Control Module

DTC	Description	Possible Causes	Action
U0405-29	Invalid Data Received From Cruise Control Module - Signal invalid	• Speed control system related fault	• Check the Speed Control Module for related DTCs and refer to the relevant DTC index
U0103-00	Lost Communication With Gear Shift Control Module A - No sub type information	• Power distribution fault to control module • CAN network fault	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Active Safety Belt Module and Transmission Shift Control Module

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Adaptive Damping Module (SUMB)

Description and Operation

Adaptive Damping Module (SUMB)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Adaptive Damping Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Vehicle Dynamic Suspension (204-05 Vehicle Dynamic Suspension, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
C101D-12	Left Front vertical acceleration sensor - Short to battery	• Left Front vertical acceleration sensor circuit short to power	• Refer to the electrical circuit diagrams and check left front vertical acceleration sensor circuit for short to power or another circuit. Repair circuit, clear the DTC and retest the system
C101D-14	Left Front vertical acceleration sensor - Short to ground or open	• Left Front vertical acceleration sensor circuit short to ground, open circuit • Vertical acceleration sensor fault	• Refer to the electrical circuit diagrams and check front vertical acceleration sensor circuit for short to ground, open circuit. If no fault found on wiring suspect sensor. Replace sensor, clear DTC and retest the system
C101D-22	Left Front vertical acceleration sensor - Signal amplitude > maximum	• Left front vertical acceleration sensor insecurely mounted • Left front vertical acceleration sensor signal circuit short to another circuit • Left front vertical acceleration sensor internal fault	• With vehicle parked on a level surface, read Left Front Vertical Accelerometer voltage and check it lies in range 1.9 to 2.1 volts. If not OK then check electrical wiring for shorts, loose connections and repair as required. If wiring OK then suspect faulty sensor/incorrectly installed sensor. Check the sensor is correctly mounted, secure or replace sensor as required. Refer to the warranty policy and procedures manual if a module is suspect, clear DTC and retest system

DTC	Description	Possible Causes	Action
C101D-26	Left Front vertical acceleration sensor - Signal rate of change below threshold	• Left front vertical acceleration sensor signal circuit short to another circuit • Left front vertical acceleration sensor internal fault	• Refer to the electrical circuit diagrams and check Left Front Vertical Accelerometer signal circuit for faults, if circuit is correct suspect faulty sensor, refer to the warranty policy and procedures manual if a module is suspect. Replace the sensor, clear the DTC and retest the system
C101D-78	Left Front vertical acceleration sensor - Alignment or adjustment incorrect	• Left front vertical acceleration sensor bracket bent • Left front vertical acceleration sensor damaged	• Check Left Front Vertical Accelerometer for location and security, if correct suspect faulty Accelerometer, refer to the warranty policy and procedures manual if a module is suspect. Replace the sensor/bracket as required, clear the DTC and retest the system
C101E-12	Right Front vertical acceleration sensor - Short to battery	• Right Front vertical acceleration sensor circuit short to power	• Refer to the electrical circuit diagrams and check right front vertical acceleration sensor circuit for short to power or another circuit. Repair circuit, clear the DTC and retest the system
C101E-14	Right Front vertical acceleration sensor - Short to ground or open	• Right Front vertical acceleration sensor circuit short to ground, open circuit • Vertical acceleration sensor fault	• Refer to the electrical circuit diagrams and check right front vertical acceleration sensor circuit for short to ground, open circuit. If no fault found on wiring suspect sensor. Replace sensor, clear DTC and retest the system
C101E-22	Right Front vertical acceleration sensor - Signal amplitude > maximum	• Right front vertical acceleration sensor insecurely mounted • Right front vertical acceleration sensor signal circuit short to another circuit • Right front vertical acceleration sensor internal fault	• With vehicle parked on a level surface, read Right Front Vertical Accelerometer voltage and check it lies in range 1.9 to 2.1 volts. If not OK then check electrical wiring for shorts, loose connections and repair as required. If wiring OK then suspect faulty sensor/incorrectly installed sensor. Check the sensor is correctly mounted, secure or replace sensor as required. refer to the warranty policy and procedures manual if a module is suspect, clear DTC and retest system
C101E-26	Right Front vertical acceleration sensor - Signal rate of change below threshold	• Right front vertical acceleration sensor signal circuit short to another circuit • Right front vertical acceleration sensor internal fault	• Refer to the electrical circuit diagrams and check Right Front Vertical Accelerometer signal circuit for faults, if circuit is correct suspect faulty sensor, refer to the warranty policy and procedures manual if a module is suspect. Replace the sensor, clear the DTC and retest the system
C101E-78	Right Front vertical acceleration sensor - Alignment or adjustment incorrect	• Right front vertical acceleration sensor bracket bent • Right front vertical acceleration sensor damaged	• Check Right Front Vertical Accelerometer for location and security, if correct suspect faulty Accelerometer, refer to the warranty policy and procedures manual if a module is suspect. Replace the sensor/bracket as required, clear the DTC and retest the system
C1024-00	System Temporarily Disabled Due To Power Interruption During Driving - No sub type information	• Loss of power to control module whilst driving	• Refer to the electrical circuit diagrams and check power and ground circuits to Adaptive Damping Control Module for intermittent or poor connection. Repair wiring circuits as required, clear DTC and retest the system
C102C-12	Right Rear vertical acceleration sensor - Short to battery	• Right Rear vertical acceleration sensor circuit short to power	• Refer to the electrical circuit diagrams and check Right Rear vertical acceleration sensor circuit for short to power or another circuit. Repair circuit, clear the DTC and retest the system
C102C-14	Right Rear vertical acceleration sensor - Short to ground or open	• Right Rear vertical acceleration sensor circuit short to ground, open circuit	• Refer to the electrical circuit diagrams and check Right Rear vertical acceleration sensor circuit for short to ground, open circuit. If no fault found on wiring suspect sensor. Replace sensor, clear DTC and retest the system

DTC	Description	Possible Causes	Action
		• Vertical acceleration sensor fault	
C102C-22	Right Rear vertical acceleration sensor - Signal amplitude > maximum	• Right Rear vertical acceleration sensor insecurely mounted • Right Rear vertical acceleration sensor signal circuit short to another circuit • Right Rear vertical acceleration sensor internal fault	• With vehicle parked on a level surface, read Right Rear Vertical Accelerometer voltage and check it lies in range 1.9 to 2.1 volts. If not OK then check electrical wiring for shorts, loose connections and repair as required. If wiring OK then suspect faulty sensor/incorrectly installed sensor. Check the sensor is correctly mounted, secure or replace sensor as required. refer to the warranty policy and procedures manual if a module is suspect, clear DTC and retest system
C102C-26	Right Rear vertical acceleration sensor - Signal rate of change below threshold	• Right Rear vertical acceleration sensor signal circuit short to another circuit • Right Rear vertical acceleration sensor internal fault	• Refer to the electrical circuit diagrams and check Right Rear Vertical Accelerometer signal circuit for faults, if circuit is correct suspect faulty sensor, refer to the warranty policy and procedures manual if a module is suspect. Replace the sensor, clear the DTC and retest the system
C102C-78	Right Rear vertical acceleration sensor - Alignment or adjustment incorrect	• Right Rear vertical acceleration sensor bracket bent • Right Rear vertical acceleration sensor damaged	• Check Right Rear Vertical Accelerometer for location and security, if correct suspect faulty Accelerometer, refer to the warranty policy and procedures manual if a module is suspect. Replace the sensor/bracket as required, clear the DTC and retest the system
C1030-12	Left Rear vertical acceleration sensor - Short to battery	• Left Rear vertical acceleration sensor circuit short to power	• Refer to the electrical circuit diagrams and check left Rear vertical acceleration sensor circuit for short to power or another circuit. Repair circuit, clear the DTC and retest the system
C1030-14	Left Rear vertical acceleration sensor - Short to ground or open	• Left rear vertical acceleration sensor circuit short to ground, open circuit • Vertical acceleration sensor fault	• Refer to the electrical circuit diagrams and check left Rear vertical acceleration sensor circuit for short to ground, open circuit. If no fault found on wiring suspect sensor. Replace sensor, clear DTC and retest the system
C1030-22	Left Rear vertical acceleration sensor - Signal amplitude > maximum	• Left Rear vertical acceleration sensor insecurely mounted • Left Rear vertical acceleration sensor signal circuit short to another circuit • Left Rear vertical acceleration sensor internal fault	• With vehicle parked on a level surface, read Left Rear Vertical Accelerometer voltage and check it lies in range 1.9 to 2.1 volts. If not OK then check electrical wiring for shorts, loose connections and repair as required. If wiring OK then suspect faulty sensor/incorrectly installed sensor. Check the sensor is correctly mounted, secure or replace sensor as required. Refer to the warranty policy and procedures manual if a module is suspect, clear DTC and retest system
C1030-26	Left Rear vertical acceleration sensor - Signal rate of change below threshold	• Left Rear vertical acceleration sensor signal circuit short to another circuit • Left Rear vertical acceleration sensor internal fault	• Refer to the electrical circuit diagrams and check Left Rear Vertical Accelerometer signal circuit for faults, if circuit is correct suspect faulty sensor, refer to the warranty policy and procedures manual if a module is suspect. Replace the sensor, clear the DTC and retest the system
C1030-78	Left Rear vertical acceleration sensor - Alignment or adjustment incorrect	• Left Rear vertical acceleration sensor bracket bent • Left Rear vertical acceleration sensor damaged	• Check Left Rear Vertical Accelerometer for location and security, if correct suspect faulty Accelerometer, refer to the warranty policy and procedures manual if a module is suspect. Replace the sensor/bracket as required, clear the DTC and retest the system
C1A03-12	Left Front Height Sensor - Circuit short to battery	• Height sensor circuit shorted to another cable	• Refer to the electrical circuit diagrams and check Front Left Height Sensor circuit for short to power, If circuit correct suspect Sensor internal fault, replace as required

DTC	Description	Possible Causes	Action
		• Height sensor internal fault	
C1A03-14	Left Front Height Sensor - Circuit short to ground or open	• Wiring to sensor (signal) open circuit • Wiring to height sensor partial short to ground • Wiring to height sensor short to other cable • Height sensor internal electrical fault	• Disconnect electrical connector to height sensor and inspect connector pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. • Voltage to sensor ground connection should be ~0v • Voltage to sensor signal connection should be ~0v • Voltage to sensor supply connection should be ~5v All voltages should be within ± 0.15v
C1A03-21	Left Front Height Sensor - Signal amplitude < minimum	• Height sensor linkage not connected • Height sensor or bracket loose • Height sensor bracket bent • Incorrect height calibration • Height sensor linkage toggled • Height sensor water ingress • Wiring to height sensor partial short to ground • Wiring to height sensor short to other cable • Height sensor electrical fault • Height sensor linkage bent • Incorrect height sensor installed	• Inspect for damage or loose fixings. NOTE If any height sensor fixings were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Confirm that the correct height sensor part number is installed, as specified in the service parts database. To check height sensor: Disconnect electrical connector to height sensor and inspect connecter pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. • Voltage to sensor ground connection should be ~0v • Voltage to sensor signal connection should be ~0v • Voltage to sensor supply connection should be ~5v All voltages should be within ± 0.15v. To check sensor operation on the vehicle: Check for water ingress around the height sensors, electrical connectors or shaft end. Check for excessive movement in the shaft in all directions. Raise vehicle (ideally on wheels-free ramp) until suspension on corner under investigation is at rebound to gain access to height sensor. Access may be improved by removing road wheel. Carefully disconnect the height sensor link from the upper suspension arm. Monitor the height sensor signal voltage output for the height sensor under investigation. Position the sensor arm so it is in the mid position and confirm that the voltage is around 2.5 volts. Move the sensor arm over the range ±40° around the mid position and confirm that the voltage changes smoothly between around 0.2 volts and 4.8 volts. If voltages are incorrect or do not change smoothly then replace sensor. NOTE: For angles of movement beyond ±40°, the sensor signal will clamp to a voltage of ~0.15v or ~4.85v, depending on position of sensor lever. This is normal. When investigation is complete, refit height sensor link to upper arm. If any fixings to the height sensor body or mounting bracket were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Refer to the relevant section of the workshop manual for the calibration procedure
C1A03-22	Left Front Height Sensor - Signal amplitude > maximum	• Height sensor linkage not connected • Height sensor or bracket loose • Height sensor bracket bent • Incorrect height calibration • Height sensor linkage toggled • Height sensor water ingress • Wiring to height sensor partial short to ground • Wiring to height	• Inspect for damage or loose fixings. NOTE If any height sensor fixings were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Confirm that the correct height sensor part number is installed, as specified in the service parts database. To check height sensor: Disconnect electrical connector to height sensor and inspect connecter pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. • Voltage to sensor ground connection should be ~0v • Voltage to sensor signal

DTC	Description	Possible Causes	Action
		sensor short to other cable • Height sensor electrical fault • Height sensor linkage bent • Incorrect height sensor installed	connection should be ~0v • Voltage to sensor supply connection should be ~5v All voltages should be within ± 0.15v. To check sensor operation on the vehicle: Check for water ingress around the height sensors, electrical connectors or shaft end. Check for excessive movement in the shaft in all directions. Raise vehicle (ideally on wheels-free ramp) until suspension on corner under investigation is at rebound to gain access to height sensor. Access may be improved by removing road wheel. Carefully disconnect the height sensor link from the upper suspension arm. Monitor the height sensor signal voltage output for the height sensor under investigation. Position the sensor arm so it is in the mid position and confirm that the voltage is around 2.5 volts. Move the sensor arm over the range ±40° around the mid position and confirm that the voltage changes smoothly between around 0.2 volts and 4.8 volts. If voltages are incorrect or do not change smoothly then replace sensor. NOTE: For angles of movement beyond ±40°, the sensor signal will clamp to a voltage of ~0.15v or ~4.85v, depending on position of sensor lever. This is normal. When investigation is complete, refit height sensor link to upper arm. If any fixings to the height sensor body or mounting bracket were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Refer to the relevant section of the workshop manual for the calibration procedure
C1A03-76	Left Front Height Sensor - Wrong mounting position	• Incorrect height calibration	• Refer to the workshop manual and perform the height sensor calibration procedure. Clear the DTC and retest the system
C1A03-78	Left Front Height Sensor - Alignment or adjustment incorrect	• Incorrect height calibration	• Refer to the workshop manual and perform the height sensor calibration procedure. Clear the DTC and retest the system
C1A04-12	Right Front Height Sensor - Circuit short to power	• Height sensor circuit shorted to another cable • Height sensor internal fault	• Refer to the electrical circuit diagrams and check Front Right Height Sensor circuit for short to power, If circuit correct suspect Sensor internal fault, replace as required
C1A04-14	Right Front Height Sensor - Circuit short to ground or open	• Wiring to sensor (signal) open circuit • Wiring to height sensor partial short to ground • Wiring to height sensor short to other cable • Height sensor internal electrical fault	• Disconnect electrical connector to height sensor and inspect connector pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. • Voltage to sensor ground connection should be ~0v • Voltage to sensor signal connection should be ~0v • Voltage to sensor supply connection should be ~5v All voltages should be within ± 0.15v
C1A04-21	Right Front Height Sensor - Signal amplitude < minimum	• Height sensor linkage not connected • Height sensor or bracket loose • Height sensor bracket bent • Incorrect height calibration • Height sensor linkage toggled • Height sensor water ingress • Wiring to height sensor partial short to ground • Wiring to height sensor short to other cable • Height sensor	• Inspect for damage or loose fixings. NOTE If any height sensor fixings were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Confirm that the correct height sensor part number is installed, as specified in the service parts database. To check height sensor: Disconnect electrical connector to height sensor and inspect connecter pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. • Voltage to sensor ground connection should be ~0v • Voltage to sensor signal connection should be ~0v • Voltage to sensor supply connection should be ~5v All voltages should be within ± 0.15v. To check sensor operation on the vehicle: Check for

DTC	Description	Possible Causes	Action
		electrical fault • Height sensor linkage bent • Incorrect height sensor installed	water ingress around the height sensors, electrical connectors or shaft end. Check for excessive movement in the shaft in all directions. Raise vehicle (ideally on wheels-free ramp) until suspension on corner under investigation is at rebound to gain access to height sensor. Access may be improved by removing road wheel. Carefully disconnect the height sensor link from the upper suspension arm. Monitor the height sensor signal voltage output for the height sensor under investigation. Position the sensor arm so it is in the mid position and confirm that the voltage is around 2.5 volts. Move the sensor arm over the range ±40° around the mid position and confirm that the voltage changes smoothly between around 0.2 volts and 4.8 volts. If voltages are incorrect or do not change smoothly then replace sensor. NOTE: For angles of movement beyond ±40°, the sensor signal will clamp to a voltage of ~0.15v or ~4.85v, depending on position of sensor lever. This is normal. When investigation is complete, refit height sensor link to upper arm. If any fixings to the height sensor body or mounting bracket were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Refer to the relevant section of the workshop manual for the calibration procedure
C1A04-22	Right Front Height Sensor - Signal amplitude > maximum	• Height sensor linkage not connected • Height sensor or bracket loose • Height sensor bracket bent • Incorrect height calibration • Height sensor linkage toggled • Height sensor water ingress • Wiring to height sensor partial short to ground • Wiring to height sensor short to other cable • Height sensor electrical fault • Height sensor linkage bent • Incorrect height sensor installed	• Inspect for damage or loose fixings. NOTE If any height sensor fixings were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Confirm that the correct height sensor part number is installed, as specified in the service parts database. To check height sensor: Disconnect electrical connector to height sensor and inspect connecter pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. • Voltage to sensor ground connection should be ~0v • Voltage to sensor signal connection should be ~0v • Voltage to sensor supply connection should be ~5v All voltages should be within ± 0.15v. To check sensor operation on the vehicle: Check for water ingress around the height sensors, electrical connectors or shaft end. Check for excessive movement in the shaft in all directions. Raise vehicle (ideally on wheels-free ramp) until suspension on corner under investigation is at rebound to gain access to height sensor. Access may be improved by removing road wheel. Carefully disconnect the height sensor link from the upper suspension arm. Monitor the height sensor signal voltage output for the height sensor under investigation. Position the sensor arm so it is in the mid position and confirm that the voltage is around 2.5 volts. Move the sensor arm over the range ±40° around the mid position and confirm that the voltage changes smoothly between around 0.2 volts and 4.8 volts. If voltages are incorrect or do not change smoothly then replace sensor. NOTE: For angles of movement beyond ±40°, the sensor signal will clamp to a voltage of ~0.15v or ~4.85v, depending on position of sensor lever. This is normal. When investigation is complete, refit height sensor link to upper arm. If any fixings to the height sensor body or mounting bracket were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Refer to the relevant section of the workshop manual for the calibration procedure
C1A04-76	Right Front Height Sensor - Wrong mounting position	• Incorrect height calibration	• Refer to the workshop manual and perform the height sensor calibration procedure. Clear the DTC and retest the system
C1A04-78	Right Front Height Sensor - Alignment or adjustment incorrect	• Incorrect height calibration	• Refer to the workshop manual and perform the height sensor calibration procedure. Clear the DTC and retest the system

DTC	Description	Possible Causes	Action
C1A05-12	Left Rear Height Sensor - Circuit short to battery	• Height sensor circuit shorted to another cable • Height sensor internal fault	• Refer to the electrical circuit diagrams and check Rear Left Height Sensor circuit for short to power, If circuit correct suspect Sensor internal fault, replace as required
C1A05-14	Left Rear Height Sensor - Circuit short to ground or open	• Wiring to sensor (signal) open circuit • Wiring to height sensor partial short to ground • Wiring to height sensor short to other cable • Height sensor internal electrical fault	• Disconnect electrical connector to height sensor and inspect connector pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. • Voltage to sensor ground connection should be ~0v • Voltage to sensor signal connection should be ~0v • Voltage to sensor supply connection should be ~5v All voltages should be within ± 0.15v
C1A05-21	Left Rear Height Sensor - Signal amplitude < minimum	• Height sensor linkage not connected • Height sensor or bracket loose • Height sensor bracket bent • Incorrect height calibration • Height sensor linkage toggled • Height sensor water ingress • Wiring to height sensor partial short to ground • Wiring to height sensor short to other cable • Height sensor electrical fault • Height sensor linkage bent • Incorrect height sensor installed	• Inspect for damage or loose fixings. NOTE If any height sensor fixings were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Confirm that the correct height sensor part number is installed, as specified in the service parts database. To check height sensor: Disconnect electrical connector to height sensor and inspect connecter pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. • Voltage to sensor ground connection should be ~0v • Voltage to sensor signal connection should be ~0v • Voltage to sensor supply connection should be ~5v All voltages should be within ± 0.15v. To check sensor operation on the vehicle: Check for water ingress around the height sensors, electrical connectors or shaft end. Check for excessive movement in the shaft in all directions. Raise vehicle (ideally on wheels-free ramp) until suspension on corner under investigation is at rebound to gain access to height sensor. Access may be improved by removing road wheel. Carefully disconnect the height sensor link from the upper suspension arm. Monitor the height sensor signal voltage output for the height sensor under investigation. Position the sensor arm so it is in the mid position and confirm that the voltage is around 2.5 volts. Move the sensor arm over the range ±40° around the mid position and confirm that the voltage changes smoothly between around 0.2 volts and 4.8 volts. If voltages are incorrect or do not change smoothly then replace sensor. NOTE: For angles of movement beyond ±40°, the sensor signal will clamp to a voltage of ~0.15v or ~4.85v, depending on position of sensor lever. This is normal. When investigation is complete, refit height sensor link to upper arm. If any fixings to the height sensor body or mounting bracket were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Refer to the relevant section of the workshop manual for the calibration procedure
C1A05-22	Left Rear Height Sensor - Signal amplitude > maximum	• Height sensor linkage not connected • Height sensor or bracket loose • Height sensor bracket bent • Incorrect height calibration • Height sensor linkage toggled • Height sensor water ingress	• Inspect for damage or loose fixings. NOTE If any height sensor fixings were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Confirm that the correct height sensor part number is installed, as specified in the service parts database. To check height sensor: Disconnect electrical connector to height sensor and inspect connecter pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect

DTC	Description	Possible Causes	Action
		• Wiring to height sensor partial short to ground • Wiring to height sensor short to other cable • Height sensor electrical fault • Height sensor linkage bent • Incorrect height sensor installed	electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. • Voltage to sensor ground connection should be ~0v • Voltage to sensor signal connection should be ~0v • Voltage to sensor supply connection should be ~5v All voltages should be within ± 0.15v. To check sensor operation on the vehicle: Check for water ingress around the height sensors, electrical connectors or shaft end. Check for excessive movement in the shaft in all directions. Raise vehicle (ideally on wheels-free ramp) until suspension on corner under investigation is at rebound to gain access to height sensor. Access may be improved by removing road wheel. Carefully disconnect the height sensor link from the upper suspension arm. Monitor the height sensor signal voltage output for the height sensor under investigation. Position the sensor arm so it is in the mid position and confirm that the voltage is around 2.5 volts. Move the sensor arm over the range ±40° around the mid position and confirm that the voltage changes smoothly between around 0.2 volts and 4.8 volts. If voltages are incorrect or do not change smoothly then replace sensor. NOTE: For angles of movement beyond ±40°, the sensor signal will clamp to a voltage of ~0.15v or ~4.85v, depending on position of sensor lever. This is normal. When investigation is complete, refit height sensor link to upper arm. If any fixings to the height sensor body or mounting bracket were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Refer to the relevant section of the workshop manual for the calibration procedure
C1A05-76	Left Rear Height Sensor - Wrong mounting position	• Incorrect height calibration	• Refer to the workshop manual and perform the height sensor calibration procedure. Clear the DTC and retest the system
C1A05-78	Left Rear Height Sensor - Alignment or adjustment incorrect	• Incorrect height calibration	• Refer to the workshop manual and perform the height sensor calibration procedure. Clear the DTC and retest the system
C1A06-12	Right Rear Height Sensor - Circuit short to battery	• Height sensor circuit shorted to another cable • Height sensor internal fault	• Refer to the electrical circuit diagrams and check Rear Right Height Sensor circuit for short to power, If circuit correct suspect Sensor internal fault, replace as required
C1A06-14	Right Rear Height Sensor - Circuit short to ground or open	• Wiring to sensor (signal) open circuit • Wiring to height sensor partial short to ground • Wiring to height sensor short to other cable • Height sensor internal electrical fault	• Disconnect electrical connector to height sensor and inspect connector pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. • Voltage to sensor ground connection should be ~0v • Voltage to sensor signal connection should be ~0v • Voltage to sensor supply connection should be ~5v All voltages should be within ± 0.15v
C1A06-21	Right Rear Height Sensor - Signal amplitude < minimum	• Height sensor linkage not connected • Height sensor or bracket loose • Height sensor bracket bent • Incorrect height calibration • Height sensor linkage toggled • Height sensor water ingress • Wiring to height sensor partial short to ground	• Inspect for damage or loose fixings. NOTE If any height sensor fixings were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Confirm that the correct height sensor part number is installed, as specified in the service parts database. To check height sensor: Disconnect electrical connector to height sensor and inspect connecter pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. • Voltage to sensor

DTC	Description	Possible Causes	Action
		• Wiring to height sensor short to other cable • Height sensor electrical fault • Height sensor linkage bent • Incorrect height sensor installed	ground connection should be ~0v • Voltage to sensor signal connection should be ~0v • Voltage to sensor supply connection should be ~5v All voltages should be within ± 0.15v. To check sensor operation on the vehicle: Check for water ingress around the height sensors, electrical connectors or shaft end. Check for excessive movement in the shaft in all directions. Raise vehicle (ideally on wheels-free ramp) until suspension on corner under investigation is at rebound to gain access to height sensor. Access may be improved by removing road wheel. Carefully disconnect the height sensor link from the upper suspension arm. Monitor the height sensor signal voltage output for the height sensor under investigation. Position the sensor arm so it is in the mid position and confirm that the voltage is around 2.5 volts. Move the sensor arm over the range ±40° around the mid position and confirm that the voltage changes smoothly between around 0.2 volts and 4.8 volts. If voltages are incorrect or do not change smoothly then replace sensor. NOTE: For angles of movement beyond ±40°, the sensor signal will clamp to a voltage of ~0.15v or ~4.85v, depending on position of sensor lever. This is normal. When investigation is complete, refit height sensor link to upper arm. If any fixings to the height sensor body or mounting bracket were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Refer to the relevant section of the workshop manual for the calibration procedure
C1A06-22	Right Rear Height Sensor - Signal amplitude > maximum	• Height sensor linkage not connected • Height sensor or bracket loose • Height sensor bracket bent • Incorrect height calibration • Height sensor linkage toggled • Height sensor water ingress • Wiring to height sensor partial short to ground • Wiring to height sensor short to other cable • Height sensor electrical fault • Height sensor linkage bent • Incorrect height sensor installed	• Inspect for damage or loose fixings. NOTE If any height sensor fixings were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Confirm that the correct height sensor part number is installed, as specified in the service parts database. To check height sensor: Disconnect electrical connector to height sensor and inspect connecter pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. • Voltage to sensor ground connection should be ~0v • Voltage to sensor signal connection should be ~0v • Voltage to sensor supply connection should be ~5v All voltages should be within ± 0.15v. To check sensor operation on the vehicle: Check for water ingress around the height sensors, electrical connectors or shaft end. Check for excessive movement in the shaft in all directions. Raise vehicle (ideally on wheels-free ramp) until suspension on corner under investigation is at rebound to gain access to height sensor. Access may be improved by removing road wheel. Carefully disconnect the height sensor link from the upper suspension arm. Monitor the height sensor signal voltage output for the height sensor under investigation. Position the sensor arm so it is in the mid position and confirm that the voltage is around 2.5 volts. Move the sensor arm over the range ±40° around the mid position and confirm that the voltage changes smoothly between around 0.2 volts and 4.8 volts. If voltages are incorrect or do not change smoothly then replace sensor. NOTE: For angles of movement beyond ±40°, the sensor signal will clamp to a voltage of ~0.15v or ~4.85v, depending on position of sensor lever. This is normal. When investigation is complete, refit height sensor link to upper arm. If any fixings to the height sensor body or mounting bracket were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Refer to the relevant section of the workshop manual for the calibration procedure
C1A06-76	Right Rear Height Sensor - Wrong mounting position	• Incorrect height calibration	• Refer to the workshop manual and perform the height sensor calibration procedure. Clear the DTC and retest the system

DTC	Description	Possible Causes	Action
C1A06-78	Right Rear Height Sensor - Alignment or adjustment incorrect	• Incorrect height calibration	• Refer to the workshop manual and perform the height sensor calibration procedure. Clear the DTC and retest the system
C110C-01	Left Front Damper Solenoid - General electrical failure	• Left front damper solenoid circuit fault	• Refer to the electrical circuit diagrams and check Front Left damper solenoid circuit for faults, If no faults are evident suspect a faulty control module, refer to the warranty policy and procedures manual if a module is suspect
C110C-14	Left Front Damper Solenoid - Short to ground or open	• Front Left Damper Solenoid circuit - short to ground, open circuit or high circuit Resistance • Front Left Damper Solenoid Failure	• Refer to the electrical circuit diagrams and check Front Left Damper Solenoid circuit for short to ground or open circuit. Check for corrosion, backed out terminals and poor crimping of terminals
C110C-18	Left Front Damper Solenoid - Circuit current below threshold	• Front Left Damper Actuator open circuit at startup	• Refer to the electrical circuit diagrams and check Front Left Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C110C-19	Left Front Damper Solenoid - Circuit current above threshold	• Front Left Damper Solenoid circuit current above threshold	• Refer to the electrical circuit diagrams and check Front Left Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C110C-1D	Left Front Damper Solenoid - Circuit current out of range	• Front Left Damper Solenoid circuit - short to ground/power, open circuit • Front Left Damper Solenoid failure	• Refer to the electrical circuit diagrams and check Front Left Damper Solenoid circuit for short to ground, power or open circuit. Check and install a new Front Left Shock Actuator as required refer to the warranty policy and procedures manual if a module is suspect
C110C-64	Left Front Damper Solenoid - Signal plausibility failure	• Front Left Damper Solenoid Measured Current control loop failed • Front Left Damper Solenoid open circuit	• Refer to the electrical circuit diagrams and check Front Left Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C110D-01	Right Front Damper Solenoid - General electrical failure	• Right front damper solenoid circuit fault	• Refer to the electrical circuit diagrams and check Front Right damper solenoid circuit for faults, If no faults are evident suspect a faulty control module, refer to the warranty policy and procedures manual if a module is suspect
C110D-14	Right Front Damper Solenoid - Circuit short to ground or open	• Front Right Damper Solenoid circuit - short to ground, open circuit or high circuit Resistance • Front Right Damper Solenoid Failure	• Refer to the electrical circuit diagrams and check Front Right Damper Solenoid circuit for short to ground or open circuit. Check for corrosion, backed out terminals and poor crimping of terminals
C110D-18	Right Front Damper Solenoid - Circuit current below threshold	• Front Right Damper Actuator open circuit at startup	• Refer to the electrical circuit diagrams and check Front Right Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C110D-19	Right Front Damper Solenoid - Circuit current above threshold	• Front Right Damper Solenoid circuit current above threshold	• Refer to the electrical circuit diagrams and check Front Right Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C110D-1D	Right Front Damper Solenoid - Circuit current out of range	• Front Right Damper Solenoid circuit - short to ground/power, open circuit • Front Right Damper Solenoid failure	• Refer to the electrical circuit diagrams and check Front Right Damper Solenoid circuit for short to ground, power or open circuit. Check and install a new Front Right Shock Actuator as required refer to the warranty policy and procedures manual if a module is suspect

DTC	Description	Possible Causes	Action
C110D-64	Right Front Damper Solenoid - Signal plausibility failure	• Front Right Damper Solenoid Measured Current control loop failed • Front Right Damper Solenoid open circuit	• Refer to the electrical circuit diagrams and check Front Right Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C110E-01	Left Rear Damper Solenoid - General electrical failure	• Left Rear damper solenoid circuit fault	• Refer to the electrical circuit diagrams and check Rear Left damper solenoid circuit for faults, If no faults are evident suspect a faulty control module, refer to the warranty policy and procedures manual if a module is suspect
C110E-14	Left Rear Damper Solenoid - Short to ground or open	• Rear Left Damper Solenoid circuit - short to ground, open circuit or high circuit Resistance • Rear Left Damper Solenoid Failure	• Refer to the electrical circuit diagrams and check Rear Left Damper Solenoid circuit for short to ground or open circuit. Check for corrosion, backed out terminals and poor crimping of terminals
C110E-18	Left Rear Damper Solenoid - Circuit current below threshold	• Rear Left Damper Actuator open circuit at startup	• Refer to the electrical circuit diagrams and check Rear Left Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C110E-19	Left Rear Damper Solenoid - Circuit current above threshold	• Rear Left Damper Solenoid circuit current above threshold	• Refer to the electrical circuit diagrams and check Rear Left Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C110E-1D	Left Rear Damper Solenoid - Circuit current out of range	• Rear Left Damper Solenoid circuit - short to ground/power, open circuit • Rear Left Damper Solenoid failure	• Refer to the electrical circuit diagrams and check Rear Left Damper Solenoid circuit for short to ground, power or open circuit. Check and install a new Rear Left Shock Actuator as required refer to the warranty policy and procedures manual if a module is suspect
C110E-64	Left Rear Damper Solenoid - Signal plausibility failure	• Rear Left Damper Solenoid Measured Current control loop failed • Rear Left Damper Solenoid open circuit	• Refer to the electrical circuit diagrams and check Rear Left Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C110F-01	Right Rear Damper Solenoid - General electrical failure	• Right Rear damper solenoid circuit fault	• Refer to the electrical circuit diagrams and check Rear Right damper solenoid circuit for faults, If no faults are evident suspect a faulty control module, refer to the warranty policy and procedures manual if a module is suspect
C110F-14	Right Rear Damper Solenoid - Circuit short to ground or open	• Rear Right Damper Solenoid circuit - short to ground, open circuit or high circuit Resistance • Rear Right Damper Solenoid Failure	• Refer to the electrical circuit diagrams and check Rear Right Damper Solenoid circuit for short to ground or open circuit. Check for corrosion, backed out terminals and poor crimping of terminals
C110F-18	Right Rear Damper Solenoid - Circuit current below threshold	• Rear Right Damper Actuator open circuit at startup	• Refer to the electrical circuit diagrams and check Rear Right Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C110F-19	Right Rear Damper Solenoid - Circuit current above threshold	• Rear Right Damper Solenoid circuit current above threshold	• Refer to the electrical circuit diagrams and check Rear Right Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C110F-1D	Right Rear Damper Solenoid - Circuit current out of range	• Rear Right Damper Solenoid circuit - short to ground/power, open circuit • Rear Right Damper	• Refer to the electrical circuit diagrams and check Rear Right Damper Solenoid circuit for short to ground, power or open circuit. Check and install a new Right Shock Actuator as required refer to the warranty policy and procedures manual if a module is suspect

DTC	Description	Possible Causes	Action
		Solenoid failure	
C110F-64	Right Rear Damper Solenoid - Signal plausibility failure	• Rear Right Damper Solenoid Measured Current control loop failed • Rear Right Damper Solenoid open circuit	• Refer to the electrical circuit diagrams and check Rear Right Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C1B14-1C	Sensor Supply Voltage A - Out of range	• Left Front Height Sensor or Right Front Height Sensor or Left Rear Height Sensor or Right Rear Height Sensor supply partial short to other circuit or ground • Left Front Height Sensor or Right Front Height Sensor or Left Rear Height Sensor or Right Rear Height Sensor internal failure • Internal control module failure	• Refer to the electrical circuit diagrams and check sensor supply for circuit fault. Check all height sensors. Check module sensor supply output voltage measured voltage should be between 4.995 volts and 4.85 volts
C1B15-1C	Sensor Supply Voltage B - Out of range	• Left Front Vertical Acceleration Sensor or Right Front Vertical Acceleration Sensor or Left Rear Vertical Acceleration Sensor or Right Rear Vertical Acceleration Sensor supply partial short to other circuit or ground. Left Front Vertical Acceleration Sensor or Right Front Vertical Acceleration Sensor or Left Rear Vertical Acceleration Sensor or Right Rear Vertical Acceleration Sensor supply partial short to other circuit or ground • Left Front Vertical Acceleration Sensor or Right Front Vertical Acceleration Sensor or Left Rear Vertical Acceleration Sensor or Right Rear Vertical Acceleration Sensor internal failure • Internal control module failure	• Refer to the electrical circuit diagrams and check sensor supply for circuit fault. Check all Vertical Acceleration Sensors. Check control module sensor supply output voltage Measured voltage should be between 4.995 volts and 4.85 volts
U0001-88	High speed CAN communication bus - Bus off	• Lost Communication With Engine Control Module (ECM) (CAN Bus circuit fault)	• Check Engine Control Module for stored DTCs. Refer to the electrical circuit diagrams and check CAN Bus circuit for faults, check CAN circuits for open circuits or shorts to power, ground or other circuits
U0100-00	Lost Communication With ECM/PCM A - No sub type information	• Missing message from Engine Control Module (ECM)	• Check Engine Control Module for stored DTCs. Refer to the electrical circuit diagrams and check CAN Bus for circuit fault
U0101-00	Lost Communication with TCM - No sub type information	• Lost Communication with Transmission Control Module (TCM) (CAN Bus circuit fault)	• Check Transmission Control Module for stored DTCs. Refer to the electrical circuit diagrams and check CAN Bus for circuit fault

DTC	Description	Possible Causes	Action
U0103-00	Lost Communication With Gear Shift Control Module A - No sub type information	• Lost Communication With Transmission Shift Module (CAN Bus circuit fault)	• Check Transmission Shift Module for stored DTCs. Refer to the electrical circuit diagrams and check Can Bus for circuit faults
U0121-00	Lost Communication With Anti-Lock Braking System (ABS) Control Module - No sub type information	• Lost Communication With Anti-Lock Braking System (ABS) Control Module (CAN Bus circuit fault)	• Check Anti lock Braking System Control Module for stored DTCs. Refer to the electrical circuit diagrams and check Can Bus circuit to Anti lock Braking System Control Module for circuit faults
U0132-00	Lost Communication With Suspension Control Module A - No sub type information	• Lost Communication With Air Suspension Control Module (CAN Bus circuit fault	• Check Air Suspension Control Module for stored DTCs. Refer to the electrical circuit diagrams and check CAN Bus circuit to Air Suspension Control Module for circuit faults
U0136-00	Lost Communication With Differential Control Module - Rear - No sub type information	• Lost Communication With Rear Differential Control Module (CAN Bus circuit fault)	• Check Rear Differential Control Module for stored DTCs. Refer to the electrical circuit diagrams and check Can Bus circuit to Rear Differential Control Module for circuit faults
U0140-00	Lost Communication With Central Junction Box - No sub type information	• Lost Communication With Central Junction Box (CAN Bus circuit fault)	• Check Central Junction Box for stored DTCs. Refer to the electrical circuit diagrams and check CAN Bus circuit to Central Junction Box for faults
U0142-00	Lost Communication With Central Junction Box B - No sub type information	• Lost Communication rear smart junction box (CAN Bus circuit fault)	• Check Auxiliary Junction Box for stored DTCs. Refer to the electrical circuit diagrams and check CAN Bus circuit to Auxiliary Junction Box for faults
U0155-00	Lost Communication With Instrument Panel Cluster (IPC) Control Module - No sub type information	• Lost Communication With Instrument Cluster (CAN bus circuit fault)	• Check Instrument Cluster for stored DTCs. Refer to the electrical circuit diagrams and check CAN Bus to Instrument Cluster for circuit fault
U0300-00	Internal control module software incompatibility - No sub type information	• CAN master configuration ID incorrect	• Check Front Smart Junction Box vehicle configuration file, check part number of adaptive damping control module
U0401-68	Invalid Data Received from ECM/PCM A - Event information	• Invalid Data Received from Engine Control Module	• Check Engine Control Module for DTCs. Refer to the relevant DTC index
U0402-68	Invalid Data Received from TCM - Event information	• Invalid Data Received from Transmission Control Module	• Check for Transmission Control Module DTCs. Refer to relevant DTC index
U0404-68	Invalid Data Received from Gear Shift Control Module A - Event information	• Invalid data received from Transmission Shift Control Module	• Check Transmission Shift Control Module for DTCs. Refer to the relevant DTC index
U0415-68	Invalid Data Received From Anti-Lock Braking System (ABS) Control Module - Event information	• Invalid Data Received From Anti-Lock Braking System (ABS) Control Module	• Check for Anti lock Braking System DTCs. Refer to the relevant DTC index
U0421-68	Invalid Data Received from Suspension Control Module A - Event	• Invalid Data Received From Air Suspension Control Module	• Check Air Suspension Control Module for stored DTCs. Refer to the relevant DTC index

DTC	Description	Possible Causes	Action
	information		
U0422-68	Invalid Data Received From Central Junction Box - Event information	• Invalid Data Received From Central Junction Box (Front Smart Junction Box)	• Check Central Junction Box for stored DTCs. Refer to the relevant DTC index
U0437-68	Invalid Data Received From Differential Control Module - Rear - Event information	• Invalid Data Received From Rear Differential Control Module	• Check Rear Differential Control Module for stored DTCs. Refer to the relevant DTC index
U0443-68	Invalid Data Received From Central Junction Box B - Event information	• Invalid Data Received From Auxiliary Junction Box	• Check Auxiliary junction box for DTCs and refer to relevant DTC index
U1A14-00	CAN initialization failure - No sub type information	• CAN network harness short, disconnected	• Refer to circuit diagrams and check CAN Bus circuit for fault (short to power, ground or open circuit)
U2100-00	Initial Configuration Not Complete - No sub type information	• Car Configuration Data not loaded (Central Junction Box installed to vehicle and not initialized) • Internal Central Junction Box failure	• Install car config to Central Junction Box. Clear DTC and retest systems
U2101-00	Control Module Configuration Incompatible - No sub type information	• Car Configuration Data transmitted over CAN does not match adaptive damping control module internal config	• Carry out the new module software installation procedure
U3000-01	Control module - General Electrical Failure	• General electrical failure	• Check integrity of electrical connectors and pins to module. Check damper negative circuits for short to Ground. Refer to the new module installation note at the top of the DTC Index. Install a new Adaptive Damping Control Module
U3000-04	Control Module - System Internal Failure	• Module Internal failure	• Refer to the electrical wiring diagrams and check all damper solenoid circuits for short to power. If no harness faults are found suspect adaptive damping control module. Install a new module, refer to the warranty policy and procedures manual if a module is suspect
U3000-43	Control Module - Special memory failure	• Module Internal failure	• Suspect Adaptive Damping Control Module internal failure. Install a new module, refer to the warranty policy and procedures manual if a module is suspect
U3000-45	Control Module - Program memory failure	• Module Internal failure	• Refer to the electrical circuit diagrams and check power and ground circuit for fault. Clear DTC turn off ignition, wait 1 minute. Turn on ignition, check for DTCs. If DTC returns suspect Adaptive Damping Control Module internal failure. Install a new module, refer to the warranty policy and procedures manual if a module is suspect
U3000-47	Control Module - Watchdog / safety Micro controller failure	• Module Internal Failure	• If this DTC is logged contact your local in-market support
U3000-52	Control Module - Not activated	• Adaptive Damping Control Module has been replaced and not programmed	• Install the latest software / Carry out the new-module (software) install procedure

DTC	Description	Possible Causes	Action
U3000-54	Control Module - Missing calibration	• Adaptive damping control module has been replaced and no software is installed	• Refer to the workshop manual. Install the latest software / Carry out the new-module (software) install procedure
U3003-1C	Battery voltage - Circuit voltage out of range	• Circuit voltage out of range (Supply Voltage at adaptive damping control module < 10.5v or Supply Voltage at adaptive damping control module > 18v for 30s)	• Check the battery is in good condition and fully charged, refer to the battery care manual. Refer to the starting and charging section of the workshop manual and check the performance of the charging system. Refer to the electrical circuit diagrams and check power and ground circuit to adaptive damping control module for faults, including intermittent high resistance
U3003-62	Battery Voltage - Signal compare failure	• High Resistance Connections • Adaptive Damping Control module Internal Failure	• Check the battery is in good condition and fully charged, refer to the battery care manual. Refer to the starting and charging section of the workshop manual and check the performance of the charging system. Refer to the electrical circuit diagrams and check power and ground circuit to adaptive damping control module for faults, including intermittent high resistance

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Air Suspension Control Module (RLM)

Description and Operation

Air Suspension Control Module (RLM)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Air Suspension Control Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Vehicle Dynamic Suspension (204-05 Vehicle Dynamic Suspension, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1A84-55	Car Configuration Data - Not configured	• System not configured - Data does not match that expected for specification • Incorrect software version loaded	• Configure the car configuration file (CCF) using the approved diagnostic system. Ensure the ride levelling control module software is the correct version (available from the Global Technical Reference web-site). Clear the DTC and test for normal operation
C112F-72	Air Spring Valve - Actuator stuck open	• Corner valve stuck open (fully or partially) • Vehicle driven while system in "Tight Tolerance" mode	• Where possible, refer to the guided diagnostic routine for this DTC on the approved diagnostic system. Complete corner valve checks. If necessary, clear tight tolerance mode. Clear the DTC and retest
C1130-66	Air Spring Air Supply - Signal has too many transitions/events	• Air spring leak • Leak in air harness to air spring • Corner valve leak to gallery • Compressor assembly fault • Vehicle driven while system in "Tight Tolerance" mode	• Visually inspect the system for air leakage. Where possible, refer to the guided diagnostic routine for this DTC on the approved diagnostic system

DTC	Description	Possible Causes	Action
C1130-7A	Air Spring Sir Supply - Fluid leak or seal failure	• Detached or burst air pipe • Leaking air spring or pipe to air spring (large leak) • Loose pipe connection • Insufficient pressure from compressor • Height sensor fault	• Visually inspect the system for an excessive air leak. Check the height sensor linkage(s) for damage/restrictions. Visually inspect the air harness for evidence of melting, crushing, kinking or collapsing. Where possible, refer to the guided diagnostic routine for this DTC on the approved diagnostic system
C1131-92	Air Supply - Performance or incorrect operation	• Loose or burst air pipe • Detached air pipe • Leaking pipe from reservoir valve block to air supply unit or either axle valve block • Insufficient pressure from compressor • Reservoir valve block piped incorrectly	• Visually inspect the system for air leakage. Check the reservoir valve block pipes for correct routing and installation
C1A03-1C	Left Front Height Sensor - Circuit voltage out of range	• Height sensor disconnected • Height sensor harness wiring short circuit to ground, short circuit to power or high resistance • Height sensor fault	• Check the sensor connector for damage. Refer to the electrical circuit diagrams and check the sensor circuit for continuity or short circuit. Check sensor signal changes when sensor is rotated. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system
C1A03-26	Left Front Height Sensor - Signal rate of change below threshold	• Sensor signal rate of change below threshold/signal voltage stuck • Height sensor linkage disconnected • Height sensor fault • Height sensor harness wiring short circuit to ground, short circuit to power or high resistance	• Check height sensor linkage is connected and not damaged. Visually inspect the height sensor for security, damage and correct orientation/installation. Check the sensor connector for damage. Refer to the electrical circuit diagrams and check the sensor circuit for continuity or short circuit. Repair/renew as necessary. Where possible, refer to the guided diagnostic routine for this DTC on the approved diagnostic system
C1A03-27	Left Front Height Sensor - Signal rate of change above threshold	• Left-hand front height sensor signal rate of change above threshold • Height sensor harness wiring short circuit to ground, short circuit to power or intermittent connection • Height sensor fault	• Check the sensor connector for damage. Refer to the electrical circuit diagrams and check the sensor circuit for continuity or short circuit. Visually inspect the height sensor for security, damage and correct orientation/installation. Repair/renew as necessary. Where possible, refer to the guided diagnostic routine for this DTC on the approved diagnostic system
C1A03-29	Left Front Height Sensor - Signal invalid	• Left-hand front height sensor signal invalid • Incorrect height calibration process	• Calibrate the system using the approved diagnostic system
C1A03-78	Left Front Height Sensor - Alignment or adjustment incorrect	• Sensor alignment or adjustment incorrect; signal out of range • Height sensor linkage not connected • Height sensor linkage toggled • Height sensor loose • Height sensor bracket bent • Incorrect height calibration • Wiring to height sensor short to ground • Wiring to height sensor short to other cable • Height sensor electrical fault	• Check height sensor linkage is connected and not damaged. Visually inspect the height sensor for security, damage and correct orientation/installation. Check the sensor connector for damage. Refer to the electrical circuit diagrams and check the sensor circuit for continuity or short circuit. Repair/renew as necessary. Where possible, refer to the guided diagnostic routine for this DTC on the approved diagnostic system. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system

DTC	Description	Possible Causes	Action
C1A03-92	Left Front Height Sensor - Performance or incorrect operation	• Left-hand front height sensor height performance not as expected/signal changing slower than expected • Axle valve block pipes connected incorrectly • Height sensor incorrectly installed • Blocked/damaged or crushed gallery pipe • Blocked/damaged or crushed air spring pipe • Corner valve stuck closed (mechanically) • Reservoir valve stuck open (mechanically)	NOTE: If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. • Check that the vehicle is free of obstructions. Check the height sensor for correct installation and torque of fixings. If necessary, calibrate the system using the approved diagnostic system. Where available, refer to the guided diagnostic routine for this DTC on the approved diagnostic system. Check for an air spring leak. Check the air harness for evidence of melting, crushing, kinking or collapsing. Check the front and rear valve block pipes for correct routing and installation. Refer to the approved diagnostic system for corner, reservoir and exhaust valve checks. Check the corner valve for leaks
C1A04-1C	Right Front Height Sensor - Circuit voltage out of range	• Right-hand front height sensor signal voltage out of range • Height sensor disconnected • Height sensor harness wiring short circuit to ground, short circuit to power or high resistance • Height sensor fault	• Check the sensor connector for damage. Refer to the electrical circuit diagrams and check the sensor circuit for continuity or short circuit. Check sensor signal changes when sensor is rotated. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system
C1A04-26	Right Front Height Sensor - Signal rate of change below threshold	• Right-hand front height sensor signal rate of change below threshold/signal voltage stuck • Height sensor linkage disconnected • Height sensor fault • Height sensor harness wiring short circuit to ground, short circuit to power or short to each other	• Check height sensor linkage is connected and not damaged. Visually inspect the wiring harness and connectors for water ingress. Where possible, refer to the guided diagnostic routine for this DTC on the approved diagnostic system
C1A04-27	Right Front Height Sensor - Signal rate of change above threshold	• Right-hand front height sensor signal rate of change above threshold • Height sensor harness wiring short circuit to ground, short circuit to power or high resistance • Height sensor fault	• Visually inspect the wiring harness and connectors for damage or water ingress. Visually inspect the height sensor for security, damage and correct orientation/installation. Repair/renew as necessary. Where possible, refer to the guided diagnostic routine for this DTC on the approved diagnostic system
C1A04-29	Right Front Height Sensor - Signal invalid	• Right-hand front height sensor signal invalid • Incorrect height calibration process	• Calibrate the system using the approved diagnostic system
C1A04-78	Right Front Height Sensor - Alignment or adjustment incorrect	• Sensor alignment or adjustment incorrect; signal out of range • Height sensor linkage not connected • Height sensor linkage toggled • Height sensor loose • Height sensor bracket bent • Incorrect height calibration • Wiring to height sensor short to ground • Wiring to height sensor short to other cable • Height sensor electrical fault	• Check height sensor linkage is connected and not damaged. Visually inspect the height sensor for security, damage and correct orientation/installation. Check the sensor connector for damage. Refer to the electrical circuit diagrams and check the sensor circuit for continuity or short circuit. Repair/renew as necessary. Where possible, refer to the guided diagnostic routine for this DTC on the approved diagnostic system. If any height sensor fixings are slackened or found to be loose, or a height sensor has been changed, the vehicle ride height must be re-calibrated. Calibrate the system using the approved diagnostic system

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Anti-Lock Braking System (ABS)

Description and Operation

Anti-Lock Braking System (ABS)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Anti-Lock Braking System module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Anti-Lock Control - Stability Assist (206-09 Anti-Lock Control - Stability Assist, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
C0021-09	Brake Booster Performance - Component Failures	• No vacuum available from engine due to split/leaking hose etc • Brake booster servo has failed due to lack of vacuum	• Check integrity of brake booster vacuum hose. Check and install a new brake booster as required
C0030-38	Left Front Tone Wheel - Signal frequency incorrect	• Left front magnetic pulse ring damaged/contaminated • Incorrect component installed • Sensor internal fault	• Check the left front magnetic pulse ring for damage or contamination. Clean or replace as required. If no damage/contamination found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph for more than 10 seconds
C0031-12	Left Front Wheel Speed Sensor - Short to battery	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to power. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect

DTC	Description	Possible Causes	Action
C0031-14	Left Front Wheel Speed Sensor - Circuit short to ground or open	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C0031-25	Left Front Wheel Speed Sensor - Signal shape/waveform failure	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for partial or intermittently grounded signal circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0031-2F	Left Front Wheel Speed Sensor - Signal erratic	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for intermittent short to power, ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0031-31	Left Front Wheel Speed Sensor - No signal	• Electrical wiring harness fault • Magnetic pulse ring de-magnetised or damaged • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for open circuit or high resistance. Check connectors for damage or corrosion. Check the wheel speed sensor for correct location and contamination. Check the magnetic pulse wheel for contamination, damage or de-magnetisation. Clean or replace the sensor or wheel bearing as required. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0031-62	Left Front Wheel Speed Sensor - Signal compare failure	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for intermittent short to power, ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0031-64	Left Front Wheel Speed Sensor - Signal plausibility failure	• Incorrect wheels/tyres installed • Electrical wiring harness fault • EMC influences on left front wheel speed sensor and supply line • Magnetic pulse wheel damaged/contaminated, de-magnetised • Sensor internal fault	• Check the correct wheels and tyres are installed. Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for intermittent short to power, or ground. Check for EMC influences on the speed sensor and circuits. Check magnetic pulse wheel for damage/contamination and de-magnetisation. Repair Wiring harness, install a new sensor or wheel bearing as required. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C0032-11	Left Front wheel Speed Sensor Supply - Circuit short to ground	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to ground. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect

DTC	Description	Possible Causes	Action
C0033-38	Right Front Tone Wheel - Signal frequency incorrect	• Right front magnetic pulse ring damaged/contaminated • Incorrect component installed • Sensor internal fault	• Check the right front magnetic pulse ring for damage or contamination. Clean or replace as required. If no damage/contamination found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph for more than 10 seconds
C0034-12	Right Front Wheel Speed Sensor - Short to battery	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to power. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C0034-14	Right Front Wheel Speed Sensor - Circuit short to ground or open	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C0034-25	Right Front Wheel Speed Sensor - Signal shape/waveform failure	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for partial or intermittently grounded signal circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0034-2F	Right Front Wheel Speed Sensor - Signal erratic	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for intermittent short to power, ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0034-31	Right Front Wheel Speed Sensor - No signal	• Electrical wiring harness fault • Magnetic pulse ring de-magnetised or damaged • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for open circuit or high resistance. Check connectors for damage or corrosion. Check the wheel speed sensor for correct location and contamination. Check the magnetic pulse wheel for contamination, damage or de-magnetisation. Clean or replace the sensor or wheel bearing as required. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0034-62	Right Front Wheel Speed Sensor - Signal compare failure	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for intermittent short to power, ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0034-64	Right Front Wheel Speed Sensor - Signal plausibility failure	• Incorrect wheels/tyres installed • Electrical wiring harness fault • EMC influences on right front	• Check the correct wheels and tyres are installed. Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for intermittent short to power, or ground. Check for EMC influences on the speed sensor and circuits. Check magnetic pulse

DTC	Description	Possible Causes	Action
		wheel speed sensor and supply line • Magnetic pulse wheel damaged/contaminated, de-magnetised • Sensor internal fault	wheel for damage/contamination and de-magnetisation. Repair wiring harness, install a new sensor or wheel bearing as required. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C0035-11	Right Front Wheel Speed Sensor Supply - Circuit short to ground	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to ground. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C0036-38	Left Rear Tone Wheel - Signal frequency incorrect	• Left rear magnetic pulse ring damaged/contaminated • Incorrect component installed • Sensor internal fault	• Check the left rear magnetic pulse ring for damage or contamination. Clean or replace as required. If no damage/contamination found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph for more than 10 seconds
C0037-12	Left Rear Wheel Speed Sensor - Short to battery	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to power. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C0037-14	Left Rear Wheel Speed Sensor - Circuit short to ground or open	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C0037-25	Left Rear Wheel Speed Sensor - Signal shape/waveform failure	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for partial or intermittently grounded signal circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0037-2F	Left Rear Wheel Speed Sensor - Signal erratic	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for intermittent short to power, ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0037-31	Left Rear Wheel Speed Sensor - No signal	• Electrical wiring harness fault • Magnetic pulse ring de-magnetised or damaged • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for open circuit or high resistance. Check connectors for damage or corrosion. Check the wheel speed sensor for correct location and contamination. Check the magnetic pulse wheel for contamination, damage or de-magnetisation. Clean or replace the sensor or wheel bearing as required. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph

DTC	Description	Possible Causes	Action
C0037-62	Left Rear Wheel Speed Sensor - Signal compare failure	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for intermittent short to power, ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0037-64	Left Rear Wheel Speed Sensor - Signal plausibility failure	• Incorrect wheels/tyres installed • Electrical wiring harness fault • EMC influences on left rear wheel speed sensor and supply line • Magnetic pulse wheel damaged/contaminated, de-magnetised • Sensor internal fault	• Check the correct wheels and tyres are installed. Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for intermittent short to power, or ground. Check for EMC influences on the speed sensor and circuits. Check magnetic pulse wheel for damage/contamination and de-magnetisation. Repair Wiring harness, install a new sensor or wheel bearing as required. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C0038-11	Left Rear Wheel Speed Sensor Supply - Circuit short to ground	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to ground. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C0039-38	Right Rear Tone Wheel - Signal frequency incorrect	• Right rear magnetic pulse ring damaged/contaminated • Incorrect component installed • Sensor internal fault	• Check the right rear magnetic pulse ring for damage or contamination. Clean or replace as required. . If no damage/contamination found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph for more than 10 seconds
C003A-12	Right Rear Wheel Speed Sensor - Short to battery	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to power. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C003A-14	Right Rear Wheel Speed Sensor - Circuit short to ground or open	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C003A-25	Right Rear Wheel Speed Sensor - Signal shape/waveform failure	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for partial or intermittently grounded signal circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C003A-2F	Right Rear Wheel Speed Sensor - Signal erratic	• Electrical wiring harness fault • Sensor internal fault	• Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for intermittent short to power, ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Audio Amplifier Module (AAM)

Description and Operation

Audio Amplifier Module (AAM)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Audio Amplifier Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Information and Entertainment System (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B128A-11	Speaker #13 - Circuit short to ground	• Wiring harness fault • Speaker fault • Audio amplifier fault	• Refer to electrical circuit diagrams, check left co-axial surround speaker circuits for short to ground. Check speaker for short circuit, open circuit. If no harness or speaker fault suspect audio amplifier module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B128A-12	Speaker #13 - Circuit short to battery	• Wiring harness fault • Speaker fault • Audio amplifier fault	• Refer to electrical circuit diagrams, check left co-axial surround speaker circuits for short to power. Check speaker for short circuit, open circuit. If no harness or speaker fault suspect audio amplifier module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B128A-13	Speaker #13 - Circuit open	• Wiring harness fault • Speaker fault • Audio amplifier fault	• Refer to electrical circuit diagrams, check left co-axial surround speaker circuits for open circuit. Check speaker for short circuit, open circuit. If no harness or speaker fault suspect audio amplifier module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B128A-1A	Speaker #13 - Circuit resistance below threshold	• Wiring harness fault • Speaker fault	• Refer to electrical circuit diagrams, check left co-axial surround speaker circuits for short circuit. Check speaker for short circuit, open circuit. If no harness or speaker fault suspect audio

DTC	Description	Possible Causes	Action
		• Audio amplifier fault	amplifier module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B128A-1E	Speaker #13 - Circuit resistance out of range	• Wiring harness fault • Speaker fault • Audio amplifier fault	• Refer to electrical circuit diagrams, check left co-axial surround speaker circuits for open circuit, high resistance, or short circuit. Check speaker for short circuit, open circuit. If no harness or speaker fault suspect audio amplifier module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B128B-11	Speaker #14 - Circuit short to ground	• Wiring harness fault • Speaker fault • Audio amplifier fault	• Refer to electrical circuit diagrams, check right co-axial surround speaker circuits for short to ground. Check speaker for short circuit, open circuit. If no harness or speaker fault suspect audio amplifier module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B128B-12	Speaker #14 - Circuit short to battery	• Wiring harness fault • Speaker fault • Audio amplifier fault	• Refer to electrical circuit diagrams, check right co-axial surround speaker circuits for short to power. Check speaker for short circuit, open circuit. If no harness or speaker fault suspect audio amplifier module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B128B-13	Speaker #14 - Circuit open	• Wiring harness fault • Speaker fault • Audio amplifier fault	• Refer to electrical circuit diagrams, check right co-axial surround speaker circuits for open circuit. Check speaker for short circuit, open circuit. If no harness or speaker fault suspect audio amplifier module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B128B-1A	Speaker #14 - Circuit resistance below threshold	• Wiring harness fault • Speaker fault • Audio amplifier fault	• Refer to electrical circuit diagrams, check right co-axial surround speaker circuits for short circuit. Check speaker for short circuit, open circuit. If no harness or speaker fault suspect audio amplifier module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B128B-1E	Speaker #14 - Circuit resistance out of range	• Wiring harness fault • Speaker fault • Audio amplifier fault	• Refer to electrical circuit diagrams, check right co-axial surround speaker circuits for open circuit, high resistance, or short circuit. Check speaker for short circuit, open circuit. If no harness or speaker fault suspect audio amplifier module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B128C-11	Speaker #15 - Circuit short to ground	• Wiring harness fault • Speaker fault • Audio amplifier fault	• Refer to electrical circuit diagrams, check front center speaker circuits for short to ground. Check speaker for short circuit, open circuit. If no harness or speaker fault suspect audio amplifier module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B128C-12	Speaker #15 - Circuit short to battery	• Wiring harness fault • Speaker fault • Audio amplifier fault	• Refer to electrical circuit diagrams, check front center speaker circuits for short to power. Check speaker for short circuit, open circuit. If no harness or speaker fault suspect audio amplifier module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B128C-13	Speaker #15 - Circuit open	• Wiring harness fault • Speaker fault • Audio amplifier fault	• Refer to electrical circuit diagrams, check front center speaker circuits for open circuit. Check speaker for short circuit, open circuit. If no harness or speaker fault suspect audio amplifier module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B128C-1A	Speaker #15 - Circuit resistance below threshold	• Wiring harness fault • Speaker fault • Audio amplifier fault	• Refer to electrical circuit diagrams, check front center speaker circuits for short circuit. Check speaker for short circuit, open circuit. If no harness or speaker fault suspect audio amplifier module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B128C-1E	Speaker #15 - Circuit resistance out of range	• Wiring harness fault • Speaker fault	• Refer to electrical circuit diagrams, check front center speaker circuits for open circuit, high resistance, or short circuit. Check speaker for short circuit, open circuit. If no harness or speaker

DTC	Description	Possible Causes	Action
		• Audio amplifier fault	fault suspect audio amplifier module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B128D-11	Speaker #16 - Circuit short to ground	• Wiring harness fault • Speaker fault • Audio amplifier fault	NOTES: Only applies to vehicles fitted with Premium or Super Premium audio system On vehicles fitted with Super Premium sound systems this DTC refers to the high frequency center speaker circuit • Refer to electrical circuit diagrams and check the front center speaker circuit for short circuit to ground. Repair circuit as required, clear DTC and retest • If fault persists, check and install a new speaker as required. Clear DTC and retest • If no harness or speaker faults are evident, check and install a new audio amplifier module as required. Clear DTC and retest
B128D-12	Speaker #16 - Circuit short to battery	• Wiring harness fault • Speaker fault • Audio amplifier fault	NOTES: Only applies to vehicles fitted with Premium or Super Premium audio system On vehicles fitted with Super Premium sound systems this DTC refers to the high frequency center speaker circuit • Refer to electrical circuit diagrams and check the front center speaker circuit for short circuit to power. Repair circuit as required, clear DTC and retest • If fault persists, check and install a new speaker as required. Clear DTC and retest • If no harness or speaker faults are evident, check and install a new audio amplifier module as required. Clear DTC and retest
B128D-13	Speaker #16 - Circuit open	• Wiring harness fault • Speaker fault • Audio amplifier fault	NOTES: Only applies to vehicles fitted with Premium or Super Premium audio system On vehicles fitted with Super Premium sound systems this DTC refers to the high frequency center speaker circuit • Refer to electrical circuit diagrams and check the front center speaker circuit for open circuit, high resistance. Check for poor or corroded connections and backed out pins. Repair circuit as required, clear DTC and retest • If fault persists, check and install a new speaker as required. Clear DTC and retest • If no harness or speaker faults are evident, check and install a new audio amplifier module as required. Clear DTC and retest
B128D-1A	Speaker #16 - Circuit resistance below threshold	• Wiring harness fault • Speaker fault • Audio amplifier fault	NOTES: Only applies to vehicles fitted with Premium or Super Premium audio system On vehicles fitted with Super Premium sound systems this DTC refers to the high frequency center speaker circuit • Refer to electrical circuit diagrams and check the wiring harness and connectors on the front center speaker circuit. Repair circuit as required, clear DTC and retest • If fault persists, check and install a new speaker as required. Clear DTC and retest • If no harness or speaker faults are evident, check and install a new audio amplifier module as required. Clear DTC and retest

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Blind Spot Monitoring System Module (SODL/SODR)

Description and Operation

Blind Spot Monitoring System Module (SODL/SODR)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Blind Spot Monitoring System Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Warning Devices (413-09 Warning Devices, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B11C9-11	Driver Display Status LED - Circuit short to ground	• System status LED circuit - Short circuit to ground	• Refer to the electrical circuit diagrams and check the system status LED circuit for short circuit to ground. Repair circuit as required, clear DTC and retest
B11C9-15	Driver Display Status LED - Circuit short to battery or open	• System status LED circuit - Short circuit to power, open circuit, high resistance	• Refer to the electrical circuit diagrams and check the system status LED circuit for short circuit to power, open circuit, high resistance. Repair circuit as required, clear DTC and retest
B11D6-11	Driver Display Alert LED - Circuit short to ground	• Warning status LED circuit - Short circuit to ground	• Refer to the electrical circuit diagrams and check the warning status LED circuit for short circuit to ground. Repair circuit as required, clear DTC and retest
B11D6-15	Driver Display Alert LED - Circuit short to battery or open	• Warning status LED circuit - Short circuit to power, open circuit, high resistance	• Refer to the electrical circuit diagrams and check the warning status LED circuit for short circuit to power, open circuit, high resistance. Repair circuit as required, clear DTC and retest

DTC	Description	Possible Causes	Action
U0010-00	Medium Speed CAN Communication Bus - No sub type information	• CAN fault	• Refer to the electrical circuit diagrams and check the power and ground connections to the module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test • Refer to the electrical circuit diagrams and check the CAN network. Repair circuit as required, clear DTC and retest
U0140-00	Lost Communication With Body Control Module - No sub type information	• Loss of CAN communication with central junction box	• Refer to the electrical circuit diagrams and check the power and ground connections to the central junction box • Using the manufacturer approved diagnostic system, complete a CAN network integrity test • Refer to the electrical circuit diagrams and check the CAN network between the central junction box and blindspot monitoring control module(s). Repair circuit as required, clear DTC and retest
U0155-00	Lost Communication With Instrument Panel Cluster (IPC) Control Module - No sub type information	• Loss of CAN communication with instrument cluster	• Refer to the electrical circuit diagrams and check the power and ground connections to the instrument cluster • Using the manufacturer approved diagnostic system, complete a CAN network integrity test • Refer to the electrical circuit diagrams and check the CAN network between the instrument cluster and blindspot monitoring control module(s). Repair circuit as required, clear DTC and retest
U0232-00	Lost Communication With Side Obstacle Detection Control Module - Left - No sub type information	• Loss of CAN communication with left side blindspot monitoring control module • Harness fault between left side mirror and left side module	• Refer to the electrical circuit diagrams and check the power and ground connections to the left side blindspot monitoring control module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test • Refer to the electrical circuit diagrams and check the CAN network between the left side blindspot monitoring control module and the right side blindspot monitoring control module. Repair circuit as required, clear DTC and retest • Refer to the electrical circuit diagrams and check the left side harness between the left side mirror and the left side blindspot monitoring control module. Repair circuit as required, clear DTC and retest
U0233-00	Lost Communication With Side Obstacle Detection Control Module - Right - No sub type information	• Loss of CAN communication with right side blindspot monitoring control module • Harness fault between right side mirror and right side module	• Refer to the electrical circuit diagrams and check the power and ground connections to the right side blindspot monitoring control module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test • Refer to the electrical circuit diagrams and check the CAN network between the right side blindspot monitoring control module and the left side blindspot monitoring control module. Repair circuit as required, clear DTC and retest • Refer to the electrical circuit diagrams and check the right side harness between the right side mirror and the right side blindspot monitoring control module. Repair circuit as required, clear DTC and retest

DTC	Description	Possible Causes	Action
U0300-00	Internal Control Module Software Incompatibility - No sub type information	• The blindspot monitoring control module or module software is not compatible with the vehicle	• Check the central junction box for related DTCs and refer to the relevant DTC index • Check the restraints control module for related DTCs and refer to the relevant DTC index • Check that the latest module software version is installed in the blindspot monitoring control module(s) • Check the blindspot monitoring control module(s) part number, install the correct part as required. Clear DTC and retest
U0415-68	Invalid Data Received From Anti-Lock Brake System (ABS) Control Module - Event information	• Unexpected data received from ABS control module	• Check the ABS control module for related DTCs and refer to the relevant DTC index
U0422-68	Invalid Data Received From Body Control Module - Event information	• Unexpected data received from central junction box	• Check the central junction box for related DTCs and refer to the relevant DTC index
U2100-00	Initial Configuration Not Complete - No sub type information	• Car configuration file incorrect	• Check and amend the car configuration file as required using the manufacturer approved diagnostic system
U2101-00	Control Module Configuration Incompatible - No sub type information	• Car configuration file information incompatible to blindspot monitoring control modules	• Check and amend the car configuration file as required using the manufacturer approved diagnostic system
U3000-44	Control Module - Data memory failure	• Blindspot monitoring control module(s) - Internal failure	• Clear DTC, cycle ignition and retest. If fault persists, refer to the electrical circuit diagrams and check the power and ground circuits to the module. Repair as required, clear DTC and retest • If fault persists, check and install a new blindspot monitoring control module as required
U3000-47	Control Module - Watchdog/safety microcontroller failure	• Blindspot monitoring control module(s) - Internal failure	• Clear DTC, cycle ignition and retest. If fault persists, refer to the electrical circuit diagrams and check the power and ground circuits to the module. Repair as required, clear DTC and retest • If fault persists, check and install a new blindspot monitoring control module as required
U3000-49	Control Module - Internal electronic failure	• Blindspot monitoring control module(s) - Internal failure	• Clear DTC, cycle ignition and retest. If fault persists, refer to the electrical circuit diagrams and check the power and ground circuits to the module. Repair as required, clear DTC and retest • If fault persists, check and install a new blindspot monitoring control module as required
U3003-62	Battery Voltage - Signal compare failure	• Blindspot monitoring control module(s) voltage differs more than ±2V compared to central electronics module voltage	• Refer to relevant section of workshop manual and battery care manual. Check battery state of charge and starting/charging system performance. Check power supply circuit from rear junction box to the blindspot monitoring control modules • Refer to electrical circuit diagrams and check the power and ground supply circuits to the modules. Repair wiring harness as required. Clear DTC and retest

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Central Junction Box (BCM)

Description and Operation

Central Junction Box (CJB)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Central Junction Box, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Communications Network (418-00 Module Communications Network, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1008-11	Wiper Mode Switch - Circuit short to ground	• Master wipe switch input circuit at ground for more than 1 second	• Refer to electrical circuit diagrams and check the master wipe switch circuit between the wiper switch and the central junction box for short to ground. Repair wiring harness as required. If no fault is found in the harness suspect the switch. Check switch for short to ground, install a new switch as required. If the switch is not at fault suspect the central junction box
B1008-15	Wiper Mode Switch - Circuit short to battery or open	• Master wipe switch input circuit at battery voltage or open load for more than 1 second	• Refer to electrical circuit diagrams and check the master wipe switch circuit between the wiper switch and the central junction box for short to power or open circuit. Repair wiring harness as required. If no fault is found in the harness suspect the switch. Check switch for short to power or open circuit, install a new switch as required. If the switch is not at fault suspect the central junction box
B1008-1E	Wiper Mode Switch - Circuit resistance out of range	• Master wipe switch input circuit signal out of range for more than 1 second	• Refer to electrical circuit diagrams and check the master wipe switch circuit between the wiper switch and the central junction box for partial

DTC	Description	Possible Causes	Action
			short or open circuit, high resistance across connectors, or short to another circuit. Repair wiring harness as required. If no fault is found in the harness suspect the switch. Check switch for damaged connector pins, install a new switch as required
B1009-51	Ignition Authorization - Not programmed	NOTE: This DTC is only likely to occur following component replacement applications failing prior to completion • Security identifier not programmed in central junction box (Part of immobilization set-up)	• Configure the central junction box as a new module using the manufacturers approved diagnostic system
B1009-62	Ignition Authorization - Signal compare failure	NOTE: This DTC is only likely to occur following component replacement applications failing prior to completion • Encrypted data exchange between instrument cluster and the central junction box does not match	• Configure the module using the manufacturers approved diagnostic system. If problem persists carry out CAN network integrity test and on demand self-test using manufacturer approved diagnostic system. Alternatively, refer to the electrical circuit diagrams and check CAN circuit
B1009-63	Ignition Authorization - Circuit/component protection time-out	• Circuit/component protection time-out • CAN circuit fault • Instrument cluster fault • Central junction box fault • Battery voltage too low	NOTE: Only diagnose this DTC if the Customer is reporting a start related issue • Clear the DTC and retest. Check for additional ignition related DTCs and rectify as necessary. If problem persists, carry out CAN network integrity test and on demand self-test using manufacturer approved diagnostic system. Alternatively, refer to the electrical circuit diagrams and check CAN circuits
B1009-81	Ignition Authorization - Invalid serial data received	• Invalid serial data received • CAN circuit fault • Instrument Cluster fault	NOTE: Only diagnose this DTC if the Customer is reporting a start related issue • Clear the DTC and retest. Check for additional ignition related DTCs and rectify as necessary. If problem persists, carry out CAN network integrity test and on demand self-test using manufacturer approved diagnostic system. Alternatively, refer to the electrical circuit diagrams and check CAN circuits
B100D-51	Column Lock Authorization - Not programmed	NOTE: This DTC is only likely to occur following component replacement applications failing prior to completion • Security identifier not programmed in central junction box (Part of Immobilization set-up)	• Configure the central junction box as a new module using the manufacturers approved diagnostic system
B100D-64	Column Lock Authorization - Signal plausibility failure	• Signal plausibility failure • Steering column lock unable to perform lock action • CAN network fault • Anti-lock braking system, engine control module, central junction box fault	NOTE: Prior to clearing this DTC, carry out the Vehicle Functional Reset application using the manufacturer approved diagnostic system • Check the serviceability of the steering column and lock. Clear the DTC and retest. If problem persists, carry out CAN network integrity test and on demand self test using manufacturer approved diagnostic system. Alternatively, refer to the electrical circuit diagrams and check CAN circuits

DTC	Description	Possible Causes	Action
B100D-67	Column Lock Authorization - Signal incorrect after event	• Signal incorrect after event • Instrument cluster fault • CAN network fault	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported a vehicle / engine start concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis • Check for additional related DTCs. Clear the DTC and retest. If problem persists, carry out CAN network integrity test and on demand self test using manufacturer approved diagnostic system. Alternatively, refer to the electrical circuit diagrams and check CAN circuits
B100D-81	Column Lock Authorization - Invalid serial data received	NOTE: This DTC is only likely to occur following component replacement applications failing prior to completion • Encrypted data exchange between steering column lock and the central junction box does not match	• Configure the central junction box as a new module using the manufacturer approved diagnostic system. If the problem persists, carry out CAN network integrity test and on demand self-test using the manufacturer approved diagnostic system. Alternatively, refer to the electrical circuit diagrams and check CAN circuits
B100D-87	Column Lock Authorisation - Missing message	• Missing message • CAN fault • No response from electric steering column lock control module, instrument cluster, central junction box • Battery voltage at electric steering column lock control module too low • Electric steering column lock control module, instrument cluster, central junction box fault	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported a vehicle / engine start concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis • Clear DTC, repeatedly lock and unlock car using the key fob and retest. Check for related DTCs and refer to the relevant DTC index • If the fault is cleared, notify the customer that the steering column lock may fail to unlock if the vehicle is parked with a high steering angle or with the road wheel against a curb. If the column lock is failing to disengage, the customer may be able to rectify this by rotating the steering wheel while pressing the engine start button • If fault persists, complete a CAN network integrity test using the manufacturers approved diagnostic system. Alternatively, refer to the electrical circuit diagrams and check CAN circuits between the central junction box, the instrument cluster and the electronic steering column lock. Refer to the electrical circuit diagrams and check the central junction box, the instrument cluster and the electronic steering column lock power and ground supply circuits for short circuit to ground, short circuit to power, open circuit, high resistance. Repair circuit(s) as required. Clear DTC, perform an on demand self-test and retest • If fault persists, check that the vehicle battery supply voltage is between 9-16 volts. Rectify as required
B100D-96	Column Lock Authorisation - Component internal failure	• Battery voltage at electric steering column lock control module too low • Torque load on steering column • CAN fault • Electric steering column lock control module - Internal failure	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported a vehicle / engine start concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis • Clear DTC, repeatedly lock and unlock car using the key fob and retest • If fault persists, check that the vehicle battery supply voltage is between 9-16 volts. Rectify as required • Ensure the column lock bolt movement is not obstructed or restricted (the parked position of the road wheels may be exerting a turning force through the steering column, preventing the lock from releasing. The steering wheel may need to

DTC	Description	Possible Causes	Action
			be held against the force to allow the column lock to release). Clear DTC, repeatedly lock and unlock car using the key fob and retest • If fault persists, complete a CAN network integrity test using the manufacturers approved diagnostic system. Alternatively, refer to the electrical circuit diagrams and check CAN circuits between the central junction box, the instrument cluster and the electronic steering column lock. Refer to the electrical circuit diagrams and check the central junction box, the instrument cluster and the electronic steering column lock power and ground supply circuits for short circuit to ground, short circuit to power, open circuit, high resistance. Repair circuit(s) as required. Clear DTC, perform an on demand self-test and retest • If fault persists, check and install a new electric steering column lock control module as required
B1024-83	Start Control Unit - Value of signal protection calculation incorrect	• Value of signal protection calculation incorrect • Immobilizer antenna unit fault • LIN network fault	• Clear the DTC and retest. Refer to the electrical circuit diagrams and check immobilizer antenna unit circuits. If the problem persists, renew the immobilizer antenna unit
B1024-87	Start Control Unit - Missing message	• Value of signal protection calculation incorrect • Immobilizer antenna unit fault • LIN network fault	• Clear the DTC and retest. Refer to the electrical circuit diagrams and check immobilizer antenna unit circuits. If the problem persists, renew the immobilizer antenna unit
B1026-11	Steering Column Lock - Circuit short to ground	• Circuit short to ground	• Refer to the electrical circuit diagrams and check electric steering column lock circuits
B102B-67	Passive Key - Signal incorrect after event	NOTE: This DTC is only likely to occur following component replacement applications failing prior to completion • Passive key authorization signal incorrect after event • Encrypted data exchange between electric steering column lock control module and central junction box does not match • Low speed CAN fault • Keyless vehicle module fault • Central junction box fault	• Configure the central junction box as a new module using the manufacturers approved diagnostic system. If the problem persists, carry out CAN network integrity test and on demand self-test using the manufacturer approved diagnostic system. Alternatively, refer to the electrical circuit diagrams and check CAN circuits
B102B-87	Passive Key - Missing message	• Passive key authorization missing message • Confirm placement of key within vehicle • Low speed CAN fault • Key fob battery low/battery contact issue • Interference from other RF signal • Electromagnetic compatibility/noise • Keyless vehicle module fault • Receiver fault • Receiver not programmed correctly • Serial communication fault (between receiver and keyless vehicle module) • Key fault • Passive antenna fault • Central junction box fault	NOTE: The action below is only required if this DTC and DTC B1B01-87 have been stored, or vehicle start issue has been reported • Check whereabouts of keys, including spare and confirm correct functionality • Refer to the electrical circuit diagrams and check the power and ground circuits to the keyless vehicle module and receiver • Check CAN communications between central junction box and keyless vehicle module • Check key fob battery • Check vehicle surroundings for possible sources of interference, move vehicle and retest. Check CAN network for interference/electromagnetic compatibility related issues • Check serial circuit between receiver and keyless vehicle module. Refer to the electrical circuit diagrams and check circuits to all three antennas • Disconnect battery, then re-connect - confirm correct operation by re-programming keys using the manufacturer approved diagnostic system

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Climate Control Module (HVAC)

Description and Operation

Climate Control Module (HVAC)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Climate Control Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Climate Control System (412-00 Climate Control System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1030-01	Left Front Seat Heater - General electrical failure	• Left front seat heater circuit short to ground, short to power, open circuit • Left front seat heater element(s) failure • Left front seat heater thermistor failure • Left front heated seat module failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check left front seat heater circuit for short to ground, short to power, open circuit. Check connection to LIN 1 / A bus and power. Check car configuration set up. Check and install a new left front seat heater element as required. Check and install a new left front heated seat module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1030-4B	Left Front Seat Heater - Over temperature	• Left front seat heater thermistor failure • Left front heated seat module failure • Climate Control Module failure	• Check and install a new left front heater element as required. Check and install a new left front heated seat module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect

DTC	Description	Possible Causes	Action
B1030-87	Left Front Seat Heater - Missing message	• Left front seat heater LIN circuit short to ground, short to power, open circuit • Left front heated seat module failure • Climate Control Module failure • Configuration fault	• Refer to the electrical circuit diagrams and check left front seat heater LIN 1 / A circuit for short to ground, short to power, open circuit. Check and install a new left front heated seat module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect. If seen with B1032-87, U0422-86 or U3000-55, this is an indication of an incorrect or unrecognised car configuration file.
B1031-01	Left Rear Seat Heater - General electrical failure	• Left rear seat heater circuit short to ground, short to power, open circuit • Left rear seat heater element(s) failure • Left rear seat heater thermistor failure • Left rear heated seat module failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check left rear seat heater circuit for short to ground, short to power, open circuit. Check connection to LIN 1 / A bus and power. Check car configuration set up. Check and install a new left rear seat heater element as required. Check and install a new left rear heated seat module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1031-4B	Left Rear Seat Heater - Over temperature	• Left rear seat heater thermistor failure • Left rear heated seat module failure • Climate Control Module failure	• Check and install a new left rear heater element as required. Check and install a new left rear heated seat module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1031-87	Left Rear Seat Heater - Missing message	• Left rear seat heater LIN circuit short to ground, short to power, open circuit • Left rear heated seat module failure • Climate Control Module failure • Configuration fault	• Refer to the electrical circuit diagrams and check left rear seat heater LIN 1 / A circuit for short to ground, short to power, open circuit. Check and install a new left rear heated seat module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect. If seen with B1033-87, U0422-86 or U3000-55, this is an indication of incorrect or unrecognised car configuration file
B1032-01	Right Front Seat Heater - General electrical failure	• Right front seat heater circuit short to ground, short to power, open circuit • Right front seat heater element(s) failure • Right front seat heater thermistor failure • Right front heated seat module failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check right front seat heater circuit for short to ground, short to power, open circuit. Check connection to LIN 2 / B bus and Power. Check car configuration set up. Check and install a new right front seat heater element as required. Check and install a new right front heated seat module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1032-4B	Right Front Seat Heater - Over temperature	• Right front seat heater thermistor failure • Right front heated seat module failure • Climate Control Module failure	• Check and install a new right front heater element as required. Check and install a new right front heated seat module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1032-87	Right Front Seat Heater - Missing message	• Right front seat heater LIN circuit short to ground, short to power, open circuit • Right front heated seat module failure • Climate Control	• Refer to the electrical circuit diagrams and check right front seat heater LIN 2 / B circuit for short to ground, short to power, open circuit. Check and install a new right front heated seat module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect. If seen with B1030-87, U0422-86 or U3000-55, this is an indication of incorrect or unrecognised car configuration file

DTC	Description	Possible Causes	Action
		Module failure • Configuration fault	
B1033-01	Right Rear Seat Heater - General electrical failure	• Right rear seat heater circuit short to ground, short to power, open circuit • Right rear seat heater element(s) failure • Right rear seat heater thermistor failure • Right rear heated seat module failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check right rear seat heater circuit for short to ground, short to power, open circuit. Check connection to LIN 2 / B bus and Power. Check and install a new right rear seat heater element as required. Check and install a new right rear heated seat module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1033-4B	Right Rear Seat Heater - Over temperature	• Right rear seat heater thermistor failure • Right rear heated seat module failure • Climate Control Module failure	• Check and install a new right rear heater element as required. Check and install a new right rear heated seat module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1033-87	Right Rear Seat Heater - Missing message	• Right rear seat heater LIN circuit short to ground, short to power, open circuit • Right rear heated seat module failure • Climate Control Module failure • Configuration fault	• Refer to the electrical circuit diagrams and check right rear seat heater LIN circuit for short to ground, short to power, open circuit. Check and install a new right rear heated seat module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect. If seen with B1031-87, U0422-86 or U3000-55, this is an indication of incorrect or unrecognised car configuration file
B1034-01	Left Front Seat Heater Element - General electrical failure	• Left front seat heater circuit short to ground, short to power, open circuit • Left front seat heater element failure • Left front heated seat module failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check left front seat heater circuit for short to ground, short to power, open circuit. Check and install a new left front seat heater element as required. Check and install a new left front heated seat module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1035-01	Left Rear Seat Heater Element - General electrical failure	• Left rear seat heater circuit short to ground, short to power, open circuit • Left rear seat heater element failure • Left rear heated seat module failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check left rear seat heater circuit for short to ground, short to power, open circuit. Check and install a new left rear seat heater element as required. Check and install a new left rear heated seat module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1036-01	Right Front Seat Heater Element - General electrical failure	• Right front seat heater circuit short to ground, short to power, open circuit • Right front seat heater element failure • Right front heated seat module failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check right front seat heater circuit for short to ground, short to power, open circuit. Check and install a new right front seat heater element as required. Check and install a new right front heated seat module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect

DTC	Description	Possible Causes	Action
B1037-01	Right Rear Seat Heater Element - General electrical failure	• Right rear seat heater circuit short to ground, short to power, open circuit • Right rear seat heater element failure • Right rear heated seat module failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check right rear seat heater circuit for short to ground, short to power, open circuit. Check and install a new right rear seat heater element as required. Check and install a new right rear heated seat module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1038-01	Left Front Seat Heater Sensor - General electrical failure	• Left front seat heater circuit short to ground, short to power, open circuit • Left front seat heater sensor failure • Left front heated seat module failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check left front seat heater circuit for short to ground, short to power, open circuit. Check and install a new left front seat heater as required. Check and install a new left front heated seat module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1039-01	Left Rear Seat Heater Sensor - General electrical failure	• Left rear seat heater circuit short to ground, short to power, open circuit • Left rear seat heater sensor failure • Left rear heated seat module failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check left rear seat heater circuit for short to ground, short to power, open circuit. Check and install a new left rear seat heater as required. Check and install a new left rear heated seat module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B103A-01	Right Front Seat Heater Sensor - General electrical failure	• Right front seat heater circuit short to ground, short to power, open circuit • Right front seat heater sensor failure • Right front heated seat module failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check right front seat heater circuit for short to ground, short to power, open circuit. Check and install a new right front seat heater as required. Check and install a new right front heated seat module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B103B-01	Right Rear Seat Heater Sensor - General electrical failure	• Right rear seat heater circuit short to ground, short to power, open circuit • Right rear seat heater sensor failure • Right rear heated seat module failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check right rear seat heater circuit for short to ground, short to power, open circuit. Check and install a new right rear seat heater as required. Check and install a new right rear heated seat module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B105A-01	Cabin Temperature Sensor Fan - General electrical failure	• In car temperature sensor aspirator circuit fault • In car sensor unit internal fault	• Refer to the electrical circuit diagrams and check the power and ground supplies to the in car temperature and humidity sensor. Check the aspirator diagnostic line for open circuit, short circuit. Repair wiring as required. Check and install a new sensor as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1083-01	Recirculation Damper Motor - General electrical failure	• Recirculation motor circuit short to ground, short to power, open circuit • Recirculation motor jammed • Recirculation motor failure	• Refer to the electrical circuit diagrams and check recirculation motor circuit for short to power, open circuit. Check recirculation motor has not jammed or been obstructed. Check and install a new recirculation motor as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect

DTC	Description	Possible Causes	Action
		• Climate Control Module failure	
B1085-00	Defroster Damper Motor - No sub type information	• Foreign object obstructing windshield distribution door • Windshield distribution motor circuit short to ground, short to power, open circuit • Damaged windshield distribution door • Windshield distribution motor failure	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported a climate control system concern. Verify the customer concern prior to diagnosis • Check and remove any obstruction in windshield distribution door. Refer to the electrical circuit diagrams and check windshield distribution motor circuit for short to ground, short to power, open circuit. Check and install a new windshield distribution door as required. Check and install a new windshield distribution motor as required. Refer to the warranty policy and procedures manual if a module is suspect
B1085-49	Defroster Damper Motor - Internal electronic failure	• Windshield distribution motor failure	• Check and install a new windshield distribution motor as required. Refer to the warranty policy and procedures manual if a module is suspect
B1087-88	LIN Bus "A" - Bus off	• LIN bus "A" circuit short to ground, short to power, high resistance, open circuit • All front actuators failed • Climate Control Module failure	• Refer to the electrical circuit diagrams and check LIN bus "1 / A" circuit for short to ground, short to power, high resistance, open circuit. Check and install new front actuators as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1088-88	LIN Bus "B" - Bus off	• LIN bus "B" circuit short to ground, short to power, high resistance, open circuit • All front actuators failed • Climate Control Module failure	• Refer to the electrical circuit diagrams and check LIN bus "2 / B" circuit for short to ground, short to power, high resistance, open circuit. Check and install new front actuators as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B10BE-11	Solar Sensor - Circuit short to ground	• Solar sensor circuit short to ground • Solar sensor failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check solar sensor circuit for short to ground. Check and install a new solar sensor as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B11ED-68	Electric Heater Control - Event information	• Event information - electric heater invalid communication message	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported an electric booster heater concern. Verify the customer concern prior to diagnosis • Clear the DTC. With engine coolant temperature low, set climate control temperature to high and retest. If DTC remains in isolation suspect the Electric booster heater. If additional LIN related DTCs are logged refer to the actions for those DTCs. Check and install a new electric heater as required, refer to the warranty policy and procedures manual if a module is suspect
B11ED-87	Electric Heater Control - Missing message	• LIN network fault • Electric heater module fault	• Refer to the electrical circuit diagrams and check the power and ground supplies to the electric heater module. Check the LIN circuits. Repair and wiring harness faults, clear the DTC and retest the system. If the DTC resets suspect the electric heater module, refer to the warranty policy and procedures manual if a module is suspect

DTC	Description	Possible Causes	Action
B11ED-96	Electric Heater Control - Component internal failure	• LIN network fault • Electric heater module fault	• Refer to the electrical circuit diagrams and check the power and ground supplies to the electric heater module. Check the LIN circuits. Repair and wiring harness faults, clear the DTC and retest the system. If the DTC resets suspect the electric heater module, refer to the warranty policy and procedures manual if a module is suspect
B11EE-01	A/C Compressor - General electrical failure	• Refrigerant solenoid valve circuit short to ground, short to each other • Refrigerant solenoid valve failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check refrigerant solenoid valve circuit for short to ground, short to each other. Check and install a new refrigerant solenoid valve as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B11F0-11	Air Intake Damper Position Sensor - Circuit short to ground	• Recirculation motor circuit short to ground • Recirculation motor failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check recirculation motor circuit for short to ground. Check and install a new recirculation motor as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B11F0-15	Air Intake Damper Position Sensor - Circuit short to battery or open	• Recirculation motor circuit short to power, open circuit • Recirculation motor failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check recirculation motor circuit for short to power, open circuit. Check and install a new recirculation motor as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B11FF-84	A/C Refrigerant Pressure - Signal below allowable range	• Insufficient refrigerant in system • Air conditioning compressor fault • Refrigerant pressure sensor failure • Refrigerant solenoid valve failure • Climate Control Module failure	• Check the timestamp for the DTC to see if it was set during cold ambient conditions (below 9 degrees C (49 degrees F). If so allow the vehicle to warm soak to verify the DTC was set correctly. Check the refrigerant system using a suitable charging station. Check the air conditioning compressor for correct operation. Check and install a new refrigerant pressure sensor as required. Check and install a new refrigerant solenoid as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B11FF-85	A/C Refrigerant Pressure - Signal above allowable range	• Excessive refrigerant in system • Blockage in air conditioning system pipework or condenser • Air conditioning fan inoperative • Refrigerant pressure sensor failure • Refrigerant solenoid valve failure • Climate Control Module failure	• Check the refrigerant system using a suitable charging station. Check the condenser and pipework for damage or restriction. Check and install a new Refrigerant pressure sensor as required. Check and install a new refrigerant solenoid as required. Check the air conditioning fan for correct operation. Check and install a new refrigerant solenoid as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1A59-11	Sensor 5 Volt Supply - Circuit short to ground	• Sensor 5 volt supply circuit short to ground • Refrigerant pressure sensor failure • Fresh - Re-circulated air mode motor failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check sensor 5 volt supply circuit for short to ground. Check and install a new Refrigerant pressure sensor as required. Check and install a new Fresh - Re-circulated air mode motor as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect

DTC	Description	Possible Causes	Action
B1A59-13	Sensor 5 Volt Supply - Circuit open	• Sensor 5 volt supply circuit open circuit • Refrigerant pressure sensor failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check sensor 5 volt supply circuit for open circuit. Check and install a new Refrigerant pressure sensor as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1A60-11	Pollution Sensor - Hydrocarbon - Circuit short to ground	• Air quality sensor circuit short to ground • Air quality sensor failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check air quality sensor circuit for short to ground. Check and install a new air quality sensor as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1A61-11	Cabin Temperature Sensor - Circuit short to ground	• Cabin temperature sensor circuit short to ground • Cabin temperature sensor failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check cabin temperature sensor circuit for short to ground. Check and install a new cabin temperature sensor as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1A61-15	Cabin Temperature Sensor - Circuit short to battery or open	• Cabin temperature sensor circuit short to power, open circuit • Cabin temperature sensor failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check cabin temperature sensor circuit for short to power, open circuit. Check and install a new cabin temperature sensor as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1A63-11	Right Solar Sensor - Circuit short to ground	• Right solar sensor circuit short to ground • Right solar sensor failure • CAN network fault	• Refer to the electrical circuit diagrams and check right solar sensor circuit for short to ground between rear parcel shelf and rear climate control panel. Check car configuration values. Check and install a new solar sensor as required. Check CAN connection from Rear Climate Control Module. Refer to the warranty policy and procedures manual if a module is suspect
B1A64-11	Left Solar Sensor - Circuit short to ground	• Left solar sensor circuit short to ground • Left solar sensor failure • CAN network fault	• Refer to the electrical circuit diagrams and check left solar sensor circuit for short to ground between rear parcel shelf and rear climate control panel. Check car configuration values. Check and install a new solar sensor as required. Check CAN connection from Rear Climate Control Module. Refer to the warranty policy and procedures manual if a module is suspect
B1A67-13	Sensor Ground - Circuit open	• Sensor(s) ground circuit open circuit • Climate Control Module failure	• Refer to the electrical circuit diagrams and check sensor circuit for open circuit. DTCs B1A61-15, B1A59-13 and P0530-15 will also be logged. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1A69-01	Humidity Sensor - General electrical failure	• Humidity sensor circuit fault • Humidity sensor failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check humidity sensor circuit for short to ground, short to power, open circuit. Check and install a new combined cabin temperature & humidity sensor as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1B62-11	Pollution Sensor - NOx - Circuit short to ground	• Air quality sensor circuit short to ground • Air quality sensor failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check air quality sensor circuit for short to ground. Check and install a new air quality sensor as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect

DTC	Description	Possible Causes	Action
B1B71-11	Evaporator Temperature Sensor - Circuit short to ground	• Evaporator temperature sensor circuit short to ground • Evaporator temperature sensor failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check evaporator temperature sensor circuit for short to ground. Check and install a new evaporator temperature sensor as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1B71-15	Evaporator Temperature Sensor - Circuit short to battery or open	• Evaporator temperature sensor circuit short to power, open circuit • Evaporator temperature sensor failure • Climate Control Module failure	• Refer to the electrical circuit diagrams and check evaporator temperature sensor circuit for short to power, open circuit. Check and install a new evaporator temperature sensor as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1B72-11	LIN Bus #1 Power Supply Circuit - Circuit short to ground	• LIN bus 1 circuit short to ground • Defrost stepper motor failure • Front right foot stepper motor failure • Front right face stepper motor failure • Front right air mix stepper motor failure • Rear right air mix stepper motor • Front left seat heater • Rear left seat heater • Climate Control Module failure	• Refer to the electrical circuit diagrams and check LIN bus 1 circuit for short to ground. Check and install new stepper motors as required. Check and install a new seat heater module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B1B73-11	LIN Bus #2 Power Supply Circuit - Circuit short to ground	• LIN bus 2 circuit short to ground • Front left foot stepper motor • Front left face stepper motor • Front left air mix stepper motor • Rear left foot stepper motor • Rear left face stepper motor • Rear left air mix stepper motor • Front right seat heater • Rear right seat heater • Electric booster heater (Diesel only) • Climate Control Module failure	• Refer to the electrical circuit diagrams and check LIN bus 2 circuit for short to ground. Check and install new stepper motors as required. Check and install a new electric heater as required. Check and install new seat heater module as required. Check and install a new Climate Control Module as required. Refer to the warranty policy and procedures manual if a module is suspect
B134C-00	Left Front Face Damper Motor - No sub type information	• Foreign object obstructing left front face distribution door • Left front face distribution motor circuit short to ground, short to power, open circuit • Damaged left front	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported a climate control system concern. Verify the customer concern prior to diagnosis • Check and remove any obstruction in left front face distribution door. Refer to the electrical circuit diagrams and check left front face distribution motor circuit for short to ground, short to power, open circuit. Check and install a new

DTC	Description	Possible Causes	Action
		face distribution door • Left front face distribution motor failure	left front face distribution door as required. Check and install a new left front face distribution motor as required. Refer to the warranty policy and procedures manual if a module is suspect
B134C-49	Left Front Face Damper Motor - Internal electronic failure	• Left front face distribution motor failure	• Check and install a new left front face distribution motor as required. Refer to the warranty policy and procedures manual if a module is suspect
B1351-00	Left Front Foot Damper Motor - No sub type information	• Foreign object obstructing left front foot distribution door • Left front foot distribution motor circuit short to ground, short to power, open circuit • Damaged left front foot distribution door • Left front foot distribution motor failure	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported a climate control system concern. Verify the customer concern prior to diagnosis • Check and remove any obstruction in left front foot distribution door. Refer to the electrical circuit diagrams and check left front foot distribution motor circuit for short to ground, short to power, open circuit. Check and install a new left front foot distribution door as required. Check and install a new left front foot distribution motor as required. Refer to the warranty policy and procedures manual if a module is suspect
B1351-49	Left Front Foot Damper Motor - Internal electronic failure	• Left front foot distribution motor failure	• Check and install a new left front foot distribution motor as required. Refer to the warranty policy and procedures manual if a module is suspect
B1352-00	Left Front Temperature Damper Motor - No sub type information	• Foreign object obstructing left front temperature distribution door • Left front temperature distribution motor circuit short to ground, short to power, open circuit • Damaged left front temperature distribution door • Left front temperature distribution motor failure	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported a climate control system concern. Verify the customer concern prior to diagnosis • Check and remove any obstruction in left front temperature distribution door. Refer to the electrical circuit diagrams and check left front temperature distribution motor circuit for short to ground, short to power, open circuit. Check and install a new left front temperature distribution door as required. Check and install a new left front temperature distribution motor as required. Refer to the warranty policy and procedures manual if a module is suspect
B1352-49	Left Front Temperature Damper Motor - Internal electronic failure	• Left front temperature distribution motor failure	• Check and install a new left front temperature distribution motor as required. Refer to the warranty policy and procedures manual if a module is suspect
B1353-00	Right Front Face Damper Motor - No sub type information	• Foreign object obstructing right front face distribution door • Right front face distribution motor circuit short to ground, short to power, open circuit • Damaged right front face distribution door • Right front face distribution motor failure	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported a climate control system concern. Verify the customer concern prior to diagnosis • Check and remove any obstruction in right front face distribution door. Refer to the electrical circuit diagrams and check right front face distribution motor circuit for short to ground, short to power, open circuit. Check and install a new right front face distribution door as required. Check and install a new right front face distribution motor as required. Refer to the warranty policy and procedures manual if a module is suspect
B1353-49	Right Front Face Damper Motor - Internal electronic failure	• Right front face distribution motor failure	• Check and install a new right front face distribution motor as required. Refer to the warranty policy and procedures manual if a module is suspect

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Climate Controlled Seat Module - Front/Rear (SCME/SCMF)

Description and Operation

Climate Controlled Seat Module - Front/Rear (SCME/SCMF)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Climate Controlled Seat Module - Front/Rear (SCME/SCMF), for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section. For additional information, refer to: Seats (501-10 Seating, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B10B9-13	Blower Control - Circuit open	• LH seat blower + circuit, open circuit • LH seat blower - circuit, open circuit • Connectors disconnected • Connector pin damage • Blower motor assembly open circuit • Climate Control Seat Module failure	Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check LH seat blower + circuit for open circuit. Check LH seat blower - circuit for open circuit. Check for any disconnected connectors or damaged connector pins. Check blower motor assembly for open circuit. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B10B9-4B	Blower Control - Over temperature	• Mechanical restriction in blower motor assembly • LH seat blower + circuit, short to ground • LH seat blower - circuit, short to ground • Blower motor assembly, short to ground • Climate Control Seat Module failure	Check for mechanical restriction or debris in blower motor assembly. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check LH seat blower + circuit for short to ground. Check LH seat blower - circuit for short to ground. Check blower motor assembly for short to ground. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.

DTC	Description	Possible Causes	Action
B1157-13	Blower Control B - Circuit open	• RH seat blower + circuit, open circuit • RH seat blower - circuit, open circuit • Connectors disconnected • Connector pin damage • Blower motor assembly open circuit • Climate Control Seat Module failure	Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check RH seat blower + circuit for open circuit. Check RH seat blower - circuit for open circuit. Check for any disconnected connectors or damaged connector pins. Check blower motor assembly for open circuit. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B1157-4B	Blower Control B - Over temperature	• Mechanical restriction in blower motor assembly • RH seat blower + circuit, short to ground • RH seat blower - circuit, short to ground • Blower motor assembly, short to ground • Climate Control Seat Module failure	Check for mechanical restriction or debris in blower motor assembly. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check RH seat blower + circuit for short to ground. Check RH seat blower - circuit for short to ground. Check blower motor assembly for short to ground. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B120E-13	Right Thermal Electric Device Control - Circuit open	• RH seat back thermal electric device + circuit, open circuit • RH seat back thermal electric device - circuit, open circuit • RH seat cushion thermal electric device + circuit, open circuit • RH seat cushion thermal electric device - circuit, open circuit • Connectors disconnected • Connector pin damage • Climate seat backrest thermal electric device assembly, open circuit • Climate seat cushion thermal electric device assembly, open circuit • Climate Control Seat Module failure	Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check, RH seat back thermal electric device + circuit for open circuit. Check RH seat back thermal electric device - circuit for open circuit. Check RH seat cushion thermal electric device + circuit for open circuit. Check RH seat cushion thermal electric device - circuit for open circuit. Check for any disconnected connectors or damaged connector pins. Check climate seat backrest thermal electric device assembly for open circuit. Check climate seat cushion thermal electric device assembly for open circuit. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B120E-19	Right Thermal Electric Device Control - Circuit current above threshold	• RH seat back thermal electric device + circuit, short to ground • RH seat back thermal electric device - circuit, short to ground • RH seat cushion thermal electric device + circuit, short to ground • RH seat cushion thermal electric device - circuit, short to ground • Climate seat backrest thermal electric device assembly, short to ground • Climate seat cushion thermal electric device assembly, short to ground • Climate Control Seat Module failure	Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check, RH seat back thermal electric device + circuit for short to ground. Check RH seat back thermal electric device - circuit for short to ground. Check RH seat cushion thermal electric device + circuit for short to ground. Check RH seat cushion thermal electric device - circuit for short to ground. Check climate seat backrest thermal electric device assembly for short to ground. Check climate seat cushion thermal electric device assembly for short to ground. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B120E-4B	Right Thermal Electric Device Control - Over temperature	• Restriction in thermal electric device air path • RH seat back thermal electric device + circuit, short to ground • RH seat back thermal electric device - circuit,	Check for blockage or restriction in thermal electric device air path. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check, RH seat back thermal electric device + circuit for short to ground. Check RH seat back thermal electric device - circuit for short to ground. Check RH seat cushion thermal electric device + circuit for short to ground. Check RH seat cushion thermal

DTC	Description	Possible Causes	Action
		short to ground • RH seat cushion thermal electric device + circuit, short to ground • RH seat cushion thermal electric device - circuit, short to ground • Climate seat backrest thermal electric device assembly, short to ground • Climate seat cushion thermal electric device assembly, short to ground • Climate Control Seat Module failure	electric device - circuit for short to ground. Check climate seat backrest thermal electric device assembly for short to ground. Check climate seat cushion thermal electric device assembly for short to ground. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B120F-98	Left Seat Cushion - Component or system over temperature	• The Climate Control Seat Module LH cushion sensor input circuit temperature exceeds 65 Degrees C continuously for more than 4 seconds during cooling • The Climate Control Seat Module LH cushion sensor input circuit temperature is greater than 110 Degrees C for more than 4 seconds during heating • Blocked or restricted thermal electric device fan exhaust vent • Restricted thermal electric fan movement	Check for blockage or restriction in thermal electric device fan exhaust vent. Check for restricted thermal electric fan movement. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B1223-13	Right Seat Cushion Temperature Sensor - Circuit open	• RH seat cushion sensor circuit, open circuit • RH seat cushion sensor - circuit, open circuit • Connectors disconnected • Connector pin damage • Climate seat cushion temperature sensor assembly, open circuit • Climate Control Seat Module failure	Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check, RH seat cushion sensor circuit for open circuit. Check RH seat cushion sensor - circuit for open circuit. Check for any disconnected connectors or damaged connector pins. Check Climate seat cushion temperature sensor assembly for open circuit. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B1224-13	Left Seat Cushion Temperature Sensor - Circuit open	• LH seat back thermal electric device + circuit, open circuit • LH seat back thermal electric device - circuit, open circuit • LH seat cushion thermal electric device + circuit, open circuit • LH seat cushion thermal electric device - circuit, open circuit • Connectors disconnected • Connector pin damage • Climate seat backrest thermal electric device assembly, open circuit • Climate seat cushion thermal electric device assembly, open circuit • Climate Control Seat Module failure	Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check, LH seat back thermal electric device + circuit for open circuit. Check LH seat back thermal electric device - circuit for open circuit. Check LH seat cushion thermal electric device + circuit for open circuit. Check LH seat cushion thermal electric device - circuit for open circuit. Check for any disconnected connectors or damaged connector pins. Check climate seat backrest thermal electric device assembly for open circuit. Check climate seat cushion thermal electric device assembly for open circuit. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B1224-19	Left Thermal Electric Device Control - Circuit current above threshold	• LH seat back thermal electric device + circuit, short to ground • LH seat back thermal electric device - circuit,	Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check, LH seat back thermal electric device + circuit for short to ground. Check LH seat back thermal electric device - circuit for short to ground. Check LH seat cushion thermal electric device + circuit for

DTC	Description	Possible Causes	Action
		short to ground • LH seat cushion thermal electric device + circuit, short to ground • LH seat cushion thermal electric device - circuit, short to ground • Climate seat backrest thermal electric device assembly, short to ground • Climate seat cushion thermal electric device assembly, short to ground • Climate Control Seat Module failure	short to ground. Check LH seat cushion thermal electric device - circuit for short to ground. Check climate seat backrest thermal electric device assembly for short to ground. Check climate seat cushion thermal electric device assembly for short to ground. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B1224-4B	Left Thermal Electric Device Control - Over temperature	• Restriction in thermal electric device air path • LH seat back thermal electric device + circuit, short to ground • LH seat back thermal electric device - circuit, short to ground • LH seat cushion thermal electric device + circuit, short to ground • LH seat cushion thermal electric device - circuit, short to ground • Climate seat backrest thermal electric device assembly, short to ground • Climate seat cushion thermal electric device assembly, short to ground • Climate Control Seat Module failure	Check for blockage or restriction in thermal electric device air path. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check, LH seat back thermal electric device + circuit for short to ground. Check LH seat back thermal electric device - circuit for short to ground. Check LH seat cushion thermal electric device + circuit for short to ground. Check LH seat cushion thermal electric device - circuit for short to ground. Check climate seat backrest thermal electric device assembly for short to ground. Check climate seat cushion thermal electric device assembly for short to ground. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B1225-13	Right Seat Back Temperature Sensor - Circuit open	• RH seat back sensor circuit, open circuit • RH seat back sensor - circuit, open circuit • Connectors disconnected • Connector pin damage • Climate seat back temperature sensor assembly, open circuit • Climate Control Seat Module failure	Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check, RH seat back sensor circuit for open circuit. Check RH seat back sensor - circuit for open circuit. Check for any disconnected connectors or damaged connector pins. Check Climate seat back temperature sensor assembly for open circuit. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B1229-13	Left Seat Back Temperature Sensor - Circuit open	• LH seat back sensor circuit, open circuit • LH seat back sensor - circuit, open circuit • Connectors disconnected • Connector pin damage • Climate seat back temperature sensor assembly, open circuit • Climate Control Seat Module failure	Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check, LH seat back sensor circuit for open circuit. Check LH seat back sensor - circuit for open circuit. Check for any disconnected connectors or damaged connector pins. Check Climate seat back temperature sensor assembly for open circuit. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B122A-11	Right Seat Cushion Blower Speed Sensor - Circuit short to ground	• RH cushion fan speed, circuit short to ground • Blower motor assembly, short to ground • Climate Control Seat Module failure	Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check, RH cushion fan speed for circuit short to ground. Check blower motor assembly for short to ground. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.

DTC	Description	Possible Causes	Action
B122A-12	Right Seat Cushion Blower Speed Sensor - Circuit short to battery	• RH cushion fan speed, circuit short to power • Blower motor assembly, short to power • Climate Control Seat Module failure	Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check, RH cushion fan speed for circuit short to power. Check blower motor assembly for short to power. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B122B-11	Right Seat Back Blower Speed Sensor - Circuit short to ground	• RH seat back fan speed, circuit short to ground • Blower motor assembly, short to ground • Climate Control Seat Module failure	Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check, RH seat back fan speed for circuit short to ground. Check blower motor assembly for short to ground. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B122B-12	Right Seat Back Blower Speed Sensor - Circuit short to battery	• RH seat back fan speed, circuit short to power • Blower motor assembly, short to power • Climate Control Seat Module failure	Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check, RH seat back fan speed for circuit short to power. Check blower motor assembly for short to power. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B122C-11	Left Seat Cushion Blower Speed Sensor - Circuit short to ground	• LH cushion fan speed, circuit short to ground • Blower motor assembly, short to ground • Climate Control Seat Module failure	Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check, LH cushion fan speed for circuit short to ground. Check blower motor assembly for short to ground. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B122C-12	Left Seat Cushion Blower Speed Sensor - Circuit short to battery	• LH cushion fan speed, circuit short to power • Blower motor assembly, short to power • Climate Control Seat Module failure	Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check, LH cushion fan speed for circuit short to power. Check blower motor assembly for short to power. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B122D-11	Left Seat Back Blower Speed Sensor - Circuit short to ground	• LH seat back fan speed, circuit short to ground • Blower motor assembly, short to ground • Climate Control Seat Module failure	Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check, LH seat back fan speed for circuit short to ground. Check blower motor assembly for short to ground. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B122D-12	Left Seat Back Blower Speed Sensor - Circuit short to battery	• LH seat back fan speed, circuit short to power • Blower motor assembly, short to power • Climate Control Seat Module failure	Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check, LH seat back fan speed for circuit short to power. Check blower motor assembly for short to power. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.

DTC	Description	Possible Causes	Action
B122E-98	Right Seat Cushion - Component or system over temperature	• The Climate Control Seat Module RH cushion sensor input circuit temperature exceeds 65 Degrees C continuously for more than 4 seconds during cooling • The Climate Control Seat Module RH cushion sensor input circuit temperature is greater than 110 Degrees C for more than 4 seconds during heating • Blocked or restricted thermal electric device fan exhaust vent • Restricted thermal electric fan movement	Check for blockage or restriction in thermal electric device fan exhaust vent. Check for restricted thermal electric fan movement. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B122F-98	Right Seat Back - Component or system over temperature	• The Climate Control Seat Module RH seat back sensor input circuit temperature exceeds 65 Degrees C continuously for more than 4 seconds during cooling • The Climate Control Seat Module RH seat back sensor input circuit temperature is greater than 110 Degrees C for more than 4 seconds during heating • Blocked or restricted thermal electric device fan exhaust vent • Restricted thermal electric fan movement	Check for blockage or restriction in thermal electric device fan exhaust vent. Check for restricted thermal electric fan movement. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B1230-98	Left Seat Back - Component or system over temperature	• The Climate Control Seat Module LH seat back sensor input circuit temperature exceeds 65 Degrees C continuously for more than 4 seconds during cooling • The Climate Control Seat Module LH seat back sensor input circuit temperature is greater than 110 Degrees C for more than 4 seconds during heating • Blocked or restricted thermal electric device fan exhaust vent • Restricted thermal electric fan movement	Check for blockage or restriction in thermal electric device fan exhaust vent. Check for restricted thermal electric fan movement. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B1231-7A	Right Seat - Fluid leak or seal failure	• The Climate Control Seat Module has detected an input temperature difference greater than expected between RH seat back sensor and RH cushion sensor • Climate seat back assembly air path leaking • Climate seat cushion assembly air path leaking • Seat assembly damaged	Check for blockage or restriction in seat back thermal electric device fan ducts. Check seat back thermal electric device fan exhaust vent is clear. Check for blockage or restriction in seat cushion thermal electric device fan ducts. Check seat cushion thermal electric device fan exhaust vent is clear. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.

DTC	Description	Possible Causes	Action
B1232-7A	Left Seat - Fluid leak or seal failure	• The Climate Control Seat Module has detected an input temperature difference greater than expected between LH seat back sensor and LH cushion sensor • Climate seat back assembly air path leaking • Climate seat cushion assembly air path leaking • Seat assembly damaged	Check for blockage or restriction in seat back thermal electric device fan ducts. Check seat back thermal electric device fan exhaust vent is clear. Check for blockage or restriction in seat cushion thermal electric device fan ducts. Check seat cushion thermal electric device fan exhaust vent is clear. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B1235-13	Left Seat Cushion Temperature Sensor - Circuit open	• LH seat cushion sensor circuit, open circuit • LH seat cushion sensor - circuit, open circuit • Connectors disconnected • Connector pin damage • Climate seat cushion temperature sensor assembly, open circuit • Climate Control Seat Module failure	Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm the fault is present. Refer to the electrical circuit diagrams and check, LH seat cushion sensor circuit for open circuit. Check LH seat cushion sensor - circuit for open circuit. Check for any disconnected connectors or damaged connector pins. Check Climate seat cushion temperature sensor assembly for open circuit. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Alternatively carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
U0010-88	Medium Speed CAN Communication Bus - Bus off	• Medium Speed CAN communication bus off	Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network.
U0140-00	Lost Communication With Body Control Module - No sub type information	• CAN harness link between Climate Control Seat Module and Central Junction Box malfunction • The Climate Control Seat Module has not received the expected CAN signal from the Central Junction Box within the specified time interval	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported a climate seat concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis Using the manufacturer approved diagnostic system, check Central Junction Box for DTCs and refer to the relevant DTC Index. Using the manufacturer approved diagnostic system, carry out network integrity test. Refer to the electrical circuit diagrams and check Central Junction Box power and ground circuits for open circuit. Check CAN harness between Climate Control Seat Module and Central Junction Box, repair as necessary.
U0142-00	Lost Communication With Body Control Module "B" - No sub type information	• CAN harness link between Climate Control Seat Module and Rear Junction Box malfunction • The Climate Control Seat Module has not received the expected CAN signal from the Rear Junction Box within the specified time interval	Using the manufacturer approved diagnostic system, check Rear Junction Box for DTCs and refer to the relevant DTC Index. Using the manufacturer approved diagnostic system, carry out network integrity test. Refer to the electrical circuit diagrams and check Rear Junction Box power and ground circuits for open circuit. Check CAN harness between Climate Control Seat Module and Rear Junction Box, repair as necessary.
U0155-00	Lost Communication With Instrument Panel Cluster (IPC) Control Module - No sub type information	• CAN harness link between Climate Control Seat Module and Instrument Panel Cluster (IPC) network malfunction • The Climate Control Seat Module has not received the expected CAN signal from the Instrument Panel Cluster (IPC) within the specified time interval	Using the manufacturer approved diagnostic system, check Instrument Panel Cluster (IPC) for DTCs and refer to the relevant DTC Index. Using the manufacturer approved diagnostic system, carry out network integrity test. Refer to the electrical circuit diagrams and check Instrument Panel Cluster (IPC) power and ground circuits for open circuit. Check CAN harness between Climate Control Seat Module and Instrument Panel Cluster (IPC), repair as necessary.
U0156-00	Lost Communication With Information Center "A" - No sub type information	• CAN harness link between Climate Control Seat Module and Information and Entertainment Control Module network malfunction	Using the manufacturer approved diagnostic system, check Information and Entertainment Control Module for DTCs and refer to the relevant DTC Index. Using the manufacturer approved diagnostic system, carry out network integrity test. Refer to the electrical circuit diagrams and check Information and Entertainment Control Module power and ground circuits for open circuit. Check CAN harness between Climate Control

DTC	Description	Possible Causes	Action
		• The Climate Control Seat Module has not received the expected CAN signal from the Information and Entertainment Control Module within the specified time interval	Seat Module and Information and Entertainment Control Module, repair as necessary.
U0300-00	Internal Control Module Software Incompatibility - No sub type information	• Incorrect or invalid software has been installed	Using the manufacturer approved diagnostic system, re-configure the Climate Control Seat Module and the Rear Junction Box. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification. Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect.
U0401-00	Invalid Data Received from ECM/PCM A - No sub type information	• The Engine Control Module (ECM) has transmitted engine speed quality factor CAN signal at a specific value for a greater than expected time period	Using the manufacturer approved diagnostic system, check Engine Control Module for DTCs and refer to the relevant DTC Index.
U2101-00	Control module Configuration Incompatible - No sub type information	• Calibration incomplete/corrupt	Using the manufacturer approved diagnostic system, re-configure the Climate Control Seat Module and the Rear Junction Box. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification.
U3000-04	Control Module - System internal failures	• Climate Control Seat Module failure • Climate Control Seat Module microprocessor failed internal ROM and/or RAM checksum test	Refer to the warranty policy and procedures manual if the Climate Control Seat Module is suspect.
U3003-62	Battery Voltage - Signal compare failure	• Mismatch in battery voltage of 2 volts or more between the measured battery voltage at the Climate Control Seat Module and the battery voltage signal sent from the Rear Junction Box	Refer to the electrical circuit diagrams and check that power supply voltage at Climate Control Seat Module and Rear Junction Box is not different by more than 2 volts. Rectify as required. Carry out On Demand Self Test (ODST) using manufacturer approved diagnostic system to confirm rectification.

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Digital Audio Broadcast Module (DABM)

Description and Operation

Digital Audio Broadcast Module (DABM)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Digital Audio Broadcast Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Information and Entertainment System (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B11A4-11	L-Band Antenna - Circuit short to ground	• L-Band antenna circuit short to ground	• Refer to the electrical circuit diagrams and check the circuit between the antenna and the tuner module
B11A4-15	L-Band Antenna - Circuit short to battery or open	• L-Band antenna circuit short to power or open circuit	• Refer to the electrical circuit diagrams and check the circuit between the antenna and the tuner module
B11A5-11	Band 3 Antenna - Circuit short to ground	• Band 3 antenna circuit short to ground	• Refer to the electrical circuit diagrams and check the circuit
B11A5-15	Band 3 Antenna - Circuit short to battery or open	• Band 3 antenna circuit short to power or open circuit	• Refer to the electrical circuit diagrams and check the circuit
U3000-04	Control Module - System internal failures	• Digital audio broadcast module internal failure	• Renew the control module. Refer to the warranty policy and procedures manual if a module is suspect

DTC	Description	Possible Causes	Action
U3000-44	Control Module - Data memory failure	• Digital audio broadcast module internal RAM memory failure	• Renew the control module. Refer to the warranty policy and procedures manual if a module is suspect
U3000-4A	Control Module - Incorrect component installed	• Digital audio broadcast module incorrect component installed - The module has been installed to a vehicle not configured to accept it	• Using the manufacturer approved diagnostic system select the vehicle configuration main menu, select configure existing modules menu and program the module
U3000-55	Control Module - Not configured	• Digital audio broadcast module not configured correctly	• Using the manufacturer approved diagnostic system select the vehicle configuration main menu, select configure existing modules menu and program the module
U3000-87	Control Module - Missing message	• Missing message	• Using the manufacturer approved diagnostic system select the vehicle configuration main menu, select configure existing modules menu and program the module
U3000-98	Control Module - Component or system over temperature	• Digital audio broadcast module component or system over temperature	• Check that the digital audio broadcast module cooling vents/air circulation is not obstructed • Cool the vehicle interior down by ensuring it is in the shade and have the A/C on cool. When cool, clear the DTC and retest. If the problem persists, renew the module. Refer to the warranty policy and procedures manual if a module is suspect
U3003-62	Battery Voltage - Signal compare failure	• Digital audio broadcast module voltage differs more than ±2V compared to central electronics module voltage	• Check vehicle battery and charging system. Refer to the relevant section in the workshop manual. Refer to the electrical circuit diagrams and check the power and ground supply circuits to the modules

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Driver Door Module/Passenger Door Module (DDM/PDM)

Description and Operation

Driver/Passenger Door Module (DDM/PDM)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Driver/Passenger Door Module (DDM/PDM). For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual.
For additional information, refer to: Driver Door Module (DDM) (419-10 Multifunction Electronic Modules, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B108F-23	Cabin Lock/Unlock Switch - Signal stuck low	• Switch pressed longer than 20 seconds • Circuit fault	• Check for mechanical faults/sticking on the left and right door trim switches. Check circuits for short to ground or other circuits. Replace switch or repair wiring as required
B109C-15	Front Courtesy Light - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test front courtesy light circuit for short to power or open circuit
B109D-11	Front Courtesy Light - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test front courtesy light circuit for short ground
B10EB-11	Driver Door Double Locking Motor - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test driver door double locking motor circuit for short ground
B10EB-15	Driver Door Double Locking Motor - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test driver door double locking motor circuit for short to power or open circuit

DTC	Description	Possible Causes	Action
B10EC-11	Passenger Door Double Locking Motor - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test passenger door double locking motor circuit for short ground
B10EC-15	Passenger Door Double Locking Motor - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test passenger door double locking motor circuit for short to power or open circuit
B10ED-11	Rear Door Driver Side Double Locking Motor - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test driver door double locking motor circuit for short ground
B10ED-15	Rear Door Driver Side Double Locking Motor - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test driver door double locking motor circuit for short to power or open circuit
B10EE-11	Rear Door Passenger Side Double Locking Motor - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test driver door double locking motor circuit for short ground
B10EE-15	Rear Door Passenger Side Double Locking Motor - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test driver door double locking motor circuit for short to power or open circuit
B1108-11	Driver Door Central Locking Motor - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test driver door central locking motor circuit for short ground
B1108-15	Driver Door Central Locking Motor - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test driver door central locking motor circuit for short to power or open circuit
B1109-11	Passenger Door Central Locking Motor - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test passenger door central locking motor circuit for short ground
B1109-15	Passenger Door Central Locking Motor - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test passenger door central locking motor circuit for short to power or open circuit
B1163-11	Left Mirror Heater Output Short To Ground - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test left mirror heater output circuit for short to ground
B1163-15	Left Mirror Heater Output Short To Power - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test left mirror heater output circuit for short to power or open circuit
B1164-11	Right Mirror Heater Output Short To Ground - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test right mirror heater output circuit for short to ground
B1164-15	Right Mirror Heater Output Short To Power - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test right mirror heater output circuit for short to power or open circuit
B1165-11	Left Front Puddle Lamp Output Short To Ground - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test left front puddle lamp output circuit for short to ground
B1165-15	Left Front Puddle Lamp Output Open Load Or Short To Battery - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test left front puddle lamp output circuit for short to power or open circuit

DTC	Description	Possible Causes	Action
B1166-11	Right Front Puddle Lamp Output Short To Ground - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test right front puddle lamp output circuit for short to ground
B1166-15	Right Front Puddle Lamp Output Open Load Or Short To Battery - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test right front puddle lamp output circuit for short to power or open circuit
B117E-07	Front Power Window Up - Mechanical failure	• Mechanical fault	• Inspect the relevant door mechanism for obstructions or mechanical faults. Repair as required. Clear DTC and retest. If DTC remains suspect relevant door module. Refer to the warranty policy and procedures manual if a module is suspect
B117E-72	Front Power Window Up - Actuator stuck open	• Door module internal relay sticking open	• Renew the relevant door module. Refer to the warranty policy and procedures manual if a module is suspect
B117E-73	Front Power Window Up - Actuator stuck closed	• Door module internal relay sticking closed	• Renew the relevant door module. Refer to the warranty policy and procedures manual if a module is suspect
B117F-72	Front Power Window Down - Actuator stuck open	• Door module internal relay sticking open	• Renew the relevant rear door module. Refer to the warranty policy and procedures manual if a module is suspect
B117F-73	Front Power Window Down - Actuator stuck closed	• Door module internal relay sticking closed	• Renew the relevant rear door module. Refer to the warranty policy and procedures manual if a module is suspect
B1189-29	Front Window Position Sensor - Signal invalid	• Missing signal from hall sensor 1 or 2 • Sensor circuit fault • Hall sensor fault	• Refer to the electrical circuit diagrams and check the hall sensor circuit between the door module and window motor. Repair as necessary. If the problem persists, renew the window motor
B118A-29	Rear Window Position Sensor - Signal invalid	• Missing signal from hall sensor 1 or 2 • Sensor circuit fault • Hall sensor fault	• Refer to the electrical circuit diagrams and check the hall sensor circuit between the door module and window motor. Repair as necessary. If the problem persists, renew the window motor
B118C-04	Left Blindspot Warning Indicator - System internal fault	• Camera module internal fault	• Check Blindspot Monitoring System Module for DTCs and refer to the relevant DTC index
B118E-00	Left Front Window - No sub type information	• Window travel limits not learned	• Refer to the workshop manual and operate the window to allow the door module to learn the fully open and closed positions. Clear the DTC and retest.
B118F-00	Right Front Window - No sub type information	• Window travel limits not learn	• Refer to the workshop manual and operate the window to allow the door module to learn the fully open and closed positions. Clear the DTC and retest.
B1190-00	Left Rear Window - No sub type information	• Window travel limits not learned	• Refer to the workshop manual and operate the window to allow the door module to learn the fully open and closed positions. Clear the DTC and retest.
B1191-00	Right Rear Window - No sub type information	• Window travel limits not learn	• Refer to the workshop manual and operate the window to allow the door module to learn the fully open and closed positions. Clear the DTC and retest.

DTC	Description	Possible Causes	Action
B11D1-83	LIN Bus Circuit "C" - Value of signal protection calculation incorrect	• Value of signal protection calculation incorrect	• Refer to the electrical circuit diagrams and test LIN circuits between driver door switchpack and Driver Door Module for short/open circuits, clear DTC and re-test
B11D1-86	LIN Bus Circuit "C" - Signal invalid	• Signal Invalid	• Refer to the electrical circuit diagrams and test LIN circuits between driver door switchpack and Driver Door Module for short/open circuits, clear DTC and re-test
B11D1-87	LIN Bus Circuit "C" - Missing message	• Missing Message	• Refer to the electrical circuit diagrams and test LIN circuits between driver door switchpack and Driver Door Module for short/open circuits, clear DTC and re-test
B11F6-11	Driver Folding Mirror Motor - Circuit short to ground	• Circuit short to ground	• Refer to the electrical circuit diagrams and mirror movement control circuits between driver door mirror and Driver Door Module for short to ground, repair wiring as required, clear DTC and re-test. If DTC remains suspect mirror, refer to the warranty policy and procedures manual if a module is suspect
B11F6-15	Driver Folding Mirror Motor - Circuit short to battery or open	• Circuit short to power or open circuit	• Refer to the electrical circuit diagrams and mirror movement control circuits between driver door mirror and Driver Door Module for short to power or open circuit, repair wiring as required, clear DTC and re-test. If DTC remains suspect mirror, refer to the warranty policy and procedures manual if a module is suspect
B11F7-11	Passenger Folding Mirror Motor - Circuit short to ground	• Circuit short to ground	• Refer to the electrical circuit diagrams and mirror movement control circuits between passenger door mirror and Passenger Door Module for short to ground, repair wiring as required, clear DTC and re-test. If DTC remains suspect mirror, refer to the warranty policy and procedures manual if a module is suspect
B11F7-15	Passenger Folding Mirror Motor - Circuit short to battery or open	• Circuit short to power or open circuit	• Refer to the electrical circuit diagrams and mirror movement control circuits between passenger door mirror and Passenger Door Module for short to power or open circuit, repair wiring as required, clear DTC and re-test. If DTC remains suspect mirror, refer to the warranty policy and procedures manual if a module is suspect
B1A94-11	Driver Mirror - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test driver mirror fold motor circuit for short to ground
B1A94-15	Driver Mirror - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test driver mirror fold motor circuit for short to power or open circuit
B1A95-11	Passenger Mirror - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test passenger mirror fold motor circuit for short to ground
B1A95-15	Passenger Mirror - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test passenger mirror fold motor circuit for short to power or open circuit
B1A98-83	LIN Bus Circuit #1 - Value of signal protection calculation incorrect	• Value of signal protection calculation incorrect	• Refer to the electrical circuit diagrams and test LIN circuit between driver switch pack and DDM for short/open circuits, clear DTC and re-test. If DTC remains install a new switch pack

DTC	Description	Possible Causes	Action
B1A98-86	LIN Bus Circuit #1 - Signal invalid	• Signal Invalid	• Refer to the electrical circuit diagrams and test LIN circuit between driver switch pack and DDM for short/open circuits, clear DTC and re-test. If DTC remains install a new switch pack
B1A98-87	LIN Bus Circuit #1 - Missing message	• Missing Message	• Refer to the electrical circuit diagrams and test LIN circuit between driver switch pack and DDM for short/open circuits, clear DTC and re-test. If DTC remains install a new switch pack
B1C09-11	Driver Left/Right Mirror Motor Circuit - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test driver left/right mirror motor circuit for short to ground
B1C09-15	Driver Left/Right Mirror Motor Circuit - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test driver left/right mirror motor circuit for short to power or open circuit
B1C10-11	Driver Up/Down Mirror Motor Circuit - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test driver up/down mirror motor circuit for short to ground
B1C10-15	Driver Up/Down Mirror Motor Circuit - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test driver up/down mirror motor circuit for short to power or open circuit
B1C11-11	Passenger Left/Right Mirror Motor Circuit - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test passenger left/right mirror motor circuit for short to ground
B1C11-15	Passenger Left/Right Mirror Motor Circuit - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test passenger left/right mirror motor circuit for short to power or open circuit
B1C12-11	Passenger Up/Down Mirror Motor Circuit - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test passenger up/down mirror motor circuit for short to ground
B1C12-15	Passenger Up/Down Mirror Motor Circuit - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test passenger up/down mirror motor circuit for short to power or open circuit
B1C13-11	Driver Up/Down Mirror Motor Feedback Circuit - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test driver up/down mirror motor feedback circuit for short to ground
B1C13-15	Driver Up/Down Mirror Motor Feedback Circuit - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test driver up/down mirror motor feedback circuit for short to power or open circuit
B1C14-11	Driver Left/Right Mirror Motor Feedback Circuit - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test driver left/right mirror motor feedback circuit for short to ground
B1C14-15	Driver Left/Right Mirror Motor Feedback Circuit - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test driver left/right mirror motor feedback circuit for short to power or open circuit
B1C15-11	Passenger Up/Down Mirror Motor Feedback Circuit - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test passenger up/down mirror motor feedback circuit for short to ground

DTC	Description	Possible Causes	Action
B1C15-15	Passenger Up/Down Mirror Motor Feedback Circuit - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test passenger up/down mirror motor feedback circuit for short to power or open circuit
B1C16-11	Passenger Left/Right Mirror Motor Feedback Circuit - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test passenger left/right mirror motor feedback circuit for short to ground
B1C16-15	Passenger Left/Right Mirror Motor Feedback Circuit - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test passenger left/right mirror motor feedback circuit for short to power or open circuit
B1C39-29	Key Lock Switch - Signal invalid	• Lock and unlock signals both active or inactive for more than 20 seconds	• Check key lock switch for damage/mechanical faults. Check lock circuits for short circuit to each other
B1D06-11	Left Turn Indicator - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test left door indicator circuit for short to ground
B1D06-15	Left Turn Indicator - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test left door indicator circuit for short to power or open circuit
B1D07-11	Right Turn Indicator - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test right door indicator circuit for short to ground
B1D07-15	Right Turn Indicator - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test right door indicator circuit for short to power or open circuit
C1B14-11	Sensor Supply #1 - Circuit short to ground	• Short to ground	• Refer to the electrical circuit diagrams and test window sensor supply circuit for short to ground
C1B14-15	Sensor Supply #1 - Circuit short to battery or open	• Short to power or open circuit	• Refer to the electrical circuit diagrams and test window sensor supply circuit for short to power or open circuit
U0010-00	Medium Speed CAN Communication Bus - No sub type information	• Medium speed CAN communication Bus	• Carry out network integrity test using manufacturer approved diagnostic system. Refer to electrical circuit diagrams and test Medium speed CAN network for open, short circuit and high resistance
U0140-00	Lost Communication With CJB - No sub type information	• Logged when subscribed CAN message missing from Central Junction Box	• Refer to the electrical circuit diagrams and test power and ground supplies to Central Junction Box. Check CAN network between Driver Door Module and Central Junction Box. Carry out network integrity test using manufacturer approved diagnostic system
U0208-00	Lost Communication With Driver Seat Module (DSM) - No sub type information	• Missing message	• Refer to the electrical circuit diagrams and test power and ground supplies to Driver Seat Module. Check CAN network between Driver Door Module and Driver Seat Module. Carry out network integrity test using manufacturer approved diagnostic system
U0300-00	Internal Control Module Software Incompatibility - No sub type information	• Car configuration file mismatch with vehicle specification	NOTE: After updating the car configuration file, set the ignition to on and wait 30 seconds before clearing the DTCs • Using the manufacturer approved diagnostic system, check and up-date the car configuration file as necessary

DTC	Description	Possible Causes	Action
U0300-4A	Internal Control Module Software Incompatibility - Incorrect component installed	• DTC is set if an incorrect front or rear door module/software is connected	• Check correct door modules are installed on the vehicle. Reprogram the modules using the manufacturers approved diagnostic system
U2002-24	Switch - Signal stuck high	• Signal stuck high	• Clear DTC and re-test. If DTC remains, install a new passenger side window switch
U2010-11	Switch Illumination - Circuit short to ground	• Circuit short to ground	• Carry out CAN network tests using the manufacturer approved diagnostic system
U2010-12	Switch Illumination - Circuit short to battery	• Circuit short to power	• Carry out CAN network tests using the manufacturer approved diagnostic system
U2012-08	Car Configuration Parameter(s) - Bus signal/message Failures	• Bus signal/message failures	• Cycle the ignition status and re-test. If DTC remains, re-configure the Auxiliary Junction Box using the manufacturer approved diagnostic system
U2013-24	Switch Pack - Signal stuck high	• Signal stuck high	• Clear DTC and re-test. If DTC remains, install a new driver side window switch pack
U2014-44	Control Module Hardware - Data memory failure	• Data Memory Failure	• Install a new Driver Door Module/Passenger Door Module, refer to the new module installation note at the top of the DTC Index
U2100-00	Initial Configuration Not Complete - No sub type information	• No sub type information	• Re-configure the Driver Door Module/Passenger Door Module using the manufacturer approved diagnostic system
U2101-00	Control Module Configuration Incompatible - No sub type information	• Incorrect component installed • Vehicle not configured correctly	• Check/configure the car configuration using the approved diagnostic system
U3000-49	Control Module - Internal electronic failure	• Internal electronic failure	• Install a new Driver Door Module/Passenger Door Module, refer to the new module installation note at the top of the DTC Index
U3002-55	Vehicle Identification Number (VIN) - Not configured	• Driver/passenger door module is not configured correctly	• Re-configure the relevant module as new using the manufacturer approved diagnostic system and re-test. If DTC remains install a new module, refer to the new module installation note at the top of the DTC Index
U3002-81	Vehicle Identification Number (VIN) - Invalid serial data received	• Vehicle/component mis-match. Corrupt VIN data being transmitted, module previously installed to other vehicle	• Install original module, check for DTCs and refer to relevant DTC Index
U3003-62	Battery Voltage - Signal compare failure	• Mis-match of battery voltage, of 2 volts or lower, between Driver Door Module/Passenger Door Module and Auxiliary Junction Box	• Check vehicle battery and charging system. Refer to the relevant section in the workshop manual. Refer to the electrical circuit diagrams and check the power and ground supply circuits to both modules

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Driver/Passenger Seat Module (DSM/PSM)

Description and Operation

Driver/Passenger Seat Module (DSM/PSM)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSM's which may be valid for the specific customer complaint and carry out the recommendations as needed.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Driver/Passenger Seat Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Seats (501-10 Seating, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B105D-11	Seat Bolster Inflate Output - Circuit short to ground	• Circuit short to ground	• Check the seat wiring harness/connectors for security/integrity. Refer to the electrical circuit diagrams and check the seat bolster circuit
B105D-15	Seat Bolster Inflate Output - Circuit short to battery or open	• Circuit short to power or open	• Check the seat wiring harness/connectors for security/integrity. Refer to the electrical circuit diagrams and check the seat bolster circuit
B105E-11	Seat Bolster Deflate Output - Circuit short to ground	• Circuit short to ground	• Check the seat wiring harness/connectors for security/integrity. Refer to the electrical circuit diagrams and check the seat bolster circuit
B105E-15	Seat Bolster Deflate Output - Circuit short to battery or open	• Circuit short to power or open	• Check the seat wiring harness/connectors for security/integrity. Refer to the electrical circuit diagrams and check the seat bolster circuit
B1060-11	Seat Headrest Motor Output - Circuit short to ground	• Circuit short to ground	• Check the seat wiring harness/connectors for security/integrity. Refer to the electrical circuit diagrams and check the seat headrest motor circuit

DTC	Description	Possible Causes	Action
B1060-15	Seat Headrest Motor Output - Circuit short to battery or open	• Circuit short to power or open	• Check the seat wiring harness/connectors for security/integrity. Refer to the electrical circuit diagrams and check the seat headrest motor circuit
B1064-31	Seat Headrest Motor Sensor - No signal	• Harness/connector problem • No signal from sensor • Sensor/motor malfunction	• Check the seat wiring harness/connectors for security/integrity • Refer to the electrical circuit diagrams and check the seat headrest motor sensor circuit. Repair circuit as required. Clear DTC and retest
B1065-24	Cushion Extend Switch - Signal stuck high	• Signal stuck high • Switch malfunction	• Check the switch function. Check the seat wiring harness/connectors for security/integrity. Refer to the electrical circuit diagrams and check the switch circuit
B1066-24	Cushion Retract Switch - Signal stuck high	• Signal stuck high • Switch malfunction	• Check the switch function. Check the seat wiring harness/connectors for security/integrity. Refer to the electrical circuit diagrams and check the switch circuit
B1067-24	Lumbar In Switch - Signal stuck high	• Signal stuck high • Switch malfunction	• Check the switch function. Check the seat wiring harness/connectors for security/integrity. Refer to the electrical circuit diagrams and check the switch circuit
B1068-24	Lumbar Out Switch - Signal stuck high	• Signal stuck high • Switch malfunction	• Check the switch function. Check the seat wiring harness/connectors for security/integrity. Refer to the electrical circuit diagrams and check the switch circuit
B1069-24	Lumbar Up Switch - Signal stuck high	• Signal stuck high • Switch malfunction	• Check the switch function. Check the seat wiring harness/connectors for security/integrity. Refer to the electrical circuit diagrams and check the switch circuit
B106A-24	Lumbar Down Switch - Signal stuck high	• Signal stuck high • Switch malfunction	• Check the switch function. Check the seat wiring harness/connectors for security/integrity. Refer to the electrical circuit diagrams and check the switch circuit
B106B-24	Bolster Inflate Switch - Signal stuck high	• Signal stuck high • Switch malfunction	• Check the switch function. Check the seat wiring harness/connectors for security/integrity. Refer to the electrical circuit diagrams and check the switch circuit
B106C-24	Bolster Deflate Switch - Signal stuck high	• Signal stuck high • Switch malfunction	• Check the switch function. Check the seat wiring harness/connectors for security/integrity. Refer to the electrical circuit diagrams and check the switch circuit
B106D-24	Headrest Up Switch - Signal stuck high	• Signal stuck high • Switch malfunction	• Check the switch function. Check the seat wiring harness/connectors for security/integrity. Refer to the electrical circuit diagrams and check the switch circuit
B106E-24	Headrest Down Switch - Signal stuck high	• Signal stuck high • Switch malfunction	• Check the switch function. Check the seat wiring harness/connectors for security/integrity. Refer to the electrical circuit diagrams and check the switch circuit
B1087-83	LIN Bus "A" - Value of signal protection calculation incorrect	• LIN bus checksum error - Value of signal protection calculation incorrect • Generic LIN bus failure	• Check for other LIN Bus related DTCs. Refer to the electrical circuit diagrams and check the LIN Bus circuit

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Electric Parking Brake (PBM)

Description and Operation

Parking Brake Module (PBM)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Parking Brake Module (PBM), for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Parking Brake (206-05 Parking Brake and Actuation, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1142-64	Ignition Status 1 - Signal plausibility failure	• Mismatch between the parking brake module ignition signal and the power mode value broadcast on the CAN bus	• Refer to electrical circuit diagrams and check parking brake module ignition power supply circuit short circuit to ground, open circuit, high resistance
C1127-31	Position Sensor - No Signal	• Parking brake actuator position sensor circuit short circuit to ground, short circuit to power, open circuit, high resistance	• Refer to the electrical circuit diagrams and check parking brake actuator position sensor circuit for short circuit to ground, short circuit to power, open circuit, high resistance
C1129-39	Actuator Engage - Incorrect has too few pulses	• Service brake adjustment incorrect after brake lining replacement • Parking brake cables seized, trapped • Brake caliper mechanical failure	NOTE: This DTC is logged when the maximum motor engage current is reached before full apply travel distance • Carry out parking brake calibration procedure • Install new parking brake cable(s) as required • Install new rear brake caliper(s) as required

DTC	Description	Possible Causes	Action
C1129-3A	Actuator Engage - Incorrect has too many pulses	• Service brake adjustment incorrect after brake lining replacement • Parking brake cables broken • Brake caliper mechanical failure	NOTE: This DTC is logged when the motor engage current is not reached or actuator has travelled too far upon apply • Carry out parking brake calibration procedure • Install new parking brake cable(s) as required • Install new rear brake caliper(s) as required
C112A-39	Actuator Disengage - Incorrect has too few pulses	• Parking brake actuator circuit open circuit, high resistance • Service brake adjustment incorrect after brake lining replacement • Parking brake cables seized, trapped • Brake caliper mechanical failure	• Refer to the electrical circuit diagrams and check the parking brake actuator circuit for open circuit, high resistance • Carry out parking brake calibration procedure • Install new parking brake cable(s) as required • Install new rear brake caliper(s) as required
C1D00-11	Park Brake Apply Switch - Circuit short to ground	NOTE: Circuit reference APPLY_SW_1 / APPLY_SW_2 • Parking brake primary/secondary apply switch circuit short circuit to ground • Parking brake switch internal failure	• Using the manufacturer approved diagnostic system, check datalogger signals - Primary Apply Switch Voltage Data (0xD932) - Secondary Apply Switch Voltage Data (0xD934). Refer to the electrical circuit diagrams and check the parking brake primary/secondary apply switch circuits for short circuit to ground • Check and install a new parking brake switch as required
C1D00-15	Park Brake Apply Switch - Circuit short to battery or open	NOTE: Circuit reference APPLY_SW_1 / APPLY_SW_2 • Parking brake primary/secondary apply switch circuit short circuit to power, open circuit, high resistance • Parking brake switch internal failure	• Using the manufacturer approved diagnostic system, check datalogger signals - Primary Apply Switch Voltage Data (0xD932) - Secondary Apply Switch Voltage Data (0xD934). Refer to the electrical circuit diagrams and check the parking brake primary/secondary apply switch circuits for short circuit to power, open circuit, high resistance • Check and install a new parking brake switch as required
C1D00-1C	Park Brake Apply Switch - Voltage out of range	NOTE: Circuit reference APPLY_SW_1 / APPLY_SW_2 • Parking brake primary/secondary apply switch circuit short circuit to ground, short circuit to power, open circuit, high resistance • Parking brake switch internal failure	• Using the manufacturer approved diagnostic system, check datalogger signals - Primary Apply Switch Voltage Data (0xD932) - Secondary Apply Switch Voltage Data (0xD934). Refer to the electrical circuit diagrams and check the parking brake primary/secondary apply switch circuits for short circuits to ground, short circuit to power, open circuit, high resistance • Check and install a new parking brake switch as required
C1D00-62	Park Brake Apply Switch - Signal compare failure	NOTE: Circuit reference APPLY_SW_1 / APPLY_SW_2 / RELEASE_SW_1 / RELEASE_SW_2 • Parking brake primary/secondary apply switch circuit short circuit to primary/secondary release switch circuit • Parking brake switch internal failure	• Refer to the electrical circuit diagrams and check the parking brake primary/secondary apply switch circuits for short circuit to primary/secondary release switch circuits • Check and install a new parking brake switch as required
C1D00-64	Park Brake Apply Switch - Signal plausibility failure	NOTE: Circuit reference APPLY_SW_1 / APPLY_SW_2 • Parking brake primary/secondary apply	• Using the manufacturer approved diagnostic system, check datalogger signals - Primary Apply Switch Voltage Data (0xD932) - Secondary Apply Switch Voltage Data (0xD934). Refer to the electrical circuit diagrams and check the parking brake primary/secondary apply switch circuits for

DTC	Description	Possible Causes	Action
		switch circuit short circuit to ground, short circuit to power, open circuit, high resistance • Parking brake switch internal failure	short circuit to ground, short circuit to power, open circuit, high resistance • Check and install a new parking brake switch as required
C1D01-11	Park Brake Release Switch - Circuit short to ground	NOTE: Circuit reference RELEASE_SW_1 / RELEASE_SW_2 • Parking brake primary/secondary release switch circuit short circuit to ground • Parking brake switch internal failure	• Using the manufacturer approved diagnostic system, check datalogger signals - Primary Release Switch Voltage Data (0xD933) - Secondary Release Switch Voltage Data (0xD935). Refer to the electrical circuit diagrams and check the parking brake primary/secondary release switch circuits for short circuit to ground • Check and install a new parking brake switch as required
C1D01-15	Park Brake Release Switch - Circuit short to battery or open	NOTE: Circuit reference RELEASE_SW_1 / RELEASE_SW_2 • Parking brake primary/secondary release switch circuit short circuit to power, open circuit, high resistance • Parking brake switch internal failure	• Using the manufacturer approved diagnostic system, check datalogger signals - Primary Release Switch Voltage Data (0xD933) - Secondary Release Switch Voltage Data (0xD935). Refer to the electrical circuit diagrams and check the parking brake primary/secondary release switch circuits for short circuit to power, open circuit, high resistance • Check and install a new parking brake switch as required
C1D01-1C	Park Brake Release Switch - Voltage out of range	NOTE: Circuit reference RELEASE_SW_1 / RELEASE_SW_2 • Parking brake primary/secondary release switch circuit short circuit to ground, short circuit to power, open circuit, high resistance • Parking brake switch internal failure	NOTE: This DTC may be set due to resting of an object (for example, a hand) on the switch with only a light pressure • Using the manufacturer approved diagnostic system, check datalogger signals - Primary Release Switch Voltage Data (0xD933) - Secondary Release Switch Voltage Data (0xD935). Refer to the electrical circuit diagrams and check the parking brake primary/secondary release switch circuits for short circuit to ground, short circuit to power, open circuit, high resistance • Check and install a new parking brake switch as required
C1D01-62	Park Brake Release Switch - Signal compare failure	NOTE: Circuit reference RELEASE_SW_1 / RELEASE_SW_2 / APPLY_SW_1 / APPLY_SW_2 • Parking brake primary/secondary release switch circuit short circuit to primary/secondary apply switch circuit • Parking brake switch internal failure	• Refer to the electrical circuit diagrams and check the parking brake primary/secondary release switch circuits for short circuit to primary/secondary apply switch circuits • Check and install a new parking brake switch as required
C1D01-64	Park Brake Release Switch - Signal plausibility failure	NOTE: Circuit reference RELEASE_SW_1 / RELEASE_SW_2 • Parking brake primary/secondary release switch circuit short circuit to ground, short circuit to power, open circuit, high resistance • Parking brake switch internal failure	NOTE: This DTC may be set due to resting of an object (for example, a hand) on the switch with only a light pressure • Using the manufacturer approved diagnostic system, check datalogger signals - Primary Release Switch Voltage Data (0xD933) - Secondary Release Switch Voltage Data (0xD935). Refer to the electrical circuit diagrams and check the parking brake primary/secondary release switch circuits for short circuit to ground, short circuit to power, open circuit, high resistance • Check and install a new parking brake switch as required

DTC	Description	Possible Causes	Action
P1536-62	Parking Brake Switch Circuit - Signal compare failure	NOTE: Circuit reference APPLY_SW_1 / APPLY_SW_2 / RELEASE_SW_1 / RELEASE_SW_2 • Parking brake primary/secondary apply switch circuits short circuit to primary/secondary release switch circuits • Parking brake switch internal failure	• Refer to the electrical circuit diagrams and check the parking brake primary/secondary apply switch circuits for short circuit to primary/secondary release switch circuits • Check and install a new parking brake switch as required
P1536-66	Parking Brake Switch Circuit - Signal has too many transitions / events	• System abuse • Parking brake switch internal failure	NOTE: The Electric Parking Brake system will be locked out if the module receives more than 30 apply/release requests within 1 minute • Cycle the ignition to clear the fault mode. Clear the DTC and test the system • Check and install a new parking brake switch as required
P1571-64	Brake Switch - Signal plausibility failure	• Brake pedal switch incorrectly adjusted • Brake pedal switch circuit short circuit to ground, short circuit to power, open circuit, high resistance • Anti-lock brake system fault	• Using the manufacturer approved diagnostic system, check datalogger signal - Brake Switch. Refer to the relevant section of the workshop manual and remove and install the brake pedal switch • Using the manufacturer approved diagnostic system, check datalogger signal - Brake Switch. Refer to the electrical circuit diagrams and check the brake pedal switch circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Using the manufacturer approved diagnostic system, check the anti-lock brake system control module for related DTCs and refer to the relevant DTC index
U0001-87	High Speed CAN Communication Bus - Missing message	• Missing message from another control module via the high speed CAN bus	• Using the manufacturer approved diagnostic system, check the snap shot data to determine the missing message source control module, check the relevant control module for related DTCs and refer to the relevant DTC index
U0001-88	High Speed CAN Communication Bus - Bus off	• High speed can bus circuit short circuit to ground, short circuit to power, open circuit, high resistance	• Using the manufacturer approved diagnostic system, perform a CAN network integrity test. Refer to the electrical circuit diagrams and check the high speed CAN bus circuit for short circuit to ground, short circuit to power, open circuit, high resistance
U0100-00	Lost Communication with ECM/PCM A - No sub type information	• Engine control module power or ground circuit open circuit, high resistance • High speed CAN bus circuit short circuit to ground, short circuit to power, open circuit, high resistance • Engine system fault	• Refer to the electrical circuit diagrams and check the engine control module power and ground circuits for open circuit, high resistance • Using the manufacturer approved diagnostic system, perform a CAN network integrity test. Refer to the electrical circuit diagrams and check the high speed CAN bus circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Using the manufacturer approved diagnostic system, check the engine control module for related DTCs and refer to the relevant DTC index
U0103-00	Lost communication With Gear Shift Module A - No sub type information	• Transmission control switch power or ground circuit open circuit, high resistance • High speed CAN bus circuit short circuit to ground, short circuit to power, open circuit, high resistance • Transmission control switch	• Refer to the electrical circuit diagrams and check the transmission control switch power and ground circuits for open circuit, high resistance • Using the manufacturer approved diagnostic system, perform a CAN network integrity test. Refer to the electrical circuit diagrams and check the high speed CAN bus circuit for short circuit to ground, short circuit to power, open circuit, high

DTC	Description	Possible Causes	Action
		fault	resistance • Using the manufacturer approved diagnostic system, check the transmission control switch for related DTCs and refer to the relevant DTC index
U0104-00	Lost communication With Cruise Control Module A - No sub type information	• Adaptive speed control module power or ground circuit open circuit, high resistance • High speed CAN bus circuit short circuit to ground, short circuit to power, open circuit, high resistance • Adaptive speed control system fault	• Refer to the electrical circuit diagrams and check the adaptive speed control module power and ground circuits for open circuit, high resistance • Using the manufacturer approved diagnostic system, perform a CAN network integrity test. Refer to the electrical circuit diagrams and check the high speed CAN bus circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Using the manufacturer approved diagnostic system, check the adaptive speed control module for related DTCs and refer to the relevant DTC index
U0121-00	Lost communication with Anti-Lock Braking System (ABS) Control Module - No sub type information	• Anti-lock brake system control module power or ground circuit open circuit, high resistance • High speed CAN bus circuit short circuit to ground, short circuit to power, open circuit, high resistance • Anti-lock brake system fault	• Refer to the electrical circuit diagrams and check the anti-lock brake system control module power and ground circuits for open circuit, high resistance • Using the manufacturer approved diagnostic system, perform a CAN network integrity test. Refer to the electrical circuit diagrams and check the high speed CAN bus circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Using the manufacturer approved diagnostic system, check the anti-lock brake system control module for related DTCs and refer to the relevant DTC index
U0155-00	Lost Communication With Instrument Panel Cluster (IPC) Control Module - No sub type information	• Instrument cluster power or ground circuit open circuit, high resistance • High speed CAN bus circuit short circuit to ground, short circuit to power, open circuit, high resistance • Instrument cluster fault	• Refer to the electrical circuit diagrams and check the instrument cluster power and ground circuits for open circuit, high resistance • Using the manufacturer approved diagnostic system, perform a CAN network integrity test. Refer to the electrical circuit diagrams and check the high speed CAN bus circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Using the manufacturer approved diagnostic system, check the instrument cluster for related DTCs and refer to the relevant DTC index
U0300-00	Internal Control Module Software Incompatibility - No sub type information	• Car configuration file mismatch with vehicle specification • Incorrect parking brake module installed	• Using the manufacturer approved diagnostic system, check and update the car configuration file as necessary • Install a new parking brake module as necessary
U0401-00	Invalid Data Received From ECM/PCM - No sub type information	• Missing/invalid data from the engine control module	• Using the manufacturer approved diagnostic system, check the engine control module for related DTCs and refer to the relevant DTC index
U0404-00	Invalid Data Received From Gear Shift Control Module A - No sub type information	• Missing/invalid data from the transmission control switch	• Using the manufacturer approved diagnostic system, check the transmission control switch for related DTCs and refer to the relevant DTC index
U0415-00	Invalid Data Received From Anti-Lock Braking System (ABS) Control Module - No sub type information	• Missing/invalid data from the anti-lock brake system control module	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported a parking brake concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis • Using the manufacturer approved diagnostic system, check the anti-lock brake system control module for related DTCs and refer to the relevant DTC index

DTC	Description	Possible Causes	Action
U0422-00	Invalid Data Received From Central Junction Box - No sub type information	• Missing/invalid data from the central junction box	• Using the manufacturer approved diagnostic system, check the central junction box for related DTCs and refer to the relevant DTC index
U0423-00	Invalid Data Received From Instrument Panel Control Module - No sub type information	• Missing/invalid data from the instrument cluster	• Using the manufacturer approved diagnostic system, check the instrument cluster for related DTCs and refer to the relevant DTC index
U0433-64	Invalid Data Received From Cruise Control Front Distance Range Sensor - Signal plausibility failure	• Missing/invalid data from the adaptive speed control module	NOTE: The parking brake module has received a request to apply the parking brake from the adaptive speed control module but the conditions were not correct for the apply to take place. For example, the vehicle was moving. The parking brake module will ignore the request but this DTC is logged for safety reference • Using the manufacturer approved diagnostic system, check the adaptive speed control module for related DTCs and refer to the relevant DTC index
U2001-68	Reduced System Function - Event information	• Ignition switched off while vehicle speed >3kph • Missing/invalid data from the anti-lock brake system control module	• Using the manufacturer approved diagnostic system, clear the DTCs and re-test • Using the manufacturer approved diagnostic system, check the anti-lock brake system control module for related DTCs and refer to the relevant DTC index
U2005-64	Vehicle Speed - Signal implausibility failure	• Missing/invalid data from the anti-lock brake system control module	NOTE: Implausible speed is defined as passing from high speed dynamic mode to static mode without passing through low speed dynamic mode • Using the manufacturer approved diagnostic system, check the anti-lock brake system control module for related DTCs and refer to the relevant DTC index
U200D-4B	Control Module Output Power A - Over temperature	• Parking brake actuator circuit short circuit to ground, short circuit to power	• Refer to the electrical circuit diagrams and check the parking brake actuator circuit for short circuit to ground, short circuit to power
U2011-11	Motor - Circuit short to ground	• Parking brake actuator circuit short circuit to ground	• Refer to the electrical circuit diagrams and check the parking brake actuator circuit for short circuit to ground
U2011-12	Motor - Circuit short to battery	• Parking brake actuator circuit short circuit to power	• Refer to the electrical circuit diagrams and check the parking brake actuator circuit for short circuit to power
U2011-13	Motor - Circuit open	• Parking brake actuator circuit open circuit, high resistance	• Refer to electrical circuit diagrams and check the parking brake actuator circuit for open circuit, high resistance
U3000-47	Control Module - Watchdog/safety micro controller failure	• Parking brake module internal failure	• Using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new parking brake module
U3002-81	Vehicle Identification Number (VIN) - Invalid serial number	• The park brake module has previously been installed to another vehicle	• Check and install the original, or a new park brake module
U3003-62	Battery Voltage - Signal compare failure	• Mismatch between the voltage at the parking brake module and the voltage value broadcast on the CAN bus	• Using the manufacturer approved diagnostic system, check data logging signal - Main ECU Voltage Supply (0xDD02). Refer to the electrical circuit diagrams and check the parking brake module power and ground circuits for open

DTC	Description	Possible Causes	Action
			circuit, high resistance
U3006-16	Control Module Input Power A - Circuit voltage below threshold	NOTE: Circuit reference LOGIC_BATT / GND • Battery/charging system fault	• Using the manufacturer approved diagnostic system, check datalogger signal - Main ECU Voltage Supply (0xDD02). Refer to the relevant section of the workshop manual and test the battery and charging system
U3006-17	Control Module Input Power A - Circuit voltage above threshold	NOTE: Circuit reference LOGIC_BATT / GND • Parking brake module power or ground circuit open circuit, high resistance • Battery/charging system fault	• Using the manufacturer approved diagnostic system, check datalogger signal - Main ECU Voltage Supply (0xDD02). Refer to the electrical circuit diagrams and check the parking brake module power and ground circuits for open circuit, high resistance • Refer to the relevant section of the workshop manual and test the battery and charging system
U3007-14	Control Module Input Power B - Circuit short to ground or open	NOTE: Circuit reference BATT_SUPPLY / GND • Parking brake module power circuit short circuit to ground • Parking brake module power or ground circuit open circuit, high resistance	• Refer to the electrical circuit diagrams and check the parking brake module power circuit for short circuit to ground • Refer to the electrical circuit diagrams and check the parking brake module power or ground circuit for open circuit, high resistance

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General Information - Diagnostic Trouble Code (DTC) Index TDV6 3.0L Diesel , DTC: Engine Control Module

Description and Operation

Engine Control Module 3.0L Tdv6 (PCM)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists diagnostic trouble codes that could be logged in the engine control module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Electronic Engine Controls (303-14A Electronic Engine Controls - TDV6 3.0L Diesel, Diagnosis and Testing).

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Engine Control Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Diesel Particulate Filter (309-00A Exhaust System - TDV6 3.0L Diesel, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1087-93	LIN Bus "A" - No operation	• Generator LIN bus communication circuit failure	• Refer to the electrical circuit diagrams and check the generator LIN bus circuit, for short circuit to power, short circuit to ground, open circuit. Repair wiring harness as required. Clear DTC and retest
B10A2-32	Crash Input - Signal low time < minimum	NOTE: - Circuit SRS_INPUT - • Restraints control module fault • Auxiliary junction box fault • Harness fault	• This DTC is set when the 'airbag deployed' signal supplied by the restraints control module is outside the specification expected by the engine control module • Check the restraints control module for DTCs and refer to the relevant DTC index • Check auxiliary junction box for DTCs and refer to the relevant DTC index • Refer to electrical circuit diagrams and check the supplementary restraints system input circuit for faults. This circuit is a single wire which connects the restraints control module

DTC	Description	Possible Causes	Action
			to the auxiliary junction box and the engine control module. Check this circuit for short circuit to power or ground, open circuit including intermittent faults. Repair wiring as required. Clear DTC and retest
B10A2-35	Crash Input - Signal high time > maximum	NOTE: - Circuit SRS_INPUT - • Restraints control module fault • Auxiliary junction box fault • Harness fault	• This DTC is set when the 'airbag deployed' signal supplied by the restraints control module is outside the specification expected by the engine control module • Check the restraints control module for DTCs and refer to the relevant DTC index • Check auxiliary junction box for DTCs and refer to the relevant DTC index • Refer to electrical circuit diagrams and check the supplementary restraints system input circuit for faults. This circuit is a single wire which connects the restraints control module to the auxiliary junction box and the engine control module. Check this circuit for short circuit to power or ground, open circuit including intermittent faults. Repair wiring as required. Clear DTC and retest
B10A2-36	Crash Input - Signal frequency too low	NOTE: - Circuit SRS_INPUT - • The engine control module detected excessive duration for one cycle of the output across a specified sample size • Restraints control module fault • Auxiliary junction box fault • Harness fault	• This DTC is set when the 'airbag deployed' signal supplied by the restraints control module is outside the specification expected by the engine control module • Check the restraints control module for DTCs and refer to the relevant DTC index • Check auxiliary junction box for DTCs and refer to the relevant DTC index • Refer to electrical circuit diagrams and check the supplementary restraints system input circuit for faults. This circuit is a single wire which connects the restraints control module to the auxiliary junction box and the engine control module. Check this circuit for short circuit to power or ground, open circuit including intermittent faults. Repair wiring as required. Clear DTC and retest
B10A2-37	Crash Input - Signal frequency too high	NOTE: - Circuit SRS_INPUT - • The engine control module detected insufficient duration for one cycle of the output across a specified sample size • Restraints control module fault • Auxiliary junction box fault • Harness fault	• This DTC is set when the 'airbag deployed' signal supplied by the restraints control module is outside the specification expected by the engine control module • Check the restraints control module for DTCs and refer to the relevant DTC index • Check auxiliary junction box for DTCs and refer to the relevant DTC index • Refer to electrical circuit diagrams and check the supplementary restraints system input circuit for faults. This circuit is a single wire which connects the restraints control module to the auxiliary junction box and the engine control module. Check this circuit for short circuit to power or ground, open circuit including intermittent faults. Repair wiring as required. Clear DTC and retest
B11D9-00	Vehicle Battery - No sub type information	• Harness fault • Battery fault • Battery monitoring system module fault	• This DTC is set when the battery monitoring system fails a diagnostic check • Refer to the battery care manual and verify that the vehicle battery is fully charged and serviceable before continuing with further diagnostic tests. If a battery fault is indicated Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component • Refer to the electrical circuit diagrams and check the connections between the battery and the battery monitoring module are clean and secure • Ensure that full battery voltage is present on

DTC	Description	Possible Causes	Action
			the monitor line pin at the battery monitoring system module connector. Ensure the battery ground connection is clean and secure • Check the LIN bus connections to the battery monitoring system module. Check LIN bus integrity. If no fault found in wiring harness suspect battery monitoring system module failure. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
B11DB-87	Battery Monitoring Module - Missing message	• Harness fault • Battery monitoring system module fault	• This DTC is set when the engine control module has lost communication with the battery monitoring system module • Refer to the battery care manual and verify that the vehicle battery is fully charged and serviceable before continuing with further diagnostic tests. If a battery fault is indicated Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component • Refer to the electrical circuit diagrams and check the connections between the battery and the battery monitoring module are clean and secure • Ensure that full battery voltage is present on the monitor line pin at the battery monitoring system module connector. Ensure the battery ground connection is clean and secure • Check the LIN bus connections to the battery monitoring system module. Check LIN bus integrity. If no fault found in wiring harness suspect battery monitoring system module failure. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
B1206-68	Crash Occurred - Event information	• Event information - the engine control module has received a crash signal from the restraints control module	• This DTC is set if the restraints control module has deployed the restraints systems following activation of the crash sensors. Check the restraints control module for DTCs and refer to the relevant DTC index
P0030-11	HO2S Heater Control Circuit (Bank 1, Sensor 1) - Circuit short to ground	NOTE: - Circuit LPPH_A - • The engine control module has detected a ground measurement for a period longer than expected or has detected a ground measurement when another value was expected • Harness fault - Pre catalyst oxygen sensor heater control circuit short circuit to ground • Pre catalyst oxygen sensor failure	• Using the manufacturer approved diagnostic system check datalogger signals, Oxygen Sensor (O2S) Heater Duty Cycle Bank 1 Sensor 1 (0x03A1). Refer to the electrical circuit diagrams and check the pre catalyst oxygen sensor heater control (heater ground) circuit for short circuit to ground. This circuit runs from the engine control module through the transmission harness to the exhaust system. Check for external harness damage due to chafing or heat. Repair harness as required. Clear DTC and retest • Suspect sensor failure if DTC resets. Heater circuit resistance measured at the component connector at approximately 20ºC ambient temperature should be 2.4 - 4.0 Ohms. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0030-12	HO2S Heater Control Circuit (Bank 1, Sensor 1) - Circuit short to battery	NOTE: - Circuit LPPH_A - • The engine control module has detected a vehicle power measurement for a	• Using the manufacturer approved diagnostic system check datalogger signals, Oxygen Sensor (O2S) Heater Duty Cycle Bank 1 Sensor 1 (0x03A1). Refer to the electrical circuit diagrams and check the pre catalyst oxygen sensor heater control (heater ground)

DTC	Description	Possible Causes	Action
		period longer than expected or has detected a vehicle power measurement when another value was expected • Harness fault - Pre catalyst oxygen sensor heater control circuit short circuit to power • Pre catalyst oxygen sensor failure	circuit for short circuit to power. This circuit runs from the engine control module through the transmission harness to the exhaust system. Check for external harness damage due to chafing or heat. Repair harness as required. Clear DTC and retest • Suspect sensor failure if DTC resets. Heater circuit resistance measured at the component connector at approximately 20ºC ambient temperature should be 2.4 - 4.0 Ohms. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0030-13	HO2S Heater Control Circuit (Bank 1, Sensor 1) - Circuit open	NOTE: - Circuit LPPH_A - • The engine control module has determined an open circuit via lack of bias voltage, low current flow, no change in the state of an input in response to an output • Harness fault - Pre catalyst oxygen sensor heater control circuit open circuit • Pre catalyst oxygen sensor failure	• Using the manufacturer approved diagnostic system check datalogger signals, Oxygen Sensor (O2S) Heater Duty Cycle Bank 1 Sensor 1 (0x03A1). Refer to the electrical circuit diagrams and check the pre catalyst oxygen sensor heater control (heater ground) circuit for open circuit. This circuit runs from the engine control module through the transmission harness to the exhaust system. Check for external harness damage due to chafing or heat. Repair harness as required. Clear DTC and retest • Suspect sensor failure if DTC resets. Heater circuit resistance measured at the component connector at approximately 20ºC ambient temperature should be 2.4 - 4.0 Ohms. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0030-4B	HO2S Heater Control Circuit (Bank 1, Sensor 1) - Over temperature	• Harness fault - Pre catalyst oxygen sensor heater control circuit short circuit to power • Pre catalyst oxygen sensor failure	• Using the manufacturer approved diagnostic system check datalogger signals, Oxygen Sensor (O2S) Heater Duty Cycle Bank 1 Sensor 1 (0x03A1). Refer to the electrical circuit diagrams and check the pre catalyst oxygen sensor heater control (heater ground) circuit for short circuit to power. This circuit runs from the engine control module through the transmission harness to the exhaust system. Check for external harness damage due to chafing or heat. Repair harness as required. Clear DTC and retest • Suspect sensor failure if DTC resets. Heater circuit resistance measured at the component connector at approximately 20ºC ambient temperature should be 2.4 - 4.0 Ohms. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0033-00	Turbocharger/Supercharger Bypass Valve Control Circuit / Open - No sub type information	NOTE: - Circuit CRV - • Harness fault - Boost air recirculation solenoid control circuit open circuit • Boost air recirculation solenoid failure	• Using the manufacturer approved diagnostic system perform the (Turbo, EGR and air path dynamic test) routine • Refer to the electrical circuit diagrams and check the boost air recirculation solenoid control circuit between the engine control module and the control valve for open circuit. Check the power supply to the control valve. Repair any wiring faults found. Clear DTC and retest • If no fault found in wiring harness suspect boost air recirculation solenoid failure. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component

DTC	Description	Possible Causes	Action
P0034-00	Turbocharger/Supercharger Bypass Valve Control Circuit Low - No sub type information	NOTE: - Circuit CRV - • Harness fault - Boost air recirculation solenoid circuit short circuit to ground • Boost air recirculation solenoid failure	• Using the manufacturer approved diagnostic system perform the (Turbo, EGR and air path dynamic test) routine • Refer to the electrical circuit diagrams and check the boost air recirculation solenoid circuit between the engine control module and the control valve for a short circuit to ground. Check the power supply to the control valve. Repair any wiring faults found. Clear DTC and retest • If no fault found in wiring harness suspect boost air recirculation solenoid failure. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0035-00	Turbocharger/Supercharger Bypass Valve Control Circuit High - No sub type information	NOTE: - Circuit CRV - • Harness fault - Boost air recirculation solenoid circuit short circuit to power • Boost air recirculation solenoid failure	• Refer to the electrical circuit diagrams and check the boost air recirculation solenoid circuit between the engine control module and the control valve for a short circuit to power. Check the power supply to the control valve. Repair any wiring faults found. Clear DTC and retest • If no fault found in wiring harness suspect boost air recirculation solenoid failure. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0039-4B	Turbocharger/Supercharger Bypass Valve Control Circuit Range/Performance - Over temperature	• Harness fault - Boost air recirculation solenoid circuit short to ground, short circuit to power, high resistance • Boost air recirculation solenoid failure	• Refer to the electrical circuit diagrams and check the boost air recirculation solenoid circuit between the engine control module and the control valve for a short circuit to ground, short circuit to power, high resistance. Check the power supply to the control valve. Repair any wiring faults found. Clear DTC and retest • If no fault found in wiring harness suspect boost air recirculation solenoid failure. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P004A-00	Turbocharger/Supercharger Boost Control B Circuit / Open - No sub type information	NOTE: - Circuit VGT_POS - VGT_NEG - • Harness fault - Variable geometry turbocharger actuator vane control circuit open circuit	• Using the manufacturer approved diagnostic system check datalogger signals, Commanded Boost Actuator Control Bank 2 (0x0533), Boost Pressure Actuator Bank 2 - controller output (0x03DE). Refer to the electrical circuit diagrams and check the variable geometry turbocharger actuator vane control circuit for open circuit. This circuit consists of a twisted pair of wires between the engine control module and the variable geometry turbocharger actuator vane control unit. Check both of the circuits for open circuit. Repair wiring as required. Clear DTC and retest
P004A-71	Turbocharger/Supercharger Boost Control B Circuit / Open - Actuator stuck	NOTE: - Circuit VGT_POS - VGT_NEG - • Harness fault - Variable geometry turbocharger actuator vane control circuit open circuit • Variable geometry turbocharger actuator vane failure	• Using the manufacturer approved diagnostic system check datalogger signals, Commanded Boost Actuator Control Bank 2 (0x0533), Boost Pressure Actuator Bank 2 - controller output (0x03DE). Refer to the electrical circuit diagrams and check the variable geometry turbocharger actuator vane control circuit for open circuit. This circuit consists of a twisted pair of wires between the engine control module and the variable geometry turbocharger actuator vane control unit. Check both of the circuits for open circuit. Repair wiring as required. Clear DTC

DTC	Description	Possible Causes	Action
			and retest • Check and install new turbocharger actuator vane control unit as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P004B-16	Turbocharger/Supercharger Boost Control B Circuit Range/Performance - Circuit Voltage Below Threshold	NOTE: - Circuit VGT_POS - VGT_NEG - • The engine control module measured a voltage below a specified range but not necessarily a short circuit to ground • Harness fault - Variable geometry turbocharger actuator vane control circuit • Variable geometry turbocharger actuator vane control unit failure	• Using the manufacturer approved diagnostic system check datalogger signals, Commanded Boost Actuator Control Bank 2 (0x0533). Refer to the electrical circuit diagrams and check the variable geometry turbocharger actuator vane control circuit for high resistance or short circuits to another circuit. This circuit consists of a twisted pair of wires between the engine control module and the variable geometry turbocharger actuator vane control unit. Check both of the circuits for faults. Repair wiring as required. Clear DTC and retest • If no fault found in wiring harness suspect variable geometry turbocharger control module failure. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P004B-19	Turbocharger/Supercharger Boost Control B Circuit Range/Performance - Circuit Current Above Threshold	NOTE: - Circuit VGT_POS - VGT_NEG - • Harness fault - Variable geometry turbocharger actuator vane control circuit short circuit to ground, short circuit to power, high resistance • Variable geometry turbocharger actuator vane control unit failure	• Using the manufacturer approved diagnostic system check datalogger signals, Commanded Boost Actuator Control Bank 2 (0x0533). Refer to the electrical circuit diagrams and check the variable geometry turbocharger actuator vane control circuit for short circuit to ground, short circuit to power, high resistance. This circuit consists of a twisted pair of wires between the engine control module and the variable geometry turbocharger actuator vane control unit. Check both of the circuits for faults. Repair wiring as required. Clear DTC and retest • If no fault found in wiring harness suspect variable geometry turbocharger control module failure. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P004B-1D	Turbocharger/Supercharger Boost Control B Circuit Range/Performance - Circuit Current Out Of Range	NOTE: - Circuit VGT_POS - VGT_NEG - • Harness fault - Variable geometry turbocharger actuator vane control circuit • Variable geometry turbocharger actuator vane control unit failure • Mechanical fault on actuator mechanism	• Using the manufacturer approved diagnostic system check datalogger signals, Commanded Boost Actuator Control Bank 2 (0x0533). Refer to the electrical circuit diagrams and check the variable geometry turbocharger actuator vane control circuit for short circuits to another circuit. This circuit consists of a twisted pair of wires between the engine control module and the variable geometry turbocharger actuator vane control unit. Check both of the circuits for faults. Repair wiring as required. Clear DTC and retest • If no fault found in wiring harness check variable geometry turbocharger control module for failure • Check for mechanical fault on actuator mechanism. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component

DTC	Description	Possible Causes	Action
P004B-4B	Turbocharger/Supercharger Boost Control B Circuit Range/Performance - Over temperature	• Harness fault - Variable geometry turbocharger actuator vane control circuit short circuit to ground, short circuit to power, high resistance. • Variable geometry turbocharger actuator vane control unit failure • Mechanical fault on actuator mechanism	• Using the manufacturer approved diagnostic system check datalogger signals, Commanded Boost Actuator Control Bank 2 (0x0533). Refer to the electrical circuit diagrams and check the variable geometry turbocharger actuator vane control circuit for short circuit to ground, short circuit to power, high resistance. This circuit consists of a twisted pair of wires between the engine control module and the variable geometry turbocharger actuator vane control unit. Check both of the circuits for faults. Repair wiring as required. Clear DTC and retest • If no fault found in wiring harness check variable geometry turbocharger control module for failure • Check for mechanical fault on actuator mechanism. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P004C-00	Turbocharger/Supercharger Boost Control B Circuit Low - No sub type information	NOTE: - Circuit VGT_POS - VGT_NEG - • Harness fault - Variable geometry turbocharger actuator vane control circuit short circuit to ground	• Using the manufacturer approved diagnostic system check datalogger signals, Commanded Boost Actuator Control Bank 2 (0x0533). Refer to the electrical circuit diagrams and check the variable geometry turbocharger actuator vane control circuit for short circuit to ground. This circuit consists of a twisted pair of wires between the engine control module and the variable geometry turbocharger actuator vane control unit. Check both sides of this circuit. Repair wiring as required. Clear DTC and retest
P004C-11	Turbocharger/Supercharger Boost Control B Circuit Low - Circuit short to ground	NOTE: - Circuit VGT_POS - VGT_NEG - • The engine control module has detected a ground measurement for a period longer than expected or has detected a ground measurement when another value was expected • Harness fault - Variable geometry turbocharger actuator vane control circuit short circuit to ground	• Using the manufacturer approved diagnostic system check datalogger signals, Commanded Boost Actuator Control Bank 2 (0x0533). Refer to the electrical circuit diagrams and check the variable geometry turbocharger actuator vane control circuit for short circuit to ground. This circuit consists of a twisted pair of wires between the engine control module and the variable geometry turbocharger actuator vane control unit. Repair wiring as required. Clear DTC and retest
P004C-12	Turbocharger/Supercharger Boost Control B Circuit Low circuit - Short to battery	NOTE: - Circuit VGT_POS - VGT_NEG - • The engine control module has detected a vehicle power measurement for a period longer than expected or has detected a vehicle power measurement when another value was expected • Harness fault - Variable geometry turbocharger actuator vane control circuit short circuit to power	• Using the manufacturer approved diagnostic system check datalogger signals, Commanded Boost Actuator Control Bank 2 (0x0533). Refer to the electrical circuit diagrams and check the variable geometry turbocharger actuator vane control circuit for short circuit to power. This circuit consists of a twisted pair of wires between the engine control module and the variable geometry turbocharger actuator vane control unit. Repair wiring as required. Clear DTC and retest
P004C-77	Turbocharger/Supercharger Boost Control B Circuit Low - Commanded position not reachable	• Harness fault - Variable geometry turbocharger actuator vane control circuit short circuit to ground, high resistance, open circuit • Harness fault - Variable geometry turbocharger sensor circuit, short circuit	• Using the manufacturer approved diagnostic system check datalogger signals, Commanded Boost Actuator Control Bank 2 (0x0533). Refer to the electrical circuit diagrams and check the variable geometry turbocharger actuator vane control circuit for short circuit to ground, high resistance, open circuit. This circuit consists of a twisted pair

DTC	Description	Possible Causes	Action
		to ground, high resistance, open circuit • Variable geometry turbocharger actuator vane control unit failure	of wires between the engine control module and the variable geometry turbocharger actuator vane control unit. Repair wiring as required. Clear DTC and retest • Refer to the electrical circuit diagrams and check the variable geometry turbocharger sensor circuit for short circuit to ground, high resistance, open circuit • If no fault found in wiring harness suspect variable geometry turbocharger control module failure or mechanical fault on actuator mechanism. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P004D-00	Turbocharger/Supercharger Boost Control B Circuit High - No sub type information	NOTE: - Circuit VGT_POS - VGT_NEG - • Harness fault - Variable geometry turbocharger actuator vane control circuit short circuit to power	• Using the manufacturer approved diagnostic system check datalogger signals, Commanded Boost Actuator Control Bank 2 (0x0533). Refer to the electrical circuit diagrams and check the boost control circuit for short circuit to power. This circuit consists of a twisted pair of wires between the engine control module and the variable geometry turbocharger actuator vane control unit. Check both sides of this circuit. Repair wiring as required. Clear DTC and retest
P004D-77	Turbocharger/Supercharger Boost Control B Circuit High - Commanded Position Not Reachable	• Harness fault - Variable geometry turbocharger actuator vane control circuit short circuit to power • Harness fault - Variable geometry turbocharger sensor circuit, short circuit to power • Variable geometry turbocharger actuator vane control unit failure	• Using the manufacturer approved diagnostic system check datalogger signals, Commanded Boost Actuator Control Bank 2 (0x0533). Refer to the electrical circuit diagrams and check the variable geometry turbocharger actuator vane control circuit for short circuit to power. This circuit consists of a twisted pair of wires between the engine control module and the variable geometry turbocharger actuator vane control unit. Repair wiring as required. Clear DTC and retest • Refer to the electrical circuit diagrams and check the variable geometry turbocharger sensor circuit for short circuit to power • If no fault found in wiring harness suspect variable geometry turbocharger control module failure or mechanical fault on actuator mechanism. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P006A-00	MAP - Mass or Volume Air Flow Correlation - No sub type information	• Intake air system, high pressure boost leak bank A • Intake air system, high pressure boost leak bi-turbo mode bank B • Intake air system, low pressure boost leak bank A • Intake air system, low pressure boost leak bank B	• If this DTC is logged with P1247-00, P0402-00 & P00BF-07, suspect intake air system, high pressure boost leak bank A • If this DTC is logged with P1247-00, suspect intake air system, high pressure boost leak bi-turbo mode bank B • If this DTC is logged with P00BE-07 & P0401-00, suspect intake air system, low pressure boost leak bank A • If this DTC is logged with P00BC-00, suspect intake air system, low pressure boost leak bank B • Using the manufacturer approved diagnostic system perform the (Turbo, EGR and air path dynamic test) routine
P006A-22	MAP - Mass or Volume Air Flow Correlation - Signal Amplitude > Maximum	• The engine control module measured a signal voltage above a specified range but not necessarily a short circuit to power, gain too high	• Check for other DTCs associated with intake and boost airflow control actuators, refer to the relevant DTC index and act on those DTCs first • Refer to workshop manual and check intake air circuit, boost air circuit and associated

DTC	Description	Possible Causes	Action
		• Error path indicating whether over boost monitoring is active or not • Fault in induction air circuit • Fault in boost air circuit • Mass air flow sensor circuit short circuit to ground, short circuit to power, high resistance, open circuit • Manifold absolute pressure sensor circuit short circuit to ground, short circuit to power, high resistance, open circuit • Mass air flow sensor failure • Manifold absolute pressure sensor failure	control valves, intercooler and air filter for leaks, blockages, restrictions and control valve actuator malfunctions • Refer to the electrical circuit diagrams and check both mass air flow sensor circuits for short circuit to ground, short circuit to power, high resistance, open circuit. Repair wiring as required. Clear DTC and retest • Check manifold absolute pressure sensor wiring circuits for short circuit to ground, short circuit to power, high resistance, open circuit. Repair wiring as required. Clear DTC and retest • If no fault found in wiring harness suspect mass air flow sensor or manifold absolute pressure sensor. Check and install new mass air flow or manifold absolute pressure sensor as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0070-16	Ambient Air Temperature Sensor Circuit - Circuit Voltage Below Threshold	NOTE: - Circuit AMBIENT_AIR_TEMP - • The engine control module measured a voltage below a specified range but not necessarily a short circuit to ground • Harness fault - ambient air temperature sensor circuit • Ambient air temperature sensor fault	• Using the manufacturer approved diagnostic system check datalogger signals, Ambient Air Temperature Sensor Voltage (0x03BA), Ambient Air Temperature (0xF466). This DTC is set when the ambient air temperature sensor signal line voltage at the engine control module is less than the threshold value. The ambient air temperature sensor thermistor is mounted in the left door mirror and the circuit consists of a ambient air temperature sensor signal line and a sensor ground circuit. Refer to the electrical circuit diagrams and check both sides of the circuit for high resistance or short circuits. Repair wiring as required • If no faults are found in the wiring circuits suspect the ambient air temperature sensor, refer to the relevant section of the workshop manual and check the sensor operation. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0070-17	Ambient Air Temperature Sensor Circuit - Circuit Voltage Above Threshold	NOTE: - Circuit AMBIENT_AIR_TEMP - • The engine control module measured a voltage above a specified range but not necessarily a short circuit to power • Harness fault - ambient air temperature sensor circuit • Ambient air temperature sensor fault	• Using the manufacturer approved diagnostic system check datalogger signals, Ambient Air Temperature Sensor Voltage (0x03BA), Ambient Air Temperature (0xF466). This DTC is set when the ambient air temperature sensor signal line voltage at the engine control module is greater than the threshold value. The ambient air temperature sensor thermistor is mounted in the left door mirror and the circuit consists of a ambient air temperature sensor signal line and a sensor ground circuit. Refer to the electrical circuit diagrams and check both sides of the circuit for high resistance or short circuits. Repair wiring as required • If no faults are found in the wiring circuits suspect the ambient air temperature sensor, refer to the relevant section of the workshop manual and check the sensor operation. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P007A-16	Charge Air Cooler Temperature Sensor Circuit (Bank 1) - Circuit Voltage Below Threshold	NOTE: - Circuit ACT - • The engine control module measured a voltage below a specified range but not	• Using the manufacturer approved diagnostic system check datalogger signals, Charge Air Temperature Voltage (0x03EE). This DTC is set when the air charge temperature sensor signal line voltage at the engine control module is less than the threshold value. The

DTC	Description	Possible Causes	Action
		necessarily a short circuit to ground • Harness fault - air charge temperature sensor circuit • Air charge temperature sensor fault	air charge temperature sensor thermistor is located in the air intake system downstream of the intercooler and consists of a signal line and a sensor ground circuit. Refer to the electrical circuit diagrams and check both sides of the circuit for high resistance or short circuits. Repair wiring as required • If no faults are found in the wiring circuits suspect the air charge temperature sensor, refer to the relevant section of the workshop manual and check the sensor operation. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P007A-17	Charge Air Cooler Temperature Sensor Circuit (Bank 1) - Circuit Voltage Above Threshold	NOTE: - Circuit ACT - • The engine control module measured a voltage above a specified range but not necessarily a short circuit to power • Harness fault - air charge temperature sensor circuit • Air charge temperature sensor fault	• Using the manufacturer approved diagnostic system check datalogger signals, Air Charge Temperature (0x051C). This DTC is set when the air charge temperature sensor signal line voltage at the engine control module is greater than the threshold value. The air charge temperature sensor thermistor is located in the air intake system downstream of the intercooler and consists of a signal line and a sensor ground circuit. Refer to the electrical circuit diagrams and check both sides of the circuit for high resistance or short circuits. Repair wiring as required • If no faults are found in the wiring circuits suspect the air charge temperature sensor, refer to the relevant section of the workshop manual and check the sensor operation. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P007A-62	Charge Air Cooler Temperature Sensor Circuit (Bank 1) - Signal Compare Failure	• Harness fault - air charge temperature sensor circuit short circuit to ground, short circuit to power, high resistance, open circuit • Air charge temperature sensor fault	• Using the manufacturer approved diagnostic system check datalogger signals, Charge Air Temperature Voltage (0x03EE). Refer to the electrical circuit diagrams and check air charge temperature sensor circuit for short circuit to ground, short circuit to power, high resistance, open circuit. Repair wiring as required • If no faults are found in the wiring circuits suspect the air charge temperature sensor, refer to the relevant section of the workshop manual and check the sensor operation. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0087-00	Fuel Rail/System Pressure - Too Low - No sub type information	• Low level fuel condition • Fuel gauge sender unit sticking • Fuel rail pressure sensor signal circuit short circuit to power • Fuel lines restricted • Fuel lines leaking • Fuel pump failure • Fuel rail pressure sensor signal circuit short circuit to ground • Fuel rail pressure sensor signal circuit open circuit • Fuel rail pressure sensor circuit high resistance • Fuel rail pressure sensor failure	• Check the fuel volume available in the fuel tank is sufficient, add fuel as required. Clear DTC and retest • Check the fuel gauge sender units for correct operation • Refer to the electrical circuit diagrams and check fuel rail pressure sensor circuit for short circuit to power • Check fuel lines for restriction • Check fuel lines for leakage • Check for fuel pump related DTCs and refer to the relevant DTC index • Refer to the electrical circuit diagrams and check fuel rail pressure sensor circuit for short circuit to ground, open circuit, high resistance • Repair wiring as required. If no wiring faults are found suspect fuel rail pressure sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the

DTC	Description	Possible Causes	Action
			installation of a new module/component
P0087-16	Fuel Rail/System Pressure - Too Low - Circuit Voltage Below Threshold	• The engine control module measured a voltage below a specified range but not necessarily a short circuit to ground • Fuel rail pressure sensor circuit, short circuit to ground, open circuit, high resistance • Fuel rail pressure sensor failure	• Refer to the electrical circuit diagrams and check fuel rail pressure sensor circuit for short circuit to ground, open circuit, high resistance • Repair wiring as required. If no wiring faults are found suspect fuel rail pressure sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0087-21	Fuel Rail/System Pressure - Too Low - Signal Amplitude < Minimum	• The engine control module measured a signal voltage below a specified range but not necessarily a short circuit to ground, gain low • Fuel lines restricted • Fuel lines leaking • Fuel injector's stuck open, leaking • Fuel pump failure • Fuel rail pressure sensor circuit short circuit to ground, open circuit, high resistance • Fuel pressure control valve circuit short circuit to ground, open circuit, high resistance • Fuel volume control valve circuit short circuit to ground, open circuit, high resistance • Fuel rail pressure sensor failure • Fuel pressure control valve failure • Fuel volume control valve failure	• Check fuel lines for restriction • Check fuel lines for leakage • Check fuel injector's for stuck open, leakage • Check for fuel pump related DTCs and refer to the relevant DTC index • Refer to the electrical circuit diagrams and check fuel rail pressure sensor circuit for short circuit to ground, open circuit, high resistance • Refer to the electrical circuit diagrams and check fuel pressure control valve circuit for short circuit to ground, open circuit, high resistance • Refer to the electrical circuit diagrams and check fuel volume control valve circuit for short circuit to ground, open circuit, high resistance • If no wiring faults are found suspect fuel rail pressure sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component • If no wiring faults are found suspect fuel pressure control valve. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component • If no wiring faults are found suspect fuel volume control valve. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0088-00	Fuel Rail/System Pressure - Too High - No sub type information	• Fuel gauge sender unit sticking • Fuel rail pressure sensor signal circuit short circuit to power • Fuel rail pressure sensor ground circuit high resistance • Fuel rail pressure sensor ground circuit open circuit • Fuel pressure control valve circuit short circuit to power, ground, open circuit, high resistance • Fuel volume control valve circuit short circuit to power, ground, open circuit, high resistance • Fuel rail pressure sensor failure • Fuel pressure control valve failure • Fuel volume control valve failure	• Check the fuel gauge sender units for correct operation • Refer to the electrical circuit diagrams and check fuel rail pressure sensor circuit for short circuit to power • Refer to the electrical circuit diagrams and check fuel rail pressure sensor ground circuit for high resistance • Refer to the electrical circuit diagrams and check fuel rail pressure sensor ground circuit for open circuit • Refer to the electrical circuit diagrams and check fuel pressure control valve circuit for short circuit to power, ground, open circuit, high resistance • Refer to the electrical circuit diagrams and check fuel volume control valve circuit for short circuit to power, ground, open circuit, high resistance • If no wiring faults are found suspect fuel rail pressure sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component • If no wiring faults are found suspect fuel

DTC	Description	Possible Causes	Action
			pressure control valve. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component • If no wiring faults are found suspect fuel volume control valve. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0088-17	Fuel Rail/System Pressure - Too High - circuit voltage above threshold	• The engine control module measured a voltage above a specified range but not necessarily a short circuit to power • Fuel rail pressure sensor signal circuit short circuit to power	• Refer to the electrical circuit diagrams and check fuel rail pressure sensor circuit for short circuit to power
P0088-22	Fuel Rail/System Pressure - Too High - Signal Amplitude > Maximum	• The engine control module measured a signal voltage above a specified range but not necessarily a short circuit to power, gain too high • Fuel gauge sender unit sticking • Fuel lines restricted • Fuel rail pressure sensor circuit short circuit to power, ground, open circuit, high resistance • Fuel pressure control valve circuit short circuit to power, ground, open circuit, high resistance • Fuel volume control valve circuit short circuit to power, ground, open circuit, high resistance • Fuel rail pressure sensor failure • Fuel pressure control valve failure • Fuel volume control valve failure • Fuel pump failure	• Check the fuel gauge sender units for correct operation • Check fuel lines for restriction • Refer to the electrical circuit diagrams and check fuel rail pressure sensor circuit for short circuit to power, ground, open circuit, high resistance • Refer to the electrical circuit diagrams and check fuel pressure control valve circuit for short circuit to power, ground, open circuit, high resistance • Refer to the electrical circuit diagrams and check fuel volume control valve circuit for short circuit to power, ground, open circuit, high resistance • If no wiring faults are found suspect fuel rail pressure sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component • If no wiring faults are found suspect fuel pressure control valve. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component • If no wiring faults are found suspect fuel volume control valve. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component • Check for fuel pump related DTCs and refer to the relevant DTC index
P0089-21	Fuel Pressure Regulator Performance - Signal Amplitude < Minimum	• The engine control module measured a signal voltage below a specified range but not necessarily a short circuit to ground, gain low • Fuel pressure regulator signal circuit short circuit to ground • Fuel pressure regulator signal circuit open circuit • Fuel pressure regulator reference voltage circuit high resistance • Fuel pressure regulator failure	• Refer to the electrical circuit diagrams and check fuel pressure regulator circuit for short circuit to ground • Refer to the electrical circuit diagrams and check fuel pressure regulator circuit for open circuit • Refer to the electrical circuit diagrams and check fuel pressure regulator reference voltage circuit for high resistance • If no wiring faults are found suspect fuel rail pressure sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component

DTC	Description	Possible Causes	Action
P0089-22	Fuel Pressure Regulator Performance - Signal Amplitude > Maximum	• The engine control module measured a signal voltage above a specified range but not necessarily a short circuit to power, gain too high • Fuel pressure regulator signal circuit short circuit to power • Fuel pressure regulator failure	• Refer to the electrical circuit diagrams and check fuel pressure regulator circuit for short circuit to power • If no wiring faults are found suspect fuel rail pressure sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0090-13	Fuel Pressure Regulator 1 Control Circuit/Open - Circuit open	NOTE: - Circuit PCV - • The engine control module has determined an open circuit via lack of bias voltage, low current flow, no change in the state of an input in response to an output • Harness fault - Fuel pressure control valve control circuit open circuit	• Using the manufacturer approved diagnostic system check datalogger signals, Fuel Pressure Relief Control Valve Duty Cycle (0x03C3). Refer to the electrical circuit diagrams and check the fuel pressure control valve control circuit for open circuit. Repair wiring as required. Clear DTC and retest
P0090-4B	Fuel Pressure Regulator 1 Control Circuit/Open - Over temperature	• Fuel pressure control valve signal circuit short circuit to power, open circuit • Fuel pressure regulator failure	• Using the manufacturer approved diagnostic system check datalogger signals, Fuel Pressure Relief Control Valve Duty Cycle (0x03C3). Refer to the electrical circuit diagrams and check fuel pressure control valve circuit for short circuit to power, open circuit • If no wiring faults are found suspect fuel rail pressure sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0091-11	Fuel Pressure Regulator 1 Control Circuit Low - Circuit short to ground	NOTE: - Circuit PCV - • The engine control module has detected a ground measurement for a period longer than expected or has detected a ground measurement when another value was expected • Harness fault - fuel pressure control valve circuit short circuit to ground • Fuel pressure control valve failure	• Using the manufacturer approved diagnostic system check datalogger signals, Fuel Pressure Relief Control Valve Duty Cycle (0x03C3). Refer to the electrical circuit diagrams and check the fuel pressure control valve circuit for short circuit to ground. Check harness from engine control module to control valve connector for external damage caused by chafing or heat. Check power supply circuit to control valve. Repair wiring as required. Clear DTC and retest • If no wiring faults are found suspect the fuel pressure control valve. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0091-16	Fuel Pressure Regulator 1 Control Circuit Low - Circuit Voltage Below Threshold	NOTE: - Circuit PCV - • The engine control module measured a voltage below a specified range but not necessarily a short circuit to ground • Harness fault - fuel pressure control valve circuit • Fuel pressure control valve failure	• Using the manufacturer approved diagnostic system check datalogger signals, Fuel Pressure Relief Control Valve Duty Cycle (0x03C3). This DTC is set when the voltage on the fuel pressure control valve circuit is less than the threshold expected by the engine control module. Check harness from engine control module to control valve connector for external damage caused by chafing or heat. Refer to the electrical circuit diagrams and check the power supply circuit to the control valve. Check the control circuit between the engine control module and the fuel pressure control valve for faults such as high resistance, short circuit to ground, intermittent open circuit. Repair wiring as

DTC	Description	Possible Causes	Action
			required. Clear DTC and retest • If no wiring faults are found suspect the fuel pressure control valve. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0092-12	Fuel Pressure Regulator 1 Control Circuit High - Circuit short to battery	NOTE: - Circuit PCV - • The engine control module has detected a vehicle power measurement for a period longer than expected or has detected a vehicle power measurement when another value was expected • Harness fault - fuel pressure control valve circuit short circuit to power	• Using the manufacturer approved diagnostic system check datalogger signals, Fuel Pressure Relief Control Valve Duty Cycle (0x03C3). Refer to the electrical circuit diagrams and check the fuel pressure control valve circuit for short circuit to power. Check harness from engine control module to control valve connector for external damage caused by chafing or heat. Check power supply circuit to control valve. Repair wiring as required. Clear DTC and retest
P0092-17	Fuel Pressure Regulator 1 Control Circuit High - Circuit Voltage Above Threshold	NOTE: - Circuit PCV - • The engine control module measured a voltage above a specified range but not necessarily a short circuit to power • Harness fault - fuel pressure control valve circuit • Fuel pressure control valve failure	• Using the manufacturer approved diagnostic system check datalogger signals, Fuel Pressure Relief Control Valve Duty Cycle (0x03C3). This DTC is set when the voltage on the fuel pressure control valve circuit is more than the threshold expected by the engine control module. Check harness from engine control module to fuel pressure control valve connector for external damage caused by chafing or heat. Refer to the electrical circuit diagrams and check the control circuit between the engine control module and the fuel pressure control valve for faults such as high resistance, short circuit to power. Repair wiring as required. Clear DTC and retest • If no wiring faults are found suspect the fuel pressure control valve. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P00AA-16	Intake Air Temperature Sensor 1 Circuit (Bank 2) - Circuit Voltage Below Threshold	NOTES: - Circuit AIR_INTAKE_TEMP - Circuit diagram component name maf/iat sensor bank 2 • The engine control module measured a voltage below a specified range but not necessarily a short circuit to ground • Harness fault - Intake air temperature sensor circuit • Intake air temperature sensor fault (part of mass air flow sensor)	• Using the manufacturer approved diagnostic system check datalogger signals, Intake Air Temperature Sensor (0x1279), Intake Air Temperature (0xF40F). This DTC is set when the voltage on the intake air temperature sensor circuit is less than the threshold expected by the engine control module. The intake air temperature sensor is integrated into the electronics package of the mass air flow. The sensor circuit consists of a thermistor exposed to air passing through the mass air flow sensor, the engine control module signal line voltage passes though the thermistor and shares the same ground circuit as the mass air flow element of the sensor. Check the harness between the engine control module and the mass airflow sensor for damage caused by chaffing or heat. Refer to the electrical circuit diagrams and check all the circuits connected to the mass air flow sensor for open circuits, short circuits, high resistance and intermittent connections. Check mass airflow sensor 2 circuits as both sensors share the ground connection. Repair wiring as required, clear the DTC and retest the system • If the DTC resets and there are no harness faults suspect the intake air temperature sensor fault (part of mass air flow sensor). Refer to the warranty policy and procedures manual, or determine if any prior approval

DTC	Description	Possible Causes	Action
			programme is in operation, prior to the installation of a new module/component
P00AA-17	Intake Air Temperature Sensor 1 Circuit (Bank 2) - Circuit Voltage Above Threshold	NOTES: - Circuit AIR_INTAKE_TEMP - Circuit diagram component name maf/iat sensor bank 2 • The engine control module measured a voltage above a specified range but not necessarily a short circuit to power • Harness fault - Intake air temperature sensor circuit • Intake air temperature sensor fault (part of mass air flow sensor)	• Using the manufacturer approved diagnostic system check datalogger signals, Intake Air Temperature Sensor (0x1279), Intake Air Temperature (0xF40F). This DTC is set when the voltage on the intake air temperature sensor circuit is greater than the threshold expected by the engine control module. The intake air temperature sensor is integrated into the electronics package of the mass air flow. The sensor circuit consists of a thermistor exposed to air passing through the mass air flow sensor, the engine control module signal line voltage passes though the thermistor and shares the same ground circuit as the mass air flow element of the sensor. Check the harness between the engine control module and the mass airflow sensor for damage caused by chaffing or heat. Refer to the electrical circuit diagrams and check all the circuits connected to the mass air flow sensor for open circuits, short circuits, high resistance and intermittent connections. Check mass airflow sensor 2 circuits as both sensors share the ground connection. Repair wiring as required, clear the DTC and retest the system • If the DTC resets and there are no harness faults suspect the intake air temperature sensor fault (part of mass air flow sensor). Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P00AA-62	Intake Air Temperature Sensor 1 Circuit (Bank 2) - Signal Compare Failure	• Harness fault - Intake air temperature sensor circuit • Intake air temperature sensor fault (part of mass air flow sensor)	• Check the harness between the engine control module and the mass airflow sensor for damage caused by chaffing or heat. Refer to the electrical circuit diagrams and check all the circuits connected to the mass air flow sensor for open circuit, short circuit, high resistance and intermittent connections. Check mass airflow sensor 2 circuits as both sensors share the ground connection. Repair wiring as required, clear the DTC and retest the system • If the DTC resets and there are no harness faults suspect the intake air temperature sensor fault (part of mass air flow sensor). Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P00BC-00	Mass or Volume Air Flow A Circuit Range/Performance - Air Flow Too Low - No sub type information	• Boost air solenoid stuck shut bi-turbo mode • Turbine intake solenoid stuck shut • Intake system low pressure boost leak bank 2	• If this DTC is logged with P1247-00, suspect boost air solenoid stuck shut bi-turbo mode • If this DTC is logged with P22D3-77 & P22CF-71, suspect turbine intake solenoid stuck shut • If this DTC is logged with P006A-00, suspect intake system low pressure boost leak bank 2 • Using the manufacturer approved diagnostic system perform the (Turbo, EGR and air path dynamic test) routine
P00BC-07	Mass or Volume Air Flow A Circuit Range/Performance - Air Flow Too Low - Mechanical Failures	NOTE: Circuit diagram component name maf/iat sensor bank 1 • Airflow disruption at sensing element of mass air flow	• This DTC is set if the mass air flow signal from sensor 1 is less than the value expected by the engine control module. Refer to the relevant sections of the workshop manual and check the induction system for air leaks, and obstructions to flow. Check the condition of the air filter and examine the

DTC	Description	Possible Causes	Action
		sensor • Mass air flow sensor failure	induction pipes for debris which could disrupt air flow at the sensing element. Clear the DTC and retest the system • If the DTC resets and there are no harness faults suspect the mass air flow sensor . Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P00BD-00	Mass or Volume Air Flow A Circuit Range/Performance - Air Flow Too High - No sub type information	NOTE: Circuit diagram component name maf/iat sensor bank 1 • Air leak at air intake system A • Harness fault - Mass air flow sensor circuit short circuit to power • Mass air flow sensor failure	• Refer to the relevant sections of the workshop manual and check the induction system for air leaks • Refer to the electrical circuit diagrams and check mass air flow sensor for short circuit to power. Repair wiring as required, clear the DTC and retest the system • If the DTC resets and there are no harness faults suspect the mass air flow sensor . Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P00BD-07	Mass or Volume Air Flow A Circuit Range/Performance - Air Flow Too High - Mechanical Failures	• Boost air solenoid stuck open mono turbo mode • Turbine intake solenoid leakage when closed • Turbine intake solenoid stuck open • Intake air system, blocked low pressure air intake. This failure mode can be caused by snow packing in the intake system. Symptoms often disappear after the vehicle has been warmed and heat soaked. Similar symptoms to seized primary turbo • Primary turbo charger seized	• If this DTC is logged with P0235-94 suspect, boost air solenoid stuck open mono turbo mode • If this DTC is logged with P0235-94 suspect, turbine intake solenoid leakage when closed • If this DTC is logged with P0235-94, P22D2-77, P1247-00 & P22CF-71 suspect, turbine intake solenoid stuck open • If this DTC is logged with P0235-94, P22D2-77, P1247-00 & P22CF-71 suspect, intake air system, blocked low pressure air intake • If this DTC is logged with P00BE-07 & P1247-00 suspect, primary turbocharger seized • Using the manufacturer approved diagnostic system perform the (Turbo, EGR and air path dynamic test) routine
P00BE-00	Mass or Volume Air Flow B Circuit Range/Performance - Air Flow Too Low - No sub type information	NOTE: Circuit diagram component name maf/iat sensor bank 2 • Boost air recirculation solenoid stuck open bi-turbo mode • Airflow disruption at sensing element of mass air flow sensor 2 • Harness fault - Mass air flow sensor circuit short circuit to ground, high resistance, open circuit • Mass air flow sensor 2 failure	• If this DTC is logged with P1247-00, suspect boost air recirculation solenoid stuck open. Refer to the relevant sections of the workshop manual and check the boost air recirculation solenoid circuit for short circuit to power, ground, open circuit. Check and install a new boost air recirculation solenoid as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component. Refer to the relevant sections of the workshop manual and check the induction system for air leaks, and obstructions to flow. Check the condition of the air filter and examine the induction pipes for debris which could disrupt air flow at the sensing element • Using the manufacturer approved diagnostic system perform the (Turbo, EGR and air path dynamic test) routine • Refer to the electrical circuit diagrams and check mass air flow sensor 2 for short circuit to ground, high resistance, open circuit. Repair wiring as required, clear the DTC and retest the system • If the DTC resets suspect the mass air flow sensor. Check and install a new mass air flow sensor 2 as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component

DTC	Description	Possible Causes	Action
P00BE-07	Mass or Volume Air Flow B Circuit Range/Performance - Air Flow Too Low - Mechanical Failures	NOTE: Circuit diagram component name maf/iat sensor bank 2 • Airflow disruption at sensing element of mass air flow • Mass air flow failure	• This DTC is set if the mass air flow signal from sensor 2 is less than the value expected by the engine control module. Refer to the relevant sections of the workshop manual and check the induction system for air leaks, and obstructions to flow. Check the condition of the air filter and examine the induction pipes for debris which could disrupt air flow at the sensing element. Clear the DTC and retest the system • If the DTC resets suspect the mass air flow sensor. Check and install a new mass air flow as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P00BF-00	Mass or Volume Air Flow B Circuit Range/Performance - Air Flow Too High - No sub type information	• Air leak at air intake system B • Harness fault - Mass air flow sensor circuit short circuit to power • Mass air flow sensor 2 failure	• If this DTC is logged with P00BE-00, suspect boost air recirculation solenoid stuck open. Refer to the relevant sections of the workshop manual and check the boost air recirculation solenoid circuit for short circuit to power, ground, open circuit. Check and install a new boost air recirculation solenoid as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component. Refer to the relevant sections of the workshop manual and check the induction system for air leaks • Using the manufacturer approved diagnostic system perform the (Turbo, EGR and air path dynamic test) routine • Refer to the electrical circuit diagrams and check mass air flow sensor 2 for short circuit to power. Repair wiring as required, clear the DTC and retest the system • If the DTC resets suspect the mass air flow sensor. Check and install a new mass air flow sensor 2 as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P00BF-07	Mass or Volume Air Flow B Circuit Range/Performance - Air Flow Too High - Mechanical Failures	• Intake air system, high pressure boost leak bank A	• If this DTC is logged with P1247-00, P006A-00 & P00BF-07, suspect intake air system, high pressure boost leak bank A • Using the manufacturer approved diagnostic system perform the (Turbo, EGR and air path dynamic test) routine
P00CF-62	Secondary Compressor Outlet Pressure Sensor - Signal compare failure	• Boost air circuit leak or blockage • Boost air recirculation solenoid fault • Boost air solenoid fault • Mechanical fault - sensor hose blocked or leaking • Harness fault - Boost air pressure sensor circuit • Boost air pressure sensor failure	• This DTC is set when the engine control module detects a signal compare failure on the boost air pressure sensor signal. Check the sensor hose for blockages or leaks. Check the sensor and harness for mechanical damage caused by heat or chaffing. Check for DTCs relating to faults on the Accelerator Pedal Position sensor as these sensors share power supply and ground connections • The boost air pressure sensor has three circuits, a 5 volt supply, a sensor ground, and an analogue voltage signal line. Refer to the electrical circuit diagrams and check the sensor voltage and ground supplies for open circuits or short circuit to ground. Check the signal line for open circuit, short circuit to power, short circuit to ground. Repair the wiring harness as required • If no fault found in wiring harness suspect boost air pressure sensor failure. The sensor provides an analogue voltage output in response to the pressure applied at the

DTC	Description	Possible Causes	Action
			sensing orifice. The output voltage range is between 0.2 and 4.8 volts. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0101-21	Mass or Volume Air Flow A Circuit Range/Performance - Signal Amplitude < Minimum	NOTE: Circuit diagram component name maf/iat sensor bank 1 • The engine control module measured a signal voltage below a specified range but not necessarily a short circuit to ground, gain low • Airflow disruption at sensing element of mass air flow sensor • Harness fault - Mass air flow sensor circuit short circuit to ground, high resistance, open circuit • Mass air flow sensor failure	• This DTC is set if the mass air flow signal from sensor 1 is less than the value expected by the engine control module. Refer to the relevant sections of the workshop manual and check the induction system for air leaks, and obstructions to flow. Check the condition of the air filter and examine the induction pipes for debris which could disrupt air flow at the sensing element • Using the manufacturer approved diagnostic system perform the (Turbo, EGR and air path dynamic test) routine • Refer to the electrical circuit diagrams and check mass air flow sensor for short circuit to ground, high resistance, open circuit. Repair wiring as required, clear the DTC and retest the system • If the DTC resets suspect the mass air flow sensor. Check and install a new mass air flow sensor as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0101-22	Mass or Volume Air Flow A Circuit Range/Performance - Signal Amplitude > Maximum	NOTE: Circuit diagram component name maf/iat sensor bank 1 • The engine control module measured a signal voltage above a specified range but not necessarily a short circuit to power, gain too high • Airflow disruption at sensing element of mass air flow sensor • Harness fault - Mass air flow sensor circuit short circuit to power • Mass air flow sensor failure	• This DTC is set if the mass air flow signal from sensor 1 is less than the value expected by the engine control module. Refer to the relevant sections of the workshop manual and check the induction system for air leaks, and obstructions to flow. Check the condition of the air filter and examine the induction pipes for debris which could disrupt air flow at the sensing element • Refer to the electrical circuit diagrams and check mass air flow sensor for short circuit to power. Repair wiring as required, clear the DTC and retest the system • If the DTC resets suspect the mass air flow sensor. Check and install a new mass air flow sensor as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0101-92	Mass or Volume Air Flow Sensor "A" Circuit Range/Performance - Performance or incorrect operation	• Airflow disruption at sensing element of mass air flow sensor • Harness fault - Mass air flow sensor circuit short circuit to ground, short circuit to power, open circuit, high resistance • Mass air flow sensor failure	• This DTC is set if the mass air flow signal from sensor 1 is less than the value expected by the engine control module. Refer to the relevant sections of the workshop manual and check the induction system for air leaks, and obstructions to flow. Check the condition of the air filter and examine the induction pipes for debris which could disrupt air flow at the sensing element • Refer to the electrical circuit diagrams and check mass air flow sensor for short circuit to ground, short circuit to power, open circuit, high resistance. Repair wiring as required, clear the DTC and retest the system • If the DTC resets suspect the mass air flow sensor. Check and install a new mass air flow sensor as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component

DTC	Description	Possible Causes	Action
P0102-00	Mass or Volume Air Flow A Circuit Low - No sub type information	NOTES: - Circuit MAFS_B - Circuit diagram component name maf/iat sensor bank 1 • Airflow disruption at sensing element of mass air flow sensor • Harness fault - Mass air flow sensor circuits • Mass air flow sensor failure	• Using the manufacturer approved diagnostic system perform the (Turbo, EGR and air path dynamic test) routine • Using the manufacturer approved diagnostic system check datalogger signals, Air Flow Rate From mass air flow Sensor Bank 1 (0x0504). This DTC is set if the mass air flow signal from sensor 1 is less than the value expected by the engine control module. Refer to the relevant sections of the workshop manual and check the induction system for air leaks, and obstructions to flow. Check the condition of the air filter and examine the induction pipes for debris which could disrupt air flow at the sensing element • Refer to the electrical circuit diagrams and check the power and ground circuits for the mass air flow sensors for high resistance, short circuits to power or ground, check the mass air flow signal line between the engine control module and the mass air flow sensor for high resistance, and intermittent faults. Repair wiring as required, clear the DTC and retest the system • If the DTC resets suspect the mass air flow sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0103-00	Mass or Volume Air Flow A Circuit High - No sub type information	NOTES: - Circuit MAFS_B - Circuit diagram component name maf/iat sensor bank 1 • Airflow disruption at sensing element of mass air flow sensor • Harness fault - Mass air flow sensor circuits • Mass air flow sensor failure	• Using the manufacturer approved diagnostic system check datalogger signals, Air Flow Rate From Mass Air Flow Sensor Bank 1 (0x0504). This DTC is set if the mass air flow signal from sensor 1 is greater than the value expected by the engine control module. Refer to the relevant sections of the workshop manual and check the induction system for air leaks, and obstructions to flow. Check the condition of the air filter and examine the induction pipes for debris which could disrupt air flow at the sensing element. Refer to the electrical circuit diagrams and check the power and ground circuits for the mass air flow sensors for high resistance, short circuits to power or ground, check the mass air flow signal line between the engine control module and the mass air flow sensor for high resistance, and intermittent faults. Repair wiring as required, clear the DTC and retest the system. If the DTC resets suspect the mass air flow sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component • Using the manufacturer approved diagnostic system check datalogger signals, Air Flow Rate From Mass Air Flow Sensor Bank 1 (0x0504). This DTC is set if the mass air flow signal from sensor 1 is greater than the value expected by the engine control module. Refer to the relevant sections of the workshop manual and check the induction system for air leaks, and obstructions to flow. Check the condition of the air filter and examine the induction pipes for debris which could disrupt air flow at the sensing element • Refer to the electrical circuit diagrams and check the power and ground circuits for the mass air flow sensors for high resistance, short circuits to power or ground, check the mass air flow signal line between the engine control module and the mass air flow sensor for high resistance, and intermittent faults. Repair wiring as required, clear the DTC and

DTC	Description	Possible Causes	Action
			retest the system • If the DTC resets suspect the mass air flow sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0105-16	Manifold Absolute Pressure/BARO circuit - Circuit voltage below threshold	NOTE: - Circuit MAP - • The engine control module measured a voltage below a specified range but not necessarily a short circuit to ground • Harness fault - Manifold absolute pressure sensor circuits • Manifold absolute pressure sensor failure • Blockage or leak between the intake manifold and the manifold absolute pressure sensor	• Refer to the electrical circuit diagrams and check the 5 volt supply circuit for open circuits, high resistance, short circuit to ground. Check the sensor ground for open circuit, short circuit to power. Check the signal circuit for short circuit to ground, high resistance. Repair wiring as required, clear the DTC and retest the system • If the DTC resets and there are no harness faults suspect the manifold absolute pressure sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component • Using the manufacturer approved diagnostic system check datalogger signals, Corrected Intake Manifold Absolute Pressure (0x0322), Manifold Absolute Pressure Sensor Voltage (0x0301), Manifold Absolute Pressure Bank 1 (0x052C). This DTC is set when the voltage on the manifold absolute pressure sensor signal circuit is less than the threshold expected by the engine control module. This sensor is a pressure transducer with a 5 volt sensor supply, a sensor ground, and a signal circuit. Refer to the workshop manual and check the manifold absolute pressure sensor is correctly connected to the air intake manifold and there are no blockages or air leaks preventing communication of pressure changes between the manifold and the sensor. Check for DTCs associated with the throttle position sensor which has a common power supply
P0105-17	Manifold Absolute Pressure/BARO circuit - Circuit voltage above threshold	NOTE: - Circuit MAP - • The engine control module measured a voltage above a specified range but not necessarily a short circuit to power • Harness fault - Manifold absolute pressure sensor circuits • Manifold absolute pressure sensor failure • Blockage or leak between the intake manifold and the manifold pressure sensor	• Refer to the electrical circuit diagrams and check the 5 volt supply circuit for short circuit to power. Check the sensor ground for open circuit, short circuit to power. Check the signal circuit for short circuit to power. Repair wiring as required, clear the DTC and retest the system • If the DTC resets and there are no harness faults suspect the manifold absolute pressure sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component • Using the manufacturer approved diagnostic system check datalogger signals, Corrected Intake Manifold Absolute Pressure (0x0504), Manifold Absolute Pressure Sensor Voltage (0x0301), Manifold Absolute Pressure Bank 1 (0x052C). This DTC is set when the voltage on the manifold absolute pressure sensor signal circuit is greater than the threshold expected by the engine control module. This sensor is a pressure transducer with a 5 volt sensor supply, a sensor ground, and a signal circuit. The sensing element is connected to intake manifold pressure downstream of the throttle plate. Refer to the workshop manual and check the manifold absolute pressure sensor is correctly connected to the air intake manifold and there are no blockages or air leaks preventing communication of pressure changes between the manifold and

DTC	Description	Possible Causes	Action
			the sensor. Check for DTCs associated with the throttle position sensor which has a common power supply
P0105-65	Manifold Absolute Pressure/Barometric Pressure Sensor Circuit - Signal has too few transitions / events	NOTE: - Circuit MAP - • Harness fault - Manifold absolute pressure sensor circuits • Manifold absolute pressure sensor failure • Blockage or leak between the intake manifold and the manifold pressure sensor	• Refer to the electrical circuit diagrams and check the 5 volt supply circuit for short circuit to power. Check the sensor ground for open circuit, short circuit to power. Check the signal circuit for short circuit to power. Repair wiring as required, clear the DTC and retest the system • If the DTC resets and there are no harness faults suspect the manifold absolute pressure sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component • Using the manufacturer approved diagnostic system check datalogger signals, Corrected Intake Manifold Absolute Pressure (0x0504), Manifold Absolute Pressure Sensor Voltage (0x0301), Manifold Absolute Pressure Bank 1 (0x052C). This DTC is set when the voltage on the manifold absolute pressure sensor signal circuit is greater than the threshold expected by the engine control module. This sensor is a pressure transducer with a 5 volt sensor supply, a sensor ground, and a signal circuit. The sensing element is connected to Intake Manifold Pressure downstream of the throttle plate. Refer to the workshop manual and check the manifold absolute pressure sensor is correctly connected to the air intake manifold and there are no blockages or air leaks preventing communication of pressure changes between the manifold and the sensor. Check for DTCs associated with the throttle position sensor which has a common power supply
P0107-00	Manifold Absolute Pressure/Barometric Pressure Sensor Circuit Low - No sub type information	NOTE: - Circuit MAP - • Harness fault - Manifold absolute pressure sensor circuits • Manifold absolute pressure sensor failure • Blockage or leak between the intake manifold and the manifold pressure sensor	• Using the manufacturer approved diagnostic system perform the (Turbo, EGR and air path dynamic test) routine • Refer to the electrical circuit diagrams and check the 5 volt supply circuit for short circuit to power. Check the sensor ground for open circuit, short circuit to power. Check the signal circuit for short circuit to power. Repair wiring as required, clear the DTC and retest the system • If the DTC resets and there are no harness faults suspect the manifold absolute pressure sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component • Using the manufacturer approved diagnostic system check datalogger signals, Corrected Intake Manifold Absolute Pressure (0x0504), Manifold Absolute Pressure Sensor Voltage (0x0301), Manifold Absolute Pressure Bank 1 (0x052C). This DTC is set when the voltage on the manifold absolute pressure sensor signal circuit is greater than the threshold expected by the engine control module. This sensor is a pressure transducer with a 5 volt sensor supply, a sensor ground, and a signal circuit. The sensing element is connected to Intake Manifold Pressure downstream of the throttle plate. Refer to the workshop manual and check the manifold absolute pressure sensor is correctly connected to the air intake manifold and there are no blockages or air leaks preventing communication of

DTC	Description	Possible Causes	Action
			pressure changes between the manifold and the sensor. Check for DTCs associated with the throttle position sensor which has a common power supply
P0107-16	Manifold Absolute Pressure/Barometric Pressure Sensor Circuit Low - Circuit voltage below threshold	NOTE: - Circuit MAP - • The engine control module measured a voltage below a specified range but not necessarily a short circuit to ground • Harness fault - Manifold absolute pressure sensor circuits • Manifold absolute pressure sensor failure • Blockage or leak between the intake manifold and the manifold pressure sensor	• Using the manufacturer approved diagnostic system perform the (Turbo, EGR and air path dynamic test) routine • Refer to the electrical circuit diagrams and check the 5 volt supply circuit for open circuit, short circuit to power, short circuit to ground. Check the sensor ground for open circuit, short circuit to power. Check the signal circuit for open circuit, short circuit to power, short circuit to ground. Repair wiring as required, clear the DTC and retest the system • If the DTC resets and there are no harness faults suspect the manifold absolute pressure sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component • Using the manufacturer approved diagnostic system check datalogger signals, Corrected Intake Manifold Absolute Pressure (0x0504), Manifold Absolute Pressure Sensor Voltage (0x0301), Manifold Absolute Pressure Bank 1 (0x052C). This DTC is set when the manifold absolute pressure sensor signal voltage is lower than expected by the engine control module. This sensor is a pressure transducer with a 5 volt sensor supply, a sensor ground, and a signal circuit. The sensing element is connected to intake manifold pressure downstream of the throttle plate. Refer to the workshop manual and check the manifold absolute pressure sensor is correctly connected to the air intake manifold and there are no blockages or air leaks preventing communication of pressure changes between the manifold and the sensor
P0108-00	Manifold Absolute Pressure/Barometric Pressure Sensor Circuit High - No sub type information	NOTE: - Circuit MAP - • Harness fault - Manifold absolute pressure sensor circuits • Manifold absolute pressure sensor failure • Blockage or leak between the intake manifold and the manifold pressure sensor	• Refer to the electrical circuit diagrams and check the 5 volt supply circuit for open circuit, short circuit to power, short circuit to ground. Check the sensor ground for open circuit, short circuit to power. Check the signal circuit for open circuit, short circuit to power, short circuit to ground. Repair wiring as required, clear the DTC and retest the system • If the DTC resets and there are no harness faults suspect the manifold absolute pressure sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component • Using the manufacturer approved diagnostic system check datalogger signals, Corrected Intake Manifold Absolute Pressure (0x0504), Manifold Absolute Pressure Sensor Voltage (0x0301), Manifold Absolute Pressure Bank 1 (0x052C). This DTC is set when the manifold absolute pressure sensor signal voltage is greater than expected by the engine control module. This sensor is a pressure transducer with a 5 volt sensor supply, a sensor ground, and a signal circuit. The sensing element is connected to Intake Manifold Pressure downstream of the throttle plate. Refer to the workshop manual and check the manifold absolute pressure sensor is corrected

DTC	Description	Possible Causes	Action
			connected to the air intake manifold and there are no blockages or air leaks preventing communication of pressure changes between the manifold and the sensor
P0108-17	Manifold Absolute Pressure/Barometric Pressure Sensor Circuit High - Circuit voltage above threshold	NOTE: - Circuit MAP - • The engine control module measured a voltage above a specified range but not necessarily a short circuit to power • Harness fault - Manifold absolute pressure sensor circuits • Manifold absolute pressure sensor failure • Blockage or leak between the intake manifold and the manifold pressure sensor	• Refer to the electrical circuit diagrams and check the 5 volt supply circuit for open circuit, short circuit to power, short circuit to ground. Check the sensor ground for open circuit, short circuit to power. Check the signal circuit for open circuit, short circuit to power, short circuit to ground. Repair wiring as required, clear the DTC and retest the system • If the DTC resets and there are no harness faults suspect the manifold absolute pressure sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component • Using the manufacturer approved diagnostic system check datalogger signals, Corrected Intake Manifold Absolute Pressure (0x0504), Manifold Absolute Pressure Sensor Voltage (0x0301), Manifold Absolute Pressure Bank 1 (0x052C). This DTC is set when the manifold absolute pressure sensor signal voltage is greater than expected by the engine control module. This sensor is a pressure transducer with a 5 volt sensor supply, a sensor ground, and a signal circuit. The sensing element is connected to intake manifold pressure downstream of the throttle plate. Refer to the workshop manual and check the manifold absolute pressure sensor is corrected connected to the air intake manifold and there are no blockages or air leaks preventing communication of pressure changes between the manifold and the sensor
P010A-92	Mass or Volume Air Flow Sensor "B" Circuit - Performance or incorrect operation	NOTE: Circuit diagram component name maf/iat sensor bank 2 • Airflow disruption at sensing element of mass air flow • Harness fault - Mass air flow sensor circuit short circuit to ground, short circuit to power, open circuit, high resistance • Mass air flow failure	• This DTC is set if the mass air flow signal from sensor 2 is greater than the value expected by the engine control module. Refer to the relevant sections of the workshop manual and check the induction system for air leaks, and obstructions to flow. Check the condition of the air filter and examine the induction pipes for debris which could disrupt air flow at the sensing element • Refer to the electrical circuit diagrams and check mass air flow sensor 2 for short circuit to ground, short circuit to power, open circuit, high resistance. Repair wiring as required, clear the DTC and retest the system • If the DTC resets suspect the mass air flow sensor. Check and install a new mass air flow sensor 2 as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P010B-21	Mass or Volume Air Flow B Circuit Range/Performance - Signal Amplitude < Minimum	NOTE: Circuit diagram component name maf/iat sensor bank 2 • The engine control module measured a signal voltage below a specified range but not necessarily a short circuit to ground, gain low • Airflow disruption at sensing	• This DTC is set if the mass air flow signal from sensor 2 is less than the value expected by the engine control module. Refer to the relevant sections of the workshop manual and check the induction system for air leaks, and obstructions to flow. Check the condition of the air filter and examine the induction pipes for debris which could disrupt air flow at the sensing element • Using the manufacturer approved diagnostic system perform the (Turbo, EGR and air path

DTC	Description	Possible Causes	Action
		element of mass air flow • Harness fault - Mass air flow sensor circuit short circuit to ground, high resistance, open circuit • Mass air flow failure	dynamic test) routine • Refer to the electrical circuit diagrams and check mass air flow sensor 2 for short circuit to ground, high resistance, open circuit. Repair wiring as required, clear the DTC and retest the system • If the DTC resets suspect the mass air flow sensor. Check and install a new mass air flow sensor 2 as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P010B-22	Mass or Volume Air Flow B Circuit Range/Performance - Signal Amplitude > Maximum	NOTE: Circuit diagram component name maf/iat sensor bank 2 • The engine control module measured a signal voltage above a specified range but not necessarily a short circuit to power, gain too high • Airflow disruption at sensing element of mass air flow sensor 2 • Harness fault - Mass air flow sensor circuit short circuit to power • Mass air flow failure	• This DTC is set if the mass air flow signal from sensor 2 is less than the value expected by the engine control module. Refer to the relevant sections of the workshop manual and check the induction system for air leaks, and obstructions to flow. Check the condition of the air filter and examine the induction pipes for debris which could disrupt air flow at the sensing element • Refer to the electrical circuit diagrams and check mass air flow sensor 2 for short circuit to power. Repair wiring as required, clear the DTC and retest the system • If the DTC resets suspect the mass air flow sensor. Check and install a new mass air flow sensor 2 as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P010C-00	Mass or Volume Air Flow B Circuit Low - No sub type information	NOTES: - Circuit MAFS_A - Circuit diagram component name maf/iat sensor bank 2 • Airflow disruption at sensing element of mass air flow • Harness fault - Mass air flow sensor circuits • Mass air flow failure	• Using the manufacturer approved diagnostic system perform the (Turbo, EGR and air path dynamic test) routine • Using the manufacturer approved diagnostic system check datalogger signals, Air Flow Rate From Mass Air Flow Sensor Bank 2 (0x0505). This DTC is set if the mass air flow signal from sensor 2 is less than the value expected by the engine control module. Refer to the relevant sections of the workshop manual and check the induction system for air leaks, and obstructions to flow. Check the condition of the air filter and examine the induction pipes for debris which could disrupt air flow at the sensing element • Refer to the electrical circuit diagrams and check the power and ground circuits for the mass air flow sensors for high resistance, short circuits to power or ground, check the mass air flow signal line between the engine control module and the mass air flow sensor for high resistance, and intermittent faults. Repair wiring as required, clear the DTC and retest the system • If the DTC resets suspect the mass air flow sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P010D-00	Mass or Volume Air Flow B Circuit High - No sub type information	NOTES: - Circuit MAFS_A - Circuit diagram component name maf/iat sensor bank 2 • Airflow disruption at sensing element of mass air flow	• Using the manufacturer approved diagnostic system check datalogger signals, Air Flow Rate From Mass Air Flow Sensor Bank 2 (0x0505). This DTC is set if the mass air flow signal from sensor 2 is greater than the value expected by the engine control module. Refer to the relevant sections of the workshop manual and check the induction system for air leaks, and obstructions to flow. Check the condition of the air filter and examine the induction pipes for debris which

DTC	Description	Possible Causes	Action
		• Harness fault - Mass air flow sensor circuits • Mass air flow failure	could disrupt air flow at the sensing element • Refer to the electrical circuit diagrams and check the power and ground circuits for the mass air flow sensors for high resistance, short circuits to power or ground, check the mass air flow signal line between the engine control module and the mass air flow sensor for high resistance, and intermittent faults. Repair wiring as required, clear the DTC and retest the system • If the DTC resets suspect the mass air flow sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0116-00	Engine Coolant Temperature Sensor 1 Circuit Range/Performance - No sub type information	NOTE: - Circuit ECT - • Engine coolant level or flow fault • Harness fault - engine coolant temperature sensor circuits • Engine coolant temperature sensor failure	• Using the manufacturer approved diagnostic system check datalogger signals, Engine Coolant Temperature Sensor (0x0357), Engine Coolant Temperature (0xF405). This DTC is set if the engine coolant temperature value fails plausibility checks by the engine control module. Refer to the workshop manual and check the engine cooling system to ensure the coolant condition and level is correct • Refer to the electrical circuit diagrams and check the engine coolant temperature sensor circuits for high resistance, short circuit to other circuits, intermittent faults. Repair wiring as required, clear the DTC and retest the system • If the DTC resets suspect the engine coolant temperature sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0116-16	Engine Coolant Temperature Sensor 1 Circuit Range/Performance - Circuit Voltage Below Threshold	NOTE: - Circuit ECT - • The engine control module measured a voltage below a specified range but not necessarily a short circuit to ground • Engine coolant level or flow fault • Harness fault - engine coolant temperature sensor circuits • Engine coolant temperature sensor failure	• Using the manufacturer approved diagnostic system check datalogger signals, Engine Coolant Temperature Sensor (0x0357), Engine Coolant Temperature (0xF405). This DTC is set if the engine coolant temperature sensor signal voltage is less than the value expected by the engine control module. Refer to the workshop manual and check the engine cooling system to ensure the coolant condition and level is correct • Refer to the electrical circuit diagrams and check the engine coolant temperature sensor circuits for high resistance, short circuit to other circuits, intermittent faults. Repair wiring as required, clear the DTC and retest the system • If the DTC resets suspect the engine coolant temperature sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0116-17	Engine Coolant Temperature Sensor 1 Circuit Range/Performance - Circuit Voltage Above Threshold	NOTE: - Circuit ECT - • The engine control module measured a voltage above a specified range but not necessarily a short circuit to power • Engine coolant level or flow fault • Harness fault - engine coolant temperature sensor circuits • Engine coolant temperature	• Using the manufacturer approved diagnostic system check datalogger signals, Engine Coolant Temperature Sensor (0x0357), Engine Coolant Temperature (0xF405). This DTC is set if the engine coolant temperature sensor signal voltage is greater than the value expected by the control module. Refer to the workshop manual and check the engine cooling system to ensure the coolant condition and level is correct • Refer to the electrical circuit diagrams and check the engine coolant temperature sensor circuits for high resistance, short circuit to other circuits, intermittent faults. Repair

DTC	Description	Possible Causes	Action
		sensor failure	wiring as required, clear the DTC and retest the system • If the DTC resets suspect the engine coolant temperature sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0116-21	Engine Coolant Temperature Sensor 1 Circuit Range/Performance - Signal Amplitude < Minimum	• The engine control module measured a signal voltage below a specified range but not necessarily a short circuit to ground, gain low • Engine coolant level or flow fault • Harness fault - engine coolant temperature sensor circuit short circuit to ground, high resistance, open circuit • Engine coolant temperature sensor failure	• Using the manufacturer approved diagnostic system check datalogger signals, Engine Coolant Temperature Sensor (0x0357), Engine Coolant Temperature (0xF405). This DTC is set if the engine coolant temperature sensor signal amplitude is lower than the value expected by the control module. Refer to the workshop manual and check the engine cooling system to ensure the coolant condition and level is correct • Refer to the electrical circuit diagrams and check the engine coolant temperature sensor for short circuit to ground, high resistance, open circuit. Repair wiring as required, clear the DTC and retest the system • If the DTC resets suspect the engine coolant temperature sensor. Check and install a new engine coolant temperature sensor as required
P0116-22	Engine Coolant Temperature Sensor 1 Circuit Range/Performance - Signal Amplitude > Maximum	• The engine control module measured a signal voltage above a specified range but not necessarily a short circuit to power, gain too high • Engine coolant level or flow fault • Harness fault - engine coolant temperature sensor circuit short circuit to power • Engine coolant temperature sensor failure	• Using the manufacturer approved diagnostic system check datalogger signals, Engine Coolant Temperature Sensor (0x0357), Engine Coolant Temperature (0xF405). This DTC is set if the engine coolant temperature sensor signal amplitude is greater than the value expected by the control module. Refer to the workshop manual and check the engine cooling system to ensure the coolant condition and level is correct • Refer to the electrical circuit diagrams and check the engine coolant temperature sensor circuit for short circuit to power. Repair wiring as required, clear the DTC and retest the system • If the DTC resets suspect the engine coolant temperature sensor. Check and install a new engine coolant temperature sensor as required
P0130-00	O2 Sensor Circuit (Bank 1 Sensor 1) - No sub type information	NOTE: - Circuit LPV_A - LPPC_A • Harness fault - Pre catalyst oxygen sensor circuit open circuit • Pre catalyst oxygen sensor component fault	• Refer to the electrical circuit diagrams and check the pre catalyst oxygen sensor circuits for open circuit. Repair wiring harness as required. Clear DTC and retest • If no fault found in wiring harness suspect pre catalyst oxygen sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0130-11	O2 Circuit (Bank 1, Sensor 1) - Circuit short to ground	NOTE: - Circuit LPV_A - • The engine control module has detected a ground measurement for a period longer than expected or has detected a ground measurement when another value was expected • Harness fault - Pre catalyst oxygen sensor circuit short circuit to ground • Pre catalyst oxygen sensor component fault	• Refer to the electrical circuit diagrams and check the pre catalyst oxygen sensor circuits for short circuit to ground. Repair wiring harness as required. Clear DTC and retest • If no fault found in wiring harness suspect pre catalyst oxygen sensor. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Headlamp Control Module (HCM)

Description and Operation

Headlamp Control Module (HCM)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Headlamp Control Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Headlamps (417-01 Exterior Lighting, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1041-04	Levelling Control - System internal failures	• No Headlamp control module functionality - Module internal failure	• Install a new Headlamp Control Module as required. Refer to the warranty policy and procedures manual
B1041-54	Levelling Control - Missing calibration	• Levelling sensor calibration routine not carried out	NOTE: Sensor calibration routine must be carried out with the vehicle unladen and with correct tire pressures. • Carry out the levelling sensor calibration routine using the manufacturer approved diagnostic system
B1087-83	LIN Bus "A" - Value of signal protection calculation incorrect	• Checksum error	• Clear the DTC and re-test. If the DTC remains install a new Headlamp Control Module. Refer to the warranty policy and procedures manual
B1087-86	LIN Bus "A" - Signal invalid	• Signal invalid	• Clear the DTC and re-test. If the DTC remains install a new Headlamp Control Module. Refer to the warranty policy and procedures manual
B1087-88	LIN Bus "A" - Bus off	• Bus Off • LIN Bus circuit short circuit to ground	• Refer to the electrical circuit diagrams and check the LIN bus circuit. Check for other related DTCs

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Headlamp Control Module B (HCMB)

Description and Operation

Headlamp Control Module B (HCMB)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Headlamp Control Module B, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Headlamps (417-01 Exterior Lighting, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1286-16	Interior Mirror - Circuit voltage below threshold	• Mirror circuit voltage below threshold - The electrochromic function does not work	• This DTC is for information only. Clear the DTC and retest. If the problem persists, renew the mirror module. Refer to the warranty policy and procedures manual if a module is suspect
B1286-17	Interior Mirror - Circuit voltage above threshold	• Mirror circuit voltage above threshold - The electrochromic function does not work	• This DTC is for information only. Clear the DTC and retest. If the problem persists, renew the mirror module. Refer to the warranty policy and procedures manual if a module is suspect
B1286-44	Interior Mirror - Data memory failure	• Mirror control module data memory failure - The electrochromic function does not work	• Renew the interior mirror module. Refer to the warranty policy and procedures manual if a module is suspect
B1286-47	Interior Mirror - Watchdog/safety micro controller failure	• Control module watchdog/safety Micro controller failure - The electrochromic function does not work	• This DTC is for information only. Clear the DTC and retest. If the problem persists, renew the mirror module. Refer to the warranty policy and procedures manual if a module is suspect

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Instrument Cluster (IPC)

Description and Operation

Instrument Cluster (IPC)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Instrument Cluster, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Instrument Cluster (413-01 Instrument Cluster, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1009-51	Ignition Authorisation - Not programmed	NOTE: This DTC is only likely to occur following component replacement applications failing prior to completion • Security Identifier not programmed in Central Junction Box (Part of Immobilization set-up)	• Configure the Instrument Cluster as a New module using the manufacturer approved diagnostic system
B1009-87	Ignition Authorisation - Missing message	• Missing message • CAN circuit fault • Instrument Cluster fault • Central Junction Box fault • Battery voltage low	NOTE: Only diagnose this DTC if the Customer is reporting a start related issue • Clear the DTC and retest • Check for additional ignition related DTCs and rectify as necessary • If problem persists, carry out CAN Network Integrity Test and On Demand Self Test using manufacturer approved diagnostic system • Refer to the electrical circuit diagrams and check CAN circuits

DTC	Description	Possible Causes	Action
B100D-64	Column Lock Authorisation - Signal plausibility failure	• Instrument Cluster can not enable Steering Column Lock Module ground • CAN Network fault • Anti-lock Braking System, Engine Control Module, Instrument Cluster fault	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported a vehicle / engine start concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis • Clear the DTC and retest. If the problem persists, carry out CAN Network Integrity Test and On Demand Self Test using the manufacturer approved diagnostic system. Alternatively, refer to the electrical circuit diagrams and check CAN network
B100E-64	Video Input "A" - signal plausibility failure	• Low voltage differential signal (LDVS) circuit fault • Module internal failure	• Refer to the electrical circuit diagrams and check the low voltage differential signal (LDVS) circuit between the instrument panel cluster and the touch screen display for fault
B1026-12	Steering Column Lock - Circuit short to battery	• Steering column lock circuit short to power	• Refer to the electrical circuit diagrams and check the Steering Column Lock Module ground circuit
B108E-13	Display - Circuit open	• Cluster display connector fails continuity check - Continuity circuit in display flex cable open circuit	• Renew the Instrument Cluster. Refer to the warranty policies and procedures before renewing the module
B10B7-86	Rear Air Discharge Temperature - Signal invalid	• Display illumination area temperature sensor signal is out of range	• Check the harness connector to the Instrument Cluster for security and integrity. Clear the DTC and retest the switch function. If the problem persists, renew the Instrument Cluster. Refer to the warranty policies and procedures before renewing the module
B115C-7A	Transfer Fuel Pump - Fluid leak or seal failure	• Transfer fuel pump fault - Fluid leak or seal failure	• Check for other fuel pump related DTCs. Renew the transfer fuel (jet) pump
B1264-13	Control Module Connector(s) Loose Or Disconnected - Circuit open	• Display not adequately connected to Instrument Cluster circuit board	• Suspect the Instrument Cluster, install a new Instrument Cluster as necessary. Refer to the Warranty Policy and Procedures manual if a module is suspect
B1264-49	Control Module Connector(s) Loose Or Disconnected - Internal electronic failure	• Airbag Telltale not adequately connected to Instrument Cluster circuit board	• Suspect the Instrument Cluster, install a new Instrument Cluster as necessary. Refer to the Warranty Policy and Procedures manual if a module is suspect
B1264-95	Control Module Connector(s) Loose Or Disconnected - Incorrect assembly	• Security Telltale not adequately connected to Instrument Cluster circuit board	• Suspect the Instrument Cluster, install a new Instrument Cluster as necessary. Refer to the Warranty Policy and Procedures manual if a module is suspect
B12FE-09	Fan - Component Failures	• Cooling fan is stalled/not running at full speed	• Check for foul condition at fan
B12FE-12	Fan - Circuit short to battery	• Cooling fan ground cannot be applied. Short to power	• Refer to the electrical circuit diagrams and check cooling fan ground circuit for short to power
B12FE-13	Fan - Circuit open	• Cooling fan ground cannot be applied. Open circuit	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported an instrument panel cluster display reduced brightness concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis

DTC	Description	Possible Causes	Action
			• Check for DTC P0607-4B (Control module performance system internal failure - over temperature). Refer to the electrical circuit diagrams and check the instrument panel cooling fan ground for broken wire, open circuit
B1A14-96	RCM Warning Lamp - Component internal failure	• SRS LED failure • Warning lamp circuit fault	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported an airbag warning lamp self check concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis • Check the harness connector to the Instrument Cluster for security and integrity. Clear the DTC and retest the switch function. If the problem persists, renew the Instrument Cluster. Refer to the warranty policies and procedures before renewing the module
B1A68-86	Ambient Temperature Sensor - Signal invalid	• Internal board temperature sensor signal is out of range/invalid	• Check the harness connector to the Instrument Cluster for security and integrity. Clear the DTC and retest the switch function. If the problem persists, renew the Instrument Cluster. Refer to the warranty policies and procedures before renewing the module
B1A85-96	Ambient Light Sensor - Component internal failure	• Internal light sensor failure	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported an instrument panel cluster brightness concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis • Check the harness connector to the Instrument Cluster for security and integrity. Clear the DTC and retest the switch function. If the problem persists, renew the Instrument Cluster. Refer to the warranty policies and procedures before renewing the module
P0607-4B	Control Module Performance - Over temperature	• Cluster over temperature	• Check the cluster cooling fan/circuit and rectify as necessary. Clear the DTC and retest
P060A-08	Internal Control Module Monitoring Processor Performance - Bus Signal/Message Failures	• Internal communication errors are causing lock-ups and resets	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported an instrument panel cluster concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis • Suspect the Instrument Cluster. Refer to the warranty policies and procedures before renewing the module
P0610-55	Control Module Vehicle Options Error - Not configured	• Control module incorrectly configured	• Configure the module using the manufacturers approved diagnostic system
U0001-88	High Speed CAN Communication Bus - Bus off	• CAN Bus off	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network
U0010-88	Medium Speed CAN Communication Bus - Bus off	• Bus off	• Carry out the CAN Network Integrity Test using the Manufacturer approved diagnostic system. Alternatively, refer to the electrical circuit diagrams and check CAN network to Instrument Cluster

DTC	Description	Possible Causes	Action
U0100-00	Lost Communication With ECM/PCM "A" - No sub type information	• No sub type information	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Engine Control Module and Instrument Cluster
U0101-00	Lost Communication with TCM - No sub type information	• No sub type information	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Transmission Control Module and Instrument Cluster
U0103-00	Lost Communication with Gear Shift Control Module A - No sub type information	• No sub type information	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Transmission Shift Control Module and Instrument Cluster
U0104-00	Lost Communication With Cruise Control Module - No sub type information	• No sub type information	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Speed Control Module and Instrument Cluster
U0121-00	Lost Communication With Anti-Lock Braking System (ABS) Control Module - No sub type information	• No sub type information	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Anti-lock Braking System Module and Instrument Cluster
U0128-00	Lost Communication With Park Brake Control Module - No sub type information	• No sub type information	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Parking Brake Module and Instrument Cluster
U0132-00	Lost Communication With Suspension Control Module "A" - no sub type information	• Power or ground circuit fault • CAN Bus circuit fault • Module internal failure	• Refer to the electrical circuit diagrams and check the power, ground and CAN Bus circuits to the continuously variable damping (CVD) module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test
U0136-00	Lost Communication With Differential Control Module - Rear - No sub type information	• No sub type information	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Rear Differential Control Module and Instrument Cluster

DTC	Description	Possible Causes	Action
U0139-00	Lost Communication With Suspension Control Module "B" - No sub type information	• No sub type information	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Adaptive Damping Control Module and Instrument Cluster
U0139-08	Lost Communication With Suspension Control Module "B" - Bus Signal/Message Failures	• Bus signal/message failures	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Adaptive Damping Control Module and Instrument Cluster
U0140-00	Lost Communication With Body Control Module - No sub type information	• No sub type information	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Central Junction Box and Instrument Cluster
U0141-00	Lost Communication With Body Control Module "A" - no sub type information	• Power or ground circuit fault • CAN Bus circuit fault • Module internal failure	• Refer to the electrical circuit diagrams and check the power, ground and CAN Bus circuit to the body control module for fault. Using the manufacturer approved diagnostic system, complete a CAN network integrity test
U0151-00	Lost Communication With Restraints Control Module - No sub type information	• No sub type information	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Restraints Control Module and Instrument Cluster
U0154-00	Lost Communication With Restraints Occupant Classification System Module - No sub type information	• No sub type information	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Restraints Control Module and Instrument Cluster
U0159-00	Lost Communication With Parking Assist Control Module "A" - No sub type information	• CAN Link Instrument Cluster /parking aid module missing message	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Parking Aid Module and Instrument Cluster
U0164-00	Lost Communication With HVAC Control Module - No sub type information	• CAN Link Instrument Cluster/HVAC module missing message	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Climate Control Module and Instrument Cluster

DTC	Description	Possible Causes	Action
U0199-00	Lost Communication With "Door Control Module A" - No sub type information	• No sub type information	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Door Control Module and Instrument Cluster
U0208-00	Lost Communication With "Seat Control Module A" - No sub type information	• No sub type information	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Seat Control Module and Instrument Cluster
U0214-00	Lost Communication With Remote Function Actuation - No sub type information	• No sub type information	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Remote Function Actuation Module and Instrument Cluster
U0232-00	Lost Communication With Side Obstacle Detection Control Module - Left - No sub type information	• No sub type information	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Side Object Detection module and Instrument Cluster
U0241-00	Lost Communication With Headlamp Control Module "A" - No sub type information	• No sub type information	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Headlamp Control Module and Instrument Cluster
U0242-00	Lost Communication With Headlamp Control Module "B" - No sub type information	• No sub type information	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Headlamp Control Module and Instrument Cluster
U0250-00	Lost Communication With Impact Classification System Module - No sub type information	• Power or ground circuit fault • CAN Bus circuit fault • Module internal failure	• Refer to the electrical circuit diagrams and check the power, ground and CAN Bus circuit to the restraints control module (RCM) for fault. Using the manufacturer approved diagnostic system, complete a CAN network integrity test
U0257-00	Lost Communication With Front Controls / Display Interface Module - No sub type information	• Power or ground circuit fault • CAN Bus circuit fault • Module internal failure	• Refer to the electrical circuit diagrams and check the power, ground and CAN Bus circuit to the front controls display interface module (FCDIM) for fault. Using the manufacturer approved diagnostic system, complete a CAN network integrity test
U025D-00	Lost Communication With Front Controls Interface Module "B" - no sub type information	• Power or ground circuit fault • CAN Bus circuit fault	• Refer to the electrical circuit diagrams and check the power, ground and CAN Bus circuit to the front controls interface module B (FCIMB)

DTC	Description	Possible Causes	Action
		• Module internal failure	for fault. Using the manufacturer approved diagnostic system, complete a CAN network integrity test
U0264-00	Lost Communication With Camera Module- Rear - no sub type information	• Power or ground circuit fault • CAN Bus circuit fault • Module internal failure	• Refer to the electrical circuit diagrams and check the power, ground and CAN Bus circuit to the rear view camera for fault. Using the manufacturer approved diagnostic system, complete a CAN network integrity test
U0300-00	Internal Control Module Software Incompatibility - No sub type information	• No sub type information	• Check for other modules reporting CAN Bus off or lost communication faults. If other modules report problems, check the software version in the Central Junction Box using the manufacturers approved diagnostic system. If no other modules report problems, check the software version in the Instrument Cluster. Update/configure as necessary
U0402-68	Invalid Data Received from TCM - Event information	• Event information	• Check for Transmission Control Module DTCs. Refer to relevant DTC index
U1A00-00	Private Communication Network - No sub type information	• No sub type information	• Refer to the electrical circuit diagrams and check the LIN Bus circuit
U2013-02	Switch Pack - General signal failure	• General signal failure	• Refer to the electrical circuit diagrams and check the LIN Bus circuit
U2013-08	Switch Pack - Bus Signal/Message Failures	• General signal failure	• Refer to the electrical circuit diagrams and check the LIN Bus circuit
U210A-86	Temperature Sensor - Signal invalid	Internal MOST Fibre Optic Transceiver temperature sensor signal is out of range	• Check the ventilation fan and ducting are not obstructed. Allow system to cool, put vehicle in the shade and operate the climate control on cool. Clear the DTC and recheck the system
U3000-46	Control Module - Calibration/parameter memory failure	• Odometer reading on cluster is missing or incorrect - calibration / parameter memory failure	• Check the harness connector to the Instrument Cluster for security and integrity. Clear the DTC and retest. If the problem persists, renew the Instrument Cluster. Refer to the warranty policies and procedures manual if a module is suspect
U3000-49	Control Module - Internal electronic failure	• Internal electronic failure	• Check the harness connector to the Instrument Cluster for security and integrity. Clear the DTC and retest. If the problem persists, renew the Instrument Cluster. Refer to the warranty policies and procedures manual if the module is suspect
U3000-55	Control Module - Not configured	• Speedometer is inaccurate • Tire size compensation is incorrectly configured	• Using the manufacturer approved diagnostic system select the vehicle configuration main menu, select configure existing modules menu and program the module
U3000-87	Control Module - Missing message	• Car configuration file missing message	• Configure the car config file using the approved diagnostic system
U3002-81	Vehicle Identification Number - Invalid serial data received	• Invalid vehicle identification number	• Configure the car config file using the approved diagnostic system
U3003-16	Control Module - Circuit voltage below threshold	• Circuit voltage below threshold (9V)	• Check vehicle battery and charging system. Refer to the relevant section in the workshop manual. Refer to the electrical circuit diagrams and check the power supply circuits to the module

DTC	Description	Possible Causes	Action
U3003-17	Control Module - Circuit voltage above threshold	• Circuit voltage above threshold (16V)	• Check vehicle battery and charging system. Refer to the relevant section in the workshop manual. Refer to the electrical circuit diagrams and check the power supply circuits to the module
U3003-62	Control Module - Signal compare failure	• Signal compare failure	• Check vehicle battery and charging system. Refer to the relevant section in the workshop manual. Refer to the electrical circuit diagrams and check the power supply circuits to the module

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Integrated Audio Module (ACM)

Description and Operation

Integrated Audio Module (ACM)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Integrated Audio Module , for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Information and Entertainment System (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
P150E-00	Electronic Control Module Cooling Fan Circuit - No sub type information	• Integrated audio module **internal** cooling fan fault	• Clear the DTC and retest. If DTC returns suspect integrated audio module internal fault
B119F-11	GPS Antenna - Circuit short to ground	NOTE: Circuit - GPS_SIG - GPS_SCN - • Global positioning system antenna not connected to integrated audio module • Global positioning system antenna circuit short to ground	• Confirm global positioning system antenna is connected to the integrated audio module • Refer to the electrical circuit diagrams and check the antenna circuit for short circuit to ground
B119F-13	GPS Antenna - Circuit open	NOTE: Circuit - GPS_SIG - GPS_SCN - • Global positioning system antenna not connected to integrated audio module	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported a navigation system concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis • Confirm global positioning system antenna is connected to the integrated audio module

DTC	Description	Possible Causes	Action
		• Global positioning system antenna circuit open circuit	• Refer to the electrical circuit diagrams and check the antenna circuit for open circuit
B11A3-49	Gyroscope - Internal electronic failures	• Integrated audio module internal fault with gyroscope	• Clear the DTC and retest. If DTC returns suspect integrated audio module internal fault
B121C-13	Hard Drive - Circuit open	• Internal fault with communication with hard drive	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported a navigation system concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis • Clear DTC and retest. If the DTC returns • Check navigation system for correct operation • Using the manufacturer approved diagnostic system check and install latest relevant level of software to the integrated audio module • Insert a CD and copy one track to the hard drive to confirm correct operation. Return vehicle to standard settings and delete the file • If DTC returns suspect integrated audio module internal fault
B121C-49	Hard Drive - Internal electronic failures	• Internal fault with integrated audio module hard drive	• Clear DTC and retest • Check navigation system for correct operation • Using the manufacturer approved diagnostic system check and install latest relevant level of software to the integrated audio module • Insert a CD and copy one track to the hard drive to confirm correct operation. Return vehicle to standard settings and delete the file • If DTC returns suspect integrated audio module internal fault
B1252-09	USB Port - Component failures	NOTE: Circuit - USB_POS - USB_GND - USB_DATA_NEG - USB_DATA_POS - • No Universal Serial Bus function	• Refer to the electrical circuit diagrams and check power supply and ground to integrated audio module • Check universal serial bus circuits, repair as required • Clear DTC and retest. If DTC returns suspect integrated audio module internal fault
B1252-19	USB Port - Circuit current above threshold	• Excessive current drawn by a universal serial bus device/cable • Universal serial bus device internal failure • Universal serial bus device cable internal failure	NOTE: If this DTC is logged, this suggests that the universal serial bus port has been overloaded, by a portable device or faulty cable • Confirm universal serial bus port operation, and using the manufacturer approved diagnostic system, check the integrated audio module for related DTCs and refer to the relevant DTC index • Disconnect all the universal serial bus connected devices. Close all the doors and lock the vehicle, wait for a few minutes (to shut down the media orientated system transport ring). Restart the vehicle and check if the universal serial bus operation has recovered • Using the manufacturer approved diagnostic system, clear the DTCs and retest. Advise the customer of the use of faulty devices/cables. Some devices will draw more current when charging such as iPads and can cause this DTC to log. This is not a permanent fault
B1296-4A	Navigation Map Data - Incorrect component installed	• Navigation map does not match the market of the vehicle	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported a navigation system concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis • Update map data as required • Using the manufacturer approved diagnostic system check and install latest relevant level of software to the integrated audio module • Using the manufacturer approved diagnostic system

DTC	Description	Possible Causes	Action
			check and up-date the car configuration file as required • Clear DTC and retest. If DTC returns suspect integrated audio module internal fault
B1A56-11	Antenna - Circuit short to ground	NOTE: Circuit - AM_FM_SIG - AM_FM_SCN - • AM/FM antenna circuit short to ground	• Refer to the electrical circuit diagrams and check AM/FM antenna circuits. If no faults found suspect the integrated audio module
B1A56-13	Antenna - Circuit open	NOTE: Circuit - AM_FM_SIG - AM_FM_SCN - • AM/FM antenna circuit open	• Refer to the electrical circuit diagrams and check AM/FM antenna circuits. If no faults found suspect the integrated audio module
B1D50-07	Digital Disk Player - Mechanical failures	• Mechanical fault	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported a navigation system concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis • Test the mechanism with two or three disks to confirm correct operation • Perform basic visual inspection for foreign matter inside disk player. Remove foreign matter if possible. If no objects are found suspect integrated audio module
B1D55-11	Antenna#2 - Circuit short to ground	NOTE: Circuit - FM2_SIG - FM2_SCN - • FM/TMC antenna circuit short to ground	• Refer to the electrical circuit diagrams and check FM/Traffic Message Channel antenna circuits. If no faults found suspect the integrated audio module
B1D55-13	Antenna#2 - Circuit open	NOTE: Circuit - FM2_SIG - FM2_SCN - • FM/Traffic Message Channel antenna circuit open circuit	• Refer to the electrical circuit diagrams and check FM/Traffic Message Channel antenna circuits. If no faults found suspect the integrated audio module
B1D57-11	Antenna#4 Circuit - Circuit short to ground	NOTE: Circuit - VICS_SIG - VICS_SCN - • Vehicle Information and Communication System beacon antenna short to ground	NOTE: Vehicle Information and Communication System (VICS) is a type of Traffic Message Channel system used in the Japan market only • Check Vehicle Information and Communication System beacon antenna is connected to the integrated audio module. Refer to the electrical circuit diagrams and check Vehicle Information and Communication System beacon antenna circuits. If no faults found suspect the integrated audio module
B1D57-13	Antenna#4 Circuit - Circuit open	NOTE: Circuit - VICS_SIG - VICS_SCN - • Vehicle Information and Communication System beacon antenna circuit open circuit	NOTE: Vehicle Information and Communication System (VICS) is a type of Traffic Message Channel system used in the Japan market only • Check Vehicle Information and Communication System beacon antenna is connected to the integrated audio module. Refer to the electrical circuit diagrams and check Vehicle Information and Communication System beacon antenna circuits. If no faults found suspect the integrated audio module
B1D78-11	Auxiliary Input - Circuit short to ground	NOTE: Circuit - AUX_1_RIGHT_POS - AUX_1_LEFT_POS - AUX_1_NEG • Auxiliary #1 input circuit short to ground	• Refer to the electrical circuit diagrams and check auxiliary input #1 circuits. If no faults found suspect the integrated audio module

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Integrated Control Panel (FCIMB)

Description and Operation

Integrated Control Panel (FCIMB)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Integrated Control Panel, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Information and Entertainment System (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B10B8-23	Push Buttons - Signal stuck low	• Front Controls Interface Module button held in (pressed by external object in contact with button) • Button contaminated / sticking • Front Controls Interface Module internal fault	• Check that no objects are pressing on the Front Controls Interface Module buttons • Check for contamination of panel/buttons such as spilt drinks/food etc. Clean the control button and retest the system • If the button sticking cannot be resolved by external cleaning suspect an internal fault • Refer to the Warranty Policy and Procedures manual if a module or component is suspect
U0010-88	Medium Speed Can Communication Bus - Bus off	• Wiring harness fault - power distribution • Wiring harness fault - medium speed CAN network	• Refer to the electrical circuit diagrams and check the power and ground connections to the module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network
U0140-08	Lost Communication with Body Control Module - Bus signal/message failures	• Wiring harness fault - power distribution • Wiring harness fault - medium speed CAN network	• Refer to the electrical circuit diagrams and check the power and ground connections to the module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check

DTC	Description	Possible Causes	Action
			the CAN network between the Central Junction Box and Front Controls Interface Module
U0164-08	Lost Communication with HVAC Control Module - Bus signal/message failures	• Wiring harness fault - power distribution • Wiring harness fault - medium speed CAN network	NOTE: Reduced HVAC performance indicated on vehicle display • Refer to the electrical circuit diagrams and check the power and ground connections to the module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the HVAC Control Module and Front Controls Interface Module
U0165-08	Lost Communication with HVAC Control Module - Rear - Bus signal/message failures	• Wiring harness fault - power distribution • Wiring harness fault - medium speed CAN network	• Refer to the electrical circuit diagrams and check the power and ground connections to the module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the HVAC Control Module - Rear and Front Controls Interface Module
U0300-00	Internal control Module Software Incompatible - No sub type information	• Software incompatible	• Check part numbers for all software components. Install correct software as required
U2101-00	Control Module Configuration incompatible - No sub type information	• Configuration incompatible	NOTE: Reduced HVAC performance indicated on vehicle display • Check and install valid software, clear DTC and confirm the system is operating correctly
U3003-62	Battery Voltage - Signal compare failure	• Power distribution fault to control module • CAN network fault	NOTE: This DTC is set when the control module registers a difference of more than 2 volts between the CAN reference battery voltage and the module supply voltage • Check other modules for supply voltage related DTCs, refer to the relevant index • Refer to the electrical circuit diagrams and check the power and ground connections to the module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Luggage Compartment Powered Lid Module (RGTM)

Description and Operation

Luggage Compartment Powered Lid Module (RGTM)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Luggage Compartment Powered Lid Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Locks, Latches and Entry Systems (501-14 Handles, Locks, Latches and Entry Systems, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
C2006-11	Left Actuator - Circuit short to ground	• Wiring harness fault • Powered trunk lid spindle actuator internal fault • Rear Gate/Trunk Control Module	• Refer to the electrical circuit diagrams and check both the powered trunk lid spindle actuator motor circuits (spindle motor power and spindle motor ground) for short to ground. Check the hall sensor positive supply line for short to ground. Repair wiring as required. Clear DTC and retest system. If no harness faults are found suspect (1) the powered trunk lid spindle actuator, (2) the Rear Gate/Trunk Control Module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C2006-12	Left Actuator - Circuit short to battery	• Wiring harness fault • Powered trunk lid spindle actuator internal fault • Rear Gate/Trunk Control Module	• Refer to the electrical circuit diagrams and check both the powered trunk lid spindle actuator motor circuits (spindle motor power and spindle motor ground) for short to power. Repair wiring as required. Clear DTC and retest system. If no harness faults are found suspect (1) the powered trunk lid spindle actuator, (2) the Rear Gate/Trunk Control Module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C2006-13	Left Actuator - Circuit open	• Wiring harness fault • Powered trunk lid spindle actuator	• Refer to the electrical circuit diagrams and check both the powered trunk lid spindle actuator motor circuits (spindle motor power and spindle motor ground) for open circuit.

DTC	Description	Possible Causes	Action
		internal fault • Rear Gate/Trunk Control Module	Repair wiring as required. Clear DTC and retest system. If no harness faults are found suspect (1) the powered trunk lid spindle actuator, (2) the Rear Gate/Trunk Control Module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C2006-15	Left Actuator - Circuit short to battery or open	• Wiring harness fault • Powered trunk lid spindle actuator internal fault • Rear Gate/Trunk Control Module	• Refer to the electrical circuit diagrams and check the hall sensor positive supply line for short to power or open circuit. Repair wiring as required. Clear DTC and retest system. If no harness faults are found suspect (1) the powered trunk lid spindle actuator, (2) the Rear Gate/Trunk Control Module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C2006-19	Left Actuator - Circuit current above threshold	• Trunk lid movement blocked • Wiring harness fault • Powered trunk lid spindle actuator internal fault • Rear Gate/Trunk Control Module	• This DTC is set if the current on the powered trunk lid spindle actuator motor circuits exceeds a predetermined value. Check that the trunk lid movement is not inhibited by an obstruction above or inside the luggage compartment. Check mechanical linkages/hinges are in good condition. Refer to the electrical circuit diagrams and check both the powered trunk lid spindle actuator motor circuits (spindle motor power and spindle motor ground) for short circuit. Repair wiring as required. Clear DTC and retest system. If no harness faults are found suspect (1) the powered spindle actuator, (2) the trunk lid Rear Gate/Trunk Control Module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C2006-31	Left Actuator - No signal	• Wiring harness fault • Powered trunk lid spindle actuator internal fault • Rear Gate/Trunk Control Module	• This DTC is set if at least one of the hall sensors is not producing a signal when the trunk lid is activated. Refer to the electrical circuit diagrams and check both the hall sensor signal circuits and the hall sensor power and ground supplies for open circuit, short circuit. Repair wiring as required. Clear DTC and retest system. If no harness faults are found suspect (1) the powered trunk lid spindle actuator, (2) the Rear Gate/Trunk Control Module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B10D0-23	Trunk Latch Clutch Switch - Signal stuck low	• Wiring harness fault • Trunk lid latch switch fault • Rear Gate/Trunk Control Module	• Check the trunk lid latch for mechanical blockages. Refer to the electrical circuit diagrams and check both the power and ground supplies to the Trunk lid Latch Switch for open circuit, short circuit. Check the secondary signal line for open circuit, short to ground. Repair wiring as required. Clear DTC and retest system. If no harness faults are found suspect (1) the trunk lid latch switch, (2) the Rear Gate/Trunk Control Module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B11C4-23	Boot/Trunk Close Button - Signal stuck low	• Trunk lid close switch held down • Wiring harness fault • Trunk lid close switch fault • Rear Gate/Trunk Control Module	• Check the trunk lid close switch is not jammed. Refer to the electrical circuit diagrams and check the signal line from the Trunk lid Close Switch to the Rear Gate/Trunk Control Module for short to ground. Repair wiring as required. Clear DTC and retest system. If no harness faults are found suspect (1) the trunk lid close switch, (2) the Rear Gate/Trunk Control Module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B1316-02	Boot/Trunk Latch Power Close Unit - General signal failure	• Wiring harness fault • Power close unit fault • Rear Gate/Trunk Control Module	• Check the trunk lid final close movement is not blocked. Check the child entrapment lever is not stuck in the pulled position. Refer to the electrical circuit diagrams and check the striker home signal line from the power close unit to the Rear Gate/Trunk Control Module for open circuit or short to power. Repair wiring as required. Clear DTC and retest system. If no harness faults are found suspect (1) the power close unit, (2) the Rear Gate/Trunk Control Module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B1316-93	Boot/Trunk Latch Power Close Unit - No operation	• Wiring harness fault • Power close unit fault • Rear Gate/Trunk	• Refer to the electrical circuit diagrams and check the motor power and motor ground supply circuits to the power close unit for open circuit, short to power. check the striker home signal line from the power close unit to the Rear Gate/Trunk

DTC	Description	Possible Causes	Action
		Control Module	Control Module for open circuit or short to power. Check the power close unit ground for open circuit, short to power. Repair wiring as required. Clear DTC and retest system. If no harness faults are found suspect (1) the power close unit, (2) the Rear Gate/Trunk Control Module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
U0010-88	Medium Speed CAN Communication Bus - Bus off	• MS CAN bus off	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a MS CAN network integrity test. Refer to the electrical circuit diagrams and check the MS CAN network
U0140-00	Lost Communication With Central Junction Box - No sub type information	• Lost communication with Central Junction Box	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a MS CAN network integrity test. Refer to the electrical circuit diagrams and check the MS CAN network between the Rear Gate/Trunk Control Module and Central Junction Box
U0300-00	Internal Control Module Software Incompatibility - No sub type information	• Software stored in Rear Gate/Trunk Control Module is not compatible with master configuration	• Check the Rear Gate/Trunk Control Module is configured correctly. Reconfigure using the manufacturers approved diagnostic equipment. Clear the DTC and retest the system
U0401-68	Invalid Data Received From ECM/PCM A - Event information	• Rear Gate/Trunk Control Module has received invalid data for the Engine Control Module	• Check the Engine Control Module for related DTCs and refer to the relevant DTC index
U0415-68	Invalid Data Received From Anti-Lock Braking System (ABS) Control Module - Event information	• Rear Gate/Trunk Control Module has received invalid data for the Anti-Lock Braking System (ABS) Control Module	• Check the Anti-Lock Braking System (ABS) Control Module for related DTCs and refer to the relevant DTC index
U201A-51	Control Module Main Calibration Data - Not programmed	• Rear Gate/Trunk Control Module has main calibration data missing	• Program the Rear Gate/Trunk Control Module using the manufacturer approved diagnostic equipment. Clear the DTC and retest the system
U201A-52	Control Module Main Calibration Data - Not activated	• Rear Gate/Trunk Control Module has incompatible main calibration data	• Program the Rear Gate/Trunk Control Module with the correct calibration file using the manufacturer approved diagnostic equipment. Clear the DTC and retest the system
U2100-00	Initial Configuration Not Complete - No sub type information	• Central Car Configuration file not received by Rear Gate/Trunk Control Module	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a MS CAN network integrity test. Refer to the electrical circuit diagrams and check the MS CAN network between the Rear Gate/Trunk Control Module and Central Junction Box. Program the Rear Gate/Trunk Control Module using the manufacturer approved diagnostic system
U2101-00	Control Module Configuration Incompatible - No sub type information	• Compatible Central Car Configuration file not received by Rear Gate/Trunk Control Module	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a MS CAN network integrity test. Refer to the electrical circuit diagrams and check the MS CAN network between the Rear Gate/Trunk Control Module and Central Junction Box. Check/amend the car configuration file Using the manufacturer approved diagnostic system

DTC	Description	Possible Causes	Action
U3000-44	Control Module - Data memory failure	• Internal Rear Gate/Trunk Control Module RAM memory failure	• Install a new Rear Gate/Trunk Control Module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
U3000-45	Control Module - Program memory failure	• Internal Rear Gate/Trunk Control Module ROM memory failure	• Install a new Rear Gate/Trunk Control Module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
U3000-46	Control Module - Calibration / parameter memory failure	• Internal Rear Gate/Trunk Control Module Non Volatile memory failure	• Install a new Rear Gate/Trunk Control Module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
U3000-49	Control Module - Internal electronic failure	• Internal Rear Gate/Trunk Control Module electronic failure detected	• Install a new Rear Gate/Trunk Control Module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
U3000-4B	Control Module - Over temperature	• The Rear Gate/Trunk Control Module has received an ambient temperature value which exceeded 80 degrees Celsius	• The ambient air temperature value received by the Rear Gate/Trunk Control Module from the Engine Control Module has exceeded 80 degrees Celsius. This signal is transmitted on CAN. If the Value exceeds 80 degrees Celsius the Rear Gate/Trunk Control Module's strategy is to protect the Powered trunk lid spindle actuator by inhibiting operation. Check the Engine Control Module for ambient temperature related DTCs and refer to the relevant DTC index. Check if the vehicle has been exposed to very high ambient temperatures e.g. a paint curing oven. Clear the DTC and retest the system
U3003-62	Battery Voltage - Signal compare failure	• Power distribution fault	• This DTC is set if there is a difference of more than 2 volts between the Rear Gate/Trunk Control Module supply line and the reference battery voltage broadcast on MS CAN. Refer to the electrical circuit diagrams and check the power and ground connections to the Rear Gate/Trunk Control Module and the Central Junction Box. Repair any wiring faults, clear the DTC and retest the system

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Occupant Classification System (OCS)

Description and Operation

Occupant Classification System (OCS)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Occupant Classification System module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Air Bag Supplemental Restraint System (SRS) (501-20B Supplemental Restraint System, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1193-53	Crash Event Storage Full and Locked - Deactivated	• The vehicle has been involved in a collision	• Confirm if vehicle has been involved in a collision, if so take appropriate repair actions • Clear DTC and retest system
B1A54-01	Occupant Belt Tension Sensor - General electrical failure	• Safety belt tension sensor jammed for more than 3 seconds	• Check safety belt for twists in the webbing or damaged webbing. Ensure no objects are jamming operation of the belt. Remove any external causes of jamming, clear DTC and retest system. If DTC remains suspect belt tension sensor fault • Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B1A54-02	Occupant Belt Tension Sensor - General signal failure	• Wiring harness fault • Control Module Fault	• Refer to the electrical circuit diagrams and check the belt tension sensor signal circuit for short circuit to the pressure sensor signal circuit. Repair wiring as required, clear DTC and retest system. If DTC remains suspect control module internal fault • Refer to the Warranty Policy and Procedures manual if a module/component is suspect

DTC	Description	Possible Causes	Action
B1A54-11	Occupant Belt Tension Sensor - Circuit short to ground	• Wiring harness fault • Occupant belt tension sensor internal fault • Control Module internal fault	• Refer to the electrical circuit diagrams and check the belt tension sensor signal circuit for short to ground. Repair wiring as required, clear DTC and retest system. If DTC remains suspect occupant belt tension sensor internal fault, check sensor for internal short from signal pin to ground pin • If no fault found with tension sensor suspect control module • Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B1A54-12	Occupant Belt Tension Sensor - Circuit short to battery	• Wiring harness fault • Occupant belt tension sensor internal fault • Control Module internal fault	• Refer to the electrical circuit diagrams and check the belt tension sensor signal circuit for short to power. Repair wiring as required, clear DTC and retest system. If DTC remains suspect occupant belt tension sensor internal fault, check sensor for internal short from signal pin to reference voltage pin • If no fault found with tension sensor suspect control module • Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B1A54-13	Occupant Belt Tension Sensor - Circuit open	• Wiring harness fault • Occupant belt tension sensor internal fault • Control Module internal fault	• Refer to the electrical circuit diagrams and check the belt tension sensor signal circuit for open circuit. Repair wiring as required, clear DTC and retest system. If DTC remains suspect occupant belt tension sensor internal fault • If no fault found with tension sensor suspect control module • Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B1A62-02	Pressure Sensor - General signal failure	• Wiring harness fault • Control Module Fault	• Refer to the electrical circuit diagrams and check the belt tension sensor signal circuit for short circuit to the pressure sensor signal circuit. Repair wiring as required, clear DTC and retest system. If DTC remains suspect control module internal fault • Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B1A62-11	Pressure Sensor - Circuit short to ground	• Wiring harness fault • Pressure sensor internal fault • Control Module internal fault	• Refer to the electrical circuit diagrams and check the pressure sensor signal circuit for short to ground. Repair wiring as required, clear DTC and retest system. If DTC remains suspect pressure sensor internal fault, check sensor for internal short from signal pin to ground pin • If no fault found with pressure sensor suspect control module • Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B1A62-12	Pressure Sensor - Circuit short to battery	• Wiring harness fault • Pressure sensor internal fault • Control Module internal fault	• Refer to the electrical circuit diagrams and check the pressure sensor signal circuit for short to power. Repair wiring as required, clear DTC and retest system. If DTC remains suspect pressure sensor internal fault • If no fault found with pressure sensor suspect control module • Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B1A62-7A	Pressure Sensor - Fluid leak or seal failure	• Internal sensor fault	• Install a new pressure sensor control module
B1A62-7B	Pressure Sensor - Low fluid level	• Internal sensor fault	• Install a new sensor bladder
U0001-00	High Speed CAN Communication Bus - No sub type information	• Wiring harness fault • Control module fault	• Check other control modules for related DTCs and refer to the relevant DTC index • Check other control modules for related DTCs and refer to the relevant DTC index. Refer to the electrical circuit diagrams and check for short circuit between CAN high and CAN low circuits. Repair wiring fault and perform

DTC	Description	Possible Causes	Action
			network integrity test using the manufacturer approved diagnostic system. If no wiring faults are found in the wiring harness suspect an internal fault within a control module • Refer to the Warranty Policy and Procedures manual if a module/component is suspect
U0151-00	Lost Communication With Restraints Control Module - No sub type information	• Wiring harness fault • Power distribution fault	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Restraints Control Module and Occupancy Classification System Control Module
U0300-00	Internal Control Module Software Incompatible - No sub type information	• Car configuration file stored in Occupancy Classification System Control Module does not match the master car configuration file • Master car configuration file not being transmitted by master control module	• Check all control modules for related DTCs and refer to the relevant DTC index • Check the components installed on the vehicle were installed by the factory or a dealer • Install the original components or a new one as required
U3000-04	Control Module - System internal failures	• Occupancy Classification System control module internal fault	• Install a new control module • Refer to the Warranty Policy and Procedures manual if a module/component is suspect
U3000-51	Control Module - Not programmed	• Occupancy Classification System control module application missing	• Program the control module using the manufacturer approved diagnostic system
U3000-54	Control Module - Missing calibration	• Calibration missing	• Using the manufacturers approved diagnostic system perform the empty seat offset routine. Clear the DTC and retest the system
U3003-16	Battery Voltage - Circuit voltage below threshold	• Battery fault • Charging system fault • Power distribution fault	• The Occupancy Classification System Control Module has detected a supply voltage below 8 volts • Check the Engine Control Module for charging circuit related DTCs. Refer to the Battery Care Manual and the Workshop Manual and check the vehicle battery and charging circuit performance • If the vehicle battery and charging system are performing correctly check power and ground supplies to the control module. Rectify wiring fault and clear the DTC. Retest the system
U3003-17	Battery Voltage - Circuit voltage above threshold	• Battery fault • Charging system fault	• The Occupancy Classification System Control Module has detected a supply voltage above 18 volts • Check the Engine Control Module for charging circuit related DTCs. Refer to the Battery Care Manual and the Workshop Manual and check the vehicle battery and charging circuit performance • Rectify battery and any wiring faults and clear the DTC. Retest the system

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Parking Aid Module (PAM)

Description and Operation

Parking Aid Control Module (PACM)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system)

When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the digital multimeter leads into account

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests

Inspect connectors for signs of water ingress, and pins for damage and/or corrosion

If diagnostic trouble codes are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals

Where an 'on demand self-test' is referred to, this can be accessed via the 'diagnostic trouble code monitor' tab on the manufacturers approved diagnostic system

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

Physical damage to the sensor (impact damage or scratched sensor surface) must NOT be changed under warranty.

The table below lists all diagnostic trouble codes (DTCs) that could be logged in the Parking Aid Control Module (PACM). For additional diagnosis and testing information refer to the relevant diagnosis and testing section.
For additional information, refer to: Parking Aid (413-13 Parking Aid, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1B36-01	Front Right Outer Sensor - General Electrical Failure	• Wiring harness fault • Front Right Outer Sensor - Component internal failure	• Refer to electrical wiring diagrams and check the front bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor

DTC	Description	Possible Causes	Action
B1B36-12	Front Right Outer Sensor - Circuit short to battery	• Wiring harness fault	• Refer to electrical wiring diagrams and check the front bumper harness for damage. Check sensor circuit for short circuit to power. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test
B1B36-96	Front Right Outer Sensor - Component internal failure	• Wiring harness fault • Front Right Outer Sensor - Component internal failure	• Refer to electrical wiring diagrams and check the front bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B38-01	Front Right Inner Sensor - General Electrical Failure	• Wiring harness fault • Front Right Inner Sensor - Component internal failure	• Refer to electrical wiring diagrams and check the front bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B38-12	Front Right Inner Sensor - Circuit short to battery	• Wiring harness fault	• Refer to electrical wiring diagrams and check the front bumper harness for damage. Check sensor circuit for short circuit to power. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test
B1B38-96	Front Right Inner Sensor - Component internal failure	• Wiring harness fault • Front Right Inner Sensor - Component internal failure	• Refer to electrical wiring diagrams and check the front bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor

DTC	Description	Possible Causes	Action
B1B40-01	Front Left Outer Sensor - General Electrical Failure	• Wiring harness fault • Front Left Outer Sensor - Component internal failure	• Refer to electrical wiring diagrams and check the front bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B40-12	Front Left Outer Sensor - Circuit short to battery	• Wiring harness fault	• Refer to electrical wiring diagrams and check the front bumper harness for damage. Check sensor circuit for short circuit to power. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test
B1B40-96	Front Left Outer Sensor - Component internal failure	• Wiring harness fault • Front Left Outer Sensor - Component internal failure	• Refer to electrical wiring diagrams and check the front bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B42-01	Front Left Inner Sensor - General electrical failure	• Wiring harness fault • Front Left Inner Sensor - Component internal failure	• Refer to electrical wiring diagrams and check the front bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B42-12	Front Left Inner Sensor - Circuit short to battery	• Wiring harness fault	• Refer to electrical wiring diagrams and check the front bumper harness for damage. Check sensor circuit for short circuit to power. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test

DTC	Description	Possible Causes	Action
B1B42-96	Front Left Inner Sensor - Component internal failure	• Wiring harness fault • Front Left Inner Sensor - Component internal failure	• Refer to electrical wiring diagrams and check the front bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B44-01	Rear Right Outer Sensor - General electrical failure	• Wiring harness fault • Rear Right Outer Sensor - Component internal failure	• Refer to electrical wiring diagrams and check the rear bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B44-12	Rear Right Outer Sensor - Circuit short to battery	• Wiring harness fault	• Refer to electrical wiring diagrams and check the rear bumper harness for damage. Check sensor circuit for short circuit to power. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test
B1B44-96	Rear Right Outer Sensor - Component internal failure	• Wiring harness fault • Rear Right Outer Sensor - Component internal failure	• Refer to electrical wiring diagrams and check the rear bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B46-01	Rear Right Inner Sensor - General electrical failure	• Wiring harness fault • Rear Right Inner Sensor - Component internal failure	• Refer to electrical wiring diagrams and check the rear bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for

DTC	Description	Possible Causes	Action
			signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B46-12	Rear Right Inner Sensor - Circuit short to battery	• Wiring harness fault	• Refer to electrical wiring diagrams and check the rear bumper harness for damage. Check sensor circuit for short circuit to power. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test
B1B46-96	Rear Right Inner Sensor - Component internal failure	• Wiring harness fault • Rear Right Inner Sensor - Component internal failure	• Refer to electrical wiring diagrams and check the rear bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B48-01	Rear Left Outer Sensor - General electrical failure	• Wiring harness fault • Rear Left Outer Sensor - Component internal failure	• Refer to electrical wiring diagrams and check the rear bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B48-12	Rear Left Outer Sensor - Circuit short to battery	• Wiring harness fault	• Refer to electrical wiring diagrams and check the rear bumper harness for damage. Check sensor circuit for short circuit to power. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test
B1B48-96	Rear Left Outer Sensor - Component internal failure	• Wiring harness fault • Rear Left Outer Sensor - Component internal failure	• Refer to electrical wiring diagrams and check the rear bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the

DTC	Description	Possible Causes	Action
			bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B50-01	Rear Left Inner Sensor - General electrical failure	• Wiring harness fault • Rear Left Inner Sensor - Component internal failure	• Refer to electrical wiring diagrams and check the rear bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B50-12	Rear Left Inner Sensor - Circuit short to battery	• Wiring harness fault	• Refer to electrical wiring diagrams and check the rear bumper harness for damage. Check sensor circuit for short circuit to power. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test
B1B50-96	Rear Left Inner Sensor - Component internal failure	• Wiring harness fault • Rear Left Inner Sensor - Component internal failure	• Refer to electrical wiring diagrams and check the rear bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B54-11	Function LED - Park Aid - Circuit short to ground	• Wiring harness fault • Switch/LED - Component internal failure	• Refer to electrical wiring diagrams and check the parking aid LED circuit for short circuit to ground. Repair or replace any wiring harness as required • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test. If the problem persists, suspect the switch/LED
B1B54-12	Function LED - Park Aid - Circuit short to battery	• Wiring harness fault • Switch/LED - Component internal failure • Control Module - Component internal failure	• Refer to electrical wiring diagrams and check the parking aid LED circuit for short circuit to power. Repair or replace any wiring harness as required • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test. If the problem persists, suspect the switch/LED
B1B57-11	Front Sensors Power Circuit- Circuit short to ground	• Wiring harness fault • Control Module - Component internal failure	• Check front and rear bumper harness for signs of damage and security of connections • Refer to electrical wiring diagrams and check the parking assist front sensor power circuit and rear sensor power circuit for short circuit to ground. Repair or replace any wiring harness as required • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test. If the problem persists, suspect the control module

DTC	Description	Possible Causes	Action
			• Cycle the ignition off, then on, to power up parking aid system and check corrective action
B1B58-11	Rear Sensors Power Circuit - Circuit short to ground	• Wiring harness fault • Control Module - Component internal failure	• Check rear and front (if front parking aid system fitted) bumper harness for signs of damage and security of connections • Refer to electrical wiring diagrams and check the parking assist rear sensor power circuit and front sensor power circuit (if front parking aid system fitted) for short circuit to ground. Repair or replace any wiring harness as required • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test. If the problem persists, suspect the control module • Cycle the ignition off, then on, to power up parking aid system and check corrective action
B1C30-73	Disable Switch - Actuator stuck closed	• Wiring harness fault • Control Switch - Component internal failure	• Refer to electrical wiring diagrams and check the parking assist switch and switch circuit. Repair or replace any wiring harness as required • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test. If the problem persists, suspect the control switch • Check the switch function
U0010-00	Medium Speed CAN Communication Bus - No sub type information	• Medium speed CAN failure - bus off	• Refer to the electrical circuit diagrams and check the Parking aid control module high speed CAN bus for short circuit to ground, short circuit to power, open circuit, high resistance, or short circuit between the paired CAN wires • Using the manufacturer approved diagnostic system, complete a CAN network integrity test • Cycle the ignition off, then on, and check if the DTC is still logged
U0140-00	Lost Communication With Body Control Module - No sub type information	• Loss of CAN communication with central junction box	• Refer to the electrical circuit diagrams and check the power and ground connections to the central junction box. Clear DTC and retest • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the central junction box and the parking aid control module
U0155-00	Lost Communication With Instrument Panel Cluster (IPC) Control Module - No sub type information	• Loss of CAN communication with instrument cluster	• Refer to the electrical circuit diagrams and check the power and ground connections to the instrument cluster. Clear DTC and retest • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the central junction box and the parking aid control module
U0300-00	Internal Control Module Software Incompatibility - No sub type information	• Car configuration file stored in Parking aid control module does not match the master car configuration file • Master car configuration file not being transmitted by master control module	• Using the manufacturer approved diagnostic system, check all other control modules, for related DTCs and refer to the relevant DTC index • Check the components installed on the vehicle were installed by the factory or a dealer • Install the original component or a new one as required.
U0422-00	Invalid Data Received From Body Control Module - No sub type information	• Invalid data received	• Using the manufacturer approved diagnostic system, check central junction box, for related DTCs and refer to the relevant DTC index • Using the manufacturer approved diagnostic system, complete a CAN network integrity test • Cycle the ignition off, then on, and check if the DTC is still logged • Clear the DTC and re-test

DTC	Description	Possible Causes	Action
U0423-00	Invalid Data Received From Instrument Panel Control Module - No sub type information	• Invalid data received	• Using the manufacturer approved diagnostic system, check instrument cluster, for related DTCs and refer to the relevant DTC index • Using the manufacturer approved diagnostic system, complete a CAN network integrity test • Cycle the ignition off, then on, and check if the DTC is still logged • Clear the DTC and re-test
U2100-00	Initial Configuration Not Complete - No sub type information	• Car configuration file not the same as expected by the parking aid control module	NOTE: After updating the car configuration file, set the ignition to on and wait 30 seconds before clearing the DTCs • Using the manufacturer approved diagnostic system, check and update the car configuration file as required. Clear the DTC and retest
U2101-00	Control Module Configuration Incompatible - No sub type information	• Parking aid control module configuration error	• Using the manufacturer approved diagnostic system check and up-date the car configuration file as required. Clear the DTC and re-test
U3000-49	Control Module - Internal electronic failure	• Parking aid control module internal failure	• Using the manufacturers approved diagnostic system clear the DTC, cycle the ignition off, then on, and check if the DTC is still logged • If the DTC is still logged suspect the parking aid control module
U3002-81	Vehicle Identification Number - Invalid serial data received	• VIN Mismatch, stored VIN does not match broadcast VIN	• Using the manufacturers approved diagnostic system clear the DTC, cycle the ignition off, then on, and check if the DTC is still logged • If the DTC is still logged replace the parking aid control module
U3003-62	Battery Voltage - Signal compare failure	• Signal compare failure in battery voltage, of 2 volts or more, between parking aid system control module and central junction box	• Using the manufacturer approved diagnostic system, check central junction box, for related DTCs and refer to the relevant DTC index • Check the vehicle charging system performance to ensure the voltage regulation is correct • Refer to relevant section of workshop manual and battery care manual. Check battery state of charge and starting/charging system performance • Refer to the electrical circuit diagrams and check parking aid control module power and ground circuits for short circuit to ground, short circuit to power, open circuit • Clear the DTC and retest

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Rear Climate Control Module (RHVAC)

Description and Operation

Rear Climate Control Module (RHVAC)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Rear Climate Control Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Climate Control System (412-00 Climate Control System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B10B8-23	Push Buttons - Signal stuck low	• Front Controls Interface Module button stuck	• Check if the Integrated Control Panel button is sticking. Check/clean button. Clear DTC then wait for 2 minutes with ignition on before retesting system. If DTC resets suspect Integrated Control Panel. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B1A64-15	Left Solar Sensor - Circuit short to battery or open	• Wiring harness fault • Sun load sensor fault • Rear HVAC control module fault	• Refer to the electrical circuit diagrams and check the left hand sunload sensor circuit for short to power or open circuit. If DTC B1A63-15 is also logged check the ground supply to the solar sensor. Repair wiring harness as required. Clear DTC and retest the system. If no wiring fault found suspect (1) sunload sensor, (2) Rear HVAC control module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
B1A64-11	Left Solar Sensor - Circuit short to ground	• Wiring harness fault • Sun load sensor fault • Rear HVAC control module fault	• Refer to the electrical circuit diagrams and check the left hand sunload sensor circuit for short to ground. Repair wiring harness as required. Clear DTC and retest the system. If no wiring fault found suspect (1) sunload sensor, (2) Rear HVAC control module. Refer to the Warranty Policy and Procedures manual if a module/component is suspect

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Rear Entertainment Module (REM)

Description and Operation

Rear Entertainment Module (REM)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Rear Entertainment Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Information and Entertainment System (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B125E-4A	Left Rear Display - Incorrect component installed	NOTE: This diagnostic trouble code is set when the module has not read the display screen serial number within 25 seconds • Rear display screen serial number not received • Rear display screen serial number invalid	• Refer to the electrical circuit diagrams and check power and ground circuits to the left rear display screen. Check private CAN circuits for open circuit, short circuit. Check the installed screen is correct for the vehicle and has not been substituted. If a new component has been installed check it was installed correctly
B125E-96	Left Rear Display - Component internal failure	• Left rear display screen reported internal failure	• Refer to the electrical circuit diagrams and check power and ground circuits to the left rear display screen. Check private CAN circuits for open circuit, short circuit. If no wiring faults are found suspect the screen. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component

DTC	Description	Possible Causes	Action
B125E-98	Left Rear Display - Component or system over temperature	NOTE: This diagnostic trouble code is set when the module has not read the display screen serial number within 25 seconds • Left rear display screen reported over temperature condition	• Check the ventilation of the screen is not obstructed. Move the vehicle into the shade and operated the climate control on a cool setting to reduce the temperature. Allow the screen to cool before performing further diagnostic steps. Refer to the electrical circuit diagrams and check power and ground circuits to the left rear display screen. Check private CAN circuits for open circuit, short circuit. If no wiring faults are found suspect the screen. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
B125F-4A	Right Rear Display - Incorrect component installed	• Rear display screen serial number not received • Rear display screen serial number invalid	• Refer to the electrical circuit diagrams and check power and ground circuits to the right rear display screen. Check private CAN circuits for open circuit, short circuit. Check the installed screen is correct for the vehicle and has not been substituted. If a new component has been installed check it was installed correctly
B125F-96	Right Rear Display - Component internal failure	• Right rear display screen reported internal failure	• Refer to the electrical circuit diagrams and check power and ground circuits to the right rear display screen. Check private CAN circuits for open circuit, short circuit. If no wiring faults are found suspect the screen. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
B125F-98	Right Rear Display - Component or system over temperature	• Right rear display screen reported over temperature condition	• Check the ventilation of the screen is not obstructed. Move the vehicle into the shade and operated the climate control on a cool setting to reduce the temperature. Allow the screen to cool before performing further diagnostic steps. Refer to the electrical circuit diagrams and check power and ground circuits to the right rear display screen. Check private CAN circuits for open circuit, short circuit. If no wiring faults are found suspect the screen. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
B12ED-88	Video Input "F" - Bus off	• Left rear display screen circuit short to ground, short to power, open circuit, high resistance • Incompatible / corrupted video source	• Refer to the electrical circuit diagrams and check left rear display screen circuit for short to ground, short to power, open circuit, high resistance. Check video source. Clear the diagnostic trouble code and retest
B12F8-88	Video Input "G" - Bus off	• Right rear display screen circuit short to ground, short to power, open circuit, high resistance • Incompatible / corrupted video source	• Refer to the electrical circuit diagrams and check right rear display screen circuit for short to ground, short to power, open circuit, high resistance. Check video source. Clear the diagnostic trouble code and retest
U200E-19	Control Module Output Power B - Circuit current above threshold	• The Remote control is consuming excess current	• Refer to the electrical circuit diagrams and check the power harness from the rear entertainment module to the remote docking station circuit for short to ground, short to power, open circuit, high resistance. Repair wiring as required and retest the system
U2014-56	Control Module Hardware - Invalid/incomplete configuration	• Incorrect hardware for installed software	• Check and verify the hardware installed on the vehicle is correct. Install/configure the correct hardware as required
U2016-56	Control Module Main Software - Invalid/incomplete configuration	• The installed software is not intended for the installed hardware	• Install the correct software using the manufacturer approved diagnostic system

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Remote Keyless Entry Module (RFA)

Description and Operation

Remote Keyless Entry Module (RFA)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Remote Keyless Entry Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Locks, Latches and Entry Systems (501-14 Handles, Locks, Latches and Entry Systems, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B102B-00	Passive Key - No sub type information	• Passive key response error • Incorrect key • Key incorrectly programmed	• Re-Program the key using the manufacturers approved diagnostic system
B10A9-00	Remote Keyless Entry Less Than 2 Keys Programmed - No sub type information	• Secret key has been programmed to the vehicle but less than 2 key fobs have been programmed	• Re-Program the key fobs using the manufacturers approved diagnostic system
B10C1-00	Left Front Unlock Pull Switch - Signal stuck open	• No power supply to door handle • Switch circuit open, or short circuit to power	• Refer to the electrical circuit diagrams and check the power supply to the door handle. Check the switch circuit is not open circuit or short to power. Repair wiring as required
B10C1-24	Left Front Unlock Pull Switch - Signal stuck ON	• Switch circuit short circuit to ground • Switch fault	• Refer to the electrical circuit diagrams and check the switch circuit is not short to ground. Repair wiring as required. If no wiring harness faults suspect switch, refer

DTC	Description	Possible Causes	Action
			to the warranty policy and procedures manual if a module/component is suspect
B10C2-00	Left Rear Unlock Pull Switch - Signal stuck open	• No power supply to door handle • Switch circuit open, or short circuit to power	• Refer to the electrical circuit diagrams and check the power supply to the door handle. Check the switch circuit is not open circuit or short to power. Repair wiring as required
B10C2-24	Left Rear Unlock Pull Switch - Signal stuck ON	• Switch circuit short circuit to ground • Switch fault	• Refer to the electrical circuit diagrams and check the switch circuit is not short to ground. Repair wiring as required. If no wiring harness faults suspect switch, refer to the warranty policy and procedures manual if a module/component is suspect
B10C3-00	Right Front Unlock Pull Switch - Signal stuck open	• No power supply to door handle • Switch circuit open, or short circuit to power	• Refer to the electrical circuit diagrams and check the power supply to the door handle. Check the switch circuit is not open circuit or short to power. Repair wiring as required
B10C3-24	Right Front Unlock Pull Switch - Signal stuck ON	• Switch circuit short circuit to ground • Switch fault	• Refer to the electrical circuit diagrams and check the switch circuit is not short to ground. Repair wiring as required. If no wiring harness faults suspect switch, refer to the warranty policy and procedures manual if a module/component is suspect
B10C4-00	Right Rear Unlock Pull Switch - Signal stuck open	• No power supply to door handle • Switch circuit open, or short circuit to power	• Refer to the electrical circuit diagrams and check the power supply to the door handle. Check the switch circuit is not open circuit or short to power. Repair wiring as required
B10C4-24	Right Rear Unlock Pull Switch - Signal stuck ON	• Switch circuit short circuit to ground • Switch fault	• Refer to the electrical circuit diagrams and check the switch circuit is not short to ground. Repair wiring as required. If no wiring harness faults suspect switch, refer to the warranty policy and procedures manual if a module/component is suspect
B10C5-24	Trunk Unlock Pull Switch - Signal stuck ON	• Switch circuit short circuit to ground • Switch fault	• Refer to the electrical circuit diagrams and check the switch circuit is not short to ground. Repair wiring as required. If no wiring harness faults suspect switch, refer to the warranty policy and procedures manual if a module/component is suspect
B10C6-00	Exterior Trunk Antenna - No sub type information	• Passive Trunk open does not function, antenna failure	• Refer to the electrical circuit diagrams and check loadspace RHS antenna circuit for short to ground, short to power. Clear the diagnostic trouble code and retest. If the problem persists, check and install new loadspace RHS antenna as required. Refer to the warranty policy and procedures manual if a module/component is suspect
B10C6-11	Exterior Trunk Antenna - Circuit short to ground	• One or both antenna wires shorted to ground or shorted to each other	• Refer to the electrical circuit diagrams and check loadspace RHS antenna circuit for short to ground, short to each other. Clear the diagnostic trouble code and retest
B10C6-12	Exterior Trunk Antenna - Circuit short to battery	• One or both antenna wires shorted to battery	• Refer to the electrical circuit diagrams and check loadspace RHS antenna circuit for short to power. Clear the diagnostic trouble code and retest
B10C6-13	Exterior Trunk Antenna - Circuit open	• One or both antenna wires open	• Refer to the electrical circuit diagrams and check loadspace RHS antenna circuit for open circuit. Clear the diagnostic trouble code and retest

DTC	Description	Possible Causes	Action
B10C6-1C	Exterior Trunk Antenna - Circuit voltage out of range	• Fault with voltage supply to all antenna drivers	• Check and install new keyless vehicle module as required. Refer to the warranty policy and procedures manual if a module/component is suspect
B10C7-00	Interior Trunk Antenna - No sub type information	• Antenna failure	• Refer to the electrical circuit diagrams and check headliner LHS antenna circuit for short to ground, short to power. Clear the diagnostic trouble code and retest. If the problem persists, check and install new headliner LHS antenna as required. Refer to the warranty policy and procedures manual if a module/component is suspect
B10C7-11	Interior Trunk Antenna - Circuit short to ground	• One or both antenna wires shorted to ground or shorted to each other	• Refer to the electrical circuit diagrams and check headliner LHS antenna circuit for short to ground, short to each other. Clear the diagnostic trouble code and retest
B10C7-12	Interior Trunk Antenna - Circuit short to battery	• One or both antenna wires shorted to battery	• Refer to the electrical circuit diagrams and check headliner LHS antenna circuit for short to power. Clear the diagnostic trouble code and retest
B10C7-13	Interior Trunk Antenna - Circuit open	• One or both antenna wires open	• Refer to the electrical circuit diagrams and check headliner LHS antenna circuit for open circuit. Clear the diagnostic trouble code and retest
B10C7-1C	Interior Trunk Antenna - Circuit voltage out of range	• Fault with voltage supply to all antenna drivers	• Check and install new keyless vehicle module as required. Refer to the warranty policy and procedures manual if a module/component is suspect
B10C8-00	Interior Center Antenna - No sub type information	• Antenna failure	• Refer to the electrical circuit diagrams and check headliner RHS antenna circuit for short to ground, short to power. Clear the diagnostic trouble code and retest. If the problem persists, check and install new headliner RHS antenna as required. Refer to the warranty policy and procedures manual if a module/component is suspect
B10C8-11	Interior Center Antenna - Circuit short to ground	• One or both antenna wires shorted to ground or shorted to each other	• Refer to the electrical circuit diagrams and check headliner RHS antenna circuit for short to ground, short to each other. Clear the diagnostic trouble code and retest
B10C8-12	Interior Center Antenna - Circuit short to battery	• One or both antenna wires shorted to battery	• Refer to the electrical circuit diagrams and check headliner RHS antenna circuit for short to power. Clear the diagnostic trouble code and retest
B10C8-13	Interior Center Antenna - Circuit open	• One or both antenna wires open	• Refer to the electrical circuit diagrams and check headliner RHS antenna circuit for open circuit. Clear the diagnostic trouble code and retest
B10C8-1C	Interior Center Antenna - Circuit voltage out of range	• Fault with voltage supply to all antenna drivers	• Check and install new keyless vehicle module as required. Refer to the warranty policy and procedures manual if a module/component is suspect
B10C9-00	Interior Front Antenna - No sub type information	• Antenna failure	• Refer to the electrical circuit diagrams and check interior front cabin antenna circuit for short to ground, short to power. Clear the diagnostic trouble code and retest. If the problem persists, check and install new interior front cabin antenna as required. Refer to the warranty policy and procedures manual if a module/component is suspect
B10C9-11	Interior Front Antenna - Circuit short to ground	• One or both antenna wires shorted to ground or shorted to each other	• Refer to the electrical circuit diagrams and check interior front cabin antenna circuit for short to ground, short to each other. Clear the diagnostic trouble code and retest

DTC	Description	Possible Causes	Action
B10C9-12	Interior Front Antenna - Circuit short to battery	• One or both antenna wires shorted to battery	• Refer to the electrical circuit diagrams and check interior front cabin antenna circuit for short to power. Clear the diagnostic trouble code and retest
B10C9-13	Interior Front Antenna - Circuit open	• One or both antenna wires open	• Refer to the electrical circuit diagrams and check interior front cabin antenna circuit for open circuit. Clear the diagnostic trouble code and retest
B10C9-1C	Interior Front Antenna - Circuit voltage out of range	• Fault with voltage supply to all antenna drivers	• Check and install new keyless vehicle module as required. Refer to the warranty policy and procedures manual if a module/component is suspect
B10CA-00	Left rear door handle Antenna - No sub type information	• Antenna failure	• Refer to the electrical circuit diagrams and check left rear door handle antenna circuit for short to ground, short to power. Clear the diagnostic trouble code and retest. If the problem persists, check and install new left rear door handle antenna as required. Refer to the warranty policy and procedures manual if a module/component is suspect
B10CA-11	Left rear door handle Antenna - Circuit short to ground	• One or both antenna wires shorted to ground or shorted to each other	• Refer to the electrical circuit diagrams and check left rear door handle antenna circuit for short to ground, short to each other. Clear the diagnostic trouble code and retest
B10CA-12	Left rear door handle Antenna - Circuit short to battery	• One or both antenna wires shorted to battery	• Refer to the electrical circuit diagrams and check left rear door handle antenna circuit for short to power. Clear the diagnostic trouble code and retest
B10CA-13	Left rear door handle Antenna - Circuit open	• One or both antenna wires open	• Refer to the electrical circuit diagrams and check left rear door handle antenna circuit for open circuit. Clear the diagnostic trouble code and retest
B10CA-1C	Left rear door handle Antenna - Circuit voltage out of range	• Fault with voltage supply to all antenna drivers	• Check and install new keyless vehicle module as required. Refer to the warranty policy and procedures manual if a module/component is suspect
B10CB-00	Right rear door handle Antenna - No sub type information	• Antenna failure	• Refer to the electrical circuit diagrams and check right rear door handle antenna circuit for short to ground, short to power. Clear the diagnostic trouble code and retest. If the problem persists, check and install new left rear door handle antenna as required. Refer to the warranty policy and procedures manual if a module/component is suspect
B10CB-11	Right rear door handle Antenna - Circuit short to ground	• One or both antenna wires shorted to ground or shorted to each other	• Refer to the electrical circuit diagrams and check right rear door handle antenna circuit for short to ground, short to each other. Clear the diagnostic trouble code and retest
B10CB-12	Right rear door handle Antenna - Circuit short to battery	• One or both antenna wires shorted to battery	• Refer to the electrical circuit diagrams and check right rear door handle antenna circuit for short to power. Clear the diagnostic trouble code and retest
B10CB-13	Right rear door handle Antenna - Circuit open	• One or both antenna wires open	• Refer to the electrical circuit diagrams and check right rear door handle antenna circuit for open circuit. Clear the diagnostic trouble code and retest
B10CB-1C	Right rear door handle Antenna - Circuit voltage out of range	• Fault with voltage supply to all antenna drivers	• Check and install new keyless vehicle module as required. Refer to the warranty policy and procedures manual if a module/component is suspect
B10CC-24	Left Front Latch Clutch Switch - Signal stuck ON	• Short to ground on switch circuit • Switch fault	• Refer to the electrical circuit diagrams and check the circuit for short to ground, if no wiring harness fault suspect switch. Refer to the warranty policy and procedures manual if a module/component is suspect

DTC	Description	Possible Causes	Action
B10CD-24	Left Rear Latch Clutch Switch - Signal stuck ON	• Short to ground on switch circuit • Switch fault	• Refer to the electrical circuit diagrams and check the circuit for short to ground, if no wiring harness fault suspect switch. Refer to the warranty policy and procedures manual if a module/component is suspect
B10CE-24	Right Front Latch Clutch Switch - Signal stuck ON	• Short to ground on switch circuit • Switch fault	• Refer to the electrical circuit diagrams and check the circuit for short to ground, if no wiring harness fault suspect switch. Refer to the warranty policy and procedures manual if a module/component is suspect
B10CF-24	Right Rear Latch Clutch Switch - Signal stuck ON	• Short to ground on switch circuit • Switch fault	• Refer to the electrical circuit diagrams and check the circuit for short to ground, if no wiring harness fault suspect switch. Refer to the warranty policy and procedures manual if a module/component is suspect
B10D1-24	Left Front Lock Button - Signal stuck ON	• Short to ground on switch circuit • Switch fault	• Refer to the electrical circuit diagrams and check the circuit for short to ground, if no wiring harness fault suspect switch. Refer to the warranty policy and procedures manual if a module/component is suspect
B10D2-24	Left Rear Lock Button - Signal stuck ON	• Short to ground on switch circuit • Switch fault	• Refer to the electrical circuit diagrams and check the circuit for short to ground, if no wiring harness fault suspect switch. Refer to the warranty policy and procedures manual if a module/component is suspect
B10D3-24	Right Front Lock Button - Signal stuck ON	• Short to ground on switch circuit • Switch fault	• Refer to the electrical circuit diagrams and check the circuit for short to ground, if no wiring harness fault suspect switch. Refer to the warranty policy and procedures manual if a module/component is suspect
B10D4-24	Right Rear Lock Button - Signal stuck ON	• Short to ground on switch circuit • Switch fault	• Refer to the electrical circuit diagrams and check the circuit for short to ground, if no wiring harness fault suspect switch. Refer to the warranty policy and procedures manual if a module/component is suspect
B12D5-00	Door Handle Proximity Sensor - No sub type information	• Short to ground at door handle switch supply circuit	• Refer to the electrical circuit diagrams and check the circuit for short to ground. Repair wiring as required, if no wiring harness fault suspect keyless vehicle module. Refer to the warranty policy and procedures manual if a module/component is suspect
B12D5-16	Door Handle Proximity Sensor - Circuit voltage below threshold	• Module supply voltage low • Keyless vehicle module - Internal failure • Door handle switch power supply circuit - Short circuit to ground, open circuit, high resistance	• Refer to the electrical circuit diagrams and check the power and ground circuits to the module. Repair circuit as required. Clear DTC and retest • Refer to relevant section of workshop manual and battery care manual. Check battery state of charge and starting/charging system performance • Refer to the electrical circuit diagrams and check the door handle switch power supply circuit for short to ground, open circuit, high resistance. Repair circuit as required. Clear DTC and retest • If fault persists, check and install a new keyless vehicle module as required
B12D6-00	Fast Door Unlock/Open Actuator - No sub type information	• E latch circuit failure	• Refer to electrical circuit diagrams and check E latch relay output circuits for short to power or ground, if no wiring harness fault suspect keyless vehicle module. Refer to the warranty policy and procedures manual if a module/component is suspect
B12EA-96	Radio Frequency (RF) Receiver - Component internal failure	• RF receiver has an internal HW failure	• Renew the receiver
B1334-24	Tailgate Glass Release Switch - Signal stuck ON	NOTE: This circuit/switch is available as an option	NOTE: This circuit/switch is available as an option • Refer to the electrical circuit diagrams and check the tailgate glass release switch circuit for short circuit to

DTC	Description	Possible Causes	Action
		• Tailgate glass release switch circuit - Short circuit to ground • Switch fault	ground. Repair circuit as required. Clear DTC and retest • If fault persists, check and install a new tailgate glass release switch as required
B1335-00	Front Triangulation / Loadspace Antenna - No sub type information	• Antenna failure	• Refer to the electrical circuit diagrams and check center console front antenna circuit for short to ground, short to power. Clear the diagnostic trouble code and retest. If the problem persists, check and install new center console front antenna as required. Refer to the warranty policy and procedures manual if a module/component is suspect
B1335-11	Front Triangulation / Loadspace Antenna - Circuit short to ground	• One or both antenna wires shorted to ground or shorted to each other	• Refer to the electrical circuit diagrams and check center console front antenna circuit for short to ground, short to each other. Clear the diagnostic trouble code and retest
B1335-12	Front Triangulation / Loadspace Antenna - Circuit short to battery	• One or both antenna wires shorted to battery	• Refer to the electrical circuit diagrams and check center console front antenna circuit for short to power. Clear the diagnostic trouble code and retest
B1335-13	Front Triangulation / Loadspace Antenna - Circuit open	• One or both antenna wires open	• Refer to the electrical circuit diagrams and check center console front antenna circuit for open circuit. Clear the diagnostic trouble code and retest
B1335-1C	Front Triangulation / Loadspace Antenna - Circuit voltage out of range	• Fault with voltage supply to all antenna drivers	• Check and install new keyless vehicle module as required. Refer to the warranty policy and procedures manual if a module/component is suspect
B1336-00	Left Front Door External Antenna - No sub type information	• Antenna failure	• Refer to the electrical circuit diagrams and check left front door handle antenna circuit for short to ground, short to power. Clear the diagnostic trouble code and retest. If the problem persists, check and install new left front door handle antenna as required. Refer to the warranty policy and procedures manual if a module/component is suspect
B1336-11	Left Front Door External Antenna - Circuit short to ground	• One or both antenna wires shorted to ground or shorted to each other	• Refer to the electrical circuit diagrams and check left front door handle antenna circuit for short to ground, short to each other. Clear the diagnostic trouble code and retest
B1336-12	Left Front Door External Antenna - Circuit short to battery	• One or both antenna wires shorted to battery	• Refer to the electrical circuit diagrams and check left front door handle antenna circuit for short to power. Clear the diagnostic trouble code and retest
B1336-13	Left Front Door External Antenna - Circuit open	• One or both antenna wires open	• Refer to the electrical circuit diagrams and check left front door handle antenna circuit for open circuit. Clear the diagnostic trouble code and retest
B1336-1C	Left Front Door External Antenna - Circuit voltage out of range	• Fault with voltage supply to all antenna drivers	• Check and install new keyless vehicle module as required. Refer to the warranty policy and procedures manual if a module/component is suspect
B1337-00	Right Front Door External Antenna - No sub type information	• Antenna failure	• Refer to the electrical circuit diagrams and check right front door handle antenna circuit for short to ground, short to power. Clear the diagnostic trouble code and retest. If the problem persists, check and install new right front door handle antenna as required. Refer to the warranty policy and procedures manual if a module/component is suspect

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DTC	Description	Possible Causes	Action
B1337-11	Right Front Door External Antenna - Circuit short to ground	• One or both antenna wires shorted to ground or shorted to each other	• Refer to the electrical circuit diagrams and check right front door handle antenna circuit for short to ground, short to each other. Clear the diagnostic trouble code and retest
B1337-12	Right Front Door External Antenna - Circuit short to battery	• One or both antenna wires shorted to battery	• Refer to the electrical circuit diagrams and check right front door handle antenna circuit for short to power. Clear the diagnostic trouble code and retest
B1337-13	Right Front Door External Antenna - Circuit open	• One or both antenna wires open	• Refer to the electrical circuit diagrams and check right front door handle antenna circuit for open circuit. Clear the diagnostic trouble code and retest
B1337-1C	Right Front Door External Antenna - Circuit voltage out of range	• Fault with voltage supply to all antenna drivers	• Check and install new keyless vehicle module as required. Refer to the warranty policy and procedures manual if a module/component is suspect
B133D-00	Loadspace/Interior Boot Antenna - No sub type information	• Antenna failure	• Refer to the electrical circuit diagrams and check loadspace LHS antenna circuit for short to ground, short to power. Clear the diagnostic trouble code and retest. If the problem persists, check and install new right front door handle antenna as required. Refer to the warranty policy and procedures manual if a module/component is suspect
B133D-11	Loadspace/Interior Boot Antenna - Circuit short to ground	• One or both antenna wires shorted to ground or shorted to each other	• Refer to the electrical circuit diagrams and check loadspace LHS antenna circuit for short to ground, short to each other. Clear the diagnostic trouble code and retest
B133D-12	Loadspace/Interior Boot Antenna - Circuit short to battery	• One or both antenna wires shorted to battery	• Refer to the electrical circuit diagrams and check loadspace LHS antenna circuit for short to power. Clear the diagnostic trouble code and retest
B133D-13	Loadspace/Interior Boot Antenna - Circuit open	• One or both antenna wires open	• Refer to the electrical circuit diagrams and check loadspace LHS antenna circuit for open circuit. Clear the diagnostic trouble code and retest
B133D-1C	Loadspace/Interior Boot Antenna - Circuit voltage out of range	• Fault with voltage supply to all antenna drivers	• Check and install new keyless vehicle module as required. Refer to the warranty policy and procedures manual if a module/component is suspect
C1017-24	Boot/Trunk Primary Switch - Signal stuck ON	NOTE: This circuit/switch is available as an option • Luggage compartment lid lock switch circuit - Short circuit to ground • Switch fault	NOTE: This circuit/switch is available as an option • Refer to the electrical circuit diagrams and check the luggage compartment lid lock switch circuit for short circuit to ground. Repair circuit as required. Clear DTC and retest • If fault persists, check and install a new luggage compartment lid door handle as required
U0010-00	Medium Speed CAN Communication Bus - No sub type information	• CAN communication failure	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network. Clear the diagnostic trouble code and retest. If the problem persists, check and install new keyless vehicle module as required. Refer to the warranty policy and procedures manual if a module/component is suspect
U0140-00	Lost Communication With Body Control Module - No sub type information	• CAN connection open or fault in body control module	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the central

DTC	Description	Possible Causes	Action
			junction box and keyless vehicle module. Clear the diagnostic trouble code and retest. If the problem persists, check and install new body control module as required. Refer to the warranty policy and procedures manual if a module/component is suspect
U0300-00	Internal Control Module Software Incompatibility - No sub type information	• Signal configuration file not loaded	• Using the manufacturer approved diagnostic system check and up-date the car configuration file as required. Clear the diagnostic trouble code and re-test
U201F-00	External Receiver - No sub type information	• Communication to the RF receiver module has been lost, short either to ground, or battery	• Check K-Line wiring. Refer to the electrical circuit diagrams and check the module K-Line, power and ground circuits. Clear the diagnostic trouble code and retest. If the problem persists, check and install new keyless vehicle module or RF receive module as required. Refer to the warranty policy and procedures manual if a module/component is suspect
U201F-31	External Receiver - No signal	• Communication to the RF receiver module has been lost	• Refer to the electrical circuit diagrams and check remote keyless entry module circuit for short to power, open circuit, high resistance • Check and install a new RF receiver module or keyless vehicle module as required
U201F-95	External Receiver - Incorrect assembly	• The RF receiver frequency does not match the car config file parameter	• Verify car config value for RF frequency is correct. If not, re-configure body control module with proper car configuration file. If correct, replace RF receiver with proper frequency unit.
U2100-00	Initial Configuration Not Complete - No sub type information	• Calibration file has not been received or is incomplete	• Reload the correct calibration file for the vehicle type into the module using the manufacturer approved diagnostic system
U2101-00	Control Module Configuration Incompatible - No sub type information	• Car configuration parameter is outside expected value	• Verify car config value sent by body control module is correct for the vehicle. If not, re-configure body control module with proper car configuration file. If correct, reload the correct calibration file for the vehicle type into the module using the manufacturer approved diagnostic system
U3000-49	Control Module - Internal electronic failure	• Internal electronic failure	• Refer to the electrical circuit diagrams and check the power and ground circuits to the module. Refer to the warranty policy and procedures manual if a module is suspect
U3002-81	Vehicle Identification Number - Invalid serial data received	• Invalid vehicle identification number	• Configure the car configuration file using the manufacturer approved diagnostic system

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Restraints Control Module (RCM)

Description and Operation

Restraints Control Module (RCM)

WARNINGS:

TO AVOID ACCIDENTAL DEPLOYMENT AND POSSIBLE PERSONAL INJURY, THE BACKUP POWER SUPPLY MUST BE DEPLETED BEFORE REPAIRING OR REPLACING ANY AIR BAG SUPPLEMENTAL RESTRAINT SYSTEM (SRS) COMPONENTS. TO DEPLETE THE BACKUP POWER SUPPLY ENERGY, DISCONNECT THE BATTERY GROUND CABLE AND WAIT ONE MINUTE. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN PERSONAL INJURY.

Do not use a multimeter to probe the restraints control module. It is possible for the power from the meter battery to trigger the activation of the airbags. Failure to follow this instruction may result in personal injury.

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.

If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

It is advisable not to use a cellular phone or to have a cellular phone in close proximity when working on the restraints control module or associated systems.

Given the legal implications of a restraints system failure, harness repairs to Air Bag module circuits are not acceptable. Where the text refers to "REPAIR the circuit", this will normally mean the replacement of a harness.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Restraints Control Module (RCM). For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual. For additional information, refer to: Air Bag Supplemental Restraint System (SRS) (501-20B Supplemental Restraint System, Diagnosis and Testing) /
Pedestrian Protection System (501-20C Pedestrian Protection System, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B0001-11	Driver Frontal Stage 1 Deployment Control - Circuit short to ground	• Driver airbag (stage 1) circuit short circuit to ground	• Refer to the electrical circuit diagrams and check the driver airbag (stage 1) circuit for short circuit to ground. Check for intermittent short circuit within the clockspring by rotating the steering column during the checks. Install a new wiring harness as necessary. Install a new clockspring as necessary. If no wiring harness fault exists, using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new driver airbag
B0001-12	Driver Frontal Stage 1 Deployment Control - Circuit short to battery	• Driver airbag (stage 1) circuit short to power	• Refer to the electrical circuit diagrams and check the driver airbag (stage 1) circuit for short circuit to power. Check for intermittent short circuit within the clockspring by rotating the steering column during the checks. Install a new wiring harness as necessary. Install a new clockspring as necessary. If no wiring harness fault exists, using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new driver airbag
B0001-13	Driver Frontal Stage 1 Deployment Control - Circuit open	• Driver airbag (stage 1) circuit open circuit, high resistance	• Refer to the electrical circuit diagrams and check the driver airbag (stage 1) circuit for open circuit, high resistance. Check for intermittent short circuit within the clockspring by rotating the steering column during the checks. Install a new wiring harness as necessary. Install a new clockspring as necessary. If no wiring harness fault exists, using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new driver airbag
B0001-1A	Driver Frontal Stage 1 Deployment Control - Circuit resistance below threshold	• Driver airbag (stage 1) circuit short circuit between power and ground	• Refer to the electrical circuit diagrams and check the driver airbag (stage 1) circuit for short circuit between power and ground. Check for intermittent short circuit within the clockspring by rotating the steering column during the checks. Install a new wiring harness as necessary. Install a new clockspring as necessary. If no wiring harness fault exists, using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new driver airbag
B0001-2B	Driver Frontal Stage 1 Deployment Control - Signal cross coupled	• Driver airbag (stage 1) circuit short circuit to another restraints circuit	• Refer to the electrical circuit diagrams and check the driver airbag (stage 1) circuit for short circuit to another restraints circuit. Check for intermittent short circuit within the clockspring by rotating the steering column during the checks. Install a new wiring harness as necessary. Install a new clockspring as necessary. If no wiring harness fault exists, using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new driver airbag
B0001-95	Driver Frontal Stage 1 Deployment Control - Incorrect assembly	• Restraints control module is not configured correctly	• Using the manufacturer approved diagnostic system, re-configure the restraints control module with the latest level software
B0002-11	Driver Frontal Stage 2 Deployment Control - Circuit short to ground	• Driver airbag (stage 2) circuit short circuit to ground	• Refer to the electrical circuit diagrams and check the driver airbag (stage 2) circuit for short circuit to ground. Check for intermittent short circuit within the clockspring by rotating the steering column during the checks. Install a new wiring harness as necessary. Install a new clockspring as necessary. If no wiring harness fault exists, using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new driver airbag

DTC	Description	Possible Causes	Action
B0002-12	Driver Frontal Stage 2 Deployment Control - Circuit short to battery	• Driver airbag (stage 2) circuit short to power	• Refer to the electrical circuit diagrams and check the driver airbag (stage 2) circuit for short circuit to power. Check for intermittent short circuit within the clockspring by rotating the steering column during the checks. Install a new wiring harness as necessary. Install a new clockspring as necessary. If no wiring harness fault exists, using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new driver airbag
B0002-13	Driver Frontal Stage 2 Deployment Control - Circuit open	• Driver airbag (stage 2) circuit open circuit, high resistance	• Refer to the electrical circuit diagrams and check the driver airbag (stage 2) circuit for open circuit, high resistance. Check for intermittent short circuit within the clockspring by rotating the steering column during the checks. Install a new wiring harness as necessary. Install a new clockspring as necessary. If no wiring harness fault exists, using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new driver airbag
B0002-1A	Driver Frontal Stage 2 Deployment Control - Circuit resistance below threshold	• Driver airbag (stage 2) circuit short circuit between power and ground	• Refer to the electrical circuit diagrams and check the driver airbag (stage 2) circuit for short circuit between power and ground. Check for intermittent short circuit within the clockspring by rotating the steering column during the checks. Install a new wiring harness as necessary. Install a new clockspring as necessary. If no wiring harness fault exists, using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new driver airbag
B0002-2B	Driver Frontal Stage 2 Deployment Control - Signal cross coupled	• Driver airbag (stage 2) circuit short circuit to another restraints circuit	• Refer to the electrical circuit diagrams and check the driver airbag (stage 2) circuit for short circuit to another restraints circuit. Check for intermittent short circuit within the clockspring by rotating the steering column during the checks. Install a new wiring harness as necessary. Install a new clockspring as necessary. If no wiring harness fault exists, using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new driver airbag
B0002-95	Driver Frontal Stage 2 Deployment Control - Incorrect assembly	• Restraints control module is not configured correctly	• Using the manufacturer approved diagnostic system, re-configure the restraints control module with the latest level software
B0010-11	Passenger Frontal Stage 1 Deployment Control - Circuit short to ground	• Passenger airbag (stage 1) circuit short to ground	• Refer to the electrical circuit diagrams and check the passenger airbag (stage 1) circuit for short circuit to ground. Install a new wiring harness as necessary. If no wiring harness fault exists, using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new passenger airbag
B0010-12	Passenger Frontal Stage 1 Deployment Control - Circuit short to battery	• Passenger airbag (stage 1) circuit short to power	• Refer to the electrical circuit diagrams and check the passenger airbag (stage 1) circuit for short circuit to power. Install a new wiring harness as necessary. If no wiring harness fault exists, using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new passenger airbag
B0010-13	Passenger Frontal Stage 1 Deployment Control - Circuit open	• Passenger airbag (stage 1) circuit open circuit, high resistance	• Refer to the electrical circuit diagrams and check the passenger airbag (stage 1) circuit for open circuit, high resistance. Install a new wiring harness as necessary. If no wiring harness fault exists, using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new passenger airbag

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Satellite Digital Audio Radio System Module (SARM)

Description and Operation

Satellite Digital Audio Radio System Module (SARM)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Satellite Digital Audio Radio System Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Information and Entertainment System (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1A89-11	Satellite Antenna - Circuit short to ground	• Circuit short to power. The Satellite Radio Module has detected a vehicle power measurement for a period longer than expected, or has detected a vehicle power measurement when another value was expected • Satellite Digital Audio Radio antenna cable short to ground • Internal failure Satellite Radio Module • Internal failure Satellite Digital Audio Radio antenna	• Refer to the electrical circuit diagrams and check Satellite Digital Audio Radio antenna cable for short to ground. Install Satellite Digital Audio Radio antenna harness as required. Suspect the Satellite Radio Module, check and install a new Satellite Radio Module as required. Suspect the Satellite Digital Audio Radio antenna, check and install a new Satellite Digital Audio Radio antenna as required. Refer to the warranty policy and procedures manual if a Module is suspect
B1A89-12	Satellite Antenna - Circuit short to battery	• Circuit short to power. The Satellite Radio Module has detected a vehicle power measurement for a period longer than expected, or has detected a vehicle power measurement when another	• Refer to the electrical circuit diagrams and check Satellite Digital Audio Radio antenna cable for short to power. Install Satellite Digital Audio Radio antenna harness as required. Suspect the Satellite Radio Module, check and install a new Satellite Radio Module as required. Suspect the Satellite Digital Audio Radio antenna, check and install a new Satellite Digital Audio

DTC	Description	Possible Causes	Action
		value was expected • Satellite Digital Audio Radio antenna cable short to power • Internal failure Satellite Radio Module • Internal failure Satellite Digital Audio Radio antenna	Radio antenna as required. Refer to the warranty policy and procedures manual if a module is suspect
B1A89-13	Satellite Antenna - Circuit open	• Circuit open. The Satellite Radio Module has determined an open circuit via lack of bias voltage, low current flow, no change in the state of an input in response to an output • Satellite Digital Audio Radio antenna cable open circuit • Internal failure Satellite Radio Module • Internal failure Satellite Digital Audio Radio antenna	• Refer to the electrical circuit diagrams and check Satellite Digital Audio Radio antenna cable for open circuit. Install Satellite Digital Audio Radio antenna harness as required. Suspect the Satellite Radio Module, check and install a new Satellite Radio Module as required. Suspect the Satellite Digital Audio Radio antenna, check and install a new Satellite Digital Audio Radio antenna as required. Refer to the warranty policy and procedures manual if a module is suspect
U3000-04	Control Module - System internal failures	• Satellite Radio Module internal failure	• Suspect the Satellite Radio Module, check and install a new Satellite Radio Module as required, Refer to the warranty policy and procedures manual if a module is suspect
U3000-4A	Control Module - Incorrect component installed	• Satellite Radio Module. Incorrect component installed • Car configuration mismatch	• Using the manufacturer approved diagnostic system select the vehicle configuration Main Menu, vehicle configuration, display and or modify the vehicle configuration file data. Check update as required
U3000-55	Control Module - Not configured	• Satellite Radio Module, not configured • Incorrect car configuration file data received	• Using the manufacturer approved diagnostic system select the vehicle configuration main menu, select configure existing Modules menu and program the Satellite Radio Module
U3000-87	Control Module - Missing message	• The Satellite Radio Module has not received the configuration file • Master module not transmitting configuration file	• Using the manufacturer approved diagnostic system check that the Satellite Radio Module is configured correctly. Check that the configuration file is being transmitted by the master module
U3000-98	Control Module - Component or system over temperature	• Satellite Radio Module cooling vents obstructed • Circuit fault • Internal electronic failure	• Check for possible causes of the Satellite Radio Module overheating. Check that the ventilation is not obstructed . Check for short circuit related DTCs. Check for internal electronic failure related DTCs. Refer to the electrical circuit diagrams and check ground circuit for high resistance. Check antenna circuit for short to power or ground. Repair wiring harness as required. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
U3003-62	Battery Voltage - Signal compare failure	• Power distribution fault • Wiring harness fault	• There is a difference of more than 2 volts between the power supply to the Satellite Radio Module and the battery voltage value broadcast on MOST. Check other control modules for battery voltage related DTCs. Refer to the electrical circuit diagrams and check the power and ground supply circuits to the Satellite Radio Module. Repair wiring as required, clear the DTC and retest the system

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Speed Control Module (CCM)

Description and Operation

Speed Control Module (CCM)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Speed Control Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Speed Control - TDV6 3.0L Diesel (310-03 Speed Control, Diagnosis and Testing) / Speed Control - 5.0L (310-03 Speed Control, Diagnosis and Testing).

DTC	Description	Possible Causes	Actions
B1A84-81	Car Configuration Data - Invalid serial data received	• Central Junction Box reporting invalid data	• Re-configure the Central Junction Box using the manufacturer approved diagnostic system and re-test. If DTC remains suspect speed control module. Refer to the warranty policy and procedures manual if a module is suspect
C1A67-54	Forward Looking Sensor - Missing calibration	• Missing calibration	• Carry out speed control sensor adjustment procedure. Refer to section 310-03 - Speed Control, General Procedures
C1A67-81	Forward Looking Sensor - Invalid serial data received	• Yaw rate voltage - out of range	• Fault may be cleared by driving vehicle at speeds greater than 23mph (36kph) then cycling ignition status. Refer to the electrical circuit diagrams and check the power supply circuit to the yaw rate sensor. Check the forward looking sensor circuits and repair as necessary
C1A67-87	Forward Looking Sensor - Missing message	• Missing message	• Refer to the electrical circuit diagrams and check the forward looking sensor circuits. Check CAN connection between forward looking sensor and speed control module. Repair as necessary

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Steering Column Lock Module (VIM)

Description and Operation

Steering Column Lock Module (VIM)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Steering Column Lock Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Steering Column Switches (211-05 Steering Column Switches, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B100D-51	Column Lock Authorisation - Not programmed	• Module not programmed	• Configure the Steering Column Lock Module using the manufacturers approved diagnostic system
B100D-62	Column Lock Authorisation - Signal compare failure	• Signal compare failure - This DTC will be logged if the encrypted data exchange does not match between Steering Column Lock and the Central Junction Box	• Configure the modules using the manufacturers approved diagnostic system. If the problem persists, complete a CAN network integrity test using the manufacturers approved diagnostic system. Perform an on demand self-test and retest
B100D-64	Column Lock Authorisation - Signal plausibility failure	• Signal plausibility failure • Steering Column Lock unable to perform lock action • CAN Network fault • Anti-lock Braking System, Engine Control Module, Central Junction Box fault	NOTE: Prior to clearing this DTC, carry out the Vehicle Functional Reset application using the manufacturer approved diagnostic system • Check the serviceability of the steering column and lock. Clear the DTC and retest. If the problem persists, carry out CAN Network Integrity Test and Module Self Test using the manufacturer approved diagnostic system. Alternatively, refer to the electrical circuit diagrams and

DTC	Description	Possible Causes	Action
			check CAN Network
B100D-87	Column Lock Authorisation - Missing message	• Missing message • CAN fault • No response from electric steering column lock control module, instrument cluster, central junction box • Battery voltage at electric steering column lock control module too low • Electric steering column lock control module, instrument cluster, central junction box fault	NOTE: Prior to clearing this DTC, carry out the Vehicle Functional Reset application using the manufacturer approved diagnostic system • Clear DTC, repeatedly lock and unlock car using the key fob and retest. Check for related DTCs and refer to the relevant DTC index • If the fault is cleared, notify the customer that the steering column lock may fail to unlock if the vehicle is parked with a high steering angle or with the road wheel against a curb. If the column lock is failing to disengage, the customer may be able to rectify this by rotating the steering wheel while pressing the engine start button • If fault persists, complete a CAN network integrity test using the manufacturers approved diagnostic system. Alternatively, refer to the electrical circuit diagrams and check CAN circuits between the central junction box, the instrument cluster and the electronic steering column lock. Refer to the electrical circuit diagrams and check the central junction box, the instrument cluster and the electronic steering column lock power and ground supply circuits for short circuit to ground, short circuit to power, open circuit, high resistance. Repair circuit(s) as required. Clear DTC, perform an on demand self-test and retest • If fault persists, check that the vehicle battery supply voltage is between 9-16 volts. Rectify as required
U0001-88	High Speed CAN Communication Bus - Bus off	• Bus off	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network
U0300-00	Internal Control Module Software Incompatibility - No sub type information	• No sub type information	• Refer to network communication section of the workshop manual. Clear the DTC and ensure the vehicle battery supply voltage is between 9-16Volts. Using the manufacturers approved diagnostic system, complete a CAN integrity test. Perform an on demand self-test and retest
U3000-49	Control Module - Internal electronic failure	• Internal electronic failure detected during self test or lock/unlock operation	• Refer to network communication section of the workshop manual. Clear the DTC and ensure the vehicle battery supply voltage is between 9-16Volts. Perform an on demand self-test and if the DTC returns suspect the electric steering column lock, refer to the warranty policy and procedures manual if a module/component is suspect
U3000-87	Control Module - Missing message	• Configuration message not received	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network. Check modules are configured correctly using the manufacturer approved diagnostic system
U3002-81	Vehicle Identification Number - Invalid serial data received	• Invalid vehicle identification number	• Confirm the correct VIN details are stored in Steering Column Lock Module using the approved diagnostic system

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Touch Screen Display (FCDIM)

Description and Operation

Touch Screen Display (FCDIM)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Touch Screen Display, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section. For additional information, refer to: (415-00 Information and Entertainment System - General Information)

Navigation System Map Updates (Description and Operation),
Information and Entertainment System (Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1087-83	LIN Bus "A" - Value of signal protection calculation incorrect	• LIN bus fault	• Refer to the electrical circuit diagrams and check the LIN bus circuit to the rear view camera for fault. Repair circuit as required, clear DTC and retest
B1087-86	LIN Bus "A" - Signal invalid	• LIN bus fault	• Refer to the electrical circuit diagrams and check the LIN bus circuit to the rear view camera for fault. Repair circuit as required, clear DTC and retest
B1087-87	LIN Bus "A" - Missing message	• LIN bus fault	• Refer to the electrical circuit diagrams and check the LIN bus circuit to the rear view camera for fault. Repair circuit as required, clear DTC and retest
B1087-88	LIN Bus "A" - Bus off	• LIN bus fault	• Refer to the electrical circuit diagrams and check the LIN bus circuit to the rear view camera for fault. Repair circuit as required, clear DTC and retest

DTC	Description	Possible Causes	Action
B1D21-13	Remote Control Switch - Circuit Open	• Steering wheel switch fault • Steering column rotary coupling fault • Wiring harness fault	NOTE: No steering wheel remote in-car entertainment switchpack functionality. This DTC is logged if the module detects an open circuit on the steering wheel audio switch signal line • Refer to the electrical circuit diagrams and check the signal line running from the steering wheel audio switchpack through the steering column rotary coupling to the touch screen for insecure connectors, open circuits, including intermittent faults (rotate steering wheel during checks). Repair circuit as required, clear DTC and retest • Also check ground connections to the touch screen for open circuits. Repair circuit as required, clear DTC and retest
U0010-00	Medium Speed CAN communication Bus - No sub type information	• Power supply fault • CAN fault	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network
U0010-48	Medium Speed CAN communication Bus - Supervised software failure	• Power supply fault • CAN fault	• Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network
U0159-00	Lost Communication with Parking Assist Control Module A - No sub type information	• Loss of CAN communication with park distance control module	• Refer to the electrical circuit diagrams and check the power and ground connections to the park distance control module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the park distance control module and the touch screen • Check the park distance control module for related DTCs and refer to the relevant DTC index
U0164-00	Lost Communications With HVAC Control Module - No sub type information	• Loss of CAN communication with automatic temperature control module	• Refer to the electrical circuit diagrams and check the power and ground connections to the automatic temperature control module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the automatic temperature control module and the touch screen • Check the automatic temperature control module for related DTCs and refer to the relevant DTC index
U0166-00	Lost Communications With Auxiliary Heater Control Module - No sub type information	• Loss of CAN communication with fuel fired booster heater	• Refer to the electrical circuit diagrams and check the power and ground connections to the fuel fired booster heater • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the fuel fired booster heater and the touch screen • Check the fuel fired booster heater for related DTCs and refer to the relevant DTC index
U0184-00	Lost Communications With Radio - No sub type information	• Loss of MOST communication with integrated audio module	• Refer to the electrical circuit diagrams and check the power and ground connections to the integrated audio module • Using the manufacturer approved diagnostic system, complete a MOST network integrity test. Refer to the electrical circuit diagrams and check the MOST network between the integrated audio module and the touch screen

DTC	Description	Possible Causes	Action
			• Check the integrated audio module for related DTCs and refer to the relevant DTC index
U0184-4A	Lost Communications With Radio - Incorrect component installed	• The serial number of the integrated audio module does not match the serial number stored in the master module	• Check the serial number of the integrated audio module is valid (as installed at the factory), if the part has been installed by a dealer the installation routine has not been performed correctly. Configure the integrated audio module using the manufacturer approved diagnostic system. Clear the DTC and retest the system
U0186-00	Lost Communication With Audio Amplifier A - No sub type information	• Loss of CAN communication with audio amplifier module	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported an information and entertainment system concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis • Refer to the electrical circuit diagrams and check the power and ground connections to the audio amplifier module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the audio amplifier module and the touch screen • Check the audio amplifier module for related DTCs and refer to the relevant DTC index
U0186-4A	Lost Communication With Audio Amplifier A - Incorrect component installed	• The serial number of the audio amplifier module does not match the serial number stored in the master module	• Check the serial number of the audio amplifier module is valid (as installed at the factory), if the part has been installed by a dealer the installation routine has not been performed correctly. Configure the audio amplifier module using the manufacturer approved diagnostic system. Clear the DTC and retest the system
U0191-00	Lost Communication With Television - No sub type information	• Loss of CAN communication with TV control module	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported an information and entertainment system concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis • Refer to the electrical circuit diagrams and check the power and ground connections to the TV control module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the TV control module and the touch screen • Check the TV control module for related DTCs and refer to the relevant DTC index
U0191-4A	Lost Communication With Television - Incorrect component installed	• The serial number of the TV control module does not match the serial number stored in the master module	• Check the serial number of the TV control module is valid (as installed at the factory), if the part has been installed by a dealer the installation routine has not been performed correctly. Configure the TV control module using the manufacturer approved diagnostic system. Clear the DTC and retest the system
U0193-00	Lost Communication With Digital Audio Control Module A - No sub type information	• Loss of CAN communication with satellite radio control module	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported an information and entertainment system concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis • Refer to the electrical circuit diagrams and check the power and ground connections to the satellite radio control module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test.

DTC	Description	Possible Causes	Action
			Refer to the electrical circuit diagrams and check the CAN network between the satellite radio control module and the touch screen • Check the satellite radio control module for related DTCs and refer to the relevant DTC index
U0193-4A	Lost Communication With Digital Audio Control Module A - Incorrect component installed	• The serial number of the satellite radio control module does not match the serial number stored in the master module	• Check the serial number of the satellite radio control module is valid (as installed at the factory), if the part has been installed by a dealer the installation routine has not been performed correctly. Configure the satellite radio control module using the manufacturer approved diagnostic system. Clear the DTC and retest the system
U0194-00	Lost Communication With Digital Audio Control Module B - No sub type information	• Loss of CAN communication with digital radio control module	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported an information and entertainment system concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis • Refer to the electrical circuit diagrams and check the power and ground connections to the digital radio control module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the digital radio control module and the touch screen • Check the digital radio control module for related DTCs and refer to the relevant DTC index
U0194-4A	Lost Communication With Digital Audio Control Module B - Incorrect component installed	• The serial number of the digital radio control module does not match the serial number stored in the master module	• Check the serial number of the digital radio control module is valid (as installed at the factory), if the part has been installed by a dealer the installation routine has not been performed correctly. Configure the digital radio control module using the manufacturer approved diagnostic system. Clear the DTC and retest the system
U0196-00	Lost Communication With Entertainment Control Module - Rear A - No sub type information	• Loss of CAN communication with rear seat entertainment control module	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported an information and entertainment system concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis • Refer to the electrical circuit diagrams and check the power and ground connections to the rear seat entertainment control module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the rear seat entertainment control module and the touch screen • Check the rear seat entertainment control module for related DTCs and refer to the relevant DTC index
U0196-4A	Lost Communication With Entertainment Control Module - Rear A - Incorrect component installed	• The serial number of the rear seat entertainment control module does not match the serial number stored in the master module	• Check the serial number of the rear seat entertainment control module is valid (as installed at the factory), if the part has been installed by a dealer the installation routine has not been performed correctly. Configure the rear seat entertainment control module using the manufacturer approved diagnostic system. Clear the DTC and retest the system
U0208-00	Lost Communication With "Seat Control Module "A" - No sub type information	• Loss of CAN communication with driver seat module	• Refer to the electrical circuit diagrams and check the power and ground connections to the driver seat module

DTC	Description	Possible Causes	Action
			• Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the driver seat module and the touch screen • Check the driver seat module for related DTCs and refer to the relevant DTC index
U0209-00	Lost Communication With "Seat Control Module "B" - No sub type information	• Loss of CAN communication with passenger seat module	• Refer to the electrical circuit diagrams and check the power and ground connections to the passenger seat module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the passenger seat module and the touch screen • Check the passenger seat module for related DTCs and refer to the relevant DTC index
U023B-00	Lost Communication With Image Processing Module B - No sub type information	• Loss of CAN communication with proximity camera control module	• Refer to the electrical circuit diagrams and check the power and ground connections to the proximity camera control module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the proximity camera control module and the touch screen • Check the proximity camera control module for related DTCs and refer to the relevant DTC index
U025D-00	Lost Communication With Front Controls Interface Module - No sub type information	• Loss of CAN communication with integrated control panel	• Refer to the electrical circuit diagrams and check the power and ground connections to the integrated control panel • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the integrated control panel and the touch screen • Check the integrated control panel for related DTCs and refer to the relevant DTC index
U0300-00	Internal Control Module Software Incapability - No sub type information	• Touch screen is not compatible with the vehicle	• Check the touch screen part number, install the correct part as required. Check the correct software is installed. Configure the touch screen using the manufacturer approved diagnostic system. Clear the DTC and retest the system
U0300-51	Internal Control Module Software Incapability - Not programmed	• Touch screen software incorrect or missing	• Check the part numbers of the software installed and download new software as required. Configure the touch screen using the manufacturer approved diagnostic system. Clear the DTC and retest the system
U1A24-87	MOST Ring Complete. No Communication - Missing message	• MOST ring complete • MOST ring node internal fault	NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported an information and entertainment system concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis • Refer to the electrical circuit diagrams and check the MOST ring for fault, bypass each MOST module in turn to isolate faulty node
U2003-87	Fibre Optic Communication Bus - Missing message	• MOST ring incomplete	• Check MOST ring for disconnected modules or fibreoptic cable concerns
U3000-4B	Control Module - Over temperature	• Touch screen panel backlight - high temperature detected	• Allow the system to cool, clear the DTC and check/monitor system for re-occurrence, if DTC re-occurs, check and install a new touch screen display as required

DTC	Description	Possible Causes	Action
U3000-98	Control Module - Component or system over temperature	• System shut down request from another module on MOST ring • MOST module - internal temperature over limit	• This DTC is logged if the touch screen receives a system shut down request from another MOST module that is registering as over temperature. Allow the system to cool, clear the DTC and check/monitor system for re-occurrence • If DTC re-occurs, refer to the electrical circuit diagrams and check each MOST module for signs of overheating and related DTCs and refer to the relevant DTC index
U3003-62	Battery Voltage - Signal compare failure	• Mismatch in supply voltage to touch screen compared to reference battery voltage	• Refer to the electrical circuit diagrams and check power supply circuits to the touch screen. Check for high resistance, short to ground. Check for charging system DTCs and refer to the relevant DTC index. Check vehicle battery and charging circuit performance. Clear the DTC and retest the system

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Transmission Control Module (TCM)

Description and Operation

Transmission Control Module (TCM)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Transmission Control Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Diagnostic Strategy (307-01 Automatic Transmission/Transaxle, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
P0121-86	Throttle/Pedal Position Sensor A Circuit Range/Performance - Signal invalid	• Throttle/Pedal Position Sensor Fault (Data received over CAN Bus)	• Check Engine Control Module for stored DTCs
P0219-86	Engine Overspeed Condition - Signal invalid	• Engine speed too low or too high (Data received over CAN Bus)	• Check Engine Control Module for stored DTCs
P0500-81	Vehicle Speed Sensor A - Invalid serial data received	• Vehicle Speed Sensor fault (Data received over CAN Bus)	• Check Dynamic Stability Control module for stored DTCs
P0501-81	Vehicle Speed Sensor A Range/Performance - Invalid serial data received	• Vehicle Speed receive over CAN Bus does not match Transmission Output-Shaft speed	• Check Dynamic Stability Control module for stored DTCs. Check correct Differential is installed to the vehicle
P0561-1C	System Voltage Unstable - Circuit voltage out of range	• Power supply voltage out of range when engine running	• Check Engine Control Module for stored DTCs. Check Charging System and Battery condition

DTC	Description	Possible Causes	Action
P0562-21	System Voltage Low - Signal amplitude < minimum	• Circuit low voltage. Battery supply voltage to Transmission Control Module	• Refer to Circuit diagrams and check Power and Ground Circuit for fault. Check Engine Control Module for stored DTCs. Check Charging System and Battery condition
P0563-22	System Voltage High - Signal amplitude > maximum	• High Battery charge, alternator fault	• Check Engine Control Module for stored DTCs. Check Charging System and Battery condition
P0601-41	Internal Control Module Memory Check Sum Error - General checksum failure	• Software error • Transmission Control Module failure	• Re-configure the Transmission Control Module using the manufacturer approved diagnostic system, clear DTC and re-test. If DTC remains, Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0604-00	Internal Control Module Random Access Memory (RAM) Error - No sub type information	• Shift-by-Wire fault	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0605-41	Internal Control Module Read Only Memory (ROM) Error - General checksum failure	• General checksum failure	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0606-04	TCM Processor - System Internal Failures	• Micro controller component faults	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0606-26	TCM Processor - Signal rate of change below threshold	• Micro controller component faults	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0606-49	TCM Processor - Internal electronic failure	• Micro controller component faults	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0613-04	TCM Processor - System Internal Failures	• Micro controller component faults	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0613-06	TCM Processor - Algorithm Based Failures	• Micro controller component faults	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0613-11	TCM Processor - Circuit Short to Ground	• Watchdog fault	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0613-12	TCM Processor - Circuit Short to Battery	• Watchdog fault	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0613-13	TCM Processor - Circuit Open	• Watchdog fault	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.

DTC	Description	Possible Causes	Action
P0613-14	TCM Processor - Circuit Short to Ground or Open	• Watchdog fault	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0613-21	TCM Processor - Signal amplitude < minimum	• Watchdog fault	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0613-22	TCM Processor - Signal amplitude > maximum	• Watchdog fault	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0613-47	TCM Processor - Watchdog / safety Micro controller failure	• Watchdog fault	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0613-49	TCM Processor - Internal electronic failure	• Micro controller component faults	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0613-68	TCM Processor - Event Information	• Watchdog fault	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P061B-02	Internal Control Module Torque Calculation Performance - General signal failure	• Transmission Control Module - positive torque signal not valid	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P061B-26	Internal Control Module Torque Calculation Performance - Signal rate of change below threshold	• Transmission Control Module positive torque signal not valid	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P062F-04	Internal Control Module EEPROM Error - System Internal Failures	• EEPROM communication error	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0642-21	Sensor Reference Voltage A Circuit Low - Signal amplitude < minimum	• Sensor supply voltage fault low	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0643-22	Sensor Reference Voltage A Circuit High - Signal amplitude > maximum	• Sensor supply voltage fault high	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0657-13	Actuator Supply Voltage A Circuit / Open - Circuit Open	• Actuator supply (pressure control valves etc) Open Circuit	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0657-1C	Actuator Supply Voltage A Circuit / Open - Circuit voltage out of range	• Actuator supply (pressure control valves etc) voltage plausibility fault	• Refer to electrical Circuit diagrams and check Transmission Control Module connector for signs of water ingress or damage, check pin 7 for Short to Power or Ground (should NOT be connected and harness terminal should have a bung installed). If no fault identified, suspect the Transmission Control Module. Check and install a new

DTC	Description	Possible Causes	Action
			Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0658-11	Actuator Supply Voltage A Circuit Low - Circuit Short to Ground	• Actuator supply (pressure control valves etc) voltage Short to Ground	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0659-12	Actuator Supply Voltage A Circuit High - Circuit Short to Battery	• Actuator supply (pressure control valves etc) voltage Short to Power	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0667-01	PCM / ECM / TCM Internal Temperature Sensor A Range/Performance - General Electrical Failure	• General electrical failure	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0667-04	PCM / ECM / TCM Internal Temperature Sensor A Range/Performance - System Internal Failures	• Internal Electronic Failure	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0667-49	PCM / ECM / TCM Internal Temperature Sensor A Range/Performance - Internal electronic failure	• Internal electronic failure	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0700-02	Transmission Control System (MIL Request) - General signal failure	• General Signal failure	• Clear DTC, Road test and re-test, Read DTCs and Investigate as required
P0700-22	Transmission Control System (MIL Request) - Signal amplitude > maximum	• Double fault from monitoring of internal power supply and pressure regulator/solenoid control software	• If any of the following DTCs are also present; P074013, P096712, P273912, P273012, P272112, P096312, P276312, P097112, suspect the Transmission Control Module, check and install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0700-75	Transmission Control System (MIL Request) - Emergency Position Not Reachable	• Emergency Position Not Reachable	• Clear DTC, Road test and re-test, Read DTCs and investigate as required
P0710-13	Transmission Fluid Temperature Sensor A Circuit - Circuit Open	• Transmission fluid temperature sensor Circuit Open Circuit	• Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0711-01	Transmission Fluid Temperature Sensor A Circuit Range/Performance - General Electrical Failure	• General electrical failure	• Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0711-22	Transmission Fluid Temperature Sensor A Circuit Range/Performance - Signal amplitude > maximum	• Signal amplitude > maximum. Excessive jump in temperature	• Clear DTC. Carry out cold start road test, continue driving vehicle until normal operating temperature is achieved. Reads DTCs, if DTC returns, suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0712-11	Transmission Fluid Temperature Sensor A Circuit Low - Circuit Short to Ground	• Transmission fluid temperature sensor Circuit Short to Ground	• Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a

DTC	Description	Possible Causes	Action
			module/component is suspect.
P0713-01	Transmission Fluid Temperature Sensor A Circuit High - General Electrical Failure	• General electrical failure	• Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0713-12	Transmission Fluid Temperature Sensor A Circuit High - Circuit Short to Battery	• Transmission fluid temperature sensor Circuit Short to Power	• Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0716-14	Turbine/Input Shaft Speed Sensor A Circuit Range/Performance - Circuit Short to Ground or Open	• Turbine/Input Shaft Speed Sensor Circuit Short to Ground or Open Circuit	• Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0716-21	Turbine/Input Shaft Speed Sensor A Circuit Range/Performance - Signal amplitude < minimum	• Turbine/Input Shaft Speed Sensor signal too small	• Clear DTC and road test, if DTC returns suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0716-22	Turbine/Input Shaft Speed Sensor A Circuit Range/Performance - Signal amplitude > maximum	• Turbine/Input Shaft Speed Sensor signal above maximum	• Clear DTC and road test, if DTC returns suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0717-12	Turbine/Input Shaft Speed Sensor A Circuit No Signal - Circuit Short to Battery	• Turbine/input shaft speed sensor A Circuit Short to Power	• Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0720-12	Output Shaft Speed Sensor Circuit - Circuit Short to Battery	• Transmission output shaft speed sensor Circuit Short to Power	• Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0720-14	Output Shaft Speed Sensor Circuit - Circuit Short to Ground or Open	• Transmission output shaft speed sensor Circuit Short to Ground or Open Circuit	• Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0721-22	Output Shaft Speed Sensor Circuit Range/Performance - Signal amplitude > maximum	• Transmission output shaft speed sensor signal above maximum	• Clear DTC and road test, if DTC returns suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0721-27	Output Shaft Speed Sensor Circuit Range/Performance - Signal rate of change above threshold	• Output shaft speed negative gradient too high	• Clear DTC and road test, if DTC returns suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0721-64	Output Shaft Speed Sensor Circuit Range/Performance - Signal plausibility failure	• Signal plausibility failure	• Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.

DTC	Description	Possible Causes	Action
P0731-07	Gear 1 Incorrect Ratio - Mechanical Failures	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0732-07	Gear 2 Incorrect Ratio - Mechanical Failures	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0733-07	Gear 3 Incorrect Ratio - Mechanical Failures	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0734-07	Gear 4 Incorrect Ratio - Mechanical Failures	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0735-07	Gear 5 Incorrect Ratio - Mechanical Failures	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0736-07	Reverse Incorrect Ratio - Mechanical Failures	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0740-13	Torque Converter Clutch Solenoid Circuit / Open - Circuit Open	• Pressure control solenoid 2 Circuit Open Circuit	• Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0741-07	Torque Converter Clutch Solenoid Circuit Performance/Stuck Off - Mechanical Failures	• Too high slip at torque converter clutch. Mechanical Failures	• Suspect torque converter lockup clutch. Install a new torque converter, refer to the warranty policy and procedures manual if a module/component is suspect. If transmission fluid is in very poor condition and dirty, install a new transmission, refer to the warranty policy and procedures manual if a module/component is suspect.
P0745-04	Pressure Control Solenoid A - System Internal Failures	• System Internal Failures	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0745-48	Pressure Control Solenoid A - Supervision Software Failure	• Supervision Software Failure	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.

DTC	Description	Possible Causes	Action
P0758-12	Shift Solenoid B Electrical - Circuit Short to Battery	• Circuit Short to Power	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0758-13	Shift Solenoid B Electrical - Circuit Open	• Solenoid valve 1 or Pressure control Solenoid G Circuit Open Circuit	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0771-71	Shift Solenoid E Performance/Stuck Off - Actuator stuck	• Actuator stuck	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0775-04	Pressure Control Solenoid B - System Internal Failures	• System Internal Failures	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0775-48	Pressure Control Solenoid B - Supervision Software Failure	• Supervision Software Failure	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0781-07	1-2 Shift - Mechanical Failures	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0781-77	2-1 Shift - Commanded position not reachable	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0782-07	2-3 Shift - Commanded position not reachable	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0782-77	3-2 Shift - Commanded position not reachable	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0783-07	3-4 Shift - Mechanical Failures	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0783-77	3-4 Shift - Commanded position not reachable	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.

DTC	Description	Possible Causes	Action
P0784-07	4-5 Shift - Mechanical Failures	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0784-77	4-5 Shift - Commanded position not reachable	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0798-1A	Pressure Control Solenoid C Electrical - Circuit Resistance Below Threshold	• Pressure control solenoid C Circuit resistance below threshold	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0798-1E	Pressure Control Solenoid C Electrical - Circuit Short to Ground	• Pressure control solenoid C electrical circuit short to ground	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0798-21	Pressure Control Solenoid C Electrical - Signal amplitude < minimum	• Pressure Control Solenoid C Electrical signal amplitude < minimum	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0814-62	Transmission Range Display Circuit - Signal compare failure	• Transmission Range Display Circuit signal compare failure	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0826-08	Up and Down Switch circuit - Bus Signal Message Failures	• Invalid CAN signal from Central Junction Box/Instrument Cluster • Stuck Sprintronic switch • CAN bus circuit fault	• Check Central Junction Box and Instrument Cluster for stored DTCs. Check gear change switches for correct operation. Refer to circuit diagrams and check CAN bus for a circuit fault
P0826-81	Up and Down Switch Circuit - Invalid serial data received	• Invalid Can signal from Central Junction Box / Instrument Cluster • Stuck Sprintronic switch • CAN Bus Circuit fault	• Check Central Junction Box and Instrument Cluster for stored DTCs. Check Gear Change Switches for correct operation. Refer to Circuit diagrams and check CAN Bus for Circuit fault
P0826-88	Up and Down Switch Circuit - Bus off	• Steering Wheel Module to Central Junction Box / Instrument Cluster LIN Bus failure	• Check Central Junction Box and Steering Wheel Ice Switches for stored DTCs. Refer to Circuit diagrams and check LIN Bus for Circuit fault
P0829-07	5-6 Shift - Mechanical Failures	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0829-77	6-5 Shift - Commanded Position Not Reachable	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.

DTC	Description	Possible Causes	Action
P084F-01	Park / Neutral Switch Input Circuit - General Electrical Failure	• Wrong voltage level detected on Park/No Park signal	• Check for correct output at Transmission Control Module park signal pin (check in all positions) 12 volts in Park, 0 volts in all other positions. If fault identified, suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect. If no fault identified, check Park signal circuit to Transmission Shift Module for short, open circuit
P0850-01	Park / Neutral Switch Input Circuit - General Electrical Failure	• General electrical failure	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0850-02	Park / Neutral Switch Input Circuit - General signal failure	• General signal failure	• Check park lock mechanism. If park lock operation is correct, suspect the transmission control module. Check and install a new transmission control module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0850-29	Park / Neutral Switch Input Circuit - Signal invalid	• Signal invalid	• Check park lock mechanism. If park lock operation is correct, suspect the transmission control module. Check and install a new transmission control module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0850-1C	Park / Neutral Switch Input Circuit - Circuit voltage out of range	• Circuit voltage out of range	• Check parklock mechanism, if parklock operation correct suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0919-93	Gear Shift Position Control Error - No operation	• No shifting despite driver request	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0919-94	Gear Shift Position Control Error - Unexpected operation	• Shifting without driver request	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0938-29	Hydraulic Oil Temperature Sensor Range/Performance - Signal invalid	• Transmission fluid temperature compared with module temperature fault	• Clear DTC. Carry out cold start road test, continue driving vehicle until normal operating temperature is achieved. Read DTCs, if DTC returns, suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0963-12	Pressure Control Solenoid A Control Circuit High - Circuit Short to Battery	• Pressure control solenoid 1 Circuit Short to Power	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0964-13	Pressure Control Solenoid B Control Circuit / Open - Circuit Open	• Pressure Control Solenoid B Control Circuit Open	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.

DTC	Description	Possible Causes	Action
P0964-14	Pressure Control Solenoid B Control Circuit / Open - Circuit Short to Ground or Open	• Pressure Control Solenoid B Control Circuit Short to Ground or Open	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0966-11	Pressure Control Solenoid B Control Circuit Low - Circuit Short to Ground	• Pressure control solenoid 2 Circuit Short to Ground	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0967-12	Pressure Control Solenoid B Control Circuit High - Circuit Short to Battery	• Pressure control solenoid 2 Circuit Short to Power	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0968-14	Pressure Control Solenoid C Control Circuit / Open - Circuit Short to Ground or Open	• Pressure control solenoid 3 Circuit Short to Ground or Open Circuit	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0970-11	Pressure Control Solenoid C Control Circuit Low - Circuit Short to Ground	• Pressure control solenoid 3 Circuit Short to Ground	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0971-12	Pressure Control Solenoid C Control Circuit High - Circuit Short to Battery	• Pressure control solenoid 3 Circuit Short to Power	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0972-22	Shift Solenoid A Control Circuit Range/Performance - Signal amplitude > maximum	• Pressure control solenoid 1 current too large	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0973-11	Shift Solenoid A Control Circuit Low - Circuit Short to Ground	• Shift solenoid A control Circuit Short to Ground	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0973-14	Shift Solenoid A Control Circuit Low - Circuit Short to Ground or Open	• Pressure control solenoid 1 Circuit Short to Ground or Open Circuit	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0973-1A	Shift Solenoid A Control Circuit Low - Circuit Resistance Below Threshold	• Shift Solenoid A control circuit resistance below threshold	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0973-1E	Shift Solenoid A Control Circuit Low - Circuit Resistance Out Of Range	• Shift Solenoid A control circuit resistance out of range	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0976-11	Shift Solenoid B Control Circuit Low - Circuit Short to Ground	• Solenoid valve 2 Circuit Short to Ground	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0976-14	Shift Solenoid B Control Circuit Low - Circuit Short to Ground or Open	• Solenoid valve 2 Circuit Short to Ground or Open Circuit	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.

DTC	Description	Possible Causes	Action
P1674-04	Control Module Software Corrupted - System Internal Failures	• System internal failures	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P1674-48	Control Module Software Corrupted - Supervision Software Failure	• Supervision software failure	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P1707-07	Transfer Case Neutral or Park/Neutral Indication Circuit - Commanded position not reachable	• Transfer case neutral or park/neutral indication circuit - mechanical failures	• Clear the DTC. Test drive the Vehicle, engaging and disengaging the parking lock several times. If the DTC recurs, check parking lock components and replace as required. If no faulty parklock component is found Clear DTC and the DTC returns suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P1707-72	Transfer Case Neutral or Park/Neutral Indication Circuit - Actuator Stuck Open	• Transfer case neutral or park/neutral indication circuit - Actuator stuck open	• Clear the DTC. Test drive the Vehicle, engaging and disengaging the parking lock several times. If the DTC recurs, check parking lock components and replace as required. If no faulty parklock component is found Clear DTC and the DTC returns suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P1707-77	Transfer Case Neutral or Park/Neutral Indication Circuit - Commanded position not reachable	• Commanded position not reachable	• Clear the DTC. Test drive the Vehicle, engaging and disengaging the parking lock several times. If the DTC recurs, check parking lock components and replace as required. If no faulty parklock component is found Clear DTC and the DTC returns suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2700-07	Transmission Friction Element A Apply Time Range/Performance - Mechanical Failures	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2701-07	Transmission Friction Element B Apply Time Range/Performance - Mechanical Failures	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2702-07	Transmission Friction Element C Apply Time Range/Performance - Mechanical Failures	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2703-07	Transmission Friction Element D Apply Time Range/Performance - Mechanical Failures	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.

DTC	Description	Possible Causes	Action
P2704-07	Transmission Friction Element E Apply Time Range/Performance - Mechanical Failures	• Gear Ratio Monitoring. Mechanical Failures	• Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2713-04	Pressure Control Solenoid D - System Internal Failures	• System internal failures	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2713-48	Pressure Control Solenoid D - Supervision Software Failure	• Supervision software failure	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2716-22	Pressure Control Solenoid D Electrical - Signal amplitude > maximum	• Pressure Control Solenoid D Electrical signal amplitude > maximum	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2716-1A	Pressure Control Solenoid D Electrical - Circuit Resistance Below Threshold	• Pressure control solenoid D circuit resistance below threshold	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2716-1E	Pressure Control Solenoid D Electrical - Circuit Resistance Out Of Range	• Pressure control solenoid D circuit resistance out of range	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2718-14	Pressure Control Solenoid D Control Circuit / Open - Circuit Short to Ground or Open	• Pressure control solenoid D Circuit Short to Ground or Open Circuit	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2720-11	Pressure Control Solenoid D Control Circuit Low - Circuit Short to Ground	• Pressure control solenoid D Circuit Short to Ground	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2721-12	Pressure Control Solenoid D Control Circuit High - Circuit Short to Battery	• Pressure control solenoid D Circuit Short to Power	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2722-04	Pressure Control Solenoid E - System Internal Failures	• Pressure Control Solenoid E system internal failures	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2722-48	Pressure Control Solenoid E - Supervision Software Failure	• Pressure Control Solenoid E supervision control software failure	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2725-22	Pressure Control Solenoid E Electrical - Signal amplitude > maximum	• Pressure Control Solenoid E Electrical signal amplitude > maximum	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2725-1A	Pressure Control Solenoid E Electrical - Circuit Resistance Below Threshold	• Pressure control solenoid E electrical resistance below threshold	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.

DTC	Description	Possible Causes	Action
P2725-1E	Pressure Control Solenoid E Electrical - Circuit Resistance Out Of Range	• Pressure control solenoid E circuit resistance out of range	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2727-14	Pressure Control Solenoid E Control Circuit / Open - Circuit Short to Ground or Open	• Pressure Control Solenoid E Control Circuit Short to Ground or Open Circuit	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2729-11	Pressure Control Solenoid E Control Circuit Low - Circuit Short to Ground	• Pressure control solenoid E Circuit Short to Ground	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2730-12	Pressure Control Solenoid E Control Circuit High - Circuit Short to Battery	• Pressure control solenoid E Circuit Short to Power	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2731-04	Pressure Control Solenoid F - System Internal Failures	• Pressure Control Solenoid F no sub type information	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2731-48	Pressure Control Solenoid F - Supervision Software Failure	• Pressure Control Solenoid F supervision software failure	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2734-22	Pressure Control Solenoid F Electrical - Signal amplitude > maximum	• Pressure Control Solenoid F Electrical signal amplitude > maximum	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2734-1A	Pressure Control Solenoid F Electrical - Circuit Resistance Below Threshold	• Pressure control solenoid F electrical circuit resistance below threshold	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2734-1E	Pressure Control Solenoid F Electrical - Circuit Resistance Out Of Range	• Pressure control solenoid F electrical circuit resistance out of range	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2736-14	Pressure Control Solenoid F Control Circuit / Open - Circuit Short to Ground or Open	• Pressure Control Solenoid F Control Circuit Short to Ground or Open	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2738-11	Pressure Control Solenoid F Control Circuit Low - Circuit Short to Ground	• Pressure Control Solenoid F Control Circuit Short to Ground	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2739-12	Pressure Control Solenoid F Control Circuit High - Circuit Short to Battery	• Pressure Control Solenoid F Control Circuit Short to Power	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2763-12	Torque Converter Clutch Pressure Control Solenoid Control Circuit High - Circuit Short to Battery	• Pressure control solenoid F Circuit Short to Power	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.

DTC	Description	Possible Causes	Action
P2764-11	Torque Converter Clutch Pressure Control Solenoid Control Circuit Low - Circuit Short to Ground	• Torque converter clutch pressure control solenoid control Circuit Short to Ground	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2764-1A	Torque Converter Clutch Pressure Control Solenoid Control Circuit Low - Circuit Resistance Below Threshold	• Torque converter clutch pressure control solenoid control circuit resistance below threshold	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2764-1E	Torque Converter Clutch Pressure Control Solenoid Control Circuit Low - Circuit Resistance Out Of Range	• Torque converter clutch pressure control solenoid control circuit resistance out of range	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2807-11	Pressure Control Solenoid G - Circuit Short to Ground	• Park solenoid Circuit Short to Ground	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2807-12	Pressure Control Solenoid G - Circuit Short to Battery	• Park solenoid Circuit Short to Power	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2807-13	Pressure Control Solenoid G - Circuit Open	• Park solenoid Circuit Open Circuit	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2807-14	Pressure Control Solenoid G - Circuit Short to Ground or Open	• Park solenoid Circuit Short to Ground or Open Circuit	• Carry out any diagnostic pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
B1087-82	LIN Bus "A" - Alive / sequence counter incorrect / not updated	• Alive counter fault	• Check Transmission Shift Module for stored DTCs. Refer to the electrical Circuit diagrams and check Transmission Control Module to Transmission Shift Module for Short to Ground or Open Circuit (LIN Bus)
B1087-83	LIN Bus "A" - Value of signal protection calculation incorrect	• Checksum error	• Check Transmission Shift Module for stored DTCs Refer to the electrical Circuit diagrams and check Transmission Control Module to Transmission Shift Module for Short to Ground or Open Circuit (LIN Bus)
B1087-87	LIN Bus "A" - Missing message	• Transmission Shift Module is NOT visible to the Transmission Control Module on the LIN Bus	• Check Transmission Shift Module for stored DTCs Refer to the electrical Circuit diagrams and check Transmission Control Module to Transmission Shift Module for Short or Open Circuit (LIN Bus)
B1087-88	LIN Bus "A" - Bus off	• LIN Bus Circuit fault. Check hardware of LIN connection between transmission and Transmission Shift Module	• Refer to the electrical Circuit diagrams and check Transmission Control Module to Transmission Shift Module LIN bus circuit for Short, Open Circuit. Check Transmission Shift Module for related DTCs
U0001-88	High Speed CAN Communication Bus - Bus off	• CAN Bus off	• Refer to the electrical Circuit diagrams and check CAN Bus for Circuit fault

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DTC	Description	Possible Causes	Action
U0100-82	Lost Communication With ECM/PCM "A" - Alive / sequence counter incorrect / not updated	• Alive counter fault	• Check Engine Control Module for stored DTCs
U0100-83	Lost Communication With ECM/PCM "A" - Value of signal protection calculation incorrect	• Checksum fault	• Check Engine Control Module for stored DTCs
U0100-87	Lost Communication With ECM/PCM "A" - Missing message	• CAN Timeout	NOTE: Do NOT install a new Engine Control Module if an Engine Control Module Timeout DTC is only logged in the Transmission Control Module, the failure is NOT with the Engine Control Module • Check Engine Control Module for stored DTCs. Check CAN Bus Circuit for fault
U0103-82	Lost Communication With Gear Shift Control Module A - Alive / sequence counter incorrect / not updated	• Alive counter fault	• Check Transmission Shift Module for stored DTCs. Check CAN Bus Circuit for fault
U0103-83	Lost Communication With Gear Shift Control Module A - Value of signal protection calculation incorrect	• Checksum fault	• Check Transmission Shift Module for stored DTCs. Check CAN Bus Circuit for fault
U0103-87	Lost Communication With Gear Shift Control Module A - Missing message	• CAN Timeout	• Check Transmission Shift Module for stored DTCs. Check CAN Bus Circuit for fault
U0122-82	Lost Communication With Vehicle Dynamics Control Module - Alive / sequence counter incorrect / not updated	• Alive counter fault	• Check Dynamic Stability Control (ABS) for stored DTCs. Check CAN Bus Circuit for fault
U0122-83	Lost Communication With Vehicle Dynamics Control Module - Value of signal protection calculation incorrect	• Checksum fault	• Check Dynamic Stability Control (ABS) for stored DTCs. Check CAN Bus Circuit for fault
U0122-87	Lost Communication With Vehicle Dynamics Control Module - Missing message	• CAN Timeout	• Check Dynamic Stability Control (ABS) for stored DTCs. Check CAN Bus Circuit for fault
U0126-00	Lost Communication With Steering Angle Sensor Module - No sub type information	• Lost Communication With Steering Angle Sensor Module	• Check SAC for stored DTCs. Check CAN Bus Circuit for fault
U0128-87	Lost Communication With Park Brake Control Module - Missing message	• CAN timeout electronic parking brake module	• Check Electronic Parking Brake Module (EPB) for stored DTCs. Check CAN Bus Circuit for fault
U0140-82	Lost Communication With Body Control Module - Alive / sequence counter incorrect / not updated	• Alive counter fault	• Check Central Junction Box for stored DTCs. Check CAN Bus Circuit for fault
U0140-83	Lost Communication With Body Control Module - Value of signal protection calculation incorrect	• Checksum fault	• Check Central Junction Box for stored DTCs. Check CAN Bus Circuit for fault
U0140-87	Lost Communication With Body Control Module - Missing message	• CAN Timeout	• Check Central Junction Box for stored DTCs. Check CAN Bus Circuit for fault
U0155-87	Lost Communication With Instrument Panel Cluster (IPC) Control Module - Missing message	• CAN timeout instrument cluster	• Check Instrument Cluster for stored DTCs. Check CAN Bus Circuit for fault
U0300-68	Control Module - Event information	• Transmission software does not match vehicle network	• Check Central Junction Box software level, Check Transmission Control Module Software level, Update software as required using the manufacturer approved process

DTC	Description	Possible Causes	Action
U0401-08	Invalid Data Received From ECM/PCM A - Bus Signal Message Failures	• Inaccurate engine speed, torque information	• Check Engine Control Module for stored DTCs, Check CAN Bus circuit for faults
U0401-68	Invalid Data Received from ECM/PCM A - Event information	• Inaccurate engine speed, torque information	• Check Engine Control Module for stored DTCs. Check CAN Bus Circuit for fault
U0401-86	Invalid Data Received from ECM/PCM A - Signal Invalid	• Inaccurate engine speed, torque information	• Check Engine Control Module for stored DTCs. Check CAN Bus Circuit for fault
U0404-68	Invalid Data Received from Gear Shift Control Module A - Event information	• Incorrect CAN data received from Transmission Shift Module	• Check Transmission Shift Module for stored DTCs. Refer to Circuit diagrams and check CAN and LIN Bus for Circuit fault
U0404-81	Invalid Data Received from Gear Shift Control Module A - Invalid Serial Data Received	• Incorrect LIN data received from Transmission Shift Module	• Check Transmission Shift Module for stored DTCs. Refer to Circuit diagrams and check CAN and LIN Bus for Circuit fault
U0416-68	Invalid Data Received From Vehicle Dynamics Control Module - Event information	• Event information brake information	• Check Engine Control Module for stored DTCs. Check CAN Bus Circuit for fault
U0422-68	Invalid Data Received From Body Control Module - Event information	• Event information invalid Power mode information	• Check Central Junction Box for stored DTCs. Check CAN Bus Circuit for fault
U101B-87	Lost Communication With GSM - Multiple Bus - Missing message	• Missing message lost communication with Transmission Shift Module (multiple Bus)	• Check Transmission Shift Module for stored DTCs. Refer to Circuit diagrams and check CAN and LIN Bus for Circuit fault
U3000-49	Control Module - Internal electronic failure	• Internal electronic failure	• Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
U3000-4B	Control Module - Circuit resistance above threshold	• Internal electronic failure	• Check and correct oil level. Check hydraulic flow through oil cooler and pipe circuit for restriction or blockage. If no restrictions found, suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
U3000-81	Control Module - Invalid serial data received	• Vehicle or Engine type signal incorrect from Central Junction Box or incorrect Transmission Control Module software installed	• Reflash the Transmission Control Module using the manufacturer approved process
U3001-94	Control Module Improper Shutdown - Unexpected operation	• Control Module Improper Shutdown (voltage related)	• Check Engine Control Module For Power (alternator) faults. Check Power and Ground Circuit and Battery for fault. Clear DTCs. Road Test. If DTC reoccurs suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Transmission Shift Module (GSM)

Description and Operation

Transmission Shift Module (GSM)

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Transmission Shift Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: External Controls (307-05 Automatic Transmission/Transaxle External Controls, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1087-08	LIN Bus "A" - Bus Signal / Message Failures	• LIN Bus "A" Error	• Refer to the electrical circuit diagrams and check LIN input signal circuit for short, open circuit
B1087-81	LIN Bus "A" - Invalid serial data received	• Transmission Control Module LIN message error: complement fault	• Refer to the electrical circuit diagrams and check LIN input signal circuit for short, open circuit faults. Check Transmission Control Module for related DTCs and refer to relevant DTC Index
B1087-82	LIN Bus "A" - Alive / sequence counter incorrect / not updated	• Transmission Control Module LIN message error: Alive counter fault	• Refer to the electrical circuit diagrams and check LIN input signal circuit for short, open circuit faults. Check Transmission Control Module for related DTCs and refer to relevant DTC Index
B1087-83	LIN Bus "A" - Value of signal protection calculation incorrect	• Transmission Control Module LIN message error: checksum fault	• Refer to the electrical circuit diagrams and check LIN input signal circuit for short, open circuit faults. Check Transmission Control Module for related DTCs and refer to relevant DTC Index

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General Information - Diagnostic Trouble Code (DTC) Index DTC: Television Module (TVM)

Description and Operation

Television Module

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Television Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section.
For additional information, refer to: Information and Entertainment System (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1A56-11	Antenna - Circuit short to ground	• Antenna 1 signal circuit - short to ground	• Refer to the electrical circuit diagrams and check Antenna 1 signal circuit for short to ground
B1A56-12	Antenna - Circuit short to battery	• Antenna 1 signal circuit - short to power	• Refer to the electrical circuit diagrams and check Antenna 1 signal circuit for short to power
B1A56-13	Antenna - Circuit open	• Antenna 1 signal circuit - open circuit	• Refer to the electrical circuit diagrams and check Antenna 1 signal circuit for open circuit
B1D55-11	Antenna #2 - Circuit short to ground	• Antenna 2 signal circuit - short to ground	• Refer to the electrical circuit diagrams and check Antenna 2 signal circuit for short to ground
B1D55-12	Antenna #2 - Circuit short to battery	• Antenna 2 signal circuit - short to power	• Refer to the electrical circuit diagrams and check Antenna 2 signal circuit for short to power

DTC	Description	Possible Causes	Action
B1D55-13	Antenna #2 - Circuit open	• Antenna 2 signal circuit - open circuit	• Refer to the electrical circuit diagrams and check Antenna 2 signal circuit for open circuit
B1D56-11	Antenna #3 Circuit - Circuit short to ground	• Antenna 3 signal circuit - short to ground	• Refer to the electrical circuit diagrams and check Antenna 3 signal circuit for short to ground
B1D56-12	Antenna #3 Circuit - Circuit short to battery	• Antenna 3 signal circuit - short to power	• Refer to the electrical circuit diagrams and check Antenna 3 signal circuit for short to power
B1D56-13	Antenna #3 Circuit - Circuit open	• Antenna 3 signal circuit - open circuit	• Refer to the electrical circuit diagrams and check Antenna 3 signal circuit for open circuit
B1D57-11	Antenna #4 Circuit - Circuit short to ground	• Antenna 4 signal circuit - short to ground	• Refer to the electrical circuit diagrams and check Antenna 4 signal circuit for short to ground
B1D57-12	Antenna #4 Circuit - Circuit short to battery	• Antenna 4 signal circuit - short to power	• Refer to the electrical circuit diagrams and check Antenna 4 signal circuit for short to power
B1D57-13	Antenna #4 Circuit - Circuit open	• Antenna 4 signal circuit - open circuit	• Refer to the electrical circuit diagrams and check Antenna 4 signal circuit for open circuit
B1D58-11	Television Output - Circuit short to ground	• Color, Video, Blank and Sync (CVBS) signal circuit output to Touch Screen Display short to ground	• Refer to the electrical circuit diagrams and check the CVBS circuit for short to ground
B1D58-12	Television Output - Circuit short to battery	• Color, Video, Blank and Sync (CVBS) signal circuit output to Touch Screen Display short to power	• Refer to the electrical circuit diagrams and check the CVBS circuit for short to power
B1D58-13	Television Output - Circuit open	• Color, Video, Blank and Sync (CVBS) signal circuit output to Touch Screen Display open circuit	• Refer to the electrical circuit diagrams and check the CVBS circuit for open circuit
U3000-49	Control Module - Internal electronic failure	• Internal communications Error	• Suspect the Television Module, refer to the Warranty Policy and Procedures manual prior to installing a new module
U3000-4B	Control Module - Over temperature	• Internal temperature over 90°C	• Check airflow to module, ensure there are no foreign objects blocking the airflow to and around the module • Clear the DTC and retest, if the DTC returns suspect an internal fault. Replace the Television Module as required, refer to the Warranty Policy and Procedures manual prior to installing a new module
U3000-51	Control Module - Not programmed	• Not programmed	• Using the Manufacturer approved diagnostic system, check and update the Television Module software as required
U3000-54	Control Module - Missing calibration	• Missing calibration	• Using the Manufacturer approved diagnostic system, check and update the Television Module software as required
U3003-62	Battery Voltage - Signal compare failure	• There is a difference of more than 2 volts between the power supply to the Television Module and the battery voltage value broadcast on MOST	NOTE: Check other control modules for battery voltage related DTCs. • If also logged in other modules, refer to the electrical circuit diagrams and check vehicle charging system and power distribution

DTC	Description	Possible Causes	Action
			system • If not logged in other modules, refer to the electrical circuit diagrams and check the power and ground supply circuits to the Television Module. Repair wiring as required, clear the DTC and retest the system

Published: 11-May-2011

General Information - Diesel Fuel System Health and Safety Precautions

Description and Operation

WARNINGS:

Fuel may not give adequate warning before toxic or harmful effects arise.

Exposure to fuel can be harmful and can cause severe health damage or death.

Provide adequate ventilation when working on fuel systems.

Extreme care must be exercised when handling hot fluids. Always wash off spilled fluids from affected areas of skin immediately.

Fuel must not be used as a cleaning agent.

Keep fuel containers tightly closed, out of direct sunlight and in a cool area. Keep away from heat sources, ignition sources and oxidizing agents.

SKIN CONTACT: Fuel is mildly irritating to the skin and may cause dermatitis due to defatting effect. Remove contaminated clothing. Wash affected areas of skin with soap and water. Seek medical attention for any persistent skin irritation or abnormality. Wash contaminated clothing before reuse.

SKIN CONTACT: Excessive or prolonged skin contact with diesel fuel may cause serious skin disorders including skin cancer.

EYE CONTACT: Fuel is mildly irritating to the eyes. Flush with plenty of running water, blinking as often as possible. Do not force the eyelid open. Seek medical attention for any persistent eye irritation or abnormality.

SWALLOWED: Fuel is moderately toxic and tends to foam on vomiting. If drawn into the lungs, inflammation may develop. Do not induce vomiting. If spontaneous vomiting occurs place the victim in a forward position to reduce the risk of fuel being drawn into the lungs. Give nothing by mouth. If breathing but unconscious, place in the recovery position. If breathing has stopped, apply artificial respiration. Seek immediate medical attention.

INHALED: Fuel is toxic to the respiratory and other body systems. Exposure may result in various symptoms including drowsiness, unconsciousness or severe health damage. Move a victim to fresh air. Keep a victim warm and at rest. If unconscious, place in the recovery position. If not breathing, apply artificial respiration. Give cardiac massage if necessary. Seek immediate medical attention.

CAUTIONS:

Fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is essential that absolute cleanliness is observed when working with these components.

Make sure that the workshop area in which the vehicle is being worked on is as clean and as dust free as possible.

Make sure that non-plated tools are used.

Tools must be cleaned using a new brush and fresh suitable evaporative cleaning agent.

Make sure to use a steel topped workbench covered with clean, lint-free, non-flocking material.

Make sure that all parts removed from the vehicle are placed on the lint-free, non-flocking material.

Make sure that any protective clothing worn is clean and made from lint-free, non-flocking material.

Make sure to wear non-powdered latex type gloves.

Make sure to protect all electrical components and connectors with lint-free non-flocking material before using the suitable evaporative cleaning agent.

NOTE: Soot, discomfort and irritation usually give adequate warning of hazardous fume concentrations.

Published: 28-Dec-2012

General Information - General Service Information

Description and Operation

Repairs and Replacements

When service parts are required, it is essential that only genuine Jaguar/Daimler replacements are used.

Attention is drawn to the following points concerning repairs and the installation of replacement parts and accessories:

- Safety features embodied in the vehicle may be impaired if other than genuine parts are installed. In certain territories, legislation prohibits the installation of parts which are not produced to the vehicle manufacturer's specification.
- Torque wrench setting figures given in this manual must be strictly adhered to. Locking devices, where specified, must be installed. If the efficiency of a locking device is impaired during removal it must be renewed.
- Owners purchasing accessories while travelling abroad should make sure that the accessory and its installed location on the vehicle conform to mandatory requirements existing in their country of origin.
- The vehicle warranty may be invalidated by the installation of other than genuine Jaguar/Daimler parts. All Jaguar/Daimler replacements have the full backing of the factory warranty.
- Jaguar/Daimler dealers are obliged to supply only genuine service parts.

Vehicle Specifications

Purchasers are advised that the specification details set out in this manual apply to a range of vehicles and not to any specific one. For the specification of a particular vehicle, purchasers should consult their dealer.

The Manufacturer reserves the right to vary the specifications, with or without notice, and at such times and in such manner as the Manufacturer thinks fit. Major as well as minor changes may be involved, in accordance with the Manufacturer's policy of continuous improvement.

Whilst every effort is made to make sure the accuracy of the particulars contained in this manual, neither the Manufacturer nor the Dealer, by whom the manual is supplied, shall in any circumstances be held liable for any inaccuracy or the consequences thereof.

Service Repair Operation Numbering

A master index of numbered operations has been compiled for universal application to all vehicles manufactured by Jaguar Land Rover Limited.

Each operation is allocated a number from the master index and cross-refers with an identical number in the Repair Operation Times schedule. The number consists of six digits arranged in three pairs.

Each maintenance procedure in this manual is described in the sequence necessary to complete the operation in the minimum time, as specified in the Repair Operation Times schedule.

References to Bank-1 and Bank-2

References to Bank-1 and Bank-2 are made with regard to the engine. When viewed from the flywheel the right-hand bank will be Bank-1 and the left-hand bank will be Bank-2.

Special Tools

Any special tools and equipment required to perform a maintenance procedure, are shown at the beginning of each procedure. When possible, illustrations are given to assist in identifying the tool needed.

Disconnecting/Connecting the Battery

Always stop the engine before disconnecting the battery negative lead and make sure the battery positive lead is isolated i.e. wrapped in a suitable cloth.

WARNING: Radio code saving devices must not be used when conducting work on Air Bag or Fuel systems. It must be noted that, when using these devices, the vehicle electrical system is still live albeit with a reduced current flow.

NOTE: Before disconnecting the battery make sure that the radio receiver/cassette player/mini disc player and compact disc player keycodes are known and, that no data is required from the Engine Control Module (ECM) as battery disconnection will erase any fault codes and idle/drive values held in the Keep Alive Memory (KAM).

Always disconnect the battery before commencing repair operations which require:

- The vehicle to be jacked up
- Work on the engine
- Work underneath the vehicle
- Arc welding

Alternatively a Radio Code Saver may be used, when not working on the Air Bag or Fuel systems. With the battery

disconnected, a Radio Code Saver will allow sufficient current to pass to maintain the radio receiver/cassette player/mini disc player and compact disc player memory, operate the clock and supply the door operated interior lights while isolating the battery in the event of a short circuit.

Reconnecting the Battery

WARNING: If the battery has been on bench charge the cells may be giving off explosive hydrogen gas. Avoid creating sparks, and if in doubt cover the vent plugs or covers with a damp cloth.

Always make sure that all electrical systems are switched OFF before reconnecting the battery to avoid causing sparks or damage to sensitive electrical equipment.

Always reconnect the battery positive lead first and the negative last, ensuring that there is a good electrical contact and the battery terminals are secure.

Restart the clock (where installed) and set it to the correct time.

Enter the radio receiver/cassette player/mini disc player and compact disc player keycodes and preset' frequencies, if known.

Following reconnection of the battery, the engine should be allowed to idle until it has reached normal operating temperature as the stored idle and drive values contained within the ECM have been lost. Allow the vehicle to idle for a further three minutes. Drive the vehicle at constant speeds of approximately 48 km/h (30 mph), 64 km/h (40 mph), 80 km/h (50 mph), 96 km/h (60 mph) and 112 km/h (70 mph) for three minutes each. This will allow the ECM to relearn idle and drive values, and may cause driveability concerns if the procedure is not carried out.

Connecting a Slave Battery Using Jump Leads

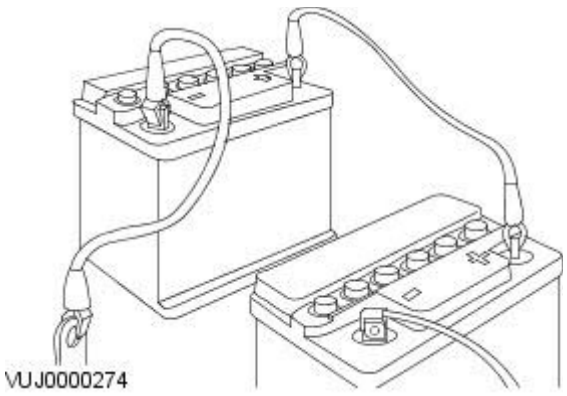
WARNING: If the slave battery has recently been charged and is gassing, cover the vent plugs or covers with a damp cloth to reduce the risk of explosion should arcing occur when connecting the jump leads.

CAUTIONS:

A discharged battery condition may have been caused by an electrical short circuit. If this condition exists there will be an apparently live circuit on the vehicle even when all circuits are switched off. This can cause arcing when the jump leads are connected.

Whilst it is not recommended that the vehicle is jump started, it is recognized that this may occasionally be the only practical way to mobilize a vehicle. In such an instance the discharged battery must be recharged immediately after jump starting to avoid permanent damage.

- Always make sure that the jump leads are adequate for the task. Heavy duty cables must be used.
- Always make sure that the slave battery is of the same voltage as the vehicle battery. The batteries must be connected in parallel.
- Always make sure that switchable electric circuits are switched off before connecting jump leads. This reduces the risk of sparks occurring when the final connection is made.



WARNING: Make sure that the ends of the jump leads do not touch each other or ground against the vehicle body at any time while the leads are attached to the battery. A fully charged battery, if shorted through jump leads, can discharge at a rate well above 1000 amps causing violent arcing and very rapid heating of the jump leads and terminals, and can even cause the battery to explode.

Always connect the jump leads in the following sequence.

- Slave battery positive first then vehicle battery positive.
- Slave battery negative next and then vehicle ground at least, 300 mm (12 in) from the battery terminal e.g. engine lifting bracket.

Always reduce the engine speed to idle before disconnecting the jump leads.

Before removing the jump leads, switch on the heater blower (high) or the heated rear screen, to reduce the voltage peak when the leads are removed.

Always disconnect the jump leads in the reverse order to the connecting sequence and take great care not to short the ends of the leads.

Do not rely on the generator to restore a discharged battery. For a generator to recharge a battery, it would take in excess of 8 hours continuous driving with no additional loads placed on the battery.

Component Cleaning

To prevent ingress of dirt, accumulations of loose dirt and greasy deposits should be removed before disconnecting or dismantling components or assemblies.

Components should be thoroughly cleaned before inspection prior to reassembly.

Cleaning Methods:

- Dry Cleaning
- Removal of loose dirt with soft or wire brushes
- Scraping dirt off with a piece of metal or wood
- Wiping off with a rag

CAUTION: Compressed air is sometimes wet so use with caution, especially on hydraulic systems.

- Blowing dirt off with compressed air (Eye protection should be worn when using this method)
- Removal of dry dust using vacuum equipment. This method should always be used to remove friction lining material dust (asbestos particles)
- Steam Cleaning

Calibration of Essential Measuring Equipment

WARNING: Failure to comply may result in personal injury or damage to components.

It is of fundamental importance that certain essential equipment e.g. torque wrenches, multimeters, exhaust gas analysers, rolling roads etc., are regularly calibrated in accordance with the manufacturers instructions.

Use of Control Modules

Control modules may only be used on the vehicle to which they were originally installed. Do not attempt to use or test a control module on any other vehicle.

Functional Test

On completion of a maintenance procedure, a thorough test should be carried out, to ensure the relevant vehicle systems are working correctly.

Preparation

Before disassembly, clean the surrounding area as thoroughly as possible. When components have been removed, blank off any exposed openings using grease-proof paper and masking tape. Immediately seal fuel, oil and hydraulic lines when separated, using plastic caps or plugs, to prevent loss of fluid and the entry of dirt. Close the open ends of oil ways, exposed by component removal, with tapered hardwood plugs or readily visible plastic plugs. Immediately a component is removed, place it in a suitable container; use a separate container for each component and its associated parts. Before dismantling a component, clean it thoroughly with a recommended cleaning agent; check that the agent will not damage any of the materials within the component. Clean the bench and obtain marking materials, labels, containers and locking wire before dismantling a component.

Dismantling

Observe scrupulous cleanliness when dismantling components, particularly when parts of the brake, fuel or hydraulic systems are being worked on. A particle of dirt or a fragment of cloth could cause a dangerous malfunction if trapped in these systems. Clean all tapped holes, crevices, oil ways and fluid passages with compressed air.

WARNING: Do not permit compressed air to enter an open wound. Always use eye protection when using compressed air.

Make sure that any O-rings used for sealing are correctly reinstalled or renewed if disturbed. Mark mating parts to make sure that they are replaced as dismantled. Whenever possible use marking materials which avoid the possibilities of causing distortion or the initiation of cracks, which could occur if a center punch or scriber were used. Wire together mating parts where necessary to prevent accidental interchange (e.g roller bearing components). Tie labels on to all parts to be renewed and to parts requiring further inspection before being passed for reassembly. Place labelled parts and other parts for rebuild in separate containers. Do not discard a part which is due for renewal until it has been compared with the new part, to make sure

that the correct part has been obtained.

Inspection

Before inspecting a component for wear or performing a dimensional check, make sure that it is absolutely clean; a slight smear of grease can conceal an incipient failure. When a component is to be checked dimensionally against figures quoted for it, use the correct equipment (surface plates, micrometers, dial gauges etc.) in serviceable condition. The use of makeshift equipment can be dangerous. Reject a component if its dimensions are outside the limits quoted, or if damage is apparent. A component may be reinstalled if its critical dimension is exactly to the limit size and it is otherwise satisfactory. Use Plastigauge 12 Type PG-1 for checking bearing surface clearance, e.g. big end bearing shell to crank journal. Instructions for the use of Plastigauge and a scale giving bearing clearances in steps of 0,0025 mm (0.0001 in) are supplied with the package.

On-Board Diagnostics (OBD)

This vehicle uses programmed electronic control systems to provide engine management and emission regulation, automatic transmission operation and anti-lock braking control. These control systems are integral with the On-Board Diagnostics (OBD) facility that is used in conjunction with either the Jaguar approved diagnostic system or the more restricted scan tools.

The OBD information in this manual provides diagnostic and rectification procedures for emission related electrical and mechanical systems. The information is intended to facilitate fault diagnosis and the subsequent rectification of the vehicle without recourse to the Jaguar approved diagnostic system.

The diagnosis and testing sections within the manual cover:

- System principles of operation with links to the relevant Description and Operation sections
- Self tests (where appropriate)
- Inspection and Verification - manual checks, symptom and Diagnostic Trouble Code (DTC) driven diagnostic charts with actions required to rectify concerns
- Component tests (where appropriate)

Circuit Diagrams

To understand the relationship between the vehicle electrical system and the system circuit diagrams, Refer to the Electrical Guide.

In the interest of clarity, single lines may represent multiple wires. Refer to the color code (1st alpha) followed by the wire reference (numeric/alpha/numeric) to trace origin and destination.

e.g. BW 647B002. BW (black with white trace) 647 (wire reference) B002 (stage from origin).

Glossary of Terms

This glossary of terms is intended to cover mainly emissions-related (to SAE J 1930) terminology, and other abbreviations that may be used in this manual.

The required term may be looked-up in the left-hand column, and subsequent columns give the standard acronym, unit or abbreviation, and definition.

Term(s)	Acronym/Unit /Abbreviation	Definition
Air Conditioning	A/C	
Accelerator Pedal Position	APP	Is a multitrack sensor which inputs the drivers demand into the engine control module (ECM)
After Bottom Dead Center	ABDC	Event occurring after bottom dead center
After Top Dead Center	ATDC	Event occurring after top dead center
Anti-lock Brake System	ABS	System which prevents wheel lock-up under braking by sensing lack of rotation of a wheel(s) and diverting fluid pressure away from it (them)
Alternating Current	ac	
Amplitude Modulation	AM	
Automatic Temperature Control	ATC	
Automatic Transmission Fluid	ATF	
Ampere	A	SI unit of current
Ampere hour	Ah	
Barometric Pressure	BARO	Pressure of surrounding air at any given temperature and altitude
Battery positive voltage	B+	The positive voltage from a battery or any circuit connected directly to it
Before Bottom Dead Center	BBDC	Event occurring before bottom dead center
Before Top Dead Center	BTDC	Event occurring before top dead center
Bottom Dead Center	BDC	Lowest point of piston travel in a reciprocating engine
Battery Junction Box	BJB	
Brake Pedal Position	BPP	
Brake Horsepower	BHP	Effective horsepower developed by an engine or motor, as measured by a brake applied to its output shaft
British Standard	BS	Standard specification issued by the British Standards Institution
Brake Traction Control System	BTCS	

Term(s)	Acronym/Unit /Abbreviation	Definition
Bus	Topology of a communication network	
Coast Clutch Solenoid	CCS	
Camshaft Position	CMP	Indicates camshaft position
Carbon dioxide	CO^2	Colorless gas with a density of approximately 1.5 times that of air
Carbon monoxide	CO	Poisonous gas produced as the result of incomplete combustion
Chlorofluorocarbon	CFC	
Catalytic converter		In-line exhaust system device used to reduce the level of engine exhaust emissions
Celsius	C	SI term for the Centigrade scale, with freezing point at zero and boiling point at 100 degrees
Compact Disc	CD	
Cylinder Head Temperature Sensor	CHT Sensor	A sensor for measuring the temperature of the cylinder head
Central Junction Box	CJB	
Crankshaft Position	CKP	Indicates crankshaft position
Clutch Pedal Position	CPP	Indicates clutch pedal position
Controller Area Network	CAN	A communication system which allows control modules to be linked together
Constant Velocity	CV	
Cubic centimeter	cm^3	
Central Security Module	CSM	Electronic module to support security system functionality
Data Link Connector	DLC	Connector providing access and/or control of the vehicle information, operating conditions, and diagnostic information
Driver Door Module	DDM	Electronic module to support driver door functionality
Driver Seat Module	DSM	Electronic module to support driver seat functionality
Daytime Running Lamps	DRL	
Deutsche Institut fur Normung	DIN	German standards regulation body
Diagnostic Trouble Code	DTC	An alpha/numeric identifier for a fault condition identified by the On-Board Diagnostic (OBD) system
Direct current	dc	Current which flows in one direction only, though it may have appreciable pulsations in its magnitude
Domestic Data Bus	D2B	
Digital Versatile Disc	DVD	
Electronic Automatic Temperature Control	EATC	
Exhaust Gas Recirculation	EGR	
Exhaust Gas Recirculation Temperature Sensor	EGRT	Sensing EGR function based on temperature change
Electronic Brake Force Distribution	EBD	
Engine Control Module	ECM	Electronic module to support engine functionality
Electronic Crash Sensor	ECS	Sensor to measure severity of impact
Engine Coolant Temperature	ECT	
Engine Oil Pressure	EOP	
European On-Board Diagnostic	EOBD	
Electronic Pressure Control	EPC	
Electrically Erasable Programmable Read-Only Memory	EEPROM	
Erasable Programmable Read-Only Memory	EPROM	
Evaporative Emission	EVAP	System designed to prevent fuel vapor from escaping into the atmosphere. Typically includes a charcoal filled canister to absorb fuel vapor
Flash Electrically Erasable Programmable Read-Only Memory	FEEPROM	
Front Electronic Module	FEM	
Flash Erasable Programmable Read-Only Memory	FEPROM	
Frequency Modulation	FM	
Fuel Pump Driver Module	FPDM	
Fuel Rail Pressure	FRP	
Generic Electronic Module	GEM	
Ground	GND	Electrical conductor used as a common return for an electrical circuit or circuits, and with a relative zero potential
Global Positioning System	GPS	
Global System for Mobile Communication	GSM	
Gross Vehicle Weight	GVW	
Heated Oxygen Sensor	HO2S	Electrically heated oxygen sensor which induces fuelling corrections

Term(s)	Acronym/Unit /Abbreviation	Definition
Hydrofluorocarbon	HFC	
High tension	HT	
Hydrocarbon	HC	
Idle Air Control	IAC	Stepper motor driven device which varies the volume of air by-passing the throttle to maintain the programmed idle speed
Intake Air Temperature	IAT	Temperature of intake air
Inertia Fuel Shut-off	IFS	An inertia system that shuts off the fuel supply when activated by pre-determined force limits brought about by (e.g.) collision
Input Shaft Speed	ISS	Indicates input shaft speed
Key On, Engine Off	KOEO	
Key On, Engine Running	KOER	
Kilogram (mass)	kg	
Kilogram (force)	kgf	
Kilogram force per square centimeter	kgf/cm^2	
Kilometer	km	
Kilometer per hour	km/h	
Kilopascal	kPa	
Kilovolt	kV	
Knock Sensor	KS	Sensor which detects the onset of detonation, and signals the ECM to retard the ignition
Liquid Crystal Display	LCD	Optical digital display system, to which applied voltage varies the way the crystals reflect light, thereby modifying the display
Lighting Control Module	LCM	
Light Emitting Diode	LED	
Low Tension	LT	Primary circuit of the ignition system, linking the battery to the primary winding in the ignition coil
Left-Hand	LH	
Left-Hand Drive	LHD	
Mass Air Flow	MAF	System which provides information on the mass flow rate of the intake air to the engine
Manifold Absolute Pressure	MAP	Absolute pressure of the intake manifold air
Manifold Absolute Pressure and Temperature	MAPT	
Malfunction Indicator Lamp	MIL	A required on-board indicator to alert the driver of an emission related malfunction
Meter (measurement)	m	
Metric (screw thread, e.g. M8)	M	
Farad	F	Unit of electrical capacitance
Millimeter	mm	
Millimeter of mercury	mmHg	
Millisecond	ms	
Model year	MY	
Newton	N	SI unit of force. 1 N = 0.2248 pounds force
Newton Meter	Nm	SI unit of torque. Must not be confused with nm (nanometer)
Negative Temperature Coefficient	NTC	
Naturally aspirated	N/A	Fuelling system using intake air at atmospheric pressure; not supercharged or turbocharged
Noise, Vibration and Harshness	NVH	
North American Specification	NAS	Vehicles for sale in the USA and Canadian markets
On-Board Diagnostic	OBD	A system that monitors some or all computer input and output control signals. Signal(s) outside the pre-determined limits imply a fault in the system or a related system
Oxides of Nitrogen	Nox	
Oxygen Sensor	O2S	A sensor which detects oxygen content in the exhaust gases
On-board Refuelling Vapour Recovery	ORVR	
Output State Control	OSC	
Output Shaft Speed	OSS	
Passenger Air Bag Deactivation	PAD	
Pulsed Secondary Air Injection	PAIR	
Passive Anti-Theft System	PATS	
Positive Crankcase Ventilation	PCV	
Parameter Identification	PID	An index number referring to a parameter within a module without knowledge of its storage location
Park/Neutral Position	PNP	
Pulse Width Modulation	PWM	
Programmable Electronic Control Units System	PECUS	Process whereby a common ECM is programmed on the production line to suit the market requirements of a particular vehicle

Term(s)	Acronym/Unit /Abbreviation	Definition
Programmable Read-only Memory	PROM	ROM with some provision for setting the stored data after manufacture
Portable Support Electronics	PSE	
Power Steering Pressure	PSP	
Polytetrafluoroethylene	PTFE	
Random Access Memory	RAM	Fast access memory store which is accessible for entry or extraction of data
Read Only Memory	ROM	Fast access memory in which data is fixed and may not be changed
Restraints Control Module	RCM	Electronic module to support functionality of the Supplemental Restraints System
Radio Data System	RDS	
Rear Electronic Module	REM	
Remote Keyless Entry	RKE	
Right-hand	RH	
Right-hand drive	RHD	
Research Octane Number	RON	
Rear Seat Module	RSM	Electronic module to support functionality of rear seats
Supercharger	SC	An intake system which utilizes a supercharger (mechanically driven device that pressurizes intake air, thereby increasing density of charge air and the consequent power output from a given displacement)
Serial Communications Link	SCL	
Standard Corporate Protocol	SCP	A high-speed, serial communications system linking all body system control modules. Control messages and data are passed between modules at up to 786 messages per second
Supplemental Restraints System	SRS	
Shift Solenoid	SS	Controls shifting in an automatic transmission
Seat Control Module	SCM	Module controlling the seat motor systems (not electric raise/lower-only seats)
Secondary Air Injection	AIR	System used for a period of time each time the engine is started, unless certain temperature criteria are met. Pumps air directly into the exhaust system which generates extra heat and reduces the time taken for the catalytic converters to reach operating temperature
Service Repair Operation (number)	SRO	Number generated by Jaguar Methods & Techniques system which relates to the time allowed to complete a repair operation. Further information on the system can be found in the separate Jaguar Publications (for each model range) entitled 'Repair Operation Times'
Society of Automotive Engineers	SAE	
Timing/Coast Clutch Solenoid	T/CCS	
Torque Converter Clutch	TCC	
Transmission Control Indicator Lamp	TCIL	
Throttle Position	TP	
Top Dead Center	TDC	
Transmission Control Module	TCM	Controls the shifting pattern of the (automatic) transmission
Transmission Control Switch	TCS	Modifies the operation of electronically controlled transmissions
Transmission Fluid Temperature	TFT	Indicates temperature of transmission fluid
Transmission Range	TR	The range in which the transmission is operating
Turbine Shaft Speed	TSS	Indicates rotational speed of transmission output shaft or turbine shaft
Variable Assist Power Steering	VAPS	
Variable Camshaft Timing	VCT	A system by which the relationship of the crankshaft and camshaft may be altered during engine running
Vehicle Identification Number	VIN	Number assigned to the vehicle by the manufacturer, primarily for licensing and identification purposes
Vehicle Speed Sensor	VSS	Sensor which provides vehicle speed information
Worldwide Diagnostic System	WDS	Jaguar approved diagnostic system
Wide Open Throttle	WOT	Full throttle position

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General Information - Health and Safety Precautions

Description and Operation

The Health and Safety Precautions subsection refers to some commonly used chemicals and materials, hazards associated with their use, and safety measures to be taken. Some of these chemicals may be included in the following list either in their own right or as an ingredient in a sealer or adhesive.

Acids and Alkalis

See also Battery Acids.

e.g. caustic soda, sulphuric acid.

Used in batteries and cleaning materials.

Irritant and corrosive to the skin, eyes, nose and throat. Cause burns. Can destroy ordinary protective clothing.

Avoid splashes to the skin, eyes and clothing. Wear suitable protective impervious apron, gloves and goggles. Do not breath mists.

Ensure access to eye wash bottles, shower and soap are readily available for splashing accidents.

Display Eye Hazard sign.

Air Bags

See also Fire, Chemical Materials - General

Highly flammable, explosive – observe No Smoking policy.

Used as a part of the Supplemental Restraint System (SRS), mounted in various positions around the vehicle.

The inflator contains a high-energetic propellant which, when ignited, produces a VERY HOT GAS (2500° C).

The gas generant used in air bags is Sodium Azide. This material is hermetically sealed in the module and is completely consumed during deployment. No attempt should be made to open an air bag inflator as this will lead to the risk of exposure to Sodium Azide. If a gas generator is ruptured, full protective clothing should be worn when dealing with the spillage.

After normal deployment, gloves and safety goggles should be worn during the handling process.

Deployed air bags should be disposed of in a plastic bag in accordance with local regulations at an approved chemical waste site.

Following any direct contact with gas generant.

- Wash affected areas thoroughly with water
- Seek medical assistance if necessary

WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any SRS components. To deplete the backup power supply energy, disconnect the battery negative cable and wait for one minute. Failure to follow this instruction may result in personal injury.

NOTE: The storage, transportation, disposal and/or recycling of air bag modules must be carried out in accordance with all applicable federal, state and local regulations including, but not limited to, those governing building and fire codes, environmental protection, occupational health and safety and transportation.

Air Bags - Do's

- Do store in an air bag safe when not installed to the vehicle.
- Do store modules in an upright position
- Do keep modules dry
- Do carry modules with the cover side pointing away from the body
- Do place modules with their cover side upwards
- Do carefully inspect modules for damage
- Do stand to one side when connecting modules
- Do make sure all test equipment is properly calibrated and maintained
- Do wash you hands after handling deployed air bags
- Do wear safety glasses when carrying out repairs to the SRS or when handling an air bag module
- Only carry out a system test with the air bag modules fully installed
- Do inspect the condition of the impact sensor mounting bracket and sensor flylead if the vehicle has been involved in an impact. Replace if damaged, even if there has been no deployment.

Air Bags - Do Nots

- Do not store highly flammable material together with modules or gas generators
- Do not store gas generators at temperatures exceeding 80° C

- Do not store modules upside down
- Do not attempt to open a gas generator housing
- Do not expose gas generators to open flame or sources of heat
- Do not place anything on top of a module cover
- Do not use damaged modules
- Do not handle a deployed device or gas generator for at least 20 minutes
- Do not probe air bag module electrical connectors or any other SRS component

Air Conditioning Refrigerant

See also Chlorofluorocarbon, Chemical Materials

Highly flammable, combustible – observe No Smoking policy.

Skin contact may result in frostbite.

Instructions given by the manufacturer must be followed. Avoid naked lights, wear suitable protective gloves and goggles.

If refrigerant comes into contact with the skin or eyes, rinse the affected areas with water immediately. Eyes should also be rinsed with an appropriate irrigation solution and should not be rubbed. SEEK MEDICAL ASSISTANCE IF NECESSARY.

Air Conditioning Refrigerant - Do Nots

- Do not expose refrigerant bottles to sunlight or heat
- Do not expose refrigerant bottles to frost
- Do not drop refrigerant bottles
- Do not vent refrigerant to atmosphere under any circumstance
- Do not mix refrigerants i.e. R12 (Freon) and R134a

Antifreeze

See also Fire, Solvents.

e.g. isopropanol, ethylene glycol, methanol.

Highly flammable, flammable, combustible.

Used in vehicle coolant systems, brake air pressure systems, screenwash solutions.

Vapors may be given off from coolant antifreeze (glycol) when heated. Avoid breathing these vapors.

Antifreeze may be absorbed through the skin in toxic or harmful quantities. Antifreeze, if swallowed can be fatal and medical attention should be sought immediately.

These products must not be used in any cooling or industrial water system which is connected or linked to general, food preparation or drinking water supplies.

Asbestos

Used in brake and clutch linings, transmission brake bands and gaskets. Jaguar original production and replacement items are asbestos free.

See also Warning Symbols on Vehicles at the end of this subsection.

Breathing asbestos dust may cause lung damage or, in some cases, cancer.

The use of drum cleaning units, vacuum cleaning or damp wiping is preferred.

Asbestos dust waste should be dampened, placed in a sealed container and marked to make sure safe disposal. If any cutting or drilling is attempted on materials containing asbestos the item should be dampened and only hand tools or low speed power tools used.

Battery Acids

See also Acids and Alkalis.

Gases released during charging are explosive. Never use naked flames or allow sparks near charging or recently charged batteries.

Ensure adequate ventilation.

Brake and Clutch Linings and Pads

See Asbestos.

Brake Fluids (Polyalkylene Glycols)

See also Fire.

Splashes to the skin and eyes may cause irritation. Avoid skin and eye contact as far as possible. Vapor inhalation hazards do not arise at ambient temperatures because of the very low vapor pressure.

Brazing

See Welding.

Chemical Materials

See also Legal Aspects.

Chemical materials such as solvents, sealers, adhesives, paints, resin foams, battery acids, antifreeze, brake fluids, fuels, oils and grease should always be used with caution and stored and handled with care. They may be toxic, harmful, corrosive, irritant or highly flammable and give rise to hazardous fumes and dusts.

The effects of excessive exposure to chemicals may be immediate or delayed; briefly experienced or permanent; cumulative; superficial; life threatening; or may reduce life-expectancy.

Chemical Materials - Do's

- Do carefully read and observe hazard and precaution warnings given on material containers (labels) and in any accompanying leaflets, posters or other instructions. Material health and safety data sheets can be obtained from manufacturers
- Do remove chemical materials from the skin and clothing as soon as practical after soiling. Change heavily soiled clothing and have it cleaned
- Do organise work practices and protective clothing to avoid soiling of the skin and eyes, and the breathing in of vapors, aerosols, dusts or fumes
- Do wash before breaks, before eating, smoking, drinking or using toilet facilities when handling chemical materials
- Do keep work areas clean, uncluttered and free from spills
- Do store chemical materials according to national and local regulations
- Do keep chemical materials out of the reach of children

Chemical Materials - Do Nots

- Do not mix chemical materials except under the manufacturer's instructions; some chemicals can form other toxic or harmful chemicals, give off toxic or harmful fumes or become explosive when mixed together
- Do not spray chemical materials, particularly those based on solvents, in confined spaces e.g. when people are inside a vehicle
- Do not apply heat or flame to chemical materials except under the manufacturer's instructions. Some are highly flammable and some may release toxic or harmful fumes
- Do not leave containers open. Fumes given off can build up to toxic, harmful or explosive concentrations. Some fumes are heavier than air and will accumulate in confined areas, pits etc.
- Do not transfer chemical materials to unlabeled containers
- Do not clean hands or clothing with chemicals. Chemicals, particularly solvents and fuels, will dry skin and may cause irritation leading to dermatitis or be absorbed through the skin in toxic or harmful quantities
- Do not use emptied containers for other materials except when they have been cleaned under supervised conditions
- Do not sniff or smell chemical materials. Brief exposure to high concentrations of fumes can be toxic or harmful

Chlorofluorocarbons (CFC)

There is concern in the scientific community that CFCs and Halons are depleting the upper ozone layer which filters out harmful ultraviolet radiation. Decreased filtration of ultraviolet radiation may result in increases in skin cancer, cataracts and immune system suppression in humans, as well as decreased productivity of crops and aquatic systems.

CFCs are used primarily as refrigerants in vehicle air conditioning systems and as aerosol propellants. Halons are used as fire extinguishants.

Jaguar supports worldwide elimination of CFC usage and it is recommended that Company subsidiaries and affiliates should phase out CFC usage as soon as acceptable substitutes are commercially available.

Clutch Fluids

See Brake fluids.

Clutch Linings and Pads

See Asbestos.

Corrosion Protection Materials

See also Solvents, Fire.

Highly flammable, flammable – observe No Smoking policy.

These materials are varied and the manufacturer's instructions should be followed. They may contain solvents, resins, petroleum products etc. Skin and eye contact should be avoided. They should only be sprayed in conditions of adequate ventilation and not in confined spaces.

Cutting

See Welding.

Dewaxing

See Solvents and Fuels (Kerosene).

Dusts

Powder, dusts or clouds may be irritant, harmful or toxic. Avoid breathing dusts from powdery chemical materials or those arising from dry abrasion operations. Wear respiratory protection if ventilation is inadequate.

Fine dusts of combustible material can present an explosion hazard. Avoid explosive limits and/or sources of ignition.

Electric Shock

Electric shock can result from the use of faulty electrical equipment or from the misuse of equipment in good condition.

Ensure that electrical equipment is maintained in good condition and frequently tested. Faulty equipment should be labelled and preferably removed from the work station.

Ensure that flexes, cables, plugs and sockets are not frayed, kinked, cut, cracked or otherwise damaged.

Ensure that electrical equipment and flexes do not come into contact with water.

Ensure that electrical equipment is protected by the correct rated fuse.

Never misuse electrical equipment and never use equipment which is in any way faulty. The results could be fatal.

Ensure that the cables of mobile electrical equipment cannot get trapped and damaged, such as in a vehicle hoist.

Ensure that the designated electrical workers are trained in basic First Aid.

In cases of electrocution:

- Switch off the power supply before approaching the victim
- If this is not possible push or drag the victim from the source of electricity using dry non-conductive material
- Commence resuscitation if trained to do so
- SUMMON MEDICAL ASSISTANCE

Engine Oils

See Lubricants and Grease.

Exhaust Fumes

These contain asphyxiating, harmful and toxic chemicals and particles such as carbon oxides, nitrogen oxides, aldehydes, lead and aromatic hydrocarbons. Engines should be run only under conditions of adequate exhaust extraction or general ventilation and not in confined spaces.

Gasolene (petrol) engine

There may not be adequate warning of odour or of irritation before toxic or harmful effects arise. These may be immediate or delayed.

Fibre Insulation

See also Dusts.

Used in noise and sound insulation.

The fibrous nature of surfaces and cut edges can cause skin irritation. This is usually a physical and not a chemical effect.

Precautions should be taken to avoid excessive skin contact through careful organization of work practices and the use of gloves.

Fire

See also Welding, Foams, Legal Aspects.

Many of the materials found on or associated with the repair of vehicles are highly flammable. Some give off toxic or harmful fumes if burnt.

Observe strict fire safety when storing and handling flammable materials or solvents, particularly near electrical equipment or welding processes.

Ensure, before using electrical or welding equipment, that there is no fire hazard present.

Have a suitable fire extinguisher available when using welding or heating equipment.

First Aid

Apart from meeting any legal requirements it is desirable for someone in the workshop to be trained in First Aid procedures.

Splashes in the eye should be flushed carefully with clean water for at least ten minutes.

Soiled skin should be washed with soap and water.

Individuals affected by inhalation of gases, fumes etc. should be removed to fresh air immediately. If effects persist, consult a doctor.

If liquids are swallowed inadvertently, consult a doctor giving the information on the container or label. Do not induce vomiting unless this action is indicated on the label.

Fluoroelastomer

See Viton.

Foams - Polyurethane

See also Fire.

Used in sound and noise insulation. Cured foams used in seat and trim cushioning.

Follow manufacturer's instructions.

Unreacted components are irritating and may be harmful to the skin and eyes. Wear gloves and goggles.

Individuals with chronic respiratory diseases, asthma, bronchial medical problems, or histories of allergic diseases should not work in or near uncured materials.

The components, vapors or spray mists can cause direct irritation, sensitivity reactions and may be toxic or harmful.

Vapors and spray mists must not be inhaled. These materials must be applied with adequate ventilation and respiratory protection. Do not remove the respirator immediately after spraying, wait until the vapor/mists have cleared.

Burning of the uncured components and the cured foams can generate toxic and harmful fumes. Smoking, naked flames or the use of electrical equipment during foaming operations and until vapors/mists have cleared should not be allowed. Any heat cutting of cured foams or partially cured foams should be conducted with extraction ventilation.

Freon

See Air Conditioning Refrigerant.

Fuels

See also, Fire, Legal Aspects, Chemicals and Solvents.

Avoid skin contact with fuel where possible. Should contact occur, wash the affected skin with soap and water.

Gasoline (Petrol)

Highly flammable - observe No Smoking policy.

Swallowing can result in mouth and throat irritation and absorption from the stomach can result in drowsiness and unconsciousness. Small amounts can be fatal to children. Aspiration of liquid into the lungs e.g. through vomiting, is a very serious hazard.

Gasoline dries the skin and can cause irritation and dermatitis on prolonged or repeated contact. Liquid in the eye causes severe pain.

Motor gasoline may contain appreciable quantities of benzene, which is toxic upon inhalation, and the concentration of gasoline vapors must be kept very low. High concentrations will cause eye, nose and throat irritation, nausea, headache, depression and symptoms of drunkenness. Very high concentrations will result in rapid loss of consciousness.

Ensure there is adequate ventilation when handling and using gasoline. Great care must be taken to avoid the serious consequences of inhalation in the event of vapor build up arising from spillages in confined spaces.

Special precautions apply to cleaning and maintenance operations on gasoline storage tanks.

Gasoline should not be used as a cleaning agent. It must not be siphoned by mouth. See First Aid.

Gas - oil (Diesel Fuel)

See warnings and cautions in relevant manual sections.

Combustible.

Gross or prolonged skin contact with high boiling point gas oils may also cause serious skin disorders including skin cancer.

Kerosene (Paraffin)

Used also as heating fuel, solvent and cleaning agent.

Flammable - observe No Smoking policy.

Irritation of the mouth and throat may result from swallowing. The main hazard from swallowing arises if liquid aspiration into the lungs occurs.

Liquid contact dries the skin and can cause irritation or dermatitis. Splashes in the eye may be slightly irritating.

In normal circumstances the low volatility does not give rise to harmful vapors. Exposure to mists and vapors from kerosene at elevated temperature should be avoided (mists may arise in dewaxing). Avoid skin and eye contact and make sure there is adequate ventilation.

Gas Cylinders

See also Fire.

Gases such as oxygen, acetylene, argon and propane are normally stored in cylinders at pressures of up to 13.790 kPa, (2000 lb/in²) and great care should be taken in handling these cylinders to avoid mechanical damage to them or to the valve gear attached. The contents of each cylinder should be clearly identified by appropriate markings.

Cylinders should be stored in well ventilated enclosures, and protected from ice and snow, or direct sunlight. Fuel gases (e.g. acetylene and propane) should not be stored in close proximity to oxygen cylinders.

Care should be exercised to prevent leaks from gas cylinders and lines, and to avoid sources of ignition.

Only trained personnel should undertake work involving gas cylinders.

Gases

See Gas Cylinders.

Gaskets (Fluoroelastomer)

See Viton.

General Workshop Tools and Equipment

It is essential that all tools and equipment are maintained in good condition and the correct safety equipment is used where required.

Never use tools or equipment for any purpose other than that for which they were designed. Never over – load equipment such as hoists, jacks, axle and chassis stands or lifting slings. Damage caused by overloading is not always immediately apparent and may result in a fatal failure the next time that the equipment is used.

Do not use damaged or defective tools or equipment, particularly high speed equipment such as grinding wheels. A damaged grinding wheel can disintegrate without warning and cause serious injury.

Wear suitable eye protection when using grinding, chiselling or sand blasting equipment.

Wear a suitable breathing mask when using abrasive blasting equipment, working with asbestos-based materials or using spraying equipment.

Ensure adequate ventilation to control dusts, mists and fumes.

High Pressure Air, Lubrication and Oil Test Equipment

See also Lubricants and Greases.

Always keep high pressure equipment in good condition, and regularly maintained, particularly at joints and unions.

Never direct a high pressure nozzle, e.g. diesel injector, at the skin as the fluid may penetrate to the under - lying tissue etc., and cause serious injury.

Halon

See CFCs.

Legal Aspects

Many laws and regulations make requirements relating to health and safety in the use and disposal of materials and equipment in workshops. Some of these laws which apply in the UK are listed. Similar laws exist for other territories:

- The Factories Act (1961)

- The Asbestos Regulations (1969)
- Highly Flammable Liquids and Liquified Petroleum Gases Regulations (1972)
- Control of Pollution Act (1974)
- Health and Safety at Work Act (1974)
- The Classification, Packaging and Labelling of Dangerous Substances Regulations (1978, 1981, 1983, 1984)
- Control of Lead at Work Regulations (1980)
- Control of Substances Hazardous to Health (COSHH) Regulations (1989)
- Abrasive Wheels Regulations (1970)
- Reporting of injuries, diseases and dangerous occurrences regulations 1985 (RIDDOR)

Workshops should be familiar, in detail, with these and associated laws and regulations.

Consult the local factory inspectorate if in any doubt.

Lubricants and Greases

Avoid all prolonged and repeated contact with mineral oils. All lubricants and greases may be irritating to the eyes and skin.

Used Engine Oil

Prolonged and repeated contact with mineral oil will result in the removal of natural oils from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities must be provided.

Do not employ used engine oils as lubricants or for any application where appreciable skin contact is likely to occur.

There are publications describing the problems and advising on precautionary measures. For the UK a typical Health and Safety Executive publication is: SHW 397: Cautionary Notice: Effects of mineral oil on the skin.

Health Protection Precautions

- Avoid prolonged and repeated contact with oils, particularly used engine oils
- Wear protective clothing, including impervious gloves where practicable
- Do not put oily rags into pockets
- Avoid contaminating clothing with oil
- Heavily soiled clothing and oil-impregnated footwear should not be worn. Overalls must be cleaned regularly
- First Aid treatment should be obtained immediately for open cuts and wounds.
- Use barrier creams, applying them before each work period, to enable easier removal of dirty oil and grease from the skin
- Wash with soap and water to make sure all oil is removed (skin cleansers and nail brushes will help). Preparations containing lanolin replace the natural skin oils which have been removed
- Do not use gasoline (petrol), kerosene (paraffin), diesel fuel (gas oil), thinners or solvents for cleaning skin.
- If skin disorders develop, obtain medical advice without delay
- Where practical, degrease components prior to handling
- Where there is a risk of eye contact, eye protection should be worn, for example, goggles or face shields; in addition an eye wash facility should be provided

Environmental Precautions

Burning used engine oil in small space heaters or boilers can be recommended only for units of approved design. In the UK the heating system must meet the requirements of HM Inspectorate of Pollution for small burners of less than 0.4 MW. If in doubt check with the appropriate local authority and/or manufacturer of approved appliances.

Dispose of used oil and used oil filters through authorized waste disposal contractors or licensed waste disposal sites, or to the waste oil reclamation trade, batteries should also be disposed off under similar arrangements. If in doubt, contact the relevant local authority for advice on disposal facilities.

It is illegal to pour used oil, antifreeze and automatic transmission fluid on to the ground, down sewers, drains, or into water courses.

Noise

Some operations may produce high noise levels which could, in time, damage hearing. In these cases, suitable ear protection must be worn.

Noise Insulation Materials

See Foams, Fibre Insulation.

0-Rings (Fluoroelastomer)

See Viton.

Paints

See also body and paint manual.

See also Solvents, Chemical Materials.

Highly flammable, flammable - observe No Smoking policy

Pressurized Equipment

See High Pressure Air, Lubrication and Oil Test Equipment.

Solder

Solders are a mixture of metals such that the melting point of the mixture is below that of the constituent metals (normally lead and tin). Solder application does not normally give rise to toxic lead fumes, provided a gas/air flame is used. Oxy-acetylene flames should not be used, as they are much hotter and will cause lead fumes to be produced.

Some fumes may be produced by the application of any flame to surfaces coated with grease etc. and inhalation of these should be avoided.

Removal of excess solder should be undertaken with care, to make sure that fine lead dust is not produced, which can give toxic effects if inhaled. Respiratory protection may be necessary.

Solder spillage and filings should be collected and removed promptly to prevent general air contamination by lead.

High standards of personal hygiene are necessary in order to avoid ingestion of lead or inhalation of solder dust from clothing.

Solvents

See also Chemical Materials, Fuels (Kerosene), Fire.

e.g. acetone, white spirit, toluene, xylene, trichloroethane.

Used in cleaning and de-waxing materials, paints, plastics, resins, thinners etc.

Some may be highly flammable or flammable.

Skin contact will degrease the skin and may result in irritation and dermatitis following repeated or prolonged contact. Some can be absorbed through the skin in toxic or harmful quantities.

Splashes in the eye may cause severe irritation and could lead to loss of vision.

Brief exposure to high concentrations of vapors or mists will cause eye and throat irritation, drowsiness, dizziness, headaches and, in the worst circumstances, unconsciousness.

Repeated or prolonged exposure to excessive but lower concentrations of vapors or mists, for which there might not be adequate warning indications, can cause more serious toxic or harmful effects.

Aspiration into the lungs (e.g. through vomiting) is the most serious consequence of swallowing.

Avoid splashes to the skin, eyes and clothing. Wear protective gloves, goggles and clothing if necessary.

Ensure good ventilation when in use, avoid breathing fumes, vapors and spray mists and keep containers tightly sealed. Do not use in confined spaces.

When spraying materials containing solvents, e.g. paints, adhesive, coatings, use extraction ventilation or personal respiratory protection in the absence of adequate general ventilation.

Do not apply heat or flame except under specific and detailed manufacturer's instructions.

Sound Insulation

See Fibre Insulation, Foams.

Suspended Loads

CAUTION: Never improvise lifting tackle.

There is always a danger when loads are lifted or suspended. Never work under an unsupported, suspended or raised load e.g. suspended engine, etc.

Always make sure that lifting equipment such as jacks, hoists, axle stands, slings, etc., are adequate and suitable for the job, in good condition and regularly maintained.

Transmission Brake Bands

See Asbestos.

Underseal

See Corrosion Protection.

Viton

In common with many other manufacturers' vehicles, some components installed to the Jaguar range have 'O' rings, seals or gaskets which contain a material known as 'Viton'.

Viton is a fluoroelastomer, that is a synthetic rubber type which contains Fluorine. It is commonly used for 'O' rings, gaskets and seals of all types. Although Viton is the most well known fluoroelastomer, there are others, including Fluorel and Tecmoflon.

When used under design conditions fluoroelastomers are perfectly safe. If, however, they are exposed to temperatures in excess of 400º C, the material will not burn, but will decompose, and one of the products formed is hydrofluoric acid.

This acid is extremely corrosive and may be absorbed directly, through contact, into the body.

'O' rings, seals or gaskets which have been exposed to very high temperatures will appear charred or as a black sticky substance.

DO NOT, under any circumstances touch them or the attached components.

Enquiries should be made to determine whether Viton or any other fluoroelastomer has been used in the affected 'O' ring, seal or gasket. If they are of natural rubber or nitrile there is no hazard. If in doubt, be cautious and assume that the material may be Viton or any fluoroelastomer.

If Viton or any other fluoroelastomers have been used, the affected area should be decontaminated before the commencement of work.

Disposable heavy duty plastic gloves should be worn at all times, and the affected area washed down using wire wool and a limewater (calcium hydroxide) solution to neutralize the acid before disposing of the decomposed Viton residue and final cleaning of the area. After use, the plastic gloves should be discarded carefully and safely.

Welding

See also Fire, Electric Shock, Gas Cylinders.

Welding processes include Resistance Welding (Spot Welding), Arc Welding and Gas Welding (and cutting).

Resistance Welding (Spot Welding)

This process may cause particles of molten metal to be emitted at a high velocity, and the eyes and skin must be protected.

Arc Welding

This process emits a high level of ultraviolet radiation which may cause arc-eye and skin burns to the operator and to other persons nearby. Gas-shielded welding processes are particularly hazardous in this respect. Personal protection must be worn, and screens used to shield other people.

CONTACT LENS WEARERS ARE ADVISED TO REVERT TO ORDINARY SPECTACLES WHEN ARC WELDING as the arc spectrum is believed to emit microwaves which dry out the fluid between the lens and the eye. This may result in blindness when the lens is removed from the eye.

Metal spatter will also occur, and appropriate eye and skin protection is necessary.

The heat of the welding arc will produce fumes and gases from the metals being welded, the rods and from any applied coatings or contamination on the surfaces being worked on. These gases and fumes may be toxic and inhalation of these should be avoided. The use of extraction ventilation to remove the fumes from the working area may be necessary particularly in cases where the general ventilation is poor, or where considerable welding work is anticipated. In extreme cases or confined spaces where adequate ventilation cannot be provided, air-fed respirators may be necessary.

Gas Welding (and Cutting)

Oxy-acetylene torches may be used for welding and cutting, and special care must be taken to prevent leakage of these gases, with consequent risk of fire and explosion.

The process will produce metal spatter and eye and skin protection is necessary.

The flame is bright, and eye protection should be used, but the ultraviolet emission is much less than that from arc welding, and lighter filters may be used.

The process itself produces few toxic fumes, but such fumes and gases may be produced from coatings on the work, particularly during cutting away of damaged body parts, and inhalation of the fumes should be avoided.

In brazing, toxic fumes may be produced from the metals in the brazing rod, and a severe hazard may arise if brazing rods containing cadmium are used. In this event particular care must be taken to avoid inhalation of fumes and expert advice may be required.

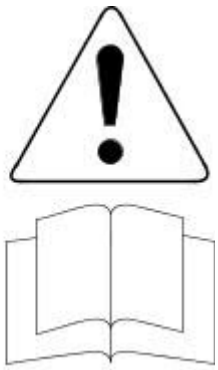
SPECIAL PRECAUTIONS MUST BE TAKEN BEFORE ANY WELDING OR CUTTING TAKES PLACE ON VESSELS WHICH HAVE CONTAINED COMBUSTIBLE MATERIALS, E.G. BOILING OR STEAMING OUT OF FUEL TANKS.

Warning Symbols on Vehicles

Decals showing warning symbols will be found on various vehicle components.

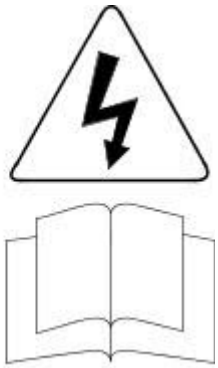
These decals must not be removed. The warnings are for the attention of owners/operators and persons carrying out service or repair operations on the vehicle.

The most commonly found decals are reproduced below together with an explanation of the warnings.



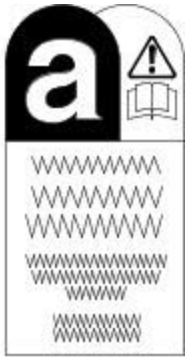
VUJ0000269

1. Components or assemblies displaying the warning triangle and open book symbol advise consultation of the relevant section of the owners handbook before touching or attempting adjustments of any kind.



VUJ0000270

2. Components or assemblies displaying the warning triangle with the electrified arrow and open book symbol give warning of inherent high voltages. Never touch these with the engine running or the ignition switched on. See Electric Shock in this subsection.



VUJ0000271

3. Jaguar vehicles and replacement parts which contain asbestos are identified by this symbol. See Asbestos in this subsection.

VUJ0000272

4. Components or assemblies displaying this symbol give warning that the component contains a corrosive substance. See Acids and Alkalis in this subsection.

VUJ0000273

5. Vehicles displaying the caution circle with a deleted lighted match symbol, caution against the use of naked lights or flames within the immediate vicinity due to the presence of highly flammable or explosive liquids or vapors. See Fire in this subsection.

VUJ0002037

6. All vehicles with the passenger air bag installed from the factory have a warning sticker attached to the instrument panel, prohibiting the use of rear facing child seats in the front seating position. Failure to follow this instruction may result in personal injury.

White Spirit

See Solvents.

Safety Precautions

WARNINGS:

Working on the fuel system results in fuel and fuel vapor being present in the atmosphere. Fuel vapor is extremely flammable, hence great care must be taken whilst working on the fuel system. Adhere strictly to the following precautions:

- Do not smoke in the work area
- Display 'no smoking' signs around the area
- Disconnect the battery before working on the fuel system
- Do not connect/disconnect electrical circuits, use electrical equipment or other tools or engage in working practices which in any way may result in the production of sparks
- Ensure that a CO^2 fire extinguisher is close at hand
- Ensure that dry sand is available to soak up any fuel spillage
- Empty fuel using suitable fire proof equipment into an authorized explosion proof container

- Do not empty fuel while working in a workshop or a pit
- Ensure that working area is well ventilated
- Ensure that any work on the fuel system is only carried out by experienced and well qualified maintenance personnel
- Ensure that fume extraction equipment is used where appropriate

Fume extraction equipment must be in operation when solvents are used e.g. Trichloroethane, white spirit, sbp3, methylene chloride, perchlorethylene. Do not smoke in the vicinity of volatile degreasing agents.

Whenever possible, use a ramp or pit whilst working beneath a vehicle, in preference to jacking. Position chocks at the wheels as well as applying the parking brake. Never rely on a jack alone to support a vehicle. Use axle stands, or blocks carefully placed at the jacking points, to provide a rigid location. Check that any lifting equipment used has adequate capacity and is fully serviceable. Ensure that a suitable form of fire extinguisher is conveniently located. When using electrical tools and equipment, inspect the power lead for damage and check that it is properly earthed. Disconnect the earth (grounded) terminal of the vehicle battery. Do not disconnect any pipes of the air conditioning refrigeration system unless you are trained and instructed to do so. A refrigerant is used which can cause blindness if allowed to come into contact with the eyes. Ensure that adequate ventilation is provided when volatile degreasing agents are being used.

Adhere strictly to handling and safety instructions given on containers and labels. Keep oils and solvents away from naked flames and other sources of ignition. Do not apply heat in an attempt to free seized nuts or fittings; as well as causing damage to protective coatings, there is a risk of damage from stray heat to electronic equipment and brake lines. Do not leave tools, equipment, spilt oil etc. around the work area. Wear protective overalls and use barrier cream when necessary.

Environmental Protection

In some countries it is illegal to pour used oil onto the ground, down sewers or drains, or into water courses. The burning of used engine oil in small space heaters or boilers is not recommended unless emission control equipment is installed. Dispose of used oil through authorized waste disposal contractors, to licensed waste disposal sites or to the waste oil reclamation trade. If in doubt, contact the Local Authority for advice on disposal facilities.

Published: 08-Dec-2012

General Information - How To Use This Manual

Description and Operation

Workshop Manual Organization

This manual covers descriptive, diagnostic (including OBD), and repair aspects to service the vehicle effectively.

The manual is arranged in sections, each section dealing with a specific part of a vehicle system. For example, Section 412-03 [Air Conditioning] covers air conditioning, which is part of the climate control system.

The first digit of the section number indicates the group (in the above example this being Electrical). There are five groups:

- General Information.
- Chassis.
- Powertrain.
- Electrical.
- Body and Paint.

The second and third digits of the section number indicate the vehicle system (12 in the above example being Climate Control).

The last two digits of the section number indicate the part of the system covered by the section (03 in the example denotes Air Conditioning).

Published: 11-May-2011

General Information - Important Safety Instructions

Description and Operation

Safety Notice

Appropriate service methods and correct repair procedures are essential for the safe, reliable operation of all motor vehicles, as well as the safety of the person doing the work. This manual provides general directions for accomplishing service and repair work with tested effective techniques. Following them will help assure reliability.

There are numerous variations in procedures, techniques, tools, and parts for servicing vehicles, as well as in the skill of the person doing the work. This manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from the instructions provided in the manual must first establish that neither personal safety or vehicle integrity is compromised from choices of methods, tools or parts.

Published: 11-May-2011

General Information - Solvents, Sealants and Adhesives

Description and Operation

WARNING: Always handle all solvents, sealers and adhesives with extreme care. Some contain chemicals or give off fumes which can be dangerous to health. Always follow the manufacturers instructions. If in doubt about any substance, particularly a solvent, DO NOT use it.

CAUTION: If in doubt about the suitability of any proprietary solvent or sealer for a particular application, contact the manufacturer of the product for information regarding storage, handling and application.

The Solvents, Sealers and Adhesives subsection refers to some commonly used chemicals and materials, hazards associated with their use, and safety measures to be taken.

Adhesives and Sealers

Highly flammable, flammable, combustible – observe No Smoking policy.

Generally should be stored in No Smoking' areas. Cleanliness and tidiness in use should be observed e.g. disposable paper covering benches; should be dispensed from applicators where possible; containers, including secondary containers, should be labelled appropriately.

Solvent - based Adhesives/Sealers - See Solvents

Follow manufacturer's instructions.

Water - based Adhesives/Sealers

Those based on polymer emulsions and rubber latexes may contain small amounts of volatile toxic and harmful chemicals. Skin and eye contact should be avoided and adequate ventilation provided during use.

Hot Melt Adhesives

In the solid state, they are safe. In the molten state they may cause burns and health hazards may arise from the inhalation of toxic fumes.

Use appropriate protective clothing and a thermostatically controlled heater with a thermal cut - out and adequate extraction.

Resin - based Adhesives/Sealers e.g. Epoxide and Formaldehyde Resin - based

Mixing should be carried out in well ventilated areas, as harmful or toxic volatile chemicals may be released.

Skin contact with uncured resins and hardeners can result in irritation, dermatitis, and absorption of toxic or harmful chemicals through the skin. Splashes can damage the eyes.

Provide adequate ventilation and avoid skin and eye contact.

Anaerobic, Cyanoacrylate (Super - glues) and other Acrylic Adhesives

Many are irritant, sensitizing or harmful to the skin and/or respiratory tract. Some are eye irritants.

Skin and eye contact should be avoided and the manufacturer's instructions followed.

Cyanoacrylate adhesives (super-glues) MUST NOT contact the skin or eyes. If skin or eye tissue is bonded, cover with a clean moist pad and seek immediate medical attention. Do not attempt to pull tissue apart. Use in well ventilated areas as vapors can cause irritation to the nose and eyes.

For two - pack systems see Resin - based and Isocyanate Adhesives/Sealers.

Isocyanate (Polyurethane) Adhesives/Sealers

See also Resin - based Adhesives

Individuals suffering from asthma or respiratory allergies should not work with or near these materials as sensitivity reactions can occur.

Over exposure is irritating to the eyes and respiratory system. Excessive concentrations may produce effects on the nervous system including drowsiness. In extreme cases, loss of consciousness may result. Long term exposure to vapor concentrations may result in adverse health effects.

Prolonged contact with the skin may lead to skin irritation and, in some cases, dermatitis.

Splashes entering the eye will cause discomfort and possible damage.

Any spraying should preferably be carried out in exhaust ventilated booths removing vapors and spray droplets from the breathing zone.

Wear appropriate gloves, eye and respiratory protection.

Published: 04-Jul-2014

General Information - Standard Workshop Practices

Description and Operation

Protecting the Vehicle

Always install covers to protect the fenders before commencing work in the engine compartment. Always install the interior protection kit, wear clean overalls and wash hands or wear gloves before working inside the vehicle. Avoid spilling hydraulic fluid, antifreeze or battery acid on the paintwork. In the event of spillage, wash off with water immediately. Use polythene sheets in the luggage compartment to protect carpets. Always use the recommended service tool, or a satisfactory equivalent, where specified. Protect temporarily exposed screw threads by replacing nuts or installing caps.

Vehicle in Workshop

When working on a vehicle in the workshop always make sure that:

- The parking brake is applied or the wheels are securely chocked to prevent the vehicle moving forwards or backwards
- If the engine is to be run, there is adequate ventilation, or an extraction hose to remove exhaust fumes is installed
- There is adequate room to jack up the vehicle and remove the wheels, if necessary
- Fender covers are always installed if any work is to be carried out in the engine compartment
- The battery is disconnected if working on the engine, underneath the vehicle, or if the vehicle is jacked up

CAUTION: When electric arc welding on a vehicle, always disconnect the generator wiring to prevent the possibility of a surge of current causing damage to the internal components of the generator.

- If using welding equipment on the vehicle, ensure a suitable fire extinguisher is readily available.

Screw Threads

- Damaged nuts, bolts and screws must always be discarded. Attempting to recut or repair damaged threads with a tap or die impairs the strength and fit of the threads and is not recommended.

NOTES:

During certain repair operations, it may be necessary to remove traces of thread locking agents using a tap. Where this is necessary, the instruction to do so will appear in the relevant operation and it is essential that a tap of the correct size and thread is used.

New Taptite bolts when used cut their own threads on the first application.

- Some bolts are coated with a thread locking agent and unless stated otherwise, they must not be reused. New bolts having the same part number as the original must always be installed. When nuts or bolts are to be discarded, the repair operation and relevant torque chart will include an instruction to that effect. Do not use proprietary thread locking agents as they may not meet the specification required. See also Encapsulated ('Patched') Bolts and Screws.
- Always make sure that replacement nuts and bolts are at least equal in strength to those that they are replacing. Castellated nuts must not be loosened to accept a split pin except in recommended cases when this forms part of an adjustment.
- Do not allow oil or grease to enter blind holes, the hydraulic action resulting from tightening the bolt or stud can split the housing and also give a false torque reading.
- Always tighten a nut, bolt or screw to the specified torque figure, damaged or corroded threads can give a false torque reading.
- Nut and bolt loosening and tightening sequences, where given, must ALWAYS be followed. Distortion of components or faulty sealing of joints will result if the sequences are not followed. Where an instruction is given to tighten in stages, these stages must be adhered to; do not attempt to combine stages particularly where certain stages involve tightening by degrees.
- To check or re-tighten a fixing to a specified torque, first loosen a quarter of a turn, then retighten to the specified torque figure.
- Unless instructed otherwise, do not lubricate bolt or nut threads prior to installing.

Where it is stated that bolts and screws may be reused, the following procedures must be carried out:

- Check that threads are undamaged.
- Remove all traces of locking agent from the threads.

CAUTION: DO NOT use a wire brush; take care that threads are not damaged.

- Make sure that threads are clean and free from oil or grease.
- Apply the specified locking agent to the bolt threads.

Supplementary Restraint System (SRS) Precautions

WARNING: Do not install rear facing child seats in the front passenger seat.

The SRS contains components which are potentially hazardous to service personnel if not handled correctly. The following guidelines and precautions are intended to alert personnel to potential sources of danger and emphasise the importance of ensuring the integrity of the SRS components installed to the vehicle.

WARNING: The following precautions MUST be adhered to when working on the SRS system:

- **The correct procedures must always be used when working on SRS components.**
- **Persons working on the SRS system must be fully trained and have been issued with the safety guidelines.**
- **The airbag modules contain extremely flammable and hazardous compounds. Contact with water, acids or heavy metals may produce harmful or explosive results. Do not dismantle, incinerate or bring into contact with electricity before the unit has been deployed.**
- **Always replace a seat belt assembly that has withstood the strain of a severe vehicle impact or if the webbing shows signs of fraying.**
- **Always disconnect the vehicle battery before carrying out any electric welding on a vehicle installed with an SRS system.**

CAUTION: Do not expose airbag modules or seat belt pre-tensioners to temperatures exceeding 85° C (185° F).

It should be noted that these precautions are not restricted to operations performed when servicing the SRS system. The same care should be exercised when working on ancillary systems and components located in the vicinity of SRS components; these include but are not limited to:

- Steering wheel airbag, rotary coupler.
- Passenger front airbag.
- Head airbag modules - front and rear.
- Seat belt pre-tensioners.
- SRS harnesses, link leads and connectors.
- Side (thorax) air bags.

Making the system safe

Before working on or in the vicinity of SRS components, make sure the system is rendered safe by performing the following operations:

- Remove the ignition key.
- Disconnect battery, earth lead first.
- Wait 2 minutes for the SRS power circuit to discharge before commencing work.

NOTE: The SRS uses energy reserve capacitors to keep the system active in the event of electrical supply failure under crash conditions. It is necessary to allow the capacitors sufficient time to discharge (2 minutes) in order to avoid the risk of accidental deployment.

Installation

In order to make sure system integrity, it is essential that the SRS system is regularly checked and maintained so that it is ready for effective operation in the event of a collision. Carefully inspect SRS components before installation. Do not install a part that shows signs of being dropped or improperly handled, such as dents, cracks or deformation.

WARNING: The integrity of the SRS systems is critical for safety reasons. Make sure the following precautions are always adhered to:

- **Do not install accessories or other objects to trim panels which cover ITS airbags.**
- **Never install used SRS components from another vehicle or attempt to repair an SRS component.**
- **When repairing an SRS system, only use genuine new parts.**
- **Never apply electrical power to an SRS component unless instructed to do so as part of an approved test procedure.**
- **Special fixings are necessary for installing an airbag module – do not use other fixings and make sure that all fixings are tightened to the correct torque.**
- **Always use new fixings when replacing an SRS component.**

CAUTIONS:

Take care not to trap airbag modules when installing interior trim components.

Make sure SRS components are not contaminated by oil or grease.

NOTES:

Following seat belt pre-tensioner deployment, the seat belts can still be used as conventional seat belts but will need to

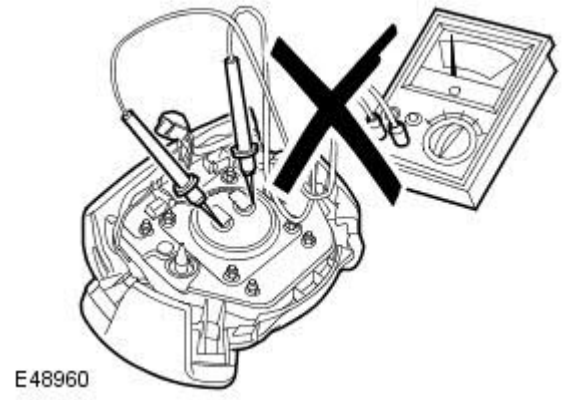
be replaced as soon as possible to make sure full SRS protection.

If the SRS components are to be replaced, the part number/bar code of the new unit must be recorded.

SRS component testing precautions

The SRS components are triggered using relatively low operating currents, always adhere to the following :

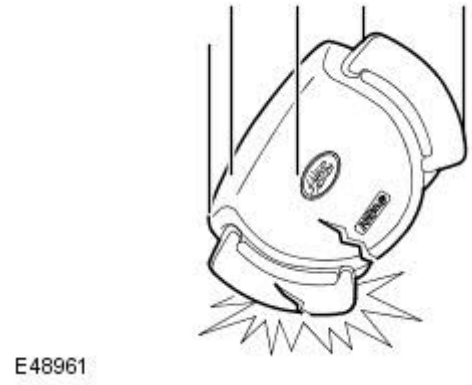
WARNING: Never use a multimeter or other general purpose equipment on SRS components. Use only approved JLR diagnostic equipment to diagnose system faults.


E48960

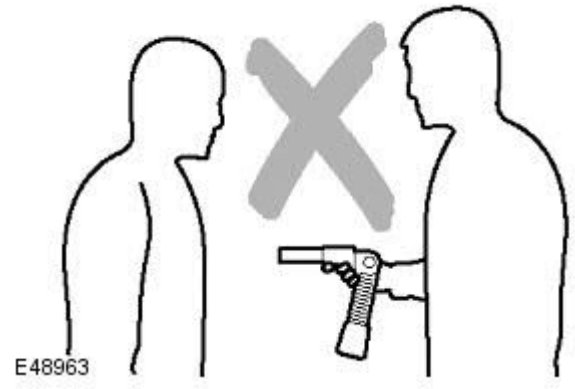
WARNING: Do not use electrical test equipment on the SRS harness while it is connected to any of the SRS components, it may cause accidental deployment and injury.

Handling and storage

Always observe the following precautions when handling SRS components:


E48961

- Never drop an SRS component. The airbag diagnostic control unit is a particularly shock sensitive device and must be handled with extreme care. Airbag modules and seat belt pre-tensioners could deploy if subjected to a strong shock.
- Never wrap your arms around an airbag module. If a module has to be carried, hold it by the cover with the cover uppermost and the base away from your body.
- Never transport airbag modules or seat belt pre-tensioners in the passenger compartment of a vehicle. Always use the luggage compartment of the vehicle for carrying airbag modules and seat belt pre-tensioner units.
- Never attach anything to an airbag cover or any trim component covering an airbag module. Do not allow anything to rest on top of an airbag module.
- Always keep components cool, dry and free from contamination.
- Never apply grease or cleaning solvents to seat belt pre-tensioner units, component failure could result.
- Always store an airbag module with the deployment side uppermost. If it is stored deployment side down, accidental deployment will propel the airbag module with sufficient force to cause serious injury.
- Keep new airbag modules in their original packaging until just prior to installing. Place the old module in the empty packaging for carriage.



WARNINGS:

When handling an inflatable tubular structure (ITS) airbag module, hold by the gas generator housing, DO NOT hold by the airbag. Do not wrap the thumb around the gas generator while holding. Do not drape airbag over shoulder or around neck. For seat buckle type pre-tensioners, hold by the piston tube, with the open end of the piston tube pointing towards the ground and the buckle facing away from your body. Do not cover the end of the piston tube. DO NOT hold buckle type pre-tensioners by the bracket assembly or cable. Never point the piston tube towards your body or other people.

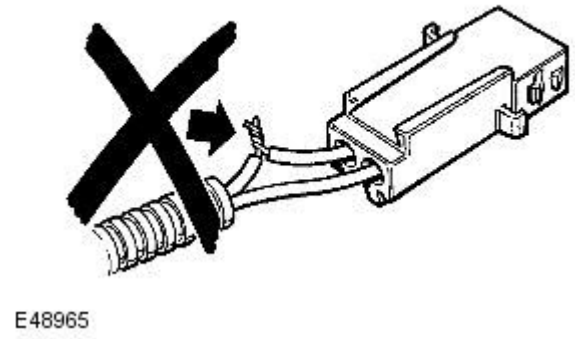
Airbag modules and seat belt pre-tensioners are classed as explosive devices. For overnight and longer term storage, they must be stored in a secure steel cabinet which has been approved as suitable for the purpose and has been registered with the local authority.

Store airbag modules or seat belt pre-tensioners in a designated storage area. If there is no designated storage area available, store in the locked luggage compartment of the vehicle and inform the workshop supervisor.

CAUTION: Improper handling or storage can internally damage the airbag module making it inoperative. If you suspect the airbag module has been damaged, install a new module and refer to the deployment/disposal procedures for disposal of the damaged module.

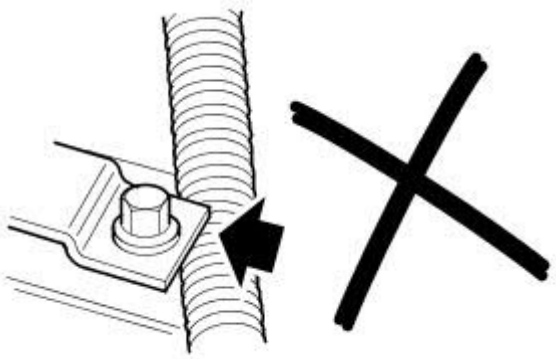
SRS harness and connectors

Always observe the following precautions with regards to SRS system electrical wiring:



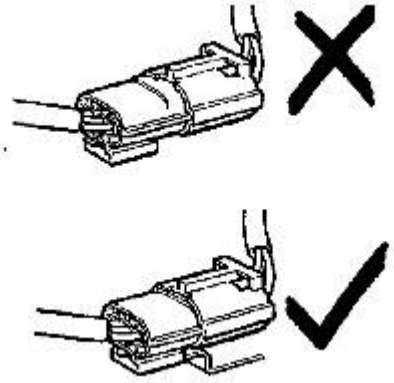
- Never attempt to modify, splice or repair SRS wiring.
- Never install electrical equipment such as a mobile telephone, two-way radio or in-car entertainment system in such a way that it could generate electrical interference in the airbag harness. Seek specialist advice when installing such equipment.

NOTE: SRS wiring can be identified by a special yellow outer sleeve protecting the wires (black with yellow stripe protective coverings are sometimes used).



E48964

WARNING: Always make sure SRS wiring is routed correctly. Be careful to avoid trapping or pinching the SRS wiring.



E48966

WARNING: Do not leave the connectors hanging loose or allow SRS components to hang from their harnesses. Look for possible chafing points.

Side impact crash sensor inspection

After any degree of side body damage, inspect the side impact crash sensors. Replace a crash sensor if there is any sign of damage.

CAUTION: Take extra care when painting or carrying out bodywork repairs in the vicinity of the crash sensors. Avoid direct exposure of the crash sensors or link harnesses to heat guns, welding or spraying equipment. Take care not to damage sensor or harness when reinstalling components.

Rotary coupler

CAUTION: Always follow the procedure for installing and checking the rotary coupler as instructed in the SRS repairs section. Comply with all safety and installation procedures to make sure the system functions correctly. Observe the following precautions:

- Do not unlock and rotate the rotary coupler when it is removed from the vehicle.
- Do not turn the road wheels when the rotary coupler is removed from the vehicle.
- Always make sure the rotary coupler is removed and installed in its central position and with the front road wheels in the straight ahead position - refer to SRS repair section for the correct removal and installation procedure.
- If a new rotary coupler is being installed, make sure the locking tab holding the coupler's rotational position is not broken; units with a broken locking tab must not be used.

Airbag location labels

WAITING AIRBAG LOCATION AND DESIGN LABELS - DUE MARCH - NEIL HARRISON 46404

Airbag and pre-tensioner deployment

WARNING: During deployment parts of the airbag module become hot enough to burn you. Wait 30 minutes after deployment before touching the airbag module.

Deployment procedures and precautions as detailed in this manual should be strictly adhered to. Only personnel who have undergone the appropriate training should undertake deployment of airbag and pre-tensioner modules. The following precautions must be complied with:

- Only use deployment equipment approved for the intended purpose.
- Deployment of airbag / pre-tensioner modules must be performed in a well ventilated area which has been designated for the purpose.
- Make sure airbag / pre-tensioner modules are not damaged or ruptured before attempting to deploy.
- Where local legislation exists, notify the relevant authorities of intention to deploy airbag and pretensioner units.
- When deploying airbag pre-tensioner units, make sure that all personnel are at least 15 metres (45 feet) away from the deployment zone.
- Make sure deployment tool is connected correctly, in compliance with the instructions detailed in the SRS section of this manual. In particular, make sure deployment tool is NOT connected to battery supply before connecting to airbag module connector.
- When deploying seat belt pre-tensioners, make sure pre-tensioner unit is secured correctly to the seat.
- When removing deployed airbag modules and pre-tensioner units, wear protective clothing. Use gloves and seal deployed units in a plastic bag.
- Following deployment of any component of the SRS system within the vehicle, all SRS components must be replaced. DO NOT reuse or salvage any parts of the SRS system.
- Do not lean over an airbag module when connecting deployment equipment.

If a vehicle is to be scrapped, undeployed airbag modules and pre-tensioner units must be manually deployed. In this case airbags can be deployed in the vehicle. Before deployment, make sure the airbag module is secure within its correct mounting position. Deployment of the driver's airbag in the vehicle may damage the steering wheel; if the vehicle is not being scrapped, deploy the module outside of the vehicle.

SRS Component Replacement Policy

CAUTIONS:

The Restraints Control Module (RCM) will log a crash fault after every impact which is severe enough to cause airbag deployment. **It is possible to have three crashes/impacts logged after one event where, for example, a front, side and rollover has occurred. After the third fault is logged, the SRS warning lamp will be illuminated and the RCM must be installed. After any airbag deployment a new RCM must be installed.**

The SRS side impact sensor must be replaced if there are any signs of physical damage or if the restraints control module (RCM) is registering a fault.

The following information details the policy for replacement of SRS components as a result of a vehicle accident.

Impacts which do not deploy the airbags or pre-tensioners

Check for structural damage in the area of the impact paying particular attention to bumper armatures, longitudinals and bracketry.

Impacts which deploy the airbags or pre-tensioners

The replacement and inspection policy is dependent on the type and severity of the crash condition. The following guidelines are the minimum that should be exercised as a result of the deployment of specific SRS components.

Check for structural damage in the area of impact paying particular attention to bumper armatures, longitudinals and bracketry.

Front Airbag Deployment - Driver and Passenger

CAUTION: If the front airbags are deployed, the following components must be replaced:

- Driver airbag module
- Passenger airbag module
- Fly leads (where applicable) connecting front airbag modules to SRS harness
- Front seat belt buckle pre-tensioner
- Rear seat belt pre-tensioners - if installed
- Driver's seat belt retractor - if installed
- Rotary coupler
- Any front impact sensors that have been physically damaged or if a fault is being registered
- Restraints control module (RCM) if the three crashes/impacts have been stored

Additionally, the following items must be inspected for damage and replaced as necessary:

- Front passenger's seat belt retractor and webbing, tongue latching function, 'D' loop and body anchorage point
- Rear seat belt buckles, webbing, buckle covers, body anchorage points and tongue latching function
- Fascia moulding adjacent to passenger airbag module
- Steering wheel
- Front seat frames and head restraints
- Steering column - if adjustment is lost or if there are signs of collapse
- Seat belt height adjusters

- Rear seat belts

Side Air Bags

CAUTION: If the side (thorax) air bags are deployed, the following components must be replaced on the side of the vehicle on which the deployment occurred:

- Side (thorax) airbag
- Any side impact sensors that have been physically damaged or if a fault is being registered
- Restraints Control Module (RCM) if the three crashes/impacts have been stored

Additionally, the following items must be inspected for damage and replaced as necessary:

- Front seat belts, retractors and webbing, tongue latching function, 'D' loop and body anchorage points
- Rear seat belt buckles, webbing, buckle covers, tongue latching function, and body anchorage points
- Front seat frame and head restraints
- Door trim casing
- Seat belt height adjusters
- Rear seat belts

Head airbag modules

CAUTION: If the head airbag modules are deployed, the following components must be replaced on the side of the vehicle on which the deployment occurred:

- Head airbag modules
- Link lead between airbag gas generator and restraints control module (RCM) harness
- Airbag retaining clips
- Internal trim finisher
- Front seat belt buckle pre-tensioners
- Any side impact sensors that have been physically damaged or if a fault is being registered
- Restraints Control Module (RCM) if the three crashes/impacts have been stored

Additionally, the following items must be inspected for damage and replaced as necessary:

- Headlining
- Component mounting brackets
- Front seat belts, retractors and webbing, tongue latching function, 'D' loop and body anchorage points
- Rear seat belt buckles, webbing, buckle covers, tongue latching function, and body anchorage points
- Adjacent trim components
- Seat belt height adjusters

Rear impacts

CAUTION: If the seat belt pre-tensioners are deployed during a rear impact, the following components must be replaced:

- Seat belt pre-tensioners
- Front and rear seat belt retractors used during the impact
- Restraints Control Module (RCM) if the three crashes/impacts have been stored

Additionally, the following items must be inspected for damage and replaced as necessary:

- Seat belt height adjusters
- Front seat belts, retractors and webbing, tongue latching function, 'D' loop and body anchorage points
- Rear seat belt buckles, webbing, buckle covers, tongue latching function, and body anchorage points

Published: 11-May-2011

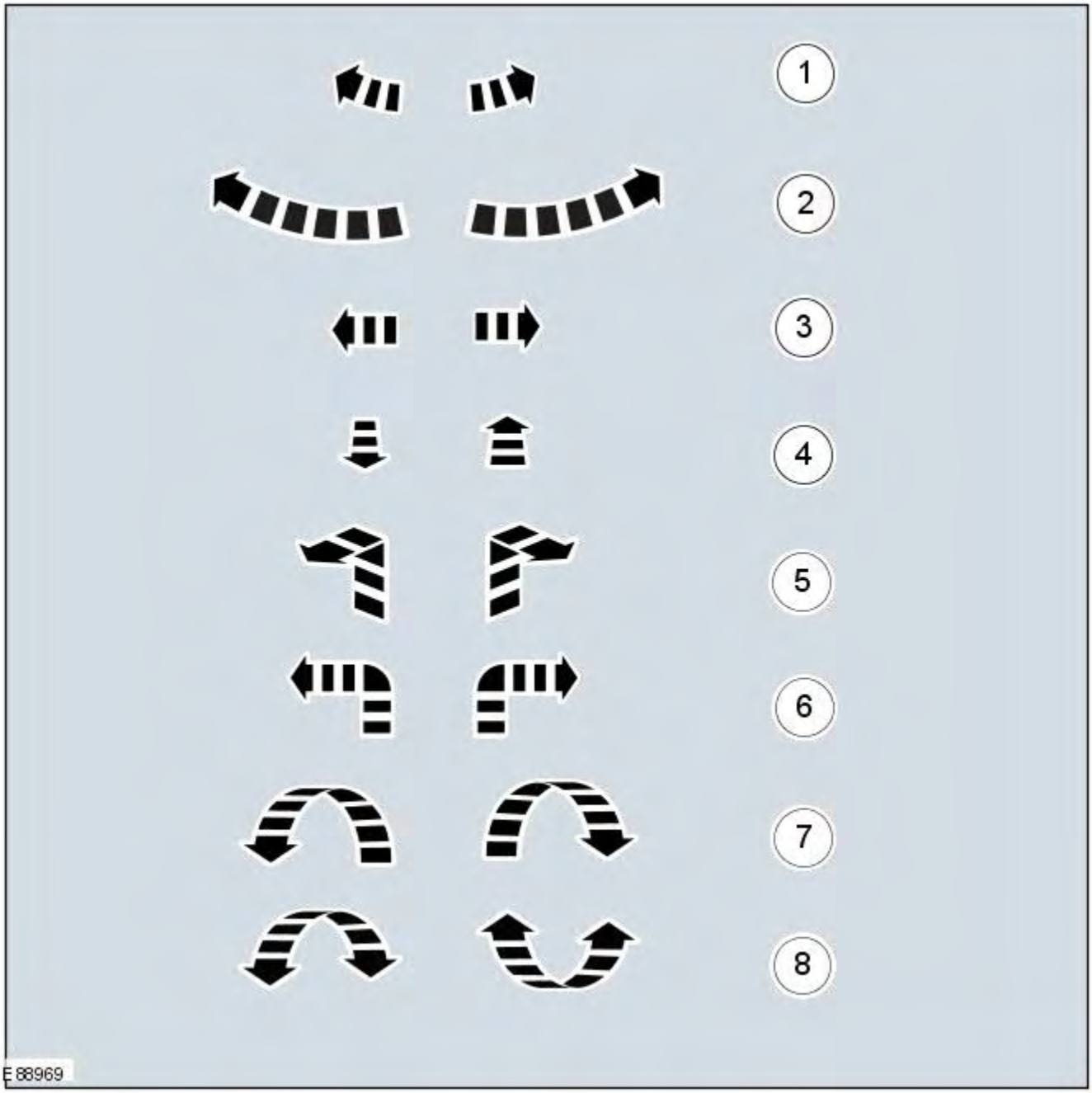
General Information - Symbols Glossary

Description and Operation

Symbols are used inside the graphics and in the text area to enhance the information display.

Movement Symbols

Movement symbols provide detailed information to a required component movement. These component movements can be rotational or 1-3 dimensional movements.

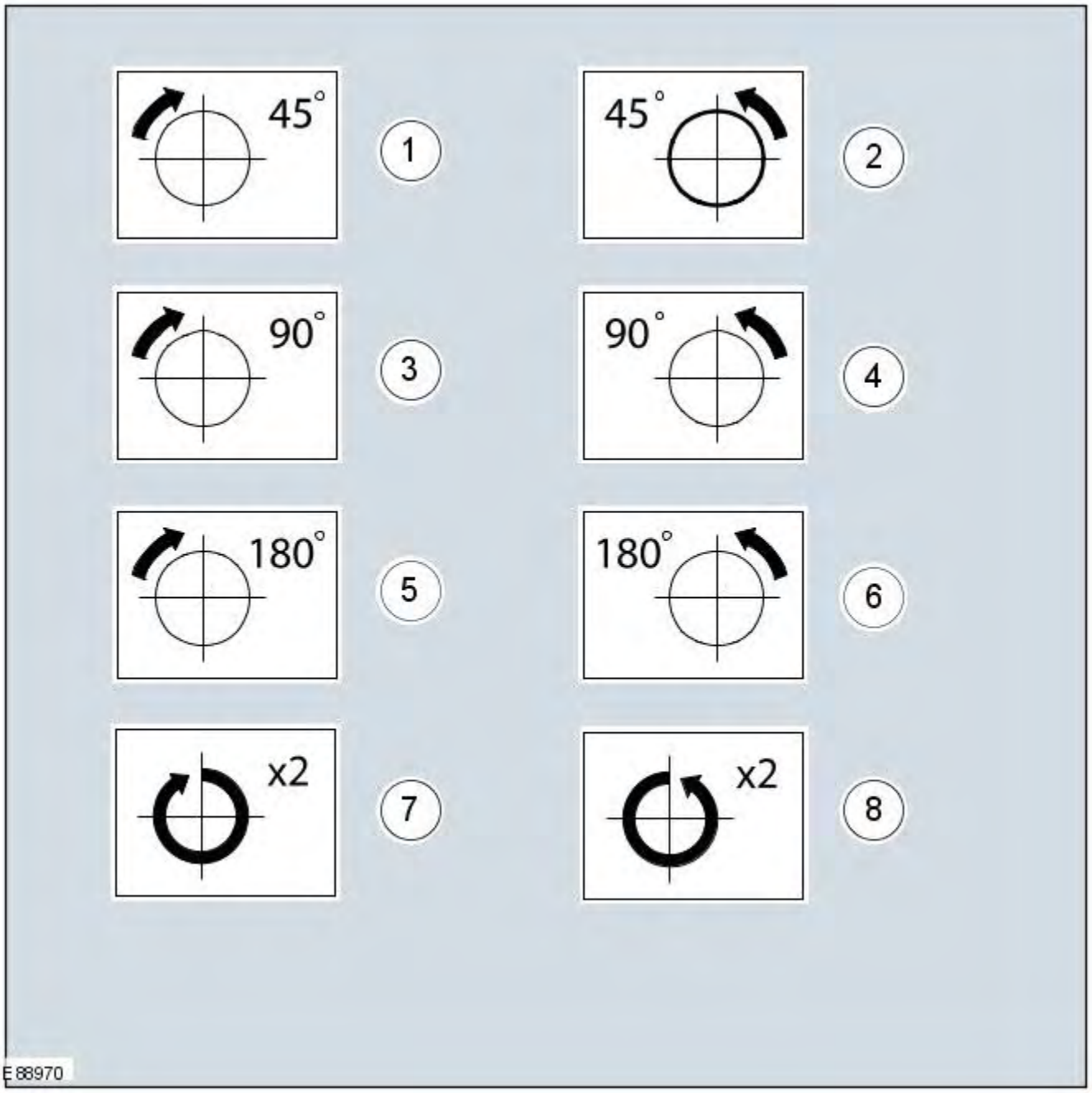


Item	Part Number	Description
1	-	Minor component movement clockwise/counterclockwise
2	-	Major component movement clockwise/counterclockwise
3	-	Component movement to the left/right/up/down
4	-	Component movement towards/away
5	-	3 dimensional component movement
6	-	2 dimensional component movement

7		3 dimensional component rotation
8		3 dimensional component cycling

Turn Symbols

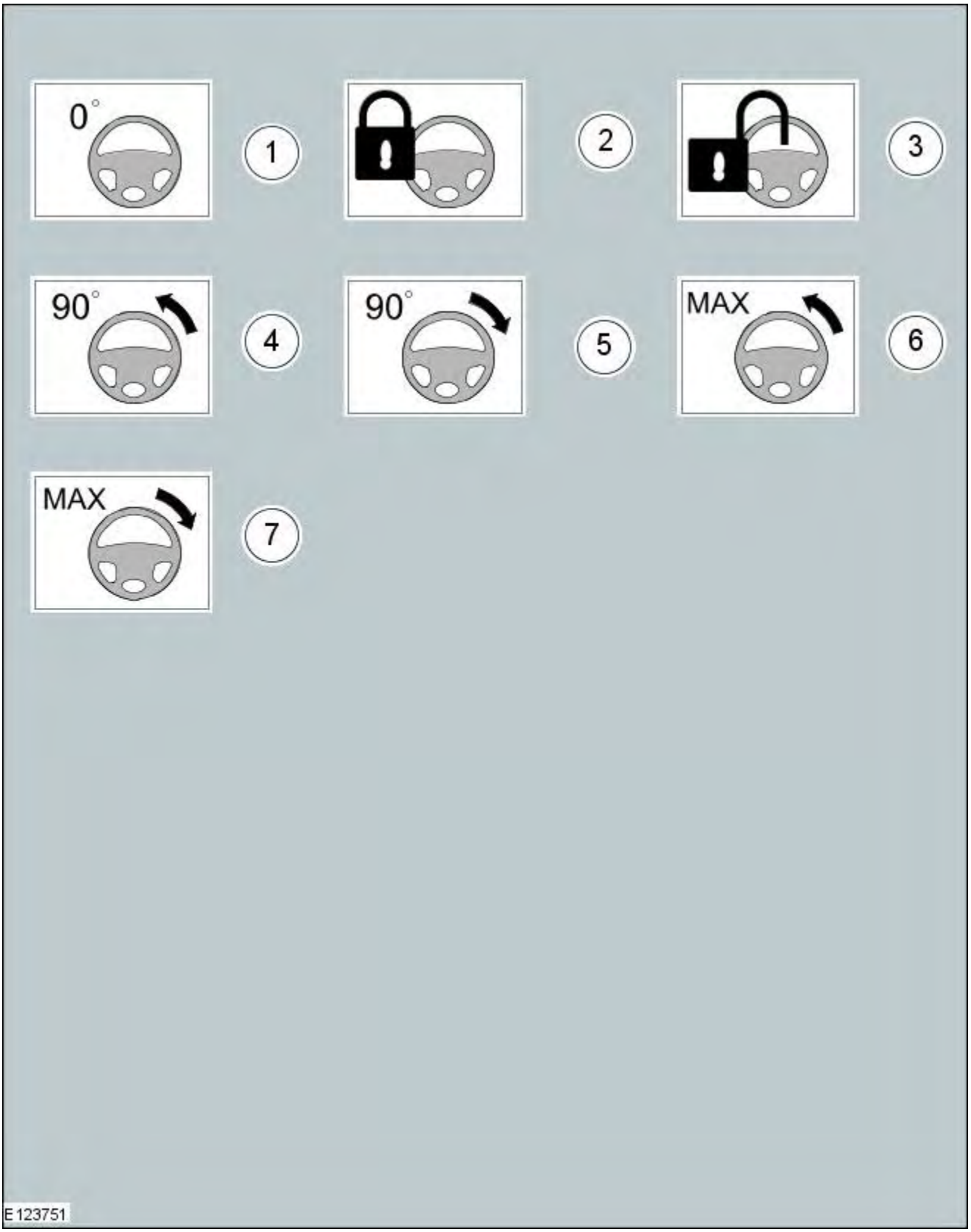
Turn symbols are used to provide further information on the direction or angle of component turns.



Item		Description
1		Turn the component clockwise through 45°
2		Turn the component counterclockwise through 45°
3		Turn the component clockwise through 90°
4		Turn the component counterclockwise through 90°
5		Turn the component clockwise through 180°
6		Turn the component counterclockwise through 180°
7		Turn the component clockwise through 2 complete turns
8		Turn the component counterclockwise through 2 complete turns

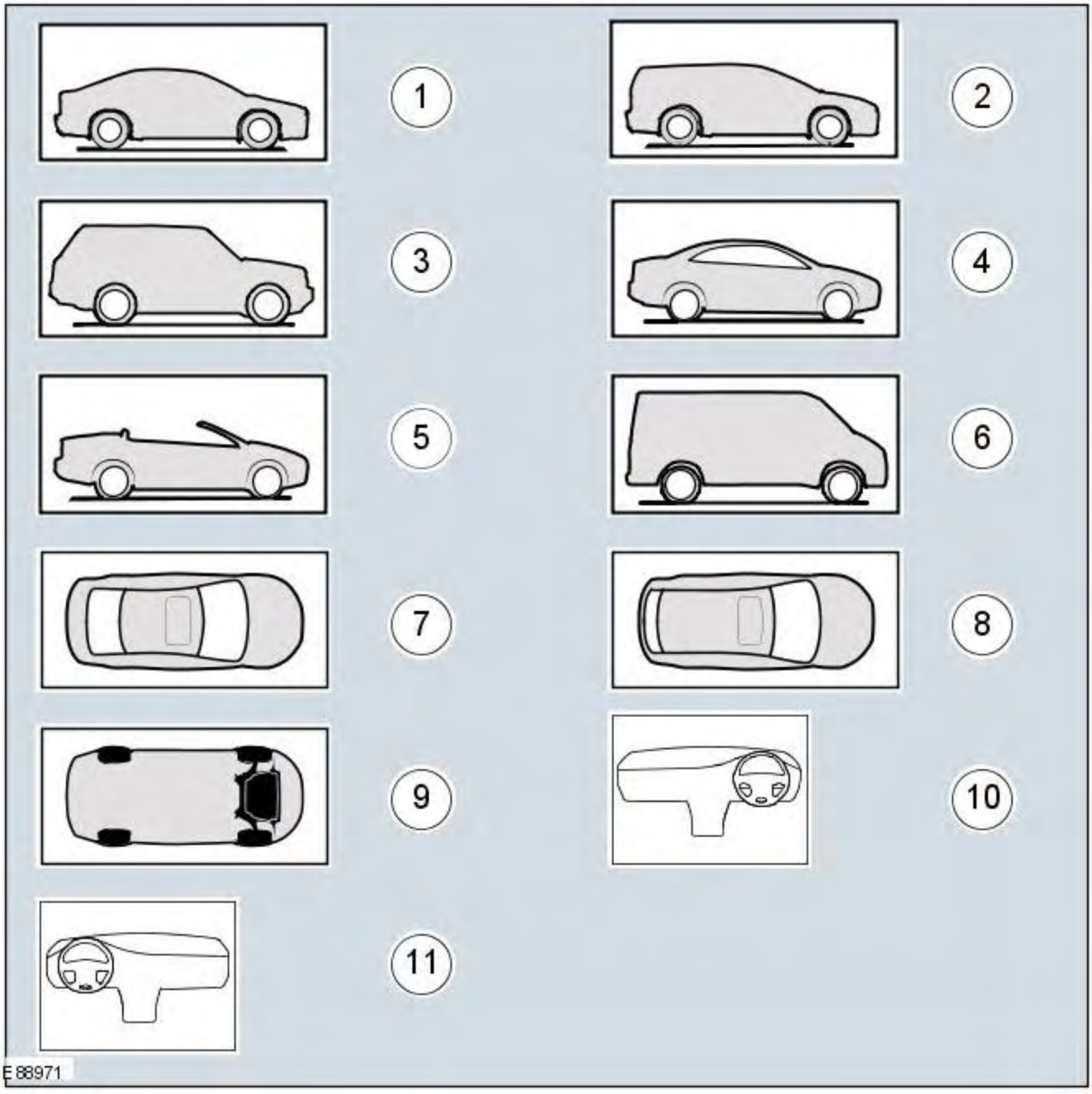
Steering Wheel Symbols

Steering wheel symbols are used to provide further information to a required steering wheel position or steering column lock status.



Item		Description
1		Steering wheel in straight ahead position
2		Steering column lock locked
3		Steering column lock unlocked

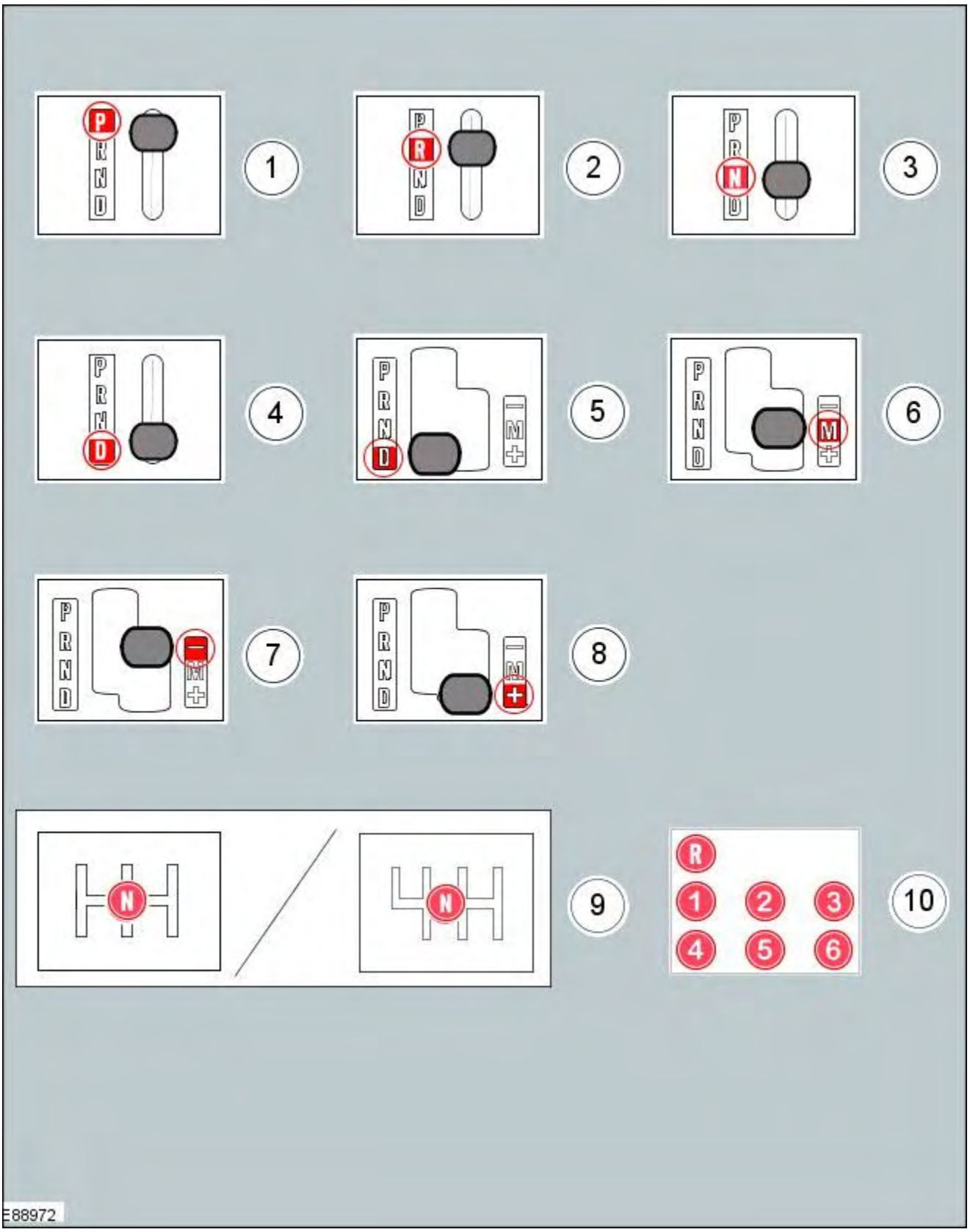
4		Turn the steering wheel to the 90° left position
5		Turn the steering wheel to the 90° right position
6		Turn the steering wheel to the left-hand end position
7		Turn the steering wheel to the right-hand end position



Item		Description
1		3, 4, 5-door body style
2		Wagon body style
3		Sports utility vehicle body style
4		Coupe body style
5		Convertible body style
6		Van body style
7		3, 4, 5-door body style - Top View
8		Wagon body style - Top View
9		Underview
10		Right-hand drive (RHD) vehicle
11		Left-hand drive (LHD) vehicle

Gearshift lever and selector lever position symbols

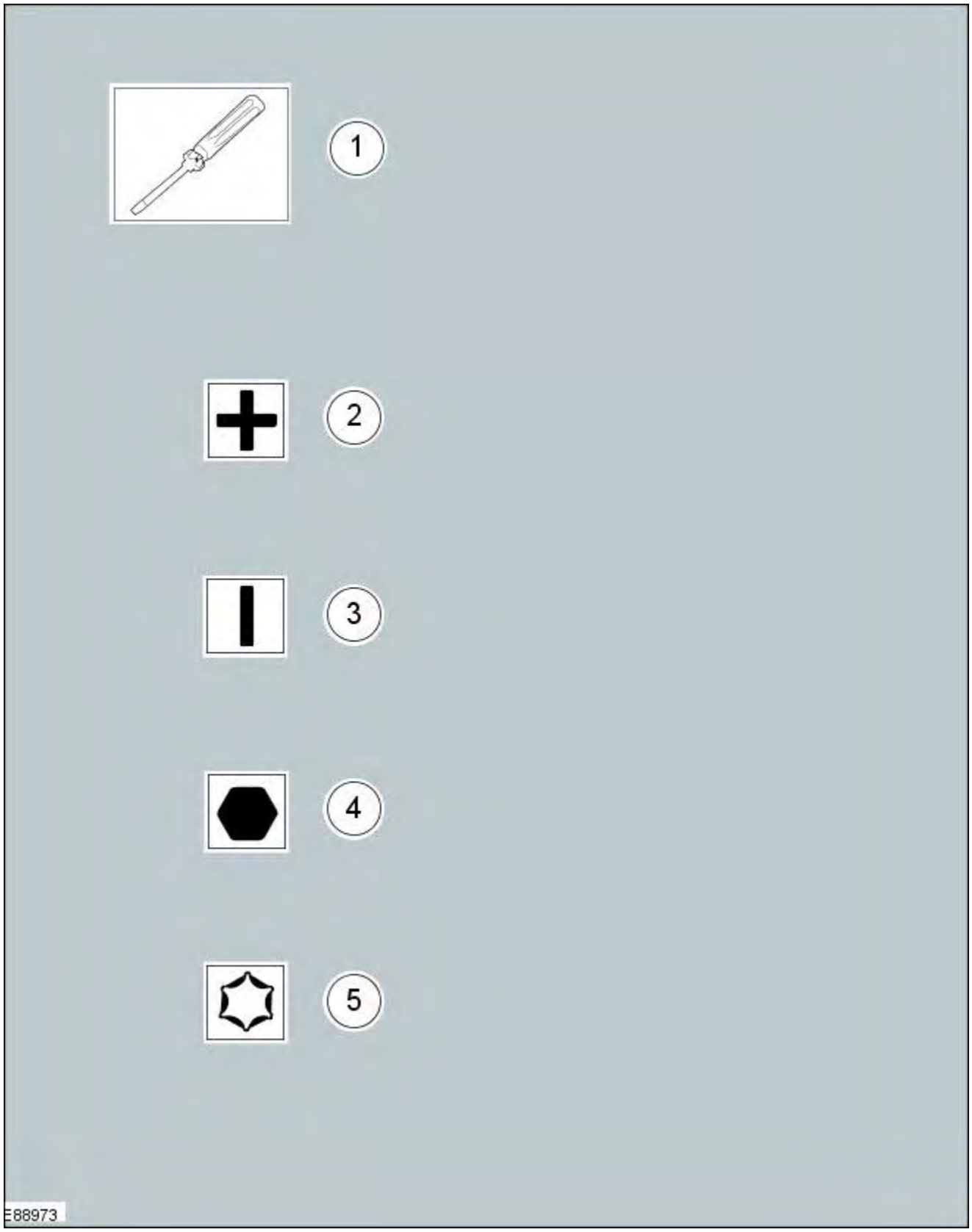
Gearshift lever and selector lever position symbols are used to show the lever position that is required to be selected to carry out a procedure step.



Item		Description
1		Set the selector lever to the park (P) position
2		Set the selector lever to the reverse ®) position
3		Set the selector lever to the neutral (N) position
4		Set the selector lever to the drive (D) position
5		Set the selector lever with manual shift pattern to the park (D) position
6		Set the selector lever with manual shift pattern to the manual (M) position
7		Set the selector lever with manual shift pattern to the shift down (-) position
8		Set the selector lever with manual shift pattern to the shift up (+) position
9		Set the gearshift lever to the neutral (N) position
10		Further gearshift lever positions that may appear in illustrations

Screwdriver symbols

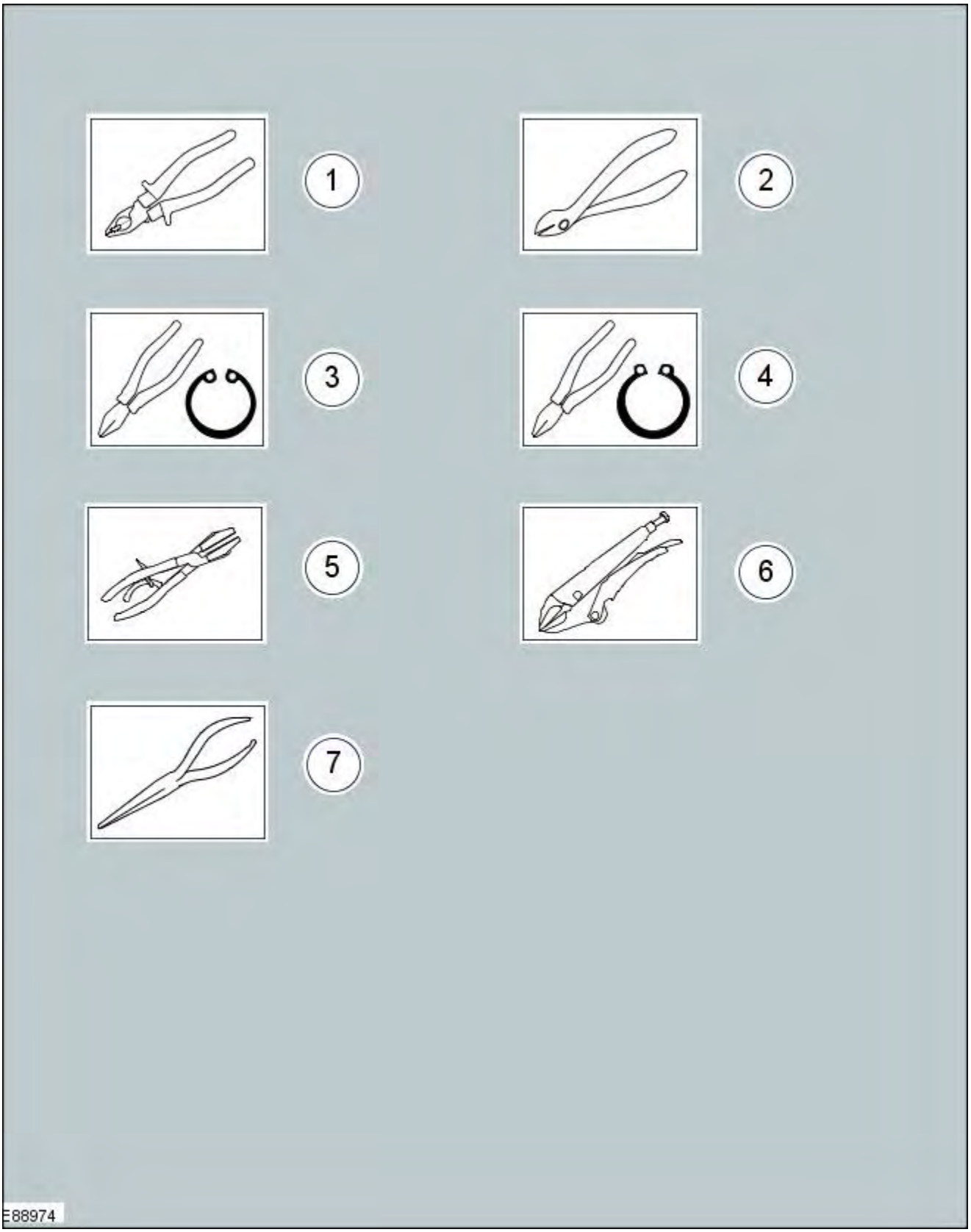
The screwdriver symbols are used to show which screwdriver bit is recommended to carry out a procedure step.



Item		Description
1		Screwdriver
2		Cross bladed screwdriver
3		Flat bladed screwdriver
4		Hexagonal screwdriver
5		TORX screwdriver

Pliers symbols

The pliers symbols are used to show which pliers is recommended to carry out a procedure step.

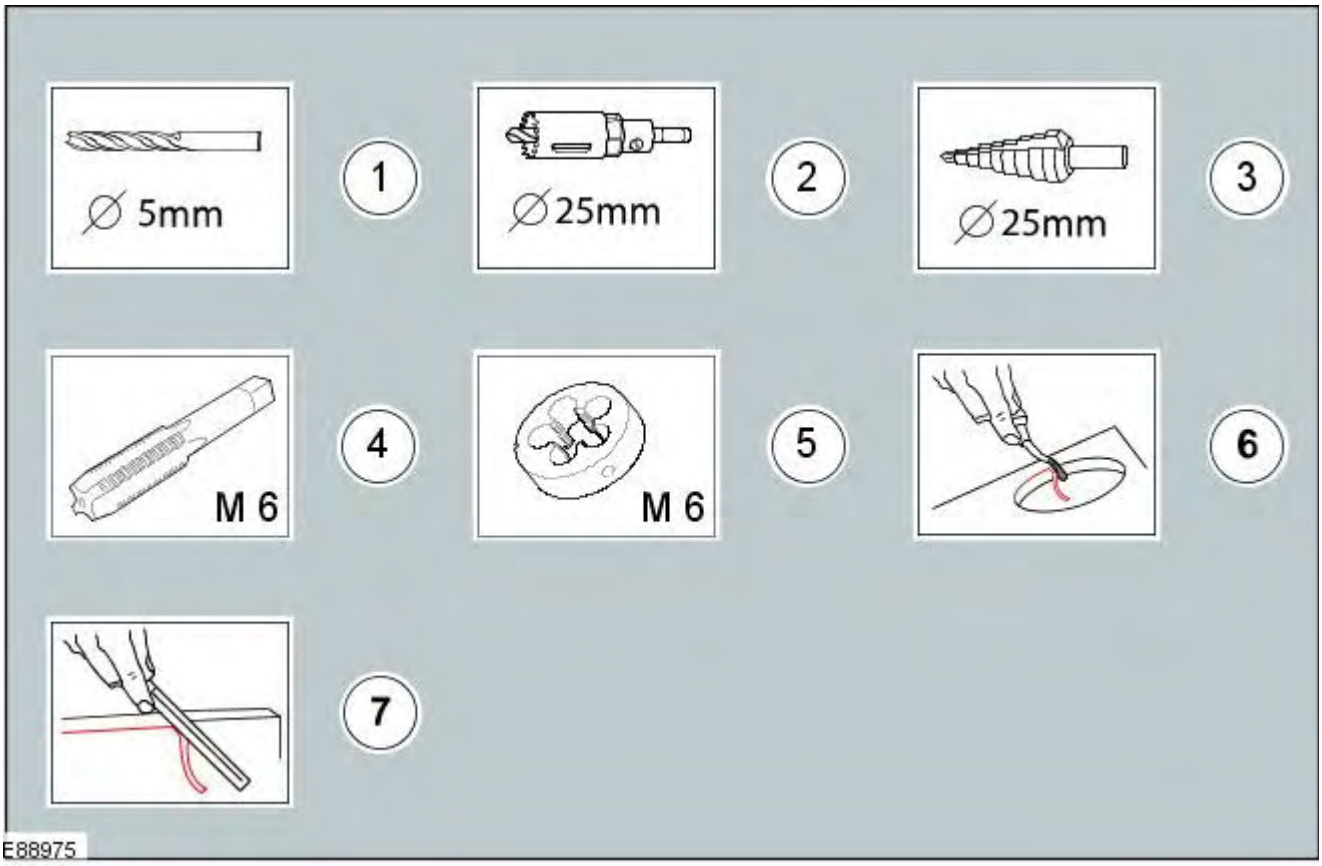


Item		Description
1		Combination pliers
2		Side cutter pliers

3		Securing ring pliers - inner
4		Securing ring pliers - outer
5		Hose clamp pliers
6		Locking pliers
7		Long nose pliers

Drill symbols

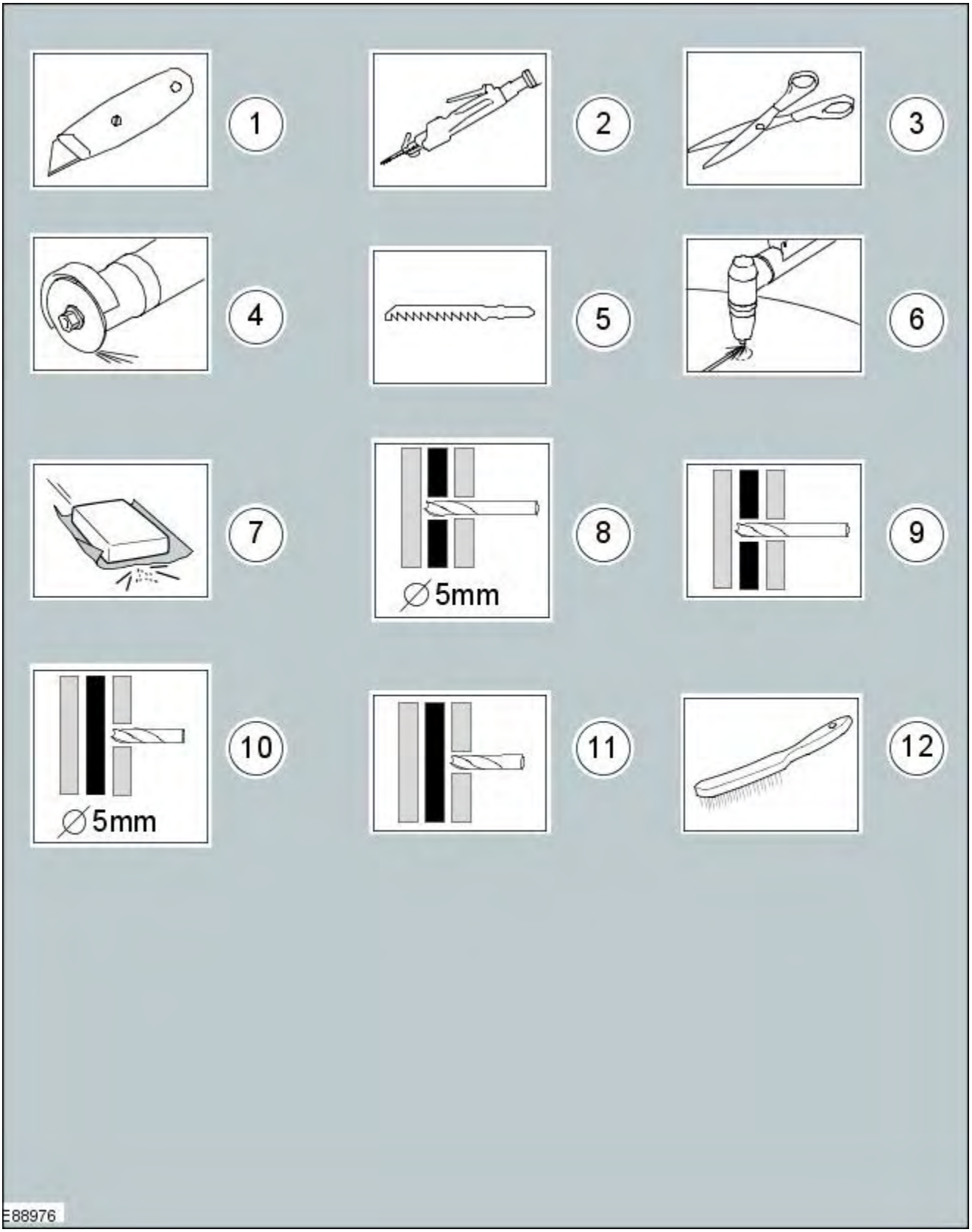
The drill symbols are used to show which type and size of drill bit is recommended to carry out a procedure step.



Item		Description
1		Drill bit with a specified diameter
2		Hole saw with a specified diameter
3		Stepped drill bit with a specified diameter
4		Tap with a specified diameter
5		Die with a specified diameter
6		Scraper for circular holes
7		Scraper for straight edges

Cutting tool symbols

The cutting tool symbols are used to show which type of cutting tool is recommended to carry out a procedure step.

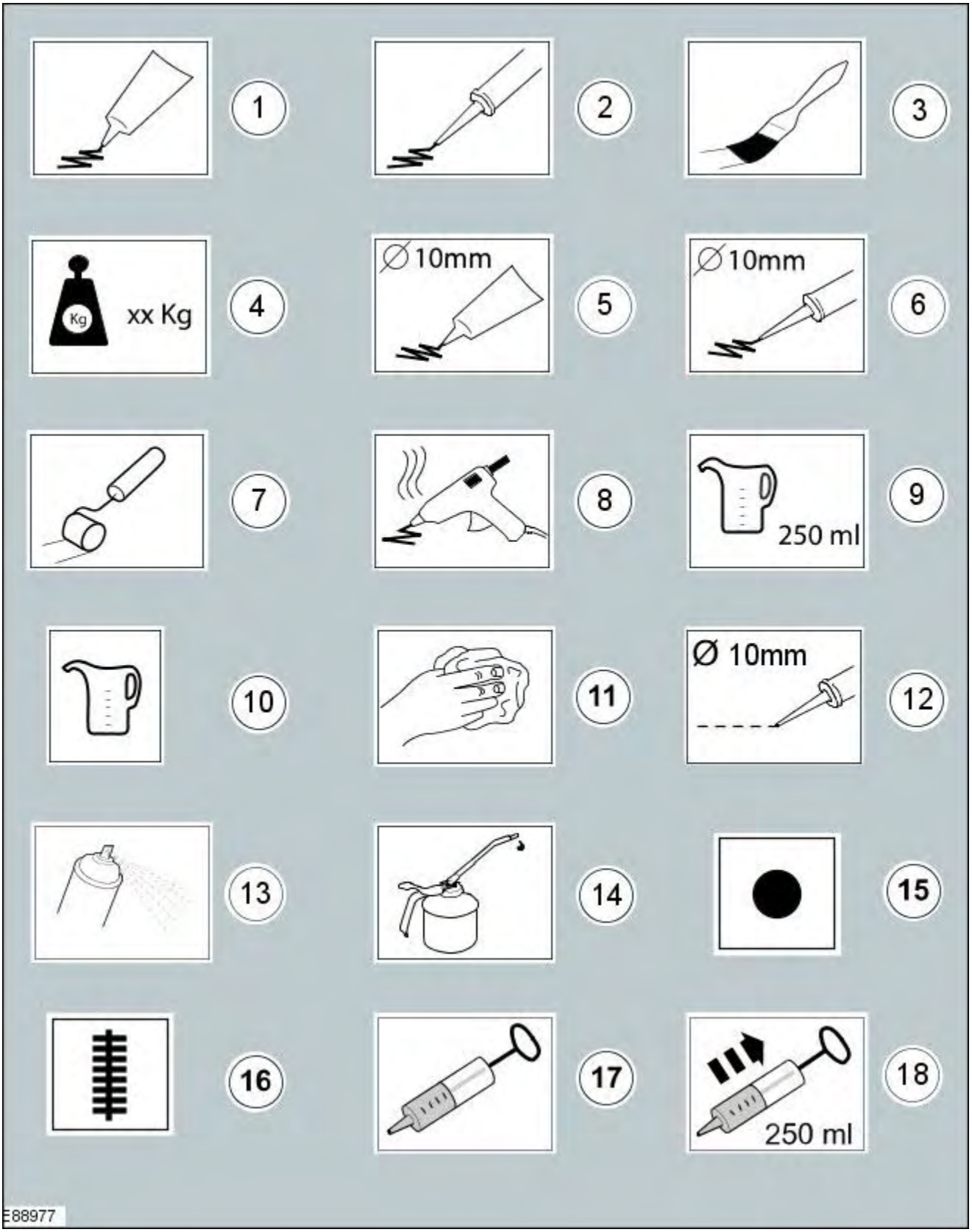


Item		Description
1		Cutting knife
2		Air body saw
3		Scissors
4		Grinder
5		Jig saw

6		Plasma cutter
7		Sanding Paper
8		Drill through the shown number of body panel layers with a specified diameter
9		Drill through the shown number of body panel layers with a suitable diameter
10		Drill through 1 body panel layer with a specified diameter
11		Drill through 1 body panel layer with a suitable diameter
12		Wire brush

Apply Chemical or load symbols

The apply chemical or load symbols are used to show where to apply which type of chemical or load to carry out a procedure step.

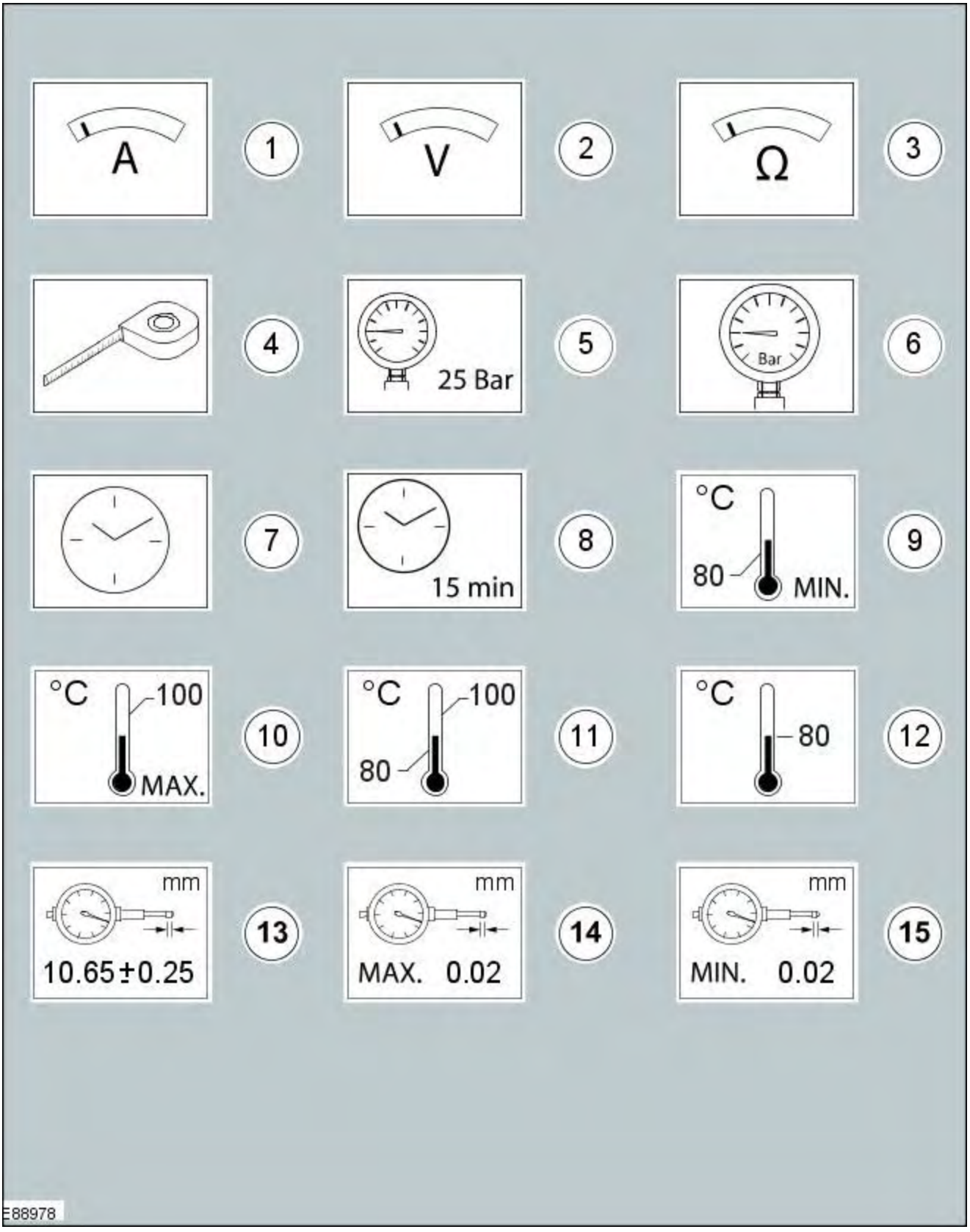


Item		Description
1		Apply a bead from the specified tube
2		Apply a bead from the specified cartridge
3		Apply the specified chemical with a brush
4		Apply the specified load to the specified component
5		Apply a bead with a specific diameter from the specified tube

6		Apply a bead with a specific diameter from the specified cartridge
7		Apply the specified chemical with a roller
8		Apply hot glue to the specified component
9		Apply the specified amount of fluid from the fluid can
10		Apply fluid from the fluid can
11		Clean the specified component with the specified material
12		Apply a broken bead from the specified tube
13		Apply the specified chemical from a spray can
14		Apply the specified lubricant to the specified component
15		Apply spot welds to the specified component
16		Apply a continuous weld to the specified component
17		Handle the fluid using a syringe
18		Extract the specified amount of fluid using a syringe

Measurement symbols

The measurement symbols are used to show where to measure which type of measurement to carry out a procedure step.

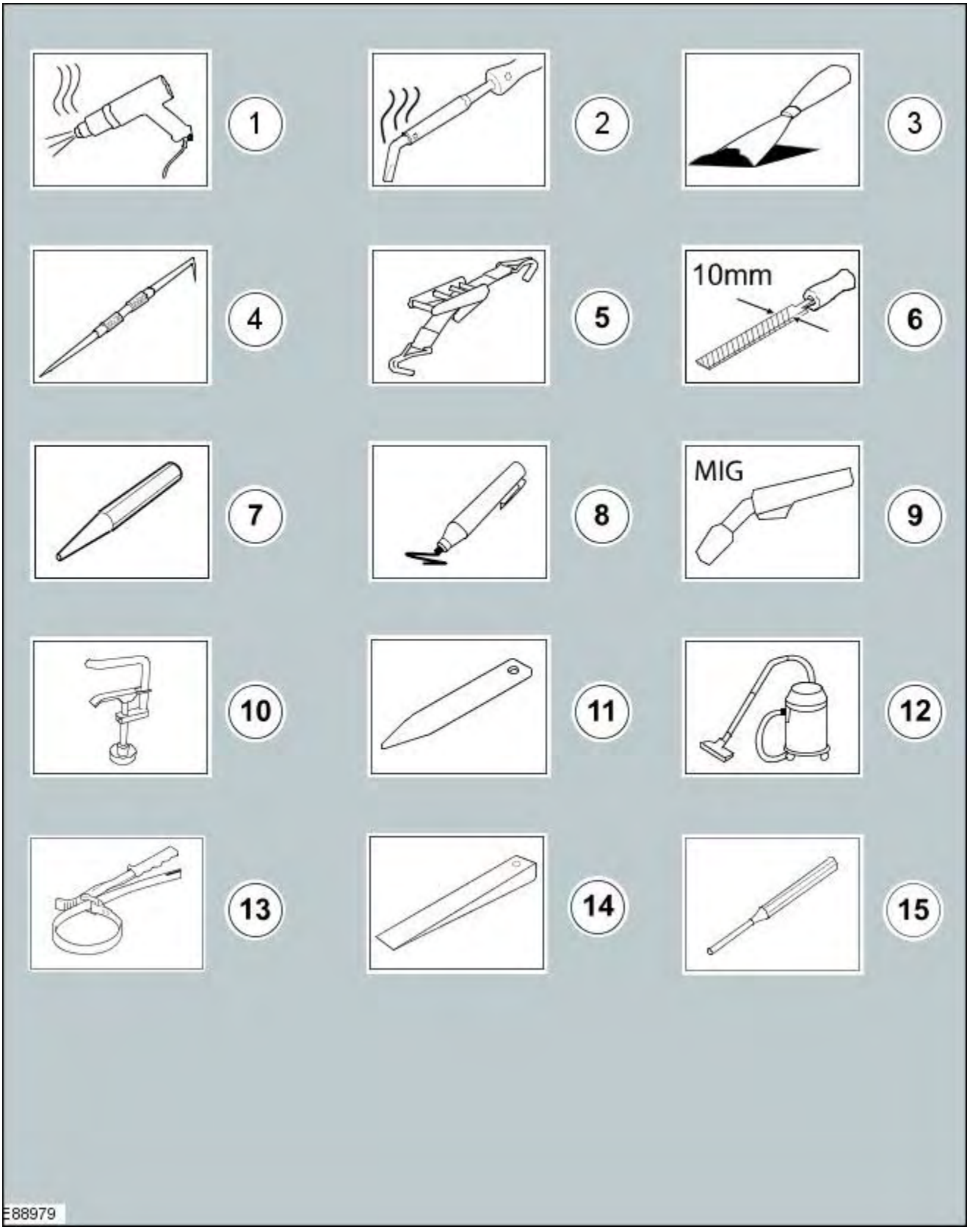


Item		Description
1		Measure the current using a digital multimeter
2		Measure the voltage using a digital multimeter
3		Measure the resistance using a digital multimeter
4		Measure the length/distance
5		Check that the specified pressure is available using a suitable pressure gauge

6		Measure the pressure at the specified port using a suitable pressure gauge
7		Measure the time using a suitable stopwatch
8		Wait for the specified period of time
9		The specified task requires the specified minimum temperature
10		The specified task requires the specified maximum temperature not to be exceeded
11		The specified task requires the specified temperature range
12		The specified task requires the specified temperature
13		Measure and check for the specified value using a dial indicator gauge
14		Measure and check for the specified MAX value using a dial indicator gauge
15		Measure and check for the specified MIN value using a dial indicator gauge

General equipment symbols

The general equipment symbols are used to show where to use which type of general equipment to carry out a procedure step.

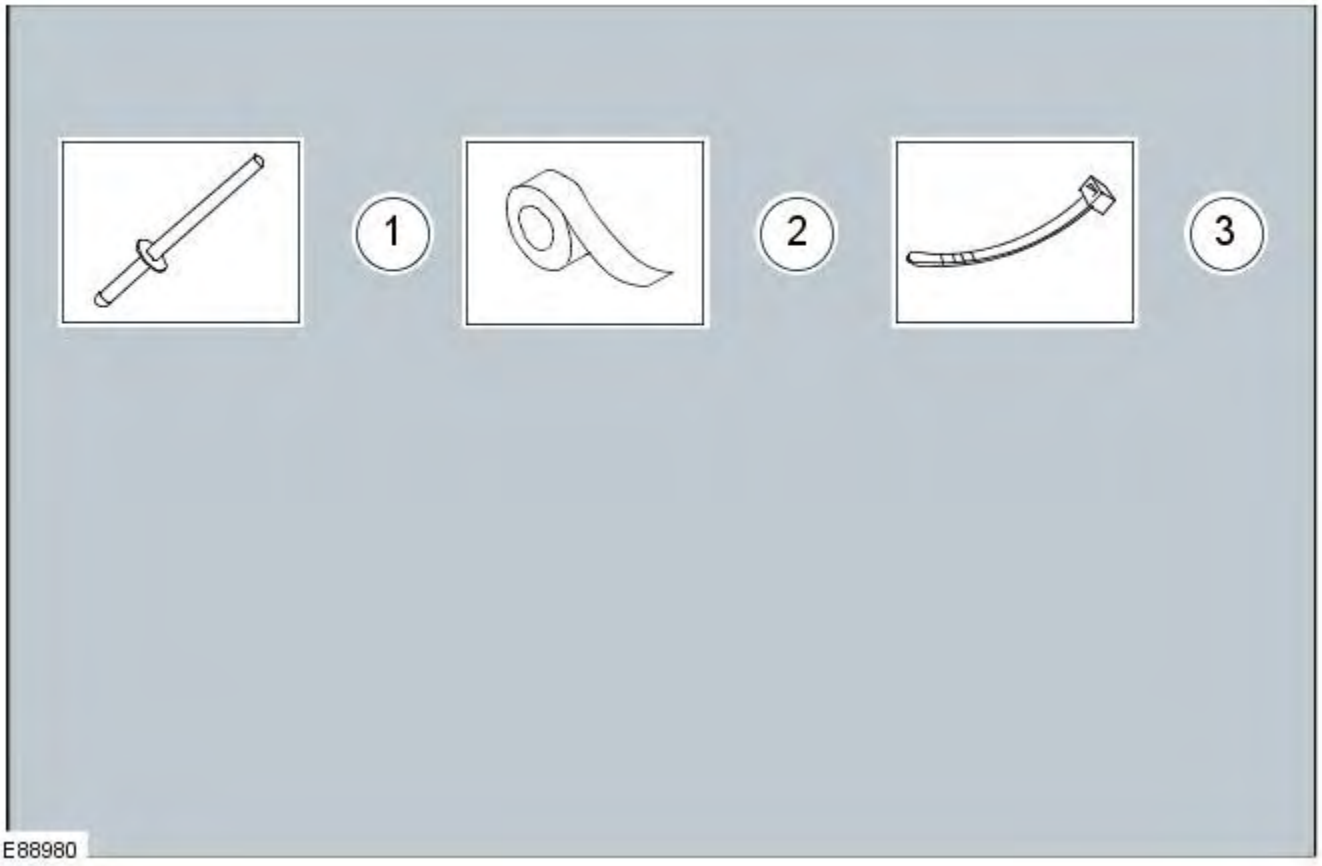


Item		Description
1		Hot air gun
2		Soldering iron
3		Scraper
4		Scriber
5		Securing strap

6		File with a specified size
7		Center punch
8		Marker
9		Metal inert gas (MIG) welding equipment
10		Hose clamp
11		Interior trim remover
12		Vacuum cleaner
13		Strap wrench
14		Wedge
15		Pin Punch

Material symbols

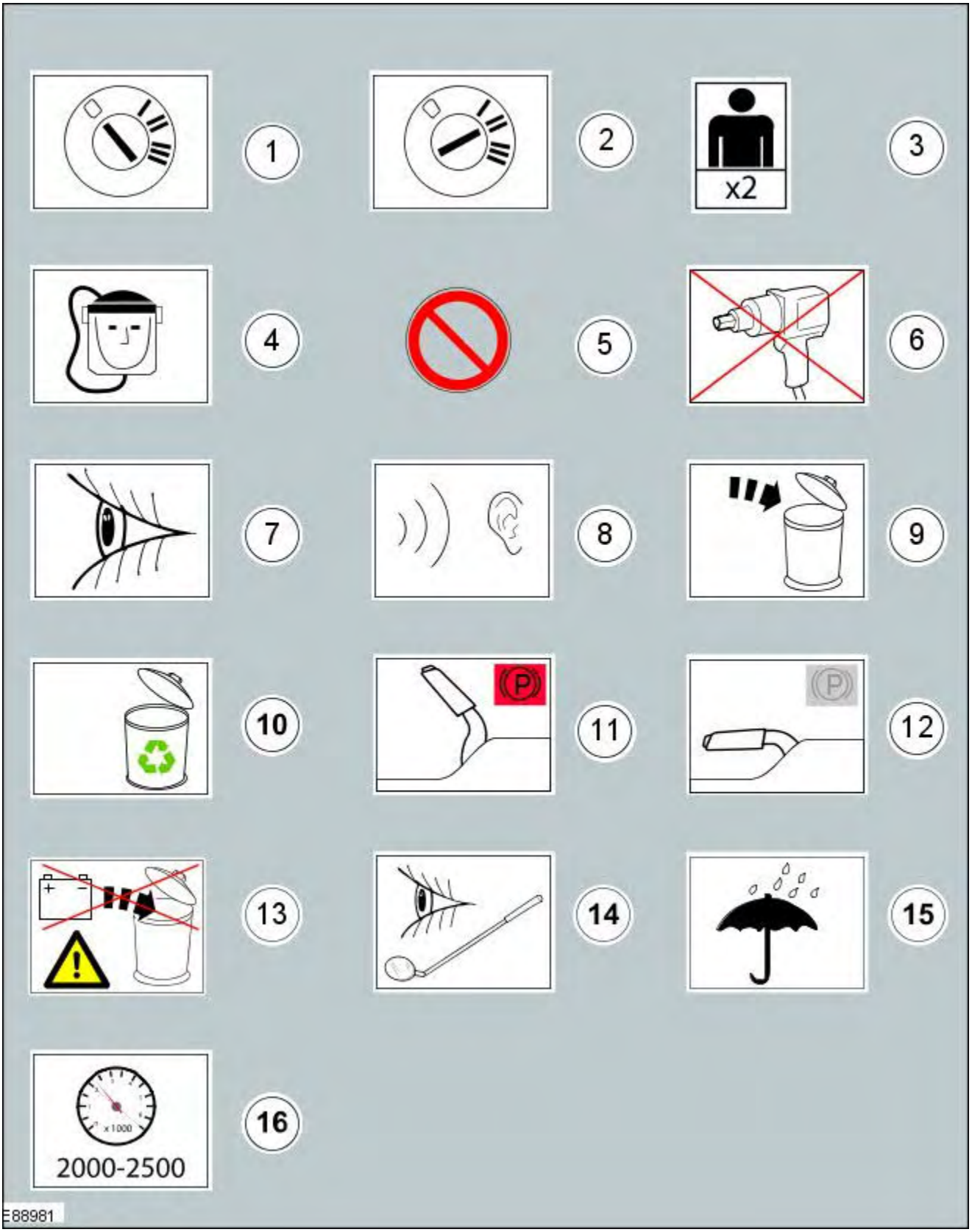
The material symbols are used to show where to use which type of material to carry out a procedure step.



Item		Description
1		Remove/Install the specified blind rivet
2		Apply tape to the specified component/area
3		Remove/Install the specified cable tie

Miscellaneous symbols

These symbols provide further information that is required to carry out a procedure step.

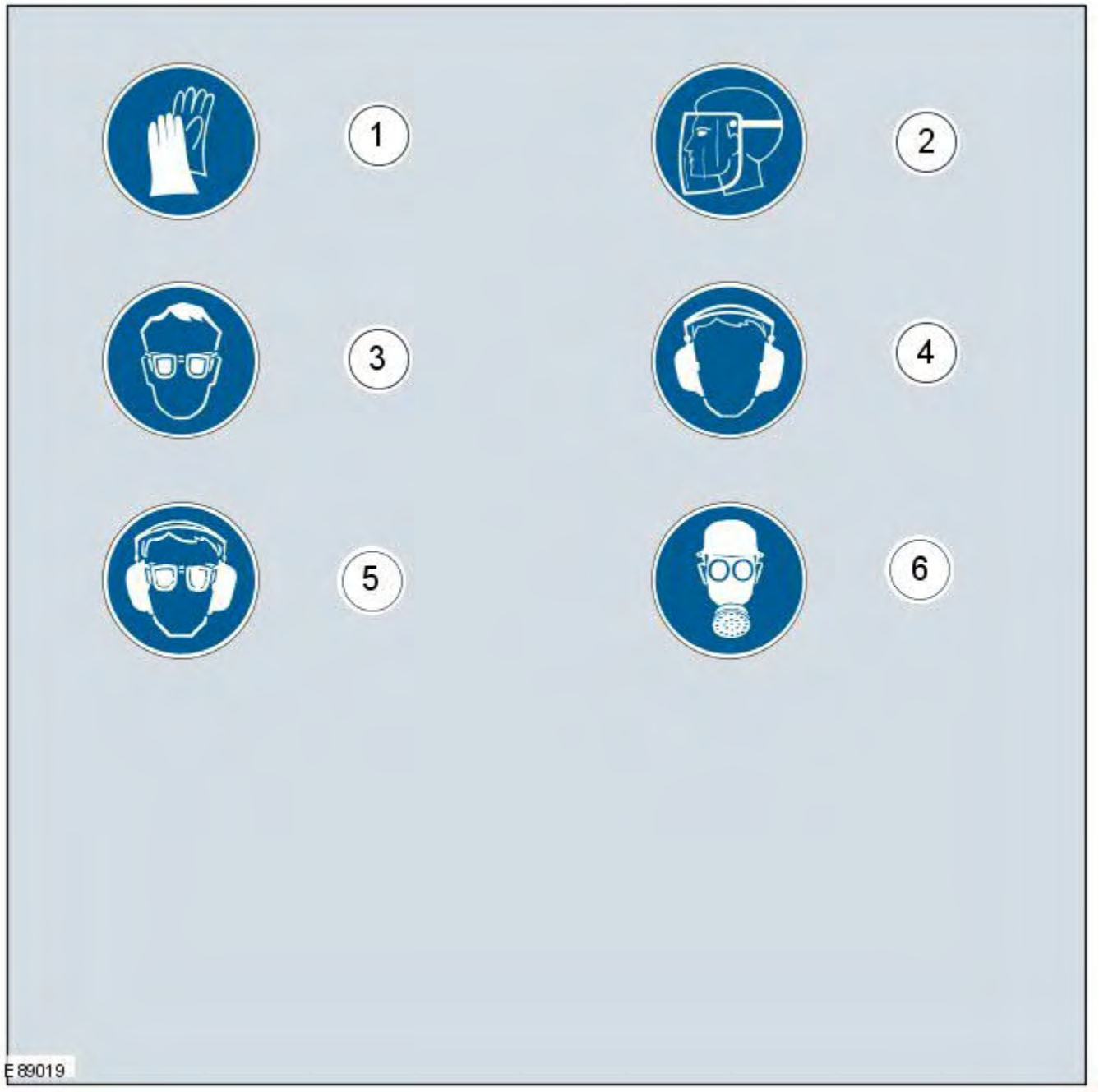


Item		Description
1		Set the ignition switch to the 0 position
2		Set the ignition switch to the II position
3		The procedure step requires the aid of the specified number of supporting technicians
4		Self contained breathing apparatus
5		General prohibition used in combination with another symbol

6		Do not use power tools
7		Visual check
8		Noise check
9		Dispose the specified component
10		Replaced by item 9 (Dispose the specified component)
11		Set the engine speed to the specified value
12		Fully apply the parking brake lever
13		Fully release the parking brake lever
14		Do not dispose of batteries into the waste bin
15		Visual check using a mirror
16		Area/component must be dry

Mandatory Protective equipment - Health and safety symbols

The protective equipment symbols advise to use a mandatory protective equipment to avoid or at least reduce possible health and safety risks.



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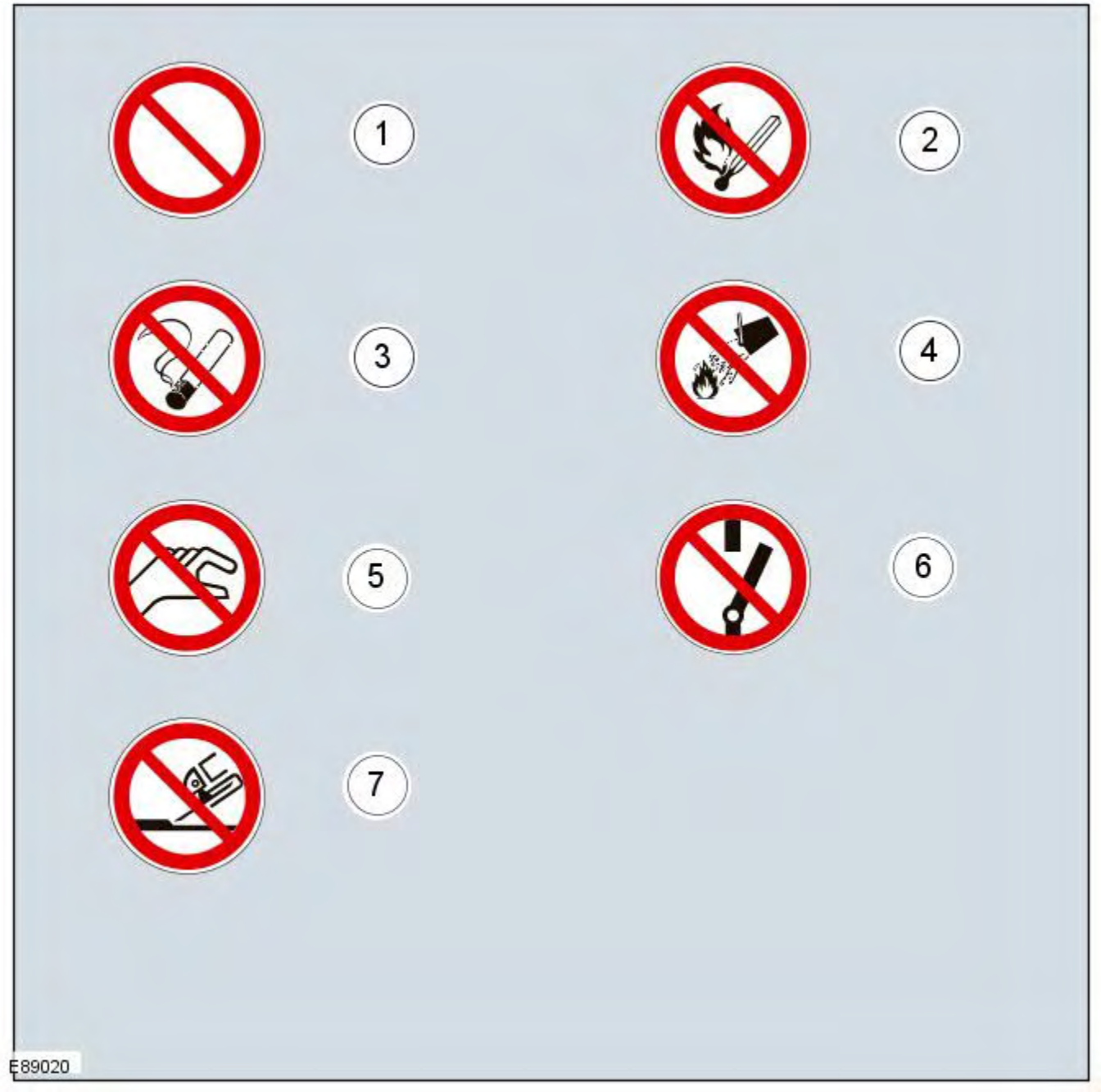
Item		Description
1		Wear protective gloves
2		Wear face guard
3		Wear safety goggles
4		Wear ear protectors
5		Wear safety goggles and ear protectors
6		Wear a respirator

Prohibition - Health and safety symbols and component damage

The prohibition symbols are used to prohibit the specified actions to avoid or at least reduce possible component damage and health and safety risks.

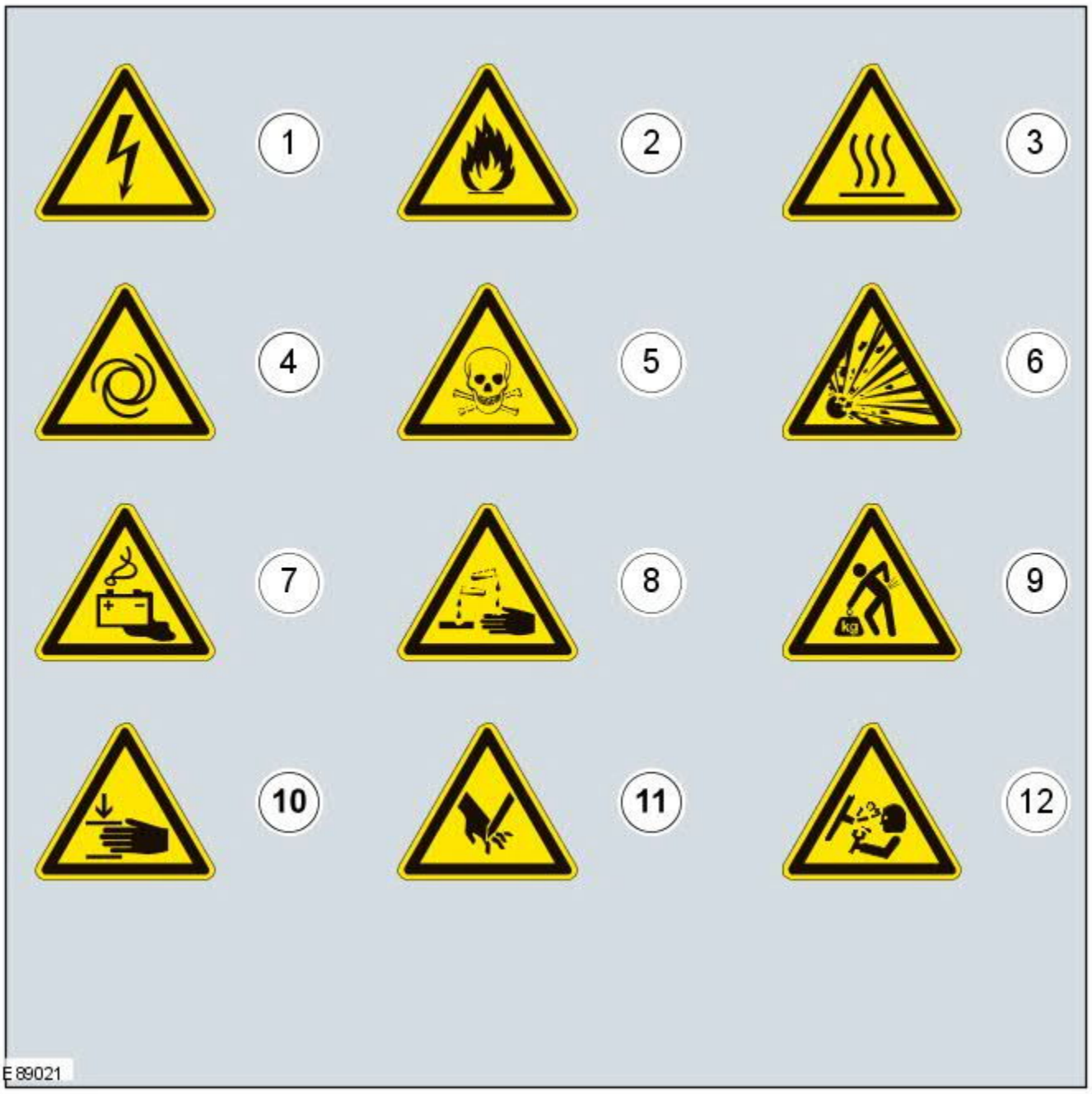


Item		Description
1		General prohibition symbol
2		No naked flames
3		No smoking
4		No water
5		Do not touch

6		Do not switch
7		No grinding

Warning symbols - Health and safety and component damage

The warning symbols are used to advise on hazardous conditions to avoid or at least reduce possible component damage and health and safety risks.

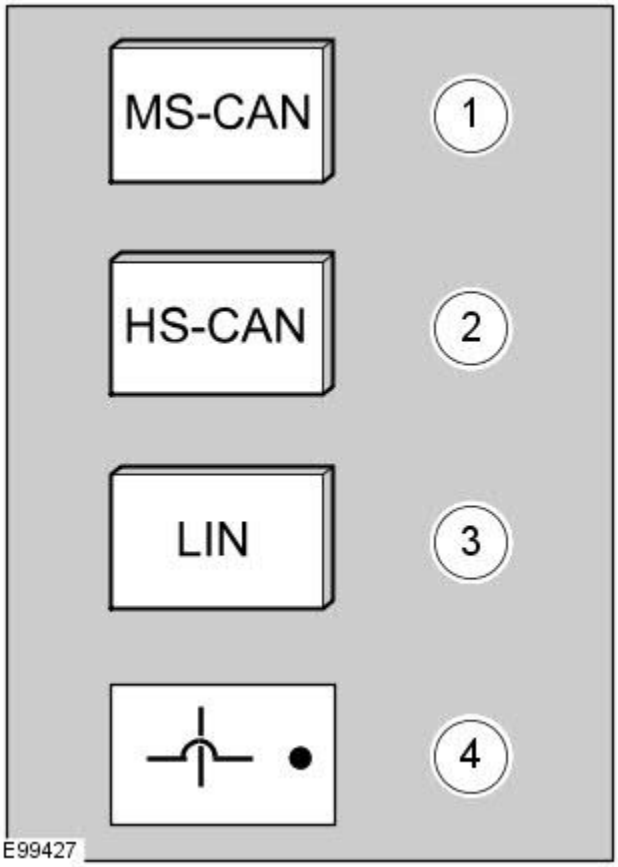


Item		Description
1		Hazardous voltage/Electrical shock/Electrocution
2		Fire Hazard/Highly flammable
3		Burn hazard/Hot surface
4		Automatic start-up
5		Toxic
6		Explosive material
7		Battery hazard
8		Corrosive material
9		Lifting hazard

10		Hand crush/Force from above
11		Cutting of fingers or hand
12		Pressure hazard

Control Diagram symbols - Description and Operation procedures

These symbols provide further information on the type of connectivity, direction of flow or type of data bus of a system.



Item		Description
1		Mid-speed Controller Area Network (CAN)
2		High-speed Controller Area Network (CAN)
3		Local Interconnect Network (LIN)
4		Wires crossing not connected

Published: 11-May-2011

General Information - Supplemental Restraint System (SRS) Health and Safety Precautions

Description and Operation

WARNINGS:

Only qualified technicians are allowed to work on pyrotechnic components.

INHALED: Exposure to pyrotechnic residue may cause low blood pressure, severe headache, irritation of mucous membranes, fainting, shortness of breath or rapid pulse. Move a victim to fresh air. Seek immediate medical attention.

EYE CONTACT: Exposure to unburned pyrotechnic residue may cause irritation, burning and etching of the eyes. Flush immediately with plenty of cold running water for at least 15 minutes. Seek immediate medical attention.

EYE CONTACT: Exposure to burned pyrotechnic residue may cause irritation, burning and etching of the eyes. Flush immediately with diluted boric acid solution. Seek immediate medical attention.

SKIN CONTACT: Unburned pyrotechnic residue may be rapidly absorbed through the skin in toxic quantities. Wash immediately with plenty of soap and water. Seek medical attention.

SKIN CONTACT: Burned pyrotechnic residue may be rapidly absorbed through the skin in toxic quantities. Wash with plenty of water. Do not use soap. Seek medical attention.

SWALLOWED: Unburned pyrotechnic residue is extremely toxic. If conscious drink plenty of water then induce vomiting. Seek immediate medical attention. If unconscious, or in convulsions do not attempt to induce vomiting or give anything by mouth. Seek immediate medical attention.

SWALLOWED: Burned pyrotechnic residue is extremely toxic. Drink plenty of water and seek immediate medical attention.

The deployment key must only be accessible to authorized personnel.

Make sure that the deployment key remains removed from the deployment equipment except during deployment.

If permenantly disabling or enabling the passenger air bag a new seat belt for vehicles without or with a passenger air bag must be installed.

Undeployed pyrotechnic components must not be deployed in the vehicle.

Pyrotechnic components must be deployed following local regulations.

Check thoroughly that no loose objects can be spread during the deployment of pyrotechnic components.

Pyrotechnic components must be transported following local regulations.

Never carry out any electrical measurement on disconnected, undeployed pyrotechnic components.

Pyrotechnic components must not be disassembled.

Pyrotechnic components are not interchangeable between vehicles.

Always carry a live air bag module away from the body with the air bag or trim cover pointing upwards.

Live air bag modules must be placed in a suitable cage when removed from the vehicle. The air bag or trim cover must be facing upwards.

Do not install a rearward facing child safety seat to the passenger seat with an activated passenger air bag.

CAUTIONS:

Pyrotechnic components must not be subjected to temperatures higher than 110°C.

Never install aftermarket accessories to the vehicle on or adjacent to the supplemental restraint system module.

Published: 11-May-2011

General Information - Road/Roller Testing

Description and Operation

Road or roller testing may be carried out for various reasons and a procedure detailing pre-test checks, through engine starting and stopping, pre-driving checks, on-test checks to final checks on completion of the test is given in this section.

Unless complete vehicle performance is being checked, the full road test procedure need not be carried out. Instead, those items particularly relevant to the system/s being checked can be extracted.

Pre - Test Checks

WARNING: If the brake system hydraulic fluid level is low, pedal travel is excessive or a hydraulic leak is found, do not attempt to road test the vehicle until the reason for the low fluid level, excessive pedal travel or hydraulic leak is found and rectified.

It is suggested that pre-test checks, and functional tests of those systems/circuits which affect the safe and legal operations of the vehicle, such as brakes, lights and steering, should always be carried out before the road or roller test.

- Engine oil level
- Engine coolant level
- Tires, for correct pressure, compatible types and tread patterns, and wear within limits
- There is sufficient fuel in the tank to complete the test
- All around the engine, transmission and under the vehicle for oil, coolant, hydraulic and fuel leaks. Make a note of any apparent leaks and wipe off the surrounding areas to make it easier to identify the extent of the leak on completion of the test

Starting the Engine

CAUTION: On initial drive away from cold and within the first 1.5 km (1 mile), do not depress accelerator pedal beyond half travel until the vehicle has attained a minimum speed of 25 km/h (15 miles/h). Never operate at high engine speed or with the accelerator pedal at full travel whilst the engine is cold.

With the ignition switched off, check:

- The parking brake is applied
- The transmission selector lever is in Park
- All instrument gauges (except fuel gauge) read zero

With the ignition switched on, check:

- Ignition controlled warning lamps come on
- Engine coolant temperature gauge registers a reading compatible with the engine coolant temperature
- Fuel gauge registers a reading appropriate to the fuel level in the tank
- The operation of the parking brake and brake fluid level warning lamps

On Road or Roller Test Check:

CAUTION: If road testing, check the brake operation while still travelling at low speed before continuing with the test. If the brakes pull to one side, or appear to be otherwise faulty, do not continue with the road test until the fault has been found and rectified.

- Initial gear engagement is smooth
- Parking brake control operates smoothly and the parking brake releases quickly and completely
- Transmission takes up the drive smoothly, without judder
- The engine power output is satisfactory, full power is achieved, acceleration is smooth and pedal operation not stiff or heavy, and engine speed returns to idle correctly
- There is no excessive or abnormally colored smoke from the engine under normal driving, heavy load or overrun conditions
- Steering operation, including power steering, is smooth, accurate, not excessively heavy or with excessive free play or vibration. Does not pull to one side and self centres smoothly after cornering
- Speedometer, oil pressure warning lamp, coolant temperature gauge and tachometer register the correct readings or operate correctly
- Switches and controls operate smoothly and positively, warning lamps operate correctly and the direction indicator control self cancels when the steering is returned to the straight ahead position
- Heating and ventilation systems work correctly and effectively
- Brake operation and efficiency

Brake Testing

WARNING: When brake testing, avoid breathing the smoke or fumes from hot brakes, this may contain asbestos dust which is hazardous to health, see Health and Safety Precautions.

Avoid brake testing on busy roads where it can cause inconvenience or danger to other road users.

CAUTION: Brake testing which includes heavy brake applications should not be carried out with new brake pads/discs or linings/drums until the components have bedded-in. New brake friction components will not reach full efficiency until the bedding-in process is complete.

Test the brakes at several speeds within the normal operating range using both light and heavy pedal pressure. Note any tendency to snatch, pull or drag, and any undue delay in application or release.

Allow the vehicle to coast and note any tendency to pull to one side, or evidence that the brakes are binding.

After stopping the vehicle (not immediately after a period of heavy braking), carefully check the brake temperature. A disc which feels hot, or appreciably hotter than the others, indicates that the brake is binding.

After completion of the test, check for:

- Oil, coolant, hydraulic, air and fuel leaks
- Abnormal temperature of any moving components or assemblies, e.g. wheel hubs, transmission, axle etc., which might indicate over tightness or lack of lubrication

Published: 11-May-2011

General Information - Window Glass Health and Safety Precautions

Description and Operation

WARNINGS:

Cured polyurethane (PU) adhesive can degrade if subjected to high temperatures. Isocyanide compounds can be released when grinding or welding in close proximity to cured PU adhesive.

SKIN CONTACT: Prolonged exposure to polyurethane (PU) adhesive may cause skin irritation. If PU adhesive comes into contact with the skin, remove any contaminated clothing. Immediately wash the skin with soap and water. Seek medical attention for any persistent skin irritation or abnormality.

EYE CONTACT: Polyurethane (PU) adhesive may cause severe irritation or damage. If PU adhesive comes into contact with the eyes, immediately flush eyes with plenty of running water for at least 15 minutes. Seek immediate medical attention.

SWALLOWED: If polyurethane (PU) adhesive is swallowed, flush the mouth thoroughly. Do not induce vomiting. Provide rest, warmth and fresh air. Seek immediate medical attention.

INHALED: Persons having a respiratory allergy may have an allergic reaction when handling polyurethane (PU) adhesive.

INHALED: Polyurethane (PU) adhesive can cause asthma like symptoms. Isocyanate vapor from primer or PU adhesive can cause allergies in the respiratory tract.

INHALED: If polyurethane (PU) adhesive fumes are inhaled, move victim to fresh air. Provide oxygen if necessary. If breathing stops, provide artificial respiration. Keep a victim warm and at rest. Seek immediate medical attention.

CAUTIONS:

Make sure that the direct glazing for bonded glass cutting blades are changed where the cutting depth changes to avoid damage to the body and trim panels.

During the curing period of the PU adhesive, the door windows must be left open to avoid a build up of pressure when the doors are opened and closed.

Published: 31-Jul-2013

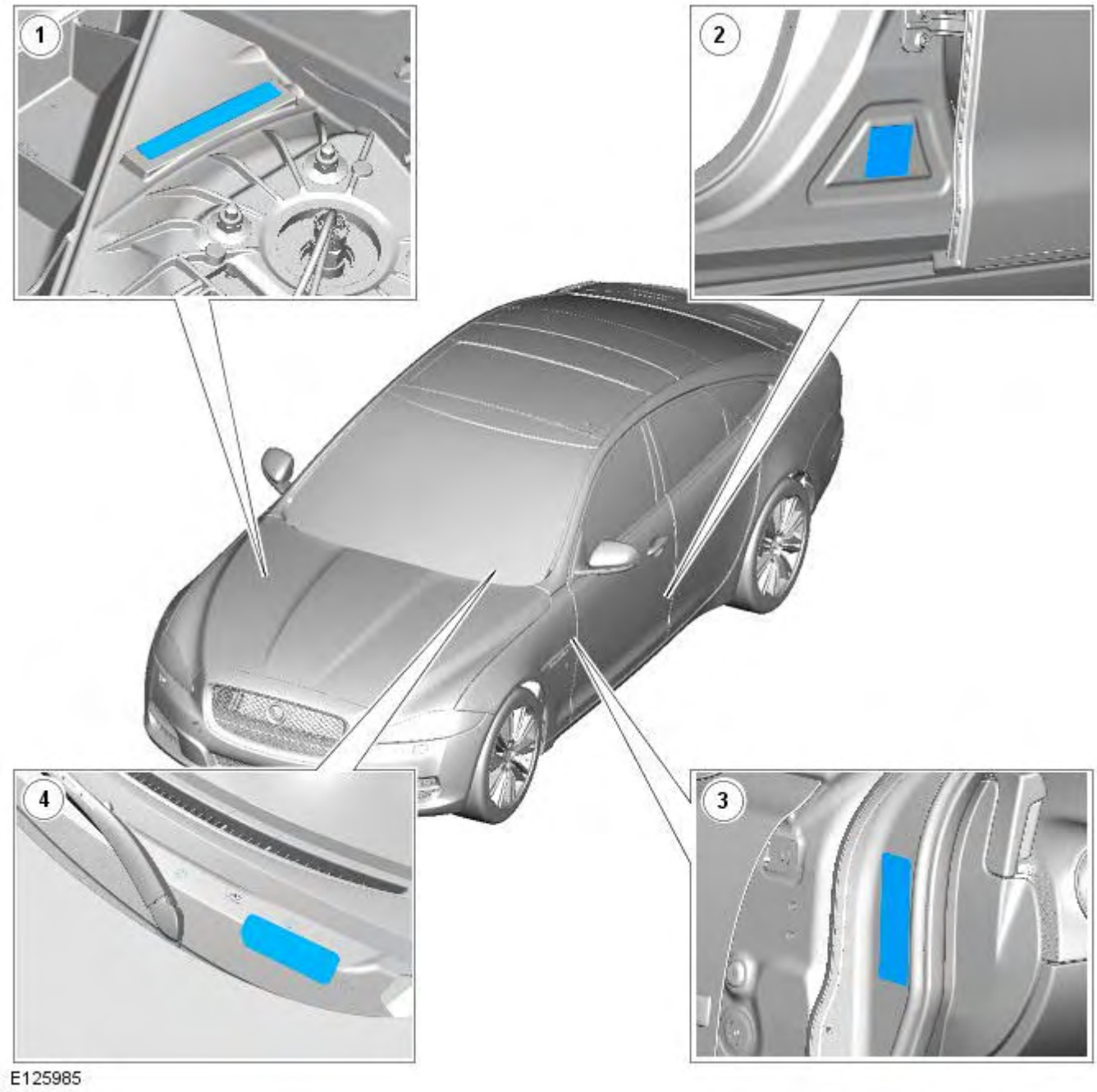
Identification Codes - Identification Codes

Description and Operation

Vehicle Identification Number (VIN)

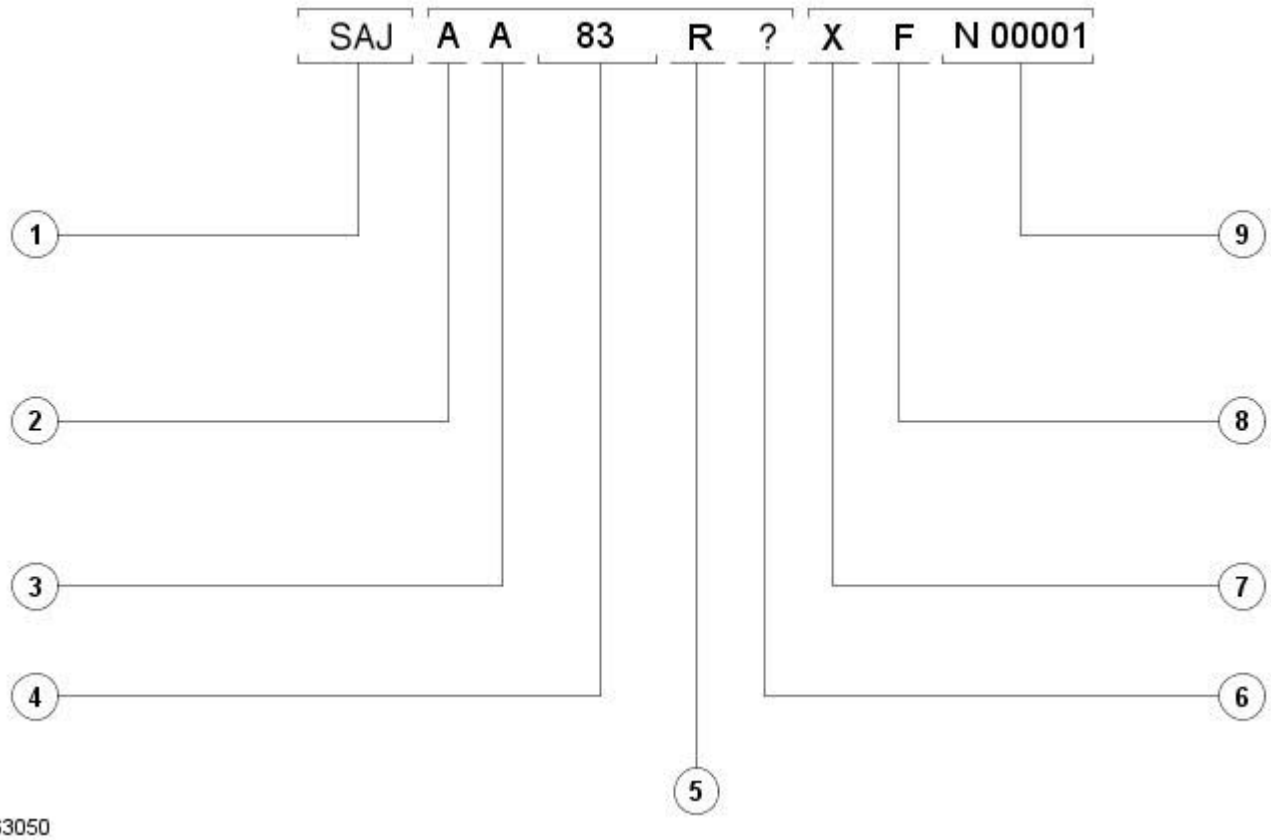
The official Vehicle Identification Number (VIN) for title and registration purposes is stamped on a metal plate and fastened to the instrument panel. It is positioned close on the left-hand side of the vehicle and is visible from the outside.

The VIN is also located on the vehicle certification label.



Item	Part Number	Description
1	—	VIN (stamped)
2	—	VIN label
3	—	E label (Europe/Rest of World shown)
4	—	VIN plate

Vehicle Identification Number (Typical)



E63050

Item		Description
1		World manufacturer identifier
2		Market, air bag specification
3		Transmission and steering code
4		Body code
5		Emission control system
6		Check digit
7		Model year
8		Assembly plant, model line
9		Production sequence number

World Manufacturer Identifier

VIN Positions 1

Codes	Manufacturer	Make	Type
SAJ	Jaguar Land Rover Limited, England	Jaguar	Passenger Car

Market, Air Bag Specification

VIN position 2

VIN code	Description
A	Rest of World with twin air bags, side air bags and curtain air bags
K	Japan with twin air bags, side air bags and curtain air bags
W	USA with twin air bags, side air bags and curtain air bags
X	Canada with twin air bags, side air bags and curtain air bags
Y	Mexico with twin air bags, side air bags and curtain air bags

Transmission, Steering Code

VIN Position 3

VIN Code	Description
A	Automatic LHS
C	Automatic RHS

Body Code

VIN Position 4

VIN Code	Description
10	SWB 5 seat saloon - Luxury (JT2)
12 & 1C	SWB 5 seat saloon - Premium luxury (JT3)
16 & 1G	SWB 5 seat saloon - Portfolio (JT5)
18 & 1J	SWB 5 seat saloon - Supersport (JT6)
20	LWB 5 seat saloon - Luxury (JT2)
22 & 2C	LWB 5 seat saloon - Premium luxury (JT3)
26 & 2G	LWB 5 seat saloon - Portfolio (JT5)
28 & 2J	LWB 5 seat saloon - Supersport (JT6)
29 & 3J	LWB 4 seat saloon – Ultimate (JT6)
31	LWB 4 seat saloon - Armoured portfolio (JT5)
36 & 3F	SWB 5 seat saloon – Supersport Sp Pack (JT6)
37 & 3G	LWB 5 seat saloon – Supersport Sp Pack (JT6)
38 & 3H	SWB 5 seat saloon – Portfolio Sp Pack (JT5)
40 & 3K	LWB 5 seat saloon – Portfolio SP Pack (JT5)

Engine Emission System

VIN Position 5

NOTES:

*1. "EU" includes the following markets: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Rep., Denmark, Estonia, Finland, France, Germany, Greece, Holland, Hungary, Italy, Latvia, Lithuania, Luxembourg, Malta, Moldova, Poland, Portugal, Rep. of Ireland, Romania, Serbia, Slovenia, Slovakia, Spain (incl. Canary Islands) Sweden & UK

*2. East Europe includes the following markets: Albania, Bosnia, Kosovo, Macedonia & Montenegro

*2. East Europe includes the following markets: Croatia, Serbia, Albania, Bosnia, Kosovo, Macedonia & Montenegro

*3. Russia includes the following markets: Belarus,Kazakhstan, Ukraine & Uzbekistan

*4. Middle East includes the following markets: Abu Dhabi, Bahrain, Dubai, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Yemen.

*5. Caribbean includes the following markets: Grand Caymen, Bahamas, Barbados, Grenada, Jamaica, Trinadad & Tobago

VIN Code	Engine	Market
F	5.0L	Algeria, Angola, Azerbaijan, Caribbean*5, Costa Rica, Dominican Rep, Egypt, Ghana, Guatemala, Libya, Nigera Middle East*4, Morocco, Panama, Paraguay, Phillipines, Syria, Tunisia, Uruquay & Vietnam
L	5.0L Supercharged (575 Nm)	Algeria, Angola, Azerbaijan, Caribbean*5, Costa Rica, Dominican Rep, Egypt, Ghana, Guatemala, Libya, Nigera Middle East*4, Morocco, Panama, Paraguay, Phillipines, Syria, Tunisia, Uruquay & Vietnam
G	5.0L Supercharged (625 Nm)	Algeria, Angola, Caribbean*5, Costa Rica, Dominican Rep, Egypt, Ghana, Guatemala, Libya, Nigera Middle East*4, Morocco, Panama, Paraguay, Phillipines, Syria, Tunisia, Uruquay & Vietnam
2	3.0 TDV6 (Euro 5 - 600 Nm)	Chile, EU*1, Israel, Morroco Norway, Russia*3, Taiwan, Turkey, Switzerland & Tunisia
D	3.0L	Egypt, Iraq, Middle East*4, Morocco, Syria, Tunisia, China (not SWB) and Russia*3
5	3.0 TDV6 (Non DPF - Euro 4- 600 Nm)	Angola, Argentina, Bermuda, Chile, China (not SWB), Dominican Rep, Ghana, Guadeloupe, Guatemala, India, Kenya, Malaysia, Martinique, Mauritius, Morocco, Nigera, Panama, Phillipines, Russia*3, Turkey, Tunisia, Uruquay & Vietnam, South Africa , Singapore, Thailand and Zimbabwe
H	3.0L (Euro 4)	China (LWB only), Morocco, Russia
P	5.0L	Argentina, Chile, China (not SWB), EU*1, East Europe*2, Israel, Norway, Russia*3, Switzerland, Taiwan & Turkey
J	5.0L Supercharged (575 Nm)	
R	5.0L Supercharged (625 Nm)	
X	5.0L	Brazil
K	5.0L Supercharged (575 Nm)	
Y	5.0L Supercharged (625 Nm)	
B	5.0L	korea
E	5.0L Supercharged (575 Nm)	

VIN Code	Engine	Market
C	5.0L Supercharged (625 Nm)	
2	3.0 TDV6 (Euro 5 - 600 Nm)	
P	5.0L	Japan
J	5.0L Supercharged (575 Nm)	
R	5.0L Supercharged (625 Nm)	
B	5.0L	USA
E	5.0L Supercharged (575 Nm)	
C	5.0L Supercharged (625 Nm)	
B	5.0L	Canada
E	5.0L Supercharged (575 Nm)	
C	5.0L Supercharged (625 Nm)	
B	5.0L	Mexico
E	5.0L Supercharged (575 Nm)	
C	5.0L Supercharged (625 Nm)	
F	5.0L	Indonesia, Caribbean*5, Kenya, Malaysia, Mauritius, Pakistan, Sri Lanka, South Africa , Singapore, Tanzania, Thailand and Zimbabwe
L	5.0L Supercharged (575 Nm)	
G	5.0L Supercharged (625 Nm)	
P	5.0L	Australia, Cyprus, Hong Kong, India (not diesel) , Malaysia, Malta, New Zealand, UK (& Eire), Singapore (not diesel)
J	5.0L Supercharged (575 Nm)	
R	5.0L Supercharged (625 Nm)	
2	3.0 TDV6 (Euro 5 - 600 Nm)	

Check Digit

VIN Position 6

VIN Code	Description
0 - 9 or X	Calculated in accordance with American standard CFR part 565

Model Year

VIN Position 7

VIN Code	Description
A	2010 model year
B	2011 model year
C	2012 model year

Assembly Plant and Model Line

VIN Position 8

VIN Code	Description
L	Castle Bromwich 5.0L Normally aspirated
M	Castle Bromwich 5.0L Supercharged
N	Castle Bromwich 3.0L TDV6
F	Castle Bromwich 3.0L

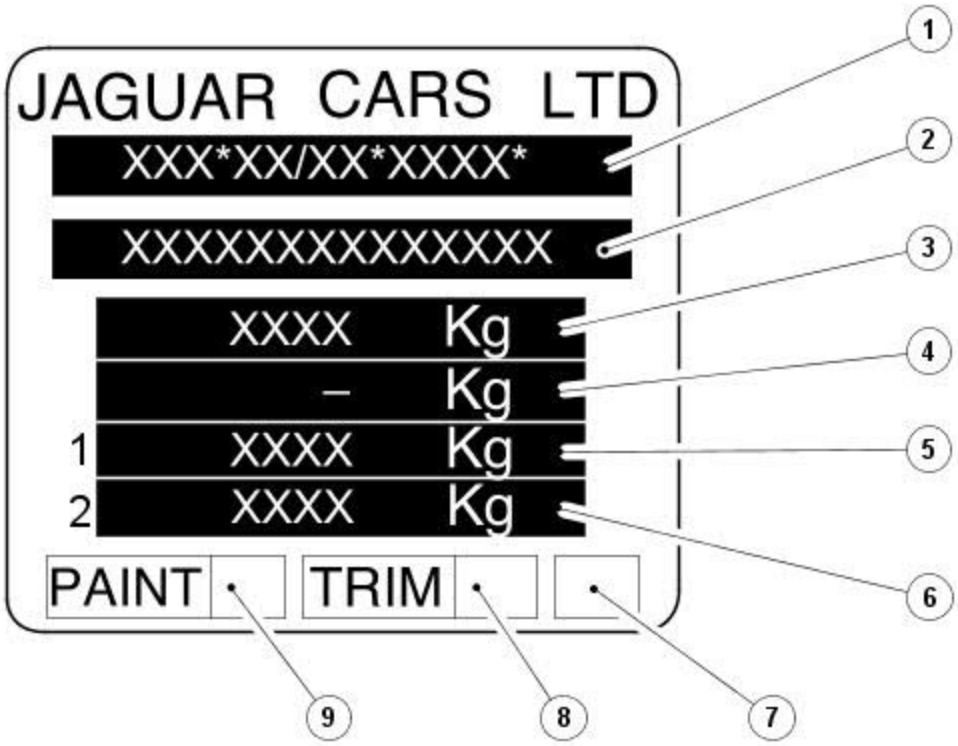
Production Sequence Number

VIN Position 9

Sequence Number
V00001 - V99999

VIN Label

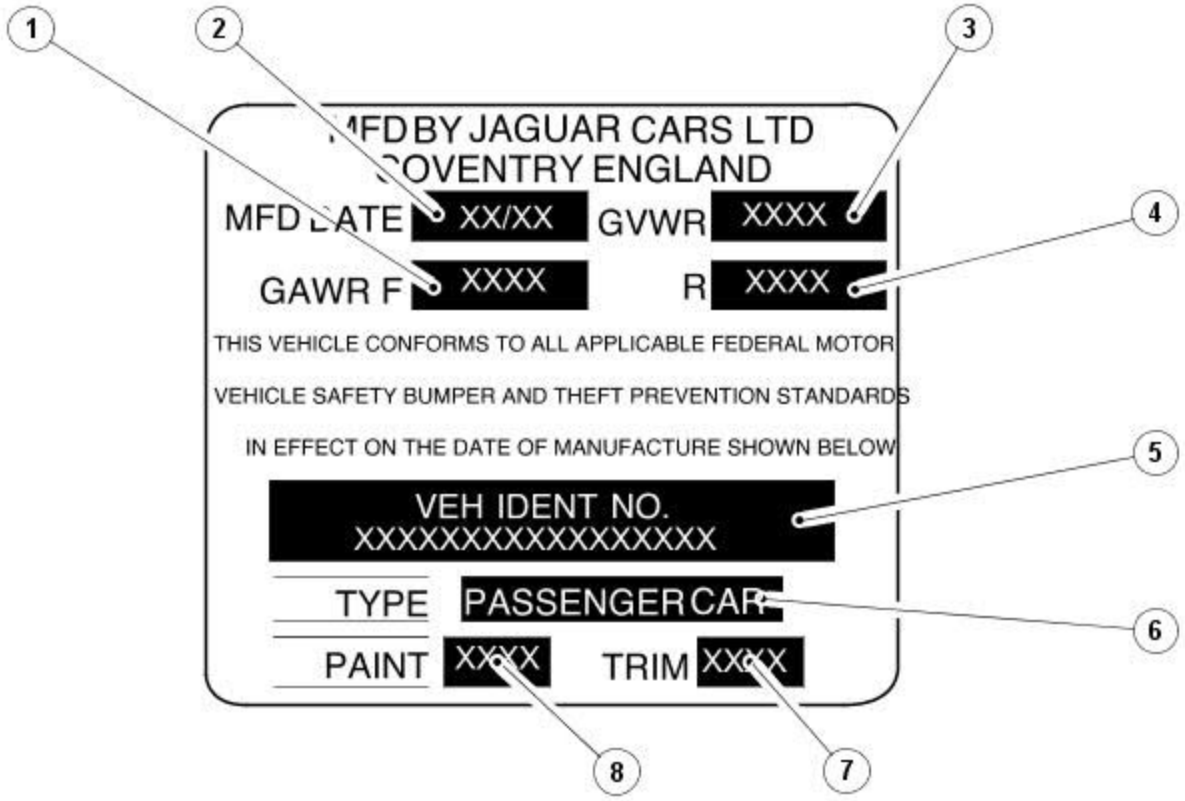
VIN Label (Europe and Rest of world)



E36533

Item		Description
1		Whole Vehicle Type Approval (WVTA) - Only shown for certain markets
2		VIN
3		Gross vehicle weight
4		Gross train weight
5		Maximum permitted front axle loading
6		Maximum permitted rear axle loading
7		Date of manufacture
8		Interior trim code
9		Paint code

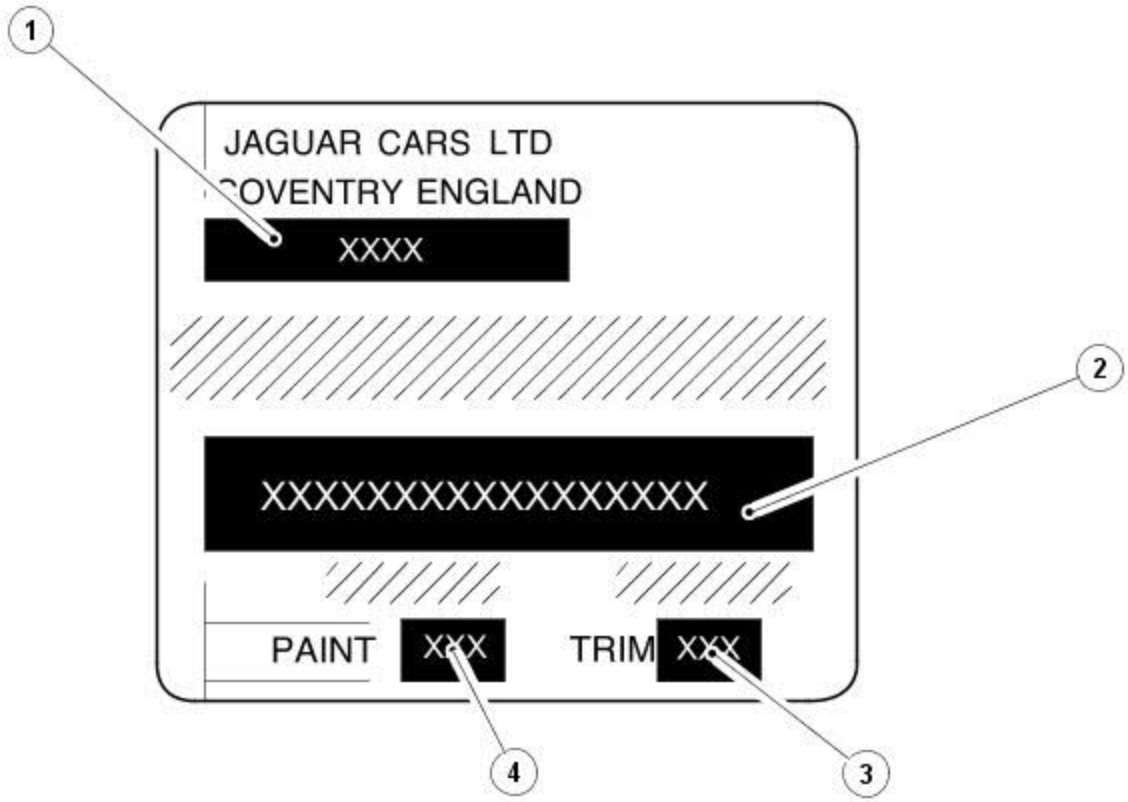
VIN Label (North America)



E36534

Item		Description
1		Maximum permitted front axle loading
2		Date of manufacture
3		Gross vehicle weight
4		Maximum permitted rear axle loading
5		VIN
6		Type
7		Interior trim code
8		Paint code

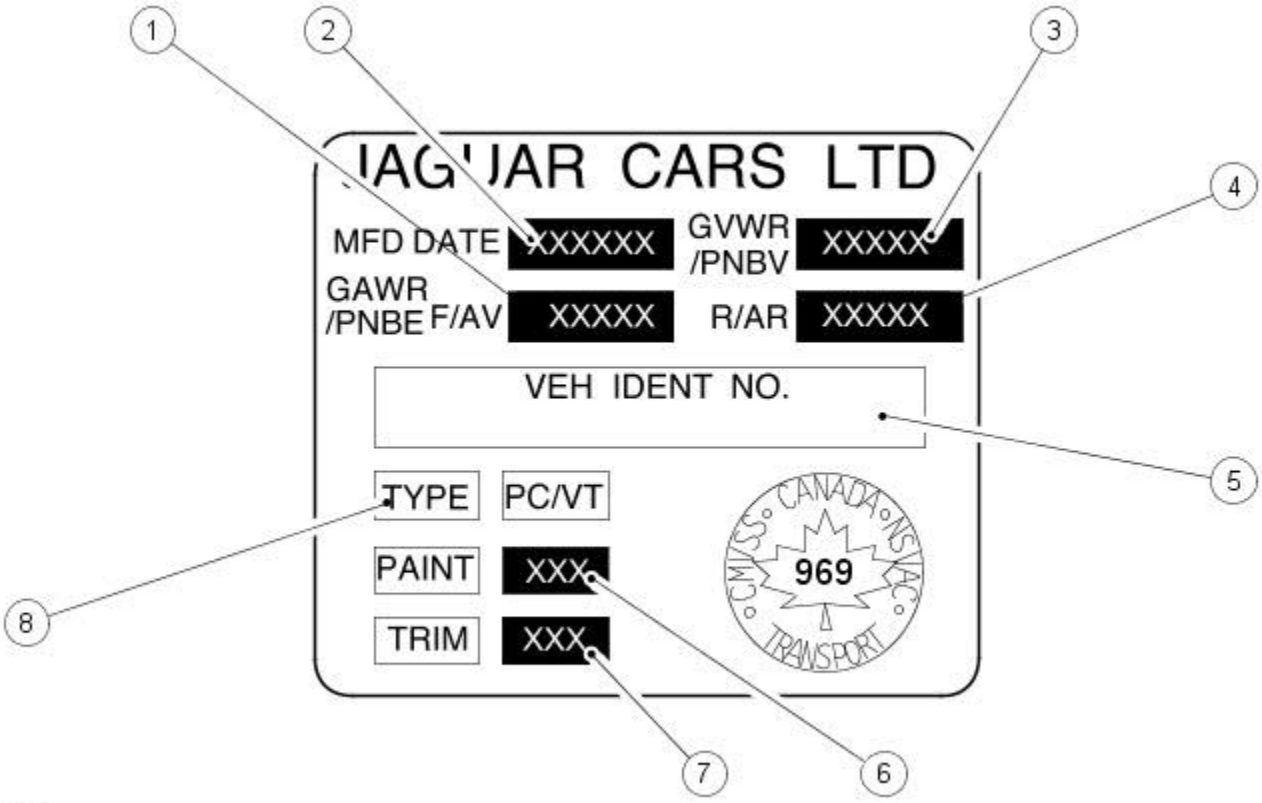
VIN Label (Saudi Arabia and Gulf States)



E36535

Item		Description
1		Date of manufacture
2		VIN
3		Interior trim code
4		Paint code

VIN Label (Canada)



E36536

Item		Description
1		Maximum permitted front axle loading
2		Date of manufacture
3		Gross vehicle weight
4		Maximum permitted rear axle loading
5		VIN
6		Paint code
7		Interior trim code
8		Type

VIN Label (China)

E99220

Item		Description
1		Occupant number
2		Engine specification (Type/Capacity/Power)
3		VIN
4		Trade mark
5		Vehicle type
6		Gross vehicle weight
7		Date of manufacture
8		Manufacturer name

VIN Label (Argentina)

Item		Description
1		VIN
2		Trade mark and manufacturer adress (in Spanish)
3		Gross vehicle weight
4		Gross train weight
5		Maximum permitted front axle loading
6		Maximum permitted rear axle loading
7		Date of manufacture
8		Interior trim code
9		Paint code

Automatic Transmission Number

The serial number of the transmission unit is displayed on a metal label or bar code (if equipped) attached to the transmission casing.

Engine Number(s)

Engine Number - 3.0L Diesel

The serial number is stamped on an engine web on the right-hand side of the cylinder block behind the engine mounting.

Engine Number - 5.0L and 5.0L Supercharged

The serial number is stamped on an engine web on the left-hand side of the cylinder block behind the engine mounting.

Engine Number - 3.0L

The engine number is contained on a bar code label on the front cover and is also stamped in the cylinder block casting on the left-hand side of the engine below the engine mounting.

Published: 11-May-2011

Jacking and Lifting - Jacking

Description and Operation

Safety Precautions

WARNING: The jack provided with the vehicle is intended to be used in an emergency for changing a deflated tire. To avoid damage to the vehicle, never use the jack to raise the vehicle for any other purpose. Refer to the Driver Handbook when using the jack supplied with the vehicle. Failure to follow these instructions may result in personal injury.

The following safety precautions must be observed when raising the vehicle to carry out service operations:

- Never rely on a jack alone to support a vehicle. Always use suitable vehicle stands to provide rigid support.
- When working beneath a vehicle, whenever possible use a vehicle hoist instead of a jack and vehicle stands.
- Make sure that the vehicle is standing on firm, level ground before using a jack.
- Do not rely on the parking brake alone; chock the wheels and put the automatic transmission into Park if possible.
- Check that any lifting equipment used has adequate capacity for the load being lifted and is in correct working order.

Published: 11-May-2011

Jacking and Lifting - Lifting

Description and Operation

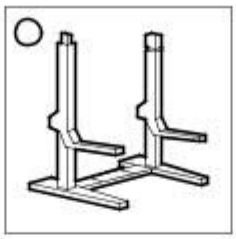
Lifting Points—Twin-Post Hoist

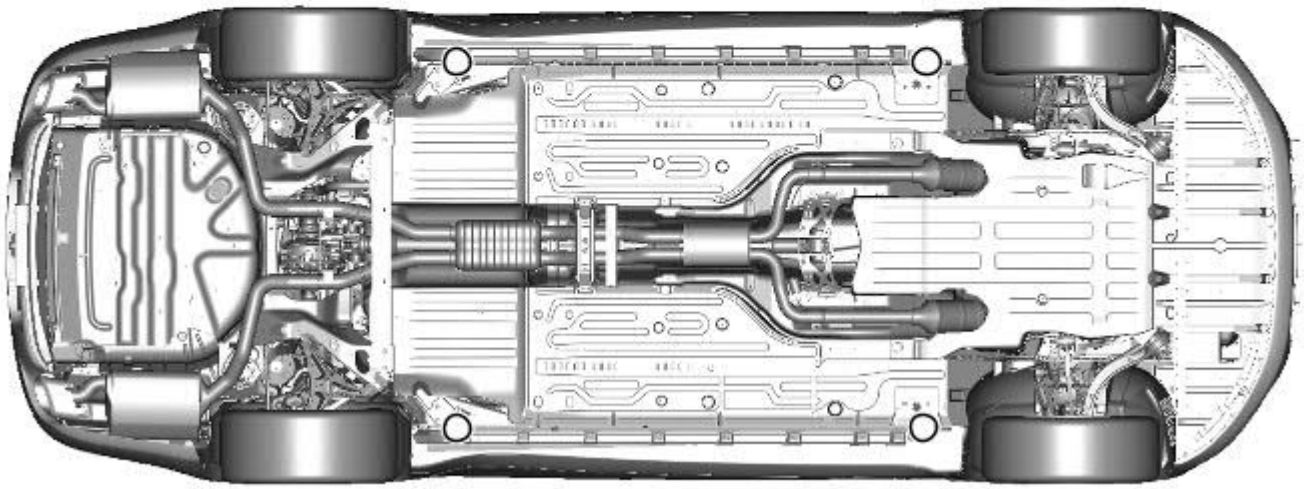
CAUTIONS:

Do not allow the hoist adapters to contact the steering linkage, suspension arms, stabilizer bar, rear subframe stabilizer brackets or to compress the lower suspension arm stabilizer bar insulator. Damage to the suspension, exhaust and steering linkage components may occur if care is not exercised when positioning the hoist adapters of two-post hoists prior to lifting the vehicle.

Never use the rear axle as a lift point. Damage to the rear axle seals and bushes may occur.

When using a twin post hoist, a cushioned pad must be utilized to avoid body damage.





E125995

Lifting Points—Floor Jack and Axle Stands

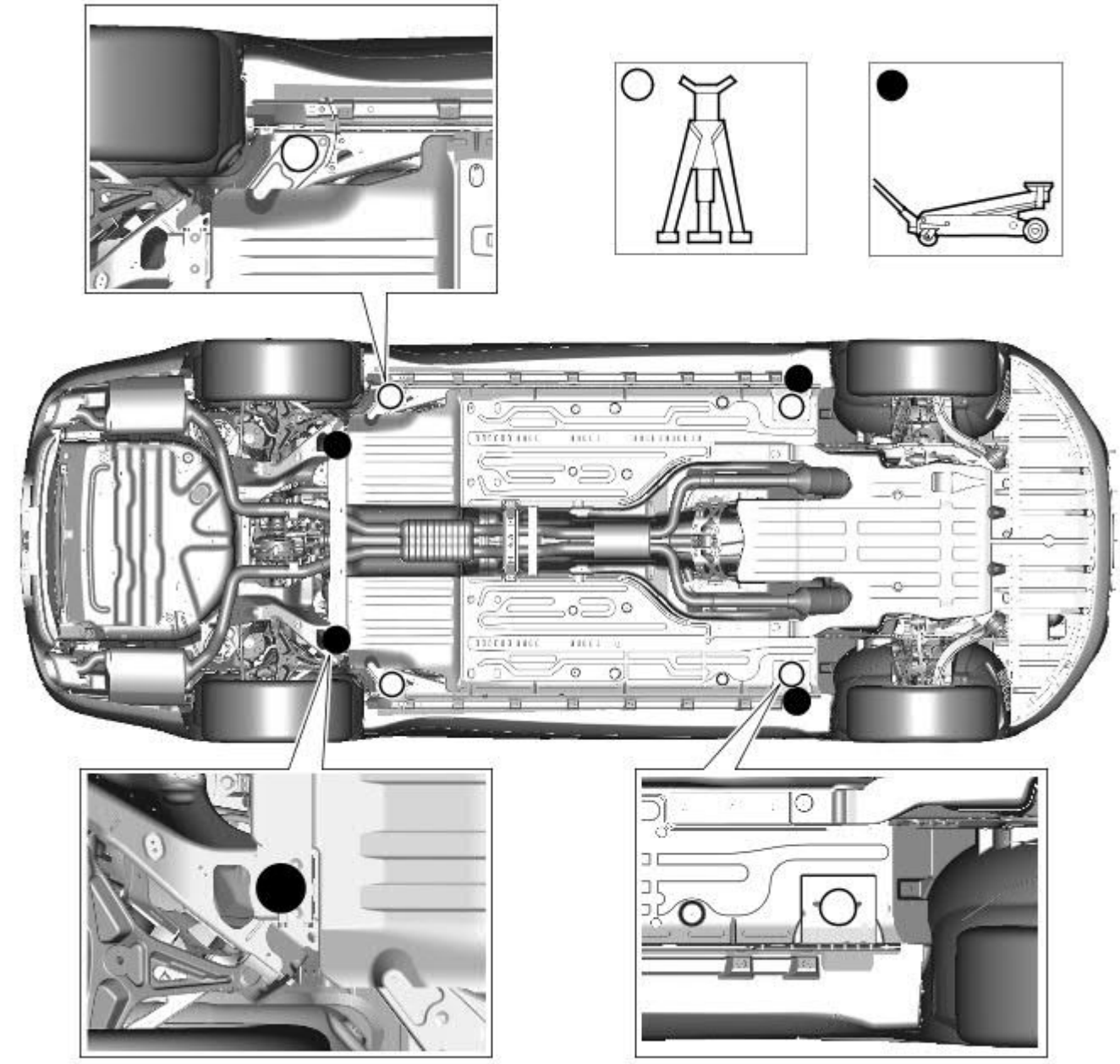
CAUTIONS:

If the vehicle is to be lifted using floor jacks, two jacks must be used to raise either the front or rear of the vehicle. If one jack only is used, excessive body twist may occur.

When using a floor jack to jack up the rear of the vehicle, the jack head must be aimed at the NVH bar securing bolts to aviod fuel tank damage or body damage.

When using a floor jack, a cushioned pad must be utilized to avoid body damage.

When using axle stands, a cushioned pad must be utilized to avoid damage to the body or rear subframe assembly.



E125994

Vehicle Recovery

NOTES:

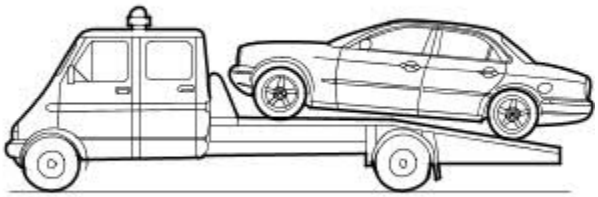
Prior to vehicle recovery, make sure the vehicle keys are available and the security system is disarmed.

Some variation in the illustrations may occur, but the essential information is always correct.

Vehicle recovery methods are:

- By flat-bed transporter.
- By rear suspended tow.

Transporter or Trailer Recovery

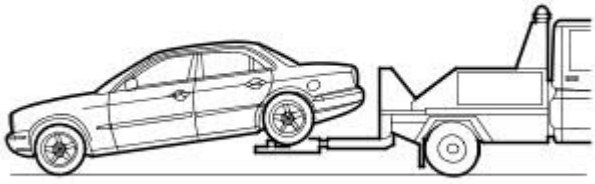


E36585

When the vehicle is being recovered by transporter or trailer:

- the parking brake must be applied and the wheels chocked.
- the gear selector lever must be in Neutral. Do not select Park on automatic transmission vehicles, as the parking lock mechanism may be damaged by the forward and backward rocking motion of the vehicle.
- the vehicle must be securely tied down to the transporter or trailer.

Rear Suspended Tow



E36586

When the vehicle is being recovered by rear suspended tow:

- the ignition key must be removed from the vehcile to lock the steering.
- the rear wheels must be correctly positioned in the lifting cradle and securely tied down.

Emergency Towing

WARNING: If the engine is not running, the steering will become heavy and the force necessary to effectively apply the brakes will be greatly increased.

CAUTION: A vehicle with a defective transmission must be towed by rear suspended tow.

When the vehicle is being towed on its own wheels:

- Local regulations for the towing of vehicles must be followed. In some countries the registration number of the towing vehicle and an 'On Tow' sign or warning triangle must be displayed at the rear of the towed vehicle.
- The gear selector lever must be in Neutral.
- The ignition must be switched on to release the steering lock and make the direction indicators, horn and stop lamps operate.
- A distance of 0,8 km (0.5 mile) must not be exceeded.
- A speed of 48 km/h (30 mph) must not be exceeded.
- The tow rope must be attached to the front towing eye.

Published: 11-May-2011

Noise, Vibration and Harshness - Noise, Vibration and Harshness (NVH)

Description and Operation

Noise, vibration and harshness (NVH) is becoming more important as vehicles become more sophisticated and passenger comfort levels increase. This section is designed to aid in the diagnosis, testing and repair of NVH concerns.

- Noise is defined as sounds not associated with the operation of passenger compartment equipment that interface with customer satisfaction.
- Vibration is defined as impulses felt by the customer that are not caused by road surface changes.
- Harshness is a ride quality issue where the customer feels that the vehicle response to the road surface is sharply transmitted to the customer.

Diagnostic Theory

Diagnosis is more than just following a series of interrelated steps in order to find the solution to the specific condition. It is a way of looking at systems that are not functioning the way they should and finding out why. Also it is knowing how the system should work and whether it is working correctly.

There are basic rules for diagnosis. If these rules are followed, the cause of the condition is usually found the first time through the system.

Know the System

- Know how the parts go together.
- Know how the system operates as well as its limits and what happens when the system goes wrong.
- Sometimes this means checking the system against one that is known to be working correctly.

Know the History of the System

A clue in any one of these areas may save time:

- How old or new is the system?
- What kind of treatment has it had?
- Has it been repaired in the past in such a manner that might relate to the present condition?
- What is the repair history?

Know the History of the Condition

- Did it start suddenly or appear gradually?
- Was it related to some other occurrence such as a collision or previous part renewal?
- Know how the condition made itself known; it may be an important clue to the cause.

Know the Probability of Certain Conditions Developing

- Look for the simple rather than the complex.
- For example:
    - Electrical conditions usually occur at connections rather than components.
    - An engine no-start is more likely to be caused by a loose wire or small adjustment rather than a sheared-off camshaft.
- Know the difference between impossible and improbable. Certain failures in a system can be improbable but still happen.
- New parts are just that, new. It does not mean they are always good functioning parts.

Do Not Cure the Symptom and Leave the Cause

Lowering the pressure in a front tire may correct the condition of a vehicle leaning to one side, but it does not correct the original condition.

Be Positive the Cause is Found

- Double check the findings.
- What caused a worn component?
- A loose transmission or engine mount could indicate that other mounts are also loose.

Diagnostic Charts

Charts are a simple way of expressing the relationship between basic logic and a physical system of components. They help discover the cause of a condition in the least time. Diagnostic charts combine many areas of diagnosis into one visual display:

- probability of certain things occurring in a system
- speed of checking certain components or functions before others
- simplicity of carrying out certain tests before others
- elimination of checking huge portions of a system by carrying out simple tests
- certainty of narrowing down the search to a small portion before carrying out in-depth testing

The fastest way to find a condition is to work with the tools that are available. This means working with proven diagnostic charts and the correct special equipment for the system.

Published: 16-Sep-2013

Noise, Vibration and Harshness - Noise, Vibration and Harshness (NVH)

Diagnosis and Testing

Principle of Operation

For a detailed description of Noise, Vibration and Harshness issues, refer to the Description and Operation section of the workshop manual.
REFER to: Noise, Vibration and Harshness (NVH) (100-04 Noise, Vibration and Harshness, Description and Operation).

Inspection and Verification

1. Verify the customer's concerns by operating the vehicle to duplicate the condition.
2. Visually inspect the vehicle to determine any obvious cause(s) of the concern(s).
3. If the inspection reveals obvious causes that can be readily identified, repair as necessary.
4. If the concern(s) remains after the inspection, determine the symptom(s) and refer to the Symptom Chart.

How To Use This Diagnostic Procedure Section

- Noise, vibration and harshness (NVH) concerns have become more important as vehicles have become more sensitive to these vibrations. This section is designed as an aid to identifying these situations
- The section provides diagnostic procedures based on symptoms. If the condition occurs at high speed, for instance, the most likely place to start is under High Speed Shake
- The road test procedure will tell how to sort the conditions into categories and how to tell a vibration from a shake
- A series of Road Test Quick Checks is provided to make sure that a cause is either pinpointed or eliminated
- Name the condition, proceed to the appropriate section and locate the correct diagnosis. When the condition is identified, the job is partly done
- Follow the diagnostic procedure as outlined
- Quick Checks are described within the step, while more involved tests and adjustments are outlined in General Procedures
- Always follow each step exactly and make notes to recall important findings later

Customer Interview

The road test and customer interview (if available) provide information that will help identify the concerns and will provide direction to the correct starting point for diagnosis.

Identify the Condition

NVH problems usually occur in a number of areas:

- tires
- engine accessories
- suspension
- driveline
- air leakage (wind noise)
- squeaks and rattles
- heating ventilation and air conditioning (HVAC)
- electrical (e.g. motor noise)
- transmission
- engine

It is important, therefore, that an NVH concern be isolated into its specific area(s) as soon as possible. The easiest and quickest way to do this is to carry out the Road Test as outlined.

Noise Diagnostic Procedure

Non-Axle Noise

The five most important sources of non-axle noise are exhaust, tires, roof racks, trim and mouldings, and transmission.

Therefore, make sure that none of the following conditions are the cause of the noise before proceeding with a driveline tear down and diagnosis.

- Under certain conditions, the pitch of the exhaust may sound very much like gear noise. At other times, it can be mistaken for a wheel bearing rumble
- Tires, especially snow tires, can have a high pitched tread whine or roar, similar to gear noise. Radial tires, to some degree, have this characteristic. Also, any non-standard tire with an unusual tread construction may emit a roar or whine type noise
- Trim and mouldings can also cause whistling or a whining noise
- Clunk may be a metallic noise heard when the automatic transmission is engaged in reverse or drive, or it may occur when the throttle is applied or released. It is caused by backlash somewhere in the driveline
- Bearing rumble sounds like marbles being tumbled. This condition is usually caused by a damaged wheel bearing

Noise Conditions

- Gear noise is typically a howling or whining due to gear damage or incorrect bearing preload. It can occur at various speeds and driving conditions, or it can be continuous
- Chuckle is a particular rattling noise that sounds like a stick against the spokes of a spinning bicycle wheel. It occurs while decelerating from approximately 64 km/h (40 miles/h) and can usually be heard all the way to a stop. The frequency varies with vehicle speed
- Knock is very similar to chuckle, though it may be louder and occurs on acceleration or deceleration. The tear down will disclose what has to be corrected

Check and rule out tires, exhaust and trim items before disassembling the transmission to diagnose and correct gear noise.

The noises described under Road Test usually have specific causes that can be diagnosed by observation as the unit is disassembled. The initial clues are the type of noise heard on the road test and the driving conditions.

Vibration Conditions

NOTE: New Constant Velocity (CV) joints should not be installed unless disassembly and inspection revealed unusual wear.

Clicking, popping or grinding noises may be caused by the following:

- Cut or damaged CV joint boots resulting in inadequate or contaminated lubricant in the outboard or inboard CV joint bearing housings
- Loose CV joint boot clamps
- Another component contacting the rear drive half shaft
- Worn, damaged or incorrectly installed wheel bearing, suspension or brake component

Vibration at highway speeds may be caused by the following:

- Out-of-balance front or rear wheels
- Out-of-round tires
- Driveline imbalance
- Driveline run-out (alignment)

NOTE: Rear drive half shafts are not balanced and are not likely to contribute to rotational vibration disturbance.

Shudder or vibration during acceleration (including from rest) may be caused by the following:

- Driveline alignment
- Excessively worn or damaged outboard or inboard CV joint bearing housing
- Excessively high CV joint operating angles caused by incorrect ride height. Check ride height, verify correct spring rate and check items under Inoperative Conditions
- Excessively worn driveshaft components

Leakage Conditions

1. Inspect the CV joint boots for evidence of cracks, tears or splits.
2. Inspect the underbody for any indication of grease splatter in the vicinity of the rear drive half shaft, outboard and inboard CV joint boot locations, which is an indication of CV joint boot or CV joint boot clamp damage.
3. Inspect the inboard CV joint bearing housing seal for leakage.

Inoperative Conditions

If a CV joint or rear drive half shaft pull-out occurs, check the following:

- suspension components for correct location, damage or wear
- bushings for wear
- subframe for damage
- bent or worn components
    - Stabilizer bar link
    - Left-hand rear suspension lower arm and bushing
    - Right-hand rear suspension lower arm and bushing
    - Rear wheel hub and rear drive half shaft

Road Test

A gear-driven unit will produce a certain amount of noise. Some noise is acceptable and may be audible at certain speeds or under various driving conditions as on a newly paved blacktop road. The slight noise is in no way detrimental and must be considered normal.

The road test and customer interview (if available) provide information needed to identify the condition and give direction to the correct starting point for diagnosis.

1. Make notes throughout the diagnosis routine. Make sure to write down even the smallest piece of information, because

it may turn out to be the most important.

2. Do not touch anything until a road test and a thorough visual inspection of the vehicle have been carried out. Leave the tire pressures and vehicle load just where they were when the condition was first observed. Adjusting tire pressures, vehicle load or making other adjustments may reduce the conditions intensity to a point where it cannot be identified clearly. It may also inject something new into the system, preventing correct diagnosis.

3. Make a visual inspection as part of the preliminary diagnosis routine, writing down anything that does not look right. Note tire pressures, but do not adjust them yet. Note leaking fluids, loose nuts and bolts, or bright spots where components may be rubbing against each other. Check the luggage compartment for unusual loads.

4. Road test the vehicle and define the condition by reproducing it several times during the road test.

5. Carry out the Road Test Quick Checks as soon as the condition is reproduced. This will identify the correct diagnostic procedure. Carry out the Road Test Quick Checks more than once to verify they are providing a valid result. Remember, the Road Test Quick Checks may not tell where the concern is, but they will tell where it is not.

Road Test Quick Checks

1. 24-80 km/h (15-50 miles/h): With light acceleration, a moaning noise is heard and possibly a vibration is felt in the front floor pan. It is usually worse at a particular engine speed and at a particular throttle setting during acceleration at that speed. It may also produce a moaning sound, depending on what component is causing it. Refer to Tip-In Moan in the Symptom Chart.

2. Acceleration/deceleration: With slow acceleration and deceleration, a shake is sometimes noticed in the steering wheel/column, seats, front floor pan, front door trim panel or front end sheet metal. It is a low frequency vibration (around 9-15 cycles per second). It may or may not be increased by applying brakes lightly. Refer to Idle Boom/Shake /Vibration in the Symptom Chart.

3. High speed: A vibration is felt in the front floor pan or seats with no visible shake, but with an accompanying sound or rumble, buzz, hum, drone or booming noise. Coast with the clutch pedal depressed or shift control selector lever in neutral and engine idling. If vibration is still evident, it may be related to wheels, tires, front brake discs, wheel hubs or front wheel bearings. Refer to High Speed Shake in the Symptom Chart.

4. Engine rpm sensitive: A vibration is felt whenever the engine reaches a particular rpm. It will disappear in neutral coasts. The vibration can be duplicated by operating the engine at the problem rpm while the vehicle is stationary. It can be caused by any component, from the accessory drive belt to the torque converter which turns at engine speed when the vehicle is stopped. Refer to High Speed Shake in the Symptom Chart.

5. Noise/vibration while turning: Clicking, popping, or grinding noises may be due to a worn, damaged, or incorrectly installed front wheel bearing, rear drive half shaft or CV joint.

6. Noise/vibration that is road speed relative: This noise/vibration can be diagnosed independent of engine speed or gear selected (engine speed varies but torque and road speed remain constant). The cause may be a rear drive axle/differential whine.

Road Conditions

An experienced technician will always establish a route that will be used for all NVH diagnosis road tests. The road selected should be reasonably smooth, level and free of undulations (unless a particular condition needs to be identified). A smooth asphalt road that allows driving over a range of speeds is best. Gravel or bumpy roads are unsuitable because of the additional road noise produced. Once the route is established and consistently used, the road noise variable is eliminated from the test results.

NOTE: Some concerns may be apparent only on smooth asphalt roads.

If a customer complains of a noise or vibration on a particular road and only on a particular road, the source of the concern may be the road surface. If possible, try to test the vehicle on the same type of road.

Vehicle Preparation

Carry out a thorough visual inspection of the vehicle before carrying out the road test. Note anything which is unusual. Do not repair or adjust any condition until the road test is carried out, unless the vehicle is inoperative or the condition could pose a hazard to the technician.

After verifying the condition has been corrected, make sure all components removed have been installed.

Lift Test

After a road test, it is sometimes useful to do a similar test on a lift.

When carrying out the high-speed shake diagnosis or engine accessory vibration diagnosis on a lift, observe the following precautions:

WARNING: If only one drive wheel is allowed to rotate, speed must be limited to 55 km/h (35 miles/h) indicated on the speedometer since actual wheel speed will be twice that indicated on the speedometer. Speed exceeding 55 km/h (35 miles/h) or allowing the drive wheel to hang unsupported could result in tire disintegration, differential failure, constant velocity joint

and drive half shaft failure, which could cause serious personal injury and extensive vehicle damage. Failure to follow these instructions may result in personal injury.

CAUTION: The suspension should not be allowed to hang free. When the CV joint is run at a very high angle, extra vibration as well as damage to the seals and joints can occur.

The rear suspension lower arm should be supported as far outboard as possible. To bring the vehicle to its correct ride height, the full weight of the vehicle should be supported in the rear by floor jacks. REFER to: (100-02 Jacking and Lifting)

Jacking (Description and Operation),
Lifting (Description and Operation).

1. Raise and support the vehicle. REFER to: (100-02 Jacking and Lifting)
   Jacking (Description and Operation),
   Lifting (Description and Operation).
2. Explore the speed range of interest using the Road Test Quick Checks as previously described.
3. Carry out a coast down in neutral. If the vehicle is free of vibration when operating at a steady indicated speed and behaves very differently in drive and coast, a transmission concern is likely.

Note, however, that a test on the lift may produce different vibrations and noises than a road test because of the effect of the lift. It is not unusual to find vibrations on the lift that were not found in the road test. If the condition found on the road can be duplicated on the lift, carrying out experiments on the lift may save a great deal of time.

Exhaust Neutralization Procedure

1. Raise vehicle on lift and slacken all exhaust fixings.
2. With all fixings loose, neutralize the exhaust system.
3. Tighten all fixings to correct torque, starting at the rear-most point working towards the front of the vehicle.

Symptom Chart

Symptom	Possible Cause	Action
High-speed shake	• Wheel end vibration • Engine/transmission • Driveline	GO to Pinpoint Test A.
Tip-in moan	• Air cleaner • Power steering • Powertrain • Engine mounts • Exhaust system	GO to Pinpoint Test B.
Idle boom/shake/vibration, or shudder	• Cable(s)/hoses(s) • Intake air distribution and filtering system • Engine mounts • Exhaust system • Belt/pulleys	GO to Pinpoint Test C.
Wheel end vibration analysis	• Suspension/rear drive halfshaft and CV joints • Tires/wheels • Wheel bearings • CV joint boots	GO to Pinpoint Test D.
Non-axle noise	• Trim/mouldings • A/C system • Accessories	GO to Pinpoint Test E.

Pinpoint Tests

NOTE: These Pinpoint Tests are designed to take the technician through a step-by-step diagnosis procedure to determine the cause of a condition. It may not always be necessary to follow the chart to its conclusion. Carry out only the Pinpoint Test steps necessary to correct the condition. Then check operation of the system to make sure the condition is corrected.

After verifying that the condition has been corrected, make sure all components removed have been installed.

PINPOINT TEST A : HIGH-SPEED SHAKE	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: NEUTRAL COAST	1 Carry out the neutral coast test.
	Does the vibration disappear during the neutral coast test? **Yes** Check and install/re-balance wheels and tires and driveshaft. Check and install new engine/transmission mounts as necessary. Repeat Road Test as outlined. **No** GO to D1.

PINPOINT TEST B : TIP-IN MOAN	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
B1: CHECK THE AIR CLEANER	
	1 Check the air cleaner. • Check the air cleaner, inlet tube, outlet tube, resonators and all other components associated with the air induction system for correct installation and tightness of all connections.
	Are the components OK? **Yes** GO to B2. **No** Correct the condition. Repeat the Road Test as outlined.
B2: CHECK THE EXHAUST SYSTEM	
	1 Carry out the exhaust system neutralizing procedure in this section.
	Is the exhaust system OK? **Yes** GO to B3. **No** Repair as necessary. Restore vehicle. Repeat the Road Test as outlined.
B3: CHECK THE POWER STEERING	
	1 Remove the auxiliary drive belt and test for tip-in moan.
	Is the tip-in moan OK? **Yes** Repair the power steering as necessary. For additional information, refer to Section 211-00. **No** Check and install new engine/transmission mounts as necessary. Repeat Road Test as outlined.

PINPOINT TEST C : IDLE BOOM/SHAKE/VIBRATION/SHUDDER	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
C1: CHECK CABLE/HOSES	
	1 Check the engine compartment for any component that may be grounding between the engine and body or chassis. Example: air conditioning (A/C) hoses.
	Are the components OK? **Yes** GO to C2. **No** Correct the condition. Repeat the Road Test as outlined.
C2: CHECK THE COOLING RADIATOR	
	1 Check the engine cooling radiator mountings and bushings for security and condition. Check the radiator installation for any component that may have a touch condition.
	Are the installation and bushings OK? **Yes** GO to C3. **No** Correct the condition. Repeat the Road Test as outlined.
C3: CHECK THE EXHAUST SYSTEM	
	1 Carry out the exhaust system neutralizing procedure in this section.
	Is the exhaust system OK? **Yes** Check and install new engine/transmission mounts as necessary. Repeat Road Test as outlined. **No** Repair as necessary. Repeat Road Test.

PINPOINT TEST D : WHEEL END VIBRATION ANALYSIS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: INSPECT THE TIRES	
	1 Inspect the tires. • Raise and support the vehicle. REFER to: (100-02 Jacking and Lifting) Jacking (Description and Operation), Lifting (Description and Operation). • Inspect the tires for: • Correct tire size • Tire/wheel compatibility • Wear or damage • Tire beads correctly seated
	Are the tires OK? **Yes** GO to D2. **No** Inspect the wheels. For additional information, refer to Section 204-00.
D2: INSPECT WHEEL BEARINGS	
	1 Inspect the wheel bearings. For additional information, refer to Section 204-00.
	Are the wheel bearings OK? **Yes** GO to D3. **No** Repair as necessary. Repeat the Road Test as outlined.
D3: INSPECT THE CONSTANT VELOCITY (CV) JOINT BOOTS	
	1 Inspect the CV joint boots. • Spin the rear tire by hand • Inspect for evidence of cracks, tears, splits or splattered grease
	Are the CV joint boots OK? **Yes** GO to D4. **No** Repair as necessary. Repeat the Road Test as outlined.
D4: INSPECT WHEEL AND TIRE RUNOUT	
	1 Inspect the wheel and tire runout. • Carry out the Wheel and Tire Check procedure. REFER to: Lifting (100-02 Jacking and Lifting, Description and Operation).
	Is the wheel and tire runout OK? **Yes** Balance the wheels and tires. Refer to the wheel balance equipment manufacturers instructions. **No** Repair as necessary. REFER to: Lifting (100-02 Jacking and Lifting, Description and Operation). Repeat the Road Test as outlined.

PINPOINT TEST E : NON-AXLE NOISE	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
E1: INSPECT VEHICLE TRIM	
	1 Check the grille and trim mouldings to see if they are the source of the noise.
	Are the vehicle trim components causing the noise? **Yes** Install new trim or repair as necessary. For additional information, refer to Section 501-08. **No** GO to E2.
E2: CHECK THE A/C SYSTEM FOR NOISE	
	1 Check the A/C system components for noise by turning the A/C system on and off.
	Is the A/C system causing the noise? **Yes** Diagnose the A/C system. REFER to: Lifting (100-02 Jacking and Lifting, Description and Operation). **No** GO to E3.
E3: CHECK NON-FACTORY ACCESSORIES	
	1 Inspect any accessories for being the source of the noise. Example: grounding body-to-frame, antennas, visors, bug deflectors and fog lights?
	Are the accessories the cause of the noise? **Yes** Adjust, repair or install new accessories or fasteners as required. **No** Verify the customer concern.

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Noise, Vibration and Harshness - Exhaust System Neutralizing

General Procedures

1. Loosen the muffler inlet pipe and resonator pipe to exhaust manifold fasteners at the flanges and the muffler inlet connection.
2. Place a stand to support the muffler parallel to the vehicle frame with the muffler pipe bracket free of stress.
3. Tighten the muffler connection.
4. Position the exhaust pipes to the manifolds and tighten. Make sure that the catalytic converter and heat shield do not contact the frame rails.
5. With the complete exhaust system tight (and cooled) the rear hanger insulator should be angled forward, to allow the system to expand rearward when heated during normal running

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Suspension System - General Information -

Vehicle Ride Height

Description		Measurement	
Description	**Front/Rear**	**Kerb mm (inch)**	**Tolerance mm (inch)**
All markets except India	Front	405 (15.94)	±12 (0.5)
	Rear	403 (15.86)	±12 (0.5)
India	Front	415 (16.33)	±12 (0.5)
	Rear	413 (16.26)	±12 (0.5)
All wheel drive	Front	405 (15.94)	±12 (0.5)
	Rear	403 (15.86)	±12 (0.5)

- Ride height is measured from the centre of the wheel to the apex of the wheel arch, through the wheel centre line.
- Kerb - with all fluids at full and a full tank of fuel, no occupants/luggage.

General Specifications

Item	Specification
Clear Vision	
Clear vision (negative value is counterclockwise)	0° ± 3°
Ball Joint Radial Play	
Lower ball joint — maximum	0.8 mm (1/32 in)
Upper ball joint — maximum	0.8 mm (1/32 in)

Wheel Alignment Specification - Front - RHD markets and Japan (excluding India)

NOTE: All figures are with vehicle at 'Showroom' ride height - full fluids, full tank of fuel, no occupants/luggage, tires inflated to normal pressures

Item		Left-hand		Right-hand		Total/Balance	
Camber		**Nominal**	**Tolerance**	**Nominal**	**Tolerance**	**Nominal**	**Tolerance**
	Decimal degrees	-0.50°	± 0.75°	-0.10°	± 0.75°	-0.40°	± 0.75°
	Degrees/minutes	-30'	± 45'	-6'	± 45'	-24'	± 45'
		Minimum	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**
	Decimal degrees	-1.25°	0.25°	-0.85°	0.65°	-1.15°	0.35°
	Degrees/minutes	-1°15'	15'	-51'	39'	-1°9'	21'
Castor		**Nominal**	**Tolerance**	**Nominal**	**Tolerance**	**Nominal**	**Tolerance**
	Decimal degrees	7.16°	± 0.75°	6.63°	± 0.75°	0.54°	± 0.75°
	Degrees/minutes	7°10'	± 45'	6°38'	± 45'	32'	± 45'
		Minimum	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**
	Decimal degrees	6.41°	7.91°	5.88°	7.38°	-0.21°	1.29°
	Degrees/minutes	6°25'	7°55'	5°53'	7°23'	-13'	1°17'
Toe		**Nominal**	**Tolerance**	**Nominal**	**Tolerance**	**Nominal**	**Tolerance**
	Decimal degrees	0.09°	±0.10°	0.09°	±0.10°	0.17°	±0.20°
	Degrees/minutes	5'	±6'	5'	±6'	10'	±12'
		Minimum	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**
	Decimal degrees	-0.02°	0.19°	-0.02°	0.19°	-0.03°	0.37°
	Degrees/minutes	-1'	11'	-1'	11'	-2'	22'

Wheel Alignment Specification - Front - India

NOTE: All figures are with vehicle at 'Showroom' ride height - full fluids, full tank of fuel, no occupants/luggage, tires inflated to normal pressures

Item		Left-hand		Right-hand		Total/Balance	
Camber		**Nominal**	**Tolerance**	**Nominal**	**Tolerance**	**Nominal**	**Tolerance**
	Decimal degrees	-0.29°	± 0.75°	0.11°	± 0.75°	-0.40°	± 0.75°
	Degrees/minutes	-17'	± 45'	7'	± 45'	-24'	± 45'
		Minimum	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**
	Decimal degrees	-1.04°	0.46°	-0.64°	0.86°	-1.15°	0.35°
	Degrees/minutes	-1°2'	28'	-38'	52'	-1°9'	21'
Castor		**Nominal**	**Tolerance**	**Nominal**	**Tolerance**	**Nominal**	**Tolerance**
	Decimal degrees	7.02°	± 0.75°	6.48°	± 0.75°	0.54°	± 0.75°
	Degrees/minutes	7°1'	± 45'	6°29'	± 45'	32'	± 45'
		Minimum	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**
	Decimal degrees	6.27°	7.77°	5.73°	7.23°	-0.21°	1.29°
	Degrees/minutes	6°16'	7°46'	5°44'	7°14'	-13'	1°17'
Toe		**Nominal**	**Tolerance**	**Nominal**	**Tolerance**	**Nominal**	**Tolerance**

Item		Left-hand		Right-hand		Total/Balance	
	Decimal degrees	0.09°	±0.10°	0.09°	±0.10°	0.17°	±0.20°
	Degrees/minutes	5'	±6'	5'	±6'	10'	±12'
		Minimum	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**
	Decimal degrees	-0.02°	0.19°	-0.02°	0.19°	-0.03°	0.37°
	Degrees/minutes	-1'	11'	-1'	11'	-2'	22'

Wheel Alignment Specification - Front - LHD markets

NOTE: All figures are with vehicle at 'Showroom' ride height - full fluids, full tank of fuel, no occupants/luggage, tires inflated to normal pressures

Item		Left-hand		Right-hand		Total/Balance	
Camber		**Nominal**	**Tolerance**	**Nominal**	**Tolerance**	**Nominal**	**Tolerance**
	Decimal degrees	-0.05°	± 0.75°	-0.55°	± 0.75°	0.50°	± 0.75°
	Degrees/minutes	-3'	± 45'	-33'	± 45'	30'	± 45'
		Minimum	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**
	Decimal degrees	-0.80°	0.70°	-1.30°	0.20°	-0.25°	1.25°
	Degrees/minutes	-48'	42'	-1°18'	12'	-15'	1°15'
Castor		**Nominal**	**Tolerance**	**Nominal**	**Tolerance**	**Nominal**	**Tolerance**
	Decimal degrees	6.89°	± 0.75°	6.89°	± 0.75°	0°	± 0.75°
	Degrees/minutes	6°53'	± 45'	6°53'	± 45'	0'	± 45'
		Minimum	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**
	Decimal degrees	6.14°	7.64°	6.14°	7.64°	-0.75°	0.75°
	Degrees/minutes	6°8'	7°38'	6°8'	7°38'	-45'	45'
Toe		**Nominal**	**Tolerance**	**Nominal**	**Tolerance**	**Nominal**	**Tolerance**
	Decimal degrees	0.09°	±0.10°	0.09°	±0.10°	0.17°	±0.20°
	Degrees/minutes	5'	±6'	5'	±6'	10'	±12'
		Minimum	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**
	Decimal degrees	-0.02°	0.19°	-0.02°	0.19°	-0.03°	0.37°
	Degrees/minutes	-1'	11'	-1'	11'	-2'	22'

Wheel Alignment Specification - Front - All wheel drive

NOTE: All figures are with vehicle at 'Showroom' ride height - full fluids, full tank of fuel, no occupants/luggage, tires inflated to normal pressures

Item		Left-hand		Right-hand		Total/Balance	
Camber		**Nominal**	**Tolerance**	**Nominal**	**Tolerance**	**Nominal**	**Tolerance**
	Decimal degrees	-0.05°	± 0.75°	-0.55°	± 0.75°	0.50°	± 0.75°
	Degrees/minutes	-3'	± 45'	-33'	± 45'	30'	± 45'
		Minimum	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**
	Decimal degrees	-0.80°	0.70°	-1.30°	0.20°	-0.25°	1.25°
	Degrees/minutes	-48'	42'	-1°18'	12'	-15'	1°15'
Castor		**Nominal**	**Tolerance**	**Nominal**	**Tolerance**	**Nominal**	**Tolerance**
	Decimal degrees	5.29°	± 0.75°	5.29°	± 0.75°	0°	± 0.75°
	Degrees/minutes	5° 17'	± 45'	5° 17'	± 45'	0'	± 45'
		Minimum	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**
	Decimal degrees	4.54°	6.04°	4.54°	6.04°	-0.75°	0.75°
	Degrees/minutes	4° 32'	6° 2'	4° 32'	6° 2'	-45'	45'
Toe		**Nominal**	**Tolerance**	**Nominal**	**Tolerance**	**Nominal**	**Tolerance**
	Decimal degrees	0.09°	±0.10°	0.09°	±0.10°	0.17°	±0.20°
	Degrees/minutes	5'	±6'	5'	±6'	10'	±12'
		Minimum	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**
	Decimal degrees	-0.02°	0.19°	-0.02°	0.19°	-0.03°	0.37°
	Degrees/minutes	-1'	11'	-1'	11'	-2'	22'

Wheel Alignment Specification - Rear - All markets (excluding India)

NOTE: All figures are with vehicle at 'Showroom' ride height - full fluids, full tank of fuel, no occupants/luggage, tires inflated to normal pressures

Item		Left-hand		Right-hand		Total/Balance		Thrust Angle	
Camber		**Nominal**	**Tolerance**	**Nominal**	**Tolerance**				
	Decimal degrees	-0.67°	± 0.75°	-0.67°	± 0.75°				
	Degrees/minutes	-40'	± 45'	-40'	± 45'				
		Minimum	**Maximum**	**Minimum**	**Maximum**				
	Decimal degrees	-1.42°	0.08°	-1.42°	0.08°				
	Degrees/minutes	-1°25'	5'	-1°25'	5'				
Toe		**Nominal**	**Tolerance**	**Nominal**	**Tolerance**	**Nominal**	**Tolerance**	**Nominal**	**Tolerance**

Item		Left-hand		Right-hand		Total/Balance		Thrust Angle	
	Decimal degrees	0.10°	± 0.14°	0.10°	± 0.14°	0.20°	± 0.20°	0°	± 0.14°
	Degrees/minutes	6'	± 8'	6'	± 8'	12'	± 12'	0'	± 8'
		Minimum	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**
	Decimal degrees	-0.04°	0.24°	-0.04°	0.24°	0°	0.40°	-0.14°	0.14°
	Degrees/minutes	-2'	14'	-2'	14'	0'	24'	-8'	8'

Wheel Alignment Specification - Rear - India

NOTE: All figures are with vehicle at 'Showroom' ride height - full fluids, full tank of fuel, no occupants/luggage, tires inflated to normal pressures

Item		Left-hand		Right-hand		Total/Balance		Thrust Angle	
Camber		**Nominal**	**Tolerance**	**Nominal**	**Tolerance**				
	Decimal degrees	-0.44°	± 0.75°	-0.44°	± 0.75°				
	Degrees/minutes	-26'	± 45'	-26'	± 45'				
		Minimum	**Maximum**	**Minimum**	**Maximum**				
	Decimal degrees	-1.19°	0.31°	-1.19°	0.31°				
	Degrees/minutes	-1°11'	19'	-1°11'	19'				
Toe		**Nominal**	**Tolerance**	**Nominal**	**Tolerance**	**Nominal**	**Tolerance**	**Nominal**	**Tolerance**
	Decimal degrees	0.08°	± 0.14°	0.08°	± 0.14°	0.16°	± 0.20°	0°	± 0.14°
	Degrees/minutes	5'	± 8'	5'	± 8'	10'	± 12'	0'	± 8'
		Minimum	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**
	Decimal degrees	-0.06°	0.22°	-0.06°	0.22°	-0.04°	0.36°	-0.14°	0.14°
	Degrees/minutes	-4'	13'	-4'	13'	-2'	22'	-8'	8'

Wheel Alignment Specification - Rear - All wheel drive

NOTE: All figures are with vehicle at 'Showroom' ride height - full fluids, full tank of fuel, no occupants/luggage, tires inflated to normal pressures

Item		Left-hand		Right-hand		Total/Balance		Thrust Angle	
Camber		**Nominal**	**Tolerance**	**Nominal**	**Tolerance**				
	Decimal degrees	-0.67°	± 0.75°	-0.67°	± 0.75°				
	Degrees/minutes	-40'	± 45'	-40'	± 45'				
		Minimum	**Maximum**	**Minimum**	**Maximum**				
	Decimal degrees	-1.42°	0.08°	-1.42°	0.08°				
	Degrees/minutes	-1°25'	5'	-1°25'	5'				
Toe		**Nominal**	**Tolerance**	**Nominal**	**Tolerance**	**Nominal**	**Tolerance**	**Nominal**	**Tolerance**
	Decimal degrees	0.10°	± 0.14°	0.10°	± 0.14°	0.20°	± 0.20°	0°	± 0.14°
	Degrees/minutes	6'	± 8'	6'	± 8'	12'	± 12'	0'	± 8'
		Minimum	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**
	Decimal degrees	-0.04°	0.24°	-0.04°	0.24°	0°	0.40°	-0.14°	0.14°
	Degrees/minutes	-2'	14'	-2'	14'	0'	24'	-8'	8'

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Suspension System - General Information - Suspension System

Diagnosis and Testing

Principles of Operation

For a detailed description of the suspension system, refer to the relevant Description and Operation section in the workshop manual.
REFER to: Front Suspension (204-01 Front Suspension, Description and Operation) /
Rear Suspension (204-02 Rear Suspension, Description and Operation).

Inspection and Verification

WARNING: Before carrying out a road test, make sure the vehicle is safe to do so. Failure to follow this instruction may result in personal injury.

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Gather as much information from the driver as possible and verify the customer concern by carrying out a road test, as closely as possible reproducing the conditions under which the fault occurs.
2. Visually inspect for obvious signs of mechanical damage.

Visual Inspection

Mechanical
• Tire pressures • Damaged wheels or tires • Wheel bearing(s) • Loose or damaged front or rear suspension components • Loose, damaged or missing suspension fastener(s) • Damaged or leaking air suspension components • Worn or damaged suspension bushing(s) • Loose, worn or damaged steering system components • Damaged axle components • Damaged chassis

3. If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the symptom chart.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Causes	Action
Crabbing	• Incorrect rear thrust angle • Damaged/worn front or rear suspension components	Check the rear alignment. Check the front and rear suspension for signs of damage or wear.
Drift/Pull/Wander	• Tire pressures • Uneven tire wear • Damaged steering components • Wheel alignment • Brake drag • Unevenly loaded or overloaded vehicle	Check and adjust the tire pressures (see visual inspection). Check for uneven tire wear, investigate the cause and rectify as necessary. Check the steering for wear/damage. Check and adjust the wheel alignment as necessary. Check for binding brakes, rectify as necessary. Advise the driver of the load issues.
Front bottoming or riding low	• Damaged suspension components • Air spring fault	Check the suspension components for damage. Check the dynamic suspension.

Symptom	Possible Causes	Action
Uneven tire wear	• Incorrect tire pressure (rapid centre rib or inner and outer edge wear) • Incorrect front or rear toe (rapid inner or outer edge wear) • Incorrect camber (rapid inner or outer edge wear) • Tires out of balance (tires cupped or dished)	Check and adjust the tire pressures (see visual inspection). Check and adjust the wheel alignment as necessary. REFER to: Suspension System (204-00 Suspension System - General Information, Diagnosis and Testing). Balance the wheels and tires as necessary.
Harsh ride	• Damaged suspension components • Air spring fault	Check the suspension components for damage. Check the dynamic suspension.
Shimmy or wheel tramp	• Wheels/tires • Loose wheel nut(s) • Loose front suspension fasteners • Front wheel bearing(s) fault • Worn or damaged suspension component bushing • Loose, worn or damaged ball joint(s) • Loose, worn or damaged steering components • Front wheel alignment	Check the wheels and tires for condition and balance. Check and tighten the wheel nuts and suspension fasteners to specification. Check the front wheel bearings, suspension bushings, ball joints and steering components for wear or damage. Check and adjust the wheel alignment as necessary. REFER to: Suspension System (204-00 Suspension System - General Information, Diagnosis and Testing).
Poor return ability of the steering (self-centering)	• Steering column • Ball joints • Steering components	Check the steering column universal joints, etc. Check the ball joints and other steering components.
Sway or roll	• Loose front or rear stabilizer bar • Worn lower suspension arm stabilizer bar insulators • Air spring fault	Check the stabilizer bar security and condition. Rectify as necessary. Check the air springs.
Vehicle leans to one side	• Front or rear suspension components • Air spring fault	Check the front and rear suspension. Check the air springs.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.

Published: 10-Oct-2013

Suspension System - General Information - Camber and Caster Adjustment

General Procedures

CAUTIONS:

Adjustments made to the camber setting will affect the front toe setting. Therefore , the camber and toe may need to be adjusted at the same time.

Make sure the steering wheel is in the straight ahead position.

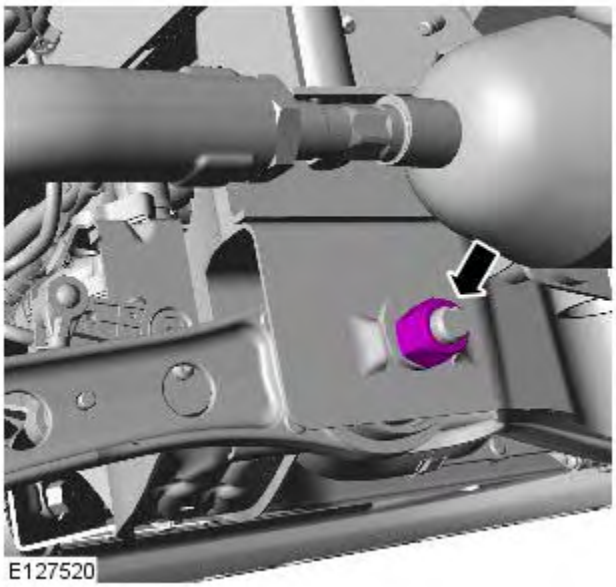
NOTES:

This procedure must be carried out using a 4-post ramp.

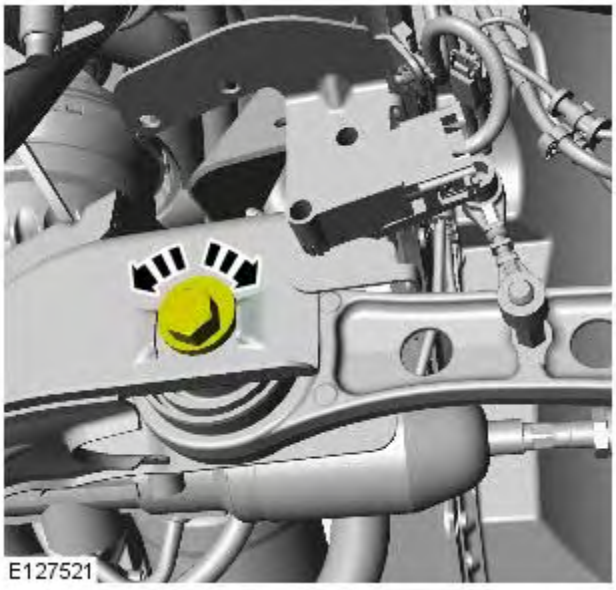
The camber and caster adjustment for the left-hand side is shown, the procedure for adjusting the right-hand side is similar.

Adjustments to the caster will affect the toe settings. Therefore, the caster and toe may need to be adjusted at the same time to achieve the correct settings.

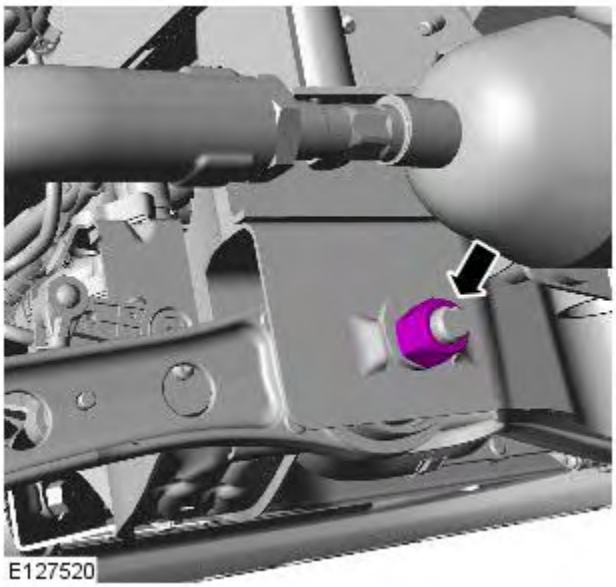
1. For wheel alignment information, refer to the suspension specification section.
   For additional information, refer to: Specifications (204-00 Suspension System - General Information, Specifications).
2. Check and adjust tire pressures.
3. Position the vehicle on a 4 post lift.
4. Check the tie rod ends, suspension joints, wheel bearings and wheels and tires for damage, wear and free play.
   - Adjust or repair any worn, damaged or incorrectly adjusted components.
5. Release the vehicle parking brake.
6. For additional information, refer to: Air Suspension Manual Tight Tolerance Setting Mode (204-05 Vehicle Dynamic Suspension, General Procedures).
7. Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment.
8. Check the front toe adjustment.
9. Check the rear toe adjustment.



10. To adjust the camber, loosen the rear lower arm lock nuts.
    - Loosen, but do not fully remove the nut.

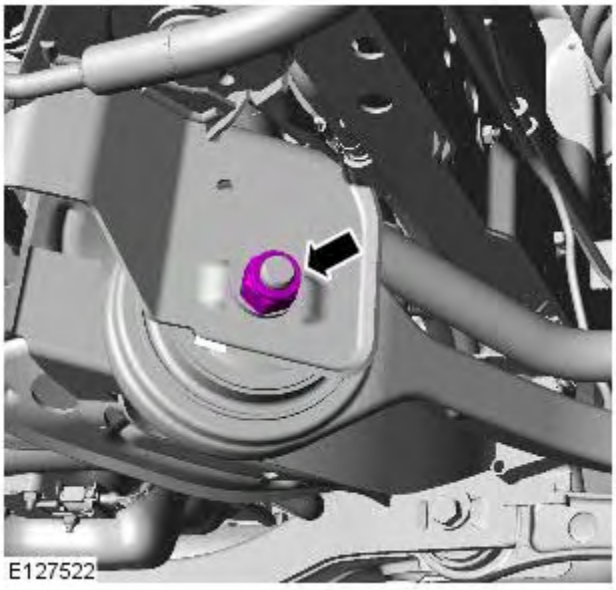


11. Rotate the camber adjustment cam bolt.



12. CAUTION: Make sure the camber adjustment bolt does not rotate while the lock nut is being tightened.

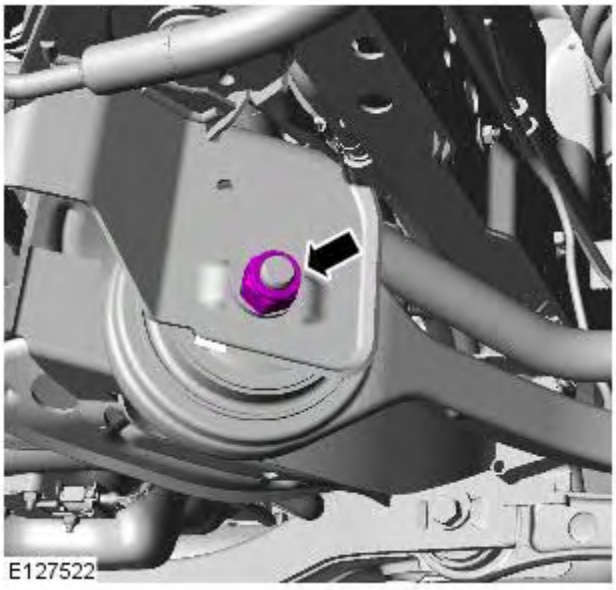
    Tighten the camber adjustment cam bolt nut.
    - Tighten the nut and bolt to 175 Nm (129 lb.ft).



13. To adjust the caster, loosen the front lower arm lock nuts.
    - Loosen, but do not fully remove the nut.

E127523

14. Rotate the caster adjustment cam bolt.



E127522

15. CAUTION: Make sure the caster adjustment bolt does not rotate while the lock nut is being tightened.

    Tighten the caster adjustment cam bolt nut.
    - Tighten the nut and bolt to 175 Nm (129 lb.ft).

16. Check the front toe adjustment.

17. Check the rear toe adjustment.

18. Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment.

Published: 16-Oct-2013

Suspension System - General Information - Four-Wheel Alignment

General Procedures

CAUTIONS:

Make sure the vehicle is on a flat level surface.

Make sure the tire pressures are within specification.

Make sure that only the manufacturers' recommended four wheel alignment equipment is used.

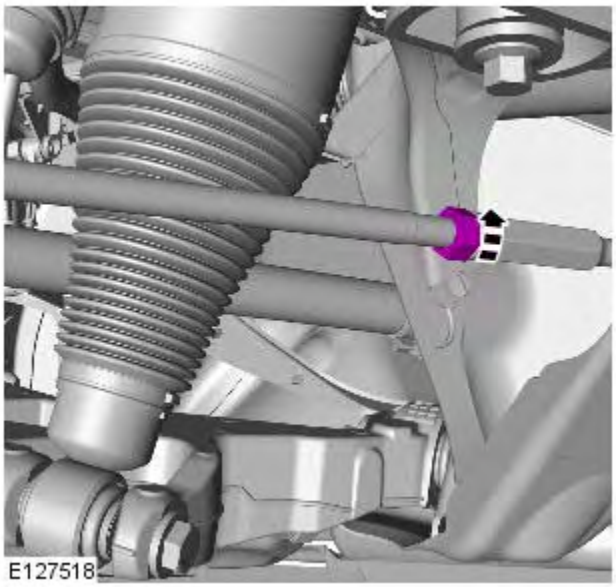
Make sure the steering wheel is in the straight ahead position.

Adjustments made to the camber setting will affect the front toe setting. Therefore , the camber and toe may need to be adjusted at the same time.

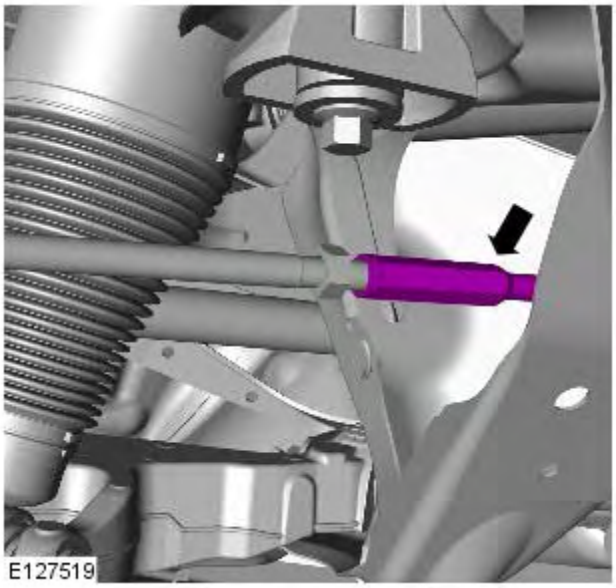
LH illustration shown, RH is similar.

NOTE: Adjustments to the caster will affect the toe settings. Therefore, the caster and toe may need to be adjusted at the same time to achieve the correct settings.

1. For wheel alignment information, refer to the suspension specification section.
   For additional information, refer to: Specifications (204-00 Suspension System - General Information, Specifications).
2. Check the tie rod ends, suspension joints, wheel bearings and wheels and tires for damage, wear and free play.
   - Adjust or repair any worn, damaged or incorrectly adjusted components.
3. Check and adjust tire pressures.
4. Position the vehicle on a calibrated, level, vehicle lift.
5. Release the vehicle parking brake.
6. For additional information, refer to: Air Suspension Manual Tight Tolerance Setting Mode (204-05 Vehicle Dynamic Suspension, General Procedures).
7. Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment.

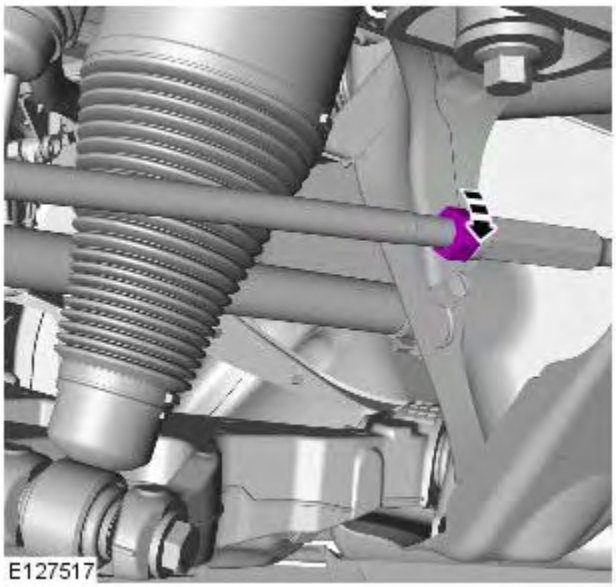


8. Adjust the rear toe.
    - To adjust, loosen the toe link locknuts.



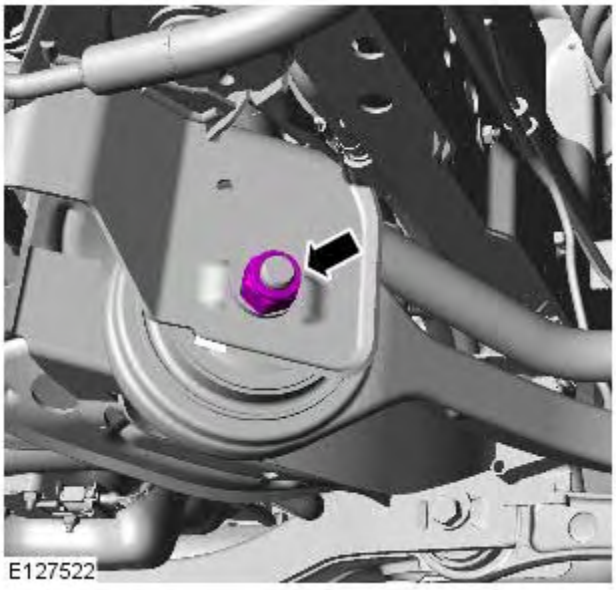
9. CAUTION: Do not allow the gaiter to twist.

   Adjust the rear toe.



10. NOTE: Use an additional wrench to prevent the component from rotating.

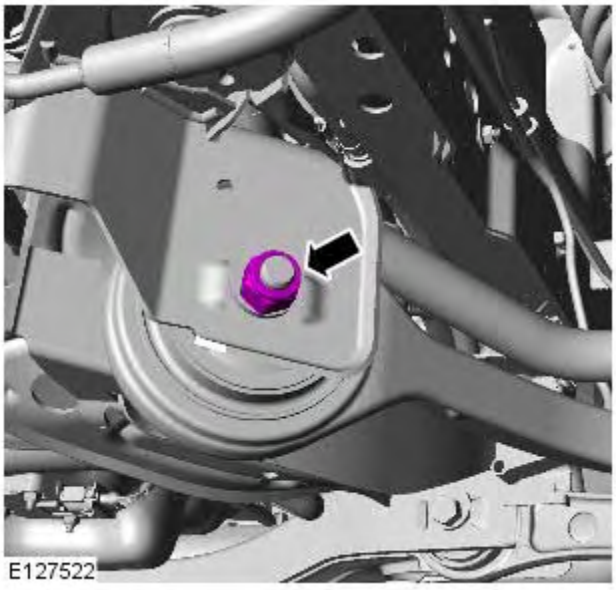
    Tighten the toe link locknuts to 55 Nm (40 lb.ft).



11. To adjust the caster, loosen the front lower arm lock nuts.
    - Loosen, but do not fully remove the nut.

E127523

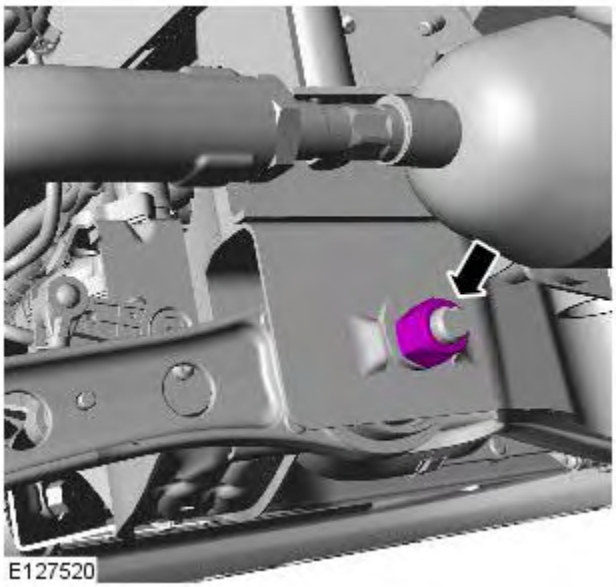
12. Rotate the caster adjustment cam bolt.



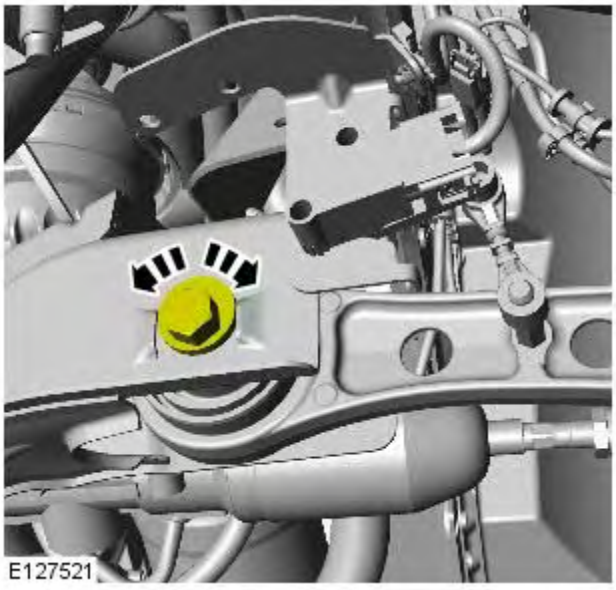
E127522

13. CAUTION: Make sure the caster adjustment bolt does not rotate while the lock nut is being tightened.

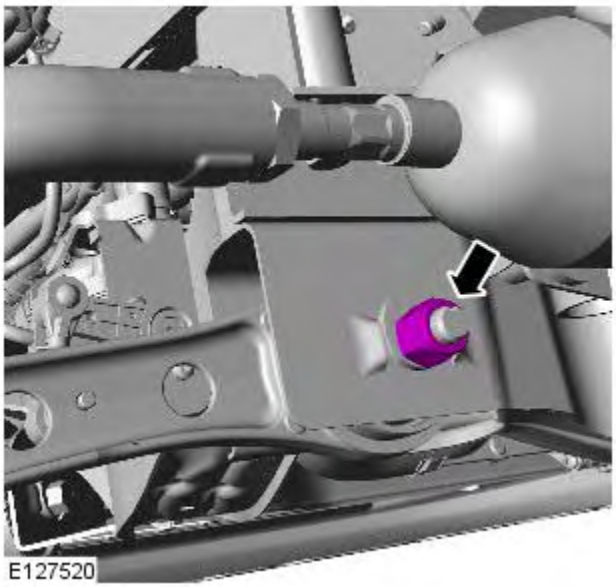
    Tighten the caster adjustment cam bolt nut.
    - Tighten the nut and bolt to 175 Nm (129 lb.ft).



14. To adjust the camber, loosen the rear lower arm lock nuts.
    - Loosen, but do not fully remove the nut.

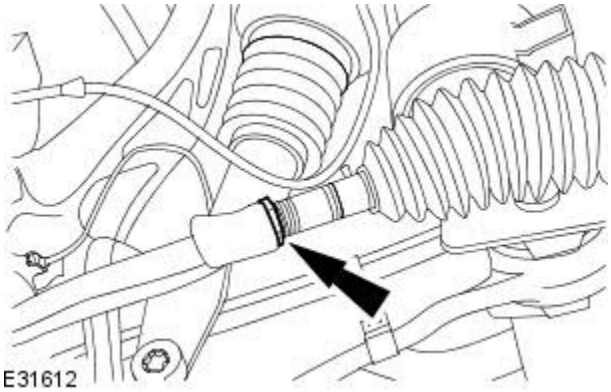


15. Rotate the camber adjustment cam bolt.

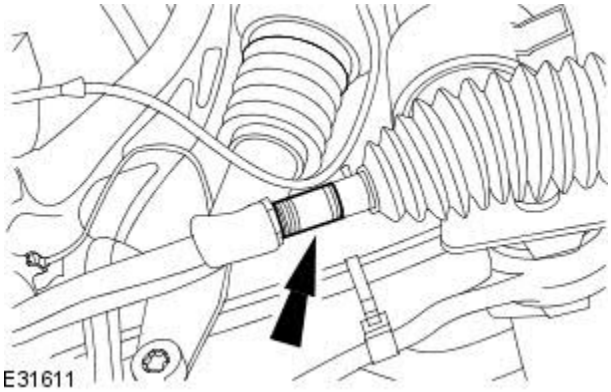


16. CAUTION: Make sure the camber adjustment bolt does not rotate while the lock nut is being tightened.

    Tighten the camber adjustment cam bolt nut.
    - Tighten the nut and bolt to 175 Nm (129 lb.ft).



17. Check the front toe adjustment.
    - To adjust, loosen the tie rod end lock nuts.



18. CAUTION: Do not allow the gaiter to twist.

    NOTE: Both tie rods must be rotated by an equal amount.

    Adjust the front toe.

19. Tighten the tie rod end lock nuts to 55 Nm (40 lb.ft).

20. Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment.

Published: 16-Oct-2013

Suspension System - General Information - Front Toe Adjustment

General Procedures

CAUTIONS:

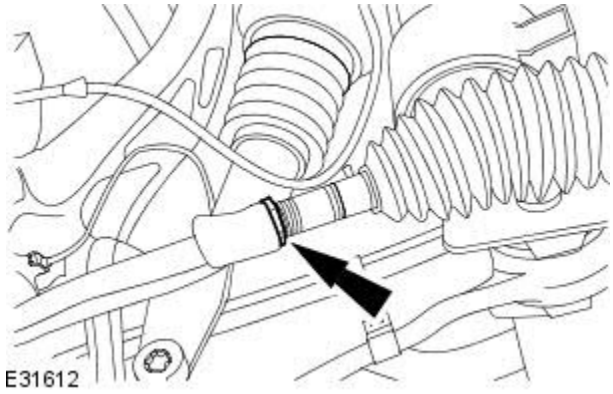
Make sure the vehicle is on a flat level surface.

Make sure the tire pressures are within specification.

Make sure that only the manufacturers' recommended four wheel alignment equipment is used.

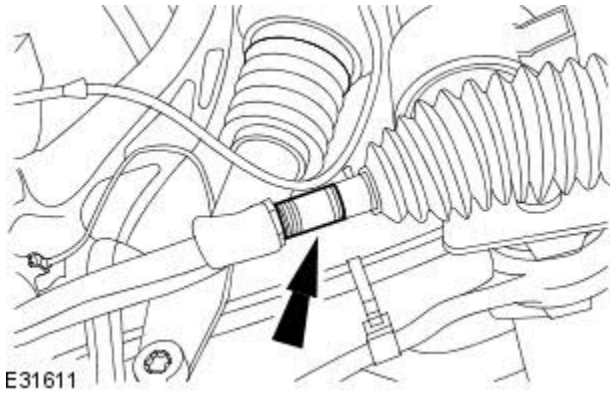
Make sure the steering is in the straight ahead position.

1. For wheel alignment information, refer to the suspension specification section.
   For additional information, refer to: Specifications (204-00 Suspension System - General Information, Specifications).
2. Check the tie rod ends, suspension joints, wheel bearings and wheels and tires for damage, wear and free play.
   - Adjust or repair any worn, damaged or incorrectly adjusted components.
3. Check and adjust tire pressures.
4. Position the vehicle on a 4 post lift.
5. Release the vehicle parking brake.
6. For additional information, refer to: Air Suspension Manual Tight Tolerance Setting Mode (204-05 Vehicle Dynamic Suspension, General Procedures).
7. Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment.



8. NOTE: LH illustration shown, RH is similar.

   To adjust, loosen the tie rod end lock nuts.



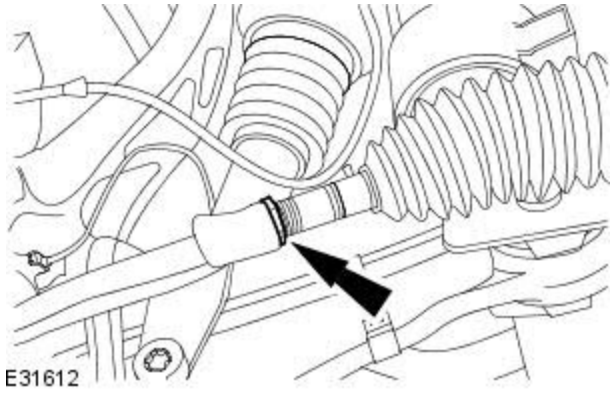
9. CAUTION: Do not allow the gaiter to twist.

   NOTES:

   Both tie rods must be rotated by an equal amount.

   LH illustration shown, RH is similar.

   Adjust the front toe.



10. NOTE: LH illustration shown, RH is similar.

    Tighten the tie rod end lock nuts to 55 Nm.

11. Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment.

Published: 14-Feb-2012

Suspension System - General Information - Front Wheel Bearing and Wheel Hub Runout Check Vehicles With: High Performance Brakes

General Procedures

NOTES:

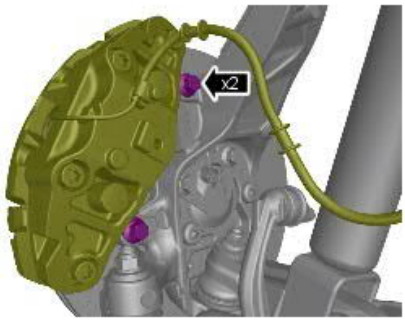
Some variation in the illustrations may occur, but the essential information is always correct.

RH illustration shown, LH similar.

1. WARNING: Make sure to support the vehicle with axle stands.

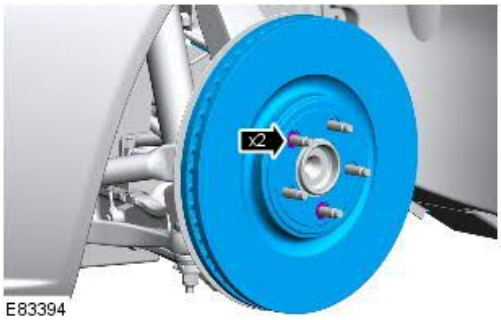
   Raise the front of the vehicle.

2. Remove the front wheel.
   For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).



E117071

3. Remove the 2 brake caliper support bolts.
   - Push the brake pads back to release the brake caliper from the disc.
   - Detach the brake caliper and position to one side with suitable tie strap.



E83394

4. Remove the disc.
   - Remove the 2 clips.

E142472

5. Mount special tool 100-053 on the lower caliper support bracket as shown.
   - A spacer washer may be required under the tool.
   - Usethe brake caliper support bolt and suitable nut.

E142472

6. Position the Dial Test Indicator (DTI) gauge probe on the hub flange as shown.

7. Zero DTI and rotate the hub one complete revolution to measure hub runout. hub runout must not exceed 0.015 mm.

8. If the hub runout exceeds the limit, install a new hub and bearing.

For additional information, refer to: Front Wheel Bearing and Wheel Hub (204-01 Front Suspension, Removal and Installation).

9. If the hub runout is within the limit install the removed components.

10. Tighten the brake support caliper bolts to 115 Nm.

Published: 14-Feb-2012

Suspension System - General Information - Front Wheel Bearing and Wheel Hub Runout Check Vehicles With: Standard Brakes

General Procedures

NOTES:

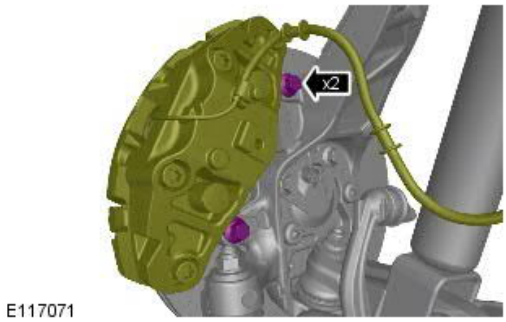
RH illustration shown, LH similar.

Some variation in the illustrations may occur, but the essential information is always correct.

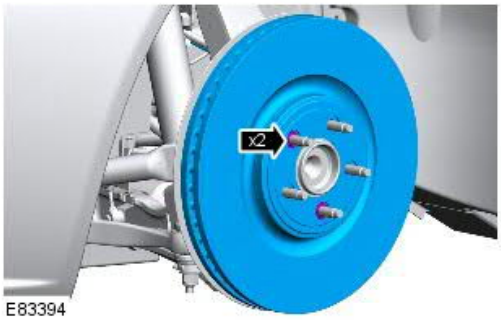
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise the front of the vehicle.

2. Remove the front wheel.
   For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).



3. Remove the 2 brake caliper support bolts.
   - Push the brake pads back to release the brake caliper from the disc.
   - Detach the brake caliper and position to one side with suitable tie strap.



4. Remove the disc.
   - Remove the 2 clips.

5. Mount special tool 100-053 on the lower caliper support bracket as shown.
   - A spacer washer may be required under the tool.
   - Use the brake caliper support bolt and suitable nut.

6. Position the Dial Test Indicator (DTI) gauge probe on the hub flange as shown.

7. Zero DTI and rotate the hub one complete revolution to measure hub runout. hub runout must not exceed 0.015 mm.

8. If the hub runout exceeds the limit, install a new hub and bearing.

For additional information, refer to: Front Wheel Bearing and Wheel Hub (204-01 Front Suspension, Removal and Installation).

9. If the hub runout is within the limit install the removed components.

10. Tighten the brake caliper support bolts to 115 Nm.

Published: 16-Oct-2013

Suspension System - General Information - Rear Toe Adjustment

General Procedures

CAUTIONS:

LH illustration shown, RH is similar.

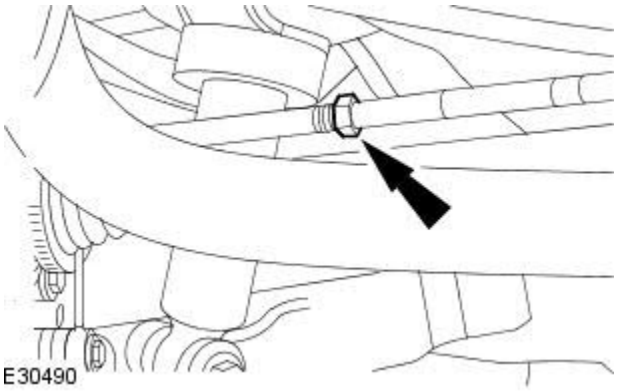
Make sure the vehicle is on a flat level surface.

Make sure the tire pressures are within specification.

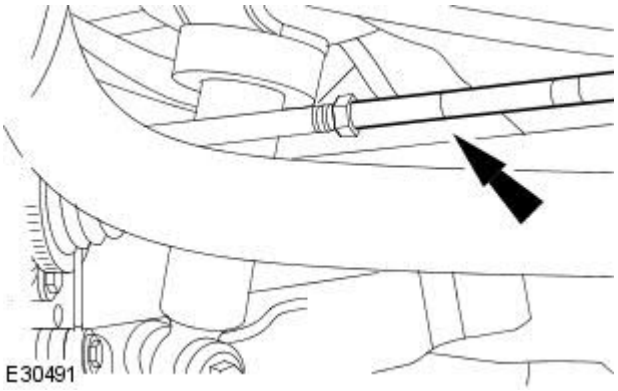
Make sure that only the manufacturers' recommended four wheel alignment equipment is used.

Make sure the steering wheel is in the straight ahead position.

1. For wheel alignment information, refer to the suspension specification section.
   For additional information, refer to: Specifications (204-00 Suspension System - General Information, Specifications).
2. Check the tie rod ends, suspension joints, wheel bearings and wheels and tires for damage, wear and free play.
   - Adjust or repair any worn, damaged or incorrectly adjusted components.
3. Check and adjust tire pressures.
4. Position the vehicle on a calibrated, level, vehicle lift.
5. Release the vehicle parking brake.
6. For additional information, refer to: Air Suspension Manual Tight Tolerance Setting Mode (204-05 Vehicle Dynamic Suspension, General Procedures).
7. Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment.



8. To adjust, loosen the toe link locknuts.



9. Adjust the rear toe.

10. NOTE: Use an additional wrench to prevent the component from rotating.

    Tighten the toe link locknuts to 55 Nm (40 lb.ft).

11. Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment.

Published: 27-Feb-2012

Suspension System - General Information - Rear Wheel Bearing and Wheel Hub Runout Check Vehicles With: Standard Brakes

General Procedures

NOTES:

RH illustration shown, LH similar.

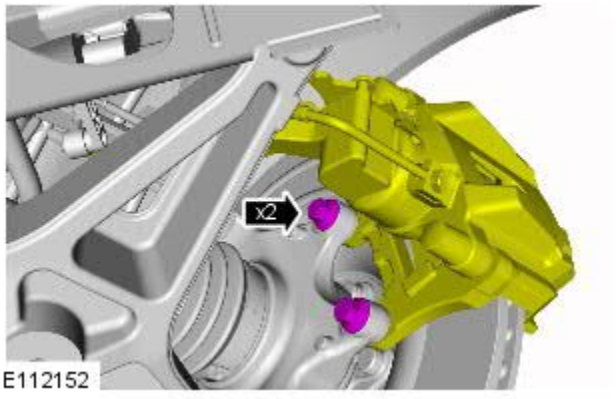
Some variation in the illustrations may occur, but the essential information is always correct.

It is recommended that the DTI is capable of measurements of 0.005 mm.

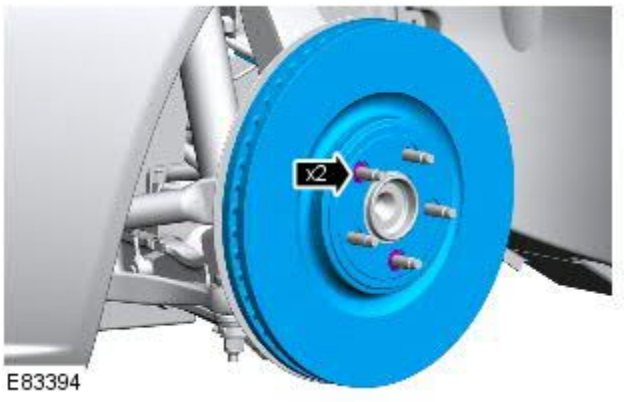
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise the rear of the vehicle.

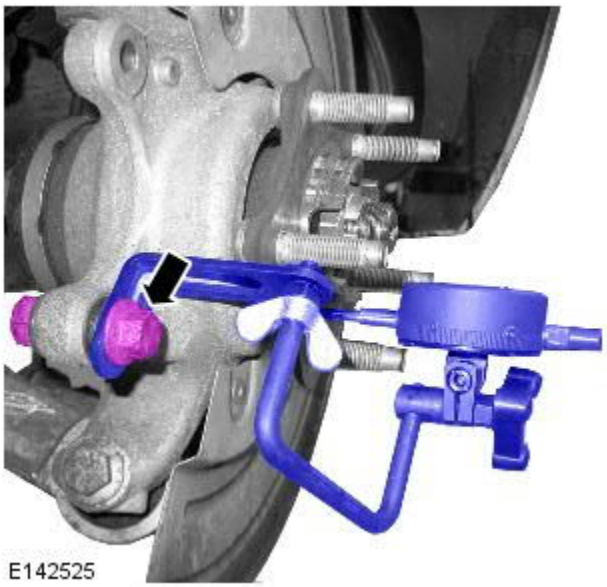
2. Remove the rear wheel.
   For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).



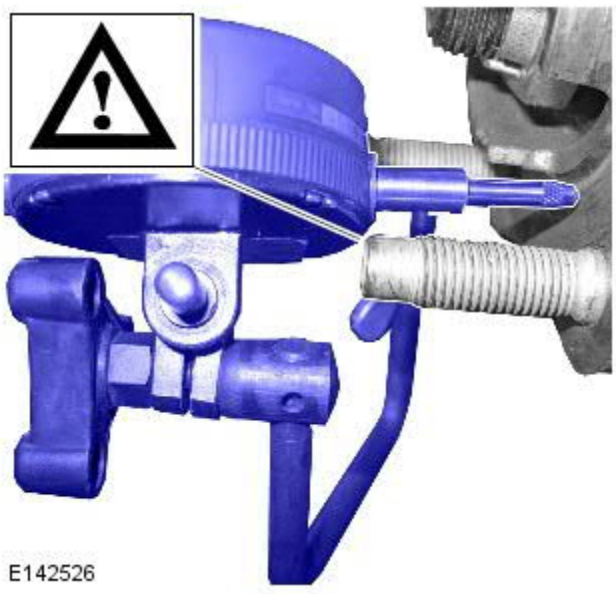
3. Remove the 2 brake caliper support bolts.
   - Push the brake pads back to release the brake caliper from the disc.
   - Detach the brake caliper and position to one side with suitable tie strap.



4. Remove the disc.
   - Remove the 2 clips.


E142525

5. Mount special tool 100-053 on the lower caliper support bracket as shown.
    - A spacer washer may be required under the tool.
    - Use the brake caliper support bolt and suitable nut.


E142526

6. CAUTION: Take care not to contact the studs.

   Position the Dial Test Indicator (DTI) gauge probe on the hub flange as shown.

7. Zero DTI and rotate the hub one complete revolution to measure hub runout. Hub runout must not exceed 0.025 mm.

8. If the hub runout exceeds the limit, install a new hub and bearing. For additional information, refer to: Rear Wheel Bearing (204-02 Rear Suspension, Removal and Installation).

9. If the hub runout is within the limit install the removed components.

10. Tighten the brake support caliper bolts to 103 Nm.

Published: 11-May-2011

Front Suspension -

Torque Specification

NOTE: * Ensure new nut and/or bolt is fitted

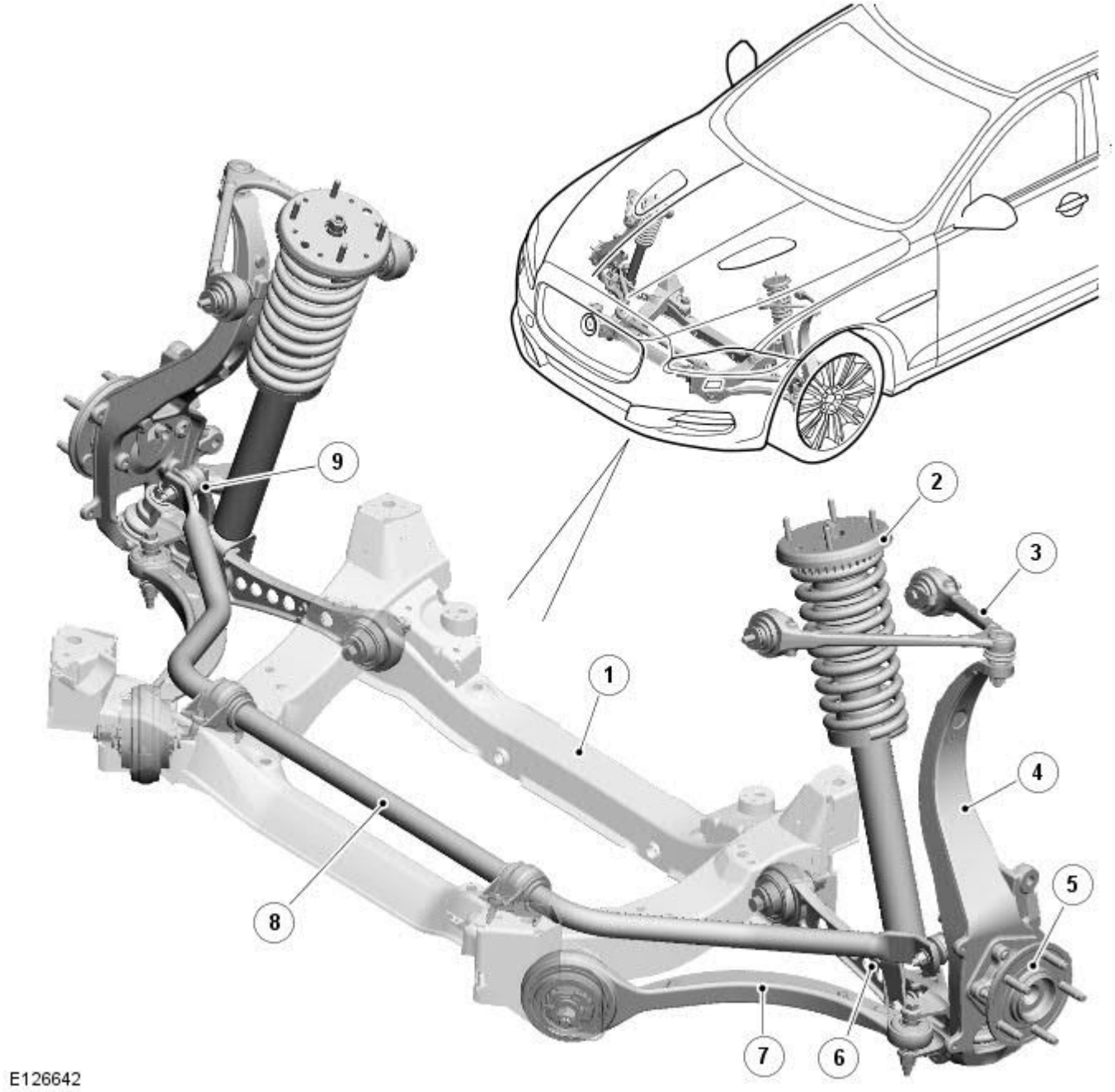
Description	Nm	lb-ft	lb-in
Steering gear to subframe retaining bolts	100	74	-
* Toe link ball joint to wheel knuckle retaining nut	133	98	-
* Stabilizer bar link to stabilizer bar retaining nut	43	32	-
* Stabilizer bar link to lower arm retaining nut	70	52	-
Stabilizer bar clamp to subframe retaining bolts	55	41	-
* Rear lower arm to wheel knuckle ball joint retaining nut	133	98	-
* Rear lower arm to subframe retaining nut	175	129	-
* Front lower arm to subframe retaining nut	175	129	-
* Front lower arm to rear lower arm retaining nut and bolt	Stage 1 - 60 Stage 2 - 135 degrees	Stage 1 - 44 Stage 2 - 135 degrees	-
* Upper arm ball joint to wheel knuckle retaining nut	90	66	-
* Upper arm to body retaining nuts	70	52	-
Shock absorber and spring assembly upper mounting to body retaining nuts	28	20	-
Shock absorber and spring assembly to lower arm retaining nut and bolt	175	129	-
Shock absorber and spring assembly upper mounting retaining nut	27	20	-
* Wheel hub and bearing assembly to wheel knuckle retaining bolts	90	66	-
Wheel and tire to wheel hub retaining nuts	125	92	-

Published: 11-May-2011

Front Suspension - Front Suspension - Component Location

Description and Operation

COMPONENT LOCATION



E126642

Item	Description
1	Subframe
2	Spring and damper assembly
3	Upper control arm
4	Wheel knuckle
5	Wheel hub and bearing assembly
6	Lower lateral control arm
7	Lower forward control arm
8	Stabilizer bar
9	Stabilizer bar link

Published: 20-Jun-2011

Front Suspension - Front Suspension - Overview

Description and Operation

OVERVIEW

The front suspension is a fully independent design assembled on a non-isolated subframe. Each front wheel knuckle attaches to unequal length wishbone-type upper and lower control arms, which minimize track and camber changes during articulation. A stabilizer bar is attached to the front of the subframe and connected to each rear lower control arm with a link assembly. A spring and damper assembly is installed between each rear lower control arm and the related front suspension housing.

Published: 29-Oct-2012

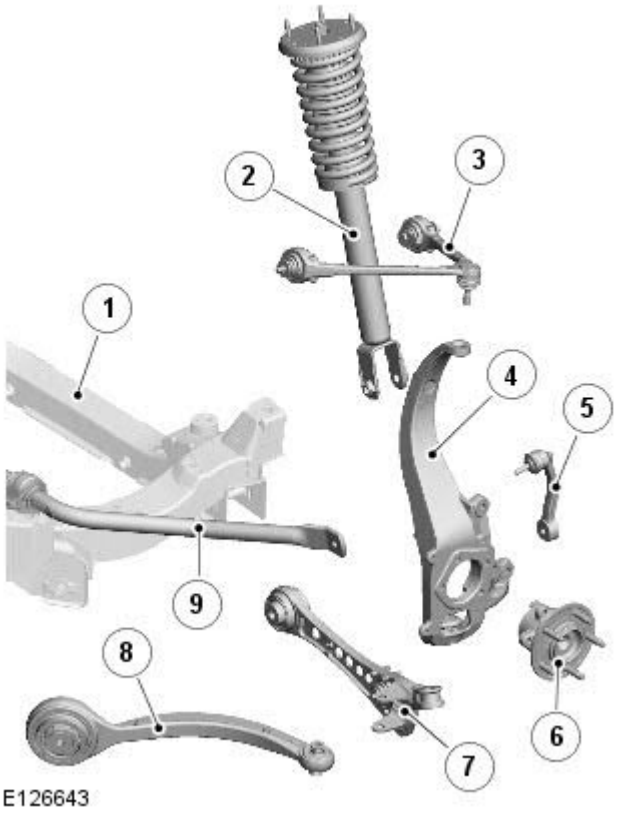
Front Suspension - Front Suspension - System Operation and Component Description

Description and Operation

System Operation

Component Description

FRONT SUSPENSION



Item	Description
1	Subframe
2	Spring and damper assembly
3	Upper control arm
4	Wheel knuckle
5	Stabilizer bar link
6	Wheel hub and bearing assembly
7	Lower lateral control arm
8	Lower forward control arm
9	Stabilizer bar

Upper Control Arm

The forged-aluminum upper control arm is a wishbone design and connects to the vehicle body through two plain bushes, and links to the swan neck wheel knuckle by an integral ball joint. The upper control arm is inclined to provide anti-dive characteristics under heavy braking, while also controlling geometry for vehicle straight-line stability.

Lower Control Arm

The forged aluminum lower control arms are of the wishbone design; the arms separate to allow for optimum bush tuning:

- The rear lateral control arm is fitted with a bush at its inner end which locates between brackets on the subframe. The arm is secured with an eccentric bolt which provides the adjustment of the suspension camber geometry. The outer end

of the control arm has a tapered hole which locates on a ball joint fitted to the wheel knuckle. An integral clevis bracket on the forward face of the lateral control arm allows for the attachment of the forward control arm. A bush is fitted below the clevis bracket to provide for the attachment of the stabilizer bar link. A cross-axis joint is fitted to a cross-hole in the control arm to provide the location for the clevis attachment of the spring and damper assembly.
- The forward control arm is fitted with a fluid-block rubber bush at its inner end which locates between brackets on the subframe. The arm is secured with an eccentric bolt which provides adjustment of the castor and camber geometry. The outer end of the control arm is fitted with a cross-axis joint and locates in the integral clevis bracket on the lateral control arm.

Wheel Knuckle

The cast aluminum wheel knuckle is a swan neck design and attaches to the upper control arm and lower lateral control arm. The lower lateral control arm locates on a non serviceable ball-joint integral with the wheel knuckle. The lower boss on the rear of the knuckle provides for the attachment of the steering gear tie-rod ball joint.

The wheel knuckle also provides the mounting locations for the:

- Wheel hub and bearing assembly.
- The wheel speed sensor (integral to the wheel hub and bearing assembly).
- Brake caliper and disc shield.

Stabilizer Bar

The tubular stabilizer bar helps to control the roll rate of the vehicle. There are three versions of stabilizer bar, depending on which engine is installed:

- 30 mm (1.18 in.) diameter joggled, on 3.0L diesel vehicles.
- 30 mm (1.18 in.) diameter straight, on 5.0L naturally aspirated and SC (supercharger) vehicles.
- A tubular 32 mm (1.26 in.) diameter on armored vehicles.

The stabilizer bar is attached to the front of the subframe with bushes and mounting brackets. The pressed steel mounting brackets locate over the bushes and are attached to the cross member with bolts screwed into threaded locations in the subframe. The stabilizer bar has collars crimped into the bar at the inside edges of the bushes. The collars prevent sideways movement of the stabilizer bar.

Each end of the stabilizer bar curves rearward to attach to a ball joint on each stabilizer link. Each stabilizer link is secured to a bush in the lower lateral arm with a bolt and locknut. The links allow the stabilizer bar to move with the wheel travel providing maximum effectiveness.

Spring and Damper Assembly

The spring and damper assemblies are located between the lower lateral arm and the front suspension housing. Each spring and damper assembly incorporates:

- An adaptive dynamics damper, which enables the damping characteristics of the suspension to be adjusted. Refer to: Vehicle Dynamic Suspension (204-05 Vehicle Dynamic Suspension, Description and Operation).
- A conventional coil spring, individually tuned to provide the required characteristics for the different engine variants.

The spring rate of the coil spring differs between models and is color coded for identification.

India-Specific Spring and Damper Assembly Spacers

E137420

Front spring and damper assemblies are fitted with spacers to raise ride height in India-specific vehicles. The color of these spacers is grey. Rear air spring and damper assemblies are built by the supplier and the increase in ride height is contained in the assemblies which are sealed.

Published: 17-May-2012

Front Suspension - Front Suspension

Diagnosis and Testing

Principle of Operation

For a detailed description of the suspension system, refer to the relevant Description and Operation section of the workshop manual.REFER to: (204-01)

Front Suspension (Description and Operation),
Front Suspension (Description and Operation),
Front Suspension (Description and Operation).

Inspection and Verification

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical
• Damaged suspension dampers

3. If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the next step
4. If the fault is not visually evident, verify the symptom and refer to the following Symptom Chart

Symptom Chart

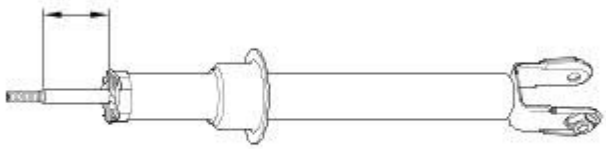
Symptom	Possible Cause	Action
Evidence of fluid on suspension damper	• Fluid on damper from an external source • Fluid leaking from damper	• Damper not faulty, do not renew • GO to Pinpoint Test A.

PINPOINT TEST A : DAMPER FLUID LEAK DIAGNOSIS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: ASSESS LEAK	
NOTES: Residual oil left over from the damper assembly process may create oil staining on the damper tube. This will not affect the function of the damper. Slight seepage is considered normal.	
	1 Assess the extent of the oil leakage
	Is the leakage serious enough to indicate that the damper seal has failed? **Yes** GO to Pinpoint Test B. **No** Damper not faulty, do not renew.

PINPOINT TEST B : CONFIRM LEAK	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
B1: ROAD TEST	
	1 Clean all traces of oil from the damper
	2 Drive the vehicle over a speed bump or similar ten times
	Is any fluid visible on the outside of the damper? **Yes** GO to Pinpoint Test C. **No** Damper not faulty, do not renew.

PINPOINT TEST C : DAMPER STICKOUT TEST	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
C1: DAMPER STICKOUT TEST	

NOTE: If a significant quantity of fluid has leaked out of the damper, the dividing piston will be displaced upwards in the tube by the pressure of the gas below it. This will limit the downward travel of the piston.

	1 Remove the suspension strut assembly REFER to: Front Shock Absorber (204-01, Removal and Installation).
	2 Remove the spring
	3 Remove the bump stop
	4 Push the damper piston fully into the damper tube
 E144894	5 Measure and record the stickout dimension (the distance between the damper tube cap and the piston rod shoulder)
	Is the stickout dimension greater than 12.0mm? **Yes** Damper unserviceable. Install a new suspension damper. Enclose a record of the stickout dimension with the returned part. **No** Damper serviceable. Re-assemble and re-install the suspension strut REFER to: Front Shock Absorber (204-01, Removal and Installation).

Published: 11-May-2011

Front Suspension - Front Shock Absorber

Removal and Installation

Special Tool(s)

E64117	Suspension spring compressor 204-476-01

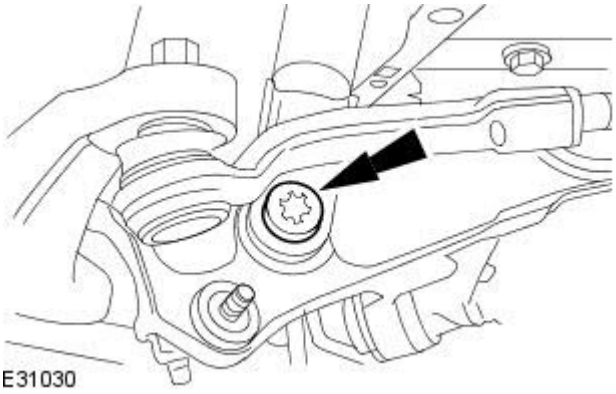
Removal

All vehicles

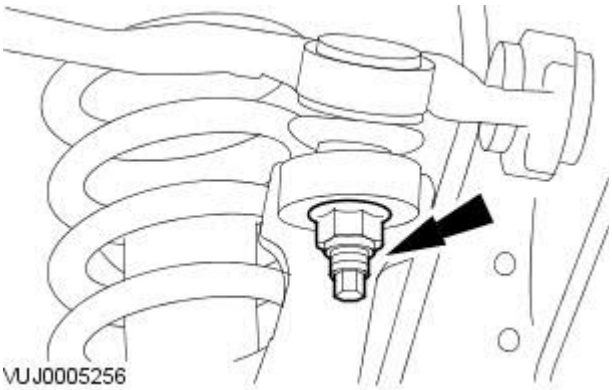
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).



3. Release the shock absorber from the lower arm.



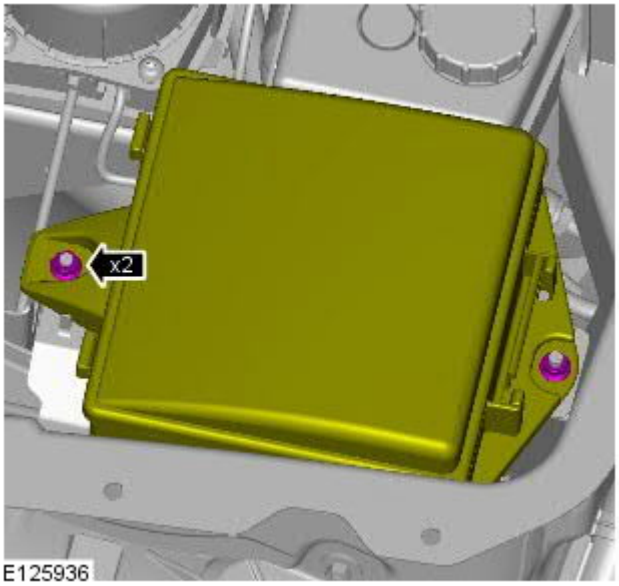
4. CAUTIONS:

   Make sure the wheel knuckle is supported. Failure to follow these instructions may result in damage to the vehicle.

   Use an Allen key to prevent the ball joint rotating whilst removing the nut.

   Discard the nut.

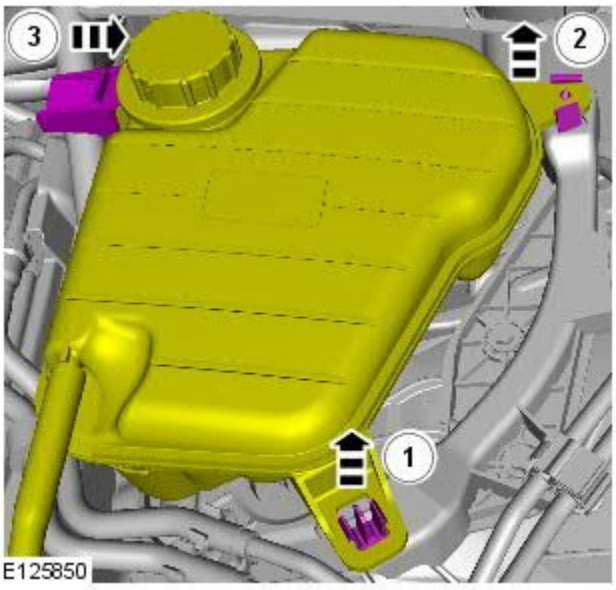
   Disconnect the upper arm from the wheel knuckle.



5. NOTE: RH side only.

   Release the fuse box.
   - Remove the 2 nuts.
   - Position the fuse box aside for access to the inboard retaining nut.

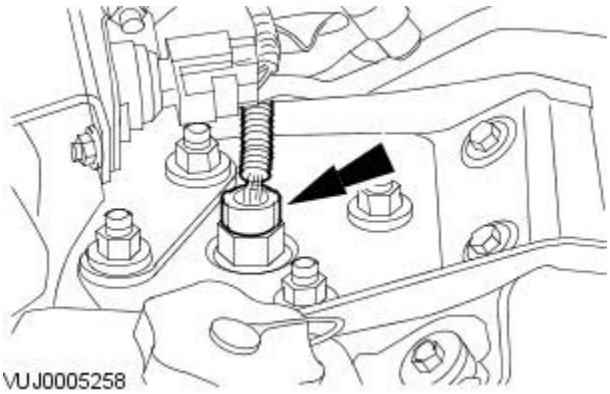
Vehicles with 5.0L engine



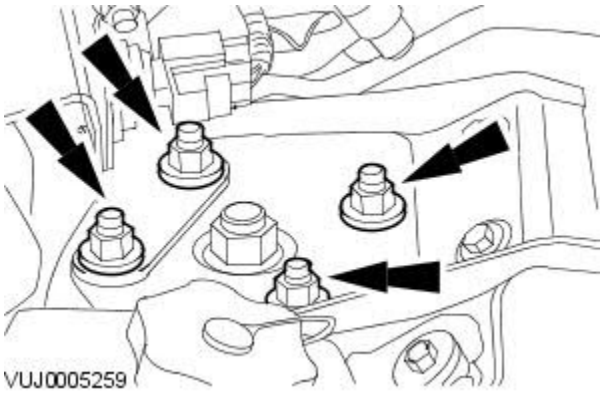
6. NOTE: LH side only.

   Release the coolant expansion tank for access.

All vehicles



7. Disconnect the electrical connector.

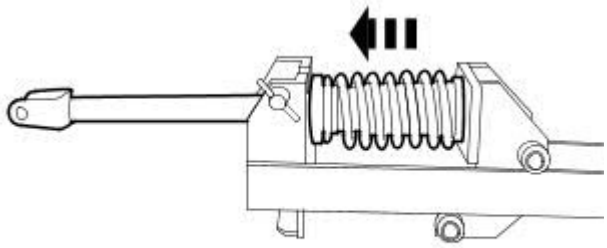


8. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

   Remove the shock absorber and spring assembly.

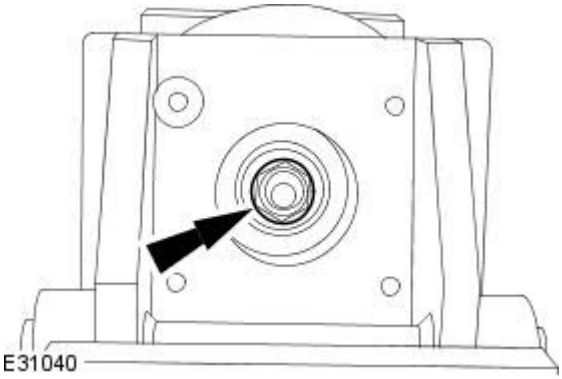
9. NOTE: Do not disassemble further if the component is removed for access only.

   Install the shock absorber and spring assembly in the spring compressor.

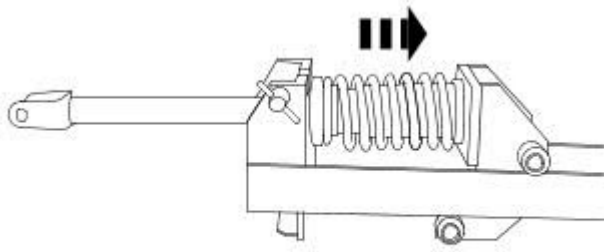


10. WARNING: The spring is under extreme tension, care must be taken at all times. Failure to follow these instuctions may result in personal injury.

    Compress the spring.



11. Remove the shock absorber retaining nut



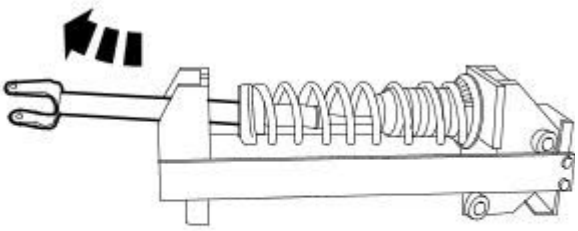
12. CAUTIONS:

    Mark the components to aid installation.

    Note the fitted position of the component prior to removal.

    Carefully release the spring tension.

13. Remove the shock absorber.



E31042

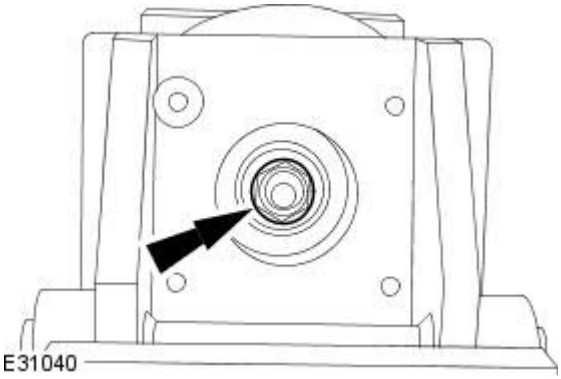
Installation

All vehicles

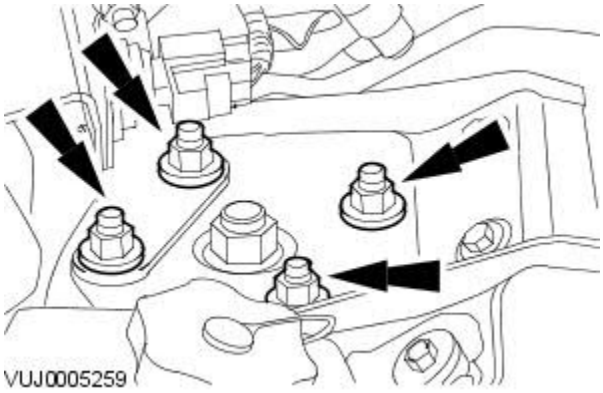
1. CAUTION: Make sure that these components are installed to the noted removal position.

   To install, reverse the removal procedure.

2. Tighten the nut to 27 Nm (20 lb.ft)



E31040



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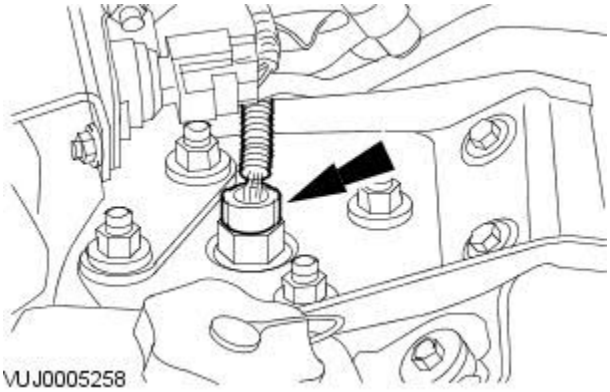
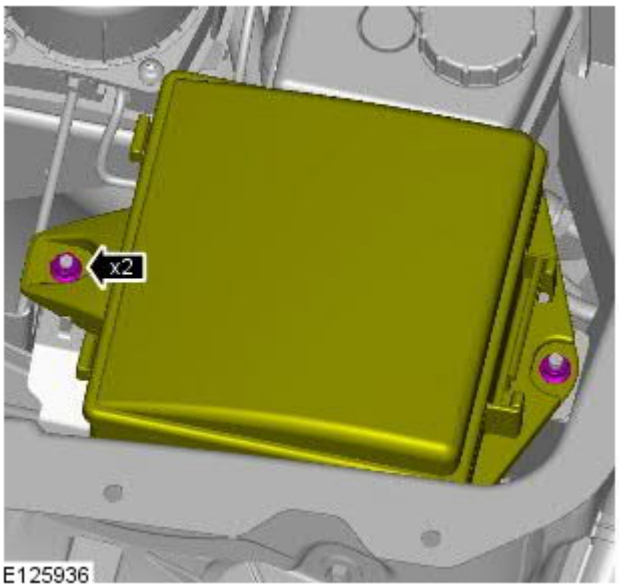
3. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

   Install the shock absorber and spring assembly.
   - Tighten the nuts to 27 Nm (20 lb.ft).



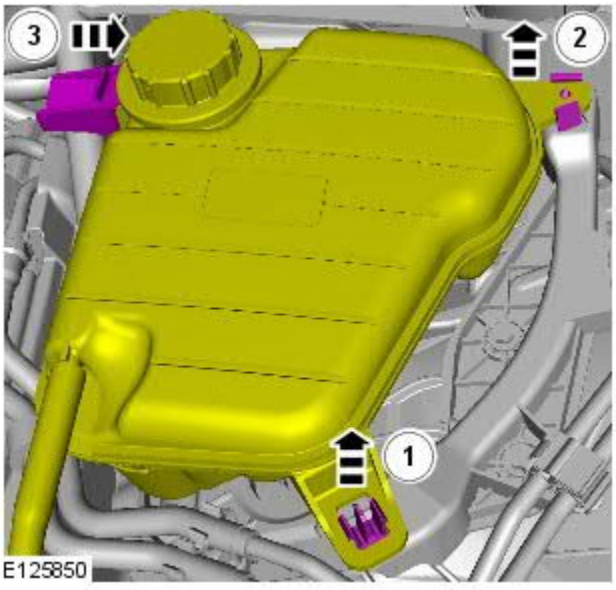
4. Connect the electrical connector.



5. NOTE: RH side only.

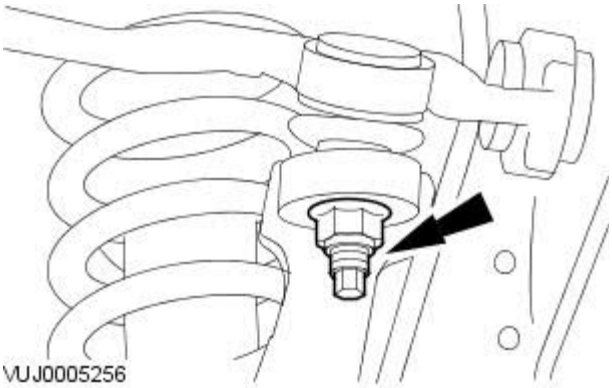
   Secure the fuse box.
   - Tighten the nuts to 8 Nm (6 lb.ft).

Vehicles with 5.0L engine



6. NOTE: LH side only.

   Install the coolant expansion tank.



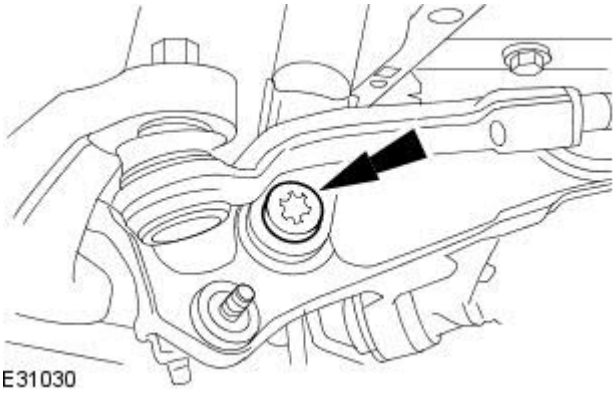
7. WARNING: Make sure that a new nut is installed.

   CAUTIONS:

   Use an Allen key to prevent the ball joint rotating whilst installing the nut.

   Make sure the wheel knuckle is supported. Failure to follow these instructions may result in damage to the vehicle.

   Secure the upper arm to the wheel knuckle.
   - Tighten the nut to 90 Nm (66 lb.ft).



8. Connect the shock absorber and spring assembly to the lower arm.
   - Tighten the bolt to 175 Nm (129 lb.ft).

9. For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

Published: 11-May-2011

Front Suspension - Front Lower Arm

Removal and Installation

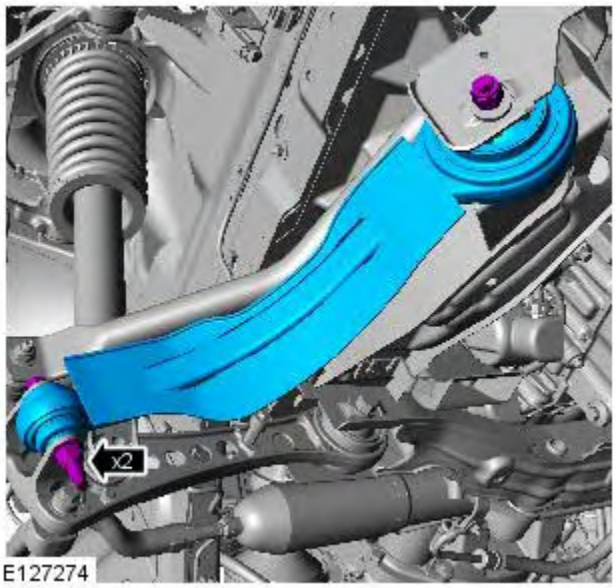
Removal

NOTE: RH illustration shown, LH is similar.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

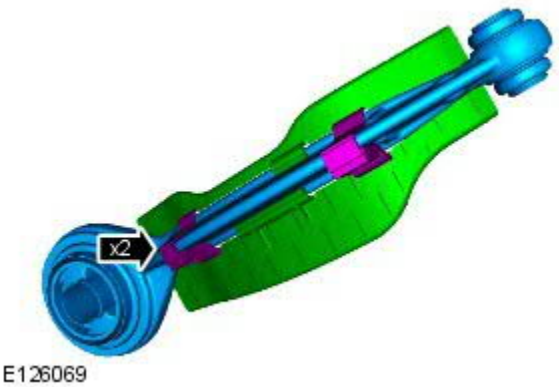
2. Remove the front wheel and tire.
   For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).



3. CAUTION: Discard the nuts.

   NOTE: Note the fitted position.

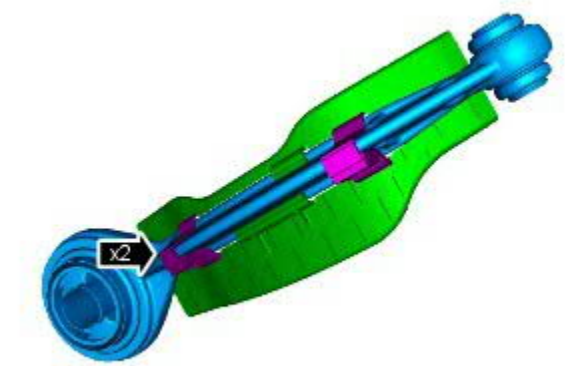
   Release the forward lower control arm.
   - Remove the 2 bolts and discard the nuts.



4. NOTE: Do not disassemble further if the component is removed for access only.

   Remove the air deflector.

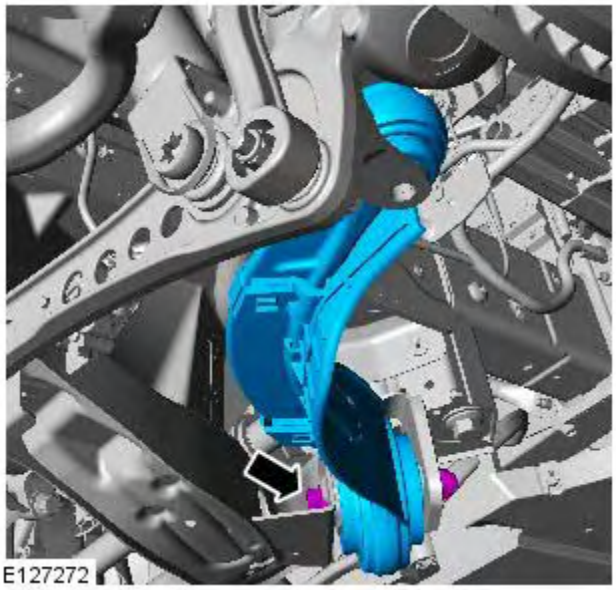
Installation



E126069

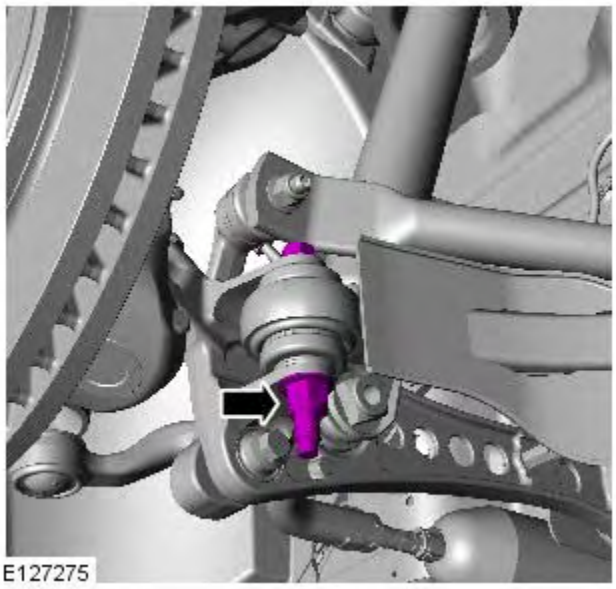
1. NOTE: This step is only required if previously removed.

   Install the air deflector.


E127272

2. WARNING: Make sure that a new nut is installed.

   Install the forward lower control arm.
   - Install the front lower arm inner retaining nut and bolt, but do not fully tighten at this stage.

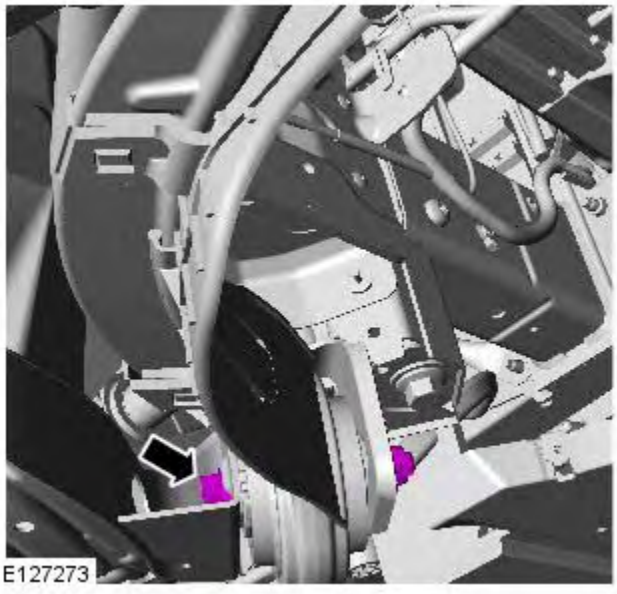

E127275

3. Install the bolt and tighten the new nut to 60 Nm (44 lb.ft) + 135 degrees.

4. Install the wheel and tire.
   For additional information, refer to: Wheel and Tire (204-04 Wheels and

Tires, Removal and Installation).

5. Lower the vehicle.



6. CAUTION: The final tightening of the front lower arm inner retaining nut and bolt must be carried out with the vehicle on its wheels

   Tighten the 14mm bolt to 175 Nm (129 lb.ft).

7. Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment, and adjust if required.

Published: 11-May-2011

Front Suspension - Rear Lower Arm

Removal and Installation

Special Tool(s)

	204-327 Remover, Ball Joint

Removal

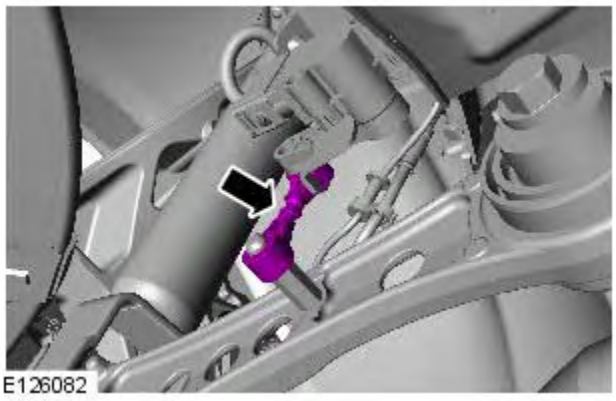
CAUTIONS:

The final tightening of the suspension components must be carried out with the vehicle on its wheels.

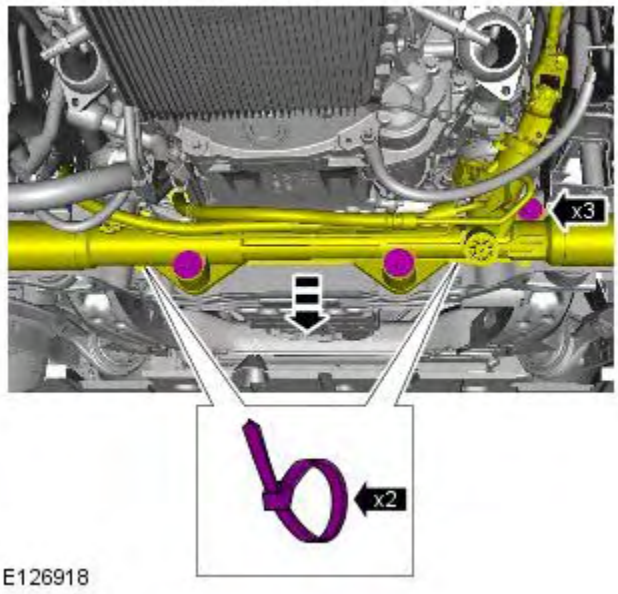
LH illustration shown, RH is similar.

NOTE: Removal steps in this procedure may contain installation details.

1. Raise the vehicle on a 4 post lift.
2. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).
3. WARNING: Make sure to support the vehicle with axle stands.

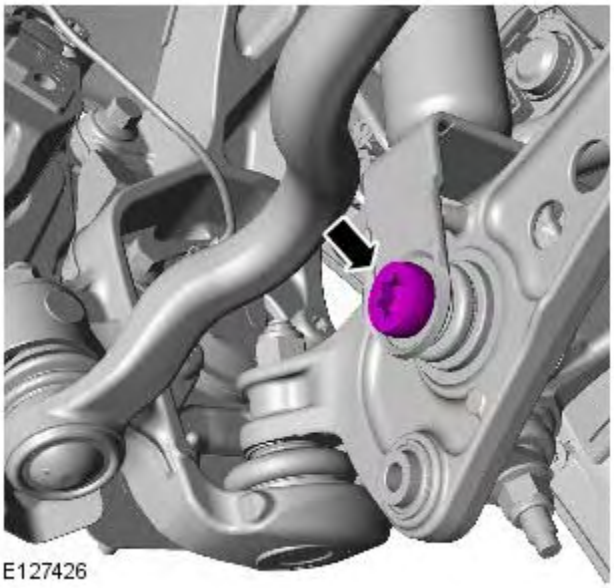
   Raise and support the body.
4. Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).
5. 

6. Refer to: Front Stabilizer Bar Link (204-01 Front Suspension, Removal and Installation).



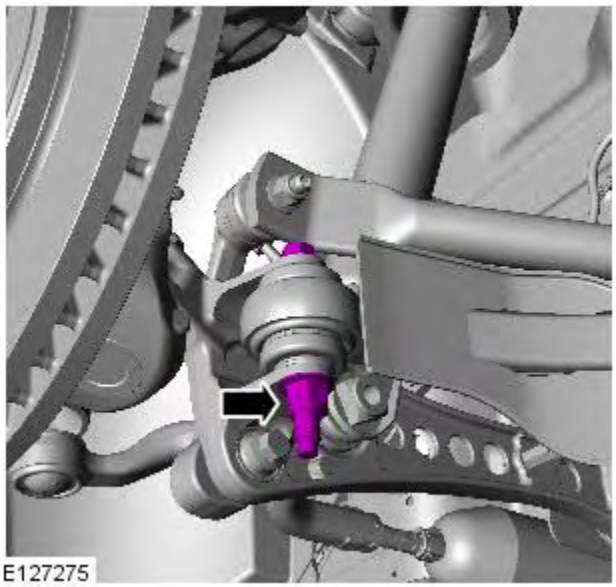
E126918

7. *Torque:* 100 Nm


E127426

8. *Torque:* 175 Nm

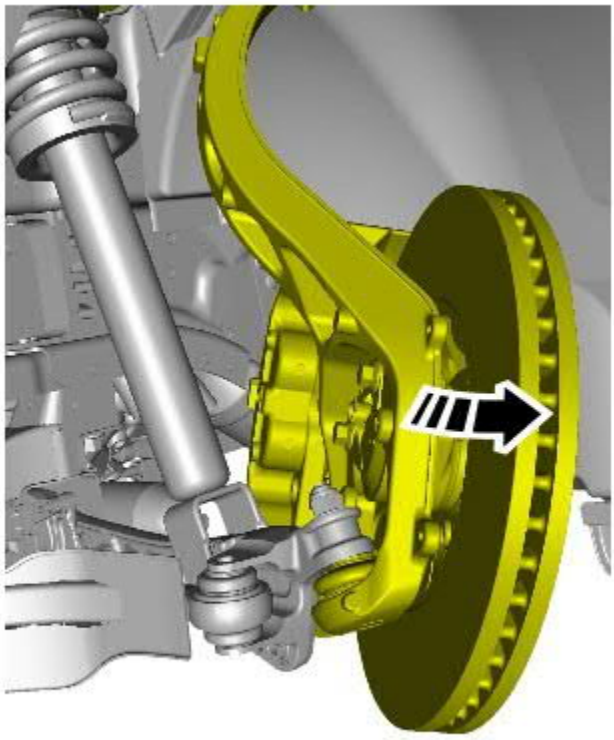
www.JagDocs.com

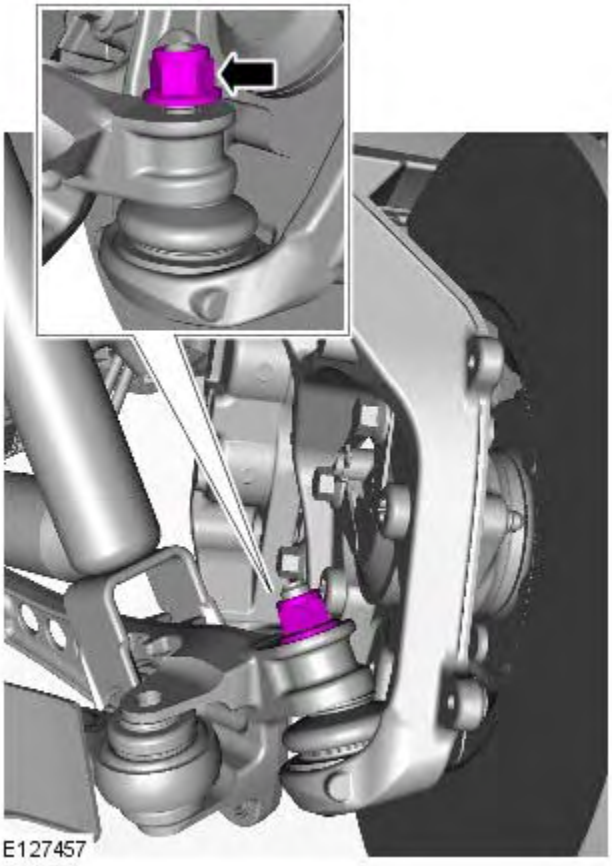

E127275

9. NOTE: Install a new retaining nut and bolt.

Torque:
Stage 1 60 Nm
Stage 2 135°

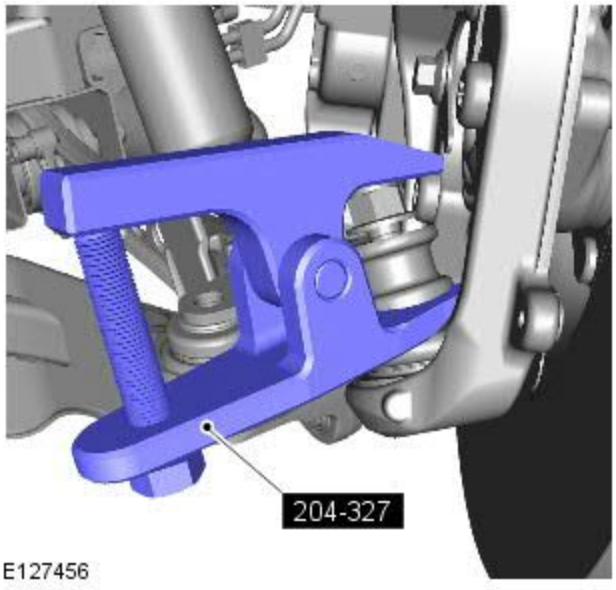
10.


E127461



11. CAUTION: Prevent the rear lower arm ball joint ball pin hexagon from rotating. Failure to follow this instruction may result in damage to the lower ball joint boot.

Torque: 133 Nm



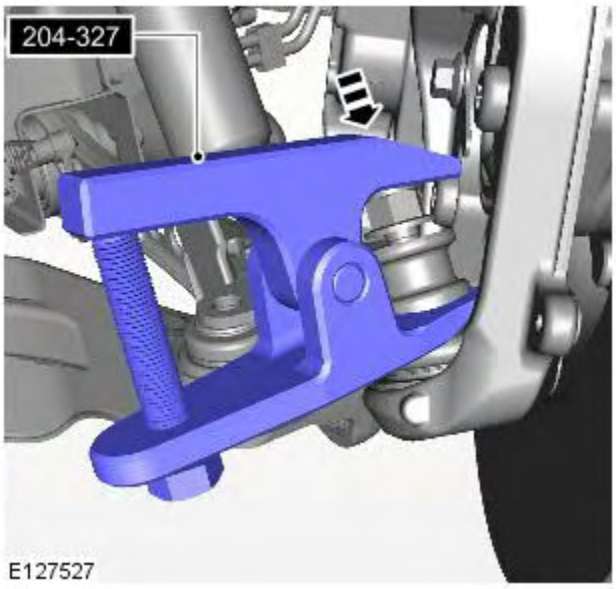
12. WARNING: Make sure the special tool is supported while carrying out the operation. Failure to follow this instruction may result in personal injury.

CAUTIONS:

Make sure the special tool is supported while carrying out the operation. Failure to follow this instruction may result in damage to the special tool.

Make sure the special tool is correctly located and the lower ball joint boot is not damaged while carrying out the operation. Failure to follow this instruction may result in damage to the component.

Special Tool(s): 204-327



13. WARNING: Make sure the special tool is supported while carrying out the operation. Failure to follow this instruction may result in personal injury.

    CAUTIONS:

    Make sure the special tool is supported while carrying out the operation. Failure to follow this instruction may result in damage to the special tool.

    Make sure the special tool is correctly located and the lower ball joint boot is not damaged while carrying out the operation. Failure to follow this instruction may result in damage to the component.

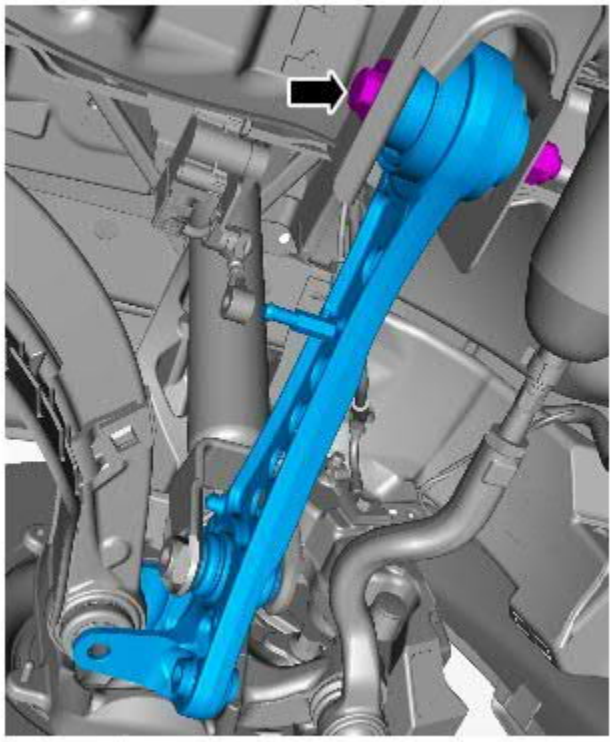
    NOTE: Do not carry out this step if the rear lower arm ball joint released from the wheel knuckle lower pivot in the step above.

    Strike the top surface of the special tool directly above the rear lower arm ball joint at the point indicated using a copper mallet.

    Special Tool(s): 204-327

14. WARNING: Make sure that a new nut is installed.

    Torque: 175 Nm



15. NOTE: Do not disassemble further if the component is removed for access only.

    Torque: 10 Nm

Installation

1. WARNING: Make sure that a new lower arm ball joint nut is installed.

   To install, reverse the removal procedure.

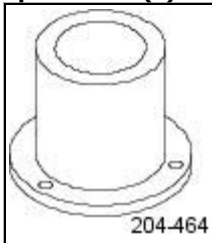
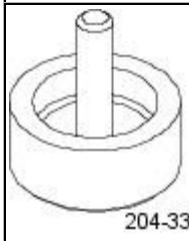
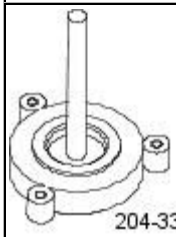
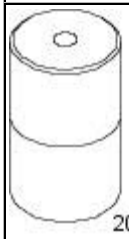
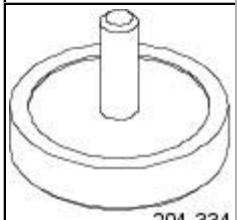
2. Refer to: Four-Wheel Alignment (204-00 Suspension System - General Information, General Procedures).

Published: 11-May-2011

Front Suspension - Rear Lower Arm Bushing

Removal and Installation

Special Tool(s)

 204-464	Rear lower arm bushing remover and installer 204-464
 204-333	Rear lower arm bushing remover 204-333
 204-332	Rear lower arm bushing installer 204-332
 204-465	Rear lower arm bushing installer 204-465
 204-334	Rear lower arm bushing installer 204-334

Removal

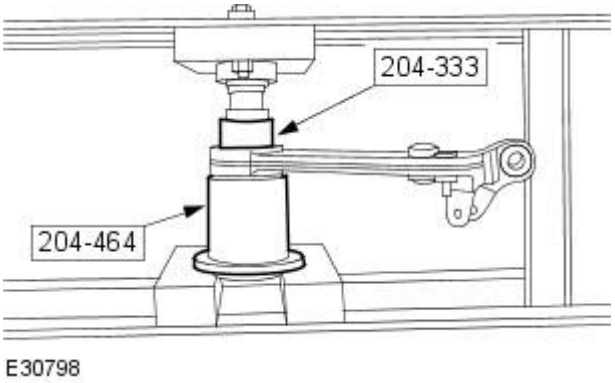
CAUTION: Nuts and bolts must be tightened with the weight of the vehicle on the suspension.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise the vehicle on a 4 post lift.

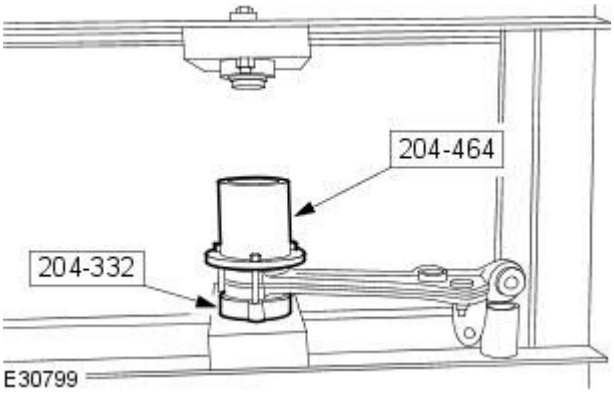
2. Remove the rear lower arm.
   For additional information, refer to: Rear Lower Arm (204-01 Front Suspension, Removal and Installation).

3. NOTE: Note the fitted bush orientation and measured height relative to arm.

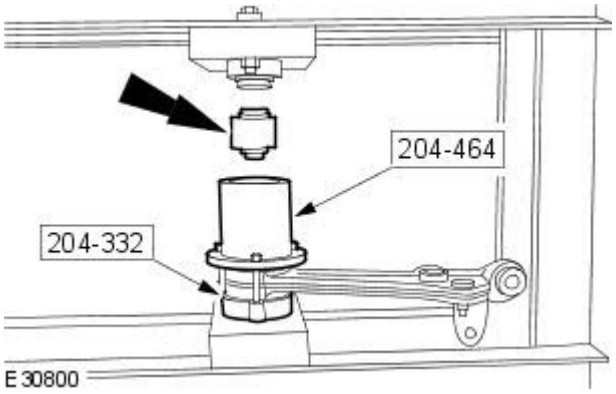


4. Using the special tools, remove and discard the lower arm rear bushings.

Installation

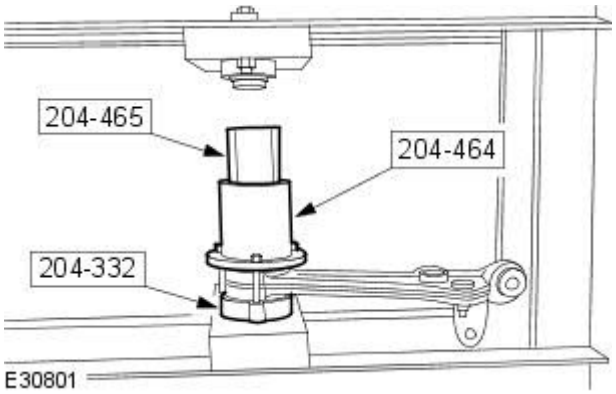


1. Install the special tools to the rear lower arm.
   - Tighten the bolts.



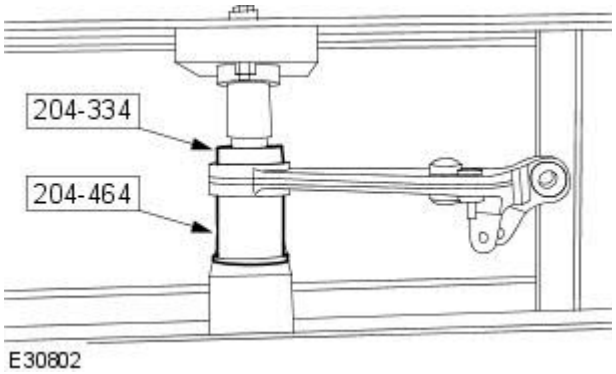
2. NOTE: Align to the orientation noted on removal.

   Position the bushing in the special tool.



3. Using the special tools, partially install the lower arm bushing.

4. NOTE: Change the special tools, then complete installation of the bushing to the measured height noted on removal.



5. Change the special tools, then complete installation of the bushing.

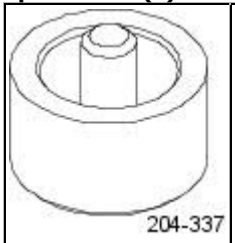
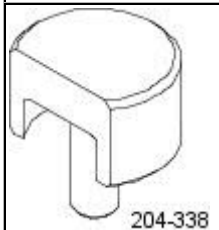
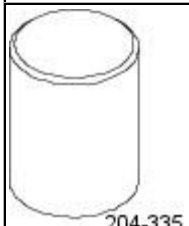
6. Install the rear lower arm.
   For additional information, refer to: Rear Lower Arm (204-01 Front Suspension, Removal and Installation).

Published: 11-May-2011

Front Suspension - Shock Absorber Bushing

Removal and Installation

Special Tool(s)

	Replacer support-bush 204-337
	Replacer-bush 204-338
	Remover-bush 204-336
	Remover support-bush 204-335

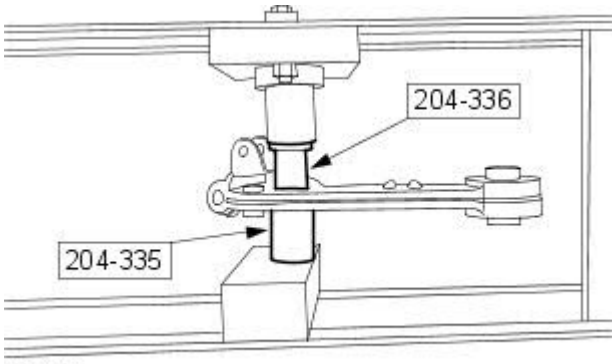
Removal

CAUTION: Nuts and bolts must be tightened with the weight of the vehicle on the suspension.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise the vehicle on a 4 post lift.

2. Remove the rear lower arm.
   For additional information, refer to: Rear Lower Arm (204-01 Front Suspension, Removal and Installation).

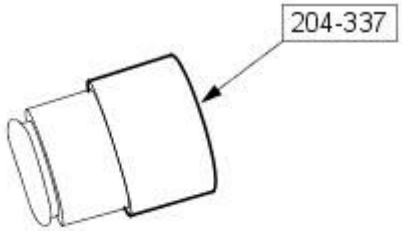


E30779

3. NOTE: Take note of the fitted position of the bush.

   Using the special tools, remove the shock absorber bushing.

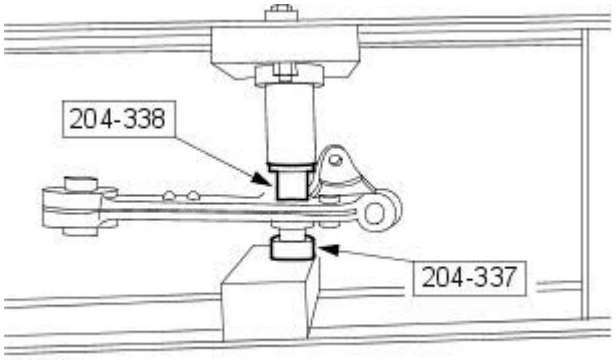
Installation



E30781

1. NOTE: Make sure the shock absorber bushing boot is correctly located into the special tool.

   Install the bushing into the special tool.



E30782

2. NOTE: Align to the position noted on removal.

   Using the special tools, install the shock absorber bushing.

3. Install the rear lower arm.
   For additional information, refer to: Rear Lower Arm (204-01 Front Suspension, Removal and Installation).

Published: 06-Jun-2013

Front Suspension - Front Stabilizer Bar TDV6 3.0L Diesel

Removal and Installation

Removal

CAUTION: The final tightening of the suspension components must be carried out with the vehicle on its wheels.

NOTE: Removal steps in this procedure may contain installation details.

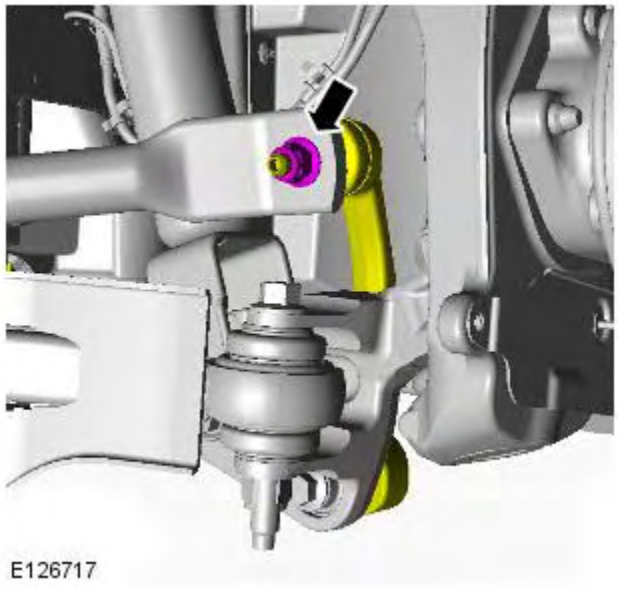
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Radiator Splash Shield (501-02 Front End Body Panels, Removal and Installation).

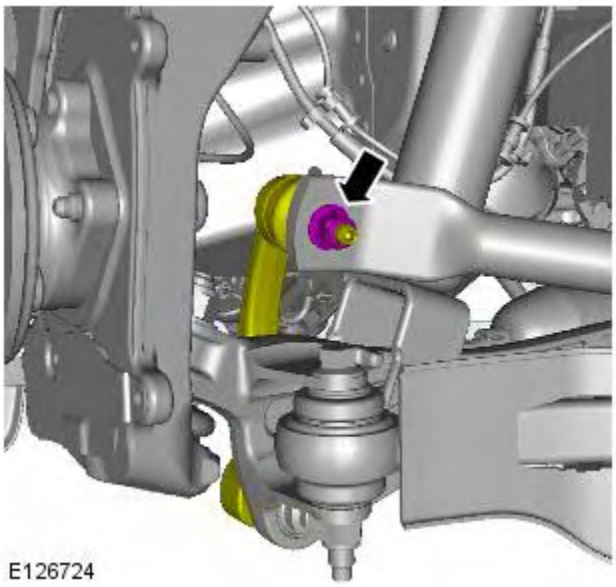
3. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

4. Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).



5. *Torque:* 43 Nm

6. *Torque:* 43 Nm



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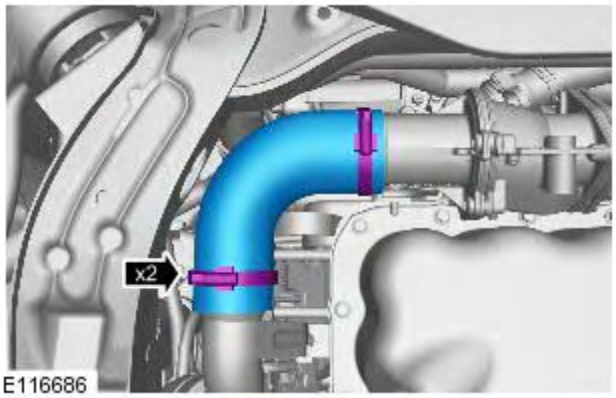

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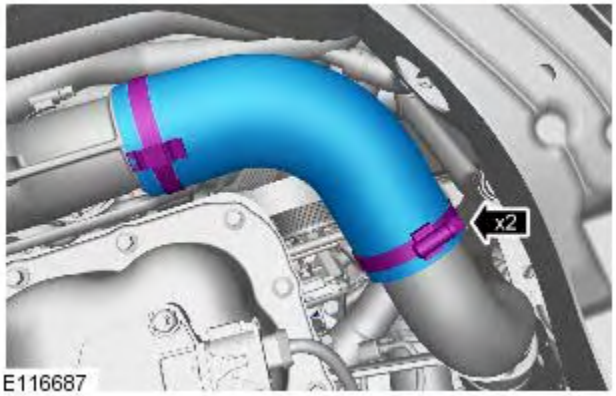

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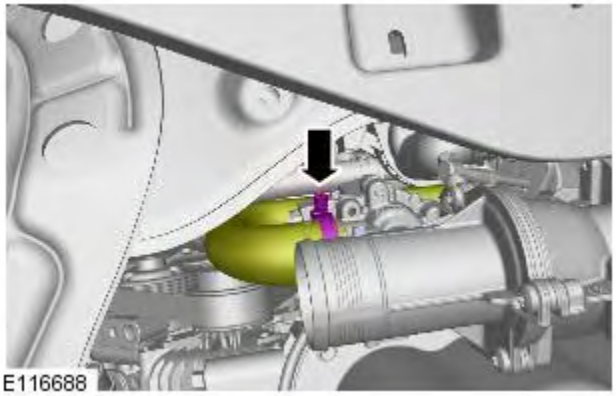

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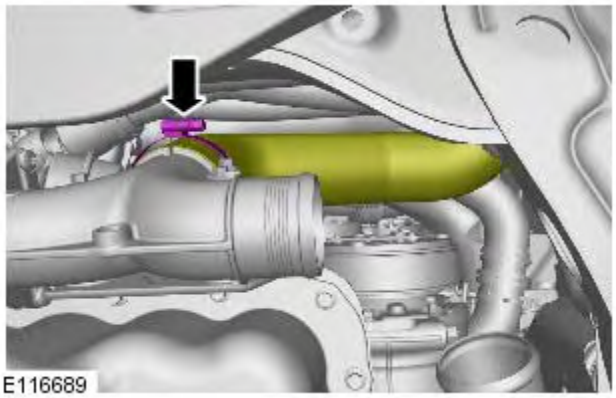

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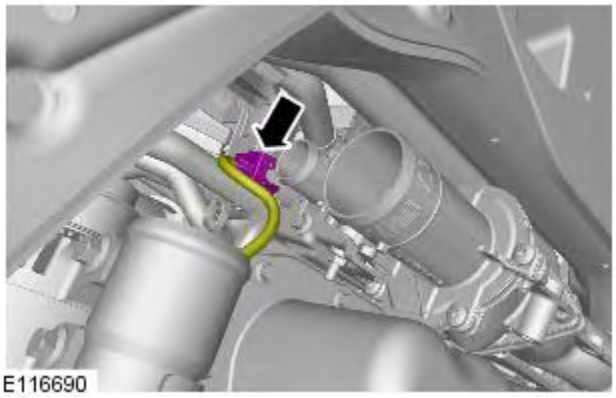

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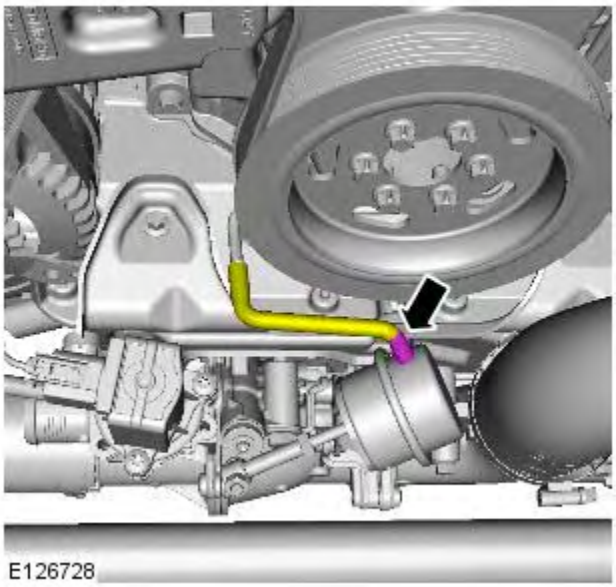

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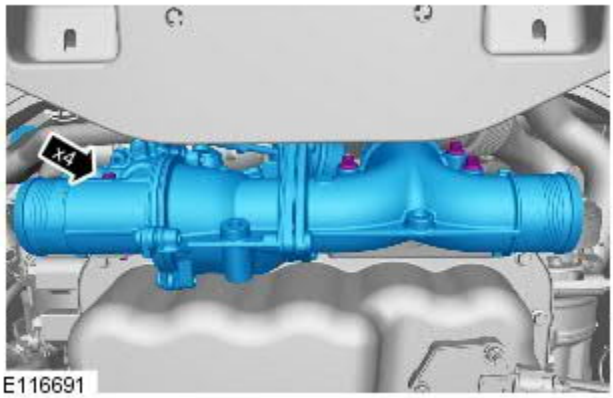

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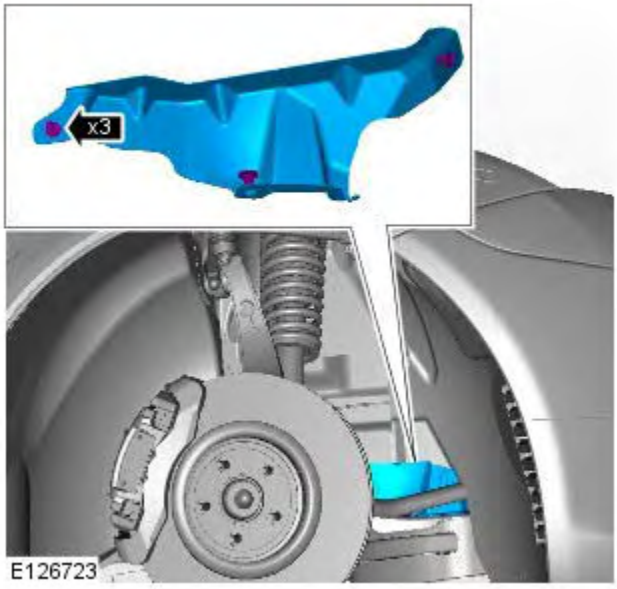

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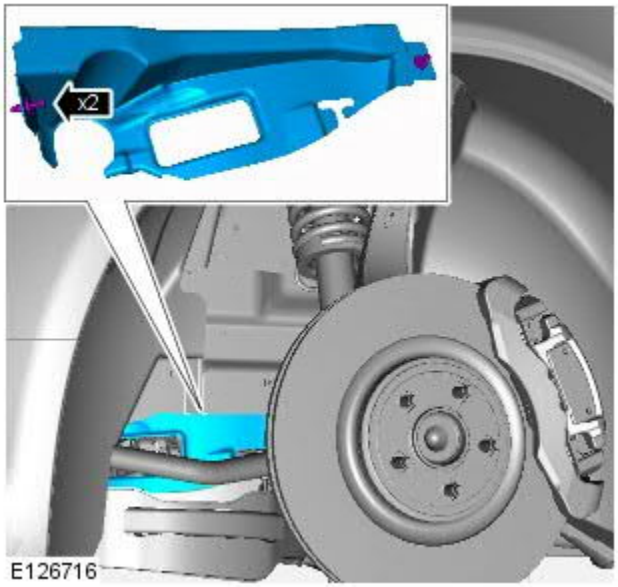
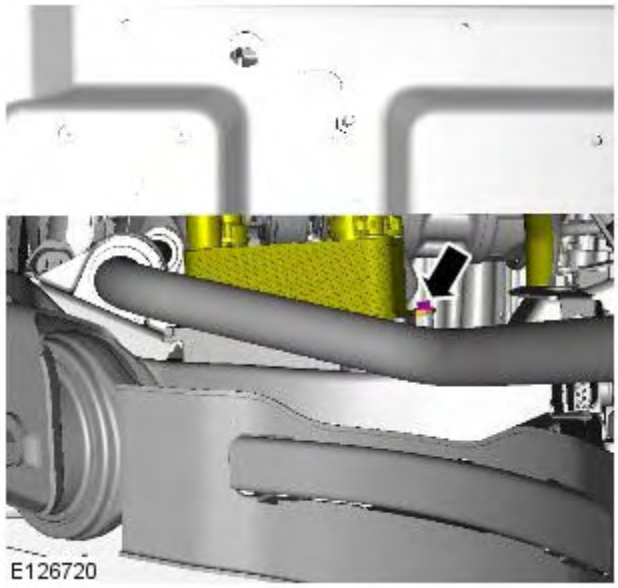
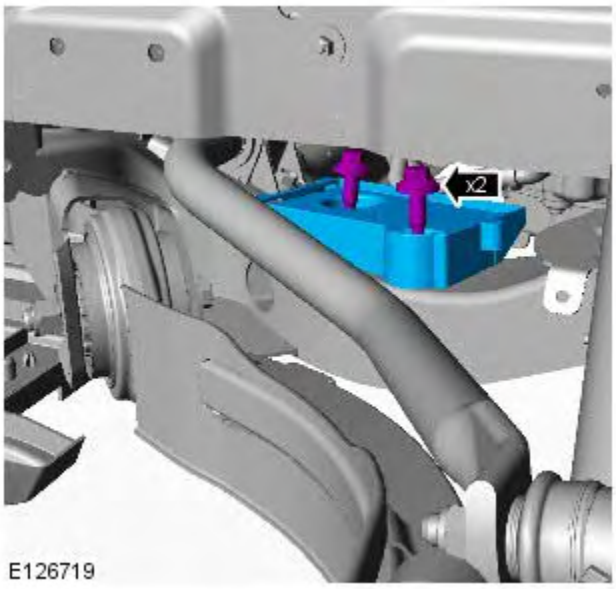
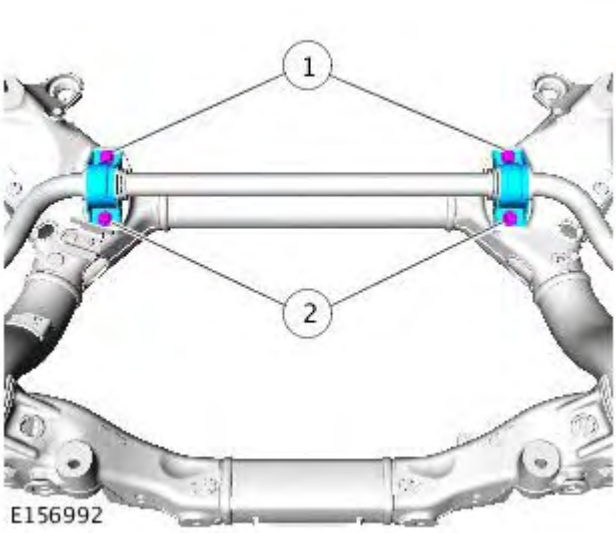


16. *Torque:* 7 Nm





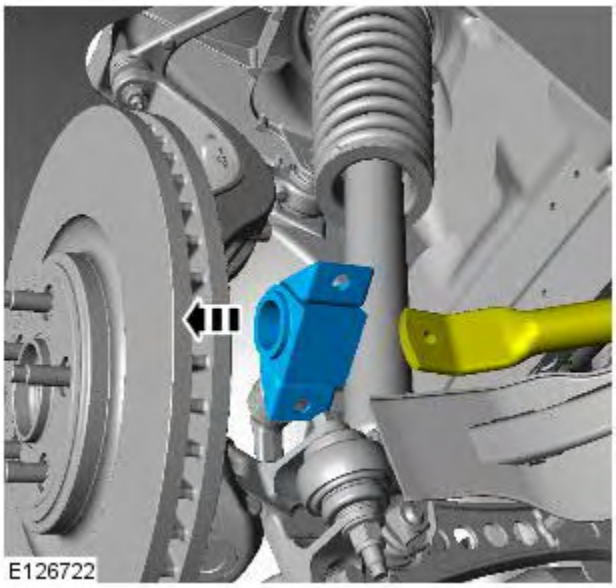
17. *Torque:* 12 Nm



18. During installation tighten the bolts in the following sequence.

    Torque:
    Bolt 1 55 Nm
    Bolt 2 55 Nm
    Bolt 1 55 Nm

19.



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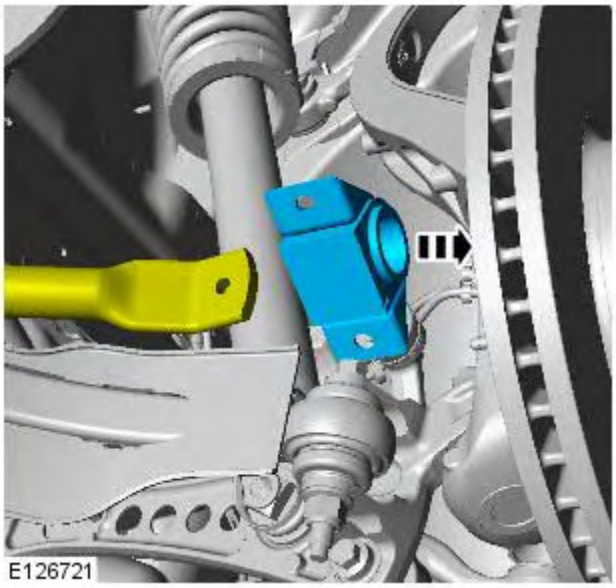

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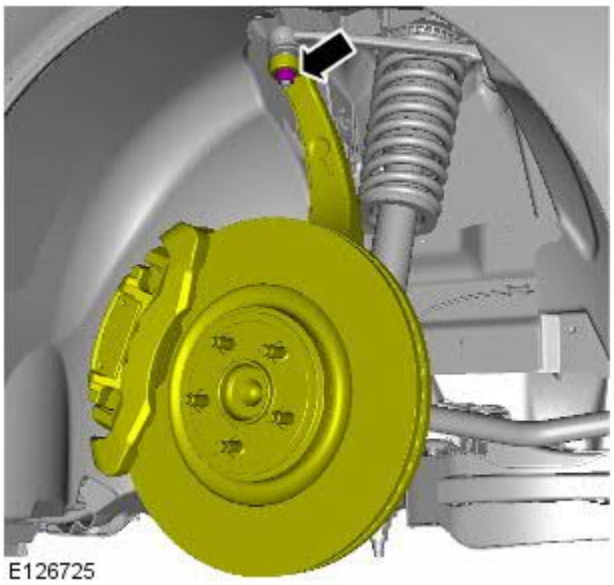
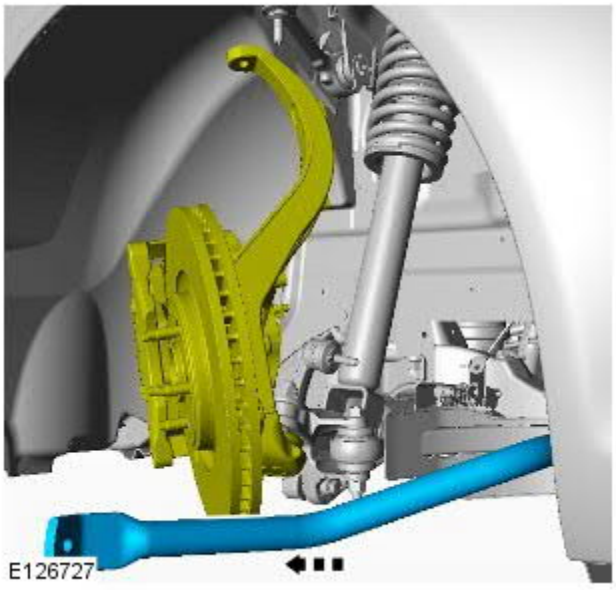


21. *Torque:* 90 Nm



22. CAUTION: Make sure the wings and trim panels are covered and protected, failure to follow this instruction may result in damage to the vehicle.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Front Suspension - Front Stabilizer Bar Link

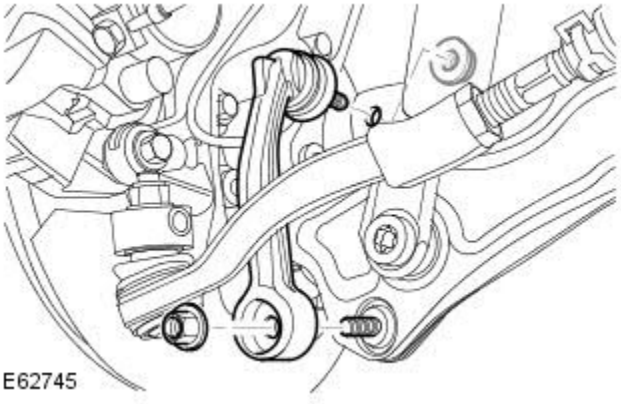
Removal and Installation

Removal

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. Remove the front wheel and tire.
   For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).



3. NOTE: Use an additional wrench to prevent the ball joint rotating.

   Remove the stabilizer bar link.
   - Remove and discard the 2 nuts.

Installation

1. WARNING: Make sure that new nuts are installed.

   NOTE: Use an additional wrench to prevent the ball joint rotating.

   Install the stabilizer bar link.
   - Tighten the upper nut to 43 Nm (32 lb.ft).
   - Tighten the lower nut to 70 Nm (52 lb.ft).

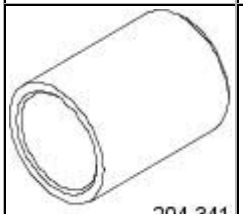
2. Install the wheel and tire.
   For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

Published: 11-May-2011

Front Suspension - Stabilizer Bar Link Bushing

Removal and Installation

Special Tool(s)

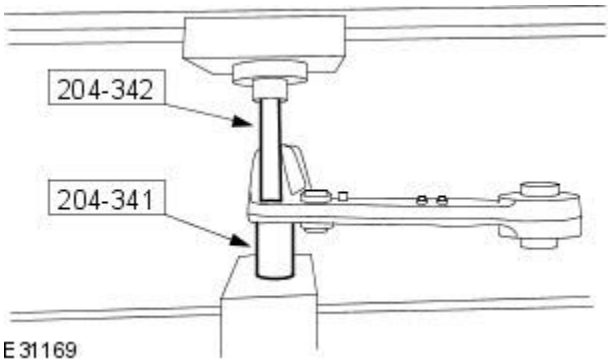
	Bush installer 204-340
	Bush remove 204-342
	Support 204-341
	Support 204-339

Removal

CAUTION: The final tightening of the suspension components must be carried out with the vehicle on its wheels.

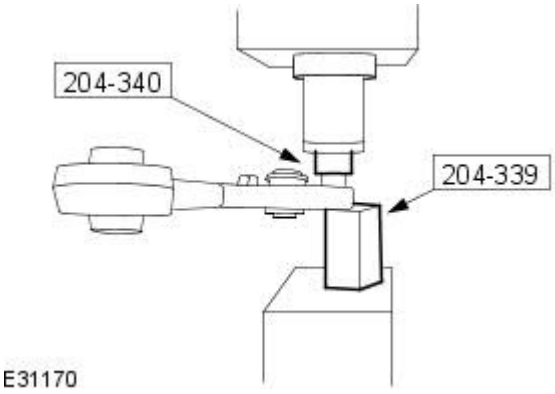
1. Raise the vehicle on a 4 post lift.
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise the front of the vehicle.
3. Remove the rear lower arm.
   For additional information, refer to: Rear Lower Arm (204-01 Front Suspension, Removal and Installation).



4. Using the special tools, remove and discard the stabilizer bar link bushing.

Installation



1. Using the special tools, install the stabilizer bar link bushing.

2. Install the rear lower arm.
   For additional information, refer to: Rear Lower Arm (204-01 Front Suspension, Removal and Installation).

Published: 11-May-2011

Front Suspension - Upper Arm LH TDV6 3.0L Diesel

Removal and Installation

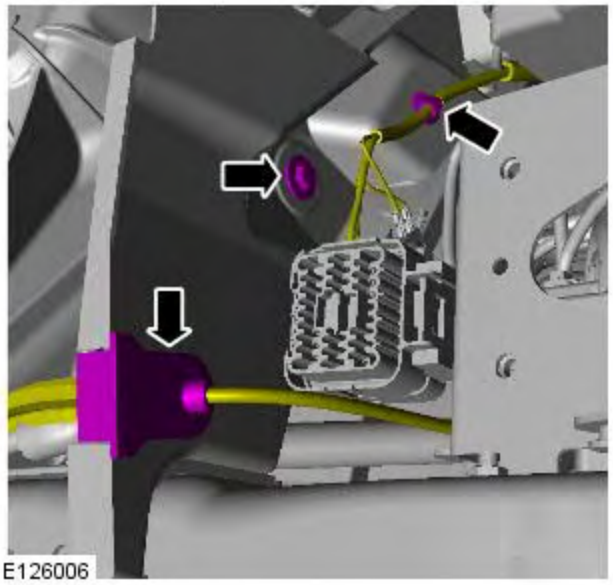
Removal

1. WARNING: Make sure to support the vehicle with axle stands.

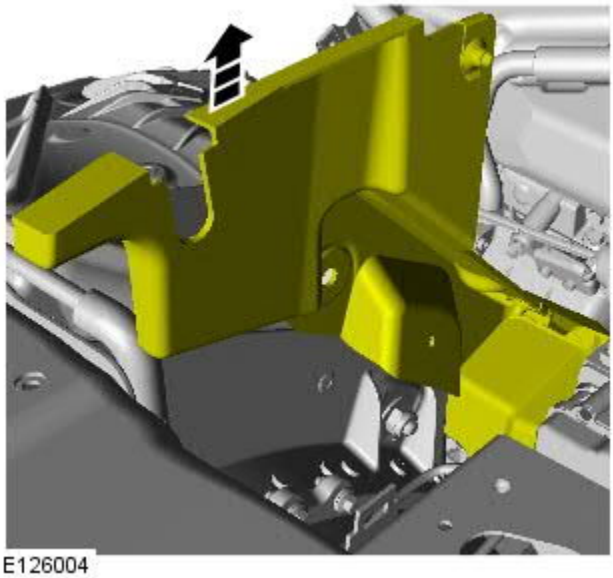
   Raise and support the vehicle.

2. Remove the shock absorber and spring assembly.
   For additional information, refer to: Front Shock Absorber (204-01 Front Suspension, Removal and Installation).

3. Remove the secondary bulkhead LH panel.
   For additional information, refer to: Secondary Bulkhead Panel LH (501-02 Front End Body Panels, Removal and Installation).

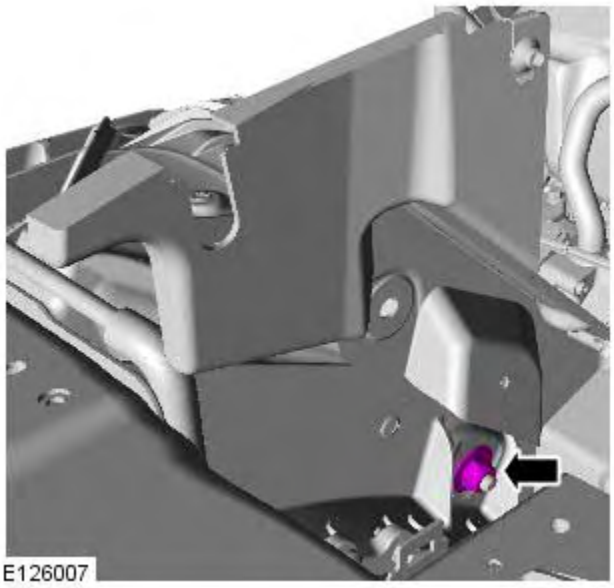


4. Release the secondary bulkhead outer LH panel.
   - Remove the bolt.
   - Release the cable clip.
   - Release the wiring harness clip.

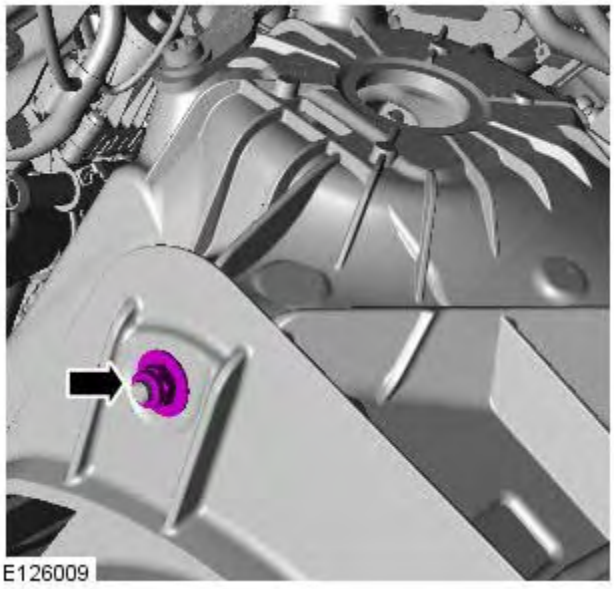


5. Aside the secondary bulkhead outer LH panel.
   - Tie aside.

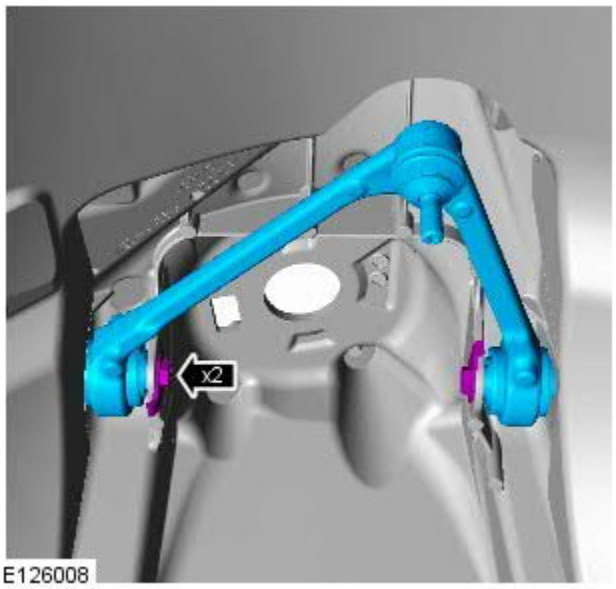
6. Remove the air cleaner.
   For additional information, refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel, Removal and Installation).


E126007

7. Remove the upper arm retaining nut.

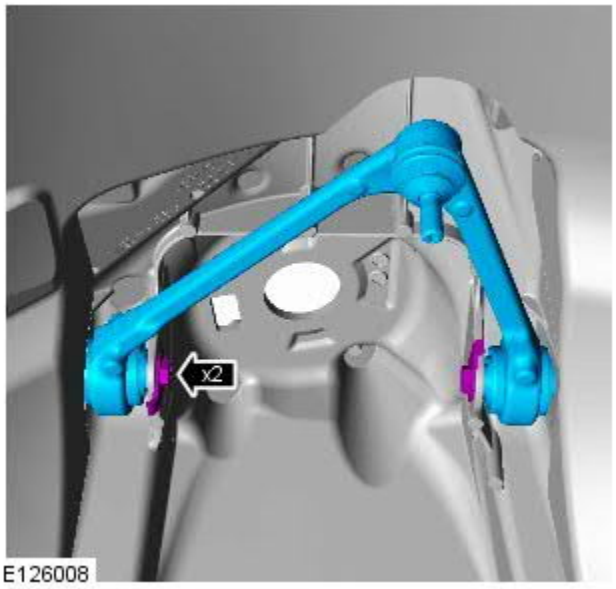

E126009

8. Remove the upper arm retaining nut.

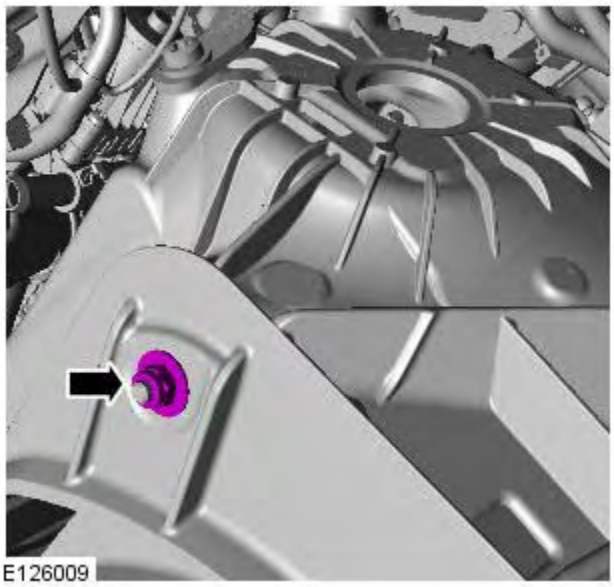


9. Remove the upper arm.

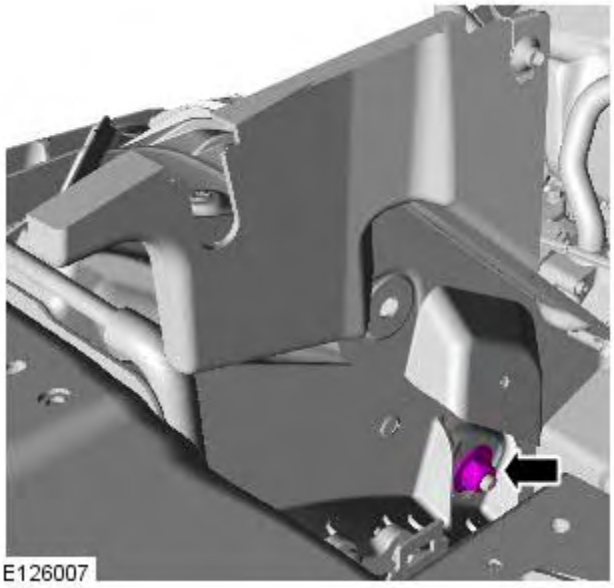
Installation



1. Install the upper arm.

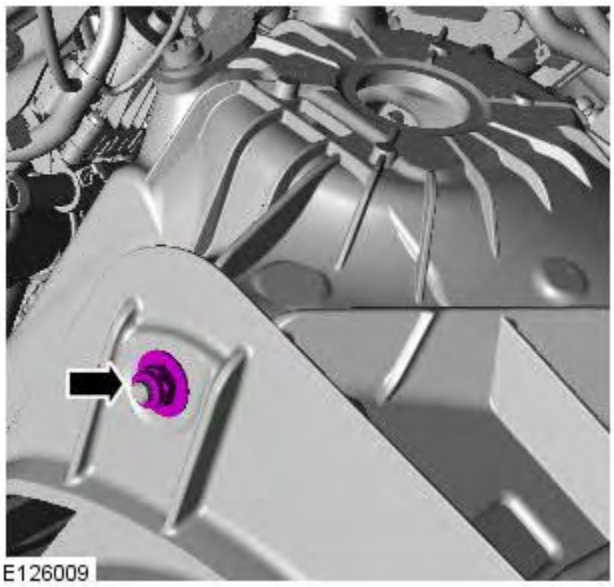

E126009

2. Install the upper arm retaining nut, but do not tighten fully at this stage.


E126007

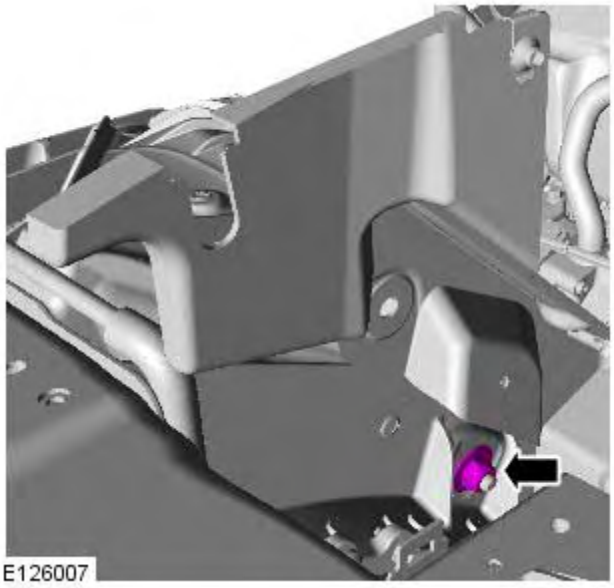
3. Install the upper arm retaining nut, but do not tighten fully at this stage.

4. Install the shock absorber and spring assembly.
For additional information, refer to: Front Shock Absorber (204-01 Front Suspension, Removal and Installation).


E126009

5. CAUTION: The final tightening of the suspension components must be carried out with the vehicle on its wheels.

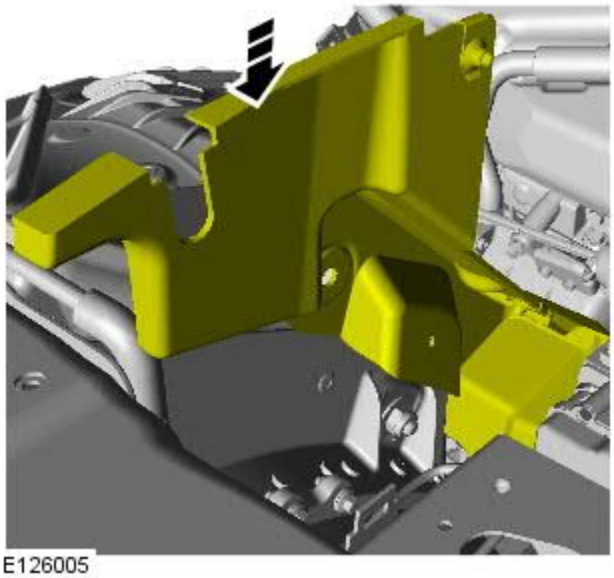
   Tighten to 70 Nm (52 lb.ft).


E126007

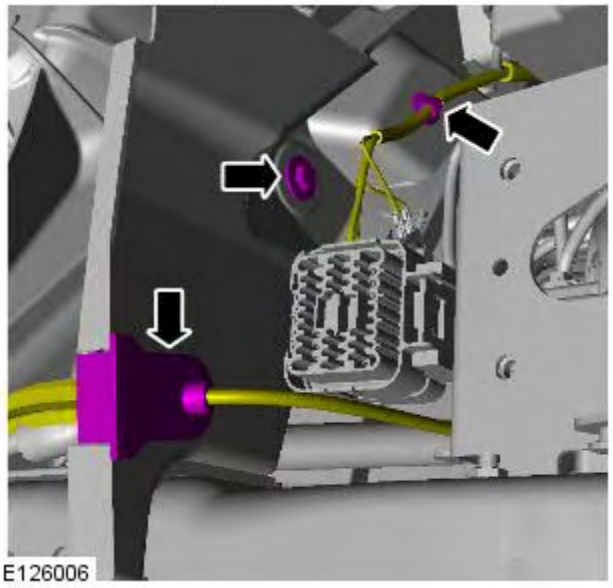
6. CAUTION: The final tightening of the suspension components must be carried out with the vehicle on its wheels.

   Tighten to 70 Nm (52 lb.ft).

7. Install the air cleaner.
   For additional information, refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel, Removal and Installation).


E126005

8. Release the secondary bulkhead outer LH panel.
    - Cut the cable tie.


E126006

9. Secure the secondary bulkhead outer LH panel.
    - Tighten the bolt to 7 Nm (5 lb.ft).
    - Secure the cable in the clip.
    - Secure the wiring harness clip.

10. Install the secondary bulkhead LH panel.
    For additional information, refer to: Secondary Bulkhead Panel LH (501-02 Front End Body Panels, Removal and Installation).

Published: 11-May-2011

Front Suspension - Upper Arm RH TDV6 3.0L Diesel

Removal and Installation

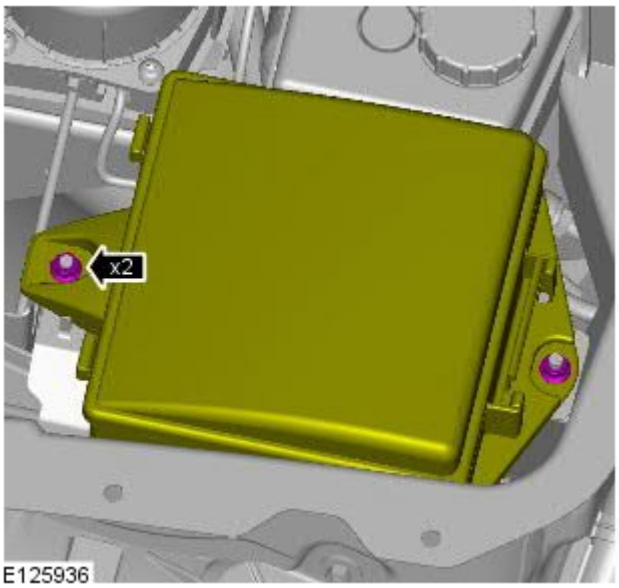
Removal

1. WARNING: Make sure to support the vehicle with axle stands.

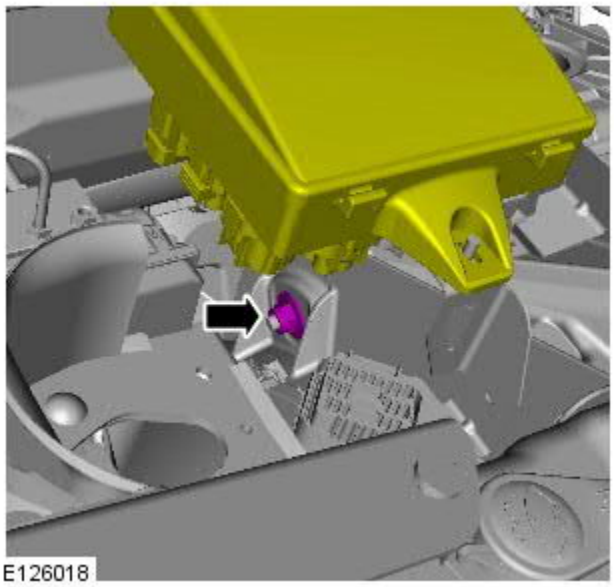
   Raise and support the vehicle.

2. Remove the shock absorber and spring assembly.
   For additional information, refer to: Front Shock Absorber (204-01 Front Suspension, Removal and Installation).

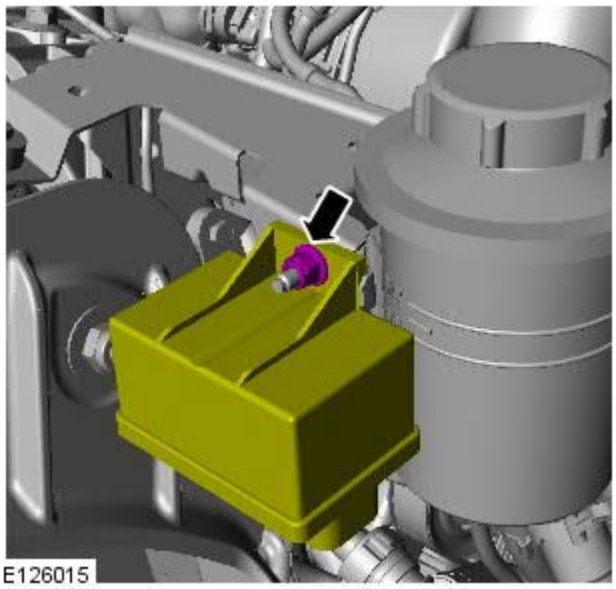
3. Remove the RH secondary bulkhead panel.
   For additional information, refer to: Secondary Bulkhead Panel RH (501-02 Front End Body Panels, Removal and Installation).



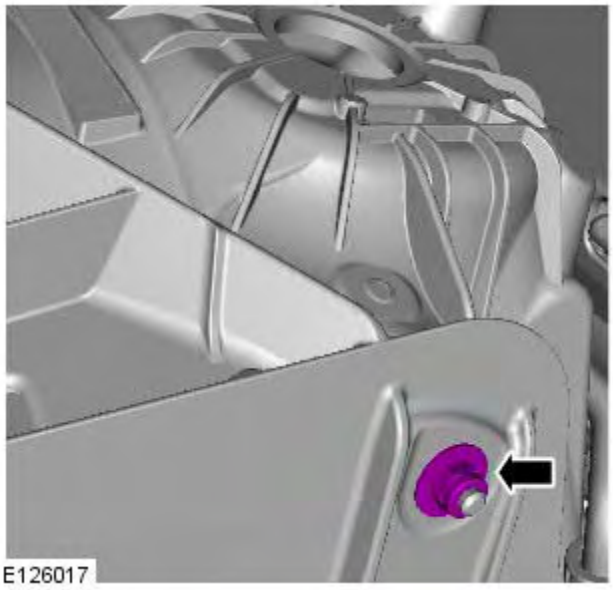
4. Release the fuse box.
   - Remove the 2 nuts.
   - Position the fuse box aside for access to the inboard retaining nut.



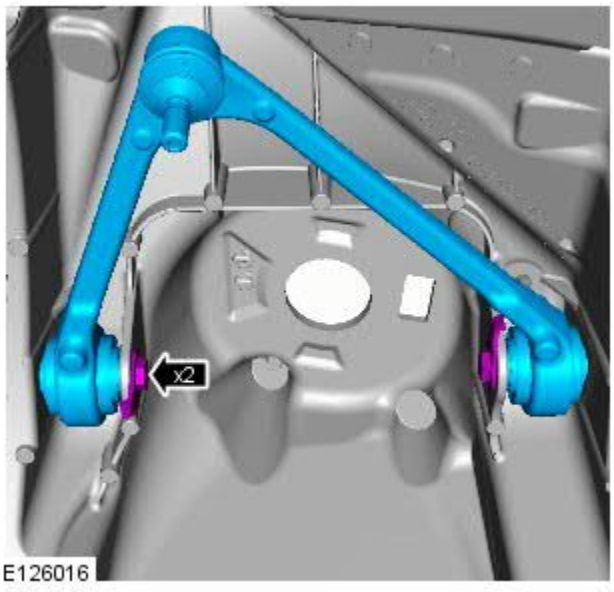
5. Remove the upper arm retaining nut.



6. Release the glow plug control unit
   - Remove the nut.

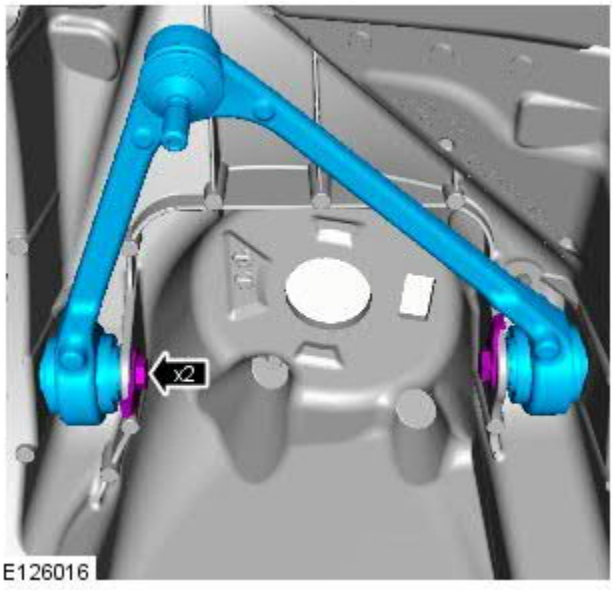


7. Remove the upper arm retaining nut.

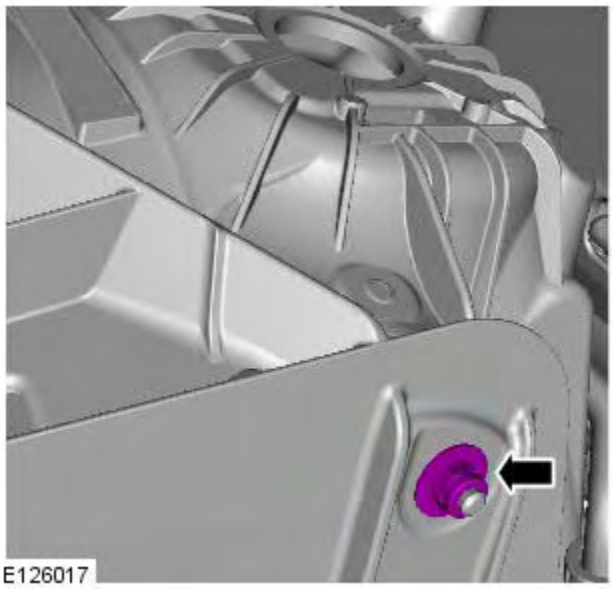


8. Remove the upper arm.

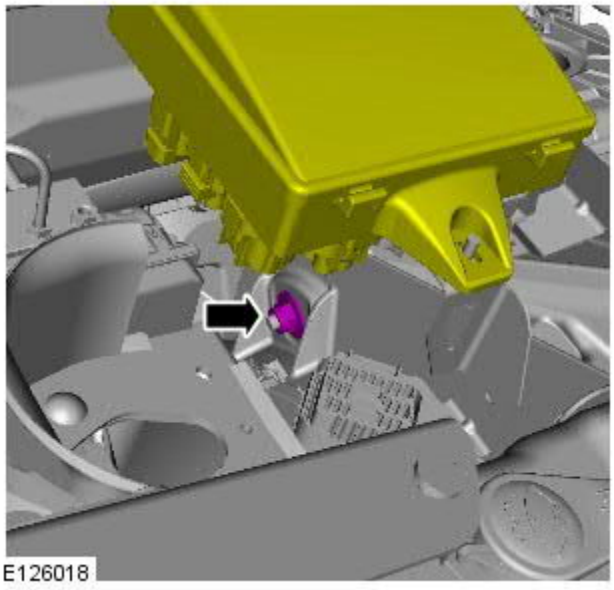
Installation



1. Install the upper arm.

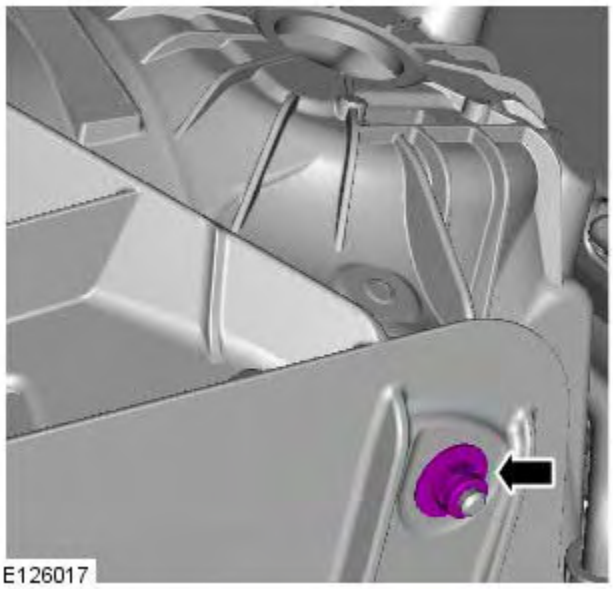


2. Install the upper arm retaining nut, but do not tighten fully at this stage.



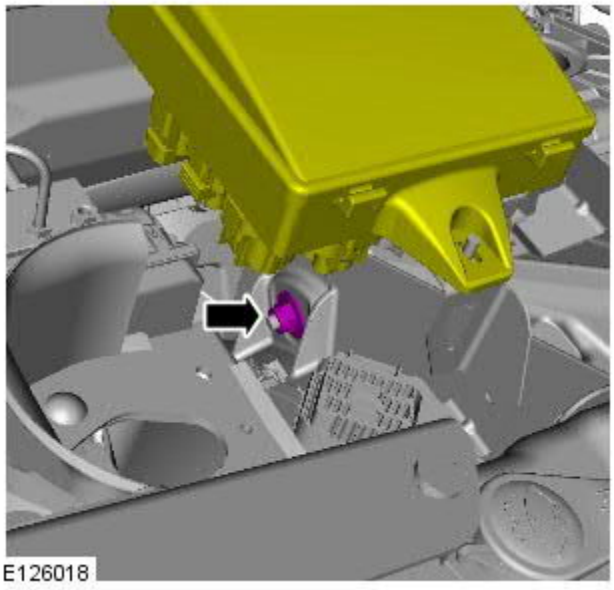
3. Install the upper arm retaining nut, but do not tighten fully at this stage.

4. Install the shock absorber and spring assembly.
   For additional information, refer to: Front Shock Absorber (204-01 Front Suspension, Removal and Installation).



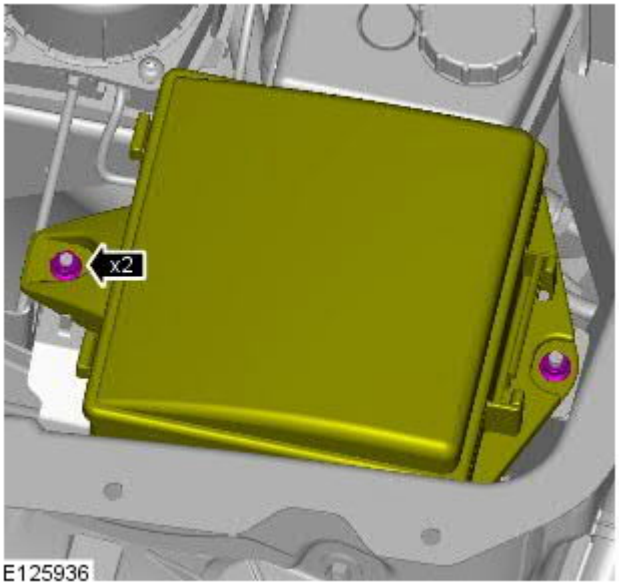
5. CAUTION: The final tightening of the suspension components must be carried out with the vehicle on its wheels.

   Tighten to 70 Nm (52 lb.ft).

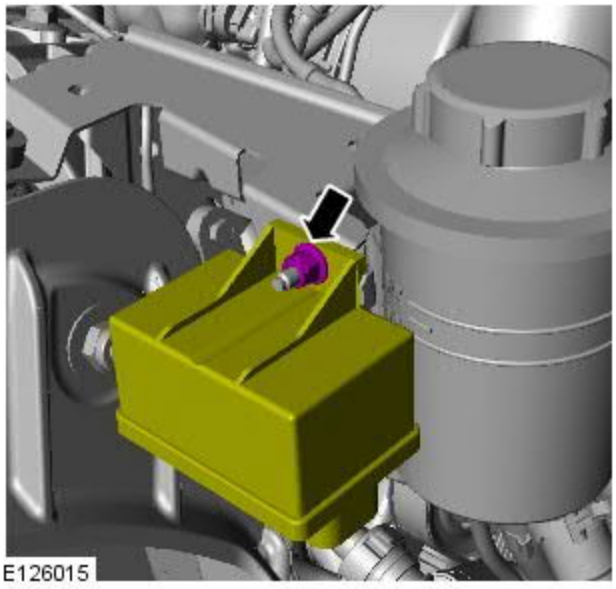


6. CAUTION: The final tightening of the suspension components must be carried out with the vehicle on its wheels.

   Tighten to 70 Nm (52 lb.ft).



7. Secure the fuse box.
   - Install the 2 nuts and tighten to 7 Nm (5 lb.ft).



8. Secure the glow plug control unit.
   - Install the nut and tighten to 7 Nm (5 lb.ft).

9. Install the RH secondary bulkhead panel.
   For additional information, refer to: Secondary Bulkhead Panel RH (501-02 Front End Body Panels, Removal and Installation).

Published: 11-May-2011

Front Suspension - Front Wheel Bearing and Wheel Hub

Removal and Installation

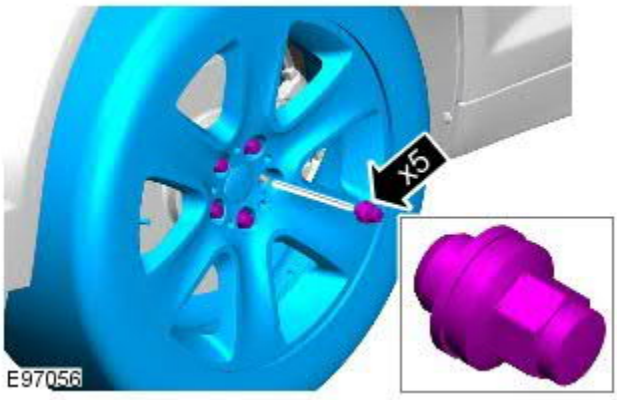
Removal

CAUTION: LH illustration shown, RH is similar.

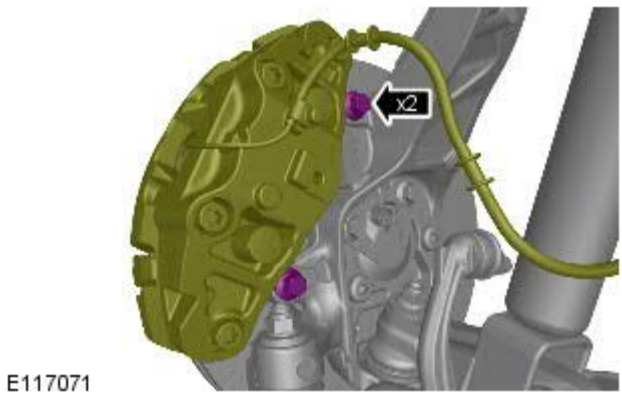
NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

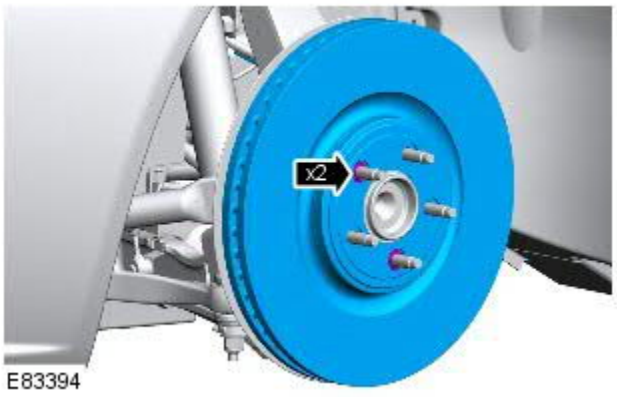


2. *Torque:* 125 Nm



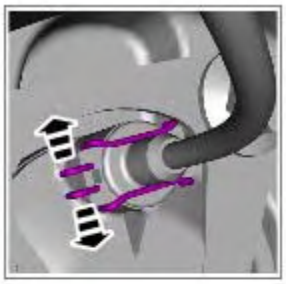
3. NOTE: Secure with cable ties.

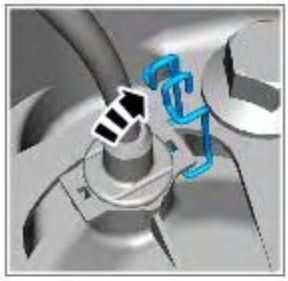
   Torque: 115 Nm

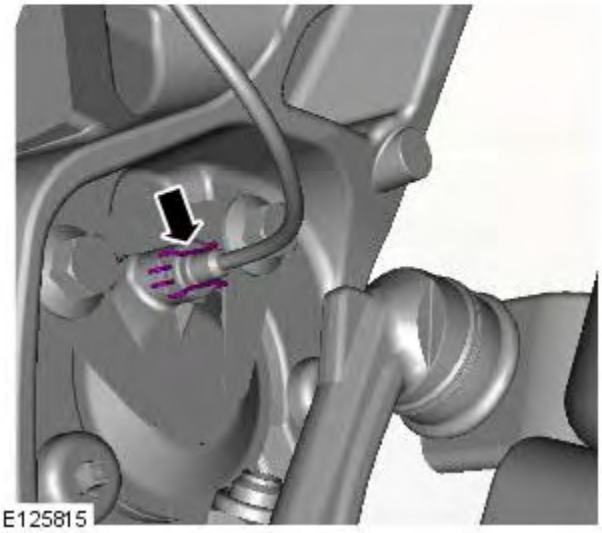


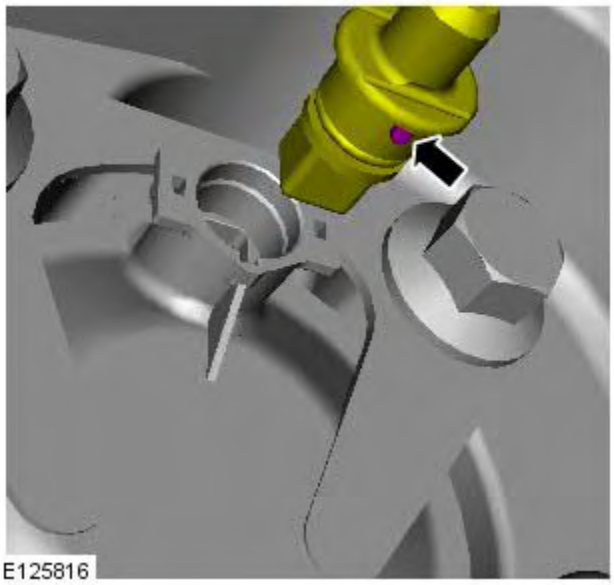
4.

5.

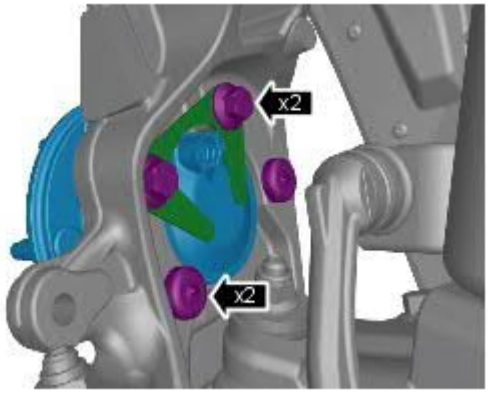








6. NOTE: Make sure that the component is installed to the noted removal position.



7. CAUTION: Do not attempt to release the wheel hub by hitting it with a hammer directly, loosen the wheel hub retaining bolts partially before applying an even amount of force to the head of each bolts to release the wheel hub from the wheel knuckle. Failure to follow this instruction may cause damage to the component.

   NOTES:

   Install the components to their original fitted positions.

   Make sure that new bolts are installed.

   Torque: 90 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Front Suspension - Wheel Knuckle

Removal and Installation

Special Tool(s)

	204-327 Remover, Ball Joint

Removal

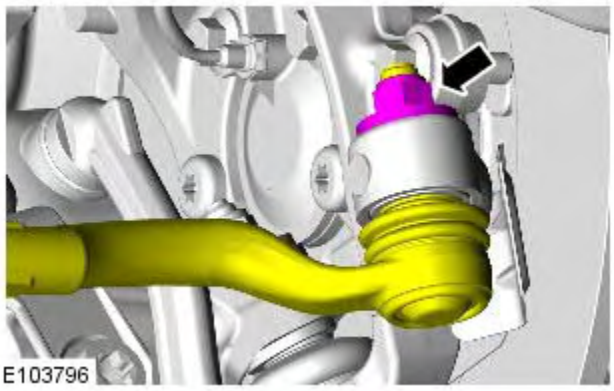
CAUTION: LH illustration shown, RH is similar.

NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Front Wheel Bearing and Wheel Hub (204-01 Front Suspension, Removal and Installation).

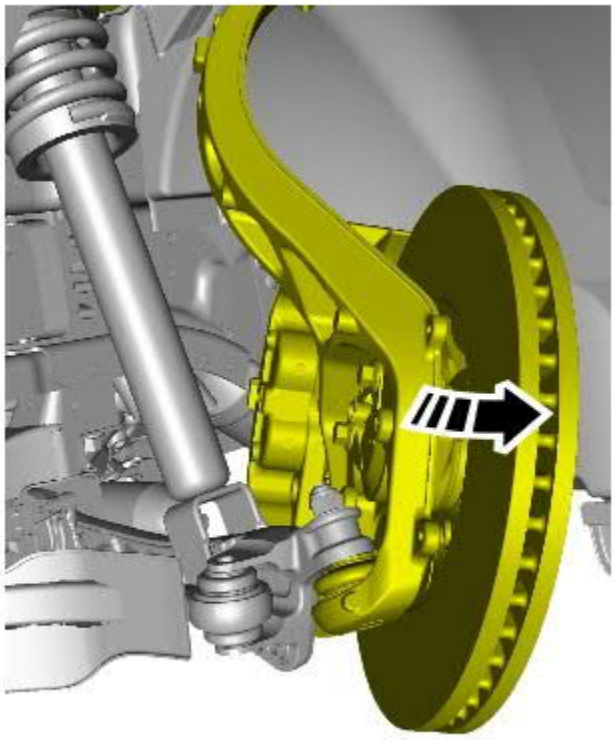


3. WARNING: Make sure that a new tie-rod end nut is installed.

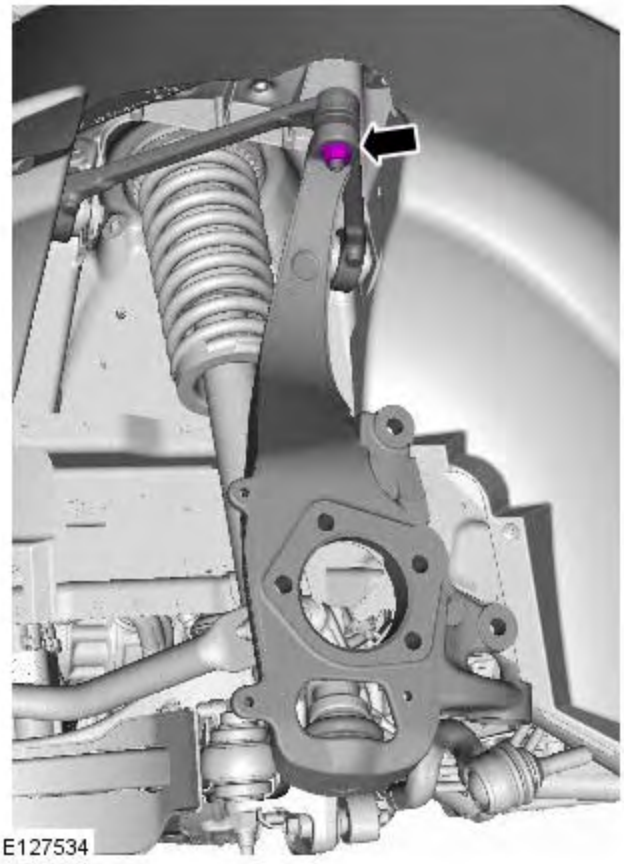
   NOTE: Use an additional wrench to prevent the ball joint rotating.

   Torque: 133 Nm

4.



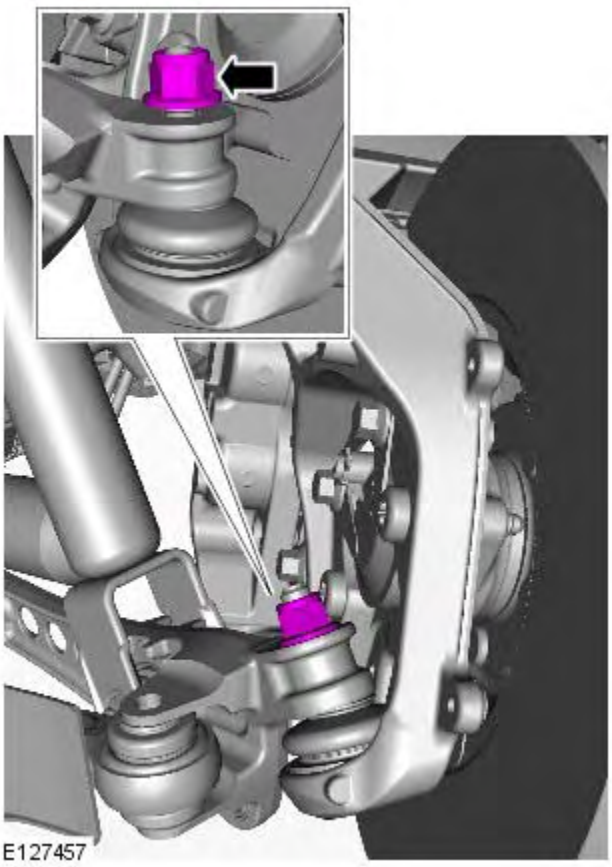
E127461



E127534

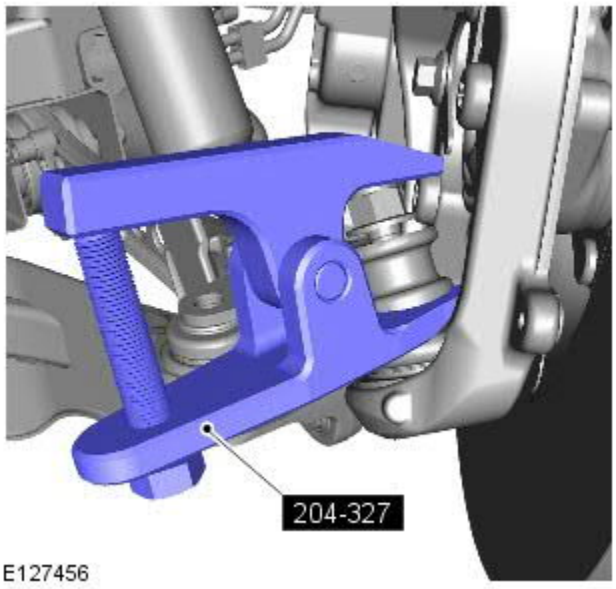
5. NOTE: Use an additional wrench to prevent the ball joint rotating.

   Loosen, but do not fully remove the nut.



6. CAUTION: Prevent the rear lower arm ball joint ball pin hexagon from rotating. Failure to follow this instruction may result in damage to the lower ball joint boot.

   Torque: 133 Nm



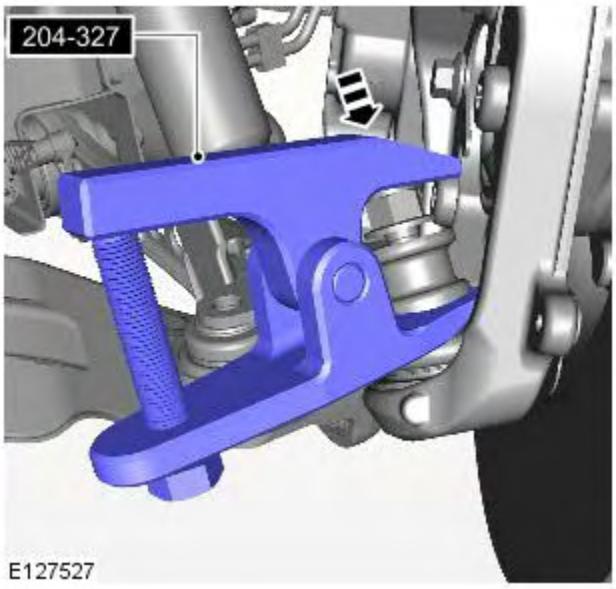
7. WARNING: Make sure the special tool is supported while carrying out the operation. Failure to follow this instruction may result in personal injury.

   CAUTIONS:

   Make sure the special tool is supported while carrying out the operation. Failure to follow this instruction may result in damage to the special tool.

   Make sure the special tool is correctly located and the lower ball joint boot is not damaged while carrying out the operation. Failure to follow this instruction may result in damage to the component.

   Special Tool(s): 204-327



8. WARNING: Make sure the special tool is supported while carrying out the operation. Failure to follow this instruction may result in personal injury.

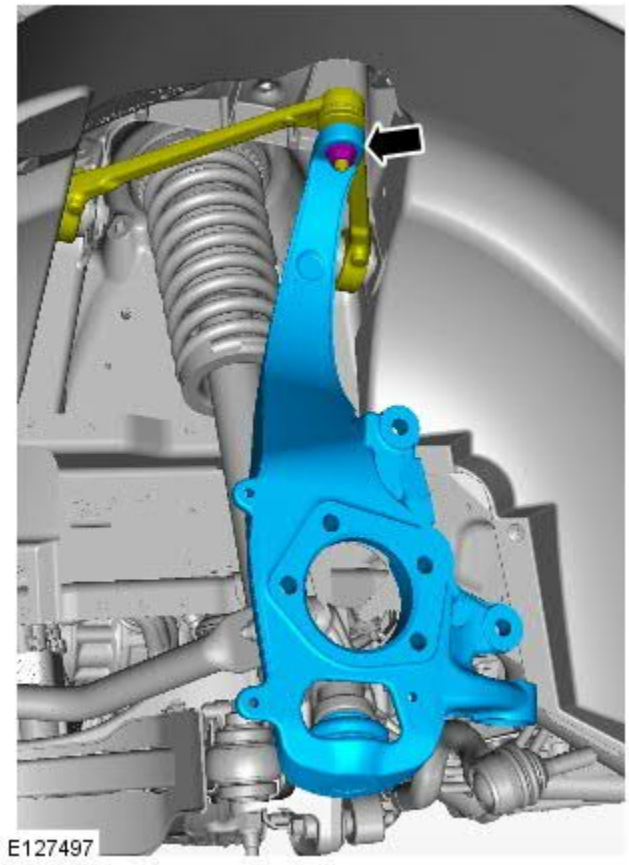
   CAUTIONS:

   Make sure the special tool is supported while carrying out the operation. Failure to follow this instruction may result in damage to the special tool.

   Make sure the special tool is correctly located and the lower ball joint boot is not damaged while carrying out the operation. Failure to follow this instruction may result in damage to the component.

   NOTE: Do not carry out this step if the rear lower arm ball joint released from the wheel knuckle lower pivot in the step above.

   Strike the top surface of the special tool directly above the rear lower arm ball joint at the point indicated using a copper mallet.



9. WARNING: Make sure that a new nut is installed.

   NOTE: Use an additional wrench to prevent the ball joint rotating.

   Torque: 90 Nm

10. NOTE: Do not disassemble further if the component is removed for access only.

Installation

1. WARNING: Make sure that a new lower arm ball joint nut is installed.

   To install, reverse the removal procedure.

Published: 25-Jun-2013

Rear Suspension -

Torque Specifications

NOTE: **+ New nut must be installed.**

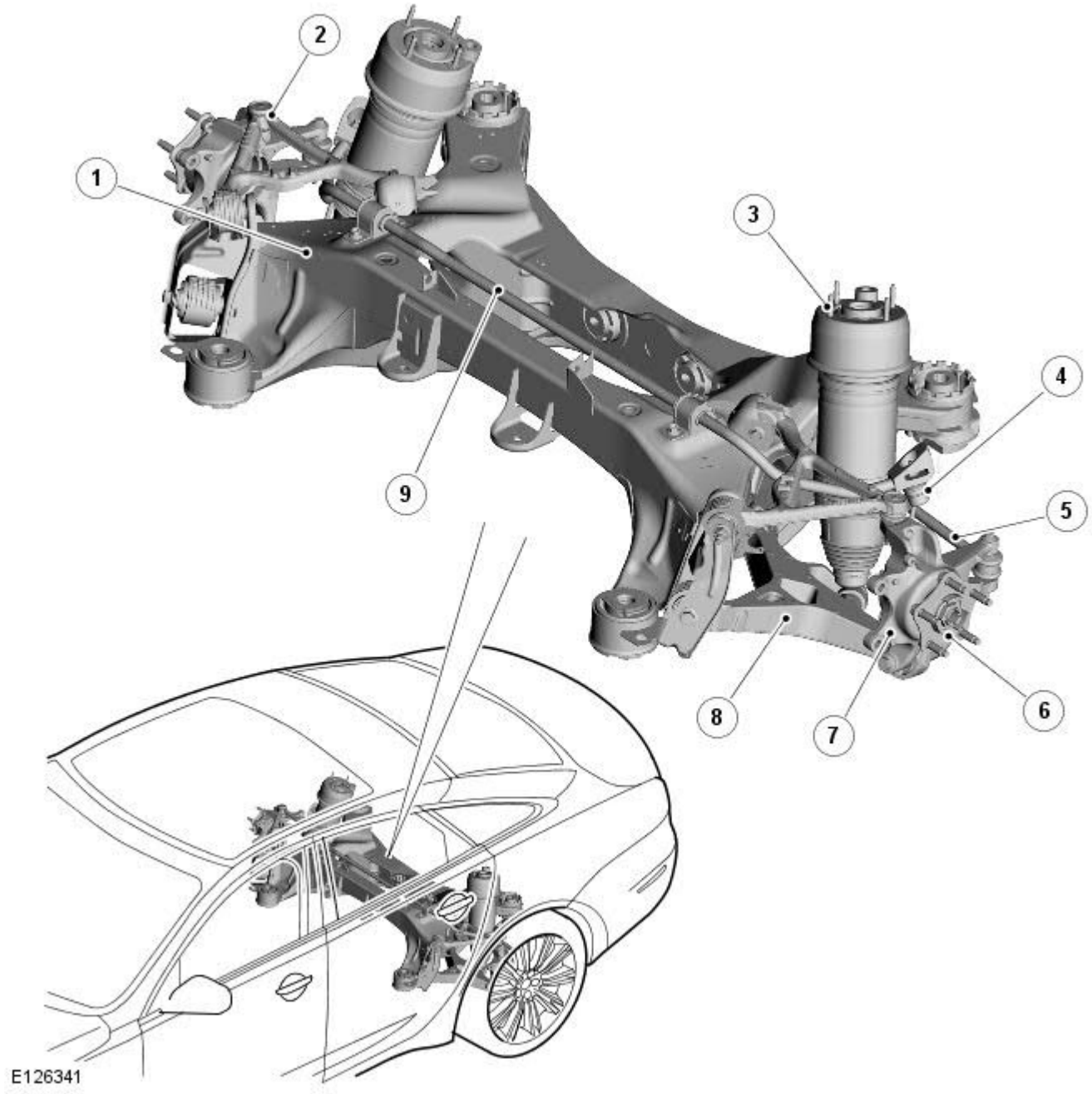
Description	Nm	lb-ft	lb-in
Halfshaft outer constant velocity joint retaining nut	300	221	-
Lower arm to wheel knuckle retaining nut and bolt	192	142	-
Lower arm to subframe retaining nut and bolt	192	142	-
Lower arm to subframe retaining bolt	192	142	-
Non XJR version - Upper arm ball joint to wheel knuckle retaining nut +	96	71	-
XJR version - Upper arm ball joint to wheel knuckle retaining nut +	-	-	-
Stage 1:	48	35	-
Stage 2:	60 Degrees	60 Degrees	-
Upper arm to subframe retaining nut and bolt	115	85	-
Toe link to subframe ball joint retaining nut	90	66	-
Toe link to wheel knuckle retaining nut and bolt	63	46	-
Toe link setting nut	55	41	-
Shock absorber and spring assembly upper mounting to body retaining nuts	28	21	-
Shock absorber and spring assembly upper mounting retaining nut	27	20	-
Shock absorber to lower arm retaining bolt	133	98	-
Stabilizer bar link to stabilizer bar retaining nut	48	35	-
Stabilizer bar clamp to subframe retaining bolt	55	41	-
Stabilizer bar link to lower arm retaining nut	48	35	-
Wheel and tire to wheel hub retaining nuts	125	92	-

Published: 11-May-2011

Rear Suspension - Rear Suspension - Component Location

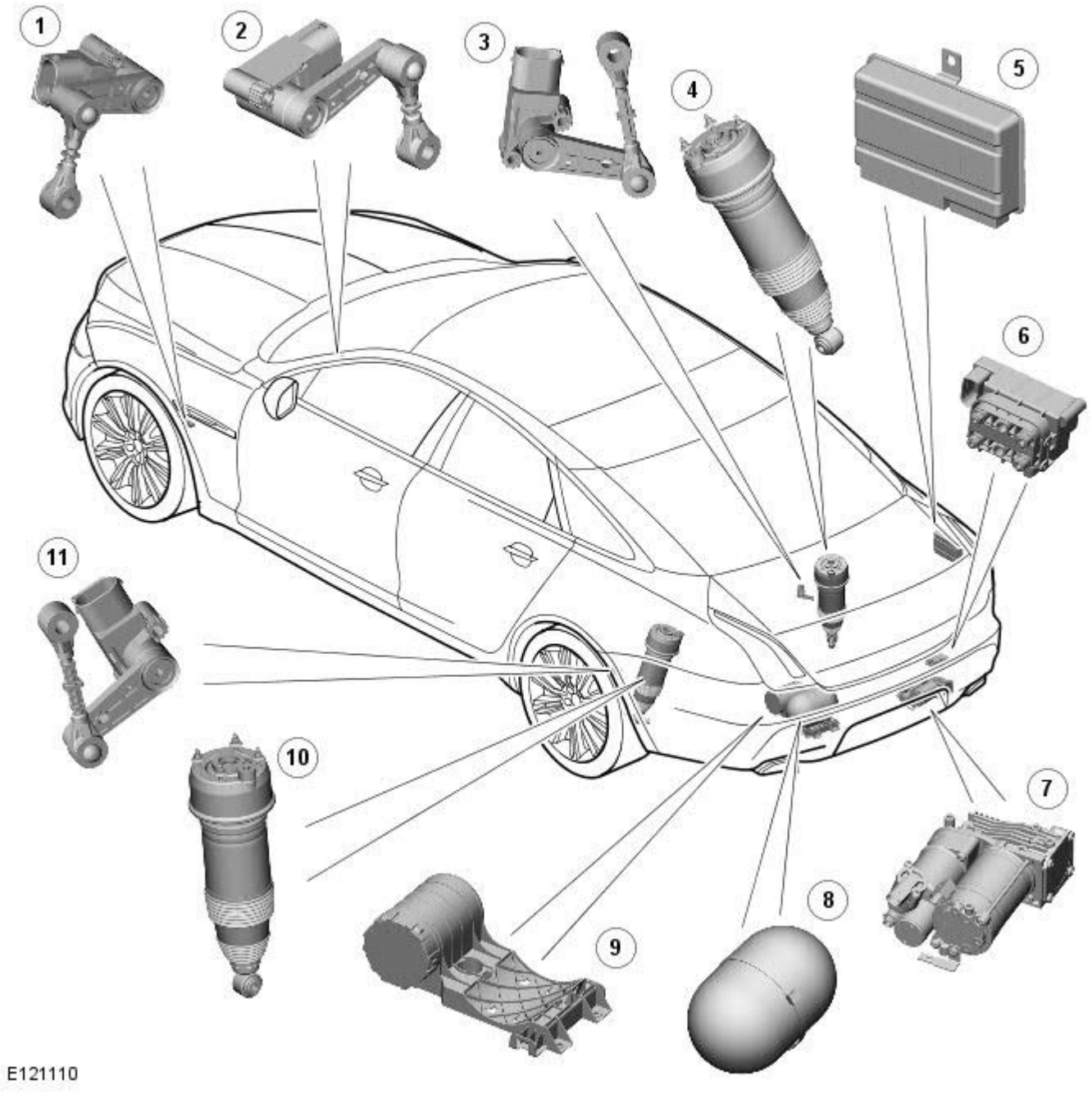
Description and Operation

COMPONENT LOCATION - SHEET 1 OF 3



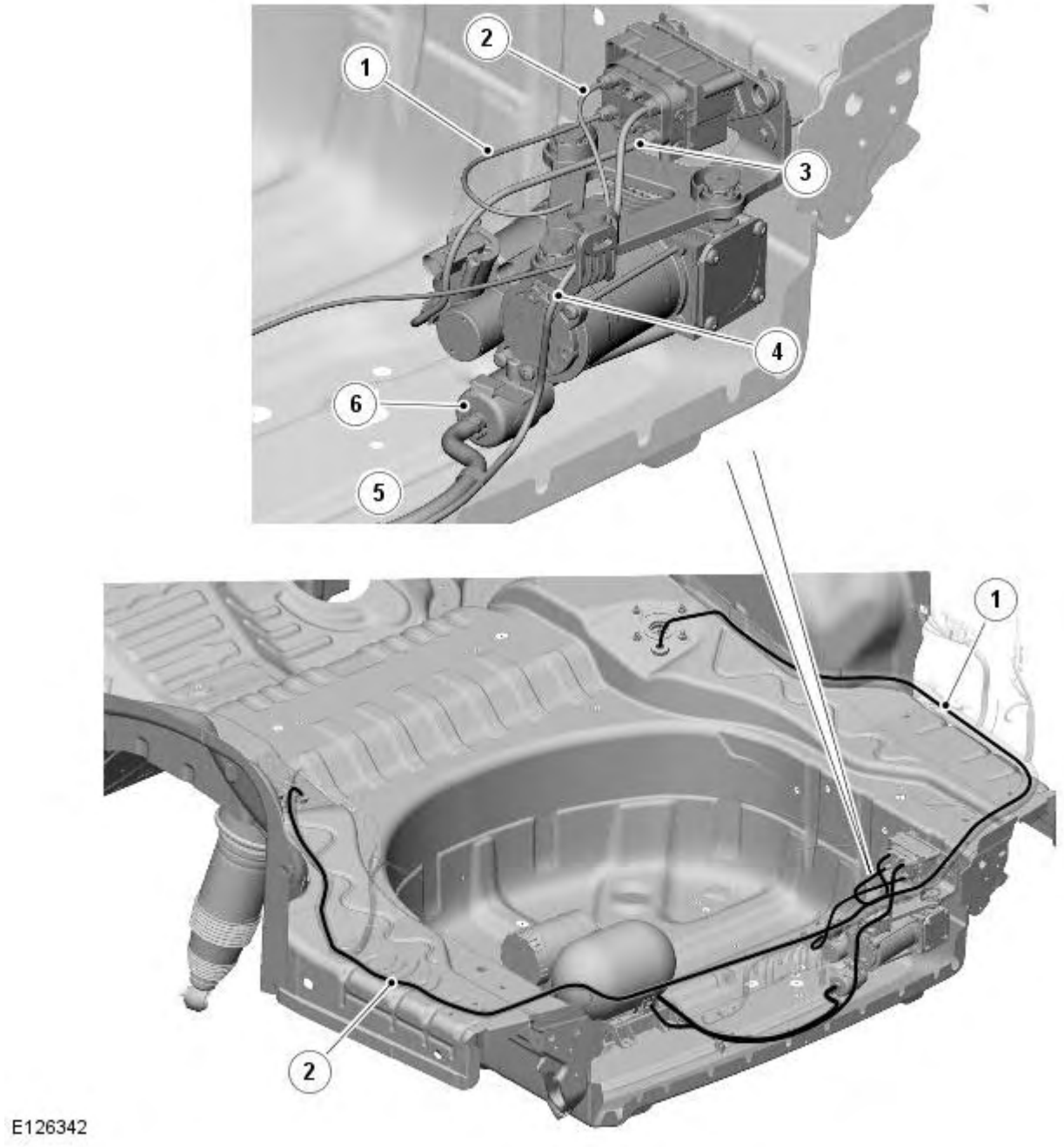
Item	Description
1	Rear subframe (reference)
2	Upper control arm
3	Spring and damper assembly
4	Stabilizer bar link
5	Toe link
6	Wheel hub and bearing assembly
7	Wheel knuckle
8	Lower control arm
9	Stabilizer bar

COMPONENT LOCATION - SHEET 2 OF 3



Item	Description
1	LH (left-hand) front suspension height sensor
2	RH (right-hand) front suspension height sensor
3	RH rear suspension height sensor
4	RH rear spring and damper assembly
5	Air suspension module
6	Valve block
7	Air compressor assembly
8	Reservoir
9	Silencer
10	LH rear spring and damper assembly
11	LH rear suspension height sensor

COMPONENT LOCATION - SHEET 3 OF 3



Item	Description
1	Valve block to RH air spring pipe
2	Valve block to LH air spring pipe
3	Compressor to valve block pipe
4	Valve block to reservoir pipe
5	Compressor inlet/exhaust pipe
6	Filter

Published: 11-May-2011

Rear Suspension - Rear Suspension - Overview

Description and Operation

OVERVIEW

The double wishbone type rear suspension is a fully independent design assembled on a steel subframe. Large diameter bushes isolate the subframe from the vehicle's body.

Toe links, installed between the wheel knuckles and the subframe, are used to adjust the toe angle of the rear wheels.

The wheel knuckles are attached to the upper and lower control arms. A spring and damper assembly is located between each lower control arm and the vehicle body.

The spring and damper assemblies incorporate air springs controlled by the air suspension system.

Air Suspension System

The air suspension system provides a fully automatic self-leveling function that ensures the vehicle maintains a constant attitude, irrespective of load, by adjusting the rear ride height to match the front ride height.

The air suspension system comprises of:

- An air spring in the spring and damper assembly of each rear wheel.
- An air compressor assembly.
- A valve block.
- A reservoir.
- A silencer.
- A network of pipes to connect the individual components.
- Four suspension height sensors (one for each corner of the vehicle).
- An air suspension module.

Published: 11-May-2011

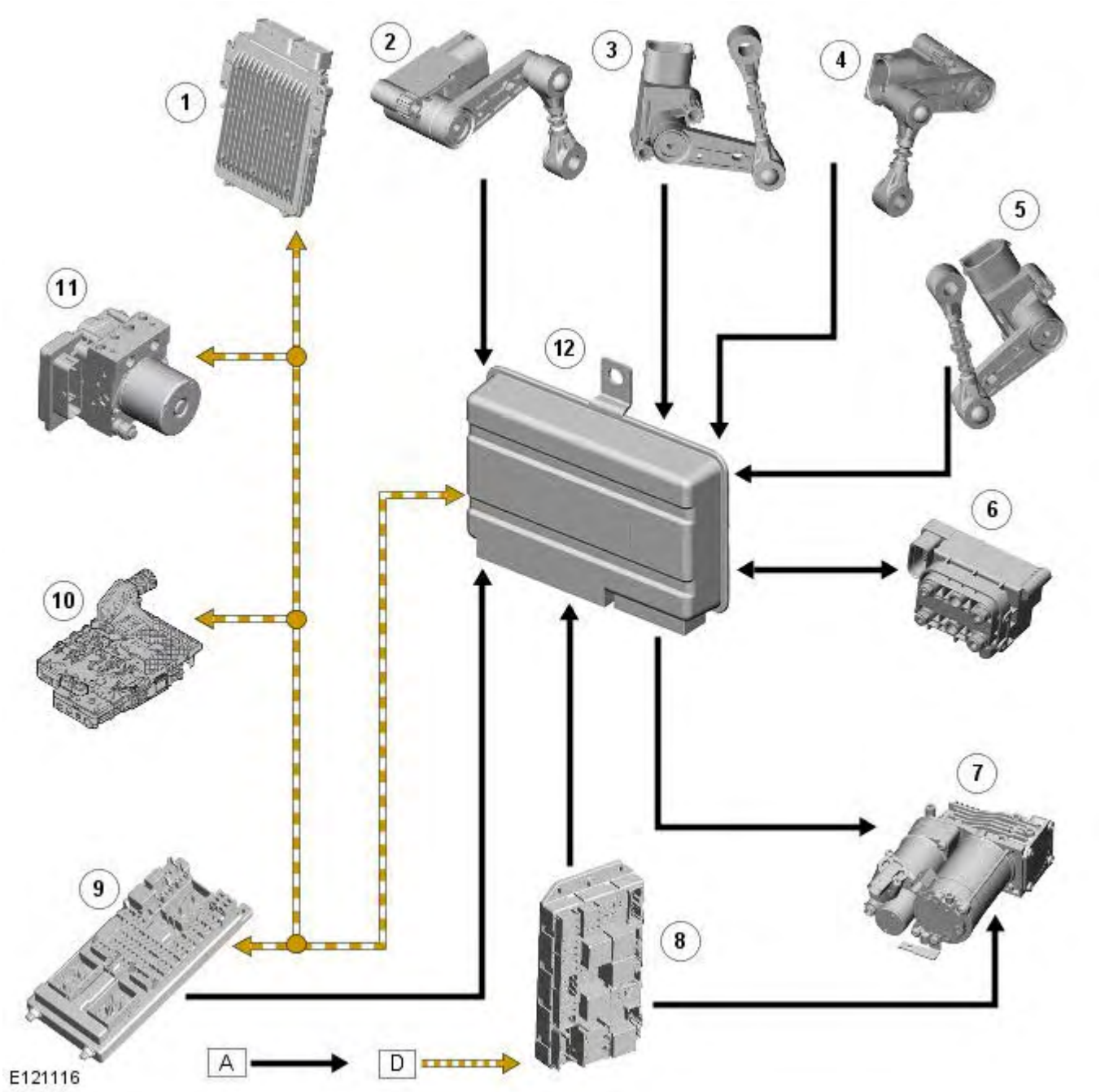
Rear Suspension - Rear Suspension - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: A = Hardwired; D = High speed CAN (controller area network).

AIR SUSPENSION SYSTEM



Item	Description
1	ECM (engine control module)
2	RH (right-hand) front height sensor
3	RH rear height sensor
4	LH (left-hand) front height sensor

5	LH rear height sensor
6	Valve block
7	Air compressor assembly
8	RJB (rear junction box)
9	CJB (central junction box)
10	TCM (transmission control module)
11	ABS (anti-lock brake system) module
12	Air suspension module

System Operation

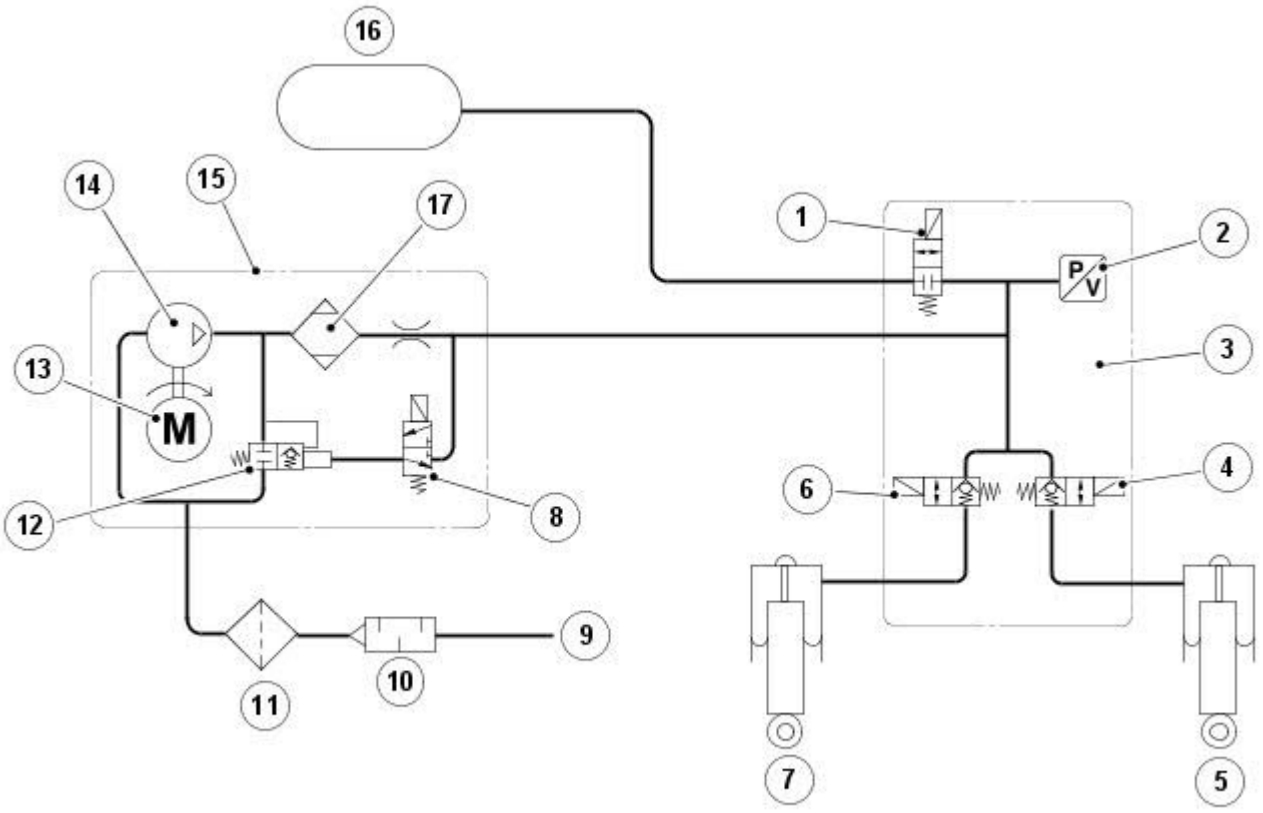
PRINCIPLES OF OPERATION - AIR SUSPENSION SYSTEM

The air suspension module adjusts the quantity of air in the springs to maintain the rear suspension at the required height. The air suspension module calculates a target height for the rear suspension based on the average height of the front suspension. If the actual height of the rear suspension is outside the tolerance band for the target height, for a given length of time, the air suspension module then adjusts the actual height to the target height. The normal tolerance band is ±9 mm (0.35 in.). This changes to ±3 mm (0.12 in.) when the vehicle is parked for 5 minutes with the engine running and all doors closed, or by putting the air suspension module into a special mode using Jaguar approved diagnostic equipment. When a door is open the tolerance band changes to -5/+20 mm (-0.20/+0.79 in.).

To decrease suspension height, the air suspension module opens the exhaust valve in the air compressor assembly and the air spring valves in the valve block to release air from the air springs. To raise the suspension height , the module opens the air spring valves to introduce air into the air springs using air from the reservoir and/or the compressor.

When vehicle speed is 22 mph (35 km/h) or less, the air suspension module normally uses air from the reservoir when it needs to raise the rear suspension. This ensures that the occupants are not disturbed by noise from the air compressor assembly. However, if the rear suspension is more than 30 mm (1.18 in.) below the target height, and there is insufficient pressure in the reservoir, the air suspension module uses the compressor to lift the suspension. When the rear suspension is more than 50 mm (2 in.) low, the air suspension module also sends a signal to the instrument cluster on the high speed CAN bus to display a Suspension Too Low message. If the vehicle is stationary the message is displayed with an amber triangle warning indicator; if the vehicle is moving a red triangle warning indicator is displayed with the message.

Air Suspension System Schematic



E126330

Item	Description
1	Reservoir valve
2	Pressure sensor
3	Valve block
4	RH air spring valve
5	RH air spring
6	LH air spring valve
7	LH air spring
8	Pilot exhaust valve
9	Inlet/Exhaust
10	Silencer
11	Filter
12	Main exhaust valve
13	Electric motor
14	Compressor
15	Air compressor assembly
16	Reservoir
17	Air drier

System Inhibits

The air suspension module is programmed to inhibit normal height change operation under conditions where it is undesirable.

To reduce the trap hazard, height changes are restricted when any of the vehicle doors are open. This restriction is removed if the vehicle speed exceeds 5 mph (8 km/h).

If the vehicle is jacked, the air suspension module detects the condition a few seconds after starting to correct the suspension height. The same logic also detects if the rear of the vehicle is grounded. If it detects one of these conditions, the air suspension module inhibits normal leveling control. If the rear wheels subsequently start to spin, the air suspension module raises the rear suspension to help release the vehicle from grounding. Normal leveling control resumes when the engine is running and the rear suspension is more than 30 mm (1.18 in.) below the nominal kerb weight height, or the vehicle speed exceeds 10 mph (15 km/h).

Diagnostics and Maintenance

When vehicles are set to transportation mode the air suspension system adopts different functionality to optimize the rear suspension height for loading and off-loading clearances. The vehicle can be switched in and out of transportation mode using Jaguar approved diagnostic equipment. In transportation mode, the rear suspension height is set to 25 mm (1 in.) above the nominal design height. If the suspension height is lower than the transportation mode set point, the message Vehicle Too Low is also displayed in the message center. When the correct height is reached (engine running) the Vehicle Too Low message is switched off.

The air suspension system has a number of special modes that may be used during vehicle servicing or repair. These modes can disable the air suspension system, make it operate within tighter tolerances or deflate the air springs and/or reservoir. While one of these modes is active the message Air Suspension Not in Customer Mode is displayed in the instrument cluster. The air suspension system is set in and out of these modes using Jaguar approved diagnostic equipment.

If a fault occurs in the air suspension system, a related DTC (diagnostic trouble code) is stored in the air suspension module. The air suspension module adopts a default leveling strategy which is most appropriate for the fault and vehicle safety. This reduces the functionality of the air suspension system depending on the type and severity of fault. A message is displayed, and an amber or red warning indicator is illuminated, in the instrument cluster. A warning chime may sound when the fault message is displayed.

The following table lists the air suspension system warning indicators, messages and chimes:

Triangle Warning Indicator	Message	Chime	Fault	Action
Amber	Suspension Fault	Alert chime when message first displayed	Fault detected that may result in some reduction in system performance or refinement	Rectify fault
Amber	Vehicle Too Low	Vehicle in transportation mode: Information chime repeated while vehicle is too low; chime stops when transportation height achieved	Vehicle rear too low when loading. Displayed when vehicle at rest if too low	Wait until vehicle has risen before driving
Amber	Vehicle Too Low	Vehicle not in transportation mode: No chime	The rear suspension is more than 50 mm (2 in.) below nominal height and the vehicle is at rest	Wait until vehicle has risen before driving

Triangle Warning Indicator	Message	Chime	Fault	Action
Red	Vehicle Too Low	Vehicle in transportation mode: Information chime repeated while vehicle is too low; chime stops when loading height achieved	Vehicle rear too low when loading and vehicle is moving	Stop until vehicle has risen
Red	Vehicle Too Low	Vehicle not in transportation mode: No chime	The rear suspension is more than 50 mm (2 in.) below nominal height and the vehicle is moving.	Stop or proceed cautiously until vehicle has risen
Amber	Air Suspension Not In Customer Mode	No chime	Air suspension system is in special mode used for vehicle servicing or repair	Change to customer mode with Jaguar approved diagnostic equipment

The following system fault will not necessarily cause a DTC to be set:

Symptom	Possible Cause
Vehicle leans / tilts after being left overnight or for some days	Leak from air spring or air spring valve

Calibration or height setting is the process of adjusting the values stored in the air suspension module for the suspension height sensor offsets for each of the four corners. Each of the suspension height sensors measures the position of the associated wheel with respect to the vehicle chassis and generates a corresponding voltage signal. Each of these voltage signals is read by the module and converted to a height value in millimeters. Ideally this height value would exactly match the actual value for each wheel, however, due to build and component tolerances there can be an offset between these two sets of values.

The calibration process sets the necessary value for this offset for each suspension height sensor so that the actual and calculated values are equal. System calibration is required in the following cases:

- A suspension height sensor is removed or replaced.
- A replacement air suspension module is fitted.
- If the suspension on any corner is dismantled and rebuilt.

The calibration procedure is carried out using Jaguar approved diagnostic equipment and a suspension height measurement tool.

The air suspension module contains a self test function, that can be activated by Jaguar approved diagnostic equipment. The test is primarily an electrical test. Checks for stuck valves or leaking valves etc. are not included.

The test routine activates each output (valves and compressor) in turn, and monitors electrical connections. The routine takes approximately 30 seconds to complete, but may be terminated immediately by switching the ignition off. Operation of the valves during this test may cause small quantities of air flow into or out of the air springs. As a result the vehicle may make small changes in height.

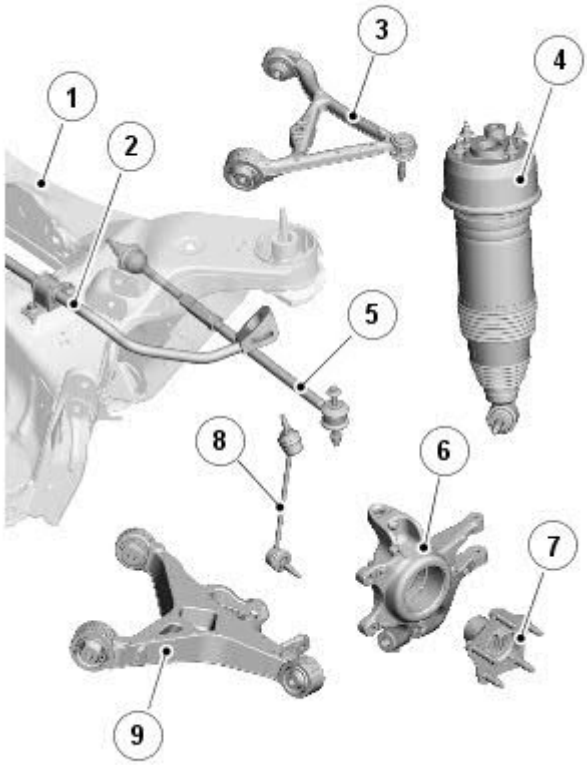
The self test operates in the following sequence:

- Opens exhaust valve 100%, then closes valve.
- Turns compressor on and off.
- Opens rear left air spring valve 100%, then closes valve.
- Opens rear right air spring valve 100%, then closes valve.
- Opens the reservoir valve 100% for 2 seconds, then closes valve.

To de-pressurize the system air is vented through the valve block, the air compressor assembly (which regenerates the air drier), the filter and the silencer to atmosphere. The system is pressurized using the air compressor assembly. The de-pressurization and pressurization of the air suspension system is initiated using Jaguar approved diagnostic equipment.

Component Description

REAR SUSPENSION



E126331

Item	Description
1	Rear subframe
2	Stabilizer bar
3	Upper control arm
4	Spring and damper assembly
5	Toe link
6	Wheel knuckle
7	Wheel hub and bearing assembly
8	Stabilizer bar link
9	Lower control arm

Upper Control Arm

The cast aluminum upper control arm locates to the subframe via one cross-axis joint and one plain rubber bush, and links to the wheel knuckle via an integral ball joint.

Lower Control Arm

The aluminum lower arm locates to the subframe via one cross-axis joint and one plain rubber bush, and to the wheel knuckle via a second plain rubber bush.

The rear of the control arm has mounting points for the damper and the stabilizer link.

Toe Link

Each toe link is located between the wheel knuckle and a bracket on the subframe.

The toe links comprise an inner rod with integral axial ball joint. The inner ball joint has a threaded spigot which locates in the bracket on the subframe and is secured with a locknut. The rod has an internal thread which accepts the outer rod.

The outer rod has a cross-axis joint at its outer end which is located in a clevis on the wheel knuckle, and is secured with a bolt and locknut.

The length of the toe link can be adjusted by rotating the inner rod. This allows for adjustment of the toe angle for the rear wheel. Once set, the inner rod can be locked in position by tightening a locknut on the outer rod against the inner rod.

Wheel Knuckle

The cast aluminum wheel knuckle attaches to:

- The upper control arm via a ball-joint located in the arm.
- The lower control arm via a plain rubber bush located in the arm.
- The toe link via a cross-axis joint located in the toe link.

The wheel knuckle also provides the mounting locations for the:

- Wheel hub assembly.
- Wheel bearing.
- Wheel speed sensor.
- Brake caliper.
- Brake disc shield.

Stabilizer Bar

All vehicles have a 17 mm (in.) stabilizer bar installed to help control the roll rate of the vehicle.

The stabilizer bar is attached to the top of the subframe with two bushes and mounting brackets. The stabilizer bar has collars crimped into the bar at the inside edges of the bushes. The collars prevent sideways movement of the stabilizer bar.

Each end of the stabilizer bar curves rearward to attach to a ball joint on each stabilizer link. Each link is attached via a second ball joint to a cast bracket on the lower control arm. The links allow the stabilizer bar to move with the wheel travel providing maximum effectiveness.

Spring and Damper Assembly

Each spring and damper assembly is attached to a cast bracket on the lower control arm and to the vehicle body by four studs secured by torque retaining nuts.

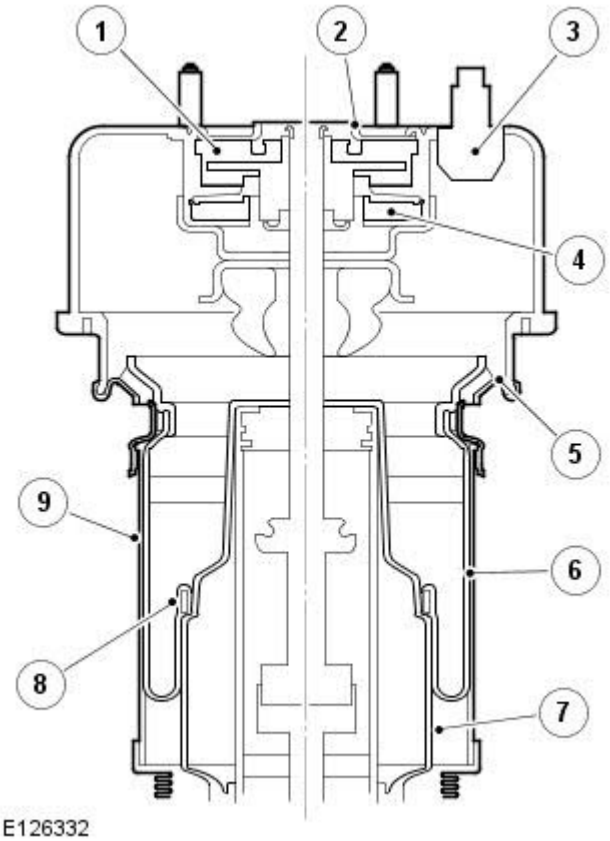
Each spring and damper assembly incorporates:

- An adaptive dynamics damper, which enables the damping characteristics of the suspension to be adjusted. Refer to: Vehicle Dynamic Suspension (204-05 Vehicle Dynamic Suspension, Description and Operation).
- An air spring, controlled by the air suspension system.

AIR SUSPENSION SYSTEM

Air Springs

Section Through Air Spring



Item	Description
1	Top mount assembly
2	Polyurethane damper mounting
3	Pressure retaining valve
4	Damper mounting seal
5	Air spring isolator
6	Air spring rolling sleeve
7	Air spring piston
8	Air spring rolling sleeve to piston crimp ring
9	Decoupled air spring guide

The air springs take the place of conventional coil springs on the rear suspension. In the air spring, a piston compresses the air as the suspension moves into bump/jounce, which cushions the movement. A rubber rolling sleeve is guided by an outer metal support sleeve and assembled around the damper. The metal support sleeve is decoupled from the top mount assembly, which allows greater damper articulation without trapping the air sleeve. This design delivers improved ride characteristics compared to a non-guided air spring, and reduces high frequency generated inputs such as those produced by a coarse road surface, for example.

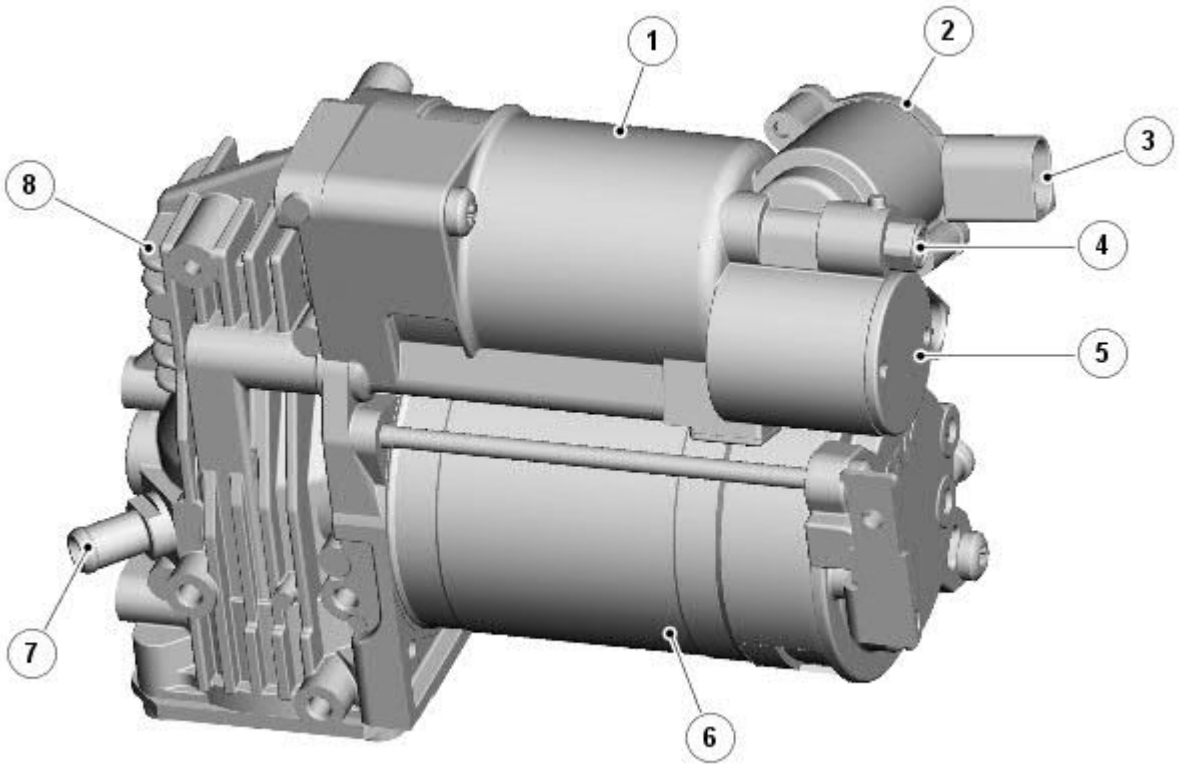
The key sealing points for the air spring are between the:

- Piston and damper body.
- Spring unit and top mount.

The method of achieving a pressure-tight seal between the air spring and the damper means that spring and damper assemblies must be replaced as a complete unit.

The air-tight top mount assembly isolates the damper from the body structure while maintaining pressure within the spring. A pressure retaining valve in the top mount ensures that air cannot be exhausted from the air spring when the pressure is less than 3.0 bar (43.5 lbf/in^2). This ensures that the rolling sleeve does not crease and become damaged. The maximum pressure in the full-bump condition at GVW (gross vehicle weight) is approximately 20 bar (290 lbf/in^2).

Air Compressor Assembly



E126333

Item	Description
1	Air drier
2	Pilot exhaust valve

3	Electrical connector
4	HP (high pressure) outlet port (to valve block)
5	Main exhaust valve
6	Electric motor
7	Air intake/exhaust port
8	Compressor housing

The air compressor assembly is installed in the luggage compartment, on a bracket in the rear right corner of the spare wheel well. For NVH (noise, vibration and harshness) reasons, the air compressor assembly is attached to the bracket by three isolator mountings, each incorporating a rubber snubbing bush and a metal spring.

The air compressor assembly incorporates:

- A two stage compressor driven by an electric motor.
- An air drier.
- A main exhaust valve.
- A pilot exhaust valve.
- An air intake / exhaust port.
- A HP outlet port.

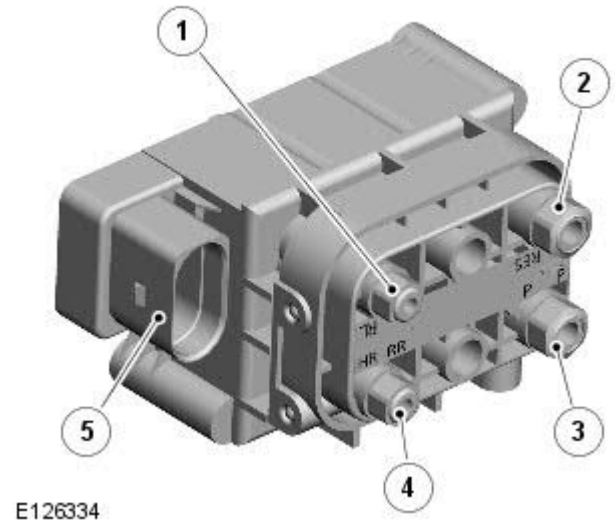
The compressor motor is operated by power from the air suspension relay in the RJB, which is controlled by the air suspension module. To prevent damage caused by overheating, the temperature of the compressor and motor is calculated by a software model in the air suspension module. The calculated temperature is based on compressor operating pressure, voltage, time and ambient air temperature. The air suspension module discontinues compressor operation if the calculated temperature increases to 100 °C (212 °F). Compressor operation resumes when the air suspension module calculates the temperature has decreased to 80 °C (176 °F).

The air drier removes moisture from the air delivered by the compressor to the HP outlet port, and consists of a chamber that contains water absorbing desiccant beads. When the air suspension system is depressurized, air is vented back through the air compressor assembly, to initiate air drier regeneration. The clean dry air vented from the system re-activates the desiccant beads.

The main exhaust valve controls the release of air from the air suspension system through the air intake / exhaust port. It also acts as a PRV (pressure relief valve) and minimum pressure retention valve. The PRV function limits the maximum pressure from the compressor to 17.5 bar (254 lbf/in^2). The minimum pressure retention function limits the minimum pressure in the system to between 0.25 and 1.00 bar (3.75 and 14.5 lbf/in^2).

The pilot exhaust valve is a solenoid operated valve that controls the operation of the main exhaust valve. A PWM (pulse width modulation) signal from the air suspension module controls the pilot exhaust valve to apply system pressure to the pilot chamber of the main exhaust valve.

Valve Block



Item	Description
1	LH air spring pipe connector
2	Reservoir pipe connector
3	Compressor pipe connector
4	RH air spring pipe connector
5	Electrical connector

The valve block is used by the air suspension module to control the flow of air between the air compressor assembly, the reservoir and the two air springs. The valve block is installed in the luggage compartment spare wheel well, on the same bracket as the air compressor assembly. Three isolator grommets locate the valve block mounting plate on the bracket.

The valve block incorporates:

- Three normally closed solenoid valves, one for each of the rear air springs and one for the reservoir.
- A pressure sensor to monitor the pressure in the line between the air compressor assembly and the three solenoid valves.

The solenoid valves control the air flow into and out of the air springs and the reservoir, and are operated by PWM signals from the air suspension module.

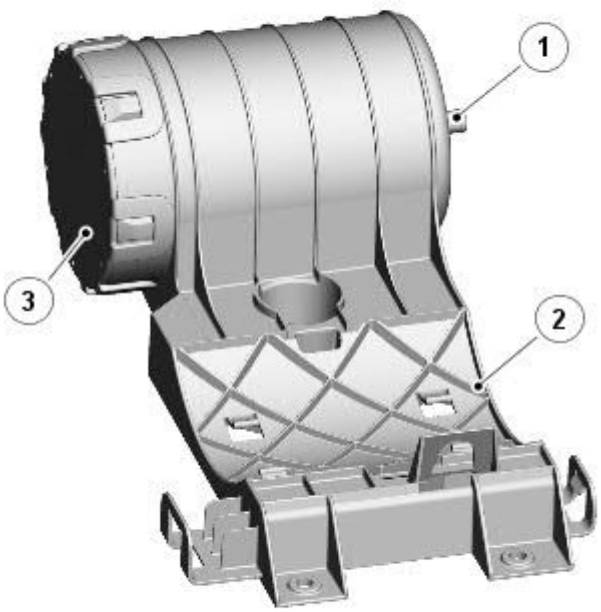
The air suspension module uses the pressure sensor signal to decide when to pressurize the air springs directly from the air compressor assembly, or from the pressurized air stored in the reservoir.

Reservoir

E126335

The reservoir stores a supply of pressurized air for immediate use by the system, which enables quiet system operation at low speeds. The reservoir is installed in the luggage compartment, on a bracket under the spare wheel, and has a capacity of 3.7 liters (226 $in.^3$). Pressure in the reservoir is controlled by the air suspension module at a nominal maximum of 16.5 bar (239 $lbf/in.^2$).

Silencer



E126336

Item	Description
1	Air intake/exhaust pipe connector
2	Reservoir bracket
3	Air intake/exhaust cap

The silencer is integrated into the reservoir bracket, and functions as an air intake and exhaust silencer. Air is exhausted as the system is leveling down.

Air Distribution Pipes

A series of pipes carry pressurized air between the system components. The air spring pipes are integrated into the electrical harnesses. The air compressor assembly to valve block pipe is separate from the other pipes, while the valve block to reservoir pipe is clipped together with the intake/exhaust pipe. A filter, attached to the underside of the air compressor assembly, is installed in the intake/exhaust pipe.

Air Suspension Module

E126559

The air suspension module uses a combination of information from other system modules and data from the suspension height sensors to measure the vehicle and suspension states. Using this information, the air suspension module applies algorithms to control the rear suspension height required for the current driving conditions.

The air suspension module is installed on the RH side of the luggage compartment, together with the adaptive damping

module, on a bracket attached to the rear quarter panel.

The air suspension module receives the following signals on the high speed CAN bus:

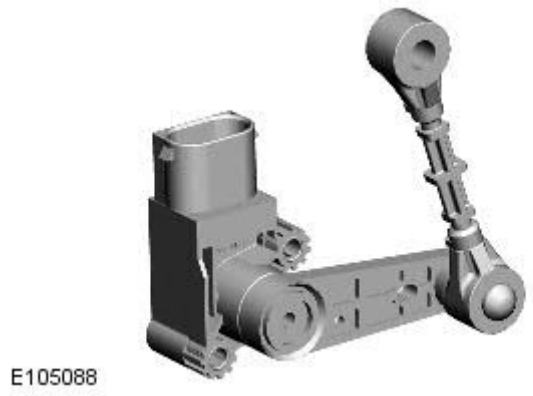
- Vehicle speed - ABS module.
- Wheel speed sensors - ABS module.
- Lateral acceleration - ABS module.
- Steering wheel angle - ABS module.
- Steering wheel angle status - ABS module.
- Engine speed - ECM.
- Gear position target - TCM.
- Vehicle information parameters - CJB.
- CCF (car configuration files) - CJB.
- Power mode (ignition signal) - CJB.

The air suspension module outputs information on the high speed CAN bus for use by other systems as follows:

- Fault message - instrument cluster.
- Individual suspension heights - other systems as required.

Suspension Height Sensors

NOTE: Rear sensor shown, front sensors similar.



Four suspension height sensors are used in the air suspension system, two for the front suspension and two for the rear suspension. A front suspension height sensor is attached to each side of the front subframe and connected by a sensor arm and sensor link to the related lower lateral arm of the front suspension. A rear suspension height sensor is attached to each side of the rear subframe and connected by a sensor arm and sensor link to the related upper control arm of the rear suspension. On each suspension height sensor, the sensor arm and sensor link convert linear movement of the suspension into rotary movement of the sensor shaft.

Each suspension height sensor contains two independent sensors:

- Sensor 1 is used by the air suspension system.
- Sensor 2 is used by the adaptive dynamics system.
  Refer to: Vehicle Dynamic Suspension (204-05 Vehicle Dynamic Suspension, Description and Operation).

The suspension height sensors measure suspension displacement at each corner of the vehicle and output a corresponding analogue signal to the air suspension module. The data from the sensors is filtered and processed by the air suspension module, and used to ensure that the vehicle remains level and at the correct height at all times by regulating the supply of air to each rear air spring unit.

Each suspension height sensor is connected to the air suspension module via three wires, which supply ground, 5 V supply and signal return.

Each sensing element consists of an array of Hall effect devices arranged to measure the direction of the magnetic field of a small magnet attached to the end of the sensor shaft. As the sensor shaft rotates, so do the lines of magnetic flux from the attached magnet. The signals from each of the Hall effect elements are processed by means of a dedicated integrated circuit, to generate an output voltage that varies as the sensor shaft is rotated. The sensor has a measurement range of ± 40° around its nominal position and the nominal sensitivity is 57 mv/° of shaft rotation.

Published: 22-May-2013

Rear Suspension - Rear Suspension

Diagnosis and Testing

For additional information.
REFER to: Suspension System (204-00 Suspension System - General Information, Diagnosis and Testing).

Published: 21-Jun-2013

Rear Suspension - Upper Arm

Removal and Installation

Removal

CAUTION: The final tightening of the suspension components must be carried out with the vehicle on its wheels.

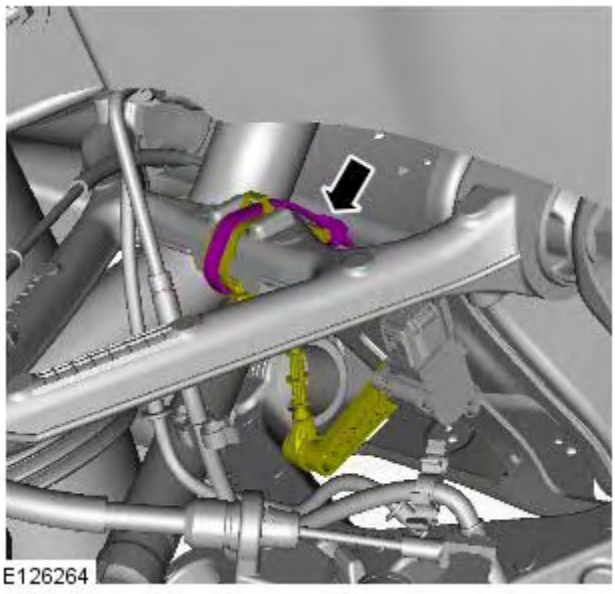
NOTES:

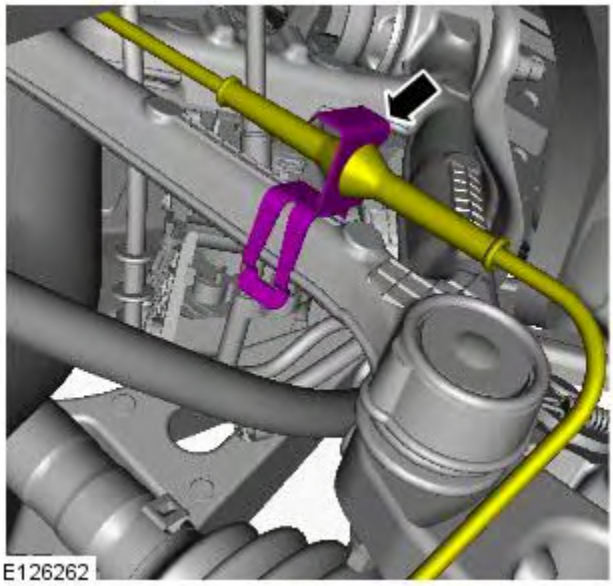
Removal steps in this procedure may contain installation details.

RH illustration shown, LH is similar.

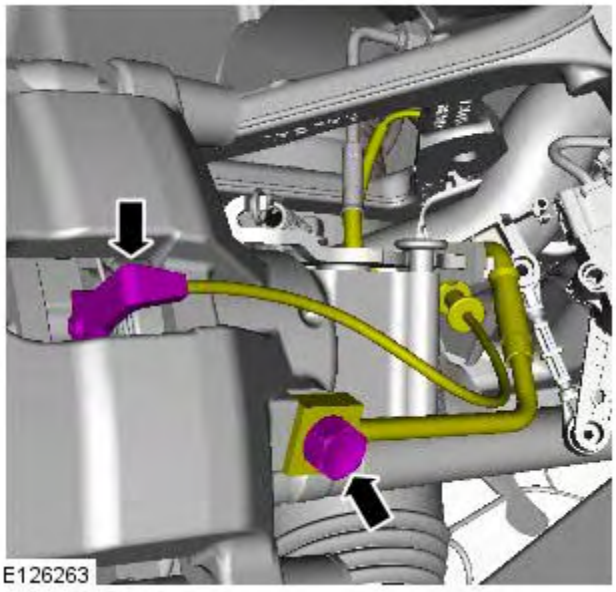
1. Raise and lower the vehicle on a 4 post ramp.
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.
3. Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).
4. Refer to: Shock Absorber and Spring Assembly (204-02 Rear Suspension, Removal and Installation).
5.





6.



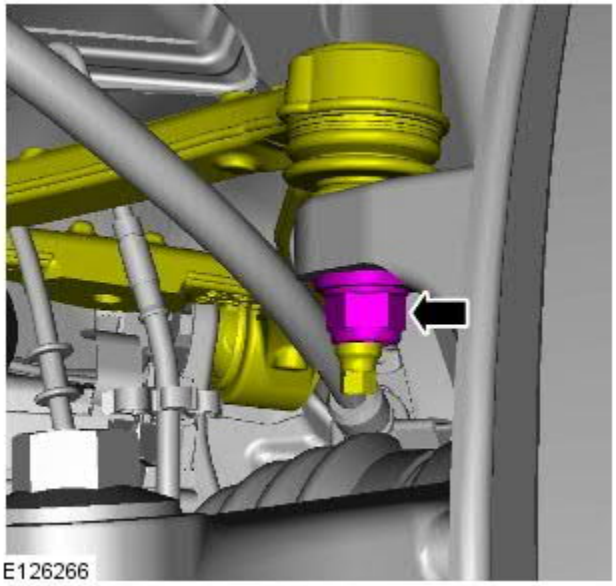
7. CAUTIONS:

Be prepared to collect escaping fluids.

Make sure that the area around the component is clean and free of foreign material.

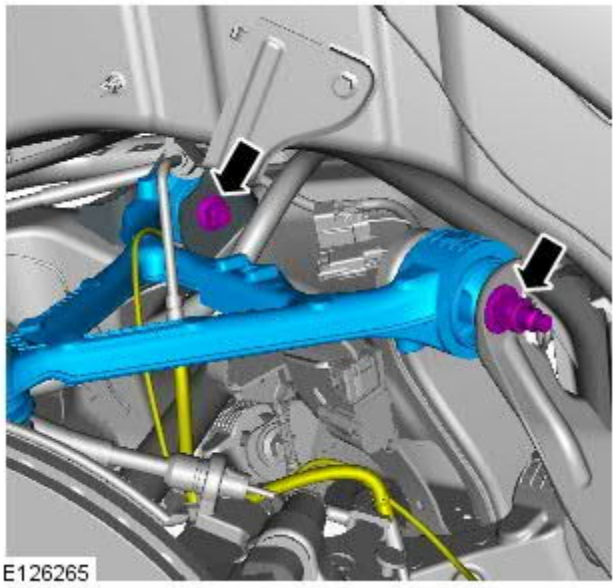
Make sure that all openings are sealed. Use new blanking caps.

Torque: 38 Nm



8. NOTE: Discard the nut.

   Torque:
   Non XJR version only 96 Nm
   XJR version only
   Stage 1:48 Nm
   Stage 2:60°



9. *Torque:* 115 Nm

Installation

1. To install, reverse the removal procedure.

2. Refer to: Brake System Bleeding (206-00 Brake System - General Information, General Procedures).

www.JagDocs.com

Published: 11-May-2011

Rear Suspension - Lower Arm

Removal and Installation

Removal

CAUTIONS:

LH illustration shown, RH is similar.

The final tightening of the suspension components must be carried out with the vehicle on its wheels.

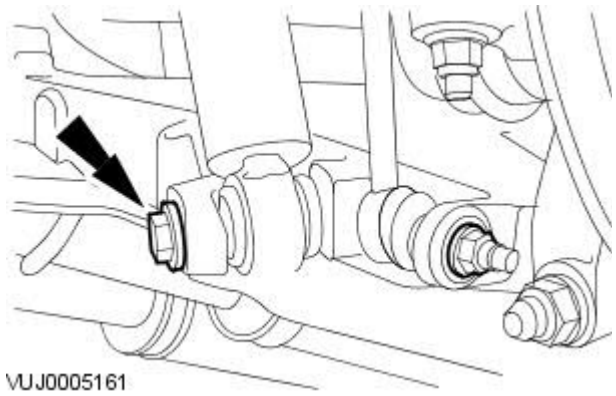
NOTES:

Before commencing work on the vehicle ensure the park brake is in the off position.

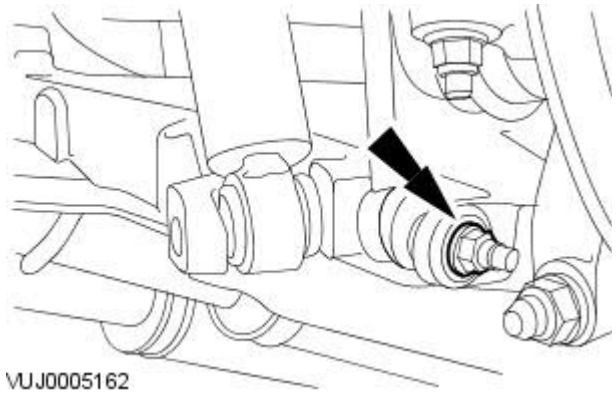
Removal steps in this procedure may contain installation details.

1. Raise and lower the vehicle on a 4 post ramp.
2. WARNING: Make sure to support the vehicle with axle stands.

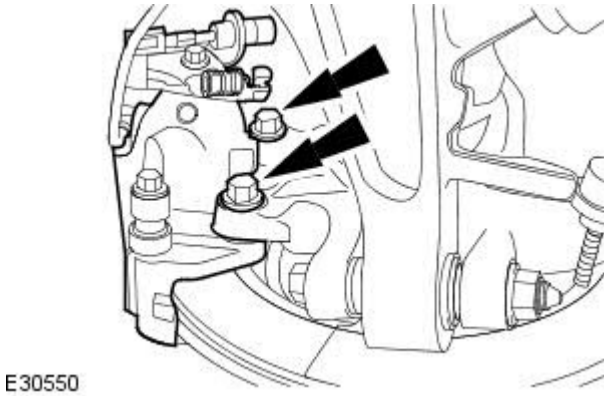
   Raise and support the vehicle.
3. Remove the wheel and tire.
   For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).


VUJ0005161

4. Release the spring and damper assembly from the lower arm.

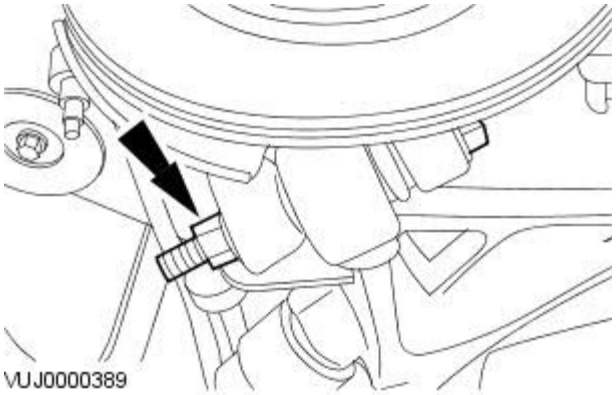

VUJ0005162

5. Release the stabilizer bar link.

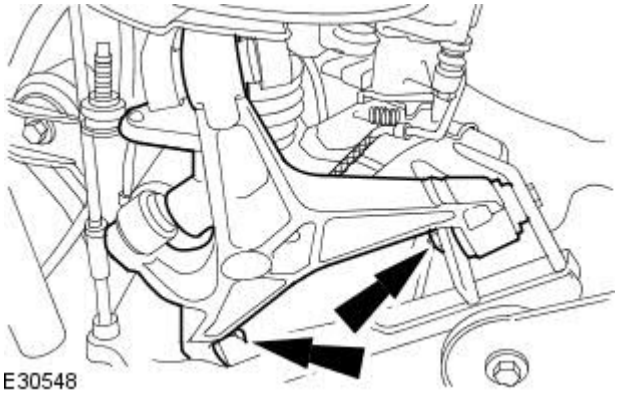

E30550

6. CAUTION: Do not allow the brake caliper to hang on the brake hose.

   Release the brake caliper and tie aside.

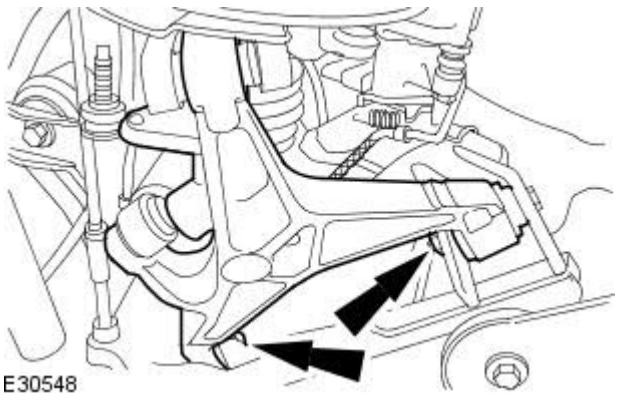

VUJ0000389

7. Release the lower arm from the wheel hub assembly.

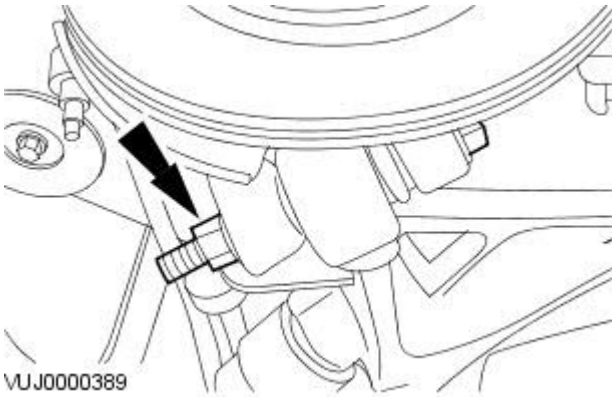

E30548

8. Remove the lower arm.

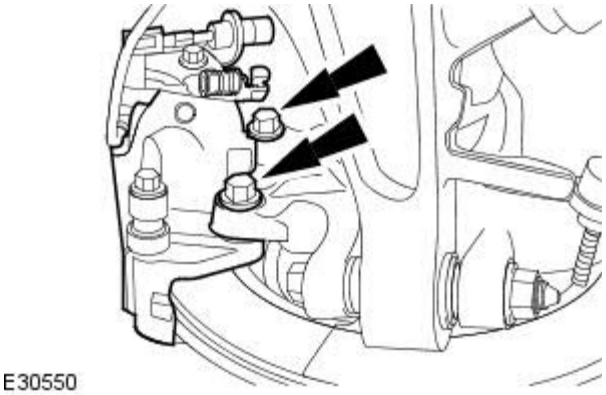
Installation


E30548

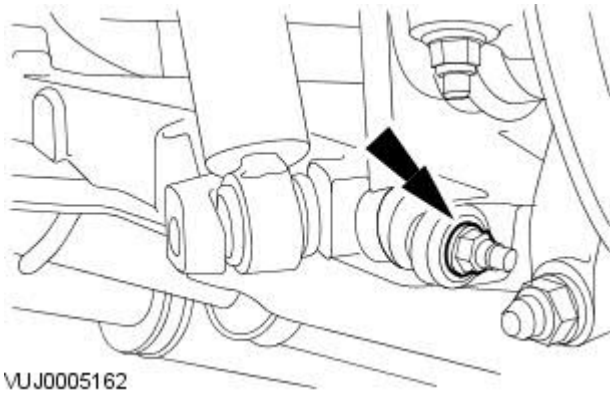
1. Install the lower arm.


VUJ0000389

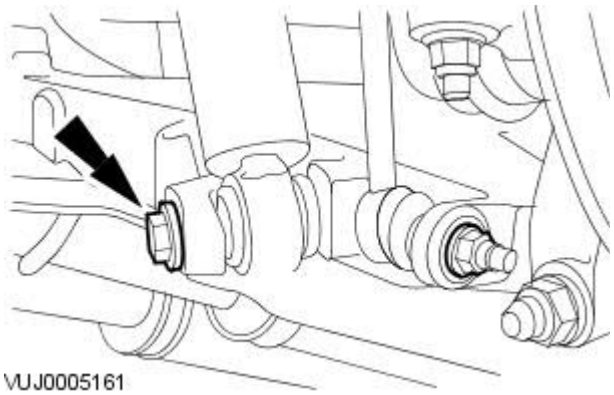
2. Secure the lower arm to the wheel hub assembly.


E30550

3. Secure the brake caliper.
   - Tighten the bolts to 103 Nm.


VUJ0005162

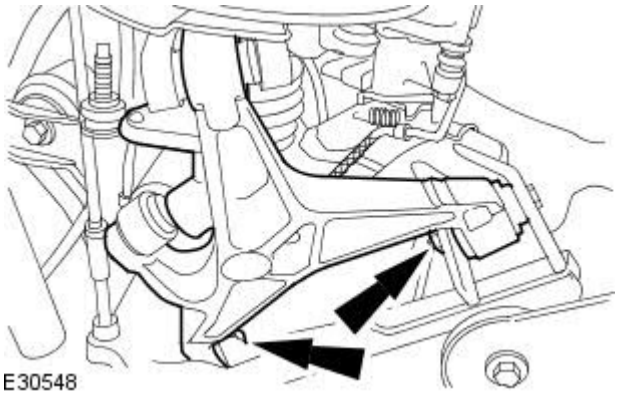
4. Secure the stabilizer bar link.
   - Tighten the nut to 48 Nm.


VUJ0005161

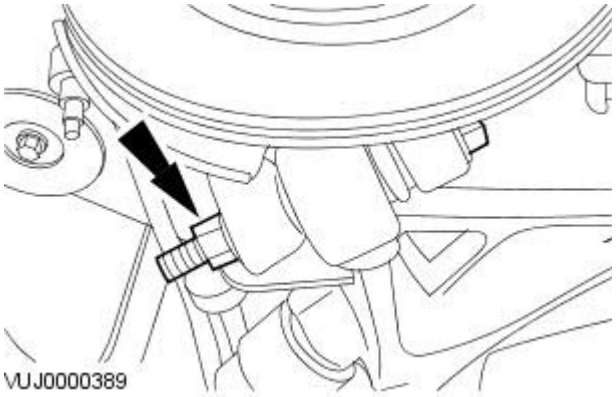
5. Secure the spring and damper assembly to the lower arm.

6. Install the wheel and tire.
   For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

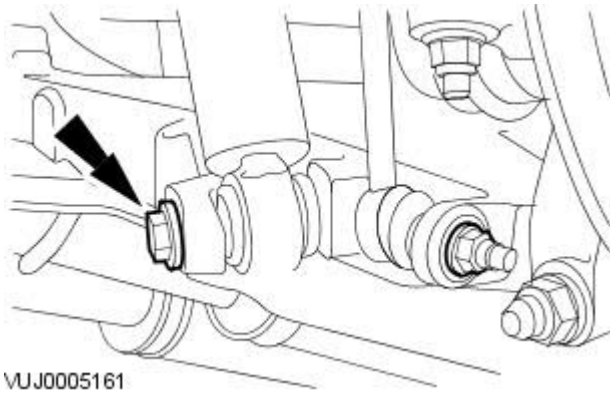
7. Lower the vehicle.



8. Tighten to 192 Nm.



9. Tighten to 192 Nm.



10. Tighten to 133 Nm.

Published: 18-Dec-2012

Rear Suspension - Shock Absorber and Spring Assembly

Removal and Installation

Removal

CAUTION: The final tightening of the suspension components must be carried out with the vehicle on its wheels.

NOTES:

Removal steps in this procedure may contain installation details.

RH illustration shown, LH is similar.

Some variation in the illustrations may occur, but the essential information is always correct.

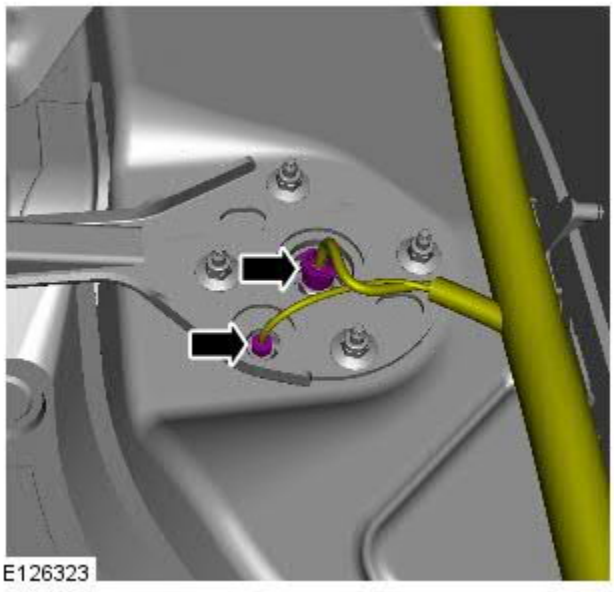
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

3. Refer to: Loadspace Trim Panel RH (501-05 Interior Trim and Ornamentation, Removal and Installation).
   Refer to: Loadspace Trim Panel LH (501-05 Interior Trim and Ornamentation, Removal and Installation).

4. Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

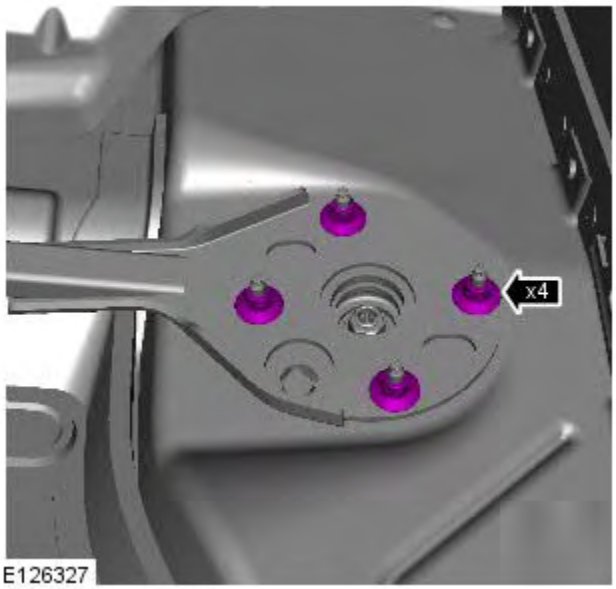


5. CAUTION: Using a suitable blanking plug, blank off the end of the air pipe to prevent dirt ingress.

   Discard the air line connector.

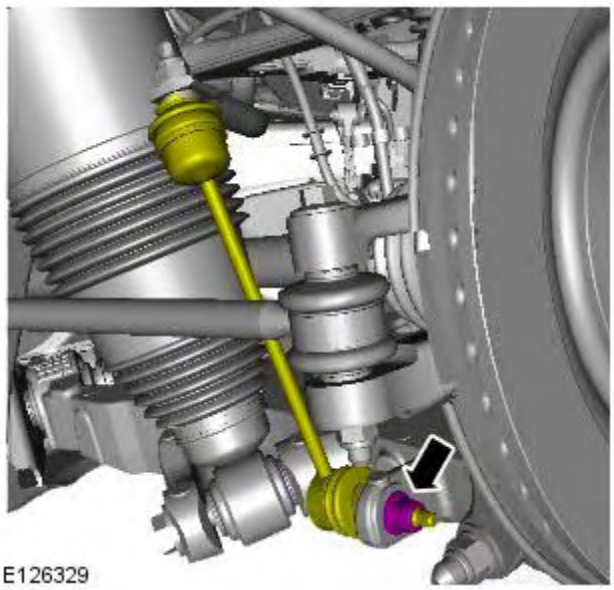
   Refer to: Air Line Connector (204-05, General Procedures).

6.

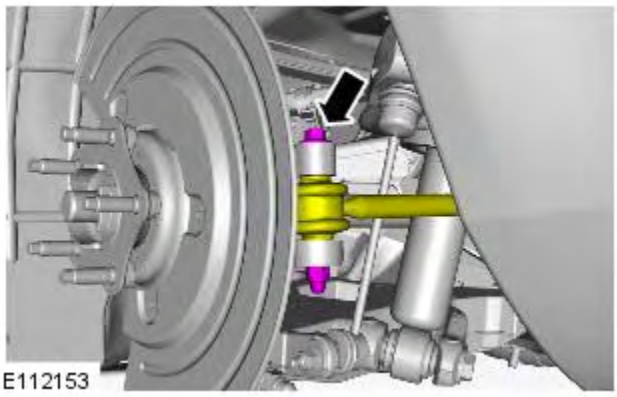


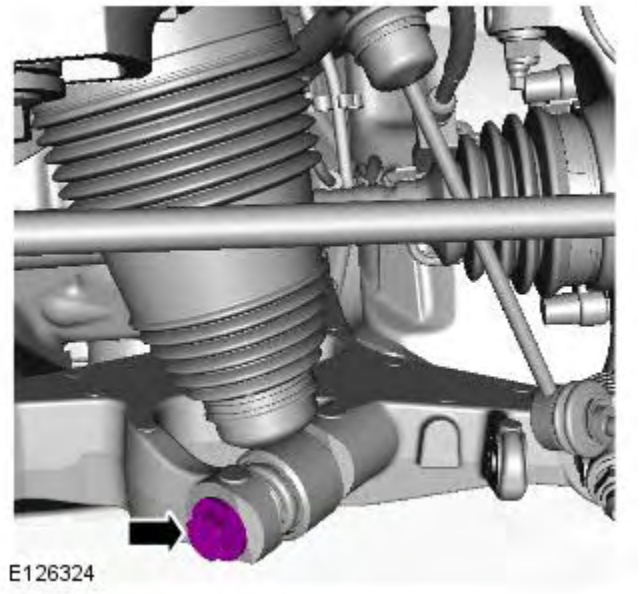
E126327

7.


E126329

8.

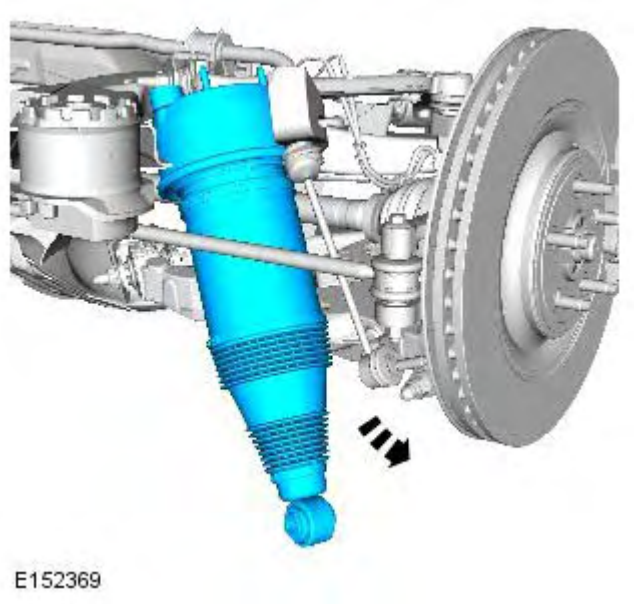

E112153


E126324

9. CAUTIONS:

   Mark the components to aid installation.

   Note the fitted position of the component prior to removal.

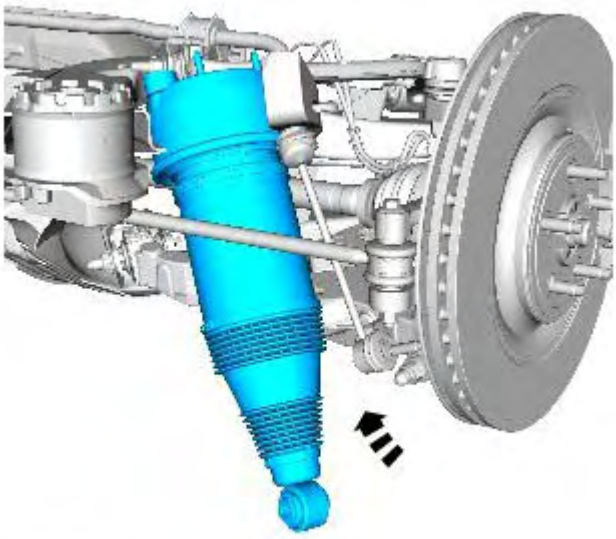

E152369

10.

Installation

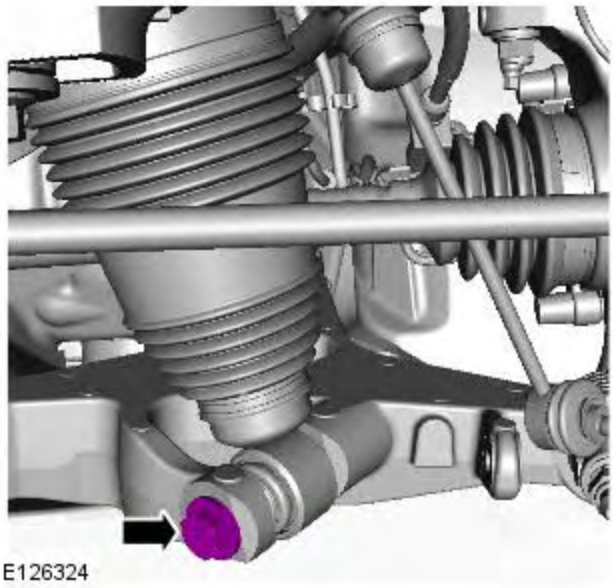
1. NOTE: Make sure that these components are installed to the noted removal position.

2.



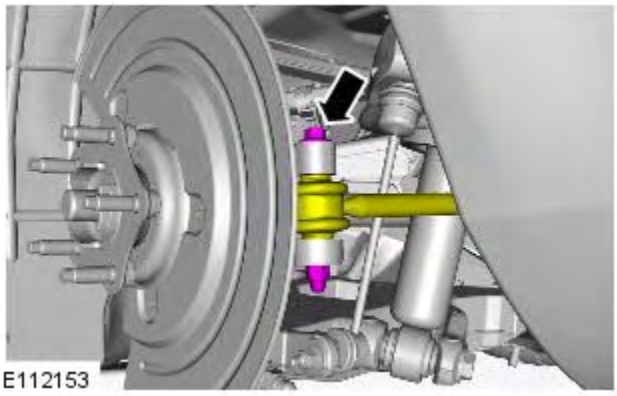
E152370

3. Do not fully tighten at this stage.

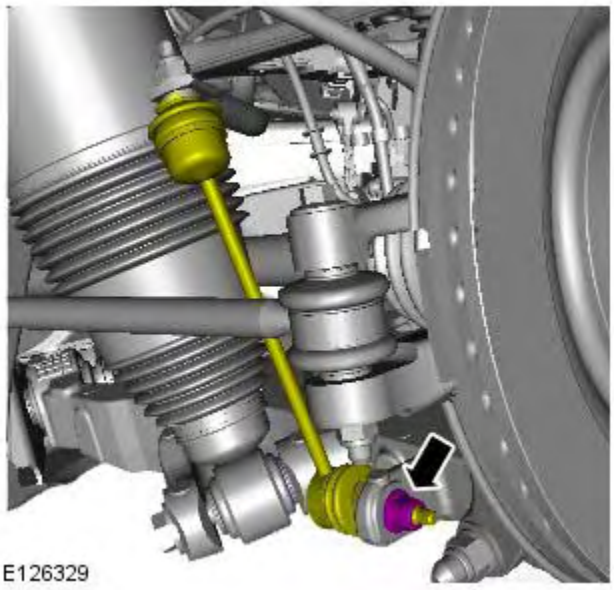


E126324

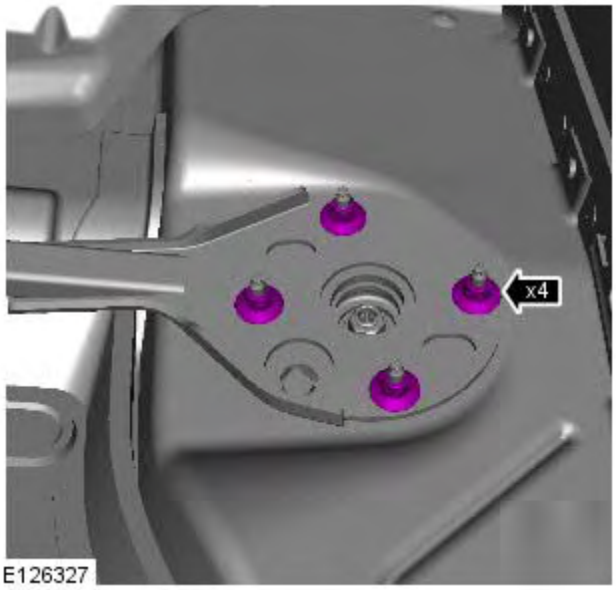
4. *Torque:* 63 Nm



E112153

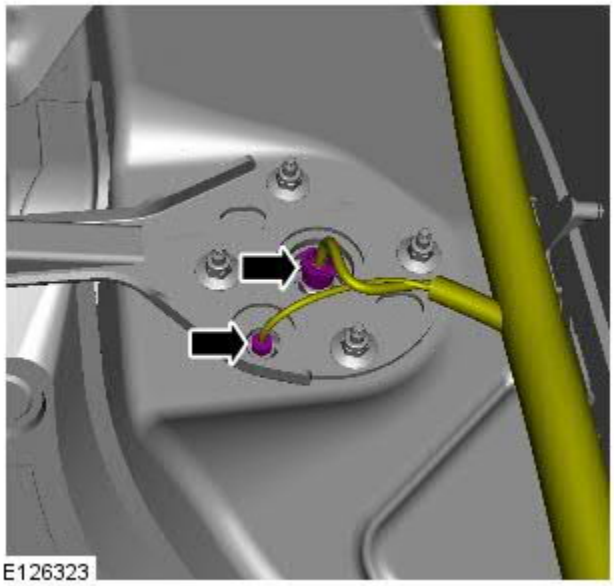

E126329

5. *Torque:* 48 Nm



E126327

6. *Torque:* 28 Nm

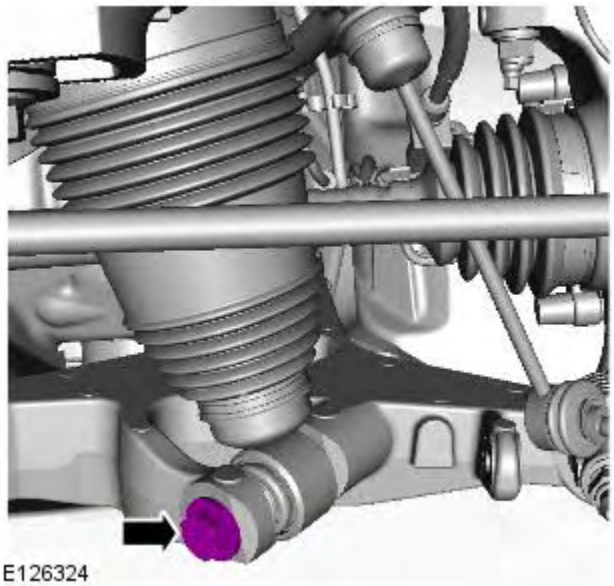

E126323

7. Install a new air line connector.

   Refer to: Air Line Connector (204-05, General Procedures).
   Torque: 5 Nm

8. Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

9. Refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).


E126324

10. Tighten the bolt at normal ride height.

    Torque: 133 Nm

11. Refer to: Loadspace Trim Panel RH (501-05 Interior Trim and Ornamentation, Removal and Installation).
    Refer to: Loadspace Trim Panel LH (501-05 Interior Trim and Ornamentation, Removal and Installation).

Published: 11-Apr-2014

Rear Suspension - Rear Stabilizer Bar

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

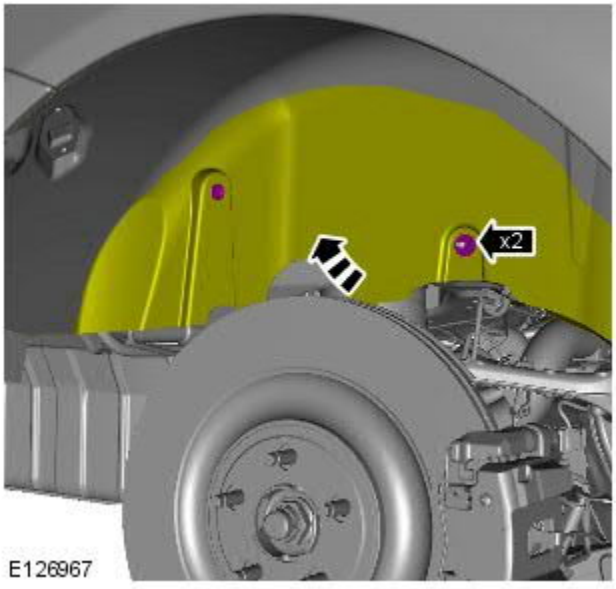
Some variation in the illustrations may occur, but the essential information is always correct.

All vehicles

1. WARNING: Make sure to support the vehicle with axle stands.

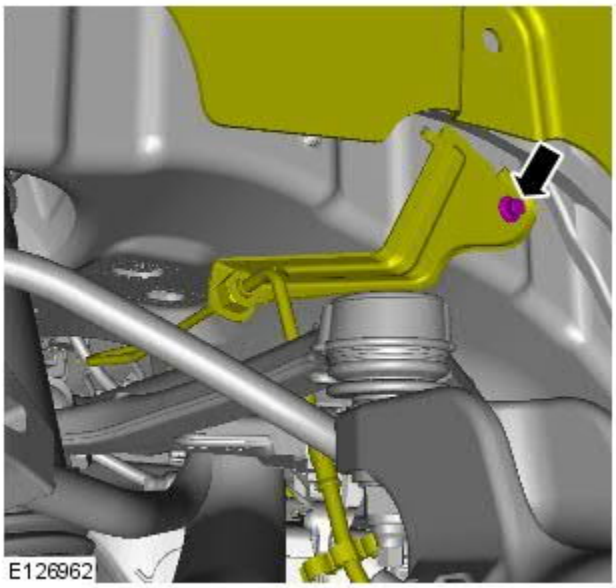
   Raise and support the vehicle.

2. Remove the rear wheels and tires.
   For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).



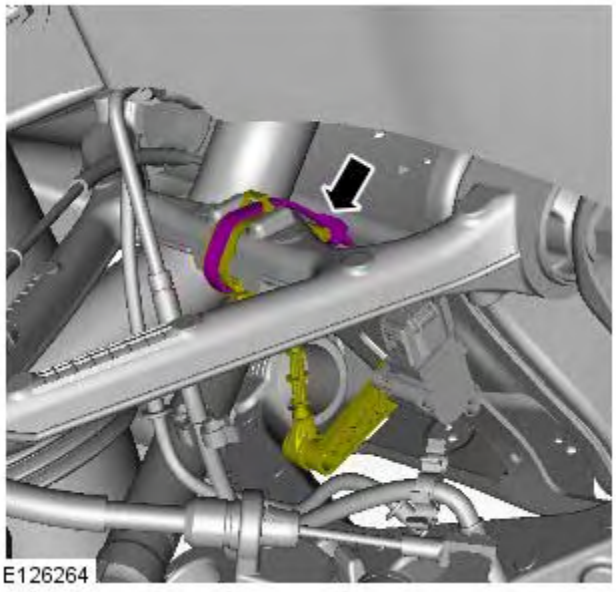
3. NOTE: Repeat the step for the other side.

   TORQUE: 7 Nm

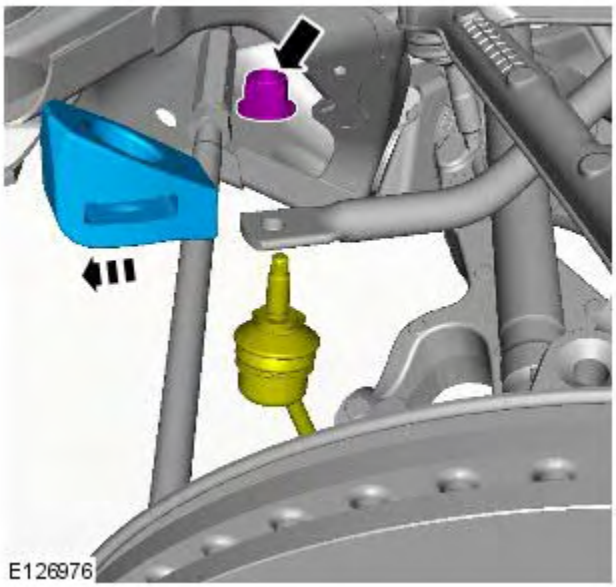


4. NOTE: Repeat the step for the other side.

   TORQUE: 10 Nm

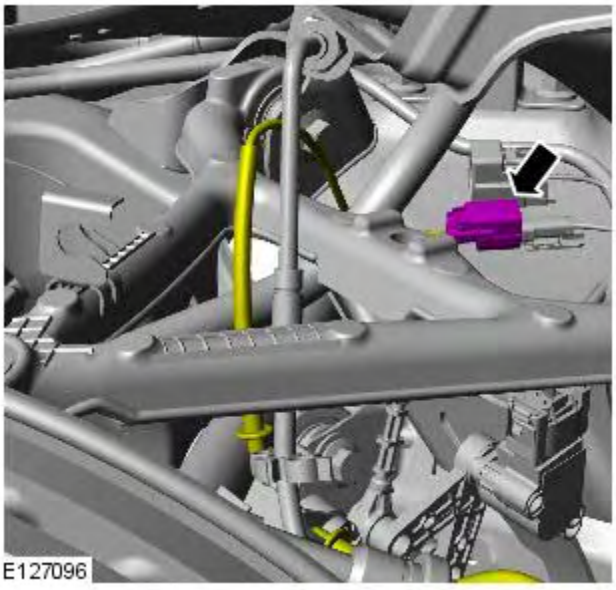


5. NOTE: Repeat the step for the other side.

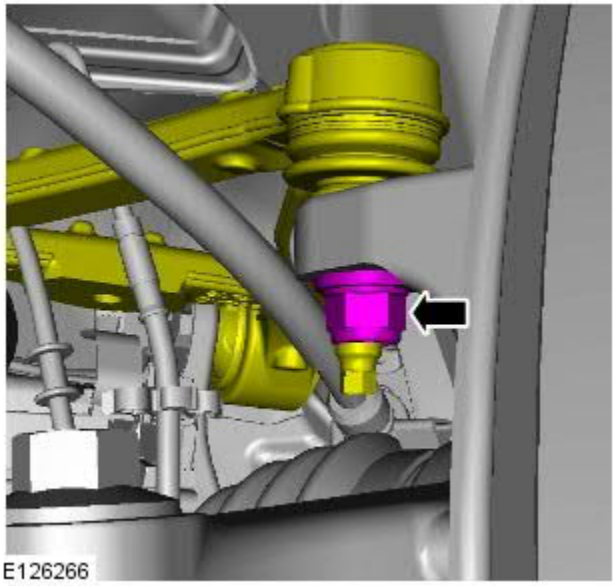


6. NOTE: Repeat the step for the other side.

   TORQUE: 48 Nm

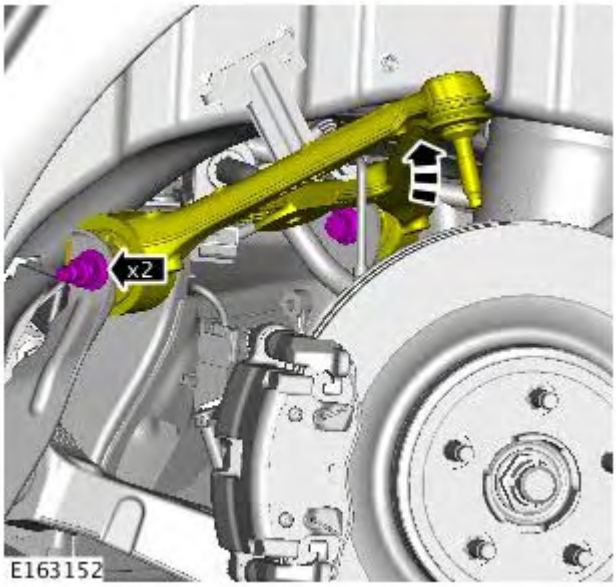


7. NOTE: Repeat the step for the other side.

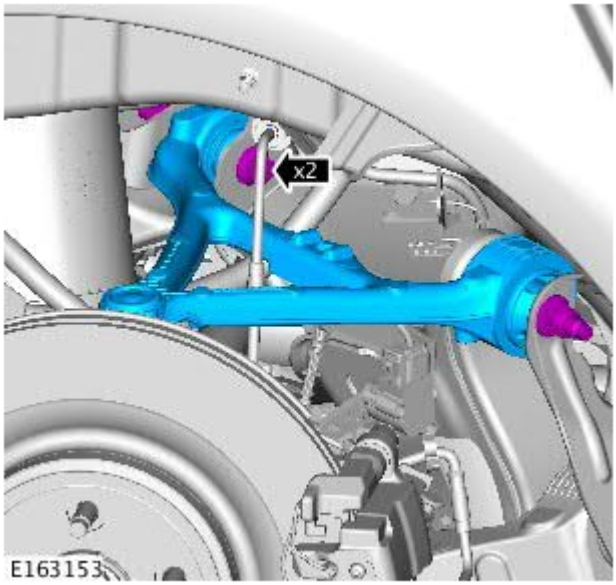


8. NOTE: Repeat the step for the other side.

   TORQUE: 96 Nm

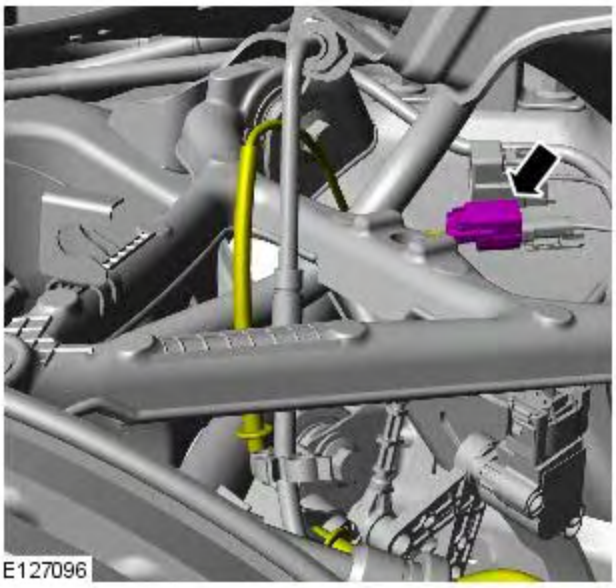


9. TORQUE: 115 Nm



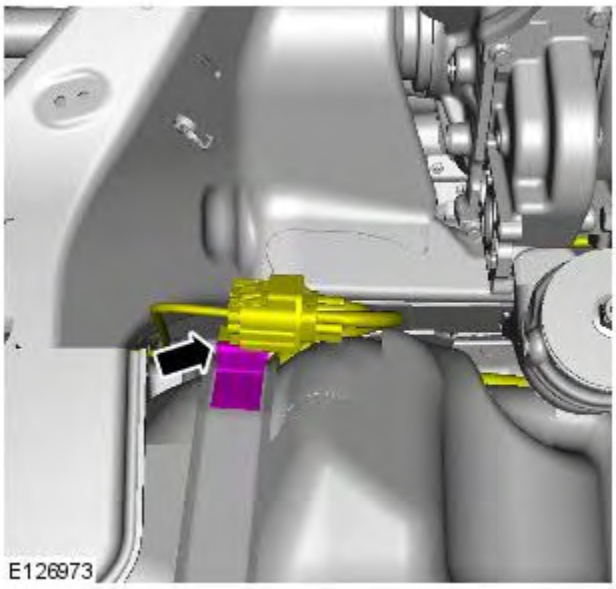
10. NOTE: Move aside for access and secure the arm.

    TORQUE: 115 Nm



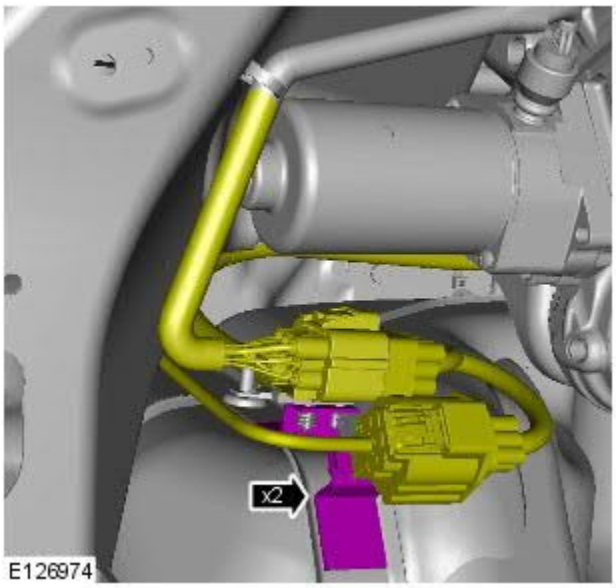
11. NOTE: RH side only.

12.

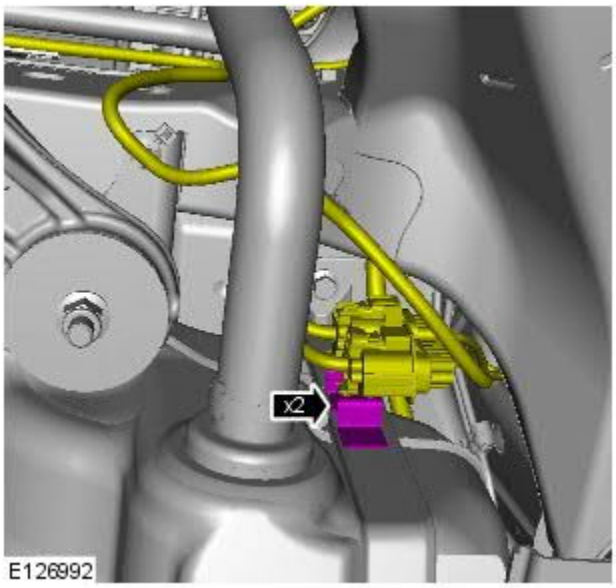


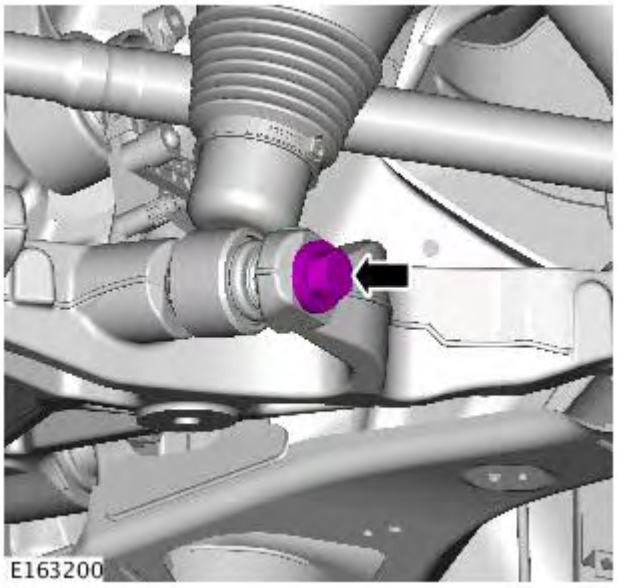
Vehicles with supercharger

13.



14.



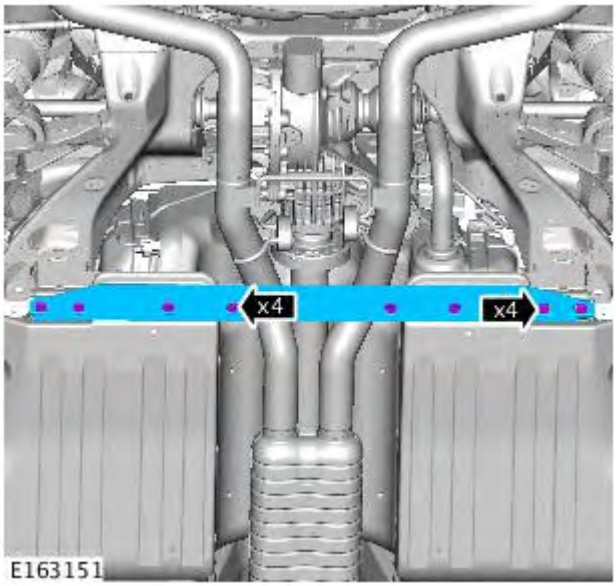


15. CAUTION: Only tighten the nuts and bolts when the suspension is at the normal ride height. Failure to follow this instruction may result in damage to the vehicle.

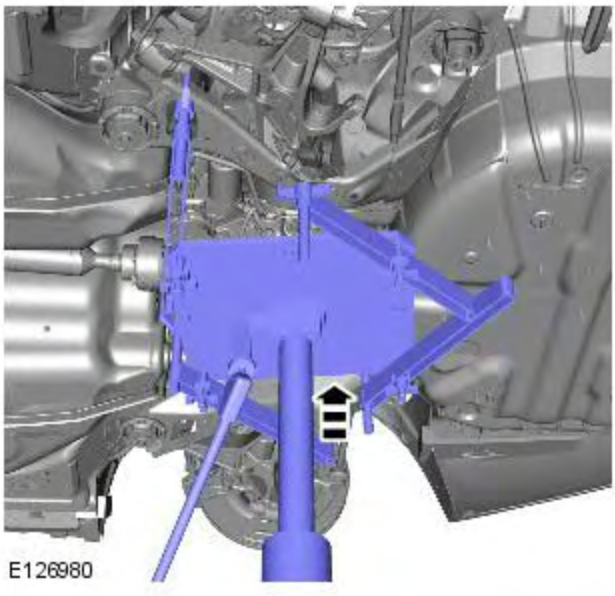
NOTE: Repeat the step for the other side.

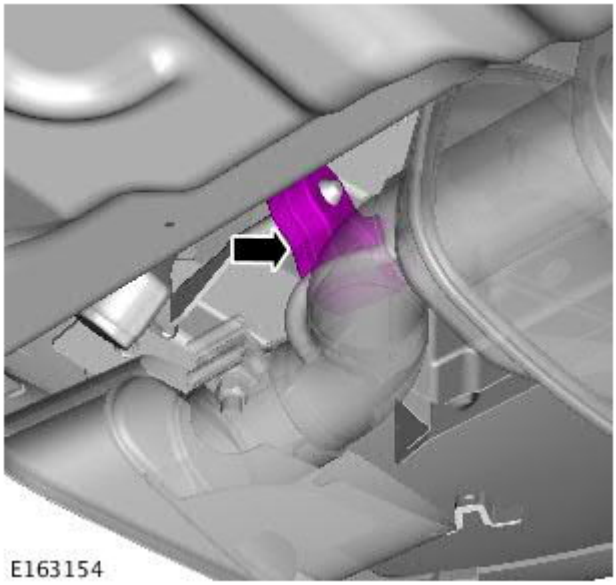
TORQUE: 133 Nm

16. TORQUE: 30 Nm



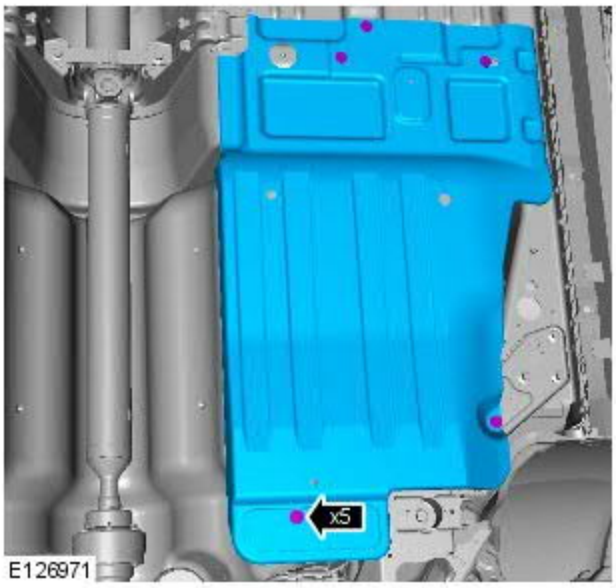
17.





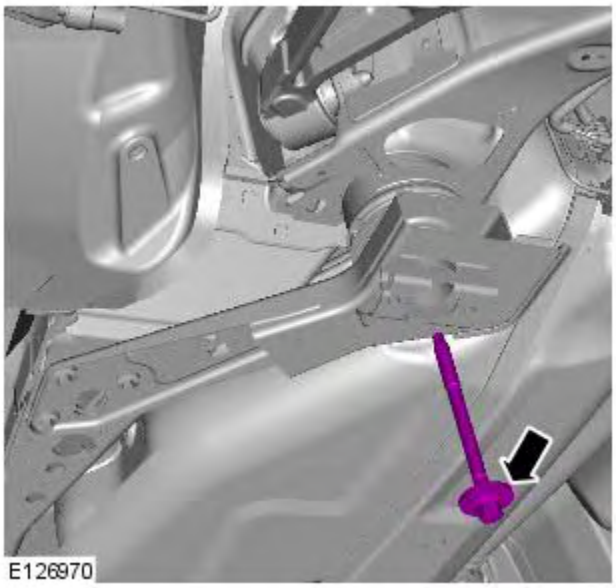
18. CAUTION: Make sure that the exhaust system is supported with suitable retaining straps.

NOTE: Repeat the step for the other side.

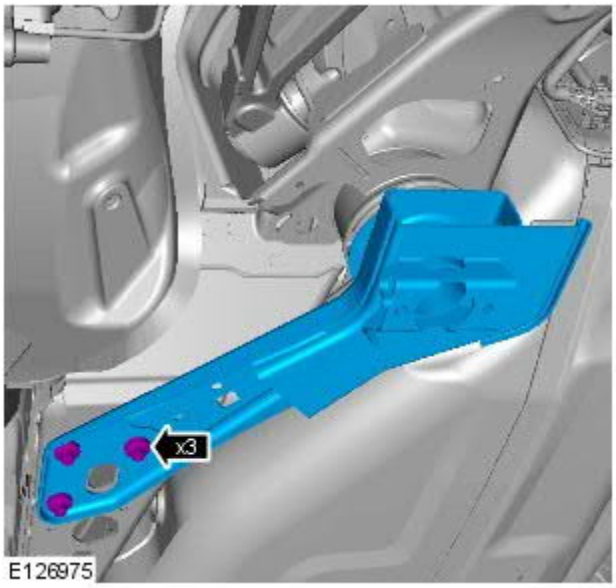


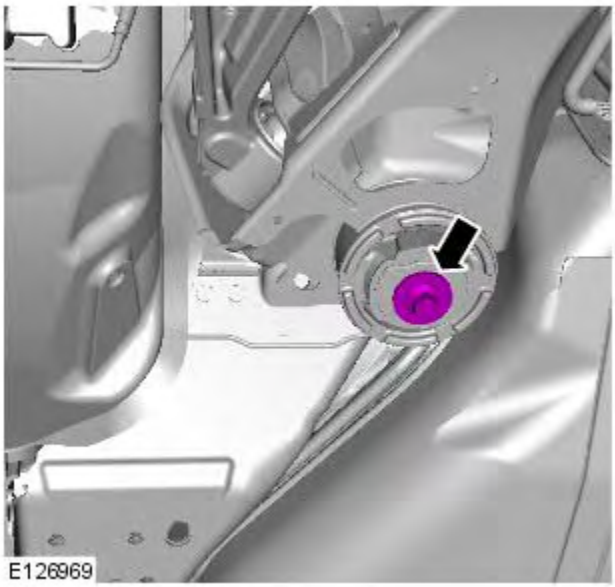
19.

20.



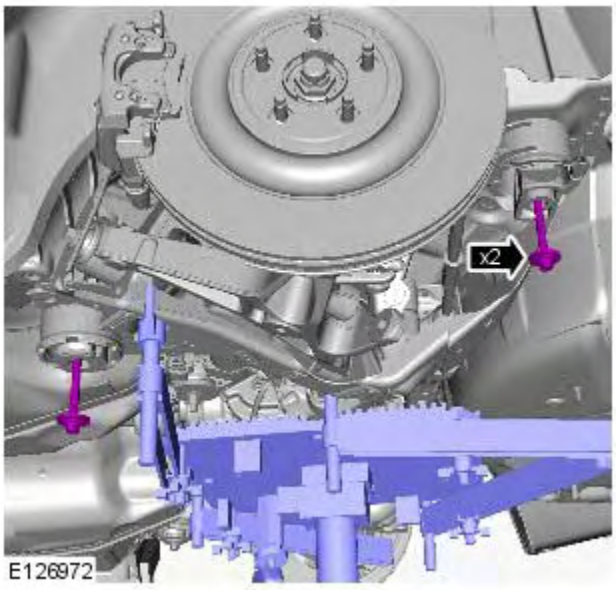
21. TORQUE: 58 Nm





22. NOTE: Do not tighten at this stage.

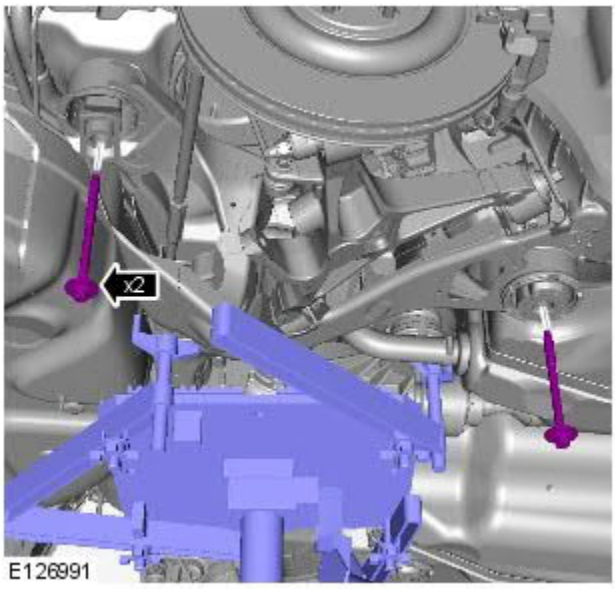
23. Repeat the above 4 steps for the other side.



24. NOTES:

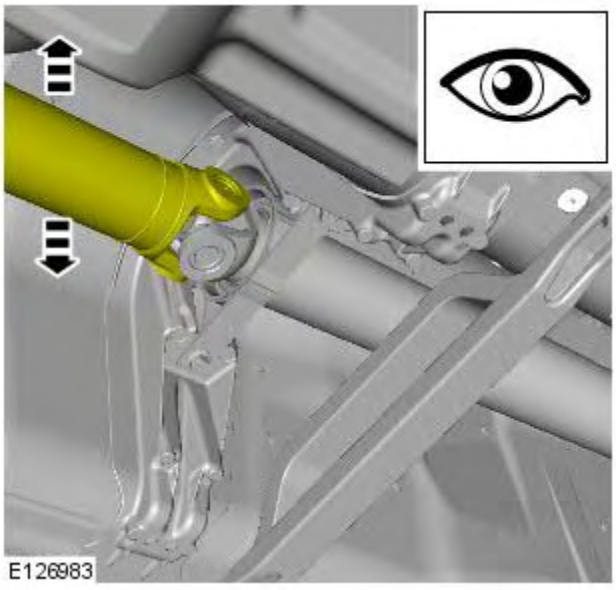
LH side only.

Loosen the bolt, but do not fully remove.



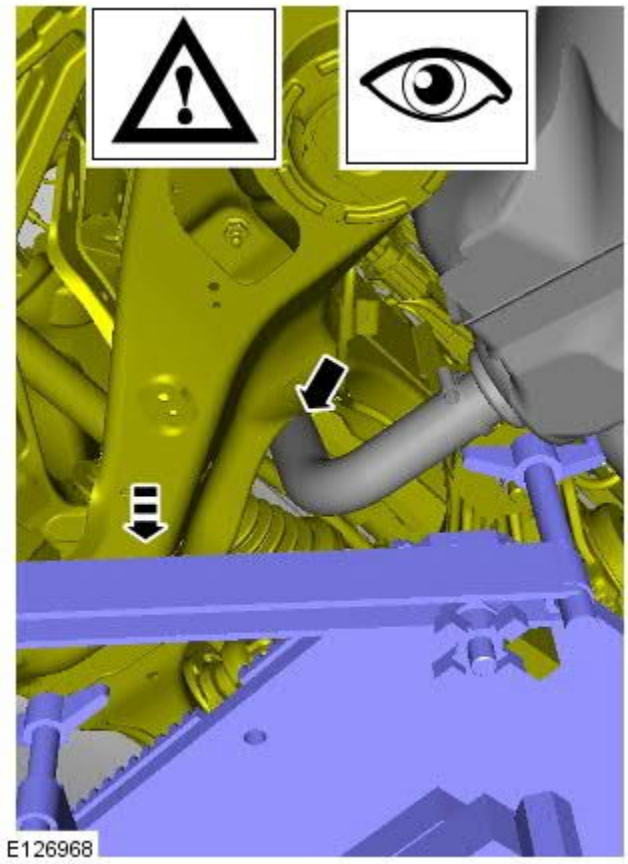
25. CAUTION: Discard the bolts.

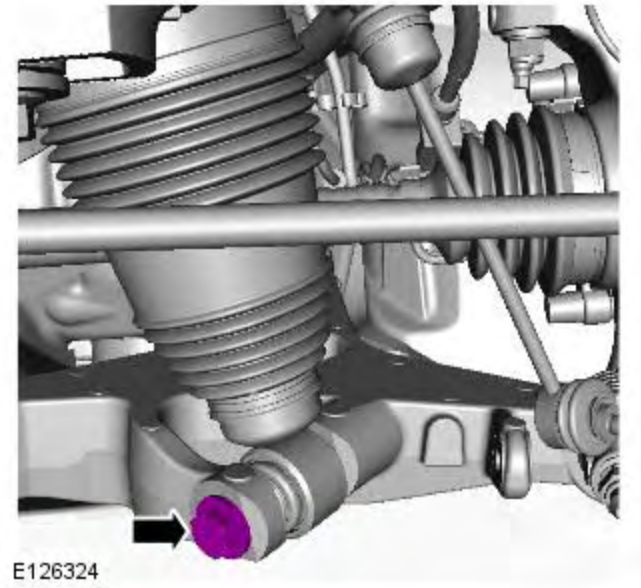
NOTE: RH side only.



26. Check for correct alignment.

27.

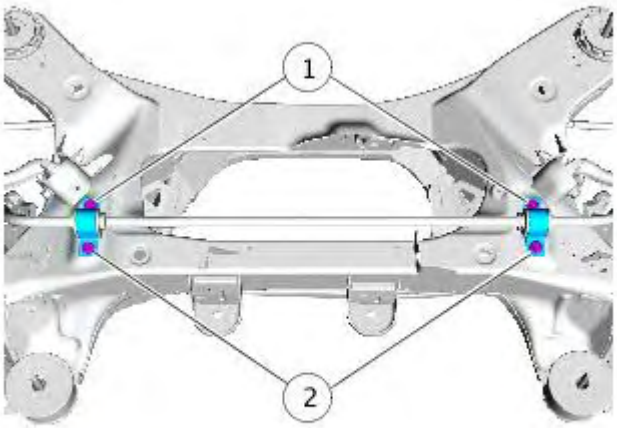




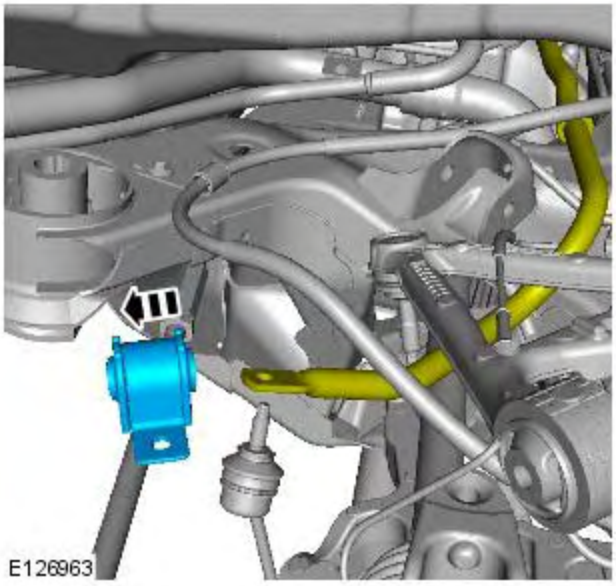
28. NOTE: RH illustration shown, LH is similar.

- TORQUE: 133 Nm
- Repeat the above step for the other side.

29. During installation tighten the bolts in the following sequence.
    - Bolt 1: 55 Nm.
    - Bolt 2: 55 Nm.
    - Bolt 1: 55 Nm.

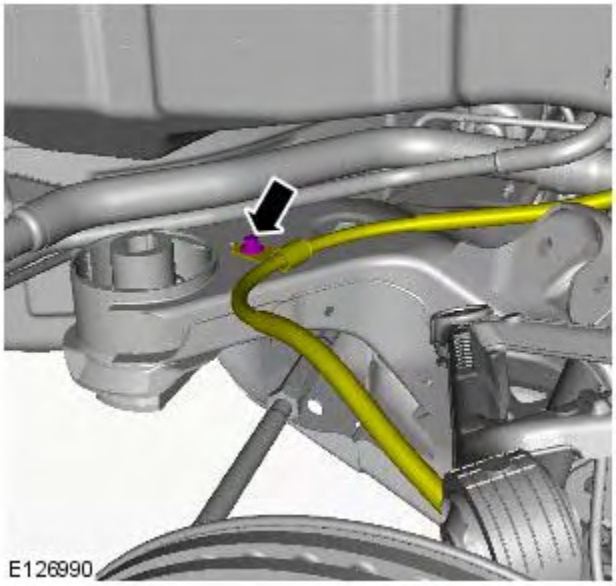


E157003



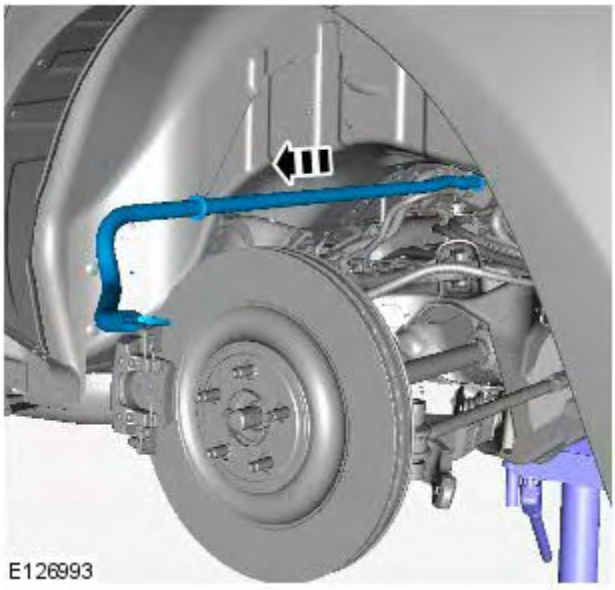
E126963

30. NOTE: Repeat the step for the other side.



31. NOTE: RH side only.

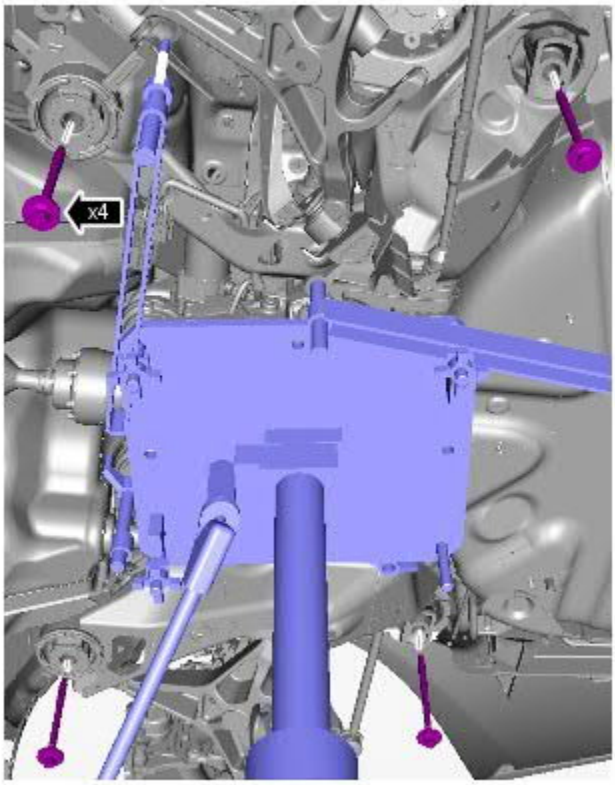
    TORQUE: 22 Nm



32.

Installation

1. To install, reverse the removal procedure.



E126985

2. CAUTION: Make sure that new subframe bolts are installed.

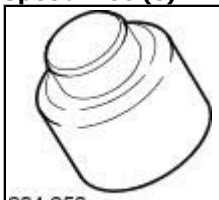
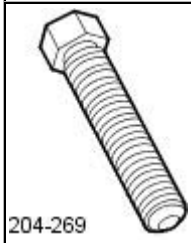
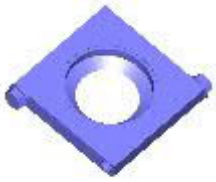
   TORQUE: 80 Nm + 240°

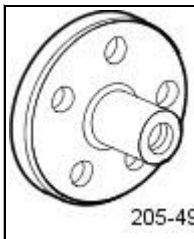
Published: 14-Feb-2012

Rear Suspension - Rear Wheel Bearing

Removal and Installation

Special Tool(s)

 204-250	204-250 Wheel bearing install and removal tool
 204-269	204-269 Flange remover forcing screw
 E117832	204-305 Remover, Wheel Bearing
204-726 E101990	204-726 Remover/Installer, Wheel Bearing
E117751	204-727A Installer, Wheel Bearing
E117752	204-791 Installer, Wheel Bearing

	205-491 Hub puller
	205-491-1 Adapter nuts
	205-725 Remover/Installer, Wheel Hub

Removal

CAUTIONS:

The final tightening of the suspension components must be carried out with the vehicle on its wheels.

LH illustration shown, RH is similar.

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

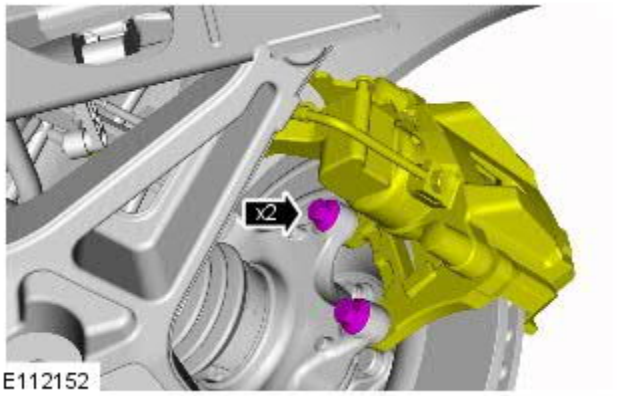
1. Raise and lower the vehicle on a 4 post ramp.
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.
3. Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

4.

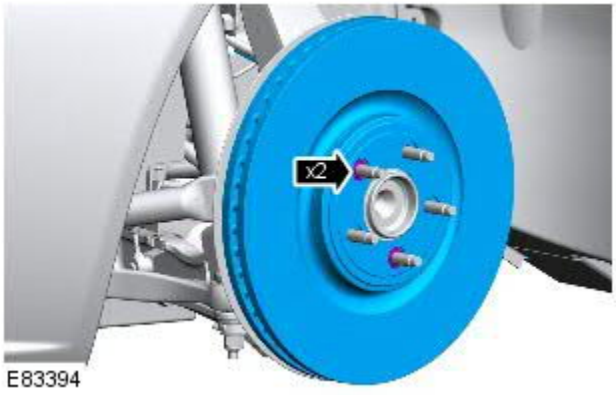
E112151

5.



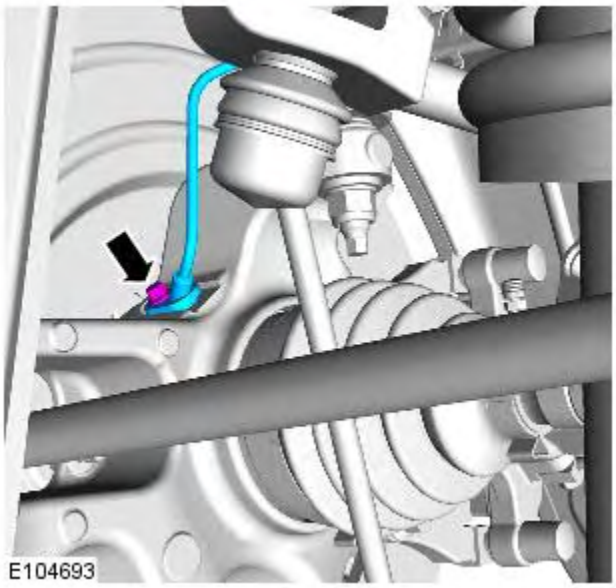
E112152

6.



E83394

7.



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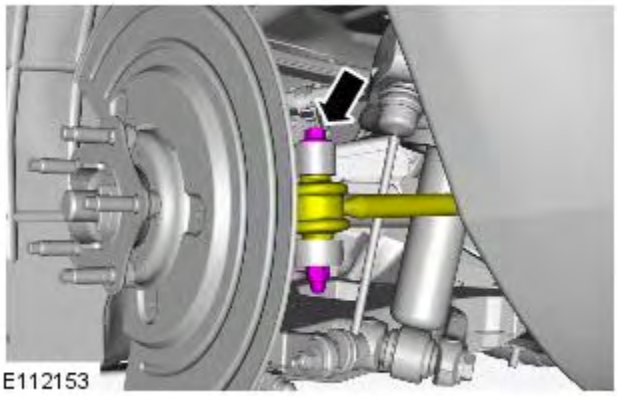

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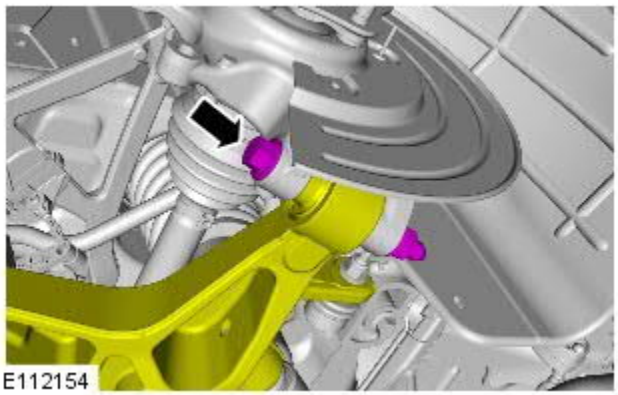
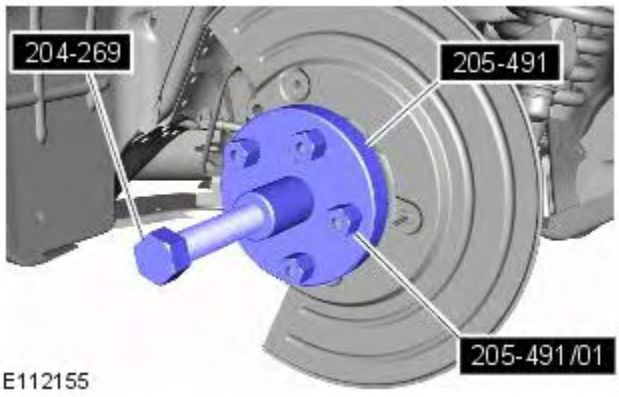
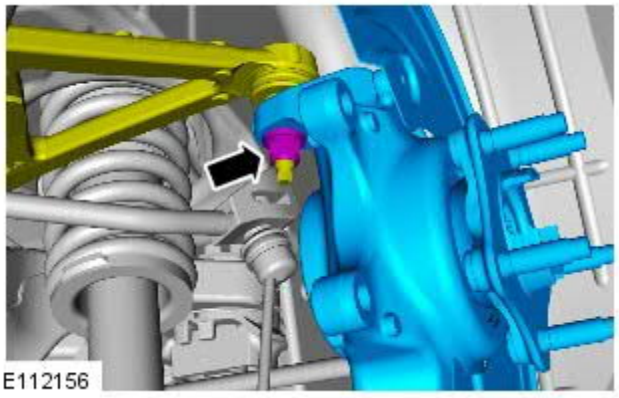




E112155

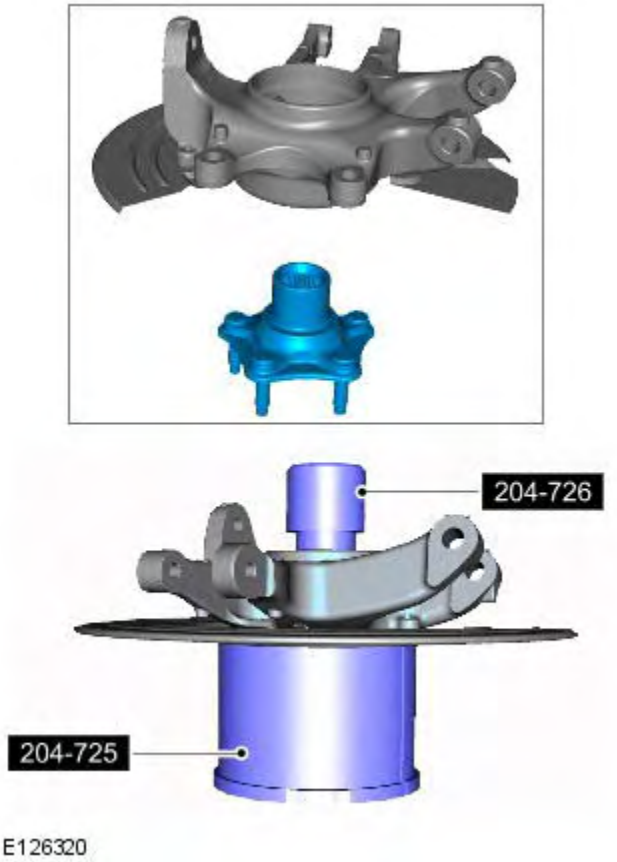
10. CAUTION: Do not use a hammer to detach the halfshaft from the hub assembly, failure to follow this instruction may result in damage to the halfshaft.

    Special Tool(s): 205-491-1, 205-491, 204-269


E112156

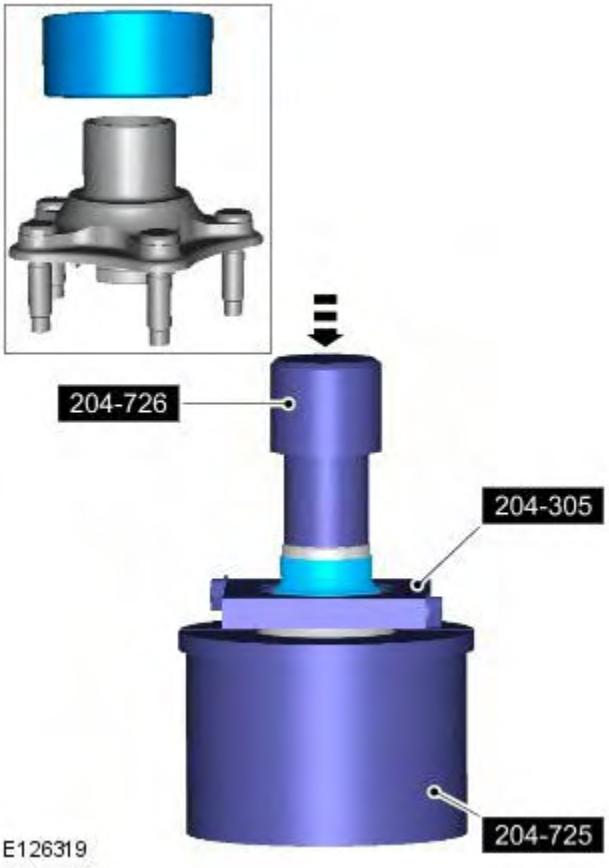
11. NOTE: Use an additional wrench to prevent the component from rotating.

12. *Special Tool(s):* 204-726, 205-725



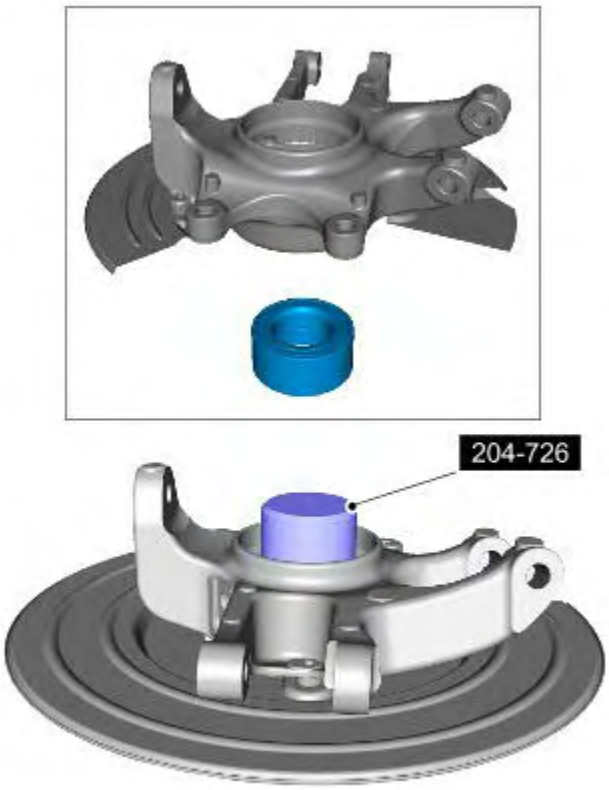
E126320

13. *Special Tool(s):* 204-305, 204-726, 205-725



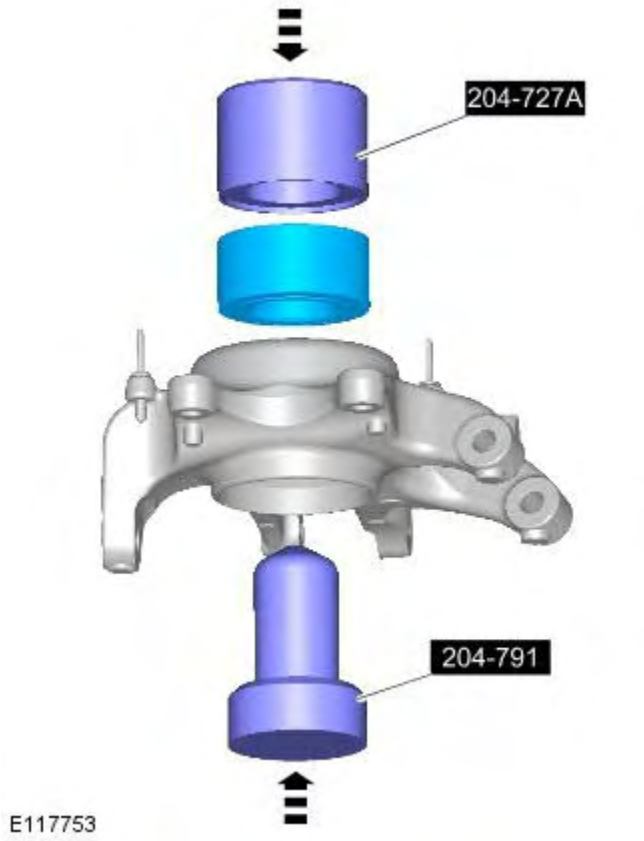
14.

15. *Special Tool(s):* 204-726



E126321

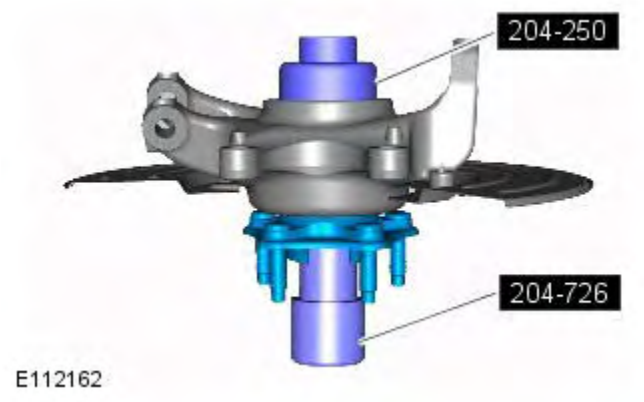
Installation



1. NOTE: Make sure correct alignment of the bearing is maintained when installing into the hub carrier.

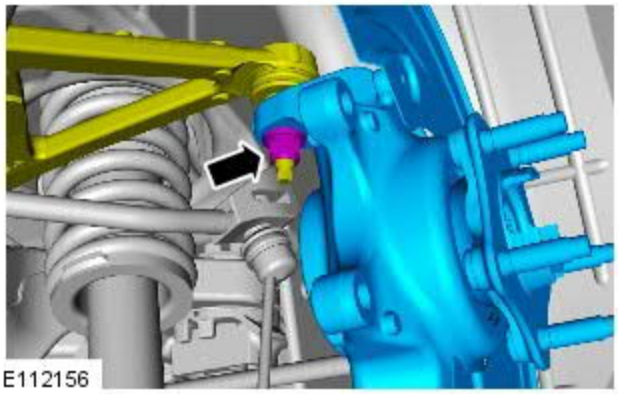
   Special Tool(s): 204-727A, 204-791

2.



3. NOTE: Make sure the correct alignment of the drive flange is maintained when installing into the hub carrier and bearing assembly.

   Special Tool(s): 204-726, 204-250

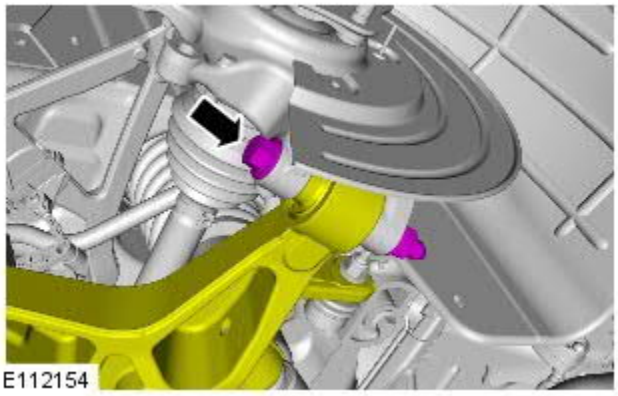

E112156

4. NOTE: Do not tighten at this stage.

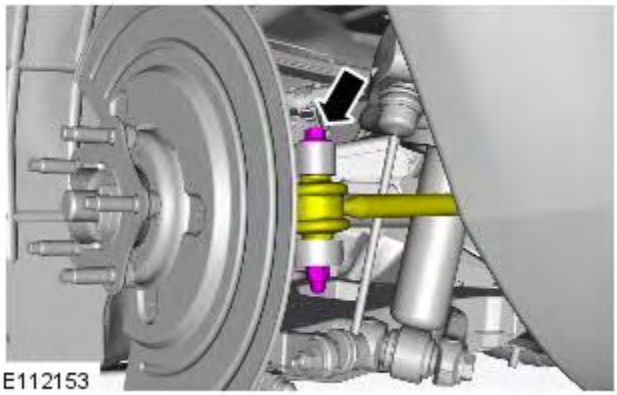
E112151

5. CAUTION: Install the halfshaft nut finger tight.

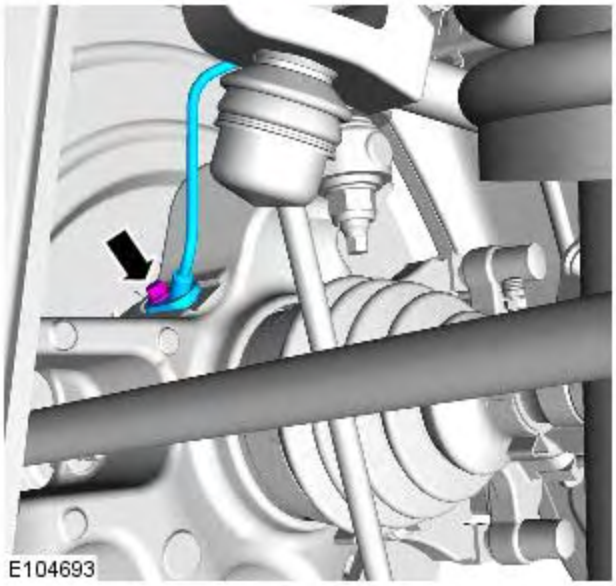
NOTE: Do not tighten at this stage.


E112154

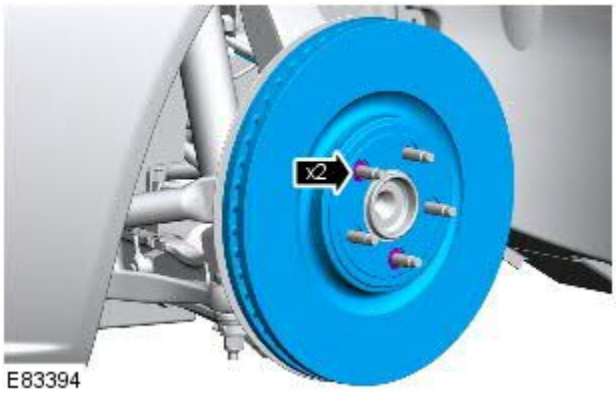
6. NOTE: Do not tighten at this stage.


E112153

7. NOTE: Do not tighten at this stage.



8. *Torque:* 6 Nm



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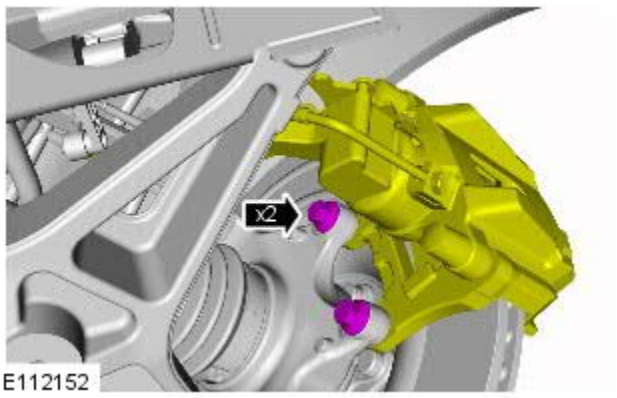
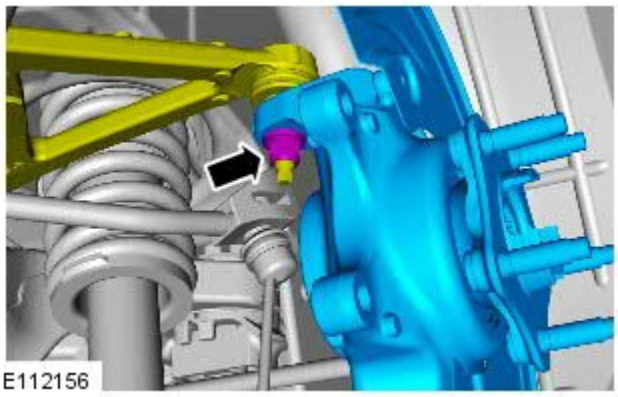


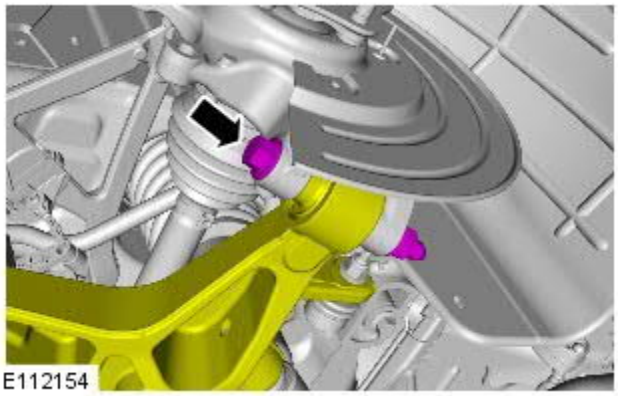
10. *Torque:* 103 Nm

11. Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

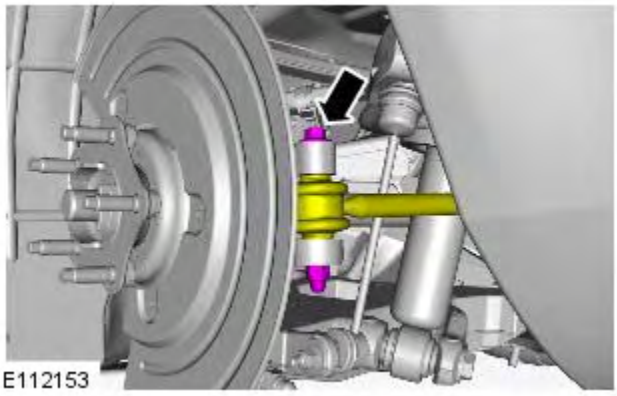
12. Lower the vehicle.


E112156

13. *Torque:* 96 Nm


E112154

14. *Torque:* 192 Nm


E112153

15. *Torque:* 63 Nm

E112151

16. CAUTION: Do not use air tools to install the nut. Failure to follow this instruction may result in damage to the component.

    Torque: 300 Nm

Published: 11-May-2011

Wheels and Tires -

Torque Specifications

Description	Nm	lb/ft	lb/in
Wheel nuts	125	92	-

Tire Pressures

NOTE: * All except vehicles with supercharger.

Manufacturer	Front Axle - Original Tire Size	Rear Axle - Original Tire Size	Tire Pressures kpa (PSI)
* Dunlop Sport Max X Gt J	245/50 ZR18 104 X/L (Y)	275/45 ZR18 107 X/L (Y)	220 (32)
Dunlop Sport Max X Gt J	245/45 ZR19 102 X/L (Y)	275/40 ZR19 105 X/L (Y)	220 (32)
Dunlop Sport Max X Gt J	245/40 ZR20 99 X/L (Y)	275/35 ZR20 102 X/L (Y)	220 (32)

Tire Pressures

Manufacturer-Winter Tires	Front Axle - Original Tire Size	Rear Axle - Original Tire Size	Tire Pressures kpa (PSI)
Pirelli Sotto Zero	245/45 R19 102V XL	275/40 R19 105V XL	220 (32)
Pirelli Sotto Zero	245/40 R20 99V XL	275/35 R20 102V XL	220 (32)

Tire Pressures

Manufacturer-All Season Tire	Front Axle	Rear Axle	Tire Pressures kpa (PSI)
Pirelli P Zeronero M+S J	245/45 R19 102 X/L H M+S	275/40 R19 105 X/L H M+S	220 (32)

Tire Pressures

NOTES:

* All except vehicles with supercharger.

** Only vehicles with supercharger.

Manufacturer-Space Saver Tires	Front Axle - Original Tire Size	Rear Axle - Original Tire Size	Tire Pressures kpa (PSI)
* Pirelli	T135/80 R18 104M	T135/80 R18 104M	420 (60)
** Pirelli	T135/70 R19 105M	T135/70 R19 105M	420 (60)

Wheel Specification

NOTES:

* All except for the North America market or vehicles with supercharger.

** Only vehicles with supercharger.

Wheel Type	Front Wheel Size	Rear Wheel Size
* Meru	8.0J x 18	9.0J x 18
Aleutian	9.0J x 19	10.0J x 19
Kasuga	9.0J x 20	10.0J x 20
Kasuga Polished	9.0J x 20	10.0J x 20
** Amirante	9.0J x 20	10.0J x 20
ETO Polished Toba	9.0J x 19	10.0J x 19
ETO Decal Silver Toba	9.0J x 19	10.0J x 19
ETO JT6 Wheel Orona Polished	9.0J x 20	10.0J x 20
ETO JT6 Wheel Orona Diamond Turn	9.0J x 20	10.0J x 20
ETO Diamond Turn Mataiva	9.0J x 20	10.0J x 20

Space Saver Wheel Specification

NOTES:

* All except vehicles with supercharger.

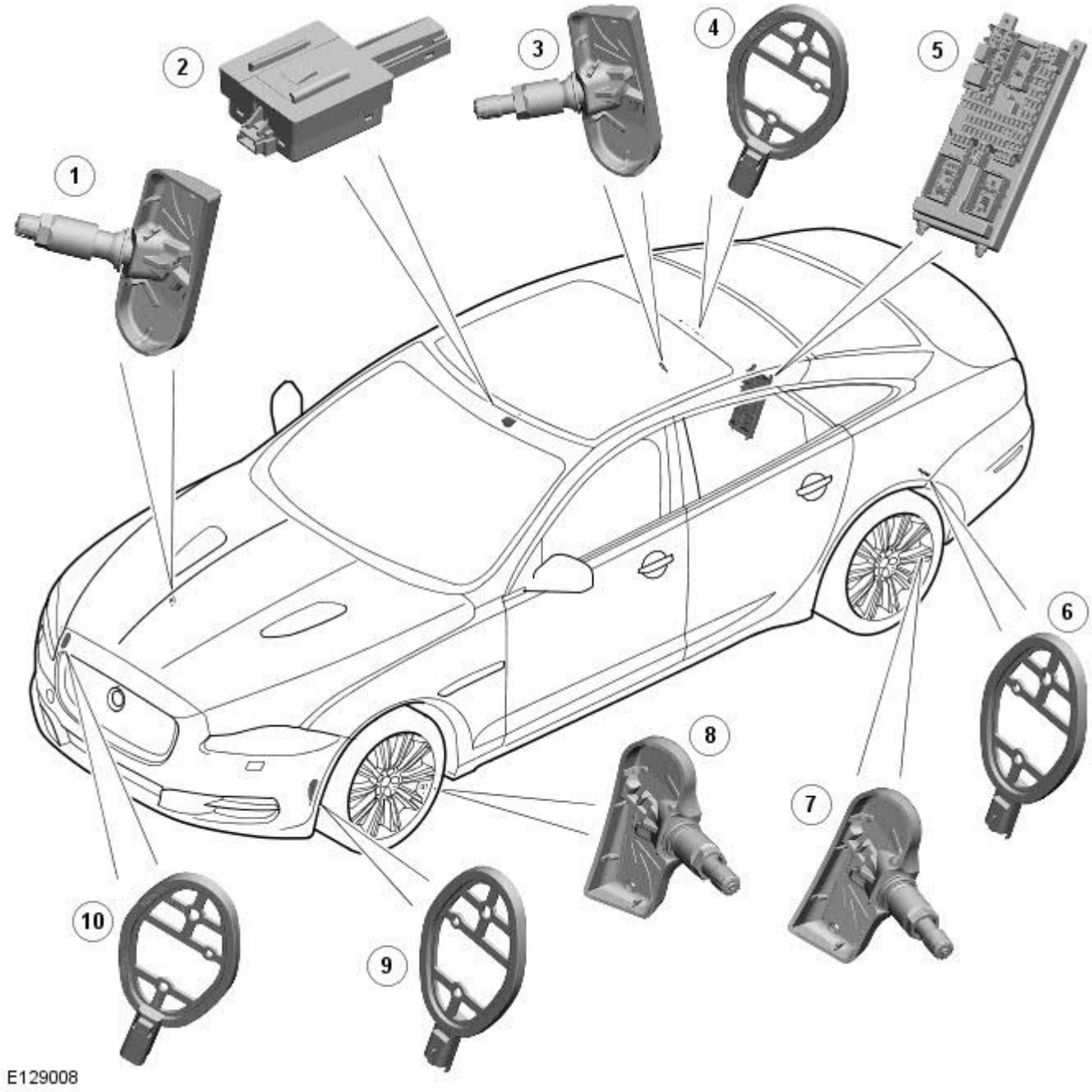
** Only vehicles with supercharger.

Wheel Type	Front Wheel Size	Rear Wheel Size
* Alloy Spare	4J x 18 ET15	4J x 18 ET15
** Alloy Spare	4J x 19 ET00	4J x 19 ET00

Published: 11-May-2011

Wheels and Tires - Tire Pressure Monitoring System (TPMS) - Component Location

Description and Operation



Item	Description
1	RH (right-hand) front tire pressure sensor
2	Tire pressure receiver
3	RH rear tire pressure sensor
4	RH rear tire pressure monitoring system initiator
5	CJB (central junction box)
6	LH (left-hand) rear tire pressure monitoring system initiator
7	LH rear tire pressure sensor
8	LH front tire pressure sensor
9	LH front tire pressure monitoring system initiator
10	RH front tire pressure monitoring system initiator

Published: 25-May-2012

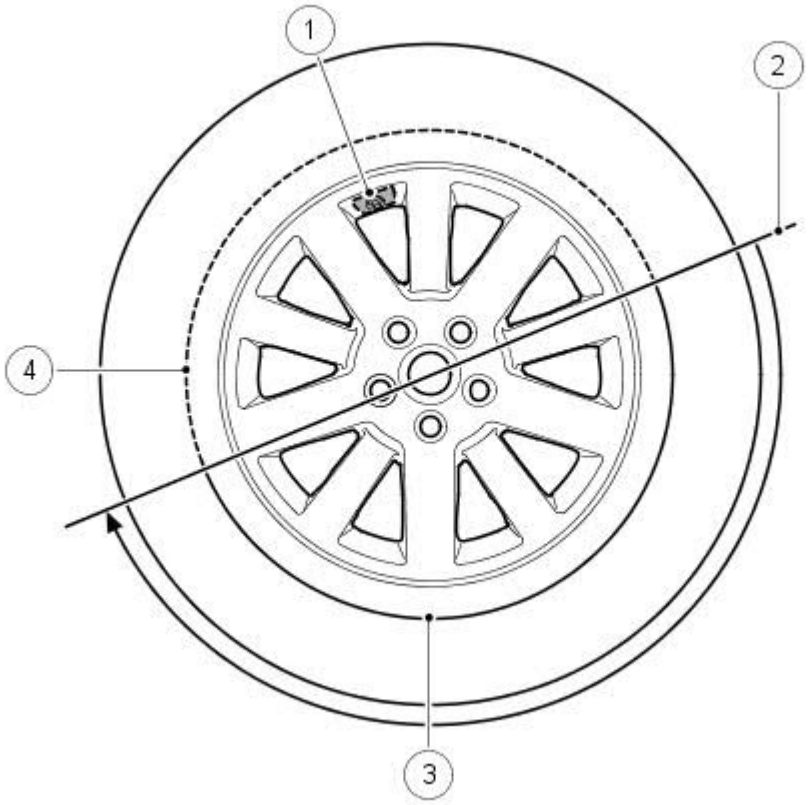
Wheels and Tires - Tire Pressure Monitoring System (TPMS) - Overview

Description and Operation

TIRES

NOTE: The TPMS valve should be serviced using the suitable service kit, each time the tyre is dismounted, to ensure an air tight seal. Attention should be made to the detail of fitting this kit.

Care must be taken when removing and refitting tires to ensure that the tire pressure sensor is not damaged.



E45549

Item	Description
1	Tire valve and pressure sensor
2	Tire fitting/removal tool initial start position
3	High tire and bead tension area
4	Low tire and bead tension area

When removing the tire, the bead breaker must not be used within 90 degrees of the tire valve in each direction.

When using the tire removal machine, the fitting arm start position must be positioned as shown in the tire changing illustration. The wheel can then be rotated through 180 degrees in a counterclockwise direction. This will relieve the high tension from the tire bead allowing the remaining 180 degrees of the tire to be manually pulled from the rim.

When refitting the tire, position the fitting arm as shown. Rotate the tire and take care that the bead on the low tension side of the tire does not damage the sensor.

Run-Flat Tires

Run-flat tires can be handled, fitted and removed using the same principles as used for normal low profile and high-performance tires, with two exceptions:

- They are always fitted with tire pressure sensors.
- They have thicker bead cores and more rigid sidewalls which require special care when being mounted on the rims.

It is recommended that the tire fitting machine is fitted with plastic rollers for the upper and lower bead. This will ensure that the bead is removed gently, protecting the rims and the tire pressure sensors.

Adequate amounts of special fitting lubricant must be used to ensure that the sidewalls move with the minimum exertion and locate on the rim flange correctly.

Run-flat tires can be identified by the marking 'RSC' on the tire sidewall.

NOTE: Vehicles fitted with run flat tires are supplied with a spare wheel, vehicle jack and wheel brace.

Tread Act - NAS Only

Vehicles supplied to the North American markets must comply with the legislation of the Transport Recall Enhancement, Accountability and Documentation (TREAD) act. Part of the requirement of the TREAD act is for the vehicle to display a label, positioned on the driver's side B-pillar, which defines the recommended tire inflation pressure, load limits and maximum load of passengers and luggage weight the vehicle can safely carry. This label will be specific to each individual vehicle and will be installed on the production line.

This label must not be removed from the vehicle. The label information will only define the specification of the vehicle as it came off the production line. It will not include dealer or owner fitted accessory wheels and tires of differing size from the original fitment.

NOTE: If tires and wheels of a non-standard size are fitted to the vehicle, the car configuration file must be updated using a Jaguar approved diagnostic system.

If the label is damaged or removed for body repair, it must be replaced with a new label specific to that vehicle. A new label is requested from Jaguar parts and will be printed specifically for the supplied VIN of the vehicle.

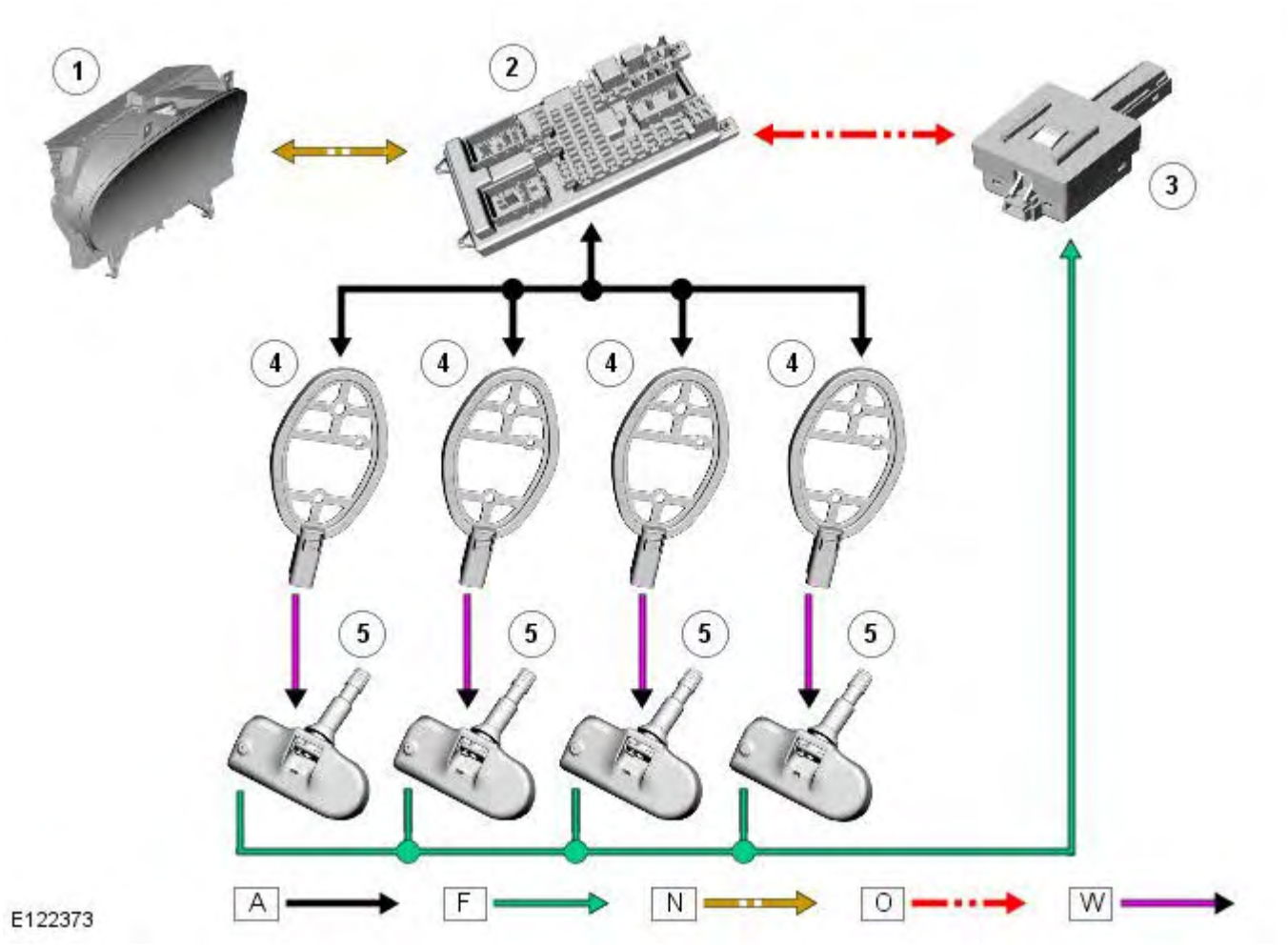
Published: 11-May-2011

Wheels and Tires - Tire Pressure Monitoring System (TPMS) - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: A = Hardwired: O = LIN bus: F = RF Transmission: N = Medium speed CAN bus: W = LF Transmission



Item	Description
1	Instrument cluster
2	CJB (central junction box)
3	TPMS (tire pressure monitoring system) receiver
4	TPMS (tire pressure monitoring system) initiators
5	Tire pressure sensors

System Operation

Tire Pressure Monitoring System (TPMS)

The controlling software for the Tire Pressure Monitoring System (TPMS) is located within the CJB. The software detects the following:

- When the tire pressure is below the recommended low pressure value - under inflated tire.
- The location of the tire on the vehicle that is below the recommended pressure.
- Malfunction warning.

The TPMS system comprises:

- CJB located behind the rear seats.
- Tire pressure receiver is located above the roof concole.

- Two front initiators positioned forward of the wheels and behind the fender splash shields.
- Two rear initiators positioned rearward of the wheels and assembled on dedicated brackets located behind the fender splash shields.
- Four sensors, each sensor is integral with a tire valve and located within the tire; the space saver spare wheel is not fitted with a sensor.

The four initiators are hard wired to the CJB. The initiators transmit 125 KHz Low Frequency (LF) signals to the tire pressure sensors which respond by modifying the mode status within the Radio Frequency (RF) transmission. The 315 or 433 MHz RF signals are detected by the tire pressure receiver which is connected directly to the CJB. The received RF signals from the tire pressure sensors are passed to the CJB and contain identification, pressure, temperature and acceleration information for each wheel and tire.

The CJB communicates with the instrument cluster via the medium speed CAN bus to provide the driver with appropriate warnings. The CJB also indicates status or failure of the TPMS or components.

Tire Location and Identification

The TPMS can identify the position of the wheels on the vehicle and assign a received tire pressure sensor identification to a specific position on the vehicle, for example front left, front right, rear left and rear right. This feature is required because of the different pressure targets and threshold that could exist between the front and rear tires.

The wheel location is performed automatically by the CJB using an 'auto-location' function. This function is fully automatic and requires no input from the driver. The CJB automatically re-learns the position of the wheels on the vehicle if the tire pressure sensors are replaced or the wheel positions on the vehicle are changed.

The TPMS software can automatically detect, under all operating conditions, the following:

- one or more new tire pressure sensors have been fitted
- one or more tire pressure sensors have stopped transmitting
- CJB can reject identifications from tire pressure sensors which do not belong to the vehicle
- two 'running' wheels on the vehicle have changed positions.

If a new tire pressure sensor is fitted on any 'running' wheel, the CJB can learn the new sensor identification automatically through the tire learn and location process.

The tire-learn and location process is ready to commence when the vehicle has been stationary or traveling at less than 12 mph (20 km/h) for 15 minutes. This is known as 'parking mode'. The learn/locate process requires the vehicle to be driven at speeds of more than 12 mph (20 km/h) for 15 minutes. If the vehicle speed reduces to below 12 mph (20 km/h), the learn process timer is suspended until the vehicle speed increases to more than 12 mph (20 km/h), after which time the timer is resumed. If the vehicle speed remains below 12 mph (20 km/h) for more than 15 minutes, the timer is set to zero and process starts again.

Low Pressure Monitoring

The tire low pressure sensor transmits by RF (315 MHz or 433 MHz depending on market) signal. These signals contain data which corresponds to tire low pressure sensor identification, tire pressure, tire temperature, acceleration and tire low pressure sensor mode.

Each time the vehicle is driven, the tire pressure monitoring system module activates each LF antenna in turn. The corresponding tire low pressure sensor detects the LF signal and responds by modifying the mode status within the RF transmission.

The system enters 'parking mode' after the vehicle speed has been less than 20 km/h (12.5 miles/h) for 12 minutes. In parking mode the tire low pressure sensors transmit a coded signal to the tire pressure monitoring system module once every 13 hours. If the tire pressure decreases by more than 0.06 bar (1 lbf/in²) the tire low pressure sensor will transmit more often as pressure is lost.

As each wheel responds to the LF signal from the tire pressure monitoring system module, it is assigned a position on the vehicle and is monitored for the remainder of that drive cycle in that position.

When the vehicle has been parked for more than 15 minutes and then driven at a speed of more than 20 km/h (12.5 miles/h), the antennas fire in turn for 6 seconds on all except North American specification vehicles or for 18 seconds on North American specification only vehicles in the following order:

- Front left
- Six second pause (for the tire pressure monitoring system module to detect a response from the tire low pressure sensor)
- Front right
- Six second pause
- Rear right
- Six second pause
- Rear left
- Six second pause.

Each tire low pressure sensor responds in turn so the tire pressure monitoring system module can establish the tire low pressure sensor positions at the start of the drive cycle. This process is repeated up to three times but less if the tire low pressure sensor positions are already known in the tire pressure monitoring system module.

This process is known as 'Auto Location' and takes:

- three to five minutes on all except North American specification vehicles to complete, and
- seven to eight minutes on North American specification vehicles to complete.

During this period the tire low pressure sensors transmit at regular intervals:

- once every 5 seconds on all except North American specification vehicles, and
- once every 15 seconds on North American specification vehicles.

For the remainder of the drive cycle the tire low pressure sensors transmit once every 60 seconds or if a change in tire pressure is sensed until the vehicle stops and the tire pressure monitoring system returns to parking mode.

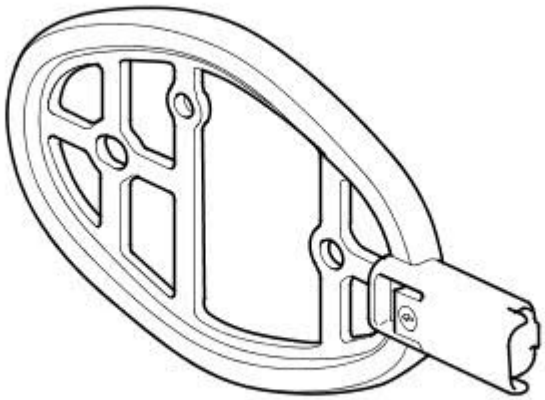
Once the wheel position is established, the antennas stop firing and do not fire again until the vehicle has been parked for more than 15 minutes. The signal transmissions from each tire low pressure sensor continue at one minute intervals whilst the vehicle is being driven. This transmission is to monitor the tire pressure. The warning occurs at 25% deflation and comprises the low tire pressure warning indicator and an appropriate message displayed in the instrument cluster message center. The message center will also display additional information about the position of the affected wheel(s).

Spare Tire Monitoring

Tire pressure sensors are not fitted to the space saver spare wheel and therefore the spare wheel is not monitored.

Component Description

Initiator

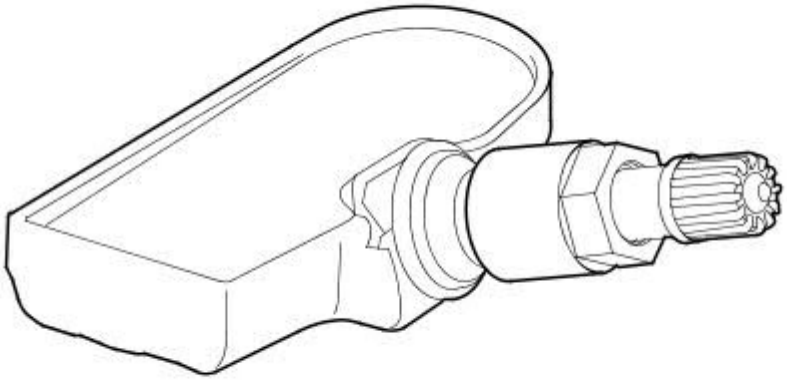


E45552

Each initiator has a connector which connects to the vehicle body harness. The initiator is a passive, LF transmitter. The initiators transmit their signals which are received by the tire pressure sensors, prompting them to modify their mode status

The CJB energizes each initiator in turn using LF drivers. The corresponding tire pressure sensor detects the LF signal and responds by modifying the mode status within the RF transmission.

Tire Pressure Sensor



E45553

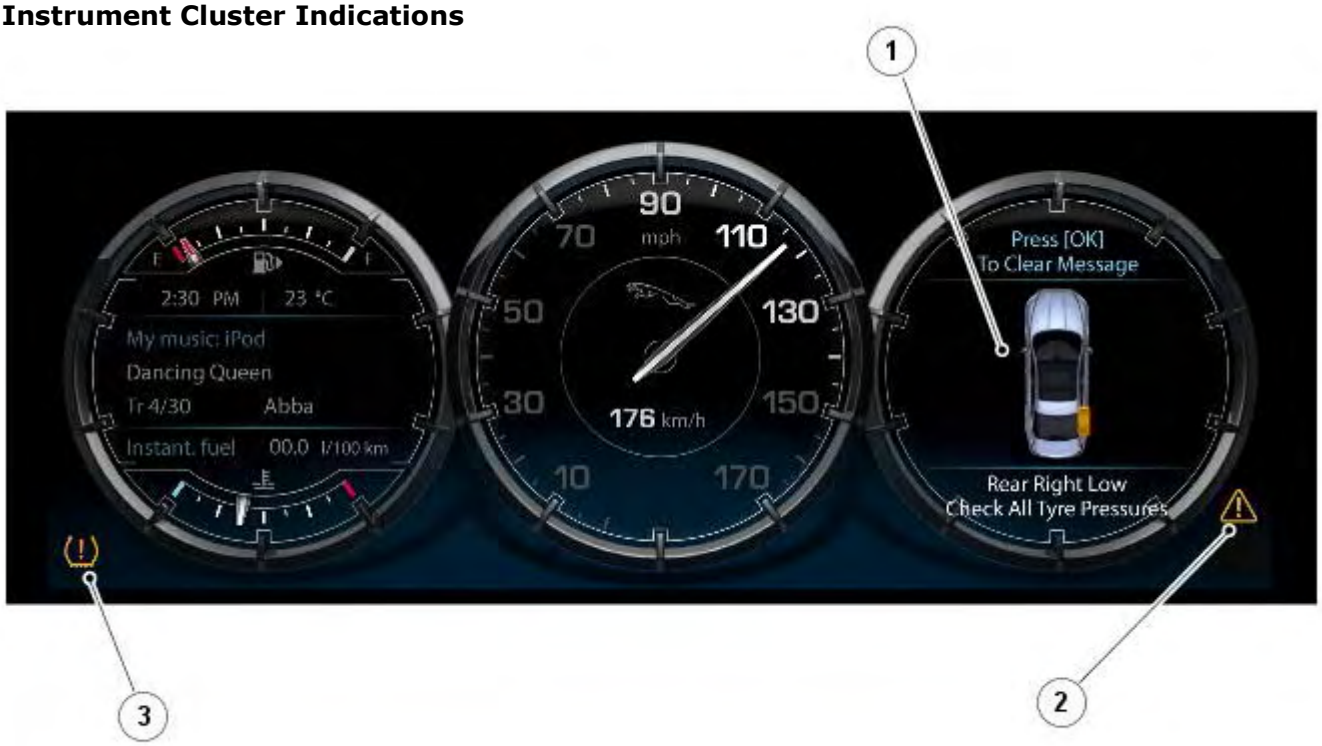
The TPMS uses active tire pressure sensors which are located on each wheel, inside the tire cavity. The sensor incorporates the tire valve and is secured in the wheel by a nut on the outside of the wheel. The sensor contains a Printed Circuit Board which houses a PTC (positive temperature coefficient) sensor, a Piezo pressure sensor, a radio receiver and transmitter and a lithium battery.

The tire pressure sensors use the PTC sensor and the Piezo sensor to periodically measure the pressure and temperature of the air inside the tire. The data is transmitted by RF data signals at either 315 MHz or 433 MHz dependant on market requirements.

The RF transmission from the sensor contains a unique identification code in its transmission data. This allows the TPMS to identify the wheel on the vehicle. If the sensor is replaced on a wheel, the new sensor identification will be learnt through the learn and location process.

NOTE: For important information regarding the removal and fitting of tire pressure sensors and associated valves, see the Tire Changing section.

Instrument Cluster Indications



E129009

Item	Description
1	Message center
2	General warning indicator
3	Low tire pressure warning indicator

The warning indications to the driver are common on all vehicles fitted with TPMS. The driver is alerted to system warnings by a low tire pressure warning indicator in the instrument cluster and an applicable text message in the message centre.

The CJB passes system status information to the instrument cluster on the medium speed CAN bus. The instrument cluster converts this data into illumination of the warning indicator and the display of an appropriate message.

When the ignition is switched on, the warning indicator is illuminated for 3 seconds for a bulb check.

NOTE: If the vehicle is not fitted with the TPMS, the warning indicator will not illuminate.

The instrument cluster checks, within the 3 second bulb check period, for a CAN bus message from the TPMS. During this time the TPMS performs internal tests and CAN bus initialization. The warning indicator will be extinguished if the CJB does not issue a fault message or tire pressure warning message.

If a TPMS fault warning message is detected by the instrument cluster at ignition on, the warning indicator will flash for 72 seconds after the 3 second bulb check period and then remain permanently illuminated.

If a tire pressure warning message is detected by the instrument cluster at ignition on, the warning indicator will extinguish briefly after the 3 second bulb check period, before re-illuminating to indicate a tire pressure warning.

The following table shows the warning indicator functionality for given events:

Event	Instrument Cluster Indications
Low pressure warning limit reached in one wheel	Warning indicator illuminated. 'CHECK TYRE PRESSURE' message displayed and applicable tire highlighted on display.
Low pressure warning limit reached in one or more wheels in low speed mode (only if programmed or learning)	Warning indicator illuminated. 'CHECK ALL TYRE PRESSURES' message displayed.
TPMS fault	Warning indicator flashes for 72 seconds and is then permanently illuminated. The flash sequence repeats after ignition on cycle. 'TYRE PRESSURE SYSTEM FAULT' message displayed.
No transmission from a specific tire pressure sensor or Specific tire pressure sensor fault	Warning indicator flashes for 72 seconds and is then permanently illuminated. The flash sequence repeats after ignition on cycle. 'TYRE NOT MONITORED' message displayed.

Event	Instrument Cluster Indications
No transmission from more than one tire pressure sensor or more than one tire pressure sensor fault	Warning indicator flashes for 72 seconds and is then permanently illuminated. The flash sequence repeats after ignition on cycle. 'TYRE PRESSURE SYSTEM FAULT' message displayed.
CAN (controller area network) signals missing	Warning indicator flashes for 72 seconds and is then permanently illuminated. The flash sequence repeats after ignition on cycle. 'TYRE PRESSURE SYSTEM FAULT' message displayed.
Vehicle enters high speed mode (only available in certain markets)	Warning indicator illuminated. 'TYRE PRESSURE LOW FOR SPEED' message displayed.

Published: 22-May-2013

Wheels and Tires - Wheels and Tires

Diagnosis and Testing

Principles of Operation

For a detailed description of the wheels and tires, refer to the relevant description and operation section in the workshop manual. REFER to: (204-04 Wheels and Tires)

Tire Pressure Monitoring System (TPMS) (Description and Operation),
Tire Pressure Monitoring System (TPMS) (Description and Operation),
Tire Pressure Monitoring System (TPMS) (Description and Operation).

General Notes

Factory installed tires and wheels are designed to operate satisfactory when inflated to the recommended inflation pressures; refer to the Specifications sub-section. The recommended pressures apply to vehicle loads up to and including full-rated load capacity

Correct tire pressures and driving technique have an important influence on tire life. Heavy cornering, excessively rapid acceleration and unnecessary sharp braking increase tire wear

Replacement tires should follow the recommended:

- size
- speed rating
- load range
- radial construction type

The use of any other size or type may seriously affect:

- safety
- ride
- handling
- speedometer and odometer calibration
- vehicle ground clearance
- tire clearance between body and chassis
- wheel bearing life
- brake cooling

Wheels need to be renewed when:

- impact damaged
- heavily corroded
- porous
- wheel stud holes or seats become damaged
- they have excessive radial or lateral runout

Safety Notes

WARNINGS:

Do not mix different types of tires on the same vehicle. Handling may be seriously affected resulting in loss of control. Failure to follow these instructions may result in personal injury.

When using winter tires, observe the direction of the sidewall moulded indicators; correct tire rotational direction is critical. Failure to follow these instructions may result in personal injury.

A tire and wheel must always be correctly matched. Wider or narrower tires than recommended could cause danger through sudden deflation. Failure to follow these instructions may result in personal injury.

When using the temporary spare wheel, maximum speed must not exceed 80 km/h (50 mile/h). Drive with caution and replace with the specified wheel and tire assembly as soon as possible. Failure to follow these instructions may result in personal injury.

Traction control (if available) must not be engaged with a temporary spare wheel fitted. Failure to follow these instructions may result in personal injury.

When changing a wheel, make sure that the vehicle cannot move. Always apply the parking brake and select the transmission park position. Failure to follow these instructions may result in personal injury.

Never run the engine with one wheel off the ground, for example, when changing the wheel. The wheel resting on the ground may cause the vehicle to move. Failure to follow these instructions may result in personal injury.

Tighten the wheel nuts to specification. Too tight may cause damage, too loose may allow the wheel to become detached. Failure to follow these instructions may result in personal injury.

Use only wheels and wheel nuts supplied by Jaguar. Aftermarket wheels or wheel nuts may not fit or function correctly and could cause injury or damage. Failure to follow these instructions may result in personal injury.

Inspection and Verification

1. Verify the customer concern by driving the vehicle
2. Visually inspect for obvious signs of damage

Visual Inspection

Mechanical
• Incorrect tire pressure • Wheel imbalance • Tires worn beyond tread wear indicators • Cuts • Abrasions • Bulges (blister) • Ply separation • Embedded objects • Impact damage • Incorrect speed rating • Incorrect load rating • Incorrect rotational direction

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the concern is not visually evident, verify the symptom and refer to the symptom chart

Tire Wear Inspection

To maximize tire performance, inspect the tires for signs of incorrect inflation and uneven wear which may indicate a need for balancing, rotation or front suspension alignment. Tires should also be checked frequently for cuts, stone bruises, abrasions, blisters, and for objects that may have become embedded in the tread. More frequent inspections are recommended when rapid or extreme temperature changes occur or when road surfaces are rough or occasionally littered with debris

Tire Wear Diagnosis

New tires should be installed if the wear indicators are exposed or if there is severe shoulder wear. Shoulder wear is usually caused by either excessive camber or excessive toe on radial tires

Sometimes incorrect rear toe settings or damaged struts will cause severe cupping' or scalloped' tire wear on non-drive wheels

Incorrect rear toe alignment will also cause other unusual wear patterns

Road Test

A tire vibration diagnostic procedure always begins with a road test. The road test and customer interview (if available) will provide much of the information needed to find the source of a vibration

During the road test, drive the vehicle on a road that is smooth and free of undulations. If vibration is apparent, note and record the following:

- The speed at which the vibration occurs
- What type of vibration occurs in each speed range
  - Mechanical or audible
- How the vibration is affected by changes in the following:
  - Engine torque
  - Vehicle speed
  - Engine speed
- Type of vibration-sensitivity: torque sensitive, vehicle speed sensitive or engine speed sensitive

The following explanations help isolate the source of the vibration

Torque Sensitive

This means that the condition may be improved or made worse by accelerating, decelerating, coasting, maintaining a steady

vehicle speed or applying engine torque

Vehicle Speed Sensitive

This means that the vibration always occurs at the same vehicle speed and is not affected by engine torque, engine speed or the transmission gear selected

Engine Speed Sensitive

This means that the vibration occurs at varying vehicle speeds when a different transmission gear is selected. It may sometimes be isolated by increasing or decreasing engine speed with the transmission in NEUTRAL or by stall testing with the transmission in gear. If the condition is engine speed sensitive, the cause is probably not related to the tires

If the road test indicates that there is tire whine, but no shake or vibration, the noise originates with the contact between the tire and the road surface

A thumping noise usually means that the tire has a flat or soft spot making a noise as they slap the roadway. Tire whine may be distinguished from axle noise. Tire whine remains the same over a range of speeds

Symptom Chart

Symptom	Possible Causes	Action
Tires show excess wear on edge of treads	• Tires under-inflated • Vehicle overloaded	• Correct pressure to specification • Correct as necessary
Tires show excess wear on edge of treads (having the correct tire pressures)	• Incorrect toe setting	• Set to specification
Tires show excess wear in centre of tread	• Tires over-inflated	• Set pressure to correct specification
Other excessive tire wear problems	• Incorrect tire pressure • Incorrect tire and wheel usage • Loose or leaking air springs • Geometry out of alignment • Loose, worn or damaged suspension components • Wheel and tire assembly out of balance • Excessive lateral or radial runout of wheel or tire	• Set pressure to correct specification • Install correct tire and wheel combination • Tighten or install new air springs as necessary • Check and adjust geometry to specification • Inspect, repair or install new suspension components as necessary • Balance wheel and tire assembly • Check, repair or install a new wheel or tire as necessary • Check, repair or install a new wheel or tire as necessary
Wheel mounting is difficult	• Incorrect application or mismatched parts, including wheel studs and wheel nuts. Corroded, worn or damaged components	• Clean or install new components as necessary
Wobble or shimmy affecting wheel runout	• Damaged wheel (eventually damaging wheel bearings and causing uneven tire wear)	• Inspect wheel rims for damage and runout. Install a new wheel rim as necessary
Excessive vibration, rough steering or severe tire wear	• Loose or incorrect installation of components	• Tighten or install new components as necessary
Vehicle vibrations	• Tires and wheels mismatched • Inflation pressure too high or too low • Uneven tire wear • Out-of-balance wheel, tire, wheel hub or disc assembly • Damaged or distorted wheel from road impact hazard or incorrect handling • Excessive radial runout • Excessive lateral runout • Incorrectly seated tire • Loose wheel mountings - damaged wheel studs, wheel nuts, worn or broken wheel hub face or foreign material on mounting faces • Defective wheel bearings	• Install correct tire and wheel combination • Set pressure to correct specification • Refer to tire wear information in this Symptom Chart • Determine the out-of-balance component and balance or install a new component as necessary • Install a new wheel as necessary • Check for incorrect wheel and tire specifications. Install a new wheel or tire as necessary • Install a new wheel or tire as necessary • Re-mount the tire as necessary • Clean mounting surfaces. Tighten or

Symptom	Possible Causes	Action
	• Brake disc imbalance • Water in tires • Loose engine or transmission mounts • Incorrect front end alignment • Loose or worn driveline or suspension parts • Excessive driveshaft runout or imbalance • Worn or damaged flexible drive joint	install new components as necessary • Install a new bearing set as necessary • Refer to the relevant Diagnosis and Testing section in the Workshop Manual. REFER to: Brake System (206-00 Brake System - General Information, Diagnosis and Testing). • Remove water • Tighten or install a new mount as necessary • Carry out front end alignment procedures as required • Repair or install new driveline or suspension components as necessary • Balance or install new driveshaft as necessary • Install new flexible drive joint as necessary
Damaged wheel hub stud threads	• Sliding wheel across the wheel studs during installation • Loose wheel nuts	• Install new wheel studs as necessary
Broken wheel studs	• Loose or overtightened wheel nuts	• Install new wheel studs as necessary
Corrosion and contamination streaks from the wheel hub wheel stud holes	• Loose wheel nuts	• Check complete assembly. Install new components as necessary. Follow correct torque procedure
Damaged wheel nuts	• Loose wheel assembly • Over-tightened wheel nuts	• Install new wheel nuts as necessary. Follow correct torque procedure
Frozen wheel nuts	• Corrosion or galling	CAUTION: Do not permit lubricant to contaminate wheel hub stud holes or wheel nut seats • If corrosion is light, wire brush away corrosion. If corrosion is excessive install new wheel studs and wheel nuts as necessary

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Central Junction Box (BCM) (100-00 General Information, Description and Operation).

Published: 21-Dec-2012

Wheels and Tires - Tire Pressure Monitoring System (TPMS)

Diagnosis and Testing

Principles of Operation

For a detailed description of the tire pressure monitoring system, refer to the relevant Description and Operation section in the workshop manual.
REFER to: Tire Pressure Monitoring System (TPMS) (204-04 Wheels and Tires, Description and Operation) / Tire Pressure Monitoring System (TPMS) (204-04 Wheels and Tires, Description and Operation) / Tire Pressure Monitoring System (TPMS) (204-04 Wheels and Tires, Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer complaint. As much information as possible should be gathered from the driver to assist in diagnosing the cause(s). Confirm which of the following two warning types (A or B) exist for the Tire Pressure Monitoring System when the ignition status is switched from 'OFF' to 'ON'
   - **(A) Check Tire Pressure Warnings.** A low tire pressure warning will **continuously** illuminate the low tire pressure warning lamp. This warning may be accompanied by a text message such as CHECK TIRE PRESSURE (refer to owner literature). The manufacturer approved diagnostic system does NOT need to be used. Diagnostic Trouble Codes (DTCs) are not generated with this type of warning. To extinguish this warning it is essential that, with the ignition 'ON', all vehicle tires (including the spare) are to be set to the correct pressure as stated in the vehicle handbook or as indicated on the placard label in the passenger/driver door aperture.

     NOTES:

     The tire pressures should be set by:

     - Using a calibrated tire pressure gauge
     - With 'cold' tires (vehicle parked in the ambient temperature for at least one hour, not in a garage with an artificial ambient temperature)

     If the tire pressure warning does not clear within two minutes, it is likely that the gauge is not correctly calibrated or the tires are 'warm'. Carry out the following steps until the warning has cleared:

     - Rotate wheels approximately 180 degrees
     - Increase the tire pressures by 3psi
     - Wait a further two minutes
     - When the tires are at ambient temperature and a **calibrated** gauge is available, reset the tire pressures to the correct pressure.

     Tire pressure adjustments are part of routine owner maintenance. Tire pressure adjustments that are required due to a lack of owner maintenance are not to be claimed under vehicle warranty.

   - **(B) System Fault Warnings.** When a system fault is detected, the low tire pressure warning lamp will flash for approximately 75 seconds prior to being continuously illuminated. Visually inspect wheel arch Tire Pressure Monitoring System Antennas and check for system DTCs. External visual damage to the tire low pressure sensors and air leaks will not cause system fault warnings (note: nut and seal system should be replaced at each tyre change using the available service kit). Check for the presence of tire low pressure sensors on all four wheels (note: a tire low pressure sensor has a metal valve stem rather than a rubber one).
2. Check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Central Junction Box (BCM) (100-00 General Information, Description and Operation).

NOTE: NO DTCs WILL BE SET WITH A LOW PRESSURE WARNING AS THIS IS A STANDARD FUNCTION OF THE SYSTEM.

Pinpoint Tests

PINPOINT TEST A : U201F11 TIRE PRESSURE MONITORING SYSTEM EXTERNAL RECEIVER DATA LINE CIRCUIT SHORT TO GROUND	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: U201F11 VERIFY EXTERNAL RECEIVER DATA LINE CIRCUIT SHORT TO GROUND	
	1 Ignition OFF.

	2 Disconnect the Tire Pressure Monitoring System Receiver electrical connector, C3MC45.
	3 Measure the resistance between. **C3MC45, harness side** — **Battery** Pin 1 — Negative terminal
	Is the resistance less than 5 Ohms? **Yes** GO to A2. **No** GO to A3.
A2: U201F11 CHECK THE EXTERNAL RECEIVER DATA LINE CIRCUIT FOR SHORT CIRCUIT TO GROUND	
	1 Disconnect the Central Junction Box electrical connector, C3BP01A.
	2 Measure the resistance between. **C3MC45, harness side** — **Battery** Pin 1 — Negative terminal
	Is the resistance less than 5 Ohms? **Yes** REPAIR the short circuit in wiring harness. **No** GO to A4.
A3: U201F11 CHECK THE TIRE PRESSURE MONITORING SYSTEM EXTERNAL RECEIVER FOR SHORT CIRCUIT TO GROUND	
	1 Reconnect the Tire Pressure Monitoring System Receiver electrical connector, C3MC45.
	2 Using manufacturer approved diagnostic system run On Demand Self Test **(0x0202)**.
	Is the DTC U201F11 set? **Yes** Replace Tire Pressure Monitoring Receiver. **No** Investigate possible cause of intermittent failure.
A4: U201F11 CHECK THE CENTRAL JUNCTION BOX FOR SHORT CIRCUIT TO GROUND	
	1 Reconnect the Central Junction Box electrical connector, C3BP01A.
	2 Reconnect the Tire Pressure Monitoring System Receiver electrical connector, C3MC45.
	3 Using manufacturer approved diagnostic system run On Demand Self Test **(0x0202)**.
	Is the DTC U201F11 set? **Yes** Replace Central Junction Box. **No** Investigate possible cause of intermittent failure.

PINPOINT TEST B : U201F12 TIRE PRESSURE MONITORING SYSTEM EXTERNAL RECEIVER DATA LINE CIRCUIT SHORT TO POWER	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
B1: U201F12 VERIFY EXTERNAL RECEIVER DATA LINE CIRCUIT SHORT TO POWER	
	1 Ignition OFF.
	2 Disconnect the Tire Pressure Monitoring System Receiver electrical connector, C3MC45.
	3 Measure the resistance between **C3MC45, harness side** — **Battery** Pin 1 — Positive terminal
	Is the resistance less than 5 Ohms? **Yes** GO to B2. **No** GO to B3.
B2: U201F12 CHECK THE EXTERNAL RECEIVER DATA LINE CIRCUIT FOR SHORT CIRCUIT TO POWER	
	1 Disconnect the Central Junction Box electrical connector, C3BP01A.
	2 Measure the resistance between **C3MC45, harness side** — **Battery** Pin 1 — Positive terminal
	Is the resistance less than 5 Ohms? **Yes** REPAIR the short circuit in wiring harness. **No** GO to B4.
B3: U201F12 CHECK THE TIRE PRESSURE MONITORING SYSTEM EXTERNAL RECEIVER FOR SHORT CIRCUIT TO POWER	
	1 Reconnect the Tire Pressure Monitoring System Receiver electrical connector, C3MC45.
	2 Using manufacturer approved diagnostic system run On Demand Self Test **(0x0202)**.

	Is the DTC U201F12 set? **Yes** Replace Tire Pressure Monitoring Receiver. **No** Investigate possible cause of intermittent failure.
B4: U201F12 CHECK THE CENTRAL JUNCTION BOX FOR SHORT CIRCUIT TO POWER	
	1 Reconnect the Central Junction Box electrical connector, C3BP01A.
	2 Reconnect the Tire Pressure Monitoring System Receiver electrical connector, C3MC45.
	3 Using manufacturer approved diagnostic system run On Demand Self Test **(0x0202)**.
	Is the DTC U201F12 set? **Yes** Replace Central Junction Box. **No** Investigate possible cause of intermittent failure.

PINPOINT TEST C : U201F87 TIRE PRESSURE MONITORING SYSTEM EXTERNAL RECEIVER DATA LINE MISSING MESSAGE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: U201F87 VERIFY EXTERNAL RECEIVER DATA LINE MISSING MESSAGE	
	1 Using manufacturer approved diagnostic system run On Demand Self Test (0x0202).
	Is the DTC U201F87 set? **Yes** GO to C2. **No** Investigate possible cause of intermittent failure.
C2: U201F87 CHECK EXTERNAL RECEIVER DATA LINE CIRCUIT	
	1 Ignition OFF.
	2 Disconnect the Tire Pressure Monitoring System Receiver electrical connector, C3MC45.
	3 Disconnect the Central Junction Box electrical connector, C3BP01A.
	4 Measure the resistance between. **C3MC45, harness side**: Pin 1 — **C3BP01A, harness side**: Pin 25
	Is the resistance less than 5 ohms? **Yes** GO to C3. **No** REPAIR the high resistance/open circuit in wiring harness.
C3: U201F87 CHECK EXTERNAL RECEIVER	
	1 Reconnect the Central Junction Box electrical connector, C3BP01A.
	2 Reconnect the Tire Pressure Monitoring System Receiver electrical connector, C3MC45.
	3 Using manufacturer approved diagnostic system run On Demand Self Test **(0x0202)**.
	Is the DTC U201F87 set? **Yes** Replace Tire Pressure Monitoring Receiver.GO to C4. **No** Investigate possible cause of intermittent failure.
C4: U201F87 CHECK CENTRAL JUNCTION BOX.	
	1 Using manufacturer approved diagnostic system run On Demand Self Test **(0x0202)**.
	Is the DTC U201F87 set? **Yes** Replace Central Junction Box. **No** Test is complete. No further action is required.

PINPOINT TEST D : C1A5712, C1A5714, C1A5912, C1A5914, C1A6112, C1A6114, C1A6312, C1A6314 TIRE PRESSURE MONITORING ANTENNA SHORT OR OPEN CIRCUIT

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: C1A5712, C1A5714, C1A5912, C1A5914, C1A6112, C1A6114, C1A6312, C1A6314 CHECK FOR SHORT/OPEN CIRCUIT IN INITIATOR HARNESS	
	1 Ignition OFF.
	2 Disconnect the Central Junction Box electrical connector, C3BP01E. (Front LF Initiators).
	3 Disconnect the Central Junction Box electrical connector, C3BP01G. (Rear LF Initiators).
	4 Measure the resistance of Front Right Hand Initiator. **C3BP01E, harness side**: Pin 1 — **C3BP01E, harness side**: Pin 2

	5 Measure the resistance of Front Left Hand Initiator. **C3BP01E, harness side** — Pin 14 **C3BP01E, harness side** — Pin 15
	6 Measure the resistance of Rear Right Hand Initiator. **C3BP01G, harness side** — Pin 30 **C3BP01G, harness side** — Pin 31
	7 Measure the resistance of Rear Left Hand Initiator. **C3BP01G, harness side** — Pin 18 **C3BP01G, harness side** — Pin 19
	Are any of the Initiator resistance measurements less than 1 Ohm? **Yes** REPAIR the short circuit as required. **No** REPAIR the open circuit as required. Clear DTC's and retest.

Published: 11-May-2011

Wheels and Tires - Tire Low Pressure Sensor

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

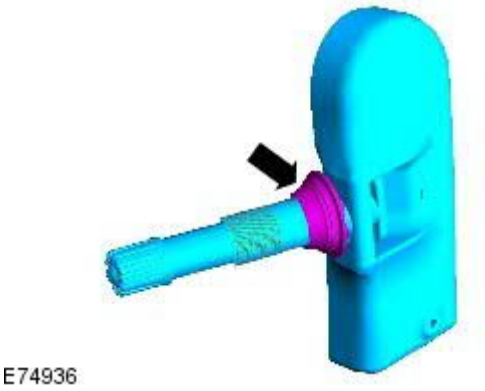
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

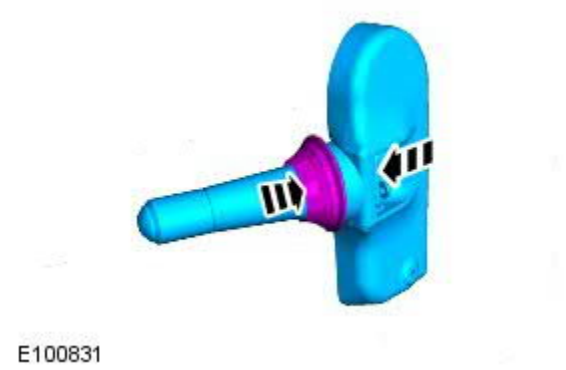
3. Remove the tire from the wheel, release the tire bead from the rim 180 degrees from the valve.

4.



5.
   - Discard the tire valve and retaining nut.

Installation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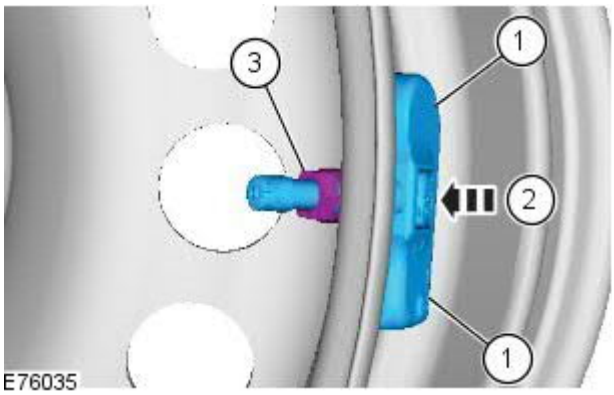
1. CAUTIONS:

   Make sure that the seal is correctly located.

   Make sure that new components are installed.

   Install the washer and seal, making sure the valve remains pressed fully onto its seat.



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2. WARNINGS:

   Make sure that any corrosion or dirt is removed from the mating surfaces.

   Make sure that a new tire valve, valve core, seal, washer, cap and retaining nut is installed.

   CAUTIONS:

   Use lint free cloth.

   Only use moderate force when installing the sensor.

   NOTE: Only tighten the nut finger tight at this stage.

   - Install the tire low pressure sensor and support the sensor body in position.
   - Support the back of the valve stem in order to prevent rotation to the tire low pressure sensor body.
   - Gently push the nut towards the center of the wheel. Tighten the nut.

     Torque: 8 Nm

3. Install the tire and balance the wheel.

4. Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

5. WARNING: Make sure to support the vehicle with axle stands.

   Lower the vehicle.

Published: 11-May-2011

Wheels and Tires - Tire Pressure Monitoring System (TPMS) Front Antenna

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

The ignition must be switched off.

RH illustration shown, LH is similar.

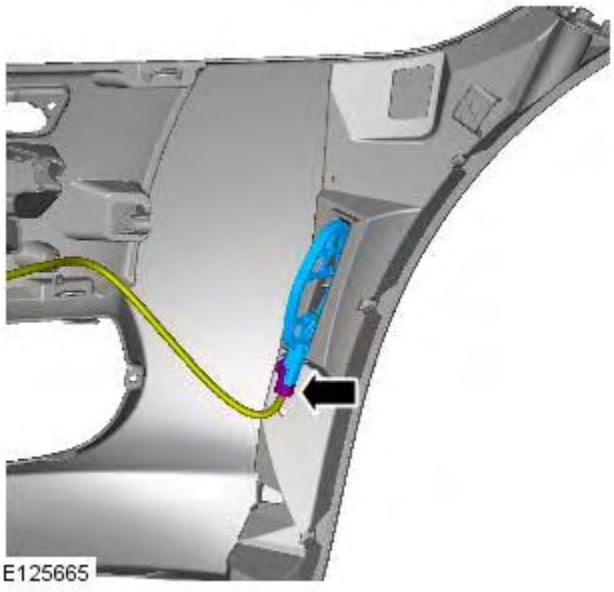
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Remove the front wheel and tire.

   Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

3. *Torque:* 1.5 Nm



4. NOTE: Component illustrated, removed for clarity.

Installation

1. To install, reverse the removal procedure.

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Wheels and Tires - Tire Pressure Monitoring System (TPMS) Rear Antenna

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

The ignition must be switched off.

RH illustration shown, LH is similar.

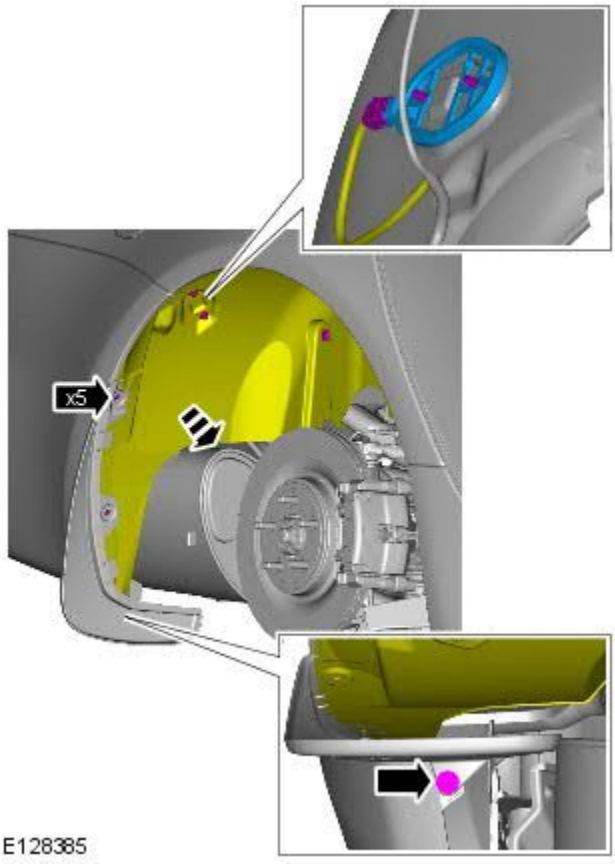
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Remove the rear wheel and tire.

   Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

3. *Torque:* 1.5 Nm



4.

Installation

1. To install, reverse the removal procedure.

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Wheels and Tires - Tire Pressure Monitoring System (TPMS) Receiver

Removal and Installation

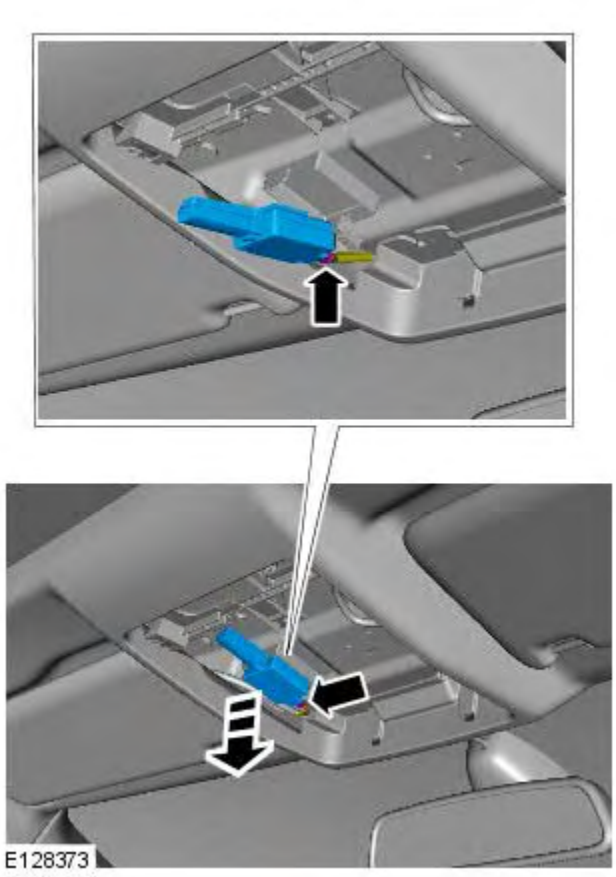
Removal

NOTES:

Removal steps in this procedure may contain installation details.

The ignition must be switched off.

1. Refer to: Overhead Console (501-12 Instrument Panel and Console, Removal and Installation).



2. CAUTION: Make sure that the component is secured in the retainer.
   - Release the component first, before disconnecting the electrical connector.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Wheels and Tires - Wheel and Tire

Removal and Installation

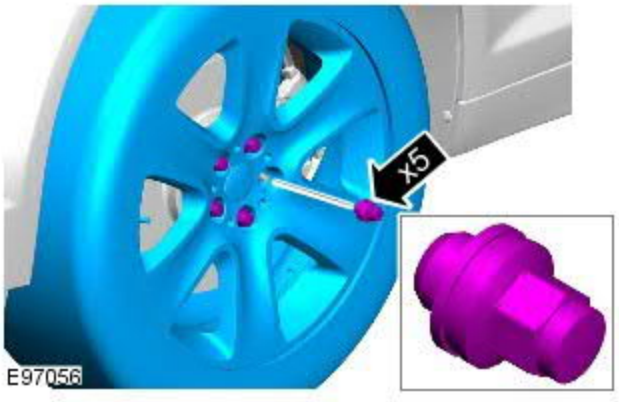
Removal

NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. *Torque:* 125 Nm



Installation

1. CAUTION: Apply a small amount of grease to the hub and wheel mating surfaces before installation. Make sure the grease does not come into contact with the vehicles braking components and the wheel stud threads. Failure to follow these instructions may result in personal injury.

   To install, reverse the removal procedure.

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Vehicle Dynamic Suspension -

Torque Specifications

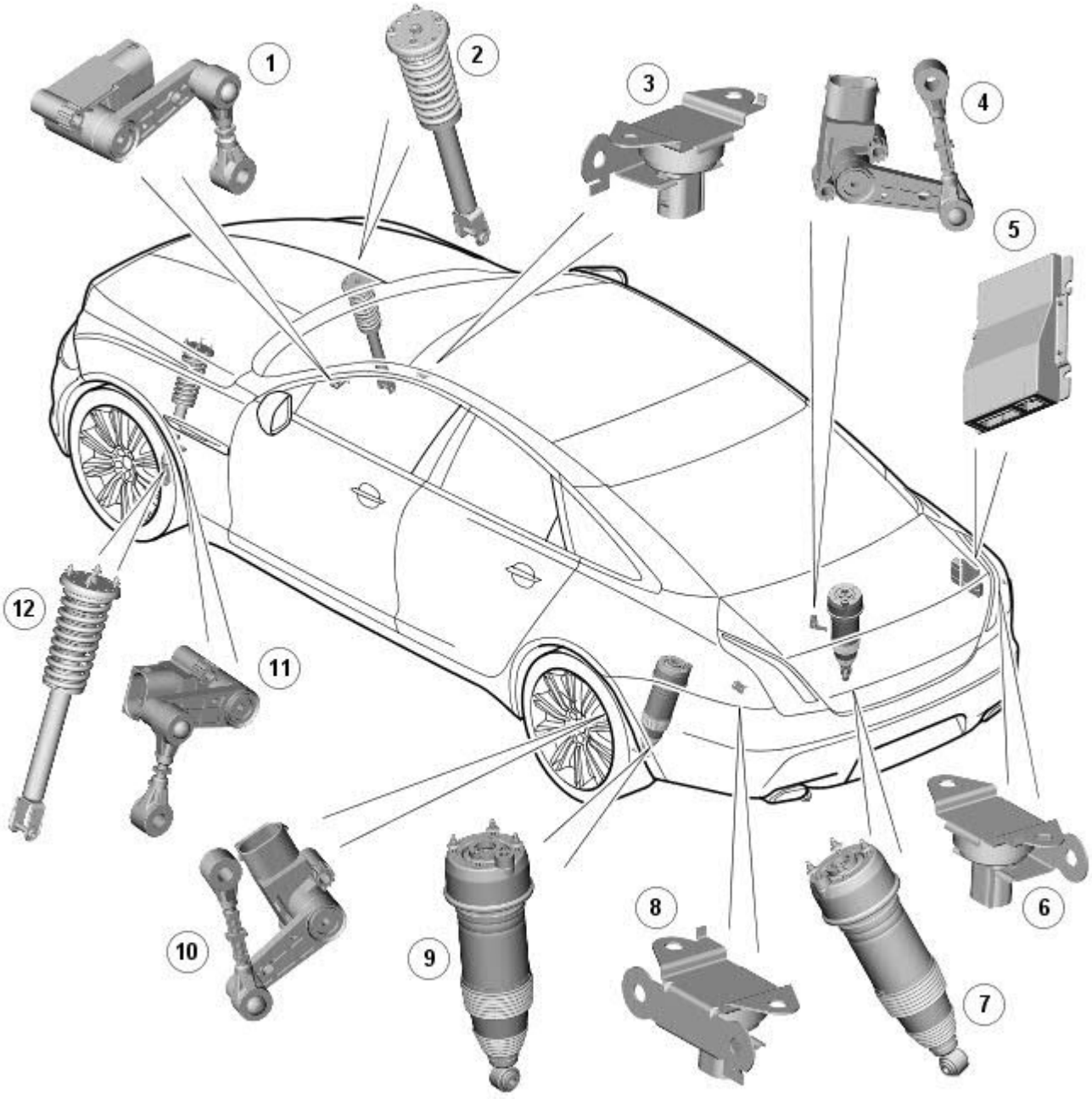
Item	Nm	lb-ft	lb-in
Air suspension control module to support bracket nut	7	-	62
Adaptive damping module to support bracket nut	12	8	-
Support bracket to body nut	12	8	-
Front suspension vertical accelerometer to body nut	5	-	44
Rear suspension vertical accelerometer to body nut	5	-	44
Front suspension height sensor bracket to front subframe bolt	20	15	-
Rear suspension height sensor to rear subframe bolt	4	-	35
Air line connector	5	-	44
Air suspension reservoir to body nuts	7	-	62
Air suspension reservoir to body bolt	7	-	62
Air suspension compressor to body bolts	9	-	80
Air suspension compressor to body nut	9	-	80

Published: 11-May-2011

Vehicle Dynamic Suspension - Vehicle Dynamic Suspension - Component Location

Description and Operation

COMPONENT LOCATION



E121118

Item	Description
1	RH (right-hand) front suspension height sensor
2	RH front spring and damper assembly
3	Front vertical accelerometer
4	RH rear suspension height sensor
5	ADM (adaptive damping module)
6	RH rear vertical accelerometer
7	RH rear spring and damper assembly
8	LH (left-hand) rear vertical accelerometer

9	LH rear spring and damper assembly
10	LH rear suspension height sensor
11	LH front suspension height sensor
12	LH front spring and damper assembly

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Vehicle Dynamic Suspension - Vehicle Dynamic Suspension - Overview

Description and Operation

OVERVIEW

The adaptive dynamics system is an electronically controlled suspension system, which continuously adjusts the damping characteristics of the suspension dampers in reaction to the current driving conditions.

The system is controlled by the ADM. The ADM receives signals from three body vertical accelerometers, four suspension height sensors and from other vehicle systems to determine vehicle state, body and wheel motions, and driver inputs. These signals are used by the ADM to continuously control the damping characteristics of each damper to the appropriate level, to give the optimum body control and vehicle ride.

The ADM also contains the controller for the electronic differential, where fitted.

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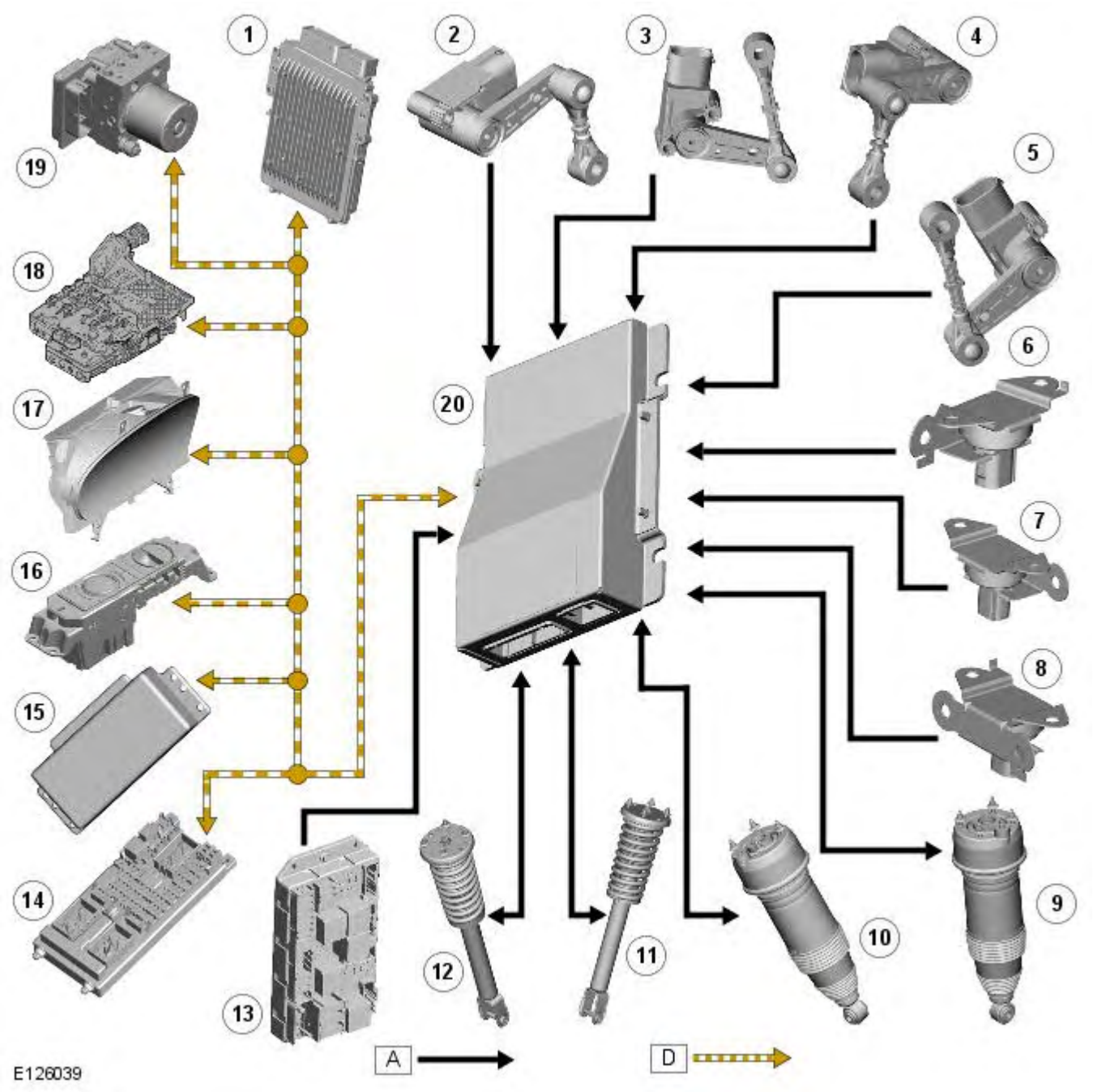
Vehicle Dynamic Suspension - Vehicle Dynamic Suspension - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: A = Hardwired; D = High speed CAN (controller area network) bus.



Item	Description
1	ECM (engine control module)
2	RH (right-hand) front suspension height sensor
3	RH rear suspension height sensor
4	LH (left-hand) front suspension height sensor
5	LH rear suspension height sensor
6	Front body vertical accelerometer

7	RH rear body vertical accelerometer
8	LH rear body vertical accelerometer
9	LH rear damper
10	RH rear damper
11	LH front damper
12	RH front damper
13	RJB (rear junction box)
14	CJB (central junction box)
15	DLM (differential locking module) (where fitted)
16	JaguarDrive selector module
17	Instrument cluster
18	TCM (transmission control module)
19	ABS (anti-lock brake system) module
20	ADM

System Operation

PRINCIPLES OF OPERATION

The ADM uses a combination of information from other system modules and data from the body vertical accelerometers and suspension height sensors to measure the vehicle and suspension states and driver inputs. Using this information, the ADM applies algorithms to control the dampers for the current driving conditions.

The ADM receives the following signals on the high speed CAN bus from the stated system components:

- Brake pressure - ABS module.
- Brake pressure quality factor - ABS module.
- Car configuration parameters - CJB.
- Engine speed - ECM.
- Engine speed quality factor - ECM.
- Engine torque flywheel actual - ECM.
- Engine torque flywheel actual quality factor - ECM.
- Gear position target - TCM.
- Lateral acceleration - ABS module.
- Power mode (ignition signal) - CJB.
- Power mode quality factor - CJB.
- Roll stability control mode - ABS module.
- Steering wheel angle - ABS module.
- Steering wheel angle speed - ABS module.
- Steering wheel angle status - ABS module.
- Terrain mode requested - JaguarDrive selector.
- Torque converter slip - TCM.
- Vehicle information parameters HS - CJB.
- Vehicle speed - ABS module.
- Vehicle speed quality factor - ABS module.
- Front left wheel speed - ABS module.
- Front left wheel speed quality factor - ABS module.
- Front right wheel speed - ABS module.
- Front right wheel speed quality factor - ABS module.
- Rear left wheel speed - ABS module.
- Rear left wheel speed quality factor - ABS module.
- Rear right wheel speed - ABS module.
- Rear right wheel speed quality factor - ABS module.

The ADM also outputs information on the high speed CAN bus for use by other systems as follows:

- Fault message - Instrument cluster.
- Terrain mode change status - JaguarDrive selector.
- Terrain mode - JaguarDrive selector.
- Front left suspension height - other systems as required.
- Front right suspension height - other systems as required.
- Rear left suspension height - other systems as required.
- Rear right suspension height - other systems as required.

The ADM monitors the input signals and operates the damper solenoids. The input signals are used in control functions and a force required for each damper, for each function, is calculated. An arbitrator monitors the force requirements from each function and apportions a force to a damper. The force is converted to the appropriate current and sent to the damper.

The control functions are as follows:

- Body Control – Uses body vertical accelerometer and CAN inputs. Calculates road induced body motions 100 times a second and sets each damper to the appropriate level to maintain a flat and level body attitude. Provides improved body control without loss of ride quality.

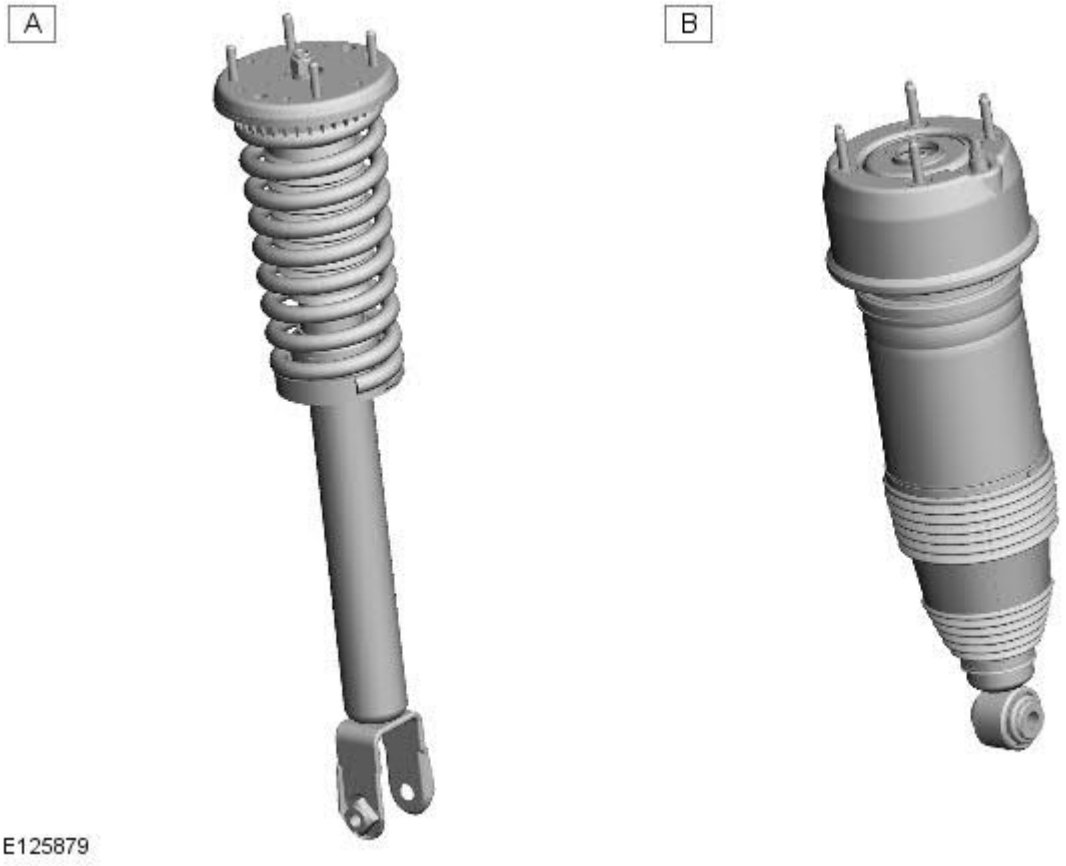
- Roll Rate Control – Uses CAN inputs. Predicts vehicle roll rate due to driver steering inputs 100 times a second and increases damping to reduce roll rate. Provides improved control and driver confidence.
- Pitch Rate Control – Uses CAN inputs. Predicts vehicle pitch rate due to driver throttle and braking inputs 100 times a second and increases damping to reduce pitch rate. Provides improved control and driver confidence.
- Bump Rebound Control – Uses suspension height sensor and CAN inputs. Monitors the position of the wheel 500 times a second and increases the damping rate as the damper approaches the end of its travel. Provides improved ride quality.
- Wheel Hop Control – Uses suspension height sensor and CAN inputs. Monitors the position of the wheel 500 times a second and detects when the wheel is at its natural frequency and increases the damping. Provides improved ride quality.

Under normal road conditions when the vehicle is stationary with the engine running, the dampers are set to the firm condition to reduce power consumption.

The ADM receives its power supply via a relay and fuse in the CJB. The relay remains energized for a period of time after the ignition is off. This allows the ADM to record and store any DTC (diagnostic trouble code) relating to adaptive dynamics system faults.

Component Description

DAMPERS



Item	Description
A	Front spring and damper assembly
B	Rear spring and damper assembly

The adaptive dynamics dampers are monotube, nitrogen gas and oil filled units, which are integrated with a conventional coil spring (front suspension) or an air spring (rear suspension) to form the spring and damper assemblies. The dampers are continuously variable, which allows the damping force to be electrically adjusted when the vehicle is being driven. The dampers provide the optimum compromise between vehicle control and ride comfort.

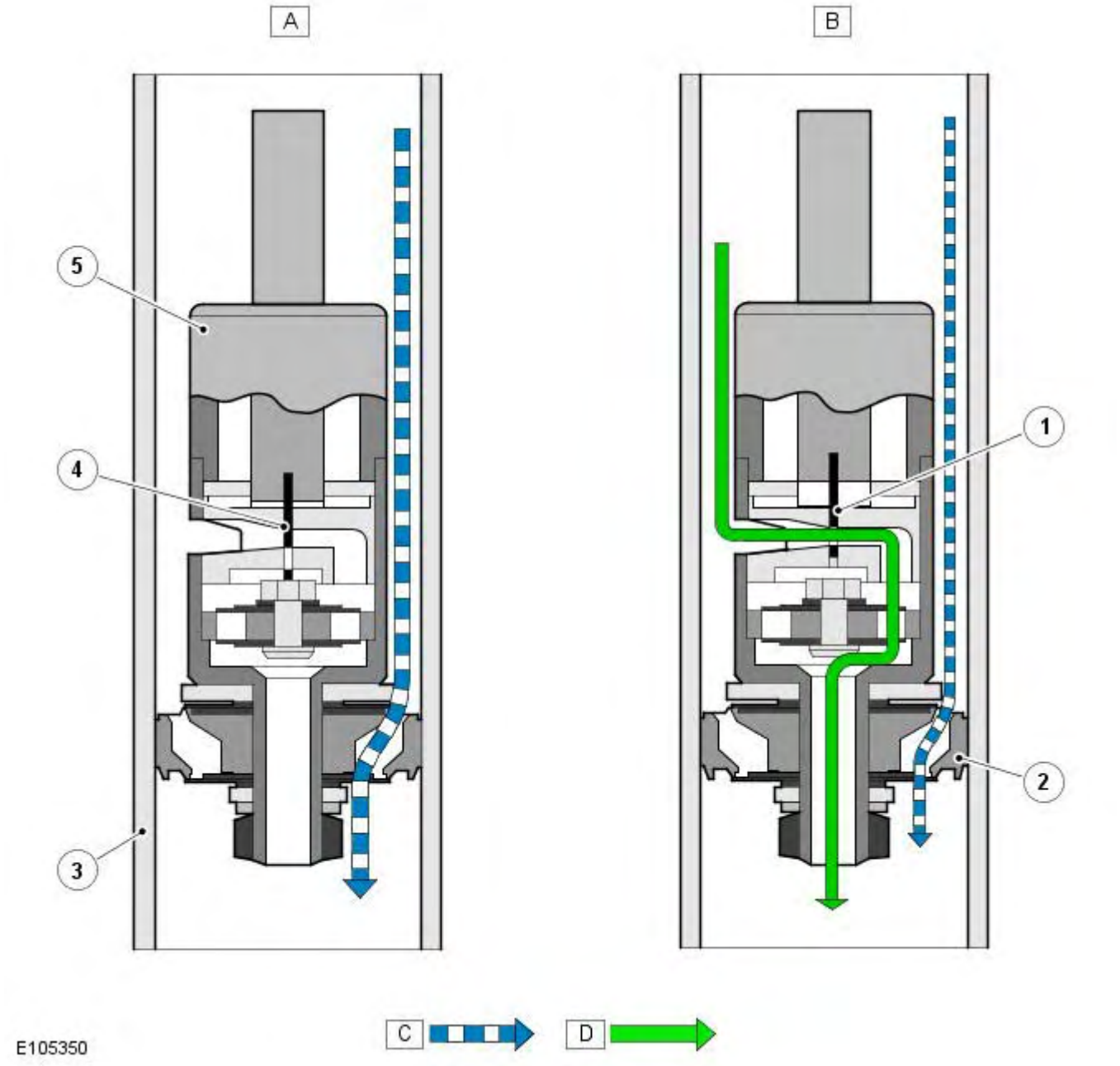
The dampers have an electrical connector on the end of the piston rod, in the center of the top mount.

In each damper, the damping adjustment is achieved by a solenoid operated variable orifice, which opens up an alternative path for oil flow within the damper. When de-energized the bypass is closed and all the oil flows through the main (firm) valve. When energized the solenoid moves an armature and control blade, which work against a spring. The control blade incorporates an orifice which slides inside a sintered housing to open up the bypass as required. In compression, oil flows from the lower portion of the damper through a hollow piston rod, a separate soft (comfort) valve, the slider housing and orifice and into the upper portion of the damper, thereby bypassing the main (firm) valve. In rebound the oil flows in the opposite direction.

In the firm setting oil flows through the main (firm) valve only, but when the bypass is opened by any amount the oil flows through both valves in a pressure balance. When fully energized the solenoid moves the armature and therefore the slider to the maximum extension and opens the orifice completely. The damper operates continuously between these two boundary conditions.

The solenoid in each damper is operated by a separate 526 Hz PWM (pulse width modulation) signal from the ADM. The ADM continuously varies the current of the PWM signals between a minimum of 0 A and a maximum of 1.5 A (i.e. between the maximum firm setting when de-energized and the maximum soft setting when fully energized) to independently increase and decrease the damping of each damper as required.

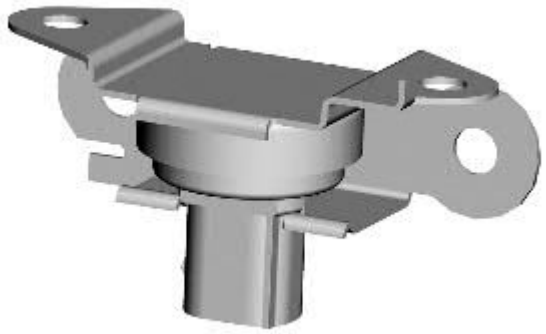
Sectioned Views of Damper Operating States



Item	Description
A	Firm setting
B	Soft setting
C	Main oil flow
D	Bypass oil flow
1	Bypass valve (open)
2	Main valve

3	Tube
4	Bypass valve (closed)
5	Piston and rod assembly

BODY VERTICAL ACCELEROMETERS


E105087

Three body vertical accelerometers are used in the adaptive dynamics system:

- A front body vertical accelerometer is attached to the body behind the right front wheel, on the front sidemember to dash gusset.
- A rear body vertical accelerometer is installed on each side of the luggage compartment, attached to the related rear quarter panel.

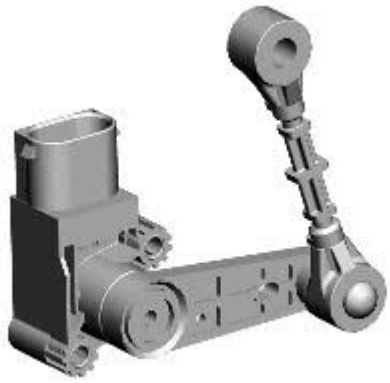
The body vertical accelerometers measure acceleration in the vertical plane and output a corresponding analogue signal to the ADM. The algorithms in the ADM calculate the heave, pitch and roll motions of the vehicle, which are used by the controller to control road induced body motion.

Each body vertical accelerometer is connected to the ADM via three wires, which supply ground, 5 V supply and signal return.

The sensing element comprises a single parallel plate capacitor, one plate of which moves relative to the other dependant on the force (acceleration) applied. This causes the capacitance to change as a function of applied acceleration. This capacitance is compared with a fixed reference capacitor in a bridge circuit and the signal is processed by means of a dedicated integrated circuit to generate an output voltage that varies as a function of applied acceleration. The sensors output a signal voltage of approximately 1 ± 0.05 v/g.

SUSPENSION HEIGHT SENSORS

NOTE: Rear sensor shown, front sensors similar.


E105088

Four suspension height sensors are used in the adaptive dynamics system, two for the front suspension and two for the rear suspension. A front suspension height sensor is attached to each side of the front subframe and connected by a sensor arm and sensor link to the related lower lateral arm of the front suspension. A rear suspension height sensor is attached to each side of the rear subframe and connected by a sensor arm and sensor link to the related upper control arm of the rear suspension. On each suspension height sensor, the sensor arm and sensor link convert linear movement of the suspension into rotary movement of the sensor shaft.

Each suspension height sensor contains two independent sensors:

- Sensor 1 is used by the air suspension system.
  Refer to: Rear Suspension (204-02 Rear Suspension, Description and Operation).

- Sensor 2 is used by the adaptive dynamics system.

The suspension height sensors measure suspension displacement at each corner of the vehicle and output a corresponding analogue signal to the ADM. The algorithms in the ADM calculate the position, velocity and frequency content of the signals and use the results for individual wheel control.

Each suspension height sensor is connected to the ADM via three wires, which supply ground, 5 V supply and signal return.

Each sensing element consists of an array of Hall effect devices arranged to measure the direction of the magnetic field of a small magnet attached to the end of the sensor shaft. As the sensor shaft rotates, so do the lines of magnetic flux from the attached magnet. The signals from each of the Hall effect elements are processed by means of a dedicated integrated circuit, to generate an output voltage that varies as the sensor shaft is rotated. The sensor has a measurement range of ± 40° around its nominal position and the nominal sensitivity is 57 mv/° of shaft rotation.

ADAPTIVE DAMPING MODULE

The ADM is installed on the right side of the luggage compartment, in a bracket attached to the rear quarter panel.

System Fault Message

If a fault is detected by the ADM, a message is sent via the high speed CAN to the instrument cluster and the message ADAPTIVE DYNAMICS FAULT is displayed. The ADM also logs an appropriate DTC. The ADM can be interrogated using a Jaguar approved diagnostic system.

If a fault is detected, the ADM implements a strategy based on the type of fault. If there is an electrical power fault, or the ADM cannot control the dampers, they default to the firm condition. If a sensor fails that only affects one or more control modes an intermediate damper setting is used as the lower threshold. The remaining working modes can demand higher damping as required.

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Vehicle Dynamic Suspension - Vehicle Dynamic Suspension

Diagnosis and Testing

Principle of Operation

For a detailed description of the adaptive damping system and operation, refer to the relevant Description and Operation section of the workshop manual.
REFER to: Vehicle Dynamic Suspension (204-05 Vehicle Dynamic Suspension, Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Coil spring(s) • Shock absorber(s) • Accelerometer(s) installation	• Fuse(s) • Wiring harness/electrical connectors • Accelerometer(s) • Adaptive Damping Control Module

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC index.

Symptom Chart

Symptom	Possible Message	Possible Other Warnings	Possible Causes	Action
Vehicle on bump stops	• Suspension fault	• Two chimes repeated regularly Red indicator permanently illuminated	• Water ingress to wiring harness or connectors • Air leak(s) • Vehicle in transportation mode • System not calibrated or calibration corrupt • Implausible articulation symptoms detected • Failure of multiple height sensors • Air suspension control module failure	Visually inspect the wiring harness and connectors for water ingress. Visually inspect the system for air leakage. Check the system mode and calibration using the approved diagnostic system. Check for implausible articulation symptoms, i.e. height sensor or linkage fault, deflated air spring, under inflated tire etc. Note implausible articulation symptoms may be caused by an un-calibrated height sensor. Check for height sensor DTCs and refer to the DTC index. Refer to the warranty policy and procedures manual if a module is suspect.
Vehicle does not sit level	• Suspension fault	• Two chimes repeated regularly Red indicator permanently illuminated	• Water ingress to wiring harness or connectors • Air leak(s) • Calibration corrupt • cross-link valve fault • Height sensor fault • Reservoir valve stuck open • Exhaust valve stuck closed • Corner valves stuck open • Air suspension	Visually inspect the wiring harness and connectors for water ingress. Visually inspect the system for air leakage and refer to the guided diagnostic routine on the approved diagnostic system. Check the system calibration using the approved diagnostic system. For front and rear cross link valve tests refer to the guided diagnostic routine on the approved diagnostic system. Check for height sensor DTCs and refer to the DTC index. For reservoir and exhaust valve tests refer to the guided diagnostic routine on the approved

Symptom	Possible Message	Possible Other Warnings	Possible Causes	Action
			control module failure	diagnostic system. Check for corner valve DTCs and refer to the DTC index. Refer to the warranty policy and procedures manual if a module is suspect.
Vehicle sits too low	• Suspension fault • Dynamic stability control (DSC)	• Two chimes, amber indicator permanently illuminated • One chime • DSC amber indicator permanently illuminated • ABS indicator permanently illuminated	• Water ingress to wiring harness or connectors • Air leak(s) • Air suspension compressor temperature sensor fault • Inlet air filter blockage/restriction • Air suspension compressor fault • Exhaust valve stuck/sticking • Air suspension control module lost communication with ABS module • ABS fault. • Air suspension control module failure	Visually inspect the wiring harness and connectors for water ingress. Visually inspect the system for air leakage. For air compressor temperature sensor, inlet air filter, exhaust valve and air compressor tests refer to the guided diagnostic routine on the approved diagnostic system. For Air suspension control module lost communication with ABS module, refer to the lost communication codes statement at the end of this table. Check for ABS DTCs, Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a module is suspect.
Vehicle sits too high	• Suspension fault	• Two chimes, amber indicator permanently illuminated	• Reservoir valve stuck open • Exhaust valve stuck closed • Corner valves stuck open • Air suspension control module failure	For reservoir valve and exhaust valve tests refer to the guided diagnostic routine on the approved diagnostic system. Check for corner valve DTCs and refer to the DTC index. Refer to the warranty policy and procedures manual if a module is suspect.
System detects extended mode unnecessarily when lowering	• -	• -	• Crossed gallery and air spring pipes • Incorrect valve block installed to front or rear • Damage or blockage in air harness	Refer to the guided diagnostic routine on the approved diagnostic system.
Vehicle leans/tilts after being left over-night or for some days	• -	• -	• Leaking air spring(s) • Leak from corner valve to gallery • Exhaust valve stuck open	Refer to the guided diagnostic routine on the approved diagnostic system.
After vehicle left over-night or for some days system regularly indicates "Suspension vehicle raising slowly" when first driving off	• Suspension vehicle raising slowly	• -	• Leaking air spring(s) • Leaking reservoir	Refer to the guided diagnostic routine on the approved diagnostic system.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Adaptive Damping Module (SUMB) (100-00 General Information, Description and Operation).

Published: 11-May-2011

Vehicle Dynamic Suspension - Air Leaks

General Procedures

1. CAUTION: Any spray used must have a corrosion inhibitor, and must not cause damage to paintwork, plastics, metals or plastic pipes.

   NOTE: The recommended leak detection spray is GOTEC LDS, Jaguar part number C2C 22398.

   The recommended leak detection spray should be used to identify any suspected leaks. This procedure should also be used where any of the air suspension components have been disturbed.

2. Clean around the area of the suspected air leak.

3. Using the recommended leak detection spray, spray around all of the air suspension components, working systematically until the source of the air leak has been found.

4. NOTE: If a new air suspension component is to be fitted, and no air leak has been detected at the pipe connectors, remove and discard the new air pipe connections supplied with the component.

   If any of the air suspension components are found to be leaking e.g. air spring, compressor, reservoir or the solenoid valve block repair is effected by replacement only. If an air leak from the pipe connector has also been identified, a new air pipe connector, supplied with the air suspension component, must be installed.

5. NOTES:

   Only Jaguar approved connectors have been tested to the correct pressure and temperature specifications.

   Air pipes must only be cut using either Hose cutter 204-494, available from SPX LTD or Hose cutter YA1000A, available from Snap-On Tools.

   If the color coded markings adjacent to the pipe connections are removed when cutting air pipes, the cut end of the air pipe must be clearly marked with a suitable colored tape or paint mark.

   If the source of the air leak is found to be a pipe connection cut 5 mm (0.2 in) off the end of the air pipe and fit a new connector.

6. NOTES:

   Air pipes must only be cut using either Hose cutter 204-494, available from SPX LTD or Hose cutter YA1000A, available from Snap-On Tools.

   Only Jaguar approved air pipes have been tested to the correct pressure and temperature specifications.

   If the source of the air leak is found to be in a section of pipe cut out the damaged section of air pipe and replace with new air pipe and air pipe connectors as required.

7. NOTE: If the repair has been unsuccessful repeat the above steps until the air leak is rectified.

   Using the Jaguar approved diagnostic system ensure that the system is fully pressurized.

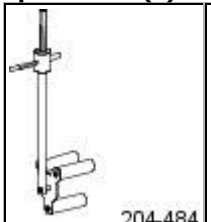
8. Using the recommended leak detection spray, spray around all of the air suspension components, working systematically to make sure that the source of the air leak has been found.

Published: 11-May-2011

Vehicle Dynamic Suspension - Ride Height Adjustments

General Procedures

Special Tool(s)

	Ride height gauge. 204-484

CAUTIONS:

Make sure the wheels and tires, tie rod ends, suspension joints and wheel bearings are free from damage, wear and free play.

Make sure there are no heavy objects in the vehicle.

The ride height must be measured with the vehicle weight supported by the suspension.

With the engine running and all vehicle doors closed, make sure the air suspension is functioning and the vehicle height can be raised and lowered using the air suspension switch.

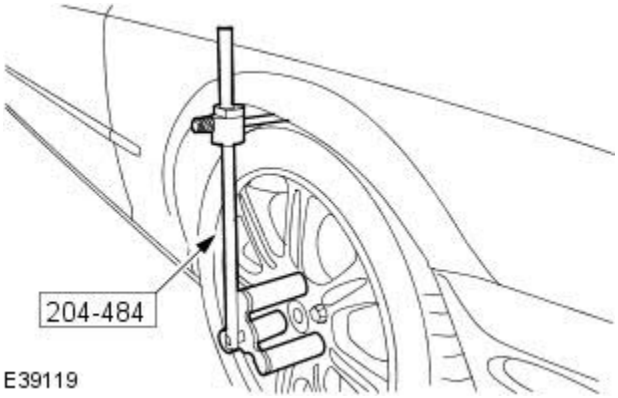
Drive the vehicle on to a flat, level surface.

Make sure the steering is in the straight ahead position.

NOTE: This procedure must be carried out after replacement of the air suspension control module, removal or replacement of a height sensor, removal or replacement of the front or rear suspension arms, replacement of body panels incorporating suspension fixing points.

1. CAUTION: Make sure the vehicle is not moved once it has been positioned to take measurements.

   Position the vehicle on a flat level surface.



2. NOTES:

   Make sure the fender splash shields are correctly fitted.

   Fit special tool 204-484 as illustrated.

   Make sure the special tool is square to the wheel face with the measuring rod in a vertical position.

   Take the measurement from the top edge of the slider on the special tool.

   Using the Jaguar approved diagnostic system carry out the ride height adjustments.

Published: 17-Dec-2012

Vehicle Dynamic Suspension - Air Suspension System Depressurize and Pressurize

General Procedures

WARNINGS:

A small amount of air pressure will be left in the air suspension system.

Eye protection must be worn.

Wear protective gloves.

CAUTIONS:

Make sure tailgate, hood and all doors are closed.

Make sure the vehicle is in a clear working area.

1. WARNING: The air suspension is pressurised. Make sure dirt or grease does not enter the system. Always wear hand, eye and ear safety standard protection when working on the system.

   Using the diagnostic tool, depressurize the air suspension system.
   - Follow the on-screen prompts.

2. Using the diagnostic tool, pressurize the air suspension system.
   - Start and run the engine.

Published: 21-Nov-2013

Vehicle Dynamic Suspension - Air Suspension Manual Tight Tolerance Setting Mode

General Procedures

Activation

NOTES:

If this procedure has been successful the instrument cluster will emit two soft chimes 1 second after the drivers door is closed. The instrument cluster will then emit two soft chimes each time the drivers door is closed to confirm that air suspension manual tight tolerance setting mode is still active.

Apply 3 light applications to the brake pedal during this procedure. Make sure that the pedal is returned to the fully off position before the next application.

1. Make sure the transmission is in the P position.
2. Run the engine.
3. Open the drivers door.
4. Press the brake pedal 3 times (making sure that the pedal is fully returned to the rest position before applying the next application).
5. Close the drivers door within 10 seconds of the first brake pedal application.

Deactivation

1. Turn the engine off or drive the vehicle over 5 mph (8 Km/h).

Published: 11-May-2011

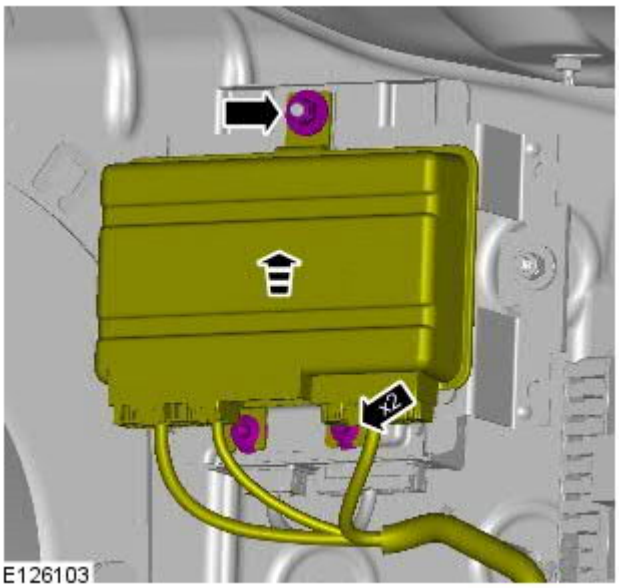
Vehicle Dynamic Suspension - Adaptive Damping Module

Removal and Installation

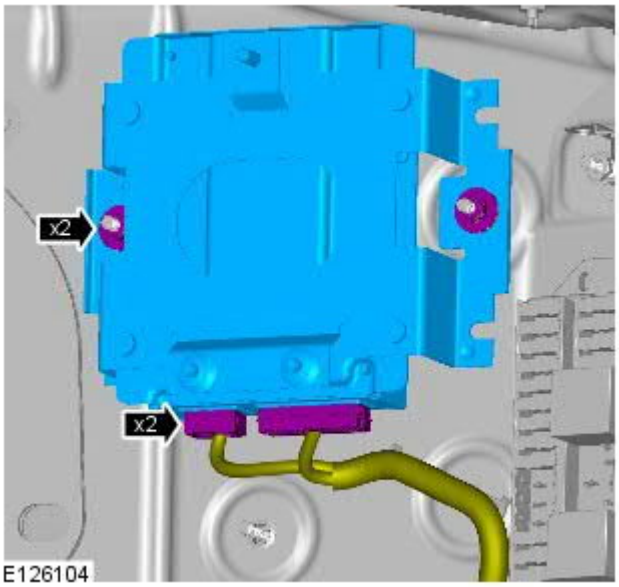
Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Loadspace Trim Panel LH (501-05 Interior Trim and Ornamentation, Removal and Installation).

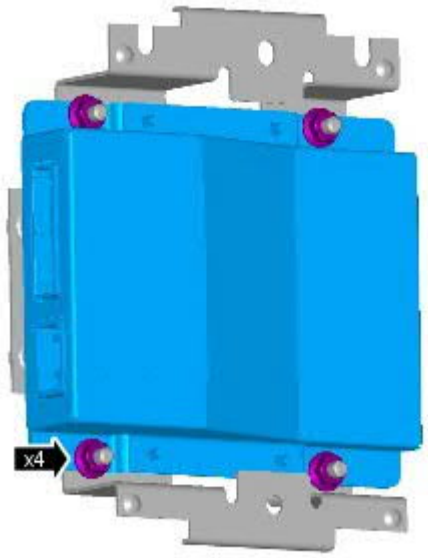


2. *Torque:* 12 Nm



3. *Torque:* 12 Nm

4. *Torque:* 12 Nm



E126102

Installation

1. To install, reverse the removal procedure.

Published: 18-Dec-2012

Vehicle Dynamic Suspension - Air Suspension Compressor

Removal and Installation

Removal

WARNING: The air suspension is pressurised. Make sure dirt or grease does not enter the system. Always wear hand, eye and ear safety standard protection when working on the system.

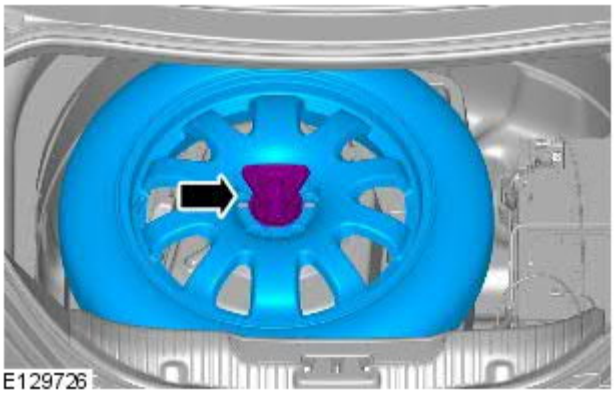
CAUTION: Do not depressurise the air suspension system before raising the vehicle.

NOTE: Removal steps in this procedure may contain installation details.

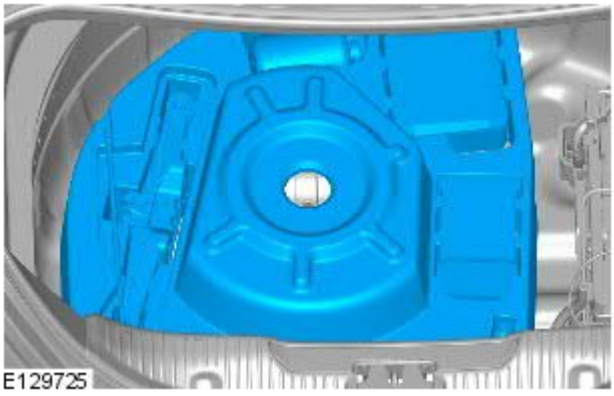
1. Refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

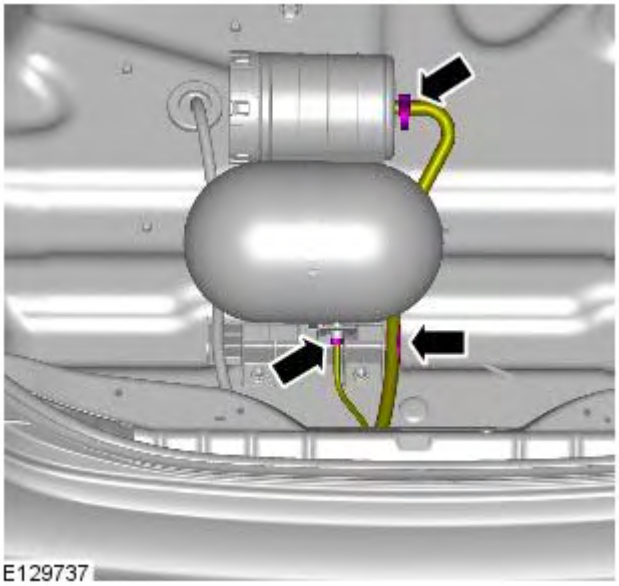
2. Refer to: Air Suspension Solenoid Valve Block (204-05 Vehicle Dynamic Suspension, Removal and Installation).

3.



4.

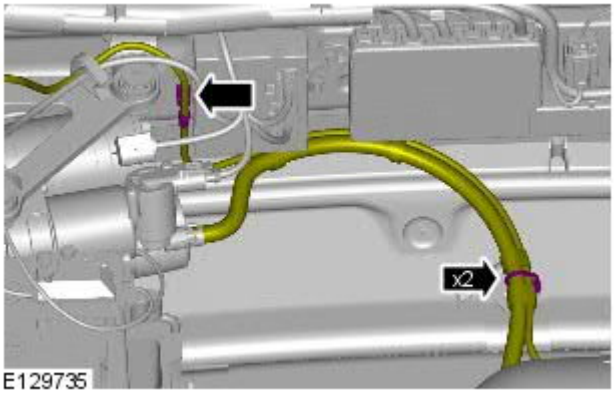




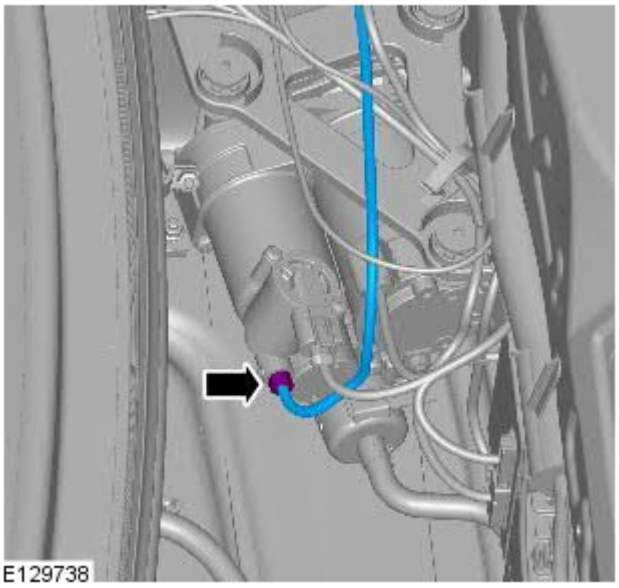
5. CAUTION: Using a suitable blanking plug, blank off the end of the air pipe to prevent dirt ingress.

   A new air line connector must be installed.

   Refer to: Air Line Connector (204-05, General Procedures).
   Torque: 3.5 Nm



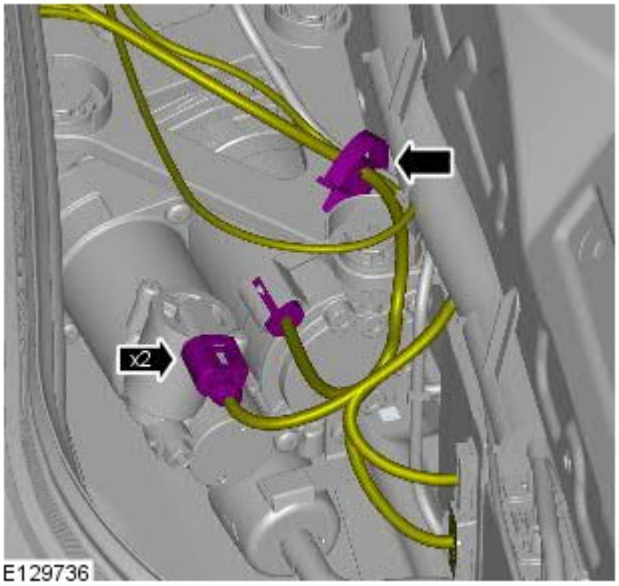
6.



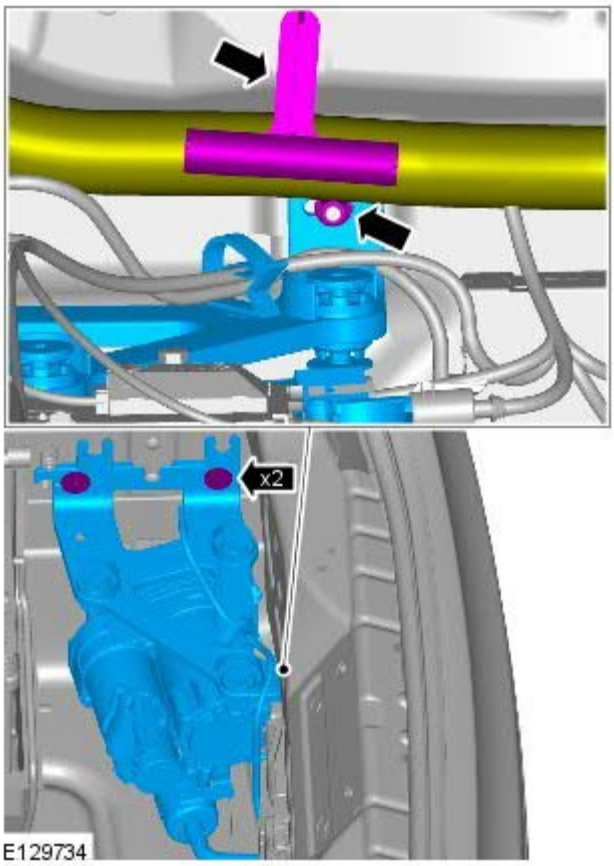
7. CAUTION: Using a suitable blanking plug, blank off the end of the air pipe to prevent dirt ingress.

   A new air line connector must be installed.

   Refer to: Air Line Connector (204-05, General Procedures).
   Torque: 3.5 Nm



8.



9. *Torque:* 9 Nm

Installation

1. To install, reverse the removal procedure.

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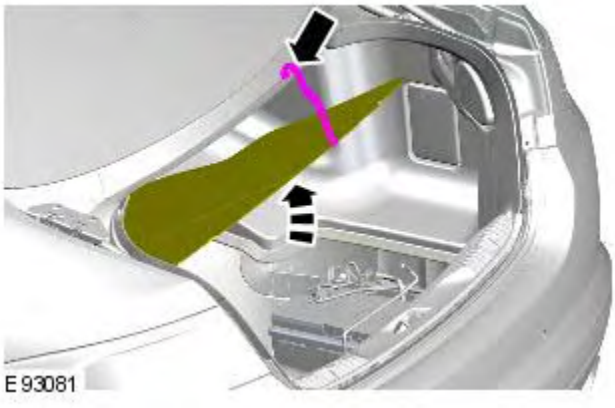
Vehicle Dynamic Suspension - Air Suspension Control Module

Removal and Installation

Removal

CAUTION: Calibration of the air suspension system must be carried out after the following components have been replaced: air suspension control module, suspension height sensor, suspension components and body panels incorporating suspension fixing points.

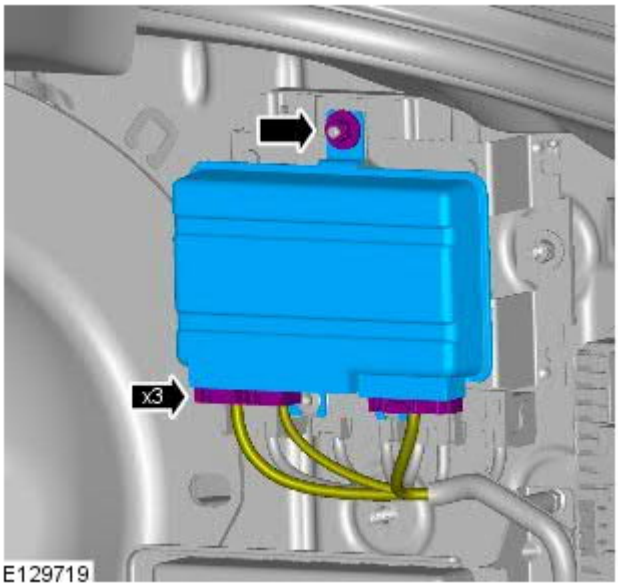
NOTE: Removal steps in this procedure may contain installation details.



1. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

3. Refer to: Loadspace Trim Panel RH (501-05 Interior Trim and Ornamentation, Removal and Installation).



4. *Torque:* 7 Nm

Installation

1. To install, reverse the removal procedure.

2. Refer to: Ride Height Adjustments (204-05 Vehicle Dynamic Suspension, General Procedures).

Published: 18-Dec-2012

Vehicle Dynamic Suspension - Air Suspension Reservoir

Removal and Installation

Removal

WARNING: The air suspension is pressurised. Make sure dirt or grease does not enter the system. Always wear hand, eye and ear safety standard protection when working on the system.

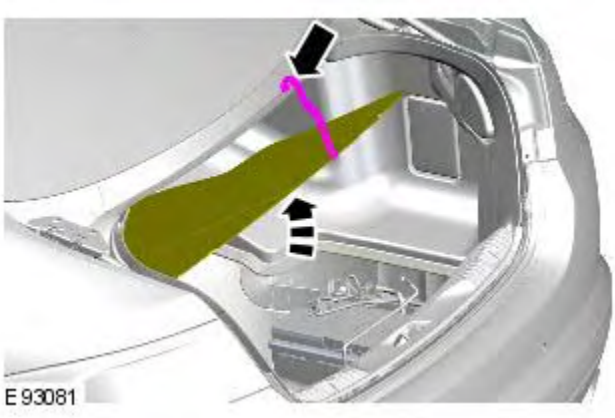
NOTES:

Removal steps in this procedure may contain installation details.

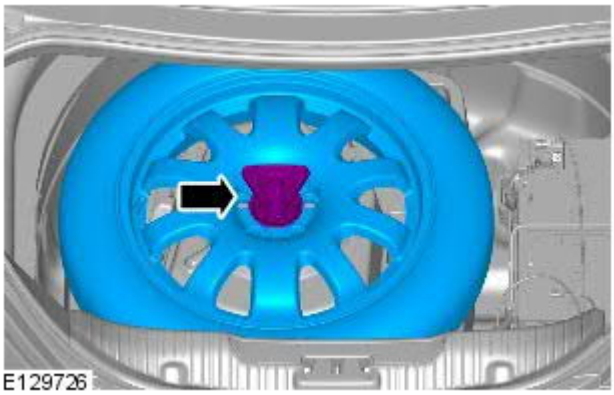
Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

2.



3.



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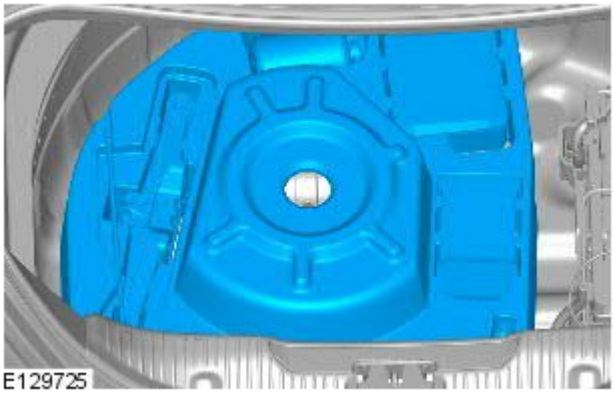
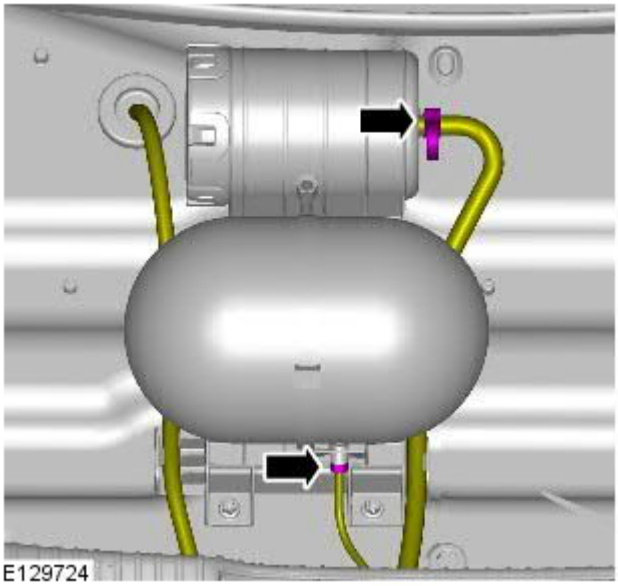


4.

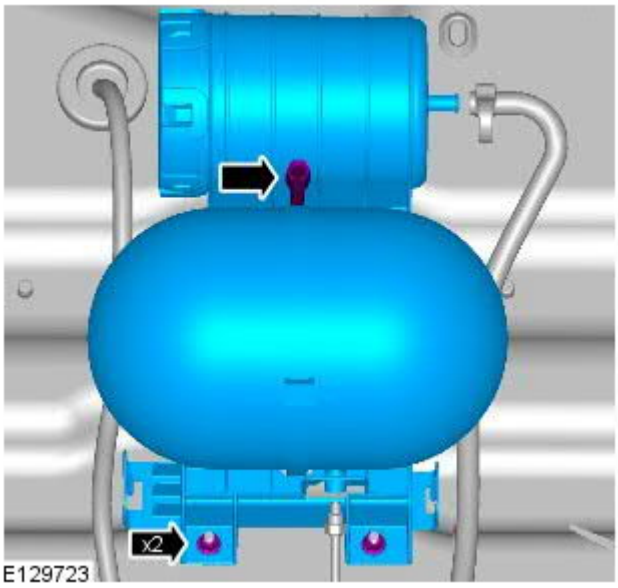


5. WARNING: Loosen the pipes no more than one full turn to allow the stored air pressure to vent for a minimum of three seconds.

CAUTION: Using a suitable blanking plug, blank off the end of the air pipe to prevent dirt ingress.

A new air line connector must be installed.

Refer to: Air Line Connector (204-05, General Procedures).
Torque: 3.5 Nm



6. *Torque:* 7 Nm

Installation

1. To install, reverse the removal procedure.

2. Check the diagnostic trouble codes (DTC)s using the approved diagnostic tool. Clear or repair as necessary

Published: 18-Dec-2012

Vehicle Dynamic Suspension - Air Suspension Solenoid Valve Block

Removal and Installation

Removal

WARNING: The air suspension is pressurised. Make sure dirt or grease does not enter the system. Always wear hand, eye and ear safety standard protection when working on the system.

CAUTION: Do not depressurise the air suspension system before raising the vehicle.

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

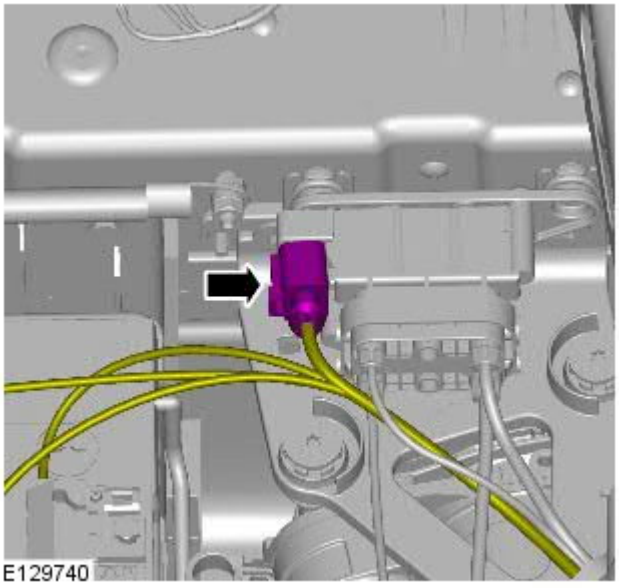
1. WARNING: Make sure to support the vehicle with axle stands.

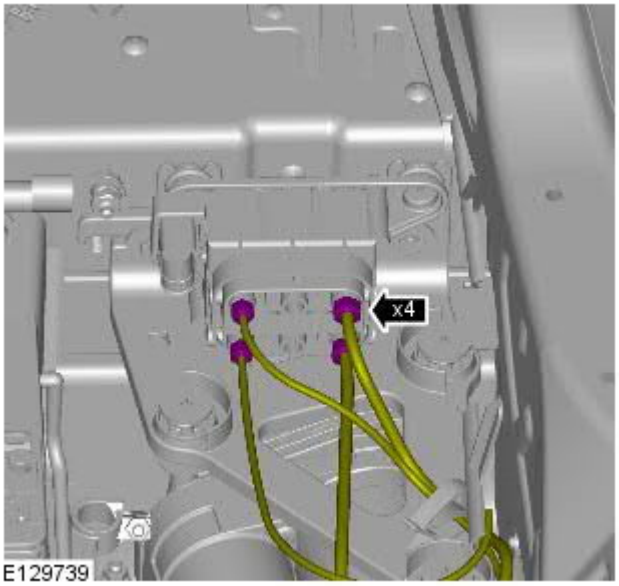
   Raise and support the vehicle.

2. Refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

3. Refer to: Loadspace Trim Panel RH (501-05 Interior Trim and Ornamentation, Removal and Installation).

4.



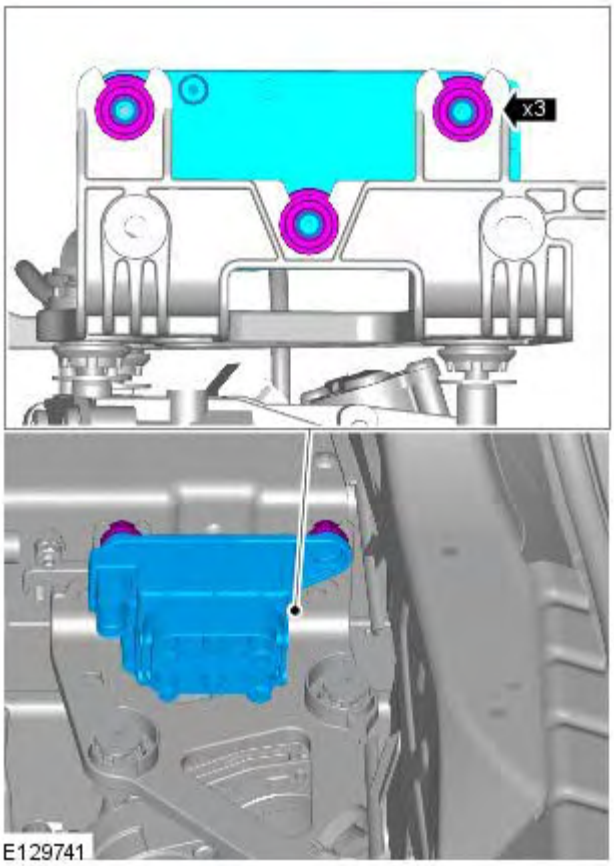


5. CAUTION: Using a suitable blanking plug, blank off the end of the air pipe to prevent dirt ingress.

   NOTE: Note the orientation of the colour coded air lines prior to removal

   Discard the air line connectors.

   Refer to: Air Line Connector (204-05, General Procedures).
   Torque:
   4 mm pipe 2 Nm
   6 mm pipe 3.5 Nm



6.

Installation

1. NOTE: New air line connectors must be installed.

   To install, reverse the removal procedure.

   Refer to: Air Line Connector (204-05, General Procedures).

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Vehicle Dynamic Suspension - Front Suspension Vertical Accelerometer

Removal and Installation

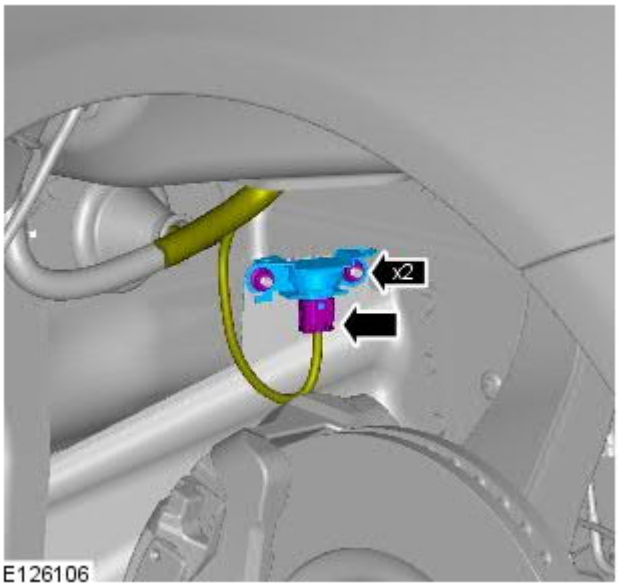
Removal

NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).



3. CAUTION: The accelerometer is an extremely delicate component and can easily be rendered unserviceable. Never use an accelerometer which has been dropped or subjected to mistreatment of any type.

   Torque: 5 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Vehicle Dynamic Suspension - Front Suspension Height Sensor

Removal and Installation

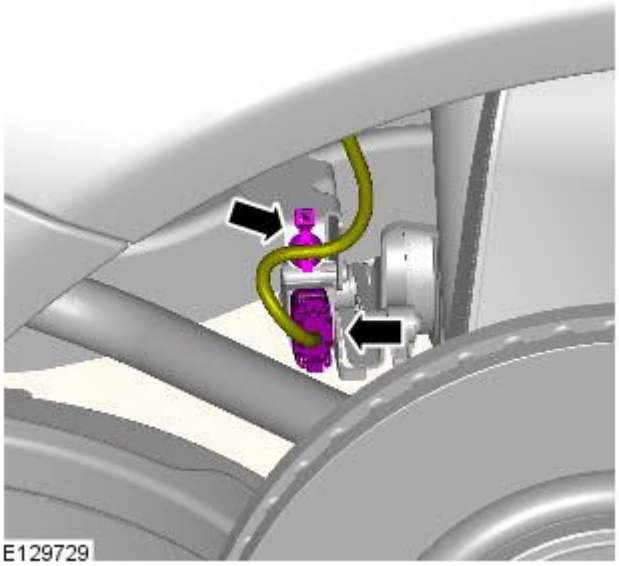
Removal

NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

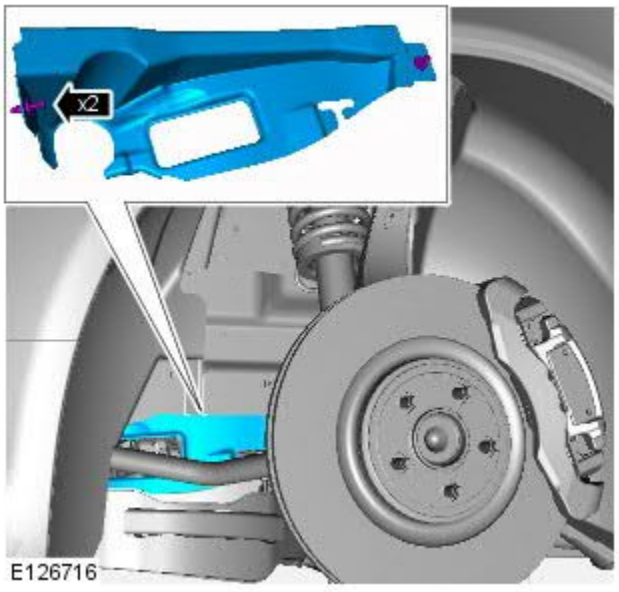
   Raise and support the vehicle.

2. Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

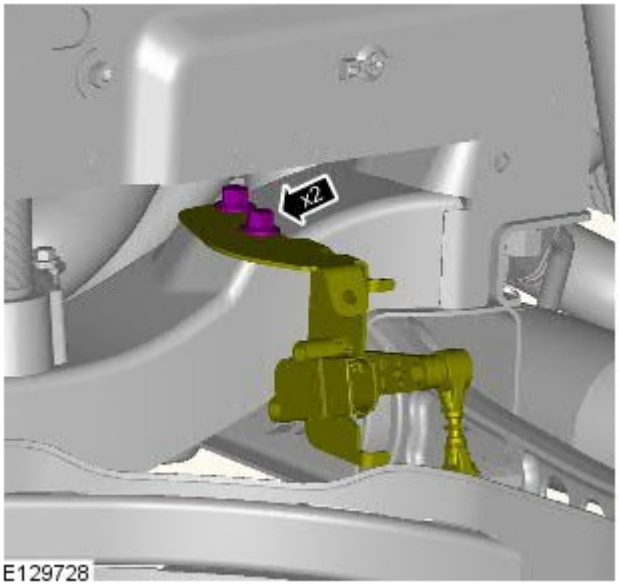


3. CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean.

   NOTE: Left-hand shown, right-hand similar.

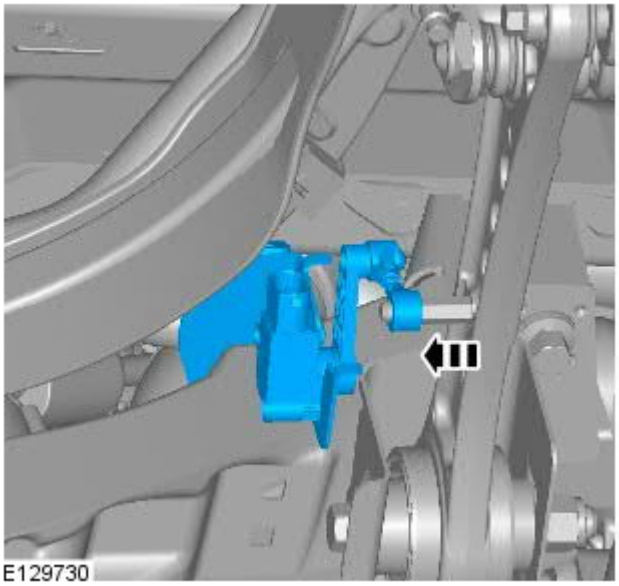


4. NOTE: LH side only.



5. NOTE: Left-hand shown, right-hand similar.

   Torque: 20 Nm



6. NOTE: Left-hand shown, right-hand similar.

Installation

1. To install, reverse the removal procedure.
2. Refer to: Ride Height Adjustments (204-05 Vehicle Dynamic Suspension, General Procedures).

Published: 11-May-2011

Vehicle Dynamic Suspension - Rear Suspension Height Sensor

Removal and Installation

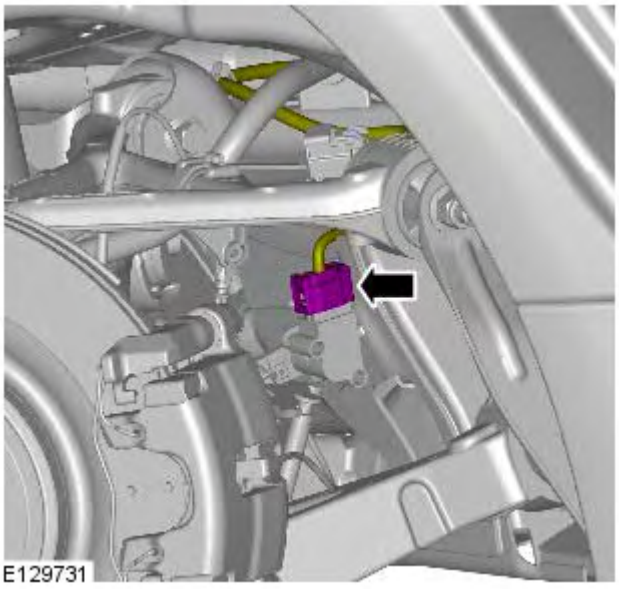
Removal

NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

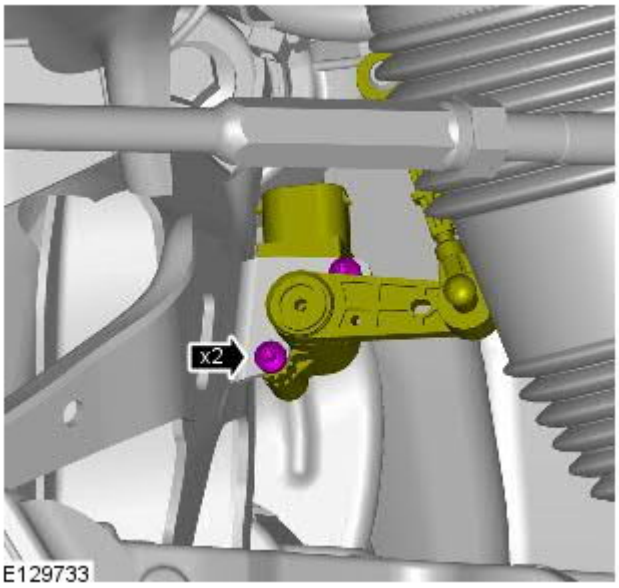
2. Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).



3. CAUTIONS:

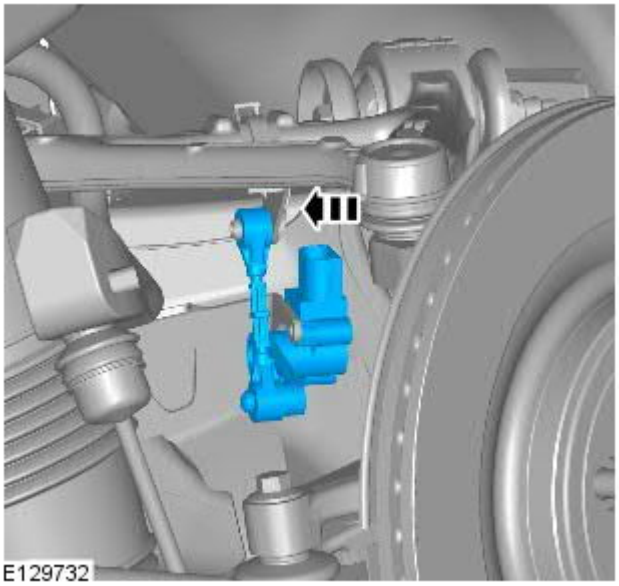
   RH illustration shown, LH is similar.

   Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean.



4. CAUTION: RH illustration shown, LH is similar.

   Torque: 4 Nm



5. CAUTION: RH illustration shown, LH is similar.

Installation

1. To install, reverse the removal procedure.

2. Refer to: Ride Height Adjustments (204-05 Vehicle Dynamic Suspension, General Procedures).

Published: 11-May-2011

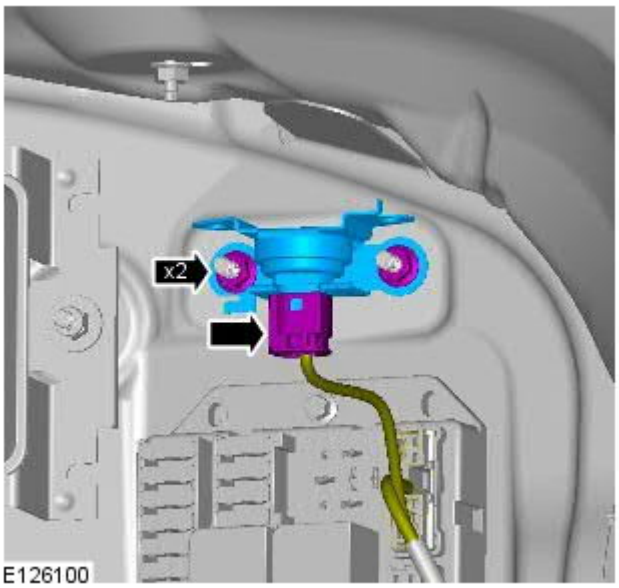
Vehicle Dynamic Suspension - Rear Suspension Vertical Accelerometer

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Loadspace Trim Panel RH (501-05 Interior Trim and Ornamentation, Removal and Installation).



2. CAUTION: The accelerometer is an extremely delicate component and can easily be rendered unserviceable. Never use an accelerometer which has been dropped or subjected to mistreatment of any type.

   Torque: 5 Nm

Installation

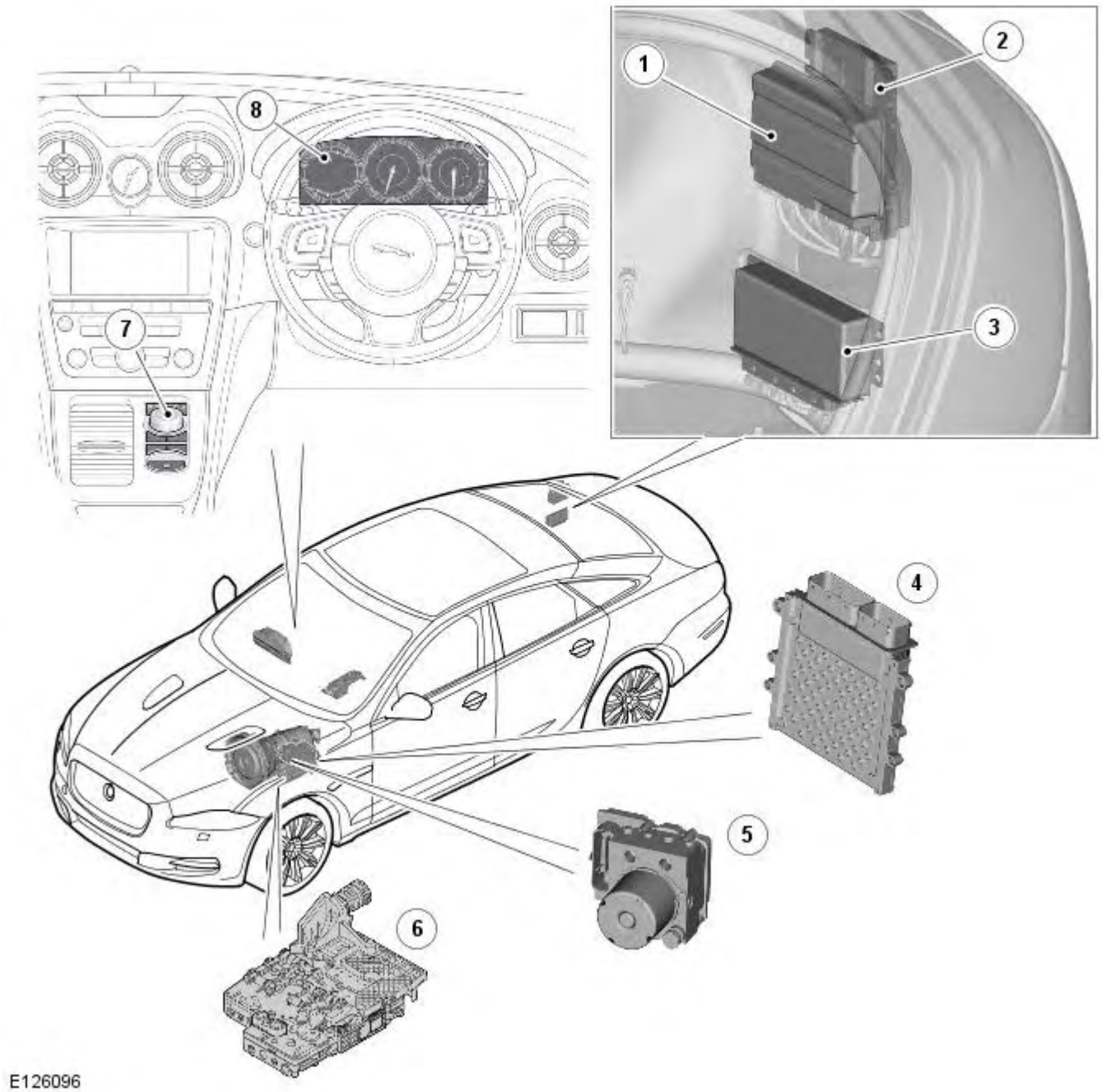
1. To install, reverse the removal procedure.

Published: 11-May-2011

Ride and Handling Optimization - Ride and Handling Optimization - Component Location

Description and Operation

COMPONENT LOCATION



Item	Description
1	Air suspension module
2	ADM (adaptive damping module)
3	DLM (differential locking module)
4	ECM (engine control module)
5	ABS (anti-lock brake system) module
6	TCM (transmission control module)
7	JaguarDrive selector module
8	Instrument cluster

Published: 11-May-2011

Ride and Handling Optimization - Ride and Handling Optimization - Overview

Description and Operation

OVERVIEW

JaguarDrive control is a selectable vehicle optimization system designed to fine-tune the driving characteristics of the vehicle by accommodating different driving conditions or driving styles. The system allows the performance envelope of the vehicle to be stretched and prevents the necessity for a single, compromised configuration for all conditions. JaguarDrive control increases the vehicle's abilities by changing the characteristics of engine mapping, transmission shifts, stability and traction interventions, suspension settings and, on SC (supercharger) vehicles, the electronic differential settings.

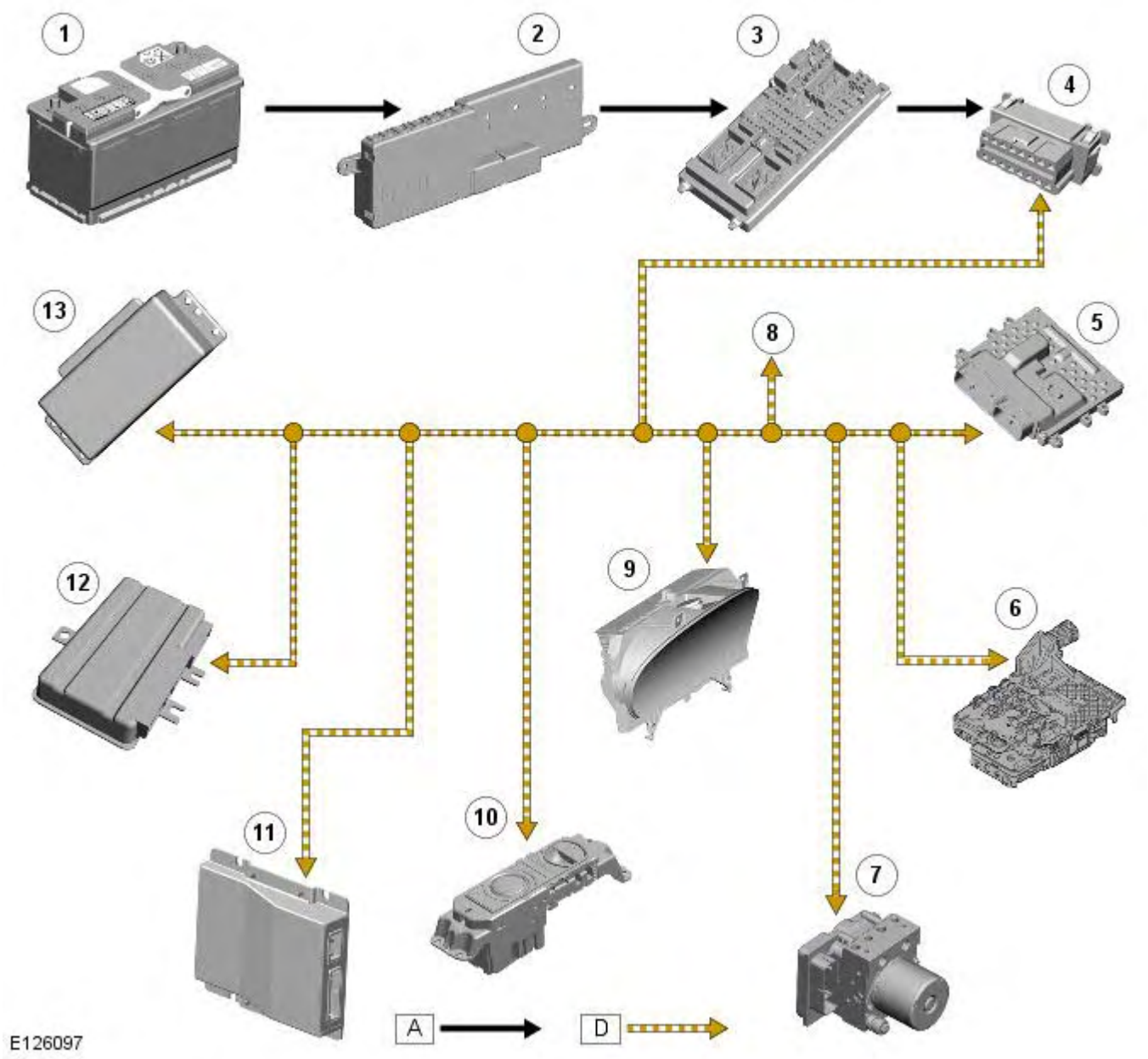
Published: 11-May-2011

Ride and Handling Optimization - Ride and Handling Optimization - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: A = Hardwired; D = High speed CAN (controller area network) bus.



Item	Description
1	Battery
2	BJB (battery junction box) (50 A midifuse)
3	CJB (central junction box) (fuse 66)
4	Diagnostic socket
5	ECM (engine control module)
6	TCM (transmission control module)

7	ABS (anti-lock brake system) module
8	High speed CAN connection to other systems
9	Instrument cluster
10	JaguarDrive selector module
11	ADM
12	Air suspension module
13	DLM

System Operation

PRINCIPLES OF OPERATION

Engine Management System

The EMS (engine management system) varies the accelerator pedal maps to change the amount of torque per percentage of pedal travel. The EMS can also change the accelerator pedal response to control the allowed torque change relative to the speed of pedal travel.

Each driving mode uses a combination of operating parameters for each sub-system. Changing between driving modes initiates a different set of operating characteristics, which will be noticeable to the driver. The driver will notice differences in engine response when, for example, the accelerator pedal is held in a constant position and the driving mode is changed from winter to dynamic, the driver will notice the torque and engine speed increase. Similarly, if the mode is changed from normal or dynamic to winter, the driver will notice a reduction in torque and engine speed.

NOTE: The change in torque and engine speed can take approximately 30 seconds and care must be taken not to confuse the JaguarDrive control system operation with an EMS fault.

Transmission Control

The TCM changes the shift maps for the JaguarDrive control mode selected. This changes the shift points providing early or late upshifts and downshifts. For example, on slippery surfaces in winter mode the transmission will select 2nd gear for starting from a standstill on a flat surface to minimize wheel slip.

Anti-lock Braking System Control

The ABS module controls several vehicle functions and adjusts the operating parameters of these functions to optimize the selected JaguarDrive control mode. Traction control uses different slip/acceleration thresholds to improve traction and vehicle composure.

If TracDSC is selected or DSC is switched off, then subsequently the JaguarDrive control mode is changed, DSC is automatically switched back on.

The stability control uses different threshold values for the selected mode, reducing the requirement for the driver to change the DSC system mode for optimum performance in various driving scenarios.

Incorrect Mode Usage

Selection of an inappropriate mode is discouraged in the following ways:

- The active mode icon is continually displayed in the instrument cluster message center and on the selected mode button on the JaguarDrive selector module.
- In dynamic mode, when the ignition has been in the off position continuously for more than 6 hours, the JaguarDrive control system defaults to the special modes off (DSC on).

Selection of an inappropriate mode for the conditions will not endanger the driver or immediately cause damage to the vehicle. Continued use of an inappropriate mode may reduce the life of some components. The driver may notice a different vehicle response, with the engine and transmission responses being different than in the special modes off.

Driver Information

The message center contains the JaguarDrive control mode icons, which display the currently selected mode. If no symbol is displayed, no special mode is selected and the system is in special modes off.

In dynamic mode when the transmission is in sport and manual mode, the gear information is displayed in red when the appropriate engine speed is reached for the optimum sporty change point.

Diagnostics

The JaguarDrive control system relies on the correct functionality of the sub-systems. If one of the sub-systems develops a fault, the JaguarDrive control system will not function, even though the fault is not in the JaguarDrive control system.

The JaguarDrive selector module and the mode buttons should only be investigated if there are no apparent faults in any of the sub-systems. If a fault in a sub-system is subsequently corrected, the JaguarDrive control system will function normally after an engine on and off cycle.

JaguarDrive Control Sub-System Faults

If a fault occurs in a sub-system, the driver is alerted by the illumination of a warning indicator and/or an appropriate message for that sub-system in the instrument cluster message center. No JaguarDrive control message will be shown when a failed sub-system displays its own message.

When a sub-system fault is present and the driver attempts to select a different JaguarDrive control mode or at the next ignition on cycle, a message WINTER MODE UNAVAILABLE or DYNAMIC MODE UNAVAILABLE will appear in the message center. This generally implies that the JaguarDrive control system has a fault, but only because a sub-system fault is preventing its operation. This message will be displayed once per ignition cycle, but is repeated if a further selection is made by the driver using the JaguarDrive control buttons or at the next ignition on cycle.

NOTE: The message WINTER MODE UNAVAILABLE or DYNAMIC MODE UNAVAILABLE can also in very rare circumstances be generated by a fault in the JaguarDrive selector module.

It is not possible for the JaguarDrive selector module to cause any fault behavior (warning indicator illumination or message generation) in any of the sub-systems. Illumination of a sub-system warning indicator and/or a sub-system related message will never be associated with a JaguarDrive selector module or JaguarDrive control system fault.

The sub-system control modules can detect a fault with the CAN bus signal from the JaguarDrive selector module. If a fault in the JaguarDrive control system is detected, the sub-system control modules will operate in the special modes off setting. The sub-system control modules will record a fault code for a failure of the JaguarDrive control CAN signal. These faults can be retrieved using the Jaguar approved diagnostic tool and will provide useful information to indicate investigation of the JaguarDrive selector module or the CAN bus network.

JaguarDrive Control System or Control Module Fault

If a fault occurs in the JaguarDrive control system, all button icon LED (light emitting diode) will be turned off (if applicable, background illumination will remain on) and pressing of the JaguarDrive control buttons is ignored. The instrument cluster message center will display a message WINTER MODE UNAVAILABLE or DYNAMIC MODE UNAVAILABLE when the fault occurs, if the fault is present and the driver attempts to select a special mode (if the control module is able to do this) or at the next ignition on cycle.

The JaguarDrive control buttons and selector module are an integrated unit. If a fault occurs in either component, the whole unit will require replacement, however, this is extremely unlikely.

CAN Bus Faults

If a CAN bus fault exists and prevents JaguarDrive control system operation, all of the JaguarDrive control button icon LED will be illuminated and pressing of the JaguarDrive control buttons is ignored.

If the instrument cluster does not receive a JaguarDrive control system CAN bus message from the JaguarDrive selector module, the message SPECIAL MODES UNAVAILABLE will be displayed when the fault occurs and will be repeated at every ignition on cycle.

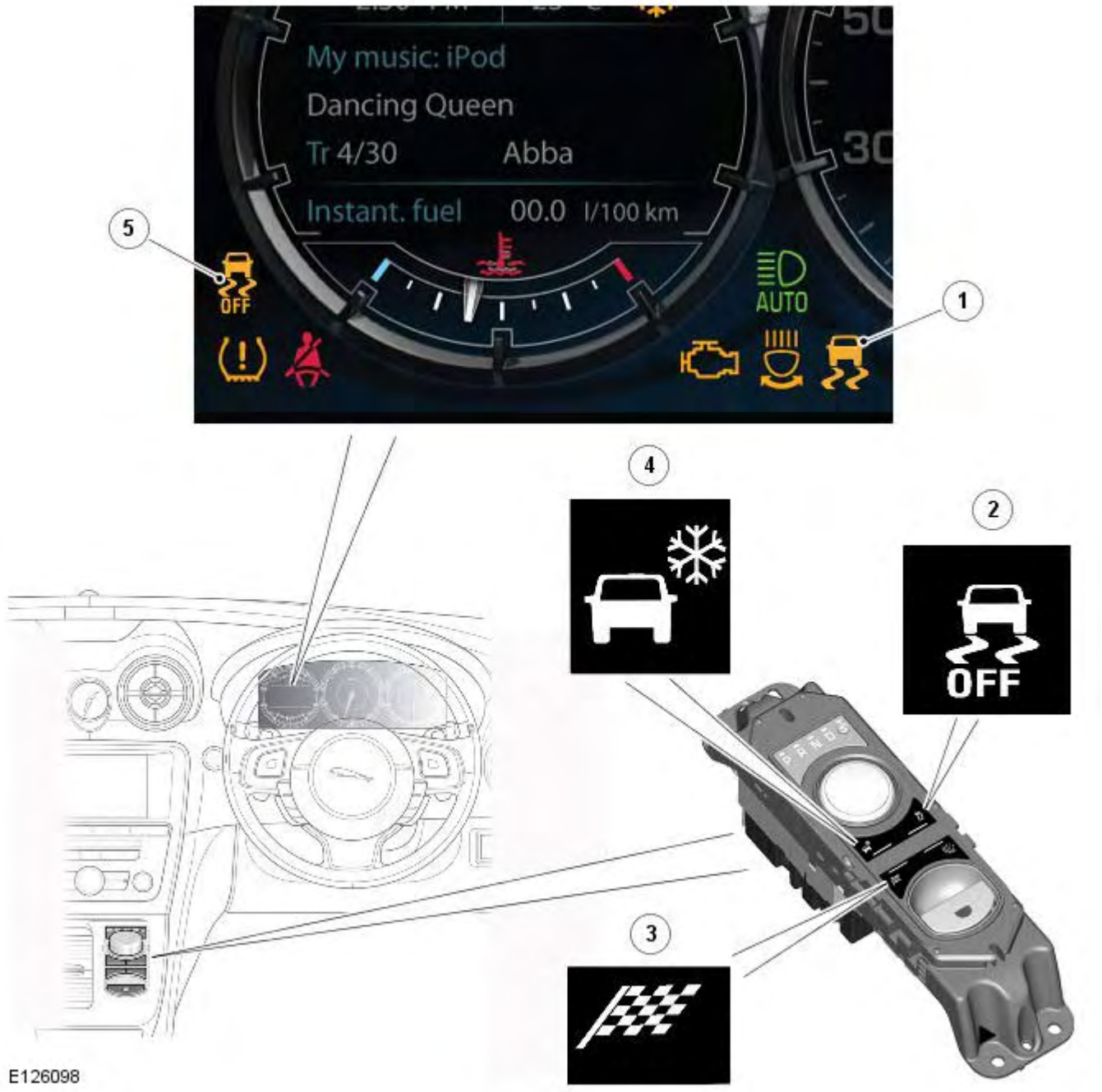
User Error

A special mode change will not occur while DSC or ABS is active (including ABS cycling). This may be misinterpreted as a system fault.

Component Description

JAGUARDRIVE CONTROLS

JaguarDrive Mode Buttons and Warning Indicators



Item	Description
1	DSC warning indicator
2	DSC/TracDSC mode button
3	Dynamic mode button
4	Winter mode button
5	DSC OFF warning indicator

The system is controlled by buttons adjacent to the JaguarDrive selector on the floor console. The buttons allow the selection of one of the following three modes:

- Special modes off
- Winter mode
- Dynamic mode.

The instrument cluster will display the selected JaguarDrive control mode in the message center.
Refer to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation).

The JaguarDrive control system uses a combination of a number of vehicle sub-systems to achieve the required vehicle characteristics for the mode selected. The following sub-systems make up the JaguarDrive control system:

- EMS (engine management system). For additional information, refer to:

Electronic Engine Controls (303-14B Electronic Engine Controls - V8 S/C 5.0L Petrol, Description and Operation),
Electronic Engine Controls (303-14C Electronic Engine Controls - V8 5.0L Petrol, Description and Operation).

- Automatic transmission.
  Refer to: Transmission Description (307-01 Automatic Transmission/Transaxle, Description and Operation).
- Brake system.
  Refer to: Anti-Lock Control - Stability Assist (206-09 Anti-Lock Control - Stability Assist, Description and Operation).
- Adaptive dynamics.
  Refer to: Vehicle Dynamic Suspension (204-05 Vehicle Dynamic Suspension, Description and Operation).
- Electronic differential control (where fitted).

The JaguarDrive control software is stored in the JaguarDrive selector module located below the JaguarDrive selector. The module detects the selection made using the buttons and transmits a signal on the high speed CAN bus, which is received by each of the sub-system control modules.

Each of the affected sub-system control modules contain software, which applies the correct operating parameters to their controlled system for the JaguarDrive control mode selection made.

Each sub-system control module also provides feedback for the selected mode so that the JaguarDrive control software can check that all systems have changed to the correct operating parameters.

NOTE: The JaguarDrive control system is a co-ordinating system only. It CANNOT generate a fault in one of the participating sub-systems. All participating sub-systems should be FULLY diagnosed before assuming a fault with JaguarDrive control. The JaguarDrive selector module should not be replaced until all other options have been exhausted.

Winter Mode

To activate winter mode, press the winter mode button briefly (not less than 500 ms) to activate or de-activate the mode.

NOTE: Winter mode cannot be active at the same time as dynamic mode.

When active the winter mode icon and message appear in the instrument cluster message center to confirm the activation.

Dynamic Stability Control

Press the DSC (dynamic stability control) mode button briefly (not less than 300 ms) to switch between DSC and TracDSC. The instrument cluster message center will temporarily display either DSC ON or TRAC DSC depending on which selection is made. When TracDSC is selected, the DSC OFF warning indicator in the instrument cluster is illuminated and the DSC button is illuminated. TracDSC is intended only for use on dry tarmac by suitably experienced drivers.
Refer to: Anti-Lock Control - Stability Assist (206-09 Anti-Lock Control - Stability Assist, Description and Operation).

DSC can be manually switched off by pressing the DSC mode button for more than 10 seconds. Confirmation is given by a chime from the instrument cluster, DSC OFF is displayed in the instrument cluster message center and the DSC OFF warning indicator in the instrument cluster is illuminated.

NOTE: DSC is operational at all times when the engine is running unless manually switched off.

Dynamic Mode

To activate dynamic mode, press the button briefly. The dynamic mode button is illuminated. Dynamic mode confirmed message is displayed in the instrument cluster message center.

NOTE: Dynamic mode cannot be active at the same time as winter mode.

In transmission sport mode and manual mode, the driver has full control over the transmission shift points and the TCM will not intervene to prevent engine overspeed (i.e. automatic upshifts are inhibited). In this setting, the gear indicator in the instrument cluster will turn red at high engine speeds to indicate an appropriate manual upshift point.

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Driveline System - General Information - Driveline System

Diagnosis and Testing

Principles of Operation

For a detailed description of the driveline system and operation, refer to the relevant Description and Operation section in the workshop manual. REFER to:

Rear Drive Halfshafts (205-05 Rear Drive Halfshafts, Diagnosis and Testing),
Rear Drive Axle and Differential (205-02 Rear Drive Axle/Differential, Diagnosis and Testing),
Driveline System (205-00 Driveline System - General Information, Diagnosis and Testing),
Driveshaft (205-01 Driveshaft, Diagnosis and Testing).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern.
   - If a road test is necessary make sure the vehicle is safe to do so.
2. Visually inspect for obvious mechanical faults.

Visual Inspection

Mechanical
• Wheel rim and tire damage or runout • Check all the driveshafts and halfshafts for damage including dents, cracks and excessive runout • Check all the CV joint gaiters for splits, damage and security • Check all the driveshafts and halfshafts for correct alignment • Check the driveshaft mounting bolts security • Check all the driveshaft and halfshaft joints for excessive movement • Check the rear driveshaft centre support bearing for security, damage and excessive wear • Check the rear differential mounting bolts and bushes for wear, damage and security • Check the rear differential for oil leaks

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Causes	Action
Vibration through the vehicle body at a specified speed	• Road wheel imbalance • Driveshaft imbalance	Road test the vehicle. If the vibration is only at a specified speed, balance the road wheels. Test for normal operation. Disconnect the rear driveshaft. Check CV and universal joints for smooth and full movement. Disconnect the front driveshaft. Check CV joints for smooth and full movement. If any joints are faulty, replace the driveshaft. Test for normal operation.
Vibration through the vehicle body at all speeds	• Misalignment of the rear driveshaft • Bent or misaligned stub axle	Road test the vehicle. Check the rear driveshaft for correct alignment through the centre support bearing. Rectify as necessary. Test for normal operation. Check for a damaged or bent stub axle. Rectify as necessary.
Rumbling noise from the rear of the vehicle varying at different vehicle speed and load	• Rear differential bearings worn • Rear wheel bearings worn • Rear driveshaft centre support bearing worn	Using a suitable listening device (e.g. stethoscope) listen to the rear differential pinion bearings and output bearings, the rear wheel bearings and the rear driveshaft centre bearing. Rectify as necessary. Test for normal operation.
Rumbling noise from the front of the vehicle varying at different vehicle speed and load	• Front differential bearings worn • Front wheel	Using a suitable listening device (e.g. stethoscope) listen to the front differential pinion bearings and output bearings and the front wheel bearings. Rectify as necessary. Test for normal operation.

Symptom	Possible Causes	Action
	bearings worn	
Whining noise from the rear of the vehicle during acceleration and overrun conditions	• Rear differential gears worn or damaged	Check and top up the rear differential oil level if necessary. Using a suitable listening device (e.g. stethoscope) listen to the rear differential. Replace the rear differential unit if there is excessive gear noise. REFER to: Rear Drive Axle and Differential (205-02 Rear Drive Axle/Differential, Diagnosis and Testing).
Knocking, clicking or clunking noise from rear of vehicle during acceleration and overrun conditions	• Rear driveshaft joint fixings insecure • Rear driveshaft joints worn or damaged • Rear halfshaft joints or splined shaft worn or damaged • Rear differential internal components worn or damaged	Disconnect the rear driveshaft. Check joint mounting bolt holes for elongation. Check the joints. Disconnect the rear halfshafts. Check the shaft splines for wear or damage. Check the CV joints. Rectify as necessary. With the rear driveshaft and halfshafts disconnected, check the rear differential for tight spots or excessive play. Rectify as necessary.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Rear Differential Control Module (RDCM) (100-00 General Information, Description and Operation).

Published: 11-May-2011

Driveshaft -

Torque Specifications

Description	Nm	lb-ft	lb-in
Centre bearing retaining bolts	48	35	-
Transmission flexible joint retaining bolts	127	94	-
Rear drive axle constant velocity (CV) joint retaining bolts	75	55	-

Published: 22-May-2013

Driveshaft - Driveshaft

Diagnosis and Testing

For additional information.
REFER to: Driveline System (205-00 Driveline System - General Information, Diagnosis and Testing).

Published: 11-May-2011

Driveshaft - Driveshaft Runout and Balancing

General Procedures

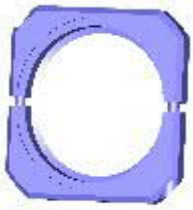
1. For additional information, refer to the Jaguar Approved Diagnostic System.

Published: 11-May-2011

Driveshaft - Driveshaft TDV6 3.0L Diesel

Removal and Installation

Special Tool(s)

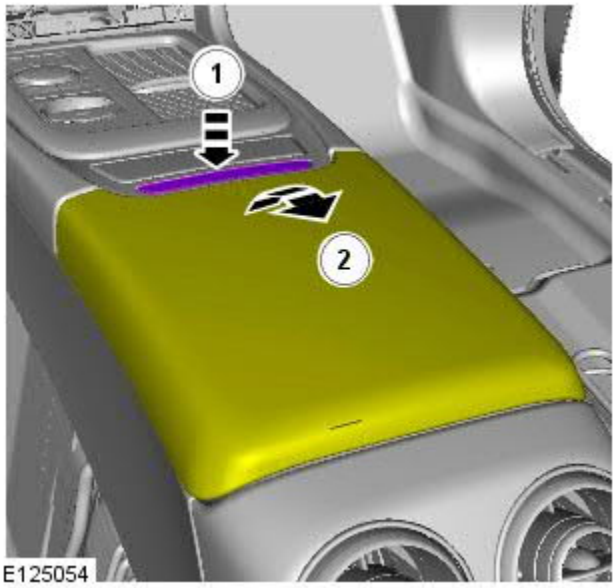
 E117586	205-932 Remover, Driveshaft

Removal

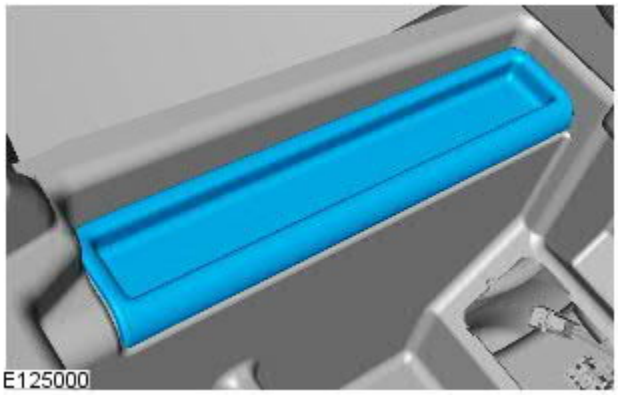
CAUTION: Apply the parking brake, chock the wheels and ensure that all personnel are clear of the vehicle before carrying out the following procedure.

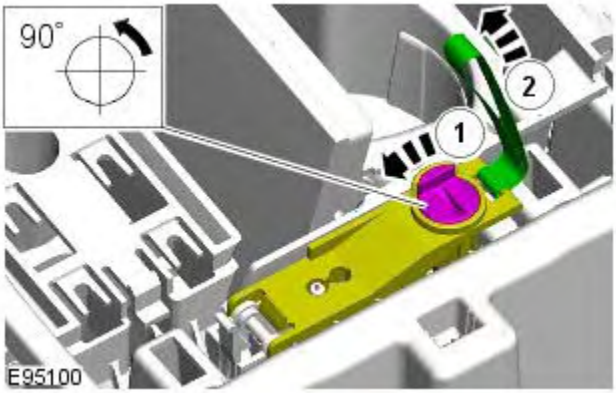
NOTE: Select NEUTRAL before disconnecting the battery, to allow the driveshaft to be turned.

1.



2.





3. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

4. NOTE: The ignition must be switched on.

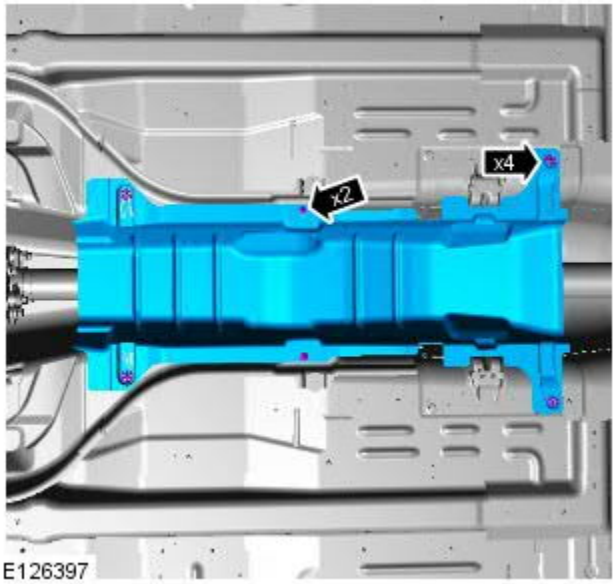
5. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

6. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

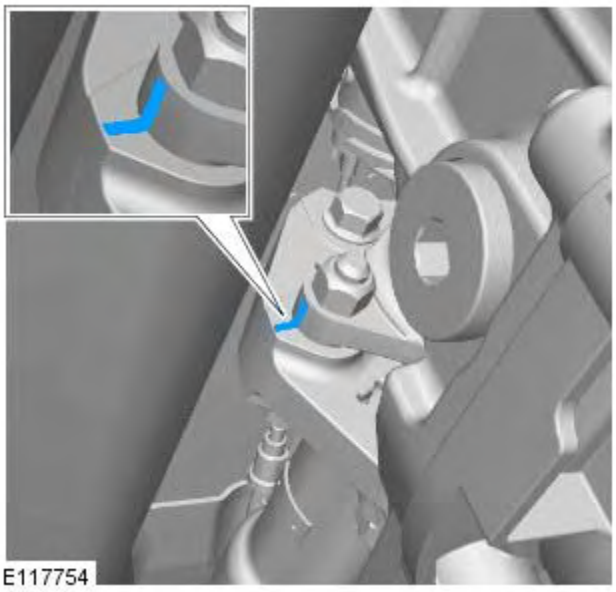
   Raise and support the vehicle.

7. Refer to: Exhaust System (309-00A Exhaust System - TDV6 3.0L Diesel, Removal and Installation).

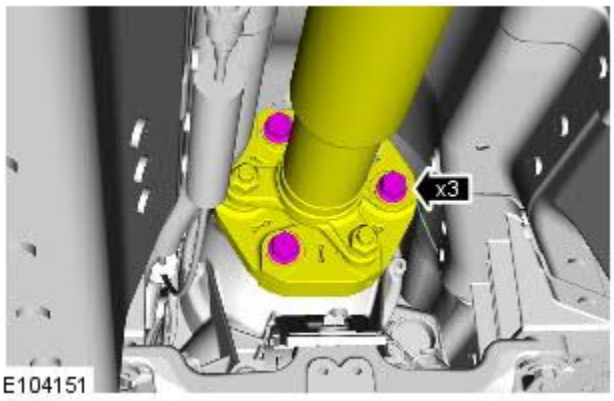
8.

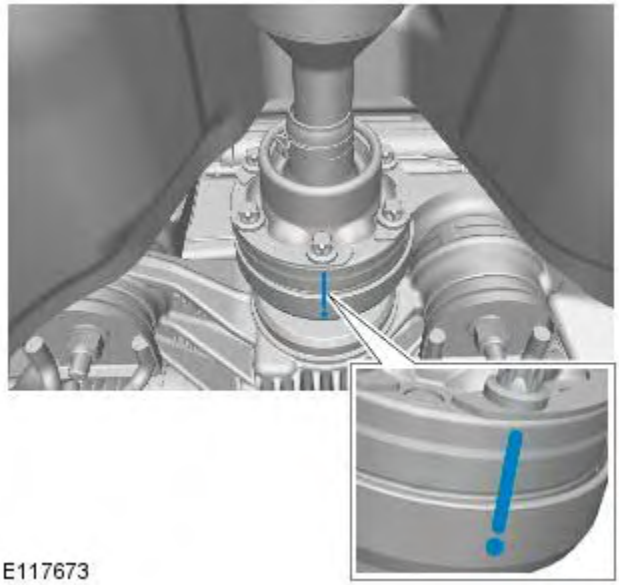


9. NOTE: Mark the position of the driveshaft on the transmission flange.



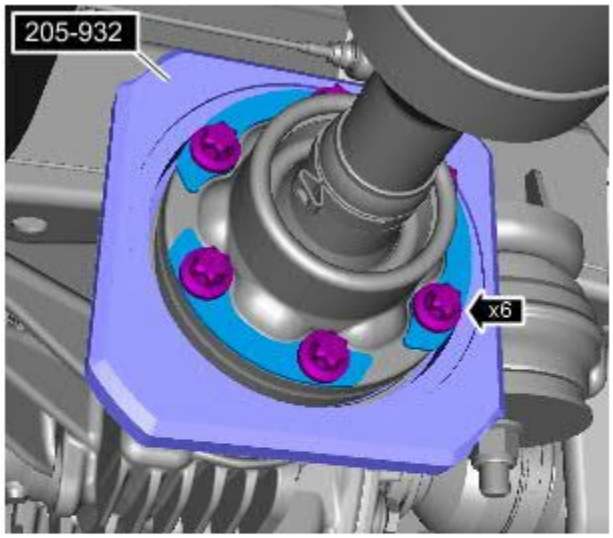
10. CAUTION: Under no circumstances must the flexible coupling (or it's fixings) be loosened or removed from the driveshaft.

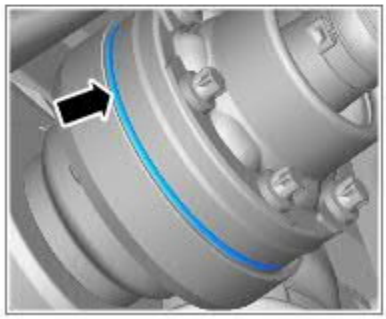



E117673

11. CAUTION: Do not use the 5mm hole on the differential case flange for the alignment mark.

NOTE: Using the 3mm hole on the differential case flange, paint an alignment mark (as indicated) to aid correct installation of the driveshaft to the differential case.

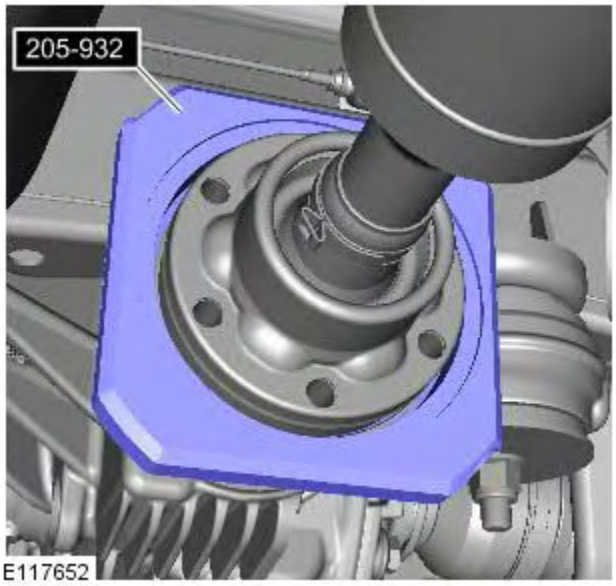



E117651

12. CAUTION: To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

NOTE: Make sure that the special tool is correctly installed to the recess on the driveshaft.

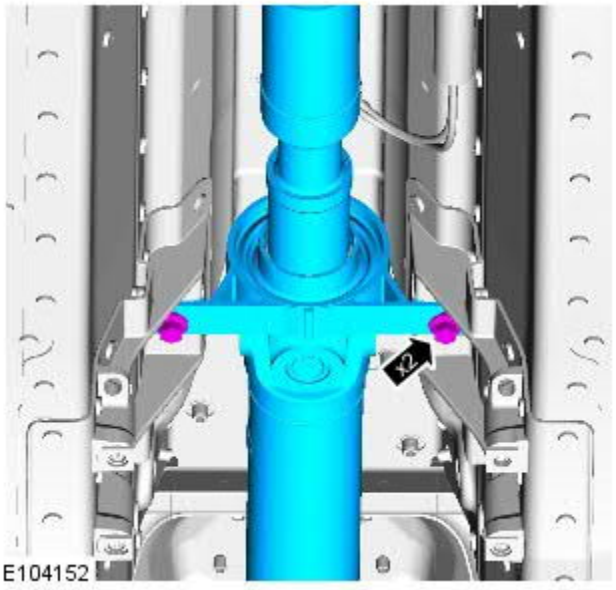
Special Tool(s): 205-932



13. CAUTION: To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

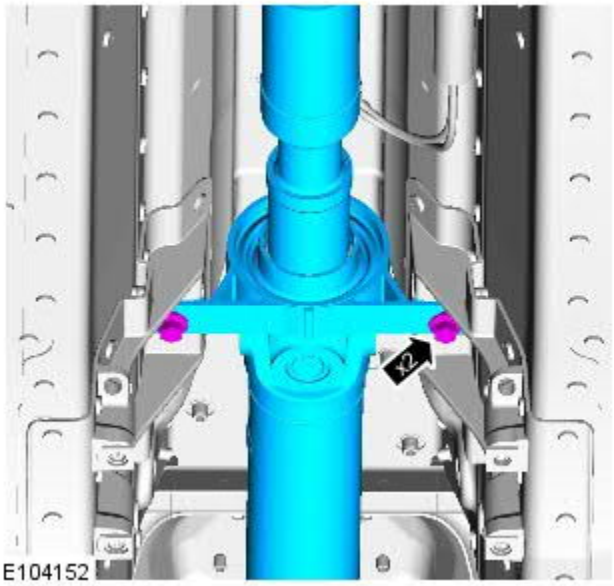
NOTE: Using a suitable hammer and drift, make sure that you only hit the corner edges of the special tool to remove the driveshaft.

Special Tool(s): 205-932

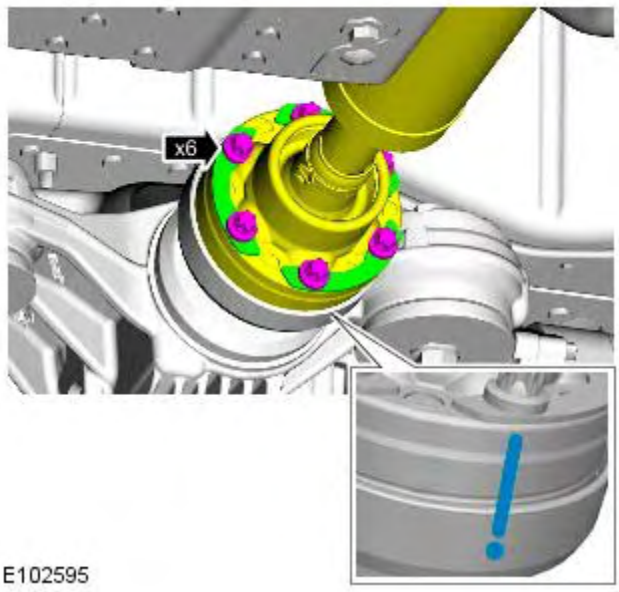


14.

Installation

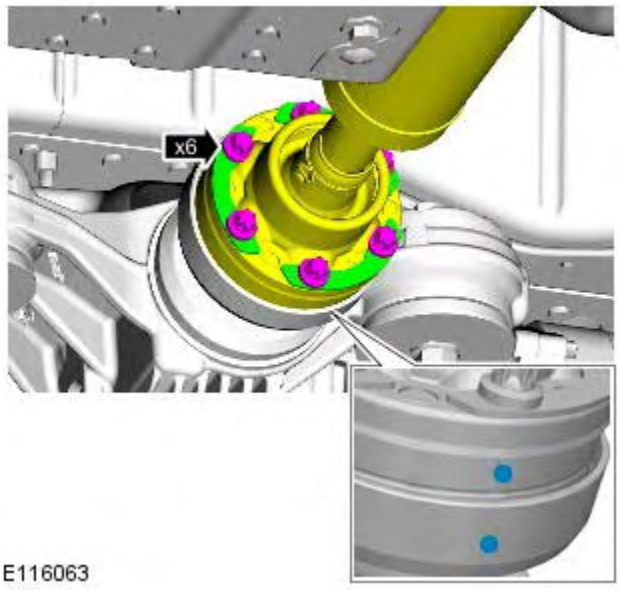


1. CAUTION: Only tighten the bolts finger-tight at this stage.



2. NOTE: Make sure that the alignment mark on the driveshaft is correctly aligned to the alignment mark on the differential case.

   Torque: 75 Nm

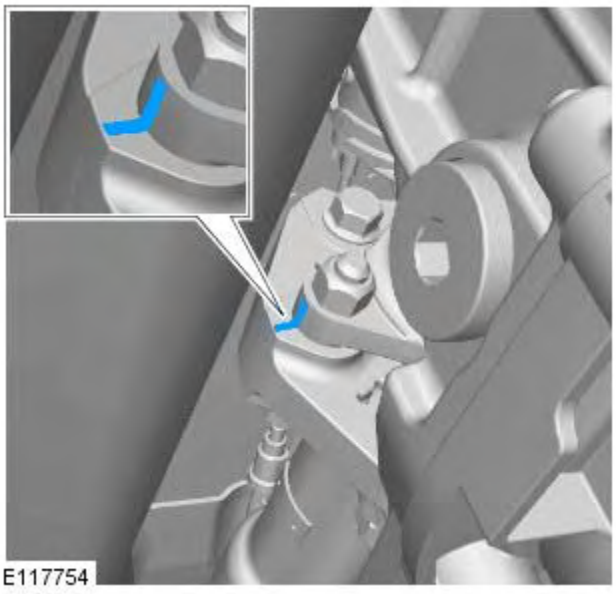


3. NOTES:

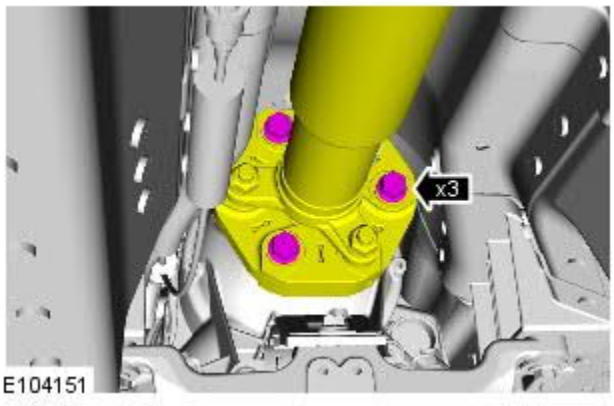
   This step only applies if a new driveshaft is being installed.

   Using the 3mm hole on the differential case flange and paint alignment mark on the driveshaft (as indicated). Make sure that the alignment marks are correctly aligned.

   Torque: 75 Nm

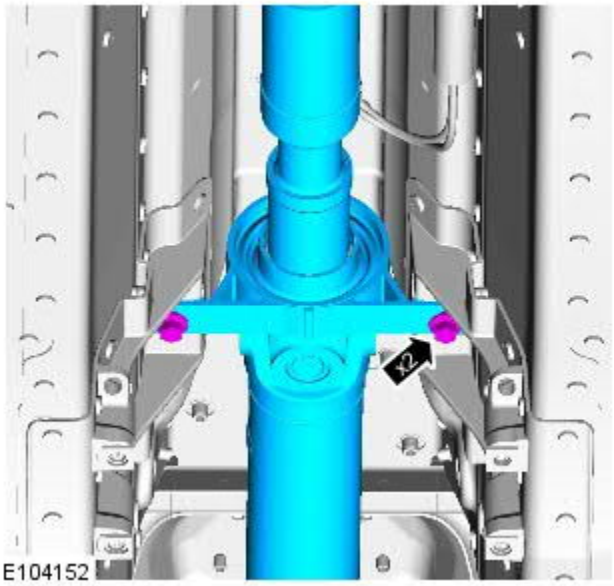


4. NOTE: Make sure that you re-align the driveshaft to the transmission flange using the alignment mark.

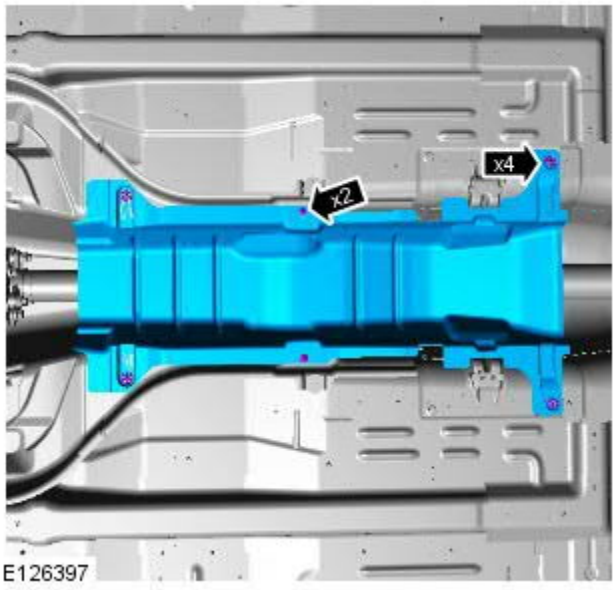


5. CAUTION: Under no circumstances must the flexible coupling (or it's fixings) be loosened or removed from the driveshaft.

   Torque: 127 Nm



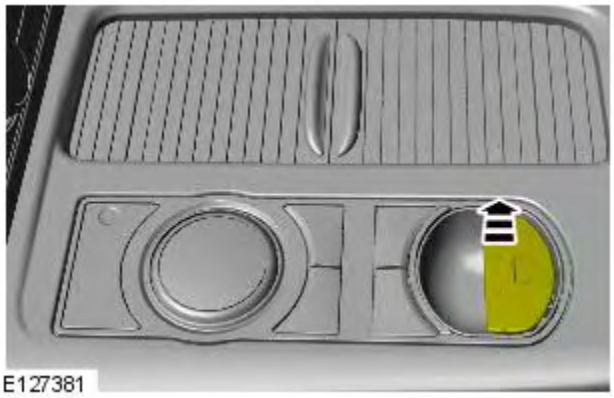
6. *Torque:* 48 Nm



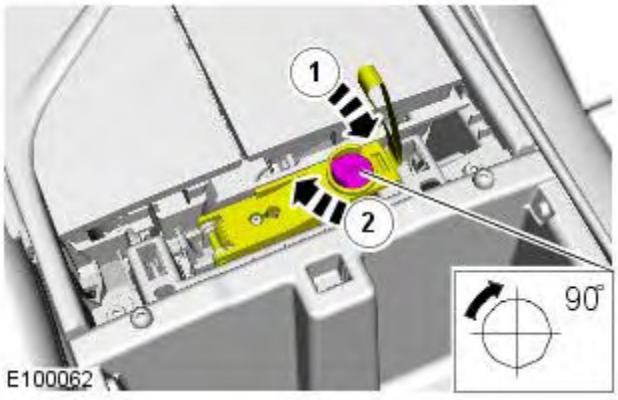
7.

8. Refer to: Exhaust System (309-00A Exhaust System - TDV6 3.0L Diesel, Removal and Installation).

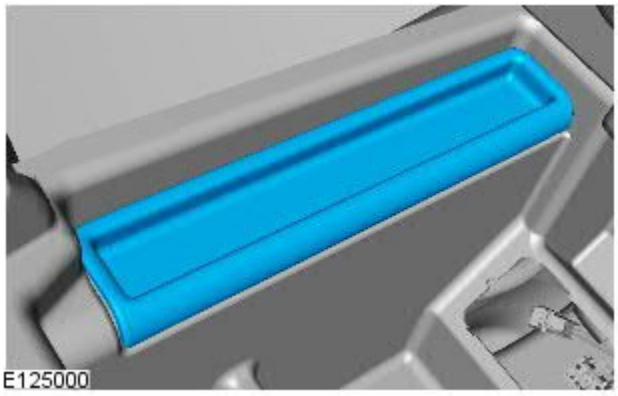
9. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).



10. NOTE: The ignition must be switched on.

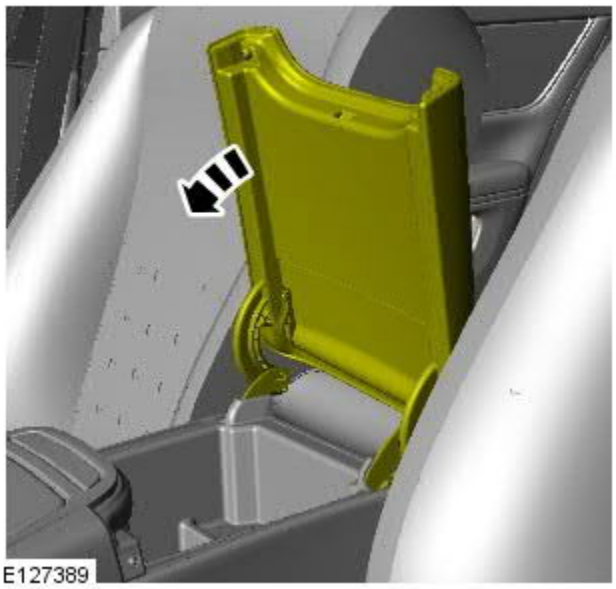


11. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



12.

13.



Published: 11-May-2011

Rear Drive Axle/Differential -

General Specifications

Item	Specification
Differential fluid - vehicles without supercharger	Castrol SAF XO (75W 90)
Differential fluid - vehicles with supercharger	Castrol BOT 720 (75W 90)

Initial Specifications

Item	Specification
Differential fluid capacity - vehicles without supercharger	0.9 Liters
Differential fluid capacity - vehicles with supercharger	1.3 Liters

Service Specifications

Item	Specification
Differential fluid capacity - vehicles without supercharger	0.85 Liters
Differential fluid capacity - vehicles with supercharger	1.25 Liters

Torque Specifications

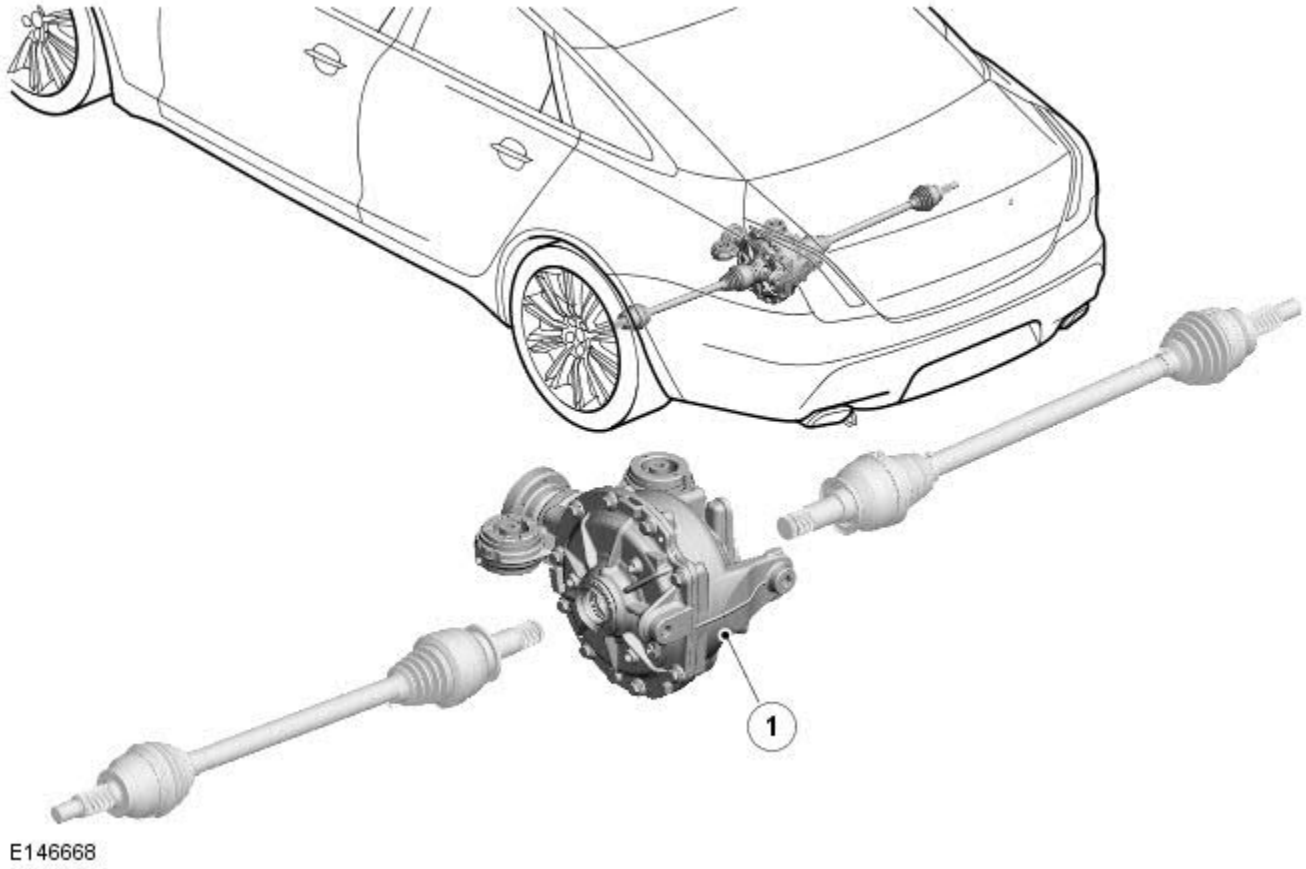
Description	Nm	lb-ft	lb-in
Differential case front retaining bolt	90	66	-
Differential case rear retaining bolts	192	142	-
Differential filler plug	27	20	-
Differential drain plug	27	20	-
Halfshaft constant velocity joint nut	300	221	-
Driveshaft retaining bolts	73	54	-

Published: 20-May-2013

Rear Drive Axle/Differential - Rear Drive Axle and Differential - Component Location

Description and Operation

OPEN REAR DIFFERENTIAL - V8 5.0L PETROL AND TDV6 3.0L DIESEL VEHICLES



Item	Description
1	Open differential

Published: 20-May-2013

Rear Drive Axle/Differential - Rear Drive Axle and Differential - Overview

Description and Operation

OVERVIEW

The rear differential has two functions:

- to convert the 'angle of drive' through 90° and distribute drive, via the rear drive halfshafts, to the rear wheels.
- to compensate for differences in the rotational speeds of the vehicle's rear wheels during cornering.

Two types of rear differential are installed:

- an open rear differential on V8 5.0L Petrol AND TDV6 3.0L Diesel vehicles
- an electric rear differential on V8 S/C 5.0L Petrol vehicles.

Both types of rear differential are attached to the rear subframe at four mounting points. Each mounting point incorporates a rubber bush to reduce NVH (noise, vibration and harshness). The bushes in the forward mounting points are installed in the differential. The bushes in the rear mounting points are installed in the rear subframe.

The open differentials are almost identical in their design and differ only in the final drive ratio and a heavier input flange which is fitted to TDV6 3.0L Diesel vehicles. The final drive ratios for the open and the electric rear differentials are as follows:

- V8 S/C 5.0L Petrol, V8 5.0L Petrol - 2.56:1
- TDV6 3.0L Diesel - 2.44:1.

NOTES:

Two variants of the open and electric rear differential are available, the case can be constructed of cast steel or aluminum and are similar in their construction. The internal components remain the same in both variants. The cast steel version is shown in the illustrations in this document.

A mass damper can be fitted to the casing of the rear differential on some models.

Published: 20-May-2013

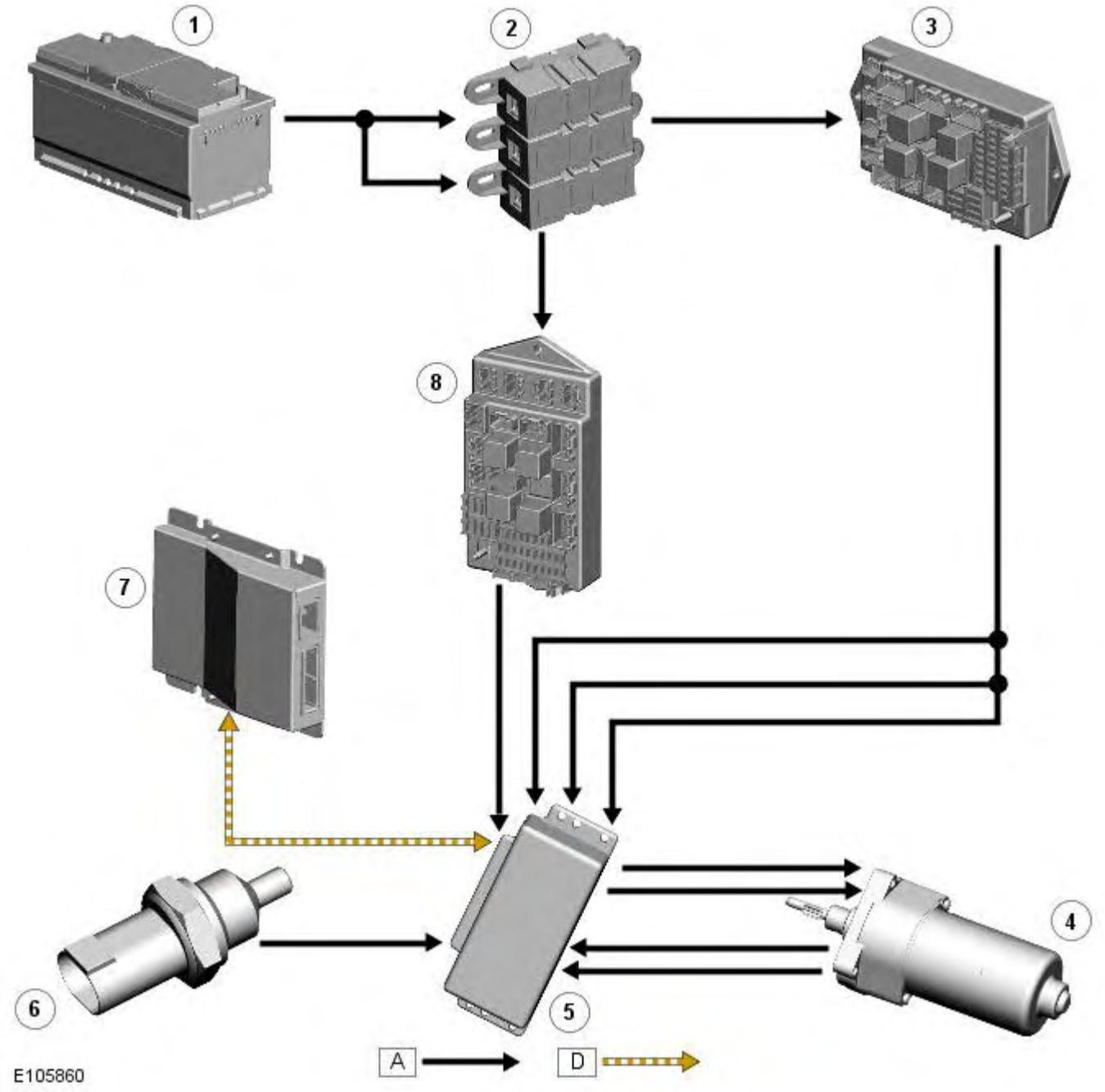
Rear Drive Axle/Differential - Rear Drive Axle and Differential - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: **A** = Hardwired; **D** = High speed CAN (controller area network) bus

Control Diagram - V8 S/C 5.0L Petrol Electric Rear Differential Only



Item	Description
1	Battery
2	Megafuse (175 A)
3	AJB (auxiliary junction box)
4	Differential locking motor

5	Rear Differential Control Module (RDCM)
6	Oil temperature sensor
7	High speed CAN from suspension control module
8	CJB (central junction box)

System Operation

OPEN REAR DIFFERENTIAL - V8 5.0L PETROL AND TDV6 3.0L DIESEL VEHICLES

Rotational input from the drive shaft is passed via the input flange to the pinion shaft and pinion gear. The angles of the pinion gear to the crown wheel drive gear moves the rotational direction through 90°.

The transferred rotational motion is now passed to the crown wheel drive gear, which in turn rotates the differential casing. The cross-shaft, which is secured to the casing, also rotates at the same speed as the casing. The planet gears, which are mounted on the shaft, also rotate with the casing. In turn, the planet gears transfer their rotational motion to the left and right hand sun gears, rotating the drive halfshafts.

When the vehicle is moving in a forward direction, the torque applied through the differential to each sun gear is equal. In this condition both drive halfshafts rotate at the same speed and the planet gears do not rotate.

If the vehicle is turning, the outer wheel will be forced to rotate faster than the inner wheel by having a greater distance to travel. The differential senses the torque difference between the sun gears. The planet gears rotate on their axes to allow the outer wheel to rotate faster than the inner one.

ELECTRIC REAR DIFFERENTIAL - V8 S/C 5.0L PETROL VEHICLES

The multiplate clutch prevents excessive differential slip and therefore maximizes the traction performance of the vehicle. This is fundamentally different from 'braked' traction control systems, which can only counteract differential slip when it occurs.

A certain amount of differential slip is required to allow the vehicle to turn corners and to remain stable under control of the ABS (anti-lock brake system). The system is completely automatic and does not require any special driver input.

The multiplate clutch actively controls the torque flow through the differential and optimizes the torque distribution in the driveline. The clutch biases the torque from the differential to the wheel with the higher grip and prevents the wheel with the lower grip from spinning.

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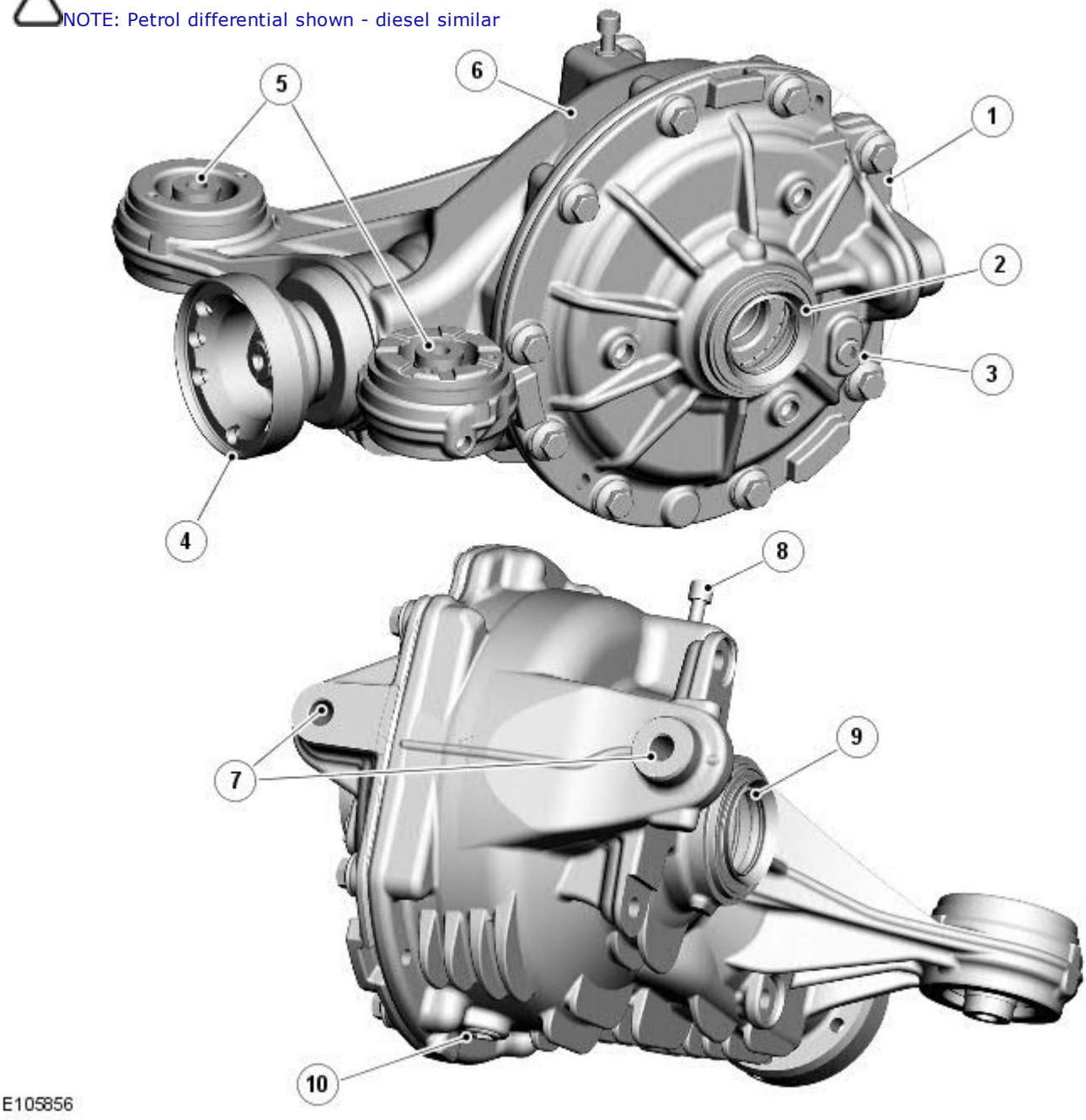
Component Description

OPEN REAR DIFFERENTIAL - V8 5.0L PETROL, V6 3.0L S/C PETROL, GTDi 2.0L PETROL AND TDV6 3.0L DIESEL VEHICLES

NOTE: Petrol differential shown - diesel similar



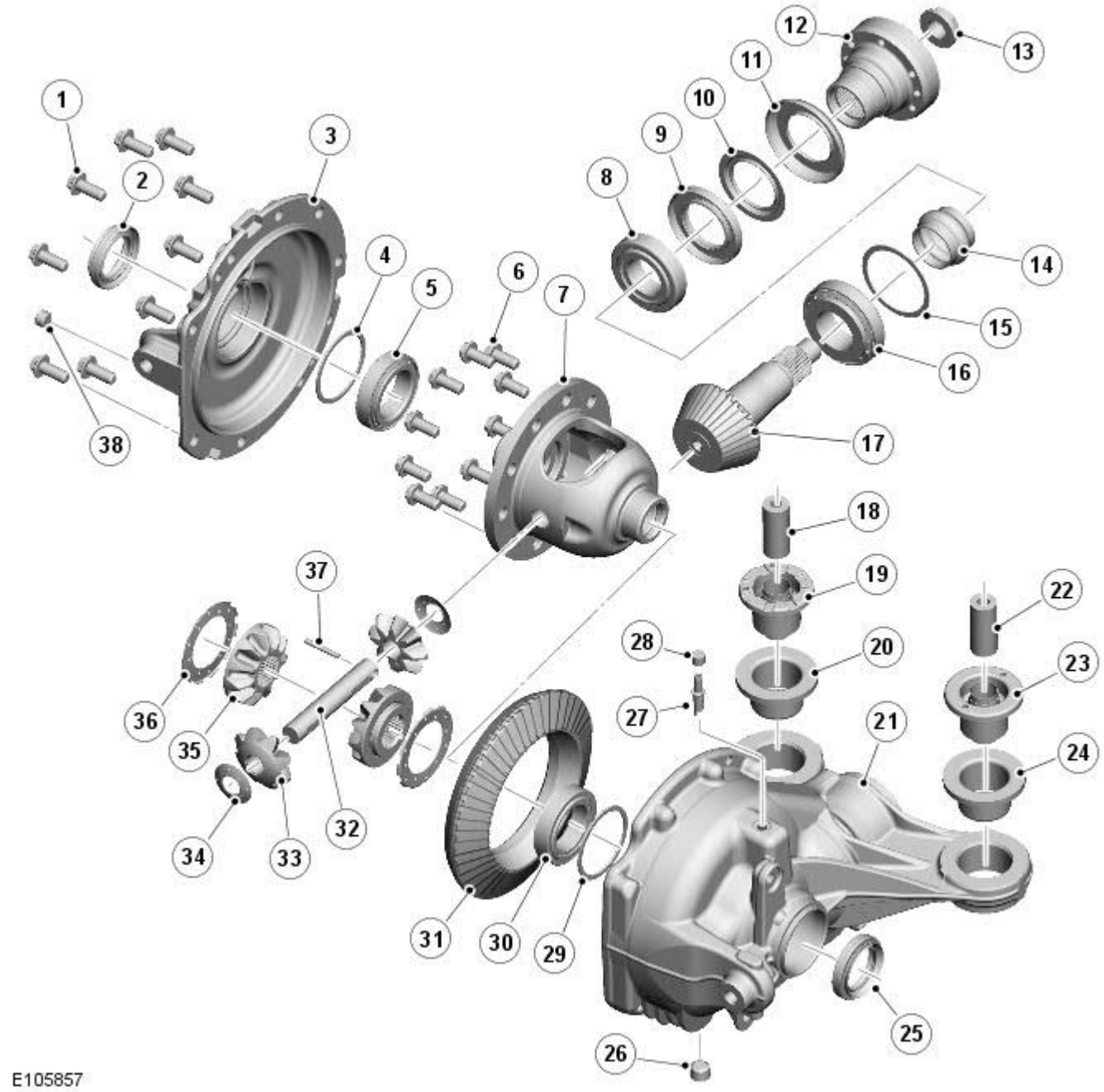
Item	Description
1	Cover
2	LH (left-hand) rear drive halfshaft oil seal
3	Filler/Level plug
4	Input flange
5	Front mounting points with insulator assemblies
6	Carrier
7	Rear mounting points
8	Breather
9	RH (right-hand) rear drive halfshaft oil seal
10	Magnetic drain plug

The open rear differential is a conventional design using a hypoid gear layout. The final drive ratios differ between engine type, refer to 'Overview' for ratio details.

The cast iron casing comprises two parts; a cover and a carrier. The carrier provides locations for all the internal components. The cover is sealed to the carrier with Loctite RTV sealant and secured with nine bolts. The cover and carrier have cast fins, which assist rigidity and cooling. A breather cap is fitted to the top of the carrier.

The diesel open rear differential differs from the petrol variants in respect to the final drive ratio and the input flange which connects the propshaft to the differential. The diesel input flange is larger to address driveline NVH (noise, vibration and harshness) boom inherent with the diesel engine.

Exploded View of Open Rear Differential



Item	Description
1	Bolt (9 off)
2	Oil seal
3	Cover
4	Shim
5	Bearing assembly
6	Bolt (10 off)
7	Differential case
8	Bearing assembly
9	Oil seal
10	Oil slinger inner

11	Oil slinger outer
12	Input flange
13	Pinion nut
14	Collapsible spacer
15	Shim
16	Bearing assembly
17	Pinion shaft
18	LH mounting insulator inner
19	LH mounting insulator rubber
20	LH mounting insulator outer
21	Carrier
22	RH mounting insulator inner
23	RH mounting insulator rubber
24	RH mounting insulator outer
25	Oil seal
26	Drain plug
27	Vent
28	Breather cap
29	Shim
30	Bearing assembly
31	Drive gear
32	Shaft
33	Planet gear (2 off)
34	Thrust washer (2 off)
35	Sun gear (2 off)
36	Spacer (2 off)
37	Roll pin
38	Fill/Level plug

The open rear differential contains a quantity of oil for splash lubrication of the internal components. A magnetic drain plug is installed in the bottom of the carrier and a filler/level plug is installed in the cover.

The open rear differential comprises a pinion shaft and hypoid pinion gear, and a crown wheel drive gear attached to a differential carrier. The differential carrier houses two planet gears and two sun gears

The pinion shaft has an externally splined outer end, which accepts and locates the input flange, which is retained by the pinion nut. The input flange has six threaded holes for the driveshaft attachment bolts. An oil seal is pressed into the carrier to seal the input flange to the carrier. The pinion shaft has a hypoid gear at its inner end, which mates with the crown wheel drive gear.

The crown wheel drive gear is located on the differential carrier and secured with ten bolts. The differential carrier is mounted on taper roller bearings located in machined bores in the carrier and the cover. Shims are installed behind the bearing cups to apply the correct bearing preload and hypoid backlash.

The differential carrier has a through hole, which provides location for a cross shaft. The planet gears are installed on the cross shaft, with thrust washers between the planet gears and the differential carrier. A roll pin locks the cross shaft to the differential carrier.

The sun gears are located in pockets in the differential carrier and mesh with the planet gears. Belville washers are fitted between the sun gears and the differential carrier and set the correct mesh contact between the planet gears and the sun gears. Each sun gear has a machined bore with internal splines and a machined groove. The splines transfer drive to the rear drive halfshafts. The groove provides positive location for the snap ring fitted to the inboard end of the rear drive halfshafts.

Oil seals are installed in the carrier and the cover to seal the rear drive halfshafts.

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Rear Drive Axle/Differential - Rear Drive Axle and Differential

Diagnosis and Testing

Principle of Operation

For a detailed description of the Rear Drive Axle and Differential, refer to the relevant Description and Operation section in the workshop manual.

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Fixings that secure Rear Differential Control Module (RDCM)(Heat path for module heatsink)	• Fuses/relays • Damaged, loose or corroded connector(s) • Damage to Wiring Loom/incorrect Location, stretched or taught

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC index.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Rear Differential Control Module (RDCM) (100-00 General Information, Description and Operation).

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Rear Drive Axle/Differential - Differential Draining and Filling

General Procedures

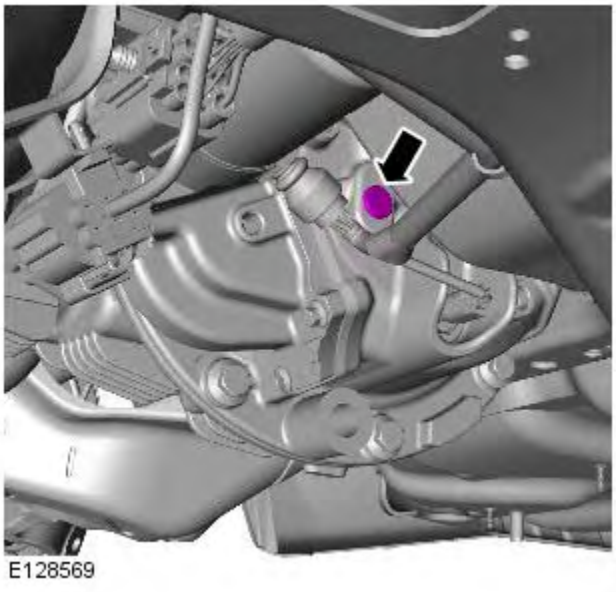
Check

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

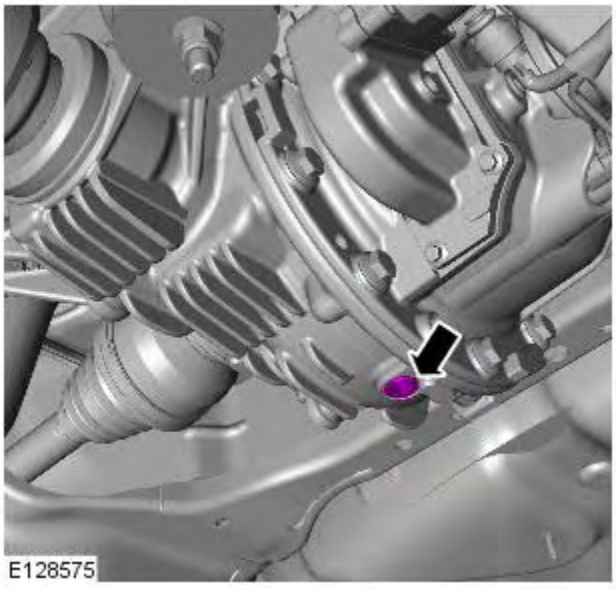
1. Refer to: Specifications (205-02 Rear Drive Axle/Differential, Specifications).

2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

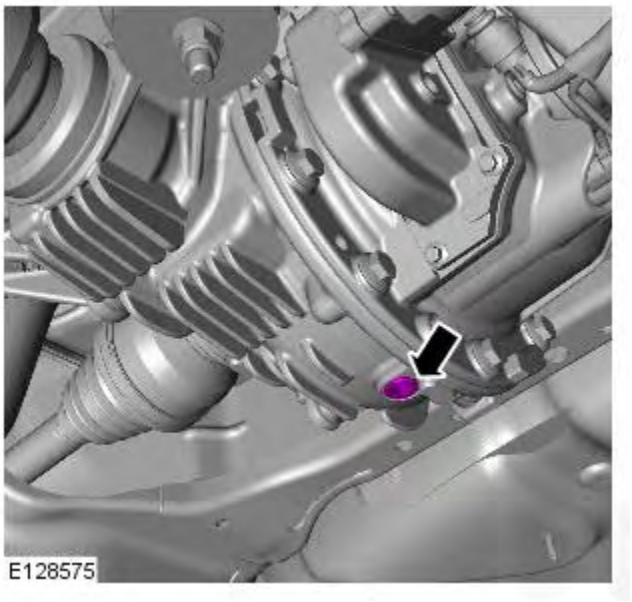

E128569

3.
   - Clean the area around the lubricant filler plug.
   - Position container to collect fluid loss.

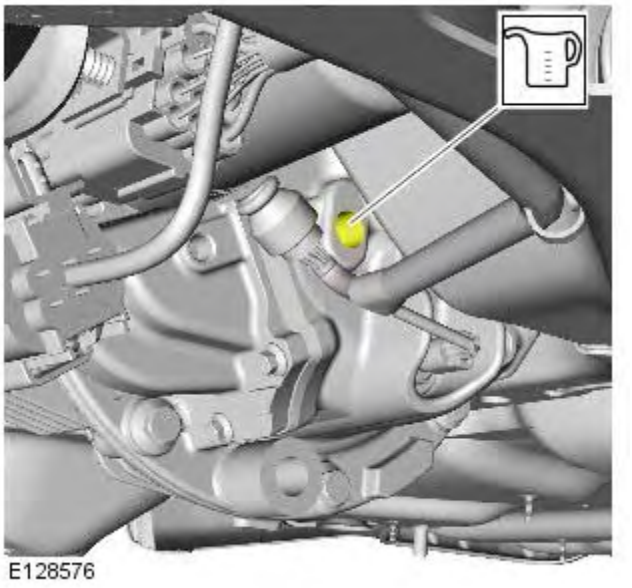

E128575

4.
   - Clean the area around the drain plug.
   - Remove the fluid drain plug.
   - Drain the differential lubricant.

Adjustment



1.
- Clean the drain plug.
- *Torque:* 27 Nm

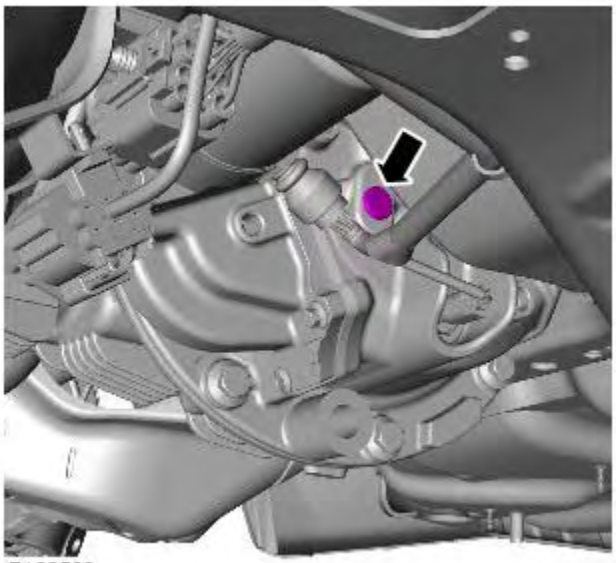


2. CAUTIONS:

Do not fill the differential with lubricant up to the filler plug. The filler plug is only used to fill the differential with lubricant, and not to act as a level indicator.

Make sure the correct specification and quanity of oil is used.

- Fill the differential with the correct amount of lubricant.


E128569

3.

- Clean the filler plug.
- *Torque:* 27 Nm

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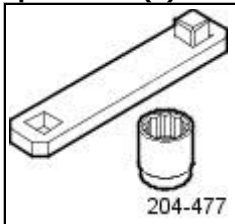
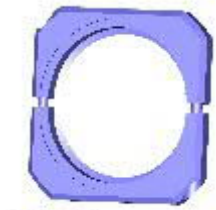
Rear Drive Axle/Differential - Differential Case

Removal and Installation

Special Tool(s)

	204-477 Replacer - Mounting Bolts Final Drive To Subframe
	205-932 Remover, Driveshaft

Removal

All vehicles

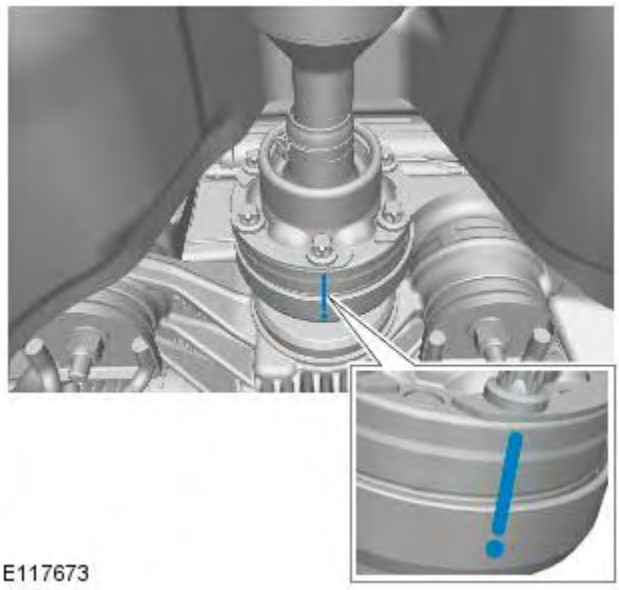
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Rear Halfshaft (205-05 Rear Drive Halfshafts, Removal and Installation).

3. Repeat the above procedure for the other side.

4. Refer to: Exhaust System (309-00B Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
   Refer to: Exhaust System (309-00A Exhaust System - TDV6 3.0L Diesel, Removal and Installation).

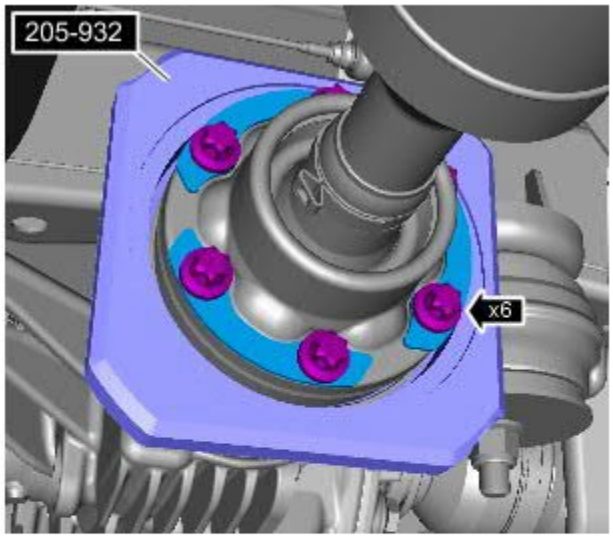

E117673

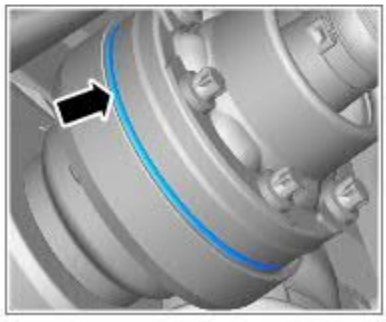
5. CAUTIONS:

Do not use the 5mm hole on the differential case flange for the alignment mark.

Make sure that the driveshaft is supported with suitable retaining straps.

NOTE: Using the 3mm hole on the differential case flange, paint an alignment mark (as indicated) to aid correct installation of the driveshaft to the differential case.



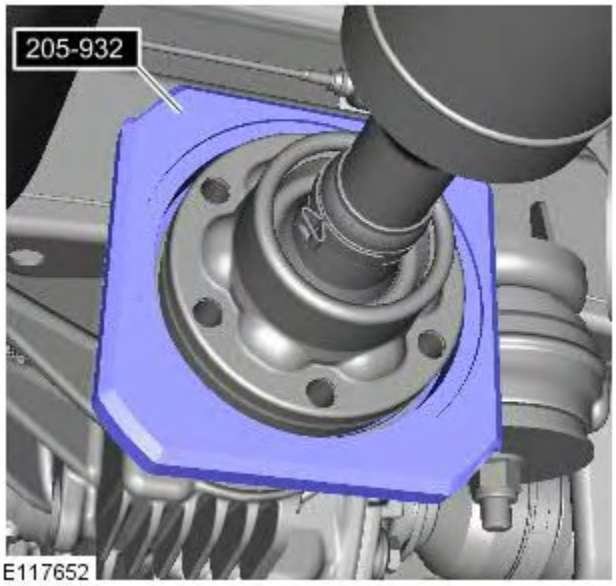

E117651

6. NOTES:

Make sure that the special tool is correctly installed to the recess on the driveshaft.

Note the illustrated orientation of the special tool.

- *Special Tool(s):* 205-932

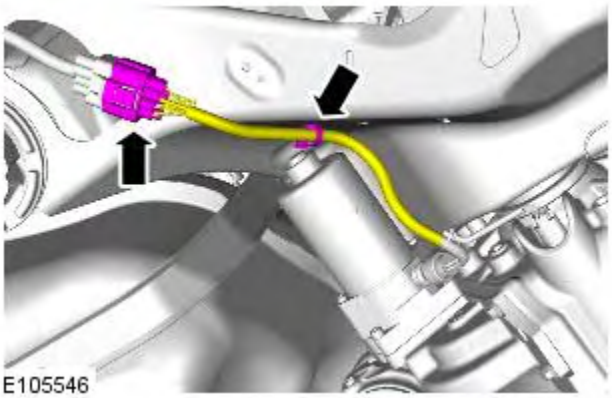


7. CAUTION: Care must be taken not to damage the surrounding components when inserting the special tool.

   NOTE: Using a suitable hammer and drift, make sure that you only hit the corner edges of the special tool to remove the driveshaft.

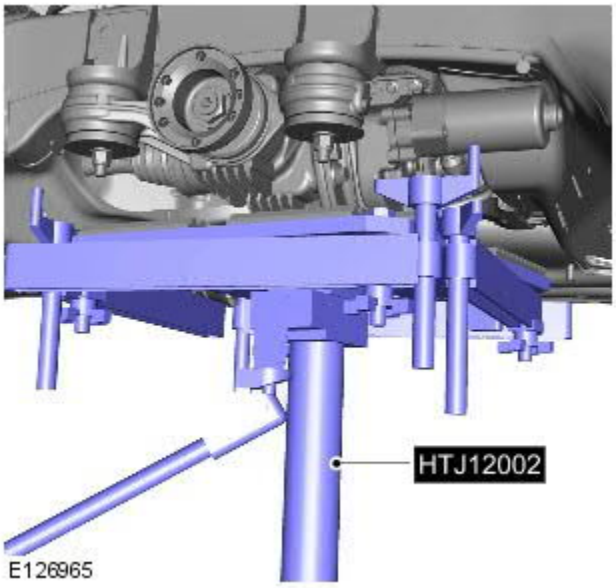
   - *Special Tool(s):* 205-932

Vehicles with supercharger

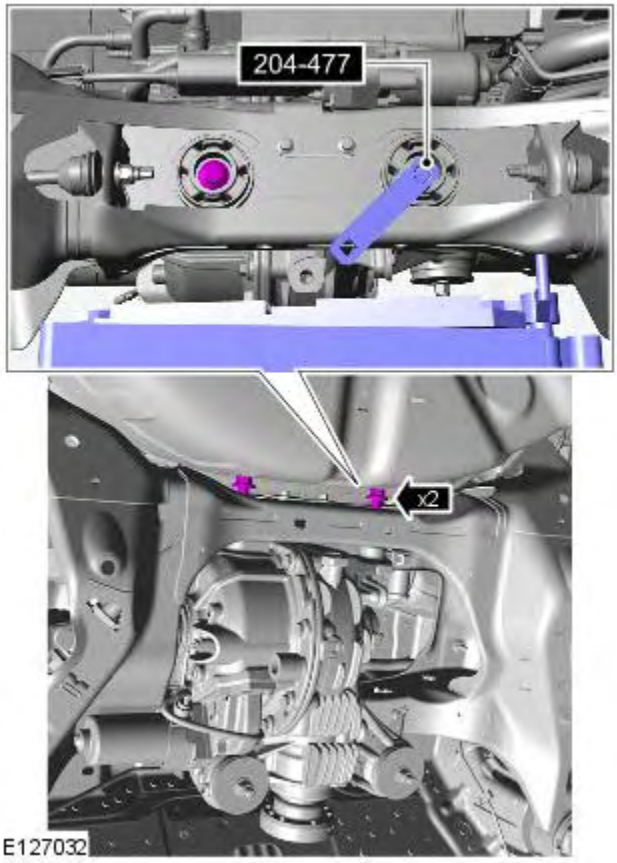


8.

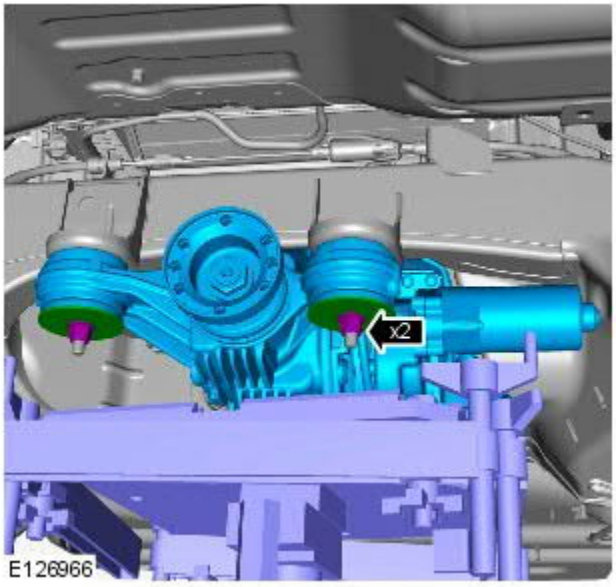
All vehicles



9.



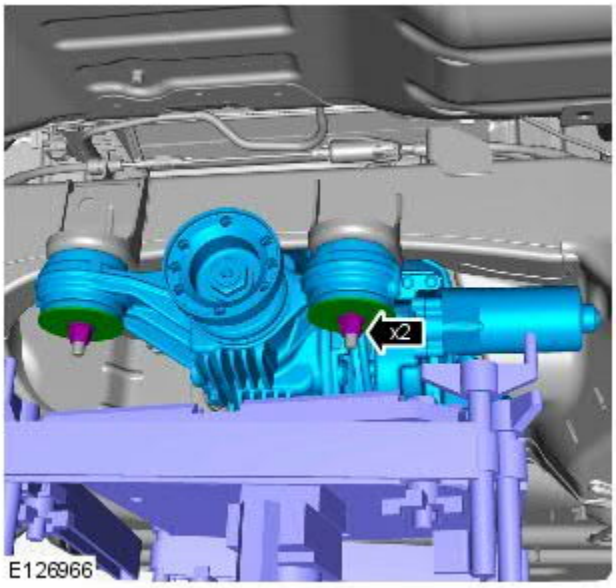
10. *Special Tool(s):* 204-477



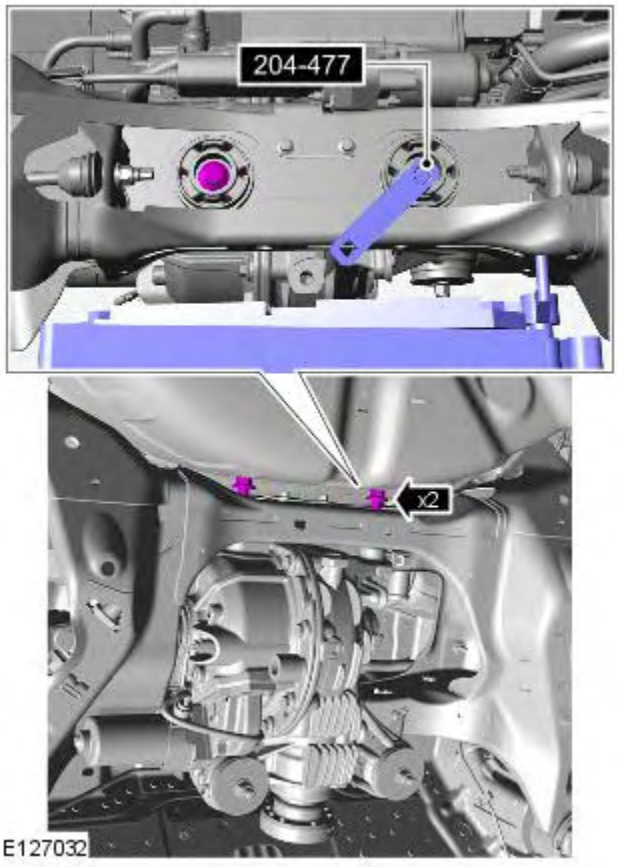
11.

Installation

All vehicles

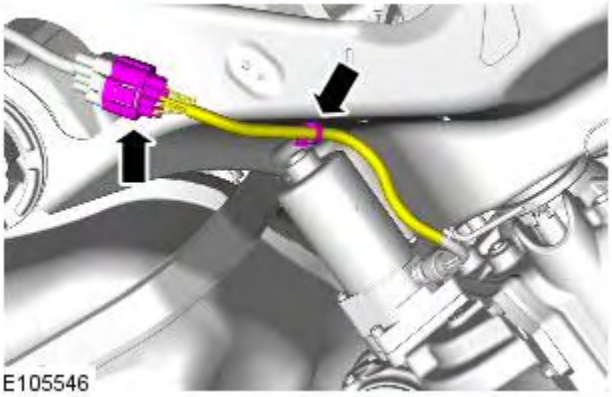


1. *Torque:* 90 Nm



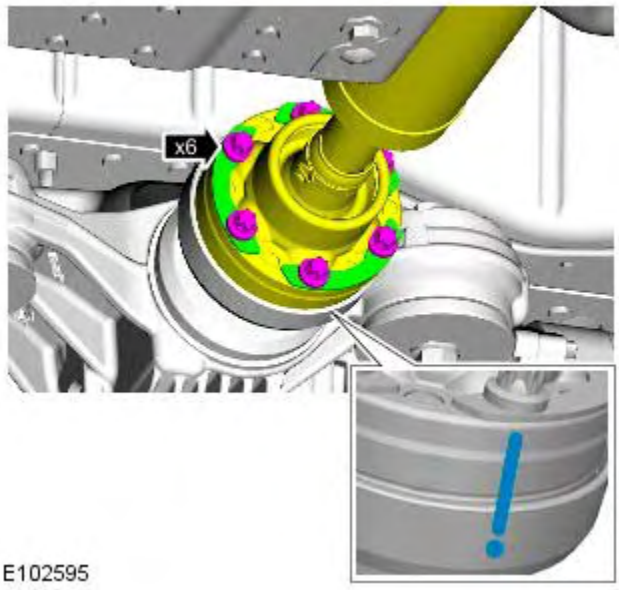
2. *Special Tool(s):* 204-477
   Torque: 192 Nm

Vehicles with supercharger



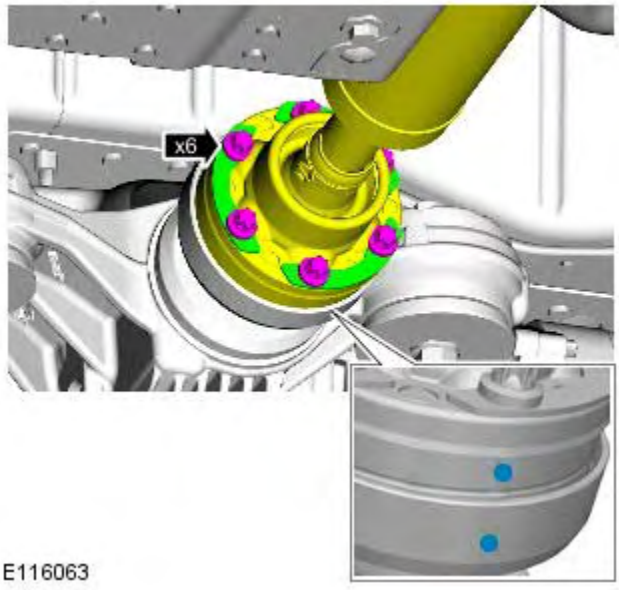
3.

All vehicles



4. NOTE: Make sure that the alignment mark on the driveshaft is correctly aligned to the alignment mark on the differential case.

Torque: 73 Nm



5. NOTES:

This step only applies if a new driveshaft is being installed.

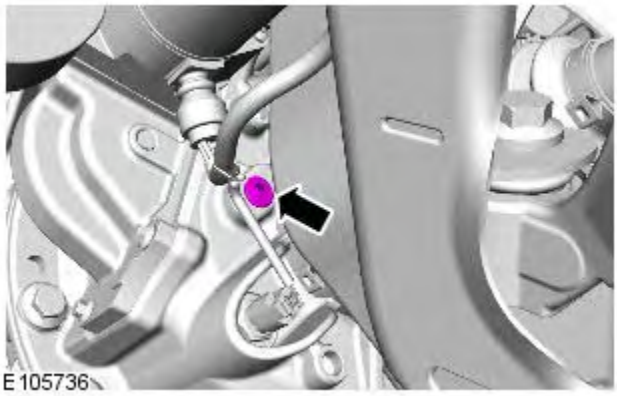
Using the 3mm hole on the differential case flange and paint alignment mark on the driveshaft (as indicated). Make sure that the alignment marks are correctly aligned.

Torque: 73 Nm

6. Refer to: Rear Halfshaft (205-05 Rear Drive Halfshafts, Removal and Installation).

7. Repeat the above procedure for the other side.

8. Refer to: Exhaust System (309-00B Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
   Refer to: Exhaust System (309-00A Exhaust System - TDV6 3.0L Diesel, Removal and Installation).



9. Check and top-up the differential case.

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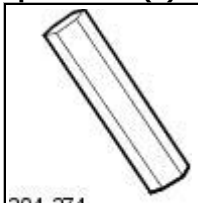
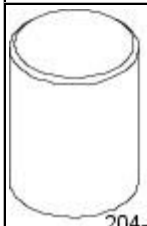
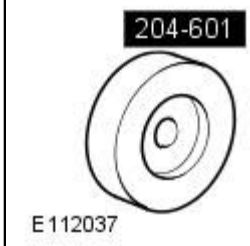
Rear Drive Axle/Differential - Differential Front Bushing

Removal and Installation

Special Tool(s)

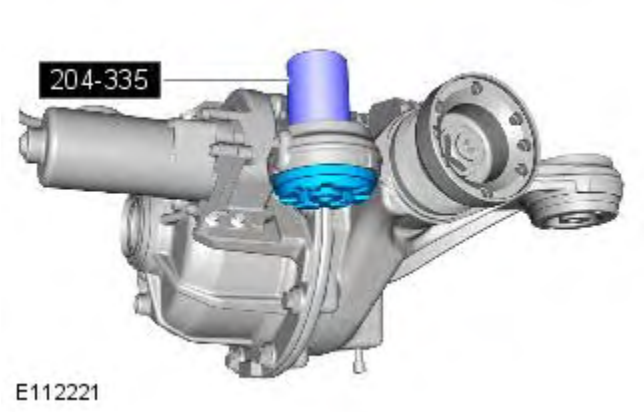
 204-274	204-274 Bush install and removal tool
204-275	204-275 Bush install and removal tool
 204-335	204-335 Bush install and removal tool
 E112037	204-601 Bush install tool
E52717	303-1121 Installer, Crankshaft Seal

Removal

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

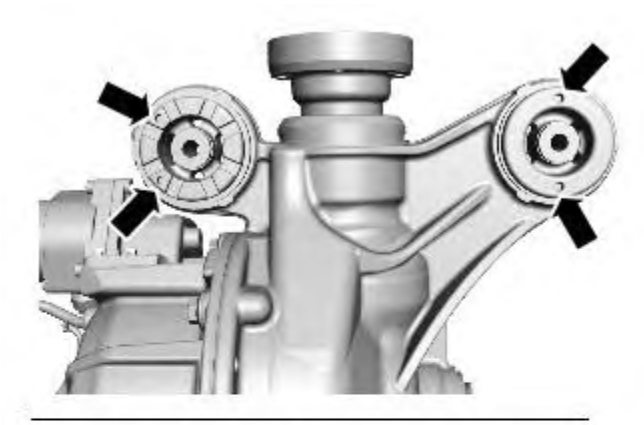
   Raise and support the vehicle.

2. Refer to: Differential Case (205-02 Rear Drive Axle/Differential, Removal and Installation).



3. *Special Tool(s):* 204-335

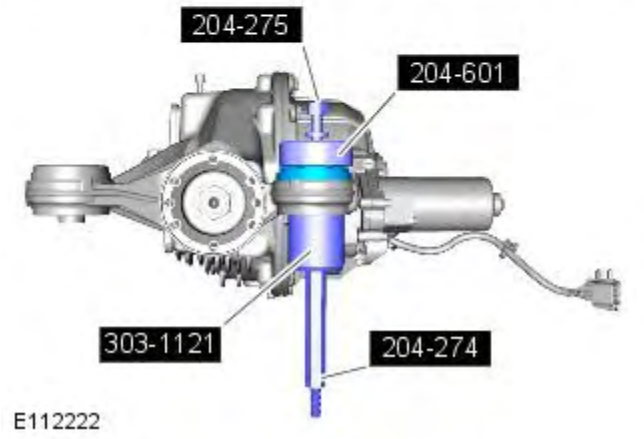
Installation



1. NOTE: Make sure the new bushes are installed in the correct orientation.

   .

   Special Tool(s): 204-275, 204-601, 303-1121, 204-274



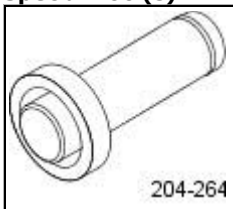
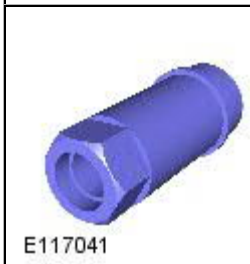
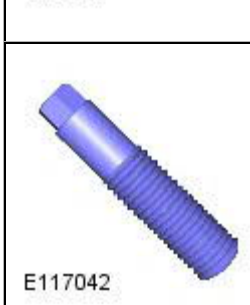
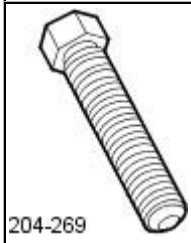
2. Refer to: Differential Case (205-02 Rear Drive Axle/Differential, Removal and Installation).

Published: 11-May-2011

Rear Drive Axle/Differential - Drive Pinion Seal

Removal and Installation

Special Tool(s)

	204-264 Pinion Seal Replacer
	204-265 Remover/Installer, Drive Pinion Seal
	204-266 Adapter for 204-265
	204-267 Adapter for 204-265
	204-269 Flange remover forcing screw
	205-053 Retainer, Drive Flange

E117921	205-053-03 Adapter, Drive Pinion Flange

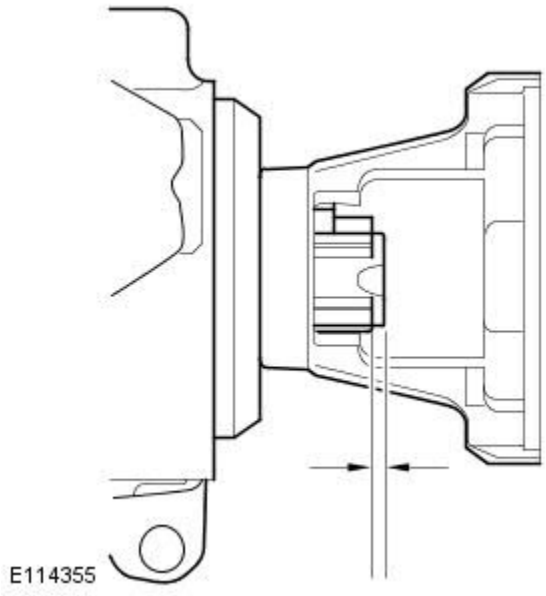
Removal

1. WARNING: Make sure to support the vehicle with axle stands.

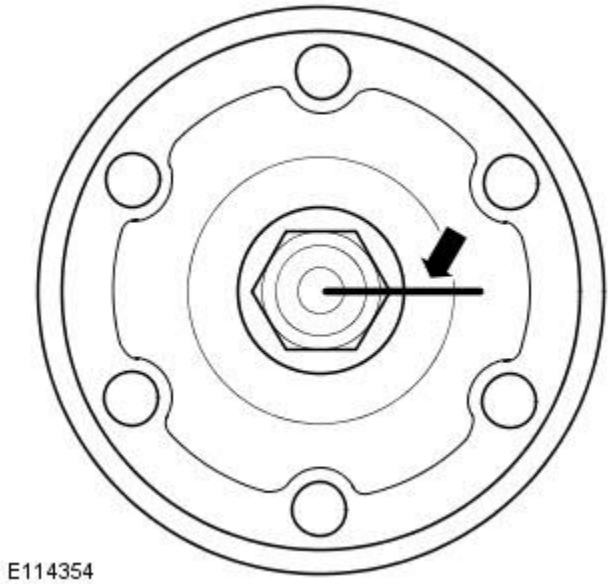
   Raise and support the vehicle.

2. Refer to: Differential Draining and Filling (205-02 Rear Drive Axle/Differential, General Procedures).

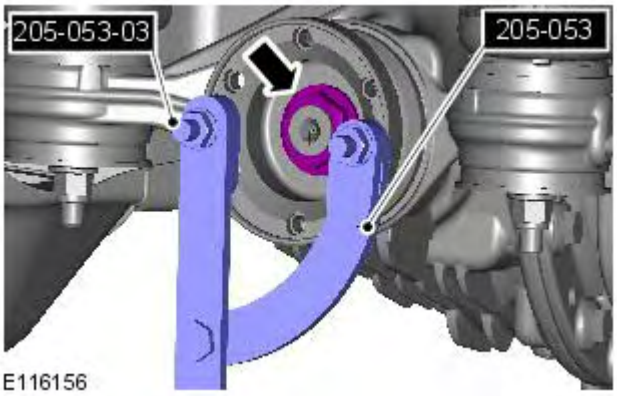
3. Refer to: Driveshaft - V8 5.0L Petrol/V8 S/C 5.0L Petrol (205-01 Driveshaft, Removal and Installation).
   Refer to: Driveshaft - TDV6 3.0L Diesel (205-01 Driveshaft, Removal and Installation).


E114355

4.
   - Measure the depth of the pinion nut on the pinion shaft.

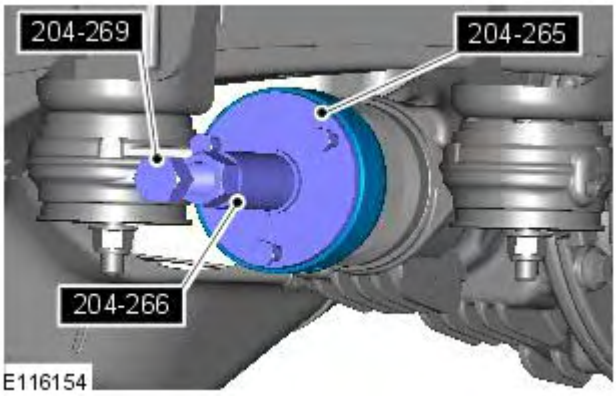

E114354

5.
- Accurately scribe a line to mark the drive pinion shaft to the drive pinion nut and pinion flange.
- Loosen the nut 180 degrees, then tighten back to the mark and note the torque value.



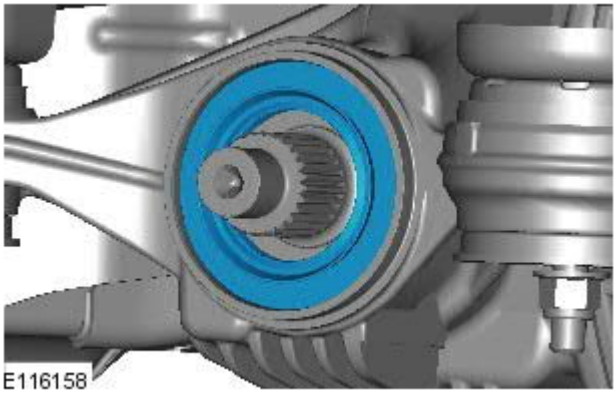
E116156

6. *Special Tool(s):* 205-053, 205-053-03



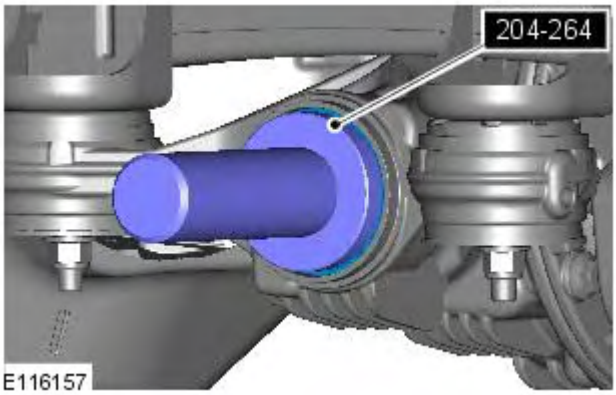
E116154

7. *Special Tool(s):* 204-266, 204-265, 204-269

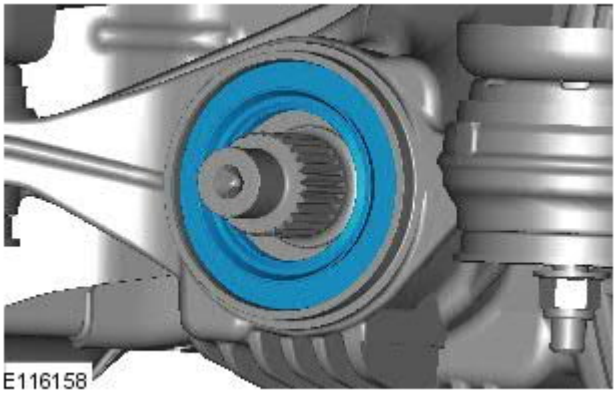


8. WARNING: Be prepared to collect escaping fluid.

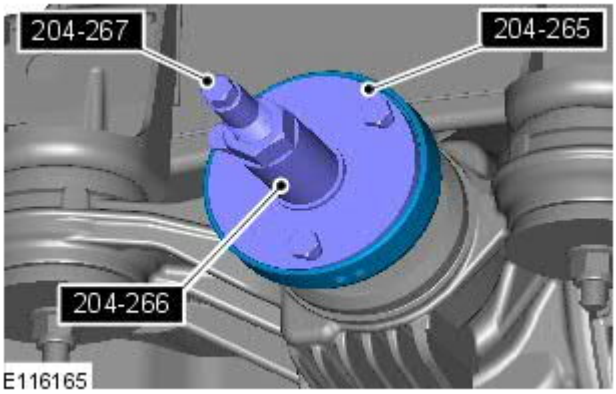
Installation



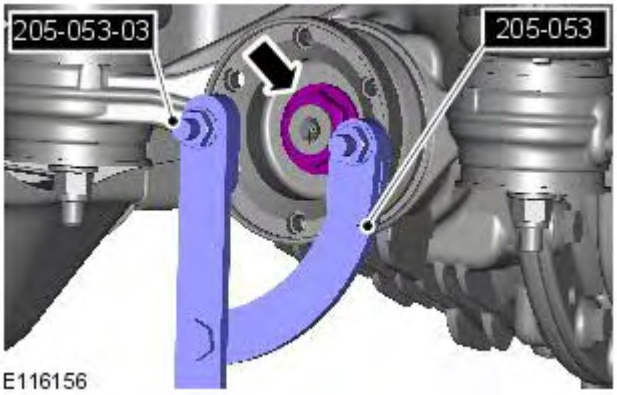
1. *Special Tool(s):* 204-264



2.



3. *Special Tool(s):* 204-267, 204-266, 204-265



4. CAUTION: Make sure the drive pinion flange has no end float and is free to rotate.

   Special Tool(s): 205-053, 205-053-03

5. Refer to: Driveshaft - V8 5.0L Petrol/V8 S/C 5.0L Petrol (205-01 Driveshaft, Removal and Installation).
   Refer to: Driveshaft - TDV6 3.0L Diesel (205-01 Driveshaft, Removal and Installation).

6. Refer to: Differential Draining and Filling (205-02 Rear Drive Axle/Differential, General Procedures).

Published: 11-May-2011

Rear Drive Halfshafts -

Lubricants, Fluids, Sealers and Adhesives

Item	Specification
Constant velocity (CV) grease	Optimal LN 584 LO

Fill Capacities

Description	Grams
Grease for inner CV joint - all vehicles	140
Grease for outer CV joint - all vehicles	125

Torque Specifcations

NOTE: Make sure that a new nut is installed.

Item	Nm	lb-ft	lb-in
Halfshaft outer constant velocity joint retaining nut	300	221	-

Published: 12-Jun-2013

Rear Drive Halfshafts - Rear Drive Halfshafts

Diagnosis and Testing

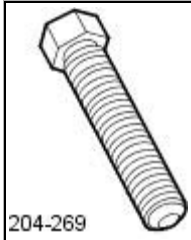
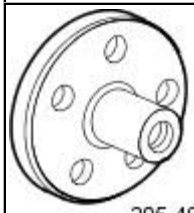
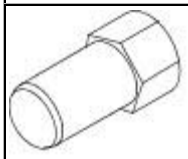
For additional information.
REFER to: Driveline System (205-00 Driveline System - General Information, Diagnosis and Testing).

Published: 04-Feb-2013

Rear Drive Halfshafts - Rear Halfshaft

Removal and Installation

Special Tool(s)

	100-012 Slide Hammer
	204-269 Flange remover forcing screw
	205-491 Hub puller
	205-491-1 Adapter nuts
	308-005 Remover, Axle oil seal
	308-621-1 Installer, Halfshaft Oil Seal

308-626/2 E54137	308-621-2 Installer/Guide, Halfshaft Oil Seal

Removal

CAUTIONS:

The final tightening of the suspension components must be carried out with the vehicle on its wheels.

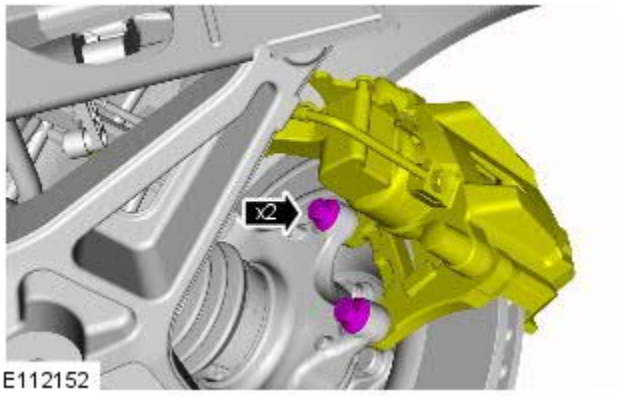
LH illustration shown, RH is similar.

1. Raise and lower the vehicle on a 4 post ramp.
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.
3. Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

E112151

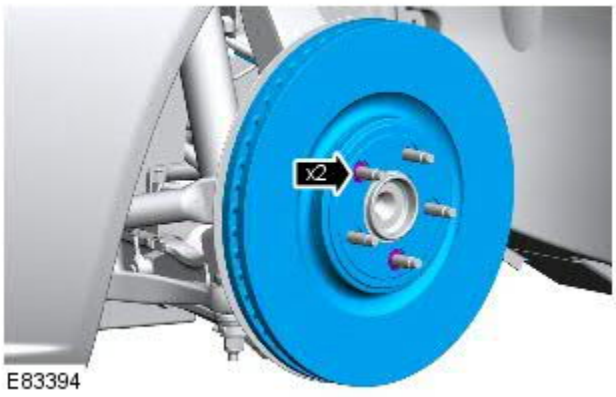
4. CAUTION: Discard the nut.



E112152

5.

6.



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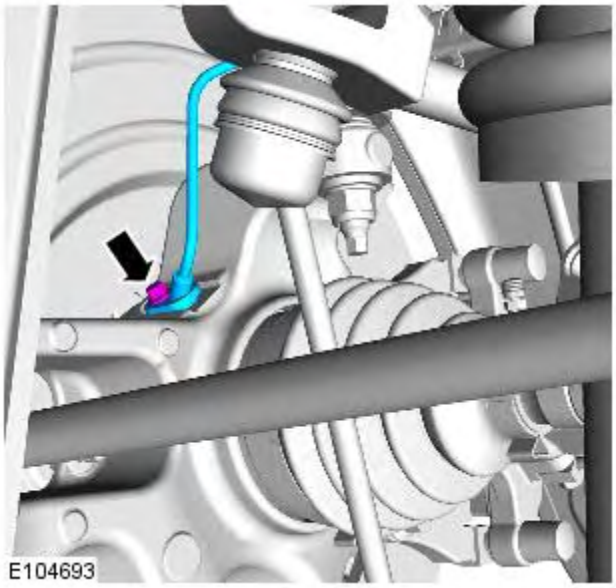

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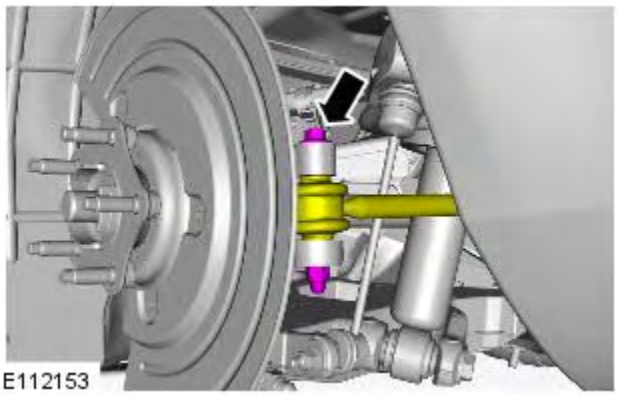

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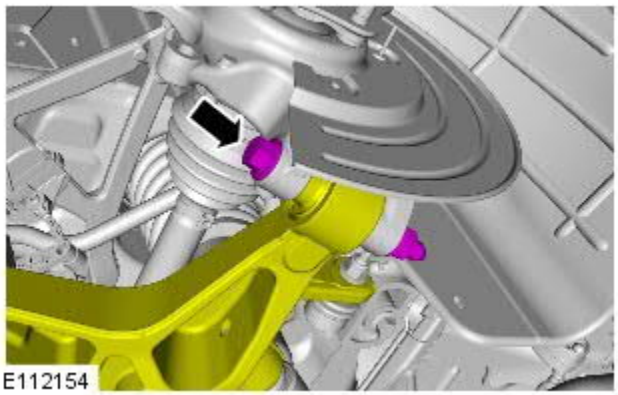
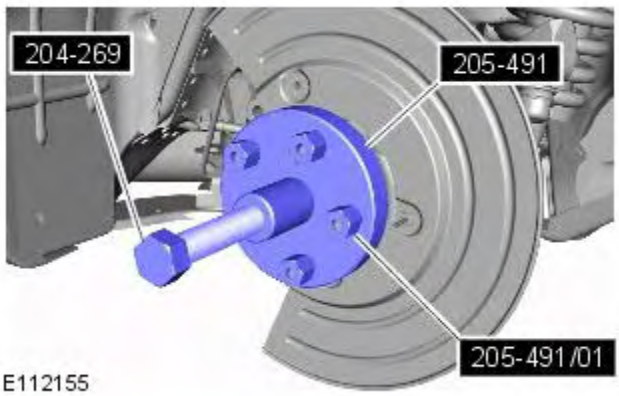
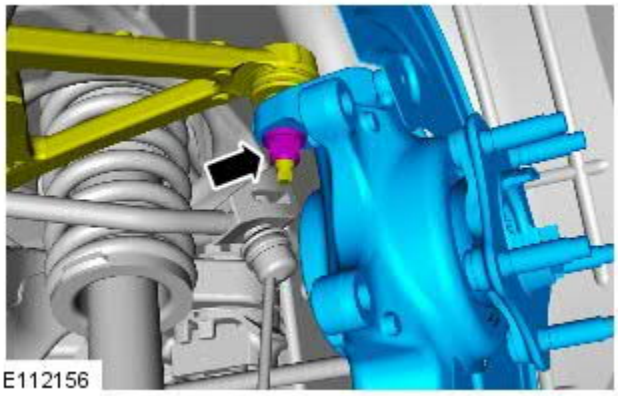


10.

- *Special Tool(s):* 205-491-1, 205-491, 204-269



11. NOTE: Use an additional wrench to prevent the component from rotating.



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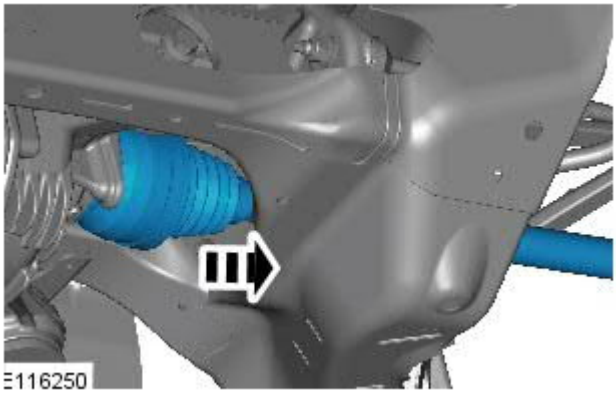
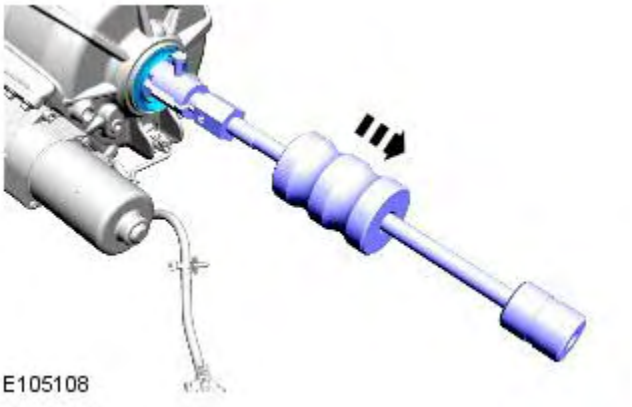
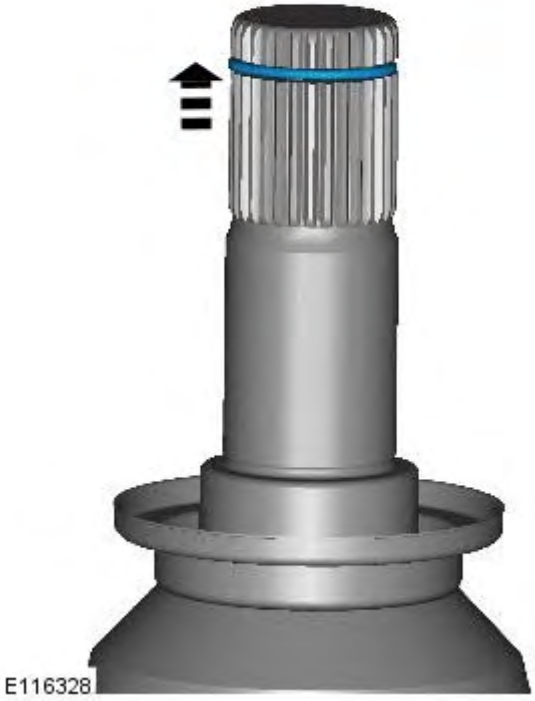




13.

- *Special Tool(s):* 308-005, 100-012

14.



Installation

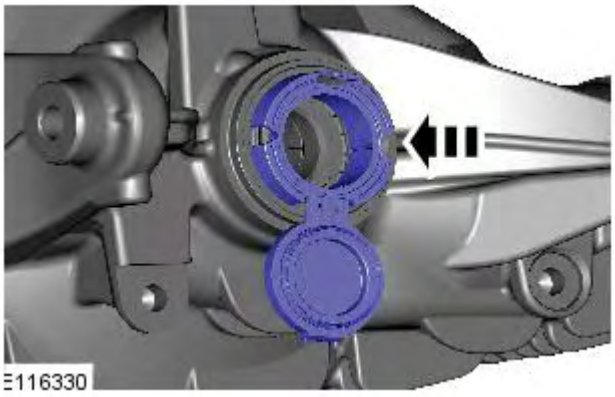
1. Clean the components mating faces.

E105109

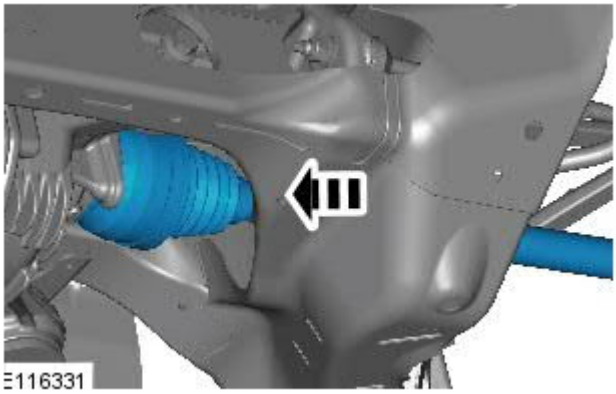
2.
- *Special Tool(s):* 308-621-1, 308-621-2, 100-012

3.

E126447


E116330

4. CAUTION: The halfshaft oil seal protector must be left in place, until the halfshaft is fully installed.

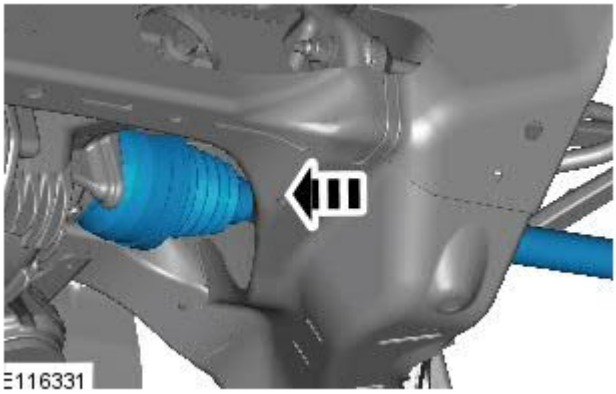


5. CAUTIONS:

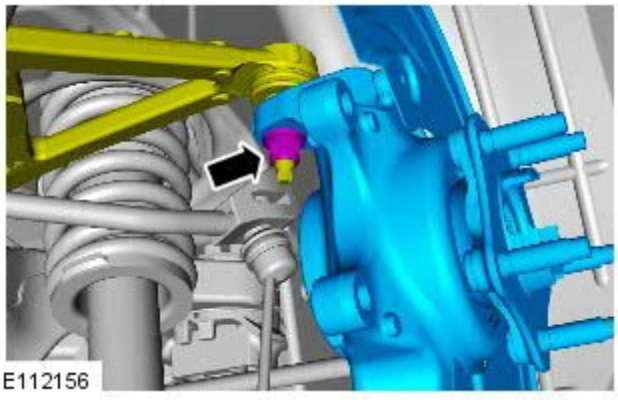
   Do not install the rear halfshaft fully at this stage.

   Only install the rear halfshaft until the halfshaft splines have past the halfshaft oil seal.

6. Remove and discard the halfshaft oil seal plutector.



7. CAUTION: Make sure that the rear halfshaft circlip is installed correctly by pulling the halfshaft gently to make sure it is engaged.

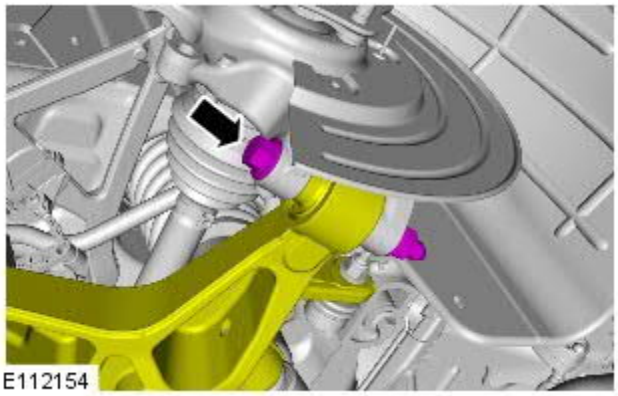


8. NOTE: Do not tighten at this stage.

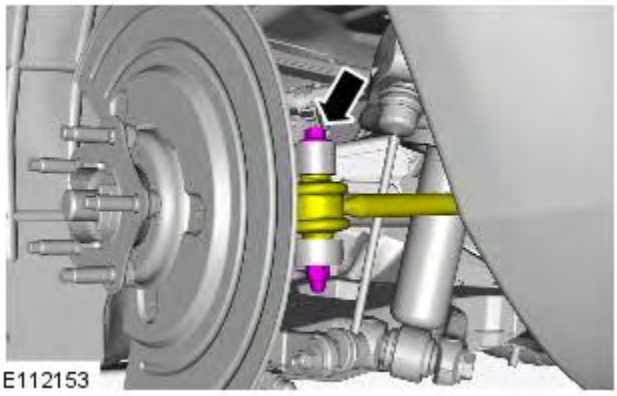
E112151

9. WARNING: Make sure that a new nut is installed.

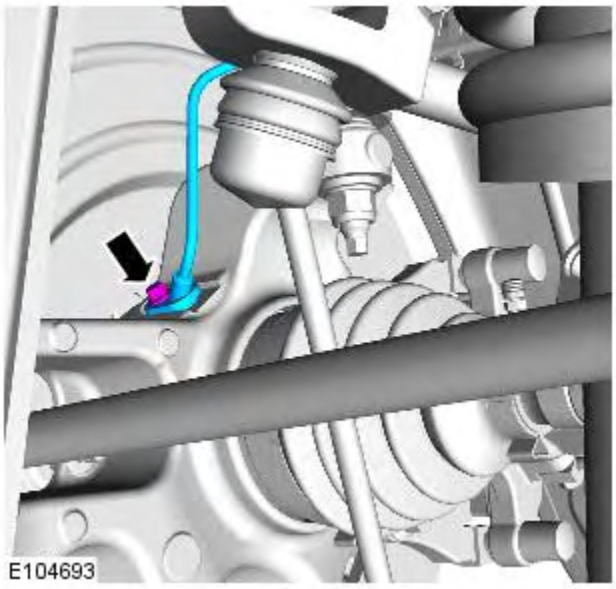
NOTE: Do not tighten at this stage.


E112154

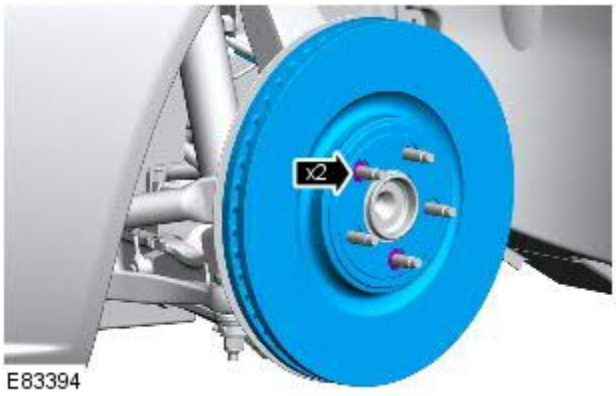
10. NOTE: Do not tighten at this stage.


E112153

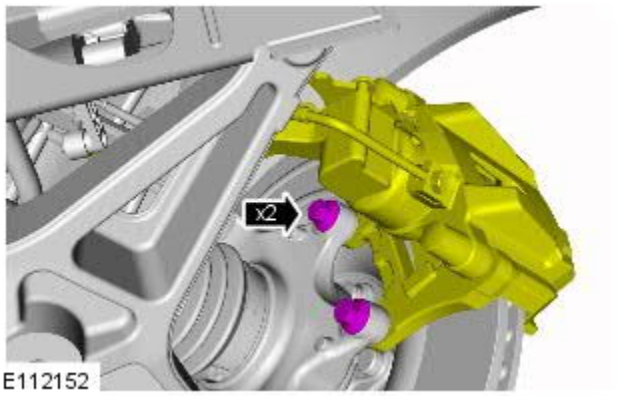
11. NOTE: Do not tighten at this stage.



12. *Torque:* 6 Nm



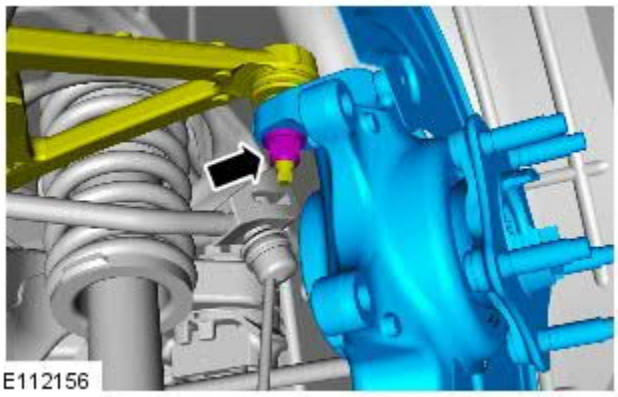
13. Install the brake disc.



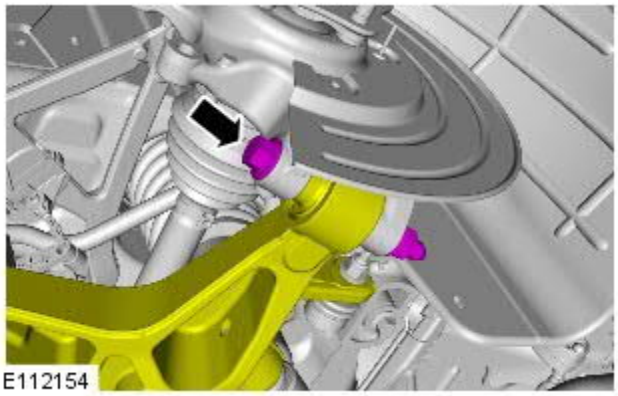
14. *Torque:* 103 Nm

15. Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

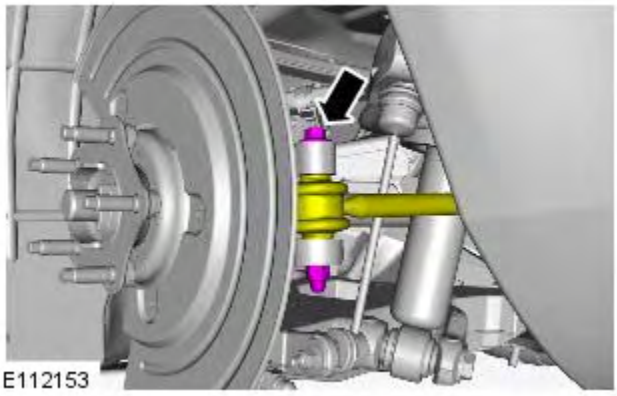
16. Lower the vehicle.


E112156

17. *Torque:* 90 Nm


E112154

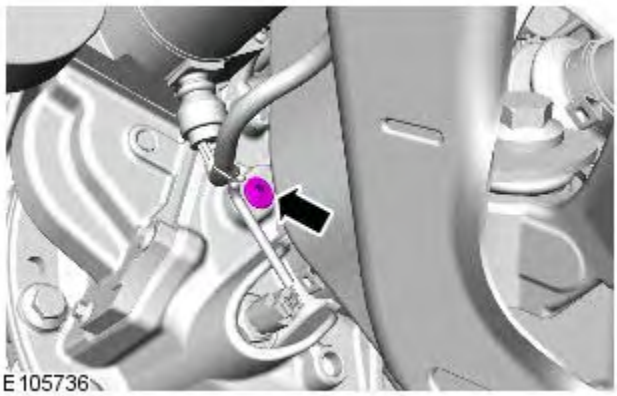
18. *Torque:* 150 Nm


E112153

19. *Torque:* 55 Nm

E112151

20. *Torque:* 300 Nm



21. Check and top-up the differential case.

Published: 11-May-2011

Rear Drive Halfshafts - Inner Constant Velocity (CV) Joint Boot

Removal and Installation

Removal

CAUTIONS:

The final tightening of the suspension components must be carried out with the vehicle on its wheels.

LH illustration shown, RH is similar.

1. Raise and lower the vehicle on a 4 post ramp.

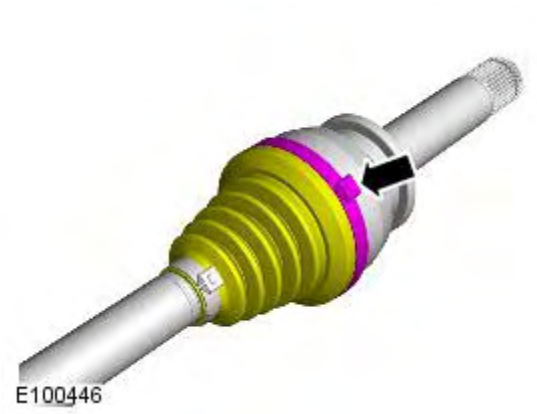
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Remove the rear halfshaft.
   For additional information, refer to: Rear Halfshaft (205-05 Rear Drive Halfshafts, Removal and Installation).

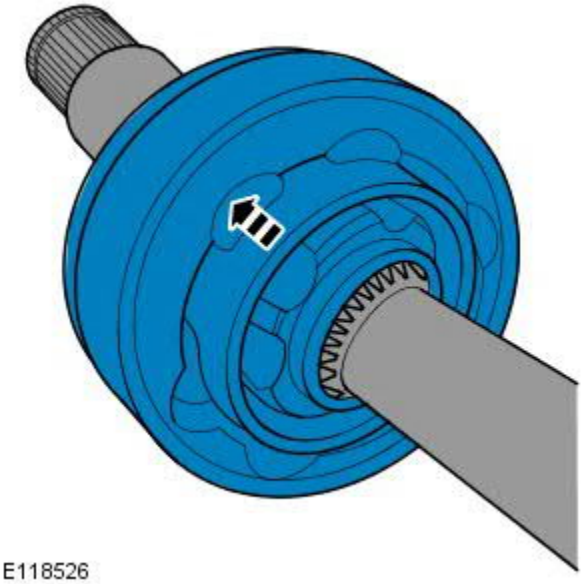
4. CAUTION: Use suitable protective covers to protect the halfshaft.

   Using a suitable clamp, secure the rear halfshaft.

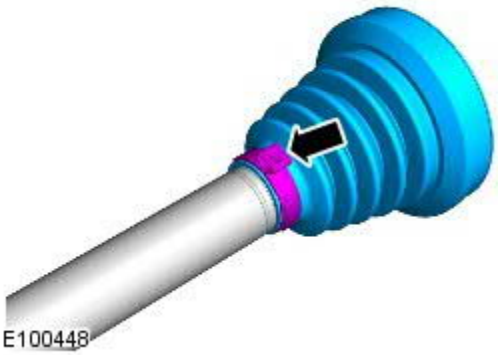


5. CAUTION: Make sure the inner constant velocity (CV) joint is not separated from the halfshaft.

   NOTE: Discard the retaining clip.


E118526

6. CAUTION: Make sure the CV joint ball bearings do not drop out of the CV joint.

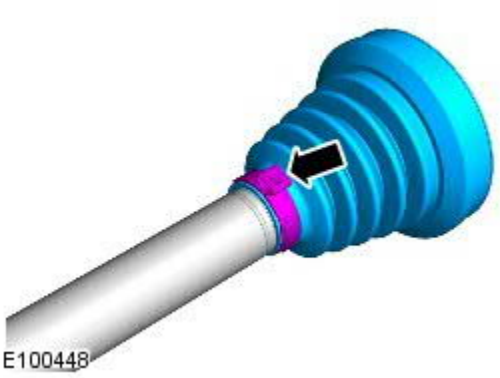

E100448

7. NOTE: Discard the retaining clip.

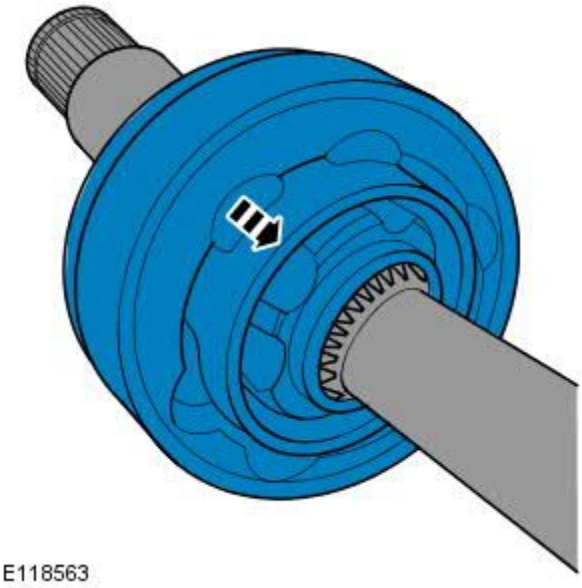
Installation

E118458

1. NOTE: Make sure that the protective sleeve is correctly installed, prior to installing the CV joint boot.


E100448

2. NOTE: Install a new retaining clip.


E118563

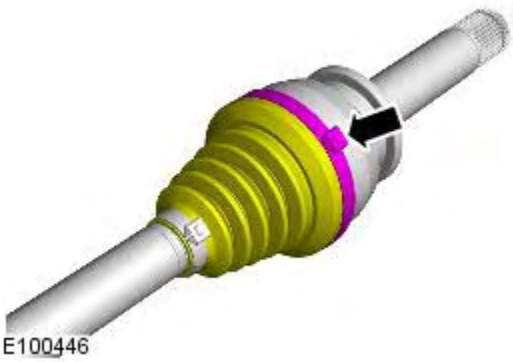
3. CAUTIONS:

Only use lubricants meeting the Jaguar specification.

Make sure the CV joint ball bearings do not drop out of the CV joint.

NOTE: Clean the constant velocity (CV) joint, removing as much of the old grease as possible.

- Fill the CV joint with 40 grams of grease.
- Fill the CV joint boot with 100 grams of grease.


E100446

4. CAUTIONS:

Make sure the CV joint is not separated from the halfshaft.

Make sure enough air is present in the CV boot.

NOTE: Install a new retaining clip.

5. NOTE: Install a new clip.

6. Remove the rear halfshaft from the clamp.

7. Install the rear halfshaft.
   For additional information, refer to: Rear Halfshaft (205-05 Rear Drive Halfshafts, Removal and Installation).

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Rear Drive Halfshafts - Outer Constant Velocity (CV) Joint Boot

Removal and Installation

Removal

CAUTIONS:

The final tightening of the suspension components must be carried out with the vehicle on its wheels.

LH illustration shown, RH is similar.

1. Raise and lower the vehicle on a 4 post ramp.
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.
3. For additional information, refer to: Inner Constant Velocity (CV) Joint Boot (205-05 Rear Drive Halfshafts, Removal and Installation).

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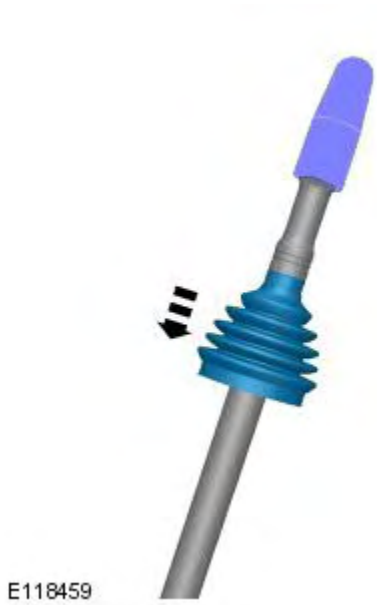
4. NOTE: Discard the retaining clips.

5.

6. CAUTION: Make sure the CV joint ball bearings do not drop out of the CV joint.

NOTE: Clean the constant velocity (CV) joint, removing as much of the old grease as possible.

Installation



1. CAUTION: Only use lubricants meeting the Jaguar specification.

NOTE: Make sure that the protective sleeve is correctly installed, prior to installing the CV joint boot.

- Fill the CV joint with 50 grams of grease.
- Fill the CV joint boot with 85 grams of grease.

E118528

2. CAUTION: Make sure enough air is present in the CV boot.

   NOTE: Install new retaining clips.

3. For additional information, refer to: Inner Constant Velocity (CV) Joint Boot (205-05 Rear Drive Halfshafts, Removal and Installation).

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Brake System - General Information -

Lubricants, Fluids, Sealers and Adhesives

CAUTION: Do not use brake fluid ITT Super Dot 4 on 2006my vehicles onwards. Failure to follow this instruction may result in damage to the vehicle.

NOTE: Brake fluid ITT Super Dot 4 has now been superseded by Shell ESL Super Dot 4 which is the Jaguar recommended brake fluid. Shell ESL Super Dot 4 can be used on all model years.

Item	Specification
Brake fluid	Shell ESL Dot 4

Brake Lining and Disc Specifications

Item	Specification
Front brake pad material nominal thickness	13 mm (0.51 in)
Front brake pad material minimum thickness	2 mm (0.08 in)
Rear brake pad material nominal thickness	10.8 mm (0.43 in)
Rear brake pad material minimum thickness	2 mm (0.08 in)
Front brake disc diameter - Vehicles with standard brakes	355 mm (14.0 in)
Front brake disc diameter - Vehicles with high performance brakes	380 mm (15.0 in)
New front brake disc nominal thickness - Vehicles with standard brakes	32 mm (1.26 in)
New front brake disc nominal thickness - Vehicles with high performance brakes	36 mm (1.42 in)
Worn front brake disc minimum thickness - Vehicles with standard brakes	30 mm (1.18 in)
Worn front brake disc minimum thickness - Vehicles with high performance brakes	34 mm (1.34 in)
Rear brake disc diameter - Vehicles with standard brakes	326 mm (12.8 in)
Rear brake disc diameter - Vehicles with high performance brakes	376 mm (14.8 in)
New rear brake disc nominal thickness - Vehicles with standard brakes	20 mm (0.79 in)
New rear brake disc nominal thickness - Vehicles with high performance brakes	26 mm (1.02 in)
Worn rear brake disc minimum thickness - Vehicles with standard brakes	18 mm (0.72 in)
Worn rear brake disc minimum thickness - Vehicles with high performance brakes	24 mm (0.94 in)
Maximum front brake disc runout (installed)	0.075 mm (0.003 in)
Maximum rear brake disc runout (installed)	0.09 mm (0.004 in)
Maximum front hub face runout (installed)	0.015 mm (0.0006 in)
Maximum rear hub face runout (installed)	0.025 mm (0.0009 in)
Front brake sliding caliper single piston diameter - Vehicles with standard brakes	60 mm (2.36 in)
Front brake sliding caliper double piston diameter - Vehicles with high performance brakes	42 mm (1.66 in)
Rear brake sliding caliper single piston diameter	45 mm (1.77 in)
Front brake caliper bleed screw	14 Nm (10 lb-ft)
Rear brake caliper bleed screw	14 Nm (10 lb-ft)

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Brake System - General Information - Brake System

Diagnosis and Testing

Principle of Operation

For a detailed description of the braking system, refer to the relevant Description and Operation section in the workshop manual.

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is NOT acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.

NOTE: Visually examine the front and rear wheel and tire assemblies for damage such as uneven wear patterns, tread worn out or sidewall damage. Verify the tires are the same size, type and, where possible, same manufacturer. Replace the damaged wheel or excessively worn tire. Wheels and tires must be cleared of any foreign matter and tire pressures adjusted to the correct specification. If the tires exhibit uneven wear or feathering, the cause must be corrected. Check the steering and suspension components for damage or wear and, if necessary, check and adjust front wheel alignment.

2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
• Brake master cylinder • Brake caliper piston(s) • Brake discs • Wheel bearings • Brake pads • Power brake booster • Brake pedal linkage • Brake booster vacuum hose • Tires • Debris	• Parking brake actuator • Parking brake module • Parking brake switch • Damaged or corroded wiring harness • Brake master cylinder fluid level switch

Road Test

Carry out a road test to compare actual vehicle braking performance with the performance standards expected by the driver. The ability of the test driver to make valid comparisons and detect performance deficiencies will depend on experience.

The driver should have a thorough knowledge of brake system operation and accepted general performance guidelines to make good comparisons and detect performance concerns.

An experienced brake technician will always establish a route that will be used for all brake diagnosis road tests. The roads selected will be reasonably smooth and level. Gravel or bumpy roads are not suitable because the surface does not allow the tires to grip the road equally. Crowned roads should be avoided because of the large amount of weight shifted to the low set of wheels on this type of road. Once the route is established and consistently used, the road surface variable can be eliminated from the test results.

Before a road test, obtain a complete description of the customer concerns or suspected condition. From the description, the technician's experience will allow the technician to match possible causes with symptoms. Certain components will be tagged as possible suspects while others will be eliminated by the evidence. More importantly, the customer description can reveal unsafe conditions which should be checked or corrected before the road test. The description will also help form the basic approach to the road test by narrowing the concern to specific components, vehicle speed or conditions.

Begin the road test with a general brake performance check. Keeping the description of the concern in mind, test the brakes at different vehicle speeds using both light and heavy pedal pressure. To determine if the concern is in the front or rear braking system, use the brake pedal and then use the parking brake control. If the condition (pull, vibration, pulsation) occurs only with the parking brake, the concern is in the rear brake system.

If the concern becomes evident during this check, verify it fits the description given before the road test. If the concern is not evident, attempt to duplicate the condition using the information from the description.

If a concern exists, use the Symptom Chart in order to isolate it to a specific sub-system and condition description. From this description, a list of possible sources can be used to further narrow the cause to a specific component or condition.

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Brakes noisy	• Brake pads • Brake discs	GO to Pinpoint Test A.
Vibration when brakes are applied	• Wheels/tires out of balance • Wheel hub nuts loose • Brake caliper mounting bolts loose • Brake pads • Foreign material/scratches /corrosion on brake disc contact surfaces • Excessive brake disc thickness variation • Excessive brake disc runout • Wheel bearing wear or failure • Suspension bushing wear or failure • Steering bushing wear or failure	GO to Pinpoint Test B.
The brakes pull or drift	• Tire pressures/wear • Brake calipers • Brake pads • Brake discs • Wheel alignment adjustment • Wheel bearing • Suspension bushings and ball joints	GO to Pinpoint Test C.
The pedal feels spongy	• Air in brake hydraulic system • Leak in hydraulic system • Brake booster/master cylinder • Brake pads	GO to Pinpoint Test D.
The pedal goes down fast	• Air in brake hydraulic system • Leak in hydraulic system • Brake booster/master cylinder • Brake pads	GO to Pinpoint Test E.
The pedal goes down slowly	• Air in brake hydraulic system • Brake booster/master cylinder	GO to Pinpoint Test F.
Excessive brake pedal effort required	• Brake pads • Brake booster	GO to Pinpoint Test G.
Brake lockup during light brake pedal force	• Brake pads • Brake calipers	GO to Pinpoint Test H.
Brakes drag	• Parking brake control applied/malfunction • Seized parking brake cables • Seized brake caliper slide pins • Seized brake caliper • Brake booster • Pedal gear	GO to Pinpoint Test I.
Excessive/Erratic brake pedal travel	• Hydraulic system • Brake pads • Brake discs • Hub and bearing assembly	GO to Pinpoint Test J.
The red brake warning indicator is always on	• Fluid level • Brake master cylinder fluid level sensor • Parking brake control • Electrical circuit	Fill the system to specification. Check for leaks. Install a new brake master cylinder fluid reservoir as required. Refer to the relevant section in the workshop manual for parking brake control and circuit tests.

Symptom	Possible Cause	Action
Slow or incomplete brake pedal return	• Brake pedal binding • Brake booster/master cylinder	GO to Pinpoint Test K.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Anti-Lock Braking System (ABS) (100-00 General Information, Description and Operation).

Pinpoint Tests

PINPOINT TEST A : BRAKES NOISY	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: INSPECT BRAKE PADS	
	1 Inspect the condition of the front and rear brake pads. Check for damage to any anti-squeal shims.
	Are the brake pads OK? **Yes** GO to A2. **No** Clean/install new front and rear brake pads as required. Re-test vehicle for brake noise.
A2: INSPECT BRAKE DISCS	
	1 Inspect the brake discs for excessive corrosion, wear or disc thickness variation.
	Does excessive corrosion, wear or disc thickness variation exist? **Yes** Install new front and rear brake discs and brake pads as required. Re-test vehicle for brake noise. **No** No action required, vehicle is OK.

PINPOINT TEST B : VIBRATION WHEN BRAKES ARE APPLIED	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
B1: ROAD TEST VEHICLE	
	1 Road test the vehicle between 40-80 km/h (25-50 mph) without applying brakes.
	Is the vibration present? **Yes** Refer to the relevant section in the workshop manual for noise vibration and harshness tests. **No** GO to B2.
B2: CHECK FOR BRAKE VIBRATION	
	1 Road test the vehicle between 40-80 km/h (25-50 mph) with light and medium application on the brake pedal.
	Is a vibration present? **Yes** Check the brake caliper mounting bolts and wheel hub nuts and tighten to specification as required. Check the balance of all road wheels and tires and repair as required. Check the brake discs for excessive wear, runout, thickness variation or cracks. Install new brake discs and brake pads as required. GO to B3. **No** No action required, vehicle is OK.
B3: IS VIBRATION STILL PRESENT UNDER BRAKE APPLICATION?	
	1 Road test the vehicle between 40-80 km/h (25-50 mph) with light and medium application on the brake pedal.
	Is a vibration present? **Yes** Check for wear or failure of steering gear bushings. Check for wear or failure of steering gear ball joints. Check for wear or failure of front wheel bearings, suspension bushings and ball joints. Check for wear or failure of rear wheel bearings, suspension bushings and ball joints. Refer to relevant section in workshop manual and install new components as required. **No** No action required, vehicle is OK.

PINPOINT TEST C : THE BRAKES PULL OR DRIFT	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
C1: ROAD TEST VEHICLE	
	1 Road test the vehicle and apply the brake pedal.
	Does the vehicle pull or drift? **Yes** GO to C2. **No**

	No action required, vehicle is OK.
C2: INSPECT TIRE CONDITION/PRESSURE	
	1 Check for excessive tire wear or incorrect pressures.
	Are the tires at the correct pressure and in good condition? **Yes** GO to C3. **No** Adjust the tire pressures or install new tires if excessively worn. Re-test the system for normal operation.
C3: CHECK CALIPERS	
	1 Check the disc brake caliper pistons and pins for binding, leaking or sticking.
	Do the disc brake caliper pistons and pins bind, leak or stick? **Yes** Rectify sticking pins and install new brake calipers as required. Re-test the system for normal operation. **No** GO to C4.
C4: INSPECT BRAKE DISCS	
	1 Check the brake discs for excessive damage, thickness variation or runout.
	Does excessive damage or runout exist? **Yes** Install new brake discs and brake pads as required. Re-test the system for normal operation. **No** GO to C5.
C5: INSPECT THE FRONT HUB AND WHEEL BEARING ASSEMBLY	
	1 Check the front hub and wheel bearing assembly.
	Are the wheel bearings OK? **Yes** GO to C6. **No** Install new wheel bearings as required. Re-test the system for normal operation.
C6: CHECK SUSPENSION BUSHINGS AND BALL JOINTS.	
	1 Check all suspension bushings and ball joints.
	Are the suspension bushings and ball joints OK? **Yes** GO to C7. **No** Install new front suspension bushings and ball joints as required. Install new rear suspension bushings and ball joints as required. Refer to the relevant section in the workshop manual.
C7: CHECK VEHICLE ALIGNMENT	
	1 Check the vehicle alignment.
	Is the alignment within specification? **Yes** No action is required, vehicle is OK. **No** Adjust the alignment as required.

PINPOINT TEST D : THE PEDAL FEELS SPONGY	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
D1: CHECK FOR SPONGY PEDAL (ENGINE OFF)	
	1 Check for a firm brake pedal.
	Is the brake pedal effort and brake pedal travel normal? **Yes** No action is required, vehicle is OK. **No** GO to D2.
D2: CHECK BRAKE PEDAL RESERVE (ENGINE OFF)	
	1 Pump the brake pedal 10 times and hold on the final application.
	Does the brake pedal feel firm on final application? **Yes** GO to D3. **No** Bleed the brake system.
D3: CHECK BRAKE PEDAL RESERVE (ENGINE ON)	
	1 With engine running at idle speed.
	2 Apply the brake pedal lightly three or four times.
	3 Wait 15 seconds for the vacuum to recover.
	4 Push down on the brake pedal until it stops moving downward or an increased resistance to the brake pedal travel occurs.
	5 Hold the brake pedal in the applied position while increasing the engine speed to 2000 revs/min.
	6 Release the accelerator pedal.

	Does the brake pedal move downward as the engine speed returns to idle? **Yes** GO to D4. **No** Check the vacuum to brake booster.
D4: CHECK BRAKE FLUID LEVEL	
	1 Check the brake master cylinder reservoir fluid level.
	Is the fluid level OK? **Yes** Bleed the brake system. Re-test the system for normal operation. **No** Check for leaking brake system and rectify as required. Add fluid and bleed the brake system. Re-test the system for normal operation.

PINPOINT TEST E : THE PEDAL GOES DOWN FAST	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
E1: ROAD TEST VEHICLE	
	1 Road test the vehicle and apply the brake pedal.
	Is the brake pedal effort and brake pedal travel normal? **Yes** No action required, vehicle is OK. **No** GO to E2.
E2: CHECK BRAKE PEDAL TRAVEL-PRESSURIZE SYSTEM	
	1 Pump the brake pedal rapidly (five times).
	Does the brake pedal travel build up and then hold? **Yes** Bleed the brake system. Re-test the system for normal operation. **No** GO to E3.
E3: CHECK FOR BRAKE SYSTEM LEAKS	
	1 Check for external brake system leaks. For additional information, refer to brake master cylinder component test in this section.
	Is there a leak present? **Yes** Repair as necessary, add fluid and bleed brake system. Re-test the system for normal operation. **No** No action required, system is OK.

PINPOINT TEST F : THE PEDAL GOES DOWN SLOWLY	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
F1: ROAD TEST VEHICLE - CHECK BRAKE PEDAL OPERATION	
	1 Check if the condition occurs during actual stopping application by applying the brake pedal while the vehicle is moving.
	Does the condition occur when the vehicle is moving? **Yes** GO to F2. **No** GO to F3.
F2: CHECK FOR BRAKE SYSTEM LEAKS	
	1 Check for external brake system leaks. For additional information, refer to brake master cylinder component test in this section.
	Are there any external brake system leaks? **Yes** Rectify as necessary. Add fluid and bleed the brake system. Re-test the system for normal operation. **No** GO to F3.
F3: CARRY OUT A BRAKE MASTER CYLINDER BYPASS TEST	
	1 Test for brake master cylinder bypass condition. Refer to Brake master cylinder component test in this section.
	Has a concern been identified? **Yes** Install a new brake master cylinder, add fluid and bleed the brake system. Re-test the system for normal operation. **No** No action required, system is OK.

PINPOINT TEST G : EXCESSIVE BRAKE PEDAL EFFORT	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**

G1: CHECK BRAKE PADS	
	1 Check the brake pads for wear, contamination, correct installation, damage and type.
	Has a concern been identified? **Yes** Correctly install or install new brake pads as required. Re-test the system for normal operation. **No** GO to G2.
G2: CHECK VACUUM	
	1 Disconnect the vacuum hose from the brake booster.
	2 Connect a vacuum/pressure tester to the vacuum hose.
	3 Run the engine at normal operating temperature.
	4 Record the vacuum reading.
	Is the reading 40.5 kPa (12 in-Hg) or greater? **Yes** GO to G3. **No** Locate and rectify the source of low vacuum. Re-test the system for normal operation.
G3: INSPECT SYSTEM	
	1 Switch the engine off.
	2 Reconnect the vacuum hose.
	3 Inspect the brake booster, rubber grommet, and all vacuum plumbing for cracks, holes, damaged connections, or missing clamps.
	4 Pump the brake pedal several times to exhaust the vacuum. Push down on the brake pedal and hold.
	Does the brake pedal move down when the engine is started? **Yes** Vacuum system is OK. **No** GO to G4.
G4: CHECK POWER BRAKE BOOSTER VALVE	
	1 Check the brake booster valve. For additional information, refer to Brake Booster component test in this section.
	Is the power brake booster valve OK? **Yes** Check the brake booster. For additional information, refer to Brake Booster component test in this section. Install a new brake booster as required. Re-test the system for normal operation. **No** Install a new brake booster valve. Re-test the system for normal operation.

PINPOINT TEST H : BRAKE LOCKUP DURING LIGHT BRAKE PEDAL FORCE	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
H1: TEST BRAKE LOCKUP	
	1 Road test the vehicle and apply the brake pedal lightly.
	Do the brakes lockup? **Yes** GO to H2. **No** No action required, vehicle is OK.
H2: INSPECT BRAKE PADS	
	1 Inspect brake pads for contamination, correct installation, damage and type.
	Has a concern been identified? **Yes** Correctly install or install new brake pads as required. Re-test the system for normal operation. **No** GO to H3.
H3: INSPECT BRAKE CALIPERS	
	1 Inspect brake calipers for binding, leaking or sticking.
	Has a concern been identified? **Yes** Correctly install or install new brake calipers as required. Re-test the system for normal operation. **No** No action required, vehicle is OK.

PINPOINT TEST I : BRAKES DRAG	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
I1: ROAD TEST VEHICLE	
	1 Road test the vehicle and apply the brakes.
	Are the brakes functioning correctly? **Yes** No action required, vehicle is OK. **No** GO to I2.

I2: CHECK BRAKE CALIPERS	
	1 Check the front and rear calipers pistons and pins for binding, leaking or sticking.
	Do the disc brake caliper pistons and pins bind, leak or stick? **Yes** Inspect the brake calipers and parking brake cables. Install new components as required. Re-test the system for normal operation. **No** GO to I3.
I3: CHECK BRAKE BOOSTER	
	1 Check the brake booster connecting rod alignment and travel.
	Is the connecting rod OK? **Yes** Vehicle is OK. **No** Install a new brake booster as required. Re-test the system for normal operation.

PINPOINT TEST J : EXCESSIVE/ERRATIC BRAKE PEDAL TRAVEL

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J1: TEST ON ROUGH ROAD	
	1 Road test the vehicle on rough road conditions.
	2 Apply the brakes slowly.
	Is the brake pedal effort and brake pedal travel normal? **Yes** No action required, vehicle is OK. **No** GO to J2.
J2: CHECK BRAKE FLUID LEVEL	
	1 Check the brake master cylinder reservoir fluid level.
	Is the fluid level OK? **Yes** GO to J3. **No** Check brake master cylinder reservoir sealing points. For additional information, refer to Brake master cylinder component test in this section. Add brake fluid and bleed the brake system. Re-test the system for normal operation.
J3: CHECK BRAKE PEDAL RESERVE	
	1 Run engine at idle speed.
	2 Apply the brake pedal lightly three or four times.
	3 Wait 15 seconds for the vacuum to replenish.
	4 Push down on the brake pedal until it stops moving downward or an increased resistance to the brake pedal travel occurs.
	5 Hold the brake pedal in the applied position while increasing the engine speed to 2000 revs/min.
	6 Release the accelerator pedal.
	Does the brake pedal move downward as the engine speed returns to idle? **Yes** GO to J4. **No** Check the vacuum to the brake booster.
J4: CHECK THE FRONT WHEEL BEARING ASSEMBLY	
	1 Check the front wheel bearing assembly.
	Are the front wheel bearings loose/damaged? **Yes** Tighten to specification or install a new front wheel bearing as required. Re-test the system for normal operation. **No** Check the front brake discs for thickness variances.

PINPOINT TEST K : SLOW OR INCOMPLETE BRAKE PEDAL RETURN

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
K1: CHECK FOR BRAKE PEDAL RETURN	
	1 Run the engine at idle while making several brake applications.
	2 Pull the brake pedal rearward with approximately 44.5 N (10lb) force.
	3 Release the brake pedal and measure the distance to the toe board.
	4 Make a hard brake application.
	5 Release the brake pedal and measure the brake pedal to toe board distance. The brake pedal should return to its original position.

	Does the brake pedal return to its original position? **Yes** No action required, vehicle is OK. **No** GO to K2.
K2: CHECK FOR BRAKE PEDAL BINDING	
	1 Disconnect the brake booster from the brake pedal. Check the brake pedal to ensure free operation.
	Is the brake pedal operating freely? **Yes** Install a new brake booster as required. Re-test the system for normal operation. **No** Repair or install new brake pedal. Re-test the system for normal operation.

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Brake System - General Information - Brake Disc Runout Check

General Procedures

Check

1. Remove the wheel and tire.
   For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

2. Install all wheel nuts and tighten equally to 20 Nm (15 lb.ft).
   - Make sure that the brake disc is fully seated against the hub face.

3. Install a dial test indicator gauge and holding fixture to a suitable mounting point.

4. NOTE: If the runout is outside specification, check the hub face runout.

   Using the dial test indicator, measure the inner and outer faces of the brake disc.
   For additional information, refer to: Specifications (206-03 Front Disc Brake, Specifications).
   1. Position the gauge so that it contacts the disc 10 mm (0.4 in) from the outer edge.
   2. Slowly rotate the hub/disc assembly. Note the reading.

5. If a front hub runout check is required, remove the front brake disc
   For additional information, refer to: Brake Disc - Vehicles With: High Performance Brakes (206-03 Front Disc Brake, Removal and Installation).
   .
   For additional information, refer to: Brake Disc - Vehicles With: Standard Brakes (206-03 Front Disc Brake, Removal and Installation).

6. If a rear hub runout check is required, remove the rear brake disc.
   For additional information, refer to: Brake Disc - Vehicles With: High Performance Brakes (206-04 Rear Disc Brake, Removal and Installation) / Brake Disc - Vehicles With: Standard Brakes (206-04 Rear Disc Brake, Removal and Installation).

7. NOTE: The hub surface should be free from dirt and corrosion. Do not use abrasive cloths to clean hub faces.

   Using the dial test indicator, measure the hub face runout.
   1. Position the gauge so that it contacts the mounting tube between the stud and the chamfer.
   2. Slowly rotate the hub and note the runout. For additional information, refer to the specification chart.
   - If the front hub runout exceeds the specifications, install a new hub, brake disc and recheck.
     For additional information, refer to: Front Wheel Bearing and Wheel Hub (204-01 Front Suspension, Removal and Installation).
     If the rear hub runout exceeds the specifications, install a new hub, brake disc and recheck.
     For additional information, refer to: Rear Wheel Bearing (204-02 Rear Suspension, Removal and Installation).

8. If the front hub face is within specification, install a new brake disc.
   For additional information, refer to: Brake Disc - Vehicles With: High Performance Brakes (206-03 Front Disc Brake, Removal and Installation)
   /
   Brake Disc - Vehicles With: Standard Brakes (206-03 Front Disc Brake, Removal and Installation).
   If the rear hub face is within specification, install a new disc.

For additional information, refer to: Brake Disc - Vehicles With: High Performance Brakes (206-04 Rear Disc Brake, Removal and Installation) / Brake Disc - Vehicles With: Standard Brakes (206-04 Rear Disc Brake, Removal and Installation).

9. Install the wheel and tire.
   For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

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Brake System - General Information - Brake System Bleeding

General Procedures

CAUTIONS:

The brake fluid reservoir must remain full with new, clean brake fluid at all times during bleeding.

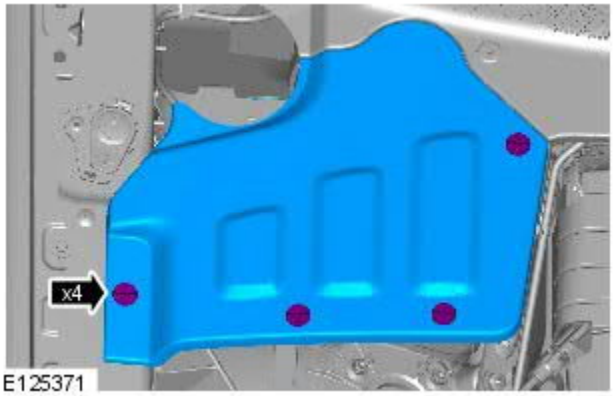
Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

All vehicles

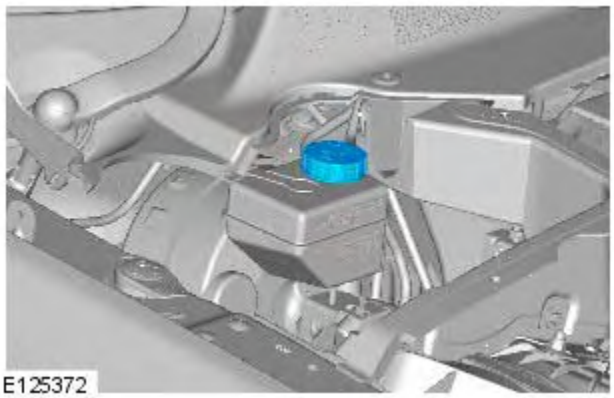
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Check that the brake fluid lines are secure and that there are no signs of a brake fluid leak. If a brake fluid leak is detected, investigate and rectify the cause of the leak before bleeding the brakes.



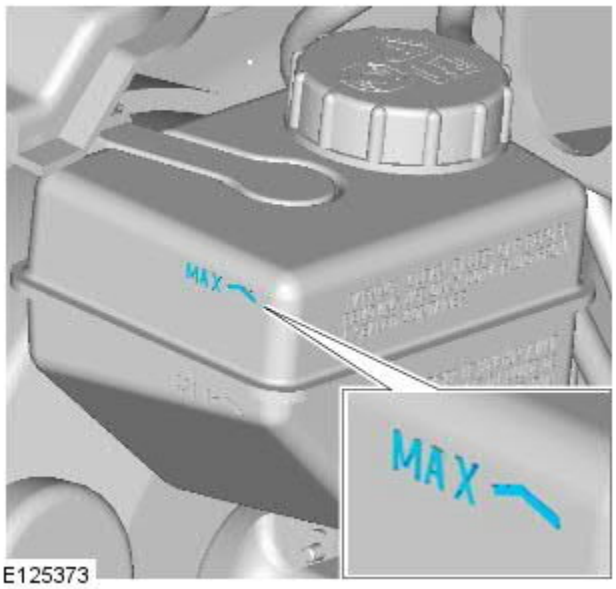
3. Remove the brake master cylinder cover.
   - Remove the 4 clips.



4. WARNING: Do not allow dirt or foreign liquids to enter the reservoir. Use only new brake fluid of the correct specification from airtight containers. Do not mix brands of brake fluid as they may not be compatible.

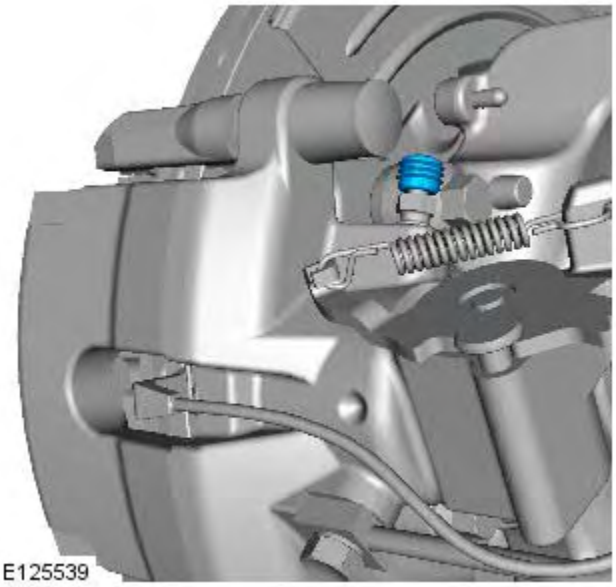
   CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

   Remove the brake fluid reservoir cap.



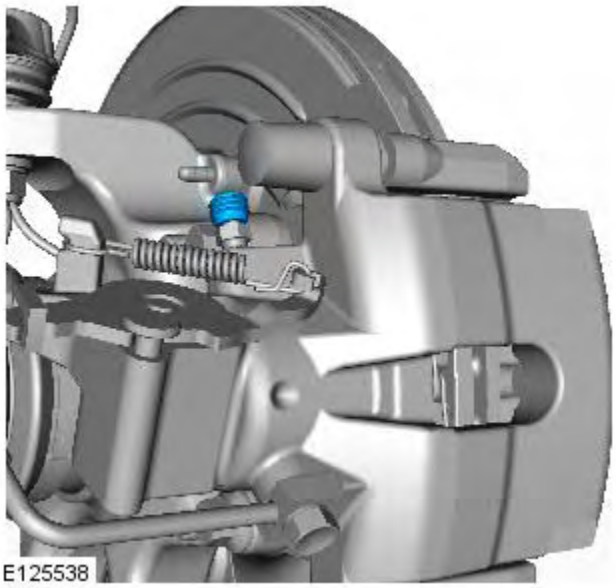
5. Fill the brake fluid reservoir to the MAX mark.

Left-hand drive vehicles



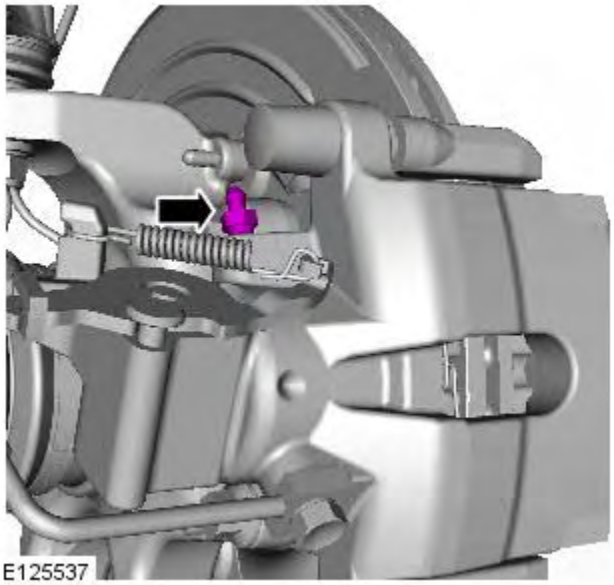
6. Install the bleed tube to the right hand rear brake caliper bleed screw and immerse the free end of the bleed tube in a bleed jar, containing a small quantity of approved brake fluid.
    - Remove the bleed screw covers.

Right-hand drive vehicles


E125538

7. Install the bleed tube to the left hand rear brake caliper bleed screw and immerse the free end of the bleed tube in a bleed jar, containing a small quantity of approved brake fluid.
    - Remove the bleed screw covers.

All vehicles


E125537

8. Loosen the bleed screw by one-half to three-quarters of a turn.

9. CAUTION: The brake fluid reservoir must remain full with new, clean brake fluid at all times during bleeding.

   NOTE: If the bleed tube used, does not have a one way valve the bleed screw will need to be closed before the brake pedal is returned to the rest position. Then opened again and the procedure repeated for each pedal application.

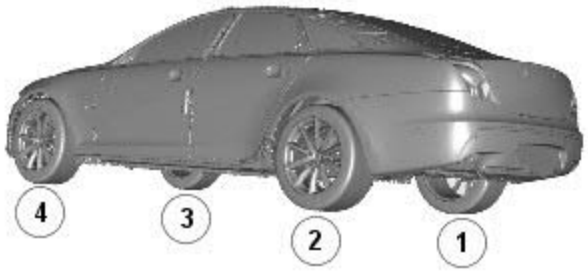
   With assistance, depress the brake pedal steadily through its full stroke and allow it to return to the rest position. Repeat the procedure until brake fluid, clean and air-free flows into the bleed jar.

10. CAUTION: Make sure the bleed screw cap is installed after bleeding. This will prevent corrosion to the bleed screw.

With the brake pedal fully depressed, tighten the bleed screw.
- Tighten the rear bleed screw to 15 Nm (11 lb.ft).
- Tighten the front bleed screw to 15 Nm (11 lb.ft).

11. Fill the brake fluid reservoir to the MAX mark.

Left-hand drive vehicles

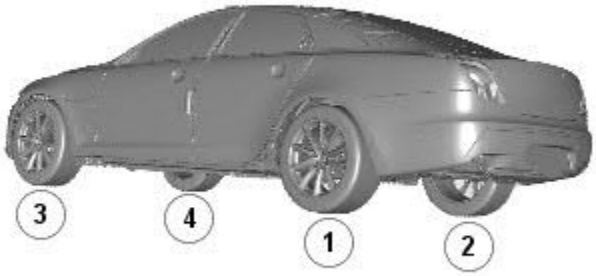


E125370

12. WARNING: Braking efficiency may be seriously impaired if an incorrect bleed sequence is used.

    Repeat the brake bleeding procedure for each brake caliper, following the sequence below.

Right-hand drive vehicles



E125374

13. WARNING: Braking efficiency may be seriously impaired if an incorrect bleed sequence is used.

    Repeat the brake bleeding procedure for each brake caliper, following the sequence below.

All vehicles

14. Fill the brake fluid reservoir to the MAX mark.

15. Apply the brakes and check for leaks.

16. Install the brake fluid reservoir cap.

17. Install the brake master cylinder cover.
    - Carefully secure the clips.

18.
    - On completion, road test the vehicle and check the brake pedal operation. The pedal travel should be short with a firm feel.

Published: 17-Feb-2012

Brake System - General Information - Front Brake Disc Runout Check - With Wheel On Vehicles With: Standard Brakes

General Procedures

1. NOTES:

   Some variation in the illustrations may occur, but the essential information is always correct.

   RH illustration shown, LH similar

   All measurements must taken with the wheel installed.

2. WARNING: Make sure to support the vehicle with axle stands.

   Raise the front of the vehicle.

3. Mount the Dial Test Indicator (DTI) gauge to the bolt as shown with tool 100-053.

4. Make sure the DTI is securely mounted.

E141871

5. Position the DTI probe 5 mm from the outer edge of the disc.
    - Zero DTI and rotate road wheel one complete revolution to measure disc runout.

E141872

6. Position the DTI probe in the centre of the disc.
    - Zero DTI and rotate road wheel one complete revolution to measure disc runout.

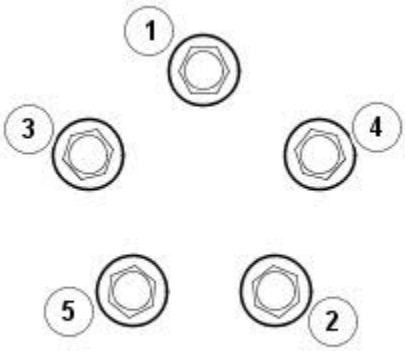
E141873

7. Position the DTI probe 5 mm from the inner edge of the disc.
    - Zero DTI and rotate road wheel one complete revolution to measure disc runout.

8. NOTE: **The disc runout limit is 0.075 mm.**

   If the disc runout exceeds the limit check the hub drive flange and bearing runout.
   For additional information, refer to: Front Wheel Bearing and Wheel Hub Runout Check - Vehicles With: Standard Brakes (204-00 Suspension System - General Information, General Procedures).

9. If hub runout is within the limit replace the brake disc.



E74593

10. Install the wheel.
    - Tighten the road wheel nuts in sequence as shown above to the following:
    - Stage 1: 4 Nm.
    - Stage 2: 60 Nm.
    - Stage 3: 125 Nm.

11. Re-check the disc runout as detailed above.

12. Remove DTI and install the bolt. 90 Nm.

Published: 27-Feb-2012

Brake System - General Information - Rear Brake Disc Runout Check - With Wheel On

General Procedures

1. NOTES:

   Some variation in the illustrations may occur, but the essential information is always correct.

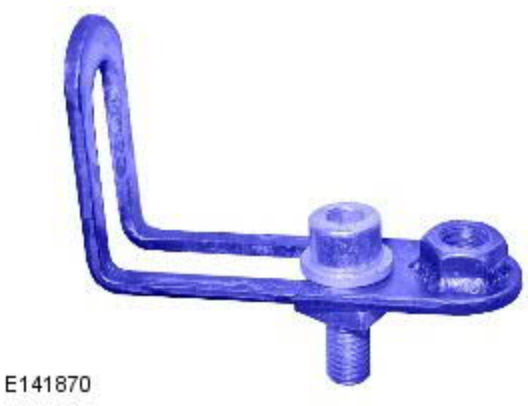
   RH illustration shown, LH similar.

   All measurements must taken be with the wheel installed.

2. WARNING: Make sure to support the vehicle with axle stands.

   Raise the rear of the vehicle.

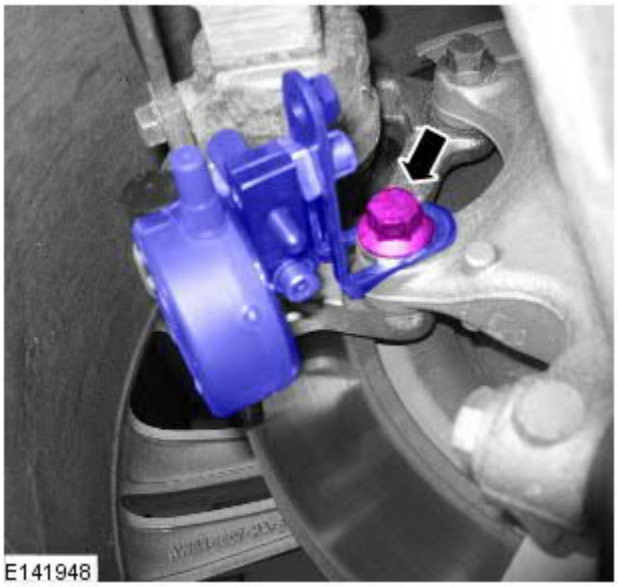
3. Modify tool 100-053 with an M8 bolt and nut as shown.



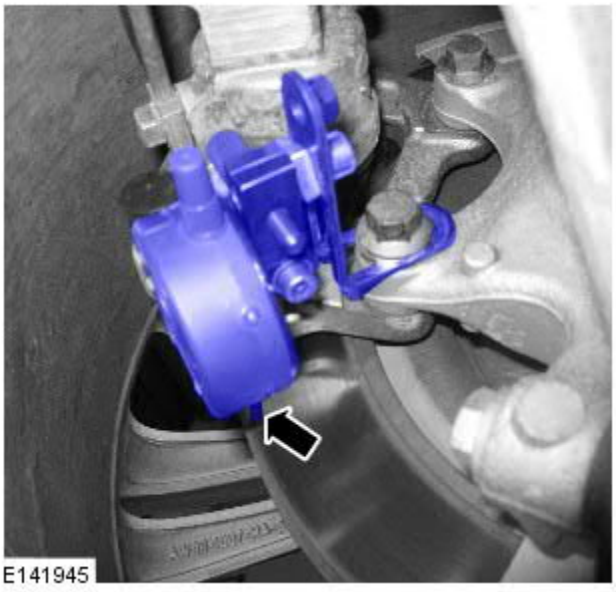
E141870

4. Mount the DTI Dial Test Indicator (DTI) gauge on the tool as shown.

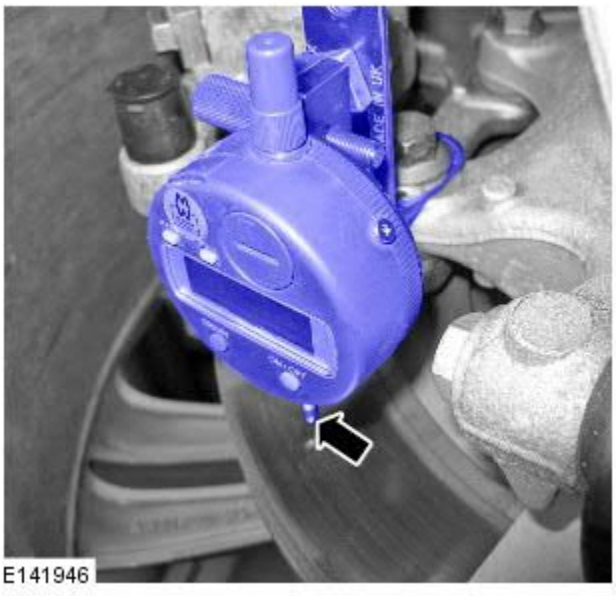
E141869



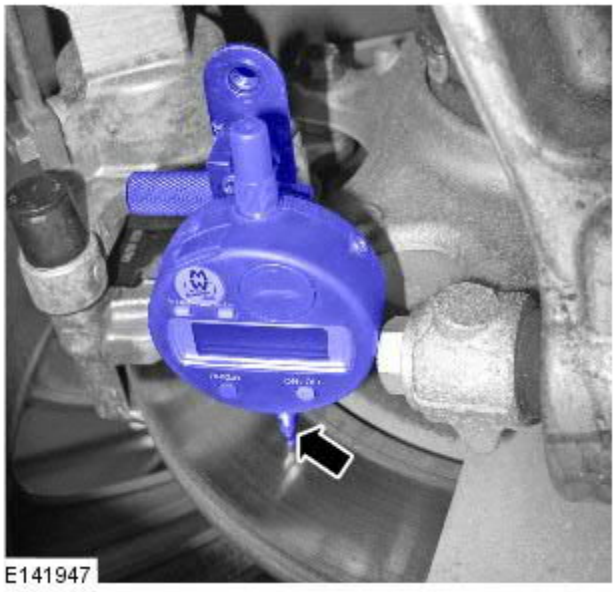
5. Securely mount the DTI on the bottom calliper mounting bolt, a spacer washer maybe required under the tool.



6. Position the DTI probe 5 mm from the outer edge of the disc.
    - Zero DTI and rotate road wheel one complete revolution to measure disc runout.


E141946

7. Position the DTI probe in the centre of the disc.
    - Zero DTI and rotate road wheel one complete revolution to measure disc runout.

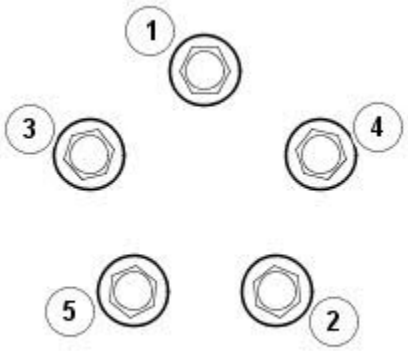

E141947

8. Position the DTI probe 5 mm from the inner edge of the disc.
    - Zero DTI and rotate road wheel one complete revolution to measure disc runout.

9. NOTE: **The disc runout limit is 0.09 mm.**

   If the disc runout exceeds the limit check the hub drive flange and bearing runout.
   For additional information, refer to: Rear Wheel Bearing and Wheel Hub Runout Check - Vehicles With: Standard Brakes (204-00 Suspension System - General Information, General Procedures).

10. If hub runout is within the limit replace the brake disc.



E74593

11. Install the wheel.
    - Tighten the road wheel nuts in sequence as shown to the following:
    - Stage 1: 4 Nm.
    - Stage 2: 60 Nm.
    - Stage 3: 125 Nm.

12. Re-check the disc runout as detailed above.

E141948

13. Remove DTI and install the bolt. 103 Nm.

Published: 30-Jul-2014

Front Disc Brake -

Description	Nm	lb-ft	lb-in
Brake caliper anchor plate retaining bolts	115	85	-
Brake caliper retaining bolts	58	43	-
Brake hose retaining bolt	42	31	-

Published: 22-May-2013

Front Disc Brake - Front Disc Brake

Diagnosis and Testing

For additional information.
REFER to: Brake System (206-00 Brake System - General Information, Diagnosis and Testing).

Published: 18-Sep-2012

Front Disc Brake - Brake Caliper Vehicles With: Standard Brakes

Removal and Installation

Removal

CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

NOTES:

Removal steps in this procedure may contain installation details.

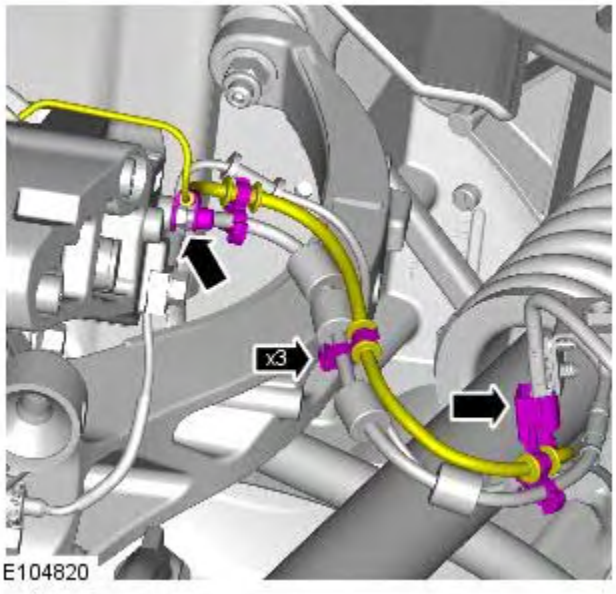
LH illustration shown, RH is similar.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

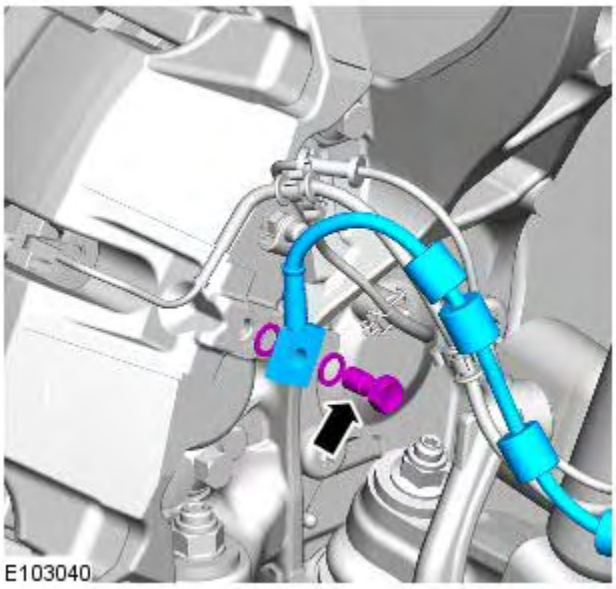
   Raise and support the vehicle.

2. Remove the left-hand front wheel and tire.

   Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).



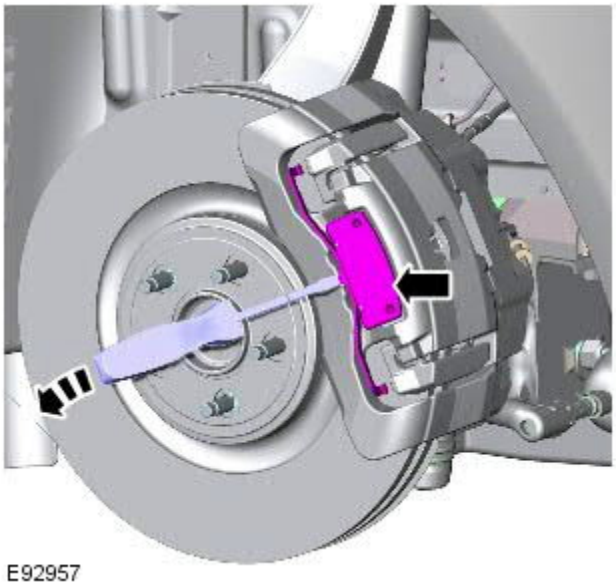
3. NOTE: LH side only.


E103040

4. CAUTION: Always plug any open connections to prevent contamination.

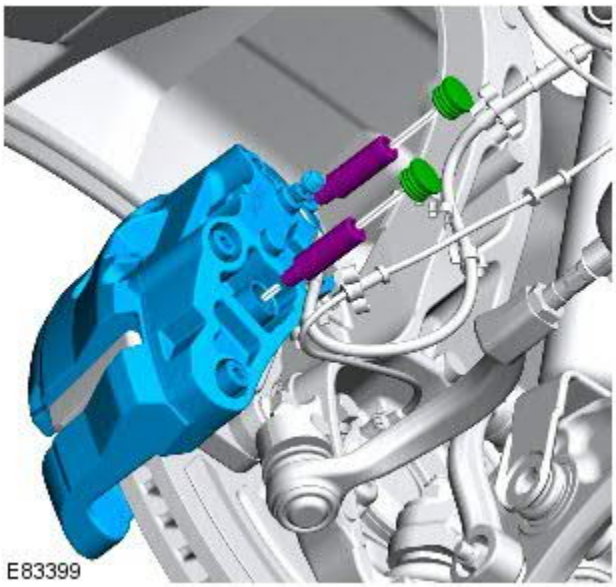
   NOTE: To prevent the loss of brake fluid, using the special tool apply the brake pedal and set to 40mm (1.6 in) below the rest position.

   - Remove and discard the two sealing washers.


E92957

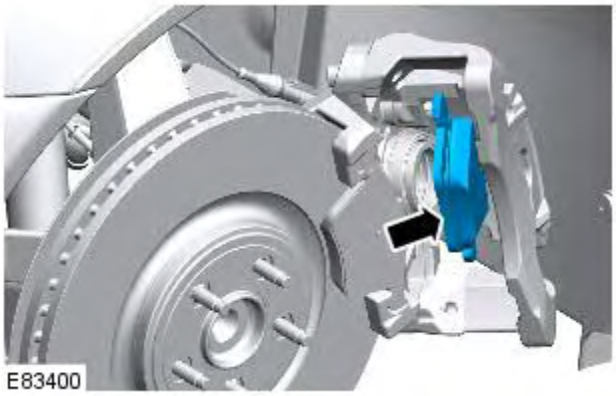
5. CAUTION: Removal of the clips is a delicate procedure, damage will occur if any force is used.

   - Lever the anti-rattle spring in the center of the spring until either side is released.

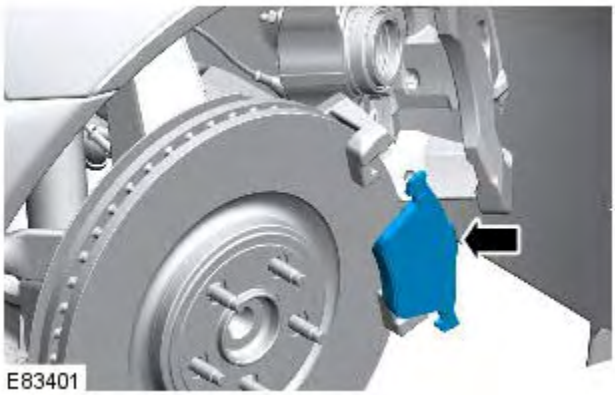


6. WARNING: If the brake caliper piston seal is damaged a new brake caliper must be installed.

   CAUTION: Do not allow the brake caliper to hang on the brake hose.



7.
   - Release the clip.



8.

Installation

1. WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.

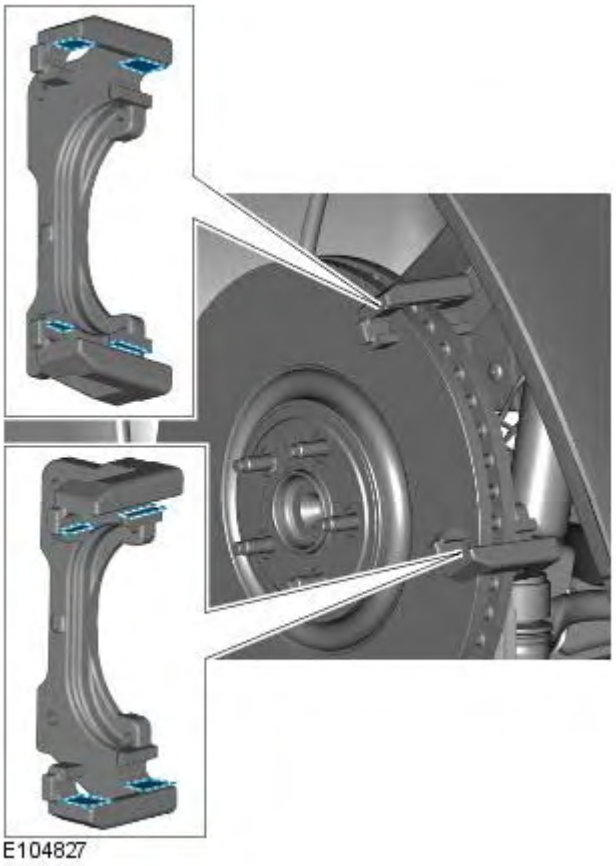
   CAUTION: As the piston is pushed back into the caliper housing, the brake fluid level in the reservoir will rise. Do not allow the reservoir

to overflow.

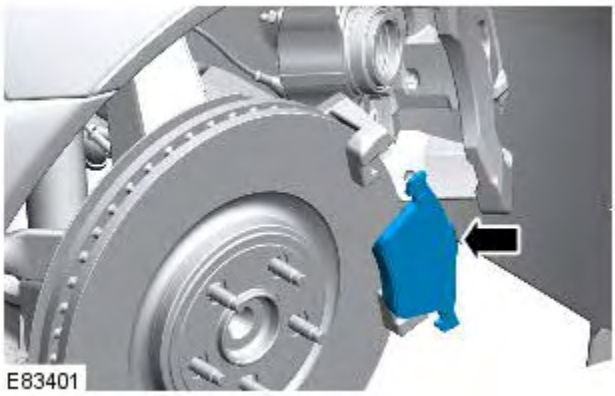
Press the piston into the caliper housing.

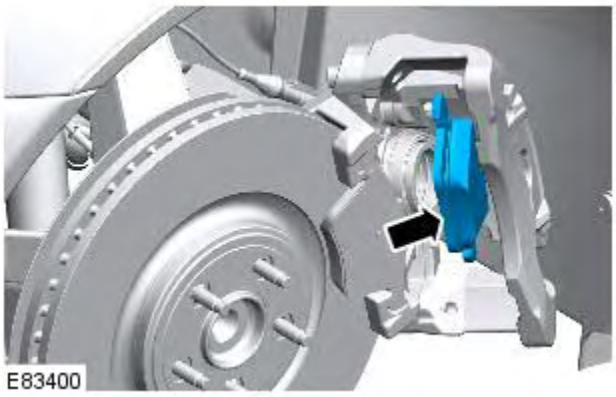
2.

- Apply grease C2C-33568 to the areas indicated.

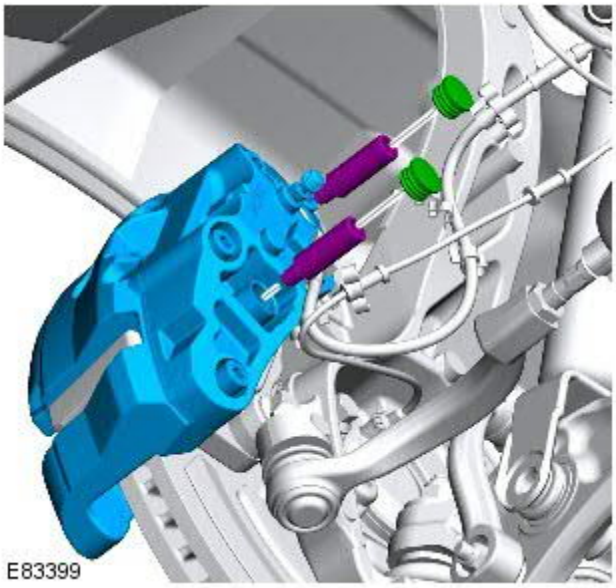

E104827

3.


E83401

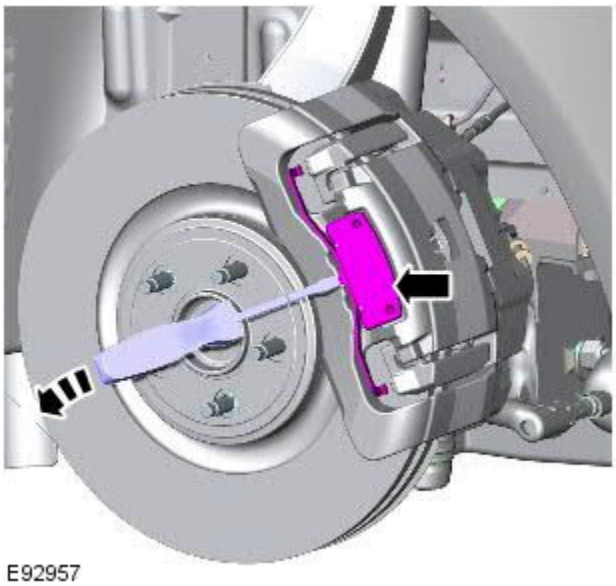

E83400

4.


E83399

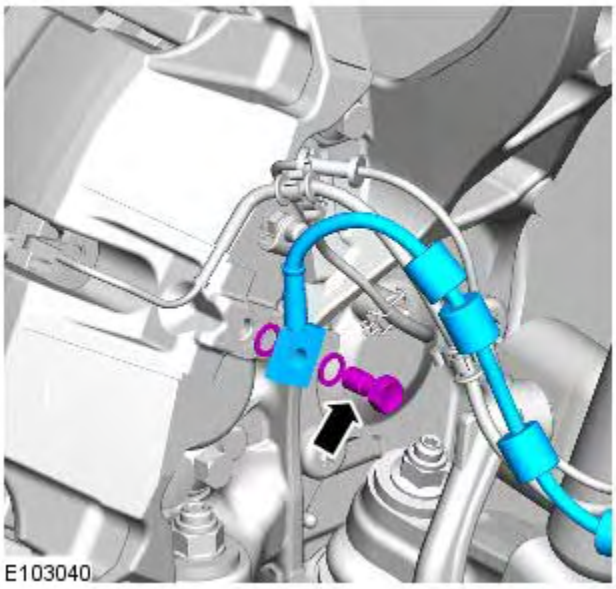
5.

- *Torque:* 58 Nm


E92957

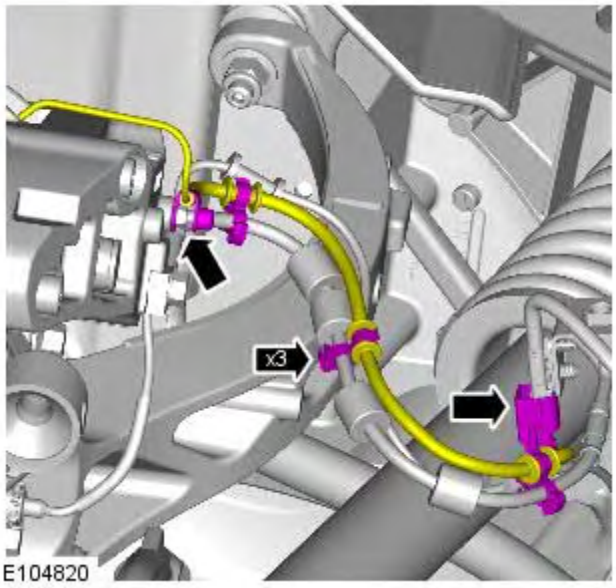
6.

- Secure the bottom arm of the anti-rattle spring under the bottom anchor bracket of the caliper.
- Compress the upper spring arm into the correct position, under the upper anchor bracket, whilst retaining the logo plate.
- Using the screw-driver, tap the central locating tag into the locked position.

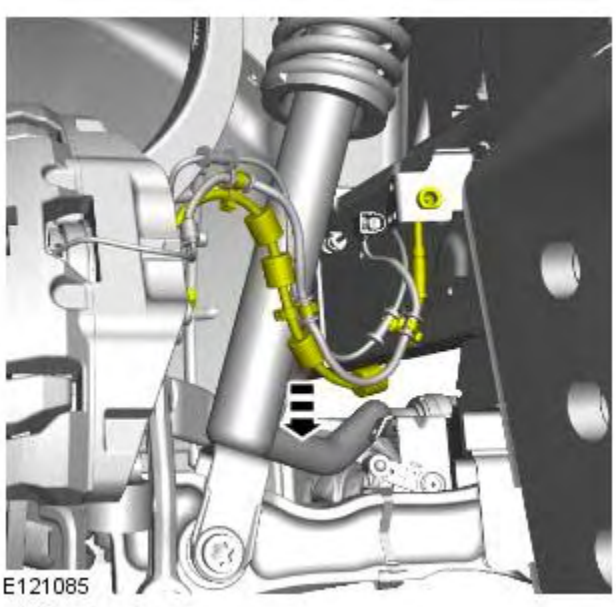


7.

- *Torque:* 42 Nm



8. NOTE: LH side only.



9. CAUTIONS:

   Make sure that the road wheels are in the straight ahead position.

   Make sure that excessive force is not used. Failure to follow this instruction may result in damage to the vehicle.

   Make sure that the brake hose is not twisted and is correctly located.

   - Pull downwards at the position shown.

10. Refer to: Brake System Bleeding (206-00 Brake System - General Information, General Procedures).

11. Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

Published: 11-May-2011

Front Disc Brake - Brake Disc Vehicles With: Standard Brakes

Removal and Installation

Removal

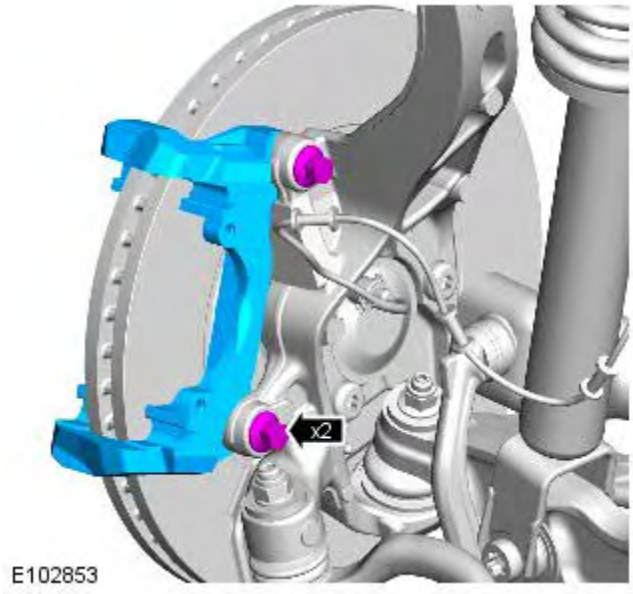
CAUTION: Brake discs must be renewed in pairs.

NOTE: Removal steps in this procedure may contain installation details.

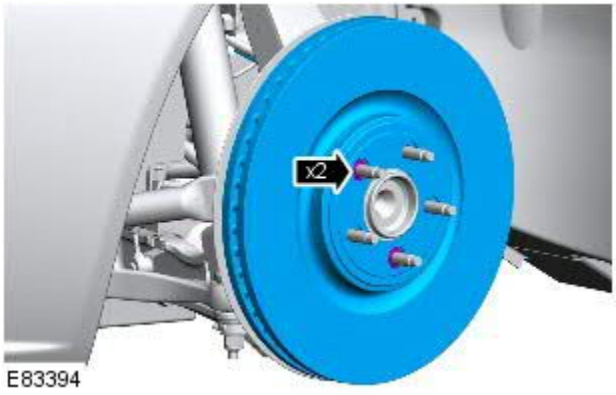
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. Refer to: Brake Pads - Vehicles With: Standard Brakes (206-03 Front Disc Brake, Removal and Installation).



3. *Torque:* 115 Nm



4. NOTE: Make sure that all the component mating faces are clean.
   - Remove the 2 clips.

5.
   - Repeat the above procedure on the opposite side.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Front Disc Brake - Brake Pads Vehicles With: Standard Brakes

Removal and Installation

Removal

WARNING: Brake pads must be renewed in axle sets only, otherwise braking efficiency may be impaired.

CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

NOTES:

The brake pad wear warning indicator sensor must be replaced each time the brake pads are serviced.

Removal steps in this procedure may contain installation details.

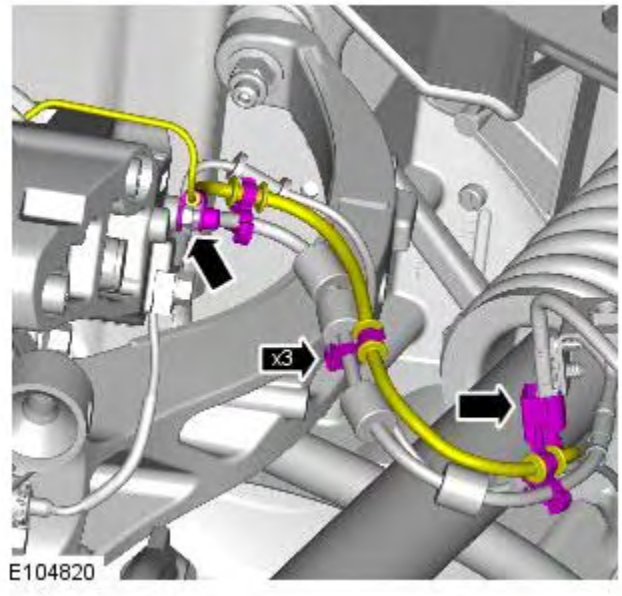
LH illustration shown, RH is similar.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

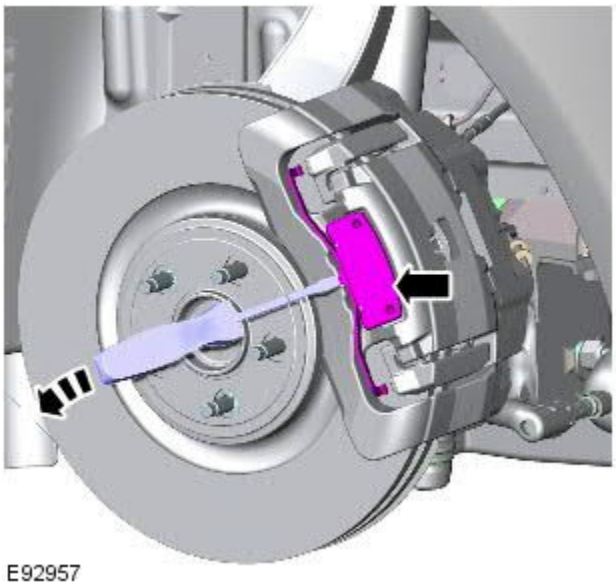
   Raise and support the vehicle.

2. Remove the front road wheels.

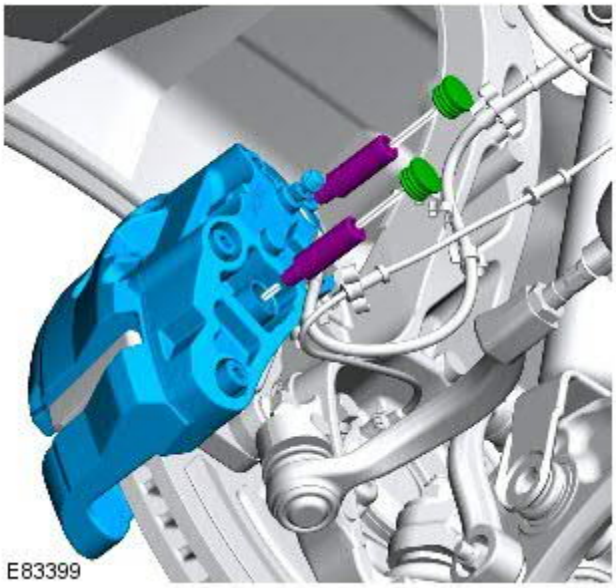
   Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).



3. NOTE: LH side only.

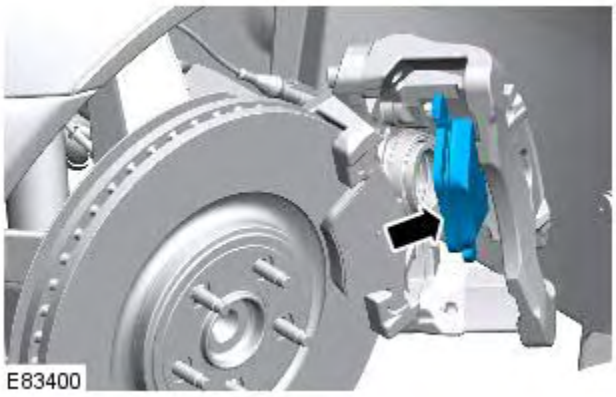

E92957

4. CAUTION: Removal of the clips is a delicate procedure, damage will occur if any force is used.
    - Lever the anti-rattle spring in the center of the spring until either side is released.

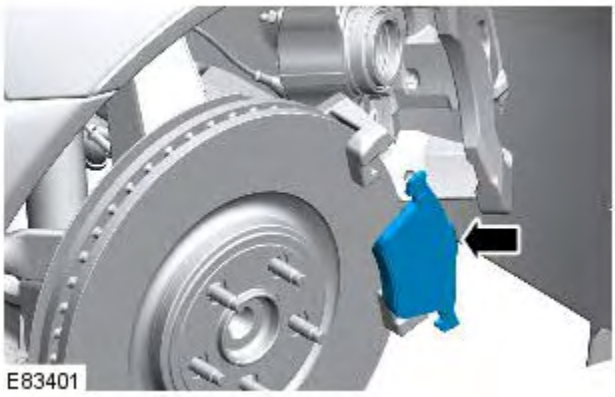

E83399

5. WARNING: If the brake caliper piston seal is damaged a new brake caliper must be installed.

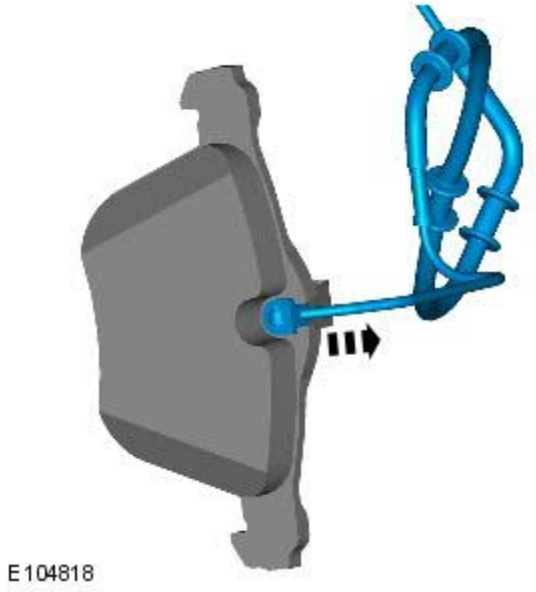
   CAUTION: Do not allow the brake caliper to hang on the brake hose.


E83400

6.
    - Release the clip.



7.



8. NOTE: LH side only.

9.
- Repeat the above procedure on the opposite side.

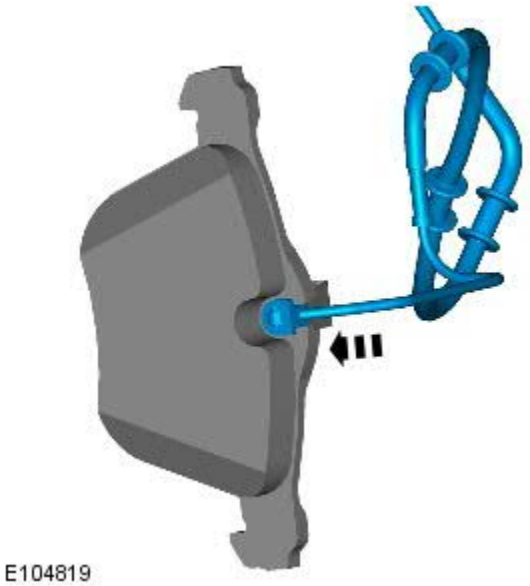
Installation

1. WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.

   CAUTION: As the piston is pushed back into the caliper housing, the brake fluid level in the reservoir will rise. Do not allow the reservoir to overflow.

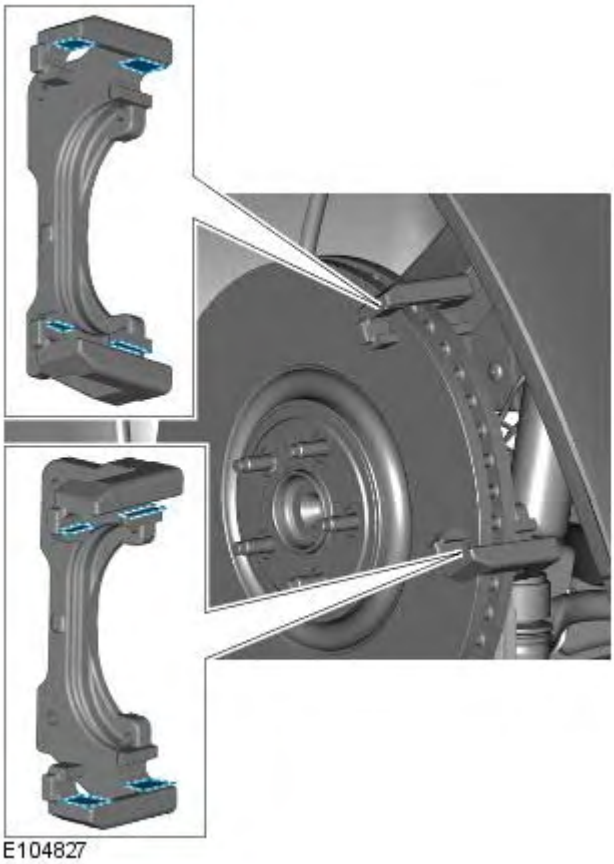
   NOTE: Make sure that all the component mating faces are clean.

   Press the piston into the caliper housing.



E104819

2. NOTE: LH side only.

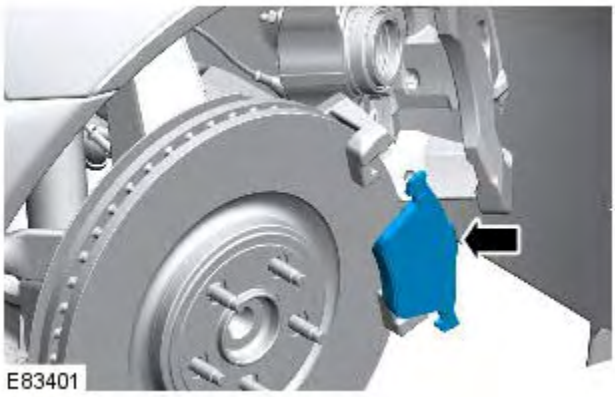


E104827

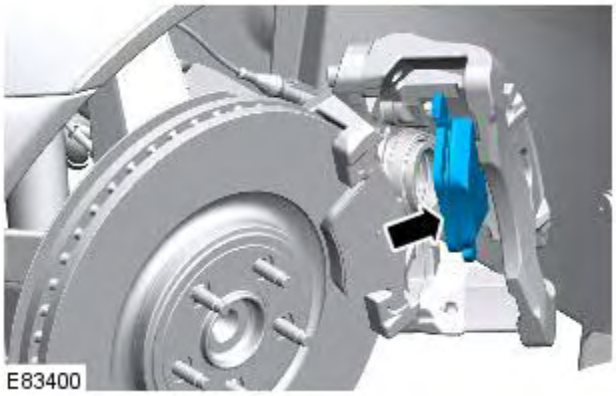
3.

- Apply grease C2C-33568 to the areas indicated.

4.

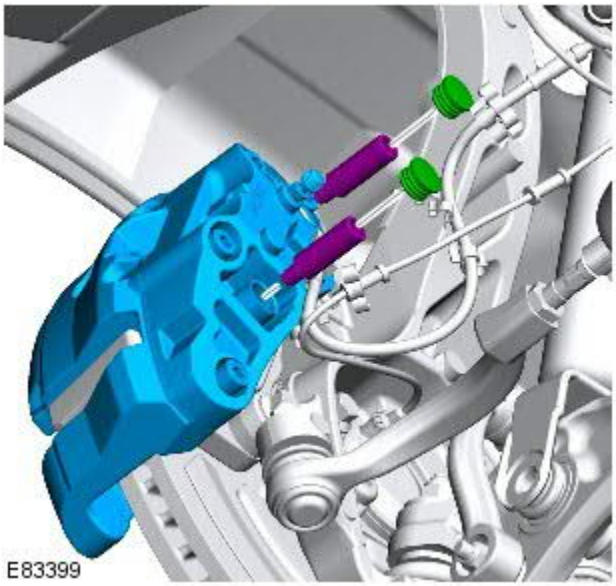


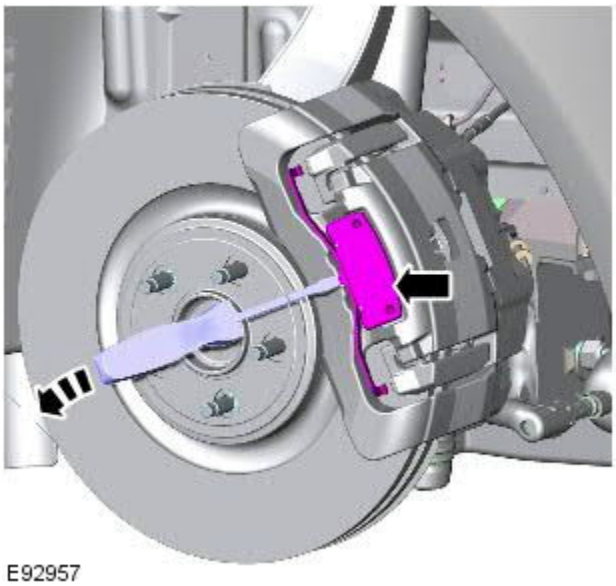
5.



6.

- *Torque:* 58 Nm

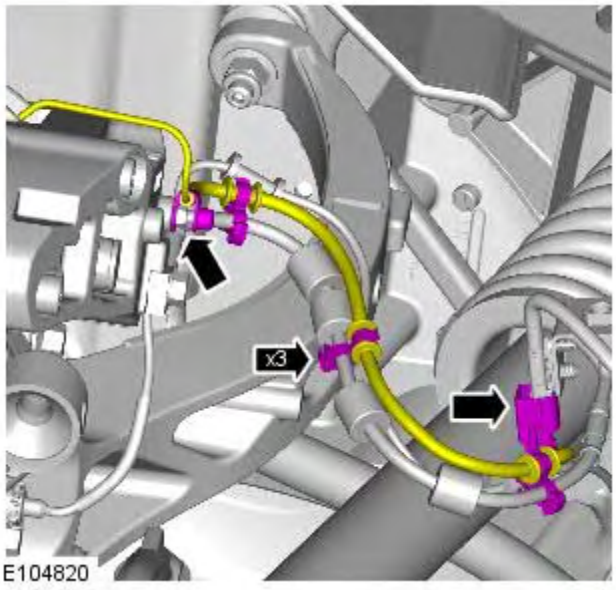




E92957

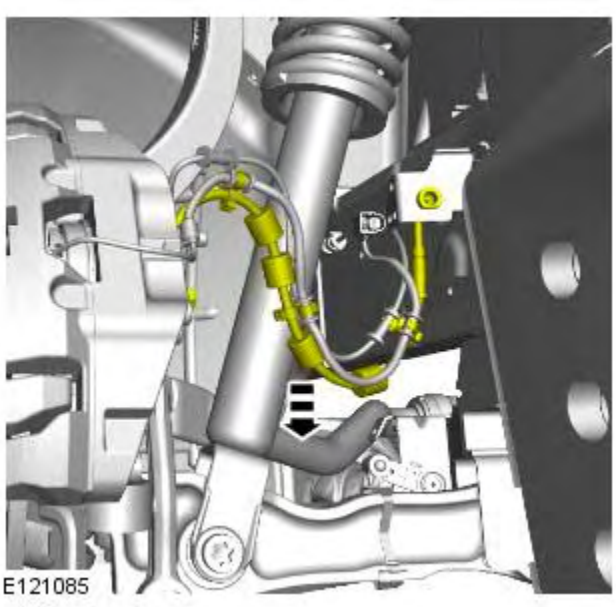
7.

- Secure the bottom arm of the anti-rattle spring under the bottom anchor bracket of the caliper.
- Compress the upper spring arm into the correct position, under the upper anchor bracket, whilst retaining the logo plate.
- Using the screw-driver, tap the central locating tag into the locked position.



E104820

8. NOTE: LH side only.



9. CAUTIONS:

   Make sure that the road wheels are in the straight ahead position.

   Make sure that excessive force is not used. Failure to follow this instruction may result in damage to the vehicle.

   Make sure that the brake hose is not twisted and is correctly located.

   - Pull downwards at the position shown.

10.
   - Repeat the above procedure on the opposite side.

11. Install the front road wheels.

    Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

12. Depress the brake pedal several times, check the fluid level in the brake fluid reservoir and top-up with brake fluid if necessary.

Published: 30-Jul-2014

Rear Disc Brake -

Torque Specifications

Description	Nm	lb-ft	lb-in
Brake hose to brake caliper	42	31	-
Brake caliper anchor plate	103	76	-
Brake caliper retaining bolts	28	21	-
Brake caliper logo badge retaining bolts - Vehicles with high performance brakes	10	7	-

Published: 22-May-2013

Rear Disc Brake - Rear Disc Brake

Diagnosis and Testing

For additional information.
REFER to: Brake System (206-00 Brake System - General Information, Diagnosis and Testing).

Published: 18-Sep-2012

Rear Disc Brake - Brake Caliper Vehicles With: Standard Brakes

Removal and Installation

Removal

WARNING: Failure to release the tension and calibrate the electric parking brake during rear parking brake related service procedures, could cause the parking brake to function incorrectly or become inoperative.

CAUTIONS:

Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

LH illustration shown, RH is similar.

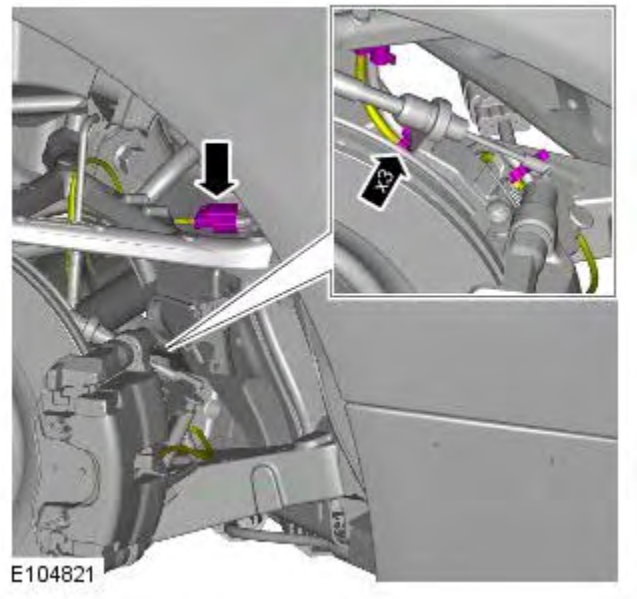
NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

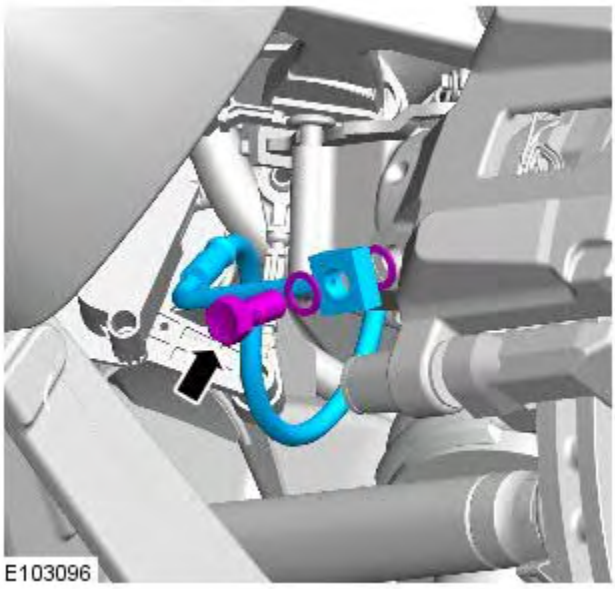
   Raise and support the vehicle.

2. Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

3. Refer to: Parking Brake Cable Tension Release (206-05 Parking Brake and Actuation, General Procedures).



4. NOTE: RH side only.



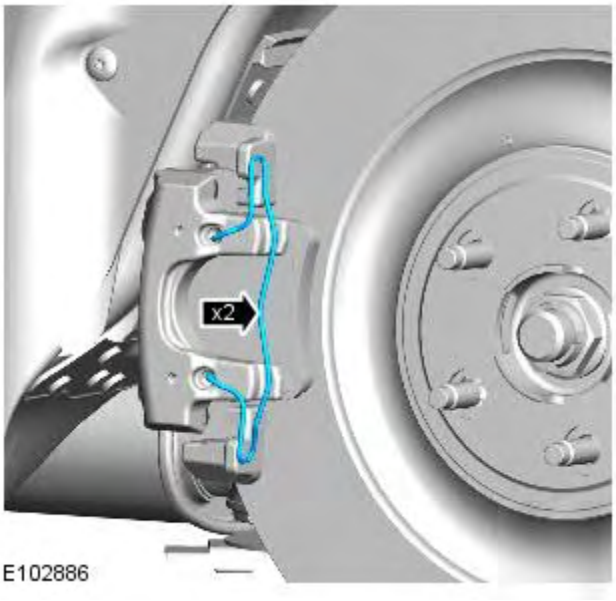
5. CAUTIONS:

Always plug any open connections to prevent contamination.

If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

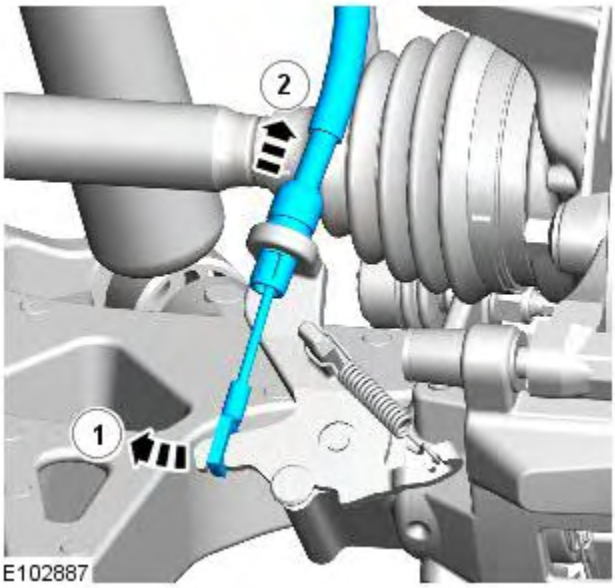
NOTE: To prevent the loss of brake fluid, using the special tool apply the brake pedal and set to 40mm (1.6 in) below the rest position.

Torque: 42 Nm

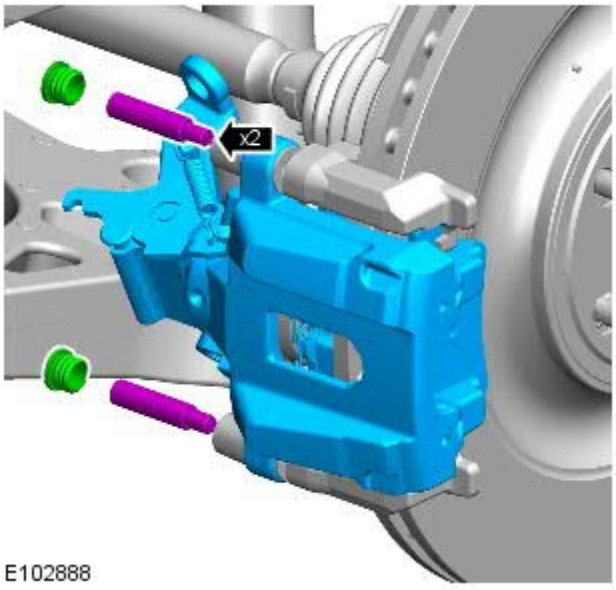


6.

- Release the 2 clips.



7.
- Release the clip.

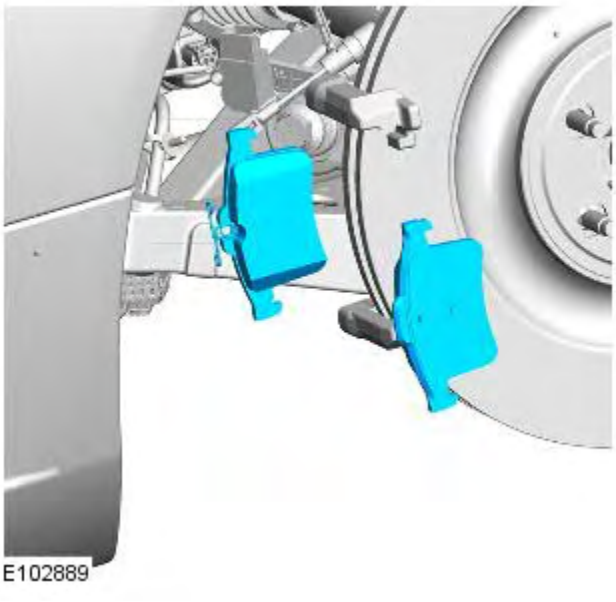


8. WARNING: If the brake caliper piston seal is damaged a new brake caliper must be installed.

CAUTION: Do not allow the brake caliper to hang on the brake hose.

Torque: 28 Nm

9.



Installation

1. To install, reverse the removal procedure.

2. Refer to: Brake System Bleeding (206-00 Brake System - General Information, General Procedures).

Published: 11-May-2011

Rear Disc Brake - Brake Disc Vehicles With: Standard Brakes

Removal and Installation

Removal

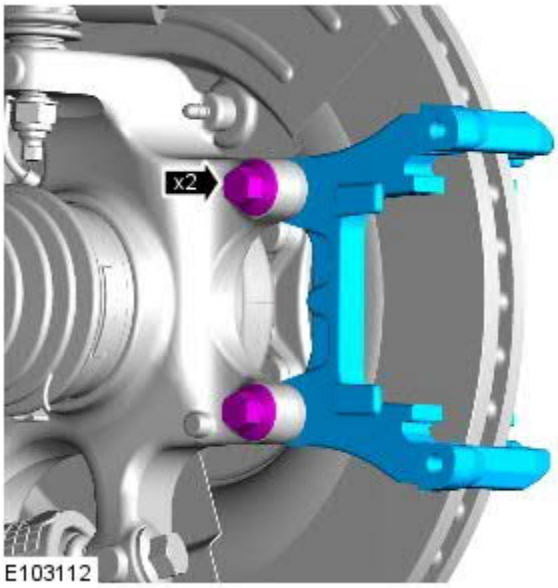
CAUTION: Brake discs must be renewed in pairs.

NOTE: Removal steps in this procedure may contain installation details.

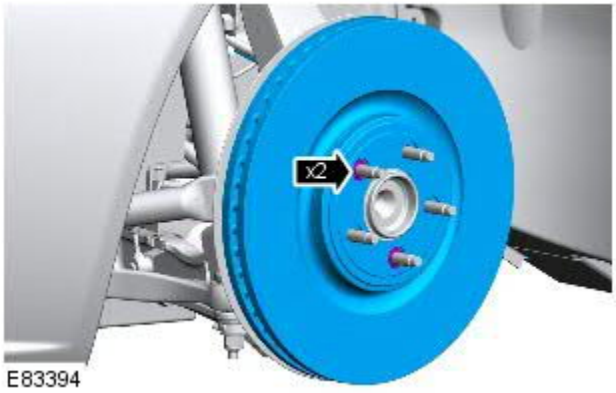
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. Refer to: Brake Pads - Vehicles With: Standard Brakes (206-04 Rear Disc Brake, Removal and Installation).



3.
   - *Torque:* 103 Nm



4. NOTE: Make sure that all the component mating faces are clean.
   - Remove the 2 clips.

5.
   - Repeat the above procedure on the opposite side.

Installation

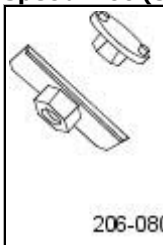
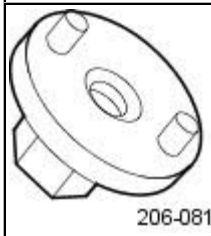
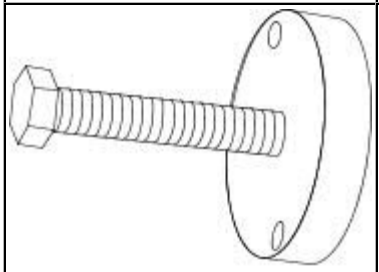
1. To install, reverse the removal procedure.

Published: 11-May-2011

Rear Disc Brake - Brake Pads Vehicles With: Standard Brakes

Removal and Installation

Special Tool(s)

	206-080 Brake caliper piston retractor tool
	206-081 Brake caliper piston retractor tool
	303-588 Remover, Crankshaft Pulley/Damper

Removal

WARNINGS:

Failure to release the tension and calibrate the electric parking brake during rear parking brake related service procedures, could cause the parking brake to function incorrectly or become inoperative.

Do not allow dirt or foreign liquids to enter the reservoir. Use only new brake fluid of the correct specification from airtight containers. Do not mix brands of brake fluid as they may not be compatible.

Brake pads must be renewed in axle sets only, otherwise braking efficiency may be impaired.

CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

NOTES:

Only extraction bolt from special tool 303-588 is used.

Removal steps in this procedure may contain installation details.

The brake pad wear warning indicator sensor must be replaced each time the brake pads are serviced.

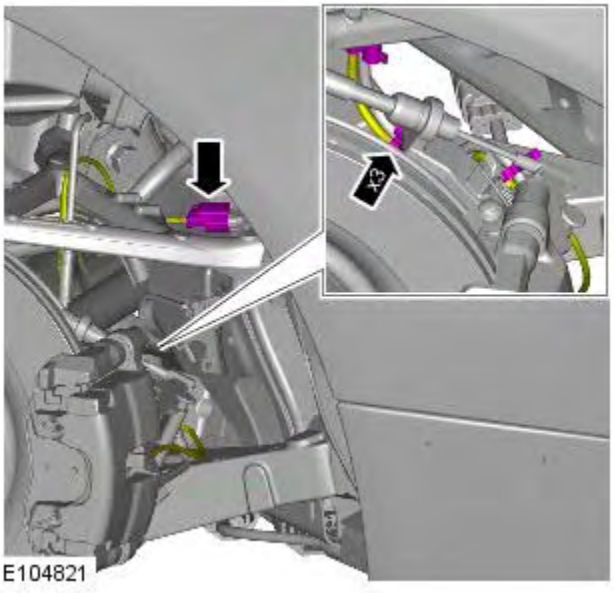
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

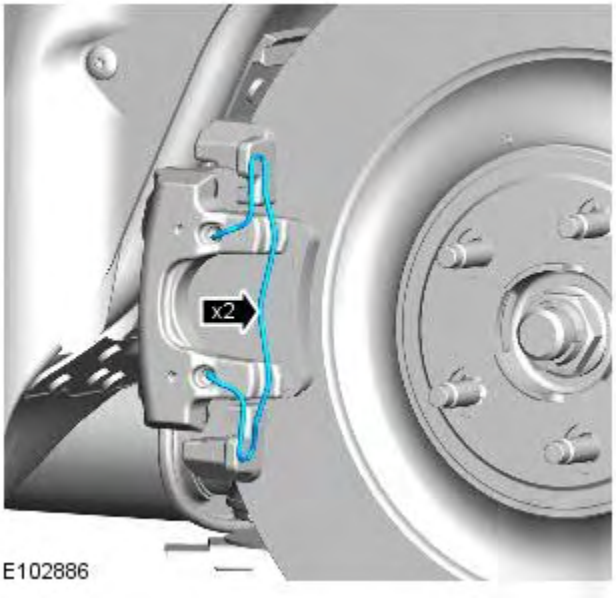
2. Remove the rear road wheels.

   Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

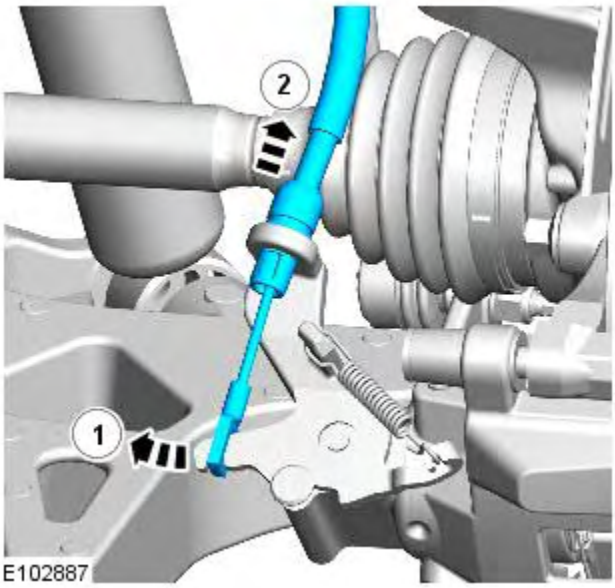
3. Refer to: Parking Brake Cable Tension Release (206-05 Parking Brake and Actuation, General Procedures).



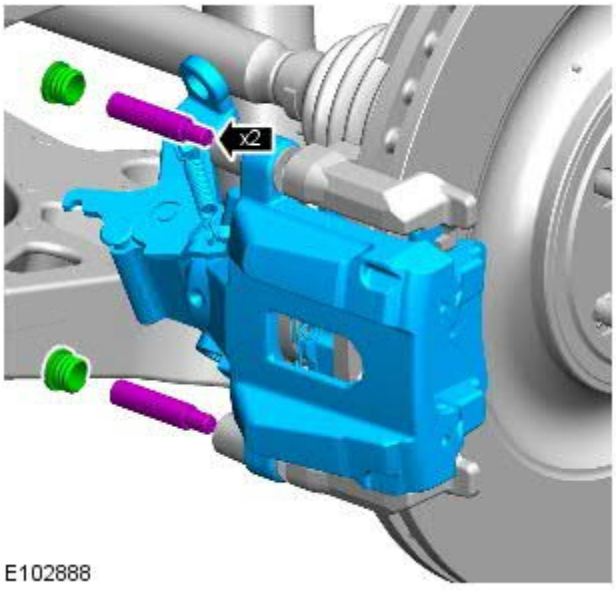
4. NOTE: RH side only.



5.
   - Release the 2 clips.



6.
- Release the clip.

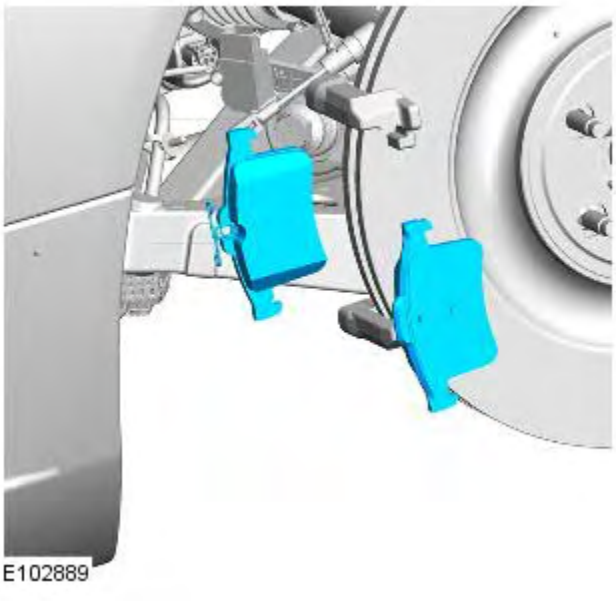


7. WARNING: If the brake caliper piston seal is damaged a new brake caliper must be installed.

CAUTION: Do not allow the brake caliper to hang on the brake hose.

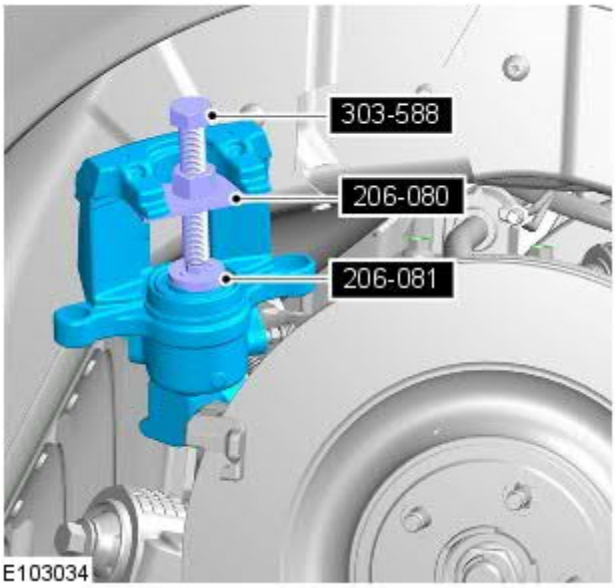
Torque: 28 Nm

8.



9.

- *Special Tool(s):* 303-588
- *Special Tool(s):* 206-080
- *Special Tool(s):* 206-081
- Using the special tools, fully retract the brake caliper piston.



10. NOTE: RH side only.

11.

- Repeat the above procedure on the opposite side.

Installation

E104772

1. NOTES:

   The brake pad wear sensor retaining tang must be installed to the sensor prior to installation to the brake pad.

   RH side only.

2. To install, reverse the removal procedure.

3.
   - Repeat the above procedure on the opposite side.

4. Depress the brake pedal several times, check the fluid level in the brake fluid reservoir and top-up with brake fluid if necessary.

Published: 11-May-2011

Parking Brake and Actuation -

Torque Specifications

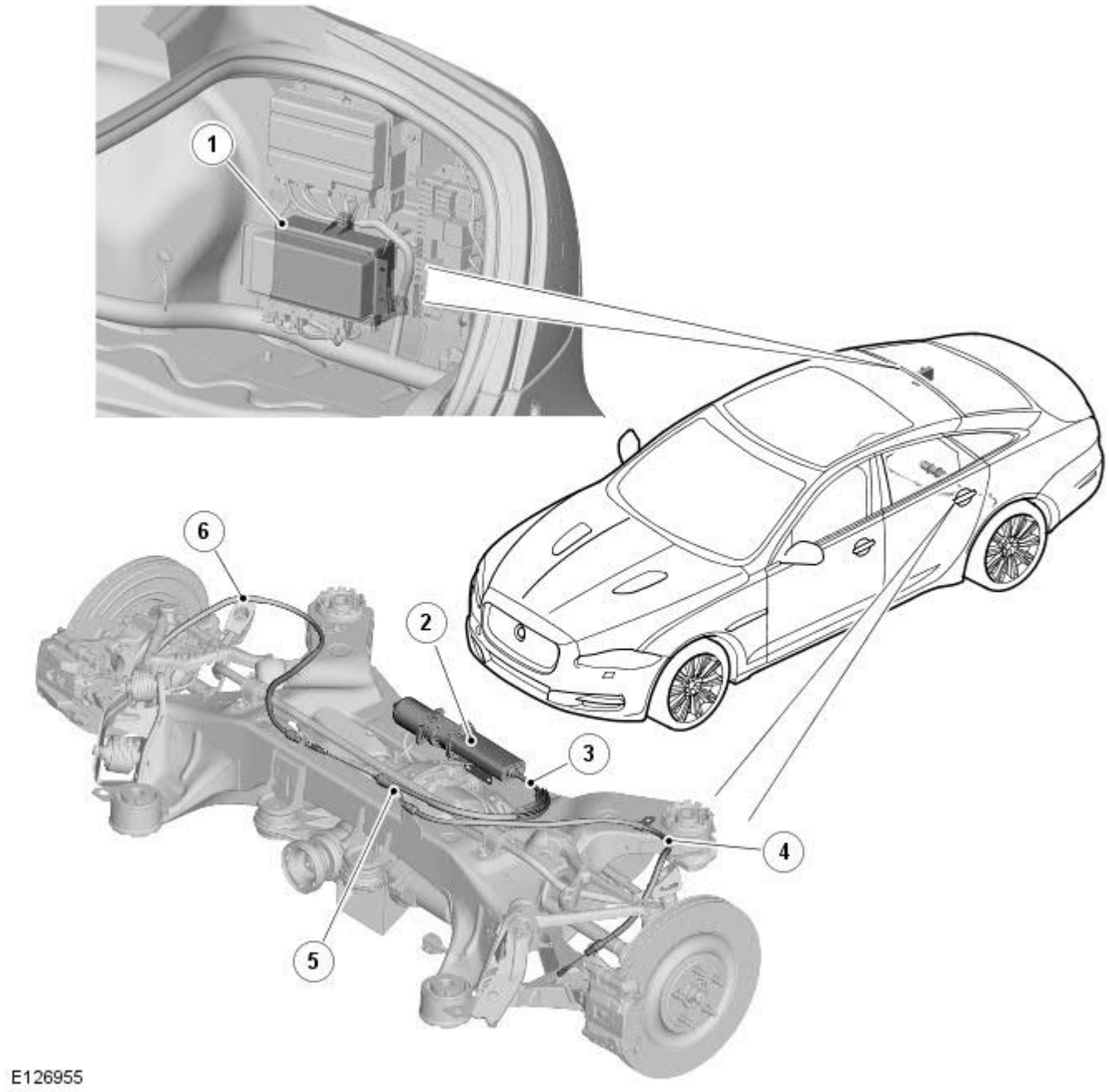
Item	Nm	lb-ft	lb-in
Parking brake actuator - bolts	20	15	-
Parking brake module - nuts	4	3	35
Parking brake switch- bolts	6	4	53

Published: 11-May-2011

Parking Brake and Actuation - Parking Brake - Component Location

Description and Operation

COMPONENT LOCATION - SHEET 1 OF 2



E126955

Item	Description
1	EPB (electronic parking brake) module
2	Parking brake actuator
3	Primary cable assembly
4	LH (left-hand) cable assembly
5	Equalizer
6	RH (right-hand) cable assembly

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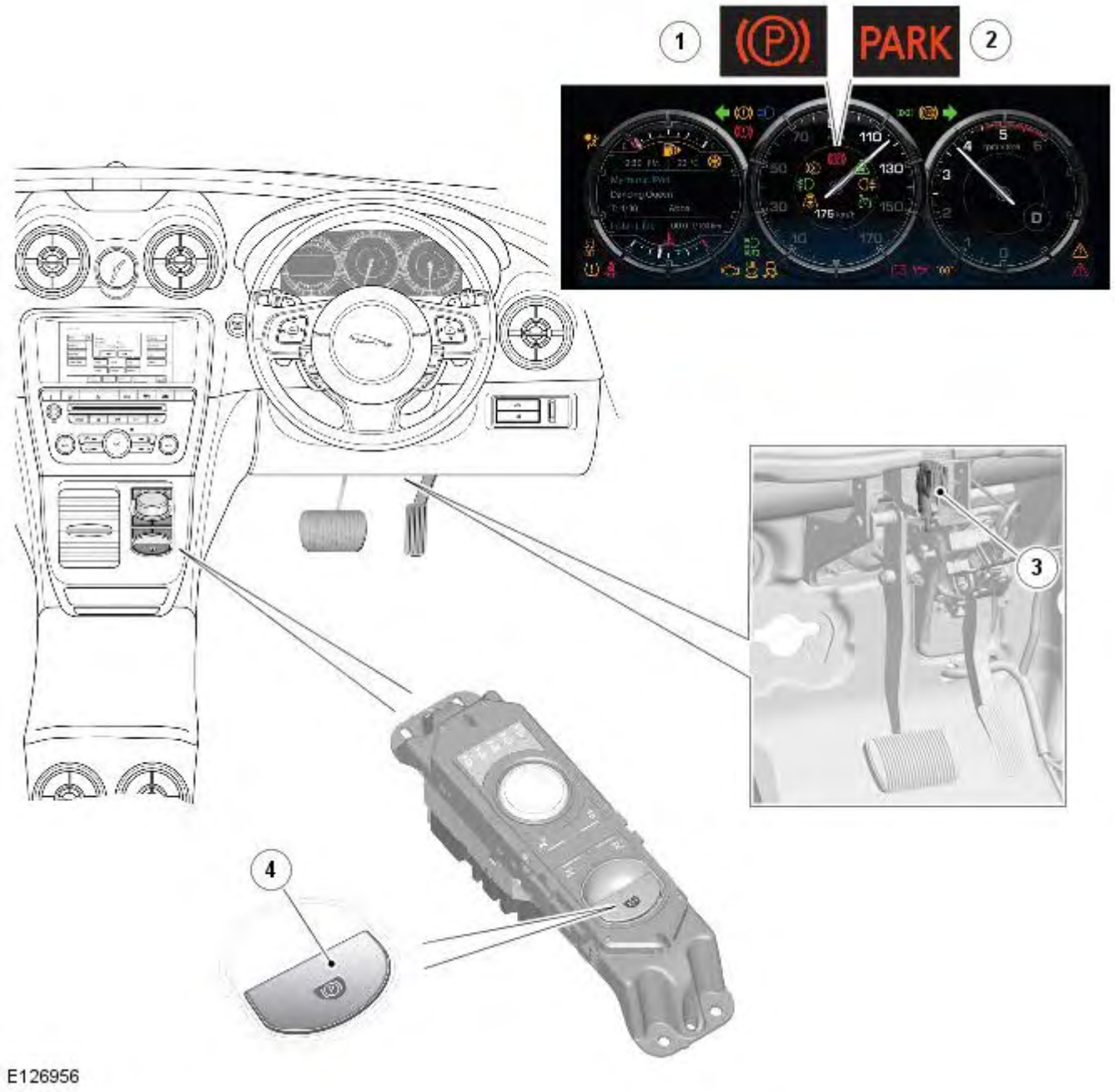
COMPONENT LOCATION - SHEET 2 OF 2



Item	Description
1	Parking brake warning indicator (all except NAS (North American Specification) vehicles)
2	Parking brake warning indicator (NAS vehicles)
3	Stoplamp switch
4	Parking brake switch

Published: 11-May-2011

Parking Brake and Actuation - Parking Brake - Overview

Description and Operation

OVERVIEW

The parking brake is an electrically actuated system that operates on the rear brake calipers. Cables are connected to the rear brake calipers, and act directly on the same pistons used for normal, hydraulic rear brake actuation.

The parking brake is controlled by the EPB (electronic parking brake) module. In response to commands from the driver through the parking brake switch, the EPB module controls operation of the parking brake actuator. The actuator adjusts the tension of the brake cables to apply and release the rear brake calipers. Features of the parking brake include:

- Manual apply.
- Manual release.
- Automatic release.

A service routine to release cable tension, using Jaguar approved diagnostic equipment, must be performed prior to working on the EPB system. This decouples the components, to prevent damage to the actuator, and inhibits all parking brake switch functions. There is also a procedure for the emergency release of cable tension.
Refer to: Parking Brake Cable Tension Release (206-05 Parking Brake and Actuation, General Procedures).

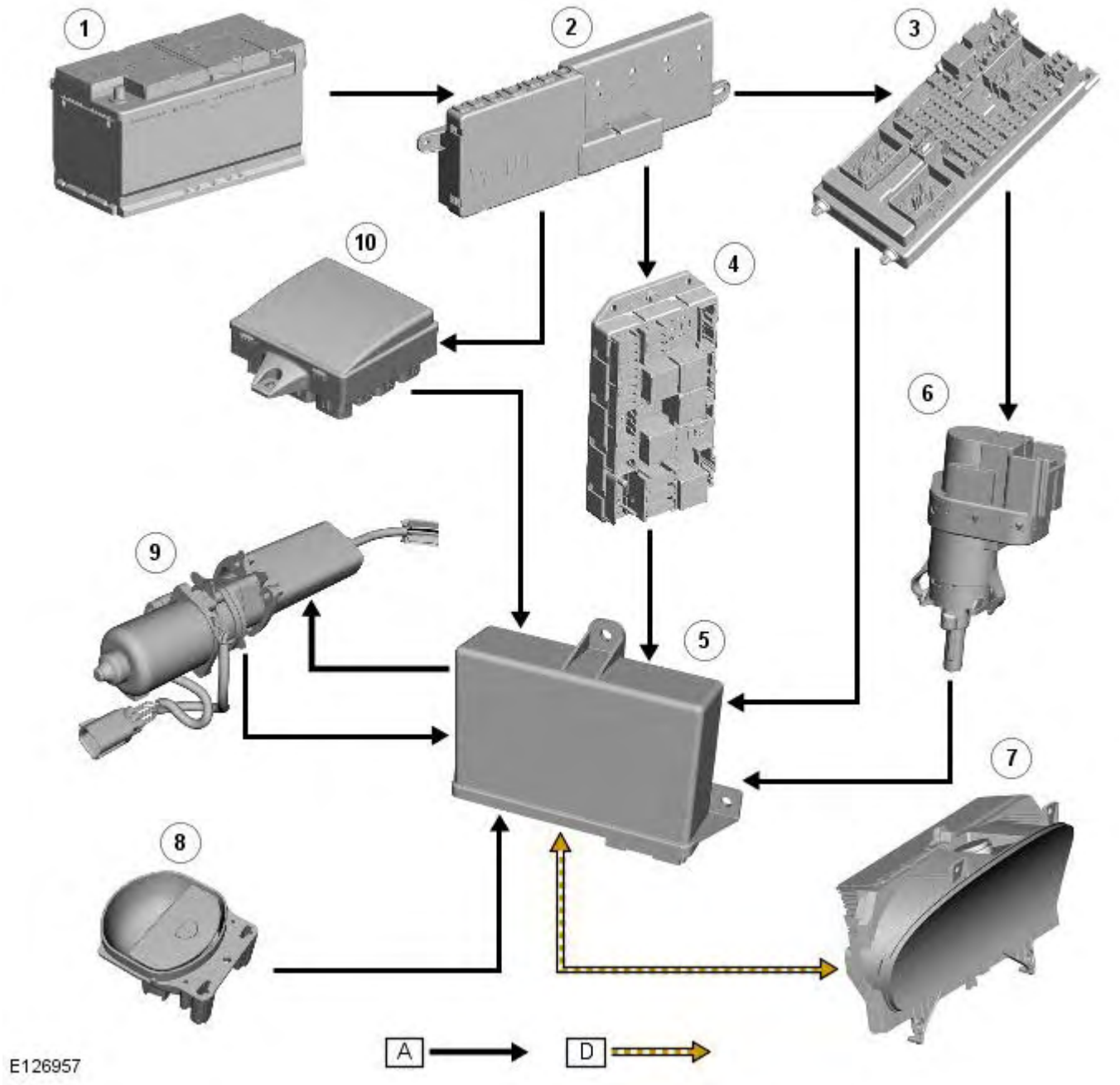
Published: 11-May-2011

Parking Brake and Actuation - Parking Brake - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: A = Hardwired; D = High speed CAN (controller area network) bus.



Item	Description
1	Battery
2	BJB (battery junction box)
3	CJB (central junction box)
4	RJB (rear junction box)
5	EPB (electronic parking brake) module
6	Stoplamp switch

7	Instrument cluster
8	Parking brake switch
9	Parking brake actuator
10	EJB (engine junction box)

System Operation

STATIC APPLY

The EPB module receives a vehicle speed signal from the ABS (anti-lock brake system) module on the high speed CAN bus. If the parking brake switch is pulled to the apply position and vehicle speed is less than 2 mph (3 km/h), the EPB module will instigate the static apply mode and drive the actuator to apply full parking brake force to the rear wheels.

The EPB module monitors the current drawn by the actuator and compares this to information held within its configuration software to determine when full braking force has been applied.

DYNAMIC APPLY

There are two dynamic apply modes; low speed dynamic and high speed dynamic. The low speed dynamic mode operates at speeds between 2 and 20 mph (3 and 32 km/h). The high speed dynamic mode operates at speeds above 20 mph (32 km/h).

If the parking brake switch is pulled up to the apply position and vehicle speed is within the low speed dynamic range, the EPB module drives the actuator to apply full parking brake force to the rear wheels.

If the parking brake switch is pulled up to the apply position and vehicle speed is within the high speed dynamic range, the EPB module will apply braking force to the rear wheels at a slower rate until full braking load is reached or the switch is released. The rate with which braking force is applied is controlled by the EPB module, which monitors both current drawn by the actuator and positional information from the actuator hall sensor and compares this to information held within its configuration software.

DRIVE AWAY RELEASE

The EPB module will initiate a drive away release function and automatically release the parking brake if the following conditions are detected:

- The engine is running.
- Drive or reverse is selected.
- Positive throttle movement is detected.

The EPB module receives messages of gear selector position and throttle angle over the high speed CAN bus from the TCM (transmission control module) and the ECM (engine control module) respectively.

RELEASE FROM PARK

The EPB module will initiate the release from park function and automatically release the parking brake if the gear selector is moved from P (park).

REPAIRS

Before carrying out any work on the parking brake system, use Jaguar approved diagnostic equipment to perform the service routine to release cable tension. The routine can be found in the vehicle configuration area, under the set-up and configuration menu. After any work has been carried out on the parking brake, the system will require resetting.

CAUTION: Do not use the emergency release tool to allow work to be carried out on the parking brake. Work can only be carried out on the parking brake system after the service routine to release cable tension has been run.

RESETTING

If the electrical supply is disconnected from the EPB module, the position memory will be lost. On battery re-connection and ignition on, Apply Foot And Park Brake will be displayed in the instrument cluster message center indicating the parking brake requires resetting.
Refer to: Parking Brake (206-05 Parking Brake and Actuation, Diagnosis and Testing).

OPERATING VOLTAGES

The EPB module will only operate the actuator if the power supply from the battery is between 9 and 16 V. At any voltage within this range, the actuator is able to fully tighten and release the brake cables. If the power supply falls outside of the range, a fault code is stored in the EPB module and can be retrieved using Jaguar approved diagnostic equipment.

Component Description

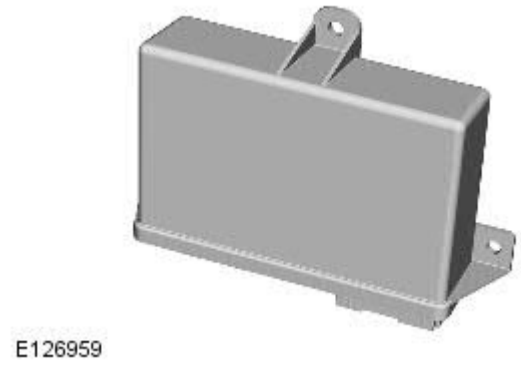
PARKING BRAKE SWITCH

The parking brake switch is mounted in the floor console, rearward of the rotary gear selector. The switch has three states:

- Apply: When the switch is pulled up to apply the parking brake.
- Release: When the switch is pushed down to release the parking brake.
- Neutral: The central default position. The switch returns to this position regardless of parking brake status.

The parking brake switch contains a pair of micro-switches for both the apply and release actions. The EPB module provides an individual hardwired electrical feed to each of the four micro-switches plus a single ground connection, allowing it to constantly monitor switch status.

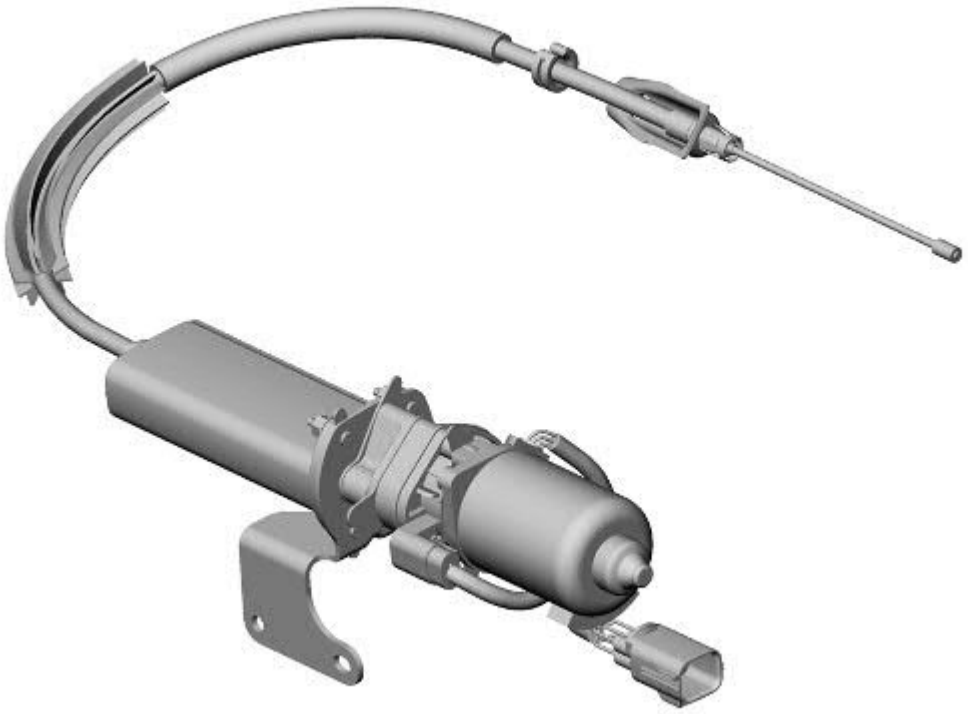
EPB MODULE



The EPB module is mounted in the luggage compartment on the RH (right-hand) side quarter panel and is connected to the vehicles electrical wiring by two multiplugs. The EPB module is connected to the high speed CAN bus, allowing it to communicate with other vehicle systems.

The EPB module monitors the condition of the parking brake switch through a series of hardwired electrical connections and controls operation of the parking brake actuator accordingly.

PARKING BRAKE ACTUATOR



E126960

The parking brake actuator is mounted on the back of the rear subframe. Operation of the actuator is controlled by the EPB module in response to parking brake switch requests from the driver.

A Hall sensor is located within the actuator and provides positional information back to the EPB module. The principle function of the Hall sensor is to ensure the actuator fully releases the parking brake when a static release request is made. The signal provided by the Hall sensor is compared to configuration information contained within the EPB module software to determine when a full release has been carried out.

STOPLAMP SWITCH

E125620

The stoplamp switch is mounted on the brake pedal mounting bracket. One of the prerequisites for releasing the parking brake is that the foot brake is applied. The EPB module is able to determine the position of the foot brake by monitoring the status of the stoplamp switch via a hardwired electrical connection.

The stoplamp switch also supplies status signals to the CJB and the ECM.

INSTRUMENT CLUSTER

The instrument cluster contains a red warning indicator for the EPB. The warning indicator is permanently illuminated while the EPB is applied. If the warning indicator flashes, the EPB has an electrical fault.

If there is an EPB fault, the message Cannot Apply Park Brake or Park Brake Fault appears in the instrument cluster message center. If the vehicle is moving with the parking brake applied, the message Caution! Park Brake Applied appears in the message center accompanied by a chime from the instrument cluster.
Refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

Published: 11-May-2011

Parking Brake and Actuation - Parking Brake

Diagnosis and Testing

Principle of Operation

For a detailed description of the Parking Brake operation, refer to the relevant Description and Operation section of the workshop manual.
REFER to: Parking Brake (206-05 Parking Brake and Actuation, Description and Operation).

Parking Brake Calibration

The parking brake system must be calibrated whenever the battery has been disconnected or has been in a state of discharge, or repairs have been carried out to the rear service or parking brake system.

NOTE: If new rear brake pads have been installed, pressure must be applied to the brake pedal a minimum of five times prior to calibration of the parking brake system.

To calibrate the parking brake system:

1. Place gear selector lever in 'P' Park position.
2. Release parking brake cable tension to service position.
3. Set the ignition status to 'ON'.
4. Apply and hold the footbrake then pull up the parking brake switch.
5. To release the parking brake, apply and hold the footbrake then release and press down the parking brake switch.

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Parking brake cable • Parking brake actuator • Brake caliper • Brake pads • Stabilizer bar drop link caps	• Fuse(s) • Wiring harness/electrical connectors • Check for bent/corroded pins • Parking brake switch • Parking brake module

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident check the system for any logged Diagnostic Trouble Codes (DTCs) and proceed to the DTC Index , alternatively, verify the customer concern and refer to the Symptom Chart.

Symptom Chart

Symptom	Possible Cause	Action
The parking brake will not engage or release (with no parking brake warning message)	• Cables fouled, trapped or damaged • Cables incorrectly routed or installed • Rear lining wear • Service brake incorrectly adjusted following lining change • Caliper malfunction	• Check the rear and primary cables for correct installation and damage. • Inspect the rear brake linings for wear. • Re-calibrate the parking brake, refer to the calibration procedure. • Check the rear service brake for correct installation and operation.

Symptom	Possible Cause	Action
The parking brake will not engage or release (with parking brake warning message)	• Cables fouled, trapped or damaged • Cables incorrectly routed or installed • Rear lining wear • Actuator malfunction • Caliper malfunction	• Check the rear and primary cables for correct installation and damage. • Inspect the rear brake linings for wear. • Re-calibrate the parking brake, refer to the calibration procedure. • Check the rear service brake for correct installation and operation.
No communication with the parking brake module	• Fuse • Module off Bus • CAN network error • Parking brake module fault	• Check fuses • Ensure battery is fully charged and in serviceable condition. Check battery voltage at parking brake module. • Check CAN network using manufacturer approved diagnostic system.
'Park brake Fault' displayed on message centre with associated warning lamps	• Parking brake system fault	• Check the parking brake module for DTCs and refer to DTC Index. REFER to: Diagnostic Trouble Code (DTC) Index (100-00, Description and Operation).
Brakes drag	• Parking brake not re-calibrated after battery has been disconnected or has been in a state of discharge, or repairs have been carried out to the rear service or parking brake system • Service brake system fault	• Re-calibrate parking brake, refer to the calibration procedure. • Check the service brake for correct operation.

DTC Index

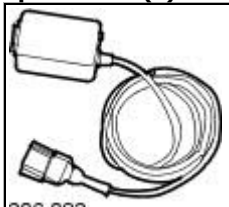
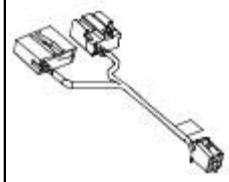
For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Electric Parking Brake (PBM) (100-00 General Information, Description and Operation).

Published: 11-May-2011

Parking Brake and Actuation - Parking Brake Cable Tension Release

General Procedures

Special Tool(s)

 206-082	Electric parking brake release tool 206-082. Only to be used for EMERGENCY brake release
 E69907	Electric parking brake release tool link lead 206-082-01. Only to be used for EMERGENCY brake release

WARNING: Failure to release the tension and calibrate the electric parking brake during rear parking brake related service procedures, could cause the parking brake to function incorrectly or become inoperative.

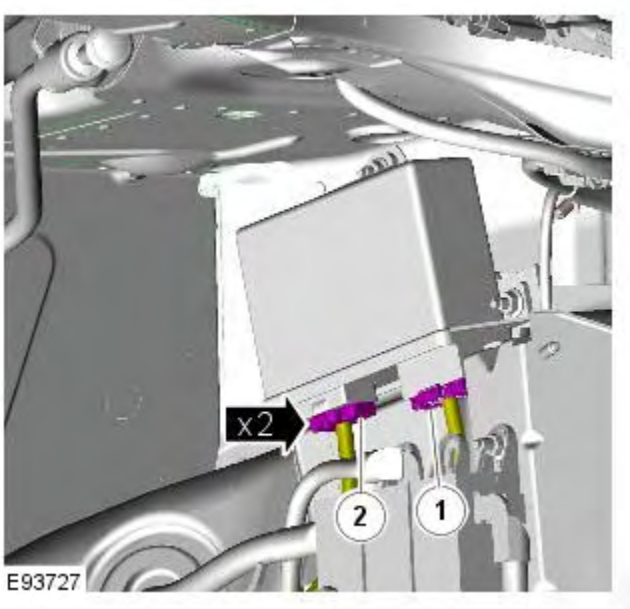
1. WARNING: Always use Jaguar approved diagnostic equipment to release the cable tension, when carrying out repair operations on the electric park brake which require cable tension release.

   Connect the Jaguar approved diagnostic equipment to release the electric parking brake cable tension.
   - Follow the on-screen instructions.

2. WARNING: The procedure below should only be used in emergency situations, to release the electric park brake. All calibration of the parking brake system will be lost, and the parking brake will need to be re-calibrated to function correctly.

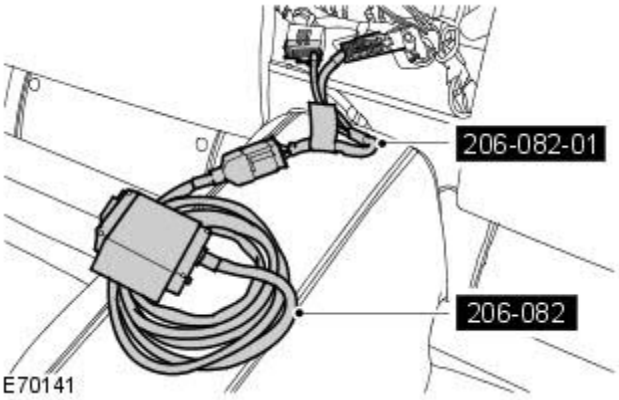
   NOTE: The tools shown must only be used in the event of an emergency.

   Remove the RH loadspace trim panel.
   For additional information, refer to: Loadspace Trim Panel RH (501-05 Interior Trim and Ornamentation, Removal and Installation).



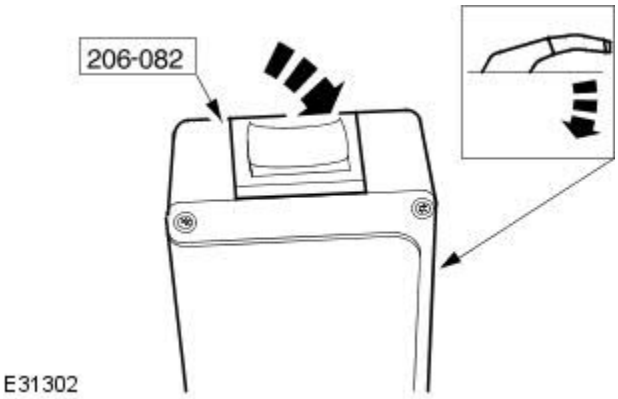
3. WARNING: Failure to follow this instruction may result in a diagnostic trouble code (DTC) being generated.

   Disconnect the 2 electrical connectors from the parking brake module, in the sequence illustrated.



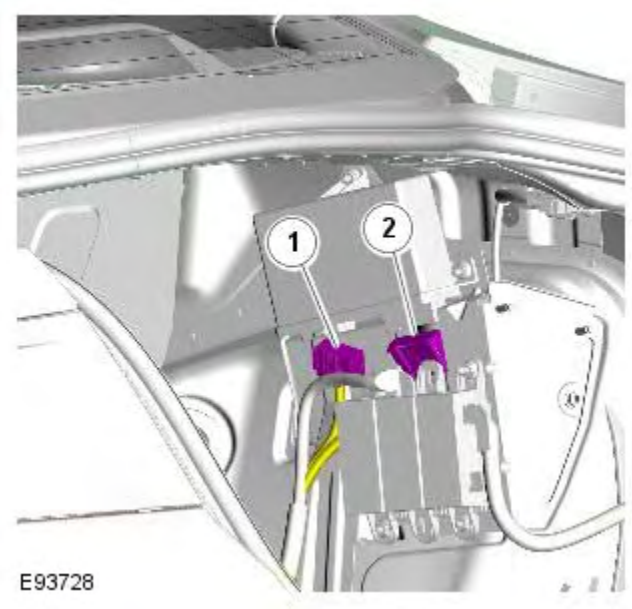
4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

   Connect the special tool to the parking brake module.



5. Release the parking brake cable tension.
   - An audible 'click', signals complete parking brake cable tension release.

6. Remove the special tool and carry out any necessary repairs on the system.



7. Connect the electrical connectors in the sequence shown.

8. Install the RH loadspace trim panel.
   For additional information, refer to: Loadspace Trim Panel RH (501-05 Interior Trim and Ornamentation, Removal and Installation).

9. WARNING: Calibrate the electric park brake using Jaguar approved diagnostic equipment. If Jaguar approved diagnostic equipment is not available disconnect the battery for approximatly 30 seconds , the vehicle will then prompt the driver to carry out the calibration procedure as per the vehicle hand book on re-connection.

   Calibrate the electric park brake.

Published: 24-May-2013

Parking Brake and Actuation - Parking Brake Cable LH

Removal and Installation

Removal

WARNING: Failure to release the tension and calibrate the electric parking brake during rear parking brake related service procedures, could cause the parking brake to function incorrectly or become inoperative.

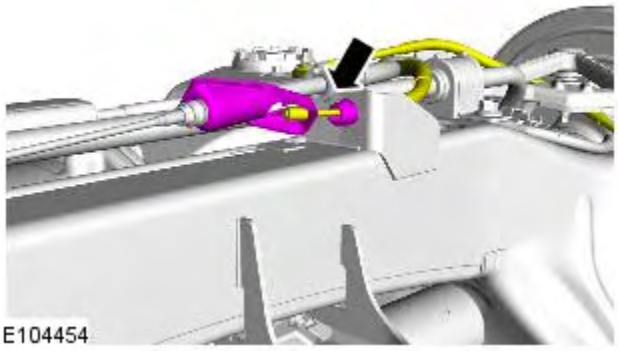
1. Refer to: Parking Brake Cable Tension Release (206-05 Parking Brake and Actuation, General Procedures).

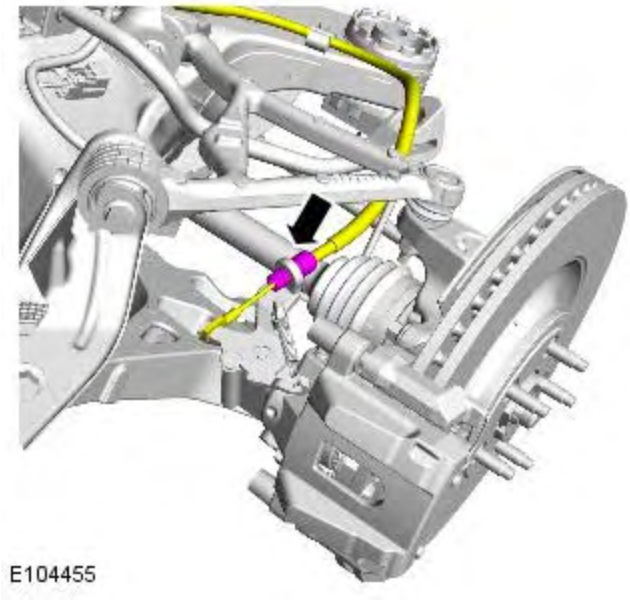
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

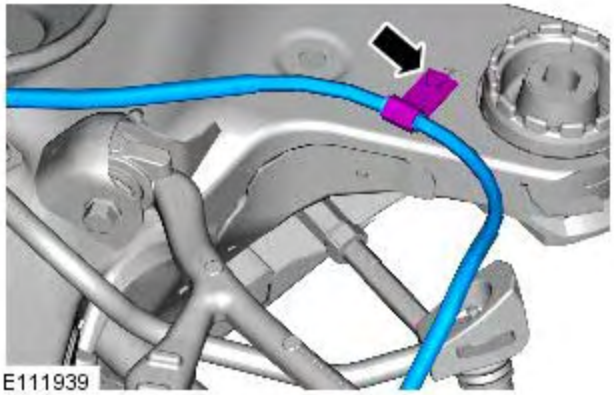
3. Refer to: Rear Subframe - TDV6 3.0L Diesel (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).
   Refer to: Rear Subframe - V8 5.0L Petrol/V8 S/C 5.0L Petrol (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).
   Refer to: Rear Subframe - GTDi 2.0L Petrol (502-00, Removal and Installation).

4.





5. NOTE: Note the fitted position.



6. *Torque:* 20 Nm

Installation

1. To install, reverse the removal procedure.

Published: 24-May-2013

Parking Brake and Actuation - Parking Brake Cable RH

Removal and Installation

Removal

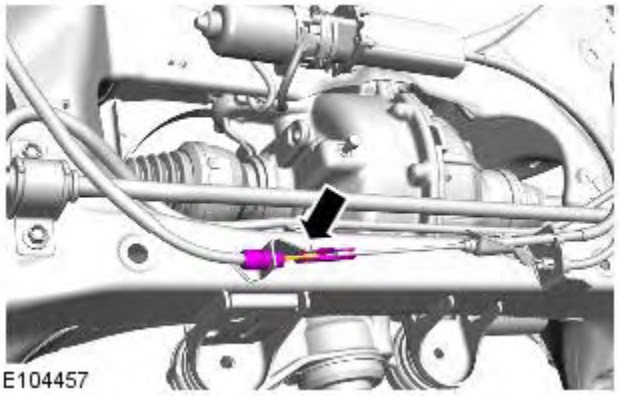
WARNING: Failure to release the tension and calibrate the electric parking brake during rear parking brake related service procedures, could cause the parking brake to function incorrectly or become inoperative.

1. Refer to: Parking Brake Cable Tension Release (206-05 Parking Brake and Actuation, General Procedures).

2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Refer to: Rear Subframe - TDV6 3.0L Diesel (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).
   Refer to: Rear Subframe - V8 5.0L Petrol/V8 S/C 5.0L Petrol (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).
   Refer to: Rear Subframe - GTDi 2.0L Petrol (502-00, Removal and Installation).



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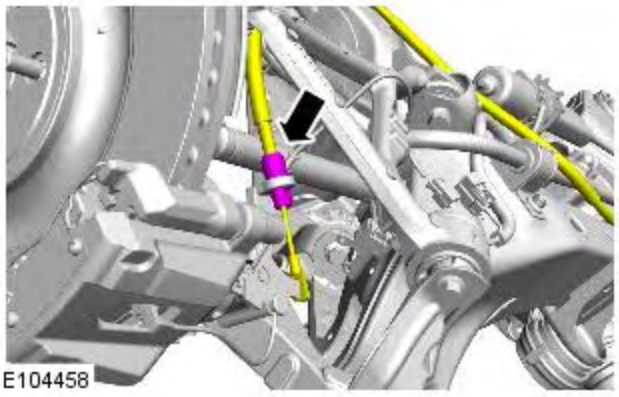
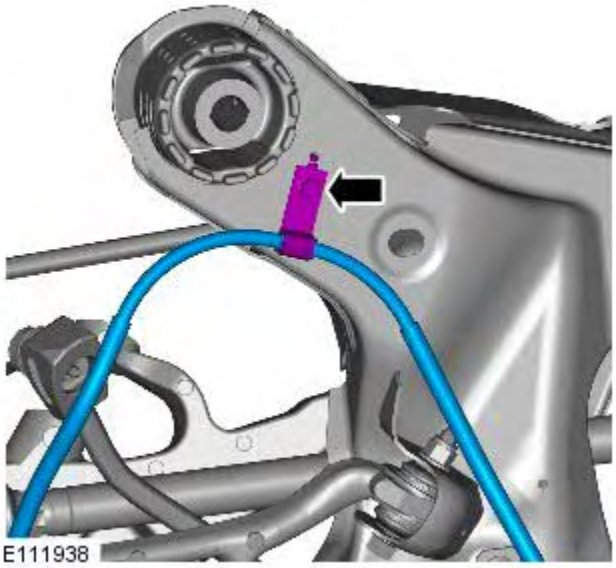


5. NOTE: Note the fitted position.

6. *Torque:* 20 Nm



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Parking Brake and Actuation - Parking Brake Module

Removal and Installation

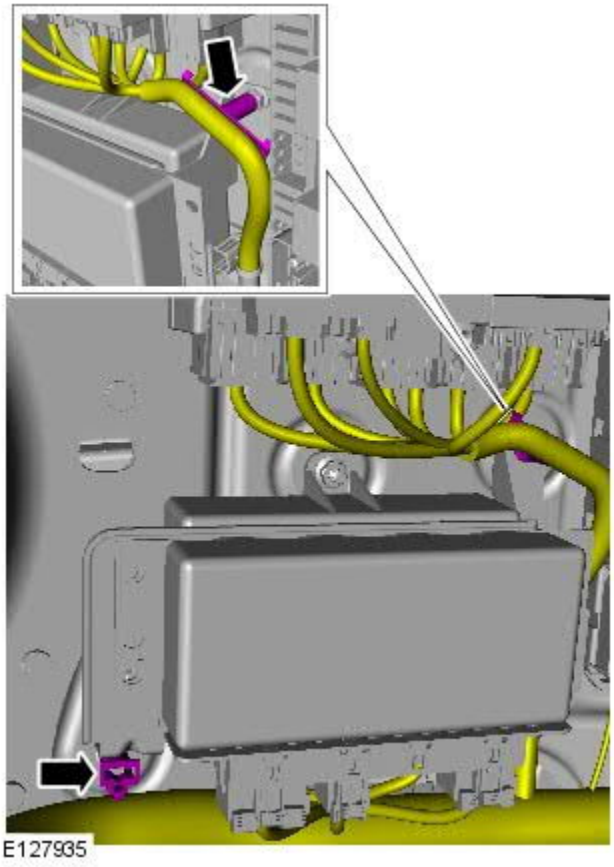
Removal

NOTE: Removal steps in this procedure may contain installation details.

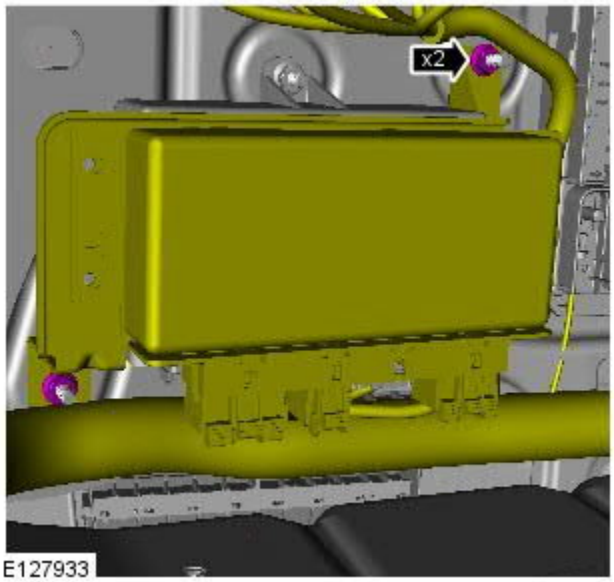
1. For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. For additional information, refer to: Loadspace Trim Panel RH (501-05 Interior Trim and Ornamentation, Removal and Installation).

3.

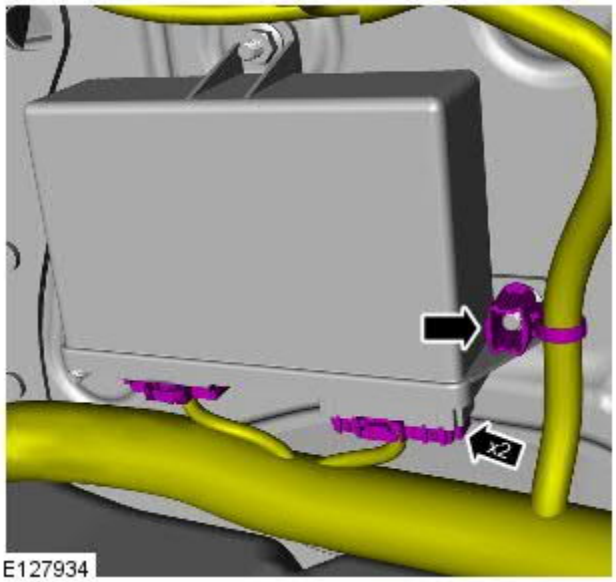


4. TORQUE: 8 Nm



E127933

5.



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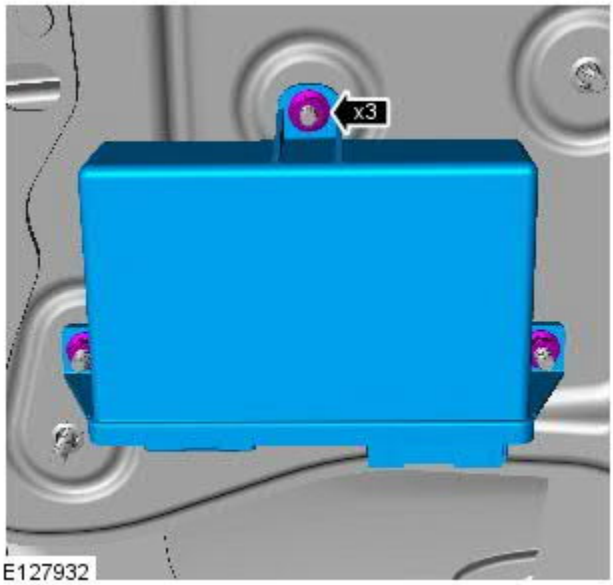


6. TORQUE: 4 Nm

Installation

1. To install, reverse the removal procedure.

2. WARNING: Calibrate the electric park brake using Jaguar approved diagnostic equipment. If Jaguar approved diagnostic equipment is not available disconnect the battery for approximatly 30 seconds , the vehicle will then prompt the driver to carry out the calibration procedure as per the vehicle hand book on re-connection.

   Re-calibrate the electric park brake.

Published: 24-May-2013

Parking Brake and Actuation - Parking Brake Release Actuator

Removal and Installation

Removal

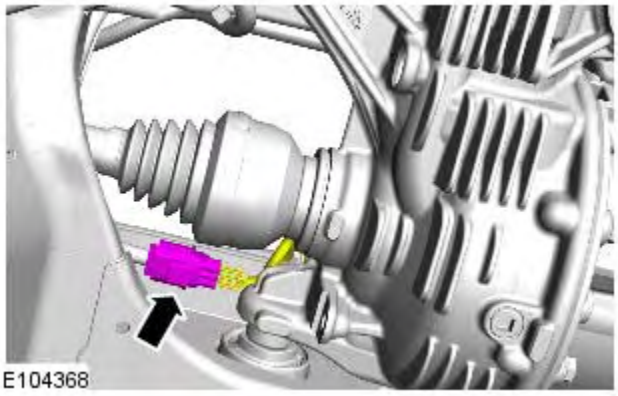
WARNING: Failure to release the tension and calibrate the electric parking brake during rear parking brake related service procedures, could cause the parking brake to function incorrectly or become inoperative.

1. Refer to: Parking Brake Cable Tension Release (206-05 Parking Brake and Actuation, General Procedures).

2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Refer to: Rear Subframe - TDV6 3.0L Diesel (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).
   Refer to: Rear Subframe - V8 5.0L Petrol/V8 S/C 5.0L Petrol (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).
   Refer to: Rear Subframe - GTDi 2.0L Petrol (502-00, Removal and Installation).



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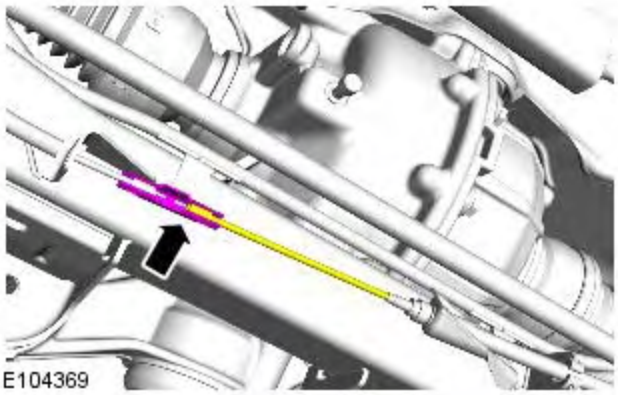

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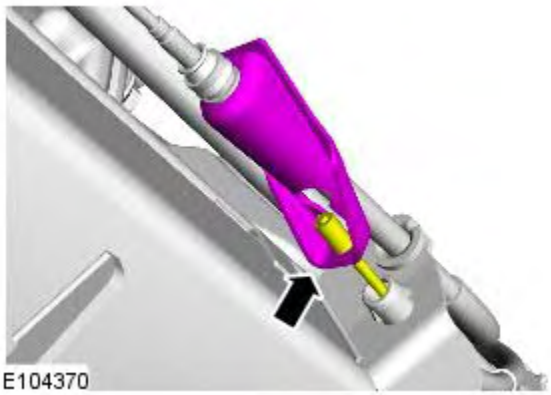

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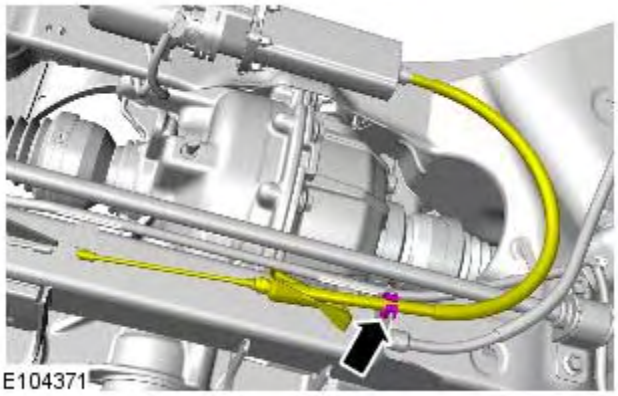

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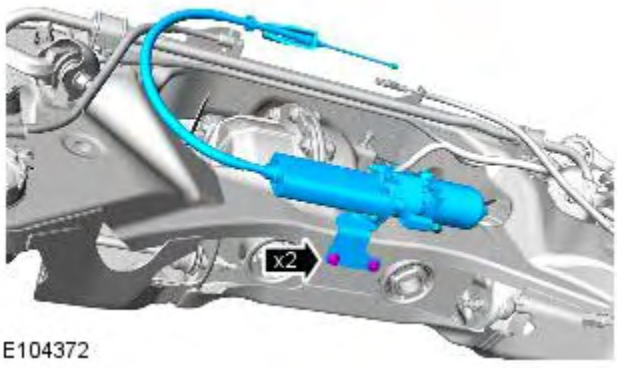


8. NOTE: Note the fitted position.

Torque: 20 Nm

Installation

1. To install, reverse the removal procedure.

2. CAUTION: Calibrate the electric park brake using Jaguar approved diagnostic system. If the Jaguar approved diagnostic system is not available disconnect the battery for approximately 30 seconds, the vehicle will then prompt the driver to carry out the calibration procedure as per the vehicle hand book on re-connection.

   Calibrate the electric parking brake (EPB) using the diagnostic tool.

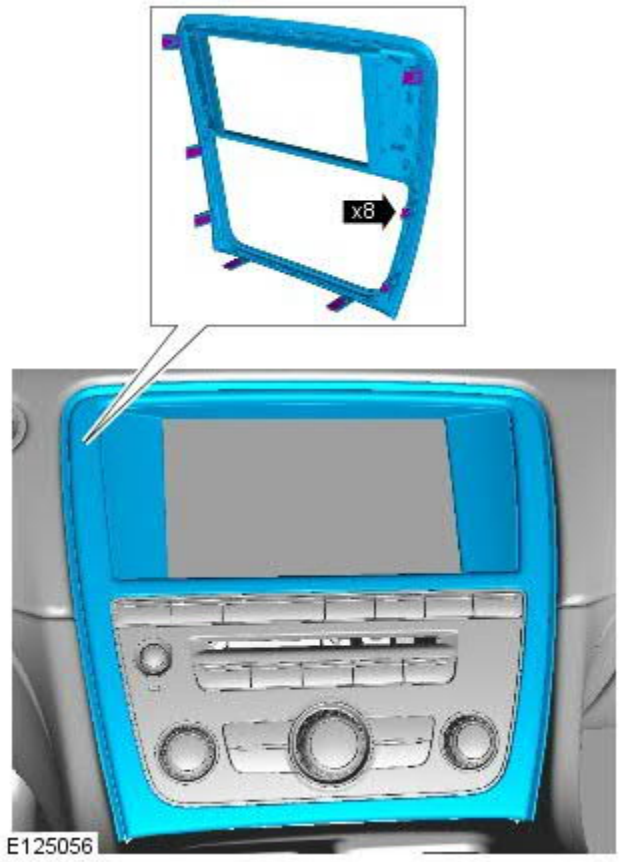
Published: 11-May-2011

Parking Brake and Actuation - Parking Brake Switch

Removal and Installation

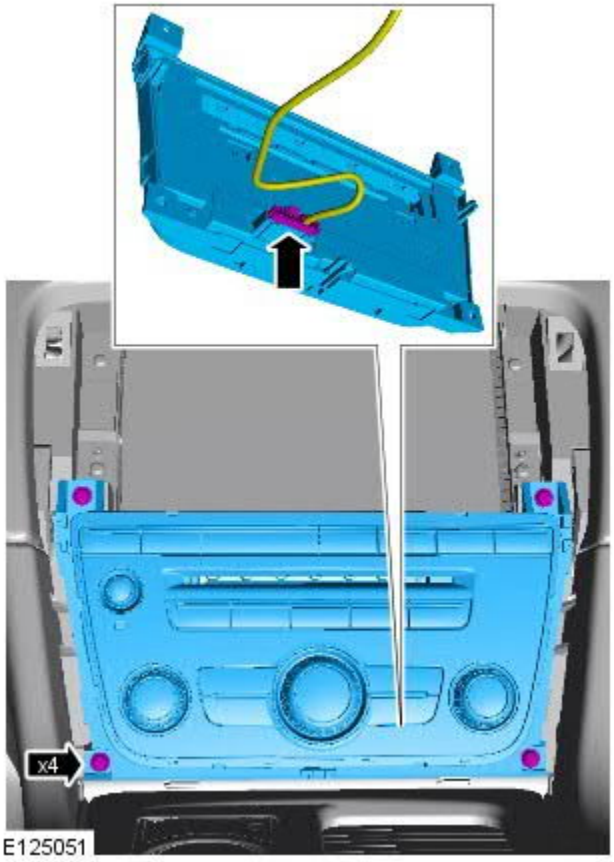
Removal

NOTE: Removal steps in this procedure may contain installation details.

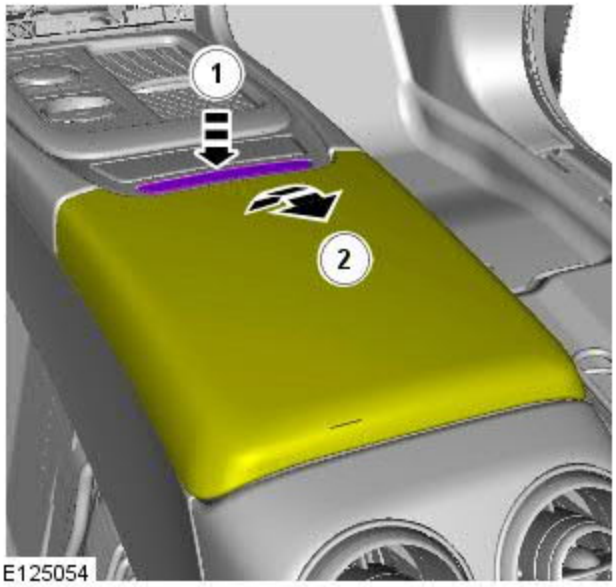


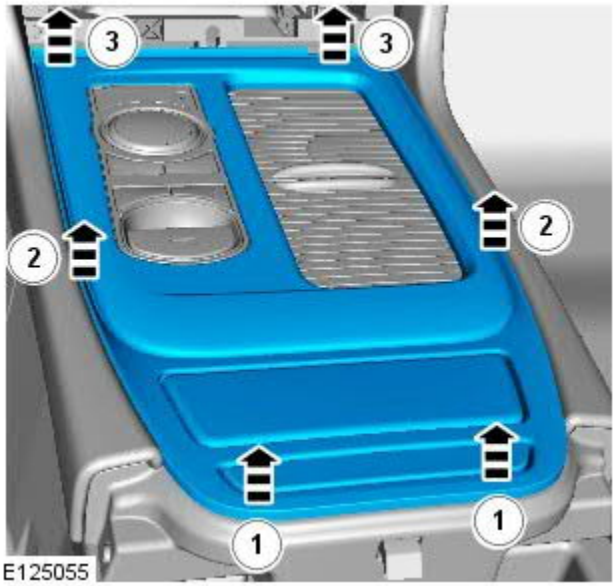
1. CAUTION: Take extra care not to damage the edges of the component.

2. *Torque:* 4 Nm

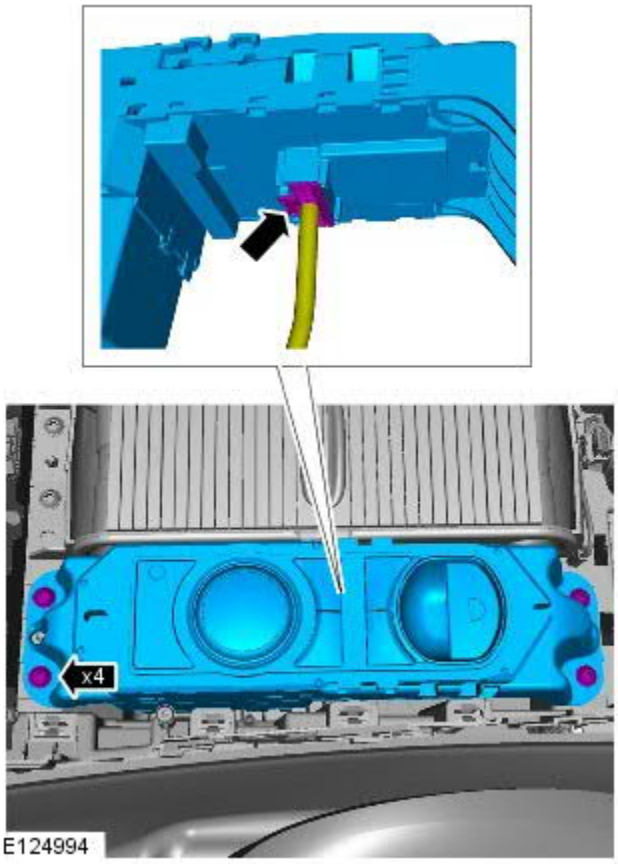


3.





4. CAUTION: Take extra care not to damage the edges of the component.



5. *Torque:* 6 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Hydraulic Brake Actuation -

Lubricants, Fluids, Sealers and Adhesives

CAUTION: Do not use brake fluid ITT Super Dot 4 on 2006my vehicles onwards. Failure to follow this instruction may result in damage to the vehicle.

NOTE: Brake fluid ITT Super Dot 4 has now been superseded by Shell ESL Super Dot 4 which is the Jaguar recommended brake fluid. Shell ESL Super Dot 4 can be used on all model years.

Item	Specification
Brake fluid	ITT Super Dot 4
Brake fluid	Shell ESL Super Dot 4

Torque Specifications

Description	Nm	lb-ft	lb-in
Brake master cylinder retaining nuts.	25	18	-
Brake fluid tubes to master cylinder	17	13	-
Brake fluid reservoir retaining bolt	4	-	35

Published: 12-Jun-2013

Hydraulic Brake Actuation - Hydraulic Brake Actuation - Overview

Description and Operation

Overview

The hydraulic brake system is a diagonally split dual line system. The system consists of a brake pedal, vacuum brake booster, brake master cylinder assembly, HCU (hydraulic control unit), hydraulic pipes and brake hoses.

Brake pipes from the master cylinder supply pressure to the brake calipers at the four corners of the vehicle via the HCU. Braided steel hoses are used to connect the brake pipes to the front and rear brake calipers.

Published: 12-Jun-2013

Hydraulic Brake Actuation - Hydraulic Brake Actuation - System Operation and Component Description

Description and Operation

System Operation

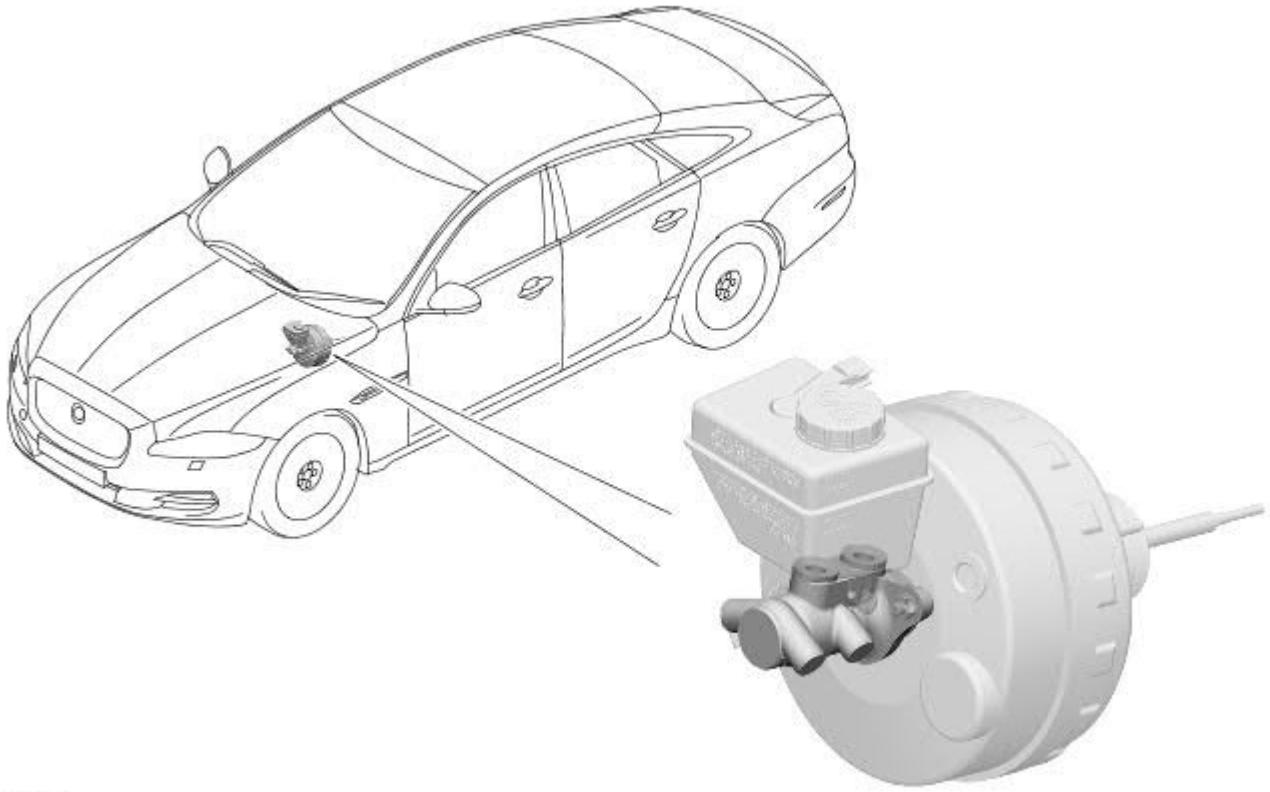
When the brake pedal is pressed, the front push rod in the brake booster pushes the master cylinder primary piston along the bore of the housing. This produces pressure in the primary pressure chamber which, in conjunction with the primary spring, overcomes the secondary spring and simultaneously moves the secondary piston along the bore. The initial movement of the pistons away from the piston stops closes the primary and secondary center valves in the master cylinder. Further movement of the pistons then pressurizes the fluid in the primary and secondary chambers and thus the brake circuits. The fluid in the chambers behind the pistons is unaffected by the movement of the pistons and can flow unrestricted through the inlet ports between the chambers and the reservoir.

Pressurized fluid enters the HCU (hydraulic control unit), which is mounted on the front of the ABS (anti-lock brake system) module. The HCU modulates the supply of pressurized fluid to the brakes under control of the ABS module.
Refer to: Anti-Lock Control - Stability Assist (206-09 Anti-Lock Control - Stability Assist, Description and Operation).

Component Description

Brake Master Cylinder and Fluid Reservoir

NOTE: LHD (left-hand drive) installation shown, RHD (right-hand drive) installation is opposite hand.



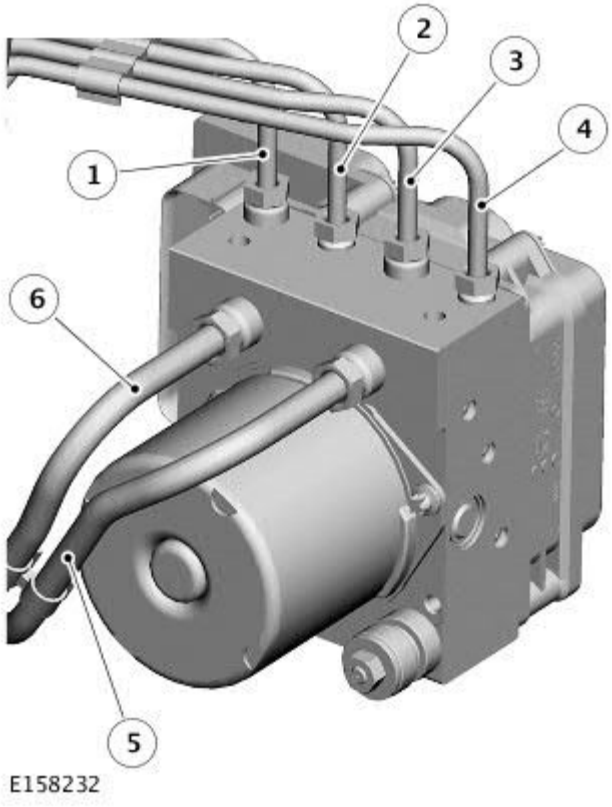
E131240

The brake booster and master cylinder assembly is fitted in the engine compartment. The brake master cylinder housing consists of two hydraulic chambers containing two pistons in tandem. The primary piston (adjacent to the brake booster) produces pressure for the primary braking circuit and this pressure acts on the secondary piston and hence creates pressure in the secondary circuit. A brake fluid reservoir is mounted on top of the master cylinder to provide a supply of brake fluid to the brake system. The reservoir cap is fitted with a brake fluid level switch.

Brake Fluid Level Switch

The brake fluid level switch is located in the fluid reservoir and is hardwired to the instrument cluster. When the level of fluid in the reservoir reaches a predetermined low level, the switch contacts close and provide a signal feed back to the instrument cluster. On receipt of the signal, the brake fluid red warning indicator will illuminate and 'BRAKE FLUID LOW' will be displayed in the message center.

ABS Module



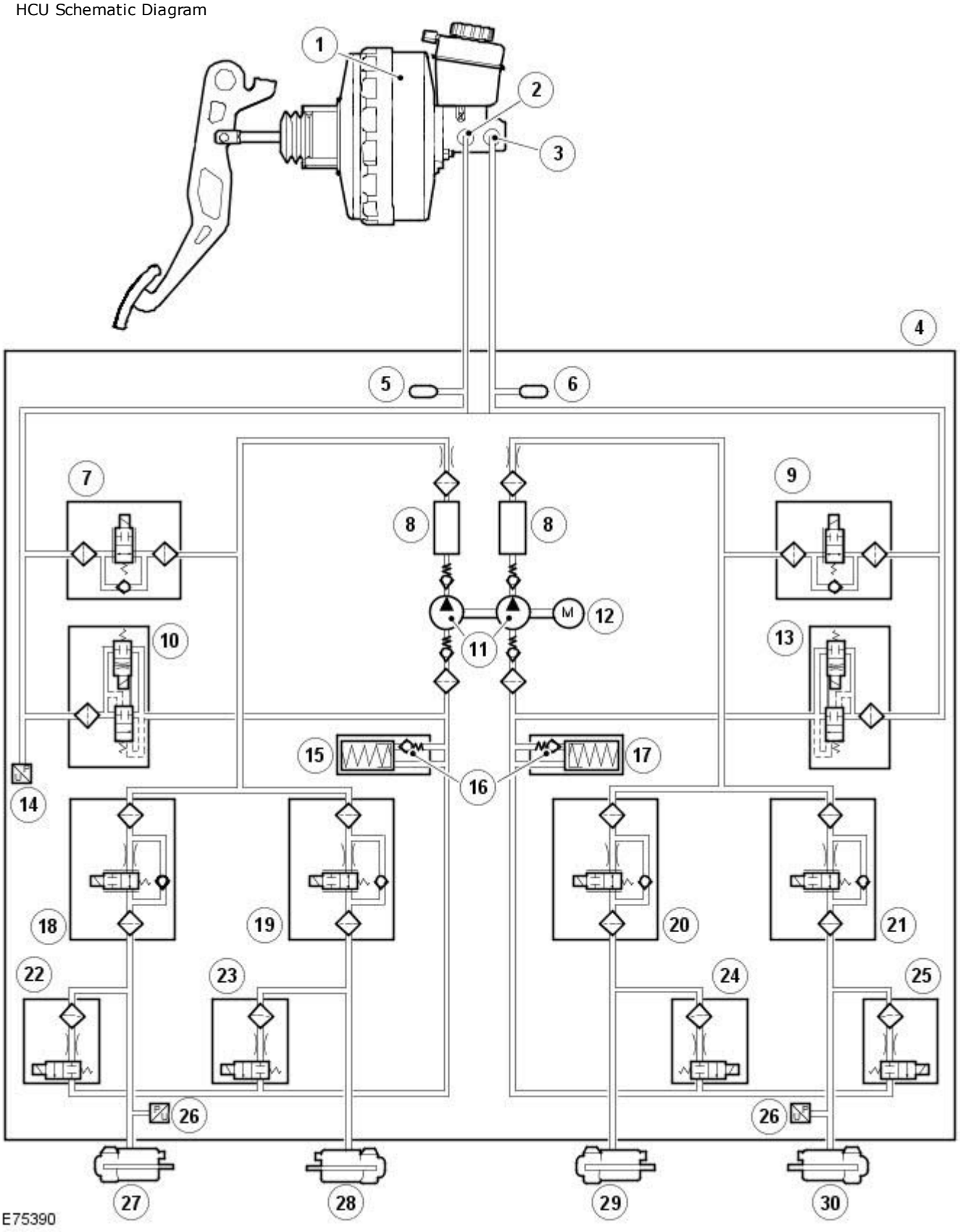
Item	Description
1	LH (left-hand) front brake
2	RH (right-hand) rear brake
3	LH rear brake
4	RH front brake
5	Primary circuit inlet port
6	Secondary circuit inlet port

The ABS module is located in the passenger side, rear engine bay and incorporates the HCU. The HCU is a four channel unit that modulates the supply of hydraulic pressure to the brakes under control of the ABS module.

The primary and secondary outlets of the master cylinder are connected to the primary and secondary circuits within the HCU. The primary circuit in the HCU has separate outlet ports to the RH front and LH rear brakes. The secondary circuit in the HCU has separate outlet ports to the LH front and RH rear brakes.

CAUTION: The ABS module and the HCU are a single unit and must not be separated.

HCU Schematic Diagram



Item	Description
1	Brake booster
2	Primary circuit
3	Secondary circuit
4	HCU

5	Pulsation damper
6	Pulsation damper
7	Separation valve
8	Damping chambers
9	Separation valve
10	Shuttle valve
11	Hydraulic pumps
12	Motor
13	Shuttle valve
14	Pressure sensor - all vehicles
15	Low pressure accumulator
16	Check valve
17	Low pressure accumulator
18	Inlet valve
19	Inlet valve
20	Inlet valve
21	Inlet valve
22	Outlet valve
23	Outlet valve
24	Outlet valve
25	Outlet valve
26	Pressure sensors - vehicles fitted with adaptive speed control only
27	RH front brake
28	LH rear brake
29	RH rear brake
30	LH front brake

Published: 22-May-2013

Hydraulic Brake Actuation - Hydraulic Brake Actuation

Diagnosis and Testing

For additional information.
REFER to: Brake System (206-00 Brake System - General Information, Diagnosis and Testing).

Published: 11-May-2011

Hydraulic Brake Actuation - Brake Fluid Reservoir

Removal and Installation

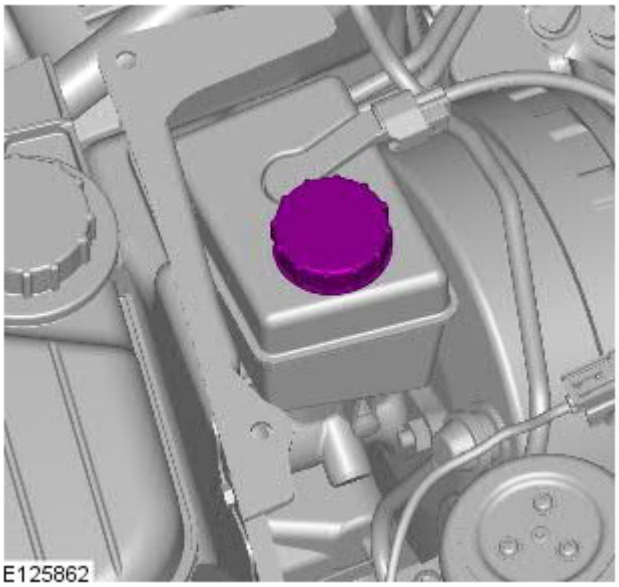
Removal

NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

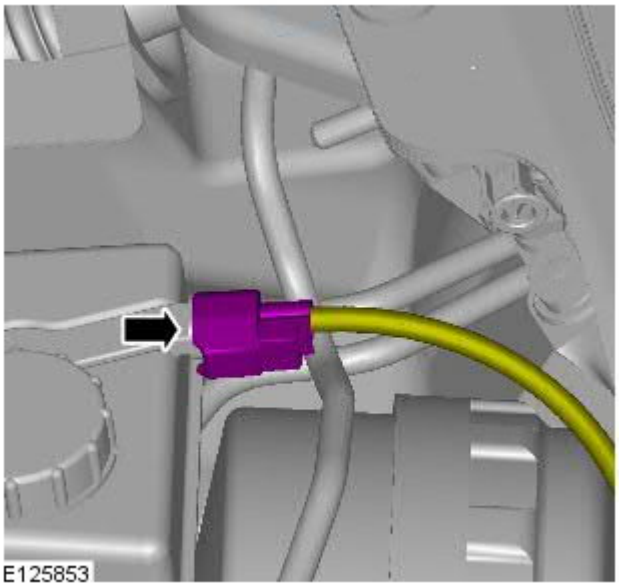
2. For additional information, refer to: Cowl Vent Screen (501-02 Front End Body Panels, Removal and Installation).



3. WARNING: Do not allow dirt or foreign liquids to enter the reservoir. Use only new brake fluid of the correct specification from airtight containers. Do not mix brands of brake fluid as they may not be compatible.

   CAUTION: If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

   - Using a suitable suction device drain the brake fluid resrvoir.
   - Clean the area around the reservoir filler cap, remove the cap.



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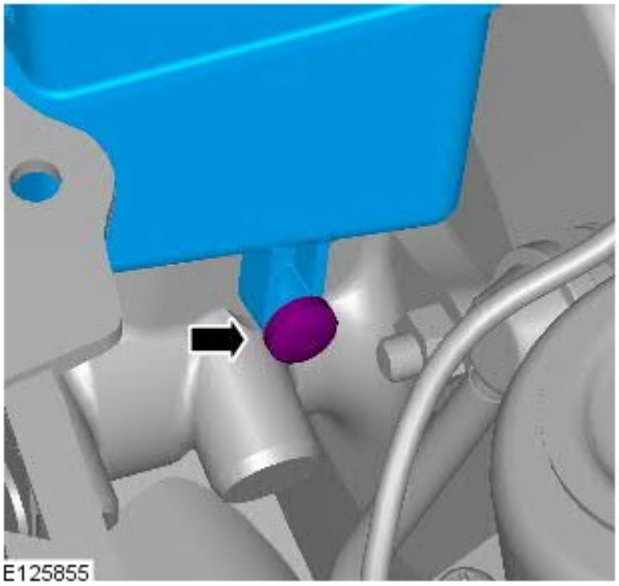
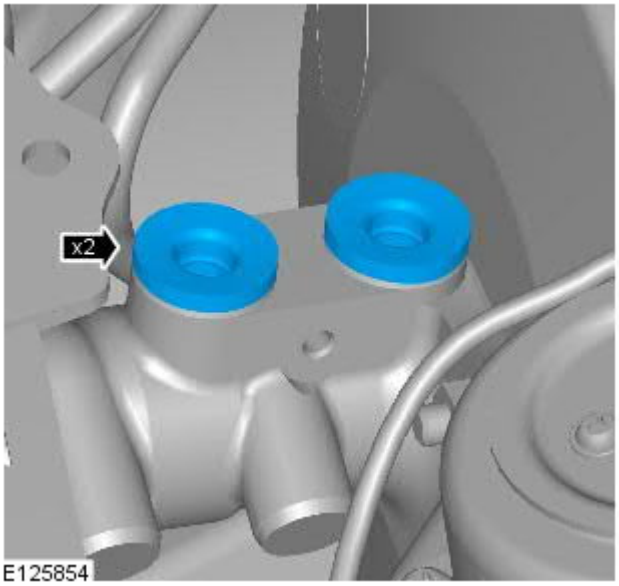


5. TORQUE: 4 Nm



6. CAUTION: Make sure that the area around the component is clean and free of foreign material.
   - Install the new seals.

Installation

1. To install, reverse the removal procedure.

2. Bleed the brake system.
   For additional information, refer to: Brake System Bleeding (206-00 Brake System - General Information, General Procedures).

Published: 11-May-2011

Hydraulic Brake Actuation - Brake Master Cylinder

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

All vehicles

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. CAUTIONS:

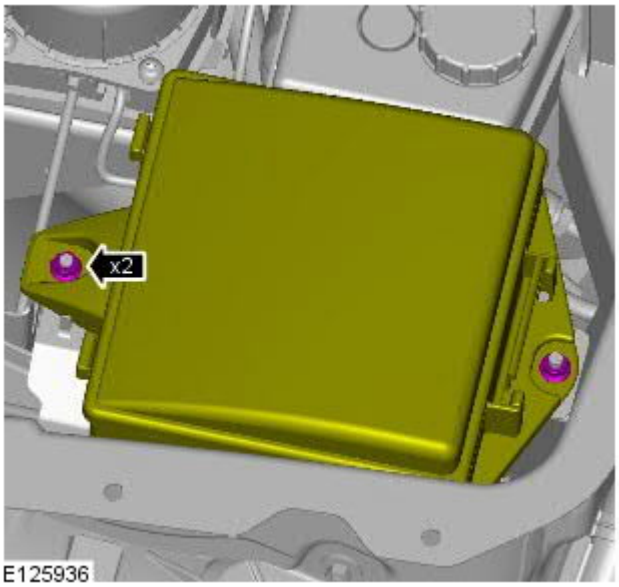
   Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

   Be prepared to collect escaping fluids.

   Make sure that all openings are sealed. Use new blanking caps.

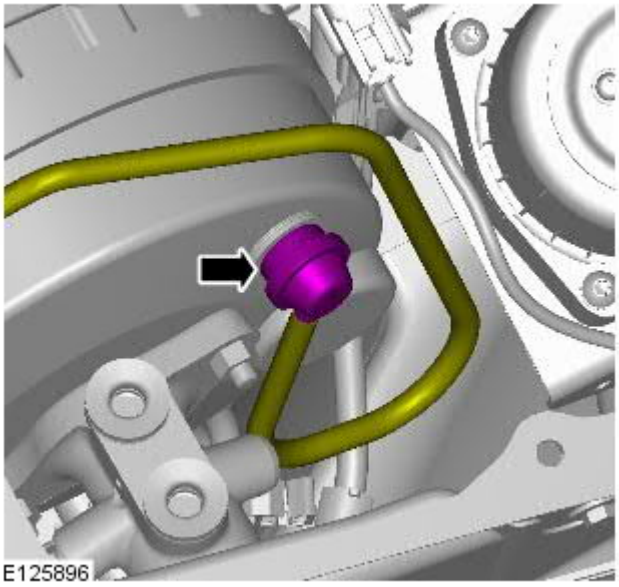
   For additional information, refer to: Brake Fluid Reservoir (206-06 Hydraulic Brake Actuation, Removal and Installation).

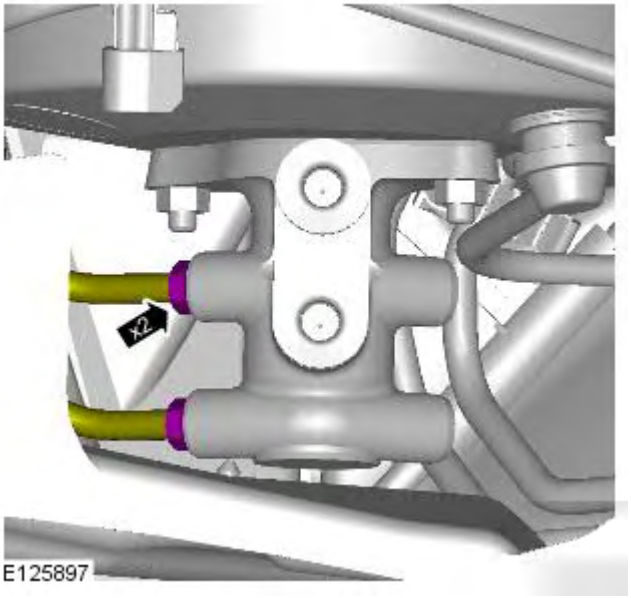
Right-hand drive vehicles



3. TORQUE: 4 Nm

4.



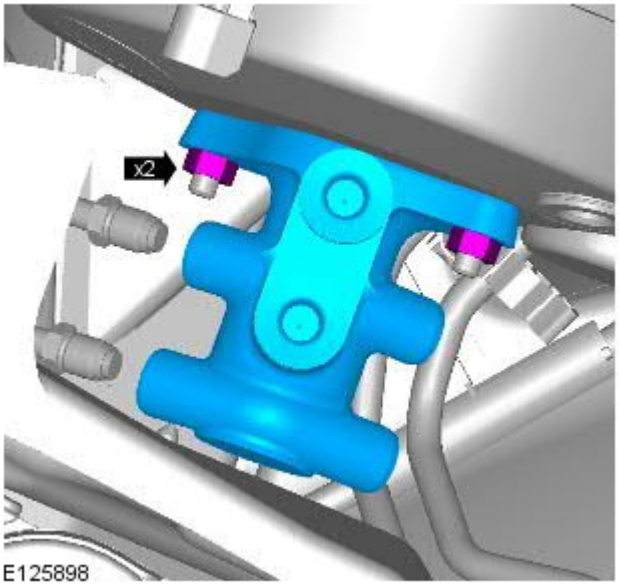


5. CAUTIONS:

Make sure that all openings are sealed. Use new blanking caps.

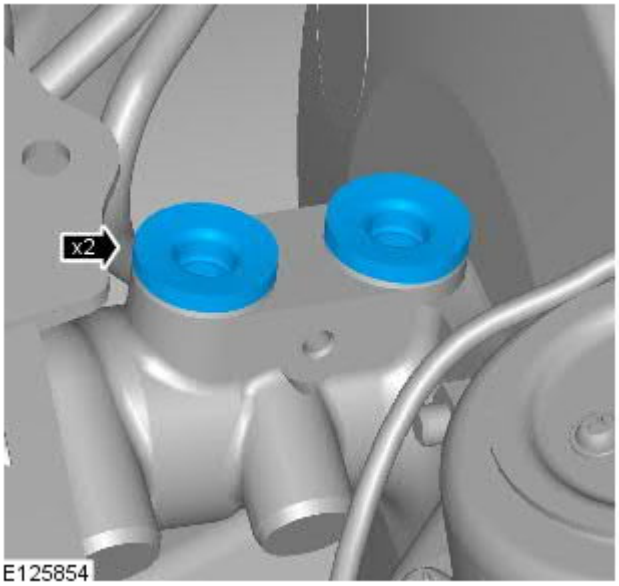
Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

TORQUE: 17 Nm



6.
- TORQUE: 25 Nm
- Install new retaining nuts.

Installation



1. CAUTION: Make sure the master cylinder is correctly aligned. Failure to make sure the master cylinder is correctly aligned to the brake booster actuation rod may cause component damage or poor brake performance.
   - Install new brake fluid reservoir seals.
   - Install a new O-ring seal.

2. To install, reverse the removal procedure.

3. For additional information, refer to: Brake System Bleeding (206-00 Brake System - General Information, General Procedures).

Published: 11-May-2011

Power Brake Actuation -

Torque Specifications

Description	Nm	lb-ft	lb-in
Brake booster retaining nuts - all vehicles	25	18	-
Exhaust gas recirculation valve coolant pipe - vehicles with 3.0L Diesel	9	-	80
Brake vacuum pump retaining nut - vehicles with 3.0L Diesel	23	17	-
Brake vacuum pump threaded stud - vehicles with 3.0L Diesel	13	10	-
Brake vacuum pump retaining bolts - vehicles with 3.0L Diesel	23	17	-
Brake vacuum pump retaining bolts - vehicles with 5.0L	12	9	-

Published: 22-May-2013

Power Brake Actuation - Power Brake System

Diagnosis and Testing

For additional information.
REFER to: Brake System (206-00 Brake System - General Information, Diagnosis and Testing).

Published: 11-May-2011

Power Brake Actuation - Brake Booster

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

LHD illustration shown, RHD is similar.

All vehicles

1. For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. For additional information, refer to: Brake Master Cylinder (206-06 Hydraulic Brake Actuation, Removal and Installation).

Right-hand drive vehicles

3. For additional information, refer to: Secondary Bulkhead Panel RH (501-02 Front End Body Panels, Removal and Installation).

Left-hand drive vehicles

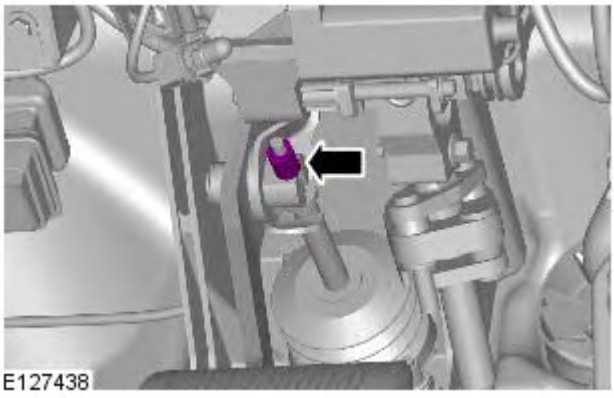
4. For additional information, refer to: Secondary Bulkhead Panel LH (501-02 Front End Body Panels, Removal and Installation).

All vehicles

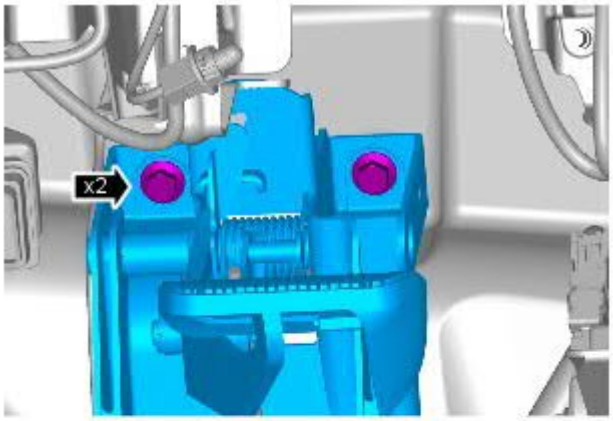
5. For additional information, refer to: Speed Control Deactivator Switch (310-03 Speed Control, Removal and Installation).

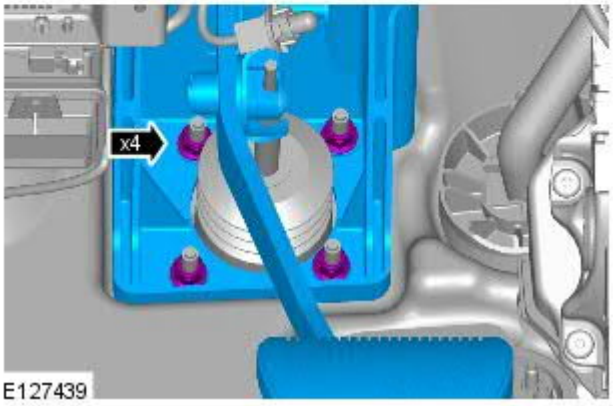
6. For additional information, refer to: Steering Column (211-04 Steering Column, Removal and Installation).

7. For additional information, refer to: Steering Column Flexible Coupling (211-04 Steering Column, Removal and Installation).

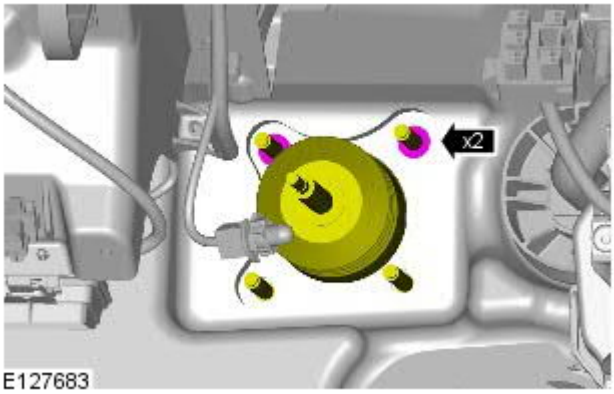


8. TORQUE: 3 Nm

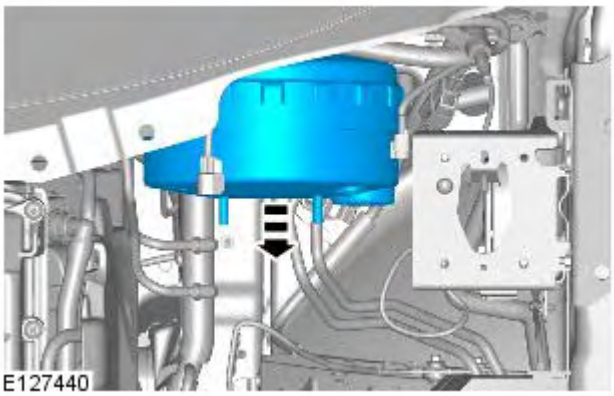




9. TORQUE: 25 Nm



10.



11. NOTE: Replace the brake booster/pedal box gasket.
    - Discard the gasket.

Installation

1. To install, reverse the removal procedure.

Published: 14-Nov-2013

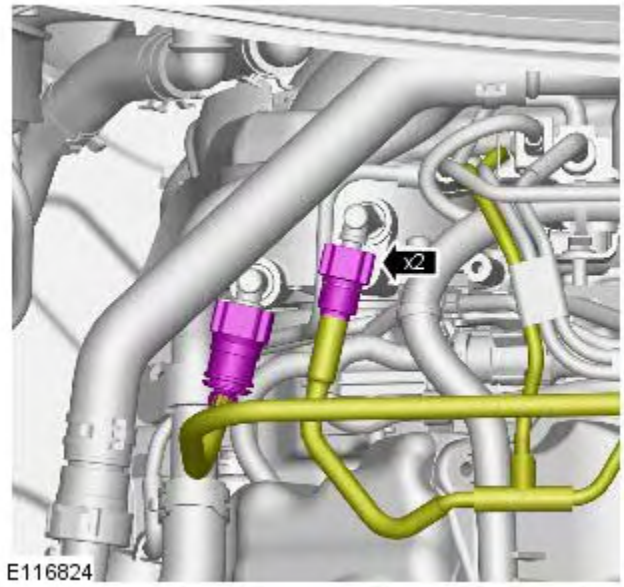
Power Brake Actuation - Brake Vacuum Pump TDV6 3.0L Diesel

Removal and Installation

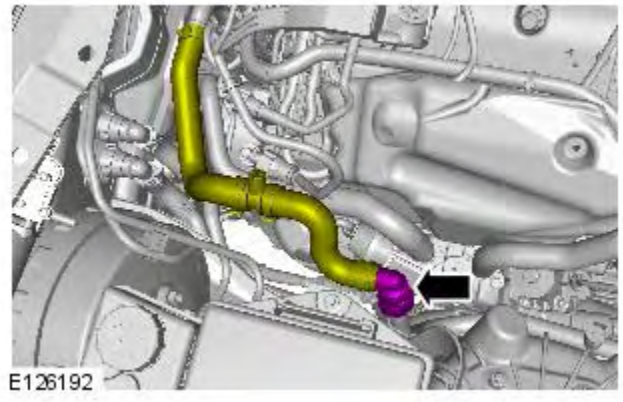
Removal

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Refer to: Secondary Bulkhead Panel RH (501-02 Front End Body Panels, Removal and Installation).
4. Refer to: Cooling System Partial Draining, Filling and Bleeding (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).



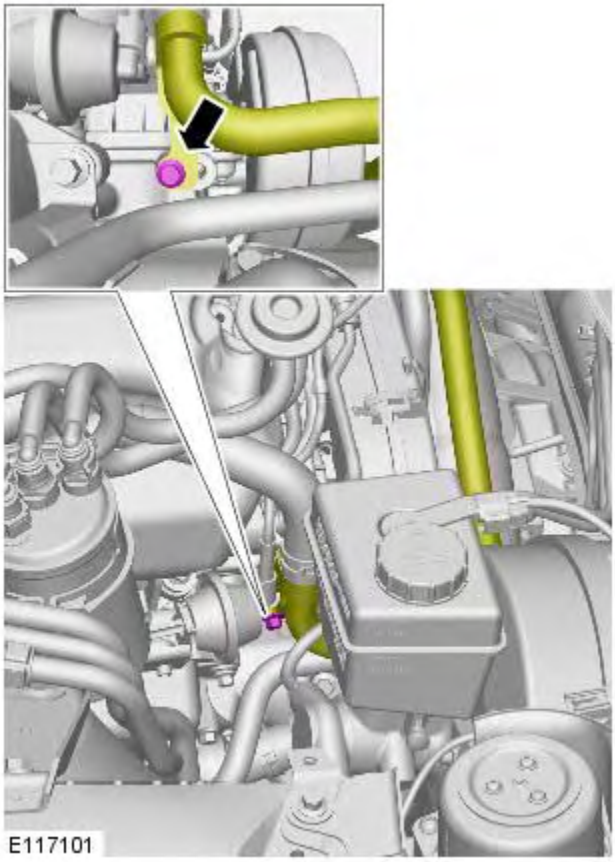
5. CAUTION: Make sure that all openings are sealed. Use new blanking caps.



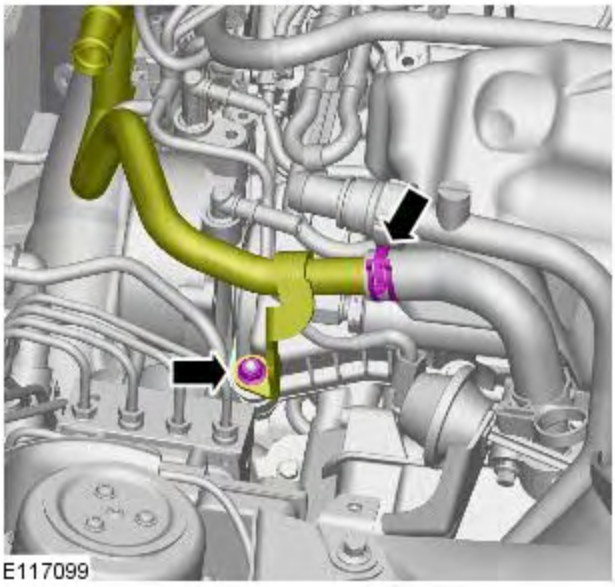
6. CAUTIONS:

   Be prepared to collect escaping coolant.

   Make sure that all openings are sealed. Use new blanking caps.



7. *Torque:* 9 Nm

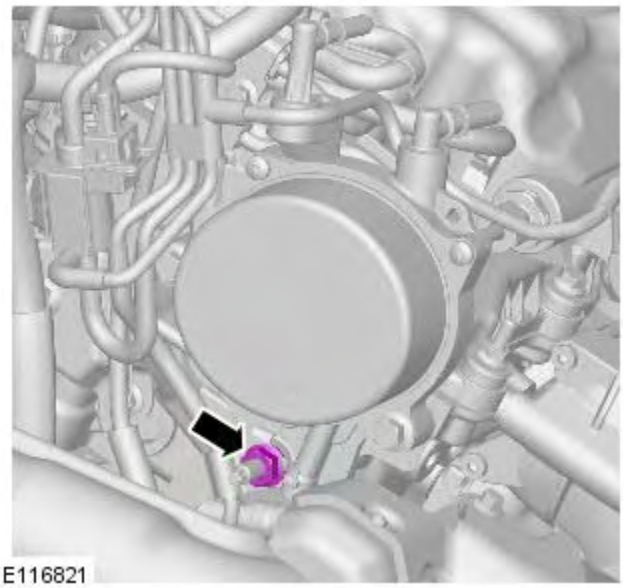


8. CAUTIONS:

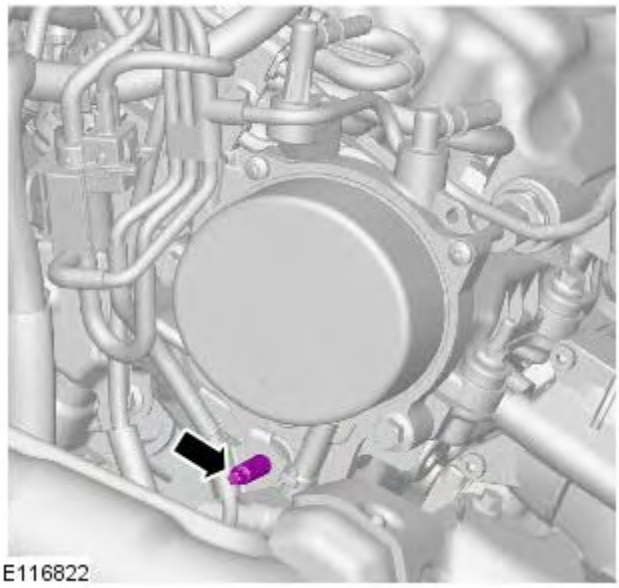
   Be prepared to collect escaping coolant.

   Make sure that all openings are sealed. Use new blanking caps.

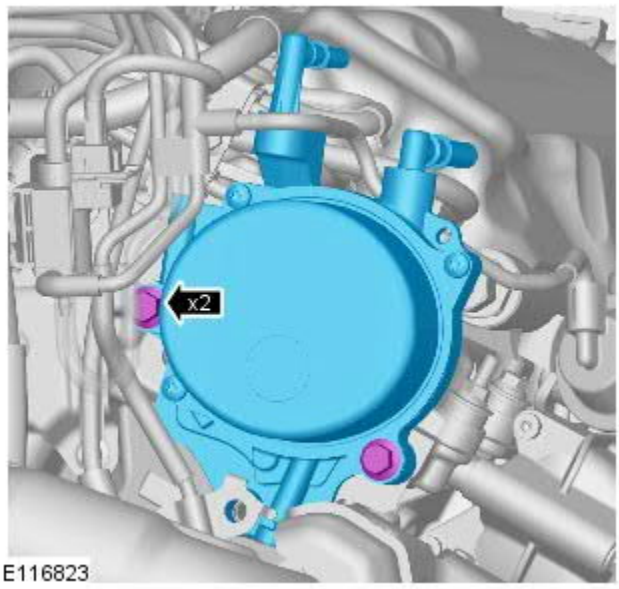
   Torque: 9 Nm


E116821

9. *Torque:* 23 Nm


E116822

10. *Torque:* 13 Nm



11. NOTE: Remove and discard the gasket.

    Torque: 23 Nm

Installation

1. NOTES:

   Install a new gasket.

   Apply silicone gasket sealant or equivalent meeting Jaguar specification.

   The application of sealant must be 10 mm square in two places. Install the brake vacuum pump immediately after applying the sealant.

   Make sure that the drive coupling is aligned with camshaft coupling.

   The brake vacuum pump should be fitted directly to the engine without smearing the sealant.

   To install, reverse the removal procedure.

Published: 11-May-2011

Anti-Lock Control - Stability Assist -

Lubricants, Fluids, Sealers and Adhesives

Item	Specification
Brake fluid	Shell ESL Dot 4

Torque Specifications

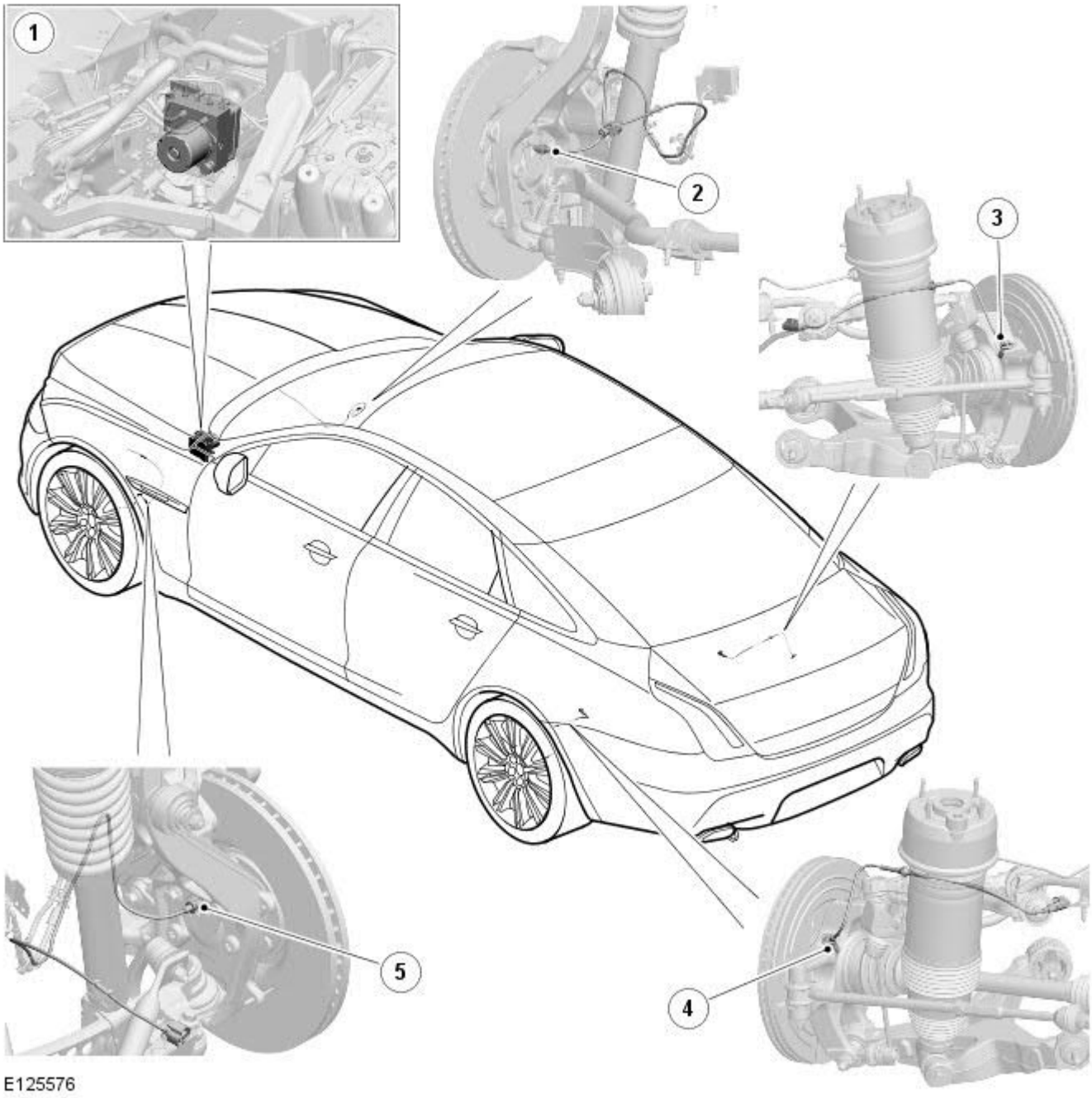
Description	Nm	lb-ft	lb-in
Brake tube to hydraulic control unit (HCU)	17	13	–
Rear wheel speed sensor retaining bolt	6	–	53
Yaw rate sensor and accelerometer retaining nuts	7	–	62
HCU retaining nuts	8	–	71
Steering wheel rotation sensor retaining screws	4	–	35
Steering column lower shroud retaining screws	1	–	9

Published: 11-May-2011

Anti-Lock Control - Stability Assist - Anti-Lock Control - Stability Assist - Component Location

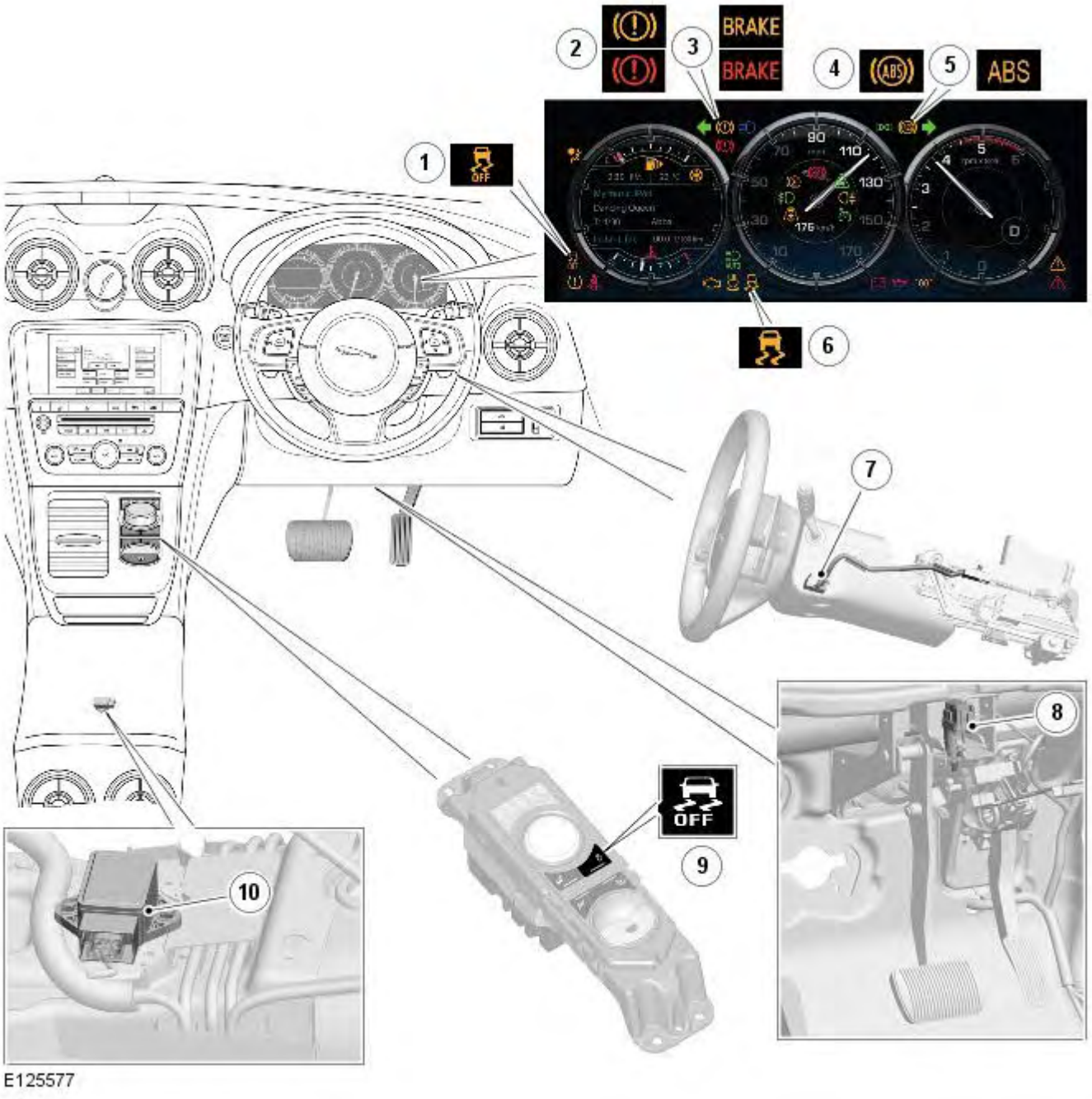
Description and Operation

NOTE: RHD (right-hand drive) installations shown, LHD (left-hand drive) installations similar.



Item	Description
1	ABS (anti-lock brake system) module
2	RH (right-hand) front wheel speed sensor
3	RH rear wheel speed sensor
4	LH (left-hand) rear wheel speed sensor
5	LH front wheel speed sensor

COMPONENT LOCATION - SHEET 2 OF 2



Item	Description
1	DSC (dynamic stability control) OFF warning indicator
2	Brake warning indicators (all except NAS)
3	Brake warning indicators (NAS)
4	ABS warning indicator (all except NAS)
5	ABS warning indicator (NAS)
6	DSC warning indicator
7	Steering angle sensor
8	Stoplamp switch
9	DSC switch
10	Yaw rate and lateral acceleration sensor

Published: 11-May-2011

Anti-Lock Control - Stability Assist - Anti-Lock Control - Stability Assist - Overview

Description and Operation

OVERVIEW

The ABS (anti-lock brake system) and DSC (dynamic stability control) system features a Bosch modulator, which is an integrated four-channel HCU (hydraulic control unit) and ABS module. The unit is located in the rear of the engine compartment on the passenger side, and is installed in the brake hydraulic circuit between the brake master cylinder and the four brake calipers.

The ABS module is connected to the high speed CAN (controller area network) bus, and actively interacts with other vehicle system control modules and associated sensors to receive and transmit current vehicle operating information.

When required, the ABS module will actively intervene and operate the HCU during braking or vehicle maneuvers to correct the vehicle attitude, stability, traction or speed. During incidents of vehicle correction, the ABS module may also request the ECM (engine control module) to control engine power in order to further stabilize and correct the vehicle.

To provide full system functionality, the ABS and DSC system comprises the following components:

- DSC switch.
- Four wheel speed sensors.
- Steering angle sensor.
- Yaw rate and lateral acceleration sensor.
- Stoplamp switch.
- Instrument cluster warning indicators.
- Integrated ABS module and HCU.

Two variants of ABS module are available, Bosch ESP®8.1 and Bosch ESP®plus8.1. The Bosch ESP®plus8.1 system is fitted to vehicles with ACC (adaptive cruise control) and incorporates a feature known as electronic brake prefill.

Electronic brake prefill, senses any rapid throttle lift off, activating a small brake hydraulic pressure build-up of approximately 3 to 5 bar (43.5 to 72.5 lbf/in^2) in anticipation of the brakes being applied. This application produces a quicker brake pedal response and consequently slightly shorter stopping distances. When the ECM detects rapid throttle lift off it signals the ABS module which controls the HCU to apply a low brake pressure to assist in a quicker brake application.

NOTE: All vehicles with ACC are supported by the Bosch ESP®plus8.1 system.

The ABS provides the following brake functions that are designed to assist the vehicle or aid the driver:

- ABS.
- DSC, including Trac DSC.
- CBC (corner brake control).
- EBD (electronic brake force distribution).
- ETC (electronic traction control).
- EBA (emergency brake assist).
- EDC (engine drag-torque control).
- EUC (enhanced understeer control).
- Electronic brake prefill (vehicles with ACC only).

All the brake functions listed are automatically active when the ignition is in power mode and the engine is running. The DSC system can be selected to off using the DSC switch.

WARNING: Although the vehicle is fitted with DSC, it remains the drivers responsibility to drive safely according to the prevailing conditions.

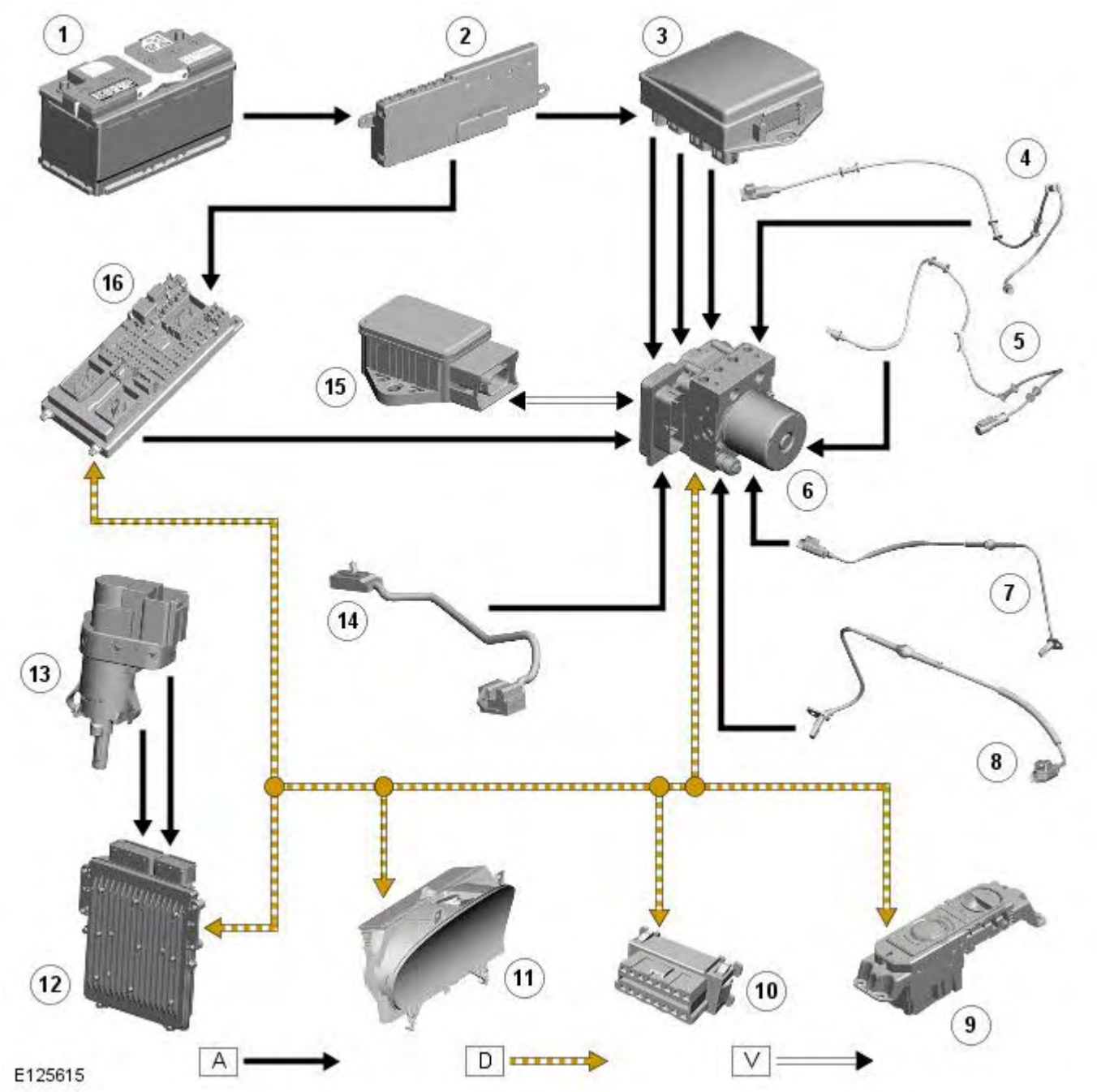
Published: 11-May-2011

Anti-Lock Control - Stability Assist - Anti-Lock Control - Stability Assist - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: A = Hardwired; D = High speed CAN (controller area network) bus; V = Private CAN bus.



Item	Description
1	Battery
2	BJB (battery junction box) (250 A megafuse to EJB (engine junction box); 50 A midifuse to CJB (central junction box))
3	EJB
4	LH (left-hand) front wheel speed sensor
5	RH (right-hand) front wheel speed sensor
6	ABS (anti-lock brake system) module

7	LH rear wheel speed sensor
8	RH rear wheel speed sensor
9	JaguarDrive selector module
10	Diagnostic socket
11	Instrument cluster
12	ECM (engine control module)
13	Stoplamp switch
14	Steering angle sensor
15	Yaw rate and lateral acceleration sensor
16	CJB

System Operation

ANTI-LOCK BRAKE SYSTEM

ABS controls the speed of all road wheels to ensure optimum wheel slip when braking at the adhesion limit. The wheels are prevented from locking to retain effective steering control of the vehicle.

DYNAMIC STABILITY CONTROL

DSC (dynamic stability control) uses brakes and powertrain torque control to assist in maintaining the yaw stability of the vehicle. While the ignition is energized the DSC function is permanently enabled, unless selected off using the DSC switch.

DSC enhances driving safety in abrupt maneuvers and in under-steer or over-steer situations that may occur in a bend. The ABS module monitors the yaw rate and lateral acceleration of the vehicle, steering input and individual wheel speeds, then selectively applies individual or multiple brakes and signals for powertrain torque adjustments to reduce under-steer or over-steer conditions.

In general:

- In an under-steer situation initially powertrain torque is controlled then the inner rear wheel is braked to counteract the yaw movement of the front axle towards the outer edge of the bend.
- In an over-steer situation initially powertrain torque is controlled then the outer front wheel is braked to counteract the yaw movement of the rear axle towards the outer edge of the bend.

The ABS module monitors the tracking stability of the vehicle using inputs from the wheel speed sensors, the steering angle sensor, and the yaw rate and lateral acceleration sensor. The tracking stability is compared with stored target data. Whenever the tracking stability deviates from the target data, the ABS module intervenes by applying the appropriate control strategy.

The following interactions occur in an intervention situation:

- High speed CAN signal to the ECM, to reduce engine torque.
- Application of braking to the appropriate corner of the vehicle.

TRAC DSC

Trac DSC is an alternative setting of DSC with reduced system interventions. With Trac DSC engaged, traction may be somewhat increased, although stability may be reduced compared to normal DSC.

WARNING: Trac DSC is intended for use only on dry tarmac by suitably experienced drivers and should not be selected for other surfaces or by drivers with insufficient skill and training to operate the vehicle safely with the Trac DSC function engaged. The less restrictive Trac DSC setting may be preferred, for example, by expert drivers engaged in high performance driving on dry tarmac surfaces such as tracks and circuits.

Briefly pressing and releasing the DSC switch will switch the vehicle between normal DSC settings and Trac DSC settings. To confirm which setting has been selected, either DSC ON or Trac DSC will be temporarily displayed in the instrument cluster message center.

When Trac DSC is selected, the amber DSC OFF warning indicator located in the instrument cluster will illuminate. The DSC OFF warning indicator will remain illuminated while Trac DSC is selected. If the DSC system is activated the DSC warning indicator will flash.

NOTE: If speed control is engaged it will automatically disengage if DSC or Trac DSC becomes active.

CORNER BRAKE CONTROL

CBC (corner brake control) influences the brake pressures, below and within DSC and ABS thresholds, to counteract the yawing moment produced when braking in a corner. CBC produces a correction torque by limiting the brake pressure on one side of the vehicle.

ELECTRONIC BRAKE FORCE DISTRIBUTION

EBD (electronic brake force distribution) limits the brake pressure applied to the rear wheels. When the brakes are applied, the weight of the vehicle transfers forwards, reducing the ability of the rear wheels to transfer braking effort to the road surface. This may cause the rear wheels to slip and make the vehicle unstable.

EBD uses the ABS braking hardware to automatically optimize the pressure to the rear brakes, below the point where ABS is normally invoked.

NOTE: Only the rear brakes are controlled by the EBD function.

ELECTRONIC TRACTION CONTROL

ETC (electronic traction control) attempts to optimize forward traction by reducing engine torque and/or applying the brake of a spinning wheel until traction is regained.

ETC is activated if an individual wheel speed is above that of the vehicle reference speed (positive slip) and the brake pedal is not pressed. The ABS module sends a high speed CAN bus message to the ECM to request a reduction in engine torque. The brake is then applied to the spinning wheel, allowing the excess torque to be transmitted to the non-spinning wheel through the drive line. If necessary, When the DSC function is selected off using the DSC switch, the braking and engine torque reduction features are both disabled.

EMERGENCY BRAKE ASSIST

EBA (emergency brake assist) assists the driver in emergency braking situations by automatically increasing the applied braking effort. The ABS module invokes EBA when:

- The brake pedal is rapidly pressed.
- The brake pedal is pressed hard enough to bring the front brakes into ABS operation.

When the brake pedal is rapidly pressed, the ABS module increases the hydraulic pressure to all of the brakes until the threshold for ABS operation is reached. This action applies the maximum braking effort for the available traction. The ABS module monitors for the sudden application of the brakes, using inputs from the brake pedal switch and from the pressure sensor within the HCU (hydraulic control unit). With the brake pedal pressed, if the rate of increase of hydraulic pressure exceeds the predetermined limit, the ABS module invokes emergency braking.

When the brake pedal is pressed hard enough to bring the front brakes into ABS operation, the ABS module increases the hydraulic pressure to the rear brakes up to the ABS threshold.

EBA operation continues until the driver releases the brake pedal, sufficiently for the hydraulic pressure in the HCU to drop below a threshold value stored in the ABS module.

ENGINE DRAG-TORQUE CONTROL

EDC (engine drag-torque control) prevents wheel slip caused by any of the following:

- A sudden decrease in engine torque when the accelerator is suddenly released.
- A downshift using the Jaguar sequential shift function on automatic transmission vehicles.

When the ABS module detects the onset of rear wheel drag slip without the brakes being applied, the ABS module signals the ECM via the high speed CAN bus to request a momentary increase in engine torque to increase the rear axle speed to match vehicle reference speed.

UNDERSTEER CONTROL

Understeer Logic Control is a proactive system which monitors the vehicle for understeer by comparing signals from the yaw rate and lateral acceleration sensor with signals from the steering angle sensor and wheel speed sensors.

When the ABS module detects the onset of understeer, the ABS module signals the ECM via the high speed CAN bus to request a decrease in engine torque. If required the ABS module will control the HCU to apply brake pressure to the inside rear wheel to correct the understeer. If the vehicle continues to understeer, EUC (enhanced understeer control) is activated and this function uses multiple brakes (maximum of three brakes) to rapidly reduce the vehicle speed.

ELECTRONIC BRAKE PREFILL (VEHICLES WITH ACC ONLY)

Electronic brake prefill (Bosch ESP®plus8.1), senses any rapid throttle lift off, activating a small brake hydraulic pressure build-up of approximately 3 to 5 bar (43.5 to 72.5 lbf/in^2) in anticipation of the brakes being applied.

This application produces a quicker brake pedal response and consequently slightly shorter stopping distances. The system supports vehicles with ACC (adaptive cruise control).

When the ABS module detects rapid throttle lift off (from the signals received from the ECM over the high speed CAN bus), it controls the HCU to apply a low brake pressure to assist in a quicker brake application.

Component Description

DYNAMIC STABILITY CONTROL SWITCH

E125616

The DSC switch is mounted in the floor console adjacent to the JaguarDrive selector.

DSC becomes active whenever the engine is running. A momentary press of the switch allows the driver to toggle between the standard DSC settings and the optimized Trac DSC settings. The message Trac DSC or DSC ON will temporarily be displayed in the instrument cluster message center. The amber DSC OFF warning indicator in the instrument cluster remains illuminated while Trac DSC is selected.

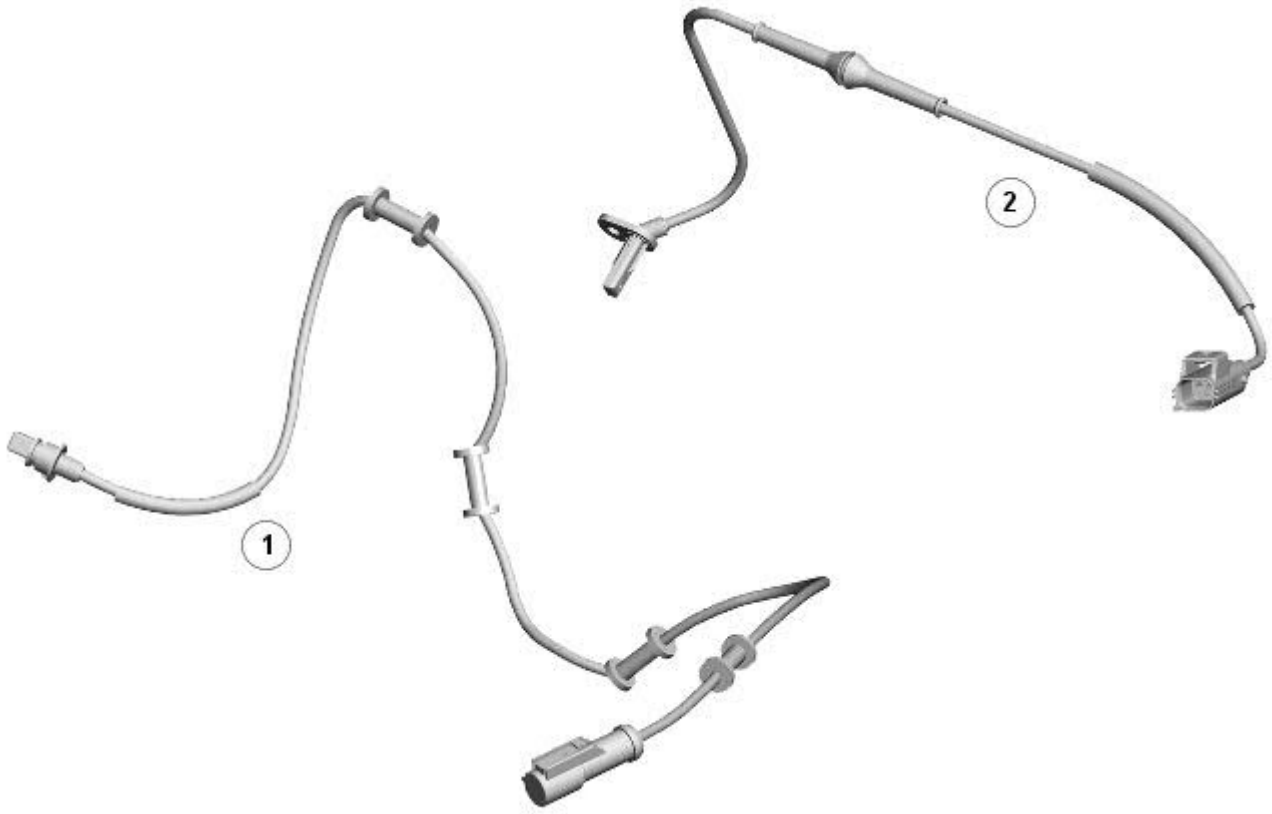
The DSC can be switched off by pressing and holding the switch for more than 10 seconds. The message DSC OFF will then be displayed in the instrument cluster message center, to confirm DSC has been switched off, and the amber DSC OFF warning indicator in the instrument cluster will remain illuminated. The system can be switched back on again by simply pressing and releasing the switch. The message 'DSC ON' will then temporarily appear in the instrument cluster message center to confirm the system is on.

NOTE: Switch requests may be delayed if the switch is pressed while a DSC operation is taking place. The switch request will be displayed in the instrument cluster but the ABS module will not initiate any stability changes until it is safe to do so.

If a fault is detected with the DSC switch, the ABS module defaults to the 'DSC ON' setting and any switch requests are ignored.

WARNING: It is recommended that when using snow chains, Trac DSC is switched off and JaguarDrive control winter mode is selected.

WHEEL SPEED SENSORS



E125617

Item	Description
1	Front wheel speed sensor
2	Rear wheel speed sensor

An active wheel speed sensor is installed in each wheel hub to provide the ABS module with a rotational speed signal from each road wheel. The head of each front wheel speed sensor is positioned close to a magnetic encoder ring incorporated into the inboard seal of the wheel bearing. The head of each rear wheel speed sensor is positioned close to a magnetic encoder ring incorporated into the rear wheel bearing assembly. Each encoder ring contains 46 north and south poles. A fly lead connects each sensor to the vehicle harness.

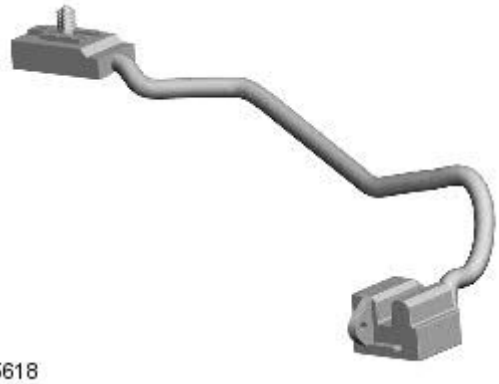
The wheel speed sensors each have a signal and a return connection with the ABS module. When the ignition is ON the ABS module supplies a signal feed to the wheel speed sensors and monitors the return signals. Any rotation of the road wheels induces current fluctuations in the return signals, which are converted into individual wheel speeds and overall vehicle speed by the ABS module.

The ABS module broadcasts the individual wheel speeds and the vehicle speed on the high speed CAN bus for use by other systems, although vehicle speed information to the roof opening panel motor/module is a hardwired connection.

If a wheel speed sensor fault is detected by the ABS module, ABS FAULT will be displayed in the instrument cluster message center and an amber warning indicator will illuminate.

As the wheel speed sensors are active devices, a return signal is available when the road wheels are not rotating. This enables the ABS module to check the condition of the speed sensors while the vehicle is stationary.

STEERING ANGLE SENSOR



E125618

The steering angle sensor measures the steering wheel angle and the rate of change of the steering wheel angle. These measurements are received by the ABS module and broadcast on the high speed CAN bus for use by other systems.

The steering angle sensor is mounted on the steering column upper shroud mounting bracket, immediately behind the multifunction switches, and is secured by 2 screws. A fly lead connects the sensor to the passenger compartment wiring harness via a 4 pin multiplug.

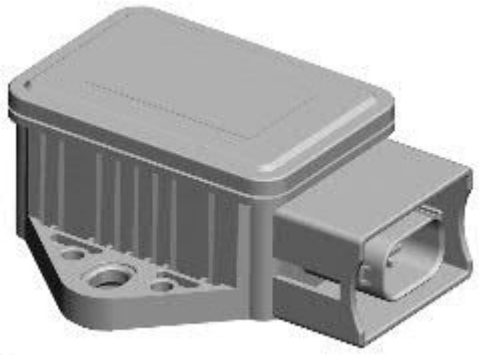
The sensor is housed in a 'U' shaped plastic casing and contains two offset LEDs (light emitting diodes) facing two detectors.

An encoder ring is mounted on the inner steering column shaft and intersects the LEDs and detectors. The encoder ring contains 60 slots which break and restore the light beams between the LEDs and the detectors as the steering wheel is rotated. The ABS module is able to determine the direction of rotation of the steering wheel by monitoring when the light beams change state. The LEDs and detectors are mounted in such a way that only one beam will change state, either to broken or restored, at any one time.

The center (straight ahead) position of the steering wheel has to be learned by the ABS module every time the ignition is switched ON. The steering angle sensor is unable to determine the center position so inputs from the yaw rate and lateral acceleration sensor and wheel speed signals are also used by the ABS module to help it perform this process. If extreme weather conditions are present, for example ice causing extreme wheel spin or understeer/oversteer, the ABS module may not be able to determine the center position of the steering wheel. In this situation, STABILITY CONTROL NOT AVAILABLE DRIVE WITH CARE will be displayed in the instrument cluster message center and the amber warning indicator will illuminate.

The message STABILITY CONTROL NOT AVAILABLE DRIVE WITH CARE will also be displayed if the ABS module detects a steering angle sensor fault. The amber warning indicator will illuminate until the fault is rectified.

YAW RATE AND LATERAL ACCELERATION SENSOR



E125619

The yaw rate and lateral acceleration sensor is located on the floor tunnel, on the floor console rear mounting bracket. The sensor is secured by two screws and connects to the vehicle wiring via a four pin multiplug.

When the ignition is ON, the sensor receives a power feed from the CJB. The sensor measures the yaw rate and lateral acceleration of the vehicle, providing values to the ABS module via a dedicated, private high speed CAN bus connection. The ABS module broadcasts these values on the high speed CAN bus for use by other systems.

If a sensor fault is detected by the ABS module, STABILITY CONTROL NOT AVAILABLE DRIVE WITH CARE will be displayed in the instrument cluster message center and the DSC warning indicator will illuminate.

STOPLAMP SWITCH

The stoplamp switch is mounted on the brake pedal box and is connected to the vehicle harness via a four pin multiplug.

When the brake pedal is pressed, the switch contacts close. This allows a hard wired signal feed to be sent to the ECM. A stoplamp switch status message is then sent from the ECM to the ABS module on the high speed CAN bus. The ABS module is then able to control braking force accordingly in conjunction with the HCU.

NOTE: The stoplamp switch also forms part of the speed control system.

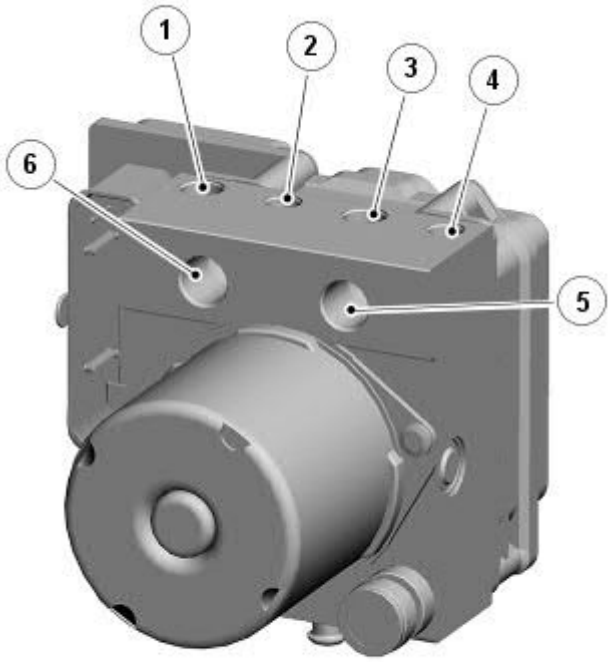
INSTRUMENT CLUSTER WARNING INDICATORS

The instrument cluster and message center contains warning indicators and warning messages to display the operating status of the anti-lock control - stability assist functions. The warning indicators and messages provide a visual notification of either a system warning or information indication to the driver. There are four warning indicators on the instrument cluster and several types of message relating to the anti-lock control - stability assist functions. The DSC OFF warning indicator and message are accompanied by an audible warning.

The following anti-lock control - stability assist warning indicators are installed in the instrument cluster:

- An amber ABS warning indicator.
- A red brake warning indicator.
- An amber DSC warning indicator.
- An amber DSC OFF warning indicator.

ABS MODULE



E125622

Item	Description
1	LH front brake outlet
2	RH rear brake outlet
3	LH rear brake outlet
4	RH front brake outlet
5	Primary inlet
6	Secondary inlet

The ABS module is located in the passenger side, rear engine bay and incorporates the HCU. The module is mounted on the rear face of the HCU, which it uses to control all braking and stability functions by modulating hydraulic pressure to the individual wheel brakes.

Two types of ABS module are available; one for vehicles with standard Speed Control, one for vehicles fitted with Adaptive Speed Control.

If an ABS modulator fault is detected, ABS FAULT will be displayed in the instrument cluster message center and the amber ABS warning indicator will illuminate.

CAUTION: The ABS module and the HCU comprise a single unit and must not be separated.

HYDRAULIC CONTROL UNIT

The HCU is a four channel unit, secured to a mounting bracket located in the passenger side, rear engine bay. The HCU modulates the supply of hydraulic pressure to the brakes under the control of the ABS module.

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Published: 22-May-2013

Anti-Lock Control - Stability Assist - Anti-Lock Control - Stability Assist

Diagnosis and Testing

Principles of Operation

For a detailed description of the anti-lock control - stability assist system, refer to the relevant description and operation sections in the workshop manual. REFER to: (206-09 Anti-Lock Control - Stability Assist)

Anti-Lock Control - Stability Assist (Description and Operation),
Anti-Lock Control - Stability Assist (Description and Operation),
Anti-Lock Control - Stability Assist (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

1. Verify the customer concern
2. Confirm if the anti-lock brake system (ABS) warning light was illuminated, or still is

NOTE: An intermittent fault may allow the warning light to go off. This does not necessarily mean the fault is not present. Some warnings will appear to clear when the ignition is cycled. This is often because the warning has flagged as a result of one of the vehicle's on-board diagnostic routines having run to detect the fault. If the same routine is not run when the ignition status is set to **ON**, the warning will not re-flag until the routine does run

3. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
• Brake fluid level • Vacuum system • Wheel speed sensor installation • Wheel speed sensor air gap • Magnetic pulse wheel(s) (damaged/contaminated) • Steering angle sensor • Yaw rate sensor and accelerometer cluster installation • Incorrect wheel or tire size	• Warning light operation • Fuses • Wheel speed sensors • Connectors/Pins • Harnesses • Steering wheel rotation sensor • Yaw rate sensor and accelerometer cluster • Booster pressure sensor • Hydraulic control unit (HCU)

4. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
5. If the cause is not visually evident, check for diagnostic trouble codes (DTCs) and refer to the DTC index

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Anti-Lock Braking System (ABS) (100-00 General Information, Description and Operation).

Published: 11-May-2011

Anti-Lock Control - Stability Assist - Anti-Lock Brake System (ABS) Module

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. NOTE: The anti-lock braking system (ABS) module mounted to the hydraulic control unit (HCU) cannot be serviced separately. If the ABS module requires replacement, the unit must be replaced as a complete assembly.

   Remove the HCU.
   For additional information, refer to: Hydraulic Control Unit (HCU) (206-09 Anti-Lock Control - Stability Assist, Removal and Installation).

Installation

1. Install the HCU.
   For additional information, refer to: Hydraulic Control Unit (HCU) (206-09 Anti-Lock Control - Stability Assist, Removal and Installation).

Published: 11-May-2011

Anti-Lock Control - Stability Assist - Front Wheel Speed Sensor

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

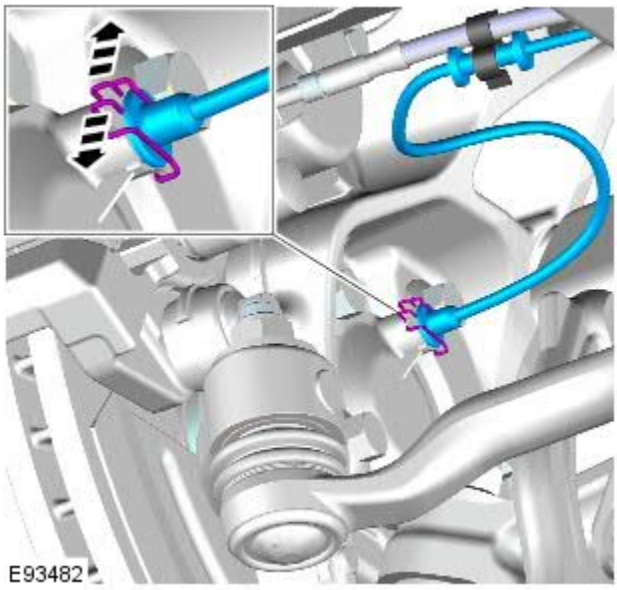
Some variation in the illustrations may occur, but the essential information is always correct.

LH illustration shown, RH is similar.

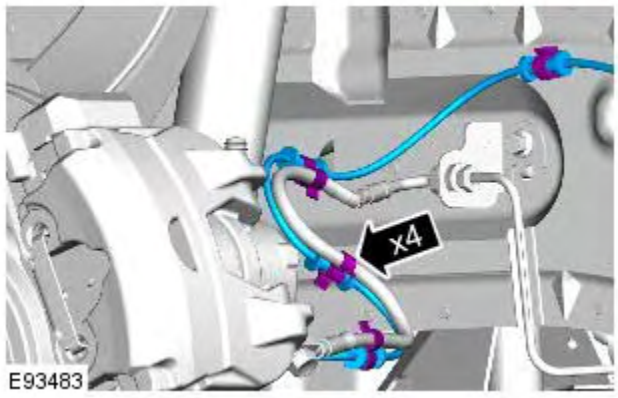
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

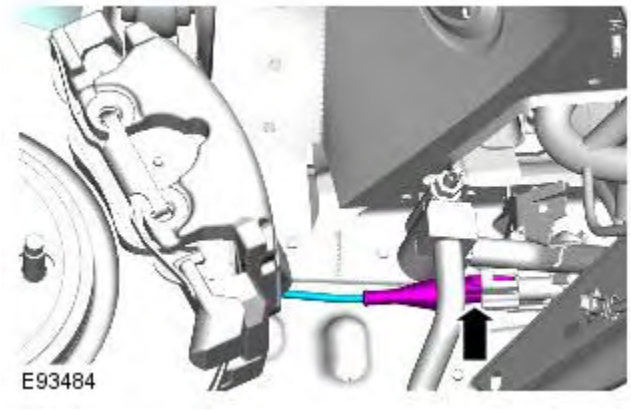
2. Refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).



3. CAUTION: Note the fitted position of the component prior to removal.

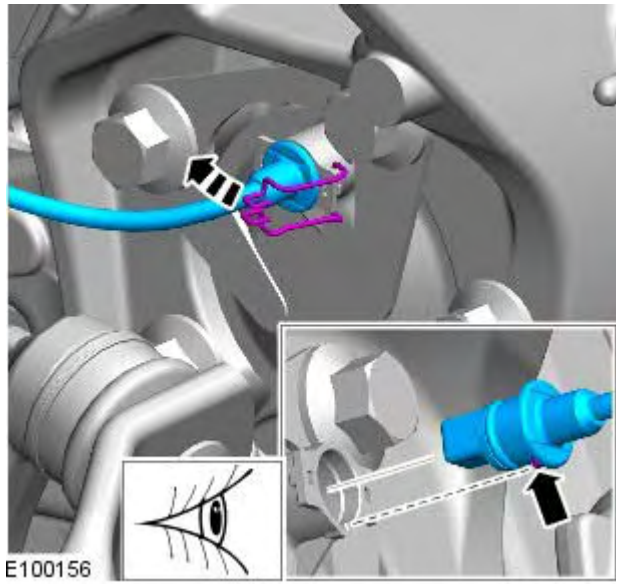


4.



5.

Installation



1. NOTE: Make sure that the component is installed to the noted removal position.

   To install, reverse the removal procedure.

Published: 11-May-2011

Anti-Lock Control - Stability Assist - Hydraulic Control Unit (HCU)

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

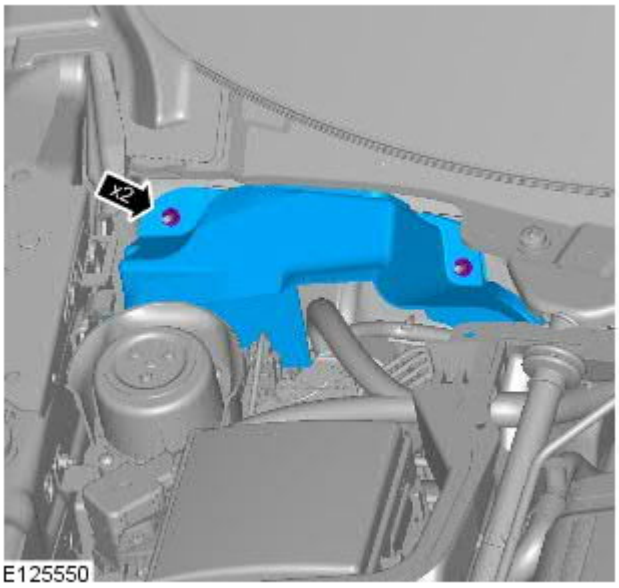
1. For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

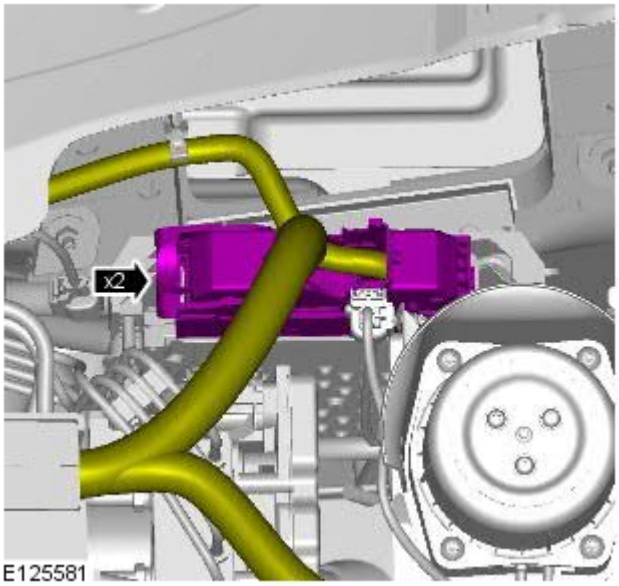
2. For additional information, refer to: Cowl Vent Screen (501-02 Front End Body Panels, Removal and Installation).

3. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

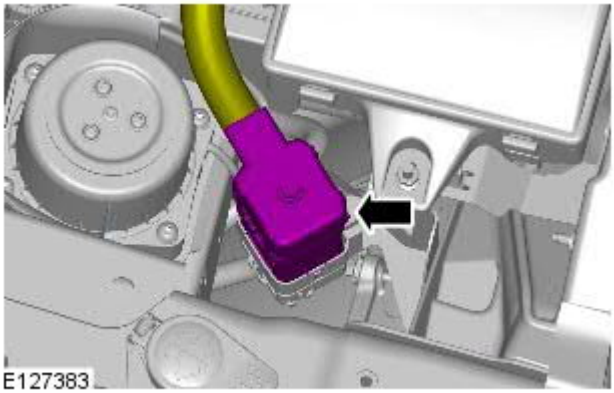
4.



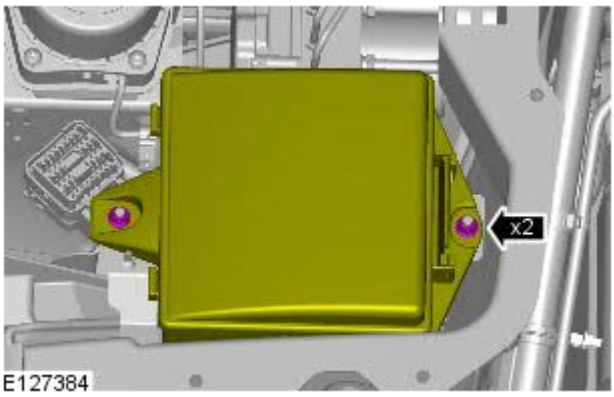


5. CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

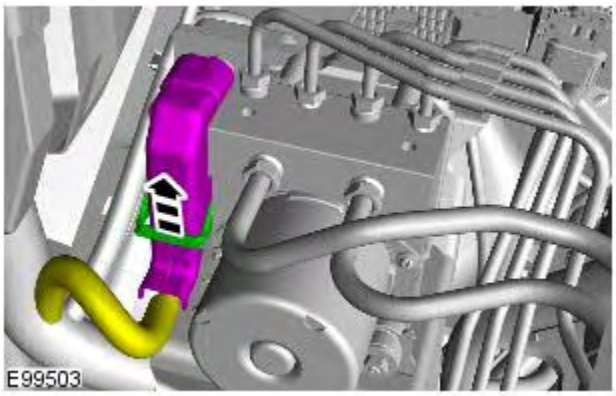
NOTE: RH illustration shown, LH is similar.



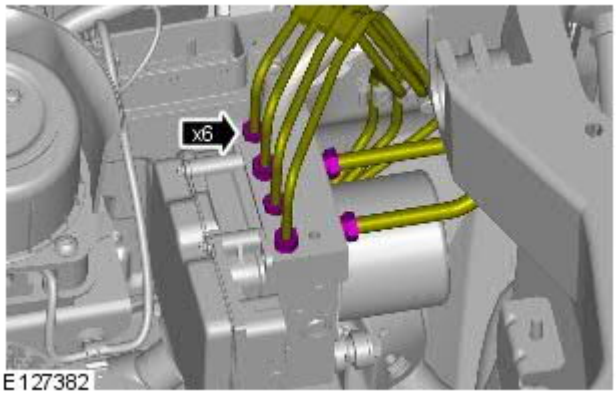
6.



7.



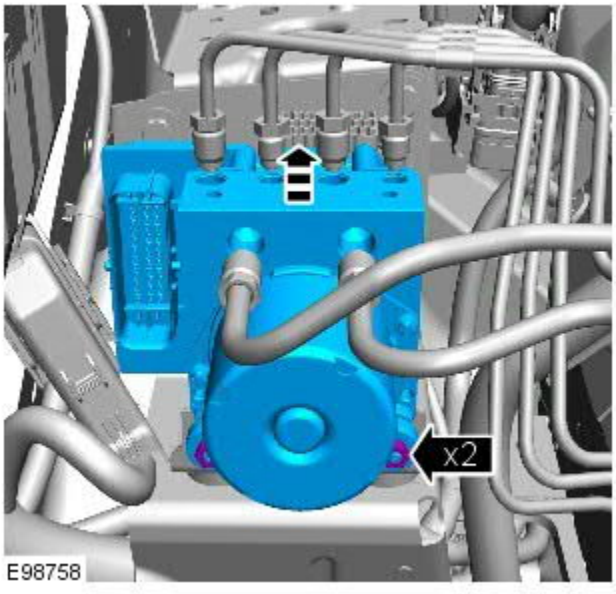
8. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



9. CAUTIONS:

   Make sure that all openings are sealed. Use new blanking caps.

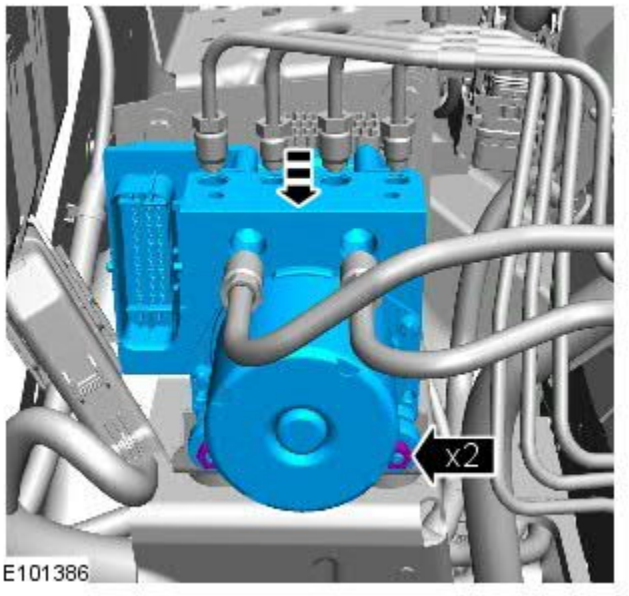
   If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.



10. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

    - Loosen but do not remove the 2 nuts.

Installation



1. CAUTION: If accidentally dropped or knocked install a new hydraulic control unit (HCU) and module.

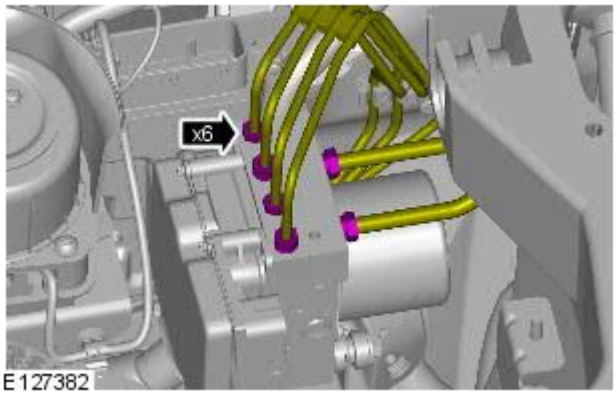
   NOTES:

   Make sure the HCU locating grommet is correctly seated in the bracket before installing the ABS module.

   Make sure the HCU locating pin is correctly located in the grommet, and the 2 isolators are fully seated in the bracket slots.

   Some variation in the illustrations may occur, but the essential information is always correct.

   TORQUE: 8 Nm



2. CAUTIONS:

   Make sure that the area around the component is clean and free of foreign material.

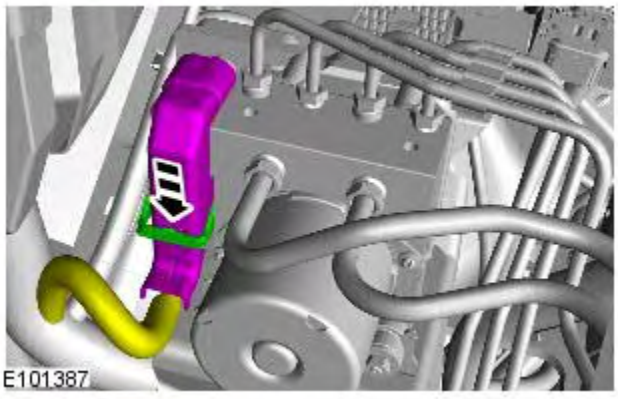
   Make sure that these components are installed to the noted removal position.

   NOTES:

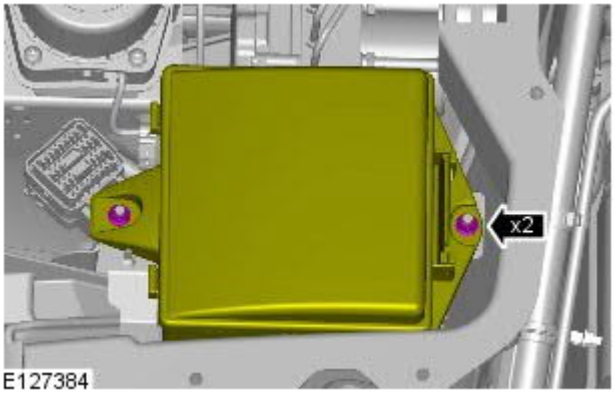
   Remove and discard the blanking caps.

   Some variation in the illustrations may occur, but the essential information is always correct.

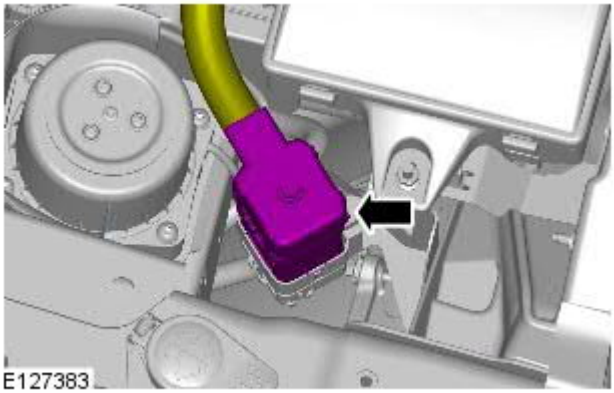
   TORQUE: 17 Nm



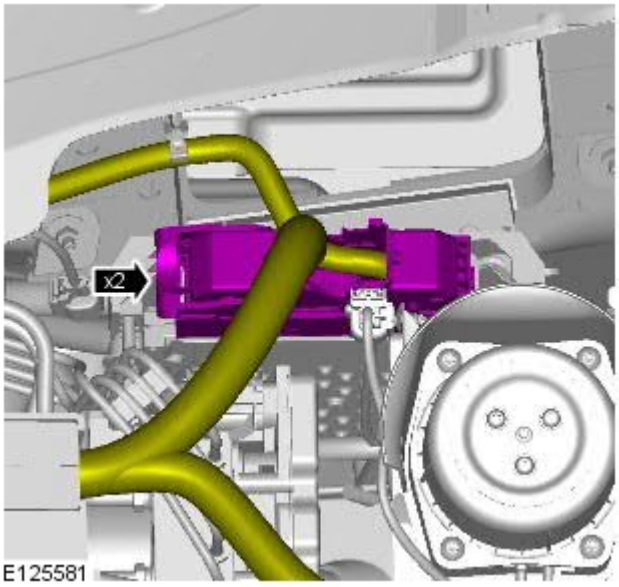
3. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



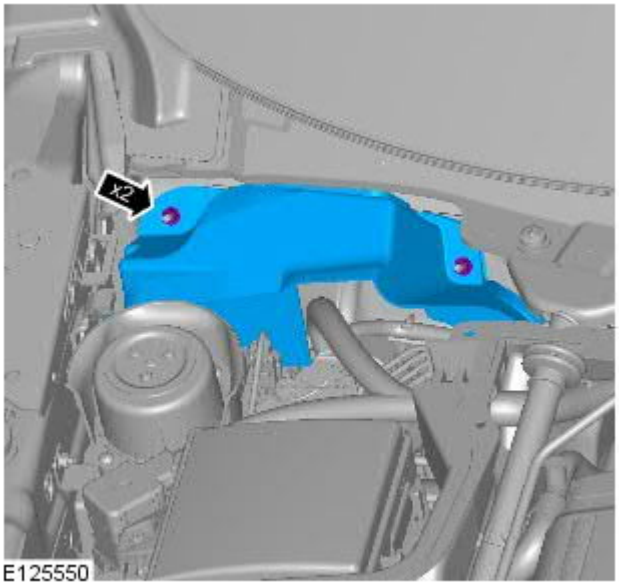
4. TORQUE: 4 Nm



5. TORQUE: 3.5 Nm



6. NOTE: RH illustration shown, LH is similar.



7. TORQUE: 7 Nm

8. For additional information, refer to: Brake System Bleeding (206-00 Brake System - General Information, General Procedures).

9. For additional information, refer to: Cowl Vent Screen (501-02 Front End Body Panels, Removal and Installation).

10. For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

11. Using the diagnostic tool, configue the new units using the Programmable Module Installation Routine.

Published: 11-May-2011

Anti-Lock Control - Stability Assist - Rear Wheel Speed Sensor

Removal and Installation

Removal

NOTES:

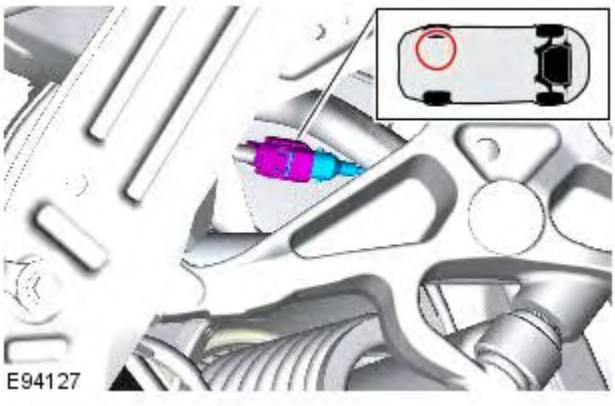
Removal steps in this procedure may contain installation details.

The ignition must be switched off.

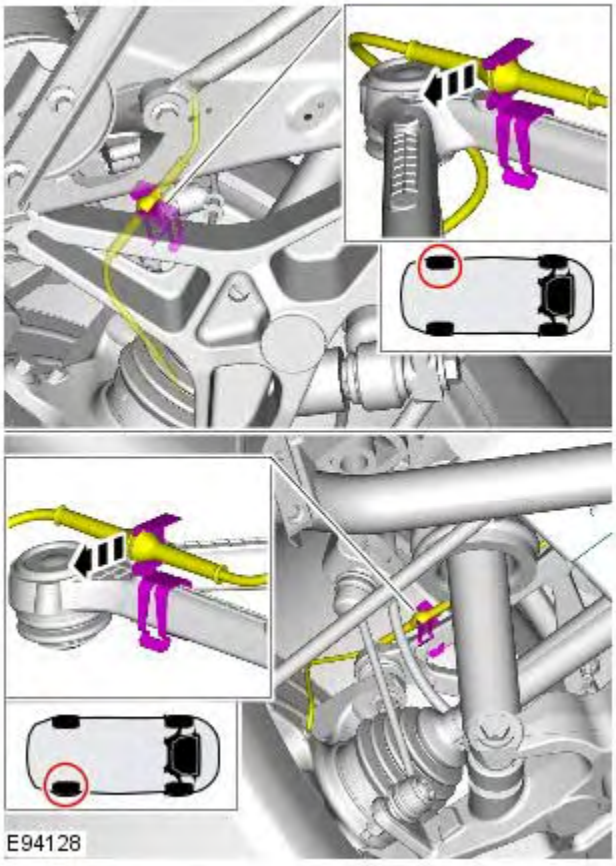
Some variation in the illustrations may occur, but the essential information is always correct.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.



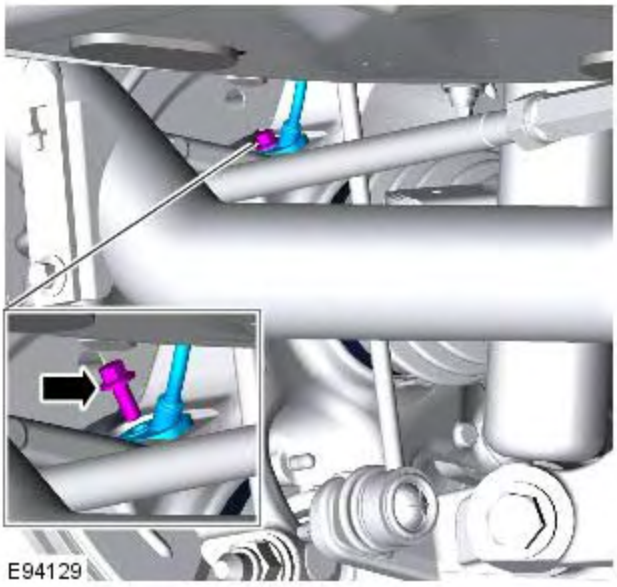
2. Disconnect the wheel speed sensor electrical connector.



3. CAUTION: Make sure that the harness retaining bracket is not removed. Failure to follow this instruction may result in damage to the harness.

NOTE: Note the orientation of the clip.

Release the wiring harness grommet.

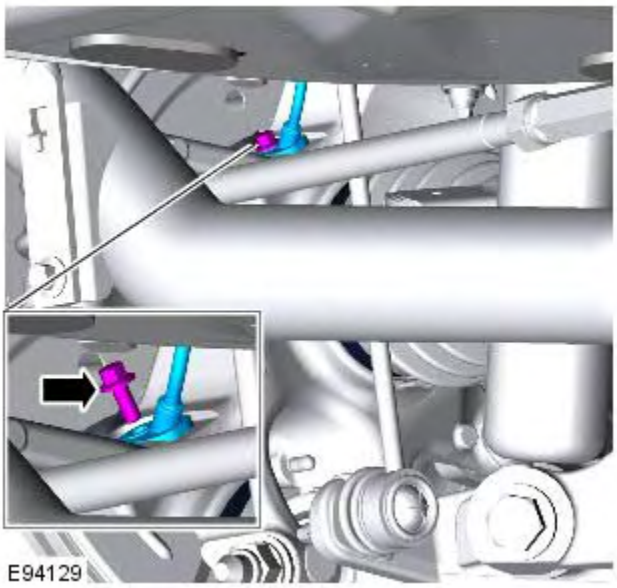


4. CAUTION: Note the fitted position of the component prior to removal.

Remove the wheel speed sensor.

- Remove the retaining bolt.
- Release the wheel speed sensor.

Installation



1. NOTE: Make sure that the component is installed to the position noted on removal.

   To install, reverse the removal procedure.
   - Tighten to 6 Nm.

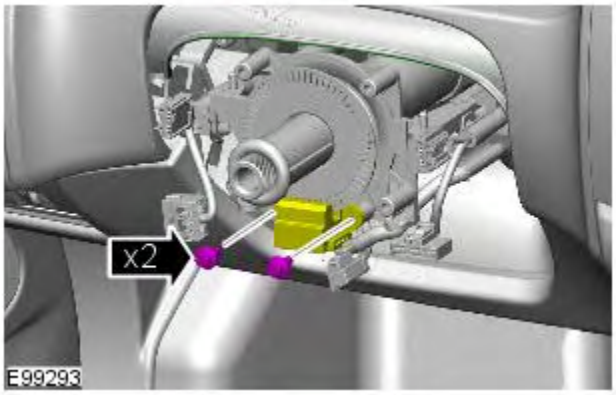
Published: 11-May-2011

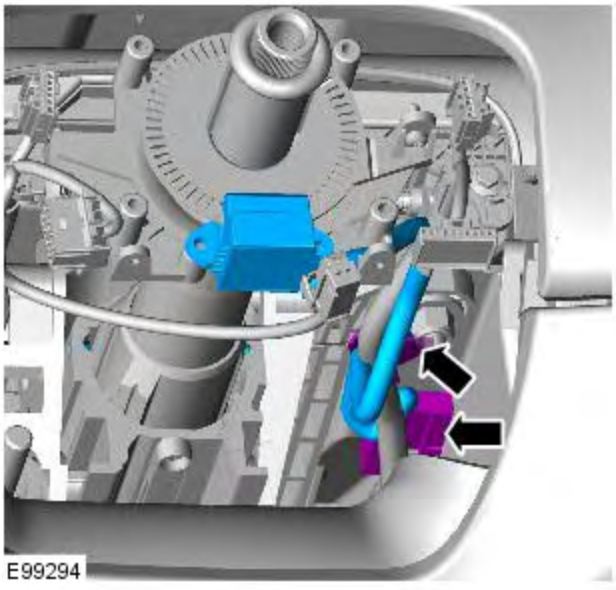
Anti-Lock Control - Stability Assist - Steering Wheel Rotation Sensor

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: Clockspring (501-20B Supplemental Restraint System, Removal and Installation).
3. 

4. 

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Anti-Lock Control - Stability Assist - Yaw Rate Sensor and Accelerometer

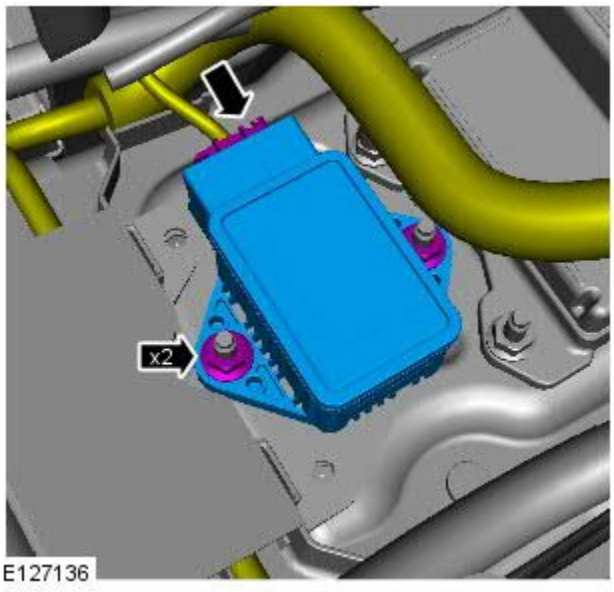
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Floor Console (501-12 Instrument Panel and Console, Removal and Installation).

2.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Steering System - General Information -

Power Steering Pump Specifications

Power steering pump relief pressure	Specification
Vehicles with Diesel Engines	106-114 bar
Vehicles with Petrol Engines	114-122 bar

Lubricants, Fluids, Sealers and Adhesives

Item	Specification
Power steering fluid	Mobil ATF320

Published: 23-May-2013

Steering System - General Information - Steering System

Diagnosis and Testing

Principle of Operation

For a detailed description of the steering system operation, refer to the relevant description and operation sections of the workshop manual. REFER to:

Power Steering (211-02 Power Steering, Description and Operation),
Power Steering (211-02 Power Steering, Description and Operation),
Power Steering (211-02 Power Steering, Description and Operation),
Power Steering - AWD (211-02 Power Steering, Description and Operation),
Power Steering - AWD (211-02 Power Steering, Description and Operation),
Power Steering - AWD (211-02 Power Steering, Description and Operation),
Steering Column (211-04 Steering Column, Description and Operation),
Steering Column (211-04 Steering Column, Description and Operation),
Steering Column (211-04 Steering Column, Description and Operation),
Steering Column Switches (211-05 Steering Column Switches, Description and Operation),
Steering Column Switches (211-05 Steering Column Switches, Description and Operation),
Steering Column Switches (211-05 Steering Column Switches, Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
• Tire condition/pressure • Fluid level • Leaks • Security, condition and correct installation of suspension components • Security, condition and correct installation of steering system components	• Fuses • Harnesses for damage/corrosion • Electrical connector(s) • Damaged/corroded pins

CAUTION: If a steering gear assembly is returned under warranty with leaking output shaft seals, but there is also damage to the steering gear boot/boots the steering gear warranty will be invalid. This is due to the steering gear output shaft seals being damaged due to foreign materials entering the steering gear boot and damaging the steering gear output shaft seals thereafter.

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the concern is not visually evident, verify the symptom and refer to the symptom chart

Symptom Charts

WARNING: It is not possible to CHECK the torque of a patchlock bolt, if the torque is suspected to be low, the bolt must be REMOVED/DISCARDED and a new bolt MUST be INSTALLED and torque to the correct value.

NOTE: If the module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Fluid Leakage

NOTE: Confirm the location of the fluid leak. CLEAN the area of the leak, inspect the area and confirm the exact position. Ensure the fluid is not from another system on the vehicle.

Symptom	Possible Causes	Action
• Power steering	• Overfilled system	• Correct the fluid level as required

Symptom	Possible Causes	Action
fluid leakage	• Steering gear	• Check and install new steering gear as required, refer to the new module/component installation note at the top of the symptom charts
	• Damaged fluid cap/reservoir	• Check and install a new fluid cap/reservoir as required
	• Loose or damaged hoses and fittings • O-ring or Dowty seals	• Tighten the hose connection or latch plate fixing to the recommended torque. REFER to: Specifications (211-00 Steering System - General Information, Specifications). Check and install new components as required • Install new O-ring or Dowty seals as required
	• Fluid cooler	• Check and install a new fluid cooler as required, refer to the new module/component installation note at the top of the symptom charts
	• Power steering pump	• Check and install a new power steering pump as required, refer to the new module/component installation note at the top of the symptom charts

Functional

Symptom	Possible Causes	Action
• Steering wheel misalignment	• Steering not correctly centred	• Check the steering alignment. REFER to: Specifications (204-00 Suspension System - General Information, Specifications).
• Excessive free play at steering wheel (refer to the steering linkage inspection and backlash (free play) check in this section)	• Steering wheel loose	• Check and tighten the steering wheel retaining bolt as required. REFER to: Specifications (211-00 Steering System - General Information, Specifications).
	• Excess play in the steering linkage	• Check and install new components as required
	• Steering gear not correctly adjusted (causing excessive backlash)	CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will invalidate the steering gear warranty • Check and install a new steering gear as required, refer to the new module/component installation note at the top of the symptom charts
	• Lower steering column universal joint pinch bolts loose	• Check and tighten the lower steering column pinch bolts as required. REFER to: Specifications (211-00 Steering System - General Information, Specifications).
	• Excessive wear in steering column universal joints	• Check and install a new steering column or steering column lower shaft as required, refer to the new module/component installation note at the top of the symptom charts

Symptom	Possible Causes	Action
	• Steering gear mounting bolts loose or damaged	• Check/tighten and install new steering gear mounting bolts as required. REFER to: Specifications (211-00 Steering System - General Information, Specifications).
	• Wear in steering gear tie-rod end ball joints	• Check and install new tie-rod ends as required, refer to the new module/component installation note at the top of the symptom charts
	NOTE: Inner ball joint wear is rare. The steering gear installed to all Jaguar vehicles has a spring loaded pinion to ensure the correct level of engagement between the rack and pinion. This play is optimized with the steering gear in the central position and should not be confused with inner ball joint wear. Check for vertical motion in the inner ball joint with the steering gear in the central position. • Wear in steering gear inner ball joints	• Check and install new steering gear as required, refer to the new module/component installation note at the top of the symptom charts
	• Wear in suspension ball joints/bushings	• Check and install new components as required
• Veer under braking	• Steering gear not correctly adjusted	CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will invalidate the steering gear warranty • Check and install a new steering gear as required, refer to the new module/component installation note at the top of the symptom charts
	• Contamination of brake pads and discs	• Check and rectify the source of the contamination and install new brake pads and discs as required, refer to the new module/component installation note at the top of the symptom charts
	• Seized front brake caliper slide pins or piston • Damaged brake discs	• Check and rectify sticking slide pins and install new calipers as required, refer to the new module/component installation note at the top of the symptom charts • Check and install new brake discs as required, refer to the new module/component installation note at the top of the symptom charts
• Vehicle pulls to one side when driving on a level surface	• Uneven tire wear • Incorrect tire pressure	• For information on diagnosis of uneven tire wear. REFER to: Suspension System (204-00 Suspension System - General Information, Diagnosis and Testing). • Check and adjust tire pressures as required. REFER to: Specifications (204-04 Wheels and Tires, Specifications).

Symptom	Possible Causes	Action
	• Incorrect geometry settings	NOTE: Dealerships must keep a copy of the BEFORE and AFTER geometry figures with job card for future reference • Check and adjust geometry as required. REFER to: (204-00 Suspension System - General Information) Camber and Caster Adjustment (General Procedures), Front Toe Adjustment (General Procedures), Rear Toe Adjustment (General Procedures).
	• Vehicle is unevenly loaded or overloaded	• Notify the customer of incorrect vehicle loading
	• Steering gear is not correctly adjusted	CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will invalidate the steering gear warranty • Check and install a new steering gear as required, refer to the new module/component installation note at the top of the symptom charts
	• Loose, damaged or worn front suspension components	• Check/tighten and install new front suspension components as required. REFER to: Specifications (204-00 Suspension System - General Information, Specifications).
	• Loose, damaged or worn rear suspension components	• Check/tighten and install new rear suspension components as required. REFER to: Specifications (204-00 Suspension System - General Information, Specifications).
	• Incorrect brake operation	• For information on diagnosis of the brake system. REFER to: Brake System (206-00 Brake System - General Information, Diagnosis and Testing).
	• Incorrect underbody alignment	• Set underbody alignment referring to the Removal and Installation procedures in section 502-00 of the workshop manual for instruction
• Vehicle wanders from side to side when driven straight ahead and the steering wheel is held in a firm position	• Incorrect tire pressure or tire size	• Check and adjust the tire pressures as required. REFER to: Specifications (204-04 Wheels and Tires, Specifications). • Check and install a new tire as required
	• Vehicle is unevenly or excessively loaded	• Notify the customer of incorrect vehicle loading

Symptom	Possible Causes	Action
	• Incorrect toe adjustment	• Check and adjust as required. REFER to: (204-00 Suspension System - General Information) Camber and Caster Adjustment (General Procedures), Front Toe Adjustment (General Procedures), Rear Toe Adjustment (General Procedures).
	• Loose or worn steering gear tie-rod end(s)	• Check/tighten and install a new tie-rod end as required. REFER to: (211-03 Steering Linkage) Specifications (Specifications), Tie Rod End (Removal and Installation).
	• Loose or worn suspension ball joint(s)	• Check/tighten and install a new suspension ball joint assembly as required. REFER to: Specifications (204-01 Front Suspension, Specifications).
	• Steering column universal joint pinch bolt loose	• Check/tighten the steering column universal joint pinch bolt to the correct torque. REFER to: Specifications (211-00 Steering System - General Information, Specifications).
	• Loose or worn rear suspension components	• Check/tighten and install new rear suspension components as required. REFER to: Specifications (204-02 Rear Suspension, Specifications).
• Poor self center action of the steering	• Incorrect tire pressure, size or type	• Check/adjust the tire pressure and install correct tire as required. REFER to: Specifications (204-04 Wheels and Tires, Specifications).
	• Incorrect geometry adjustment	NOTE: Dealerships must keep a copy of the BEFORE and AFTER geometry figures with job card for future reference • Check and adjust as required. REFER to: (204-00 Suspension System - General Information) Camber and Caster Adjustment (General Procedures), Front Toe Adjustment (General Procedures), Rear Toe Adjustment (General Procedures).
	• Steering column/steering column lower shaft interference	• Check the steering column and steering column lower shaft are free from interference from the engine harness, sound proofing and floor covering
	• Steering column shroud fouling on the steering wheel	• Correctly install/align as necessary

Symptom	Possible Causes	Action
	• Steering column universal joints binding or stiff	• Check and install a new upper or lower steering column as required. REFER to: (211-04 Steering Column) Steering Column (Removal and Installation), Steering Column Flexible Coupling (Removal and Installation).
	• Steering column lower shaft floor seal incorrectly installed, binding or damaged	• Correctly install or install new lower shaft as required.
	• Binding or damaged steering gear tie-rod(s)	• Check and install a new tie-rod end as required. REFER to: Steering Column Flexible Coupling (211-04 Steering Column, Removal and Installation).
	• Loose, damaged or worn front suspension components	• Check/tighten and install new front suspension components as required. REFER to: Specifications (204-01 Front Suspension, Specifications).
• Excessive steering efforts required during low speed/rapid manoeuvring and/or during parking manoeuvres	• Low power steering fluid	• Check and rectify any fluid leakage. Fill to correct level. REFER to: Specifications (211-00 Steering System - General Information, Specifications).
	• Damaged front end accessory drive belt tensioner	• Check and install a new FEAD belt tensioner as required
	• Power steering hose or fluid cooler restriction	• Check hoses and cooler for restriction/damage and install new components as required
	• Power steering fluid aeration	• Bleed the power steering system. REFER to: Power Steering System Bleeding (211-00 Steering System - General Information, General Procedures).
	• Steering transducer not closed - no feed voltage or cable fault	• Refer to the electrical circuit diagrams and test power steering solenoid circuit
	NOTE: REFER to the power steering pressure check in this section. • Power steering fluid delivery pressure or flow too low • Internal steering gear leakage	• Check and install a new power steering pump or steering gear as required
• Steering operation is very heavy when VEHICLE IS IN MOTION AT LOW SPEED, but when stationary manoeuvring is NORMAL	• Steering transducer open early	• Refer to the electrical circuit diagrams and test steering transducer circuit
	• Speedometer signal error	• Check for vehicle speed related DTCs and refer to the relevant DTC index

Symptom	Possible Causes	Action
• Steering operation is very light when VEHICLE IN MOTION AT HIGHER SPEED, but when stationary manoeuvring is NORMAL	• Steering transducer not open, (no power steering fluid flow)	• Refer to the electrical circuit diagrams and test steering transducer circuit
	• Speedometer signal error	• Check for vehicle speed related DTCs and refer to the relevant DTC index
	• Power steering fluid low pressure pipe/hose restricted flow	• Check for kinking or blockage of pipe/hose • Ensure correct installation and install a new power steering fluid low pressure pipe/hose as necessary
	• Fluid reservoir filter blocked	• Check and install a new reservoir, refill with fluid and bleed the system
• Steering operation is heavy in one direction	• Lower steering column interference	• Check the steering column is free from interference from the engine harness, sound proofing or the floor covering
	• Incorrect steering geometry	NOTE: Dealerships must keep a copy of the BEFORE and AFTER geometry figures with job card for future reference. • Check and adjust the front wheel alignment. REFER to: (204-00 Suspension System - General Information) Camber and Caster Adjustment (General Procedures), Front Toe Adjustment (General Procedures), Rear Toe Adjustment (General Procedures).
	• Faulty rotary valve/seal	NOTE: Refer to the power steering pressure check in this section • If the power steering system pressure is low but the power steering pump maximum output pressure is correct install a new steering gear
	• Tire fouling on the wheel arch liner or suspension components	• Check for correct installation or damage to wheel arch liner and suspension components. Correctly install and install new components as required • Check tire for correct size, type and pressure
	• Damaged steering gear cylinder feed pipe	• Check and install new components as required
• Steering operation is heavy in both directions	• Low power steering fluid	• Check and rectify any fluid leaks. Refer to the fluid leakage symptom charts in this section • Fill power steering system to correct level

Symptom	Possible Causes	Action
	• Faulty rotary valve/seal	NOTE: Refer to the power steering pressure check in this section • If the power steering system pressure is low but the power steering pump maximum output pressure is correct, install a new steering gear
	NOTE: Refer to the power steering pressure check in this section • Power steering fluid delivery pressure or flow too low • Internal steering gear leakage	• Check and install a new power steering pump or steering gear as required
	• Fluid loss at the power steering pump shaft seal	• Check and install a new power steering pump as required. REFER to: Power Steering Pump - TDV6 3.0L Diesel (211-02 Power Steering, Removal and Installation), Power Steering Pump - V8 5.0L Petrol/V8 S/C 5.0L Petrol (211-02 Power Steering, Removal and Installation), Power Steering Pump - V6 3.0L Petrol (211-02 Power Steering, Removal and Installation), Power Steering Pump - V6 S/C 3.0L Petrol (211-02 Power Steering, Removal and Installation), Power Steering Pump - GTDi 2.0L Petrol (211-02, Removal and Installation).
	• Steering column universal joints binding or stiff	• Check and install a new upper or lower steering column as required. REFER to: (211-04 Steering Column) Steering Column (Removal and Installation), Steering Column Flexible Coupling (Removal and Installation).
	• Seized front ball joints	• Check and install new components as required
	• Seized or worn steering gear	• Check and install new steering gear as required
• Steering operation varies from heavy to light when driving at constant speed	• Lower steering column interference	• Check the steering column is free from interference from the engine harness, sound proofing and floor covering
	• Incorrect speedometer signal	• Check for vehicle speed related DTCs and refer to the relevant DTC index
	• Power steering solenoid circuit fault	• Refer to the electrical circuit diagrams and test power steering solenoid circuit

Symptom	Possible Causes	Action
	• Steering column universal joint binding or stiff	• Check and install a new upper or lower steering column as required. REFER to: (211-04 Steering Column) Steering Column (Removal and Installation), Steering Column Flexible Coupling (Removal and Installation).
• Uncharacteristic effort/speed relationship	• Power steering solenoid circuit fault	• Refer to the electrical circuit diagrams and test power steering solenoid circuit
• Excessive kick-back through steering wheel	• Incorrect tire pressure, size or type	• Check and adjust the tire pressure and install correct tire as required. REFER to: Specifications (204-04 Wheels and Tires, Specifications).
	NOTE: Inner ball joint wear is rare. The steering gear installed to all Jaguar vehicles have a spring loaded pinion to ensure the correct level of engagement between the rack and pinion. This play is optimized with the steering gear in the central position and should not be confused with inner ball joint wear. Check for vertical motion in the inner ball joint with the steering gear in the central position. • Badly worn steering gear/linkage	• Check and install new steering gear and tie-rod ends as required
	• Loose or worn front suspension components/bushings	• Tighten and install new front suspension components as required. REFER to: Specifications (211-00 Steering System - General Information, Specifications).
• Column will not adjust • Column will not move to memory position	• Electrical/electronic failure	• Check steering column movement datalogger signal using the manufacturer approved diagnostic system • Check fuses/relays • Check instrument cluster for column movement/memory related DTCs and refer to DTC index. REFER to: Instrument Cluster (413-01 Instrument Cluster, Diagnosis and Testing). - If DTCs B1C3314, B1C3514 are stored, and the column inches when the switch is activated and there is no memory recall function, there will be an existing fault with the circuit, if the column function is OK the fault is intermittent - If DTCs B1C3277, B1C3477 are stored, these should be ignored in this case • Check condition of wiring and connectors • Carry out column calibration application using the manufacturer approved diagnostic system. The BAR code information is located in the right

Symptom	Possible Causes	Action
		hand luggage compartment floor area below the carpet • Check seat control memory module
	• Motor locked/jammed	• Check to see if mechanism has reached hard end stops • Free mechanism • Replace motor with appropriate service kit
• Column easy entry/exit does not function	• Electrical/electronic failure	• Turn column adjust switch to AUTO position, check that 'Column Adjust AUTO' text is displayed in the instrument cluster message center • Check steering column movement datalogger signal using the manufacturer approved diagnostic system • Check fuses/relays • Check instrument cluster for column movement/memory related DTCs and refer to DTC index. REFER to: Instrument Cluster (413-01 Instrument Cluster, Diagnosis and Testing). - If DTCs B1C3314, B1C3514 are stored, and the column inches when the switch is activated and there is no memory recall function, there will be an existing fault with the circuit, if the column function is OK the fault is intermittent - If DTCs B1C3277, B1C3477 are stored, these should be ignored in this case • Check condition of wiring and connectors • Carry out column calibration application using the manufacturer approved diagnostic system. The BAR code information is located in the right hand luggage compartment floor area below the carpet • Check seat control memory module for DTCs and refer to DTC index
• Electromechanical steering column lock will not operate	• Internal lock failure	• Refer to the electrical circuit diagrams and test steering column lock circuit • Install a new steering column lock as required

Noise

Symptom	Possible Causes	Action
• Continuous noise	• Low power steering fluid level	• Check for leaks and rectify as required. For further information refer to the symptom charts for leakage in this section. Fill power steering fluid reservoir to correct level
	NOTE: Look for small air bubbles visible in the fluid, air may also get trapped in the hydraulic system	• Bleed the power steering system. REFER to: Power Steering System Bleeding (211-00 Steering System - General Information, General Procedures).

Symptom	Possible Causes	Action
	• Air in hydraulic system	
	• Power steering pipe/hose in contact with the vehicle body	• Check and reposition, or install new IF damaged/deformed, power steering pipe/hose
	• Power steering pipe/hose restricted or twisted	• Check and clear restriction to pipe/hose • Reposition power steering pipe/hose. Install new pipe/hose IF permanently damaged/deformed
	• Power steering pump mounting bolts loose	• Tighten the power steering pump mounting bolts to the correct torque. REFER to: Specifications (211-00 Steering System - General Information, Specifications).
• Noise gets worse when system is loaded	NOTE: Refer to the power steering pressure check in this section • Low power steering fluid level • Aerated fluid • Low power steering pump pressure	• Check and fill power steering fluid reservoir to correct level • Bleed the power steering system. REFER to: Power Steering System Bleeding (211-00 Steering System - General Information, General Procedures). • Check power steering pump pressure. If the pump pressure is low, install a new power steering pump
• Front end accessory drive belt squeal	• Front end accessory drive belt incorrectly tensioned or glazed	• Check front end accessory drive belt tension • Check front end accessory drive belt condition and install a new belt as required
• Chirp noise from the steering pump when a load is applied	• Loose or worn front end accessory drive belt	• Check front end accessory drive belt tension • Check front end accessory drive belt condition and install a new belt as required
• Scrape/grind noise from behind steering wheel while steering	• Steering column shroud foul condition or clockspring	• Correctly install the steering column shroud to eliminate the foul condition • Install a new clockspring as required
	• Foreign objects	• Remove foreign objects from between steering column shroud and steering wheel/steering column rotating components
• Click	• Clockspring or steering column multifunction switch LH	• Correctly install and install new components as required
	• Loose universal joint pinch bolt	• Install a new universal joint pinch bolt and tighten to correct specification. REFER to: Specifications (211-00 Steering System - General Information, Specifications).
• Squeak	• Steering column shroud joints	• Apply Krytox spray to steering column shroud joints
	• Clockspring	• Install new clockspring as required
• Knock	• Loose fixings (universal joint pinch bolt and steering column fixings)	• Tighten fixings to correct specification. REFER to: Specifications (211-00 Steering System - General Information, Specifications).
• Rattle	• Foreign objects	• Remove foreign objects from between steering column shroud and steering wheel/steering column rotating components
	• Loose fixings	• Tighten steering column fixings to correct specification. REFER to: Specifications (211-00 Steering System

Symptom	Possible Causes	Action
		- General Information, Specifications).
• Noise while adjusting column	• Electric motor/solenoid	NOTE: Before carrying out repairs/replacement, assess column adjustment noise levels against other vehicles of the same model • Install new components as required
	• Motor spindle/lead screw	• Lubricate lead screw

Vibration

Symptom	Possible Causes	Action
• Wheel fight (kick back) - condition where roughness is felt in the steering wheel by the driver when the vehicle is driven over rough surfaces	• Loose or worn steering components/bushings	CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will invalidate the steering gear warranty. • Tighten and install new steering components/bushings as required
	• Loose or worn suspension components/bushings	• Tighten and install new suspension components/bushings as required
• Nibble (shimmy) - condition where oscillation of the steering wheel occurs (not vertical which is shake). This is driven by road wheel imbalance	• Road wheel and tire condition	• Check for wheel and tire damage. Install new components as required • Check for tire uniformity. Install new tire(s) as required
	• Road wheel imbalance	• Check and adjust road wheel balance as required
• Shake - condition where vertical vibration of the steering wheel/column occurs (not oscillation which is nibble)	NOTE: Vibration smooths out after several miles of driving • Road wheel imbalance due to tire flat-spotting	• Ensure tires installed are to Jaguar specification. Install new tires as required • Check and adjust tire pressures to correct specification

Component Tests

Steering Linkage Inspection and Backlash (Free play) Check

CAUTION: Steering gear boots must be handled carefully to avoid damage. Use new clamps when installing steering gear boots.

Inspect the boots for cuts, deterioration, twisting or distortion. Check the steering gear boots to make sure they are tight. Install new boots or clamps as required

NOTE: The following steps must be carried out with assistance.

1. With the wheels in the straight ahead position, gently turn the steering wheel to the left and the right to check for free play
2. Free play should be between 0 and 6 mm (0 and 0.24 in) at the steering wheel rim. If the free play exceeds this limit, either the ball joints are worn, the lower steering column joints are worn or the backlash of the steering gear is excessive

CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will invalidate the steering gear warranty.

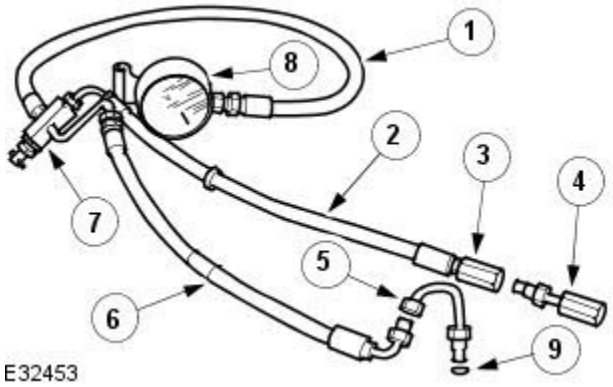
3. The backlash of the steering gear cannot be adjusted, install a new steering gear if excessive backlash is diagnosed
4. Grasp the steering wheel firmly and move it up and down and to the left and right without turning the wheel to check for column bearing wear, steering wheel or steering column

Power Steering Fluid Condition Check

1. Run the engine for 2 minutes
2. Check the power steering fluid system level
3. Observe the color and the odor. The color under normal circumstances should be dark reddish, not brown or black
4. Using a suitable clean syringe extract a suitable amount of fluid from the reservoir
5. Allow the fluid to drip onto a facial tissue and examine the stain
6. If evidence of solid material is found, the power steering fluid system should be drained for further inspection
7. If fluid contamination or steering component failure is confirmed by the sediment in the power steering fluid system, refer to steering fault diagnosis by symptom charts in this section

Power Steering Pressure Test

Test Equipment



Item	Part Number	Description
1	211-011	Pressure gauge hose
2	211-011-08	Pump return hose
3	211-011-07	Pump return hose connector
4	211-011-03/2	Test equipment to high pressure hose adaptor
5	211-011-03/1	Pump high pressure outlet to hose adaptor
6	211-011-02	Pump adaptor to control valve hose
7	211-011-01	Control valve
8	211-011	Pressure gauge
9	-	'O' ring seal

The measurement of the maximum system pressure, (which is governed by the pressure relief valve) is achieved by inserting the service tool (pressure gauge and adaptors) into the fluid circuit of the power steering system. Run the engine at idle speed, turn the steering from lock to lock and read the maximum pressure recorded on the gauge

Installing Test Equipment

To install the pressure test equipment:

- Place a suitable drain tray below the power steering pump
- Install a hose clamp on the reservoir to pump hose prior to disconnecting any hoses, to avoid unnecessary loss of fluid
- Disconnect the hose from the power steering pump high pressure outlet
- Install the pump outlet to hose adaptor (5). Do not omit the 'O' ring seal (9)
- Connect the power steering pump adaptor to control valve hose (6) of the test equipment
- Install the adaptor (4) in the high pressure hose previously removed from the power steering pump outlet
- Connect the connector (3) of the test equipment hose (2) to the adaptor (4)
- Remove the hose clamp from the reservoir hose
- Start the engine to check the system pressure

With the control valve (7) OPEN and the engine idling, the following system pressures may be checked:

- During turning when static (dry parking pressure)
- When the steering is held on full lock (maximum system pressure or pressure relief)
- With the steering at rest (idle pressure or back pressure)

CAUTIONS:

To avoid excessive heating of the power steering pump when checking the pressure, do not close the valve for more than 5 seconds maximum.

When checking the pump pressure DO NOT drive the vehicle with the test equipment installed.

With the control valve (7) CLOSED the power steering pump maximum output pressure can be checked

Removing Test Equipment

To remove the test equipment:

- Install a hose clamp on the reservoir to power steering pump hose
- Removing the test equipment is a reversal of the installation instructions
- Install a new 'O' ring seal (9) to the power steering pump high pressure outlet to hose connection
- Install the original hose to the power steering pump
- Remove the clamp from the reservoir to the power steering pump hose
- Top-up the reservoir fluid
- Bleed the power steering system.
  REFER to: Power Steering System Bleeding (211-00 Steering System - General Information, General Procedures).

Description of Terms

General Steering System Noises

Boom

Rhythmic sound like a drum roll or distant thunder. May cause pressure on the ear drum

Buzz

Low-pitched sound, like a bee. Usually associated with vibrations

Chatter

Rapidly repeating metallic sound

Chuckle

Rapid noise that sounds like a stick against the spokes of a spinning bicycle wheel

Chirp

High pitched rapidly repeating sound, like chirping birds

Click

Light sound, like a ball point pen being clicked

Click/Thump

Heavy metal-to-metal sound, like a hammer striking steel

Grind

Abrasive sound, like a grinding wheel or sandpaper rubbing against wood

Groan/Moan

Continuous, low-pitched humming sound

Groan/Howl

Low, guttural sound, like an angry dog

Hiss

Continuous sound like air escaping from a tire valve

Hum

Continuous sound of varying frequencies, like a wire humming in the wind

Knock

Heavy, loud repeating sound like a knock on a door

Ping

Similar to knock, except at higher frequency

Rattle

A sound suggesting looseness, such as marbles rolling around in a can

Roar

Deep, long, prolonged sound like an animal, or winds and ocean waves

Rumble

Low, heavy continuous sound like that made by wagons or thunder

Scrape

Grating noise like one hard plastic part rubbing against another

Squeak

High-pitched sound like rubbing a clean window

Squeal

Continuous, high-pitched sound like running finger nails across a chalkboard

Tap

Light, hammering sound like tapping pencil on edge of table. May be rhythmic or intermittent

Whirr/Whine

High-pitched buzzing sound, like an electric motor or drill

Whistle

Sharp, shrill sound, like wind passing a small opening

Specific Steering System Noise Types

Belt Squeal

Belt squeal is a high frequency air-borne noise generated by slippage of the ribbed Vee belt on the power steering pump pulley. Squeal increases with system loading and at full lock

Clonk

Clonk is a structure-borne noise heard as a loose-sounding rattle or vibration coming from the steering column. Clonk can be identified by driving and turning over cobblestones, rough roads, or high frequency bumps such as 25-50 mm tall tar strips. Clonk requires a tie-rod load impact

Column Knock

Column knock is a loose-sounding rattle or vibration generated by the steering column shaft contacting other portions of the column assembly. The noise is both audible and tactile. Column knock is generated by driving over cobblestones or rough pavement. It is not necessary to turn the steering wheel to create this noise

Column Rattle

Column rattle is a metallic sounding noise created when applying a highly impulsive force to the steering wheel. Column rattle is often used to combine the more general group of column noises including clonk and column knock. Column rattle noises can be caused by clonk, knock, loose column components, bonus parts etc. A series of parked, straight-line driving, and cornering tests should be carried out to isolate the source/sources

Grinding/Scrape

Grinding is a low frequency noise in the column when the steering wheel is turned. It is generally caused by interference between moving components such as the steering wheel to steering column shroud

Grunt (Squawk/Whoop)

Grunt is a 'honking' sound elicited when coming off one of the steering stops. Grunt is generally excited during parking manoeuvres with a low to medium speed steering input

Hiss (Swish)

Hiss or Valve Hiss is a high-frequency sound coming from the steering gear when the system is loaded. It is a rushing or 'swish' noise that doesn't change frequency with RPM. Hiss is the general noise generated by the flow of hydraulic fluid through restrictions in the steering system. Restrictions include the rotary steering valve, power steering tubes, connectors, tuning

orifices, etc. Hiss can be air-borne and structure-borne, but the structure-borne path through the steering intermediate shaft is usually dominant

Moan (Groan)

Moan is the general structure-borne noise of the steering system. Moan is primarily transmitted to the driver via the body structure through the pump mount, engine mounts, power steering lines and power steering brackets. On some vehicles, moan is a loud humming noise, often present when the wheel is turned and the system is loaded. It may change frequency with engine RPM and if the system is loaded or unloaded

Steering Gear Knock (Steering Gear Slap)

CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will invalidate the steering gear warranty.

Steering gear knock is a rattle sound and steering wheel vibration caused by separation of the steering gear and pinion while driving over bumps. It is a structure-borne noise transmitted through the intermediate shaft and column. Steering gear knock can also be heard as a 'thump' or impact noise that occurs with the vehicle stationary when the steering wheel is released from a loaded position and allowed to return to rest. Noise occurs with the engine on or off

Rattles

Rattles are noises caused by knocking or hitting of components in the steering system. Steering rattles can occur in the engine compartment, the suspension, or the passenger compartment. Rattles can be caused by loose components, movable and flexible components, and improper clearances

Squeaks/Scrapes

Squeaks/Scrapes are noises due to friction or component rubbing anywhere in the steering system. Squeaks/Scrapes have appeared in steering linkages and joints, in column components and in column and steering wheel trim

Weep

Weep is an air-borne noise, occasionally generated when turning the steering across lock at a constant rate. When present on a vehicle the noise, once initiated can often be maintained across a large proportion of the available steering movement

Whistle

Whistle is similar to hiss but is louder and of a higher frequency. It is also more of a pure tone noise than hiss. Whistle is air-borne and is generated by a high flow rate of hydraulic fluid through a small restriction

Zip

Zip noise is the air-borne noise generated by power steering pump cavitation when power steering fluid does not flow freely through the suction hose from the reservoir to the pump. Zip primarily occurs during cold weather at start-up

Steering System Vibrations and Harshness

Buzz

Buzz is a tactile rotary vibration felt in the steering wheel when steering inputs are slow. Buzz can also be called a grinding feel and it is closely related to grunt and is caused by high system gain with low damping. Buzz is generally excited during parking manoeuvres with low to medium speed steering input

Buzz (Electrical)

A different steering buzz can be caused by pulse width modulated (PWM) electric actuators used in variable assist steering systems. This buzz is felt by turning the ignition key to run without starting the engine and holding onto the steering wheel. In extreme cases, the buzz can be felt with the engine running also

Column/Steering Wheel Shake

Column shake is a low frequency vertical vibration excited by primary engine vibrations

Nibble (Shimmy)

Steering nibble is a rotary oscillation or vibration of the steering wheel, which can be excited at a specific vehicle speed. Nibble is driven by wheel and tire imbalance exciting a suspension recession mode, which then translates into steering gear travel and finally steering wheel nibble

Shudder (Judder)

Shudder is a low frequency oscillation of the entire steering system (tire, wheels, steering gear and linkage, etc.) when the vehicle is steered during static-park or at low speeds. Shudder is very dependent on road surface

Torque/Velocity Variation (Phasing/Effort Cycling)

Steering wheel torque variation occurring twice in one revolution is normally as a result of problems with the lower steering column (intermediate shaft), but foul conditions generally result in either constant stiffness or single point stiffness. Depending upon the orientation of the joints, the steering can feel asymmetric (torque falling off in one direction and rising in the other) or else it can simply have pronounced peaks and troughs as the steering moves from lock to lock

Wheel Fight (Kick Back)

Wheel fight is excess feedback of sudden road forces through the steering system and back to the driver. It is evaluated at all vehicle speeds over cobblestones, rough roads, and potholes. The tires, wheels, and suspension generate forces into the steering systems. Steering friction, hydraulic damping, hydraulic compliance, mechanical compliance, steering ratio, and assist gain all affect how much is transmitted to the driver

DTC Index

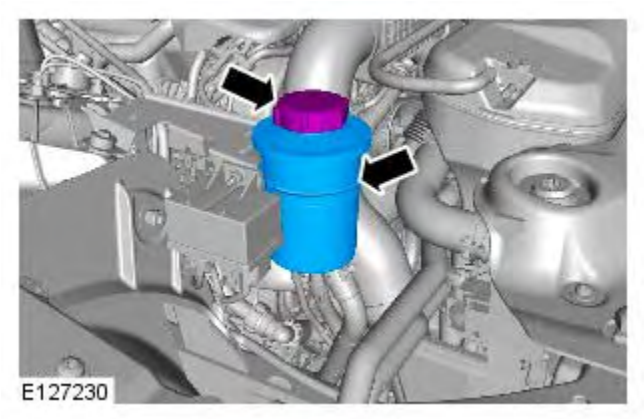
For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Steering Column Lock Module (VIM) (100-00 General Information, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - DTC: Central Junction Box (BCM) (100-00 General Information, Description and Operation).

Published: 11-May-2011

Steering System - General Information - Power Steering System Bleeding

General Procedures

1. Clean power steering fluid reservoir around the filler cap and fluid indicator.
   - Check the power steering fluid, if aerated, wait until fluid is free from bubbles then top-up reservoir to UPPER level mark with recommended fluid.



2. CAUTION: Fluid must always be present in the reservoir during bleeding.

   Remove the filler cap and fill to the MAX level mark.
   - Install the reservoir filler cap.

3. Start the engine and allow to run for 10 seconds, stop the engine.
   - Check the power steering fluid, if aerated, wait until fluid is free from bubbles then top-up reservoir to UPPER level mark with recommended fluid.

4. CAUTION: Do not hold steering on full lock for longer than 10 seconds.

   Start the engine and turn steering fully lock to lock, stop the engine.
   - Check and top-up power steering fluid level.

5. Start and run the engine for 2 minutes, turn the steering fully lock to lock.
   - Check and top-up power steering fluid level.

Published: 11-May-2011

Steering System - General Information - Power Steering System Flushing

General Procedures

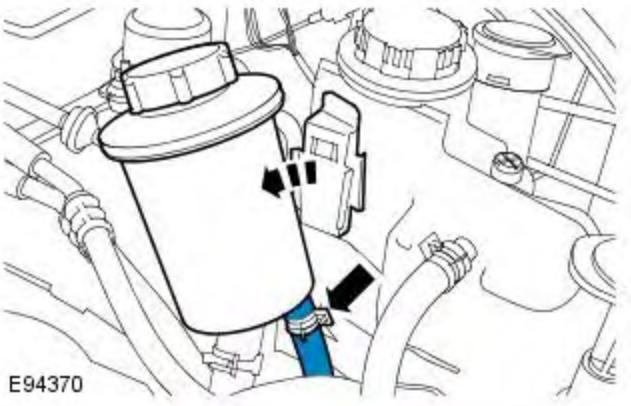
NOTES:

If heavy steering or contamination within the power steering system is found, it is necessary to carry out the system flush procedure as detailed below. If any components have been replaced in the power steering system the procedure below must be carried out in full.

Some variation in the illustrations may occur, but the essential information is always correct.

1. Remove the power steering fluid reservoir cap.

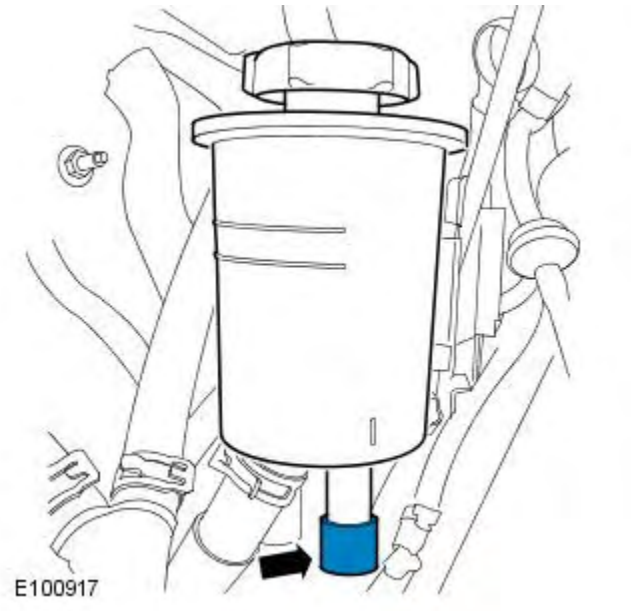
2. Using a suitable syringe, remove the power steering fluid from the power steering fluid reservoir.



3. CAUTION: Be prepared to collect escaping fluids.

   NOTE: Note the orientation of the clip.

   Detach the power steering fluid reservoir.
   - Detach but do not remove the power steering fluid reservoir.
   - Release the power steering fluid return hose from the power steering fluid reservoir.
   - If a quick release coupling is fitted to the power steering return hose, release the power steering fluid return hose from the coupling by removing the clip.

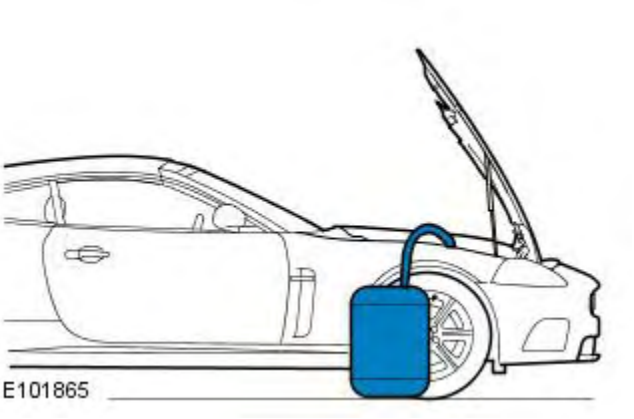


4. CAUTIONS:

   Be prepared to collect escaping fluids.

   Make sure that all openings are sealed. Use new blanking caps.

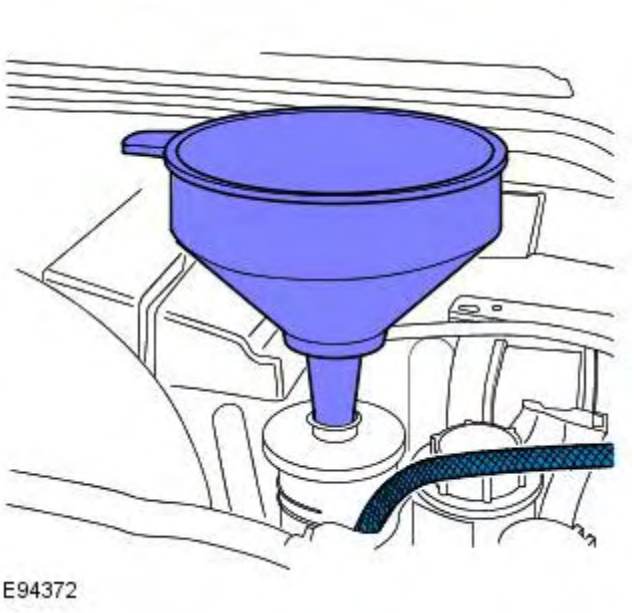
   Using a suitable blanking cap, cap the power steering reservoir return pipe.



5. CAUTION: Be prepared to collect escaping fluids.

   NOTE: Make sure the extended pipe is not kinked or twisted and is correctly secured with hose clips.

   Attach a suitable pipe to the power steering return hose to allow the fluid to drain.



6. NOTES:

   The suitable funnel should have the a capacity of 4 litres and O-ring seal

   The suitable funnel must be tightly sealed to the power steering fluid reservoir to avoid fluid leakage.

   Install a suitable funnel onto the power steering fluid reservoir.

7. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

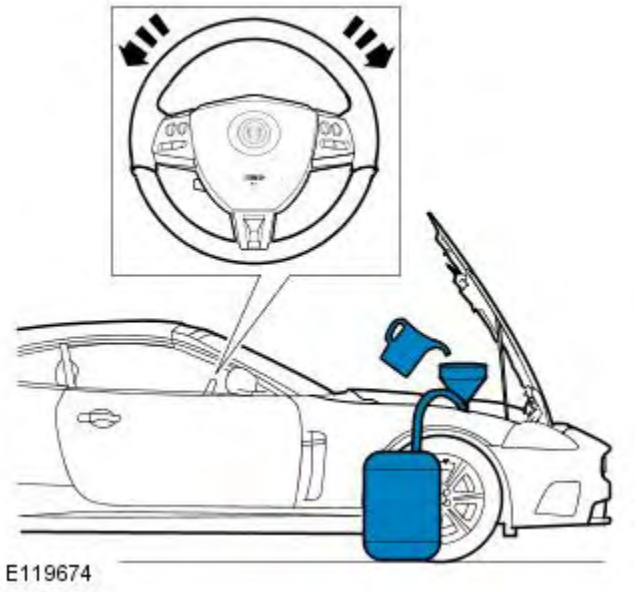
   Raise and support the vehicle with the wheels just clear of the ground.

8. CAUTIONS:

   Steps 8 and 9 must be carried out within 2 - 3 seconds of each other. Failure to follow this instruction may result in damage to the power steering system.

   Be prepared to collect escaping fluids.

   Using the suitable funnel, top up the power steering system with the specified fluid. Make sure the fluid level is maintained at two thirds full in the funnel.


E119674

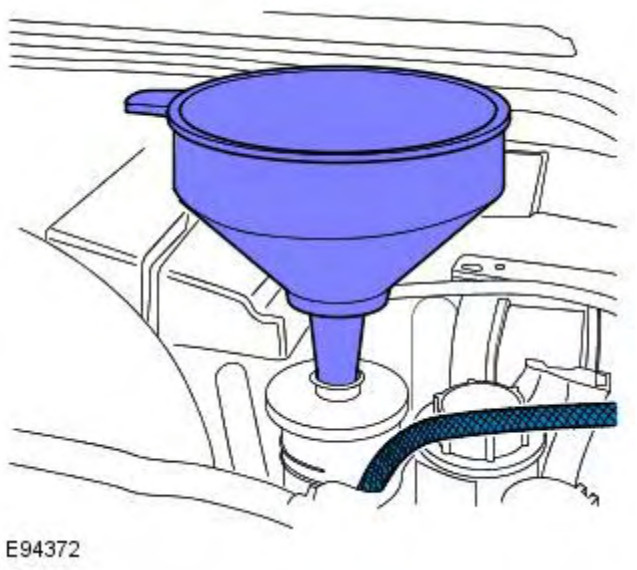
9. CAUTIONS:

   Be prepared to collect escaping fluids.

   Do not allow the power steering fluid level in the power steering fluid reservoir to fall below the minimum power steering fluid level. Failure to follow this instruction may result in damage to the power steering system.

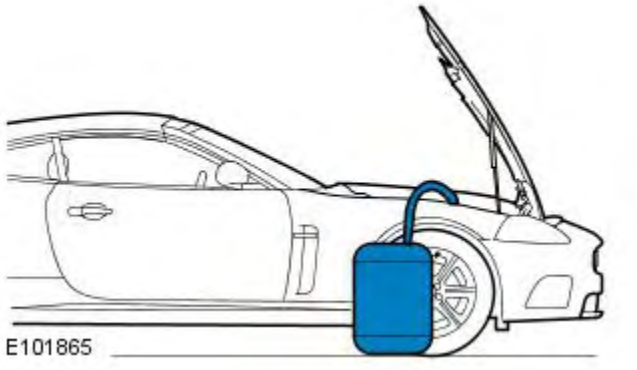
   Make sure the engine is switched off as soon as the full 4 litres of power steering fluid has entered the power steering fluid reservoir.

   Flush the power steering system.
   - Start the engine.
   - With assistance turn the steering slowly lock to lock 3 times at approximately 1 revolution every 5 seconds.
   - Continue to flush the power steering system until 4 litres of power steering fluid has been added to the power steering reservoir. This should take approximately 30 seconds.


E94372

10. CAUTION: Be prepared to collect escaping fluids.

    Remove the suitable funnel.


E101865

11. CAUTION: Be prepared to collect escaping fluids.

    Remove the suitable pipe to the power steering return hose.

12. CAUTION: Be prepared to collect escaping fluids.

Connect the power steering return hose to the reservoir.

- If a quick release coupling is fitted to the power steering return hose, release the power steering fluid return hose from the coupling by removing the clip.

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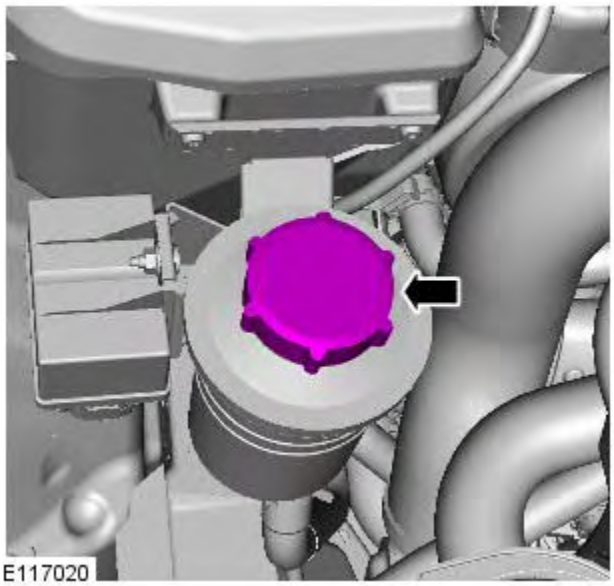
Steering System - General Information - Power Steering System Filling

General Procedures

Draining

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

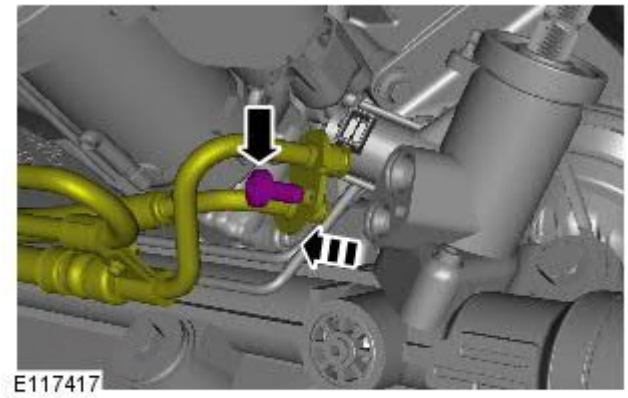


1.

2. WARNING: Make sure to support the vehicle with axle stands.

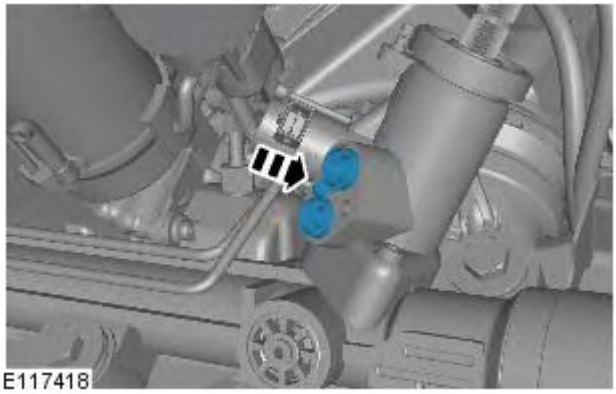
   Raise and support the vehicle.

3. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).



4. CAUTION: Be prepared to collect escaping fluids.

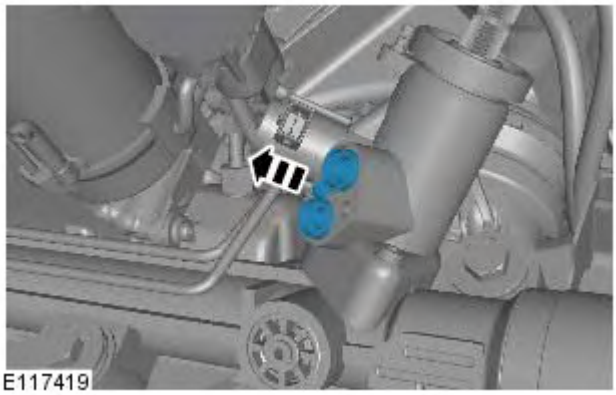
   NOTE: Remove and discard the O-ring seals.



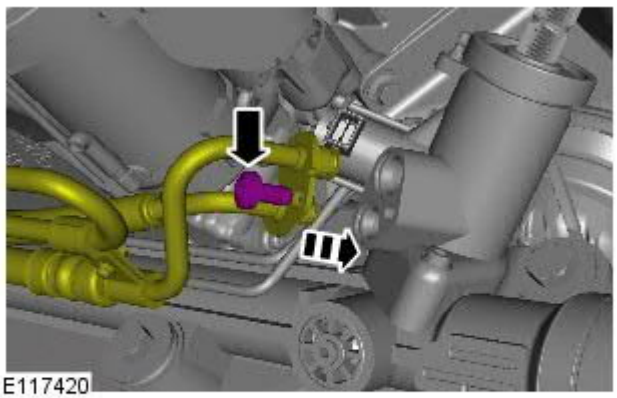
5. CAUTION: Make sure that the area around the component is clean and free of foreign material.

Filling

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



1. CAUTION: Make sure that the area around the component is clean and free of foreign material.



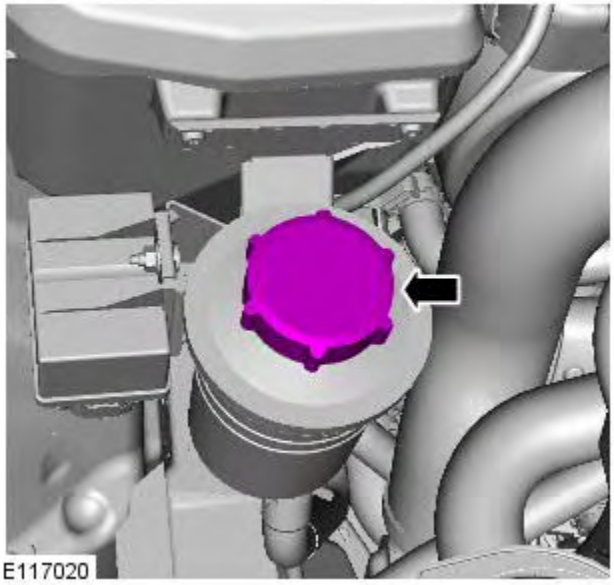
2. CAUTIONS:

   Make sure that the area around the component is clean and free of foreign material.

   Install new o-ring seals

   Torque: 24 Nm

3. Lower the vehicle.



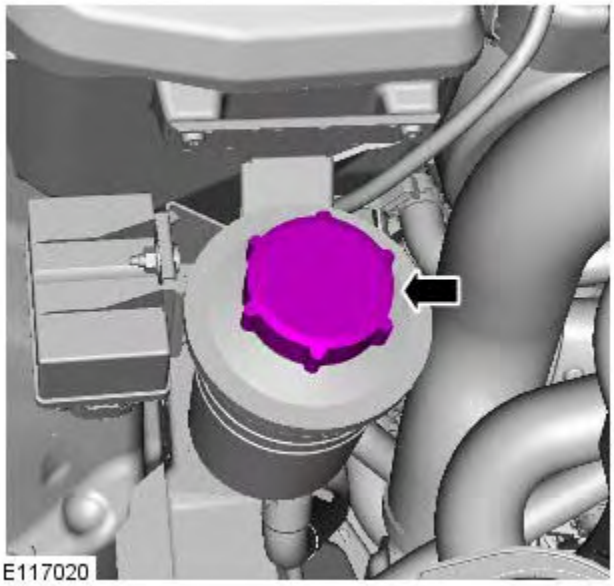
4. CAUTION: Fluid must always be present in the reservoir during bleeding.
   - Fill the power steering reservoir.

5. Install the vacuum hand pump to the power steering fluid reservoir.

6. NOTE: Apply the maximum vacuum possible on the reservoir for 1 minute.

   Apply a vacuum to the power steering fluid reservoir.

7. Remove the vacuum hand pump from the power steering fluid reservoir.



8. CAUTION: Fluid must always be present in the reservoir during bleeding.
   - Fill the power steering reservoir.

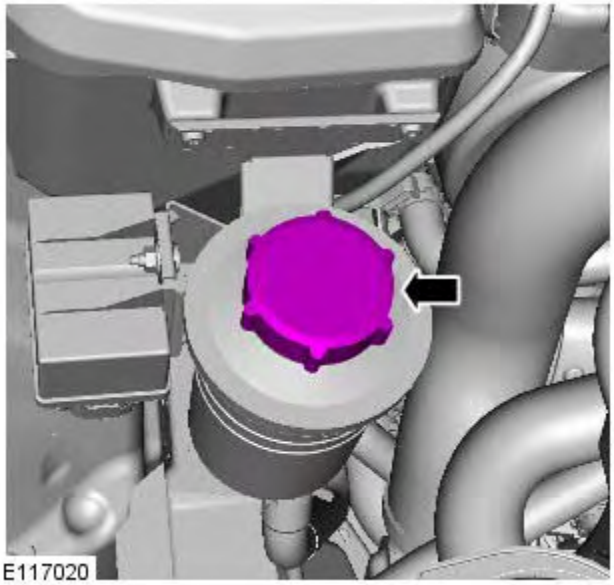
9.
   - Run the engine for 30 seconds.
   - Turn the steering fully lock-to-lock, stop the engine.

10. Install the vacuum hand pump to the power steering fluid reservoir.

11. NOTE: Apply the maximum vacuum possible on the reservoir for 1 minute.

    Apply a vacuum to the power steering fluid reservoir.

12. Remove the vacuum hand pump from the power steering fluid reservoir.



13. CAUTION: Fluid must always be present in the reservoir during bleeding.
    - Fill the power steering reservoir.

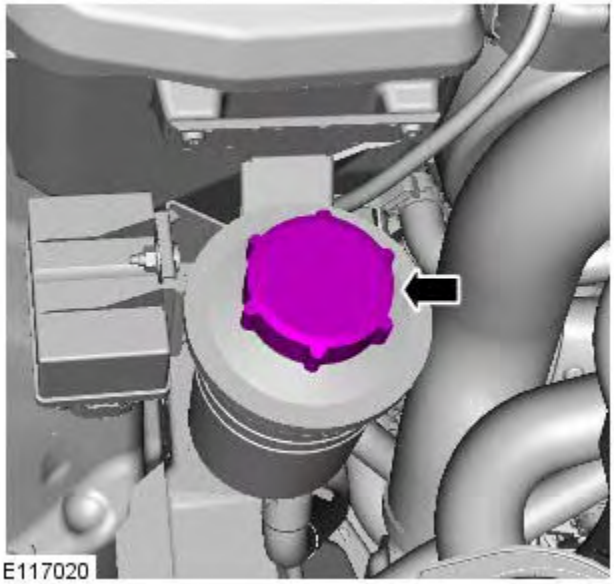
14.
    - Run the engine for 30 seconds.
    - Turn the steering fully lock-to-lock, stop the engine.

15. Install the vacuum hand pump to the power steering fluid reservoir.

16. NOTE: Apply the maximum vacuum possible on the reservoir for 1 minute.

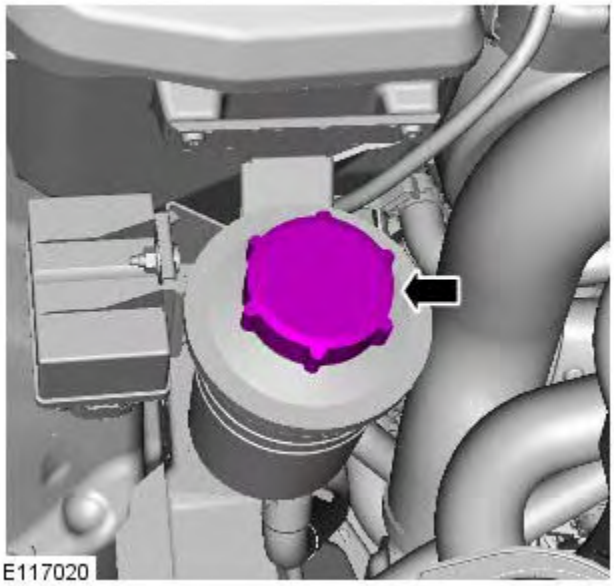
    Apply a vacuum to the power steering fluid reservoir.

17. Remove the vacuum hand pump from the power steering fluid reservoir.



18. CAUTION: Fluid must always be present in the reservoir during bleeding.
    - Fill the power steering reservoir.

19.
    - Run the engine for 30 seconds.
    - Turn the steering fully lock-to-lock, stop the engine.



20.
    - Install the power steering fluid reservoir cap.

21. Check for fluid leaks.

22. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

Published: 13-Aug-2013

Power Steering -

NOTES:

* Only vehicles with diesel engines

** Only vehicles with Petrol engines

*** Only vehicles with AWD

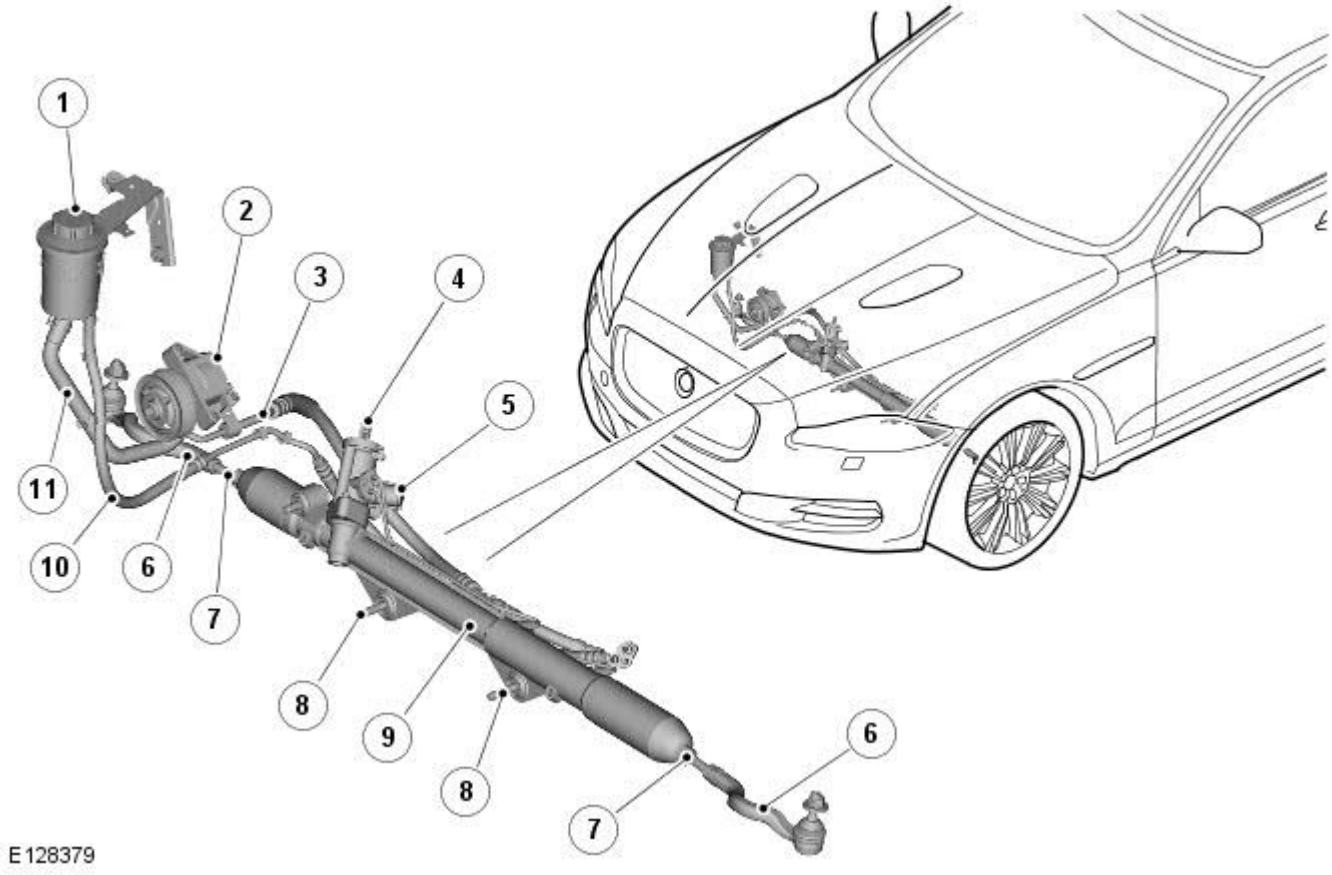
Description	Nm	lb-ft	lb-in
Lower steering column to steering gear pinch bolt	35	26	-
Power steering pump pulley retaining bolts	25	18	-
Power steering pump retaining bolts	25	18	-
* Power steering pump outlet pipe bolt	24	17	-
** Power steering pump outlet pipe bolt	25	18	-
Steering gear retaining bolts	117	86	-
*** Steering gear retaining bolts (lower)	117	86	-
*** Steering gear retaining bolts (upper)	60 + 240°	44 + 240°	-
Steering gear supply and return lines clamp bolt	25	18	-
Power steering pump union - vehicles with 2.0L petrol engines	25	18	-
Power steering pump pipe bracket - vehicles with 2.0L petrol engines	8	-	71

Published: 11-May-2011

Power Steering - Power Steering - Component Location

Description and Operation

POWER STEERING - COMPONENT LOCATION 3.0L V6 DIESEL



Item	Description
1	Power steering fluid reservoir
2	Power steering pump
3	High pressure feed pipe to steering gear
4	Valve unit
5	Servotronic transducer valve
6	Tie-rod end (2 off)
7	Tie-rod (2 off)
8	Mounting bolt (3 off)
9	Steering gear
10	Low pressure fluid return hose
11	Feed pipe to pump

Published: 11-May-2011

Power Steering - Power Steering - Overview

Description and Operation

OVERVIEW

The steering system comprises a ZF manufactured rack and pinion Servotronic 2 steering gear, a power steering pump, a fluid reservoir, a fluid cooler (if fitted) and fluid hoses. The steering gear is an end take-off rack and pinion power assisted unit with the addition of road speed proportional ZF Servotronic 2 assistance.

The steering rack is connected to the front wheel knuckles by adjustable tie-rods. The tie-rods allow for adjustment to centralize the steering wheel and also adjust the toe setting of the front wheel geometry.

The steering gear has a variable ratio rack. This provides conventional response when the steering is in the centre, straight ahead position, but provides more direct and faster steering as the turning angle increases. The variable ratio provides precise and rapid steering response at high speeds and provides optimized steering of the vehicle when manoeuvring into parking spaces, turning in tight areas and when cornering in extreme conditions.

Fluid is supplied to the steering gear by a fixed displacement vane pump on petrol models and a variable displacement pump on diesel models. The pump is driven by a belt from the crankshaft pulley. On petrol models the pump is mounted on the LH (left-hand) side of the engine. On diesel models the pump is mounted on the RH (right-hand) side of the engine. A fluid reservoir is positioned at the front RH side of the engine compartment, forward of the front suspension housing on diesel models and on the front LH side of the engine compartment, forward of the front suspension housing on petrol models.

On petrol engine vehicles, a fluid cooler is located in front of the engine cooling radiator. Diesel models do not have a fluid cooler.

Servotronic 2 adds electronic control and speed sensitive steering to the steering gear. The Servotronic 2 feature provides easy and comfortable steering operation when parking, improved 'road feel' at increased road speeds and adds an integrated, positive center feel feature which optimises steering wheel torque during high speed driving. The Servotronic 2 system is controlled by software which is incorporated into the instrument cluster. The software responds to road speed signals and controls the power assistance via a transducer valve located on the steering gear valve housing.

Published: 11-May-2011

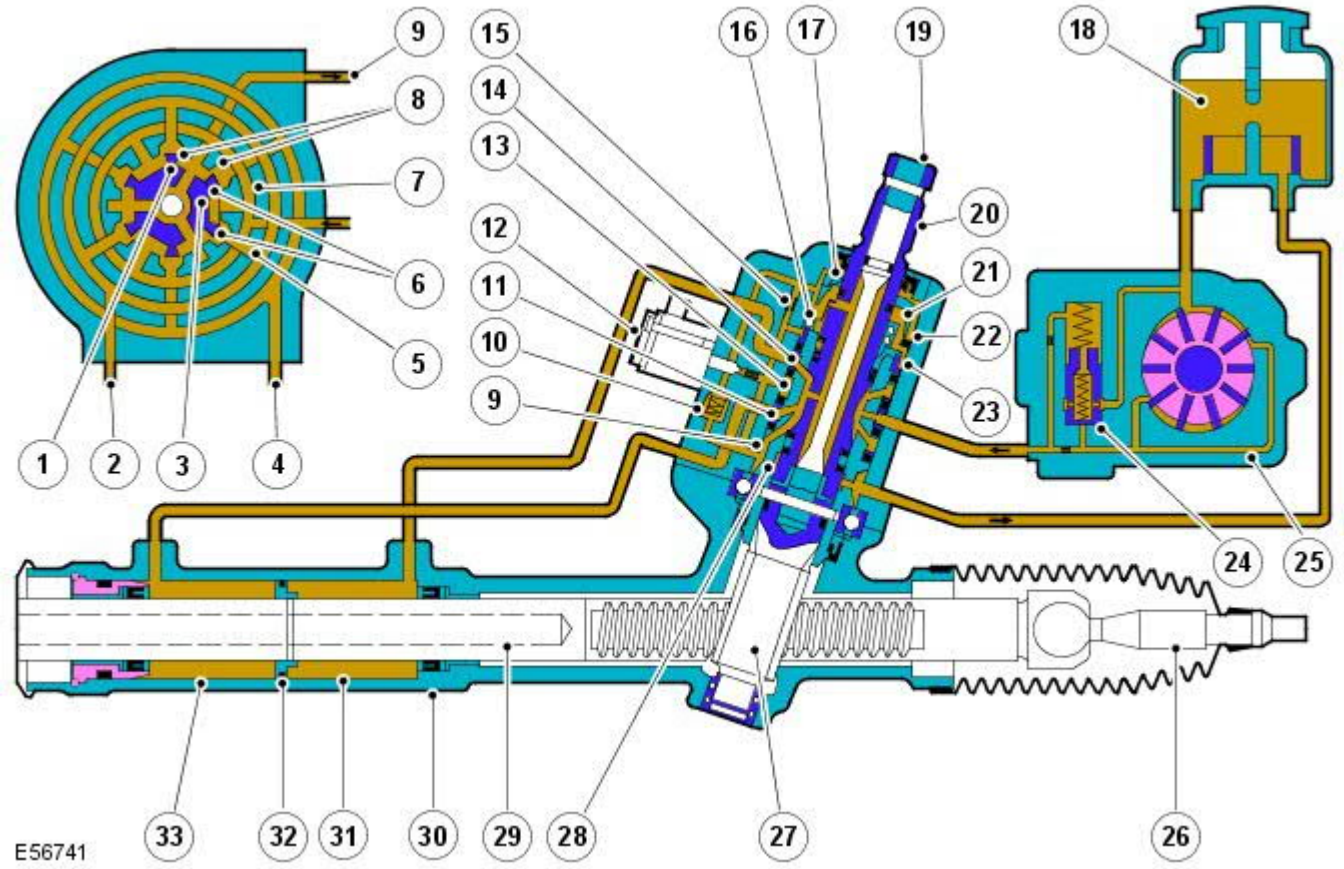
Power Steering - Power Steering - System Operation and Component Description

Description and Operation

System Operation

The following hydraulic circuits show power steering operation and fluid flow for the steering in a straight ahead, neutral position and when turning right. The circuit diagram for turning left is similar to that shown for turning right.

Power Steering in Neutral Position



Item	Description
1	Return fluid control groove
2	Radial groove
3	Feed fluid control groove
4	Radial groove
5	Axial groove
6	Feed fluid control edge
7	Feed fluid radial groove
8	Return fluid control edge
9	Return fluid chamber
10	Cut-off valve
11	Radial groove
12	Servotronic transducer valve
13	Feed fluid radial groove
14	Radial groove
15	Orifice
16	Balls
17	Compression spring

18	Torsion bar
19	Power steering fluid reservoir
20	Valve rotor
21	Reaction piston
22	Reaction chamber
23	Centering piece
24	Pressure relief/flow limiting valve
25	Power steering pump
26	Inner tie-rod
27	Pinion
28	Valve sleeve
29	Steering gear rack
30	Steering gear housing
31	Power assist cylinder - right
32	Piston
33	Power assist cylinder - left

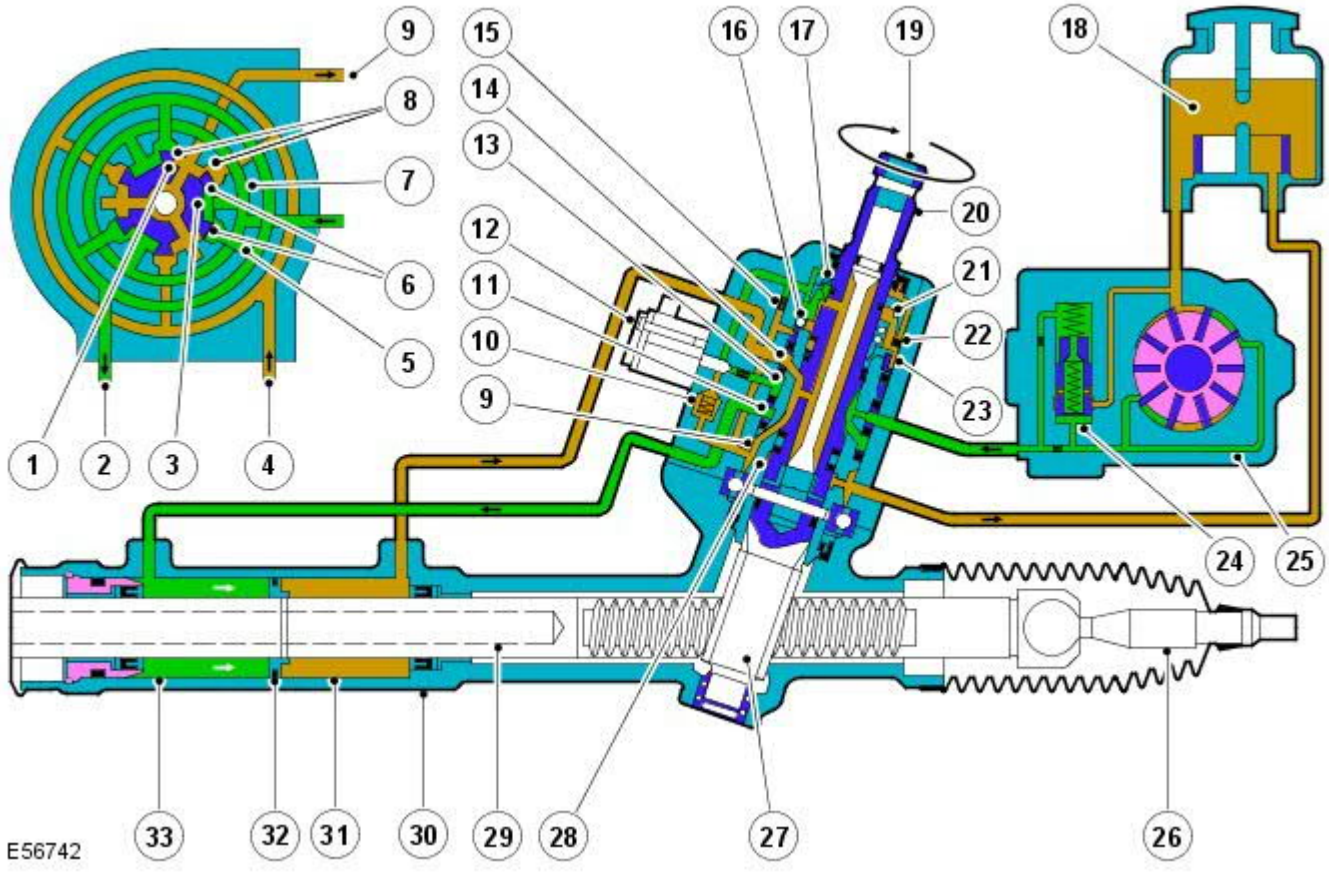
When the engine is started, the power steering pump draws fluid from the reservoir down the low pressure suction line. The fluid passes through the pump and is delivered at pressure, via a hose, to the steering rack valve unit.

The pressurized fluid flows through a connecting bore in the valve and, via the feed fluid radial groove and the transverse bores in the valve sleeve, passes to the feed fluid control groove of the valve rotor.

In the neutral (straight ahead) position , the fluid passes over the open feed fluid control edges to all valve sleeve axial grooves. The fluid then passes through return fluid control edges and the return fluid grooves of the valve rotor, back to the reservoir via the fluid cooler (if fitted).

Simultaneously, the radial grooves of the valve and their associated pipes provide a connection to the left and right power assist cylinders.

Power Steering in Right Turn Position



Item	Description
1	Return fluid control groove
2	Radial groove
3	Feed fluid control groove
4	Radial groove
5	Axial groove
6	Feed fluid control edge
7	Feed fluid radial groove
8	Return fluid control edge
9	Return fluid chamber
10	Cut-off valve
11	Radial groove
12	Servotronic transducer valve
13	Feed fluid radial groove
14	Radial groove
15	Orifice
16	Balls
17	Compression spring
18	Torsion bar
19	Power steering fluid reservoir
20	Valve rotor
21	Reaction piston
22	Reaction chamber
23	Centering piece
24	Pressure relief/flow limiting valve
25	Power steering pump
26	Inner tie-rod
27	Pinion
28	Valve sleeve
29	Steering gear rack
30	Steering gear housing
31	Power assist cylinder - right
32	Piston
33	Power assist cylinder - left

When the steering wheel is turned to the right, the steering rack and piston moves to the left in the piston bore. The valve rotor is rotated to the right (clockwise) and pressurized fluid is directed over the further opened feed fluid control edges and to the associated axial grooves, the radial groove and via an external pipe to the left power assist cylinder chamber. The pressure applied to the piston from the left power assist cylinder chamber provides the hydraulic assistance.

An adaptable pressure build-up is achieved by the partially or fully closed feed fluid control edges restricting or preventing a connection between the fluid pressure inlet and the other axial grooves connected to the radial groove.

Simultaneously, the fluid pressure outlet to the pressurized axial grooves are restricted or partially restricted by the closing return fluid control edges. The fluid displaced by the piston from the right power assist cylinder chamber, flows through an external pipe to the radial grooves. From there the fluid passes to the associated axial grooves and on to the return fluid control grooves, via the further opened return fluid control edges.

The return flow of fluid to the reservoir passes via interconnecting bores which lead to the return fluid chamber. When the steering wheel is turned to the left the operating sequence is as above but the pressure is applied to the opposite side of the piston.

Servotronic Operation

The Servotronic software contains a number of steering maps which are selected via the car configuration file depending on the vehicle mode and tire fitment.

If a failure of the Servotronic valve or software occurs, the system will suspend Servotronic assistance and only normal power steering wheel be available. Fault codes relating to the fault are stored, but no warning lamps are illuminated and the driver may be aware of the steering being 'heavier' than usual.

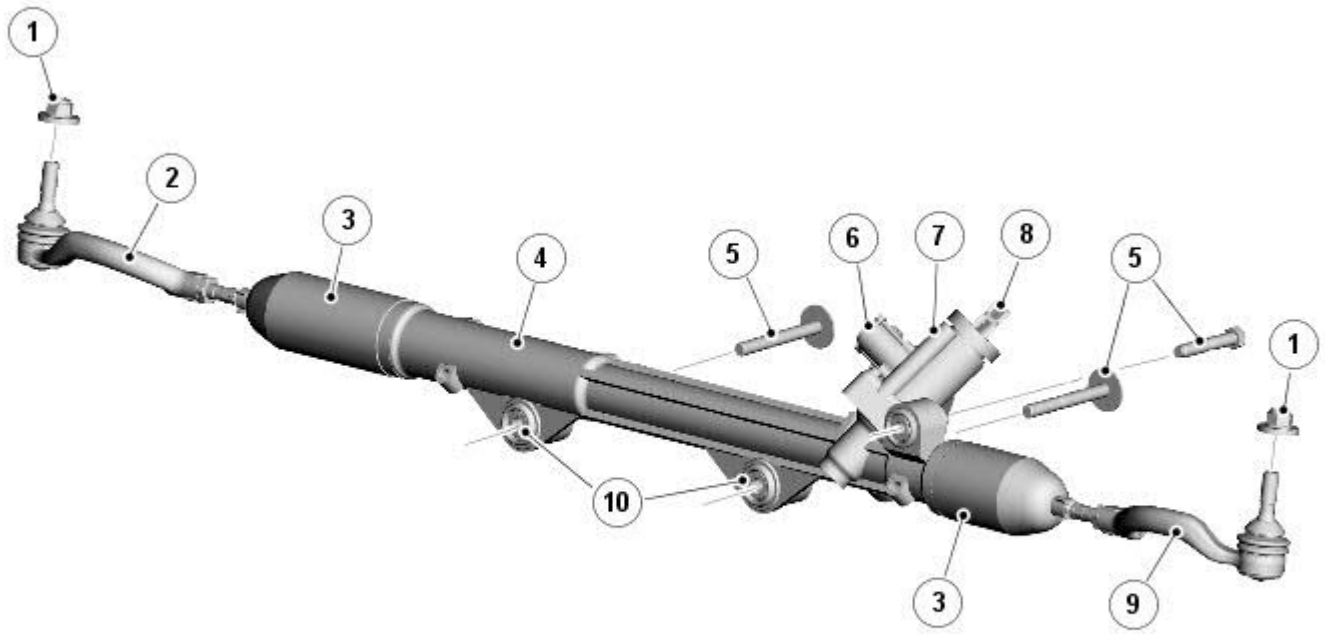
When the vehicle is manoeuvred into and out of a parking space (or other similar manoeuvre), the Servotronic software uses road speed data from the ABS (anti-lock brake system) module to determine the vehicle speed, which in this case will be slow or stationary. The Servotronic software analyses the signals and outputs an appropriate control current to the Servotronic transducer valve. The Servotronic valve closes and prevents fluid flowing from the feed fluid radial groove to the reaction

chamber. An orifice also ensures that there is return pressure in the reaction chamber. This condition eliminates any 'reaction' ensuring that the steering is very light to operate, reducing the effort required to turn the steering wheel.

As the vehicle is driven and the road speed increases, the Servotronic software analyses the road speed signals from the ABS module and reduces the amount of control current supplied to the Servotronic valve which increases the reaction pressure. This modifies the input torque applied through the steering wheel and provides the driver with an improved 'road feel' allowing precise steering and directional stability.

Component Description

Steering Gear



E97211

Item	Description
1	Locknut (2 off)
2	RH (right-hand) tie-rod
3	Steering gear boot (2 off)
4	Steering gear
5	Bolt and washer (3 off)
6	Servotronic valve
7	Valve unit
8	Input shaft
9	LH (left-hand) tie-rod
10	Steering gear mounting bushes

The steering gear is located at the rear of the engine and attached to the front sub-frame. The gear is secured to the sub-frame with 3 bolts and washers which screw into threaded tubes in bushes which are integral with the sub-frame.

The steering gear comprises a cast aluminum, valve housing which contains the hydraulic valve unit and Servotronic valve. The mechanical steering rack and the hydraulic actuator are located in a aluminum cylinder which is attached to the cast valve housing.

The steering gear uses a rack with an integrated piston which is guided on plain bearings within the cylinder and the valve housing. The pinion, which is attached to the valve unit, runs in bearings and meshes with the rack teeth. The rack is pressed against the pinion by a spring loaded yoke which ensures that the teeth mesh with the minimum of play. The pinion is connected to the valve unit via a torsion bar. The rotary motion of the steering wheel is converted into linear movement of the rack by the rack and pinion mechanism and is initiated by the valve unit. This movement is transferred into movement of the road wheels by adjustable tie-rods.

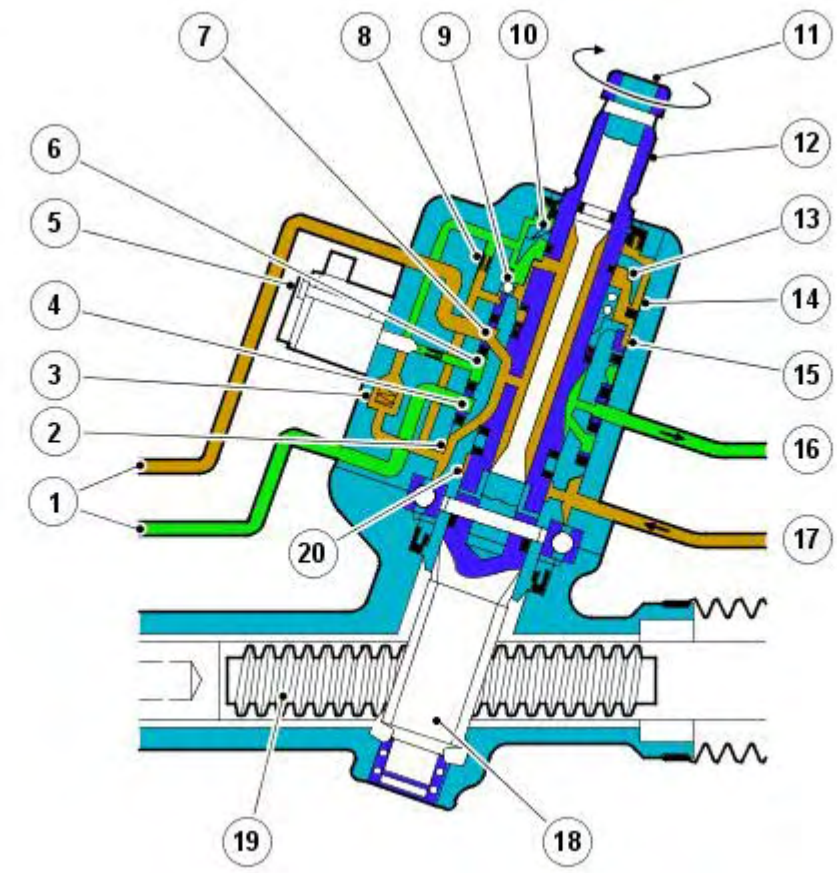
The rack teeth angles vary from 20 degrees in the centre position to 40 degrees at the end sections of the rack. It is this variation in teeth angles which provides the variable ratio.

The piston of the hydraulic actuator is located on the rack bar. Each side of the piston is connected to fluid pressure or fluid return via external metal pipes which are connected to the valve unit.

Each end of the rack bar has a threaded hole which provides for the fitment of the tie-rod. The external ends of the gear are sealed with boots which prevent the ingress of dirt and moisture. The tie-rod has a long threaded area which allows for the fitment of the tie-rod end. The thread allows for the adjustment of the steering toe. When the correct toe setting is achieved, a locknut is tightened against the tie-rod end preventing inadvertent movement.

The gear rack bar has a central hole machined along most of its length. The hole allows the air in the boots to be balanced when the steering is turned. The boots are serviceable items and are retained on the gear housing and the tie-rod with clips.

Valve Unit



Item	Description
1	Pressure/return to/from steering gear
2	Return fluid chamber
3	Cut-off valve
4	Radial groove
5	Servotronic transducer valve
6	Fluid feed radial groove
7	Radial groove
8	Orifice
9	Balls
10	Compression spring
11	Torsion bar
12	Valve rotor
13	Reaction piston
14	Reaction chamber
15	Centering piece
16	Return to reservoir

17	Pressure supply from pump
18	Pinion
19	Steering gear rack bar
20	Valve sleeve

The valve unit is an integral part of the steering gear. The principle function of the valve unit is to provide power assistance (i.e. when parking) to optimize the effort required to turn the steering wheel.

The pinion housing of the valve is an integral part of the main steering gear casting. The pinion housing has four machined ports which provide connections for pressure feed from the power steering pump, return fluid to the reservoir and pressure feeds to each side of the cylinder piston.

The valve unit comprises an outer sleeve, an input shaft, a torsion bar and a pinion shaft. The valve unit is co-axial with the pinion shaft which is connected to the steering column via the input shaft. The valve unit components are located in the steering gear pinion housing which is sealed with a cap.

The outer sleeve is located in the main bore of the pinion housing. Three annular grooves are machined on its outer diameter. PTFE (polytetrafluoroethylene) rings are located between the grooves and seal against the bore of the pinion housing. Holes are drilled radially in each annular groove through the wall of the sleeve. The bore of the outer sleeve is machined to accept the input shaft. Six equally spaced slots are machined in the bore of the sleeve. The ends of the slots are closed and do not continue to the end of the outer sleeve. The radial holes in the outer sleeve are drilled into each slot.

The input shaft has two machined flats at its outer end which allow for the attachment of the steering column intermediate shaft yoke. The flats ensure that the intermediate shaft is fitted in the correct position. The inner end of the input shaft forms a dog-tooth which mates with a slot in the pinion shaft. The fit of the dog-tooth in the slot allows a small amount of relative rotation between the input shaft and the pinion shaft before the dog-tooth contacts the wall of the slot. This ensures that, if the power assistance fails, the steering can be operated manually without over stressing the torsion bar. The central portion of the input shaft has equally spaced longitudinal slots machined in its circumference. The slots are arranged alternately around the input shaft.

The torsion bar is fitted inside the input shaft and is an interference fit in the pinion shaft. The torsion bar is connected to the input shaft by a drive pin. The torsion bar is machined to a smaller diameter in its central section. The smaller diameter allows the torsion bar to twist in response to torque applied from the steering wheel in relation to the grip of the tyres on the road surface.

The pinion shaft has machined teeth on its central diameter which mate with teeth on the steering gear rack. A slot, machined in the upper end of the pinion shaft mates with the dog-tooth on the input shaft. The pinion shaft locates in the pinion housing and rotates on ball and roller bearings.

Servotronic Valve

The Servotronic transducer valve is located in a port in the side of the steering gear valve housing. The valve is sealed in the housing with an O-ring seal and is secured with two long screws into threaded holes in the housing. The Servotronic valve is a transducer controlled valve which responds to control signals supplied from Servotronic software in the instrument cluster.

The Servotronic valve determines the hydraulic reaction at the steering gear rotary valve and controls the input torque required to turn the steering wheel. The Servotronic system allows the steering to be turned with the optimum effort when the vehicle is stationary or manoeuvred at slow speed. The hydraulic reaction changes proportional to the vehicle speed, with the required steering effort increasing as the vehicle moves faster. At high speeds, the Servotronic system provides the driver with a good feedback through the steering providing precise steering and improved stability.

The instrument cluster receives road speed signals from the ABS module and calculates the correct controlling signal for the Servotronic valve. The Servotronic software within the instrument cluster has a diagnostic capability which allows a Jaguar approved diagnostic system to check the tune of the steering and retrieve fault codes relating to the Servotronic valve. Two fault codes are stored relating to the valve for positive connection short to ground or battery and negative connection short to ground or battery.

The Servotronic software within the instrument cluster also contains a number of steering maps which are selected via the car configuration file depending on the vehicle model and tire fitment.

If a failure of the Servotronic valve or software occurs, the system will suspend Servotronic assistance and only a default level of assistance will be available. Fault codes relating to the fault are stored in the instrument cluster. No warning lamps are illuminated and the driver may be aware of the steering being 'heavier' than usual.

Power Steering Pump - 5.0L V8 Petrol Models

E128381

The power steering pumps used on the different petrol engine variants are basically the same pump with different flow control valve mechanisms. The pump is a positive displacement, vane type pump which supplies a constant fluid flow to the steering gear valve unit. The pump is driven by a Poly Vee belt from the crankshaft pulley. A self-adjusting tensioner is fitted to maintain the correct tension on the belt.

The pump has an internal pressure relief valve and a flow control valve. The pressure relief valve limits the maximum pressure supplied to the steering gear to 118 bar (1711 lbf in2) ± 4 bar (58 lbf in2). The flow control valve limits the maximum flow to 8.50 l/min (1.87 gal/min) ± 0.50 l/min (0.16 gal/min) regardless of engine speed. The pump has a displacement of 11.0 cm3/rev (0.67 in3/rev).

A shaft runs longitudinally through the pump. One end of the shaft is fitted with a pressed-on drive pulley, the opposite end of the shaft is closed by a cover. The shaft runs in bearings located in the body and oil seals at each end of the shaft prevent leakage of hydraulic fluid. The pump contains ten vanes which rotate within a cam ring and are driven by the shaft. As the vanes rotate, the cam ring causes the space between the vanes to increase. This causes a depression between the vanes and fluid is drawn from the reservoir via the suction hose into the space between the vanes.

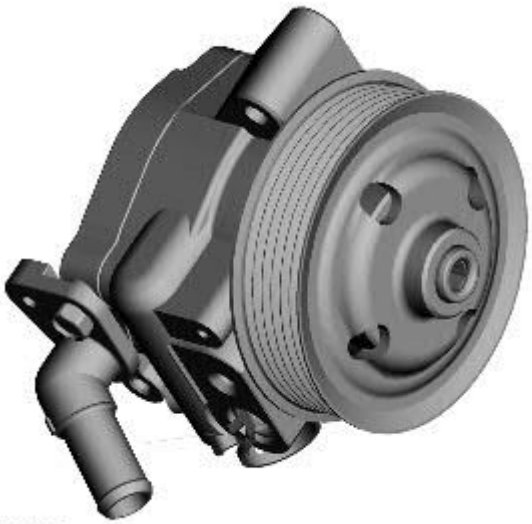
As the shaft rotates, the inlet port is closed to the vanes which have drawn in fluid, trapping the fluid between the vanes. The cam ring causes the space between the vanes to reduce and consequentially compresses and pressurises the hydraulic fluid trapped between them.

Further rotation of the shaft moves the vanes to the outlet port. As the vanes pass the port plate the pressurized fluid passes from the pump outlet port into the pressure hose to the steering gear.

The pressurized fluid is subject to control by the flow control and pressure relief valve. The flow control valve maintains a constant flow of fluid supplied to the steering gear irrespective of engine speed variations. The pressure relief valve limits the maximum pressure on the output side of the pump. A metering orifice is included in the discharge port of the pump. If the pressure in the orifice reaches a predetermined level, a spring loaded ball in the centre of the flow control valve is lifted from its seat and allows pressurized fluid to recirculate within the pump.

The pressure relief valve will operate if the discharge from the pump is restricted, i.e.; steering held on full lock. If the output from the pump is blocked, all output is recirculated through the pump. In this condition, as no fresh fluid is drawn into the pump from the reservoir, the fluid temperature inside the pump will increase rapidly. Consequentially, periods of operation of the steering gear on full lock should be kept to a minimum to prevent overheating of the pump and the fluid within it.

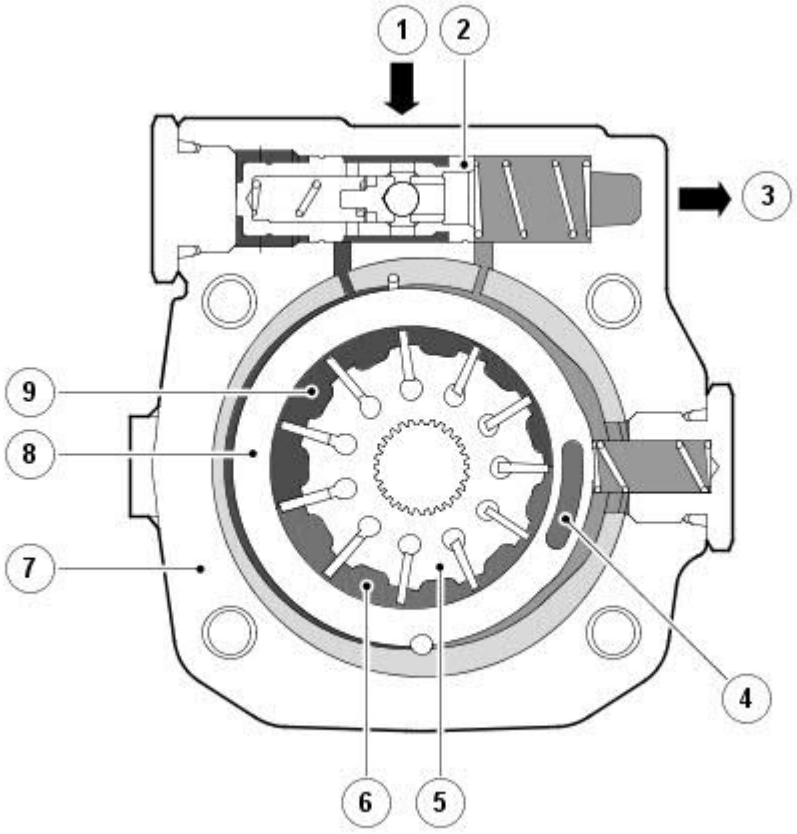
Power Steering Pump - 3.0L V6 Diesel Models



E128382

A variable displacement power steering pump is used on the diesel engine variants. The variable displacement, vane type pump supplies the required hydraulic pressure to the steering gear valve unit. The pump is located at the front of the engine and is driven by the FEAD (front end accessory drive) Poly Vee belt which is directly driven from the crankshaft. The output from the pump increases proportionally with the load applied to the steering valve unit.

NOTE: Typical pump section shown.



E62615

Item	Description
1	Power steering fluid inlet port
2	Flow control valve
3	Power steering fluid outlet port

4	Variable Orifice
5	Pump rotor
6	High pressure
7	Adapter ring
8	Cam Ring
9	Low pressure

The pump consists of a shaft containing a number of slots into which vanes are inserted and these vanes run within a cam ring in the pump body. The centerline of the shaft is not concentric with that of the bore of the body and this creates the expanding and contracting cavities that form the pumping action.

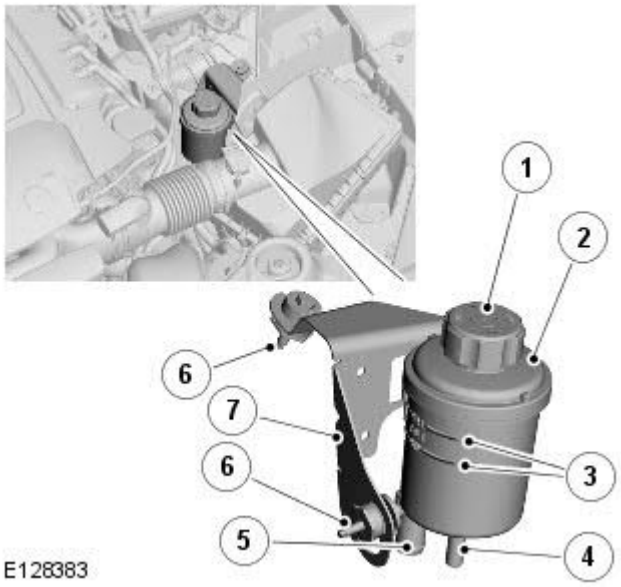
The vanes rotate within the cam ring and are driven by the shaft. As the vanes rotate, the cam ring causes the space between the vanes to increase. This causes a depression between the vanes and fluid is drawn from the reservoir via the suction hose into the space between the vanes. As the shaft rotates, the inlet port is closed to the vanes which have drawn in fluid, trapping the fluid between the vanes. The cam ring causes the space between the vanes to reduce and consequentially compresses and pressurizes the hydraulic fluid trapped between them. Further rotation of the shaft moves the vanes to the outlet port. As the vanes pass the port plate the pressurized fluid passes from the pump outlet port into the pressure hose to the steering gear.

The cam ring in the pump body can move within the valve body. By moving the cam ring it is possible to vary the eccentricity of the shaft and the vanes in relation to the cam ring. As the eccentricity is decreased, the volume of hydraulic fluid trapped between the vanes decreases, maintaining the flow in response to pump speed. This reduces the load required to turn the pump and therefore improves engine output and economy. This allows the flow rate to be matched to the system demands and increased flow rate is only required when the steering wheel is turned.

The pump has an internal regulating valve which controls the eccentricity of the cam ring and therefore varies the flow rate according to demand. The regulating relief valve limits the maximum pressure supplied to the steering gear to 110 bar (1595 lbf in2) ± 4 bar (58 lbf in2) and also limits the maximum flow to 8.5 l/min (1.86 gal/min) ± 0.5 l/min (0.1 gal/min) regardless of engine speed.

Fluid Reservoir

NOTE: V8 petrol model shown



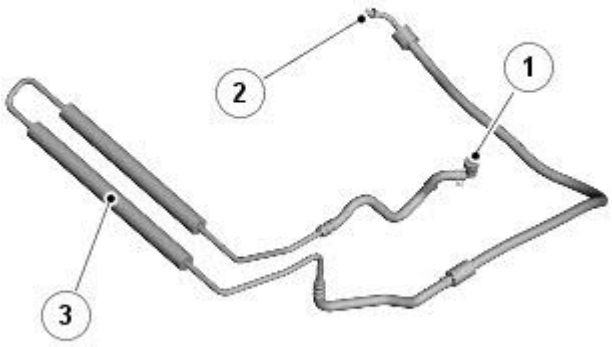
Item	Description
1	Cap (2 off)
2	Reservoir body
3	Max/Min level
4	Return connection
5	Suction hose connection
6	Bolt, washer and rubber mounting (2 off)
7	Mounting bracket

The reservoir is located in the engine compartment, on the LH suspension housing on V8 Petrol models and the RH suspension housing on diesel models. The reservoir is attached to a bracket via slide mounting, and the bracket is attached to the suspension housing with 2 bolts and rubber mounts.

The reservoir is a plastic moulding with an integral 80 micron, non-serviceable filter. Two moulded ports at the base of the reservoir provide for attachment of the fluid supply hose to the power steering pump and fluid return hose from the fluid cooler. The reservoir is fitted with a removable cap which is screwed 1/4 turn to lock into the reservoir body.

The reservoir has upper and minimum marks moulded on its outside of the body.

Fluid Cooler (5.0L V8 petrol only)



E128384

Item	Description
1	Hose - return to fluid reservoir
2	Hose - Return from steering gear valve unit
3	Fluid cooler

The fluid cooler is located in the return circuit from the steering gear to the reservoir. The cooler is an aluminum fin and tube design. Cool air entering the front of the vehicle passes over the cooler and flows through the fins. The fins act as heat exchangers, conducting heat from the fluid as it passes through the tube.

Published: 11-May-2011

Power Steering - Power Steering

Diagnosis and Testing

For additional information.
REFER to: Steering System (211-00, Diagnosis and Testing).

Published: 04-Jul-2013

Power Steering - Steering Gear

Removal and Installation

Removal

CAUTIONS:

Make sure that only the manufacturers' recommended four wheel alignment equipment is used.

Do not turn the steering wheel with the steering column lower shaft disconnected as damage to the clockspring and steering wheel switches may occur.

NOTES:

Make sure the steering is in the straight ahead position.

The ignition must be switched off.

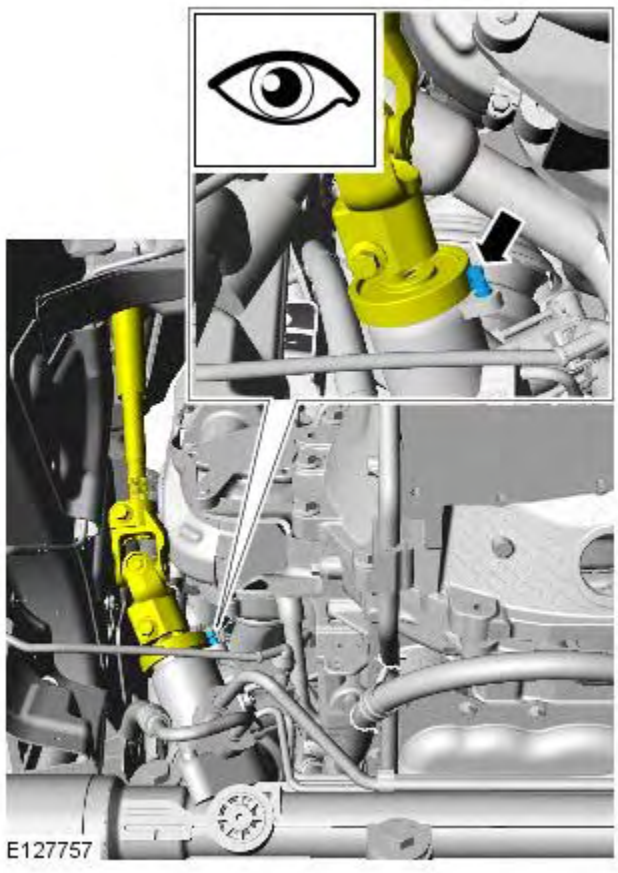
LHD illustration shown, RHD is similar.

All vehicles

1. WARNING: Make sure to support the vehicle with axle stands.

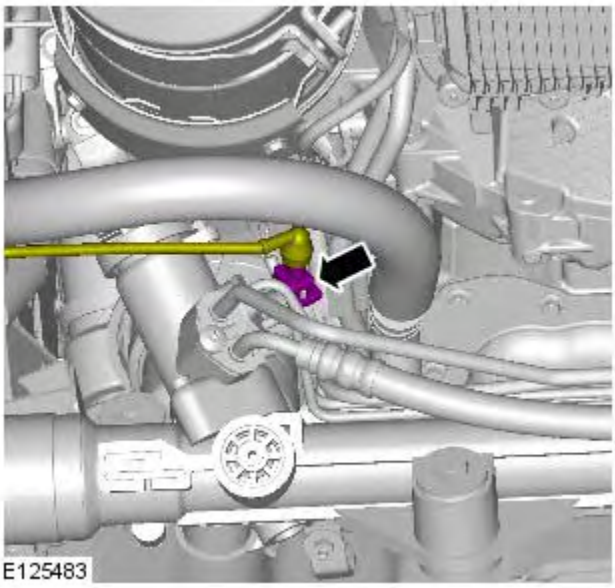
   Raise and support the vehicle.

2. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).



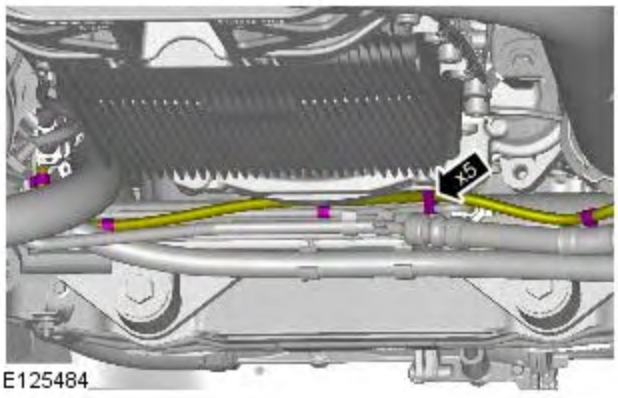
3. Make sure the alignment mark, on the steering gear pinion seal protection cover, is central to the steering gear pinion casting.

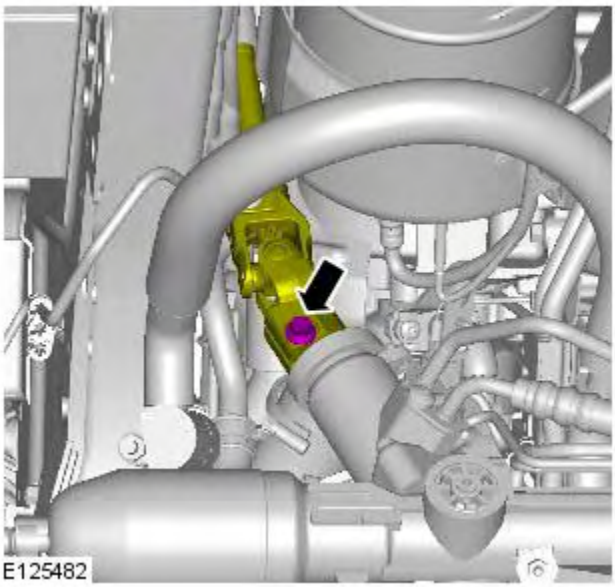
4.



Vehicles with 3.0L diesel engine

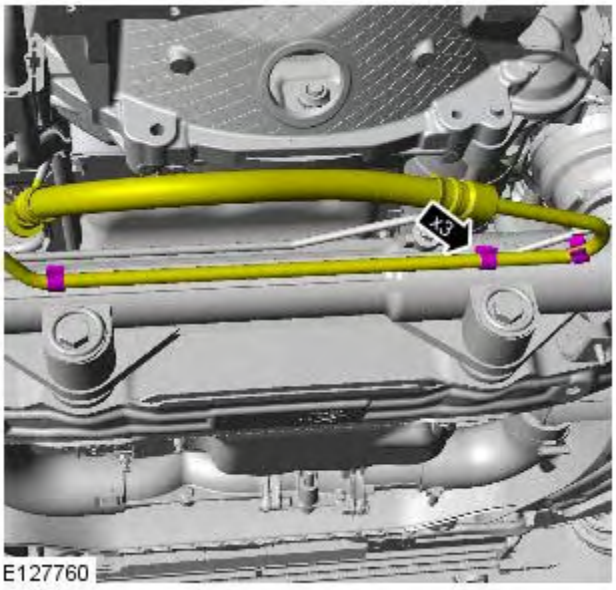
5.



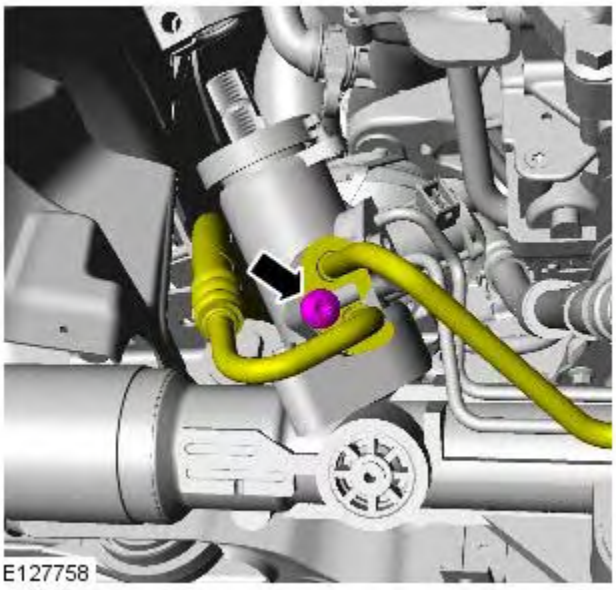


6. CAUTION: Make sure that a new bolt is installed.

   Torque: 35 Nm



7.



8. CAUTIONS:

   Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean and dry. Plug open connections to prevent contamination.

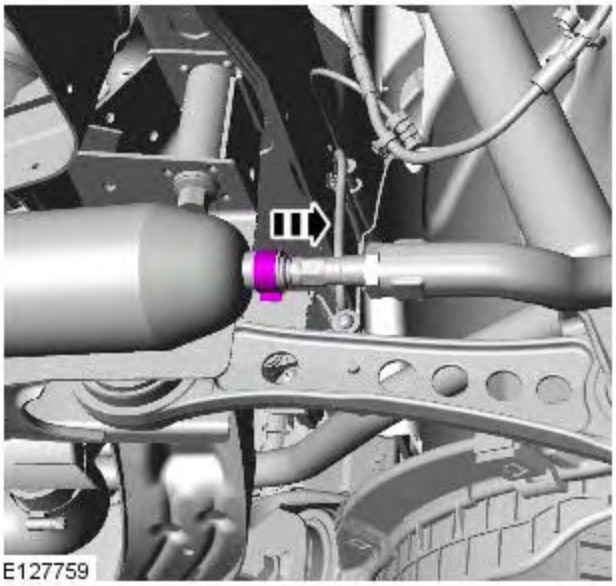
   Cap the power steering line to prevent loses of fluid and dirt ingress.

   If power steering fluid is spilt on the paintwork, the effected area must be immediately washed down with cold water. Failure to follow this instruction may result in damage to the vehicle.

   Be prepared to collect escaping fluids.

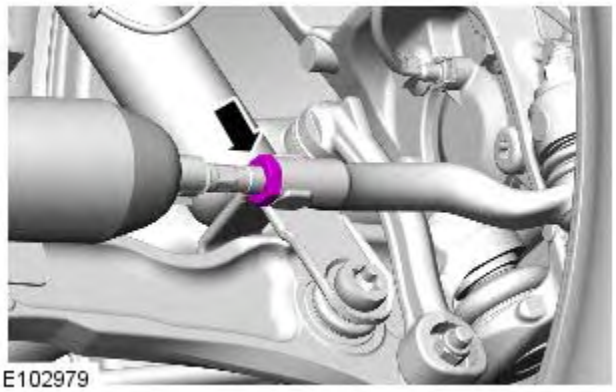
   NOTE: Install new O-ring seals.

   Torque: 25 Nm



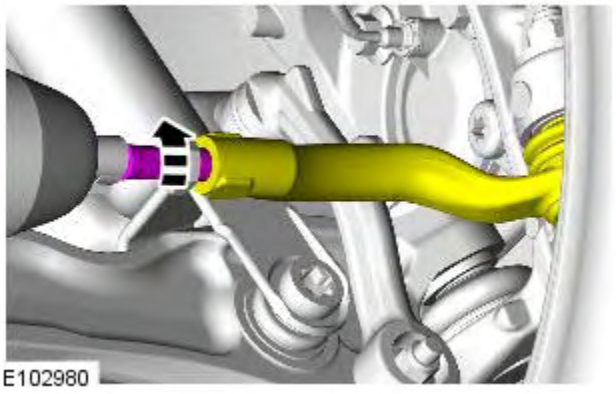
9. NOTE: RH illustration shown, LH is similar.

   Repeat the above step for the other side.



10. NOTE: RH illustration shown, LH is similar.

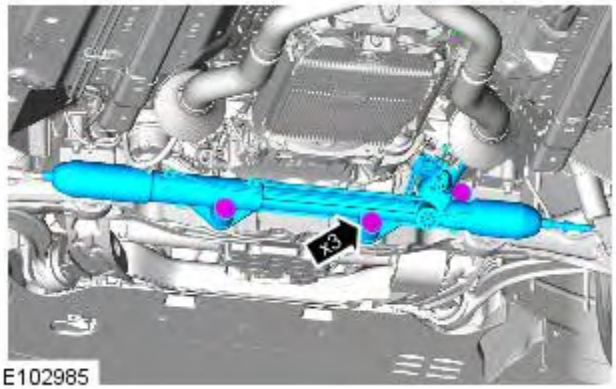
    - *Torque:* 55 Nm
    - Repeat the above step for the other side.



11. CAUTIONS:

    Do not allow the gaiter to twist.

    Make sure that the tie rod end is installed with the same number of turns as when removed.



12. NOTE: RHD illustration shown, LHD is similar.

    Torque: 117 Nm

Installation

1. To install, reverse the removal procedure.
2. Refer to: Power Steering System Bleeding (211-00 Steering System - General Information, General Procedures).
3. Refer to: Front Toe Adjustment (204-00 Suspension System - General Information, General Procedures).

Published: 11-May-2011

Power Steering - Power Steering Fluid Reservoir TDV6 3.0L Diesel

Removal and Installation

Removal

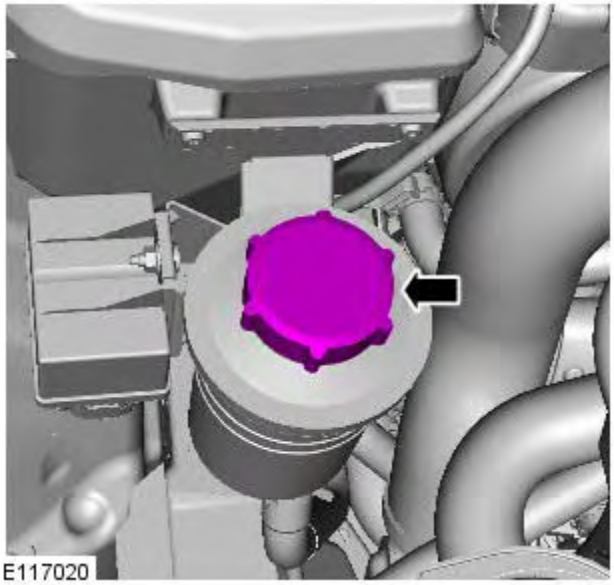
NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

All vehicles

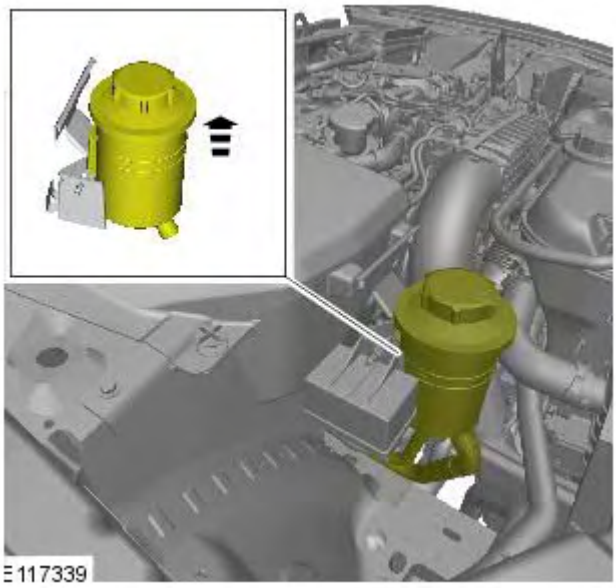
1.

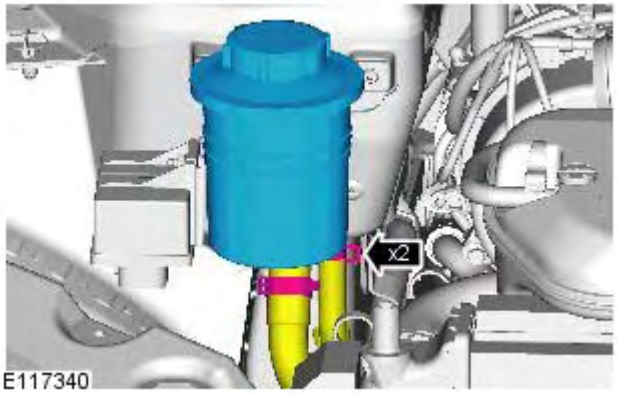


2. Siphon the fluid from the power steering reservoir.

Vehicles with diesel engine

3.



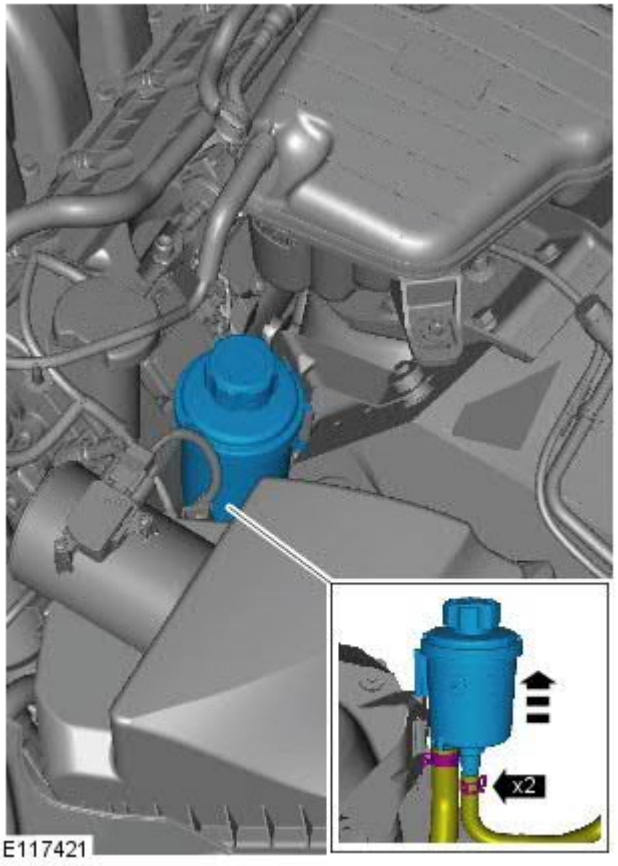


4. CAUTIONS:

   Be prepared to collect escaping fluids.

   Make sure that all openings are sealed. Use new blanking caps.

Vehicles with petrol engine



5. CAUTIONS:

   Be prepared to collect escaping fluids.

   Make sure that all openings are sealed. Use new blanking caps.

Installation

1. To install, reverse the removal procedure.
2. Refer to: Power Steering System Bleeding (211-00 Steering System - General Information, General Procedures).

Published: 11-May-2011

Power Steering - Power Steering Pump TDV6 3.0L Diesel

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

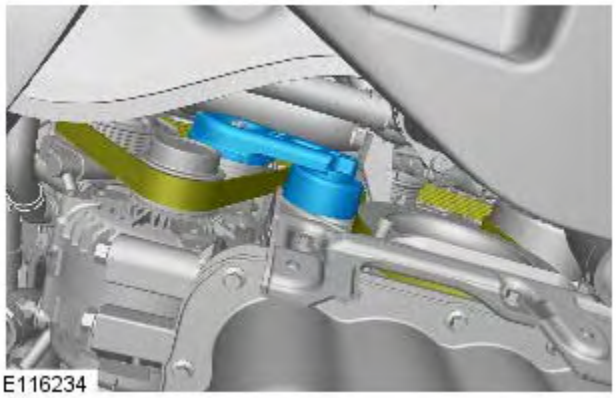
2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

3. Refer to: Power Steering System Filling (211-00 Steering System - General Information, General Procedures).

4. Refer to: Turbocharger Bypass Valve (303-04B Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Removal and Installation).

5.



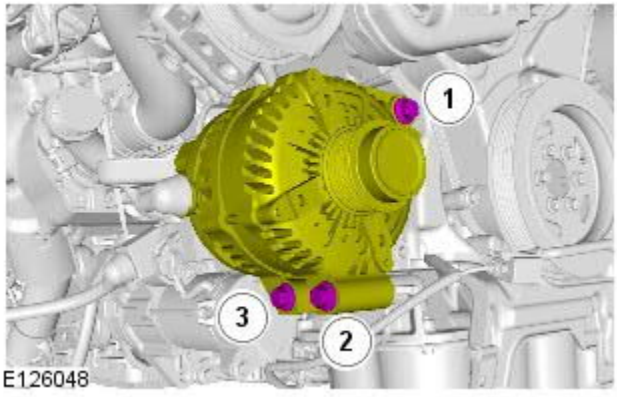
6. CAUTIONS:

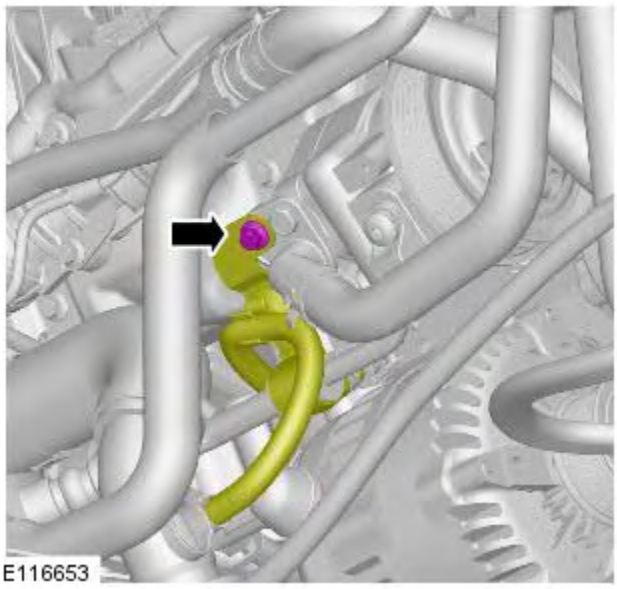
   Install all the bolts finger tight before final tightening.

   Tighten the bolts in the sequence shown.

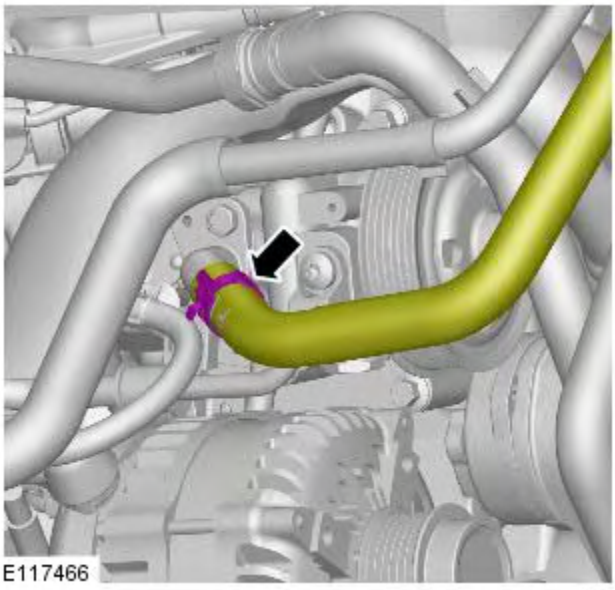
   NOTE: Engine shown removed for clarity.

   Torque: 47 Nm




E116653

7. *Torque:* 8 Nm


E117466

8. CAUTION: Be prepared to collect escaping fluids.

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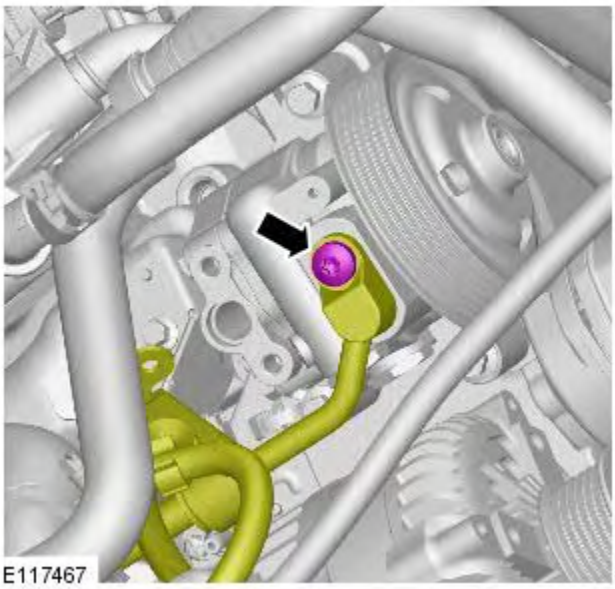
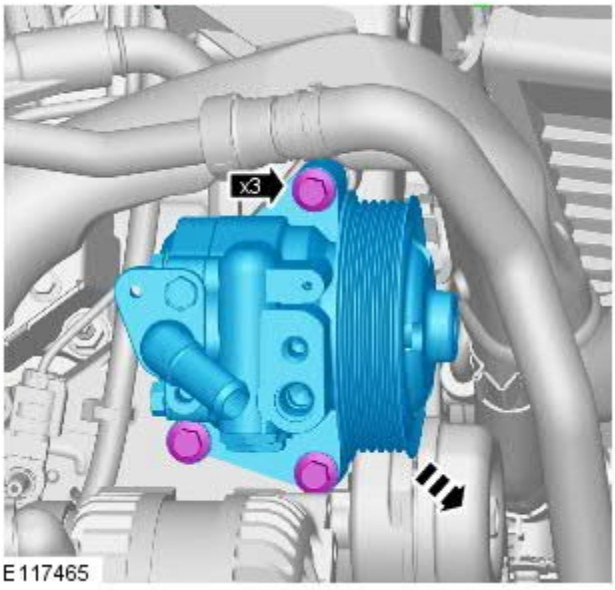


9. CAUTION: Be prepared to collect escaping fluids.

   Torque: 24 Nm



10. CAUTION: Be prepared to collect escaping fluids.

    Torque: 25 Nm

Installation

1. To install, reverse the removal procedure.

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Steering Linkage -

Torque Specifications

Description	Nm	lb-ft	lb-in
Tie-rod end retaining nut	133	98	-
Tie-rod end lock nut	55	41	-

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Steering Linkage - Steering Linkage

Diagnosis and Testing

For additional information.
REFER to: Steering System (211-00, Diagnosis and Testing).

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Steering Linkage - Tie Rod End

Removal and Installation

Removal

CAUTION: LH illustration shown, RH is similar.

NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

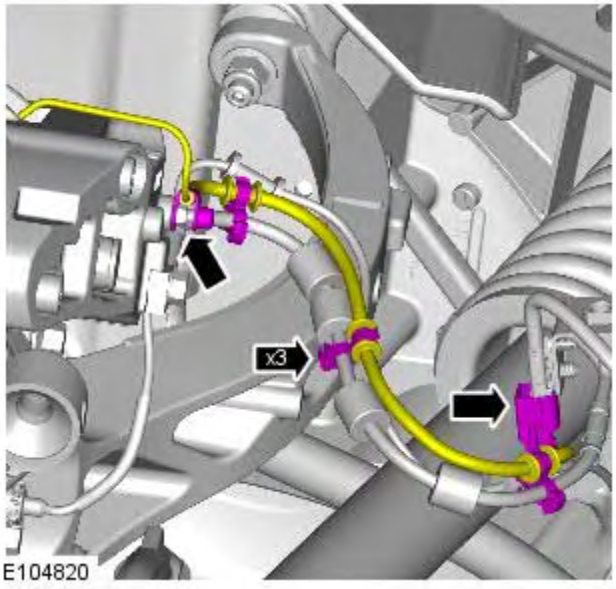
Removal steps in this procedure may contain installation details.

All vehicles

1. WARNING: Make sure to support the vehicle with axle stands.

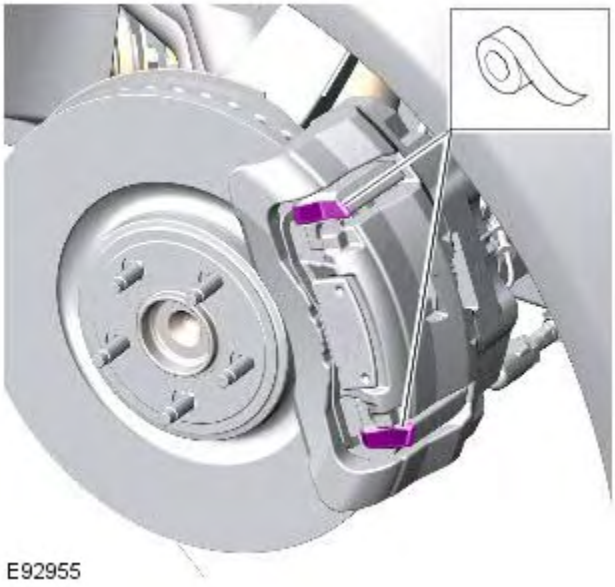
   Raise and support the vehicle.

2. Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).



3. NOTE: LH side only.

Vehicles with high performance brakes


E92955

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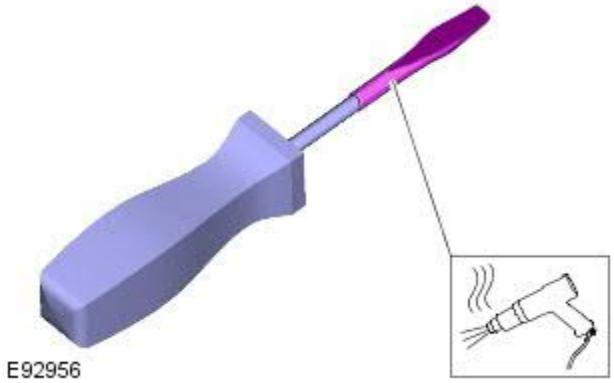
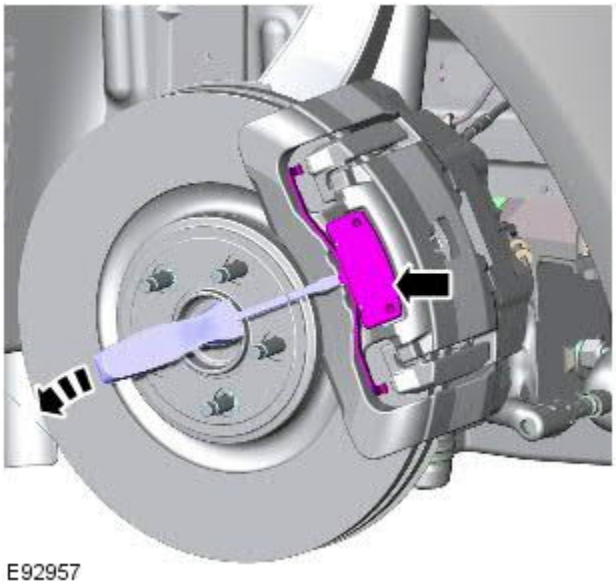

E92956

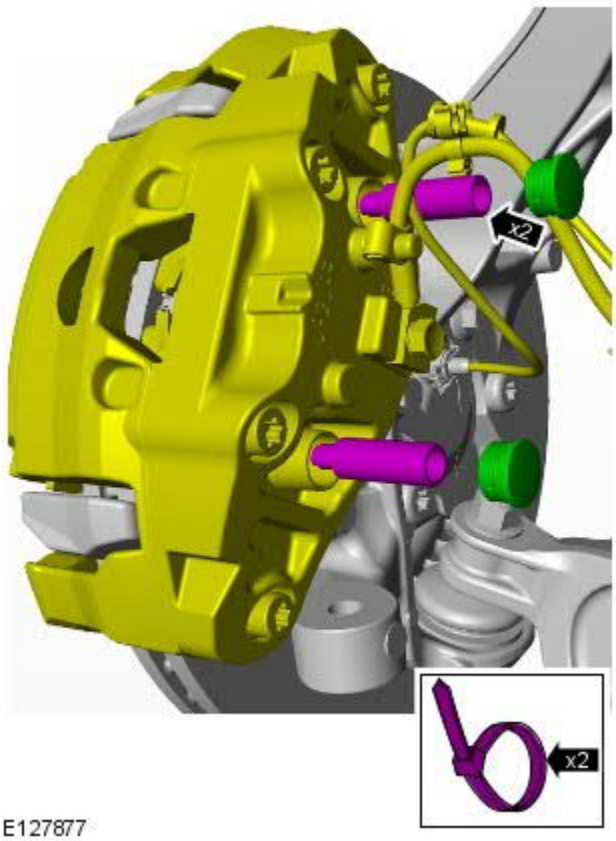
5.

All vehicles


E92957

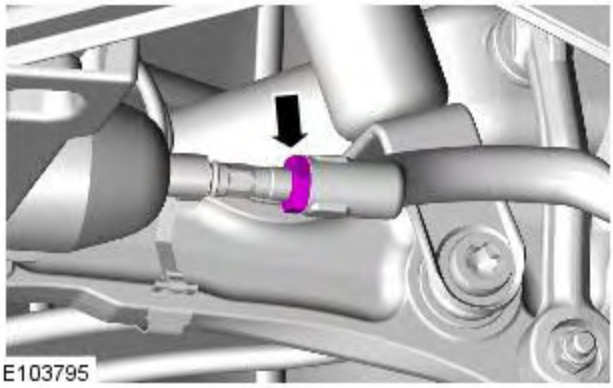
6. CAUTION: Removal of the clips is a delicate procedure, damage will occur if any force is used.

- Lever the anti-rattle spring in the center of the spring until either side is released.



E127877

7. CAUTION: Do not allow the brake caliper to hang on the brake hose.


E103795

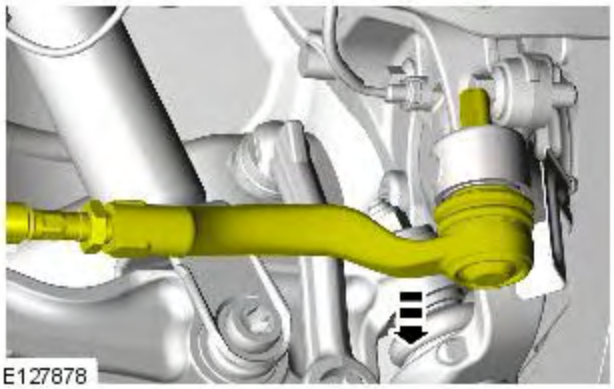
8. NOTE: RH illustration shown, LH is similar.

Torque: 55 Nm

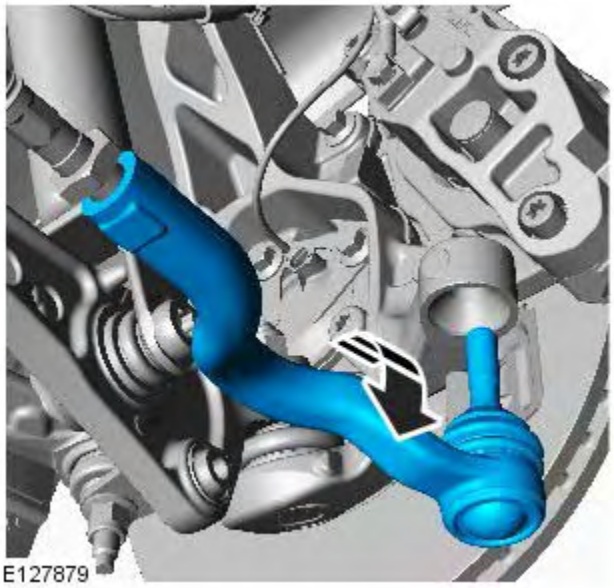
E127911

9. NOTE: RH illustration shown, LH is similar.

Torque: 133 Nm



10. NOTE: RH illustration shown, LH is similar.



11. CAUTIONS:

Note the number of turns when removing the tie rod end to aid installation.

Make sure that the tie rod end is installed with the same number of turns as when removed.

NOTE: RH illustration shown, LH is similar.

Installation

1. To install, reverse the removal procedure.
2. Refer to: Four-Wheel Alignment (204-00 Suspension System - General Information, General Procedures).

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Steering Column -

Torque Specifications

Description	Nm	lb-ft	lb-in
Steering wheel retaining bolt	40	29	-
Steering column pinch bolt	30	22	-
Steering column retaining nuts	25	18	-
Steering column flexible coupling to body bolts	10	7	

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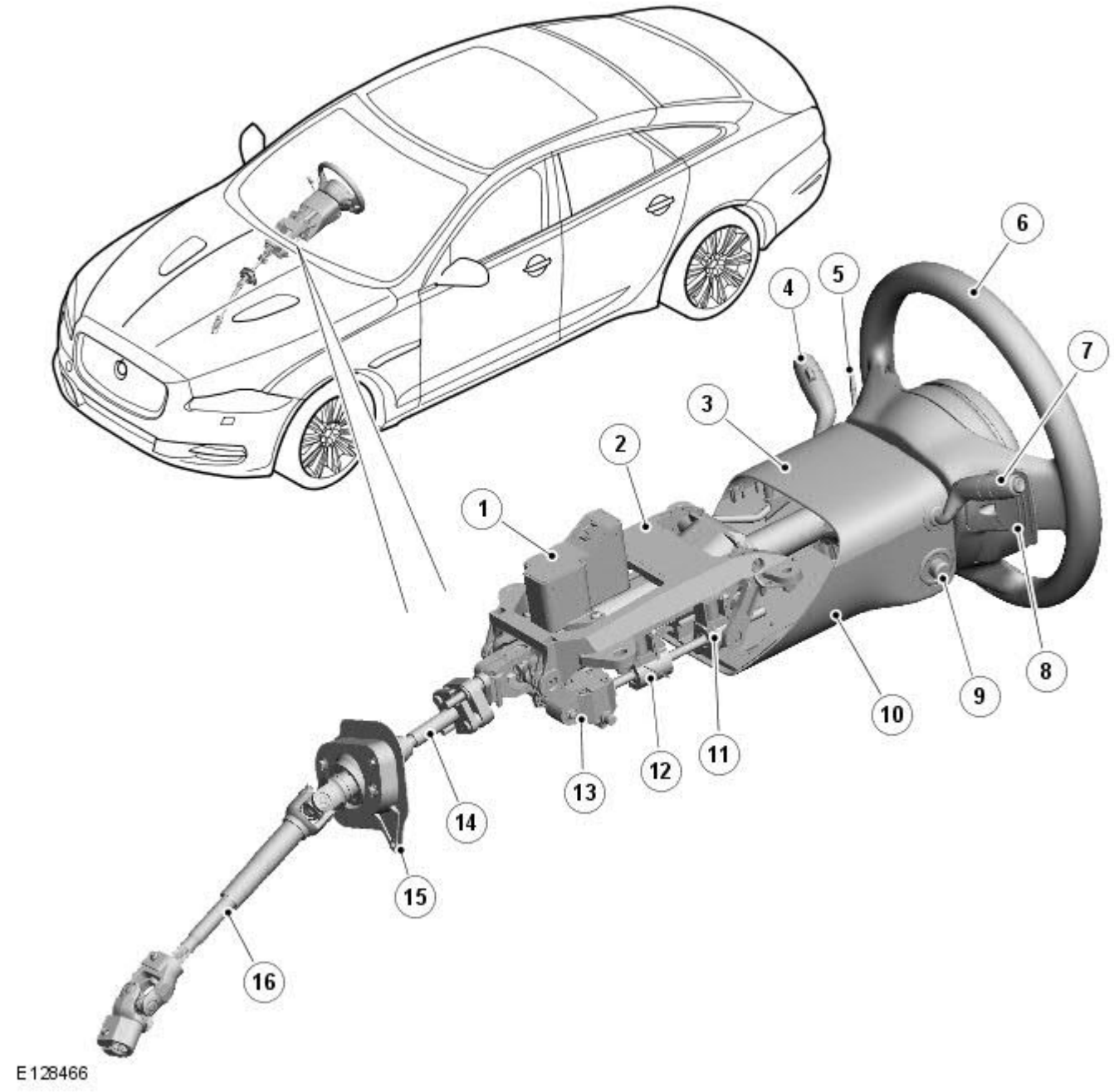
Steering Column - Steering Column - Component Location

Description and Operation



Item	Description
1	Electric steering lock mechanism
2	Column mounting plate
3	Upper shroud
4	Right Hand (RH) steering column multifunction switch
5	RH gear change paddle switch
6	Steering wheel
7	Left Hand (LH) steering column multifunction switch
8	Column adjust switch
9	Lower shroud
10	Rake adjustment housing

11	Reach adjustment housing
12	Column adjustment motor
13	Lower column - Upper collapse shaft
14	Bulkhead bearing and seal assembly
15	Lower column - Lower collapse shaft

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Steering Column - Steering Column - Overview

Description and Operation

OVERVIEW

The steering column comprises the upper column assembly, the intermediate shaft assembly and the steering wheel. The 3 components are positively connected together to pass driver rotary input from the steering wheel to a linear output of the steering rack.

The electric steering column is a standard fitment on all models. The upper column assembly contains electrical adjustment for steering wheel reach and rake, the electric column lock mechanism and the steering angle sensor. Steering adjustment memory positions are stored in the driver's seat module. The column also features a 'tilt away' function which moves the steering column away from the driver allowing easier exit and entry to the vehicle.

Column adjustment is provided by a single motor for both reach and rake adjustment. Operation of the column adjustment is controlled by a four way joystick type switch located in the column lower shroud. Column adjustment is an integral part of the driver position memory system.

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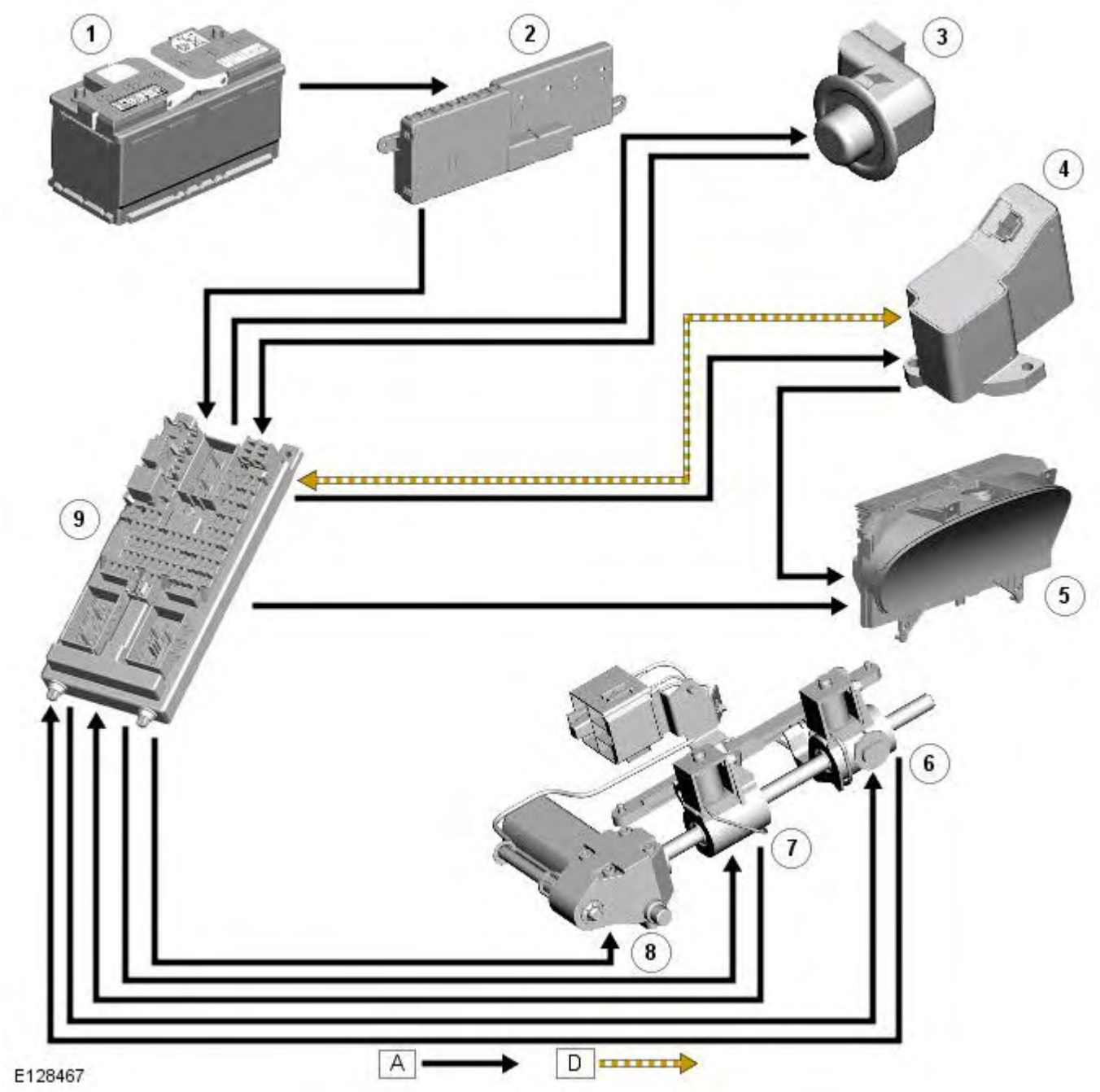
Steering Column - Steering Column - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: **A** = Hardwired; **D** = High speed CAN bus

Steering Column Control Diagram



Item	Description
1	Battery
2	Battery Junction Box (BJB)
3	Steering column adjust switch
4	Electric steering column lock

5	Instrument cluster
6	Rake adjustment solenoid and potentiometer
7	Reach adjustment solenoid and potentiometer
8	Column adjustment motor
9	Central Junction Box (CJB)

System Operation

STEERING COLUMN OPERATION

Power for the steering column operation is supplied via a megafuse in the BJB (battery junction box) to the CJB (central junction box). The CJB in turn supplies power to the column adjustment motor, the reach and rake solenoids and also the adjustment potentiometers in response to driver requests made with the column adjust switch.

The column adjust switch is a joystick type, 2-axis switch with positions for reach and rake adjustment. The switch can also be rotated to change the mode selection from auto to manual. The switch is hardwired to the CJB with 3 wires. The 3 wires provide a power supply to the switch and the mode select switch, the third connection is a ground provided by the CJB. Up/down (rake) and in/out (reach) selections on the switch are each passed through a resistor of differing values to the CJB. The CJB monitors the output value from the switch and operates the column adjustment motor in the required direction and simultaneously energizes the required solenoid for rake or reach adjustment. When the applicable solenoid is energized, a clutch is engaged and locates on a lead screw. The motor rotates the lead screw and the rotational drive of the screw is transferred into linear movement of the applicable clutch to move either the rake or reach adjustment. For reach adjustment, the lead screw drives the outer housing in or out as required. For rake adjustment the lead screw drives a rake lever which moves the column up or down as required.

The position of the column is monitored by potentiometers which are connected to the CJB. The CJB monitors the output signal from the potentiometers to precisely control the positioning of the column in each plane.

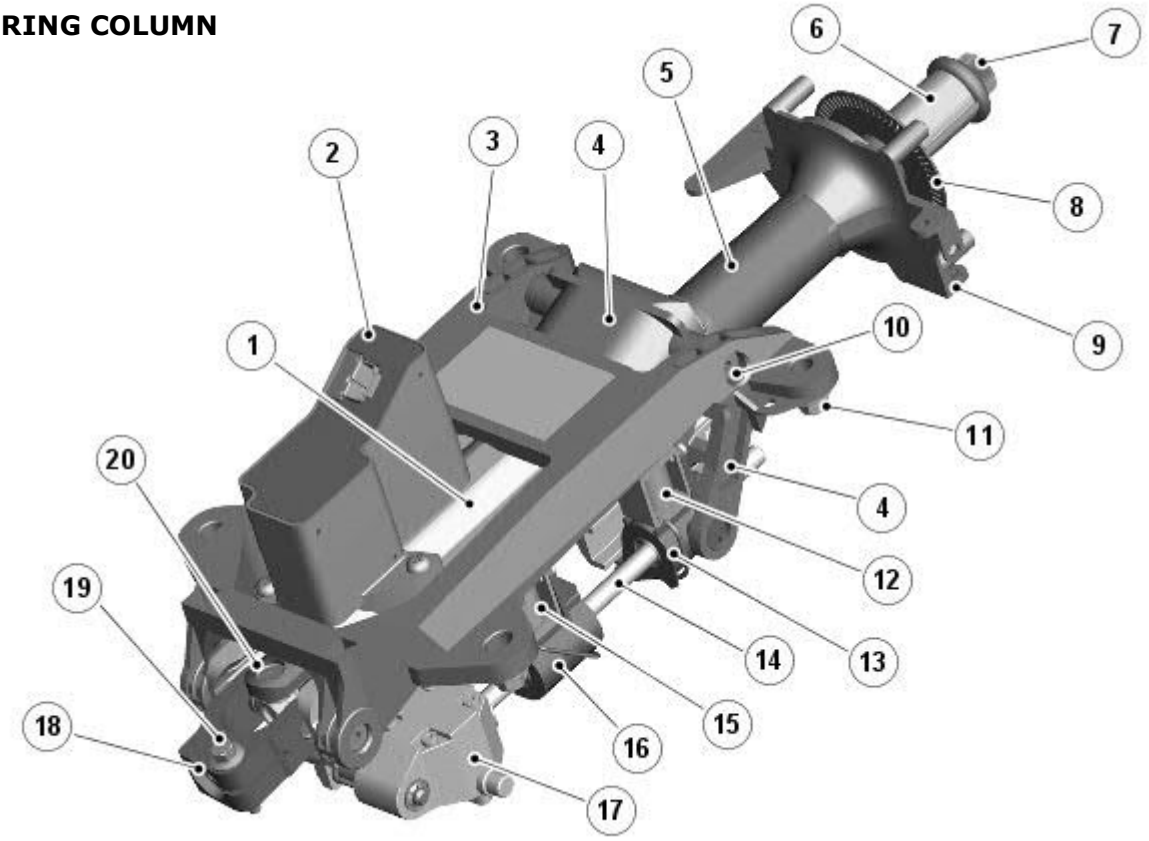
The CJB controls the memory positioning of the column via a medium speed CAN (controller area network) bus connection to the driver's seat module. The CJB receives information regarding the particular remote handset used to enter the vehicle and outputs positional information relative to that stored for the handset. This information is used by the CJB to move the column to the memorized position relating to the remote handset used.

The column logic in the CJB also incorporates an entry/exit mode. When the vehicle is unlocked or the ignition is switched off, the CJB lifts the column upwards to its maximum rake position to allow the driver more room below the steering wheel and improve access/egress of the vehicle. When the ignition is next switched on the column will adjust to its previous position.

The electric steering column lock is controlled by the CJB and is an integral function of the passive start system.
Refer to: Anti-Theft - Passive (419-01B Anti-Theft - Passive, Description and Operation).

Component Description

STEERING COLUMN

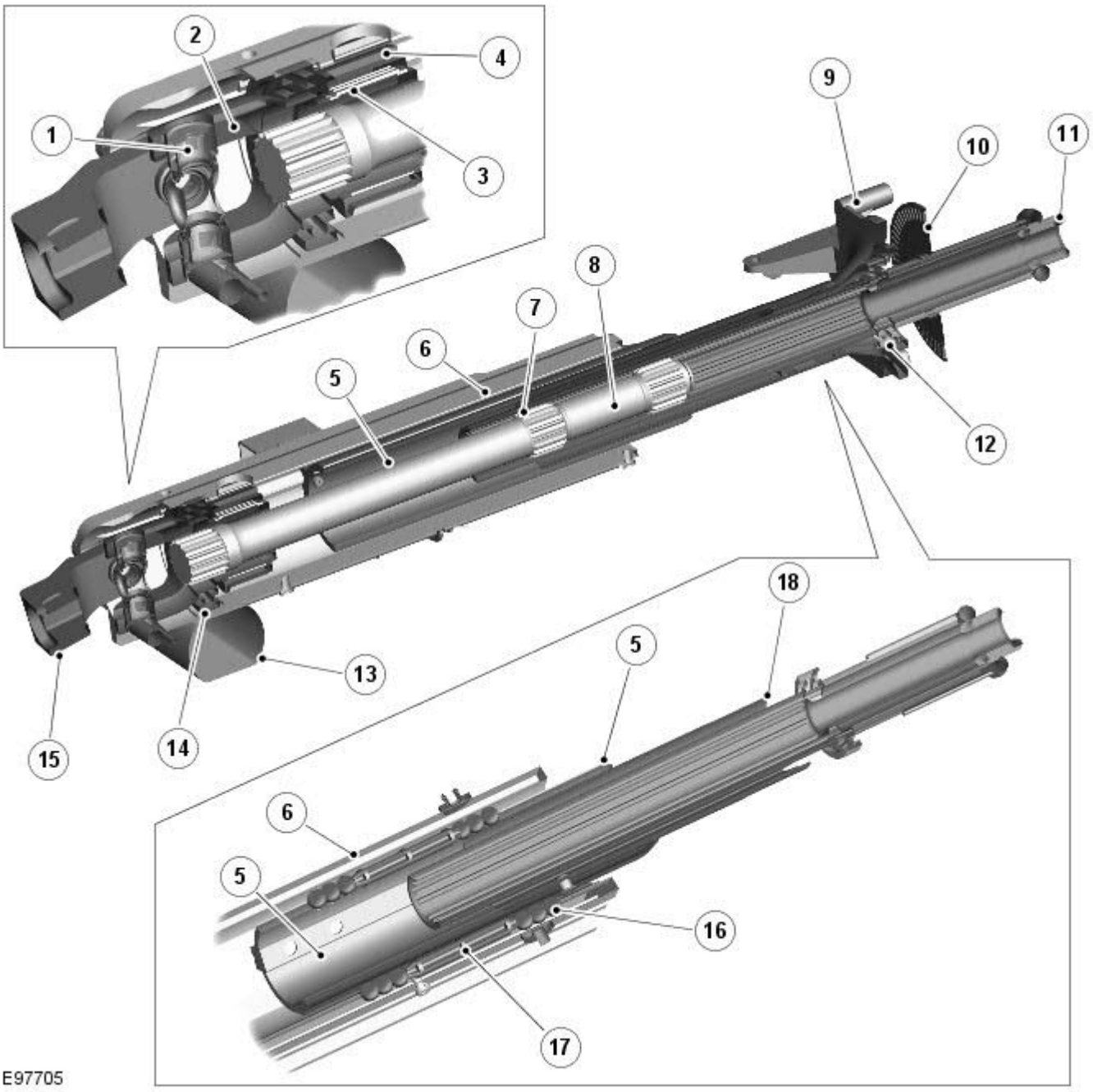


E97704

Item	Description
1	Rake housing
2	Electric steering column lock
3	Mounting plate
4	Rake lever
5	Crash tube
6	Distance keeper
7	Steering wheel mounting splines
8	Steering angle sensor ring
9	Crash adaptor
10	Rake lever pivot bearing (2 off)
11	Flanged locknut (4 off) - mounting to cross-beam
12	Rake solenoid
13	Rake clutch
14	Spindle
15	Reach solenoid
16	Reach clutch
17	Column adjustment motor
18	Outer clamping yoke
19	Clamp bolt
20	Inner tube yoke

WARNING: Do not attempt to dismantle the steering column. The crash safety of the unit will be compromised.

The steering column is attached to the in-vehicle cross-beam and secured with 4 flanged lock nuts onto studs integral with the cross-beam.



Item	Description
1	Tube and clamping yoke pivot bearing
2	Tube yoke
3	Tolerance ring
4	Locking ring
5	Axial housing
6	Rake housing
7	Tube
8	Splined shaft
9	Crash adaptor
10	Steering angle sensor ring
11	Steering wheel mounting splines
12	Upper bearing
13	Column adjustment motor
14	Lower bearing

15	Outer clamping yoke
16	Ball bearings (12 off)
17	Distance keeper
18	Crash tube

The column comprises a cast magnesium mounting bracket which provides for the attachment to the cross-beam. Attached to the mounting bracket is a rake lever which is connected to the mounting bracket at the lower end with 2 pivot bearings. The bearings allow the rake lever to rotate upwards or downwards to adjust the column rake.

The rake lever also provides for the attachment of the rake housing which can slide within the lever to provide reach adjustment. Within the rake housing is the axial housing which is supported on each side with 6 ball bearings which allow the rake housing to move forward or backwards. The bearings on each side are arranged in groups of 3 bearings and are separated by a distance keeper which allows the housing to be supported on bearings along its length. Within the axial housing is a tube which is supported at the upper end of the column on the upper bearing. The tube has a central splined hole which provides for the fitment of the splined shaft. The splined shaft can slide within the tube on the splines when the column reach is adjusted or the column collapses in a crash condition. The splined shaft also passes rotary motion from the steering wheel through the length of the column to the outer clamping yoke which is supported on the lower bearing.

The electric steering column lock is attached to the top of the rake lever. A lock bolt within the steering column lock engages in one of 8 slots in the locking sleeve located at the lower end of the column preventing rotation of the steering wheel. The locking sleeve is retained by a tolerance ring which in turn is located on the outer diameter of the tube yoke. The tolerance ring allows a specified amount of torque to be applied to the splined shaft before it slips, preventing damage to the column lock due to excessive force being applied to the steering wheel when the lock is engaged. The tolerance ring is designed to slip on the splined shaft when the applied torque exceeds the fitted slip load of 200 Nm minimum. Repeated rotation of the lock collar will reduce its slipping torque to 100 Nm minimum. The lock is controlled by the CJB and is an integral function of the passive start system.

A steering angle sensor is located at the upper end of the steering column and is attached to the crash adaptor. The sensor measures steering rotation via a toothed wheel located on the splined tube at the upper end of the column. The sensor receives a power supply from the CJB and supplies 2 signals (A and B) relating to the steering rotation to the ABS (anti-lock brake system) module. The module transmits this data on the high speed CAN bus for use by other vehicle systems.
Refer to: Anti-Lock Control - Stability Assist (206-09 Anti-Lock Control - Stability Assist, Description and Operation).

The steering column is adjustable electrically, for reach and rake. The adjustment mechanism comprises an electric adjustment motor, a lead screw, a rake solenoid, a reach solenoid, a reach clutch and a rake clutch. The column adjustment is controlled manually using a joystick switch located on the LH (left-hand) side of the column lower cowl. The joystick can be moved forward and backward to adjust the column reach in and out and moved up and down to adjust the rake. The switch selection energizes the adjustment motor in the applicable direction and also engages the applicable solenoid and clutch.

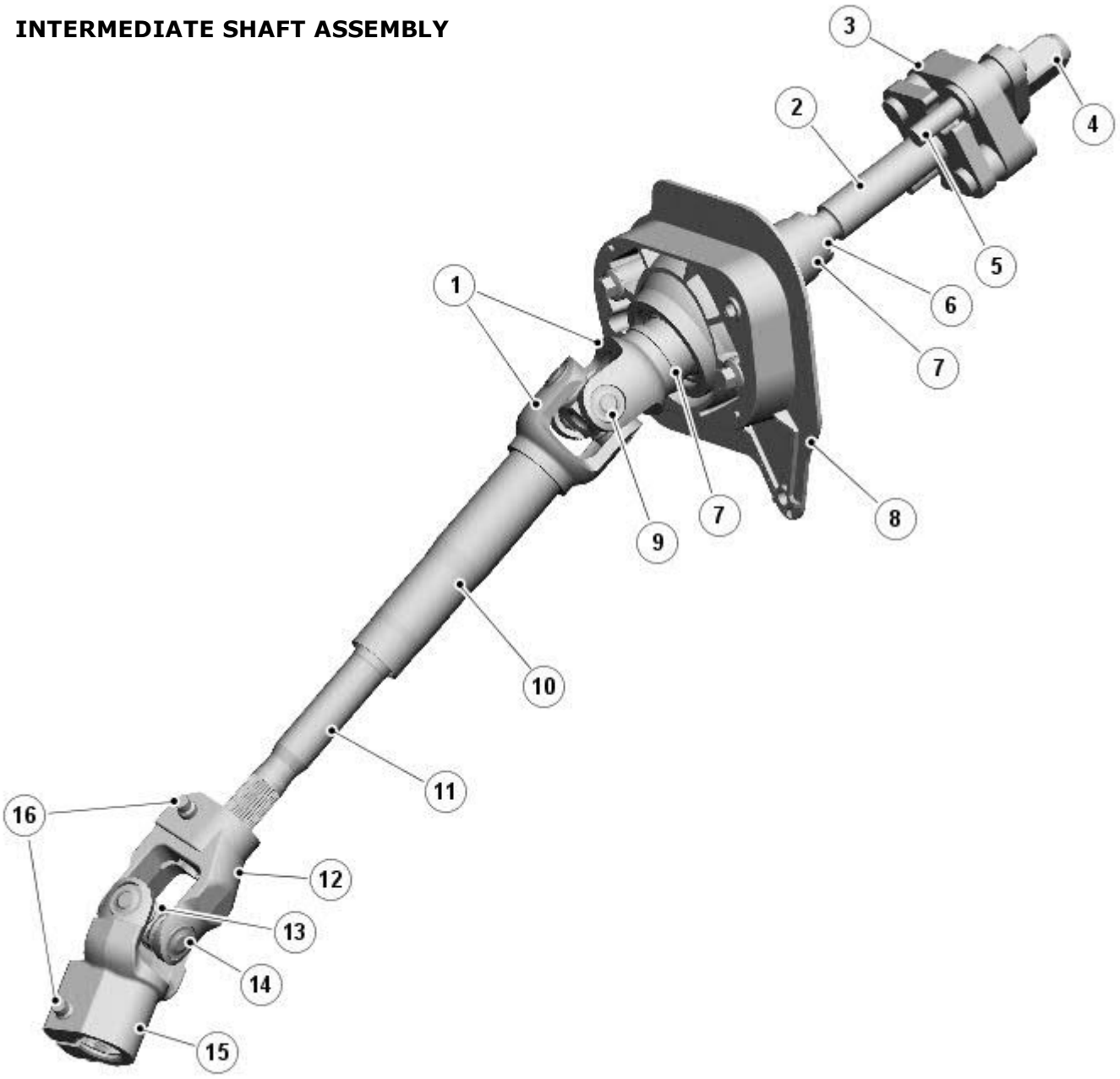
When the joystick switch is rotated to the 'auto' position, the steering column will adjust to the uppermost rake position when the ignition is switched off. It will re-adjust to the position corresponding to the memory position for the remote handset when the ignition is switched on.

The memory function of the electric column is controlled by the CJB and linked to the driver';s seat module. The module provides for the storage of three separate memory positions which are stored against 3 individual remote handsets.
Refer to: Seats (501-10 Seating, Description and Operation).

The steering wheel locates on a splined shaft in the upper column assembly and is secured with a bolt. The steering wheel houses the driver's airbag and switches for the audio system, gear change and speed control. A clockspring is used to connect the steering wheel electrical components to the vehicle harness.

Two plastic shrouds are fitted to the upper column assembly. The lower shroud is fitted with an energy absorbing foam pad to minimize leg injury in the event of an accident.

INTERMEDIATE SHAFT ASSEMBLY



E128468

Item	Description
1	Yoke
2	Upper collapse shaft
3	Flexible coupling
4	Shaft plate
5	Rivet (4 off)
6	Upper tube
7	Plastic sleeve
8	Boot
9	Bearing (4 off)
10	Teeth tube
11	Lower shaft
12	Upper yoke
13	Spider
14	Bearing (4 off)

15	Lower yoke
16	Yoke clamp bolt (2 off)

The intermediate shaft assembly comprises 2 splined shafts connected by a universal joint in the center.

The upper collapse shaft has a flexible coupling at its upper end. The flexible coupling controls axial and torsional movements and also assists with noise and vibration damping. The flexible coupling is fitted with a shaft plate which has a boss with machined flats on it. The flats provide positive location on the upper column outer clamping yoke. A cut-out in the boss allows for the fitment of a clamping bolt to secure the upper column outer clamping yoke. The cut-out ensures that the lower shaft assembly can only be fitted in one orientation.

The upper collapse shaft is connected to the stopper plate of the flexible coupling with splines. The stopper plate is connected to the shaft plate via the flexible coupling and is secured with rivets. The upper collapse shaft has a series of splines which engage with the upper tube. The splines allow the upper collapse shaft to slide into the upper tube in the event of an accident.

The upper tube is positively connected to the upper half of the yoke of the universal joint. A plastic tube is located around the upper tube and provides for the attachment of a boot which seals the lower shaft assembly where it passes through the vehicle bulkhead.

The yoke is attached to the teeth tube which in turn is located over the lower shaft on splines. The teeth tube is fitted with a tolerance ring which provides resistance to movement of the splines on the lower shaft. The splines of the lower shaft allow it to slide into the teeth tube with the tolerance ring controlling the collapse.

The lower shaft is fitted with a yoke which provides the attachment to the torsion bar of the steering valve unit.

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Steering Column - Steering Column

Diagnosis and Testing

For additional information.
REFER to: Steering System (211-00, Diagnosis and Testing).

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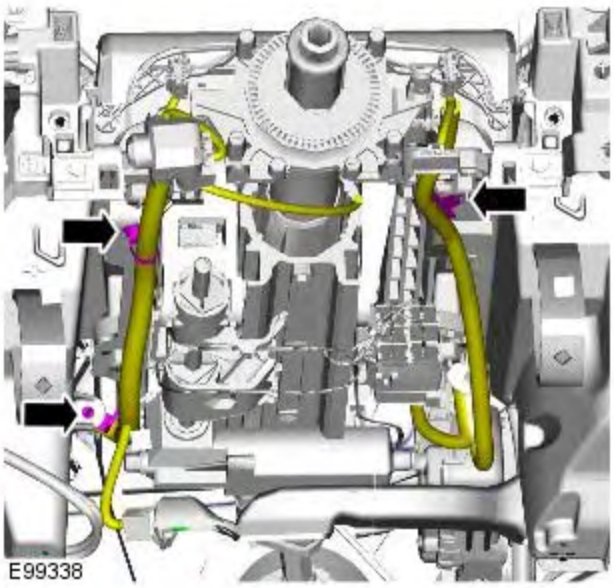
Steering Column - Steering Column

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: Instrument Panel Lower Section (501-12 Instrument Panel and Console, Removal and Installation).
3. Refer to: Steering Wheel Rotation Sensor (206-09 Anti-Lock Control - Stability Assist, Removal and Installation).
4.



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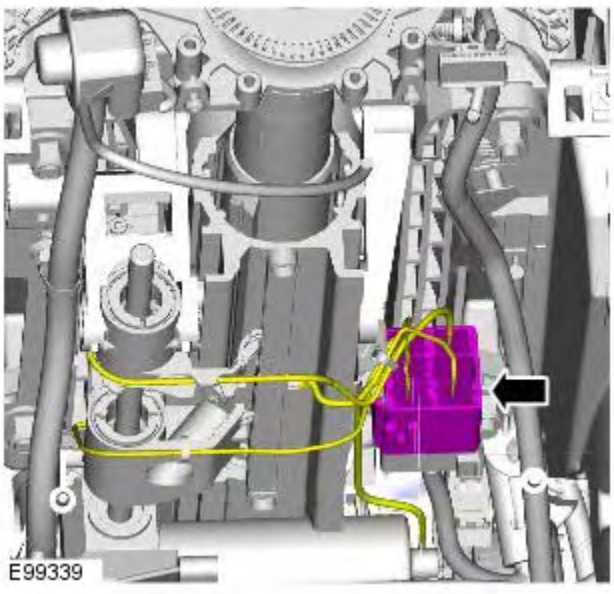

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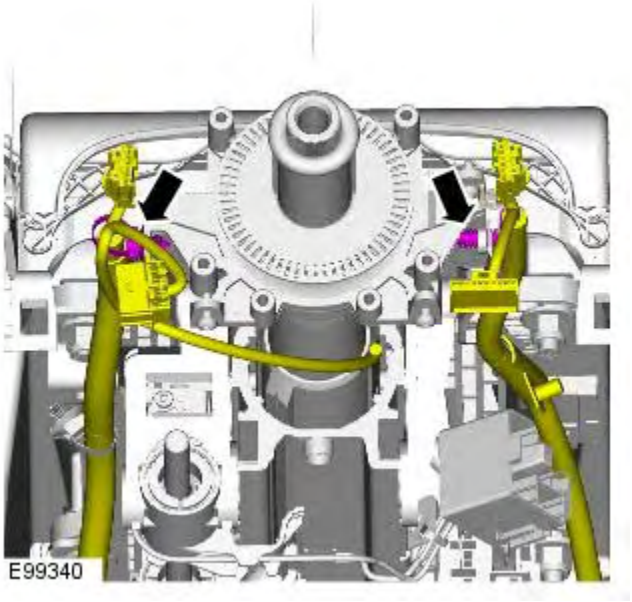

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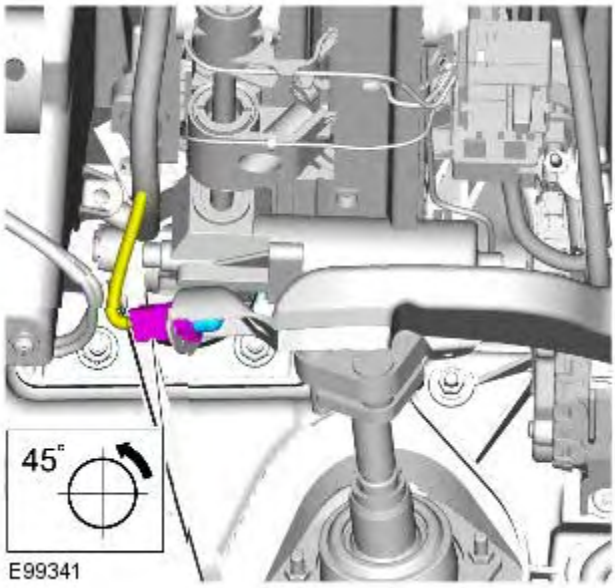

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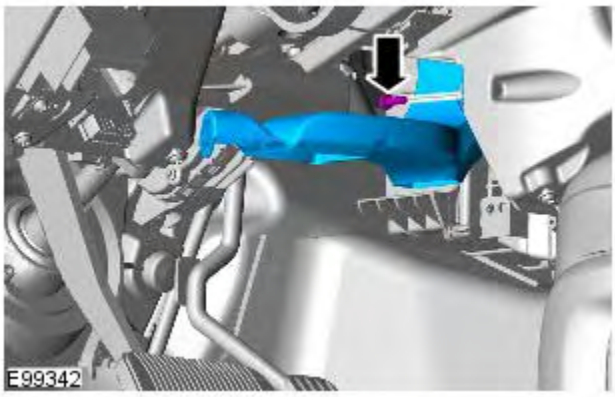
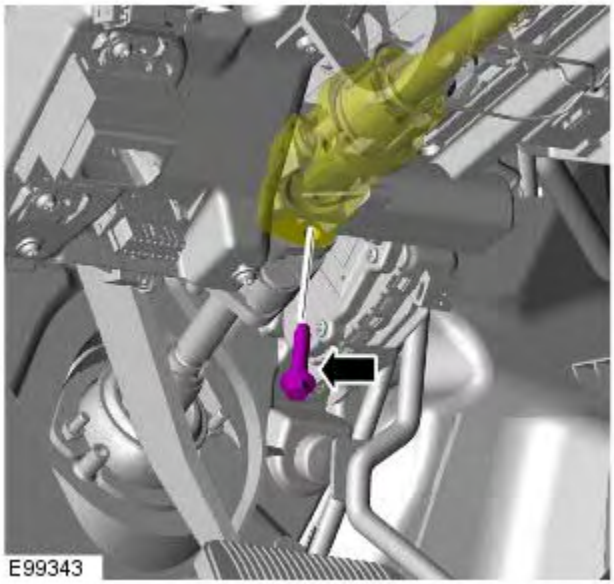
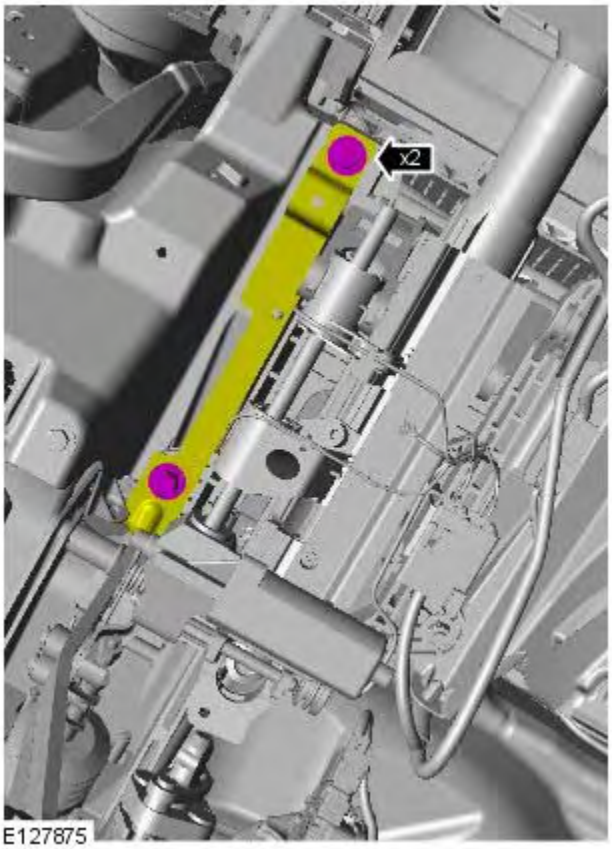
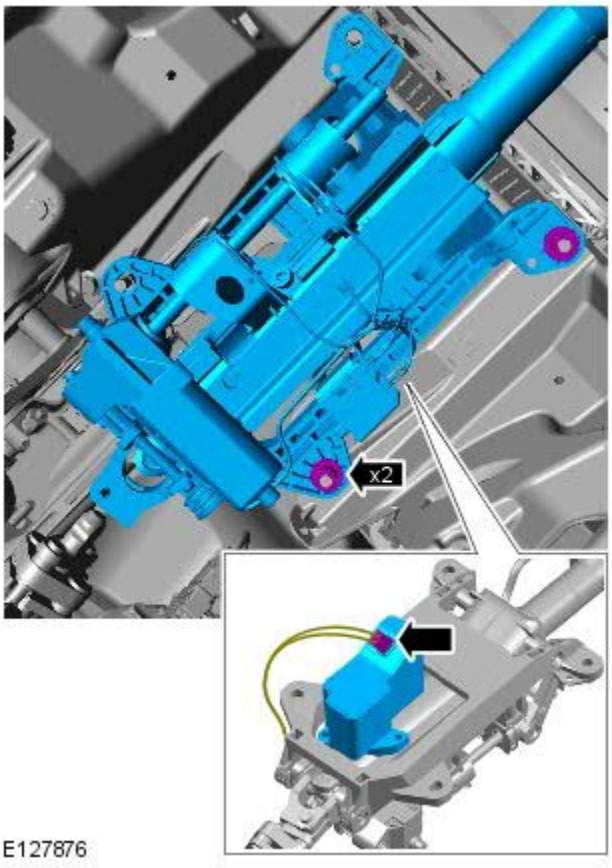


9. *Torque:* 30 Nm



10. *Torque:* 25 Nm





11. *Torque:* 25 Nm

Installation

1. To install, reverse the removal procedure.

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Steering Column - Steering Column Flexible Coupling

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

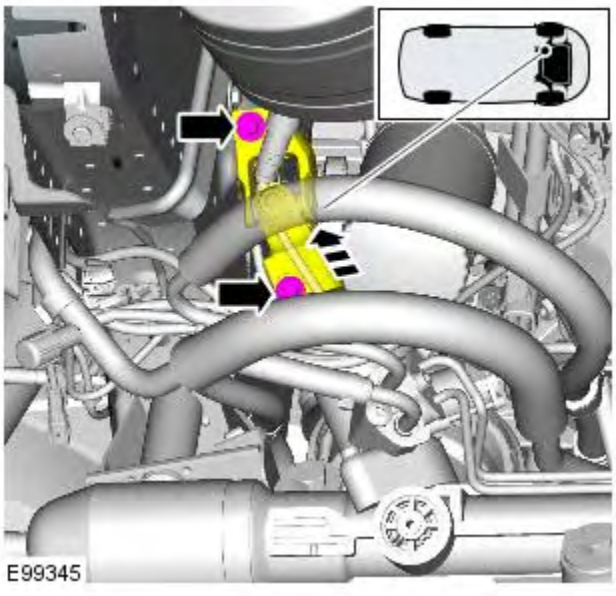
LHD illustration shown, RHD is similar.

1. WARNING: Make sure to support the vehicle with axle stands.

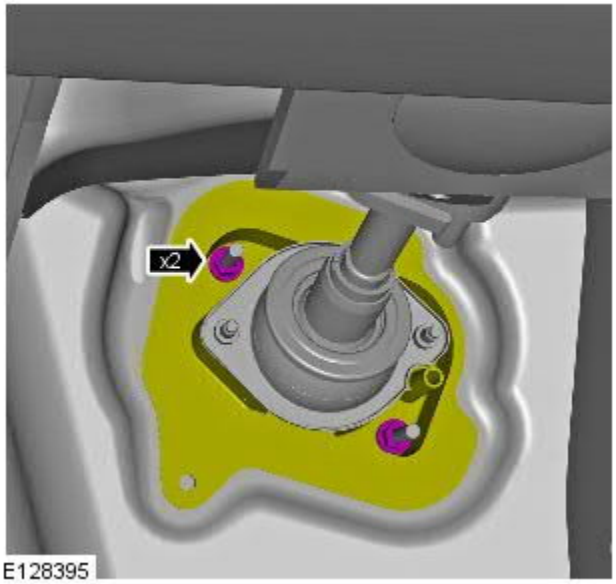
   Raise and support the vehicle.

2. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

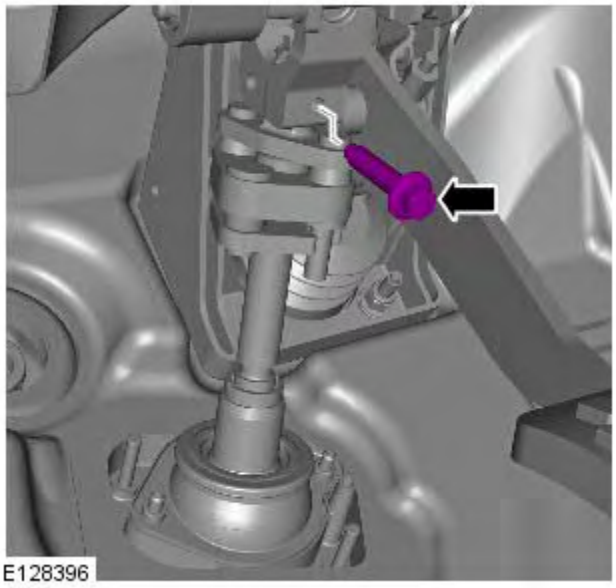
3. Refer to: Instrument Panel Lower Section (501-12 Instrument Panel and Console, Removal and Installation).



4. *Torque:* 30 Nm

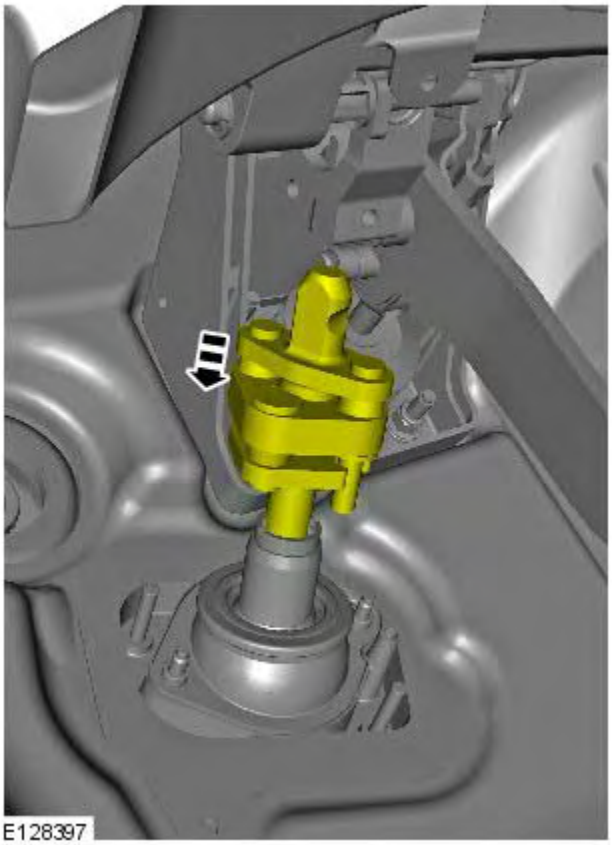


5. *Torque:* 10 Nm



6. *Torque:* 30 Nm

7.



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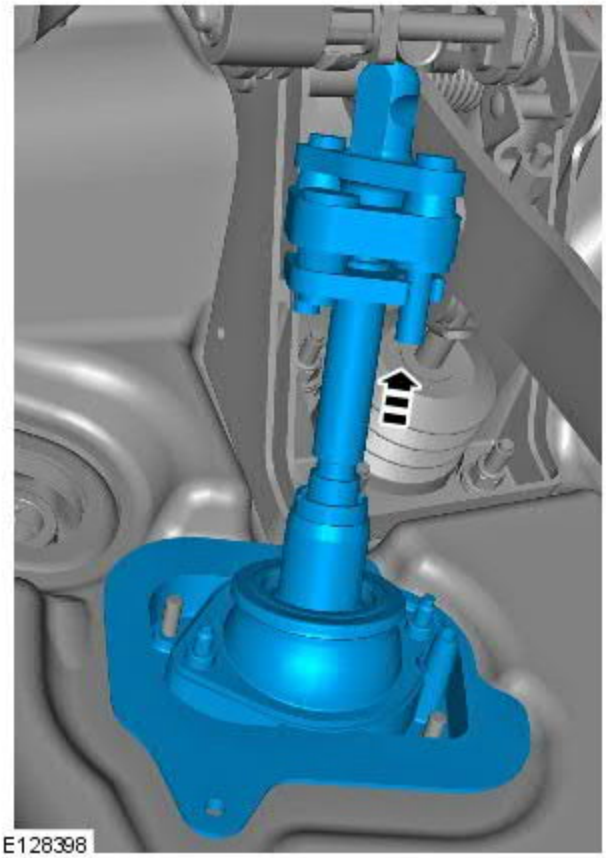


Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

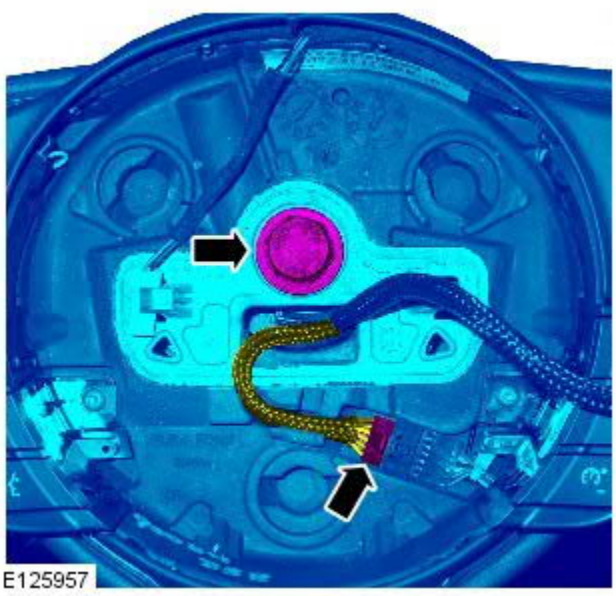
Steering Column - Steering Wheel
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. Refer to: Driver Air Bag Module (501-20B Supplemental Restraint System, Removal and Installation).

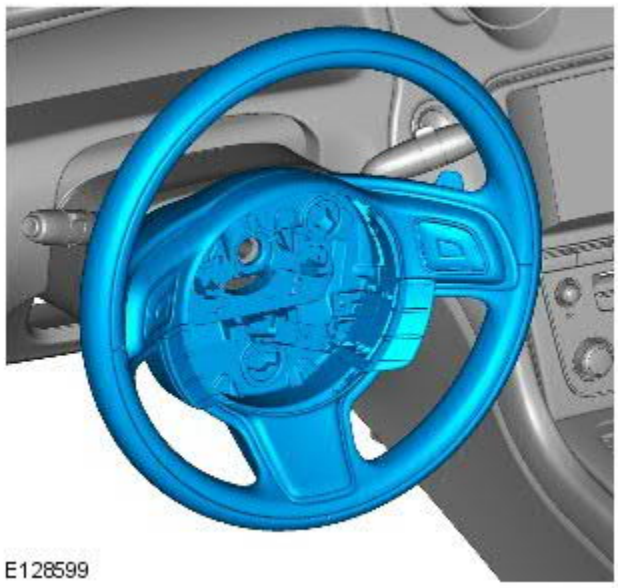

E125957

3. CAUTIONS:

   Make sure that the road wheels are in the straight ahead position.

   Make sure that the arrow on the cassette is centered and pointing vertically prior to the steering wheel installation. On removal of the special tool keep the clockspring cables taught to prevent the cassette moving from the set position. Do not allow the clockspring to unwind. Failure to follow this instruction may result in damage to the component.

   Torque: 40 Nm

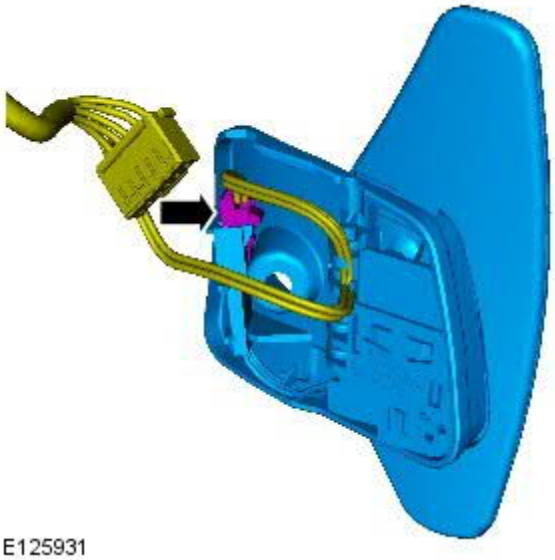

E128599

4. NOTE: Do not disassemble further if the component is removed for access only.

5. *Torque:* 6 Nm

E125932

6.

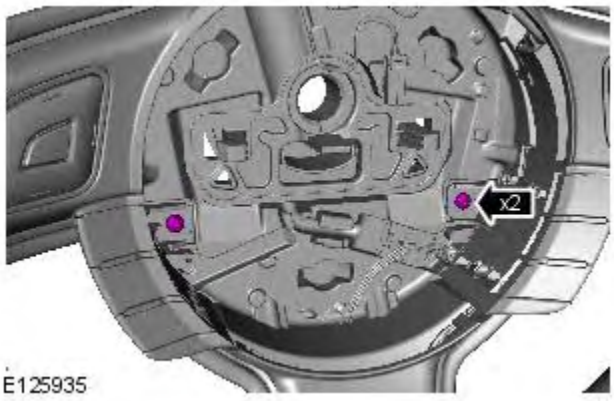

E125931

7. CAUTIONS:

Note the fitted position of the component prior to removal.

Take extra care not to damage the edges of the component.

Torque: 6 Nm



E125935

8.

E125934

Installation

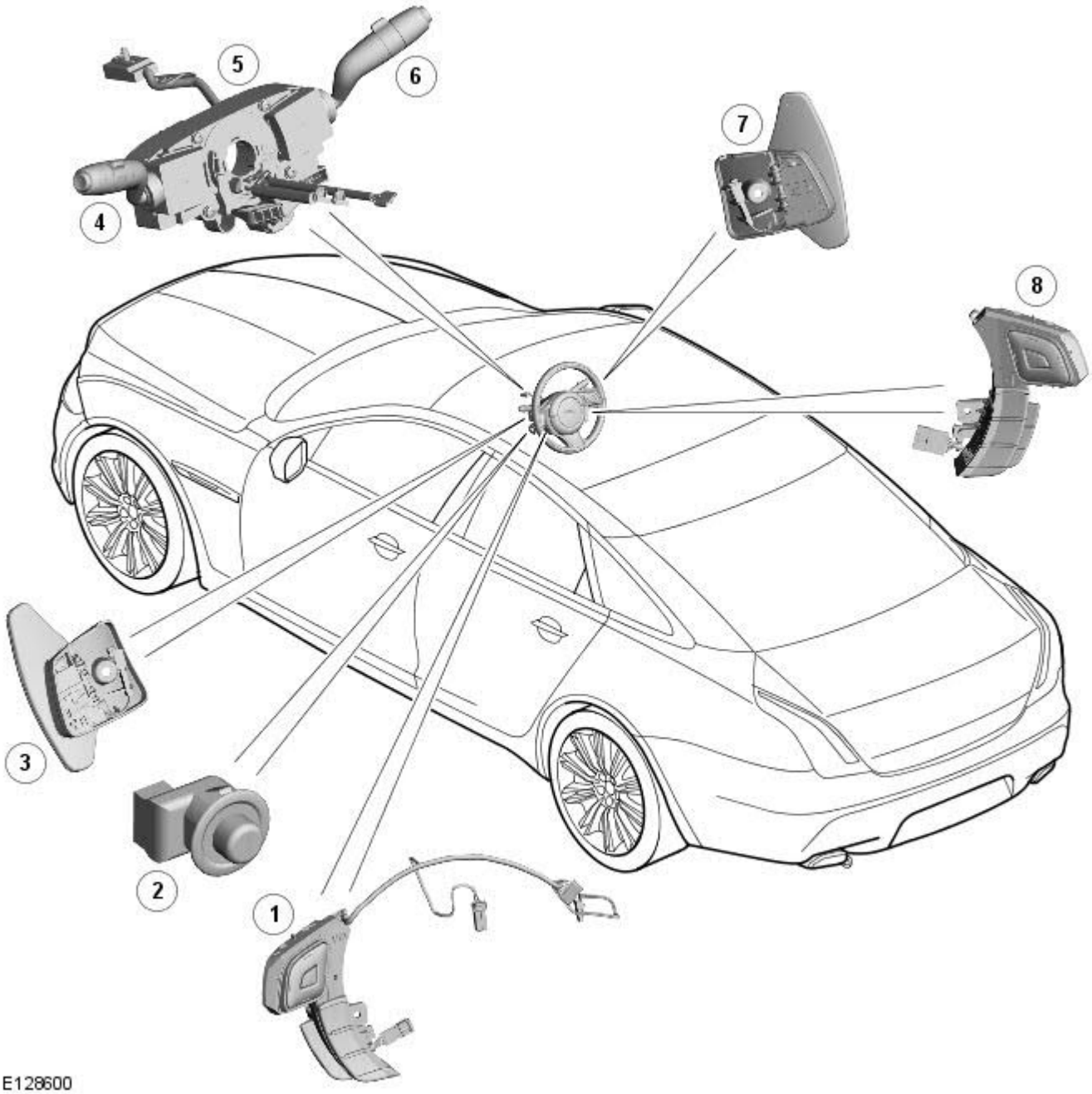
1. To install, reverse the removal procedure.

Published: 11-May-2011

Steering Column Switches - Steering Column Switches - Component Location

Description and Operation

STEERING COLUMN SWITCHES - COMPONENT LOCATION



Item	Description
1	Left Hand (LH) steering wheel switch assembly
2	Steering column adjust switch
3	LH gear change (-) paddle switch
4	LH steering column multifnction switch
5	Clockspring
6	Right Hand (RH) steering column multifunction switch
7	RH gear change (+) paddle switch
8	RH steering wheel switch assembly

Published: 11-May-2011

Steering Column Switches - Steering Column Switches - Overview

Description and Operation

OVERVIEW

The steering column multifunction switches are situated on the steering column and consist of the wiper switch, the turn signal indicator/lighting switch and the trip computer switch.

The RH (right-hand) multifunction switch controls the following windshield wiper functions:

- Flick wipe
- Intermittent wipe
- Slow speed wipe
- Fast speed wipe
- Wash/wipe
- Rain sensing/variable wipe selection.

The LH (left-hand) multifunction switch controls the following functions:

- Turn signal indicators
- Side lamps
- Headlamps
- Autolamps
- High/low beam
- Headlamp flash
- Headlamp timer
- Trip computer

The steering column adjustment switch is located in the steering column lower shroud on the LH side. The switch is a 5 position 'joystick' which controls reach and rake adjustment and also automatic and manual control.

The trip button allows the driver to cycle though an option menu and also reset trip cycle mileage calculations. The trip computer information is displayed in the instrument cluster message centre.

Steering wheel mounted switches on the LH side of the driver's airbag, control the audio and telephone functions. Switches on the RH side of the driver's airbag, control the speed control functions.

The steering wheel has an internal heating element. This is controlled by the driver via the Touch Screen Display (TSD).

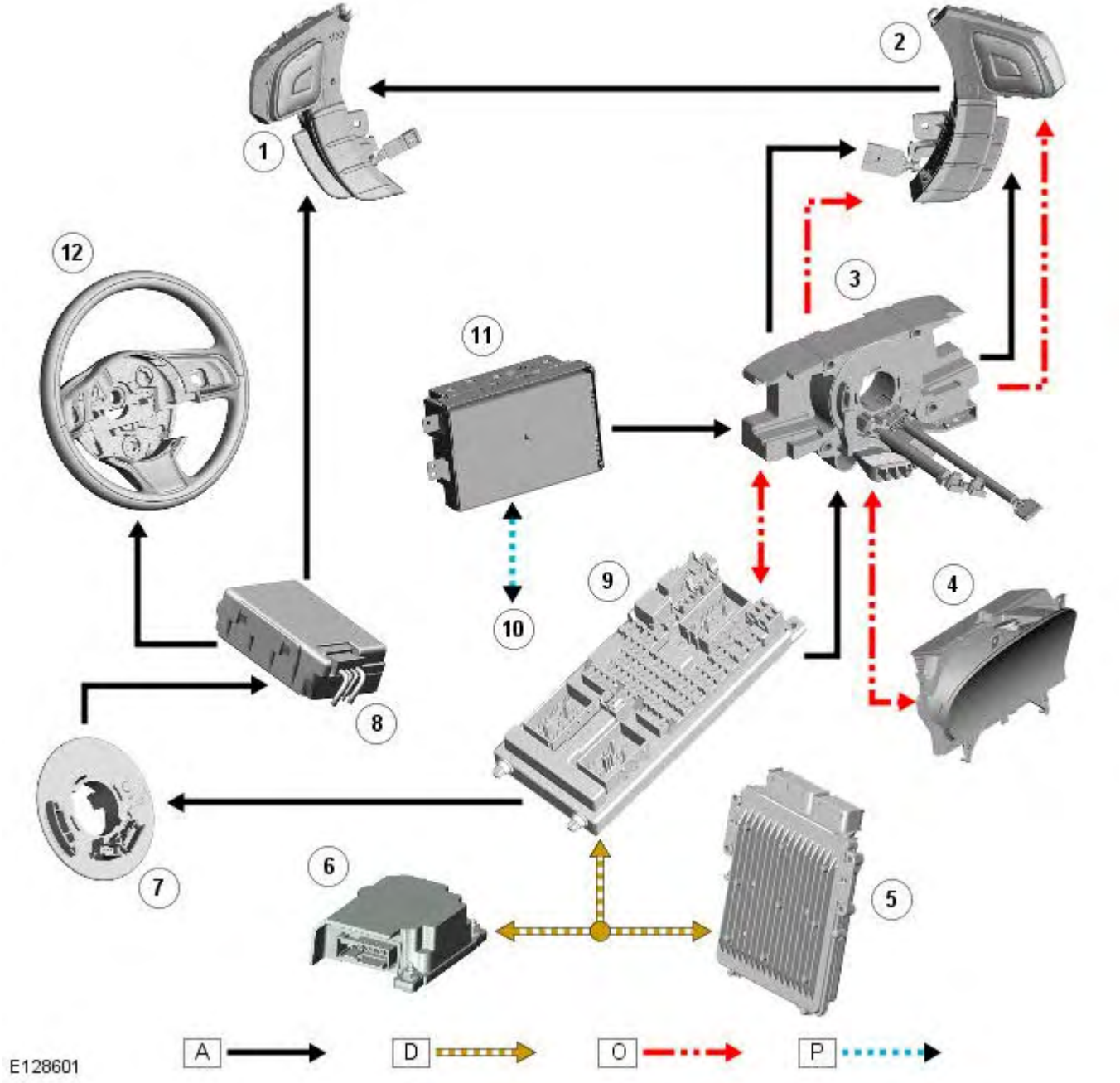
Published: 11-May-2011

Steering Column Switches - Steering Column Switches - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: **A** = Hardwired; **O** = Local Interconnect Network (LIN); **D** = High speed Controller Area Network (CAN) bus; **P** = Media Orientated System Transport (MOST) ring



Item	Description
1	LH steering wheel switch assembly
2	RH steering wheel switch assembly
3	Clockspring
4	Instrument cluster
5	Engine Control Module (ECM)

6	Adaptive speed control module
7	Slip ring
8	Steering wheel heater module
9	Central Junction Box (CJB)
10	To MOST ring
11	Touch Screen Display (TSD)
12	Steering wheel heater element

System Operation

LEFT HAND (LH) STEERING COLUMN MULTIFUNCTION SWITCH

TURN SIGNAL INDICATORS

The CJB (central junction box) outputs a reference voltage to the turn signal indicator switch. When the switch is in the central off position, the voltage flows through 3 resistors which are connected in series and back to the CJBwhich monitors the signal and determines the turn signal indicators are off.

When the switch is operated in the LH (left-hand) turn signal indicator position, the reference voltage from the CJB is routed via 1 of the resistors. The returned signal voltage is detected by the CJB which activates the applicable turn signal indicators until it detects the voltage through the 3 resistors to signal the the indicators are now off.

When the switch is operated in the RH (right-hand) turn signal indicator position, the reference voltage from the CJB is routed via 2 of the resistors. The returned signal voltage is detected by the CJB which activates the applicable turn signal indicators until it detects the voltage through the 3 resistors to signal the the indicators are now off.

LIGHTING CONTROL SWITCH

The CJB outputs 2 reference voltages to the rotary lighting control switch; one feed being supplied to the light selection function of the switch and the second feed being supplied to the autolamp exit delay function. The switch position is determined by CJB by monitoring the change in returned signal voltage which is routed through up to 4 resistors in series depending on the selection made.

When the lighting control switch is in the off position, the reference voltage flows through 1 of the resistors. The returned signal voltage is detected by the CJB which determines that no lighting selection is made. The reference voltage to the autolamp exit delay switch is routed through 4 resistors which is detected by the CJB which determines that autolamp or exit delay has not been selected.

When the lighting control switch is in the sidelamp position, the reference voltage flows through 2 of the resistors. The returned signal voltage is detected by the CJB which activates the sidelamps. The reference voltage to the autolamp exit delay switch is routed through 4 resistors which is detected by the CJB which determines that autolamp or exit delay has not been selected.

When the lighting control switch is in the headlamp position, the reference voltage flows through 3 of the resistors. The returned signal voltage is detected by the CJB which activateS the headlamps. The reference voltage to the autolamp exit delay switch is routed through 4 resistors which is detected by the CJB which determines that autolamp or exit delay has not been selected.

When the lighting control switch is in the autolamp position, the reference voltage flows through 4 of the resistors. The returned signal voltage is detected by the CJB which activates the autolamp function. The reference voltage to the autolamp exit delay switch is routed through 4 resistors which is detected by the CJB which determines that autolamp has been selected.

AUTOLAMP EXIT DELAY

When the lighting control switch is in any of the autolamp exit delay positions, the lighting control switch reference voltage flows through 1, 2 or 3 of the 4 of the resistors. The returned signal voltage is detected by the CJB which determines that autolamp has been selected.

Depending on the selected position, the reference voltage to the autolamp exit delay switch is routed through 3, 2 or 1 of the resistors which is detected by the CJB. The CJB the activates the autolamp exit delay period that has been selected at 30, 60 or 120 seconds respectively.

TRIP FUNCTION BUTTON

The CJB outputs a reference voltage to the trip function button. When the function button is pressed a ground path is completed and a signal voltage is returned to the CJB via a resistor in the switch. The returned reference voltage is detected by the CJB which performs the requested trip function.

RIGHT HAND (RH) STEERING COLUMN MULTIFUNCTION SWITCH

The CJB outputs 4 separate reference voltages to the following switch functions:

- Wash/wipe switch
- Intermittent wipe switch

- Master wiper switch
- Flick wipe switch

WASH/WIPE SWITCH

The reference voltage is supplied from the CJB to one of two resistors connected in parallel. When the switch is not being operated the current flows through one resistor and the returned signal voltage is monitored by the CJB. When the wash/wipe switch is operated, a connection is made and the current flows through the second resistor. The change in signal voltage is detected by the CJB which activates the wash/wipe function.

INTERMITTENT DELAY/AUTO WIPE SWITCH

The reference voltage is supplied from the CJB to the switch and can pass through up to 7 resistors, connected in series, for intermittent delay selections and the auto wipe function.

When the rotary switch is in the auto position the reference voltage flows through 1 resistor. The returned signal voltage is detected by the CJB which determines auto wipe is selected and activates the auto wipe function.

With the rotary switch in one of the intermittent positions, the reference voltage is routed through up to 7 of the resistors depending on the delay period selected. The returned signal voltage is detected by the CJB which determines the selected delay period and activates the selected intermittent wipe function.

NOTE: The delay period for the intermittent selections can vary according to vehicle speed.

MASTER WIPER SWITCH

The reference voltage supplied from the CJB to the master wiper switch. The voltage can pass through up to 4 resistors connected in series.

When the switch is in the off position, the reference voltage passes through 4 resistors and the returned voltage is monitored by the CJB which determines that no wiper selections have been requested.

With the switch in the intermittent, slow wipe or fast wipe position, the reference voltage passes through 3, 2 or 1 resistors respectively. The returned signal voltage is detected by the instrument cluster which determines selected delay period. The instrument cluster outputs a message on the medium speed CAN bus to the CJB to activate the selected wipe function.

FLICK WIPE SWITCH

The reference voltage is supplied FROM THE CJB to one of two resistors connected in parallel. When the switch is not being operated the current flows through one resistor and the returned signal voltage is monitored by the CJB. When the flick wipe switch is operated, a connection is made and the current flows through the second resistor. The change in signal voltage is detected by the CJB which activates the flick wipe function.

STEERING COLUMN ADJUST SWITCH

The CJB supplies 2 reference voltages to the column adjust switch.

The first reference voltage is supplied to the joystick switch. When the switch is moved to one of its 4 positions, the switch contact is completed and the reference voltage is passed through one of 4 different resistors with different values. The returned signal voltage is measured by the CJB which determines the selected column adjust request. The CJB outputs a supply to the steering column adjustment motor and energizes the applicable clutch solenoid to move the column to the desired position.

The second reference voltage is supplied to the auto/manual selection of the switch. When the switch is in the auto position, the reference voltage passes directly through the switch contacts and is measured by the CJB. The CJB outputs a message on the medium speed CAN (controller area network) bus to the driver seat module which responds with the recorded memory position setting. The CJB then activates the column adjustment motor and clutch solenoids to move the column to the memorized position. When the switch is in the manual position the reference circuit is broken. The CJB detects the broken circuit and allows manual operation of the column adjustment switch to move the column.

STEERING WHEEL HEATER

The heated steering wheel module receives a power supply from the ignition relay in the CJB. This is passed via a pair of slip rings in the steering wheel to the heated steering wheel module. When the driver operates the heated steering wheel switch, which is located on the LH steering wheel switch assembly, a path is completed between the switch and the steering wheel heater module. This is sensed by a heated steering wheel status circuit located in the switch assembly. A status is passed from the status circuit to the heated steering wheel module which operates the heater elements. The module monitors the element temperature via a NTC (negative temperature coefficient) temperature sensor and controls the power supply to the element to keep the wheel at the optimum temperature.

Component Description

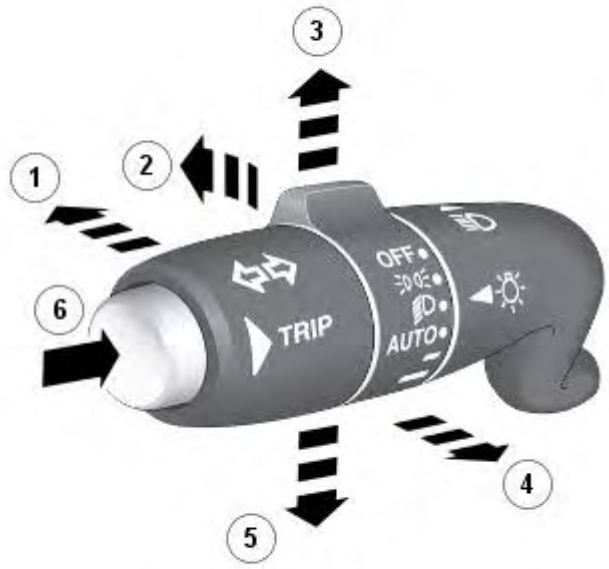
STEERING COLUMN MULTIFUNCTION SWITCH

The steering column multifunction switches are situated on the steering column and consists of the wiper switch, the turn signal indicator/lighting switch and the trip computer switch.

The steering column adjustment switch is located in the steering column lower shroud on the LH side. The switch is a 4 position 'joystick' which controls reach and rake adjustment.

Steering wheel mounted switches on the LH side of the driver's airbag, control the audio and telephone functions. Switches on the RH side of the driver's airbag, control the speed control functions. Refer to: Audio System (415-01A Information and Entertainment System, Description and Operation).

LEFT HAND (LH) STEERING COLUMN MULTIFUNCTION SWITCH



E97751

Item	Description
1	High beam
2	Lighting control rotary switch
3	RH turn signal indicator
4	Headlamp flash
5	LH turn signal indicator
6	Trip computer function button

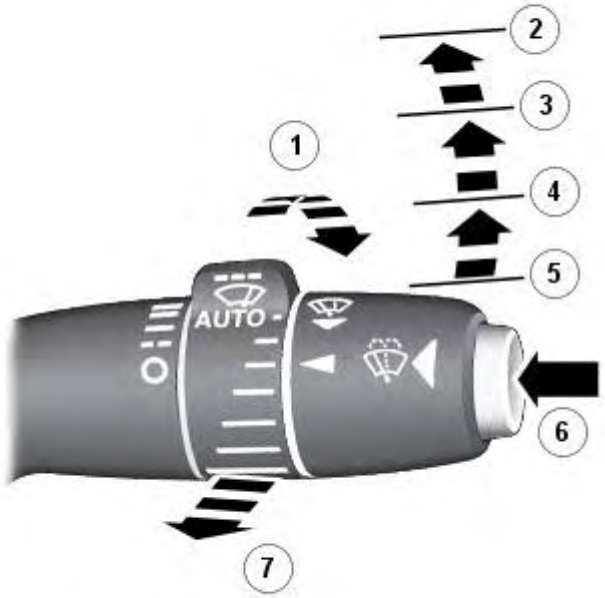
The LH multifunction switch controls the following windshield wiper functions:

- Turn signal indicators
- Side lamps
- Headlamps
- Auto lamps
- High/low beam
- Headlamp flash
- Headlamp timer
- Trip computer.

The switch is located in a slot in the clockspring and secured with 2 plastic clips.

H

RIGHT HAND (RH) STEERING COLUMN MULTIFUNCTION SWITCH



E97752

Item	Description
1	Auto/intermittent rotary switch
2	Fast wipe
3	Slow wipe
4	Intermittent wipe
5	Off position
6	Wash/wipe
7	Flick wipe

The RH multifunction switch controls the following windshield wiper functions:

- Flick wipe
- Intermittent wipe
- Slow speed wipe
- Fast speed wipe
- Wash/wipe
- Rain sensing/variable wipe selection

The switch is located in a slot in the clockspring and secured with 2 plastic clips.

STEERING COLUMN ADJUST SWITCH

The column adjustment switch is located in the steering column lower shroud and held in place with a spring clip. The 4-way joystick switch allows the adjustment of the steering column for both reach and rake angle.

The switch has a two position rotary switch which allows selection of auto and manual operation. The manual position allows the driver to set the position of the steering column as required and disables the automatic positioning by the memory function. The auto position allows the desired position of the column to be set by the driver using the driver's seat memory buttons. The column position is automatically reset once the applicable remote handset has been detected by the vehicle security systems.

STEERING WHEEL HEATER

On certain models the rim of the steering wheel contains a heater element. Operation of the heater is selected using a switch on the LH steering wheel switch assembly.

The heater temperature is controlled by a heated steering wheel control module located within the steering wheel. Power for the heater element is supplied to the steering wheel via 2 contacts on the clockspring and a slip ring mounted on the steering wheel.

Published: 30-Aug-2012

Steering Column Switches - Steering Column Switches

Diagnosis and Testing

Principles of Operation

For a detailed description of the steering column switches, refer to the relevant Description and Operation section in the workshop manual.
REFER to: Steering Column Switches (211-05 Steering Column Switches, Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Switches • Electric steering column lock	• Fuse(s) • Electrical connector(s) • Wiring Harness

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Steering Column Lock Module (VIM) (100-00 General Information, Description and Operation).

Published: 11-May-2011

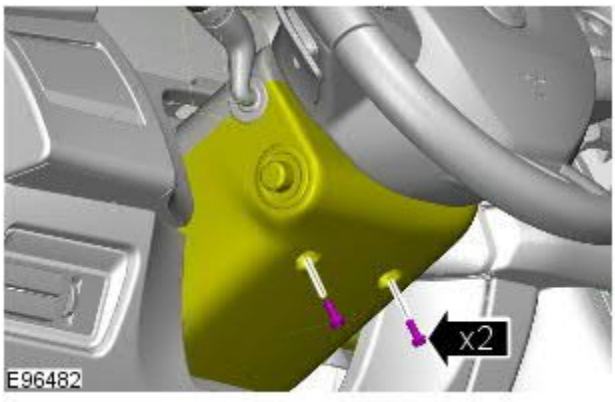
Steering Column Switches - Steering Column Multifunction Switch LH

Removal and Installation

Removal

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1.



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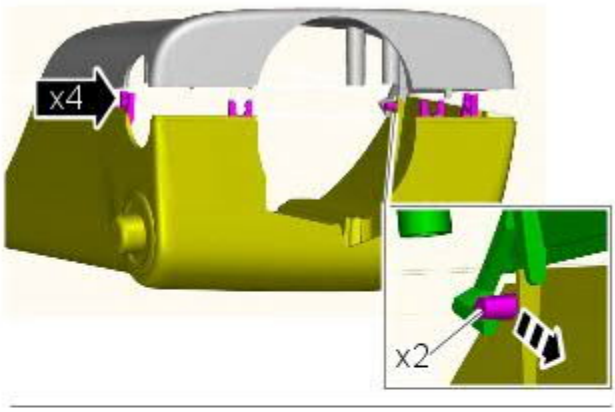

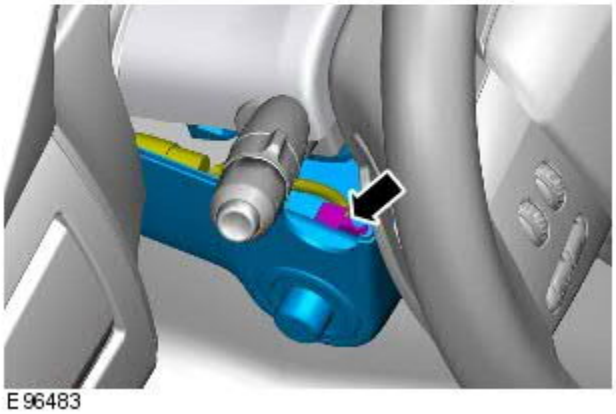

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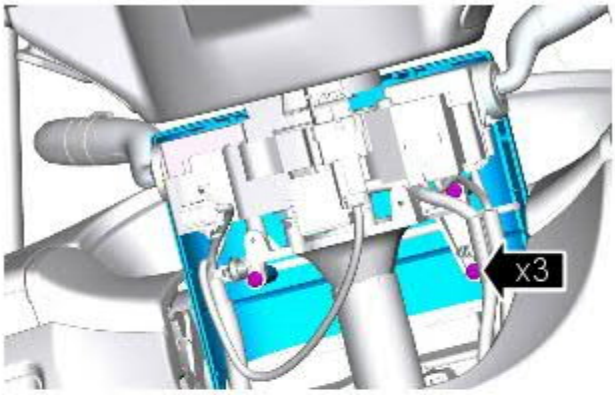

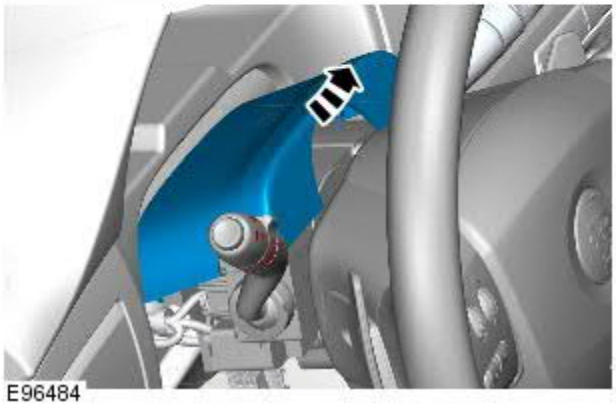

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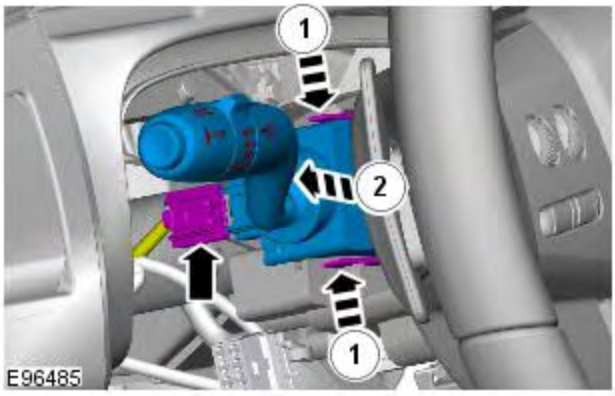


Installation

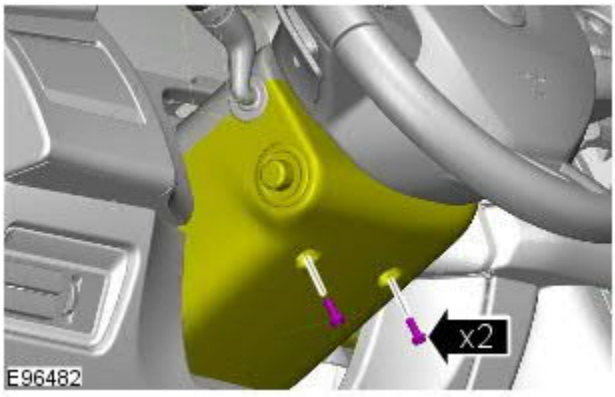
1. To install, reverse the removal procedure.

Published: 11-May-2011

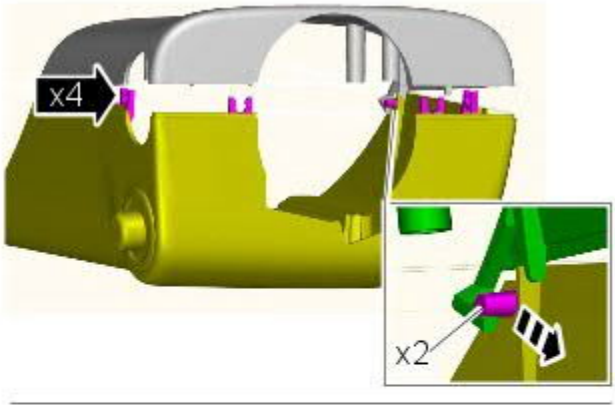
Steering Column Switches - Steering Column Multifunction Switch RH

Removal and Installation

Removal



1.



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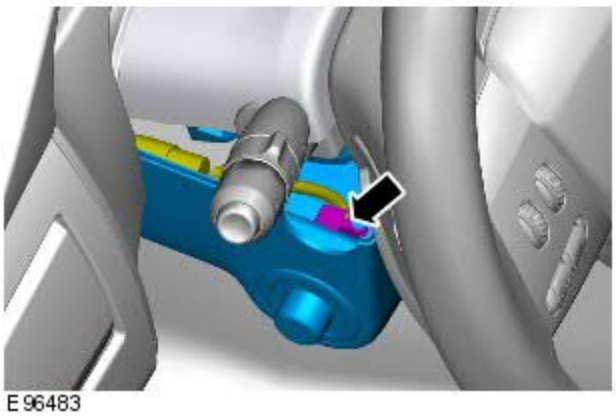

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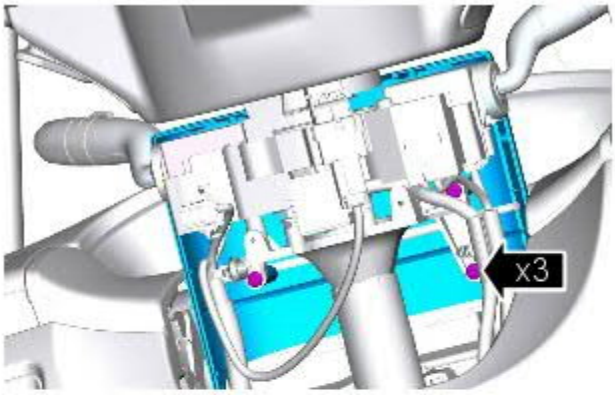

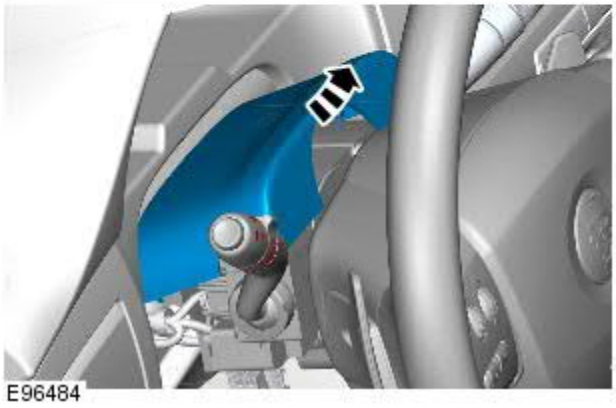

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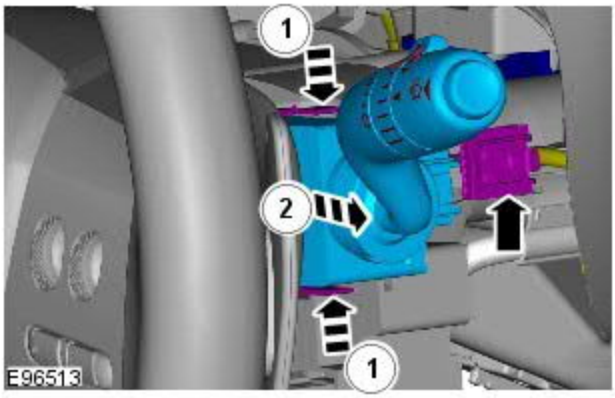


Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

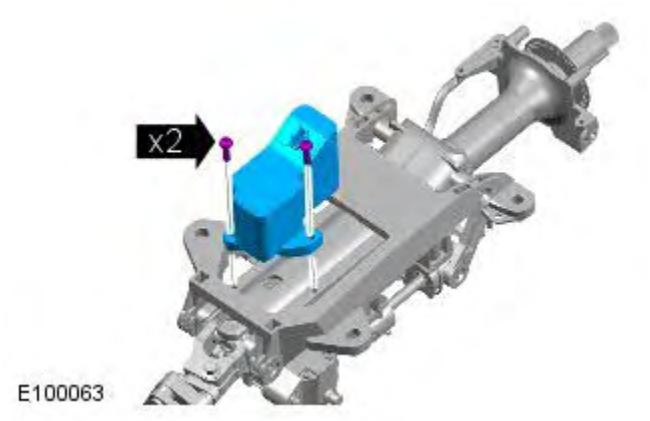
Steering Column Switches - Steering Column Lock Actuator

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: Steering Column (211-04 Steering Column, Removal and Installation).



3. *Torque:* 9 Nm

Installation

1. NOTE: New units must be configured using the Programmable Module Installation Routine in the diagnostic tool.

   To install, reverse the removal procedure.

Published: 04-May-2012

Steering Column Switches - Ignition Switch

Removal and Installation

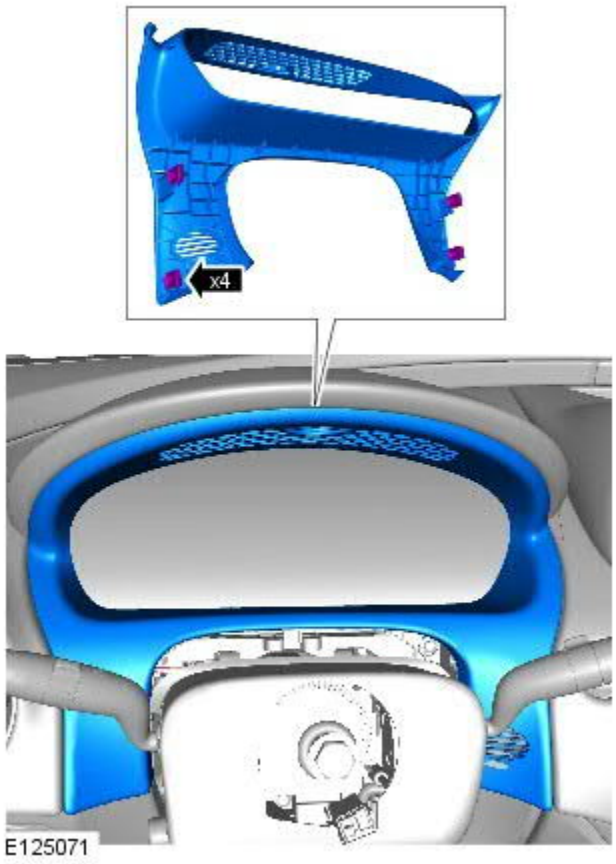
Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Position the steering wheel fully lowered and fully extended.

2. NOTE: The steering wheel is shown removed for clarity.

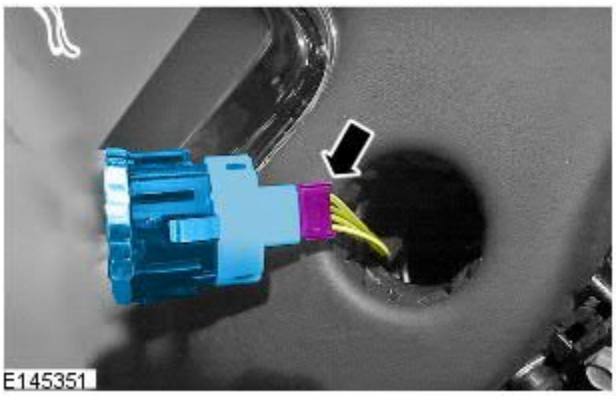
   Torque: 2 Nm



3. NOTE: The steering wheel is shown removed for clarity.

4.

5.



Installation

1. To install, reverse the removal procedure.

www.JagDocs.com

Published: 16-Jun-2013

Engine System - General Information - Engine TDV6 3.0L Diesel

Diagnosis and Testing

Principles of Operation

As diagnosis of the different areas of the engine is covered in other sections and by general procedures, this section is limited to an oil pressure test.

For a detailed description of the engine system, refer to the relevant Description and Operation section in the workshop manual. REFER to: (303-01A Engine - TDV6 3.0L Diesel)

Engine (Description and Operation),
Engine (Description and Operation),
Engine (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical damage.

Visual Inspection

Mechanical
• Engine oil level • Coolant level • Transmission fluid level • Fuel level • Coolant leaks • Oil leaks • Fuel leaks • Visibly damaged or worn parts • Loose or missing nuts or bolts • Fuel contamination/grade/quality • Sensor installation/condition • Viscous fan and solenoid

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Engine Oil Pressure Check

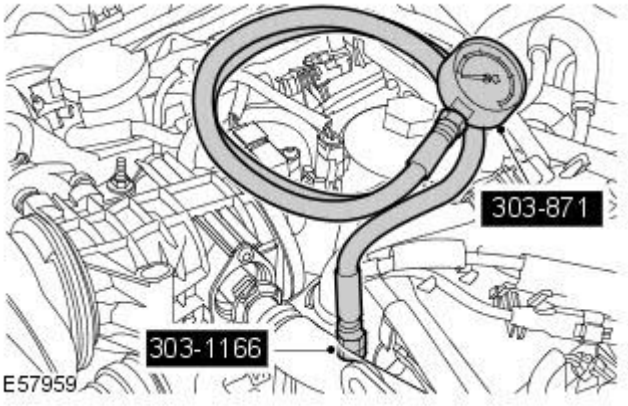
NOTE: Prior to checking the engine oil pressure, a road test of 6 miles (10 kilometres), must be carried out. Do not attempt to attain engine normal operating temperature by allowing the engine to idle.

1. WARNINGS:

   The spilling of hot engine oil is unavoidable during this procedure, care must be taken to prevent scalding.

   Wear protective gloves.

   Remove the oil pressure sensor.
2. Install the special tool to the oil filter housing.
3. Install the special tool gauge and tighten the union.



4. Check and top-up the engine oil, if required.
5. Start and run the engine.
6. Note the oil pressure readings with the engine running at idle and 3500 RPM.
7. Turn off the engine.
8. Remove the special tools.
9. Install the oil pressure sensor.
10. Check and top-up the engine oil, if required.

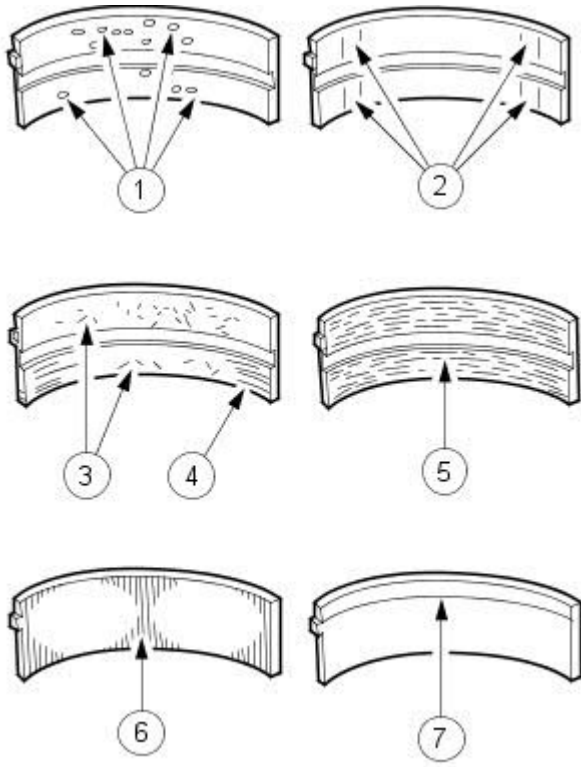
DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - TDV6 3.0L Diesel , DTC: Engine Control Module (100-00 General Information, Description and Operation).

Published: 11-May-2011

Engine System - General Information - Bearing Inspection

General Procedures



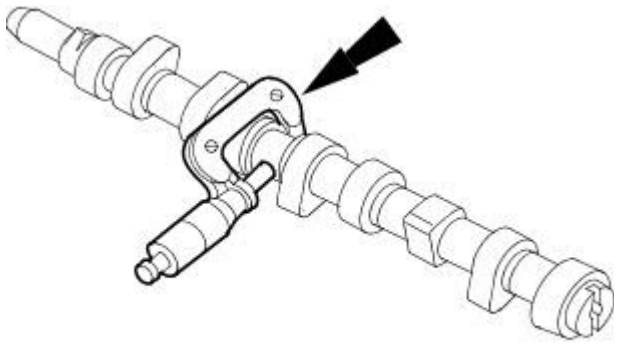
VUJ0002219

1. Inspect bearings for the following defects.
    1. Cratering - fatigue failure
    2. Spot polishing - incorrect seating.
    3. Imbedded dirt engine oil.
    4. Scratching - dirty engine oil.
    5. Base exposed - poor lubrication.
    6. Both edges worn - journal damaged.
    7. One edge worn - journal tapered or bearing not seated.

Published: 11-May-2011

Engine System - General Information - Camshaft Bearing Journal Diameter

General Procedures



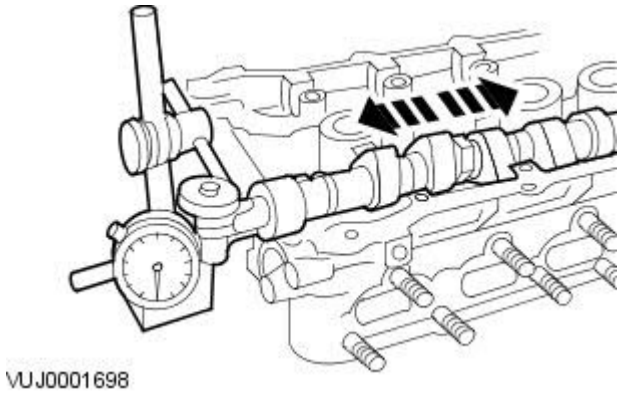
VUJ0001695

1. Determine the diameter of the camshaft journals.
    - Using a micrometer measure the diameter at 90 degrees intervals to determine if the journals are out-of-round.
    - Measure at two different points on the journal to determine if there is any tapering.
    - If the measurements are out of the specified range, install a new camshaft.

Published: 11-May-2011

Engine System - General Information - Camshaft End Play

General Procedures



VUJ0001698

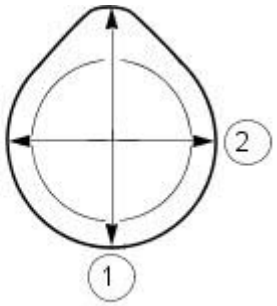
1. NOTE: Make sure that the camshaft is to specification.

   Using the special tool, measure the end play.
   - Slide the camshaft in both directions. Read and note the maximum and minimum values on the dial indicator gauge.
     1. End play = maximum value minus minimum value.
   - If the measurement is out of specification, install new components.

Published: 11-May-2011

Engine System - General Information - Camshaft Lobe Lift

General Procedures



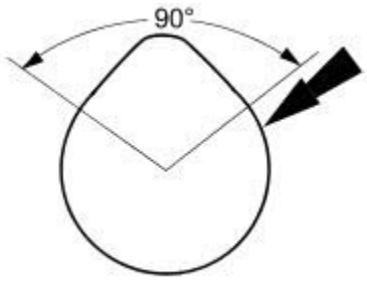
VUJ0001699

1. Measure the diameter (1) and diameter (2) with a vernier caliper. The difference in measurements is the lobe lift.

Published: 11-May-2011

Engine System - General Information - Camshaft Surface Inspection

General Procedures



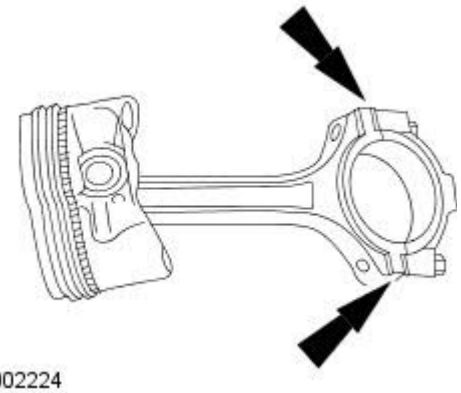
VUJ0001700

1. Inspect camshaft lobes for pitting or damage in the active area. Minor pitting is acceptable outside the active area.

Published: 11-May-2011

Engine System - General Information - Connecting Rod Cleaning

General Procedures



VUJ0002224

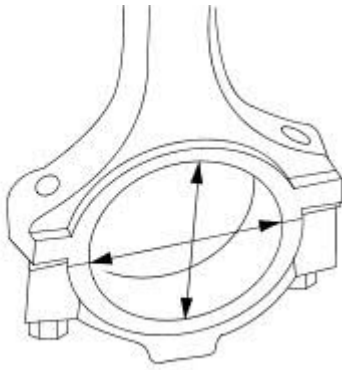
1. CAUTION: Do not use a caustic cleaning solution or damage to connecting rods may occur.

   Mark and separate the parts and clean with solvent. Clean the oil passages.

Published: 11-May-2011

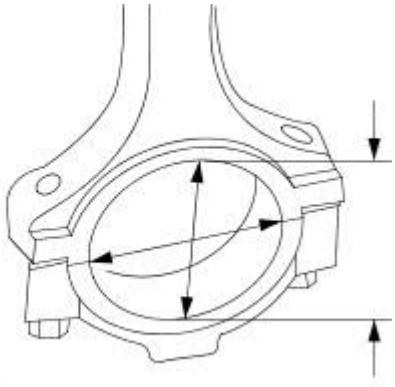
Engine System - General Information - Connecting Rod Large End Bore

General Procedures



VUJ0002223

1. Measure the bearing bore in two directions. The difference is the connecting rod bore out-of-round. Verify the out-of-round is within specification.



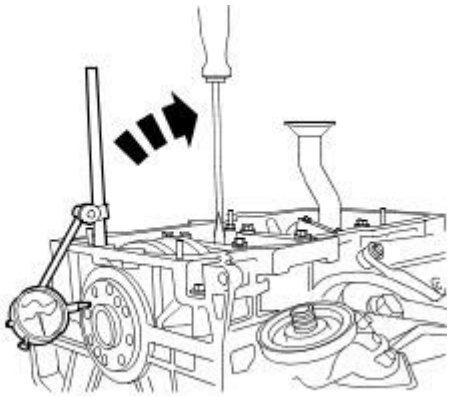
VUJ0002222

2. Measure the bearing bore diameter in two directions. Verify the bearing bore is within specification.

Published: 11-May-2011

Engine System - General Information - Crankshaft End Play

General Procedures



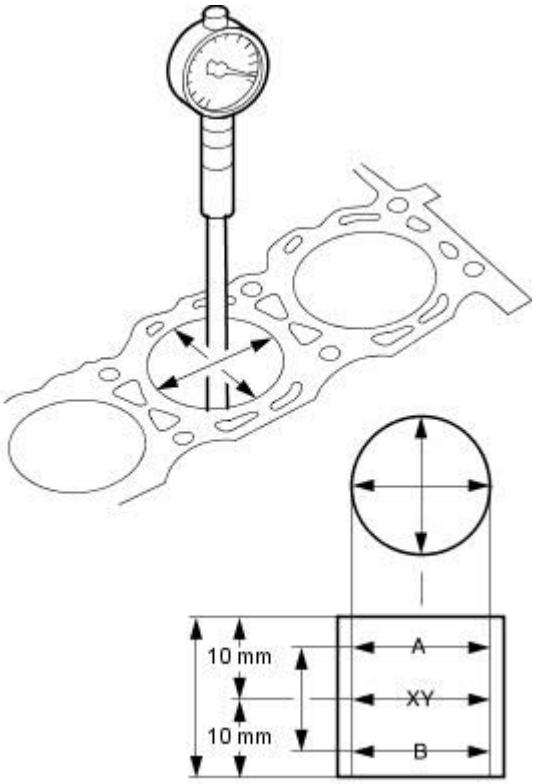
VUJ0002235

1. Using the Dial Indicator Gauge with Brackets, measure the end play.
    - Measure the end play by lifting the crankshaft using a lever.
    - If the value is out of the specification, install new thrust half rings to take up the end float and repeat the measurement.

Published: 11-May-2011

Engine System - General Information - Cylinder Bore Out-of-Round

General Procedures



VUJ0002234

1. NOTE: The main bearing caps or lower crankcase must be in place and tightened to the specified torque; however, the bearing shells should not be installed.

   Measure the cylinder bore with an internal micrometer.
   - Carry out the measurements in different directions and at different heights to determine if there is any out-of-roundness or tapering.
   - If the measurement is out of the specified range, hone out the cylinder block or install a new block.

Published: 11-May-2011

Engine System - General Information - Exhaust Manifold Cleaning and Inspection

General Procedures

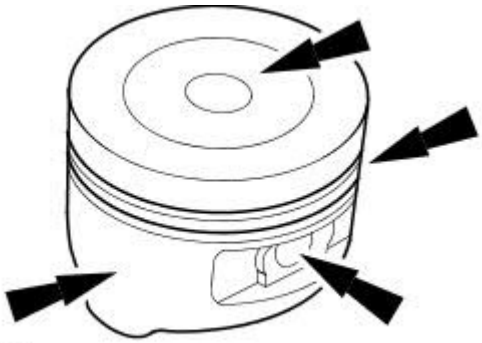
1. Inspect the cylinder head joining flanges of the exhaust manifold for evidence of exhaust gas leaks.

2. Inspect the exhaust manifold for cracks, damaged gasket surfaces, or other damage that would make it unfit for further use.

Published: 11-May-2011

Engine System - General Information - Piston Inspection

General Procedures



VUJ0002233

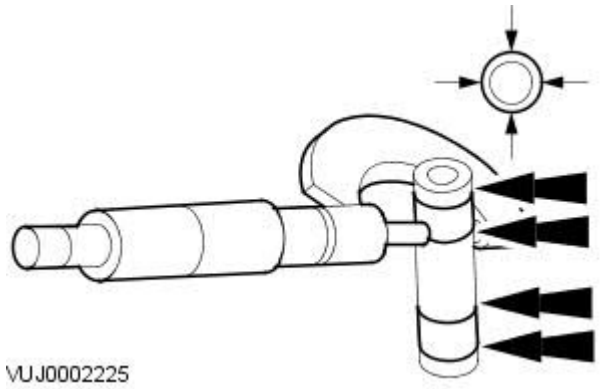
1. CAUTION: Do not use any aggressive cleaning fluid or a wire brush to clean the piston.

   Carry out a visual inspection.
   - Clean the piston skirt, pin bush, ring grooves and crown and check for wear or cracks.
   - If there are signs of wear on the piston skirt, check whether the connecting rod is twisted or bent.

Published: 11-May-2011

Engine System - General Information - Piston Pin Diameter

General Procedures



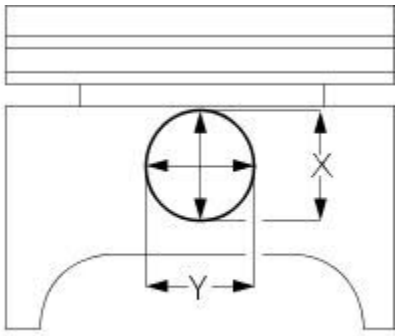
1. NOTE: The piston and piston pin are a matched pair. Do not mix up the components.

   Measure the piston pin diameter.
   - Measure the diameter in two directions.
   - If the values are not to specification, install a new piston and a new piston pin.

Published: 11-May-2011

Engine System - General Information - Piston Pin to Bore Diameter

General Procedures



VUJ0002232

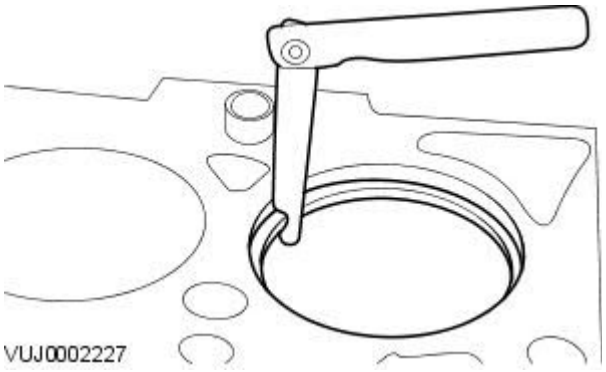
1. NOTE: The piston and piston pin form a matched pair. Do not mix up the components.

   Measure the diameter of the piston pin bore.
   - Measure the diameter in two directions.
   - If the values are not to specification, install both a new piston and a new piston pin.

Published: 11-May-2011

Engine System - General Information - Piston Ring End Gap

General Procedures



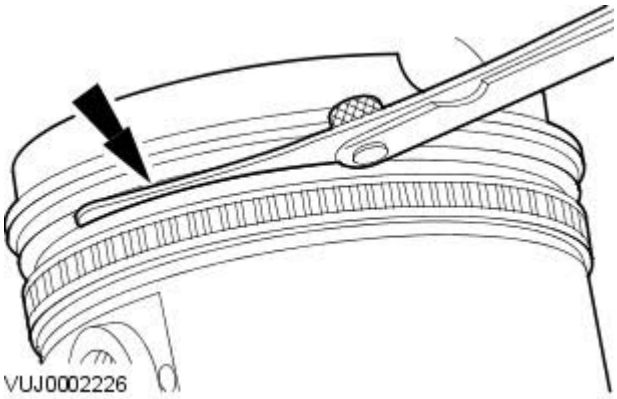
1. CAUTION: Do not mix up the piston rings. Install the piston rings in the same position and location.

   Using the Feeler Gauge, measure the piston ring gap.
   - The values given in the specification refer to a gauge ring used during production.

Published: 11-May-2011

Engine System - General Information - Piston Ring-to-Groove Clearance

General Procedures



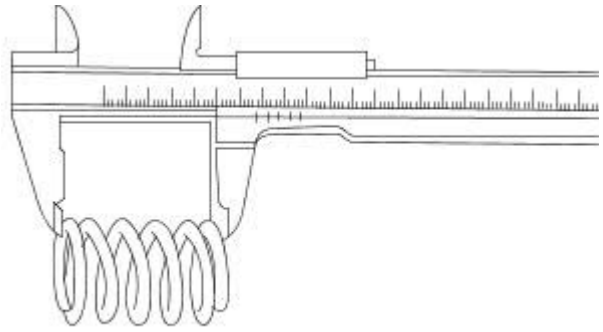
1. NOTE: The piston ring must protrude from the piston groove. To determine the piston ring clearance, insert the Feeler Gauge right to the back of the groove, behind the wear ridge.

   Using the Feeler Gauge, measure the piston ring clearance.

Published: 11-May-2011

Engine System - General Information - Valve Spring Free Length

General Procedures



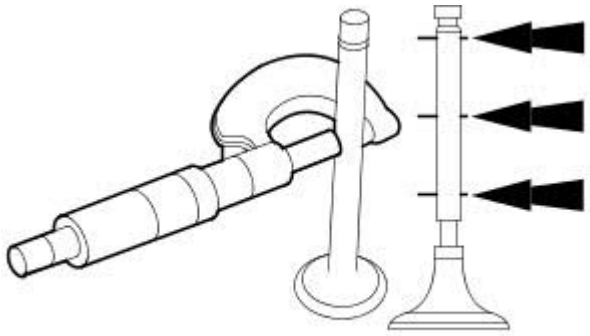
VUJ0002221

1. Using a vernier gauge, measure the free length of each valve spring. Verify the length is within specification.

Published: 11-May-2011

Engine System - General Information - Valve Stem Diameter

General Procedures



VUJ0002220

1. Using a micrometer measure the diameter of the valve stems.
    - If the measurements are not to specification, install a new valve.

Published: 02-Jun-2011

Engine System - General Information - Leakage Test Using Smoke Test Equipment

General Procedures

CAUTION: The compressed air line supply pressure must be between 3.5 and 12 bar (50 and 175 psi) for the smoke test equipment to function correctly. Do not exceed this pressure. Failure to follow this instruction may result in damage to the smoke test equipment.

NOTES:

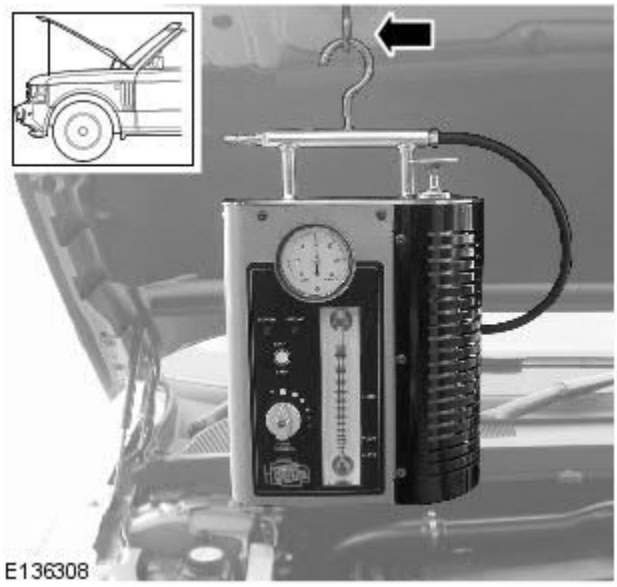
The vehicle battery must be in good condition and fully charged before carrying out this procedure.

On vehicles with 3.0L TDV6, it will be necessary to insert smoke at both air cleaner outlet pipes independently if the right hand turbocharger and associated hoses are to be tested.

In some cases it may be necessary to remove undertrays, trim or engine covers to obtain access to all potential leak locations.

Some variation in the illustrations may occur, but the essential information is always correct.

For further information regarding operation of the test equipment refer to the manufacturers operators manual supplied with the kit.



1. WARNING: Use an additional support to prevent the hood from falling if the smoke test equipment is secured to the hood. Failure to follow this instruction may result in personal injury.

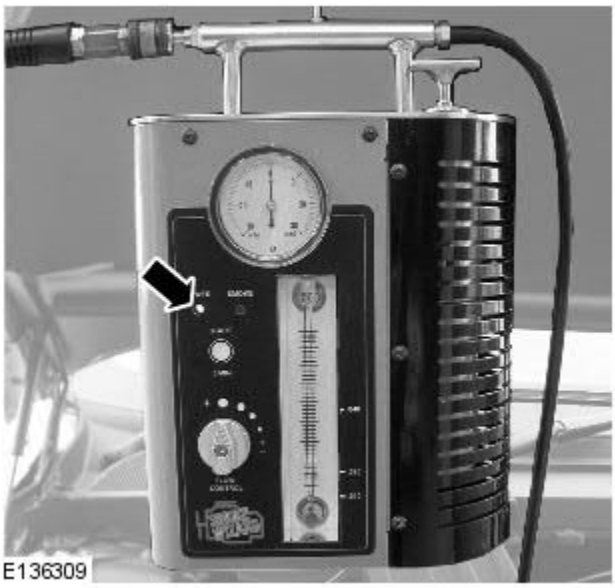
   Install the smoke test equipment to a suitable location under the hood.

2. Connect a suitable compressed air line to the smoke test equipment.

3. Connect the smoke test equipment positive power cable to the battery positive terminal.

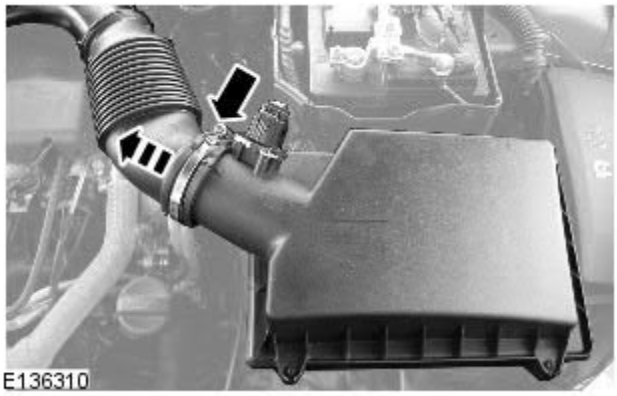
4. WARNING: Do not connect the smoke test equipment negative cable to the battery negative terminal.

   Connect the smoke test equipment negative cable to a suitable body ground point.



5. NOTE: A flashing green light indicates low battery voltage. In this case, place the battery on charge and make sure that the battery is fully charged before using the smoke test equipment.

   Observe the power indicator lamp on the smoke test equipment. Make sure that a continuous green light is displayed.

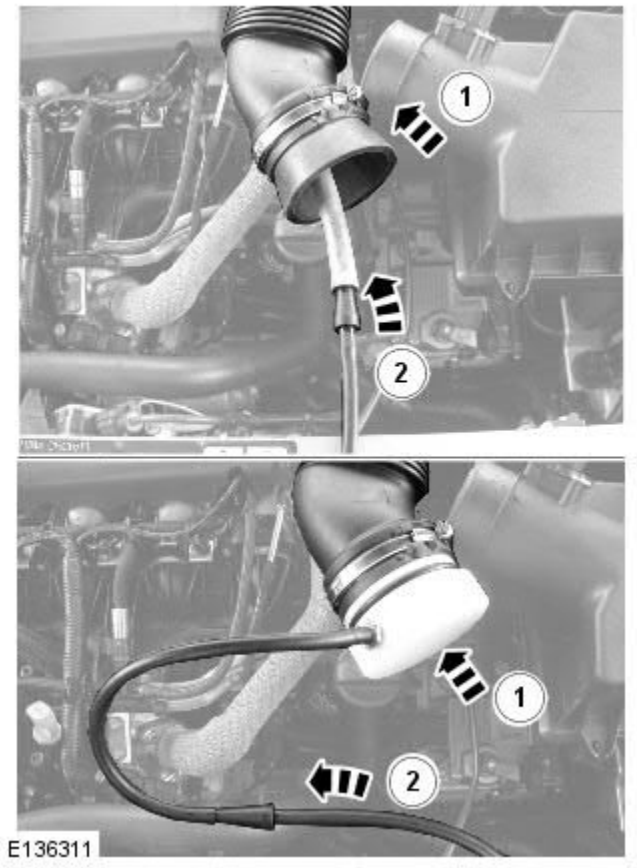


6. NOTES:

   In some cases it may be necessary to remove the air cleaner(s) to allow access to the air cleaner outlet pipes.

   In some cases it will be necessary to cap one of the air cleaner outlet pipes. Use the blanking caps supplied in the kit to cap the open orifice.

   Disconnect the air cleaner outlet pipe(s).



7. NOTE: Make sure the smoke test equipment adapter is a good fit to the air cleaner outlet pipe. This must be an air tight seal.

   Connect the smoke test equipment supply hose to the air cleaner outlet pipe.
   1. Install the appropriate adapter to the air cleaner outlet pipe.
   2. Connect the smoke test equipment supply hose to the adapter link hose.

8. NOTES:

   The flow control valve must be in the fully open position.

   Smoke is produced for 5 minutes. The smoke test equipment will automatically switch off after this period of time.

   Switch the smoke test equipment on.

9. Remove the oil filler cap, and observe until a constant flow of smoke is visible leaving the oil filler orifice. Install the oil filler cap.

10. NOTE: The longer smoke is allowed to exit from a leak, the more fluorescent dye will be deposited at a leak location.

    Using the torch supplied in the kit set to white light, look for escaping smoke. Alternatively, use the ultraviolet light to look for fluorescent dye deposits at the source of a leak.

Published: 11-Nov-2011

Engine System - General Information - Cylinder Head Gasket Selection TDV6 3.0L Diesel

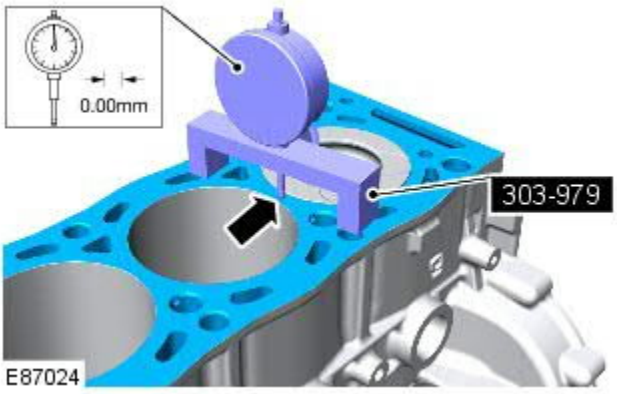
General Procedures

Special Tool(s)

	303-979 Measuring Bridge, Piston Protusion

Check

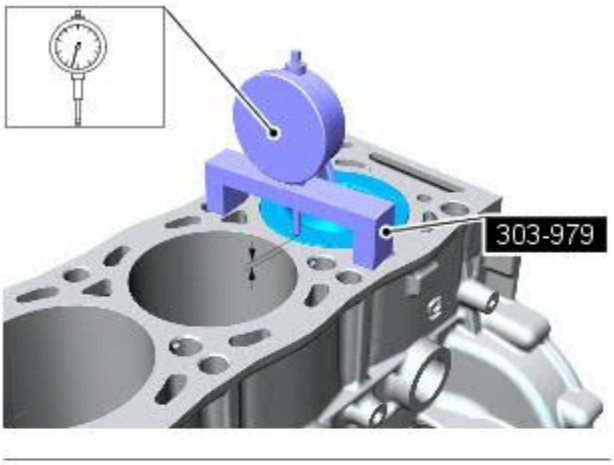
NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

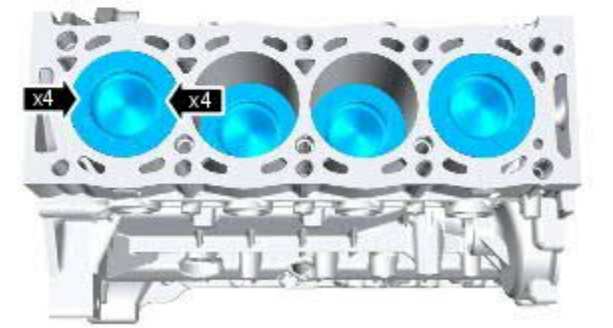


1. CAUTION: Make sure that the surface is clean and free of foreign material.

   Zero the gauge on the cylinder block machined face.

   Special Tool(s): 303-979





E87025

2. CAUTION: Make sure that the surface is clean and free of foreign material.

   NOTE: Note the dial gauge readings.

   Take 2 measurements on each piston crown.

3. Use the average piston protrusion measurement (taken from all piston measurements), to select the correct thickness cylinder head gasket.

   Refer to: Specifications (303-01A Engine - TDV6 3.0L Diesel, Specifications).

www.JagDocs.com

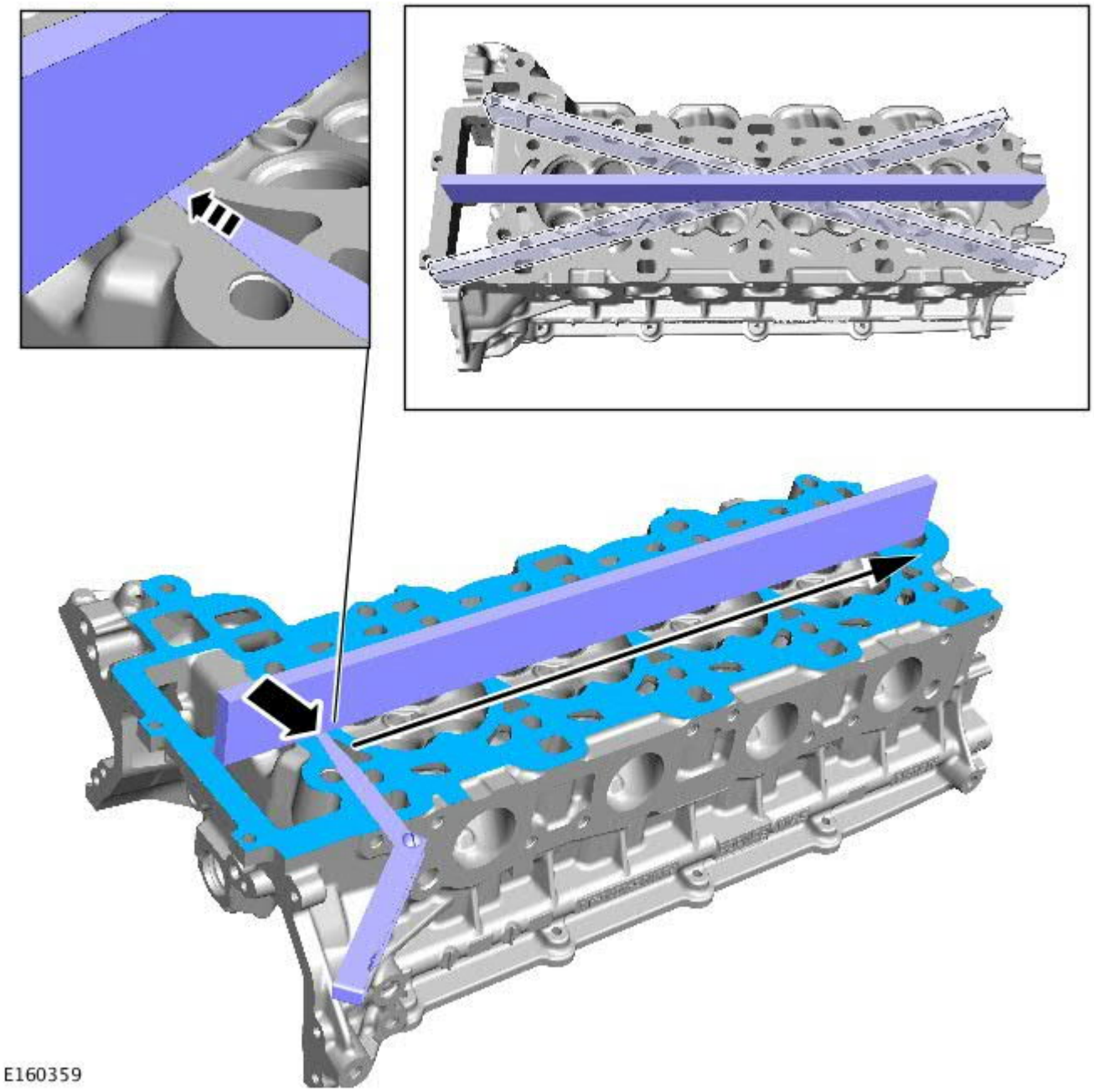
Published: 17-Jun-2014

Engine System - General Information - Cylinder Head Distortion

General Procedures

Check

1. Using a suitable metallic straight edge and feeler gauge, measure the cylinder head face in the areas illustrated. **Note the maximum value**.



2. CAUTION: Machine the **minimum** thickness of material from the cylinder head to meet specification. If a selection of cylinder head gaskets are available, increase the thickness of the cylinder head gasket by one size.

   NOTES:

Prior to having the cylinder head machined, prior approval is required by Jaguar or Land Rover engineering.

If the cylinder head requires machining, this must be carried out by a local engineering company.

If the cylinder head exceeds the maximum value (0.2mm), the cylinder head must be machined.

Published: 09-Apr-2014

Engine System - General Information - Cylinder Compression Test TDV6 3.0L Diesel

General Procedures

Special Tool(s)

E164040	JLR-303-1623-2 Adaptor, Compression Tester
E164039	JLR-303-1629 SP 90 Degree Elbow, Compression Tester

Check

CAUTION: Before disconnecting or removing components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

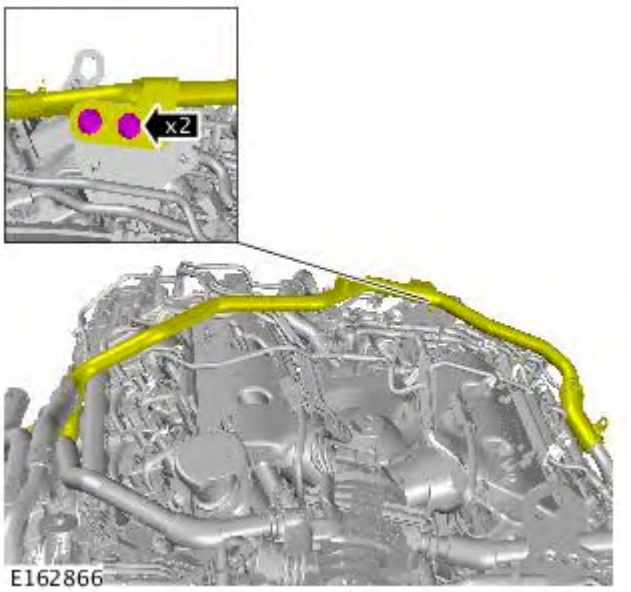
NOTES:

Removal steps in this procedure may contain installation details.

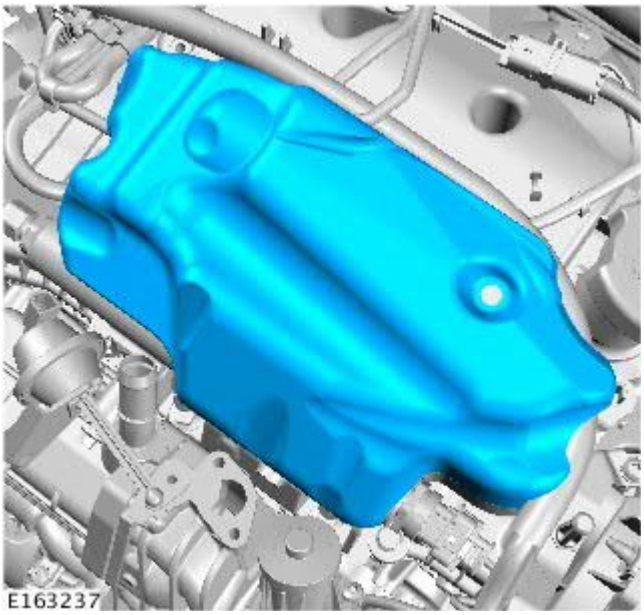
Some variation in the illustrations may occur, but the essential information is always correct.

The vehicle battery must be in good condition and fully charged before carrying out this procedure.

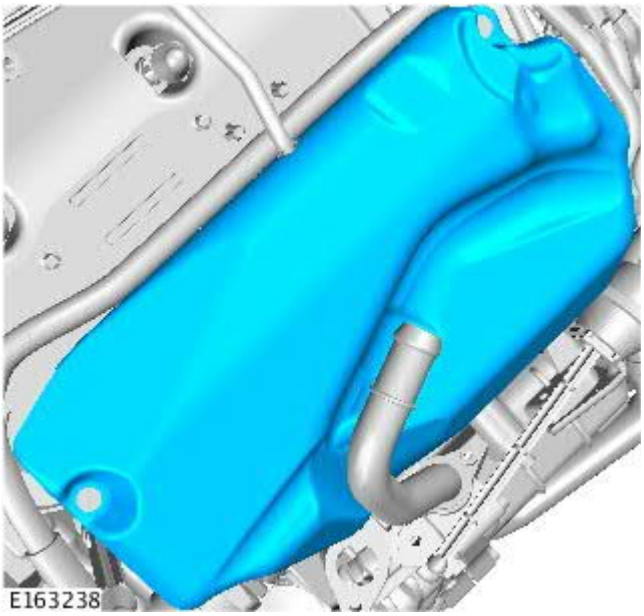
1. Refer to: Glow Plugs (303-07B Glow Plug System - TDV6 3.0L Diesel, Removal and Installation).



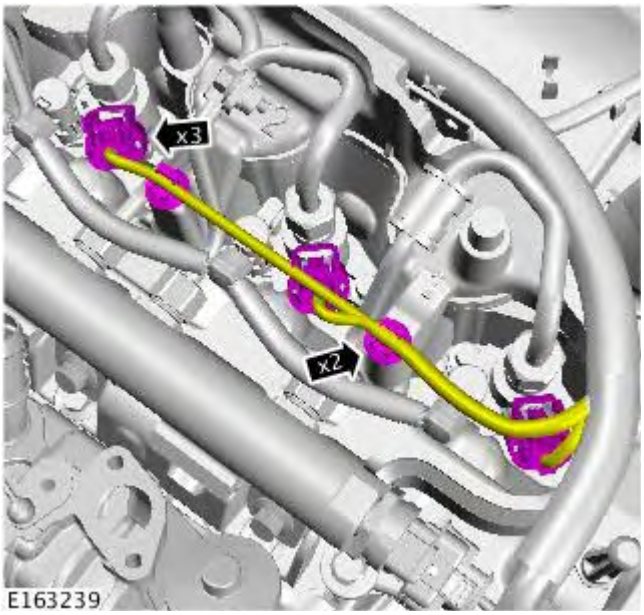
2. *Torque:* 10 Nm



3. NOTE: Some components shown removed for clarity.

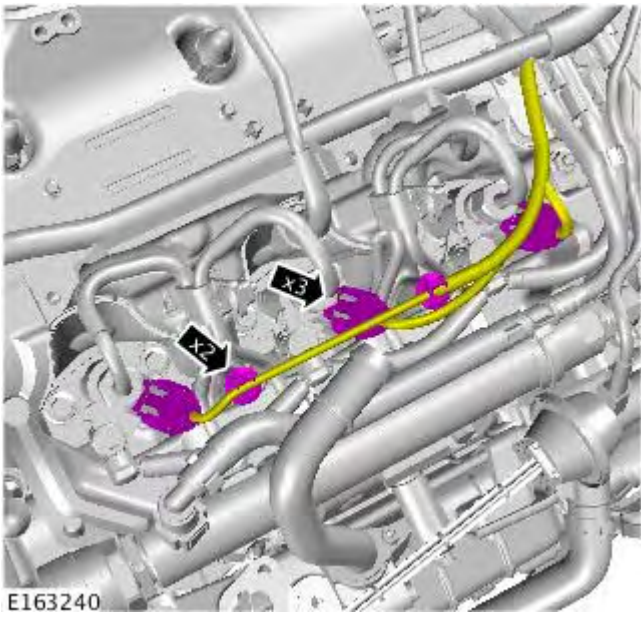


4. NOTE: Some components shown removed for clarity.



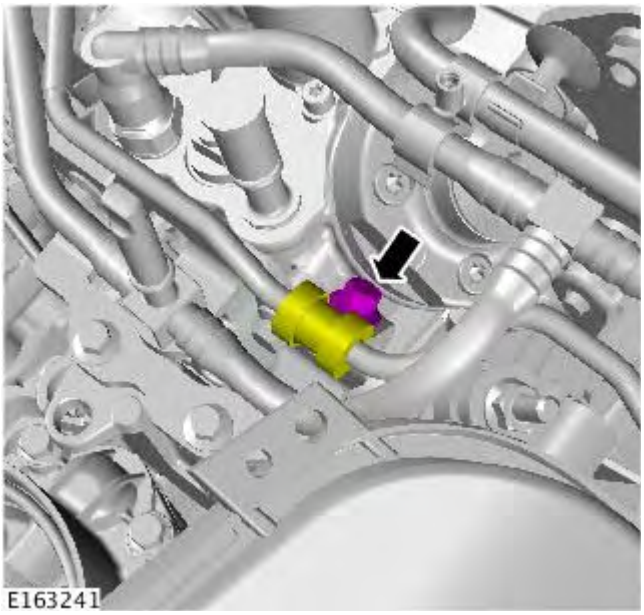
5. CAUTION: Make sure the fuel injection system is disabled before carrying out a cylinder compression test. Failure to follow this step may result in damage to the vehicle.

NOTE: Some components shown removed for clarity.

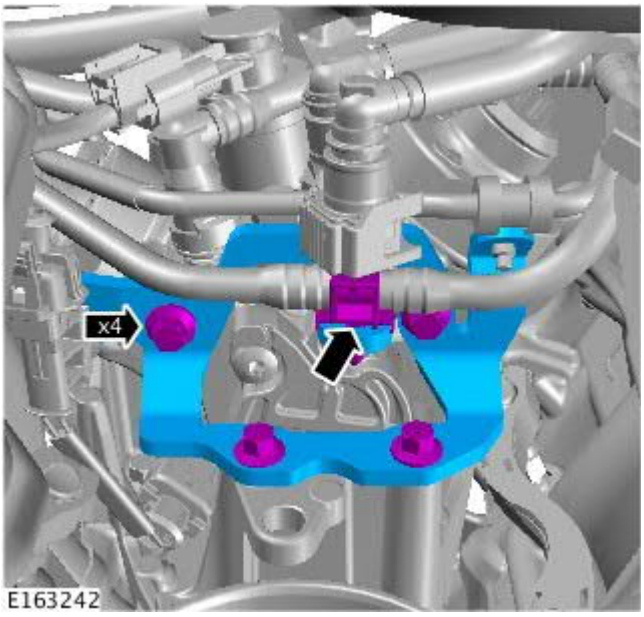


6. CAUTION: Make sure the fuel injection system is disabled before carrying out a cylinder compression test. Failure to follow this step may result in damage to the vehicle.

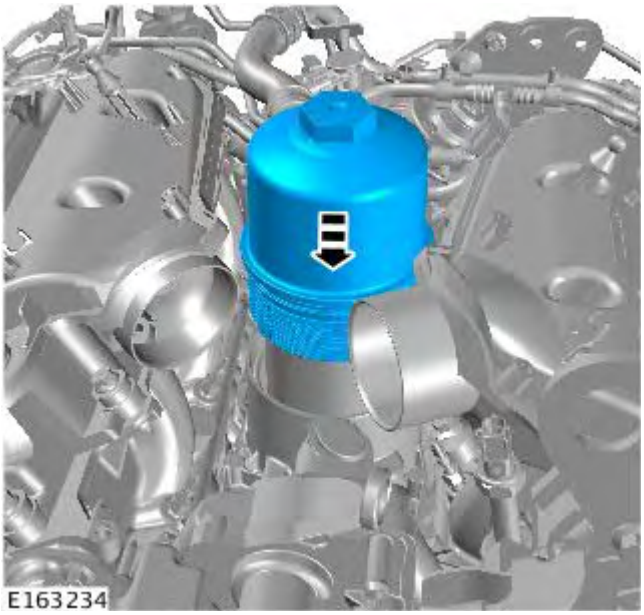
NOTE: Some components shown removed for clarity.



7. *Torque:* 10 Nm



8. *Torque:* 10 Nm

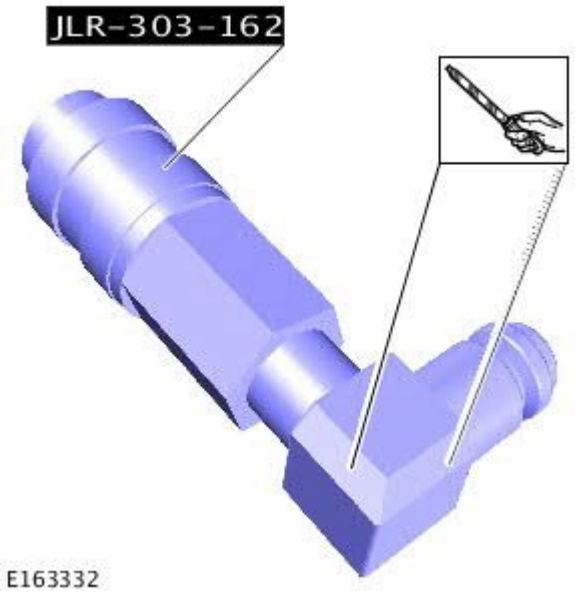


9. Install the oil filter element and housing.

   Torque: 28 Nm

10. CAUTION: Make sure the fuel injection system is disabled before carrying out a cylinder compression test. Failure to follow this step may result in damage to the vehicle.

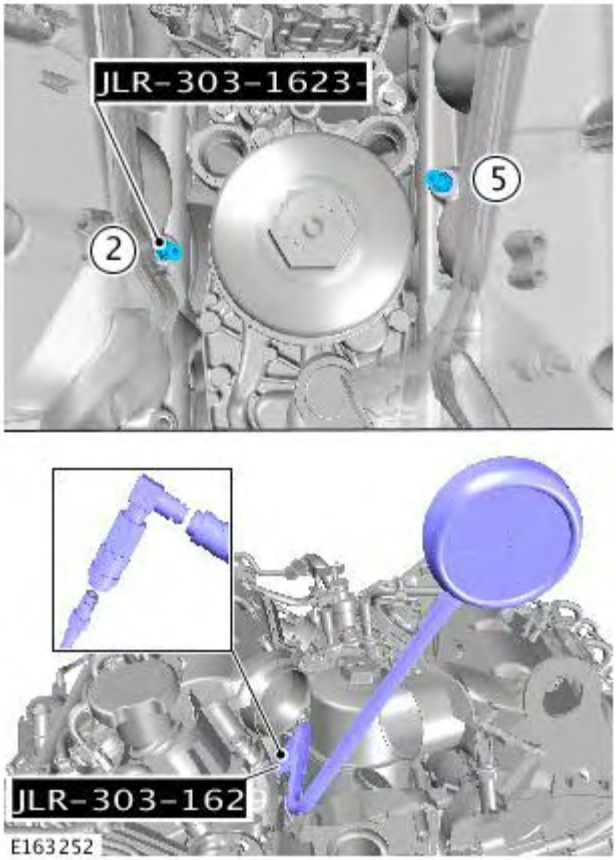
    Crank the engine for approximately five seconds to remove any remaining fuel in the cylinders.



11. CAUTION: Make sure that the component is clean, free of foreign material and lubricant.

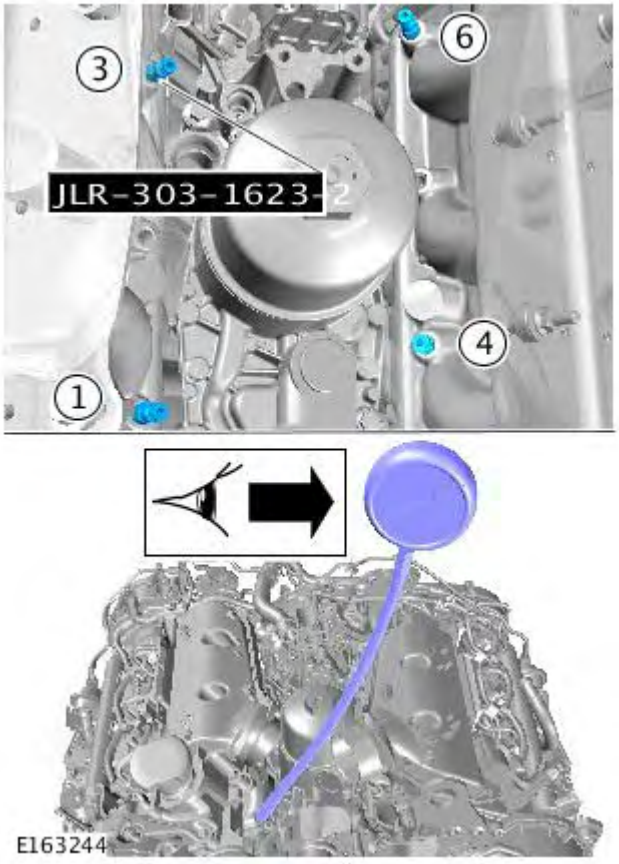
    Using a suitable tool, remove the corner edges of special tool JLR-303-1629 as illustrated.

    Special Tool(s): JLR-303-1629

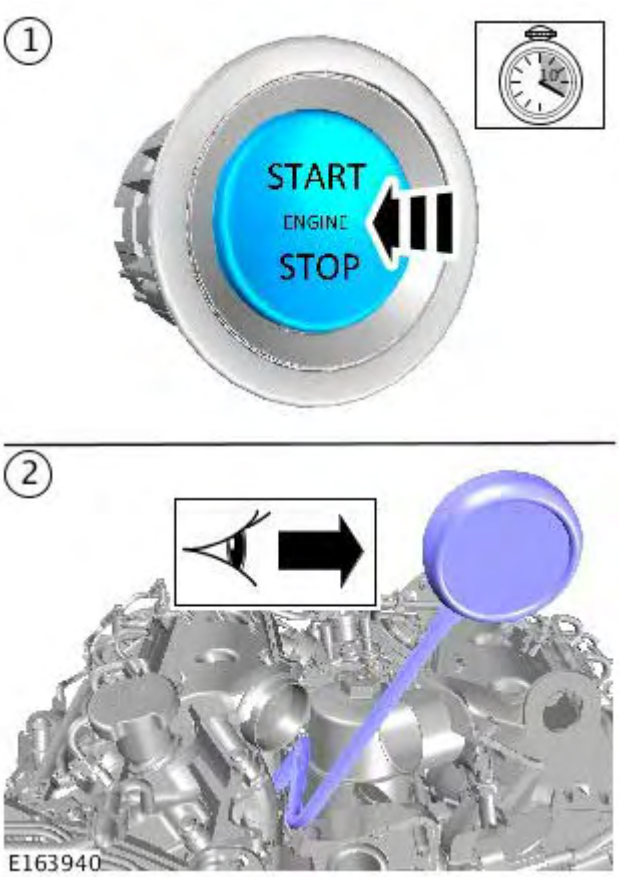


12. NOTE: The compression test gauge requires special tool JLR-303-1629 for cylinders 2 and 5.

    Special Tool(s): JLR-303-1623-2, JLR-303-1629
    Torque: 10 Nm



13. *Special Tool(s):* JLR-303-1623-2
Torque: 10 Nm



14. NOTES:

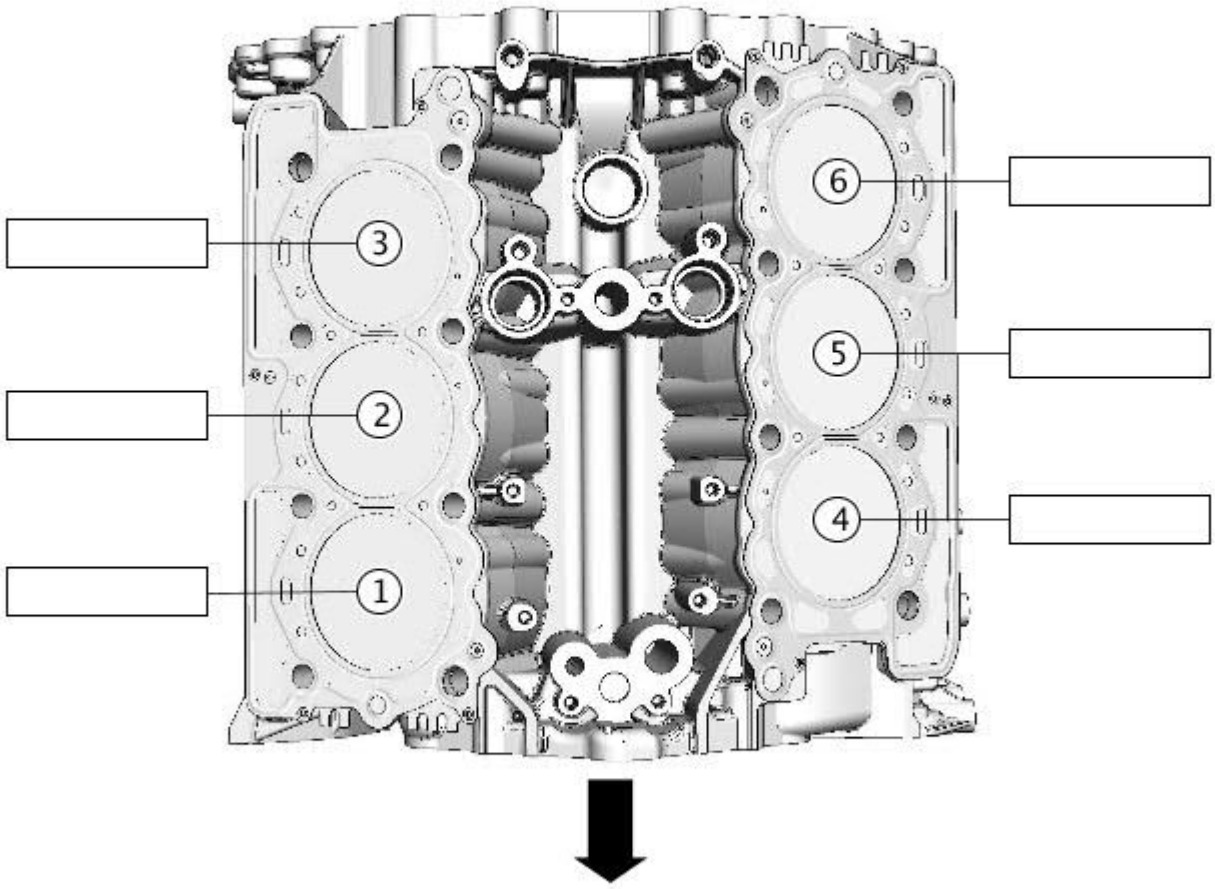
This step requires the aid of another technician.

Print graphic number E163867 in Step 15. Use this graphic to record each cylinder compression figure.

The vehicle battery must be in good condition and fully charged before carrying out this procedure.

Crank the engine for 10 seconds and record the figure displayed on the compression test gauge. Make sure the pressure is released from the compression test gauge after each cylinder recording. Repeat the process for all cylinders.

15.



E163867

16. NOTE: Remove and discard all blanking caps.

    To install, reverse the removal procedure.

17. The minimum cylinder compression reading recorded must be within 10% of the maximum cylinder compression reading recorded. If the difference across the cylinders is higher than 10% please contact dealer technical support (DTS) for further assistance.

18. Using Land Rover approved diagnostic equipment, read and clear any diagnostic trouble codes (DTCs).

Published: 23-Jul-2014

Engine - TDV6 3.0L Diesel -

Engine Data

Engine Description	Engine Capacity	Maximum Engine Torque (EEC) (SAE)	Maximum Engine Power (EEC) (SAE)	Compression Ratio	Bore	Stroke
60° "Vee" • 6 Cylinder • 24 Valves	2993 ccm	600 Nm at 2000 RPM	202 kW at 4000 RPM	16.1:1 ± 0.5	84	90

Engine Firing Order

Firing Order
1:4:2:5:3:6

Glow Plug

Specification
9X2Q-6M090-AC

Lubricants,Fluids,Sealers and Adhesives

Description	Specification
Engine oil (EUR)	5W–30 meeting Jaguar WSS–M2C934–B
Engine oil (ROW)	5W–30 meeting Jaguar WSS–M2C913–B or C
Sealant	WSE–M4G323–A5
Core plug and stub pipe retainer	WSK-M2G349-A7
Jaguar premium cooling system fluid	WSS-M97B44-D

Capacities

Description	Liters
Engine oil initial fill	7.7
Engine oil service fill with oil filter change	6.6

Cylinder Head and Valve Train

Item	Specification
Valve guide inner diameter (mm)	5.980 ± 0.010
Intake valve effective length (mm) (tip to gauge line)	94.99mm +/- 0.15
Exhaust valve effective length (mm) (tip to gauge line)	94.45mm +/-0.15
Valve stem to guide clearance intake diametrical (mm)	0.027 - 0.063
Valve stem to guide clearance exhaust diametrical (mm)	0.037 - 0.073
Valve head diameter intake (mm)	27.8mm +/-0.1
Valve head diameter exhaust (mm)	25.2mm +/-0.1
Intake valve face angle (degrees)	44 deg 52 min +/-7min30sec
Exhaust valve face angle (degrees)	44 deg 52 min +/-7min30sec
Valve stem diameter intake (mm)	5.935±0.008
Valve stem diameter exhaust (mm)	5.925±0.008
Valve spring free length (mm) - inlet	38.9mm
Valve spring free length (mm) - exhaust	38.9mm
Valve spring installed height (mm) - inlet	31.22mm
Valve spring installed height (mm) - exhaust	31.22mm
Camshaft lobe max lift intake (mm)	3.75187mm
Camshaft lobe max lift exhaust (mm)	3.80999mm
Camshaft journal to cylinder head bearing surface clearance diametrical (mm)	0.040-0.090
Camshaft journal diameter - all positions	25.950±0.010
Bearing diameter - all positions	26.015±0.015
Camshaft journal maximum run out limit (mm)	0.030mm
Camshaft journal maximum out of round (mm) - all journals	0.010mm
Cylinder head **maximum** permitted warp (flatness specification)	0.2 mm (0.008 in)

Cylinder Head Gasket

Identification	Gasket Thickness (mm)	Piston Protrusion (mm)
2	1.17	0.552 - 0.603
3	1.22	0.604 - 0.655
4	1.27	0.656 - 0.707
5	1.32	0.708 - 0.760

Torque Specification

NOTE: A = refer to procedure for correct torque sequence

Description	Nm	lb-ft	lb-in
Piston cooling nozzle	10	7	88
Engine coolant drain plug	18	13	159
Cylinder head retaining bolts	**A**	-	-
Oil filter housing retaining bolts	10	7	88
Fuel injection pump cradle retaining bolts	23	17	203
Fuel injection pump to cradle retaining bolts	23	17	203

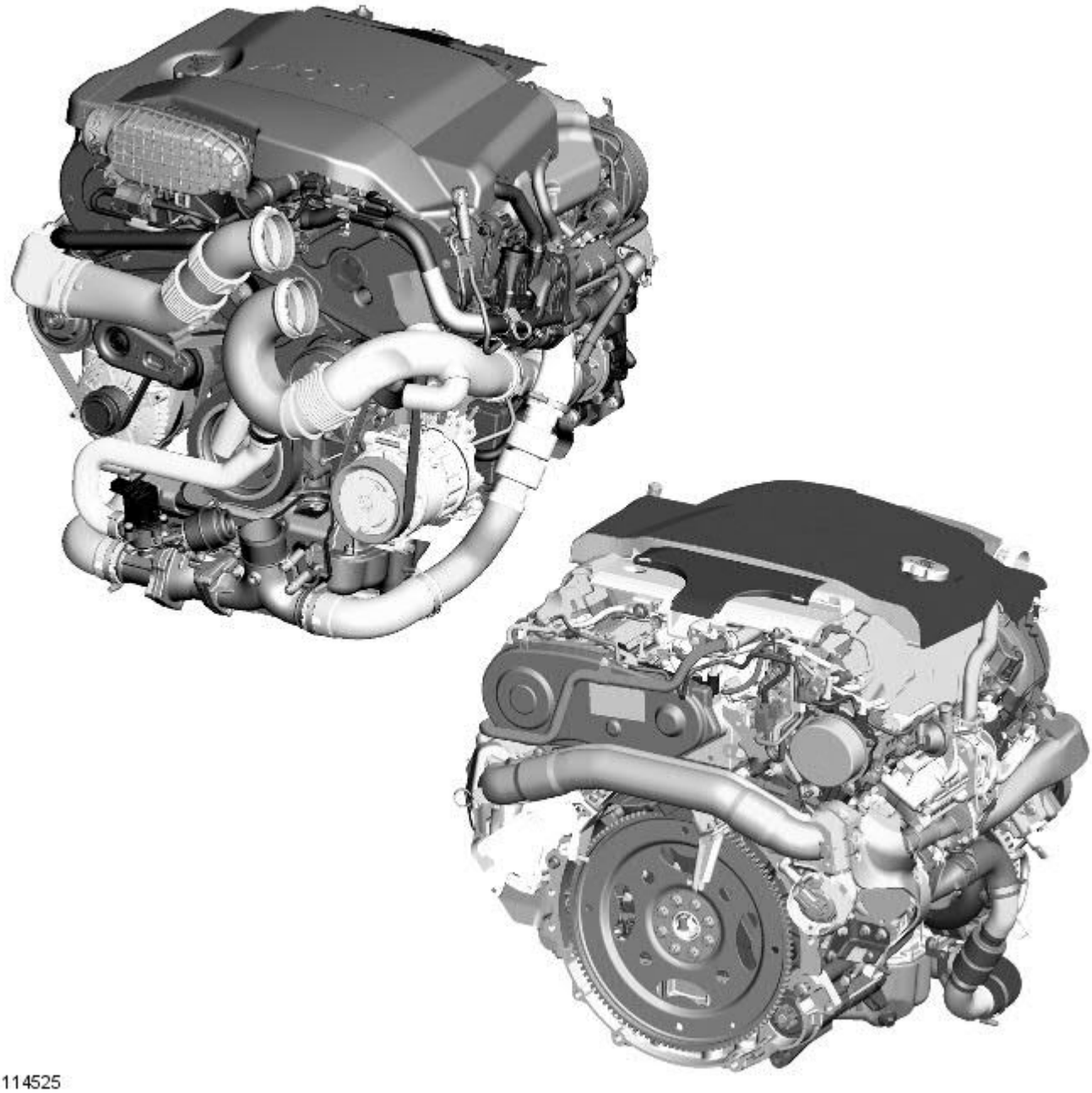
Description	Nm	lb-ft	lb-in
Fuel injection pump bracket to cradle retaining bolts	10	7	88
Fuel injection pump to bracket retaining bolts	10	7	88
Oil pump retaining bolts	10	7	88
Crankshaft rear oil seal housing retaining bolts	10	7	88
Oil pan extension retaining bolts M6	10	7	88
Oil pan extension retaining bolts M8	23	17	88
Oil pump pick up pipe retaining bolts	10	7	88
Oil pan retaining bolts	10	7	88
Engine oil level sensor retaining nuts	10	7	88
Crankshaft timing belt pulley retaining bolt	**A**	-	-
Crankshaft position sensor (CKP) retaining bolt	5	-	44
Timing chain tensioner retaining bolts	10	7	88
Camshaft bearing cap retaining bolts	**A**	-	-
Timing belt idler pulley retaining bolt	45	33	398
Fuel injection pump belt rear cover retaining bolts	10	7	88
Fuel injection pump sprocket retaining nut	50	37	442
Coolant outlet pipe retaining bolts	10	7	88
Coolant pump retaining bolts	10	7	88
Timing belt tensioner retaining bolt	26	19	230
Engine lifting eye bolts	23	17	203
Camshaft rear end accessory drive (READ) pulley hub retaining bolt	Stage 1 - 80 Stage 2 - 80 degrees	Stage 1 - 59 Stage 2 - 80 degrees	Stage 1 - 708 Stage 2 - 80 degrees
Camshaft front timing pulley hub retaining bolt	80 + 80°	59 + 80 °	708 + 80°
Camshaft READ pulley retaining bolt	23	17	203
Camshaft front timing pulley retaining bolt	23	17	203
Fuel injection pump timing belt tensioner bolt	23	17	203
Camshaft position sensor (CMP) retaining bolt	10	7	88
Intake manifold / camshaft cover retaining bolts	10	7	88
Brake vacuum pump retaining bolts	23	17	203
Engine oil pressure (EOP) switch	14	10	124
Glow plug	11	8	97
Fuel rail retaining bolts	23	16	203
Fuel rail bracket retaining bolts	23	16	203
Fuel injector retaining bolts	**A**	-	-
High pressure fuel line union nuts	**A**	-	-
High pressure fuel line bracket retaining bolts	9	-	80
Turbocharger assembly to exhaust manifold retaining nuts	24	18	212
Exhaust manifold to cylinder head retaining nuts	**A**	-	-
Exhaust manifold heatshield retaining bolts	11	8	97
Turbocharger heatshield retaining bolts	11	8	97
Exhaust gas recirculation (EGR) valve retaining bolts M6	10	7	88
Accessory drive belt idler pulley bracket retaining bolts	83	61	735
Timing belt covers retaining bolts	10	7	88
Engine mount bracket to engine retaining bolts	90	66	796
Exhaust cross over pipe retaining nuts	24	18	212
Engine coolant inlet pipe retaining bolts	10	7	88
Coolant pump pulley retaining bolts	25	18	221
Crankshaft pulley/vibration damper retaining bolts	25	18	221
Throttle body retaining threaded stud	10	7	88
Wiring harness retaining nuts	10	7	88
Vacuum hose assembly retaining bolts	10	7	88
Flexplate retaining bolts	**A**	-	-
Accessory drive component bracket retaining bolts	23	17	203
Power steering pump retaining bolts	23	17	203
Generator retanining bolts	47	35	416
Accessory drive belt tensioner retaining bolt	47	35	416
Accessory drive belt idler pulley retaining bolt	47	35	416
Air conditioning compressor bracket retaining bolts	23	17	203
Air conditioning compressor retaining bolts	23	17	203

Published: 11-May-2011

Engine - TDV6 3.0L Diesel - Engine - Component Location

Description and Operation

External Views



E114525

Published: 11-May-2011

Engine - TDV6 3.0L Diesel - Engine - Overview

Description and Operation

OVERVIEW

The 3.0 liter diesel engine is a V6 configuration unit with 2 banks of 3 cylinders arranged at 60 degrees to each other. There are 4 valves per cylinder, which are operated by 2 overhead camshafts per cylinder bank.

The cylinder block is cast in compacted graphite iron, which uses less material to produce compared to a conventional cast iron block. This provides reduced weight and length with superior structural capabilities. A separate aluminum ladder frame, bolted to the underside of the cylinder block, provides a lightweight, compact and very stiff bottom end of the engine.

The cylinder heads are cast aluminum with a moulded plastic camshaft cover with an integral air intake. The single-piece oil pan is formed from stamped steel. The exhaust manifolds are cast from an iron alloy. A moulded plastic acoustic cover is fitted over the upper engine to absorb engine-generated noise.

A low compression ratio of 16:1 contributes to improved emissions quality, quieter combustion and compatibility with the engine’s unique forced induction system. For additional information refer to Intake Air distribution and Filtering.

The low compression ratio also means less heat build-up in the piston bowl and more efficient fuel burn, resulting in the production of lower levels of pollutants. It also assists with cold starting allowing a faster cranking speed.

Published: 11-May-2011

Engine - TDV6 3.0L Diesel - Engine - System Operation and Component Description

Description and Operation

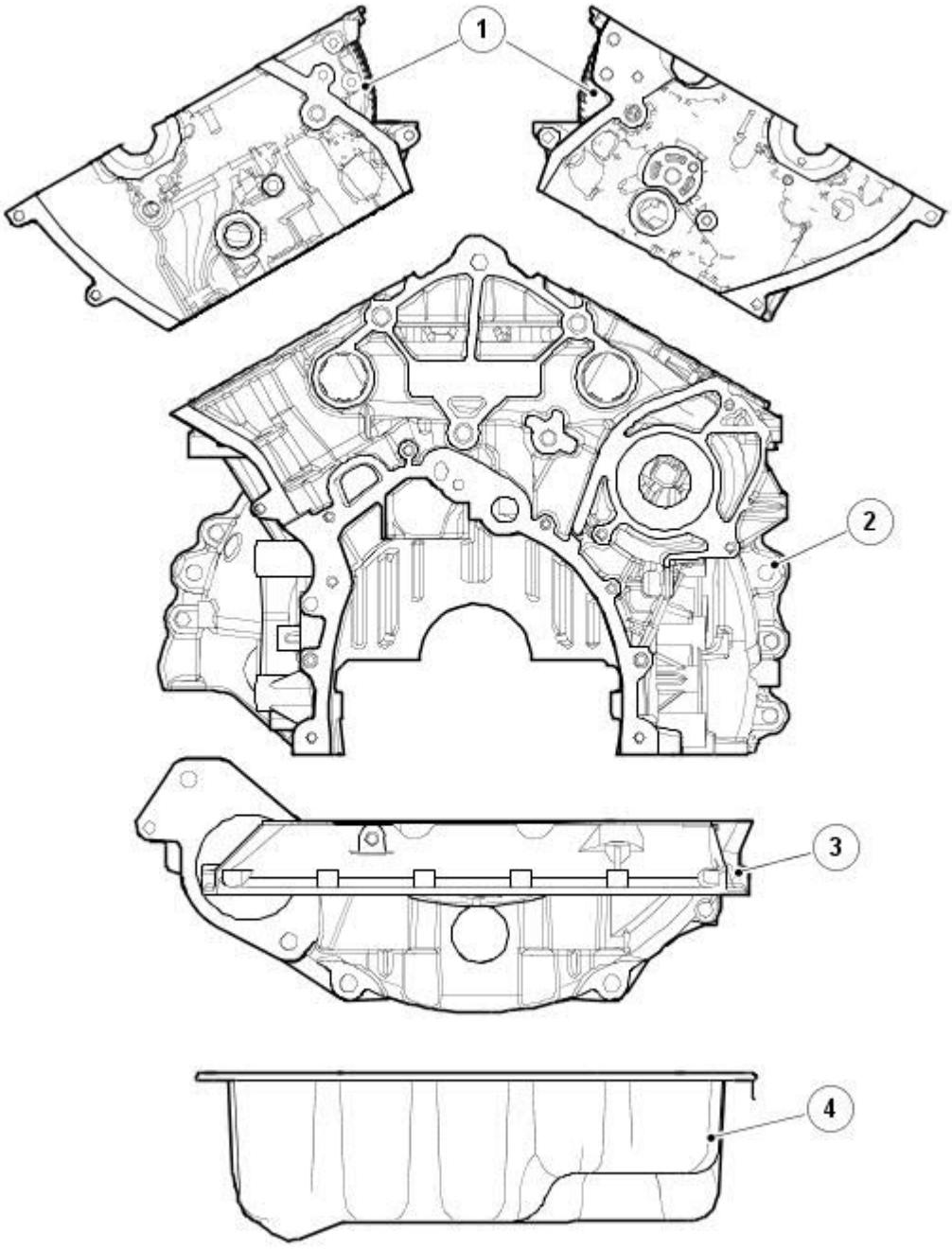
System Operation

OPERATION

Operation of the engine is controlled by the ECM (engine control module). For additional information refer to 303-14A Electronic Engine Controls.

Component Description

ENGINE STRUCTURE



Item	Description
1	Cylinder heads

2	Cylinder block
3	Stiffening frame
4	Oil pan

CYLINDER BLOCK COMPONENTS

The cylinder block is a single cast construction with a hollow beam structure, cast from compact graphite iron. This type of construction provides outstanding strength and durability and uses less material than a conventional cast iron block, therefore reducing engine weight and length.

The use of compact graphite iron allows the cross sectional areas of the casting to be reduced, compared with a conventional gray cast iron block. This ensures reduced engine weight and length, with higher structural capabilities.

To maintain the stiffness of the bottom end of the cylinder block and crankshaft system, the cylinder block has a deep skirt and bearing cap design. Each of the main bearing caps is double bolted at each side of the crankshaft bearing and cross bolted back to the cylinder block.

The cylinder block assembly is further stiffened by coupling it to a separate die cast aluminium stiffening frame, which is bolted to the cylinder block skirt faces and to the bearing caps.

Lubrication oil is distributed through the cylinder block, via a main oil gallery and channels bored in the block, to all critical moving parts. These channels divert oil to the main and connecting rod bearings via holes machined into the crankshaft.

A tapping at the rear of the cylinder block connects a pipe to the turbochargers by means of banjo connections. Oil is supplied, under pressure via this tapping, from the oil pump to provide lubrication for the bearings of the turbochargers.

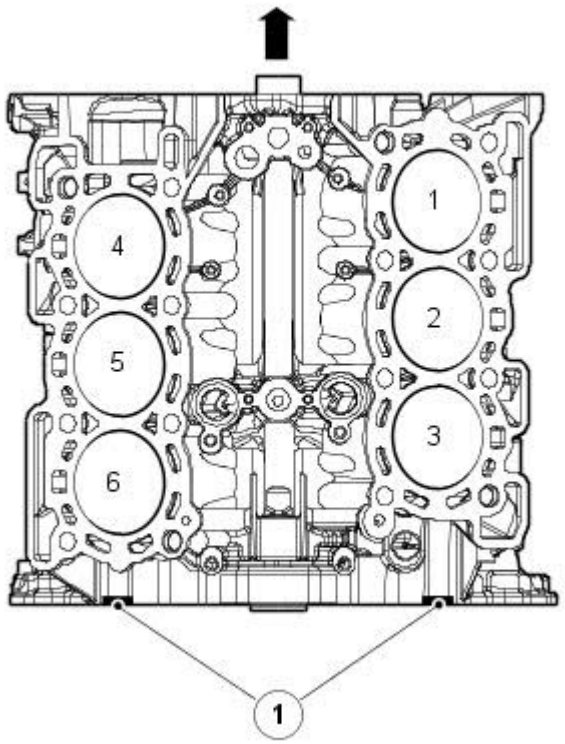
Cylinder cooling is achieved by coolant circulating through chambers in the cylinder block casting.

Two hollow metal dowels are used to locate the cylinder heads to the cylinder block, 1 on each side at the rear of the unit.

A port is included at the RH (right-hand) and LH (left-hand) side of the cylinder block, below each of the turbochargers, to connect the turbochargers oil return pipe to the oil pan.

Two coolant drain plugs are installed in the cylinder block; one is fitted in the rear RH side, and the other is fitted in the middle of the cylinder block on the LH side.

Engine Data



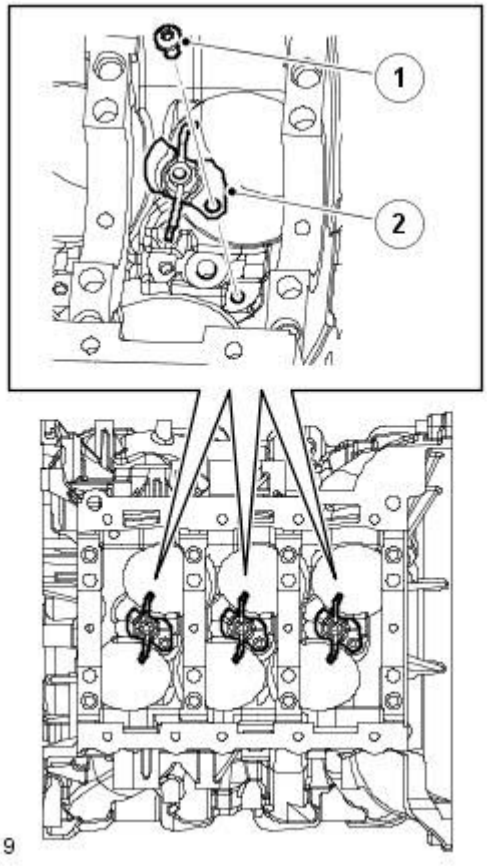
E44217

NOTE: Arrow indicates front of engine

Item	Description
1	Engine data locations

Engine data is marked at 2 locations at the back of the cylinder block. Component diameters are represented by alphabetical and numerical codes; keys to the codes are in the removal and installation section of this manual.

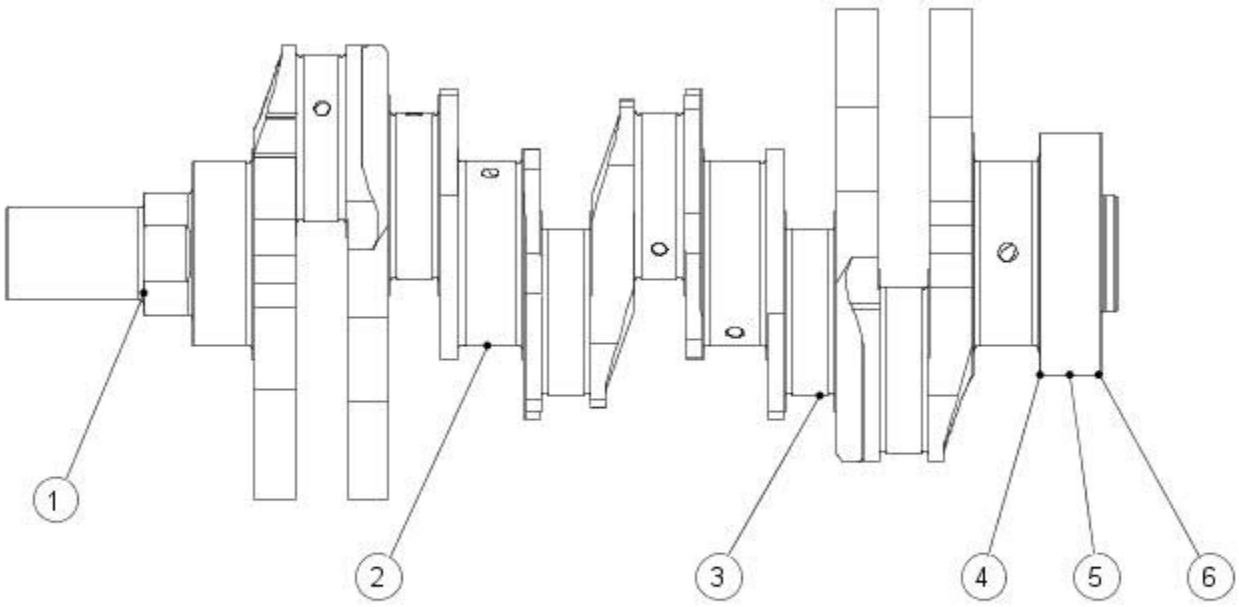
Piston Cooling Jets



Item	Description
1	Bolt
2	Cooling jet

Jets located in the cylinder block provide piston and piston pin lubrication and cooling. These jets spray oil onto the inside of the piston, the oil then flows through 2 internal wave shaped channels to help cool each piston crown.

CRANKSHAFT



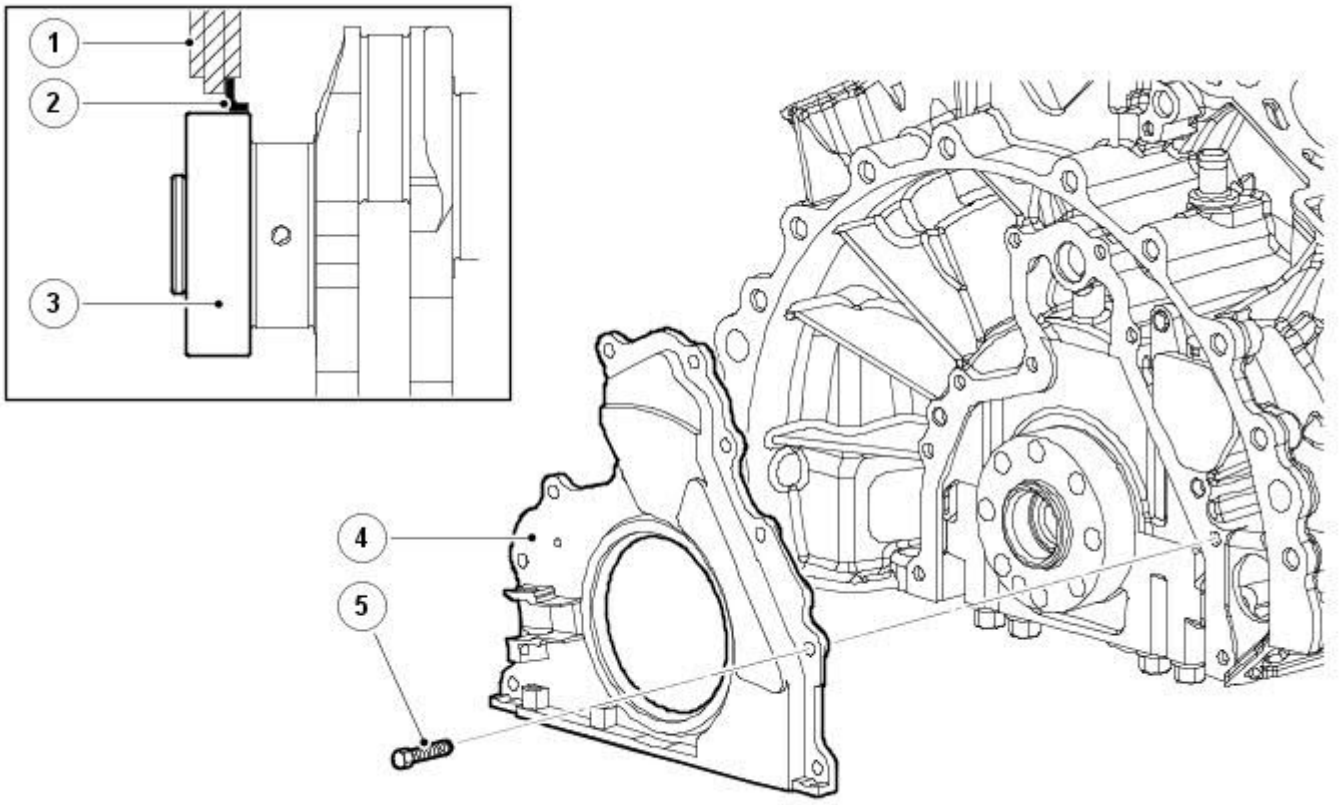
E52135

Item	Description
1	Oil pump drive
2	Main bearing Journal
3	Connecting rod bearing journal
4	Rear drive flange
5	Rear oil seal location
6	Trigger wheel location

The crankshaft is forged steel and fillet rolled with induction hardened journals, which run in 4 bearings with clamped 2 layer bearing shells. The upper and lower shells of bearing number 4 are flanged, which limits the end float of the crankshaft. The main bearing caps are double bolted and cross bolted to increase the strength and rigidity of the engine block.

The main bearings are aluminum/tin split plain selective bearings. An oil groove in the top half of each bearing transfers oil into the crankshaft for lubrication of the connecting rod bearings. The upper and lower shells of bearing number 4 contain integral thrust washers, which limit the end float of the crankshaft.

Rear Crankshaft Oil Seal



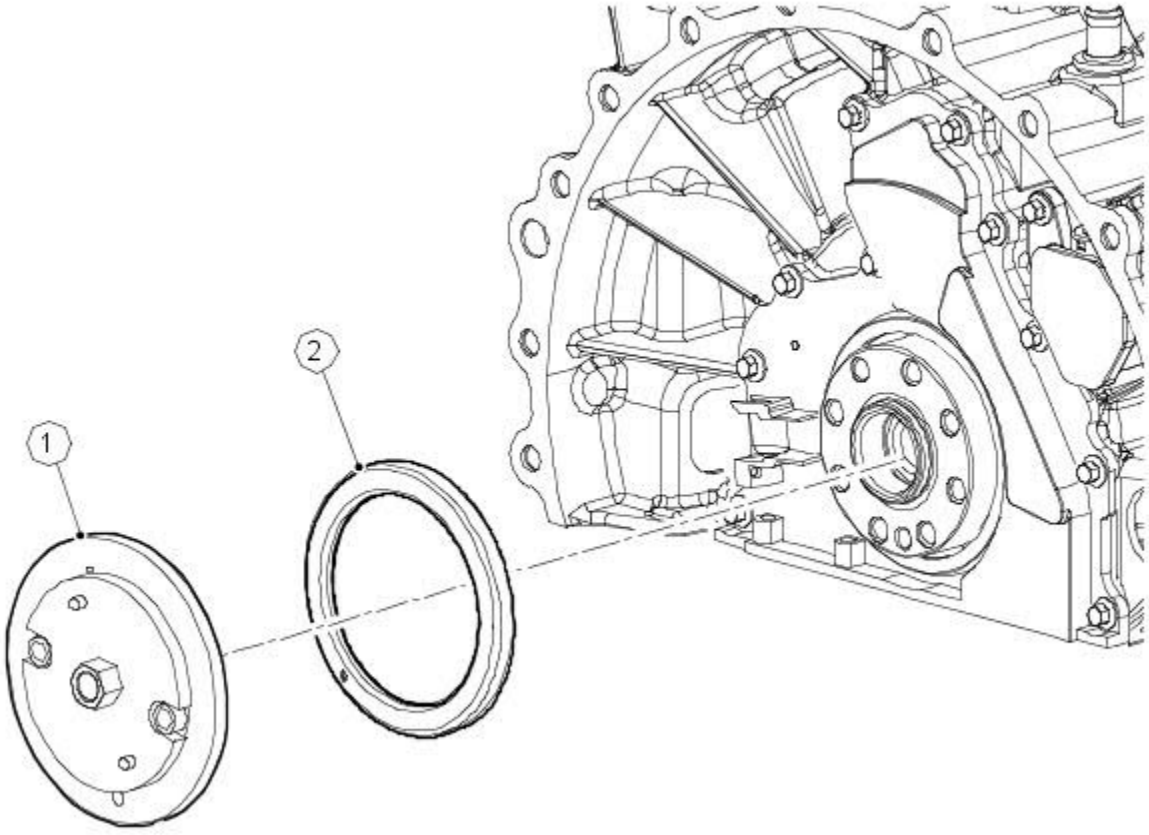
E44227

Item	Description
1	Housing
2	Seal
3	Crankshaft
4	Rear oil seal retainer
5	Bolt (10 off)

The rear main oil seal and retainer assembly is a one-piece unit and is supplied with its own plastic fitting sleeve. The seal and retainer have 2 locating dowels, 10 fixing bolts and a rubber seal. In addition, the retainer has a location for the crankshaft position sensor.
Refer to: Electronic Engine Controls (303-14A Electronic Engine Controls - TDV6 3.0L Diesel, Description and Operation).

A torsional vibration crankshaft damper pulley is bolted to the front of the crankshaft.

Crankshaft Trigger Wheel



E52137

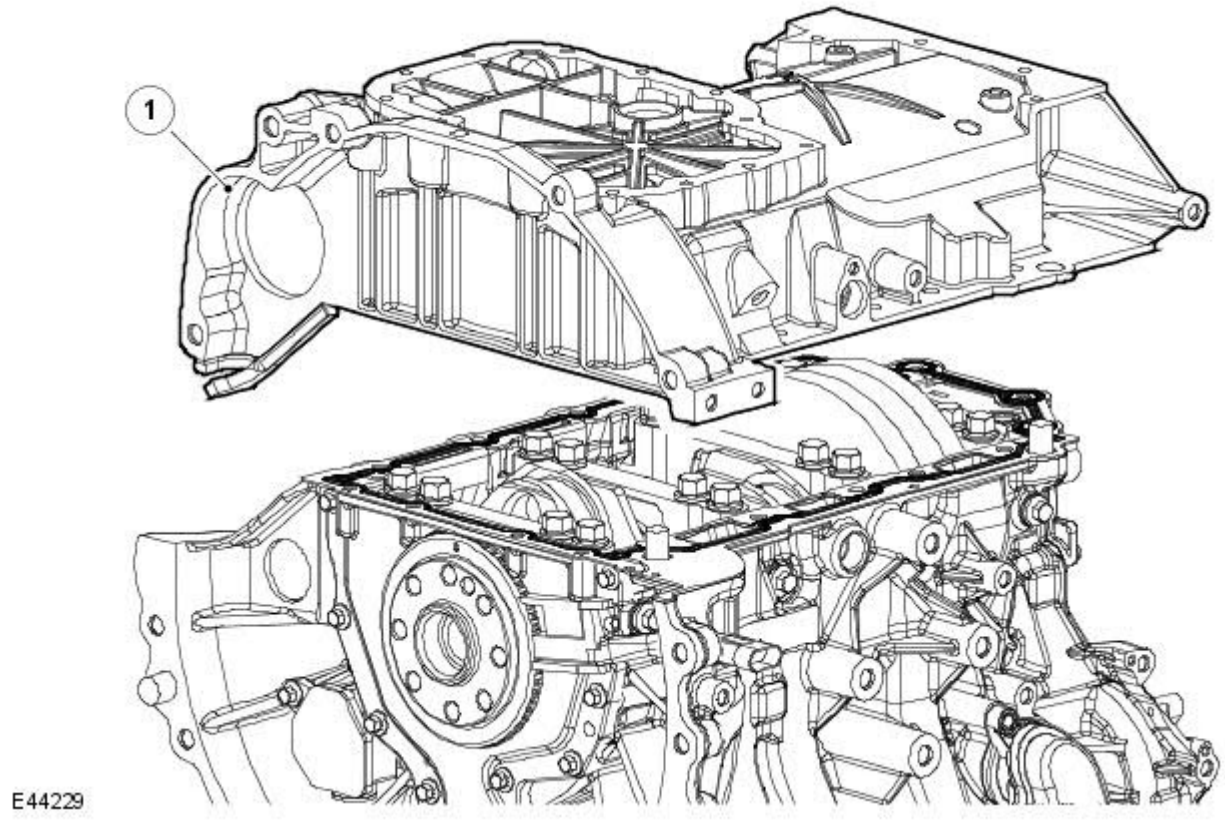
Item	Description
1	Special Tool
2	Trigger wheel

The crankshaft trigger wheel is located on the rear of the crankshaft. It is pressed onto the crank using a special tool, which also precisely aligns the trigger wheel for crankshaft position and timing.

The trigger wheel consists of 60 magnets minus 2 for ECM crankshaft position reference and synchronization. The magnets cannot be seen on the trigger wheel, which therefore can only be positioned using a special tool.
Refer to: Electronic Engine Controls (303-14A Electronic Engine Controls - TDV6 3.0L Diesel, Description and Operation).

If the trigger is removed for any reason, then a new trigger wheel must be fitted.

Stiffening Frame



Item	Description
1	Stiffening Frame

The stiffening frame is fitted to the lower cylinder block to stiffen the base structure of the engine, helping to reduce noise, vibration and harshness. The frame is made of high-pressure die cast aluminum and also incorporates an oil baffle plate to reduce oil foaming and splash.

The stiffening frame is secured to the cylinder block with 2 dowels, 2 locator pins for the gasket and 18 retaining bolts; 3 different lengths of bolts are used:

- M6 x 20 (6 off)
- M8 x 75 (4 off)
- M6 x 105 (8 off).

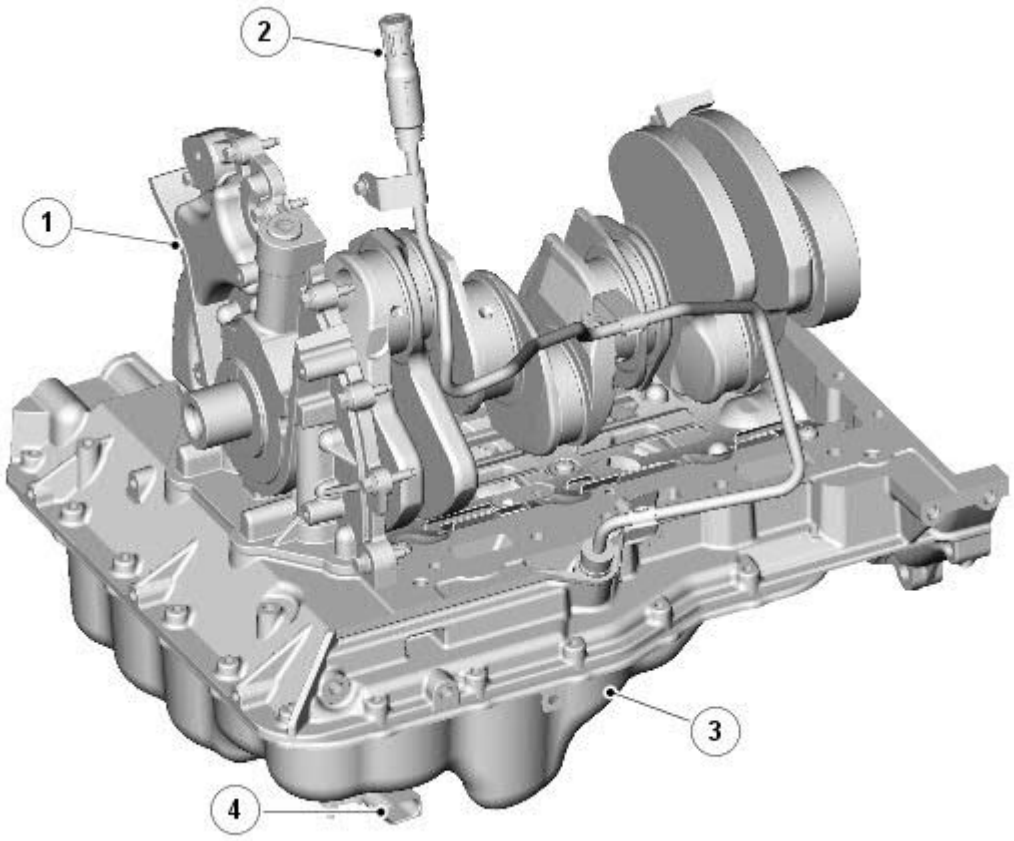
Iron inserts, cast into the main bearing supports of the stiffening frame, minimize main bearing clearance changes due to heat expansion.

A gasket seals the joint between the stiffening frame and the cylinder block.

An oil pick-up pipe with an integral strainer, locates in the front of the stiffening frame to provide oil to the crankshaft driven oil pump.

OIL PAN COMPONENTS

A pressed steel oil pan, manufactured from a 'sound deadening steel' material, is bolted to the stiffening frame with 14 M6 x 16 bolts and is sealed with a reusable gasket. An engine oil drain plug and the oil level and temperature sensor are located towards the front of the oil pan.

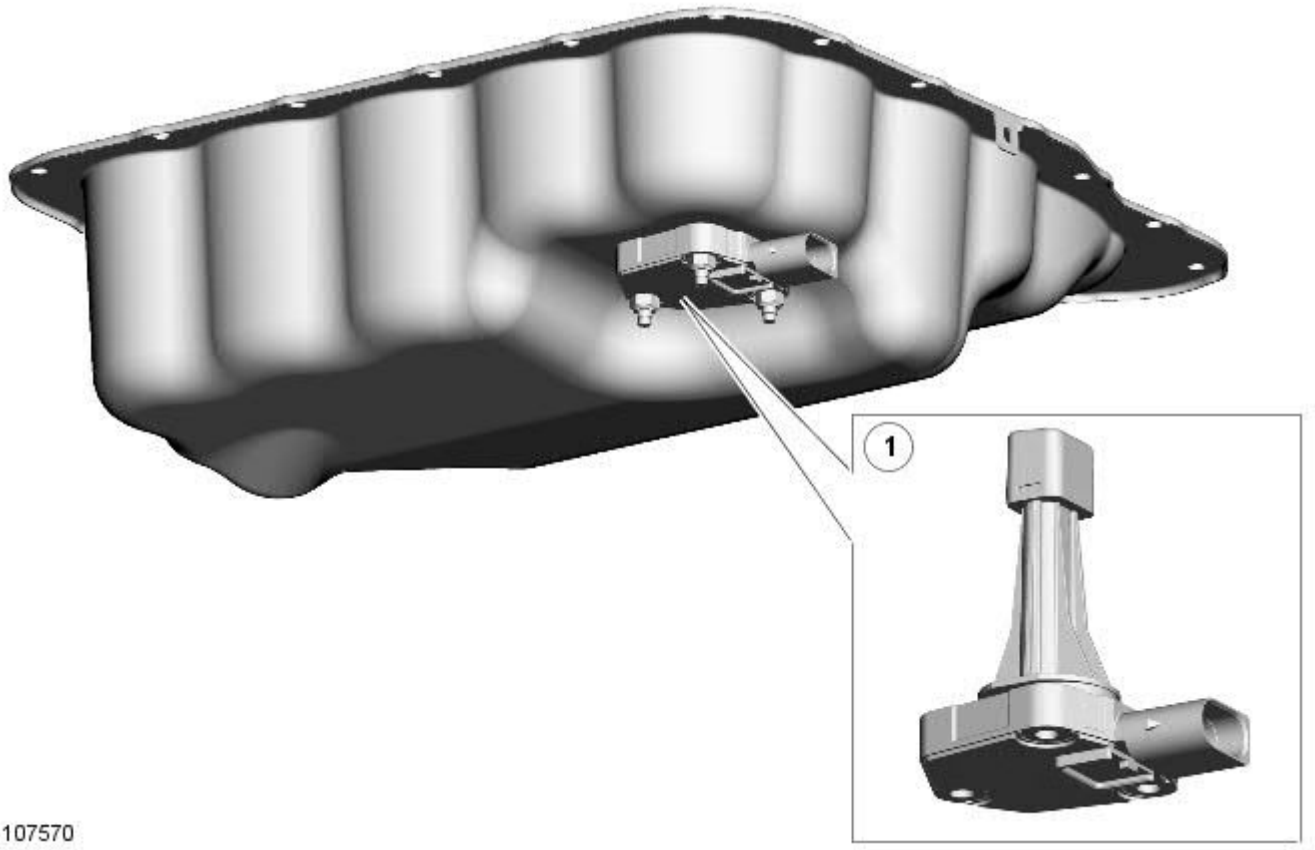


E117583

Item	Description
1	Oil pump
2	Oil suction tube
3	Oil pan
4	Oil level and temperature sensor

An ultrasonic sensor provides an electronic indication when the oil in the oil pan is low or high. This removes the requirement for the mechanical dipstick. The sensor monitors the level of the oil continually during trips. An advantage in comparison with the static 'dipstick' method is that all marginal influences, for example vehicle being on a slope, lateral and longitudinal acceleration, are compensated for by averaging.

The values determined can be used to signal that the minimum oil level has been reached or to display the current oil level if required.

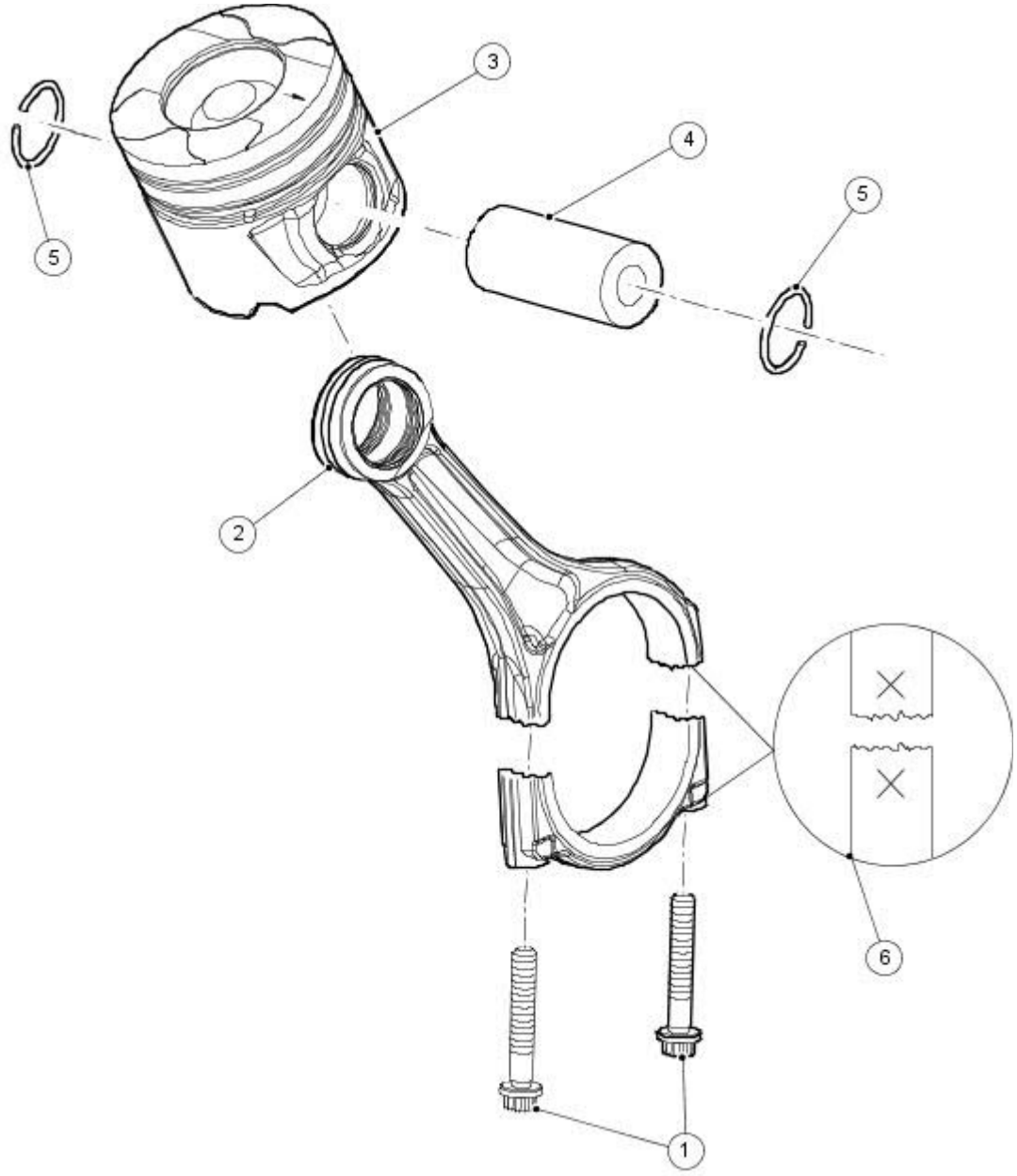


Item	Description
1	Oil level and temperature sensor

The sensor is mounted to the underside of the oil pan where it sends an ultrasonic pulse vertically upward, it then measures the time for the pulse to be reflected back from the top surface of the oil.

Warnings will be displayed in the message center if the oil level is not maintained within the safe operating levels (minimum and maximum). A warning will also be displayed if there is a fault with the oil level monitoring system.

PISTON AND CONNECTING ROD ASSEMBLY



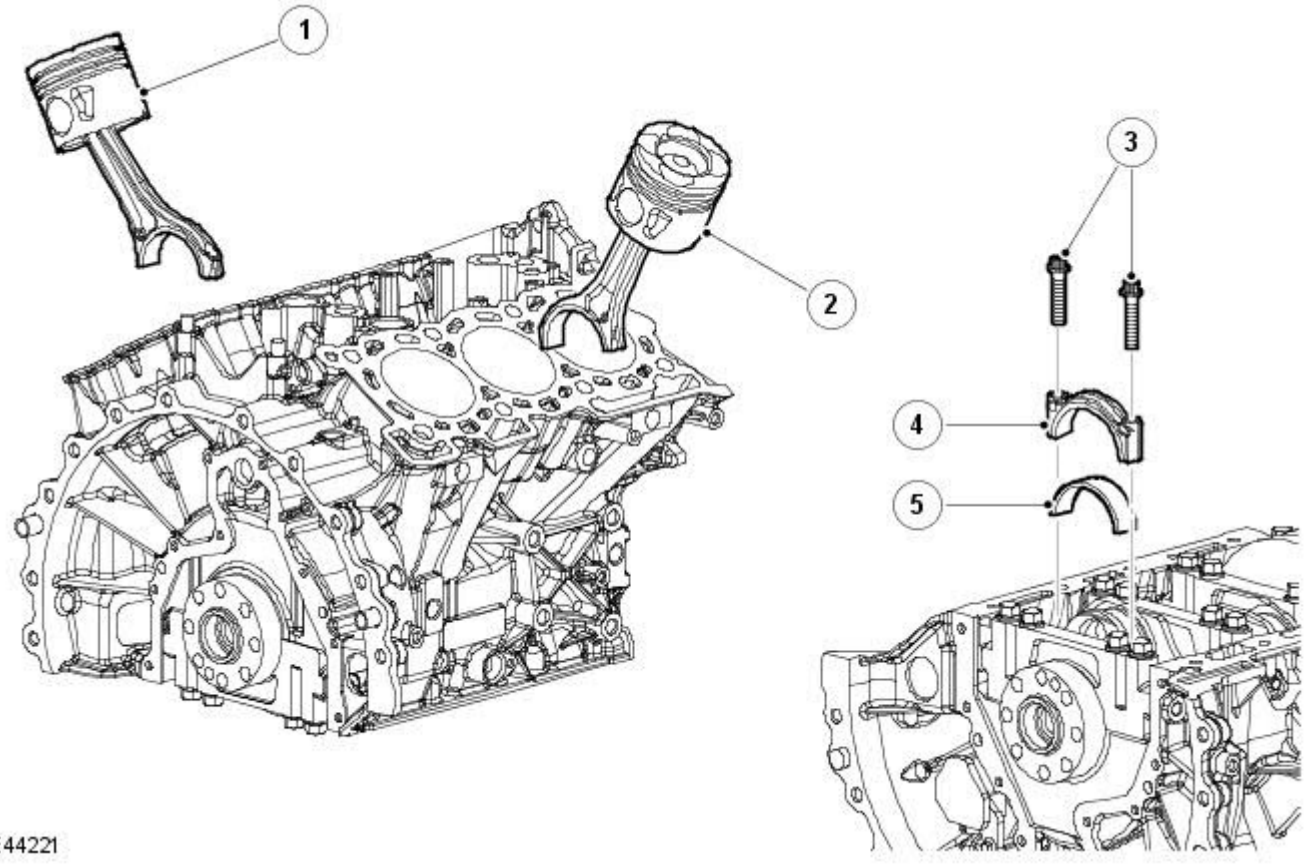
E52134

Item	Description
1	Connecting rod bolts (2 off)
2	Connecting rod
3	Piston
4	Piston pin
5	Circlips
6	Connecting rod identification

The connecting rods are manufactured from sinter-forged steel and have fracture-split bearing caps. The bearing caps are produced by fracturing the opposing sides of the connecting rod at the bearing horizontal centre-line. As well as being easier to manufacture, when reassembled the fractured surfaces interlock to form a strong seamless joint. The cylinder position is etched on adjoining sides of the joint to identify matching connecting rods and bearing caps. The selective connecting rod bearings are aluminum/tin split plain bearings. The connecting rod bearing is 'sputter coated', which is a manufacturing process that layers the bearing material to produce a higher load capacity for improved durability.

NOTE: The connecting rods are not selective.

Piston and Connecting Rod Orientation



Item	Description
1	Piston and connecting rod assembly, cylinders 4-6
2	Piston and connecting rod assembly, cylinders 1-3
3	Bolts (12 off)
4	Connecting rod bearing cap (6 off)
5	Connecting rod lower bearing (6 off)

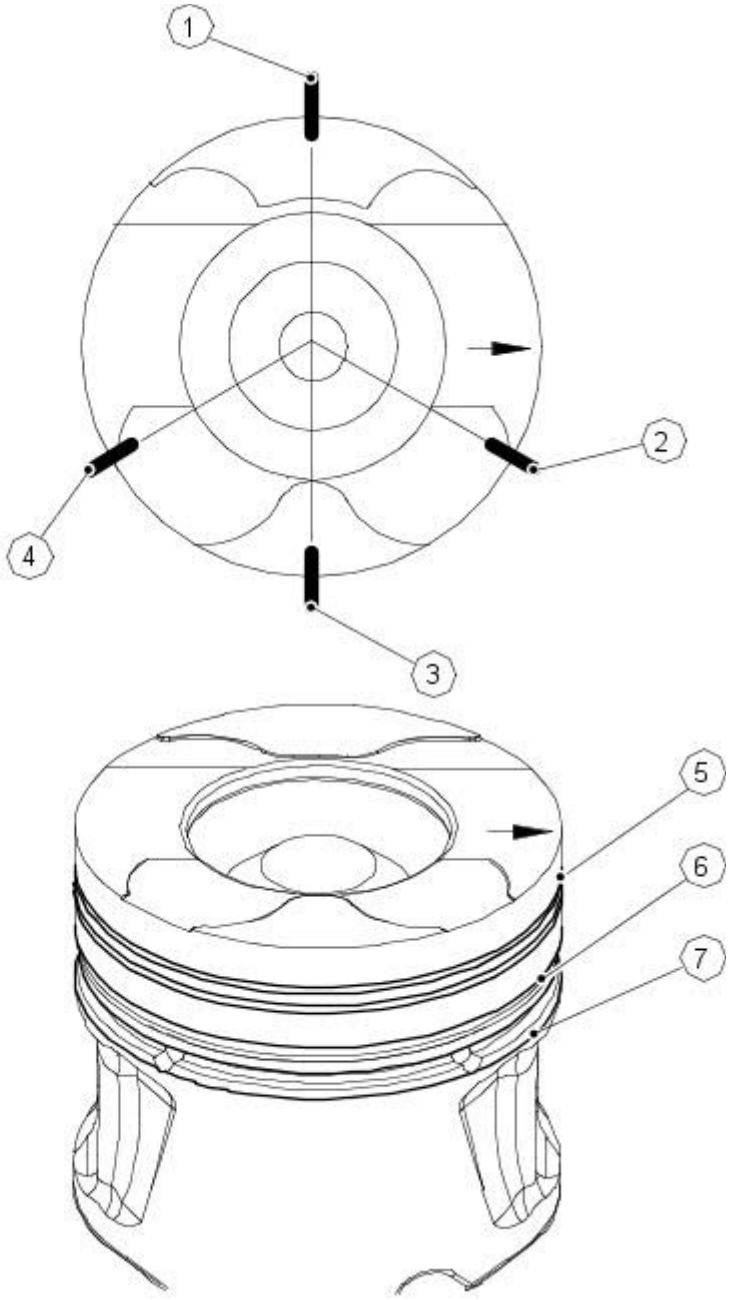
When installing a connecting rod, ensure the back of the connecting rod faces the center of the 'vee'.

The pistons are made from aluminum alloy and are fitted with 3 rings. The piston crown incorporates a pronounced bowl; this forms the combustion chamber, which promotes swirl and turbulence necessary for good combustion and improved emissions. In addition, the piston skirt has a molybdenum-coated surface, which counteracts scoring of the cylinder bore and piston.

The piston also incorporates a double wave gallery within the piston crown to enhance piston cooling. The pistons are supplied oil by means of spray jets located in the cylinder block oil gallery. These jets ensure optimum piston cooling to counteract the high temperatures generated by the combustion process.

Each piston is installed on a piston pin located in an aluminum/tin bushing in the connecting rod.

Piston Ring Orientation



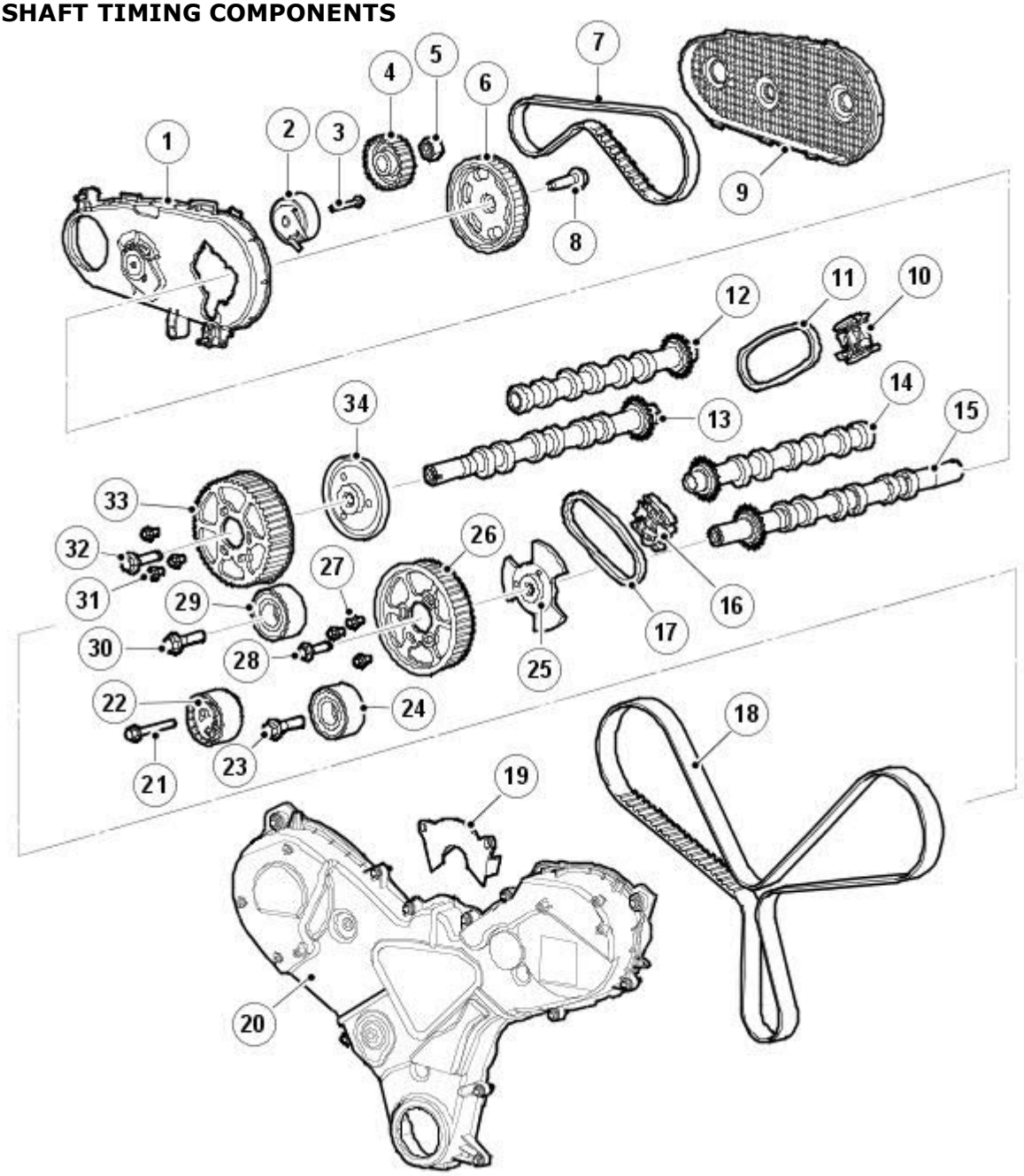
E52133

Item	Description
1	Ring gap oil control
2	Ring gap upper compression
3	Spiral joint oil control
4	Ring gap lower compression
5	Upper compression ring
6	Lower compression ring
7	Oil control ring

When installing pistons, ensure that the arrows on the piston crowns all point to the front of the engine. All pistons are common single grade/single part number for all engines.

The piston top ring is a taper type and is fitted with the taper to the top of the piston. All rings marked 'top' are assembled with 'top' uppermost. All rings must be spaced evenly around the piston before installing. The circumference gap of the double bevelled oil control ring must be opposite the spiral control joint.

CAMSHAFT TIMING COMPONENTS



E94884

Item	Description
1	Rear engine accessory drive rear cover
2	Rear engine accessory drive tensioner
3	Bolt
4	Fuel pump pulley
5	Nut
6	Rear engine accessory drive camshaft pulley
7	Rear engine accessory drive belt
8	Bolt
9	Rear engine accessory drive front cover
10	RH chain tensioner
11	RH timing chain
12	RH intake camshaft
13	RH exhaust camshaft
14	LH intake camshaft

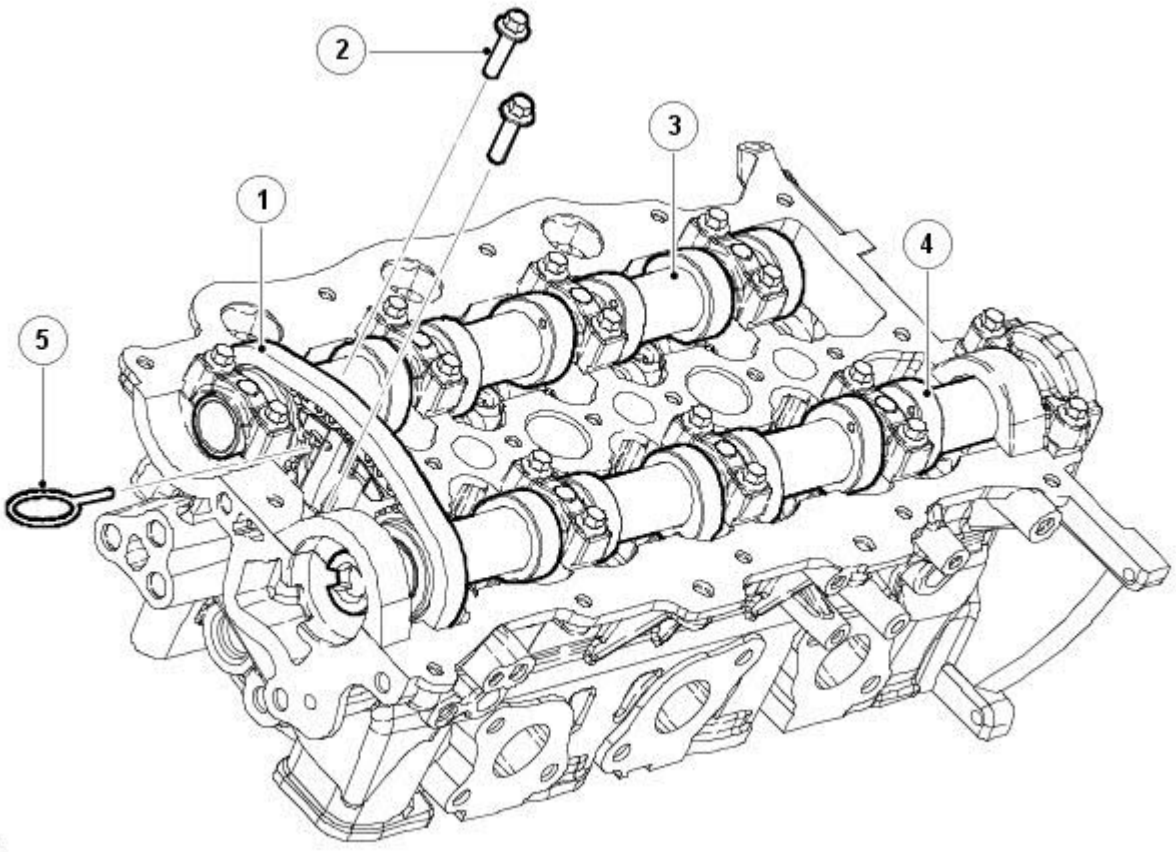
15	LH exhaust camshaft
16	LH chain tensioner
17	LH timing chain
18	Timing belt
19	Front cover bridge
20	Primary drive cover
21	Bolt
22	Tensioner
23	Bolt
24	Idler
25	Camshaft hub
26	LH camshaft timing pulley
27	Bolt (3 off)
28	Bolt
29	Idler
30	Bolt
31	Bolt (3 off)
32	Bolt
33	RH camshaft timing pulley
34	Camshaft hub

Primary drive is provided by a single toothed belt from the crankshaft to the exhaust camshaft gears of each cylinder bank via 2 idler pulleys and a tensioner.

Timing belt adjustment is carried out by an eccentric type tensioner mounted on the RH front face of the cylinder block.

A primary drive cover is made up from 3 separate plastic mouldings. The covers are secured to the front of the cylinder block and cylinder heads with 15 bolts and 1 stud and nut. The 2 upper covers are partially sealed with a rubber seal.

Secondary Drive



E44233

Item	Description
1	Timing chain
2	Bolts
3	Intake camshaft
4	Exhaust camshaft
5	Tensioner firing pin

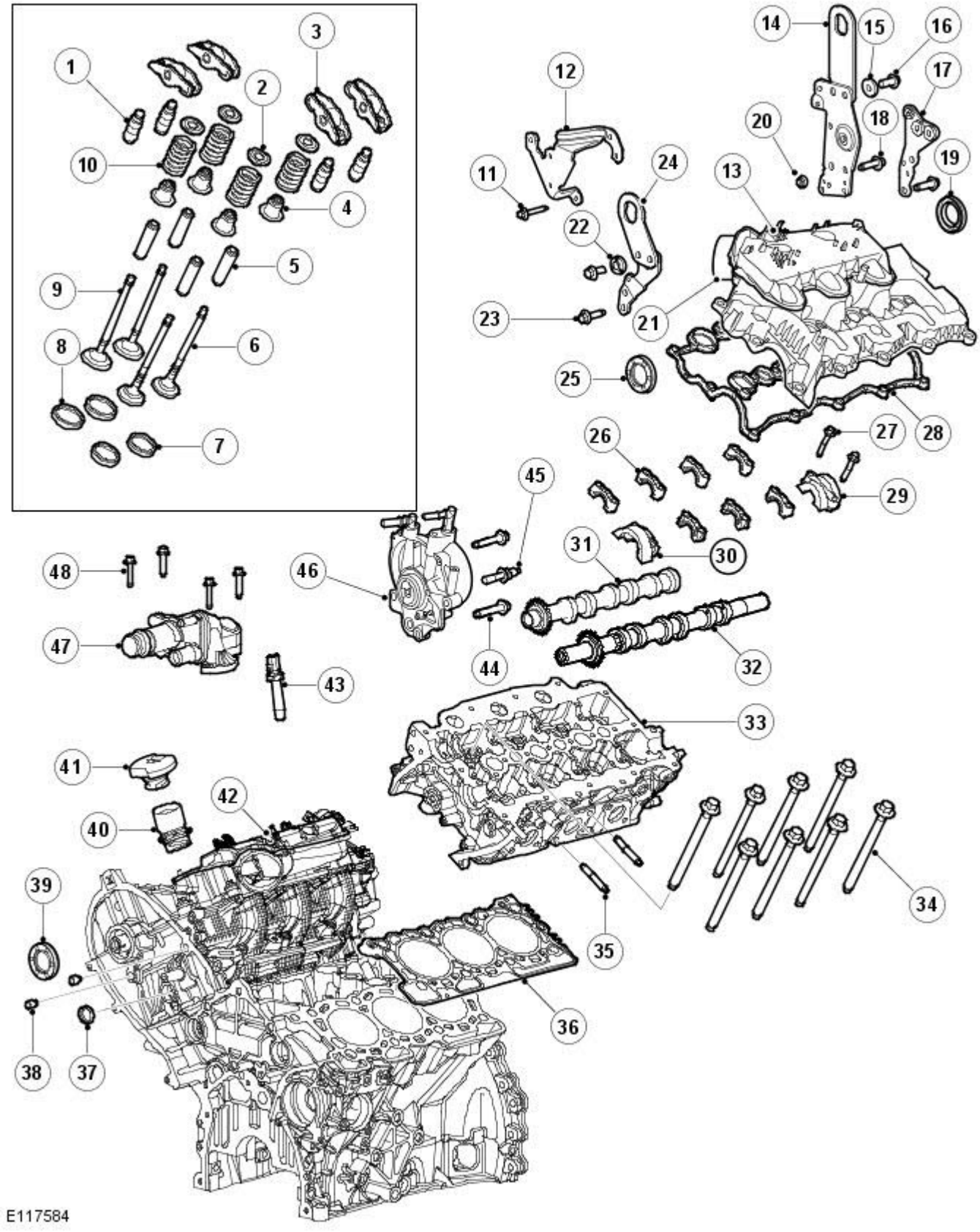
Secondary drive is provided by 2 short crossover chains, which transfer drive from the exhaust camshaft gears to the intake camshaft gears. The crossover drives are located at the rear of the RH cylinder bank and the front of the LH cylinder bank. This allows for a much shorter and simpler run for the main camshaft drive belt at the front of the engine.

Each crossover chain is tensioned via an automatic chain tensioner, which acts directly on the chains via a guide rail. The tensioners are located between the exhaust and intake camshafts at the front or rear of the cylinder head, depending on the cylinder bank.

The tensioner firing pin holds the automatic chain tensioner in a compressed state to aid installation.

CYLINDER HEAD COMPONENTS

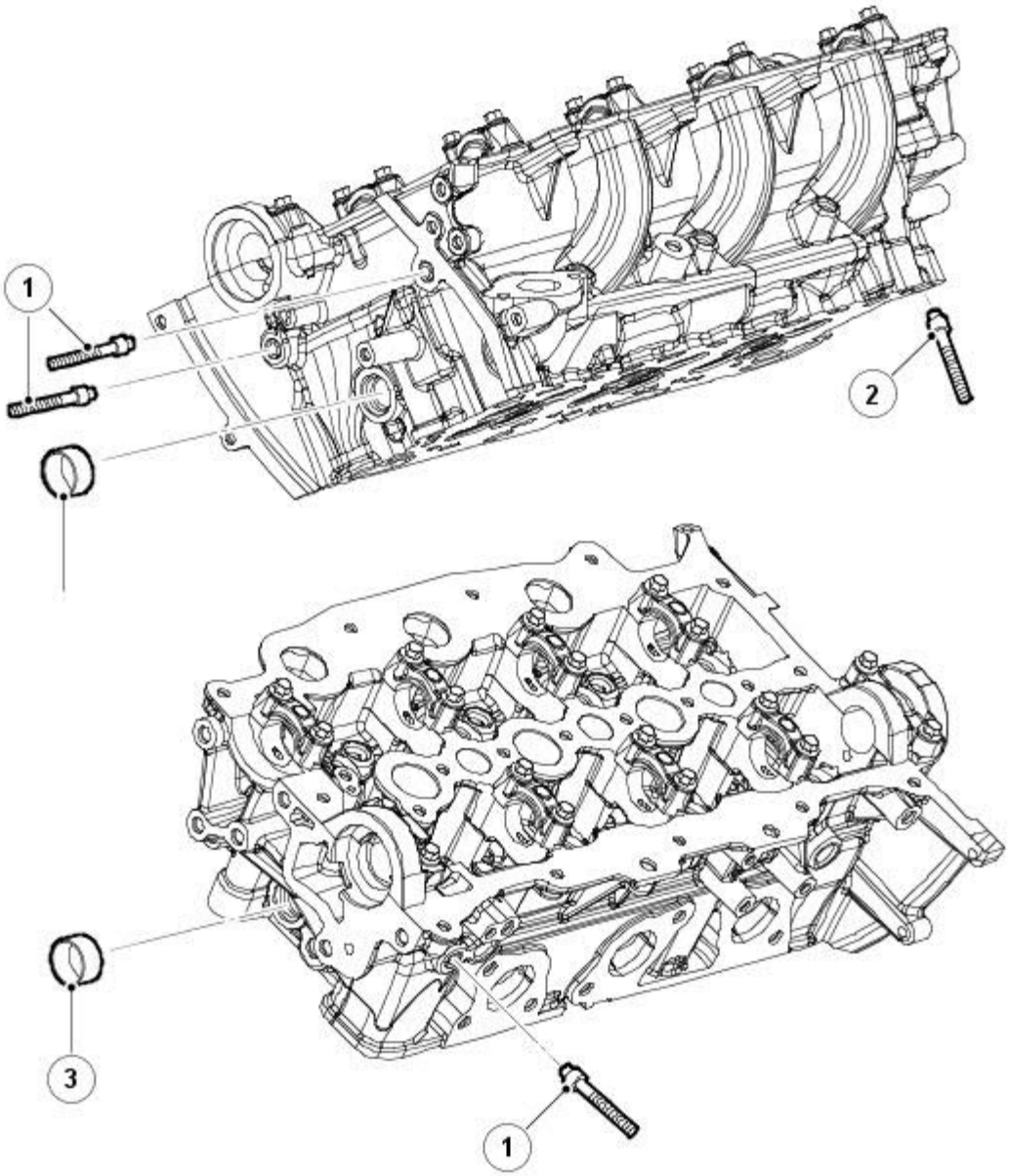
NOTE: LH cylinder head shown; RH cylinder head similar.



Item	Description
1	Hydraulic lash adjusters (12 off)
2	Valve spring retainers (12 off)

3	Roller rockers (12 off)
4	Valve stem seals (12 off)
5	Valve guides (12 off)
6	Exhaust valves (6 off)
7	Intake valve seats (6 off)
8	Exhaust valve seats (6 off)
9	Intake valves (6 off)
10	Valve springs (12 off)
11	Bolt
12	Bracket
13	Intake manifold
14	Lifting eye
15	Washer
16	Bolt
17	Bolt
18	Bolt
19	Seal
20	Cap
21	Intake manifold cover assembly
22	Washer
23	Bolt
24	Lifting eye
25	Seal
26	Camshaft bearing caps (7 off)
27	Bolts (18 off)
28	Gasket
29	Camshaft bearing cap and seal housing
30	Camshaft bearing cap and seal housing
31	Intake camshaft
32	Exhaust camshaft
33	Cylinder head
34	Cylinder head bolts (8 off)
35	Exhaust manifold studs (6 off)
36	Cylinder head gasket
37	Core plug
38	Plug
39	Seal
40	Oil filler tube
41	Oil filler cap
42	Intake manifold
43	Injectors (3 off)
44	Bolt (2 off)
45	Bolt
46	Vacuum pump
47	Water outlet assembly
48	Bolt (4 off)

Cylinder Heads



E44236

Item	Description
1	Studs
2	Bolts
3	Blanking plug

The aluminum gravity die cast cylinder heads are unique to each cylinder bank. Eight deep-seated bolts help reduce distortion and secure each cylinder head to the cylinder block. The cylinder head bolts are located beneath the camshafts, 4 under the intake camshaft and 4 under the exhaust camshaft. Two hollow dowels align each cylinder head with the cylinder block.

NOTE: The cylinder heads cannot be reworked.

The cylinder head gasket is a 3-layer, laminated steel type and is available in 5 different thicknesses. The choice of gasket thickness is dependent on the maximum piston protrusion. Gasket thickness is identified by serrations cut into the front end of the gasket.

The cylinder head has 4 ports machined at each cylinder location, 2 exhaust ports and 2 intake ports. One of the intake ports is helical and functions as a swirl port, the other is arranged laterally as a tangential port and functions as a charge port.

The camshafts are of a hollow steel tube construction, with pressed on sintered lobes. Each camshaft is retained by aluminum

alloy caps, 5 for the exhaust camshafts and 4 for the intake camshafts. Location letters, A to I for the intake camshaft and R to Z for the exhaust camshaft, are marked on the outer faces of the caps for each cylinder head.

The LH cylinder bank exhaust camshaft is machined to accept a rear camshaft gear. The rear camshaft gear provides drive for the high-pressure fuel pump.
Refer to: Fuel Charging and Controls (303-04C Fuel Charging and Controls - V8 5.0L Petrol, Description and Operation).

The exhaust camshaft gear of the LH cylinder head also incorporates a trigger wheel, which is used in conjunction with the camshaft sensor to measure engine position.
Refer to: Electronic Engine Controls (303-14A Electronic Engine Controls - TDV6 3.0L Diesel, Description and Operation).

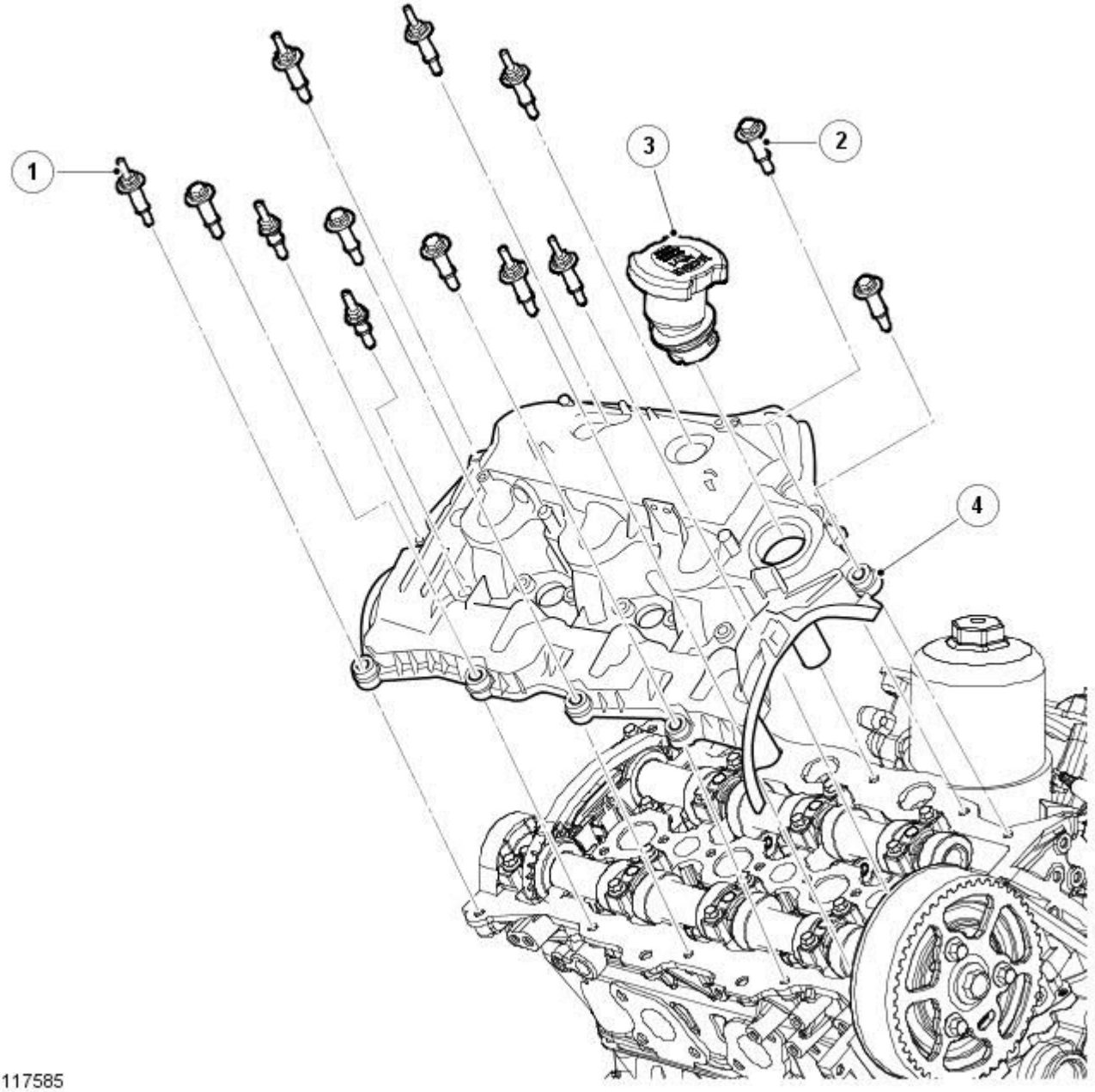
The RH cylinder head exhaust camshaft is machined at the rear end to provide a drive connection for the vacuum pump.

The fuel injection nozzles are centrally mounted above each cylinder.
Refer to: Fuel Charging and Controls (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, Description and Operation).

The glow plugs are arranged centrally on the intake side of the cylinder heads, between the 2 intake ports of each cylinder.
Refer to: Glow Plug System (303-07B Glow Plug System - TDV6 3.0L Diesel, Description and Operation).

The engine lifting eyes are bolted to the cylinder head, 1 at the front and 2 at the rear, 1 per cylinder head.

Camshaft Covers

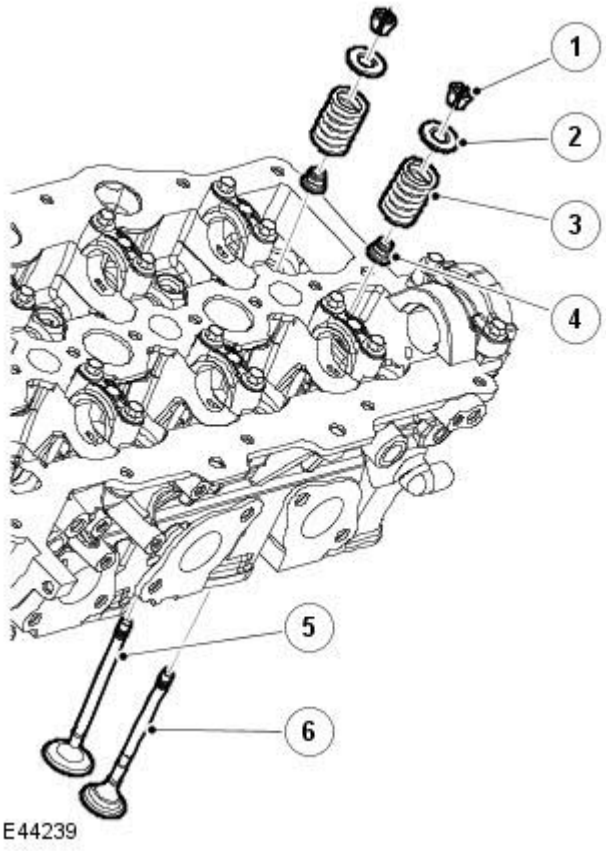


Item	Description
1	Stud bolt M6 x 40 (6 off)
2	Bolt M6 x 40 (7 off)
3	Oil filler cap
4	RH camshaft cover assembly

The camshaft covers are manufactured from vinyl ester composite. The RH bank camshaft cover incorporates an outlet for the full load engine breather and the engine oil filler cap. The LH bank camshaft cover incorporates an outlet for the part load engine breather. For additional information refer to 303-08A engine Emission Control.

Silicon rubber in-groove gaskets seal the joints between the camshaft covers and the cylinder heads. Together with spacers and seals on the camshaft cover fasteners, they also isolate the covers from direct contact with the cylinder heads, to reduce noise.

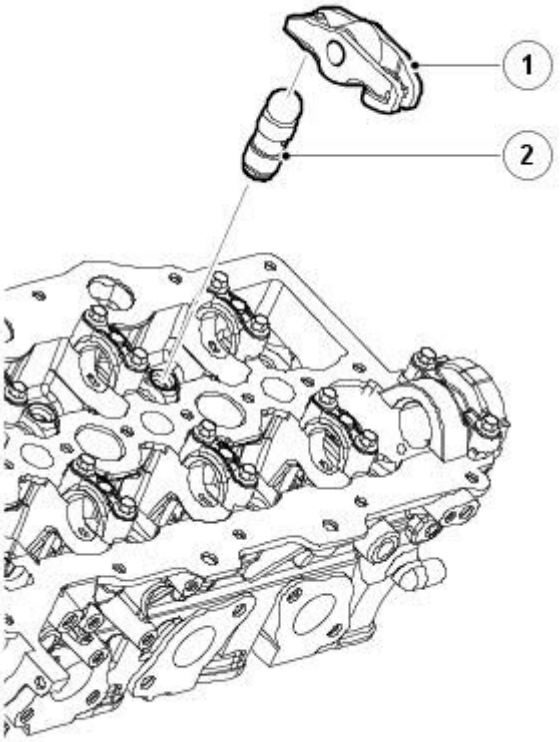
Intake and Exhaust Valves



Item	Description
1	Valve spring collet (24 off, 12 per cylinder head)
2	Valve spring retainer (24 off, 12 per cylinder head)
3	Valve spring (24 off, 12 per cylinder head)
4	Valve stem seal (24 off, 12 per cylinder head)
5	Intake valve (12 off, 6 per cylinder head)
6	Exhaust valve (12 off, 6 per cylinder head)

Each cylinder head incorporates 2 overhead camshafts operating 4 valves per cylinder via steel roller rockers with hydraulic lash adjusters.

Roller Rockers with Hydraulic Lash Adjusters

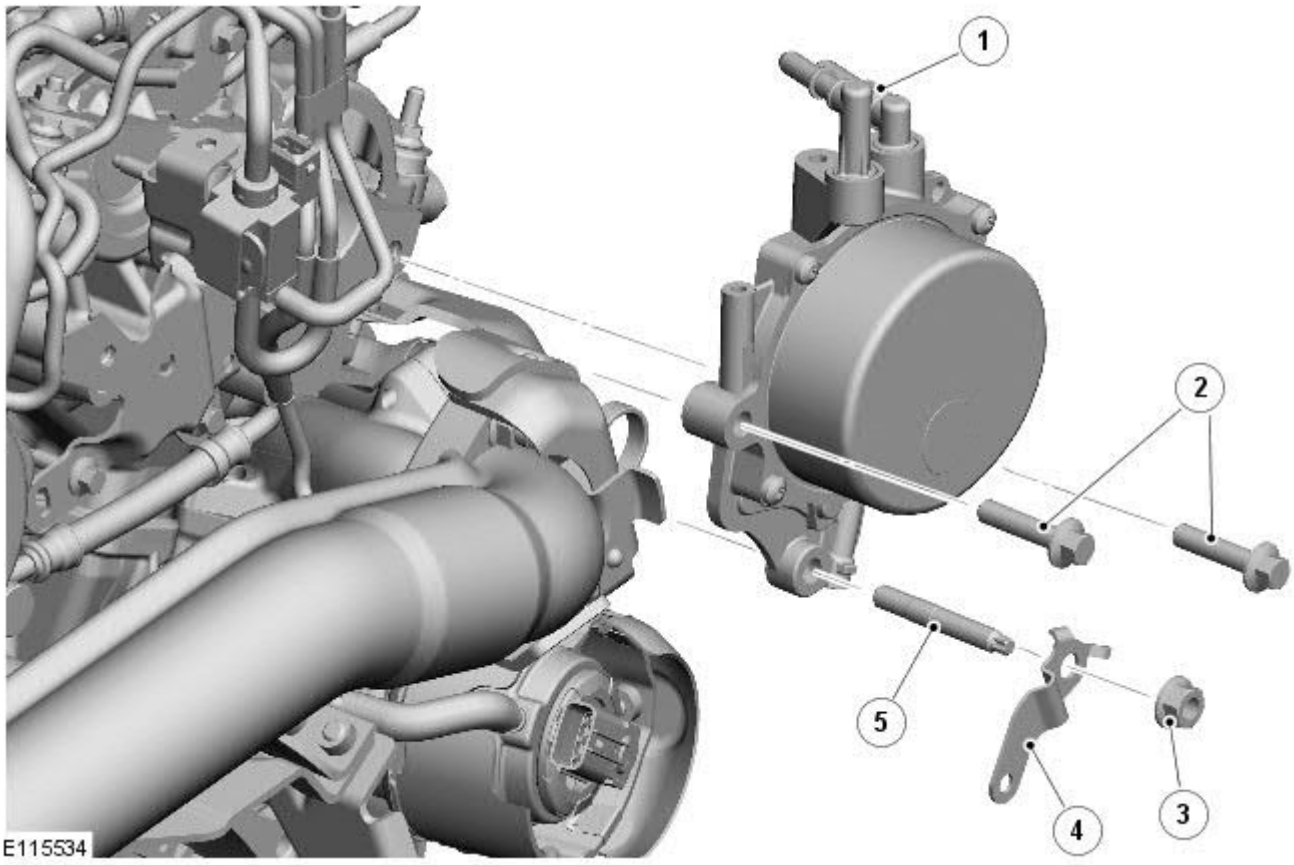


E44238

Item	Description
1	Roller rocker (24 off, 12 per cylinder head)
2	Hydraulic lash adjuster (24 off, 12 per cylinder head)

The lightweight valve gear provides good economy and noise levels. Valve head diameters are 31 mm (1.220 in) for the exhaust and 35 mm (1.378 in) for the intake. All valves have 5 mm (0.197 in) diameter stems supported in sintered metal seats and guide inserts. Collets, valve collars and spring seats locate single valve springs on both intake and exhaust valves. Valve stem seals are integrated into the spring seats.

Vacuum Pump

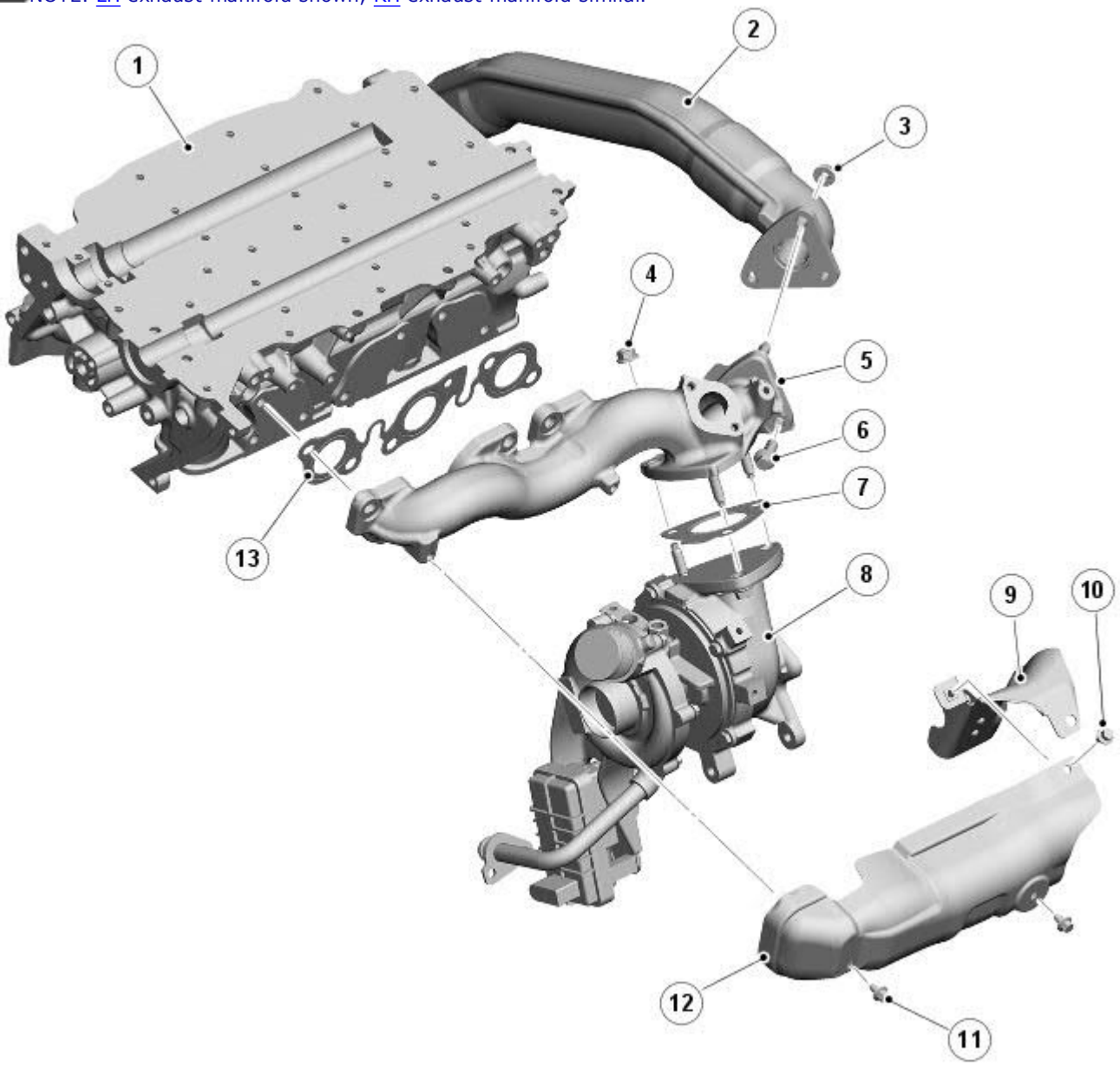


Item	Description
1	Vacuum pump connections
2	Bolt (2 off)
3	Nut
4	Bracket (emission hose)
5	Stud

The vacuum pump is located at the rear of the RH side cylinder head and is driven from the exhaust camshaft.

Exhaust Manifolds

NOTE: LH exhaust manifold shown; RH exhaust manifold similar.



E115531

Item	Description
1	Cylinder head
2	Connecting pipe
3	Nut (2 off)
4	Nut (3 off)
5	Exhaust manifold
6	Bolt
7	Gasket
8	Turbocharger (primary turbocharger shown)
9	Manifold rear heat shield
10	Bolt
11	Bolt (2 off)
12	Manifold heat shield

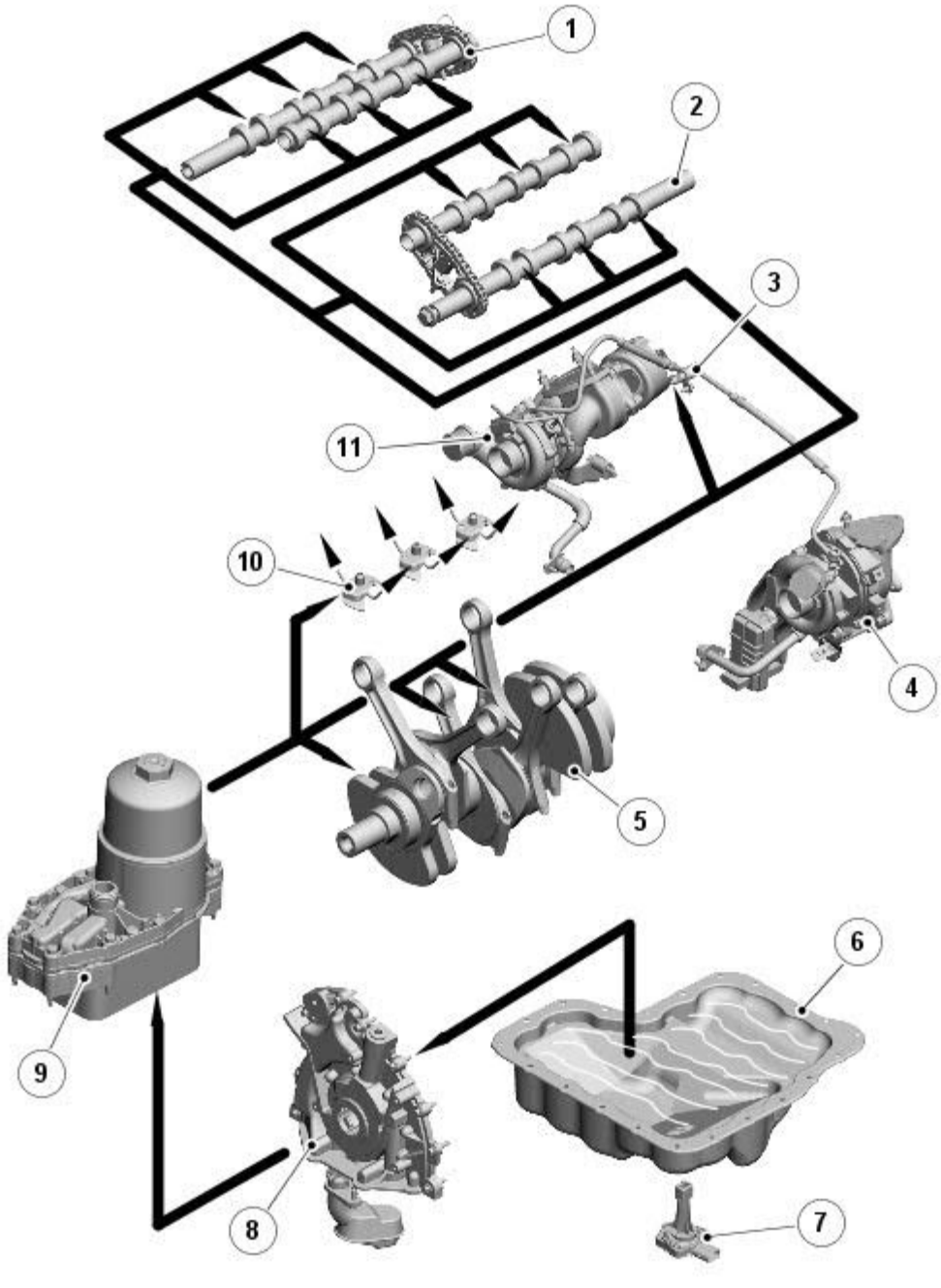
The exhaust manifolds are cast from an iron alloy with a high nickel content giving excellent heat and corrosion resistance properties. They are sealed to the cylinder head by means of a steel gasket. Sacrificial plastic sleeves are used to align the manifolds. These sleeves must be changed when refitting the manifolds. Spacers on the securing bolts allow the manifolds to

expand and retract with changes of temperature while maintaining the clamping loads.

Each manifold has a connection for the EGR (exhaust gas recirculation) transfer pipe.

The engine is fitted with twin variable geometry turbochargers, which fix to the exhaust manifolds by a 3-hole flange with a steel gasket.

LUBRICATION SYSTEM



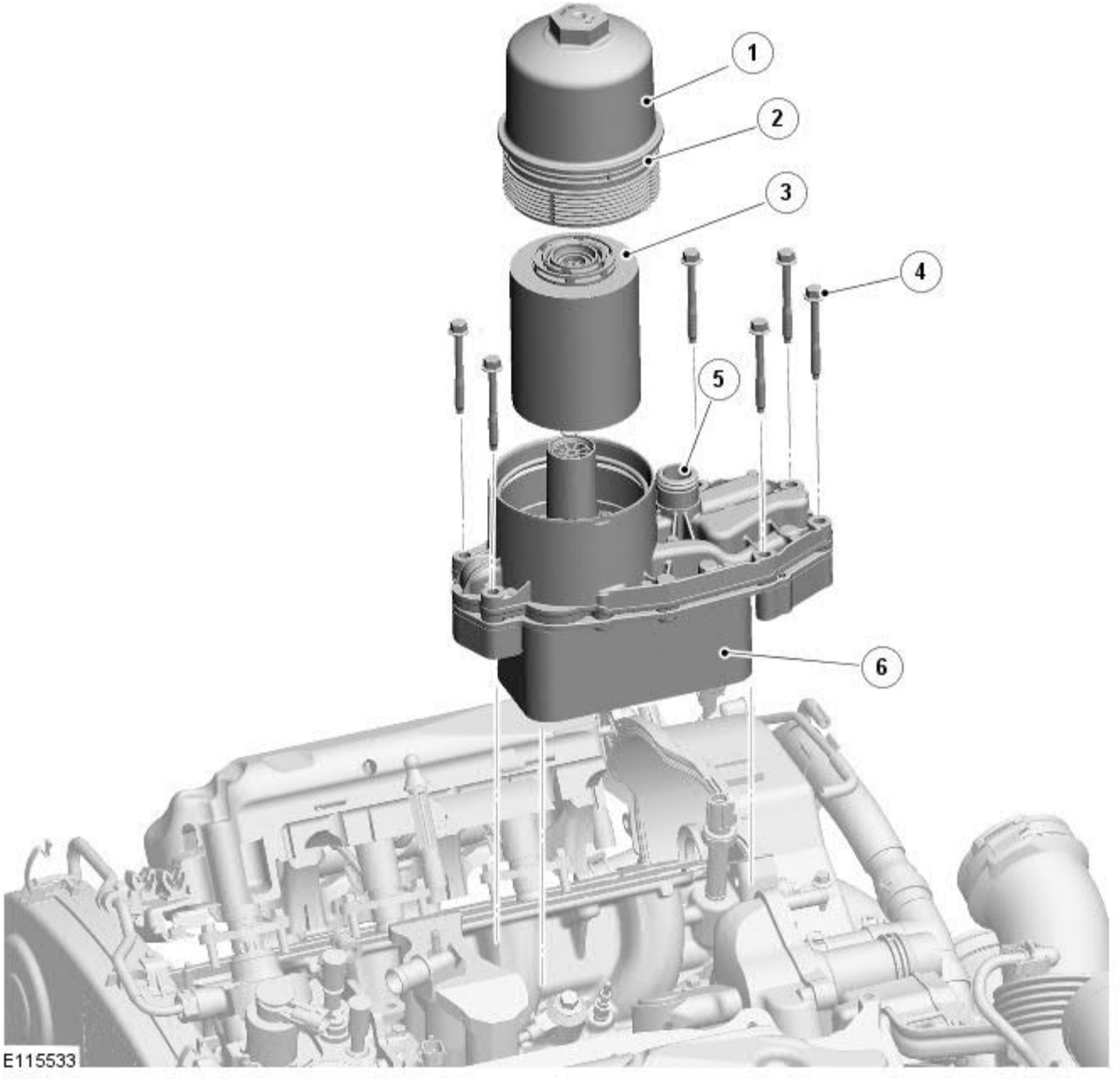
Item	Description
1	Inlet camshaft
2	Exhaust camshaft
3	Turbocharger oil supply
4	Primary turbocharger
5	Crankshaft and connecting rods
6	Oil pan
7	Oil level and temperature sensor
8	Oil pump

9	Oil cooler and filter assembly
10	Piston cooling jets
11	Secondary turbocharger

Oil is drawn from the oil pan and pressurized by the oil pump. The output from the oil pump is then filtered and distributed through internal oil passageways.

All moving parts are lubricated by pressure or splash oil. Pressurized oil is also provided for operation of the hydraulic adjusters and the timing gear chain tensioners.

Oil Cooler and Filter Assembly



Item	Description
1	Filter housing
2	'O' ring seal
3	Paper element
4	Retaining bolt (6 off)
5	Coolant outlet connection
6	Cooler assembly

The engine is lubricated by a force-feed oil circulation system with a full flow oil filter. The oil cooler forms a unit with the oil filter, which is mounted centrally in the middle of the cylinder block between the 2 banks of cylinders. The engine oil is cooled using the engine cooling system. This eliminates the need for an additional engine oil cooler remotely mounted.

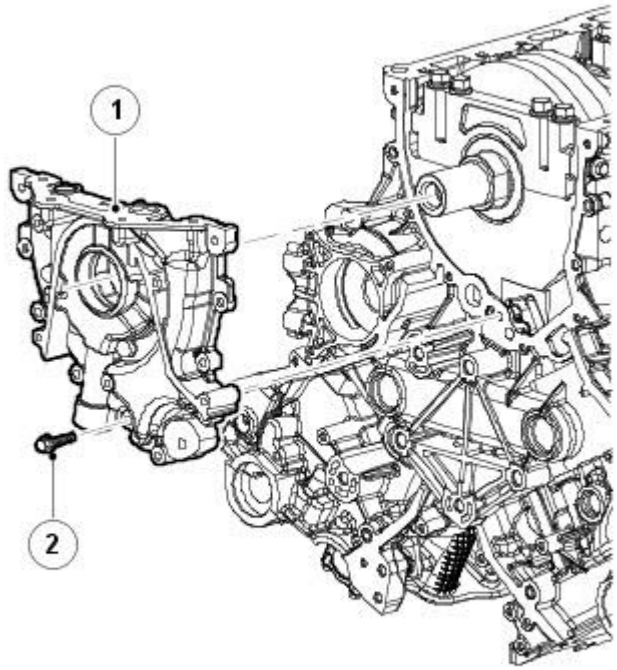
Oil returns to the oil pan under gravity. Large drain holes through the cylinder heads and cylinder block ensure the quick return of the oil, reducing the volume of oil required and enabling an accurate check of the contents soon after the engine stops.

System replenishment is through the oil filler cap on the RH camshaft cover.

The moulded composite oil pick-up is immersed in the oil reservoir to provide a supply to the oil pump during all normal vehicle attitudes. A mesh screen in the inlet prevents debris from entering the oil system.

NOTE: Fuel cooling is facilitated by a blast air fuel cooler in the return line to the fuel tank.

Oil Pump



E44230

Item	Description
1	Oil pump
2	Bolt (10 off)

The oil pump is a gear type pump and is bolted and dowelled to the front of the cylinder block. It is sealed by means of a rubber gasket, which is recessed into the oil pump housing. The pump inlet and outlet ports align with oil passages in the stiffening frame.

The pumping element is an eccentric rotor, which is directly driven by flats on the crankshaft. An integral pressure relief valve regulates pump outlet pressure at 4.5 bar (65.25 lb/in^2).

The front crankshaft oil seal is housed in the oil pump casing and is fitted such that its front face is 1 mm (0.04 in) under flush with the machined front face of the oil pump.

NOTE: The seal is not to be pushed all the way into the bore as this will block the seal drains.

The oil pressure switch, located in the 'vee' at the front of the LHcylinder head, connects a ground input to the instrument cluster when oil pressure is present. The switch operates at a pressure of 0.15 to 0.41 bar (2.2 to 5.9 lb/in^2).

Published: 11-May-2011

Engine - TDV6 3.0L Diesel - Engine

Diagnosis and Testing

Principles of Operation

For a detailed description of the engine system and operation, refer to the relevant Description and Operation section in the workshop manual. REFER to: (303-01A Engine - TDV6 3.0L Diesel)

Engine (Description and Operation),
Engine (Description and Operation),
Engine (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical damage.

Visual Inspection

Mechanical
• Engine oil level • Engine (turns freely) • Coolant level • Transmission fluid level • Fuel level • Coolant leaks • Oil leaks • Fuel leaks • Visibly damaged or worn parts • Loose or missing nuts or bolts • Fuel contamination/grade/quality • Sensor installation/condition • Viscous fan and solenoid

3. If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the symptom chart.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Engine Control Module 3.0L Tdv6 (PCM) (100-00, Description and Operation).

Published: 11-May-2011

Engine - TDV6 3.0L Diesel - Engine Oil Draining and Filling

General Procedures

Draining

WARNING: The spilling of hot engine oil is unavoidable during this procedure, care must be taken to prevent scalding.

CAUTION: Make sure the engine is warm.

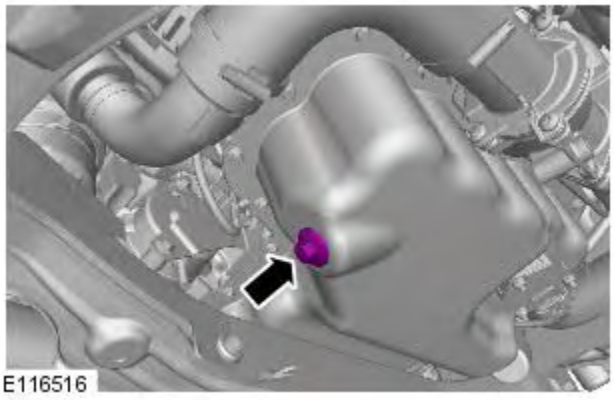
NOTE: **Some variation in the illustrations may occur, but the essential information is always correct.**

1. Refer to: Oil Filter Element (303-01 Engine - 3.0L Diesel, Removal and Installation).

2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).



4. WARNING: Observe due care when draining engine oil as the oil can be very hot.

   CAUTIONS:

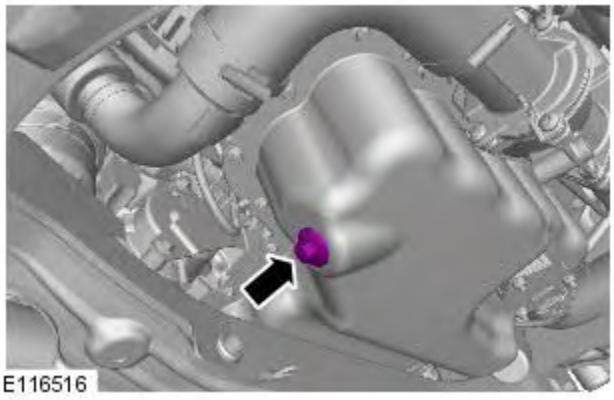
   Be prepared to collect escaping oil.

   Discard the bolt.

   Allow at least 10 minutes for the engine oil to drain.

   Drain the engine oil.

Filling



1. CAUTIONS:

   Make sure that the component is clean, free of foreign material and lubricant.

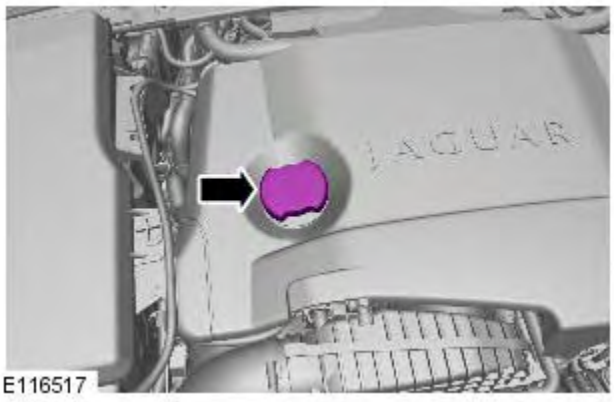
   Make sure that a new bolt is installed.

   Torque: 23 Nm

2. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

3. Lower the vehicle.

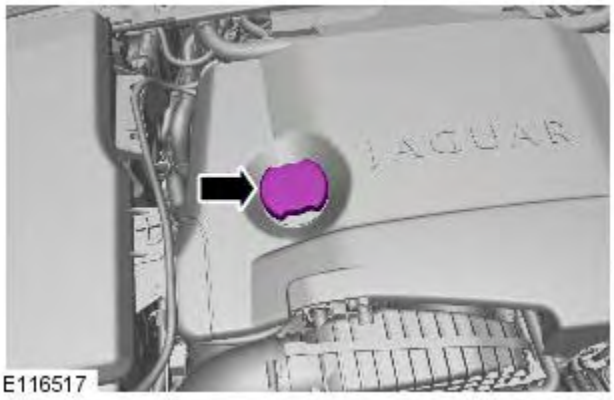
4. Refer to: Oil Filter Element (303-01 Engine - 3.0L Diesel, Removal and Installation).



5. Fill the engine with oil.

6. CAUTION: Make sure that the vehicle is left for 5 minutes from filling with oil and that the engine oil level is reading at least minimum, before starting the engine. To check engine oil level follow steps 9-16.

   Clean any residual engine oil from the oil filler cap area.



7.

8.
   - Start the engine and allow to run for 20 minutes, stop the engine.
   - Check for leaks.

9. CAUTIONS:

   Make sure that the vehicle is parked on level ground.

   Make sure that the selector lever and the gearshift mechanism are in the park (P) position.

   Make sure that the hood is open.

   NOTE: Allow 10 minutes from the engine switch off for the engine oil level to stabilize.

- Turn the ignition on.

10.
- Press the right-hand directional button to access the instrument cluster menu.

E127027

11.
- Press the right-hand OK button.

E127026

12.

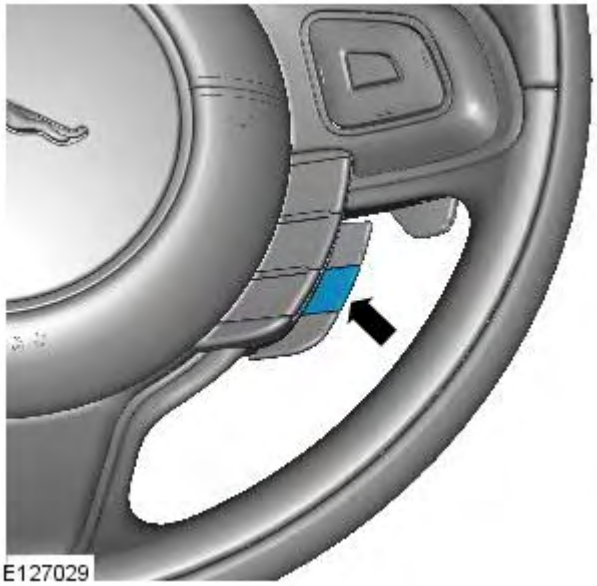
- Press the right-hand directional button to access the Oil Level Display.

E127028

13.

- Press the right-hand OK button and follow the instructions.

E127030



14.

- Press the cruise control cancel button twice within 2 seconds.

15.

- The message center display will revert to the normal display in the trip computer.
- Scroll through the trip menu to access the engine oil level display.
- This display is now the live reading of the engine oil level.
- Take a reading from the level display and, if necessary, top up with oil as instructed.

16. Turn the ignition off.

17. NOTE: Allow 10 minutes for the engine oil level to stabilize if there has been additional oil top up.

    - Turn the ignition on.

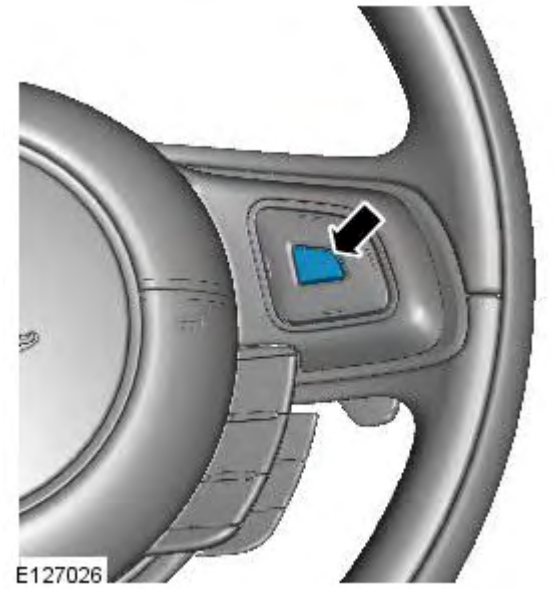
18.

- Press the right-hand directional button to access the instrument cluster menu.

E127027

19.

- Press the right-hand OK button.



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20.

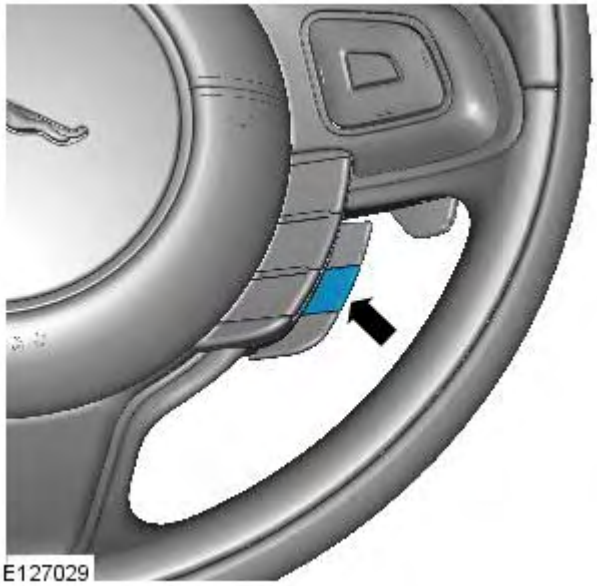
- Press the right-hand directional button to access the Oil Level Display.

E127028

21.

- Press the right-hand OK button and follow the instructions.

E127030

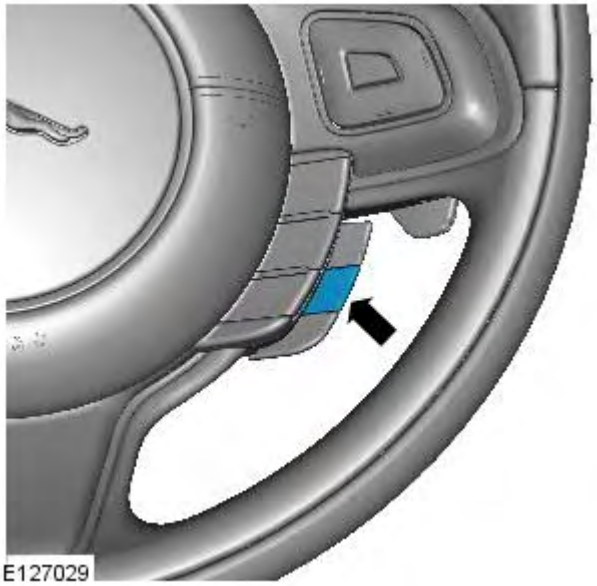


22.

- Press the cruise control cancel button twice within 2 seconds.

23.

- The message center display will revert to the normal display in the trip computer.
- Scroll through the trip menu to access the engine oil level display.
- This display is now the live reading of the engine oil level.
- Take a reading from the level display and, if necessary, top up with oil as instructed.


E127029

24.
- Press and hold the cruise control cancel button for more than 2 seconds.

25.
- The message center display will revert to the normal display in the trip computer.

26. Turn the ignition off.

27. Turn the ignition on.

28.
- Press the right-hand directional button to access the instrument cluster menu.

E127027

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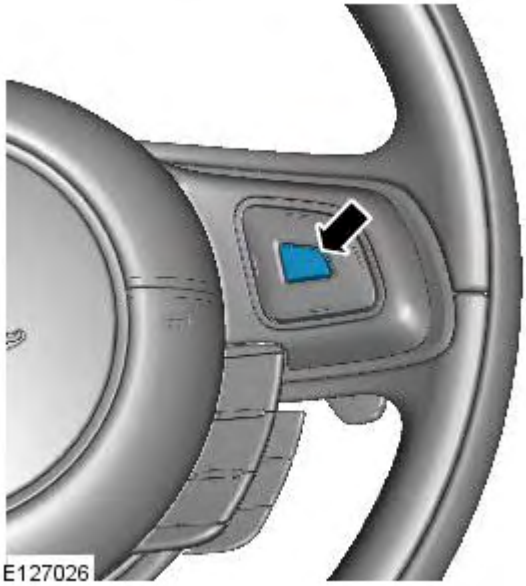
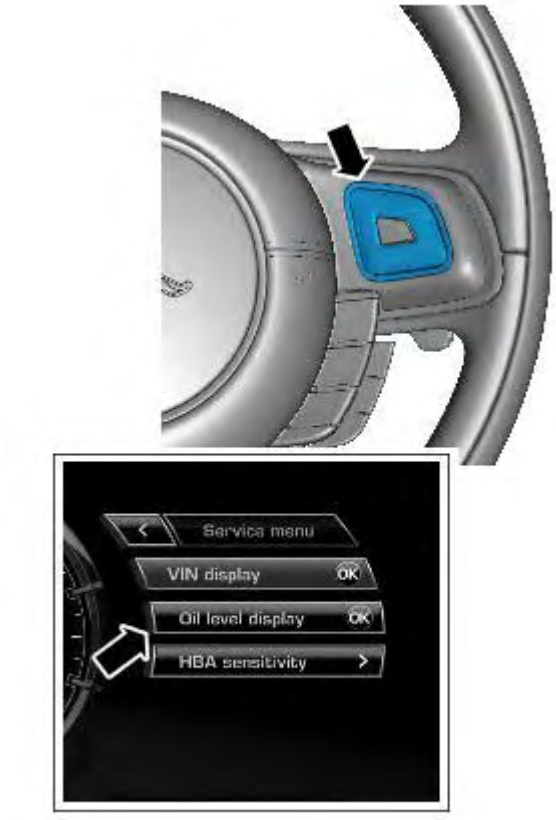


29.

- Press the right-hand OK button.



30.

- Press the right-hand directional button to access the Oil Level Display.

E127031

31.

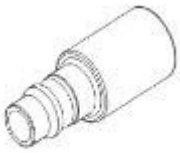
- Press the right-hand OK button and follow the instructions.
- Make sure that the average oil level value has now been updated.

Published: 11-May-2011

Engine - TDV6 3.0L Diesel - Engine Oil Vacuum Draining and Filling

General Procedures

Special Tool(s)

E129630	303-1484 Vacuum Pump, Oil Drain
 E129631	303-1484-01 Adapter for 303-1484

Draining

WARNING: The spilling of hot engine oil is unavoidable during this procedure, care must be taken to prevent scalding.

CAUTION: Make sure the engine is warm.

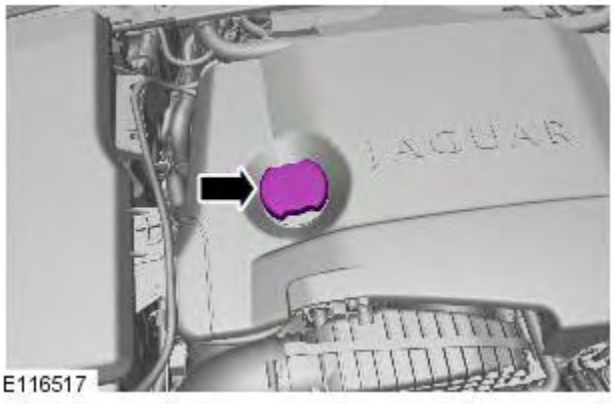
NOTES:

Clean the components general area prior to dismantling.

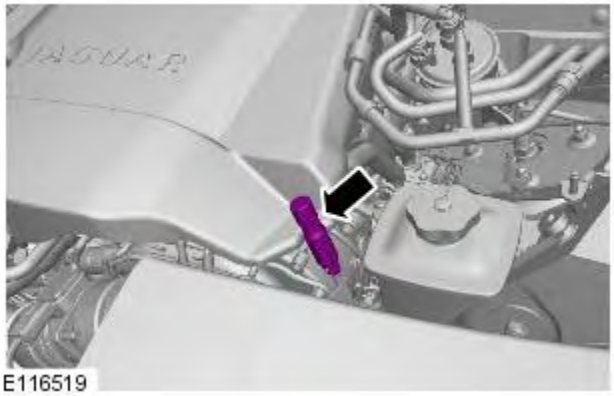
Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Oil Filter Element (303-01 Engine - 3.0L V6 - TdV6, Removal and Installation).

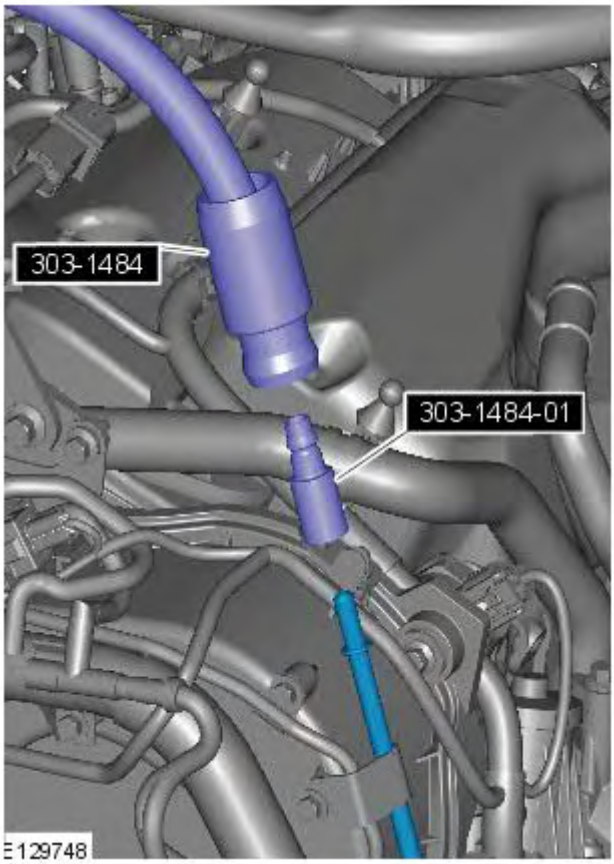
2.



E116517



3. CAUTION: Allow 10 minutes from turning the engine off before starting oil extraction.



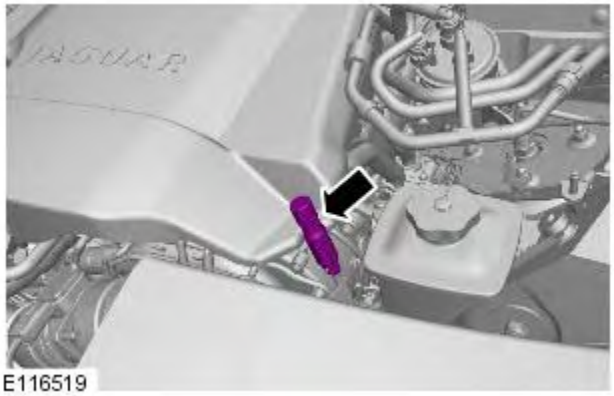
4.
- Using the oil vacuum pump drain the oil out through the oil extraction tube.

  Special Tool(s): 303-1484, 303-1484-01

5.
- Remove the oil vacuum pump.

Filling

1. Refer to: Oil Filter Element (303-01 Engine - 3.0L V6 - TdV6, Removal and Installation).

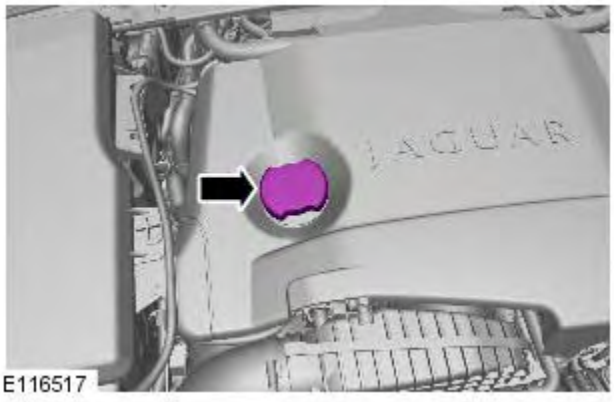


2.

3. Fill the engine with oil.

4. CAUTION: Make sure that the vehicle is left for 5 minutes from filling with oil and that the engine oil level is reading at least minimum, before starting the engine. To check engine oil level follow steps 7-14.

   Clean any residual engine oil from the oil filler cap area.



5. CAUTION: Correct installation of the oil filler cap can be obtained by tightening the cap until an audible click is heard.

6.
   - Start the engine and allow to run for 20 minutes, stop the engine.
   - Check for leaks.

7. CAUTIONS:

   Make sure that the vehicle is parked on level ground.

   Make sure that the selector lever and the gearshift mechanism are in the park (P) position.

   Make sure that the hood is open.

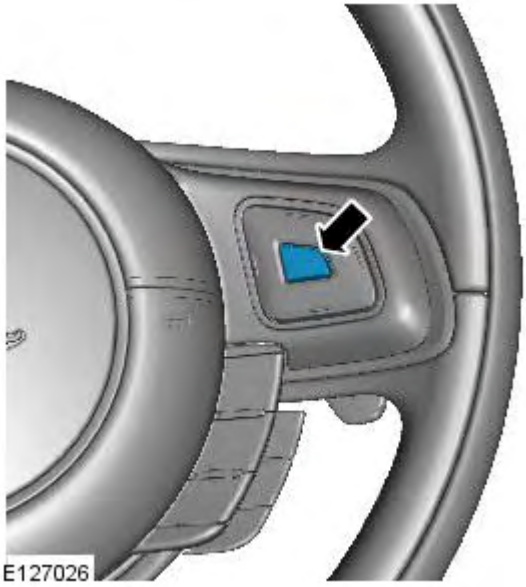
   NOTE: Allow 10 minutes from the engine switch off for the engine oil level to stabilize.

   - Turn the ignition on.

E127027

8.

- Press the right-hand directional button to access the instrument cluster menu.


E127026

9.

- Press the right-hand OK button.

E127028

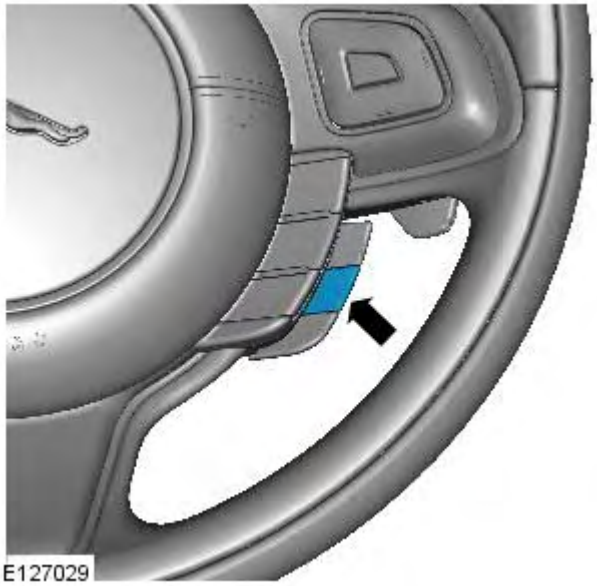
10.

- Press the right-hand directional button to access the Oil Level Display.

E127030

11.

- Press the right-hand OK button and follow the instructions.



12.
- Press the cruise control cancel button twice within 2 seconds.

13.
- The message center display will revert to the normal display in the trip computer.
- Scroll through the trip menu to access the engine oil level display.
- This display is now the live reading of the engine oil level.
- Take a reading from the level display and, if necessary, top up with oil as instructed.

14. Turn the ignition off.

15. NOTE: Allow 10 minutes for the engine oil level to stabilize if there has been additional oil top up.
    - Turn the ignition on.

16.

- Press the right-hand directional button to access the instrument cluster menu.

E127027

17.

- Press the right-hand OK button.

E127026

18.

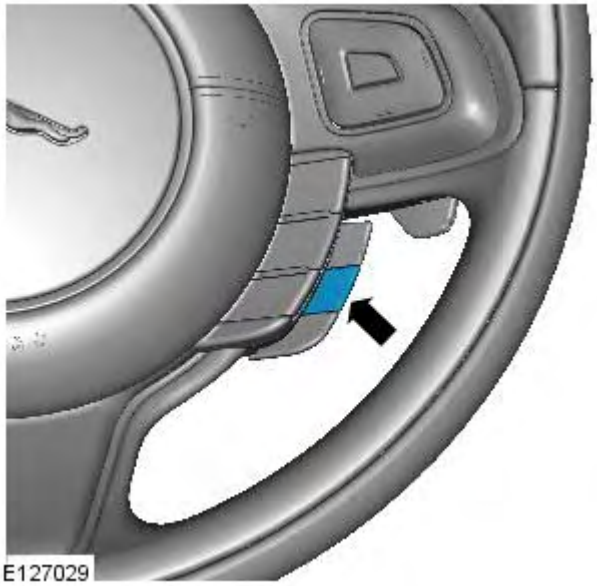
- Press the right-hand directional button to access the Oil Level Display.

E127028

19.

- Press the right-hand OK button and follow the instructions.

E127030

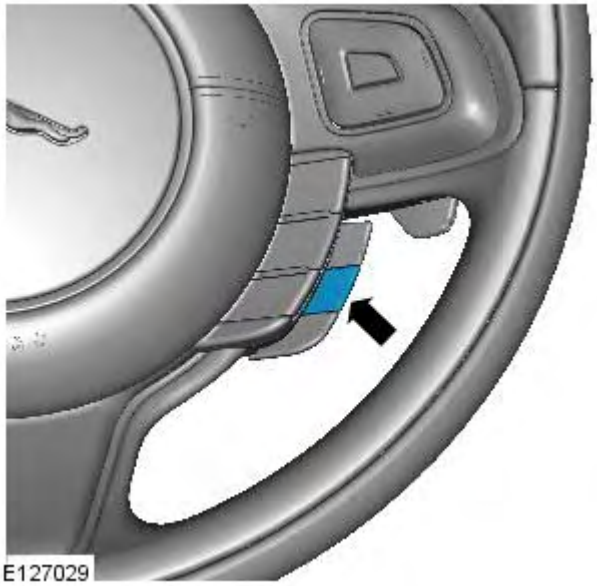


20.

- Press the cruise control cancel button twice within 2 seconds.

21.

- The message center display will revert to the normal display in the trip computer.
- Scroll through the trip menu to access the engine oil level display.
- This display is now the live reading of the engine oil level.
- Take a reading from the level display and, if necessary, top up with oil as instructed.


E127029

22.
- Press and hold the cruise control cancel button for more than 2 seconds.

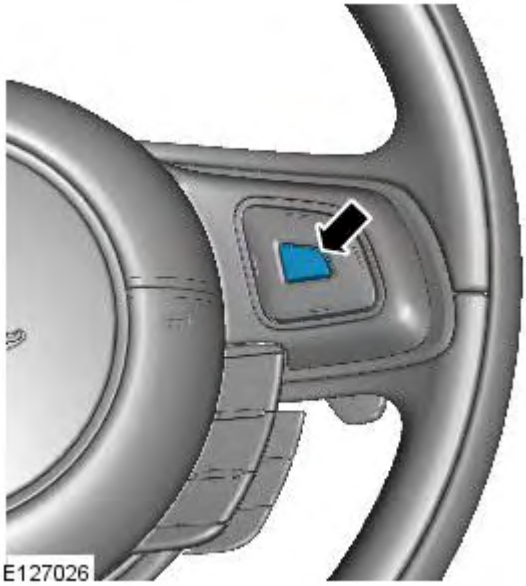
23.
- The message center display will revert to the normal display in the trip computer.

24. Turn the ignition off.

25. Turn the ignition on.

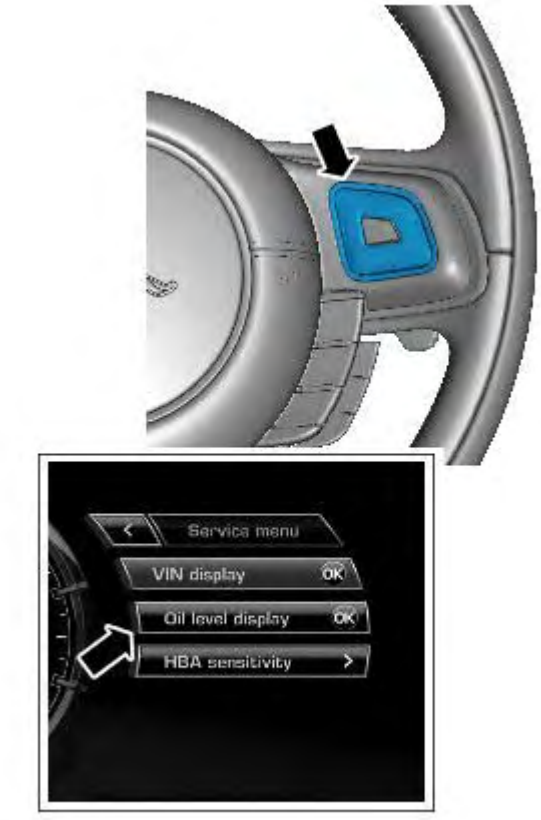
26.
- Press the right-hand directional button to access the instrument cluster menu.

E127027



27.

- Press the right-hand OK button.



28.

- Press the right-hand directional button to access the Oil Level Display.

E127031

29.

- Press the right-hand OK button and follow the instructions.
- Make sure that the average oil level value has now been updated.

Published: 11-May-2011

Engine - TDV6 3.0L Diesel - Camshaft LH

Removal and Installation

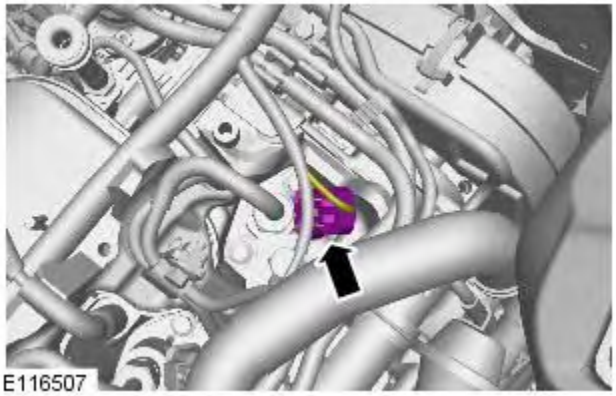
Special Tool(s)

E54135	100-012 Slide Hammer
E54549	303-1124 Holding Tool, Camshaft Front Pulley
E116924	310-213 Fuel Injector Removal Adapter

Removal

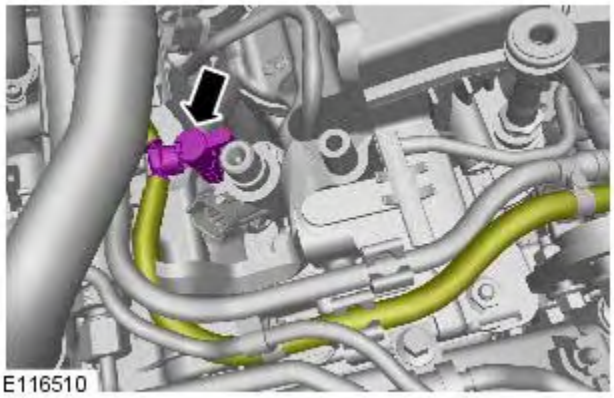
NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: Intake Air Shutoff Throttle (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).
3. Refer to: Fuel Rail LH (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).
4. Refer to: Rear End Accessory Drive (READ) (303-05A Accessory Drive - TDV6 3.0L Diesel, Removal and Installation).
5. Refer to: Timing Belt (303-01, Removal and Installation).



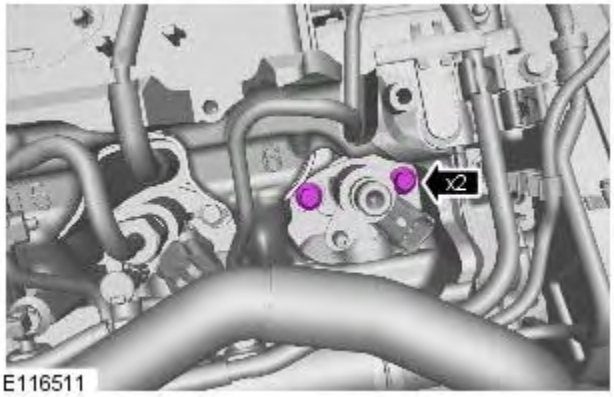
6.

7. Refer to: Fuel Injection Component Cleaning (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, General Procedures).



8. CAUTION: Be prepared to collect escaping fuel.

NOTE: Make sure that the fuel injector return line has a maximum of 8 uses.



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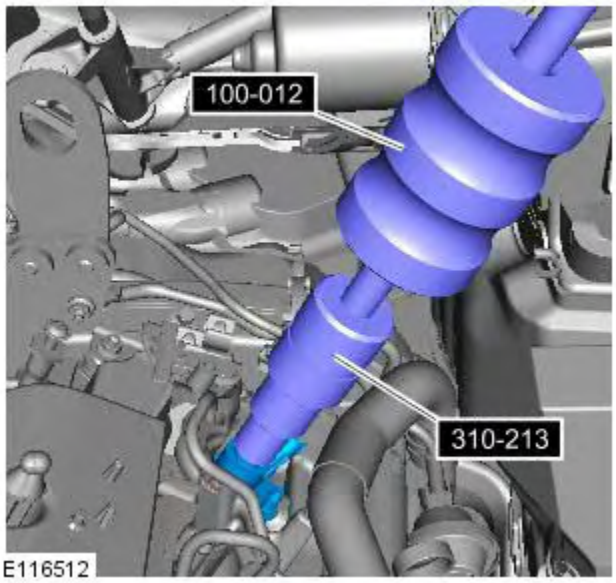
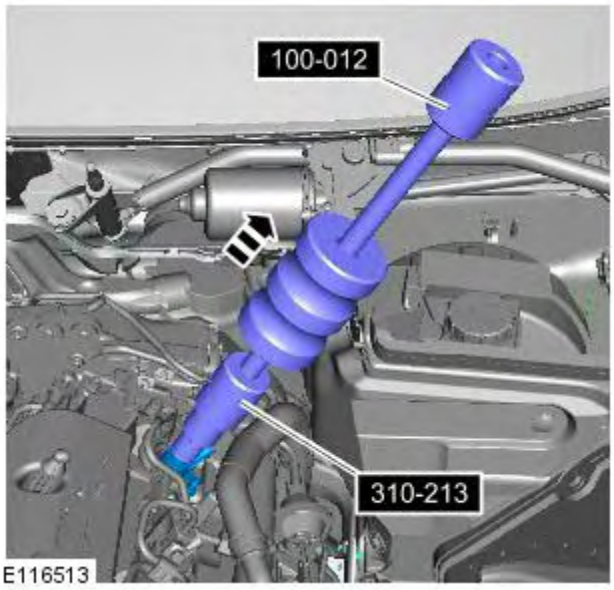


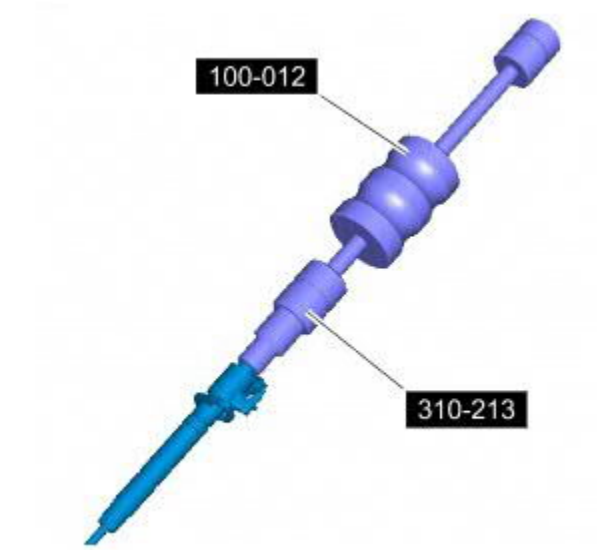
10. Install the special tool.

    Special Tool(s): 100-012, 310-213



11.

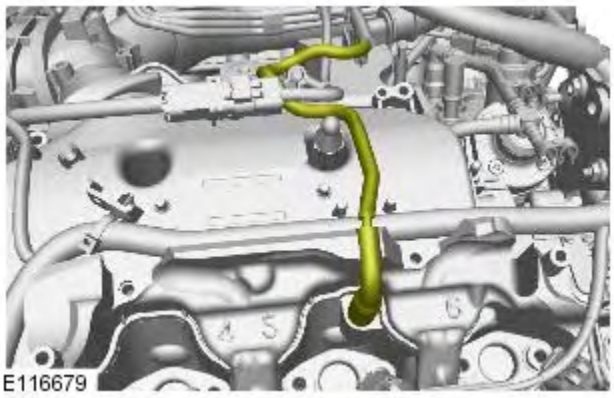
12. Remove the special tool.



E116514

13. Remove the 2 remaining fuel injectors.

14.


E116679

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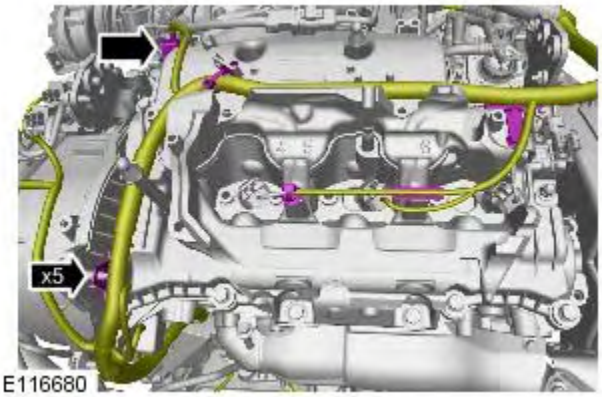

E116680

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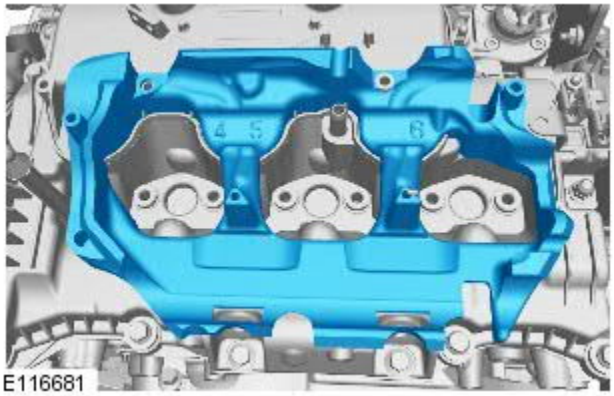

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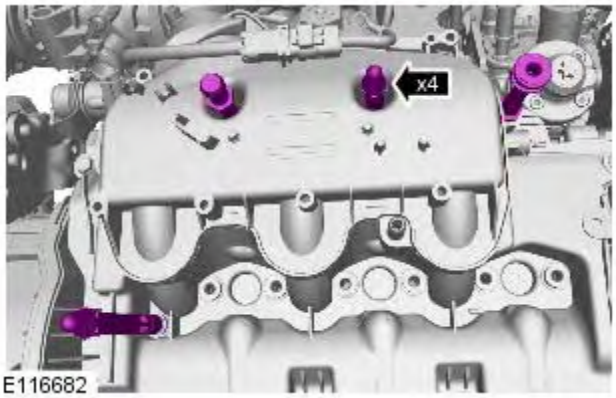
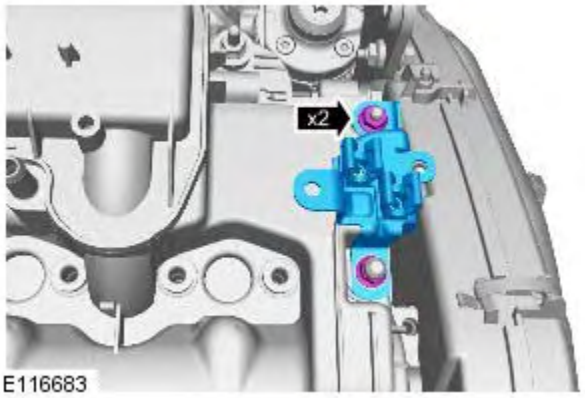


18.



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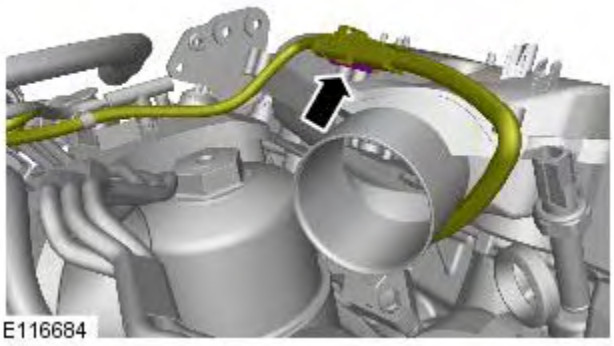

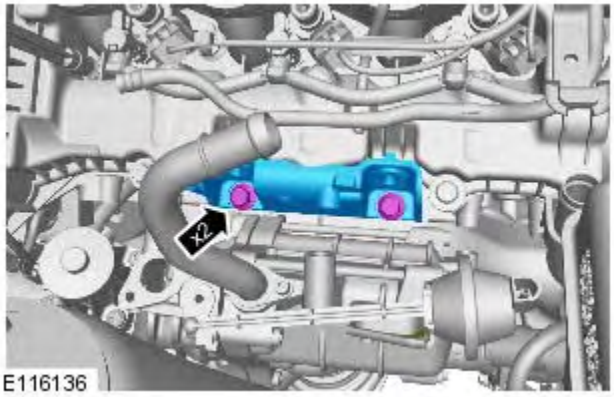

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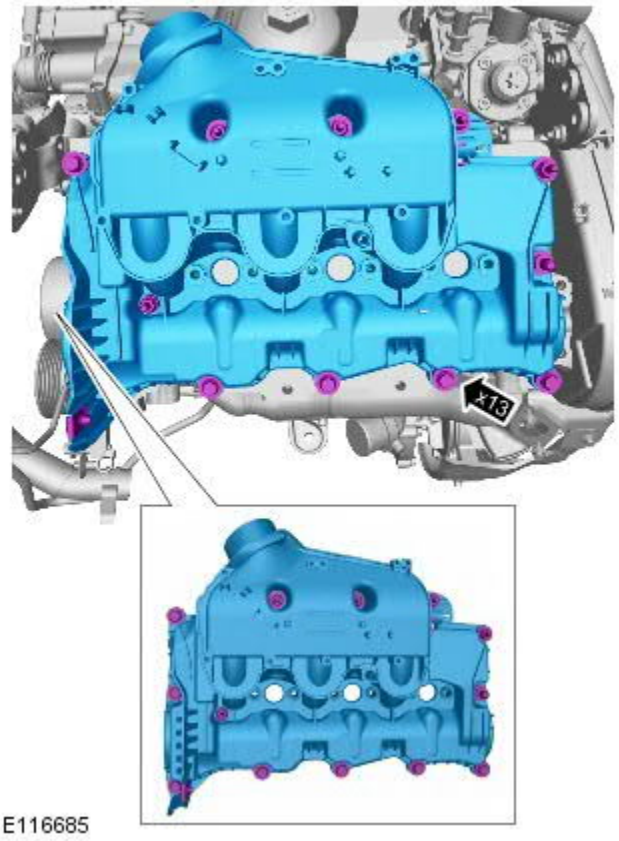
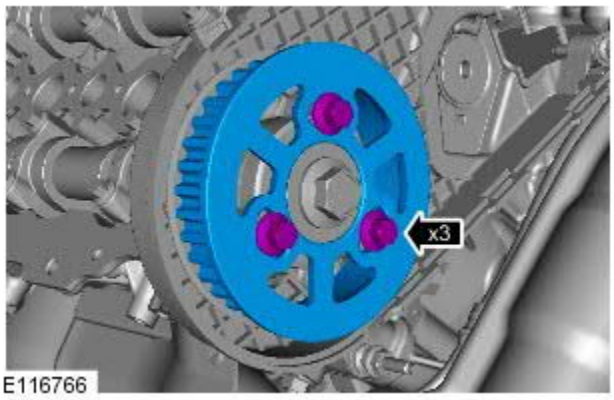


21. NOTE: Discard the gasket.



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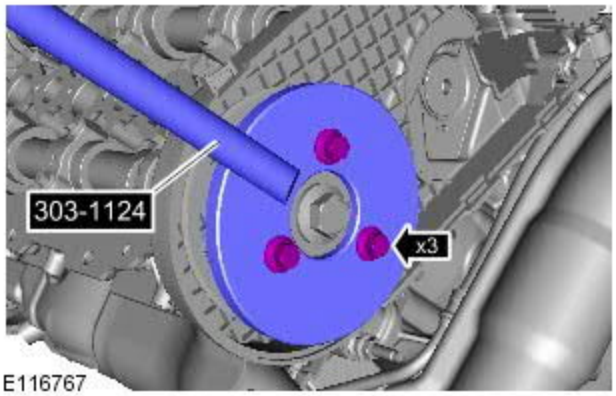
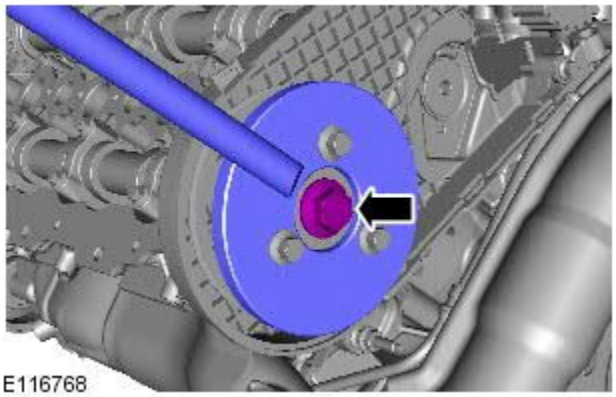


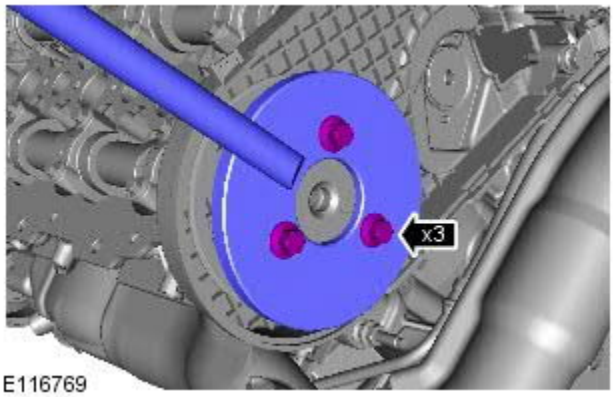
E116767

23. Install the special tool.

    Special Tool(s): 303-1124

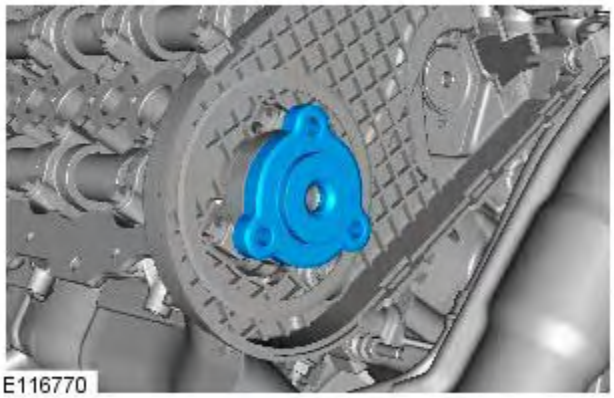

E116768

24.



E116769

25. Remove the special tool.


E116770

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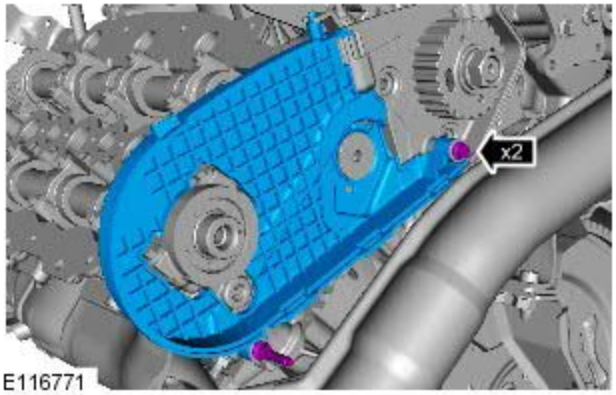

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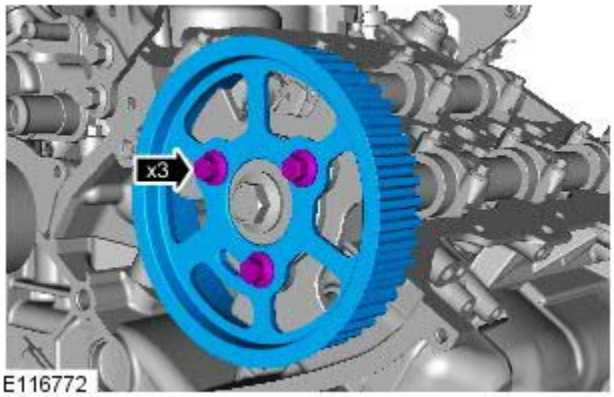

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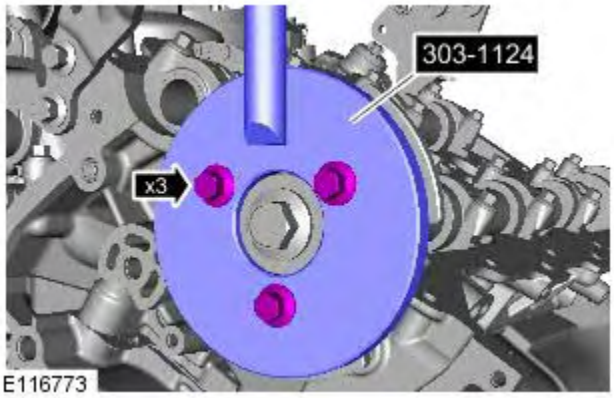
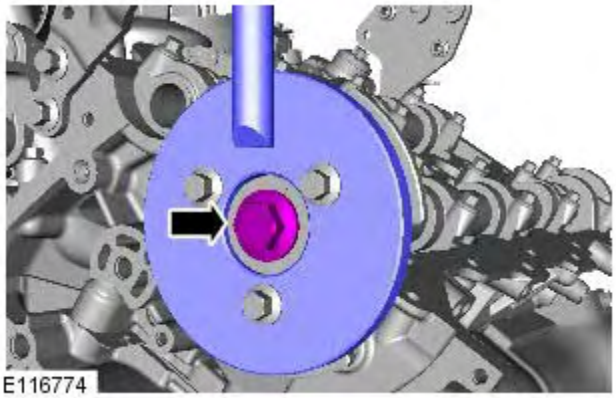


29. Install the special tool.

Special Tool(s): 303-1124



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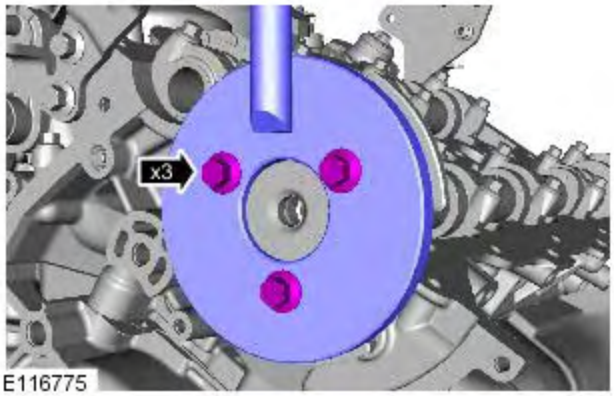
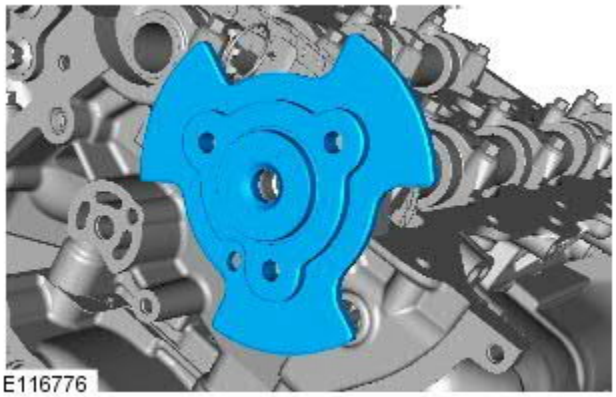
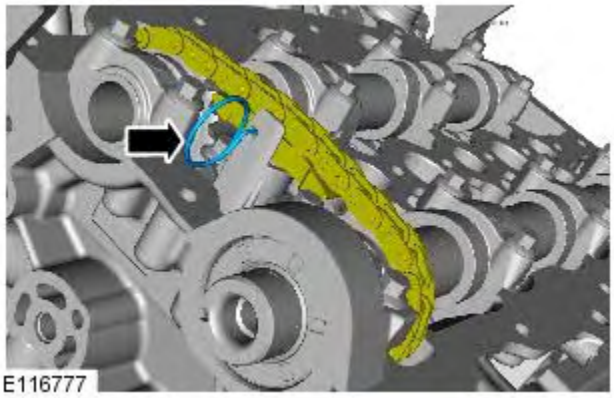


31. Remove the special tool.

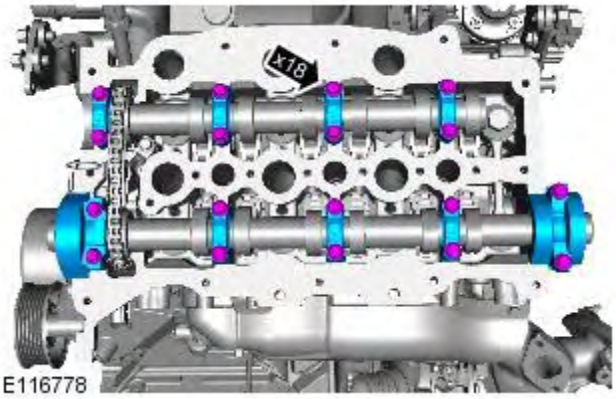


32.



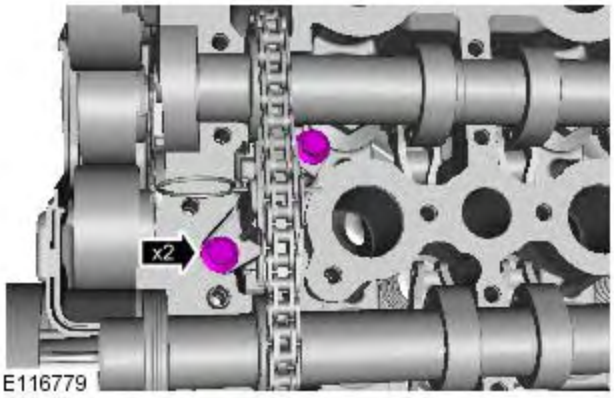
33.

- Reposition the secondary timing chain tensioner.
- Retain the secondary timing chain tensioner plunger.



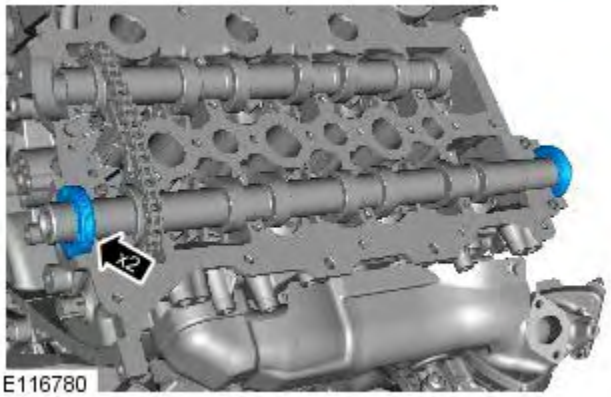
34. Remove the camshaft bearing caps evenly.

35.



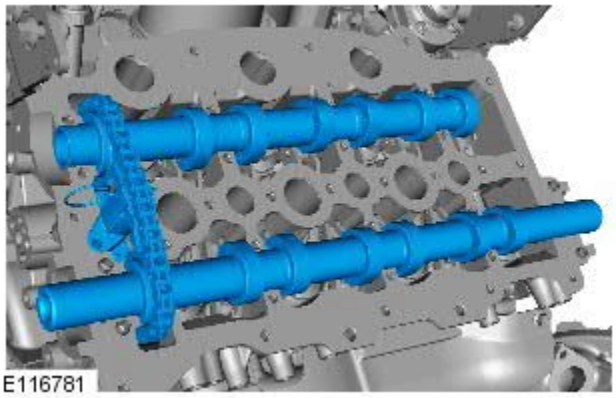
E116779

36. CAUTION: Discard the seals.

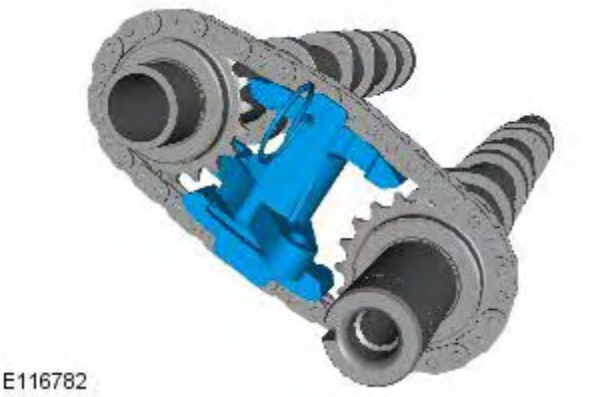


E116780

37.


E116781

38.


E116782

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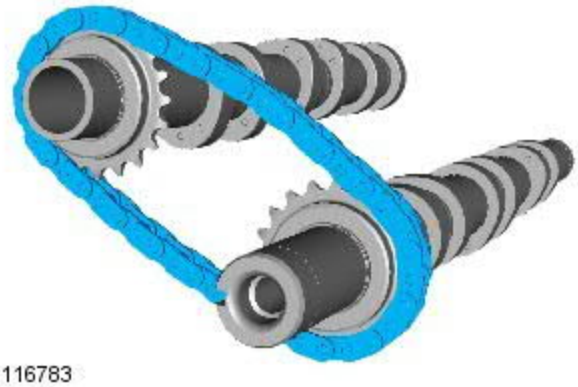
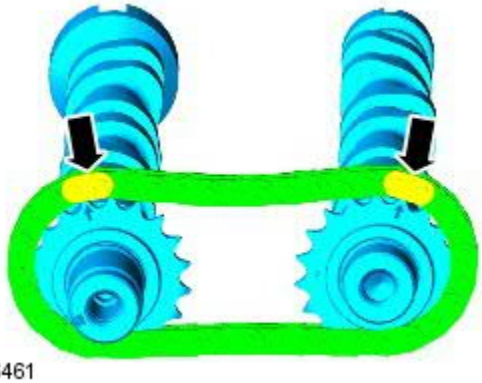


E116783

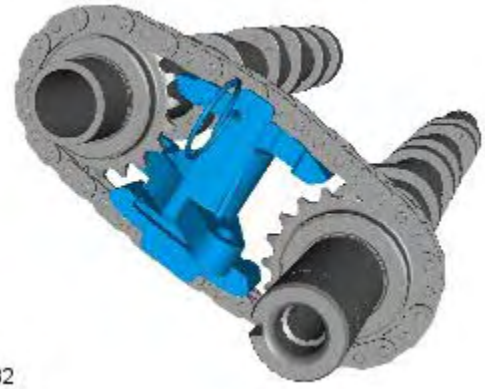
Installation

1.

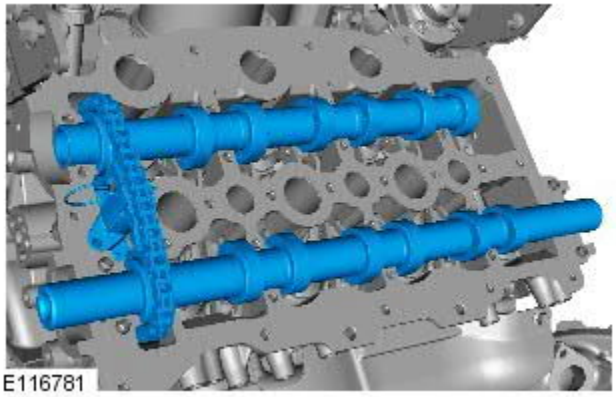


E86461

2.



E116782

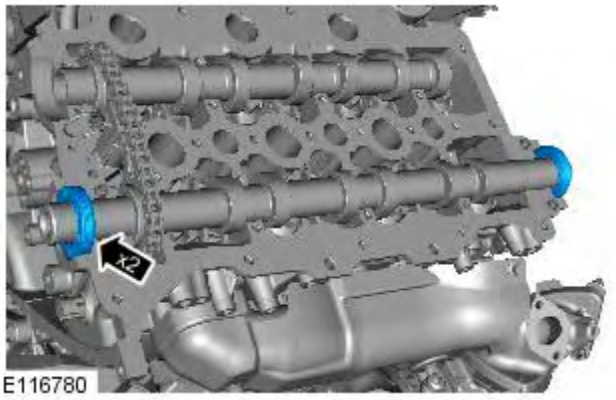


3. CAUTION: Make sure that the dots on the camshafts are aligned at the 12 o'clock position. Failure to follow this instruction may result in damage to the engine.

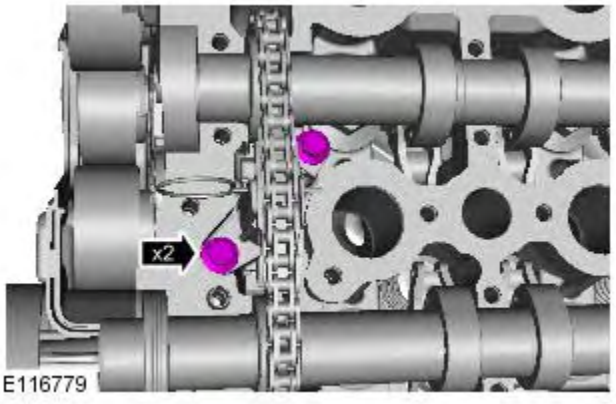
   NOTES:

   Lubricate the camshafts and the camshaft bearing caps with oil meeting Jaguar specification prior to installation.

   Use hypoid oil to lubricate the camshafts.



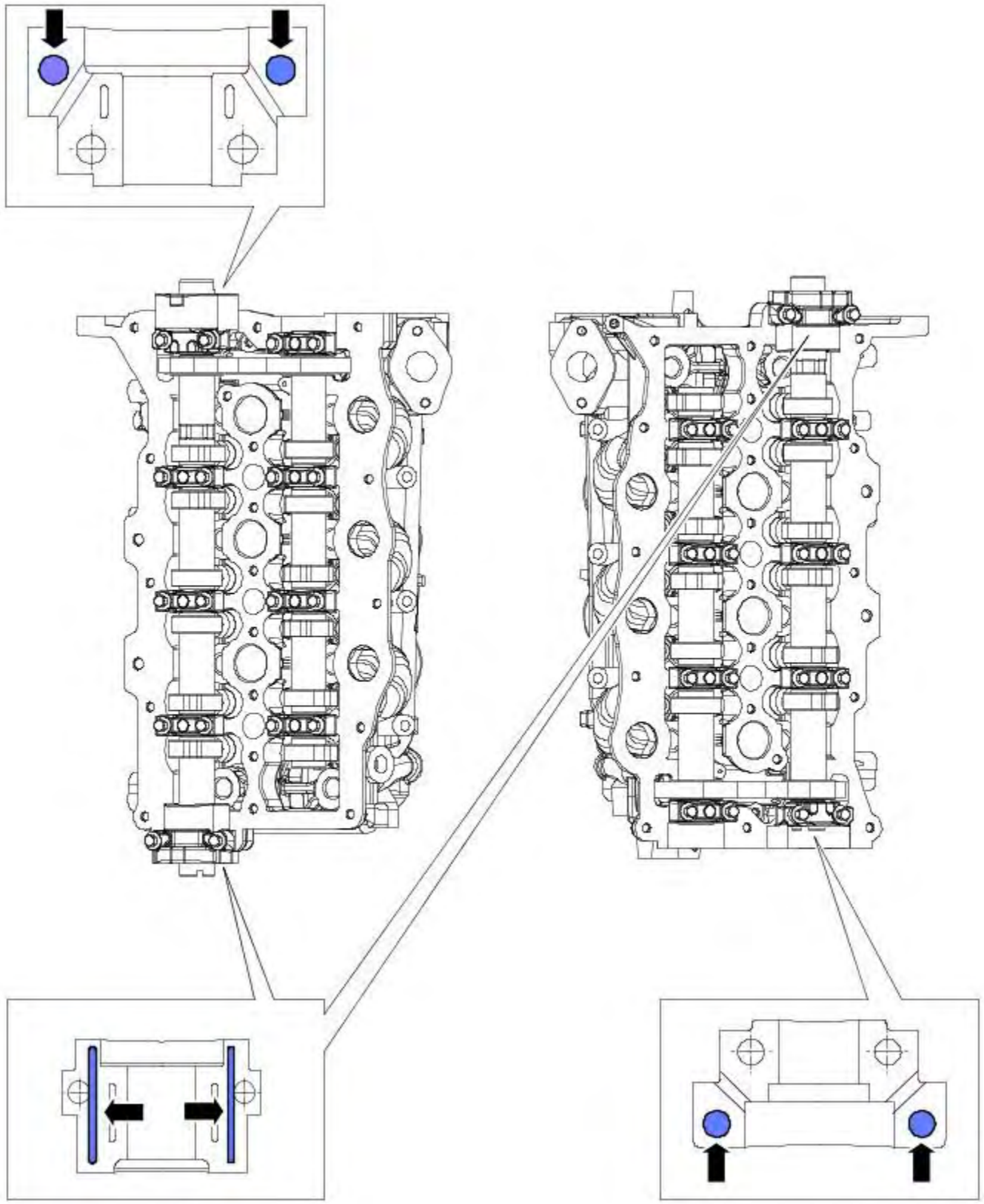
4. NOTE: Install new seals.



5. *Torque:* 10 Nm

6.

- Apply Loctite 518 sealant to the exhaust camshaft seal bearing caps.
- Apply Loctite 518 sealant, 2 mm wide, to the LH rear and RH front camshaft bearing caps.
- Apply Loctite 518 sealant, 7 mm diameter, to the LH front and RH rear camshaft bearing caps.



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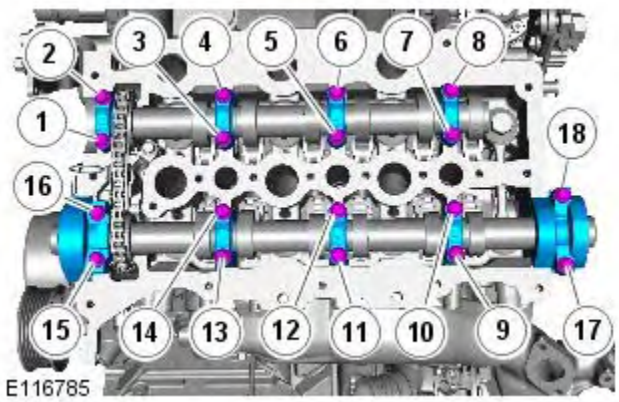
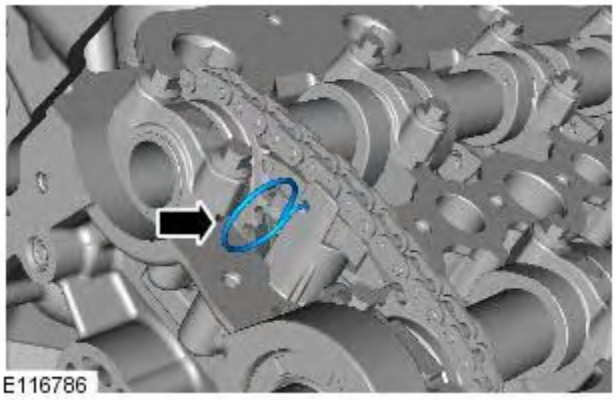


7. NOTE: Tighten the bolts in the indicated sequence.

   - Install the camshaft bearing caps in their original positions.
   - Stage 1: Bolts 1 to 14, 1 Nm.
   - Stage 2: Bolts 1 to 14, 5 Nm.
   - Stage 3: Bolts 1 to 14, 10 Nm.
   - Stage 4: Bolts 15 to 18, 1 Nm.
   - Stage 5: Bolts 15 to 18, 5 Nm.
   - Stage 6: Bolts 15 to 18, 10 Nm.



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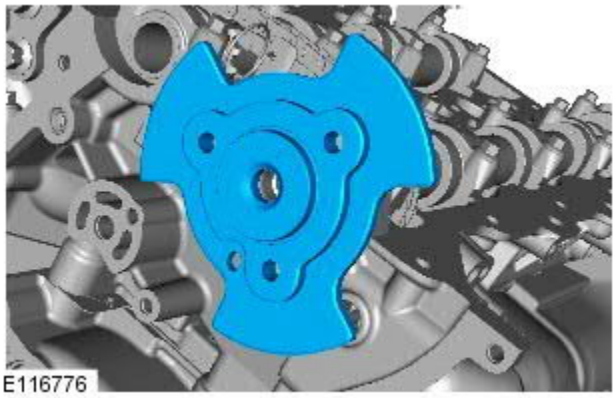

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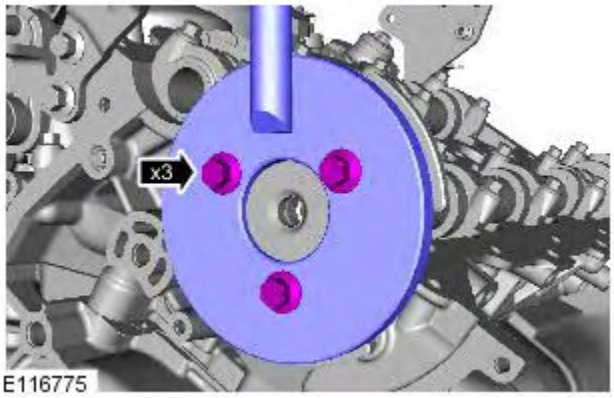
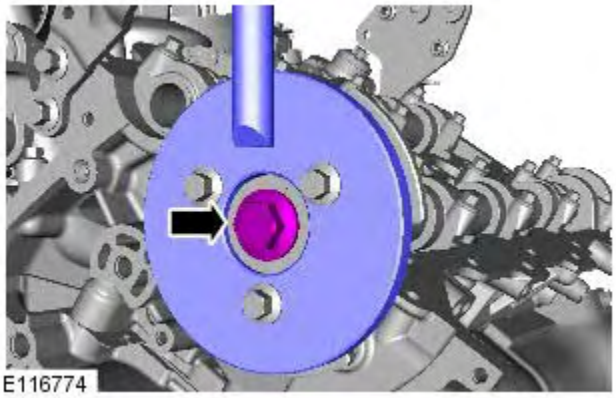
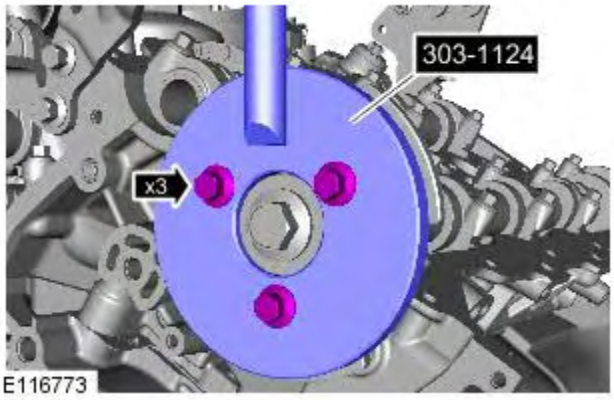


10. Install the special tool.

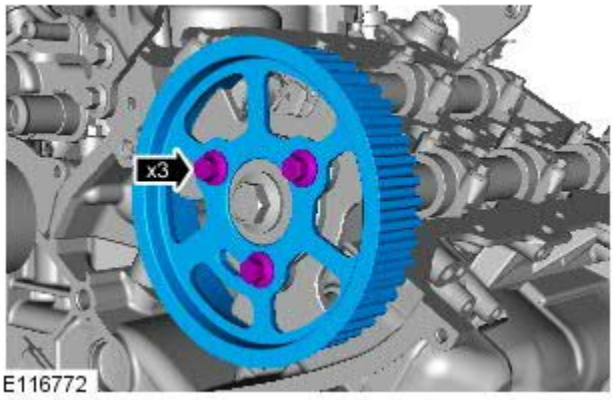
    Special Tool(s): 303-1124



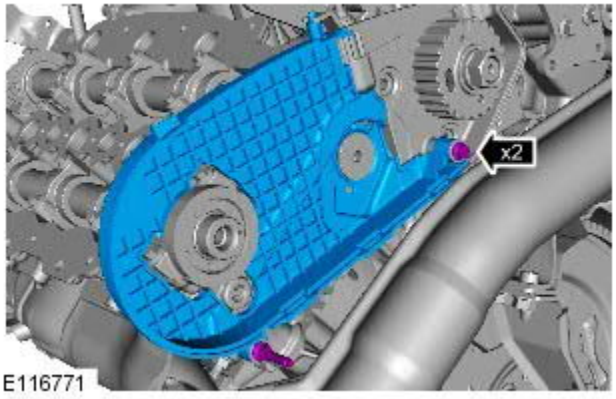
11. *Torque:*
    Stage 1:80 Nm
    Stage 2:80°



12. Remove the special tool.

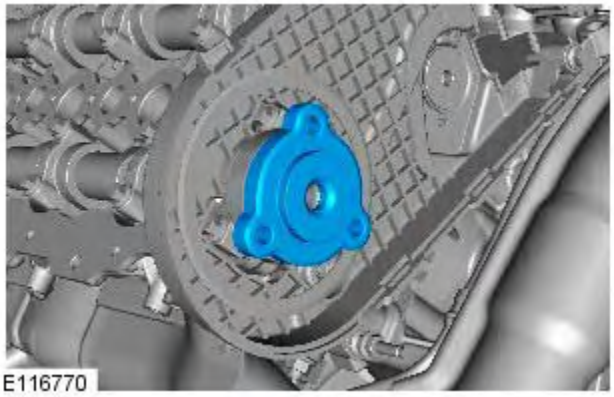


13. CAUTION: Only tighten the bolt finger-tight at this stage.



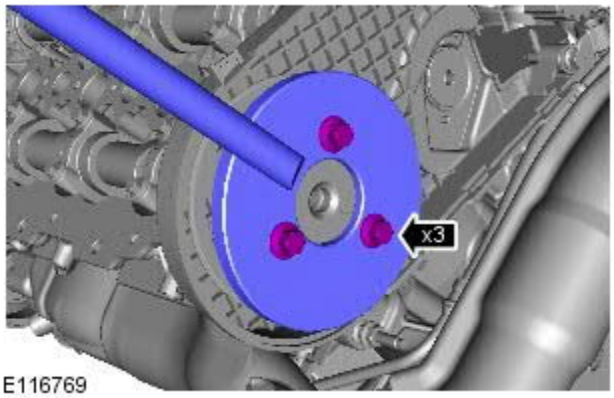
14. *Torque:* 10 Nm

15.

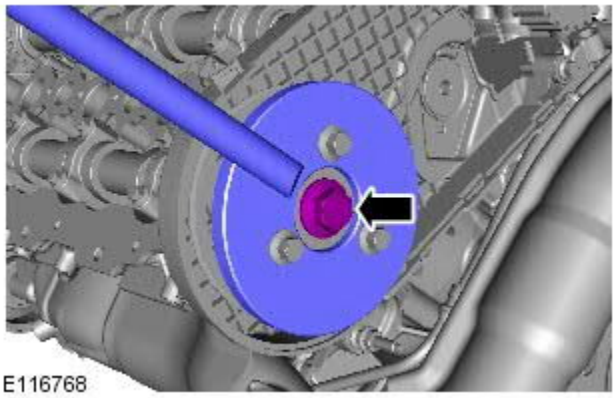


16. Install the special tool.

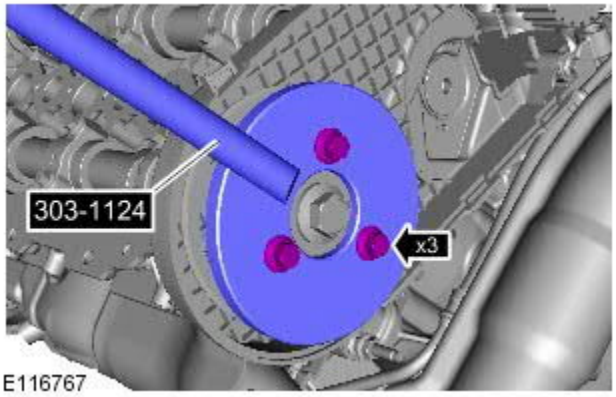
Special Tool(s): 303-1124

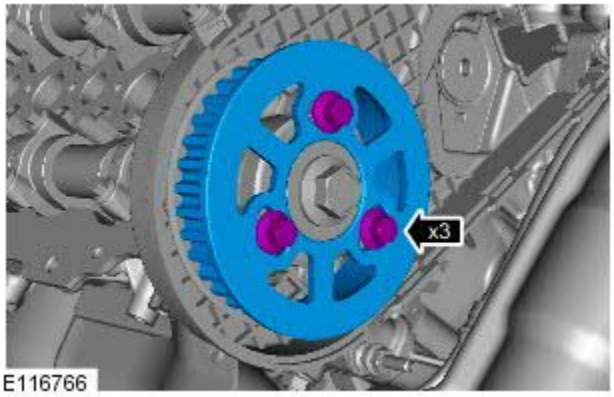


17. *Torque:*
Stage 1:80 Nm
Stage 2:80°

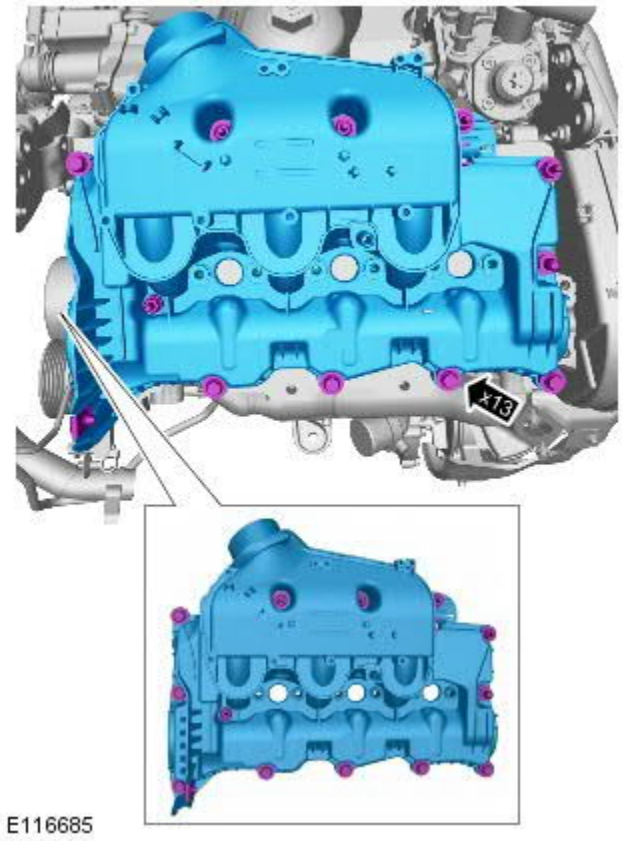


18. Remove the special tool.





19. CAUTION: Only tighten the bolt finger-tight at this stage.



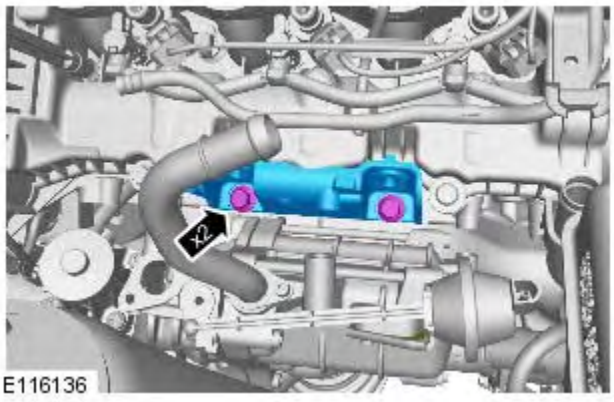
20. CAUTIONS:

Make sure that the mating faces are clean and free of corrosion and foreign material.

Install all the bolts finger tight before final tightening.

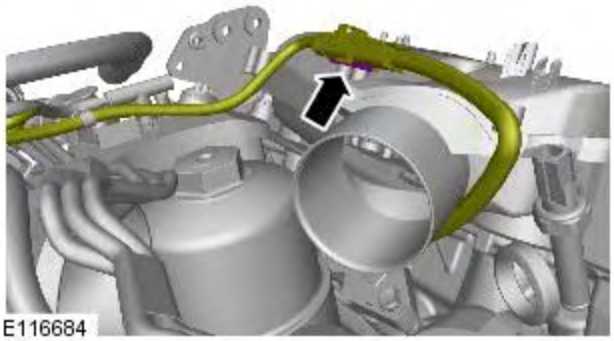
NOTE: Install a new gasket.

Torque: 10 Nm

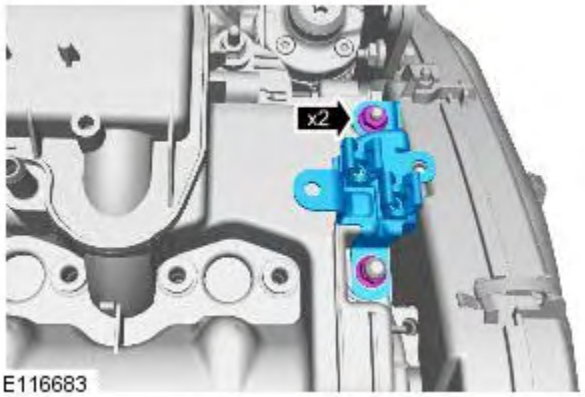


21. *Torque:* 24 Nm

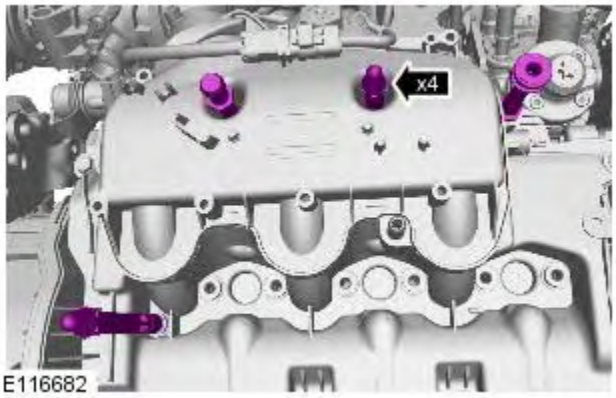
22.



23. *Torque:* 10 Nm



24. *Torque:* 7 Nm



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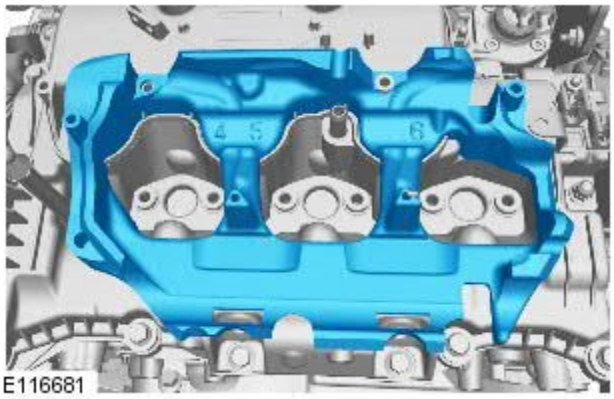

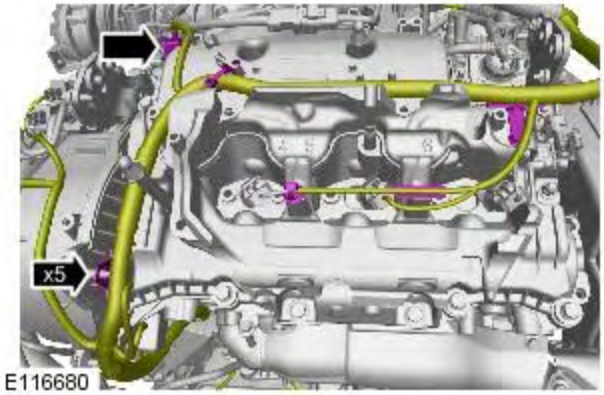

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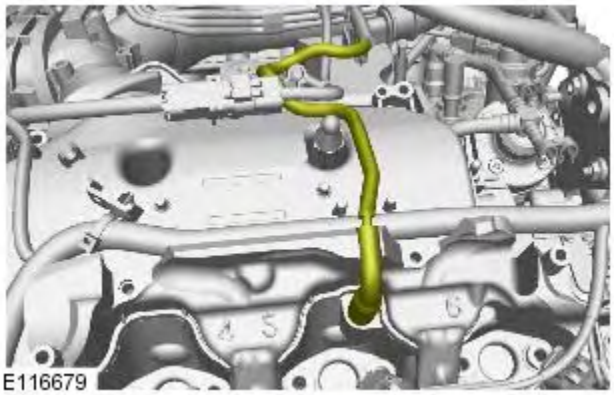
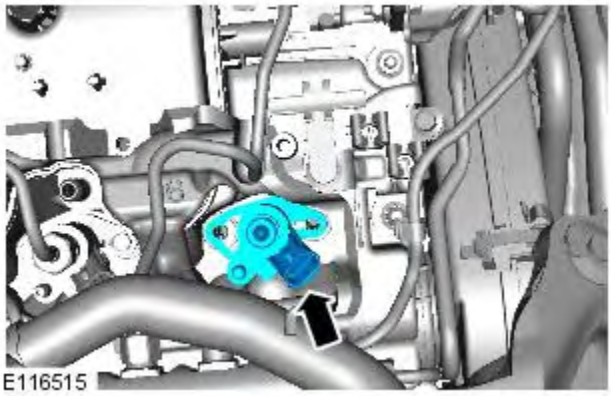


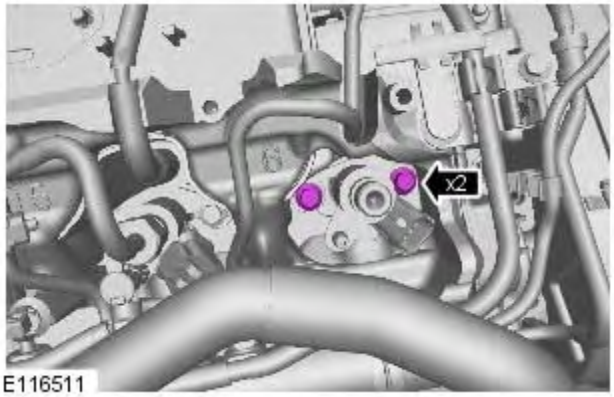
27.



28. CAUTIONS:

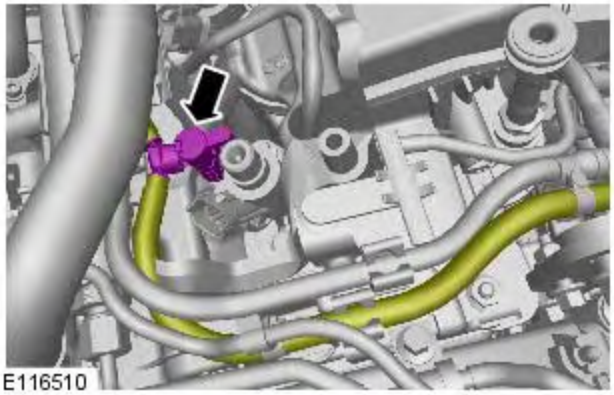
⚠ Make sure that the area around the open fuel injector ports are clean and free of foreign material and lubricant prior to installing the fuel injector.

⚠ Make sure that a new sealing washer is installed.



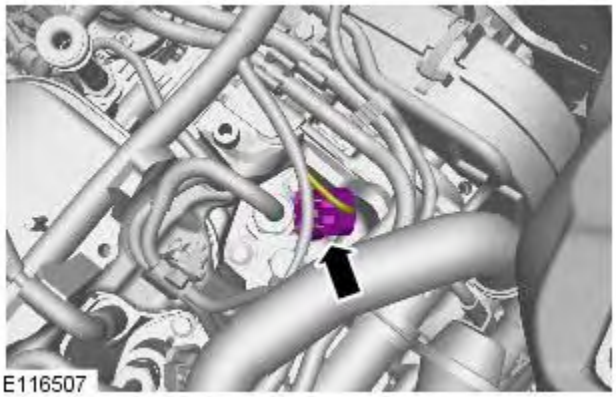
29. NOTE: Tighten the retaining bolts evenly and progressively.

Torque: 9 Nm



30. CAUTION: Be prepared to collect escaping fuel.

NOTE: Make sure that the fuel injector return line has a maximum of 8 uses.



31.

32. Install the 2 remaining fuel injectors.

33. Refer to: Timing Belt (303-01, Removal and Installation).

34. Refer to: Rear End Accessory Drive (READ) (303-05A Accessory Drive - TDV6 3.0L Diesel, Removal and Installation).

35. Refer to: Intake Air Shutoff Throttle (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).

36. Refer to: Fuel Rail LH (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).

37. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 13-Sep-2013

Engine - TDV6 3.0L Diesel - Camshaft RH

Removal and Installation

Special Tool(s)

	303-1117 Timing Peg, Automatic Transmission
	303-1124 Holding Tool, Camshaft Front Pulley
	303-1126 Timing Peg, Camshaft Pulley

Removal

1. Disconnect the battery ground cable.

   Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNING: Make sure to support the vehicle with axle stands.

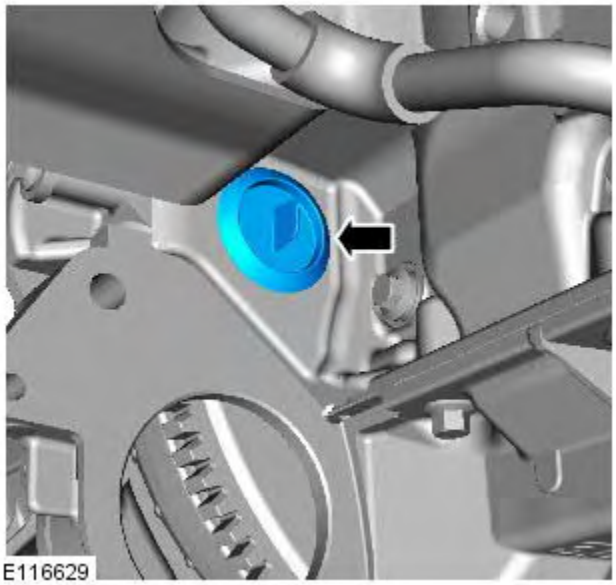
   Raise and support the vehicle.

3. Refer to: Starter Motor (303-06A Starting System - TDV6 3.0L Diesel, Removal and Installation).

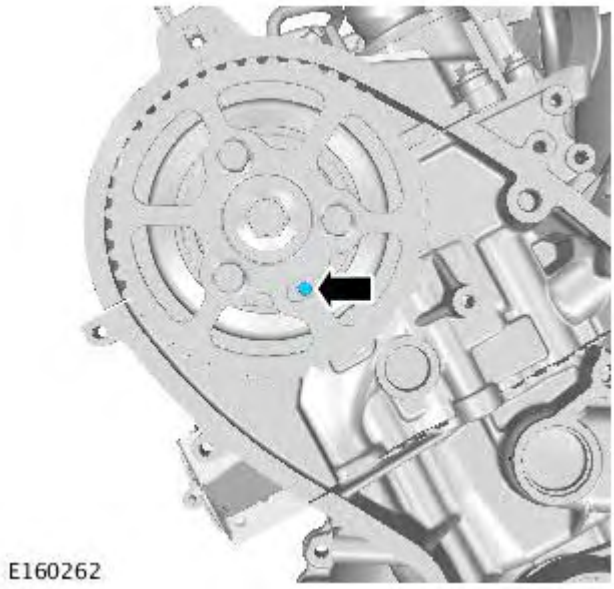
4. Refer to: Brake Vacuum Pump - TDV6 3.0L Diesel (206-07 Power Brake Actuation, Removal and Installation).

5. Refer to: Valve Cover RH (303-01A Engine - TDV6 3.0L Diesel, Removal and Installation).

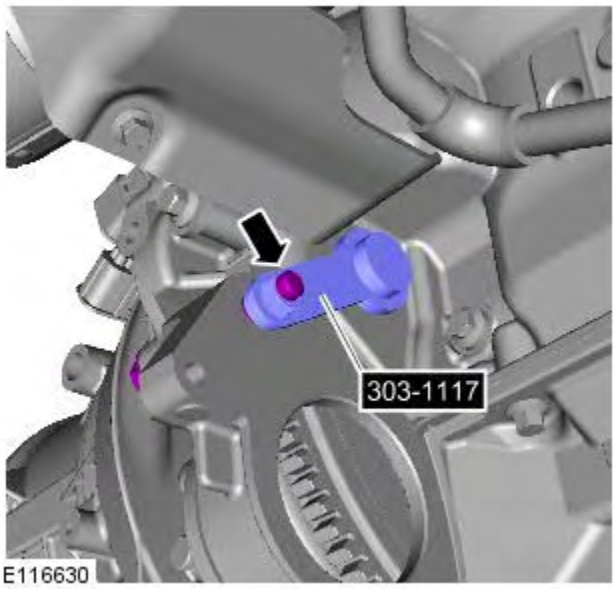
6.



7. Rotate the crankshaft clockwise to align the crankshaft alignment hole in the flywheel or flexplate with the block aperture.

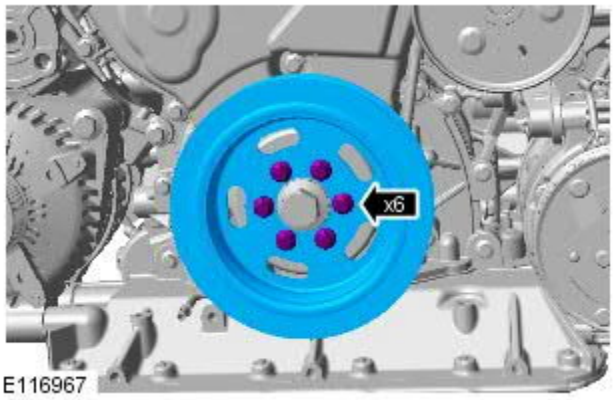


8. Check the camshaft pulley alignment holes are correctly aligned. If the alignment holes are not aligned, rotate the crankshaft one full turn clockwise.



9. Install the special tool.

   Special Tool(s): 303-1117



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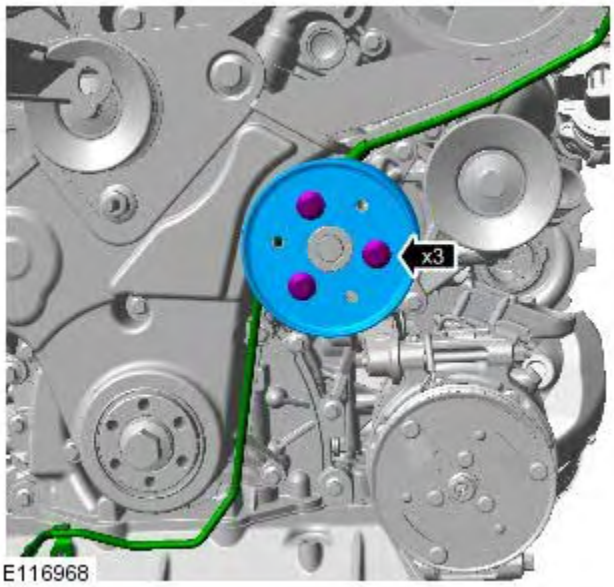
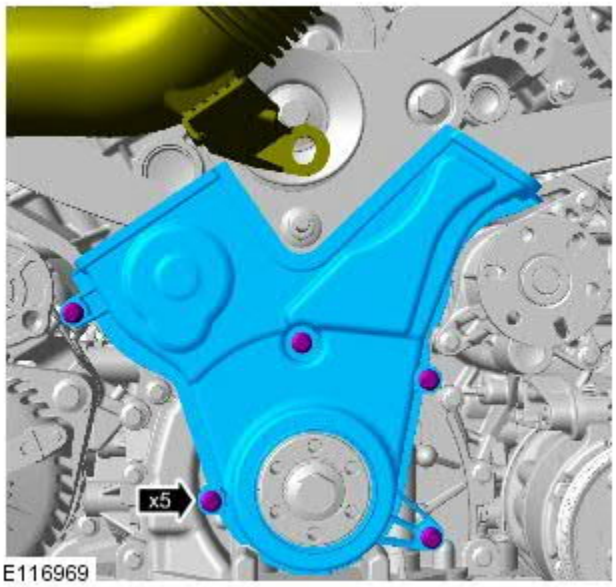
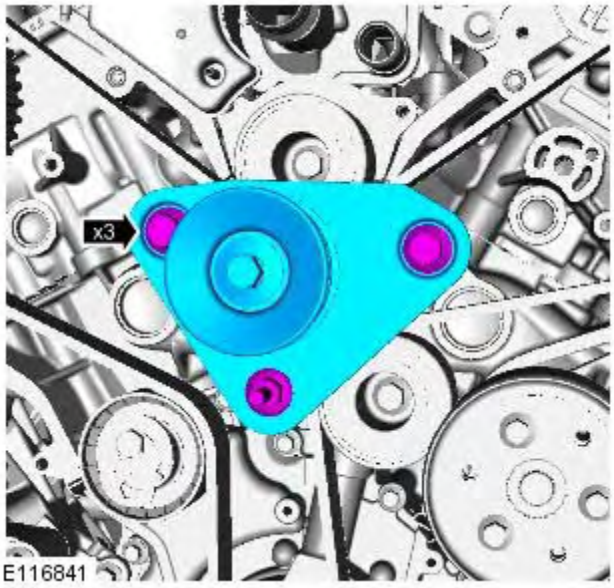


11. CAUTION: Discard the bolts.



12. NOTE: Discard the gasket.



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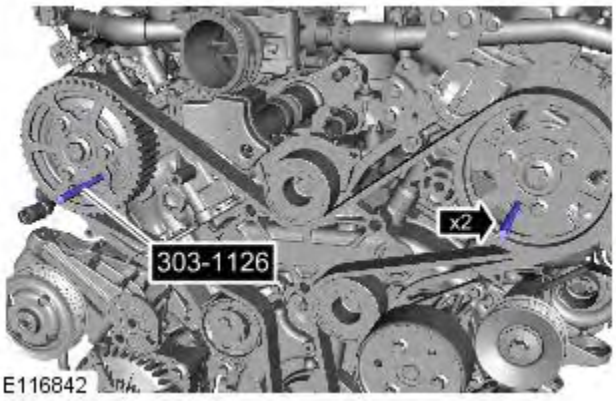
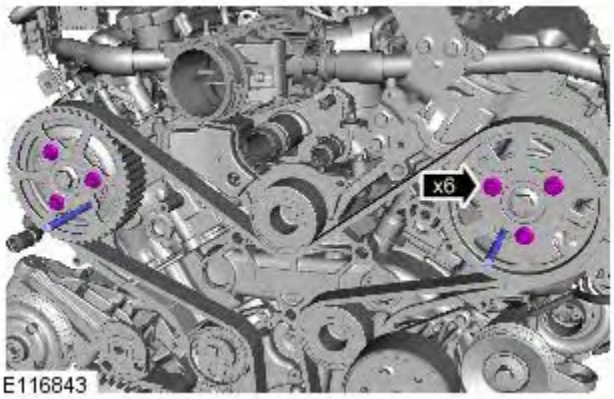
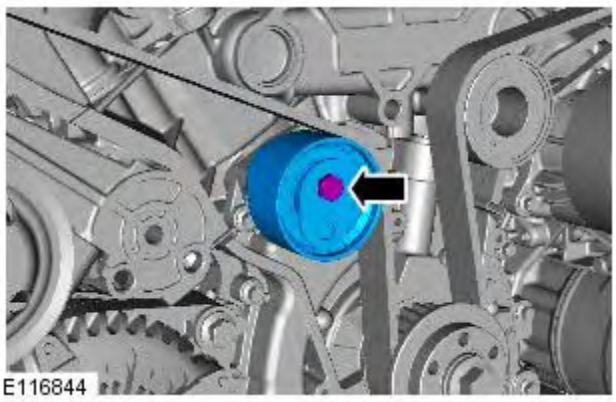


14. *Special Tool(s):* 303-1126



15. CAUTION: Do not use the special tools to lock the camshafts. Failure to follow this instruction may result in damage to the engine or the special tools.

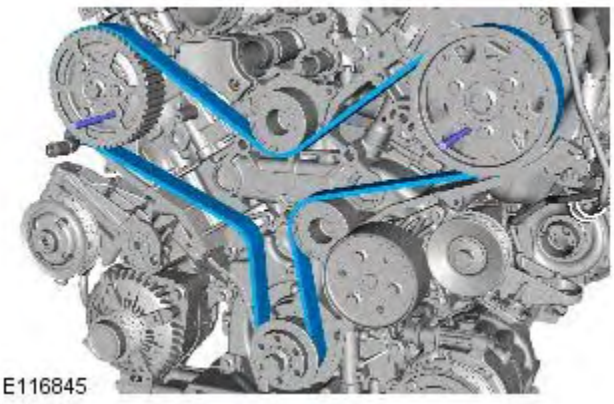
NOTE: Do not loosen the bolts more than 2 turns.



16. CAUTIONS:

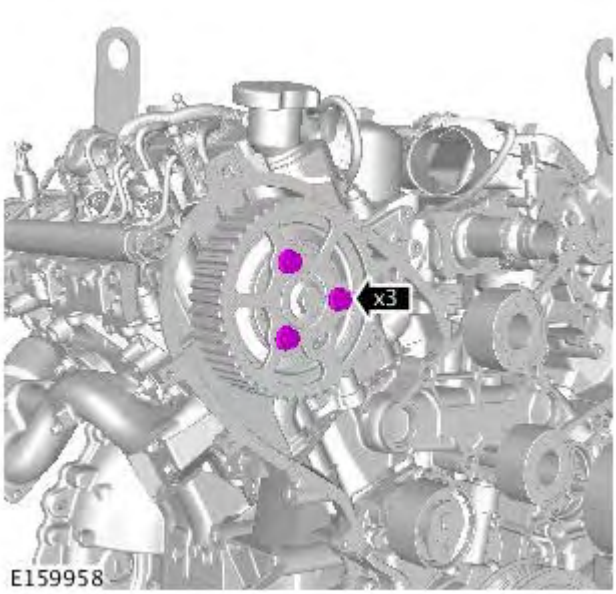
Discard the component.

Discard the bolt.



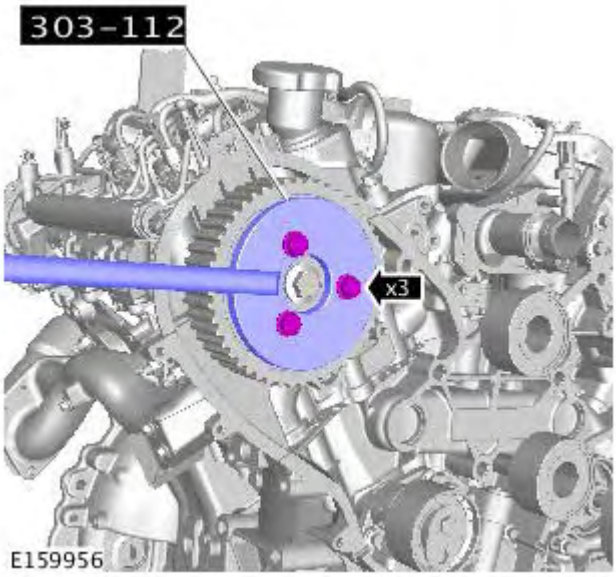
17. CAUTION: Discard the component.

18.



19. Install the special tool.

Special Tool(s): 303-1124



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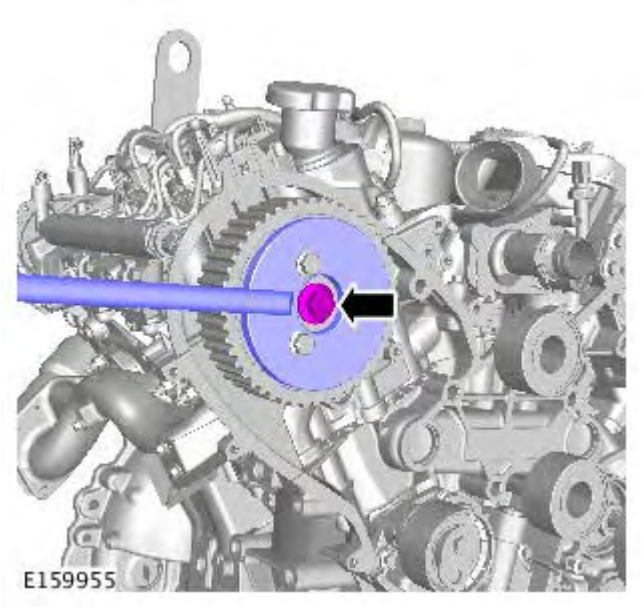
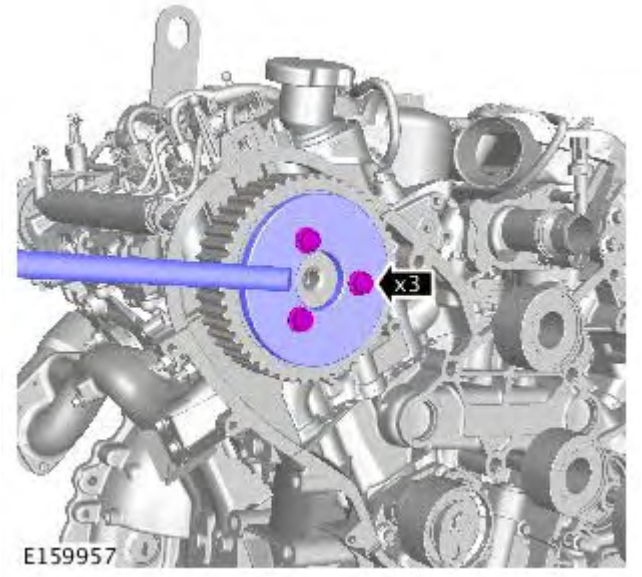
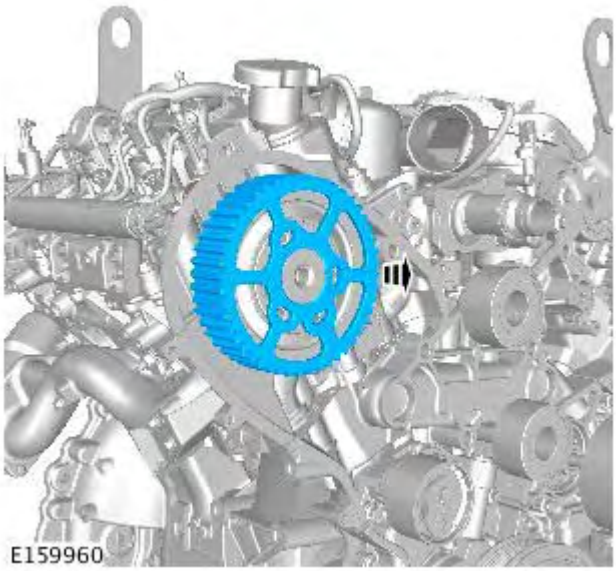


21. Remove the special tool.

Special Tool(s): 303-1124

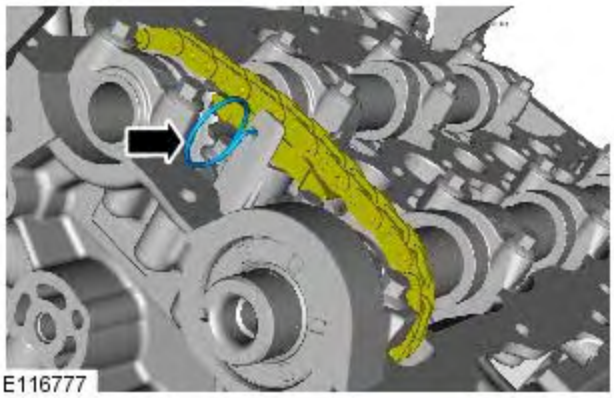


22.

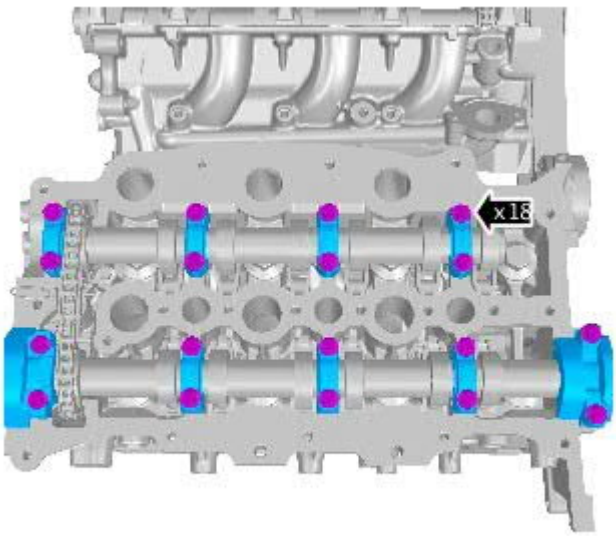


23.

- Reposition the secondary timing chain tensioner.
- Retain the secondary timing chain tensioner plunger.

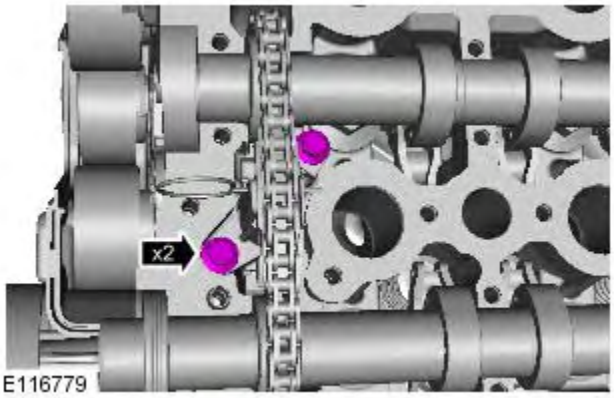


24. Remove the camshaft bearing caps evenly.

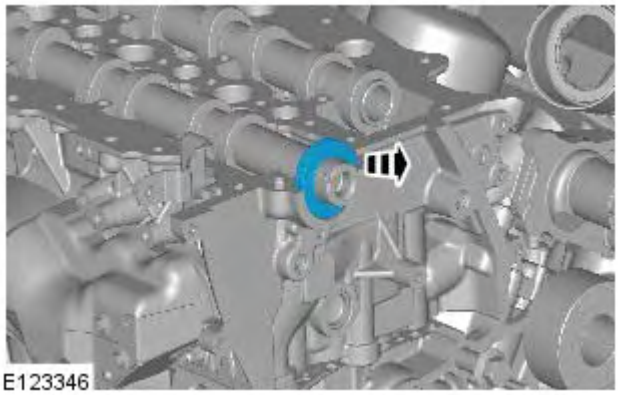


E159959

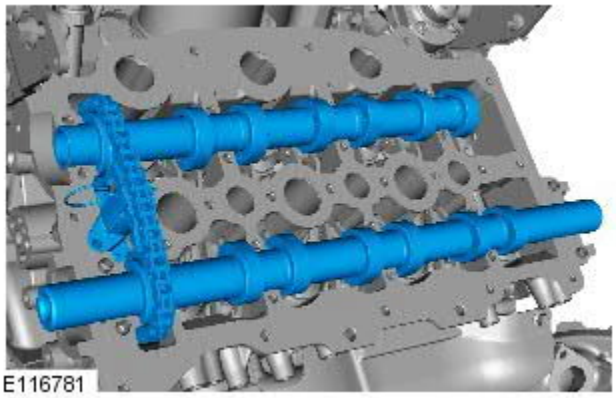
25.



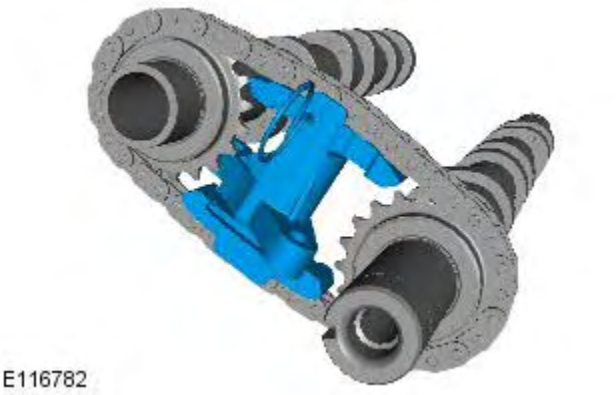
26. CAUTION: Discard the seal.



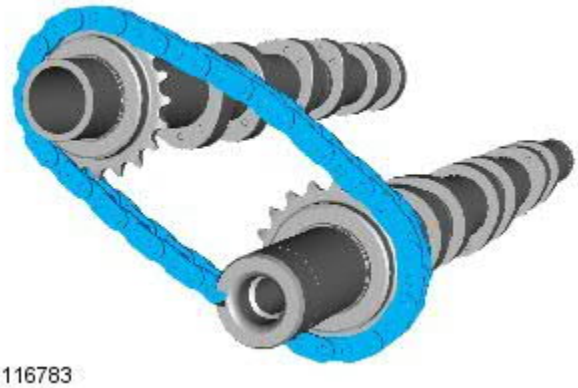
27. Remove the RH bank camshafts and secondary timing chain tensioner assembly.



28. Remove the secondary timing chain tensioner assembly.



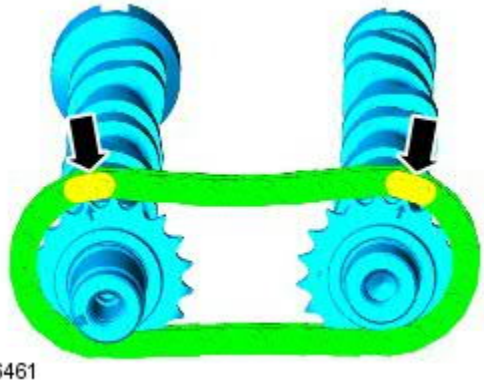
29. Remove the secondary timing chain from the camshafts.



E116783

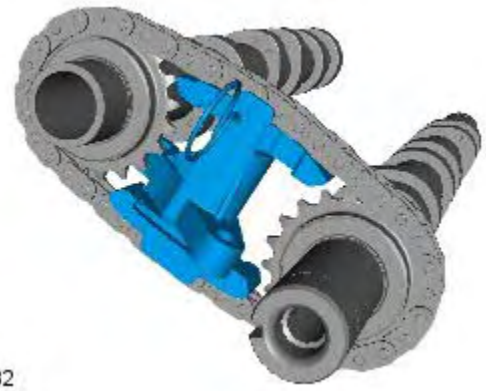
Installation

1. Install the secondary timing chain onto the camshafts.

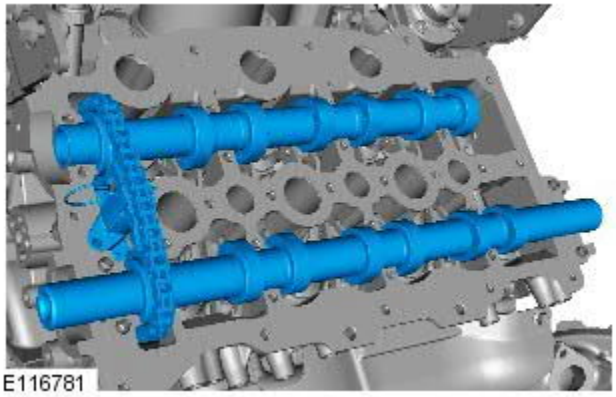


E86461

2. Install the secondary timing chain tensioner assembly.



E116782



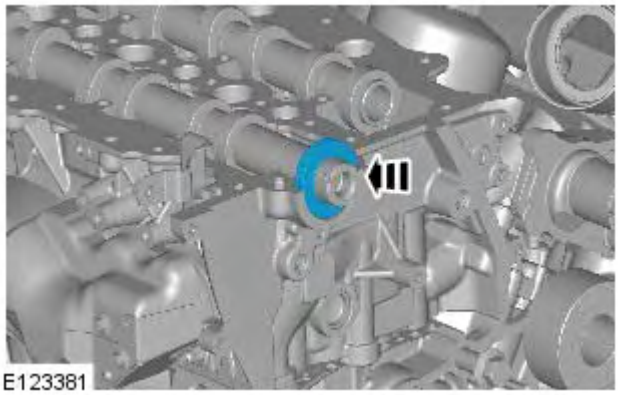
3. CAUTION: Make sure that the dots on the camshafts are aligned at the 12 o'clock position. Failure to follow this instruction may result in damage to the engine.

   NOTES:

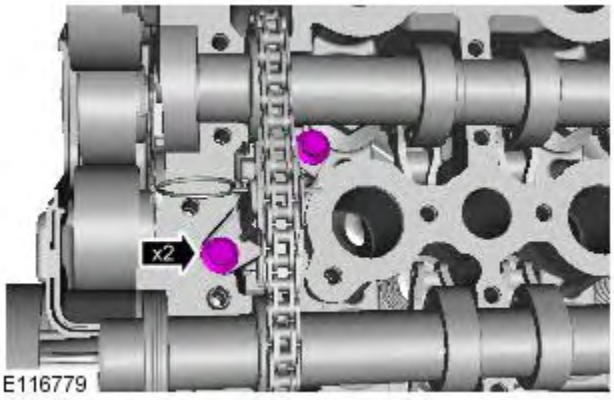
   Lubricate the camshafts and the camshaft bearing caps with oil meeting Jaguar specification prior to installation.

   Use hypoid oil to lubricate the camshafts.

   Install the camshafts.



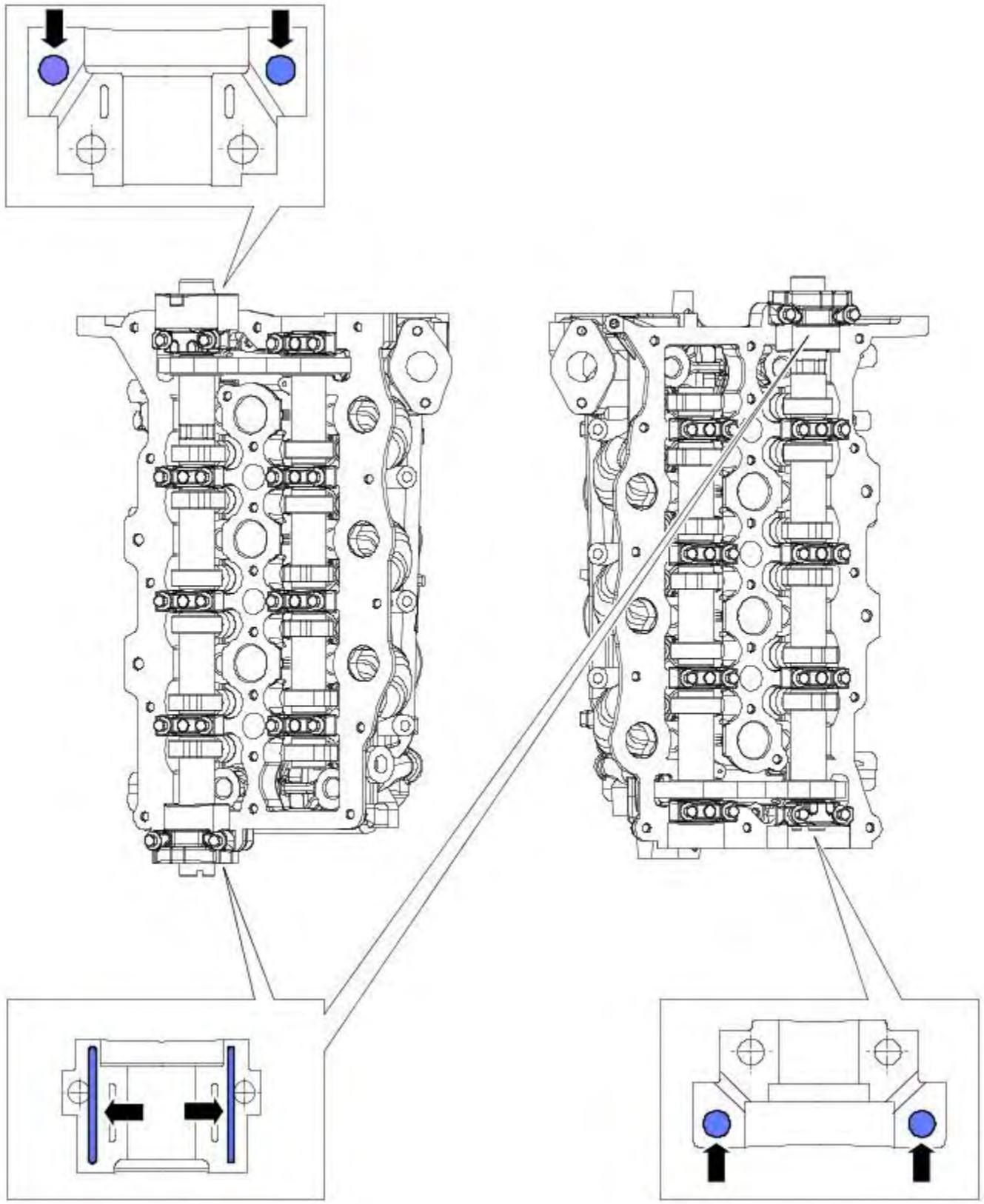
4. NOTE: Install a new seal.



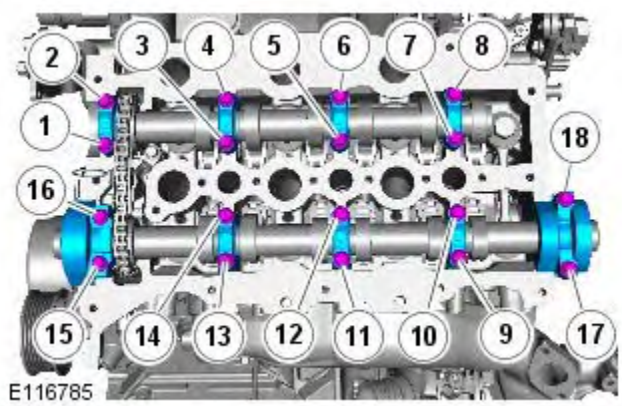
5. *Torque:* 10 Nm

6.

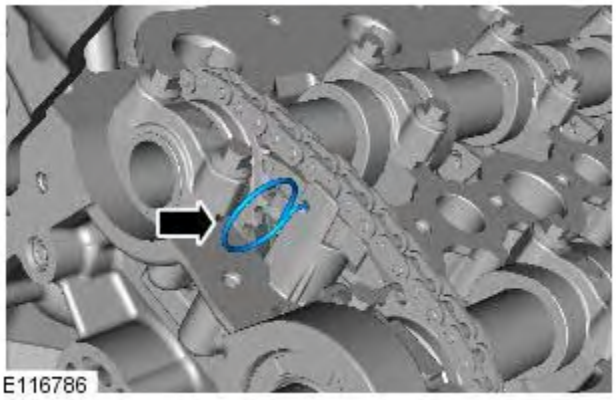
- Apply Loctite 518 sealant to the exhaust camshaft seal bearing caps.
- Apply Loctite 518 sealant, 2 mm wide, to the LH rear and RH front camshaft bearing caps.
- Apply Loctite 518 sealant, 7 mm diameter, to the LH front and RH rear camshaft bearing caps.



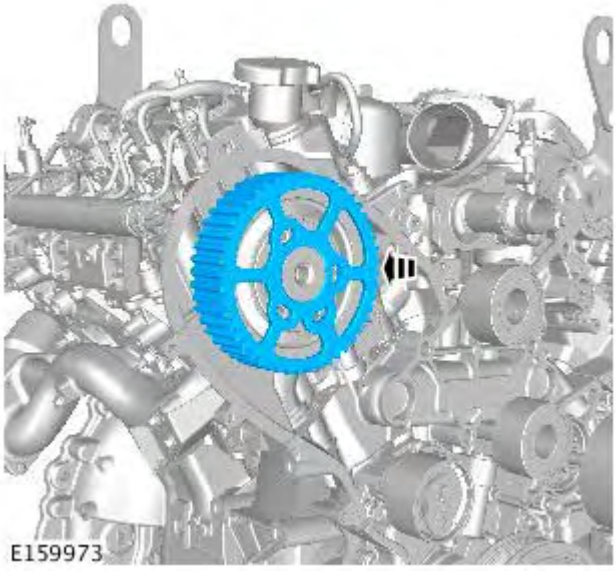
E116784



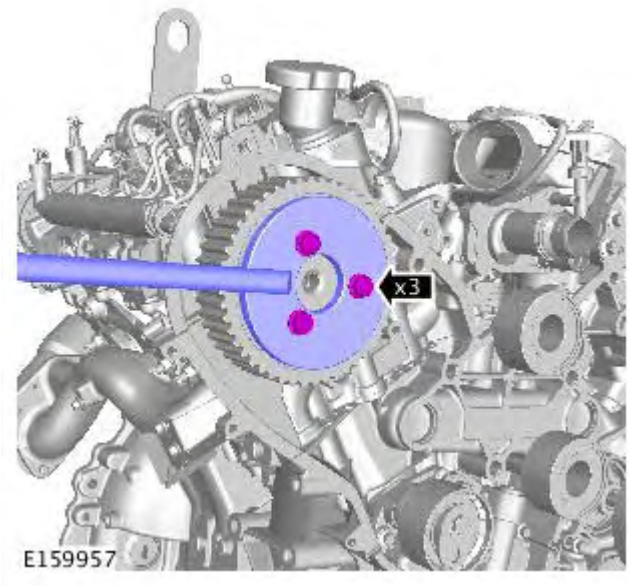
7. NOTE: Tighten the bolts in the indicated sequence.
   - Install the camshaft bearing caps in their original positions.
   - Stage 1: Bolts 1 to 14, 1 Nm.
   - Stage 2: Bolts 1 to 14, 5 Nm.
   - Stage 3: Bolts 1 to 14, 10 Nm.
   - Stage 4: Bolts 15 to 18, 1 Nm.
   - Stage 5: Bolts 15 to 18, 5 Nm.
   - Stage 6: Bolts 15 to 18, 10 Nm.



8. Remove the secondary timing chain tensioner retaining pin.

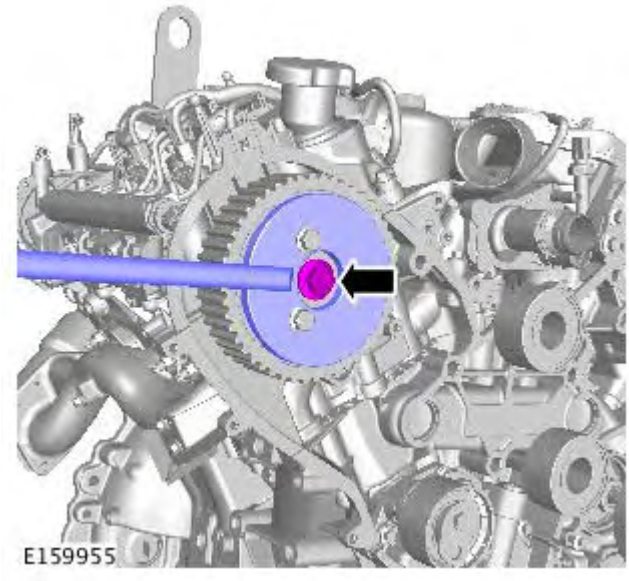


9.

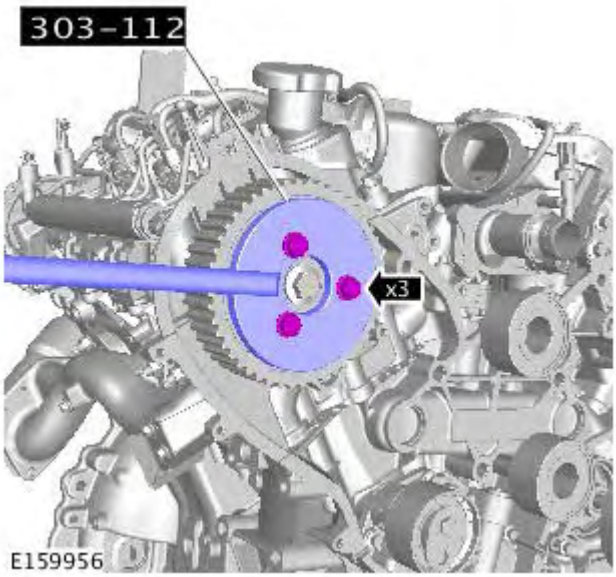


10. Install the special tool.

    Special Tool(s): 303-1124

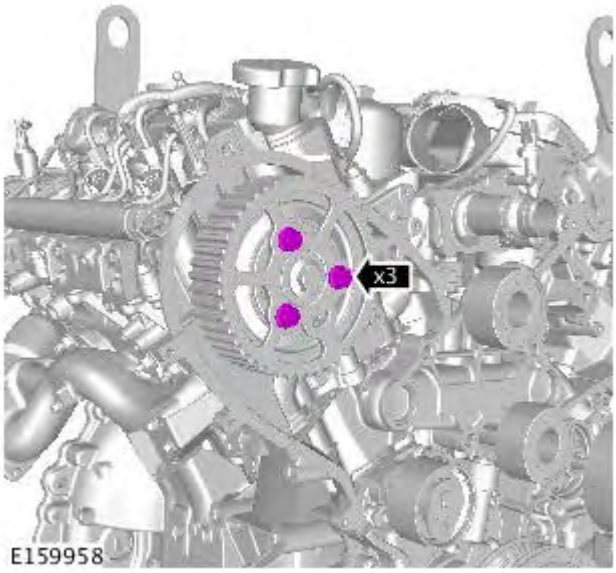


11. *Torque:*
    Stage 1:80 Nm
    Stage 2:80°

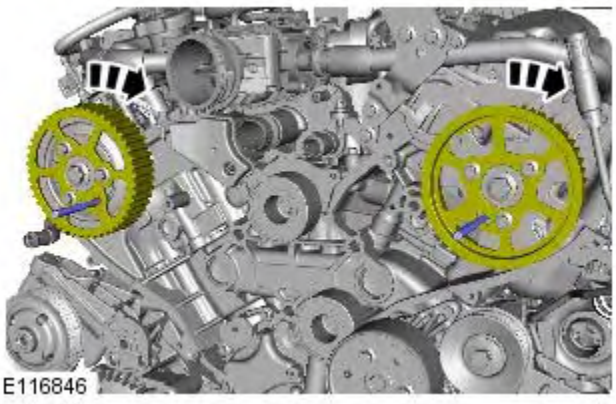


12. Remove the special tool.

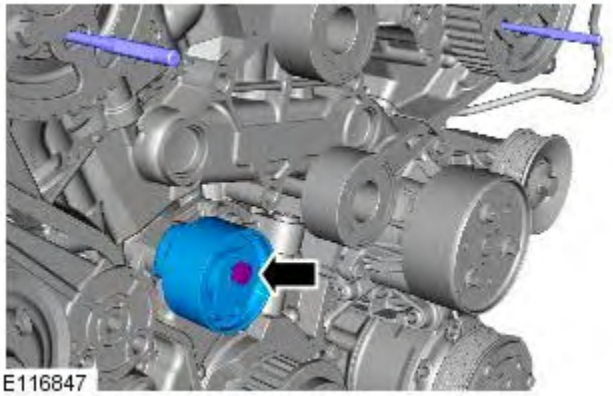
    Special Tool(s): 303-1124



13. CAUTION: Only tighten the bolt finger-tight at this stage.



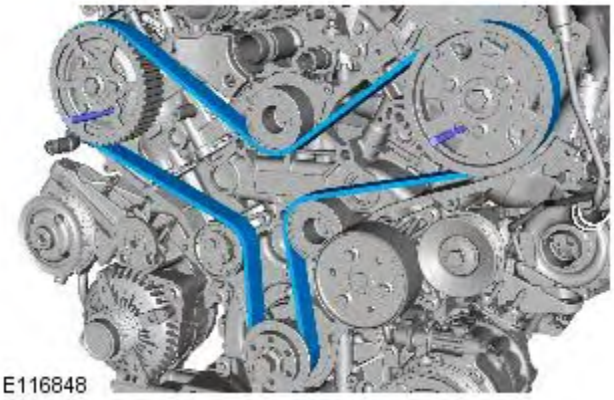
14.



15. CAUTIONS:

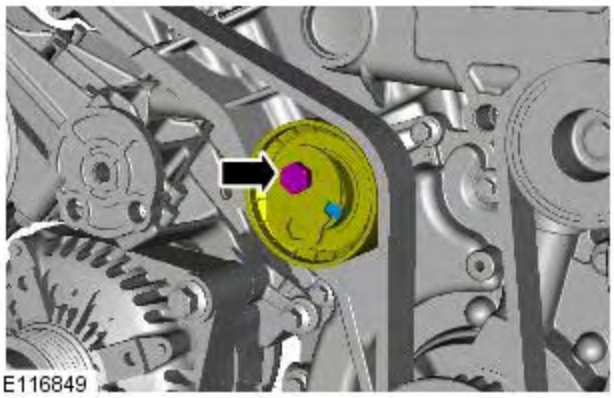
⚠ Make sure that a new bolt is installed.

⚠ Only tighten the bolts finger-tight at this stage.



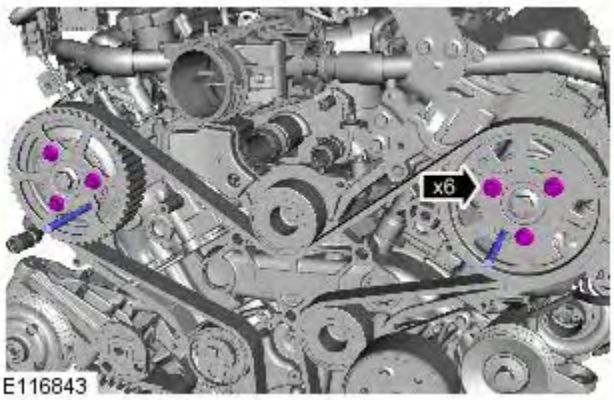
16. ⚠ CAUTION: Make sure the camshaft pulleys remain in the clockwise position.

- Install the new timing belt.
- Starting at the crankshaft pulley, install the timing belt in a counter-clockwise direction, in the sequence shown.
- Stage one: Attach the timing belt to the crankshaft pulley.
- Stage two: Attach the timing belt to the idler pulley.
- Stage three: Attach the timing belt to the left-hand camshaft pulley.
- Stage four: Attach the timing belt to the idler pulley.
- Stage five: Attach the timing belt to the RH camshaft pulley.
- Stage six: Attach the timing belt to the timing belt tensioner.



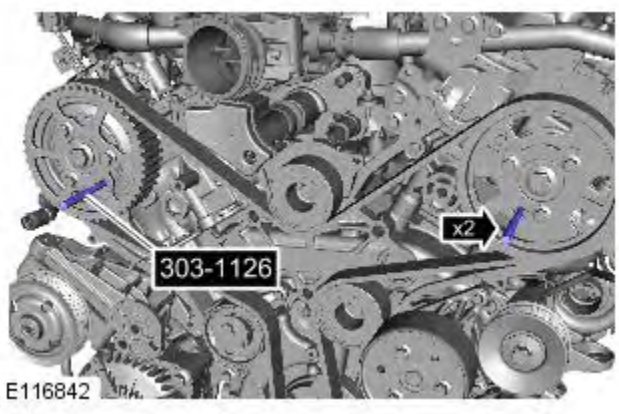
17. ⚠ CAUTION: Make sure the timing belt tensioner window is aligned with the groove as illustrated.

- Tension the timing belt.
- Rotate the tensioner assembly counter-clockwise.
- *Torque:* 26 Nm



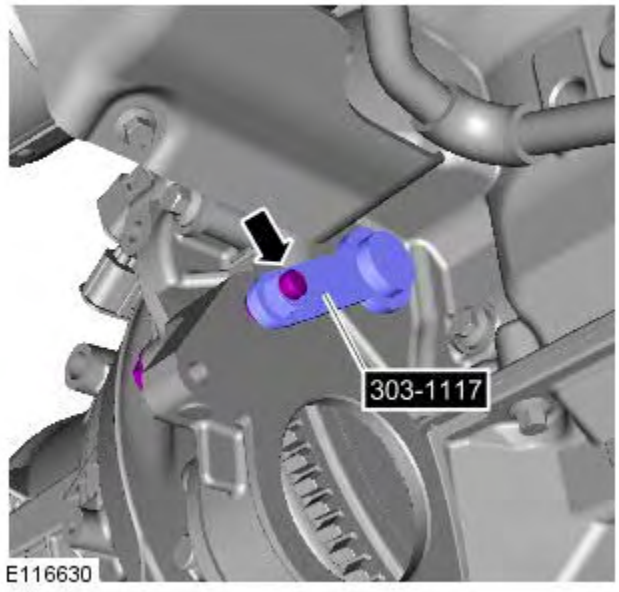
18. ⚠ CAUTION: Do not use the special tools to lock the camshafts. Failure to follow this instruction may result in damage to the engine or the special tools.

- Using a suitable tool, counterhold the camshaft pulley center retaining bolts.
- *Torque:* 23 Nm



19. Remove the special tool.

    Special Tool(s): 303-1126

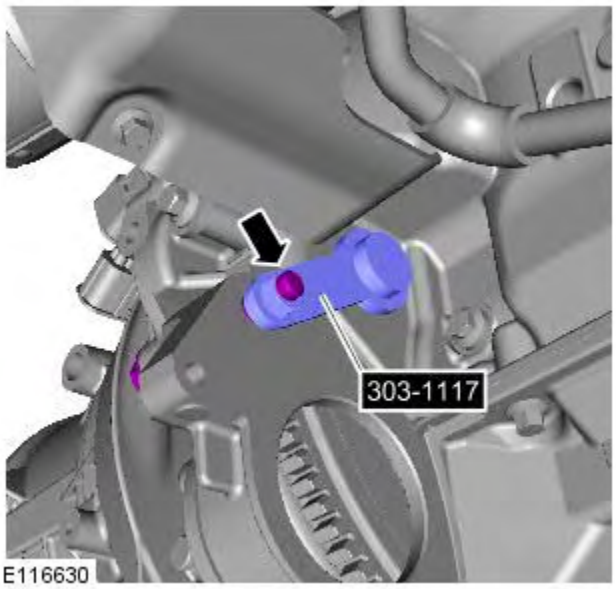


20. Remove the special tool.

    Special Tool(s): 303-1117

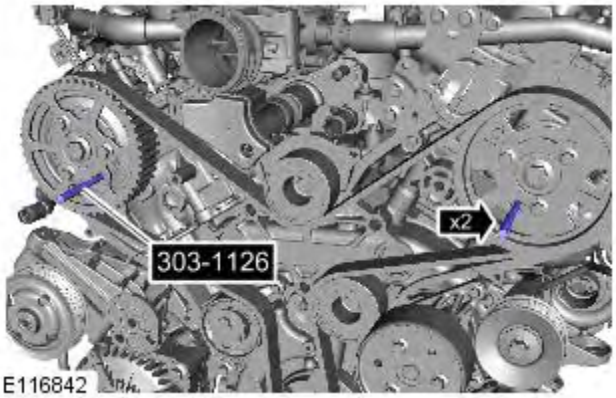
21. CAUTION: Only rotate the crankshaft clockwise.

    Rotate the engine two complete turns clockwise.



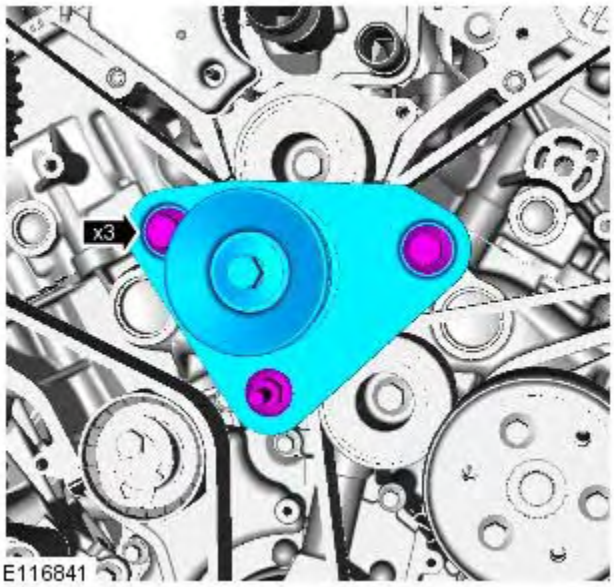
22. Install with the special tool.

    Special Tool(s): 303-1117

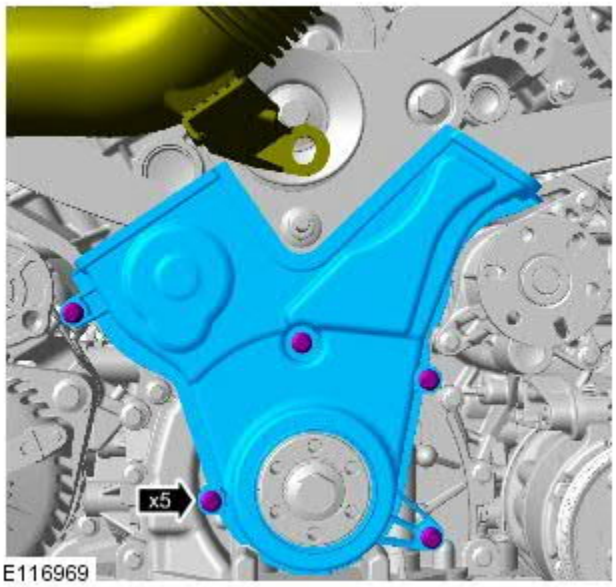


23.
- Install the special tools to the exhaust camshaft pulleys.

  Special Tool(s): 303-1126
- If the special tool does not fit correctly, repeat the timing belt installation procedure.
- Remove the special tools from the camshaft pulleys.

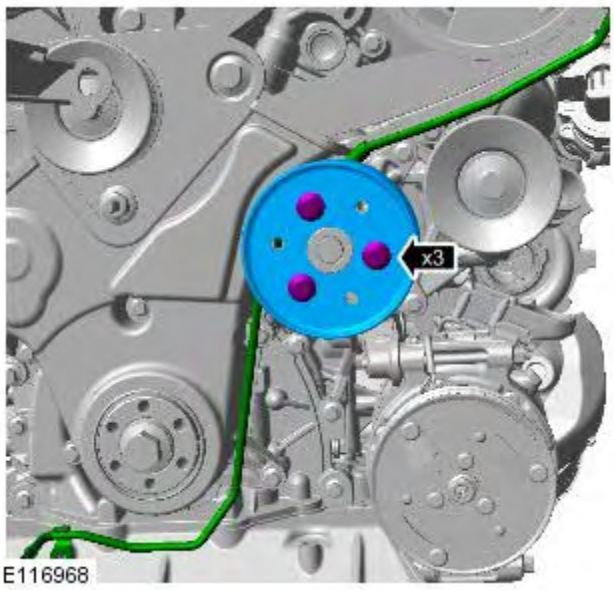


24. *Torque:* 80 Nm



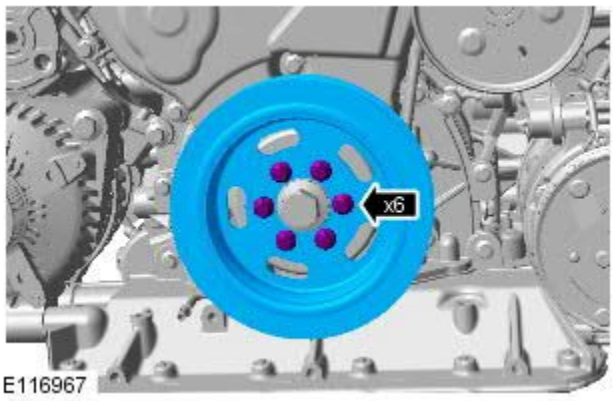
25. NOTE: Install a new gasket.

Torque: 10 Nm

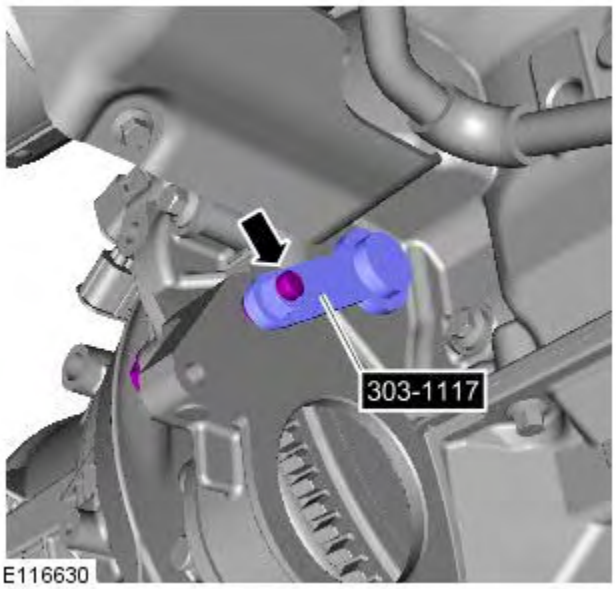


26. CAUTION: Make sure that new bolts are installed.

Torque: 24 Nm

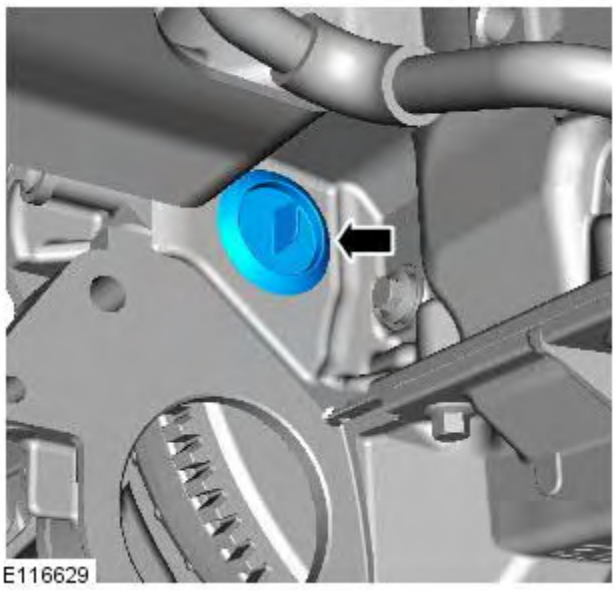


27. *Torque:* 25 Nm



28. Remove the special tool.

    Special Tool(s): 303-1117



29.

30. Refer to: Valve Cover RH (303-01A Engine - TDV6 3.0L Diesel, Removal and Installation).

31. Refer to: Starter Motor (303-06A Starting System - TDV6 3.0L Diesel, Removal and Installation).

32. Disconnect the battery ground cable.

    Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 06-Jul-2011

Engine - TDV6 3.0L Diesel - Camshaft Front Seal

Removal and Installation

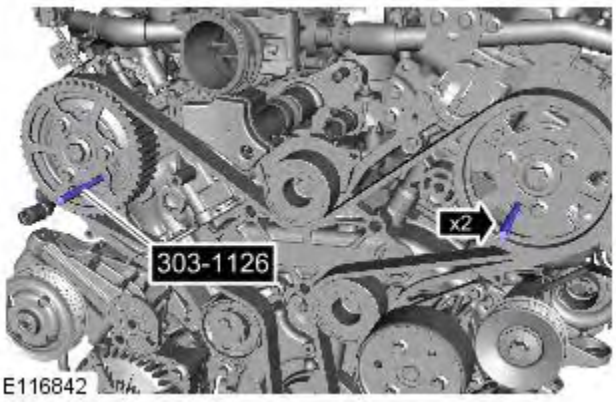
Removal

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. WARNING: Make sure to support the vehicle with axle stands.

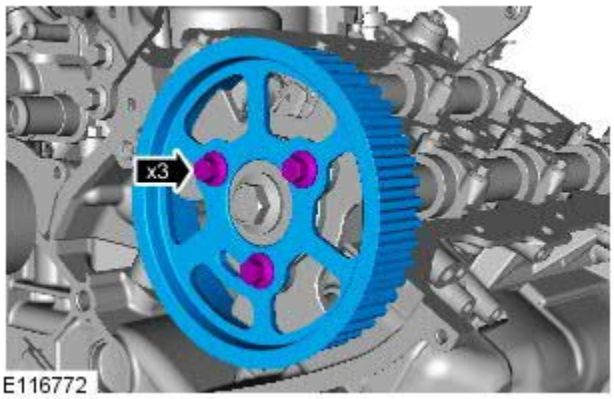
   Raise and support the vehicle.

2. Refer to: Timing Belt (303-01, Removal and Installation).

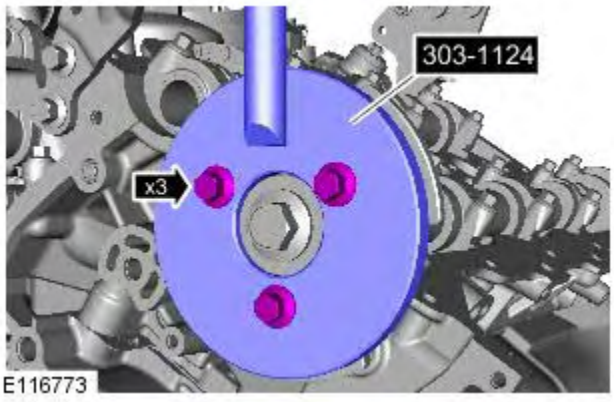


3. CAUTION: Do not use the special tools to lock the camshafts. Failure to follow this instruction may result in damage to the engine or the special tools.

   Remove the special tool.

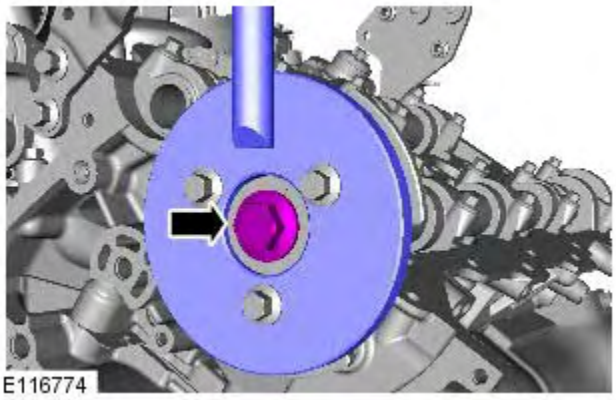


4.

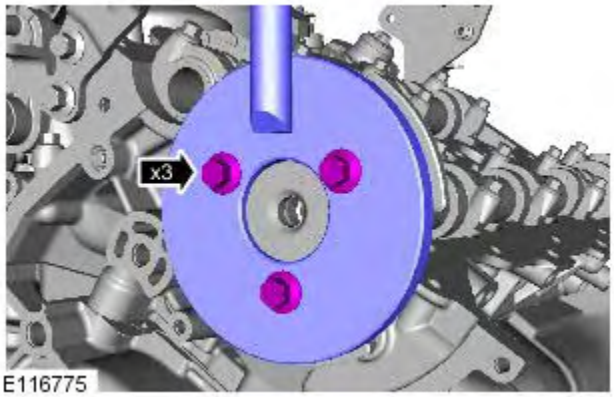


5. Install the special tool.

6.



7. Remove the special tool.



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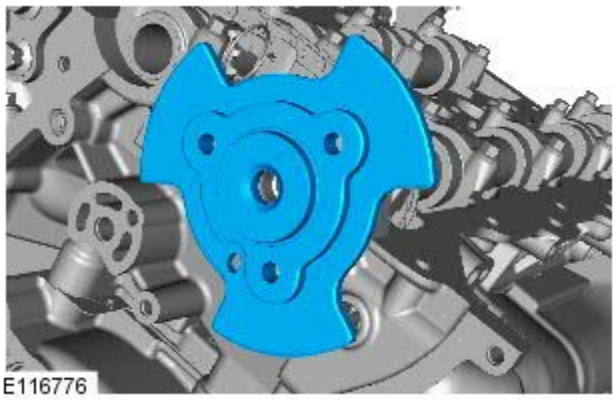
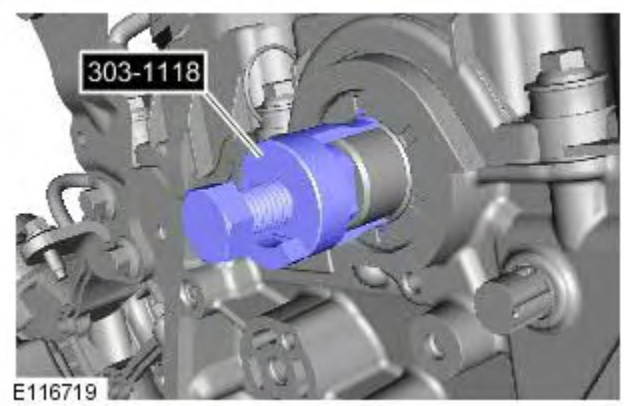
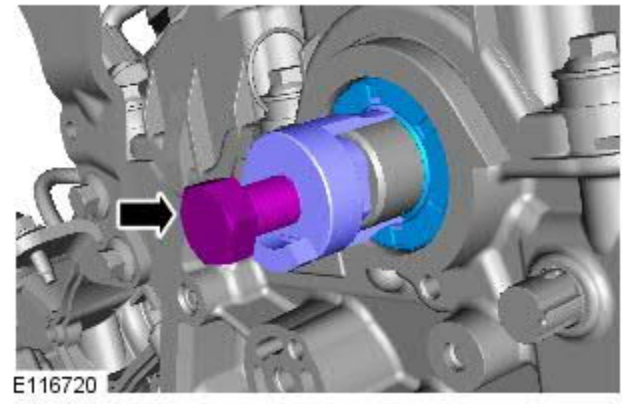




9. CAUTION: Make sure the special tool is correctly seated behind the camshaft seal. Failure to follow this instruction may result in damage to the special tool.

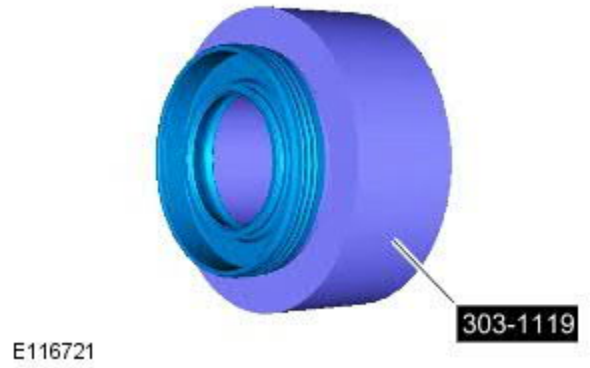
   Install the special tool.

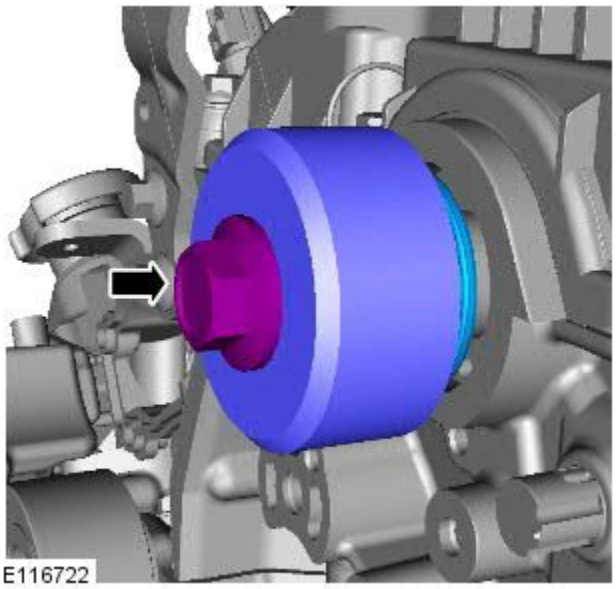


10.

Installation

1. Install with the special tool.





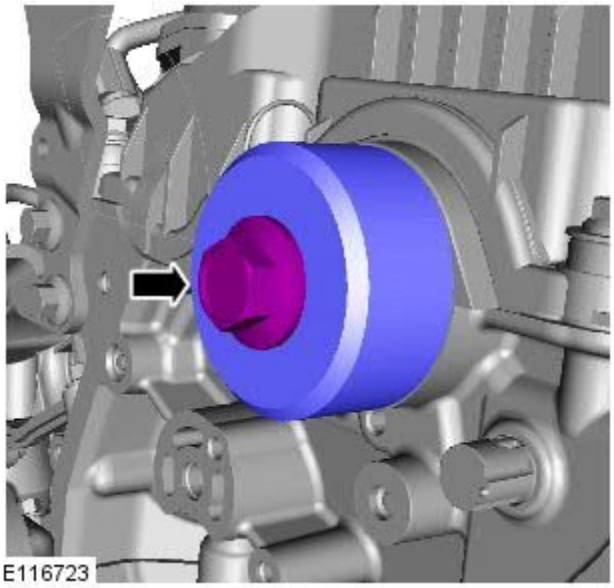
2. CAUTIONS:

   Make sure the seal is installed correctly.

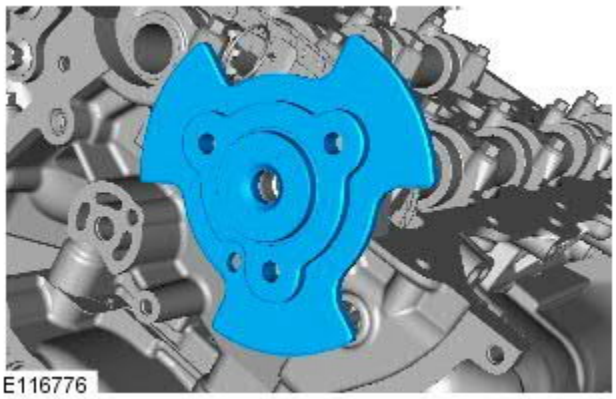
   Make sure that the mating faces are clean and free of corrosion and foreign material.

   Do not use any lubricant on the camshaft front seal or the camshaft. Failure to follow this instruction may result in damage to the vehicle.

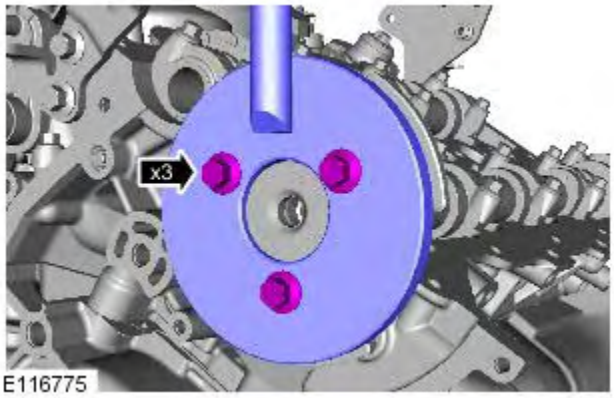
   NOTE: Make sure that the seal is 1mm below the face of the cylinder head.



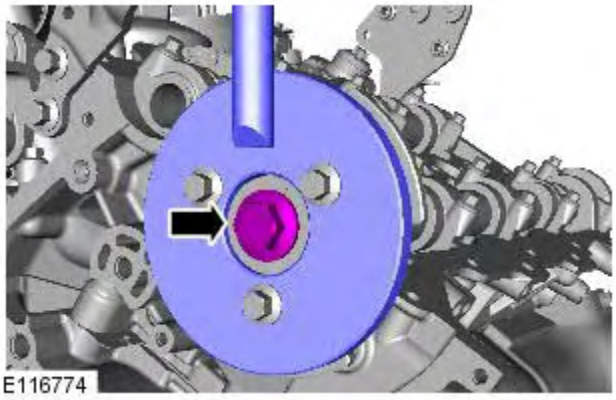
3. Remove the special tool.



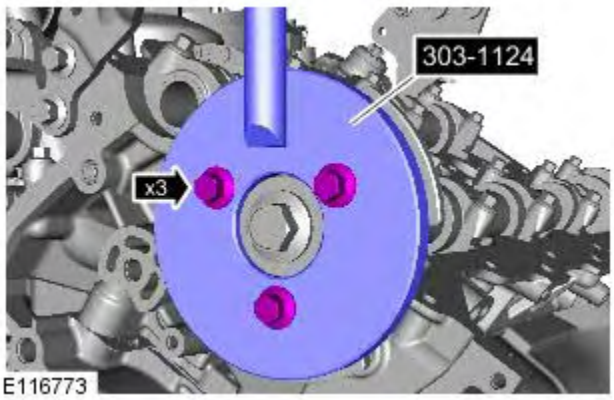
4.



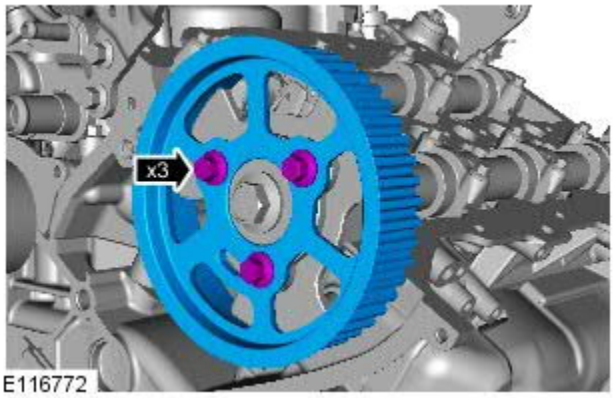
5. Install the special tool.



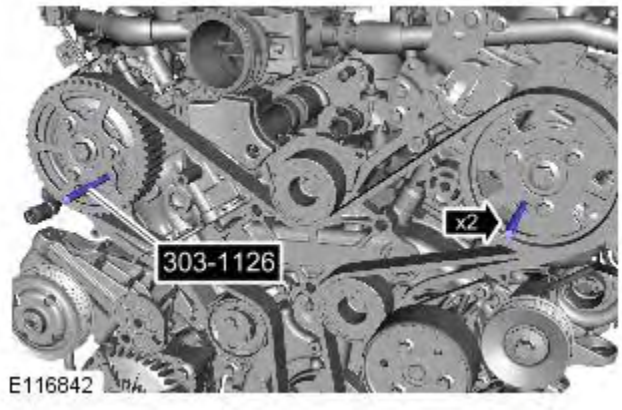
6. *Torque:*
   Stage 1:80 Nm
   Stage 2:80°



7. Remove the special tool.



8. CAUTION: Only tighten the bolt finger-tight at this stage.



9. CAUTION: Do not use the special tools to lock the camshafts. Failure to follow this instruction may result in damage to the engine or the special tools.

   Install the special tool.

10. Refer to: Timing Belt (303-01, Removal and Installation).

Published: 11-May-2011

Engine - TDV6 3.0L Diesel - Camshaft Rear Seal

Removal and Installation

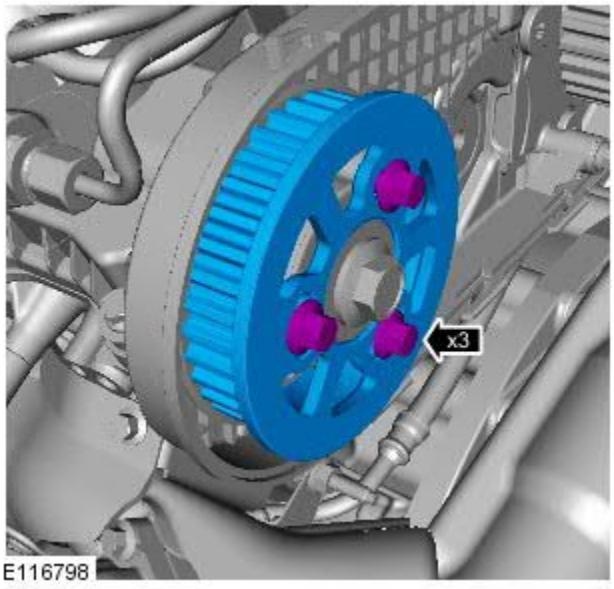
Special Tool(s)

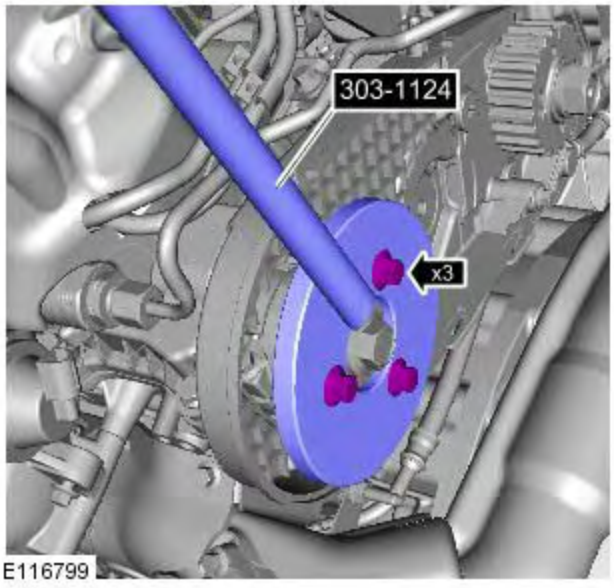
	303-1118 Remover, Camshaft Seal
	303-1119 Installer, Camshaft Seal
	303-1124 Holding Tool, Camshaft Front Pulley

Removal

1. Refer to: Rear End Accessory Drive (READ) (303-05A Accessory Drive - TDV6 3.0L Diesel, Removal and Installation).

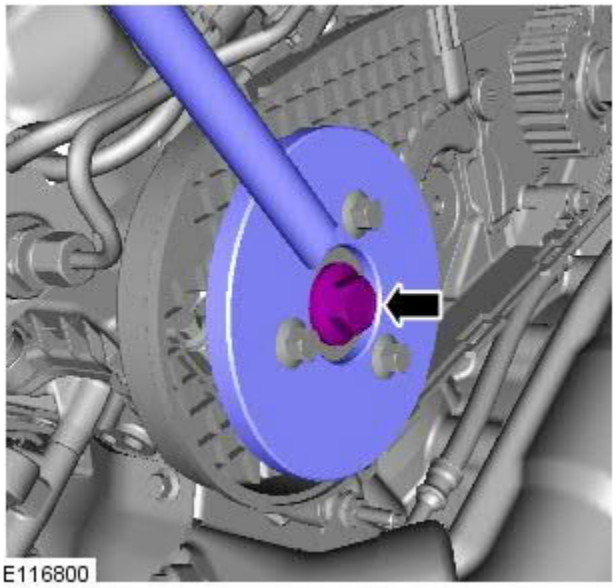
2.



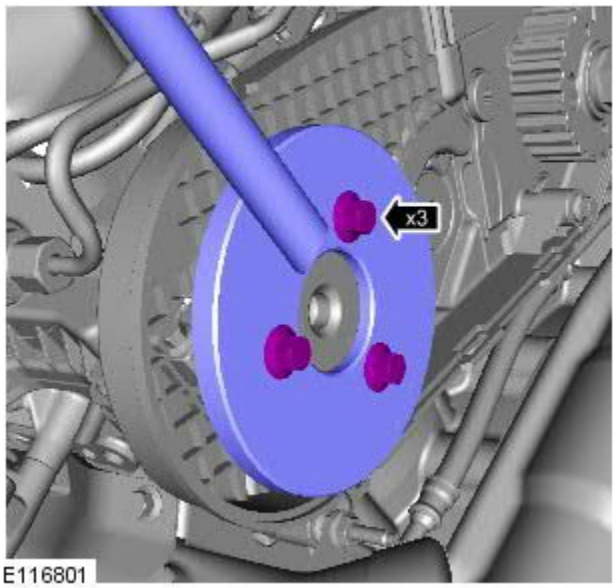


3. Install the special tool.

   Special Tool(s): 303-1124

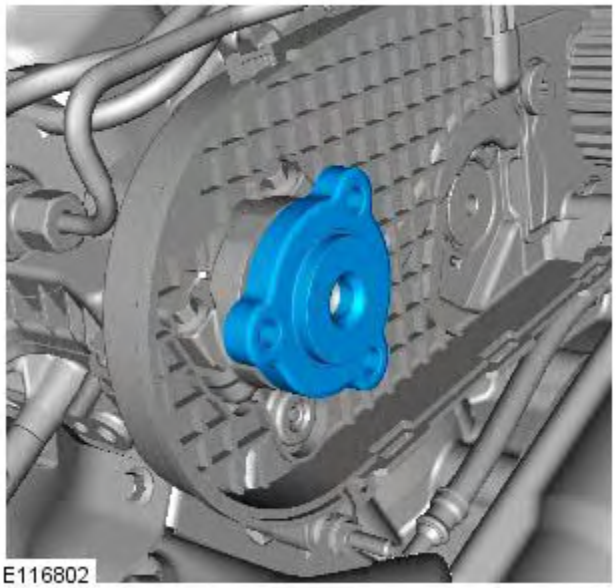


4.

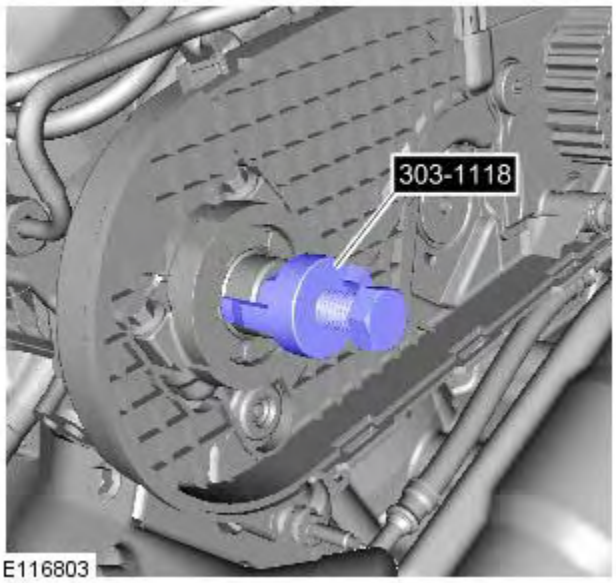


E116801

5. Remove the special tool.


E116802

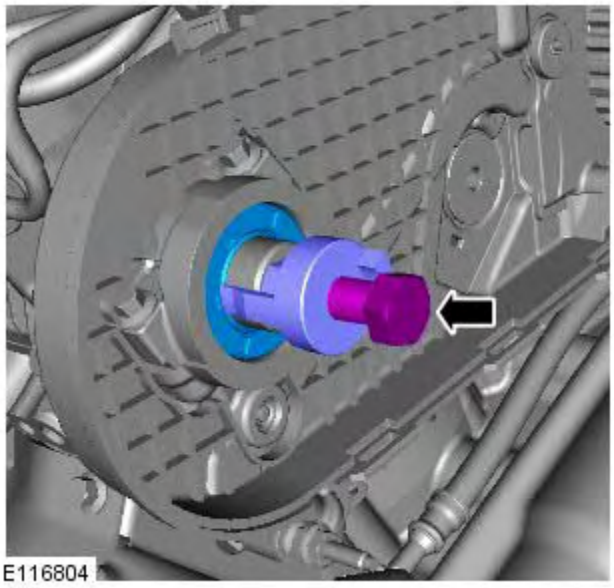
6.



7. CAUTION: Make sure the special tool is correctly seated behind the camshaft seal. Failure to follow this instruction may result in damage to the special tool.

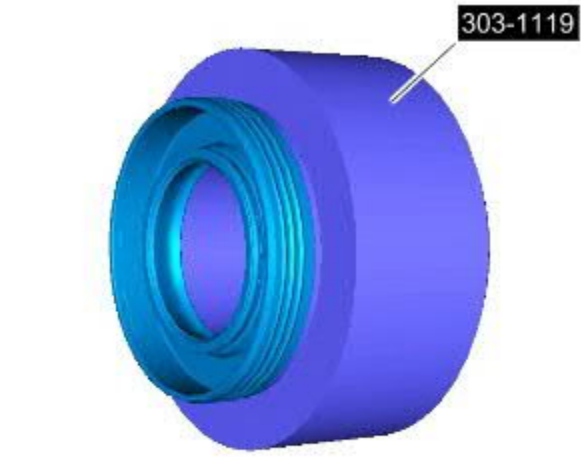
   Install the special tool.

   Special Tool(s): 303-1118



8.

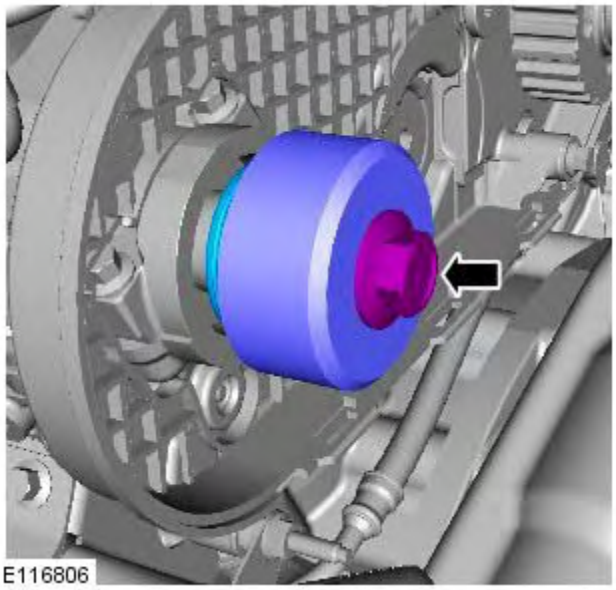
Installation



E116805

1. Install with the special tool.

   Special Tool(s): 303-1119



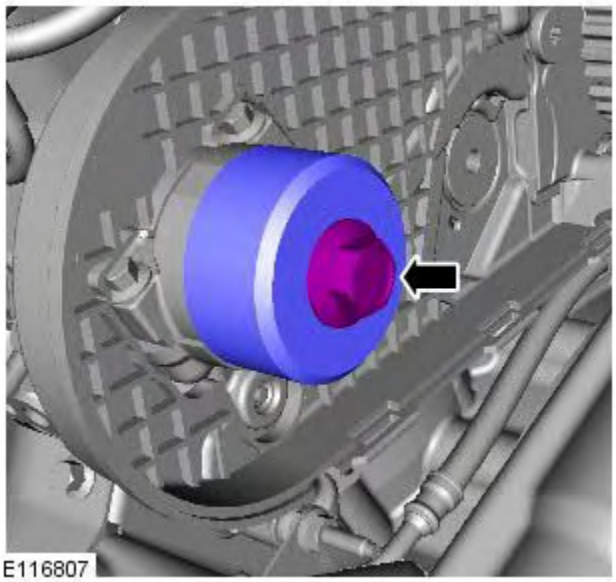
E116806

2. CAUTIONS:

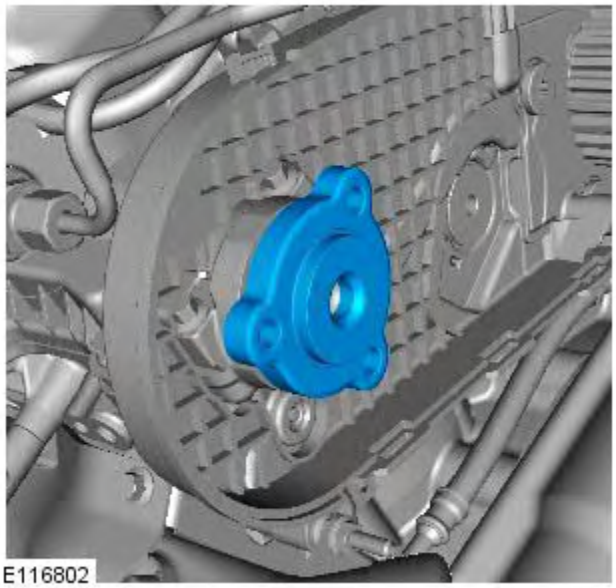
   Make sure the seal is installed correctly.

   Make sure that the mating faces are clean and free of corrosion and foreign material.

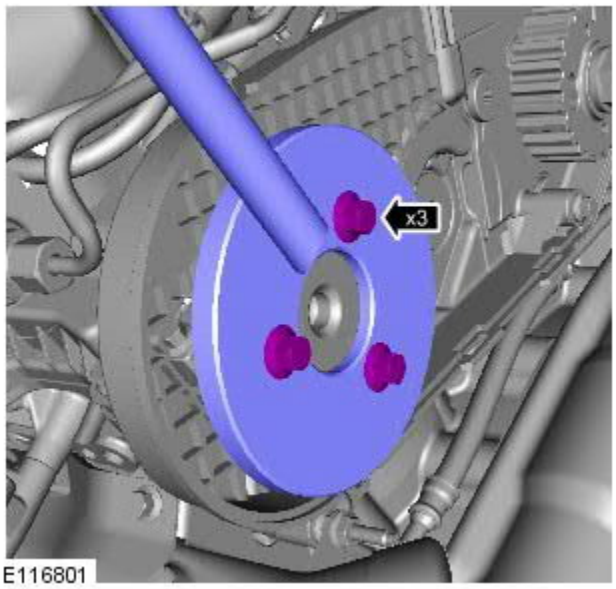
   NOTE: Make sure that the seal is 1mm below the face of the cylinder head.


E116807

3. Remove the special tool.

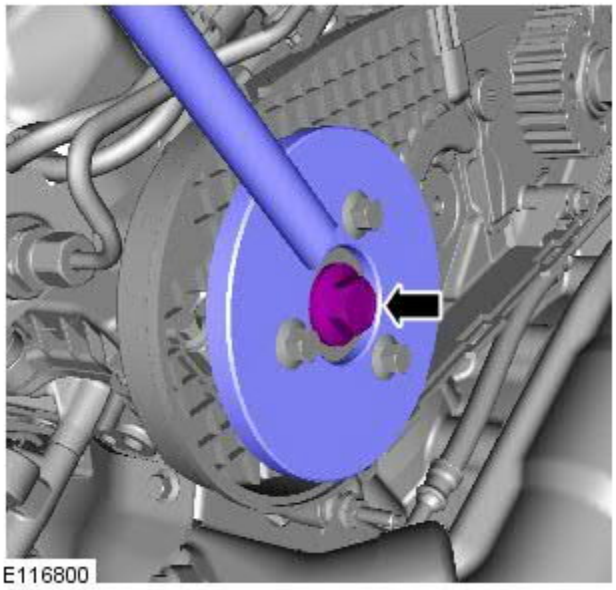

E116802

4.



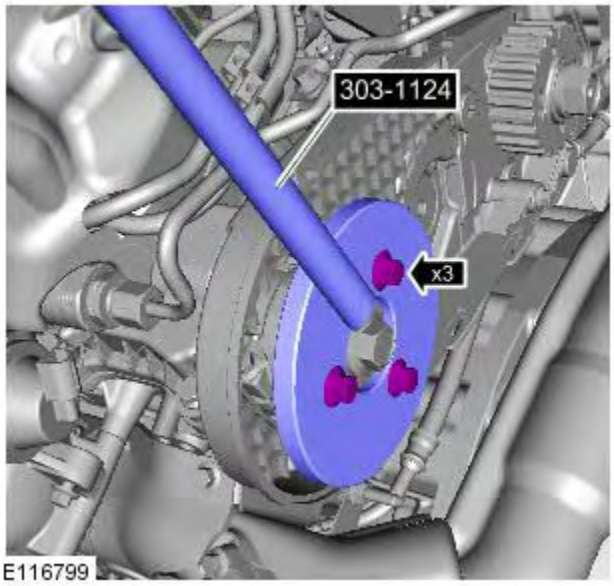
5. Install the special tool.

   Special Tool(s): 303-1124

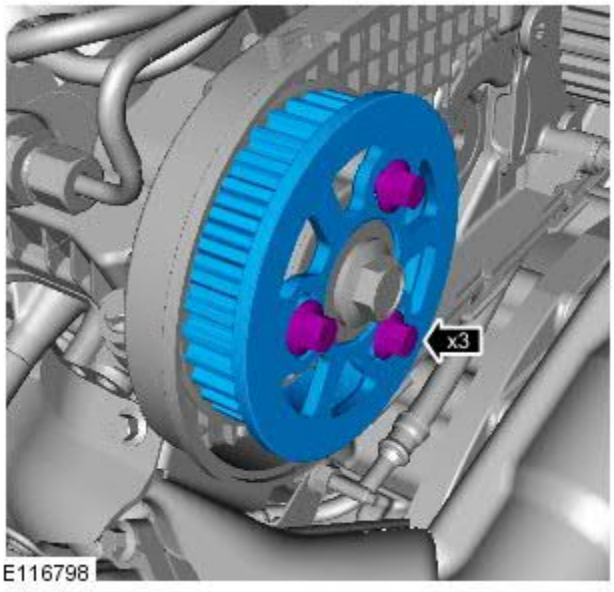


6.

- *Torque:*
  Stage 1:80 Nm
  Stage 2:80°



7. Remove the special tool.



8. CAUTION: Only tighten the bolt finger-tight at this stage.

9. Refer to: Rear End Accessory Drive (READ) (303-05A Accessory Drive - TDV6 3.0L Diesel, Removal and Installation).

Published: 11-May-2011

Engine - TDV6 3.0L Diesel - Crankshaft Front Seal

Removal and Installation

Special Tool(s)

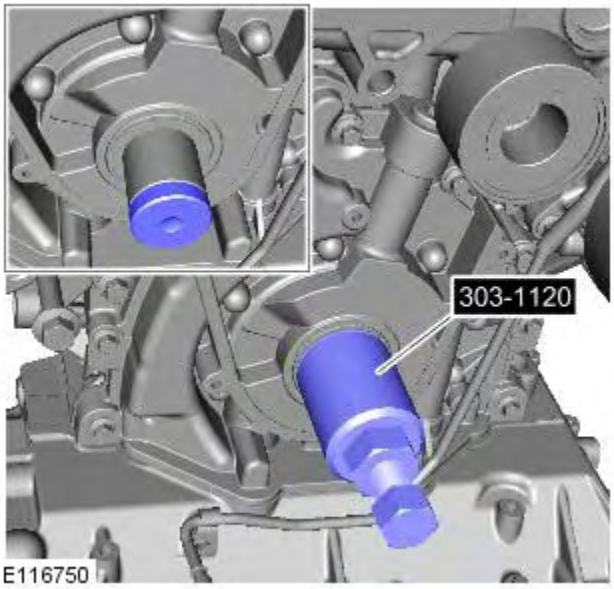
	303-1120 Remover, Crankshaft Front Seal
	303-1121 Installer, Crankshaft Seal
	303-1122 Installer, Crankshaft Front Seal

Removal

1. WARNING: Make sure to support the vehicle with axle stands.

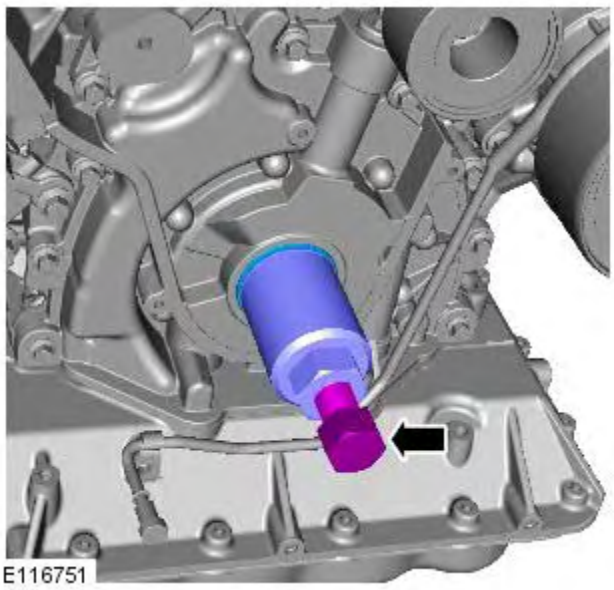
   Raise and support the vehicle.

2. Refer to: Crankshaft Pulley (303-01, Removal and Installation).



3. Install the special tool.

   Special Tool(s): 303-1120



4. CAUTION: Discard the seal.

   Using the special tool, remove the crankshaft front seal.

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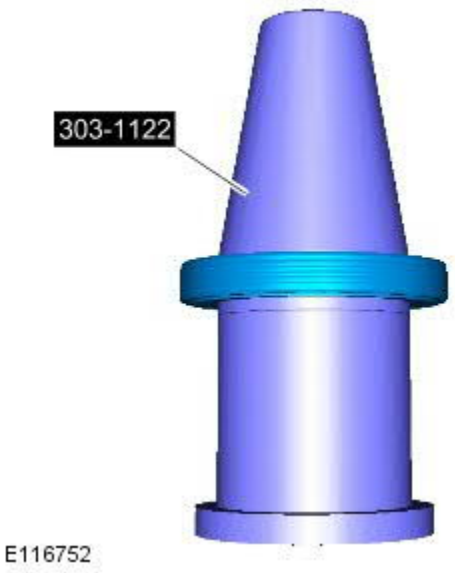
Installation



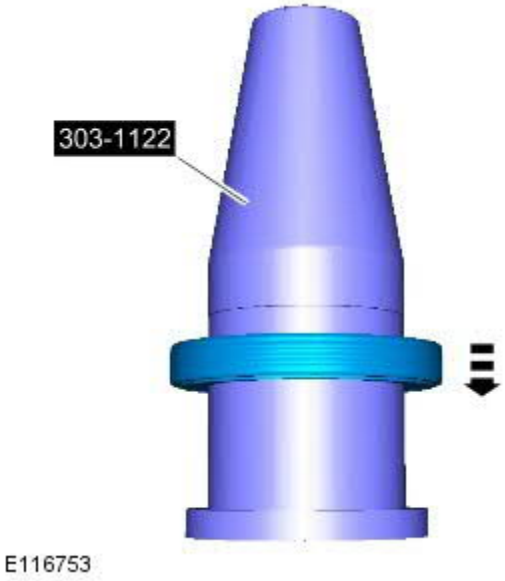
E116752

1. CAUTION: Do not use any lubricant on the crankshaft front seal, special tools or the crankshaft. Failure to follow this instruction may result in damage to the vehicle.

   NOTE: Make sure that all the component mating faces are clean.

   Install a new crankshaft front seal to the special tool.

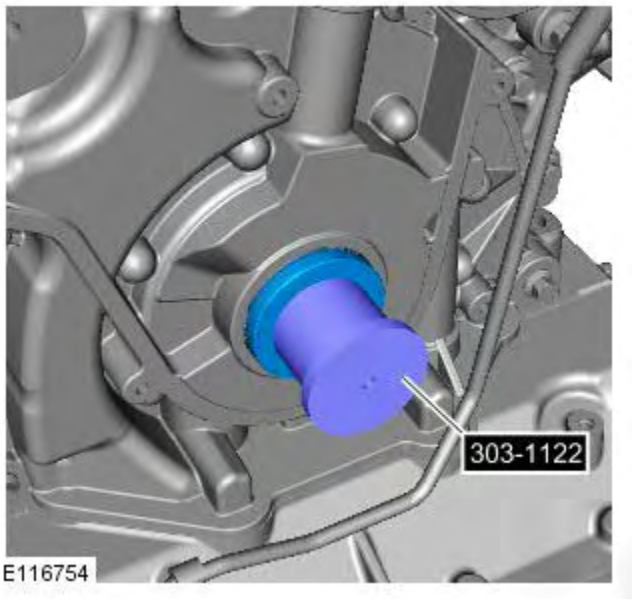
   Special Tool(s): 303-1122



E116753

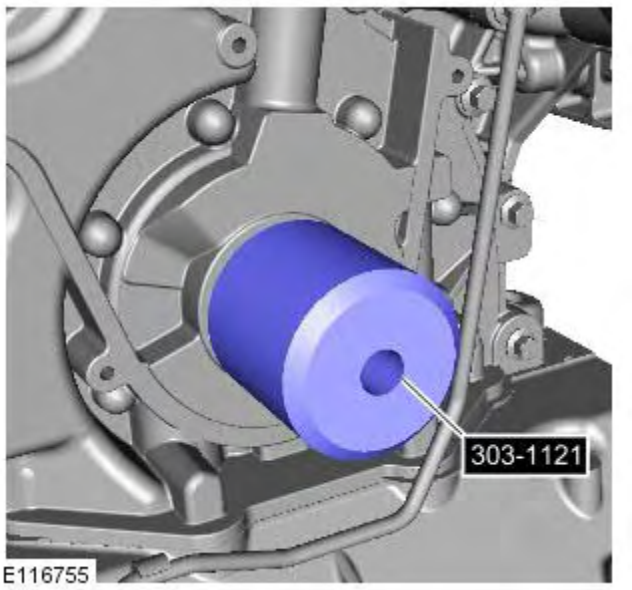
2. Reposition the crankshaft front seal along the special tool.

   Special Tool(s): 303-1122



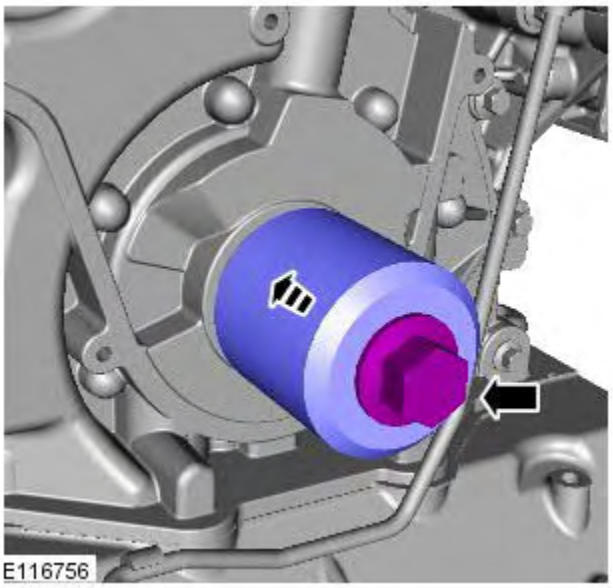
3. Install the special tool to the crankshaft.

   Special Tool(s): 303-1122



4. Install the special tool to the crankshaft.

   Special Tool(s): 303-1121



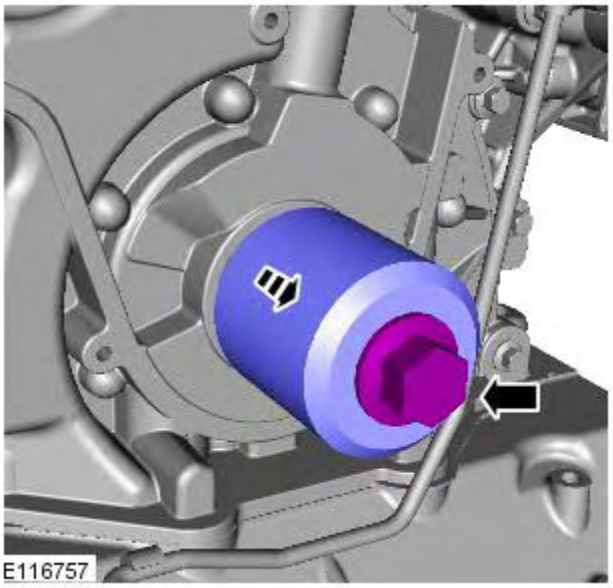
5. CAUTIONS:

   Make sure the seal is installed correctly.

   Make sure that the seal is seated 1mm under flush.

   Discard the bolt.

   Using the special tool, install the crankshaft front seal.



6. Remove the special tool.

7. Refer to: Crankshaft Pulley (303-01, Removal and Installation).

Published: 11-May-2011

Engine - TDV6 3.0L Diesel - Crankshaft Pulley

Removal and Installation

Special Tool(s)

	303-1117 Timing Peg, Automatic Transmission
	303-1123 Locking Tool, Flywheel
	303-D121 Puller, General Purpose

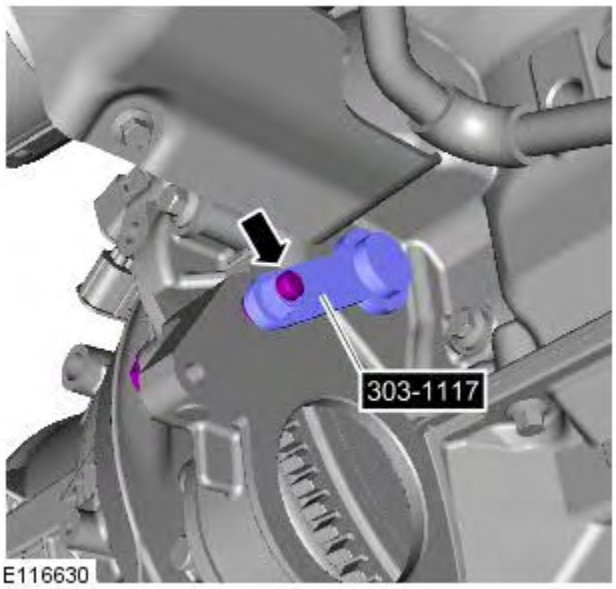
Removal

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

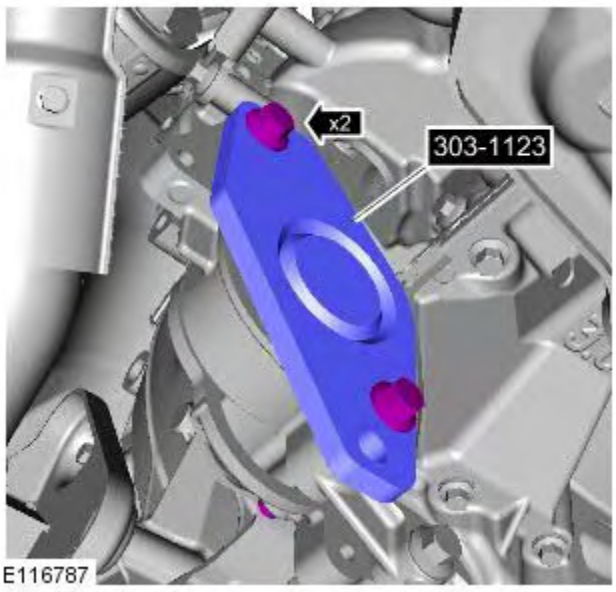
2. Refer to: Timing Belt (303-01, Removal and Installation).

3. Refer to: Cooling Fan Motor and Shroud (303-03A Engine Cooling - TDV6 3.0L Diesel, Removal and Installation).



4.

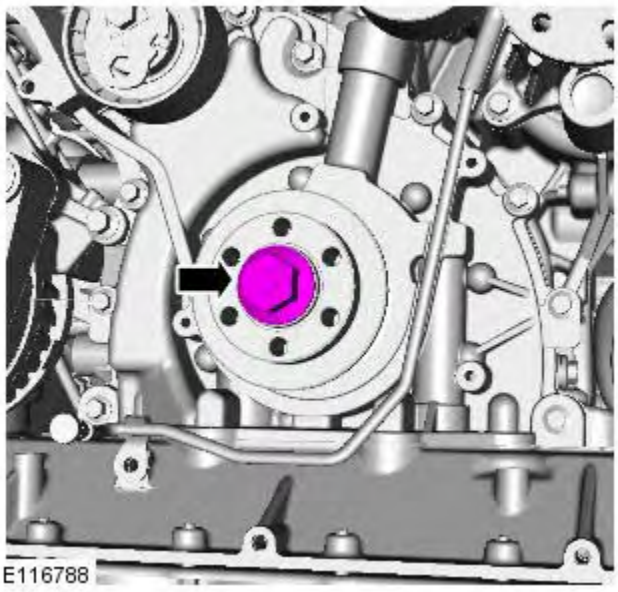
- Remove the special tool.
- *Special Tool(s):* 303-1117



5.

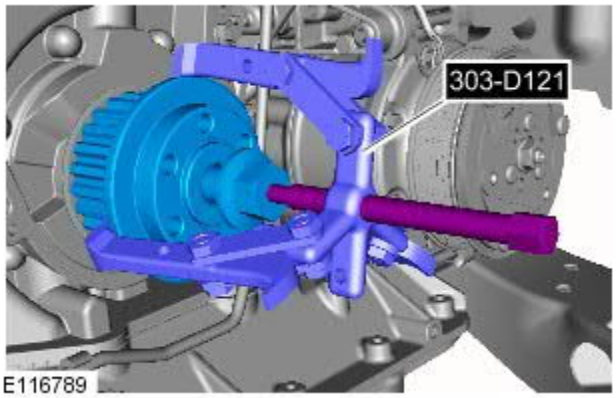
- Install the special tool.
- *Special Tool(s):* 303-1123

6.


E116788

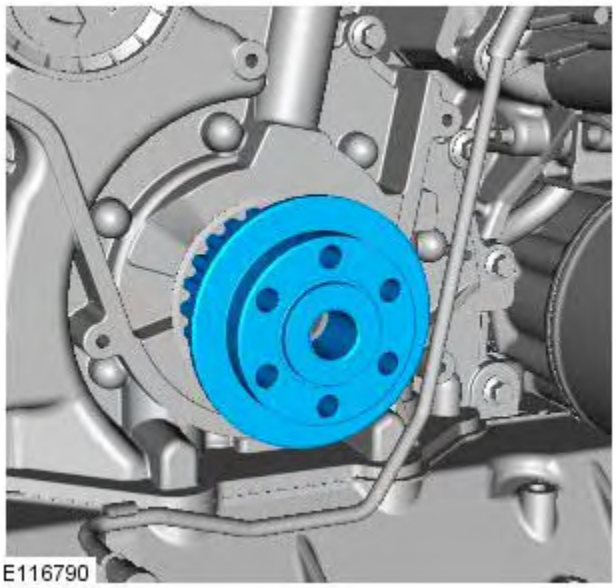
7.

- Install the special tool.
- *Special Tool(s):* 303-D121

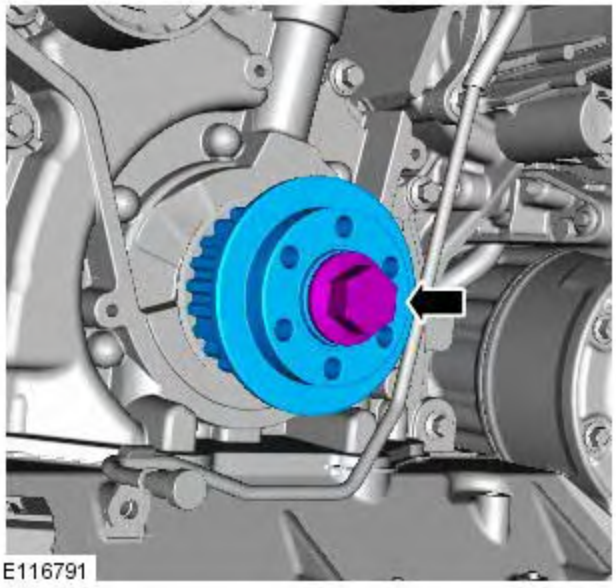


E116789

8. CAUTION: Discard the bolt.


E116790

Installation



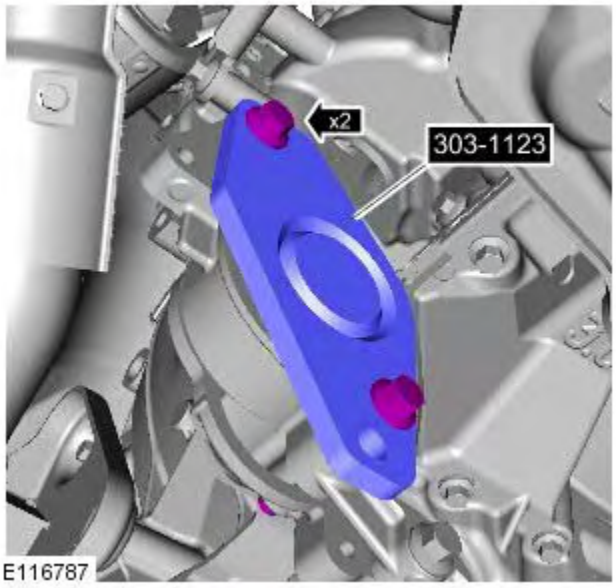
1. CAUTIONS:

   Make sure that the pulley washer is correctly seated before installing the pulley.

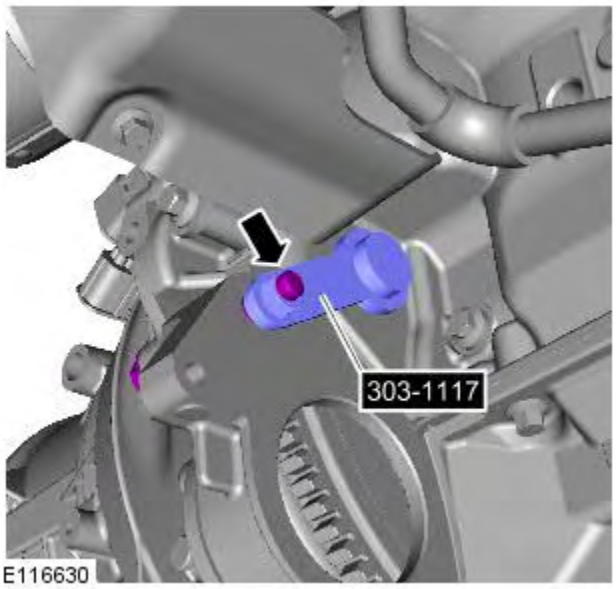
   Do not lubricate the components.

   Make sure that a new bolt is installed.

   Torque:
   Stage 1:150 Nm
   Stage 2:300 Nm
   Stage 3:90°



2.
   - Remove the special tool.
   - *Special Tool(s):* 303-1123



3.
- Install the special tool.
- *Special Tool(s):* 303-1117

4. Refer to: Cooling Fan Motor and Shroud (303-03A Engine Cooling - TDV6 3.0L Diesel, Removal and Installation).

5. Refer to: Timing Belt (303-01, Removal and Installation).

Published: 11-May-2011

Engine - TDV6 3.0L Diesel - Crankshaft Rear Seal

Removal and Installation

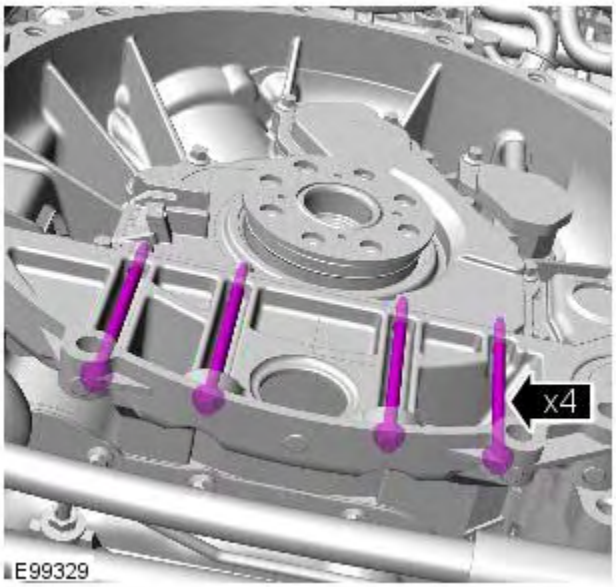
Removal

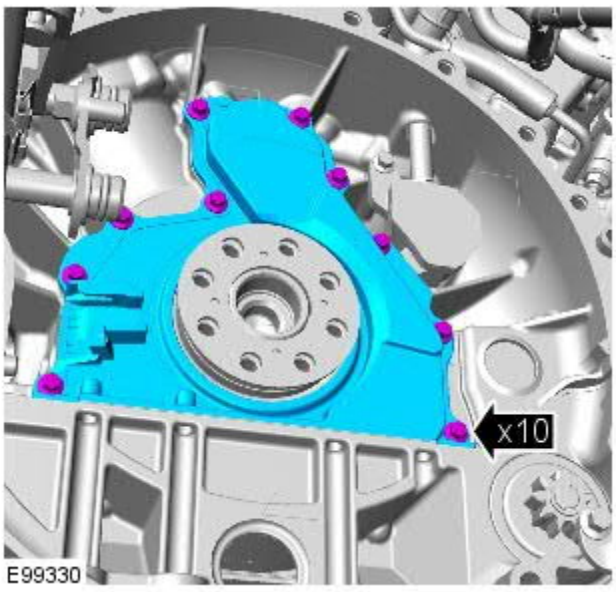
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Crankshaft Position (CKP) Sensor Ring (303-14A Electronic Engine Controls - TDV6 3.0L Diesel, Removal and Installation).

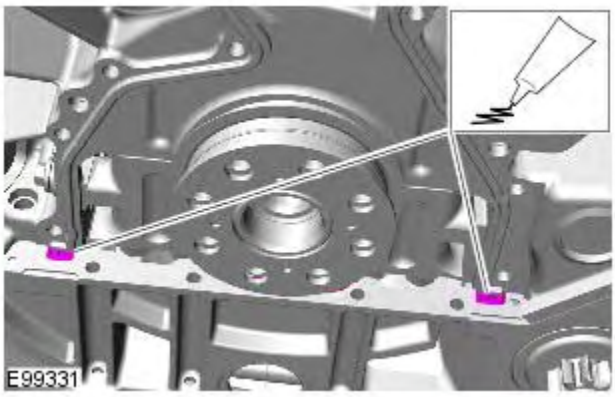
3.





4. CAUTION: Discard the seal.

Installation

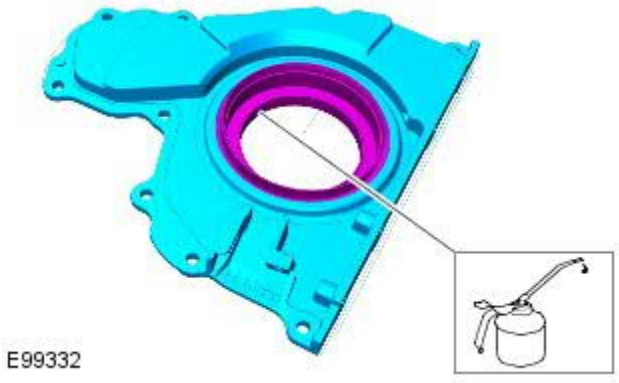


1. CAUTIONS:

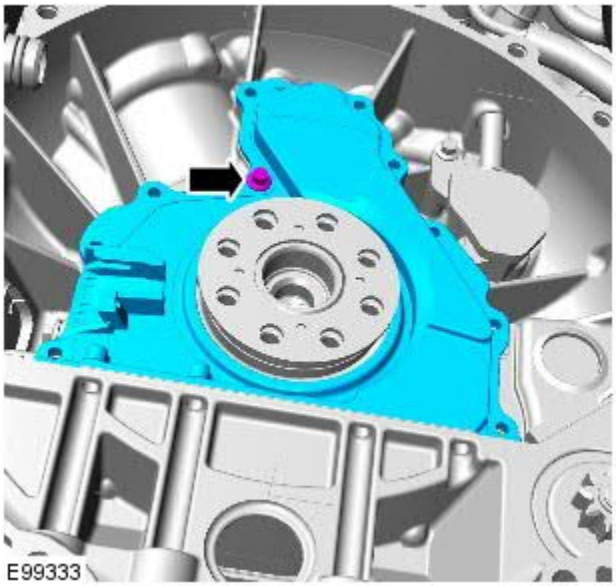
   Make sure that the crankshaft rear oil seal is correctly located.

   Make sure the crankshaft seal mating faces are clean and dry.

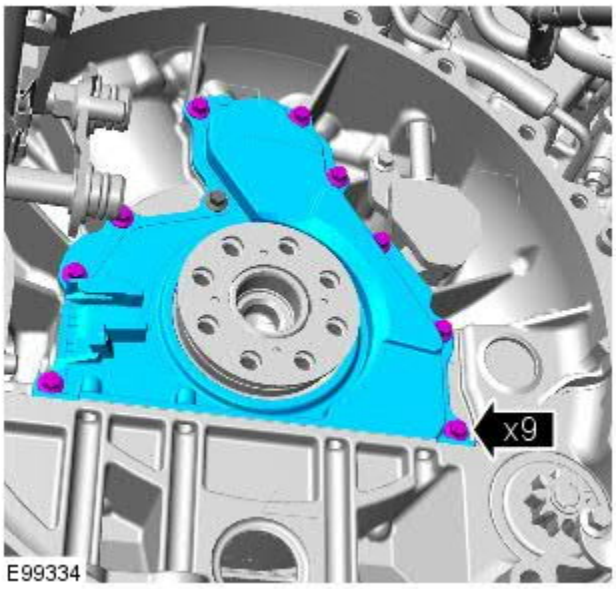
   Apply an 8 mm bead of sealant to the cylinder block in the areas shown.



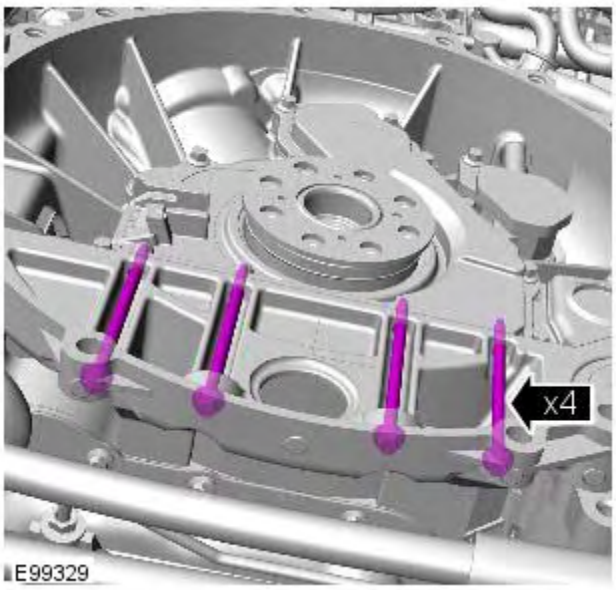
2.
   - Lubricate the oil seal.



3. *Torque:* 10 Nm



4. *Torque:* 10 Nm



5. *Torque:* 10 Nm

6. Refer to: Crankshaft Position (CKP) Sensor Ring (303-14A Electronic Engine Controls - TDV6 3.0L Diesel, Removal and Installation).

Published: 11-May-2011

Engine - TDV6 3.0L Diesel - Crankshaft Vibration Damper

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

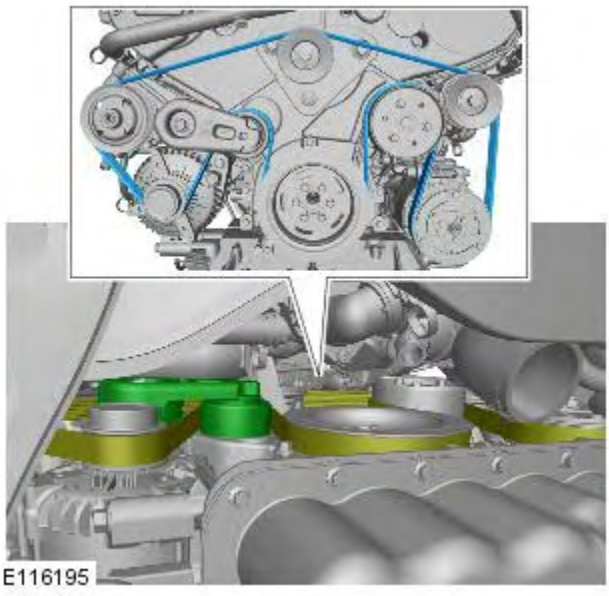
Some variation in the illustrations may occur, but the essential information is always correct.

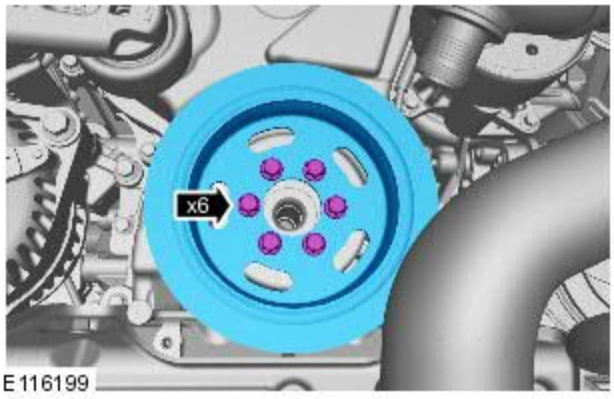
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Turbocharger Bypass Valve (303-04B Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Removal and Installation).

3.





4. CAUTIONS:

   Discard the bolts.

   Make sure that new bolts are installed.

   Tighten the bolts in a diagonal sequence.

   NOTE: Install the bolt finger tight before final tightening.

   Torque: 25 Nm

Installation

1. To install reverse the removal procedure.

Published: 20-Nov-2012

Engine - TDV6 3.0L Diesel - Cylinder Head LH

Removal and Installation

Removal

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

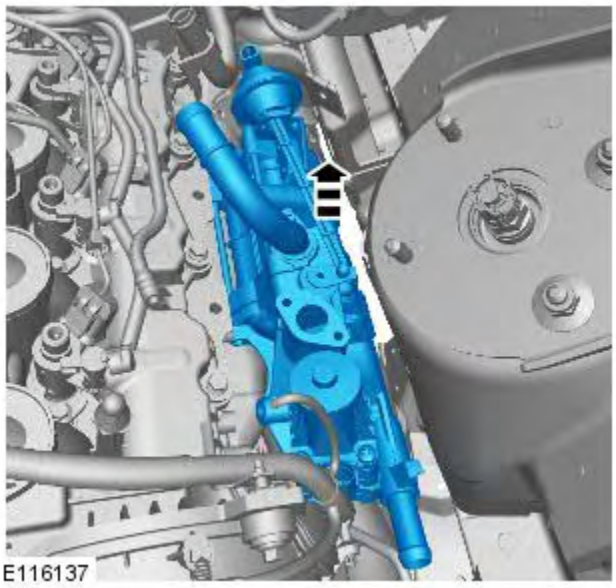
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Refer to: Camshaft (303-01A, Removal and Installation).

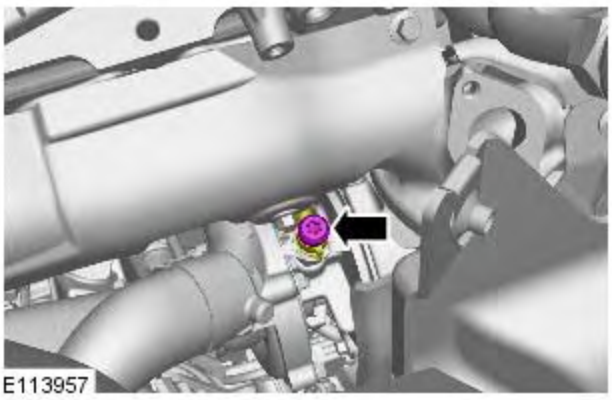
4. Refer to: Glow Plugs (303-07B Glow Plug System - TDV6 3.0L Diesel, Removal and Installation).

5.



6. Refer to: Catalytic Converter (309-00A Exhaust System - TDV6 3.0L Diesel, Removal and Installation).

7. NOTE: Discard the sealing washers.



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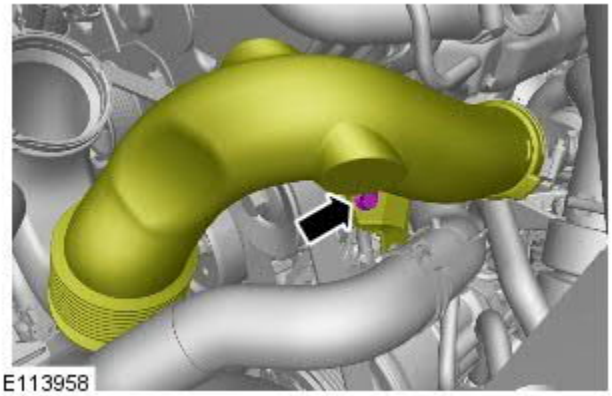

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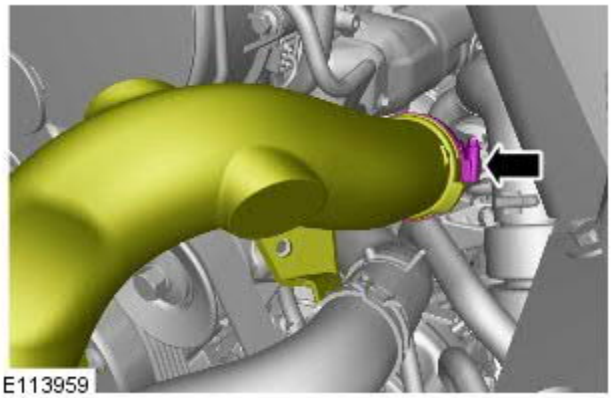

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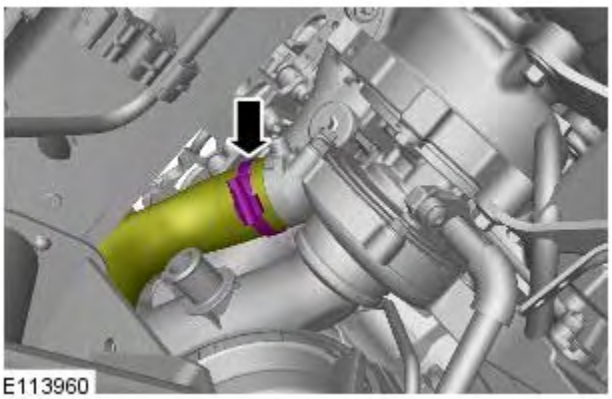

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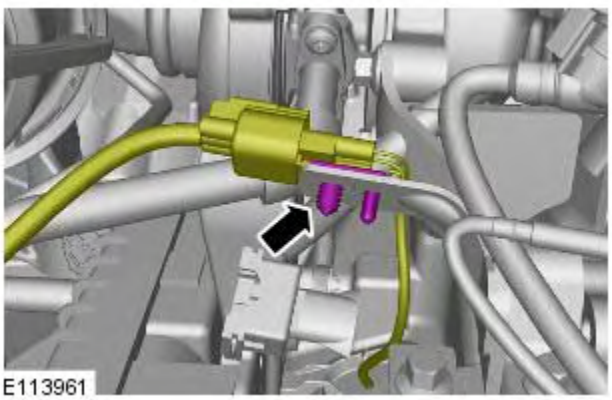

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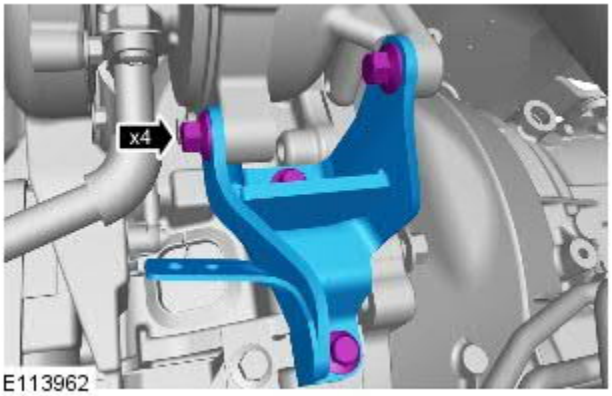
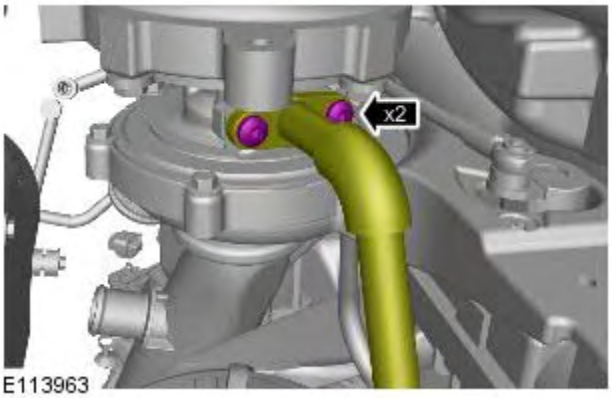
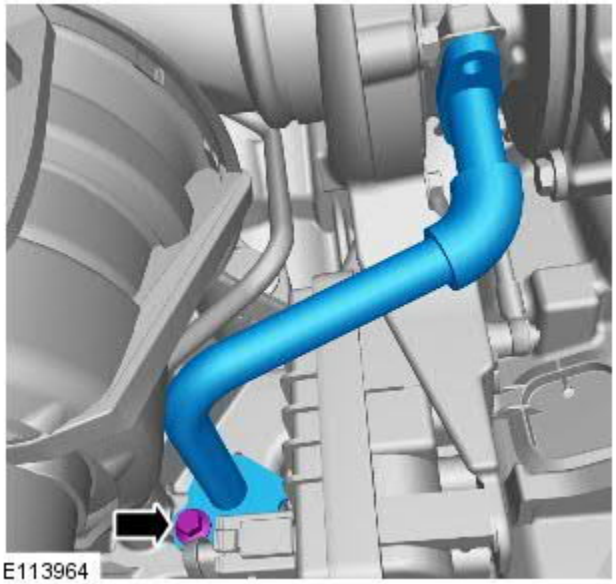
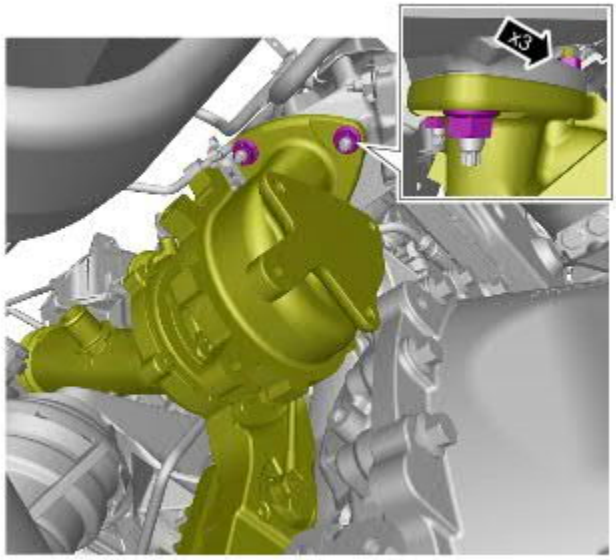


13. NOTE: Discard the gasket.



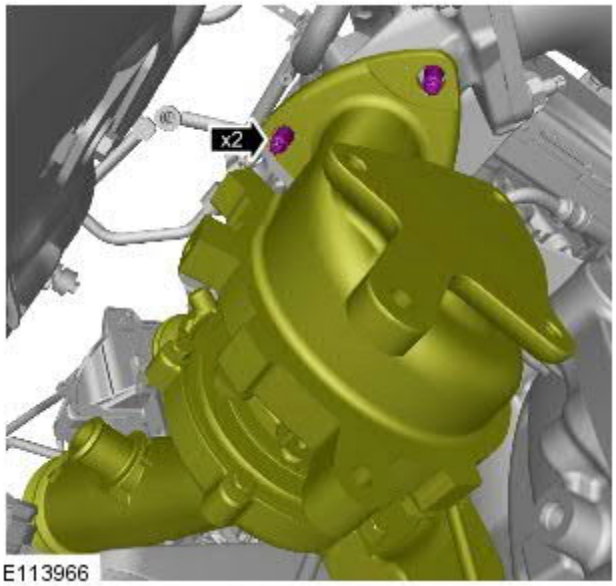
14. CAUTION: Discard the seal.





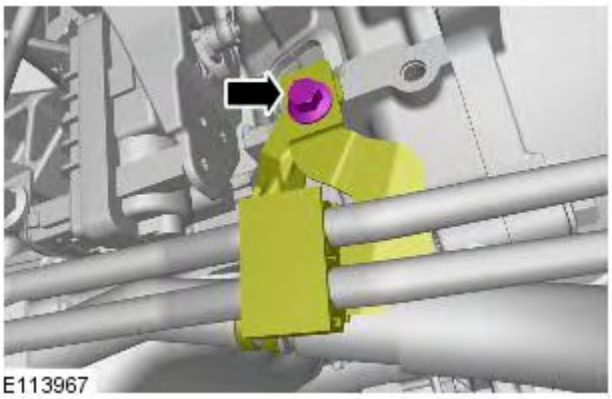
E113965

15. CAUTION: Discard the nuts.



E113966

16. CAUTION: Discard the studs.


E113967

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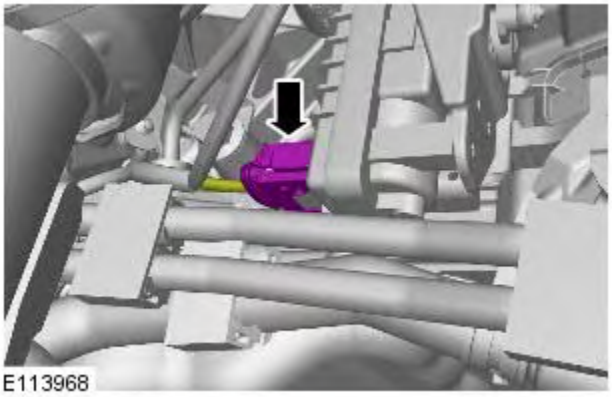
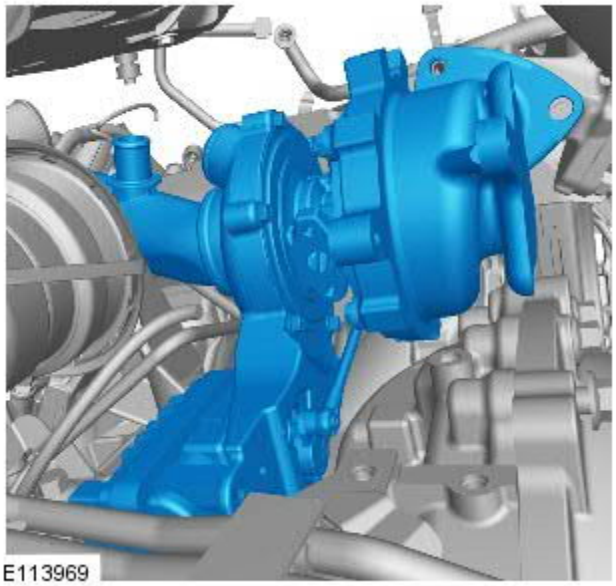

E113968

18.

- Position the turbocharger to one side.


E113969

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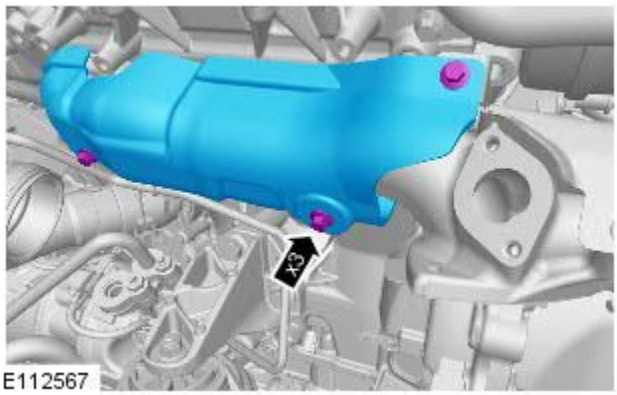
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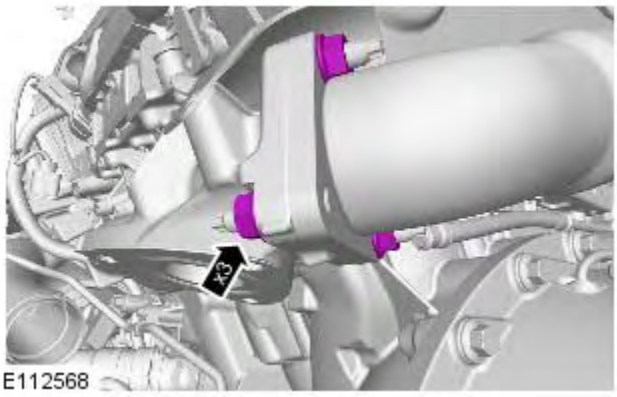
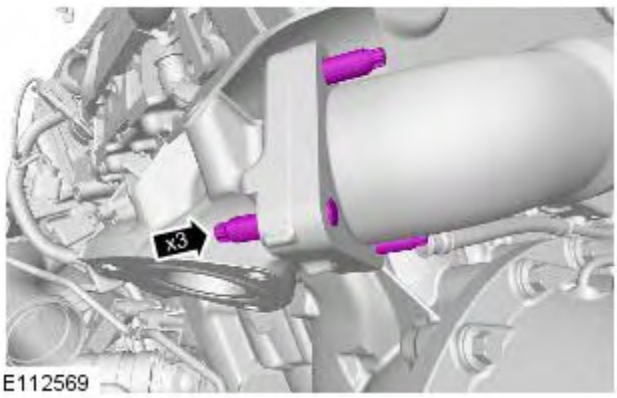
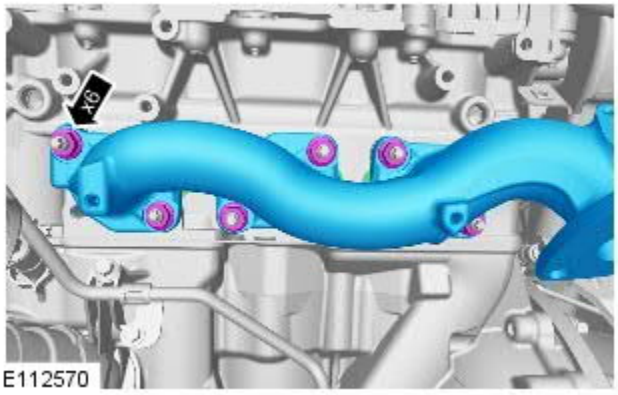


21. CAUTION: Discard the nuts.

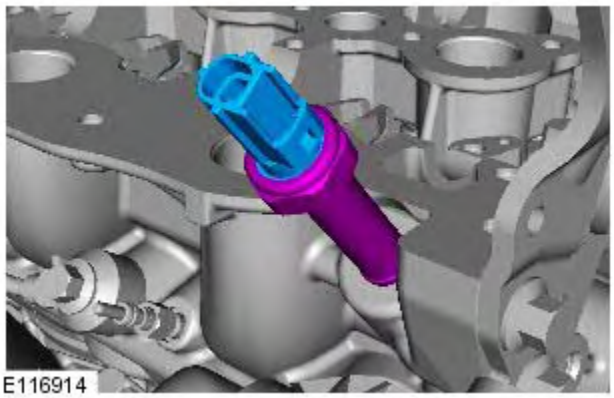


22. CAUTION: Discard the studs.



23. CAUTION: Discard the nuts.

NOTE: Discard the gasket.



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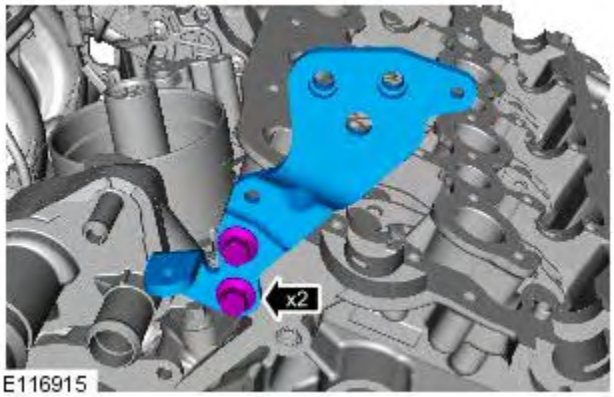
25.



E116915

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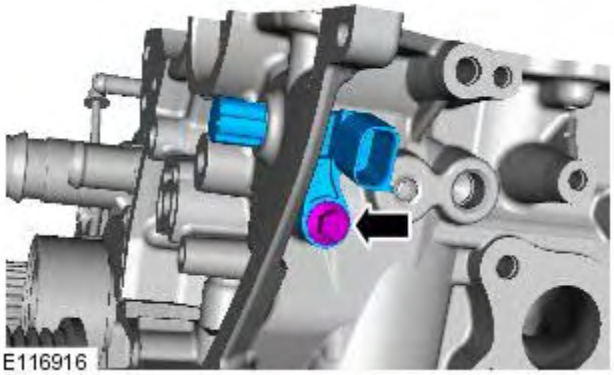
E116916

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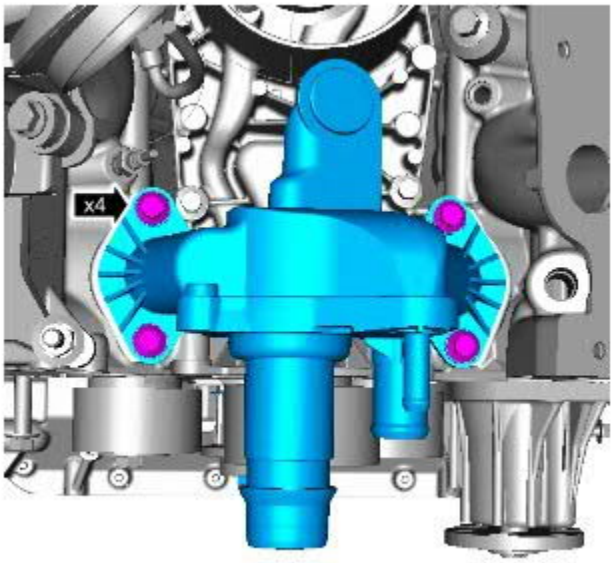

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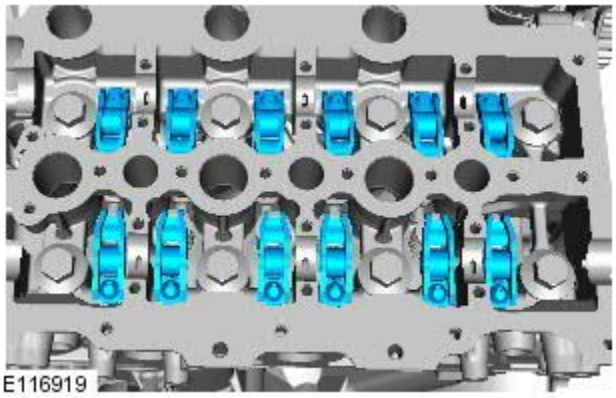

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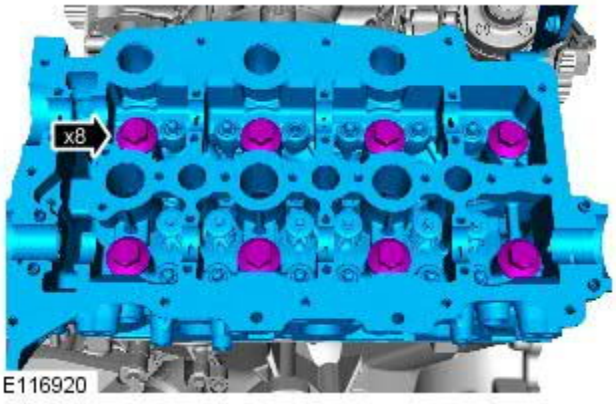
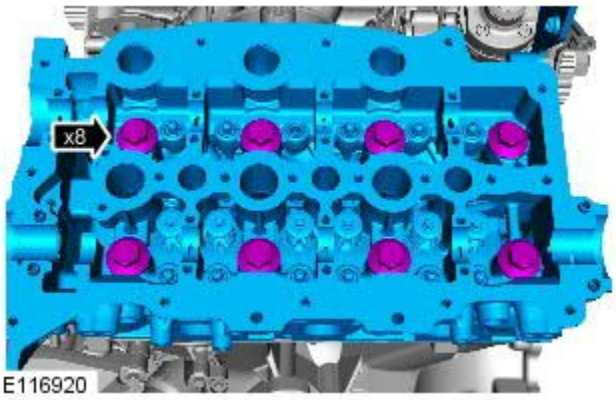


29. CAUTION: Discard the bolts.

NOTE: Discard the gasket.

Installation

1. CAUTION: Make sure that the mating faces are clean and free of foreign material.



2. CAUTIONS:

Only tighten the bolts finger-tight at this stage.

Make sure that new bolts are installed.

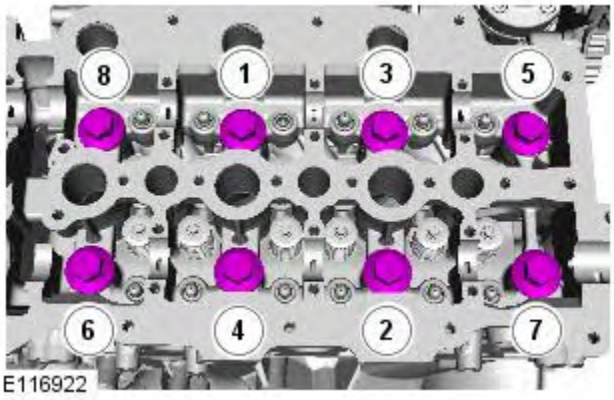
Use care when installing the cylinder head. Damage to the cylinder block, cylinder head or cylinder head gasket may result.

The head gasket must be installed over the cylinder block dowels.

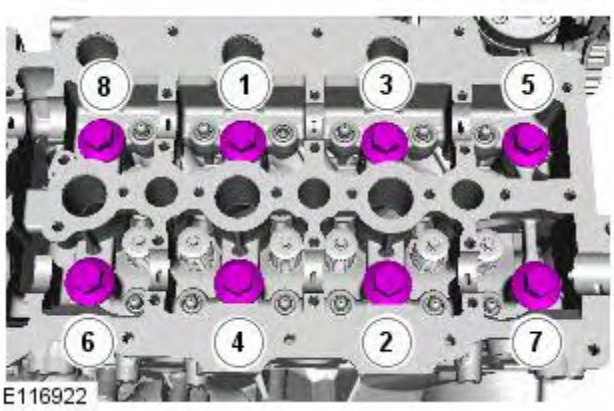
NOTES:

Install a new gasket.

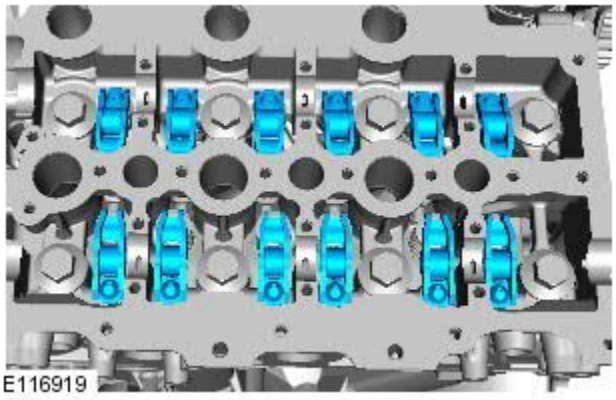
No additional lubrication to the cylinder head bolts is required.



3. NOTE: Tighten the bolts in the indicated sequence.
   - *Torque:* 80 Nm



4. NOTE: Tighten the bolts in the indicated sequence.
   - *Torque:* 180°



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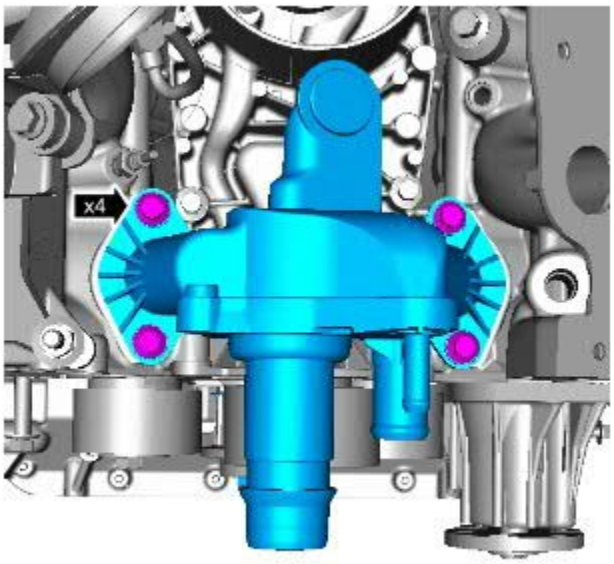
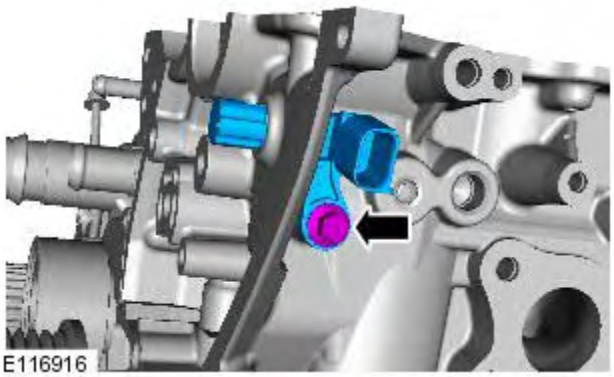


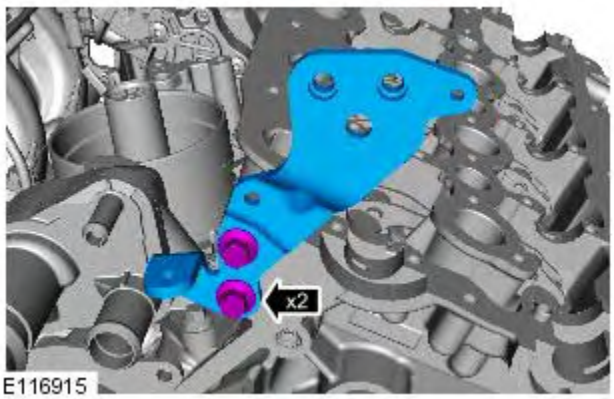
E116917

6. CAUTION: Install the new seals.

   Torque: 10 Nm

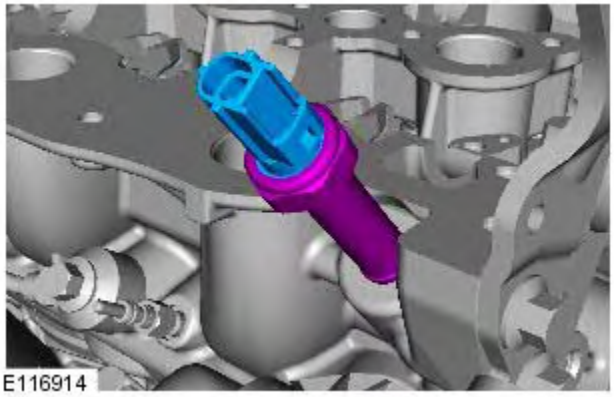

E116916

7. *Torque:* 10 Nm

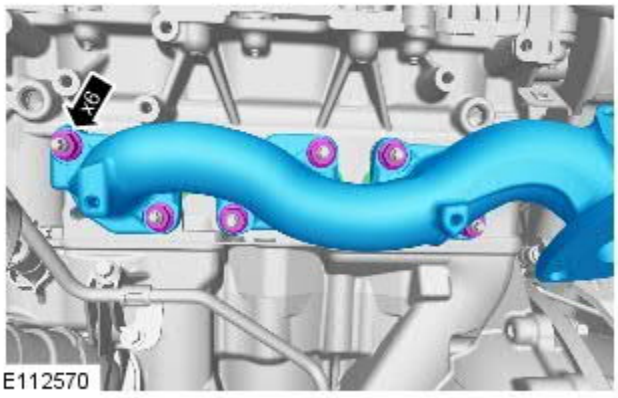


E116915

8. *Torque:* 24 Nm



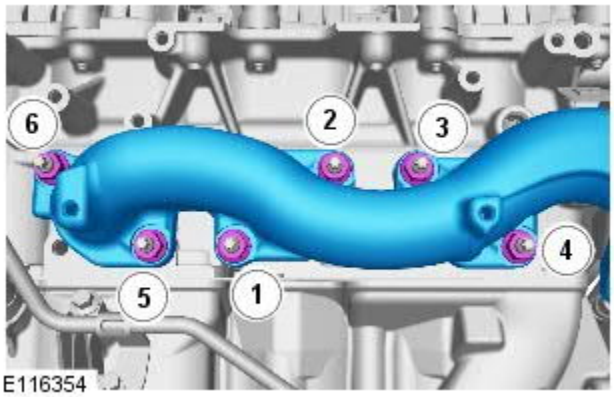
9. *Torque:* 14 Nm



10. WARNING: Make sure that new nuts are installed.

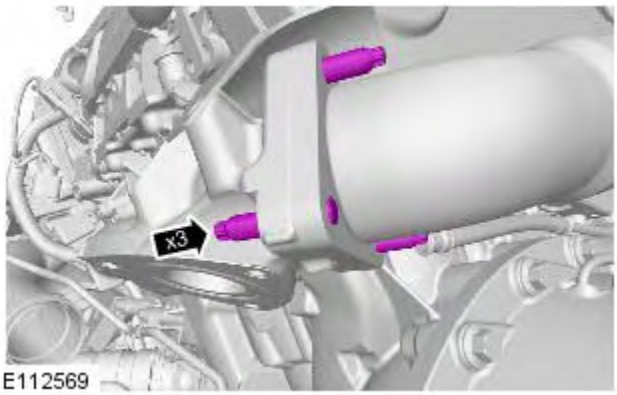
CAUTION: Install the nuts finger tight before final tightening.

NOTE: Install a new gasket.



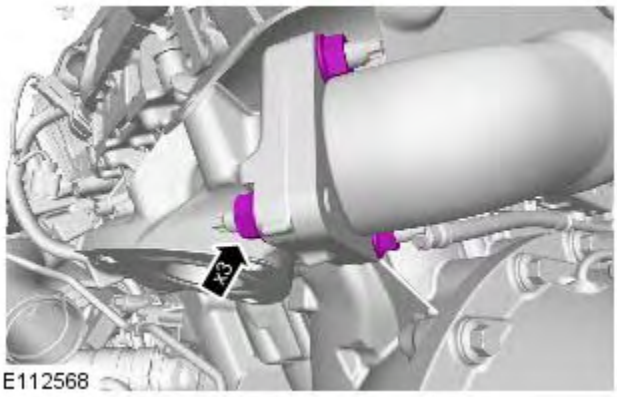
11. NOTE: Tighten the bolts in the indicated sequence.

Torque: 24 Nm



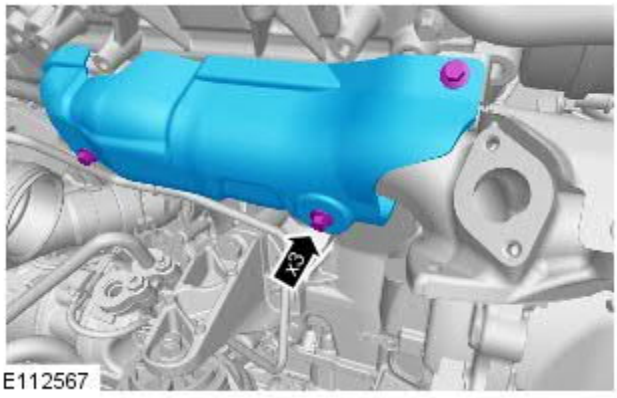
12. CAUTION: Install new studs.

Torque: 24 Nm

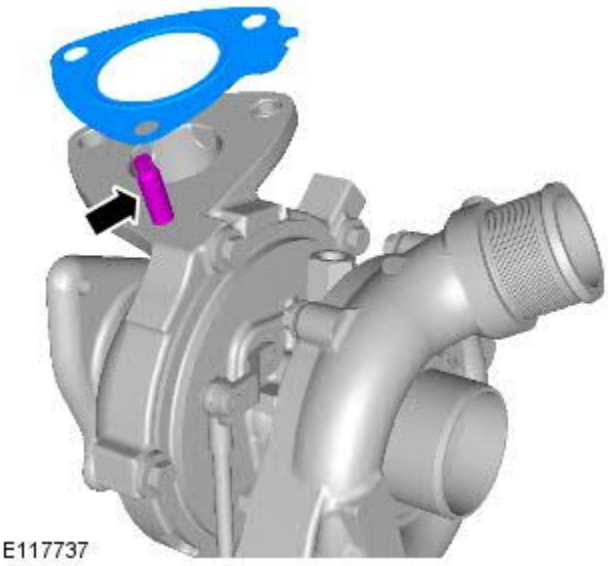


13. WARNING: Make sure that new nuts are installed.

    Torque: 24 Nm



14. *Torque:* 10 Nm



15. CAUTIONS:

    Install new studs.

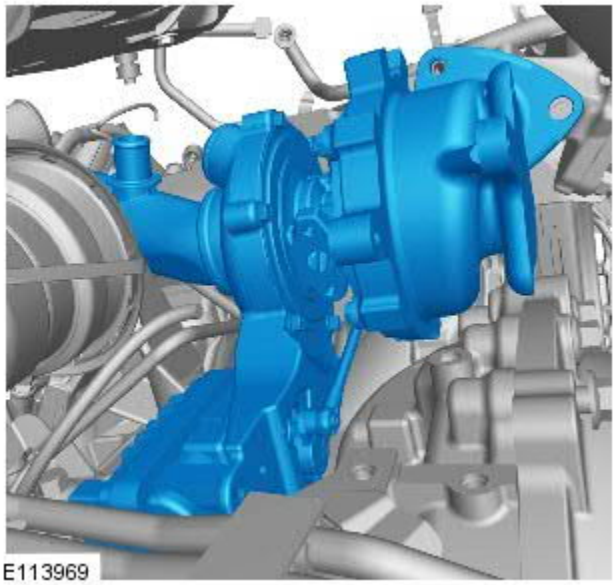
    Check the turbocharger and exhaust manifold mating faces for distortion.

    Install a new turbocharger to exhaust manifold gasket every time the turbocharger is removed.

    Make sure that the mating faces are clean and free of corrosion and foreign material.

    Torque: 13 Nm

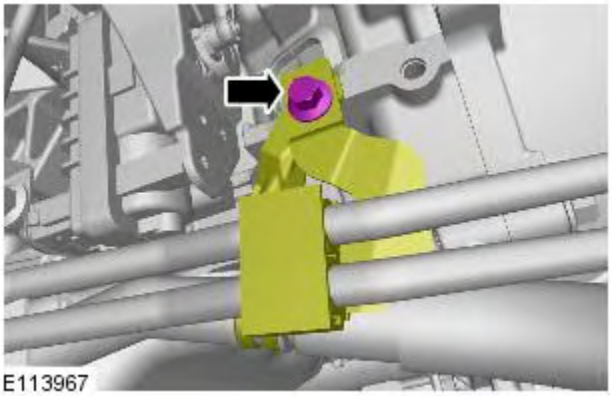
16.

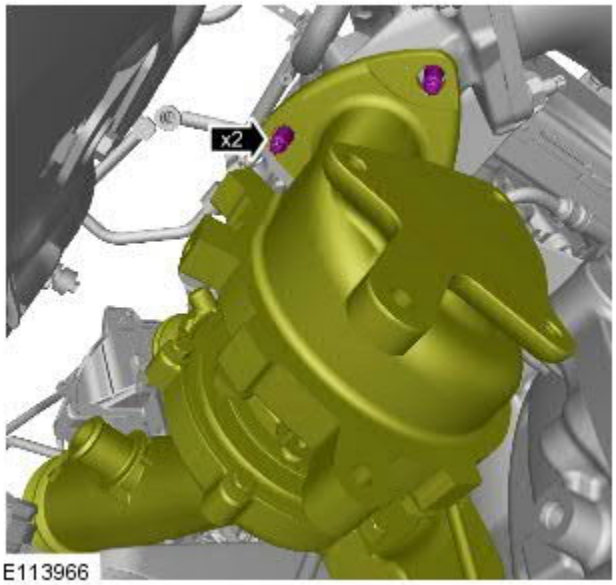

E113969

17.

E113968

18. *Torque:* 10 Nm

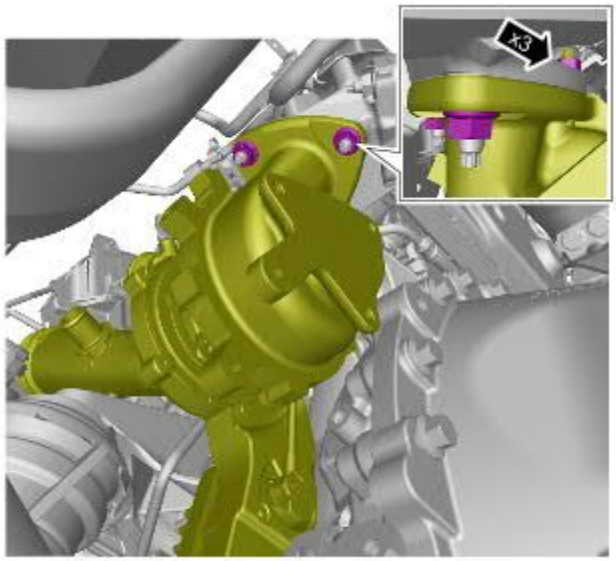

E113967



E113966

19. CAUTION: Install new studs.

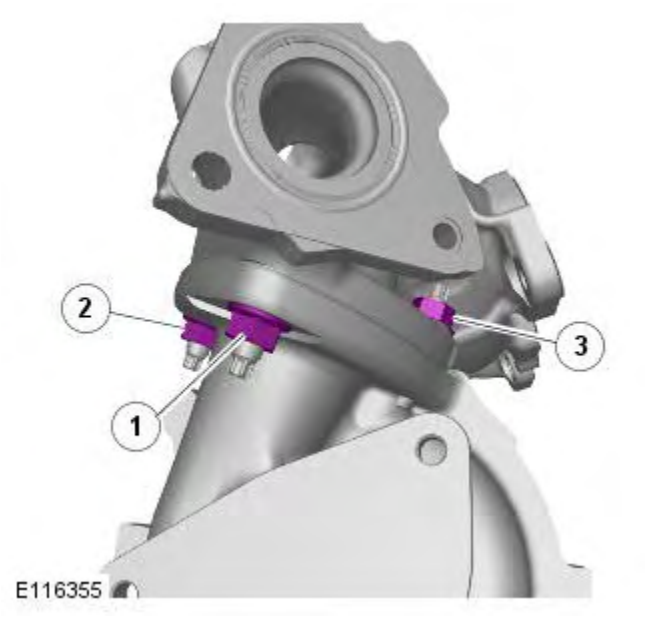
Torque: 13 Nm



E113965

20. WARNING: Make sure that new nuts are installed.

CAUTION: Only tighten the nut finger tight at this stage.

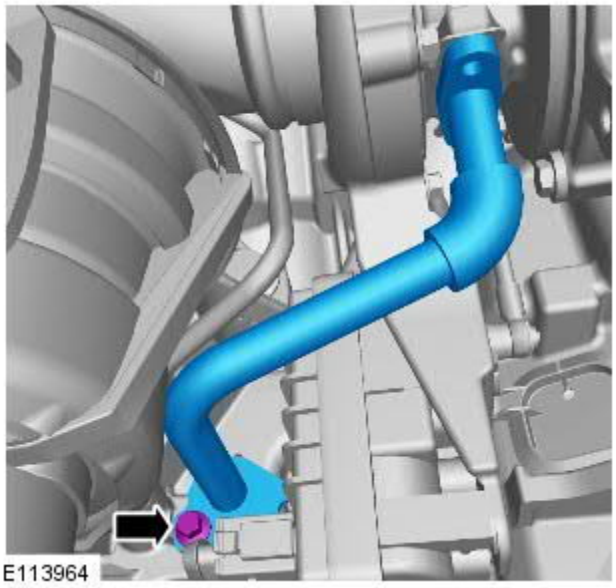


21. NOTES:

Tighten the bolts in the indicated sequence.

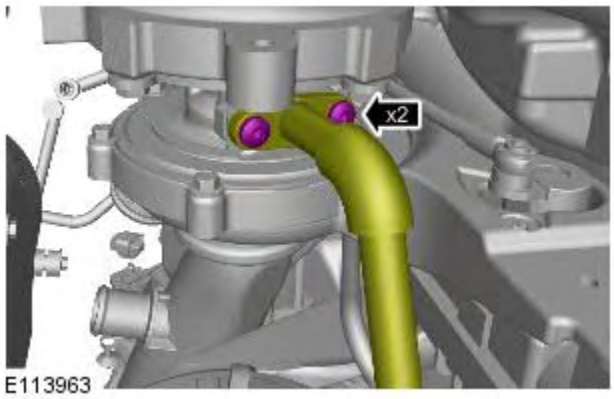
Turbocharger shown removed for clarity.

Torque: 24 Nm



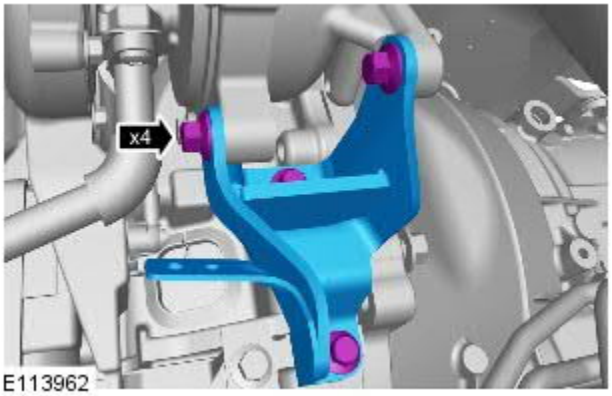
22. CAUTION: Install a new seal.

Torque: 10 Nm

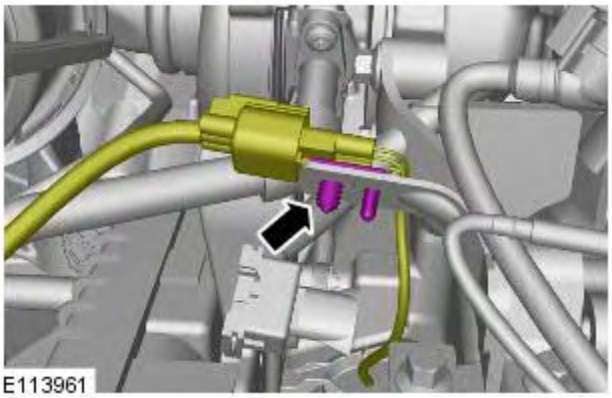


23. NOTE: Install a new gasket.

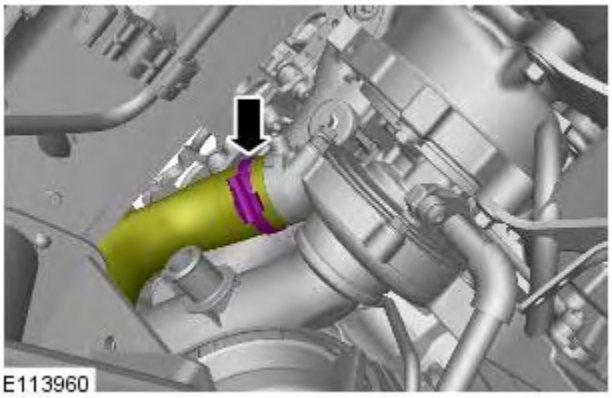
Torque: 10 Nm



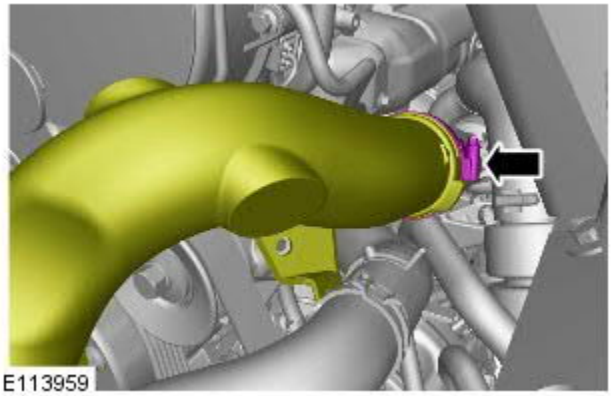
24. *Torque:* 33 Nm



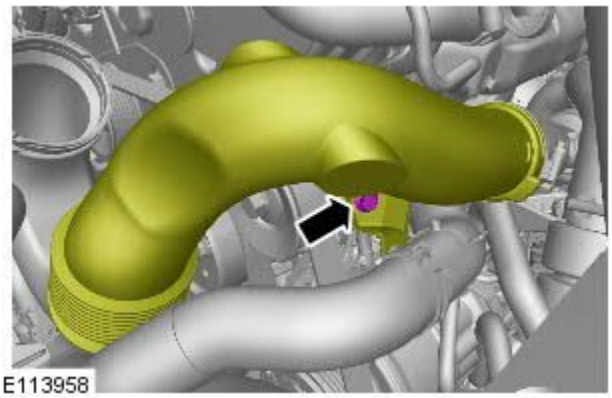
25.



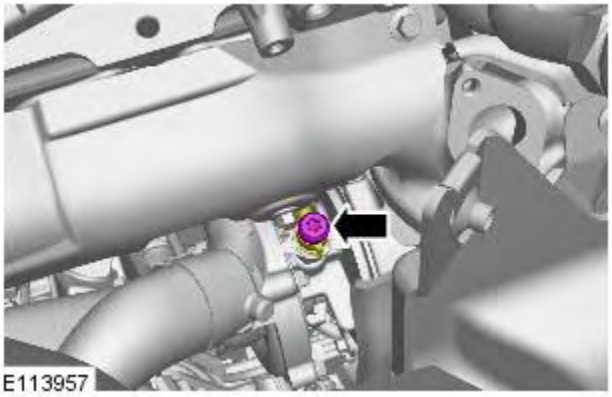
26. *Torque:* 7 Nm



27. *Torque:* 7 Nm



28. *Torque:* 10 Nm

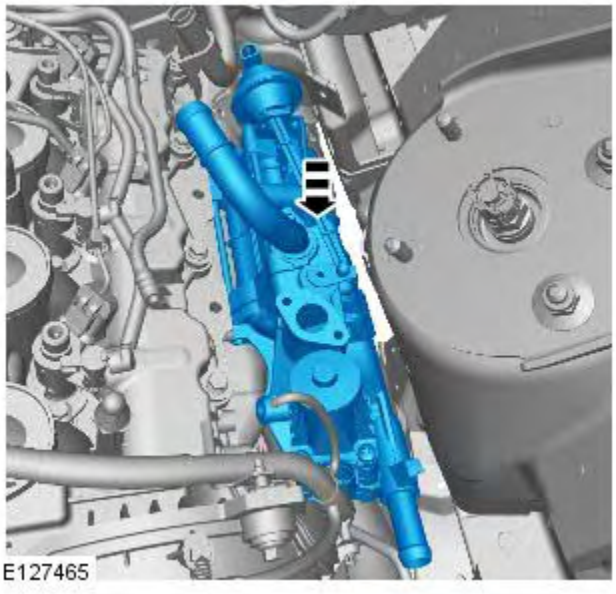


29. CAUTION: Make sure that a new sealing washer is installed.

    Torque: 30 Nm

30. Refer to: Catalytic Converter (309-00A Exhaust System - TDV6 3.0L Diesel, Removal and Installation).

31.



32. Refer to: Glow Plugs (303-07B Glow Plug System - TDV6 3.0L Diesel, Removal and Installation).

33. Refer to: Camshaft (303-01A, Removal and Installation).

34. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 12-Sep-2013

Engine - TDV6 3.0L Diesel - Cylinder Head RH

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

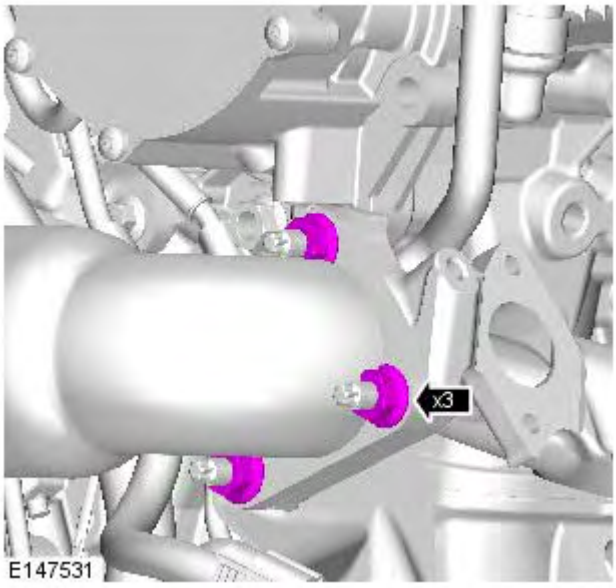
1. Disconnect the battery ground cable

   Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

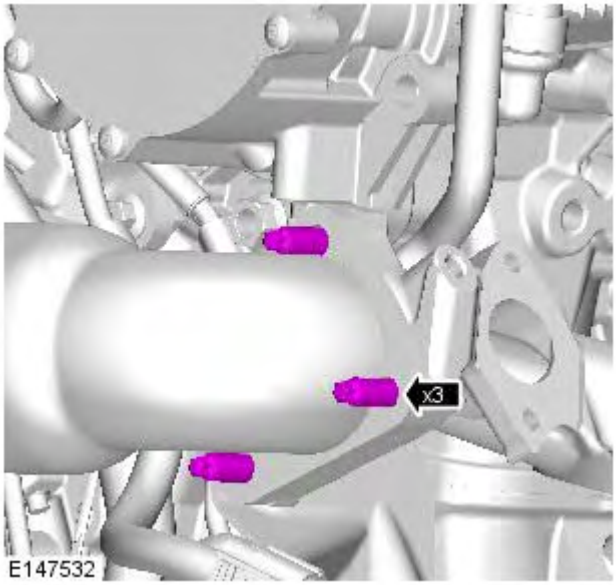
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

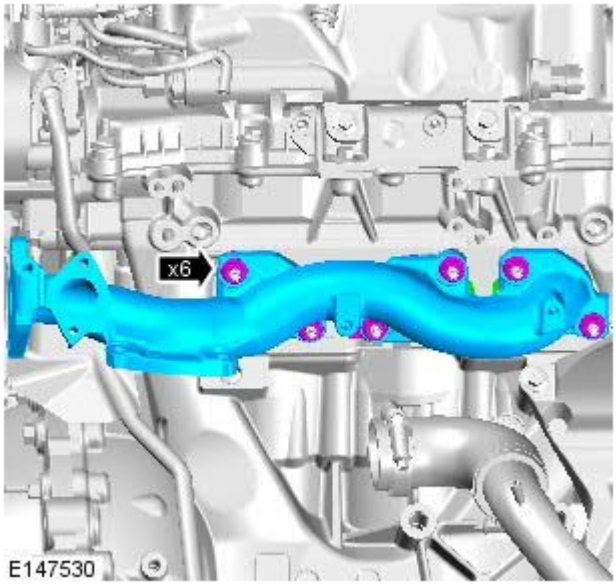
3. Refer to: Turbocharger RH (303-04B Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Removal and Installation).



4. CAUTION: Discard the nuts.

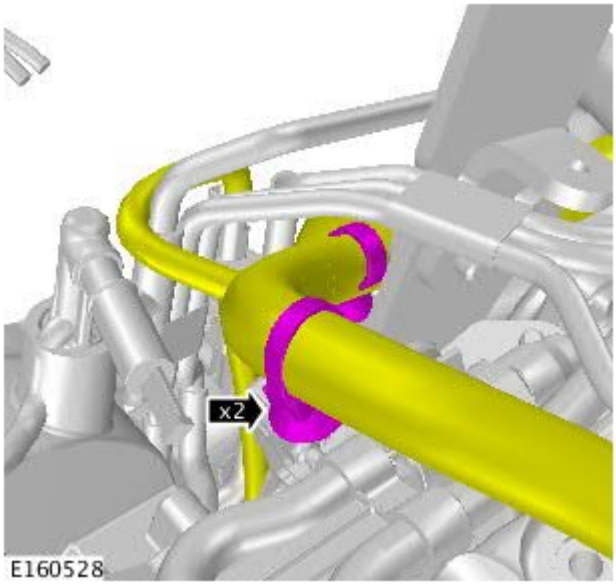


5. CAUTION: Discard the studs.

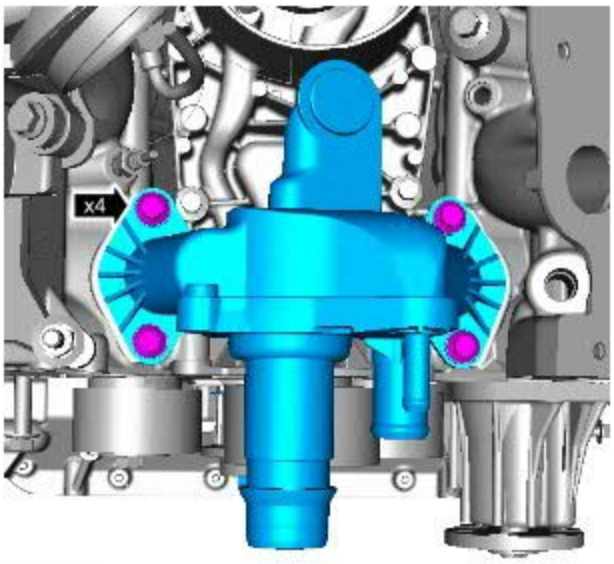


6. NOTE: Discard the gasket.

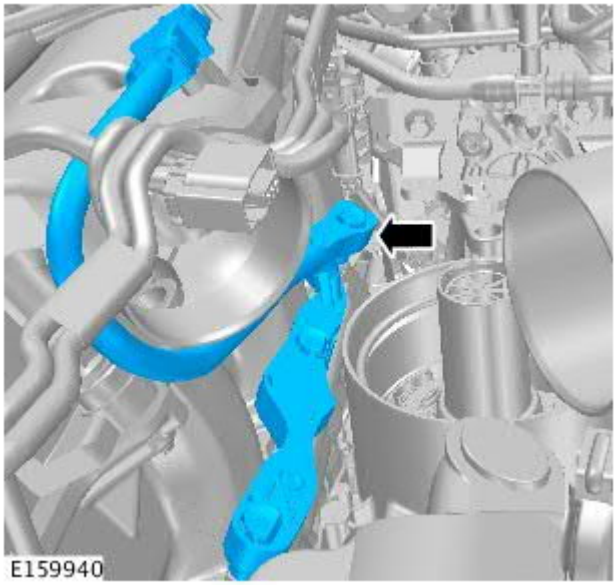
7.



8.



9.



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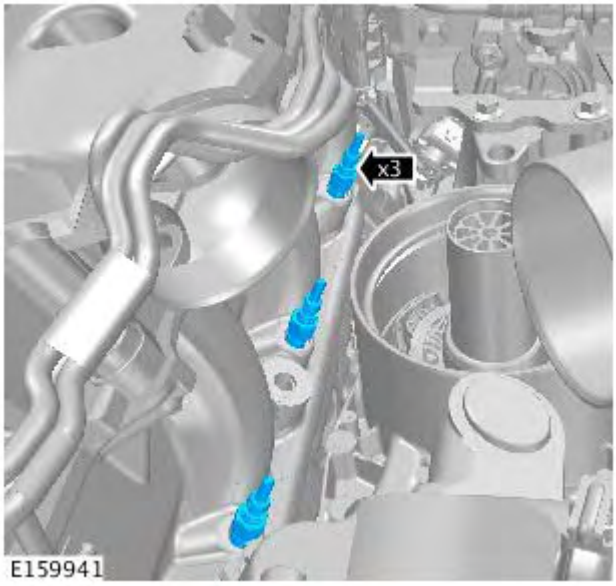
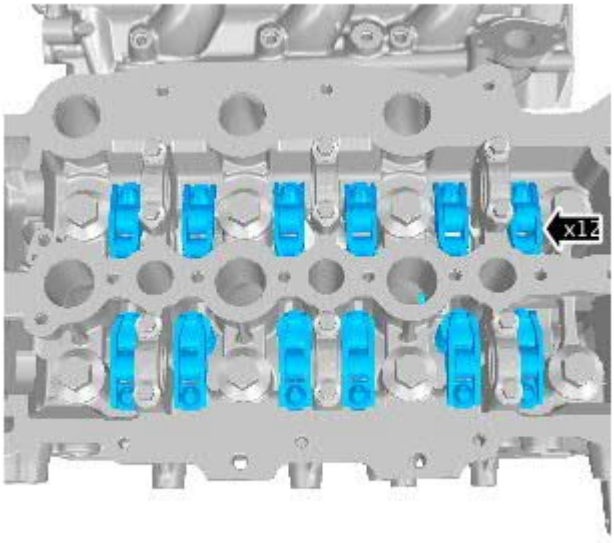
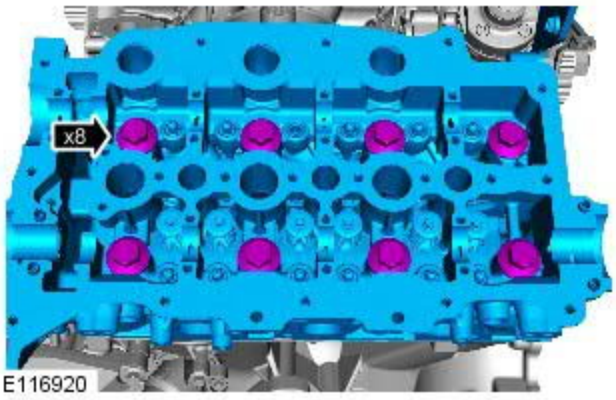


11. Refer to: Camshaft RH (303-01A Engine - TDV6 3.0L Diesel, Removal and Installation).

12.



E159939



E116920

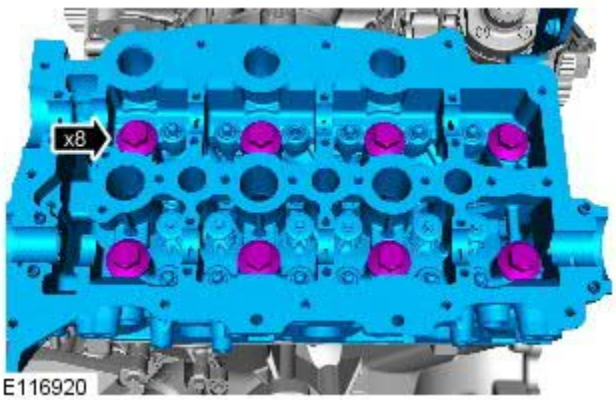
13. CAUTION: Discard the bolts.

NOTE: Discard the gasket.

Installation

1. CAUTION: Make sure that the mating faces are clean and free of foreign material.

   Clean and inspect the cylinder head and cylinder block.



E116920

2. CAUTIONS:

   Only tighten the bolts finger-tight at this stage.

   Make sure that new bolts are installed.

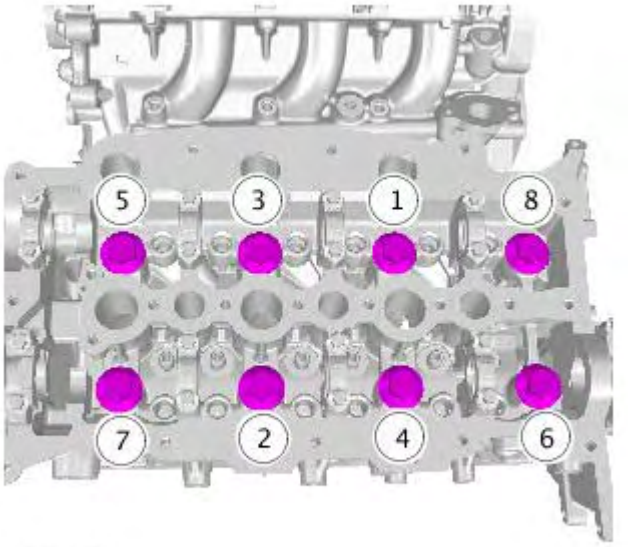
   Use care when installing the cylinder head. Damage to the cylinder block, cylinder head or cylinder head gasket may result.

   The head gasket must be installed over the cylinder block dowels.

   NOTES:

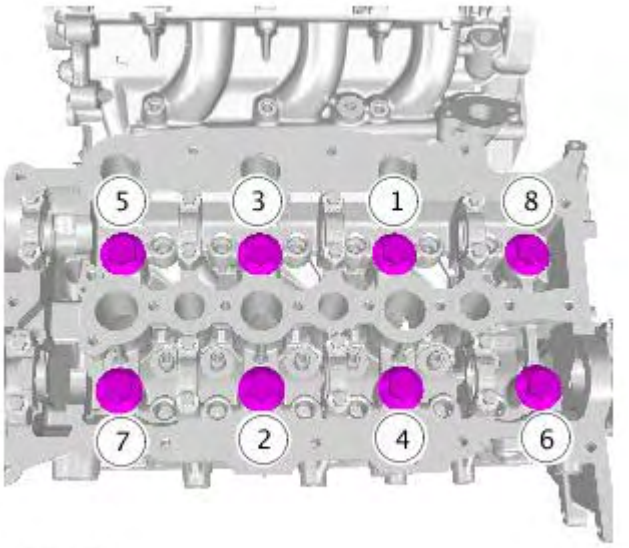
Install a new gasket.

No additional lubrication to the cylinder head bolts is required.



E159942

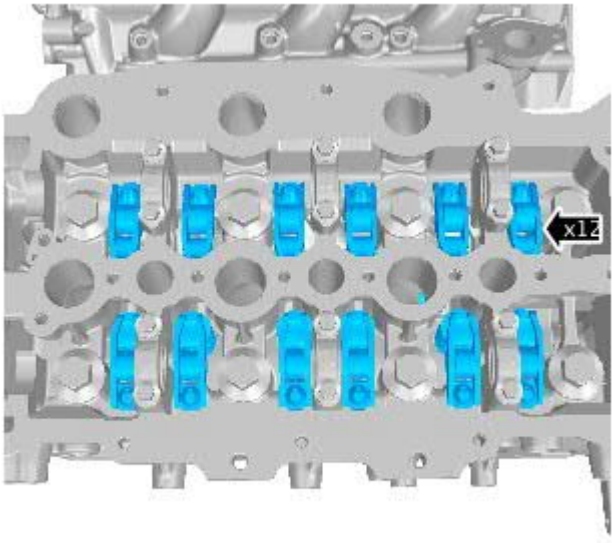
3. NOTE: Tighten the bolts in the indicated sequence.
   - *Torque:* 80 Nm



E159942

4. NOTE: Tighten the bolts in the indicated sequence.
   - *Torque:* 180°

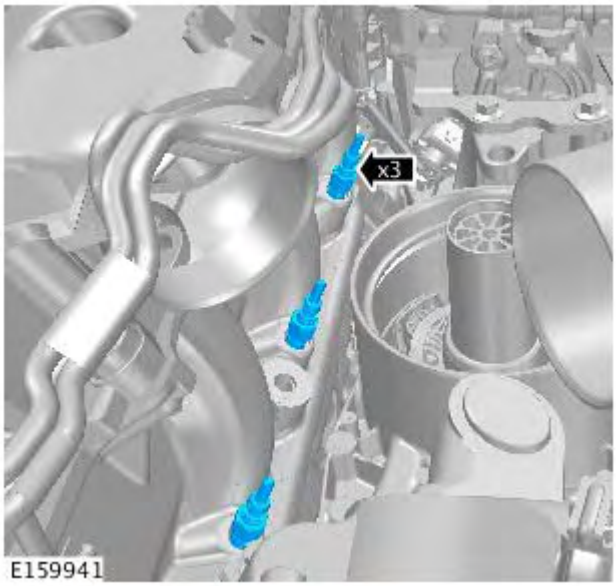
5.



E159939

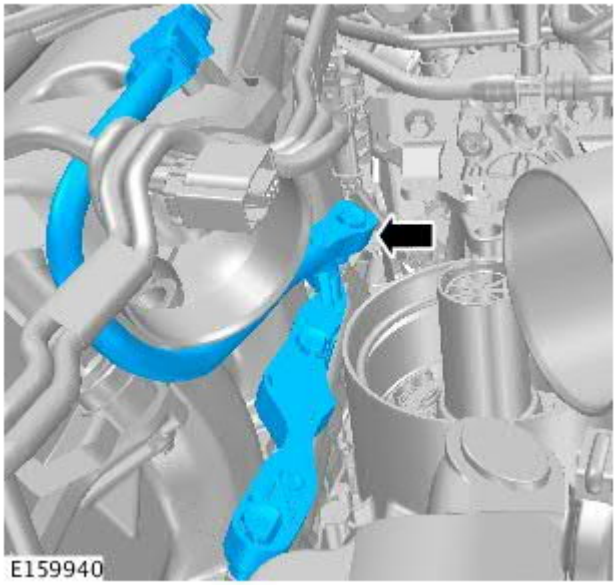
6. Refer to: Camshaft RH (303-01A Engine - TDV6 3.0L Diesel, Removal and Installation).

7. *Torque:* 10 Nm

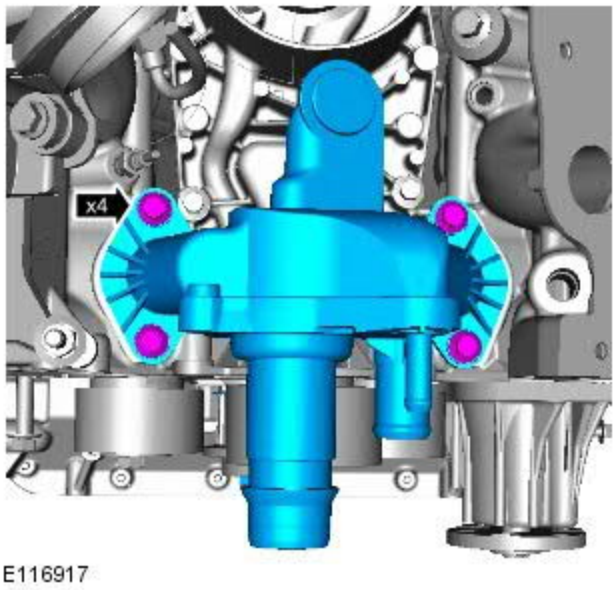


E159941

8.



9. *Torque:* 10 Nm



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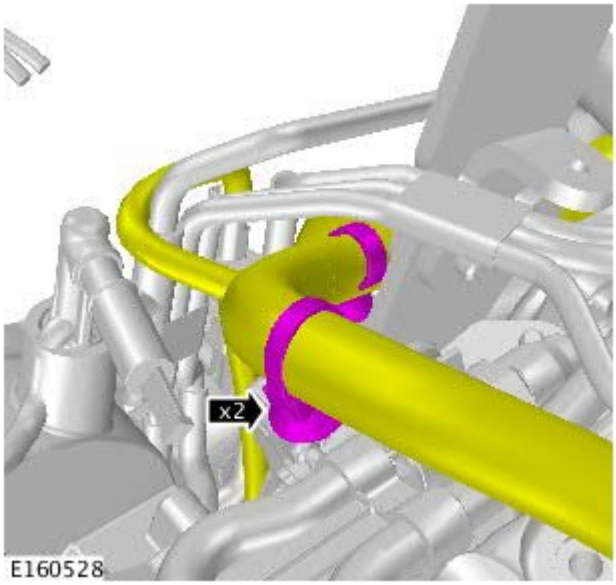
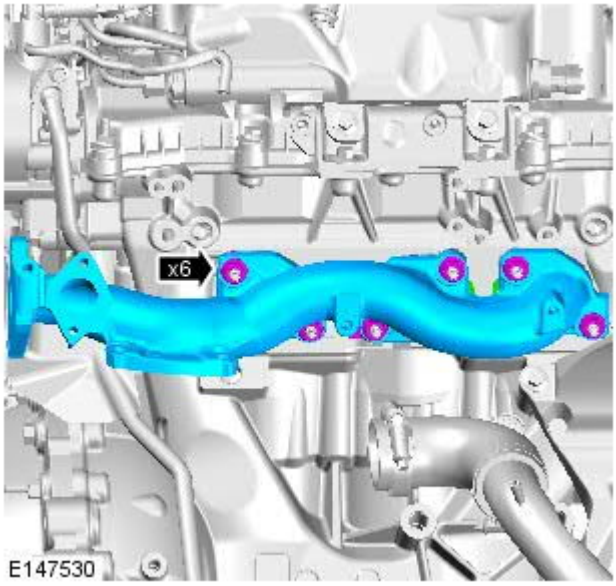
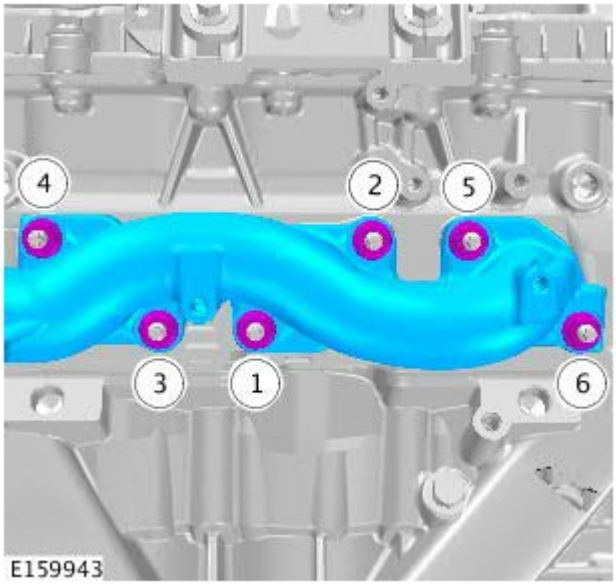




11. WARNING: Make sure that new nuts are installed.

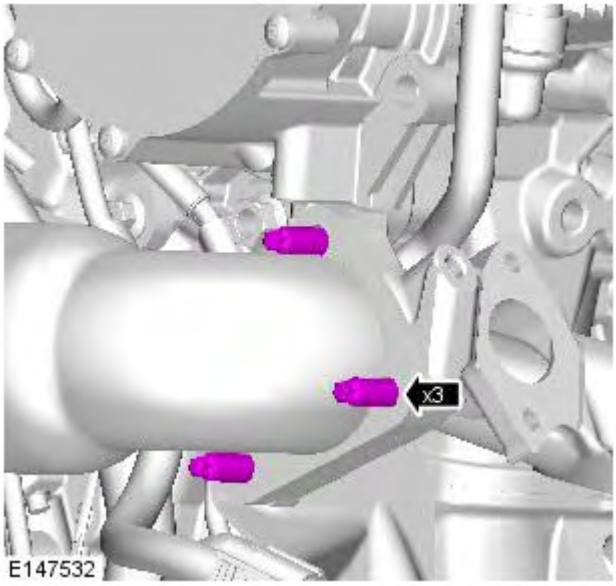
CAUTION: Install the nuts finger tight before final tightening.

NOTE: Install a new gasket.



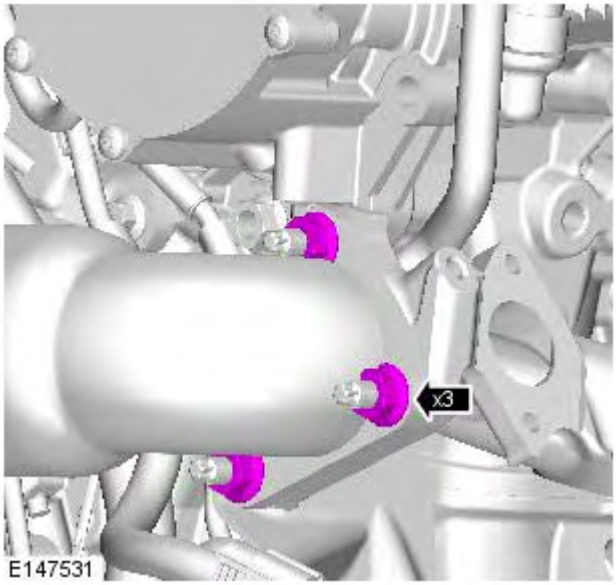
12. NOTE: Tighten the bolts in the indicated sequence.

Torque: 28 Nm



13. CAUTION: Install new studs.

Torque: 13 Nm



14. WARNING: Make sure that new nuts are installed.

    Torque: 24 Nm

15. Refer to: Turbocharger RH (303-04B Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Removal and Installation).

16. Reconnect the battery ground cable

    Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 11-May-2011

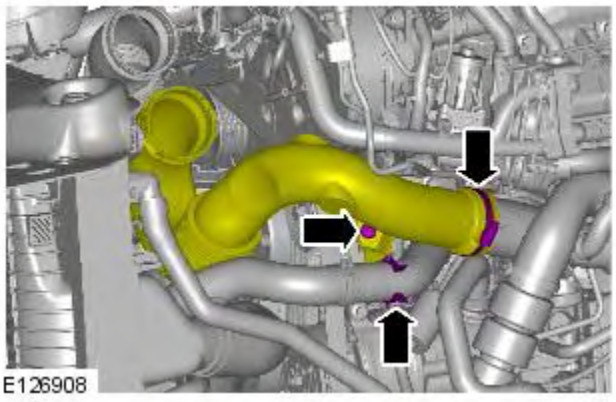
Engine - TDV6 3.0L Diesel - Engine Mount LH

Removal and Installation

Removal

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel, Removal and Installation).



2. NOTE: Engine shown removed for clarity.

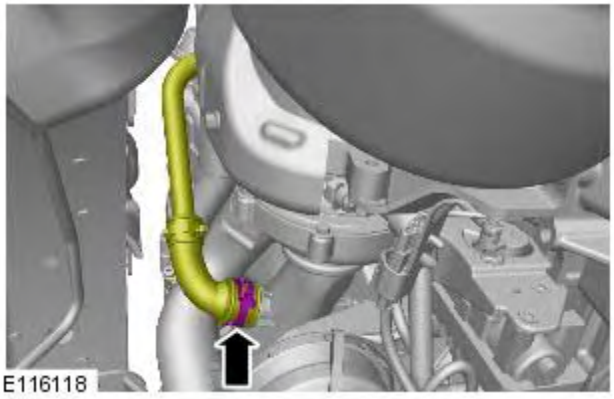
   Torque: 10 Nm

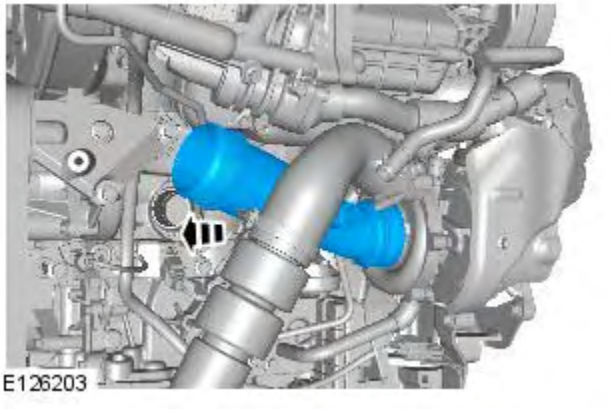
3. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

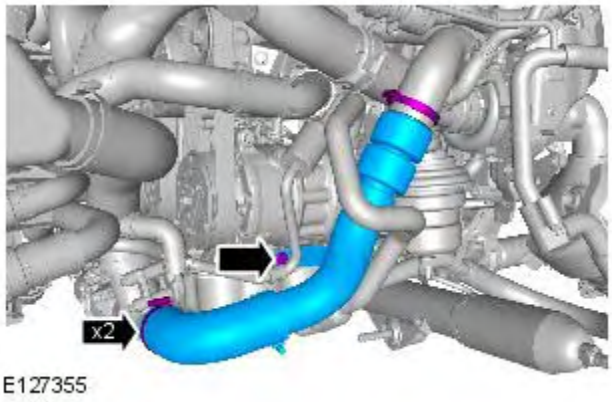
4. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

5.



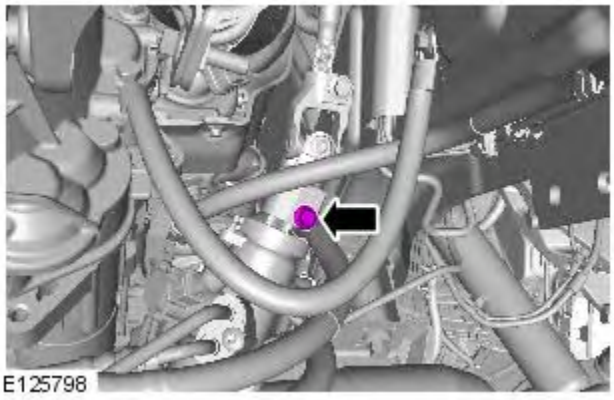


6. NOTE: Engine shown removed for clarity.



7. NOTE: Engine shown removed for clarity.

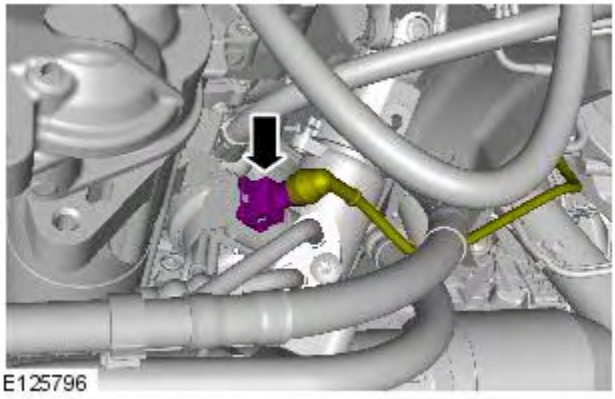
Torque: 10 Nm



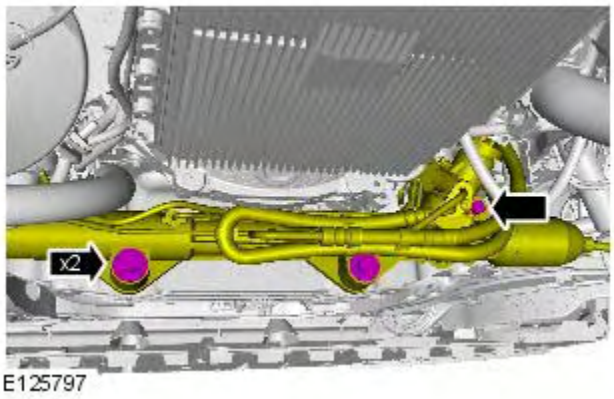
8. CAUTION: Note the fitted position of the component prior to removal.

NOTE: RHD shown, LHD is similar.

Torque: 35 Nm



9. NOTE: RHD shown, LHD is similar.



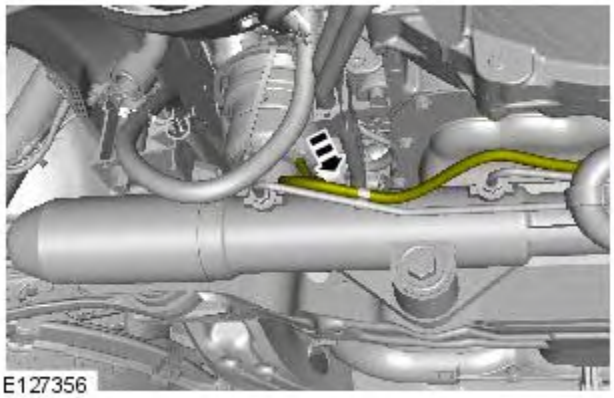
E125797

10. NOTES:

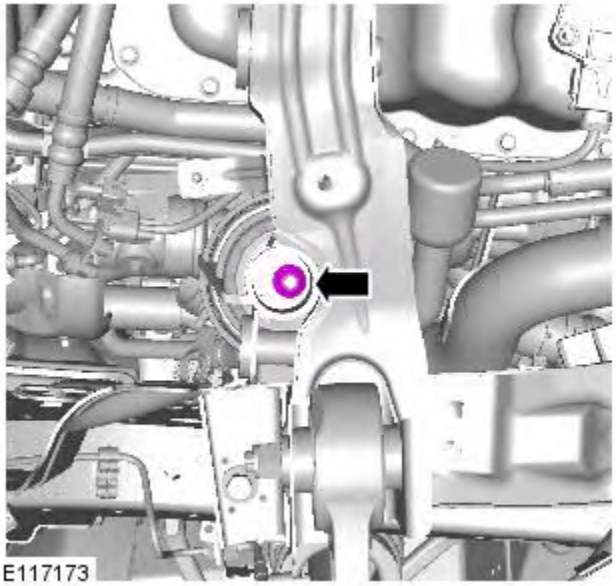
Support as necessary.

RHD shown, LHD is similar.

Torque: 100 Nm

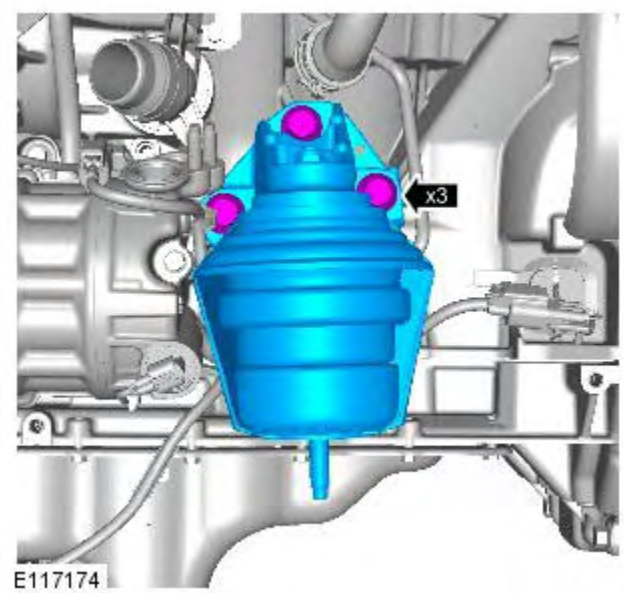

E127356

11.


E117173

12. *Torque:* 63 Nm

13. Using a suitable hydraulic jack, raise and support the engine.



14. *Torque:* 90 Nm

15. CAUTION: Note the fitted position of the component prior to removal.

    NOTES:

    Position and secure component in a bench vice fitted with soft jaws.

    Do not disassemble further if the component is removed for access only.

    Torque: 48 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Engine - TDV6 3.0L Diesel - Engine Mount RH

Removal and Installation

Removal

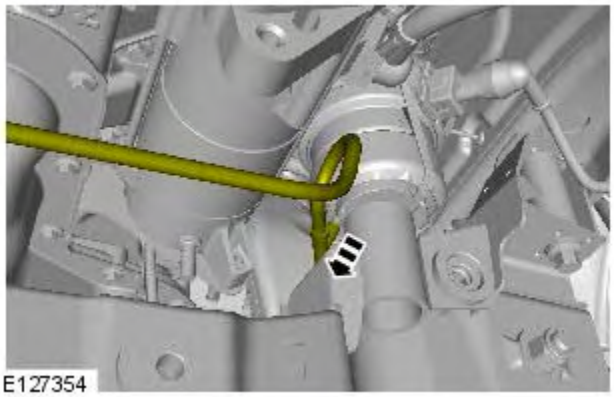
NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

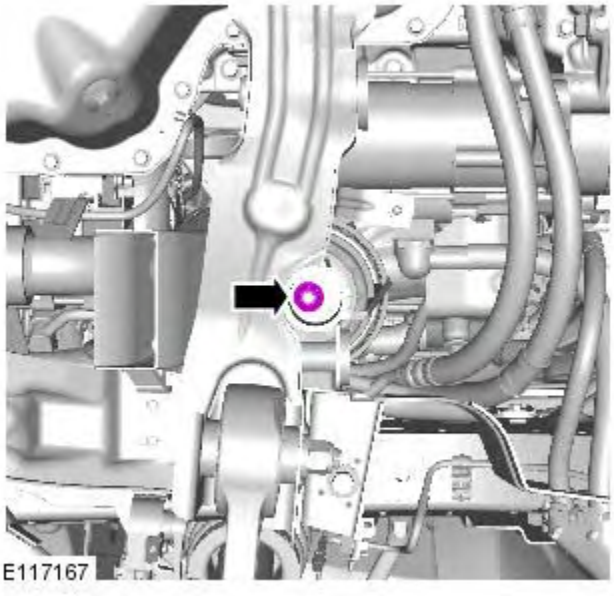
   Raise and support the vehicle.

2. Refer to: Turbocharger RH (303-04B Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Removal and Installation).

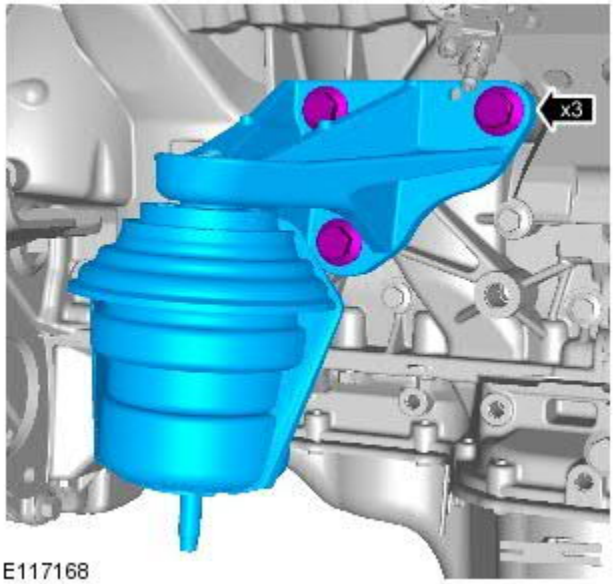
3.



4. *Torque:* 63 Nm



5. Using a suitable hydraulic jack, raise and support the engine.



E117168

6. *Torque:* 90 Nm

E117169

7. CAUTION: Note the fitted position of the component prior to removal.

   NOTES:

   Position and secure component in a bench vice fitted with soft jaws.

   Do not disassemble further if the component is removed for access only.

   Torque: 48 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Engine - TDV6 3.0L Diesel - Exhaust Manifold LH

Removal and Installation

Removal

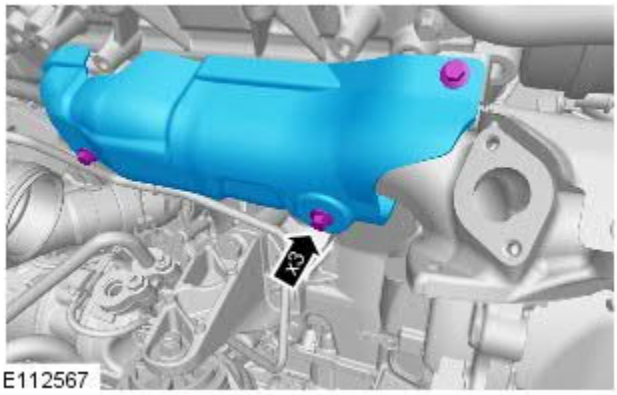
NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

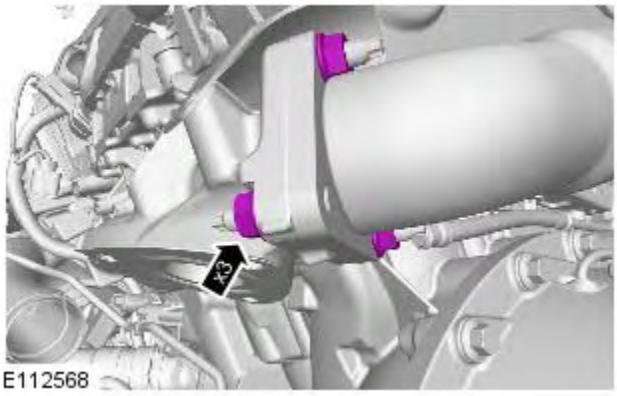
2. Refer to: Turbocharger LH (303-04B Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Removal and Installation).

3.

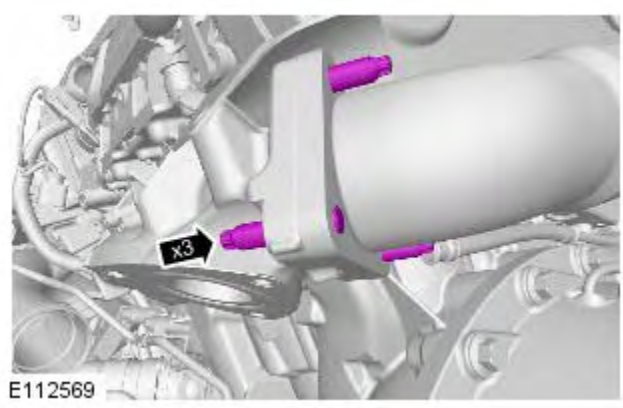


E112567

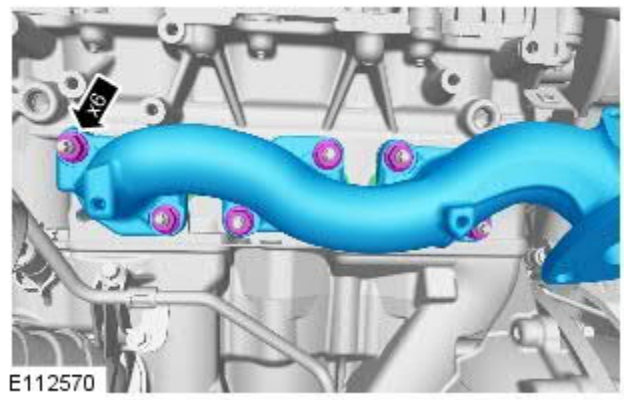
4. CAUTION: Discard the nuts.



E112568



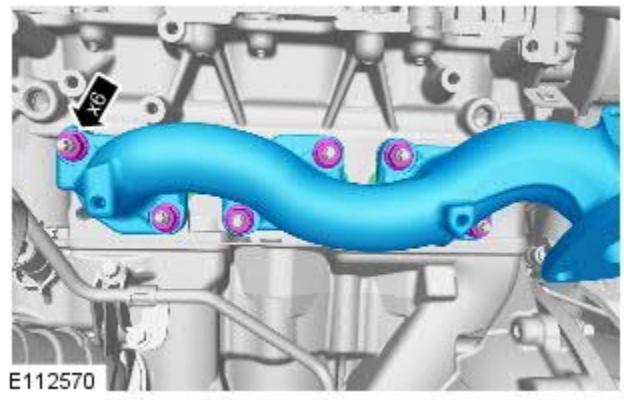
5. CAUTION: Discard the studs.



6. CAUTION: Discard the nuts.

NOTE: Discard the gasket.

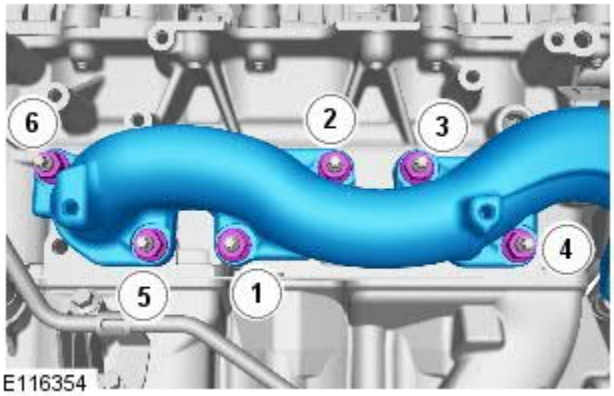
Installation



1. WARNING: Make sure that new nuts are installed.

CAUTION: Install the nuts finger tight before final tightening.

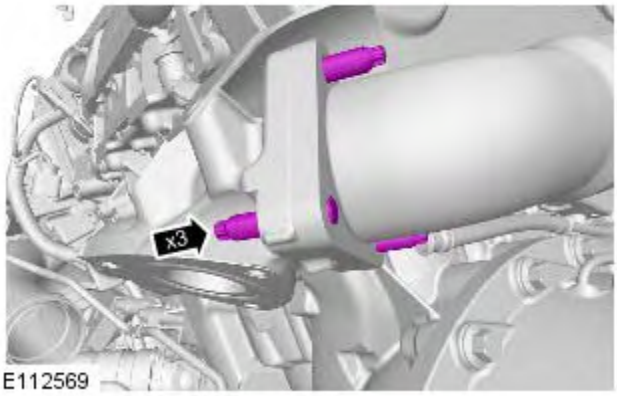
NOTE: Install a new gasket.



E116354

2. NOTE: Tighten the bolts in the indicated sequence.

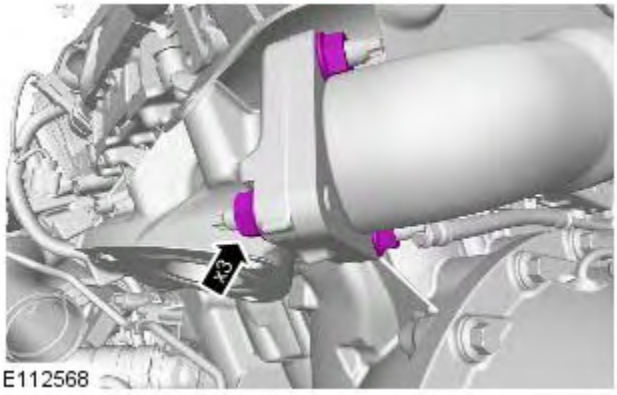
   Torque: 28 Nm



E112569

3. CAUTION: Install new studs.

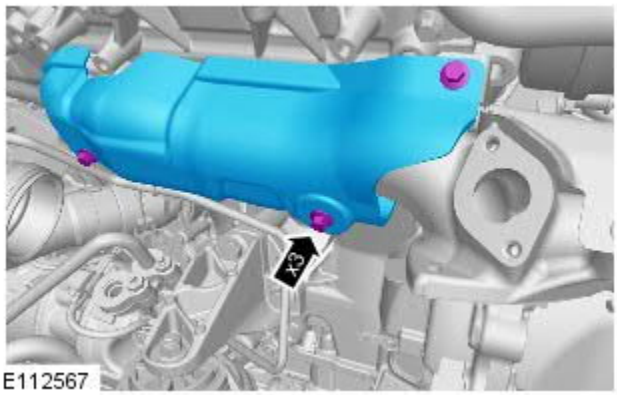
   Torque: 13 Nm



E112568

4. WARNING: Make sure that new nuts are installed.

   Torque: 24 Nm



E112567

5. *Torque:* 10 Nm

6. Refer to: Turbocharger LH (303-04B Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Removal and Installation).

Published: 12-Sep-2013

Engine - TDV6 3.0L Diesel - Exhaust Manifold RH

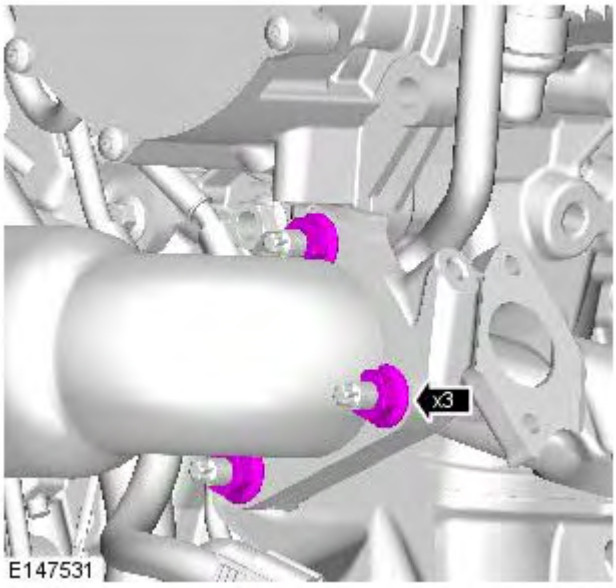
Removal and Installation

Removal

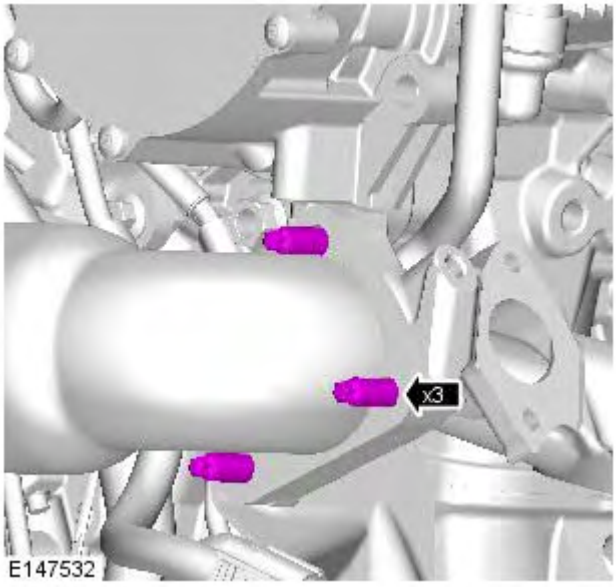
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

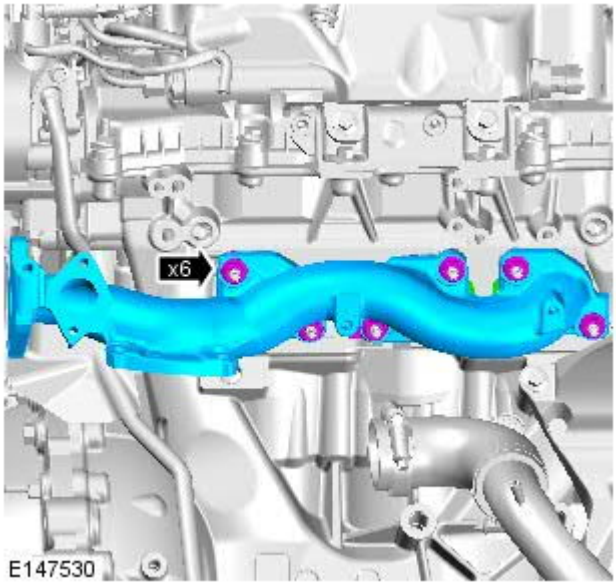
2. Refer to: Turbocharger RH (303-04B Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Removal and Installation).



3. CAUTION: Discard the nuts.



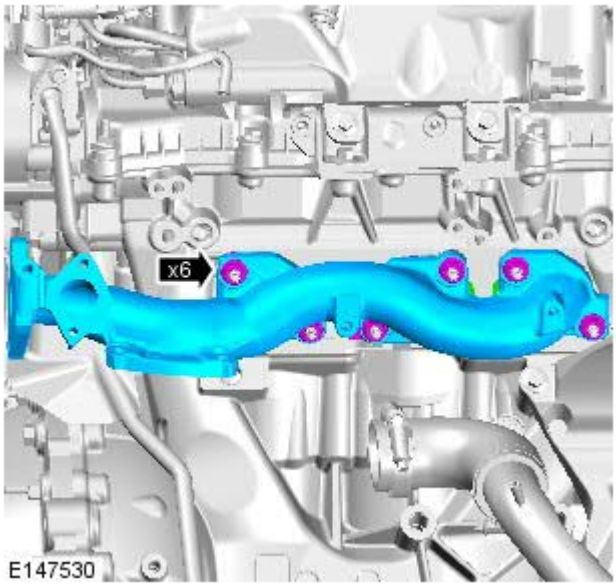
4. CAUTION: Discard the studs.



5. CAUTION: Discard the nuts.

   NOTE: Discard the gasket.

Installation

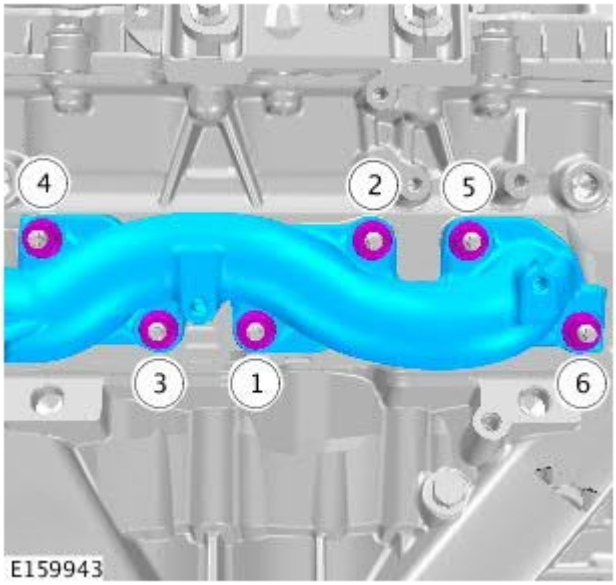


1. CAUTIONS:

   Make sure that new nuts are installed.

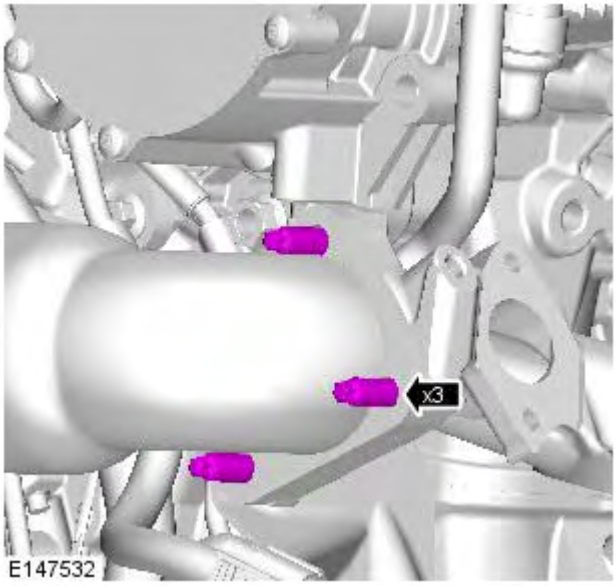
   Install the nuts finger tight before final tightening.

   NOTE: Install a new gasket.



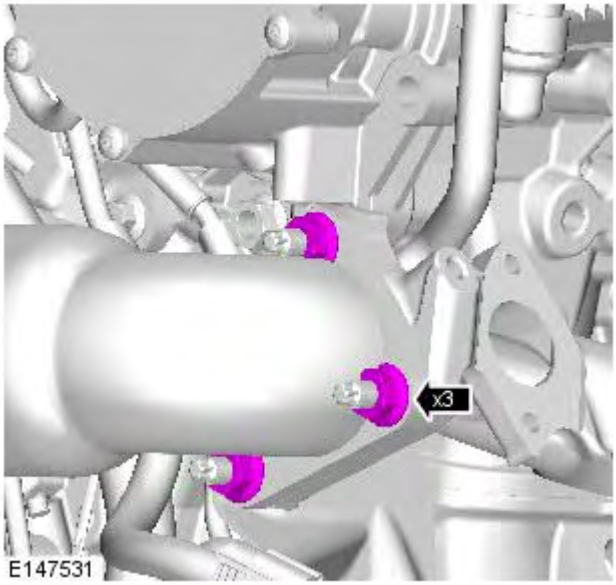
2. NOTE: Tighten the bolts in the indicated sequence.

   Torque: 28 Nm



3. CAUTION: Install new studs.

   Torque: 13 Nm



4. CAUTION: Make sure that new nuts are installed.

   Torque: 28 Nm

5. Refer to: Turbocharger RH (303-04B Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Removal and Installation).

Published: 11-May-2011

Engine - TDV6 3.0L Diesel - Exhaust Manifold Crossover Pipe

Removal and Installation

Removal

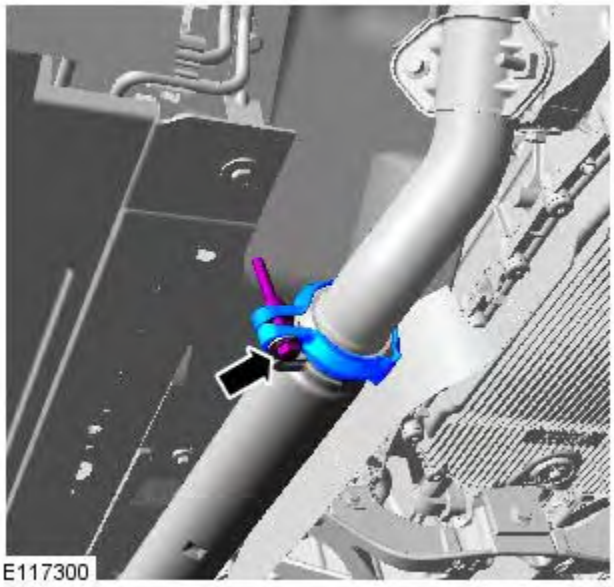
NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

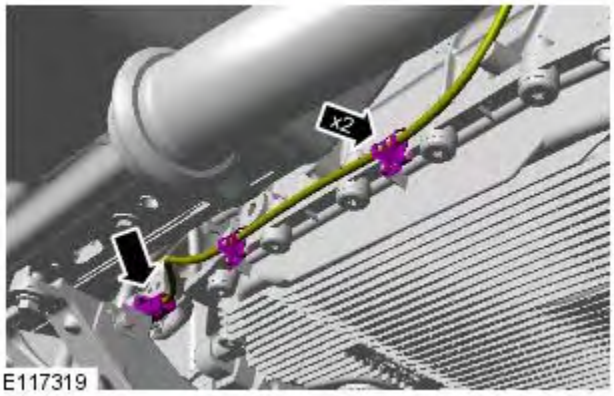
   Raise and support the vehicle.

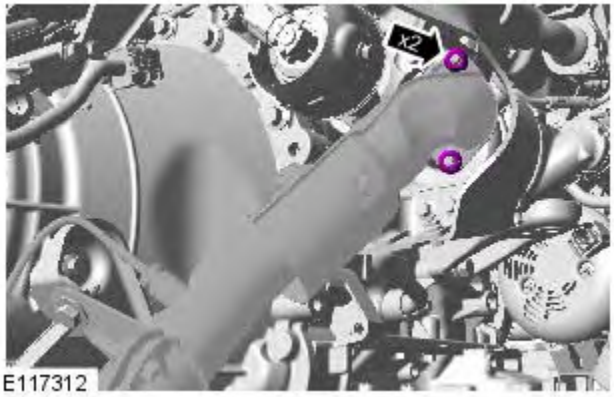
2. Refer to: Catalytic Converter (309-00A Exhaust System - TDV6 3.0L Diesel, Removal and Installation).

3.

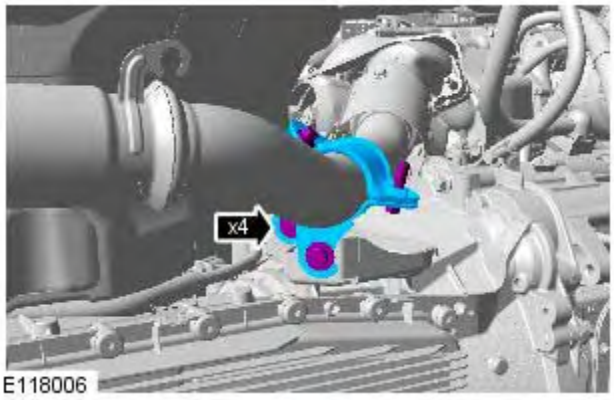


4.





5. CAUTION: Discard the nuts.



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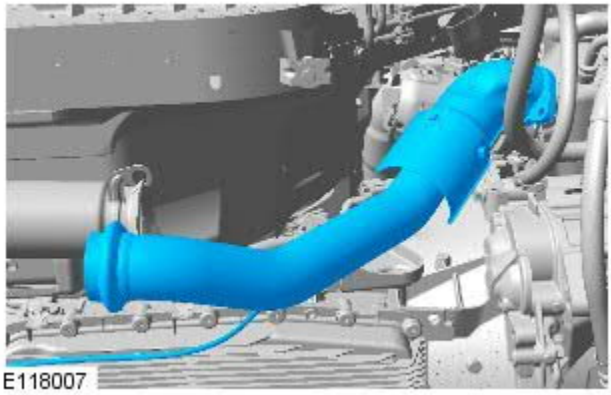
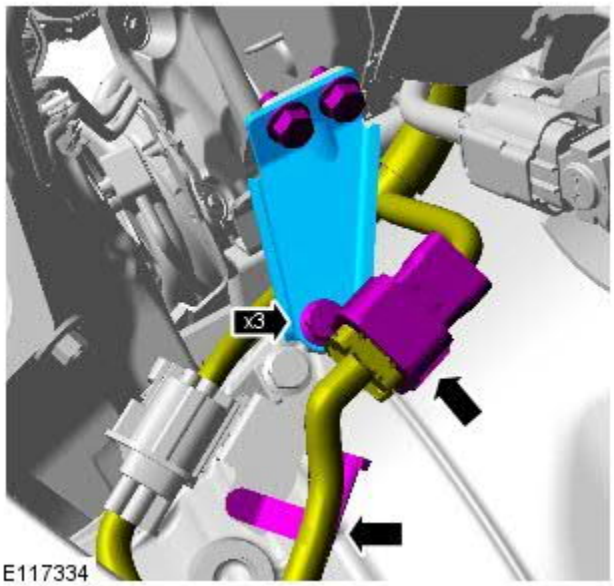


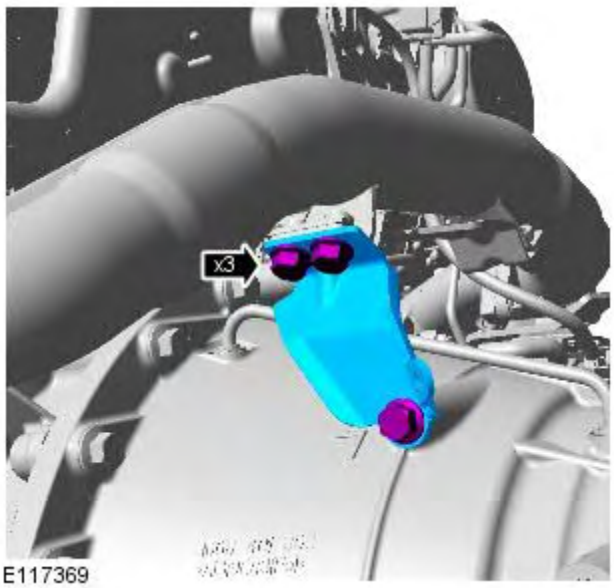
7.

8.



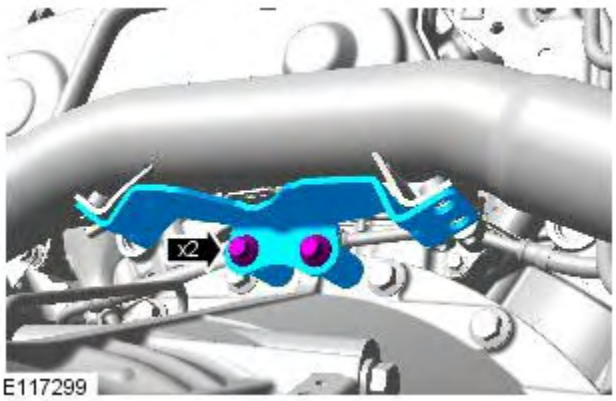
E117334

9.



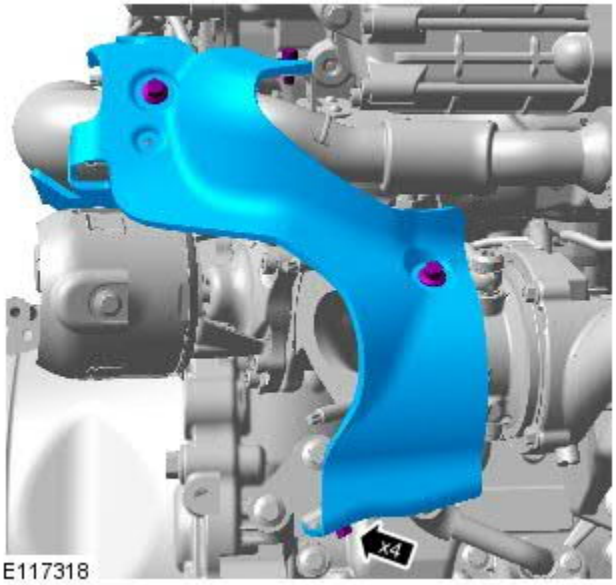
E117369

10.

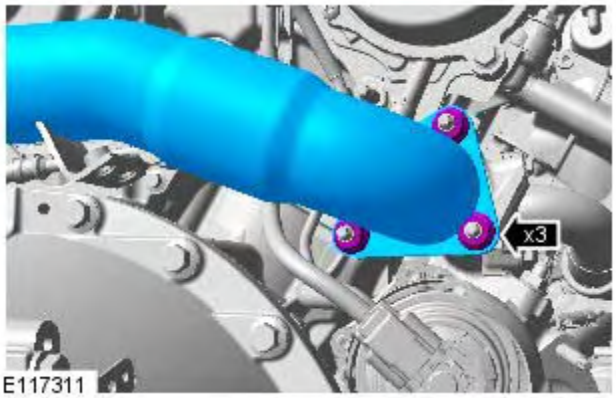


E117299

11.



12. CAUTION: Discard the nuts.



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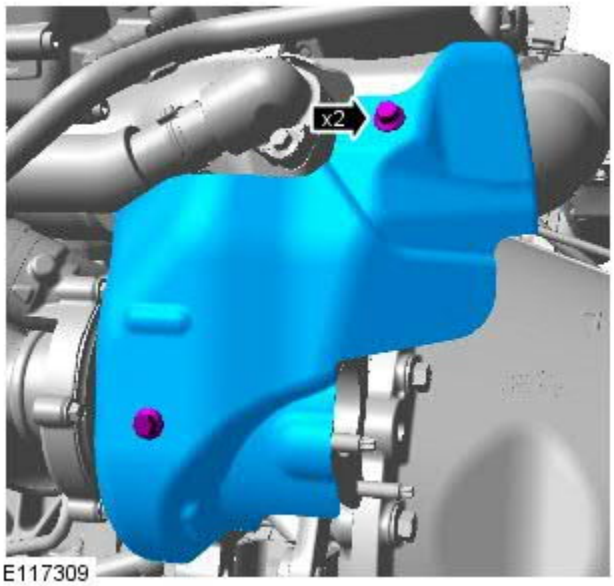
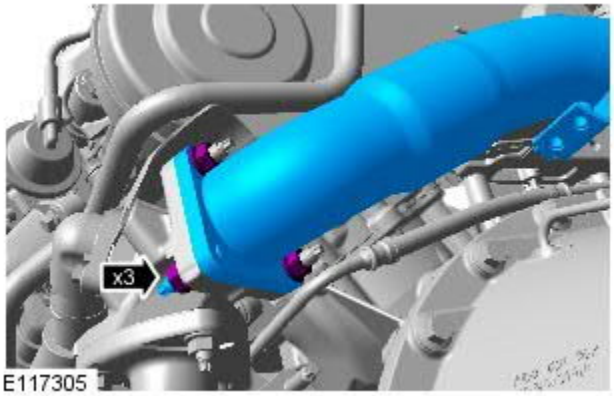
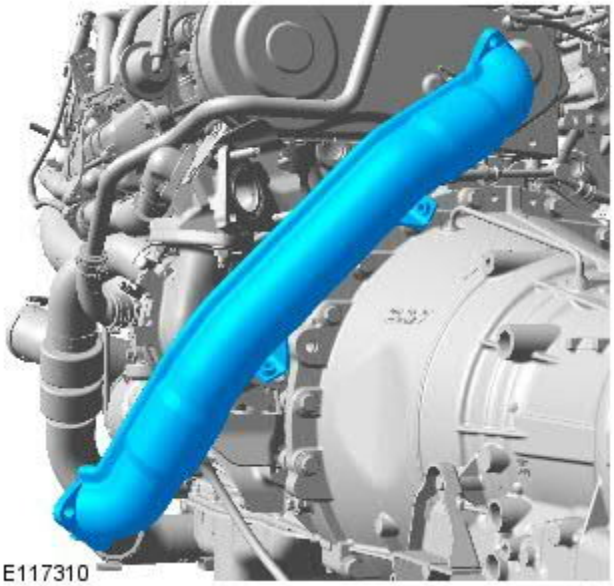




14. CAUTION: Discard the nuts.



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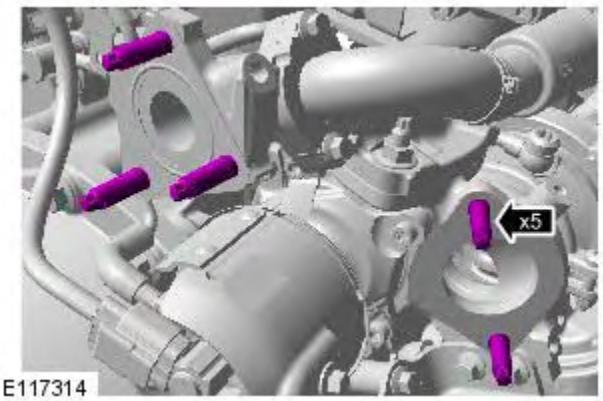
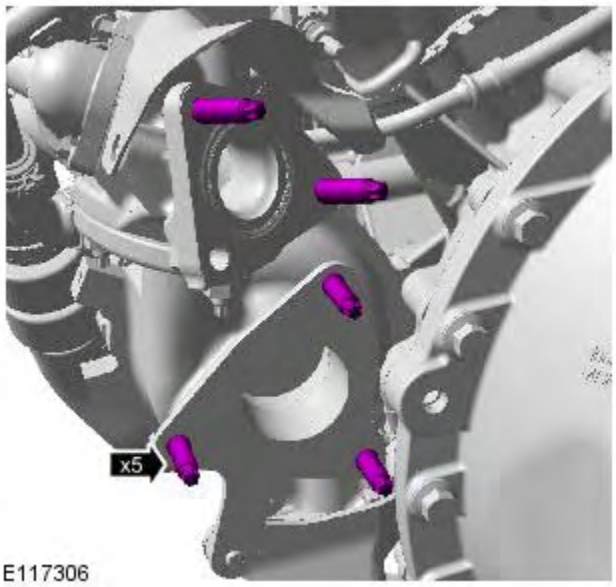


16. CAUTION: Discard the studs.



E117306

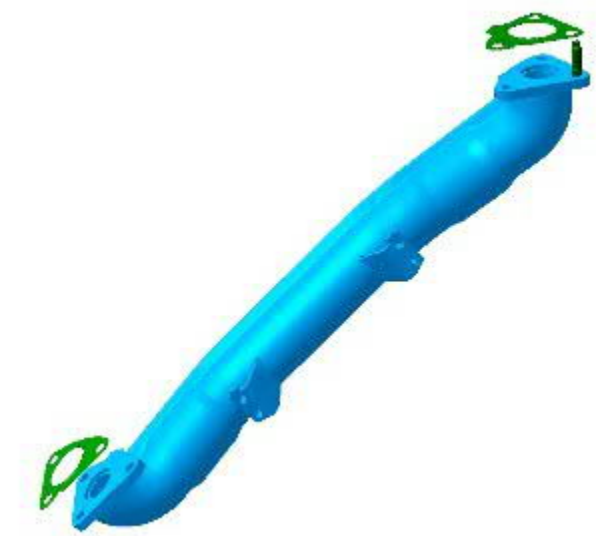
17. CAUTION: Discard the studs.

E117304

18. CAUTION: Discard the studs.

NOTE: Discard the gasket.

Installation

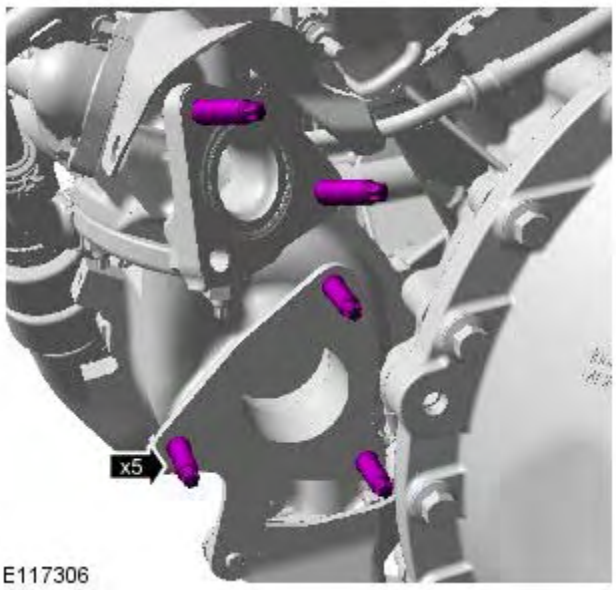

E117304

1. NOTES:

   New exhaust manifold retaining studs must be fitted if the old studs are removed.

   Install new gaskets.

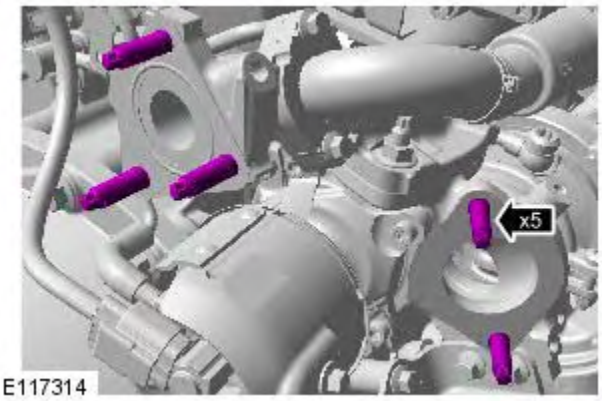
   Torque: 15 Nm



E117306

2. NOTE: New exhaust manifold retaining studs must be fitted if the old studs are removed.

   Torque: 15 Nm

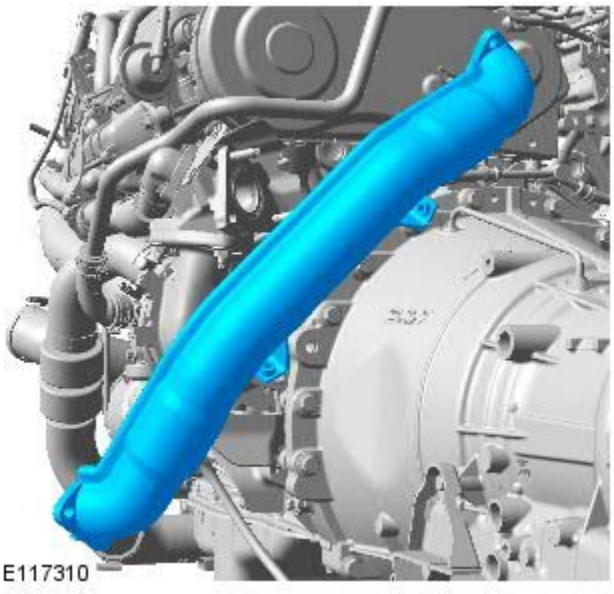


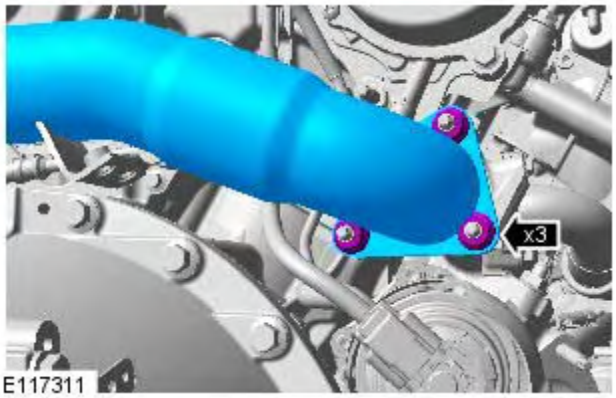
E117314

3. NOTE: New exhaust manifold retaining studs must be fitted if the old studs are removed.

   Torque: 15 Nm

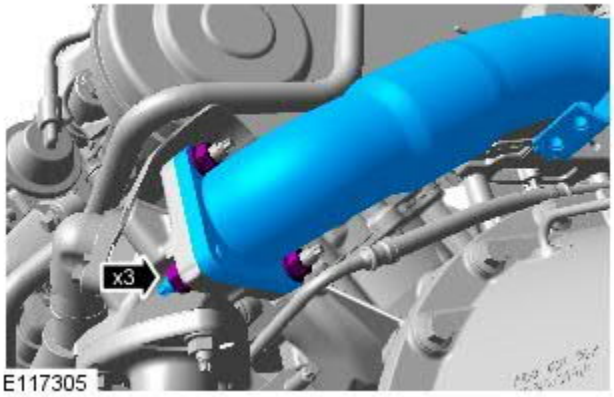
4.





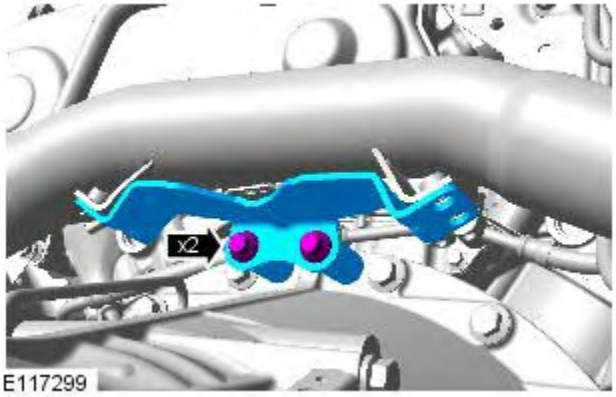
5. WARNING: Make sure that new nuts are installed.

CAUTION: Only tighten the nuts finger-tight at this stage.

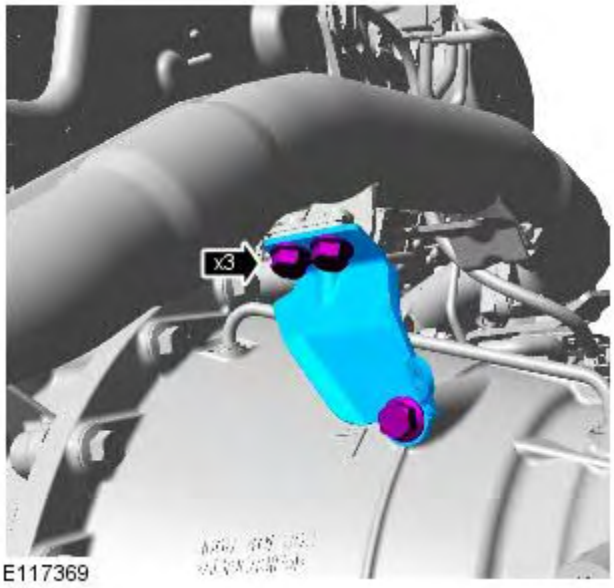


6. WARNING: Make sure that new nuts are installed.

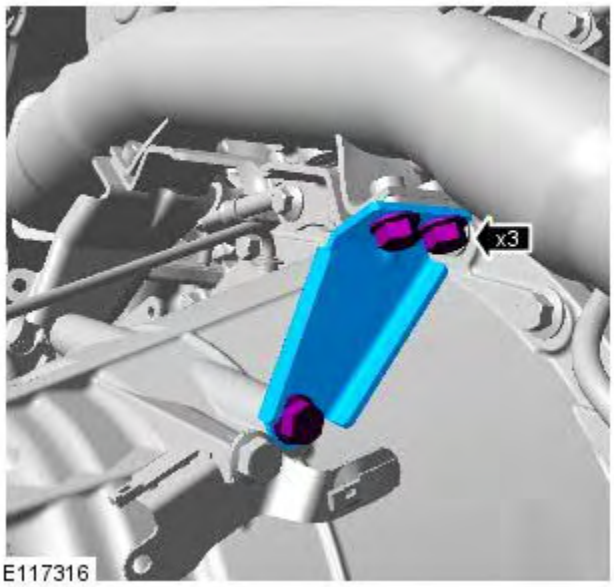
CAUTION: Only tighten the nuts finger-tight at this stage.



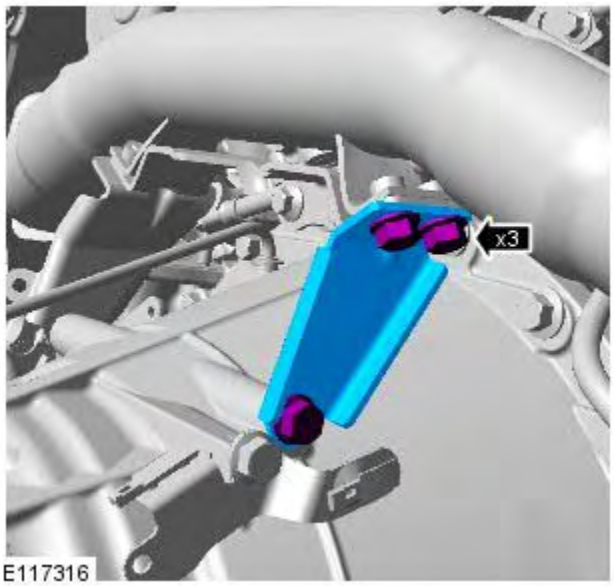
7. CAUTION: Only tighten the bolts finger-tight at this stage.



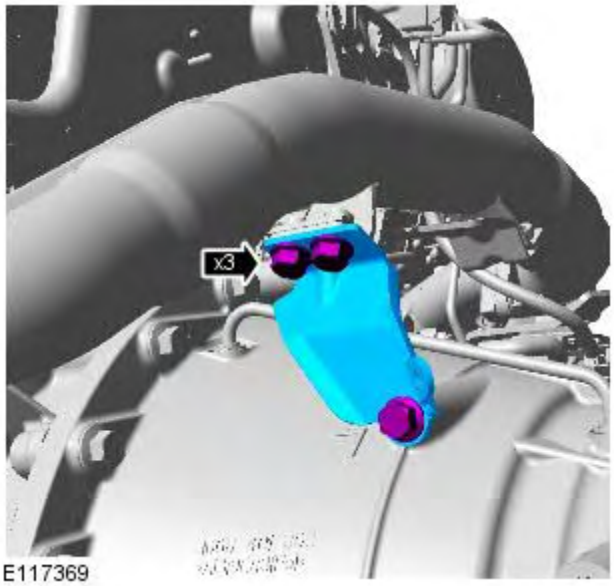
8. CAUTION: Only tighten the bolts finger-tight at this stage.



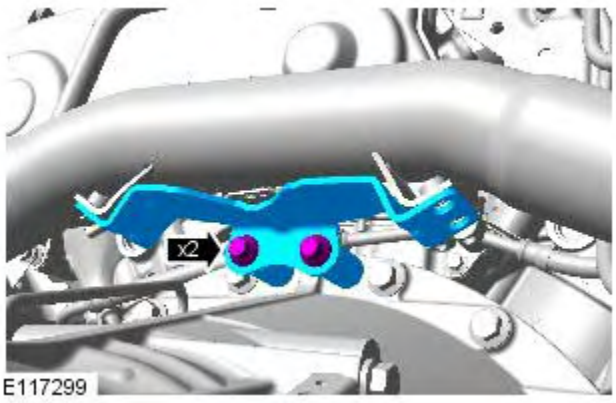
9. CAUTION: Only tighten the bolts finger-tight at this stage.



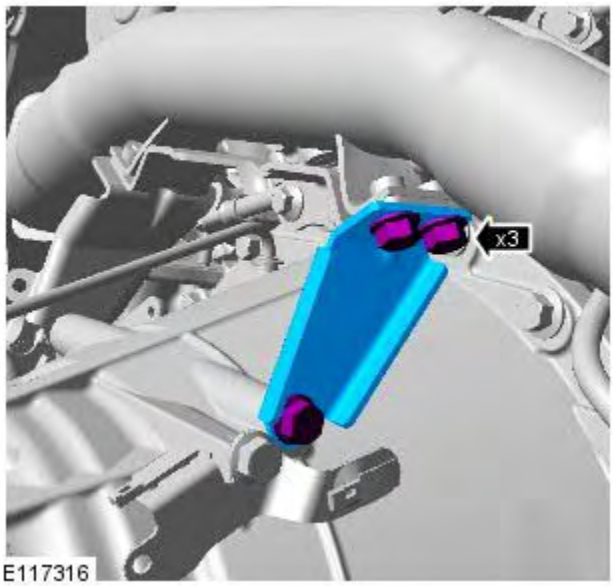
10. Remove the exhaust cross-over pipe RH support bracket.



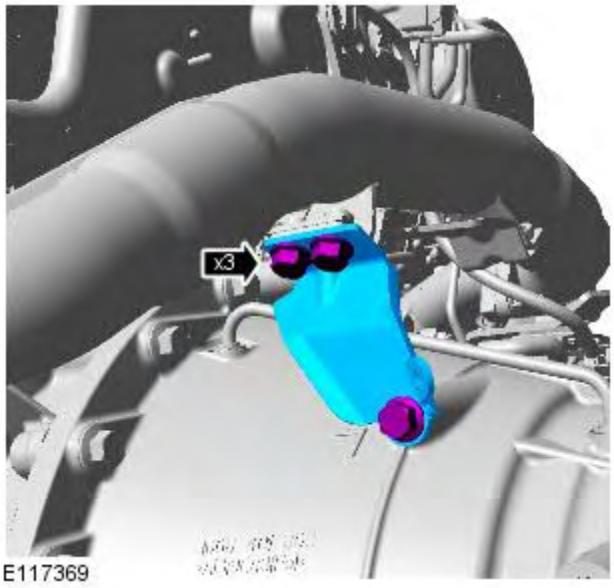
11. Remove the exhaust cross-over pipe LH support bracket.



12. *Torque:* 23 Nm

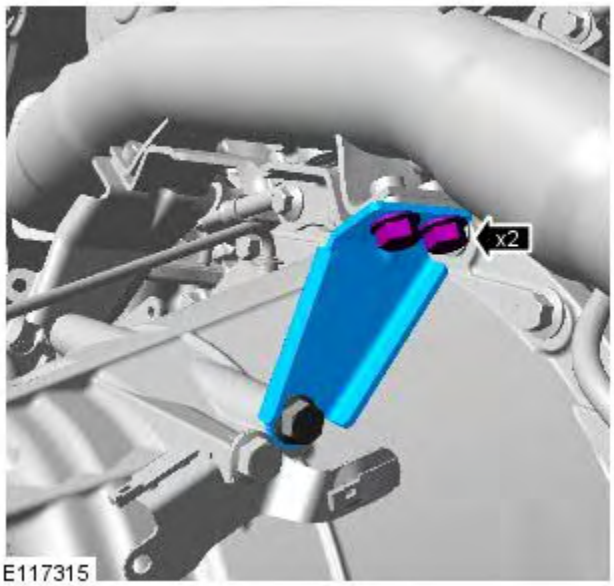


13. CAUTION: Only tighten the bolts finger-tight at this stage.

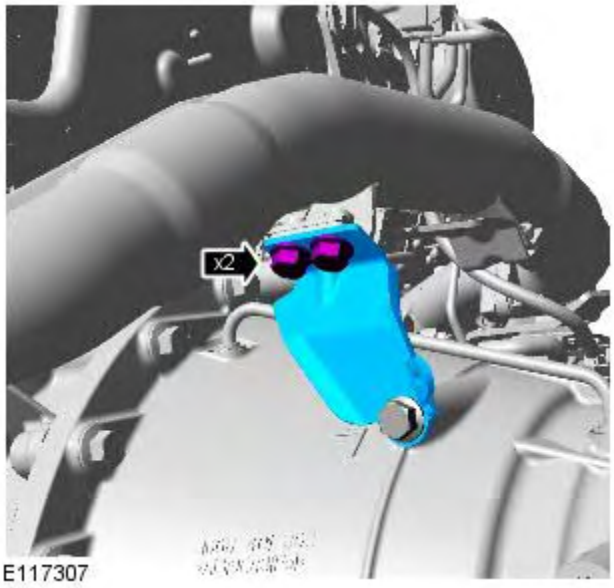


14. CAUTION: Only tighten the bolts finger-tight at this stage.

15. *Torque:* 23 Nm

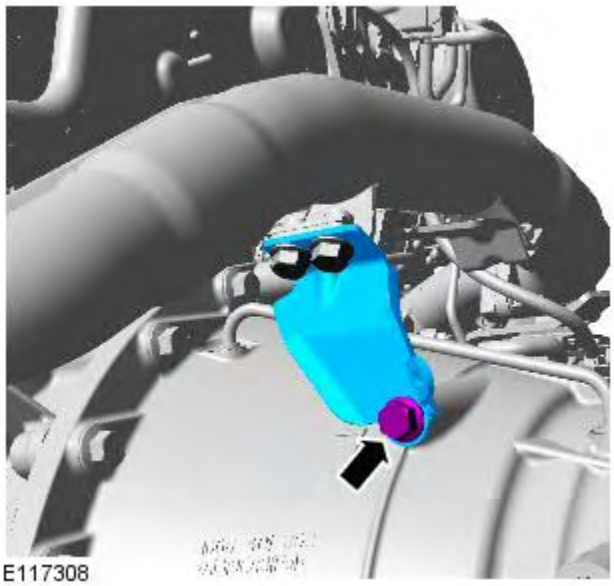


16. *Torque:* 23 Nm

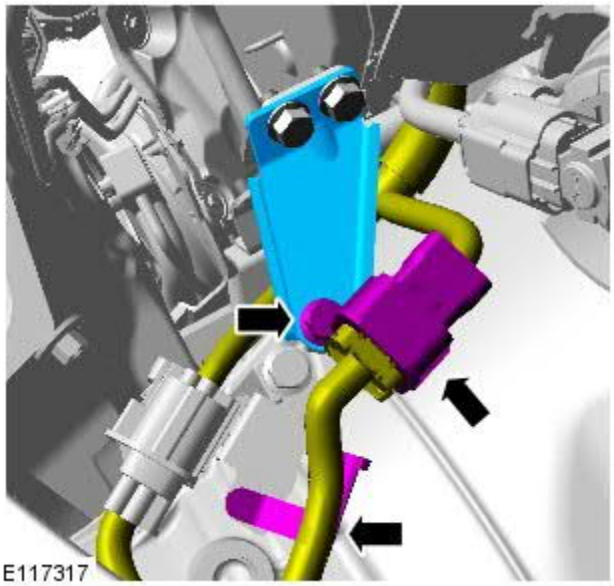


www.JagDocs.com

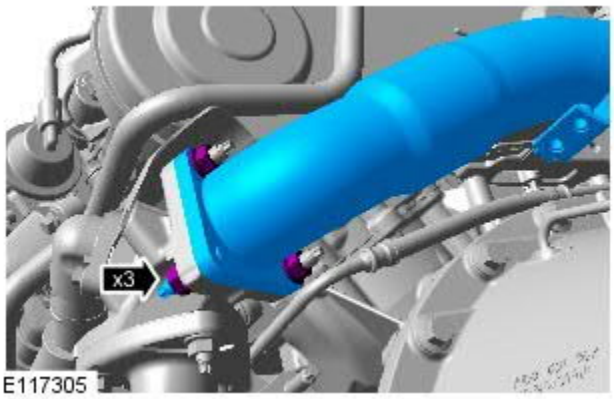
17. *Torque:* 23 Nm


E117308

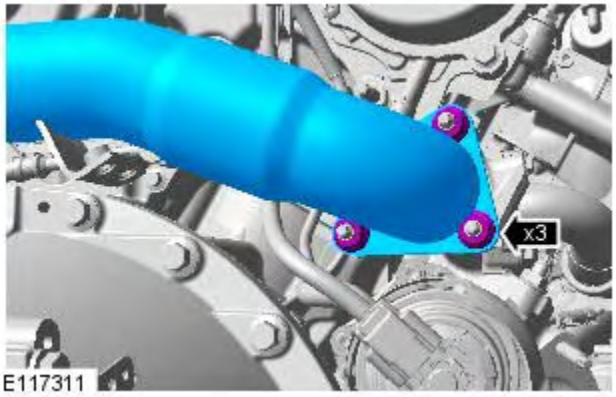
18. *Torque:* 23 Nm


E117317

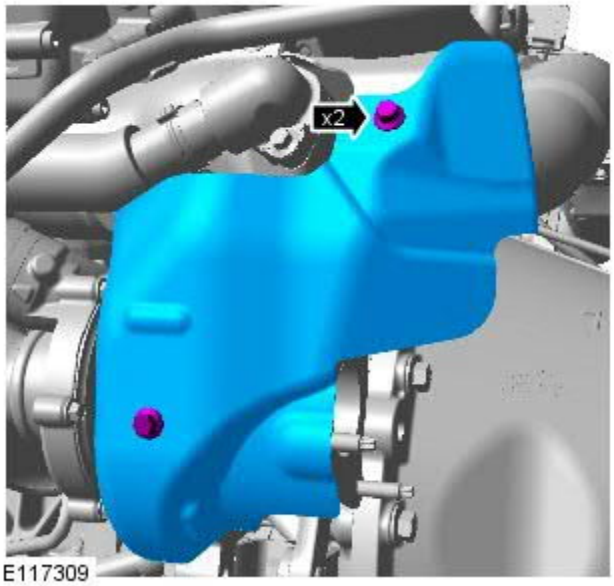
19. *Torque:* 23 Nm



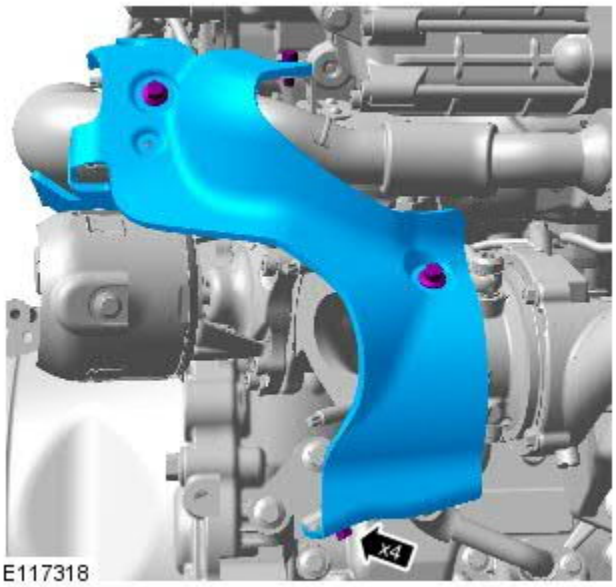
E117305



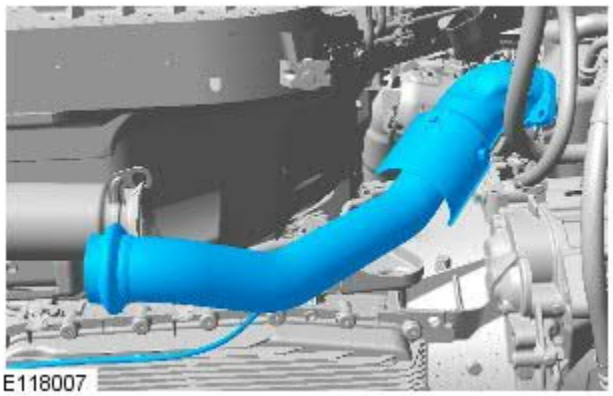
20. *Torque:* 23 Nm



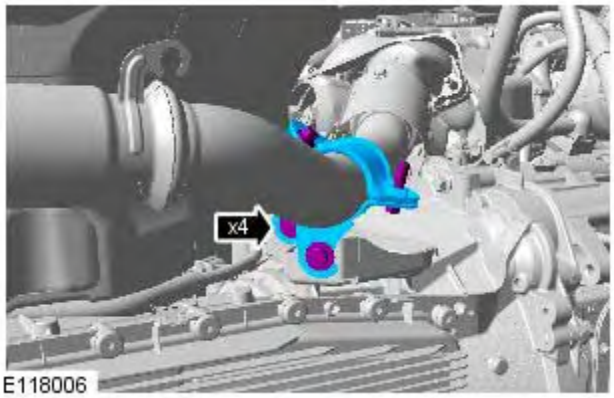
21. *Torque:* 11 Nm



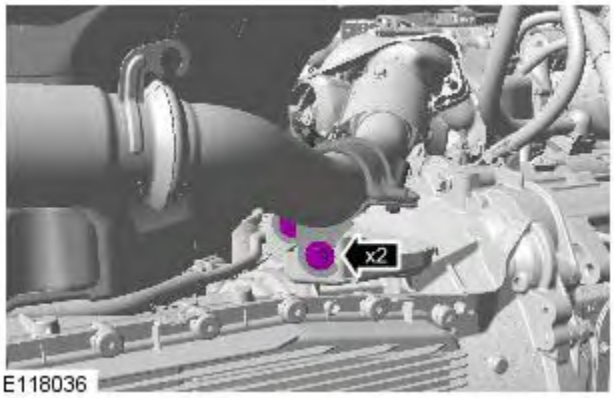
22. *Torque:* 11 Nm



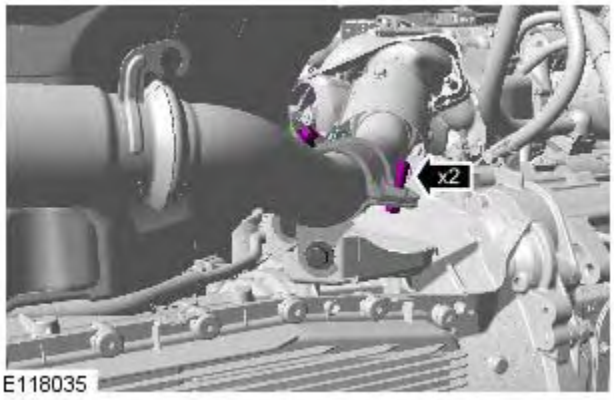
23.



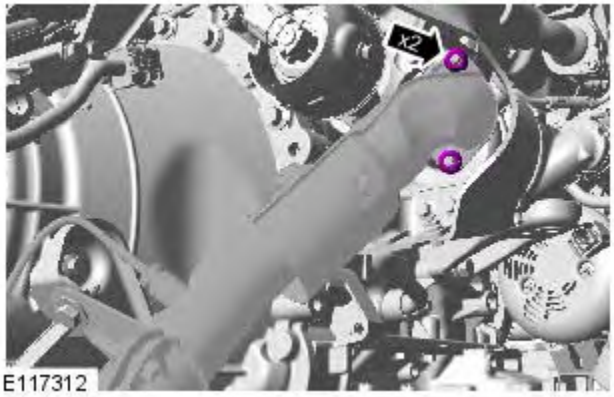
24. CAUTION: Only tighten the nuts finger-tight at this stage.



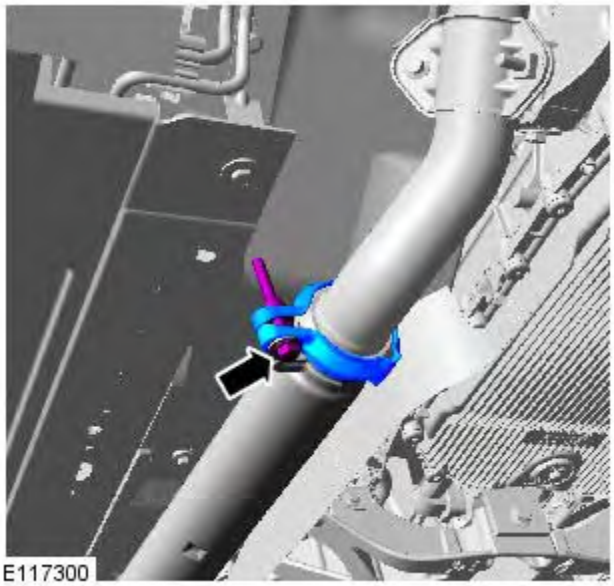
25. *Torque:* 25 Nm



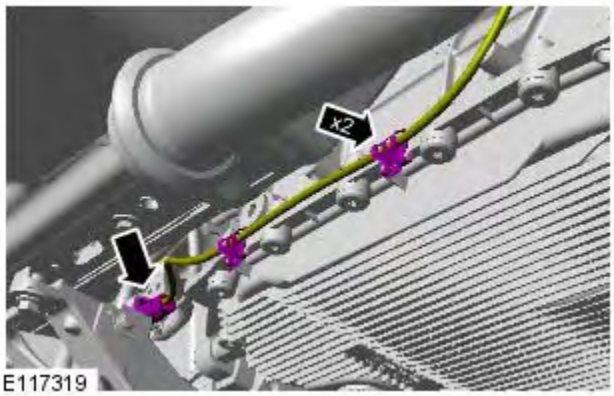
26. *Torque:* 12 Nm



27. *Torque:* 22 Nm



28. *Torque:* 11 Nm



29.

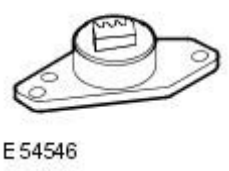
30. Refer to: Catalytic Converter (309-00A Exhaust System - TDV6 3.0L Diesel, Removal and Installation).

Published: 11-May-2011

Engine - TDV6 3.0L Diesel - Flexplate

Removal and Installation

Special Tool(s)

	303-1123 Locking Tool, Flywheel

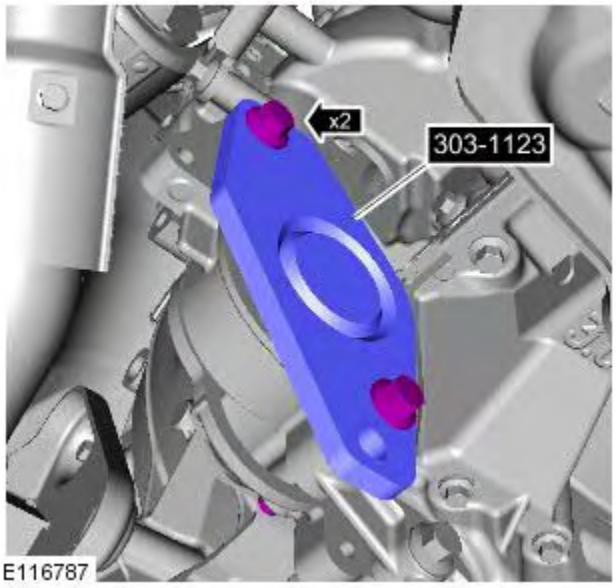
Removal

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

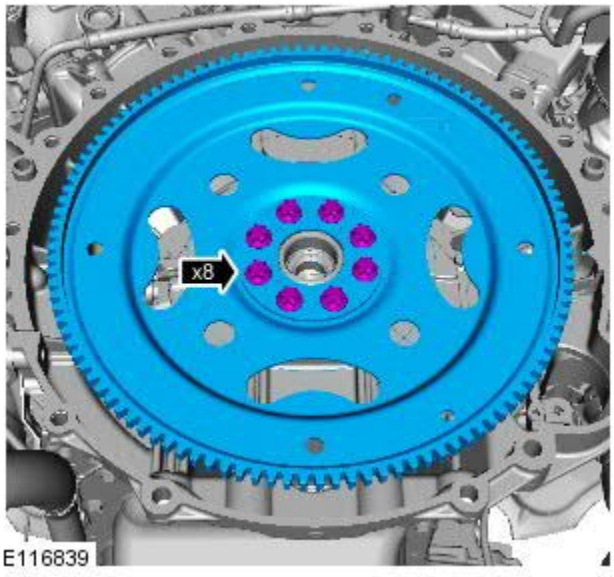
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Refer to: Transmission - TDV6 3.0L Diesel (307-01 Automatic Transmission/Transaxle, Installation).



4.
   - Install the special tool.
   - *Special Tool(s):* 303-1123



5. CAUTION: Discard the bolts.

   NOTE: Prevent the flexplate from rotating.

Installation

1. CAUTION: Make sure that new bolts are installed.

   NOTES:

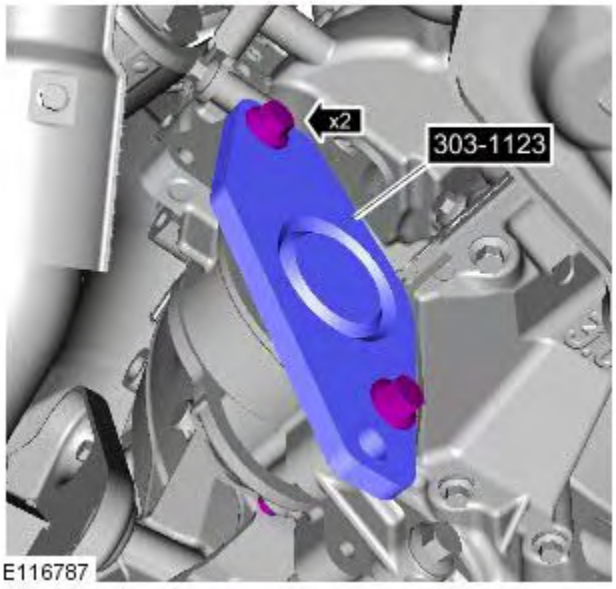
   Make sure that all the component mating faces are clean.

   Loosely install all retaining bolts.

   - Prevent the flexplate from rotating.

2. CAUTION: Tighten the bolts evenly in the stages shown.

   - Stage 1: Tighten to 50 Nm.
   - Stage 2: Tighten to 45 degrees.
   - Stage 3: Tighten to 45 degrees.



3.
- Remove the special tool.
- *Special Tool(s):* 303-1123

4. Refer to: Transmission - TDV6 3.0L Diesel (307-01 Automatic Transmission/Transaxle, Installation).

5. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

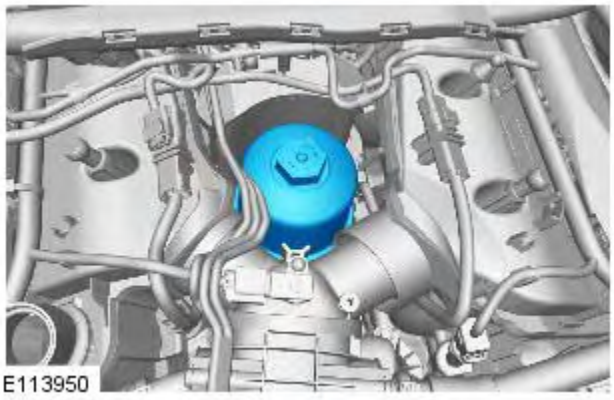
Published: 11-May-2011

Engine - TDV6 3.0L Diesel - Oil Filter Element

Removal and Installation

Removal

1. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).


E113950

2.
   - Rotate the oil filter element housing six complete turns counter-clockwise.
   - Allow the engine oil to drain from the oil filter element housing for two minutes.
   - Remove the oil filter element housing.

E113951

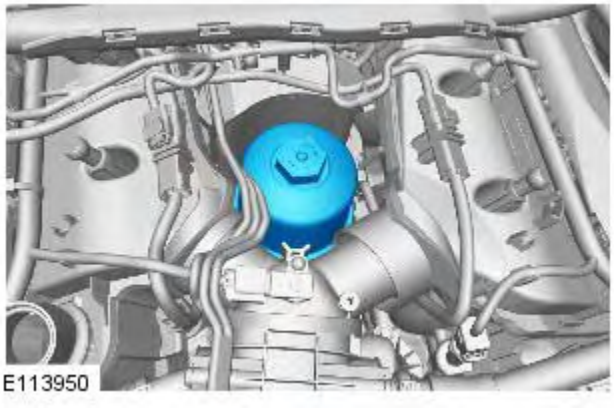
3. NOTE: Remove and discard the O-ring seal.

Installation

E113952

1. CAUTION: A new O-ring seal is to be installed.

   NOTE: Lubricate the O-ring seal with clean engine oil.



2. NOTE: Make sure that only a hand wrench and socket is used to remove and install the oil filter cap.

   Torque: 27 Nm

3. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

4. Start and run the engine.

5. Check and top-up the engine oil.

Published: 11-May-2011

Engine - TDV6 3.0L Diesel - Oil Pan

Removal and Installation

Removal

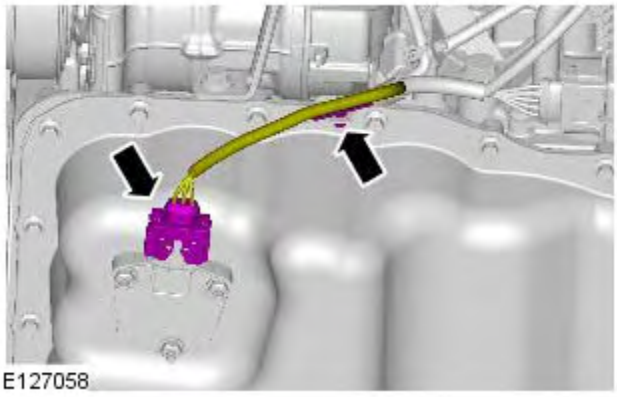
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Refer to: Engine Oil Draining and Filling (303-01A Engine - TDV6 3.0L Diesel, General Procedures).

4.



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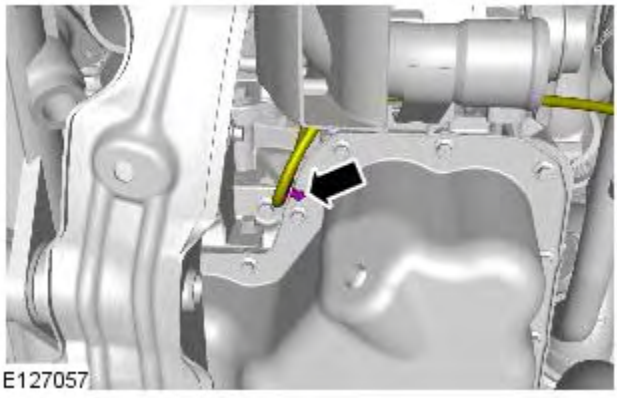
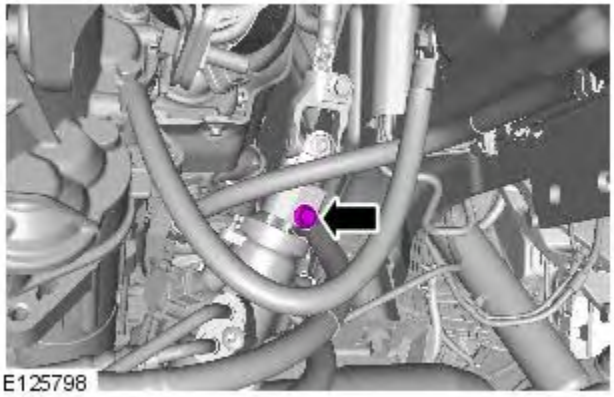


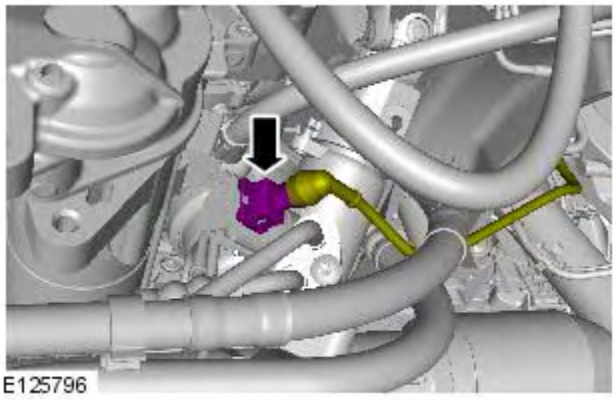


6. CAUTIONS:

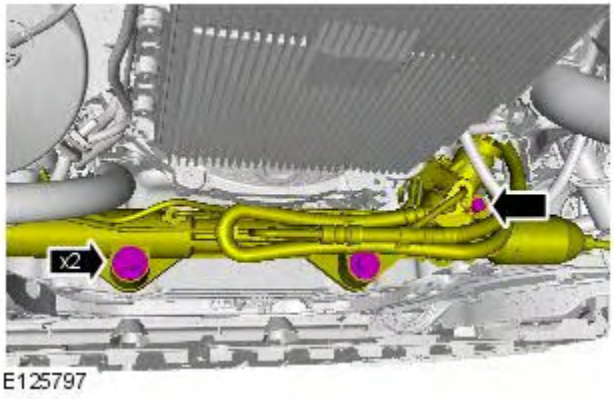
   Note the fitted position of the component prior to removal.

   Discard the bolt.

   NOTE: RHD shown, LHD is similar.



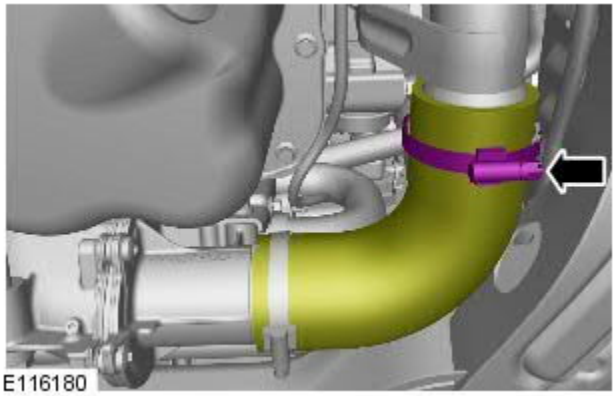
7. NOTE: RHD shown, LHD is similar.



8. NOTES:

   Support as necessary.

   RHD shown, LHD is similar.



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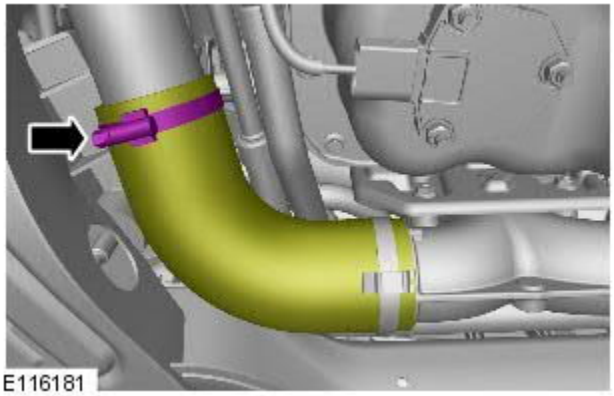

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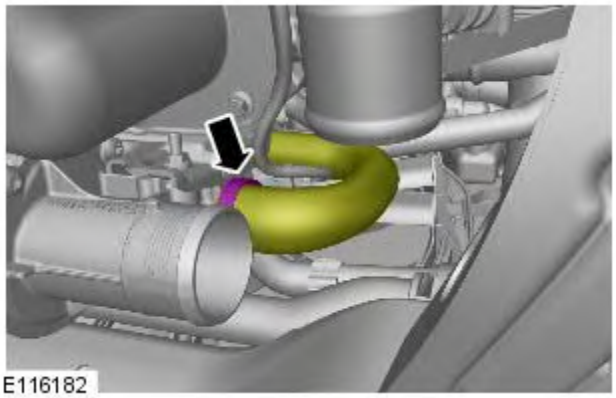

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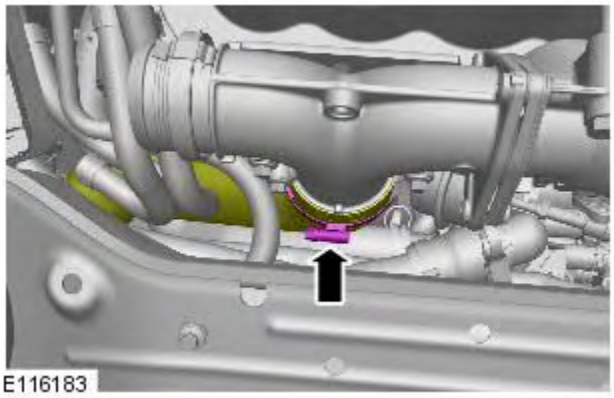

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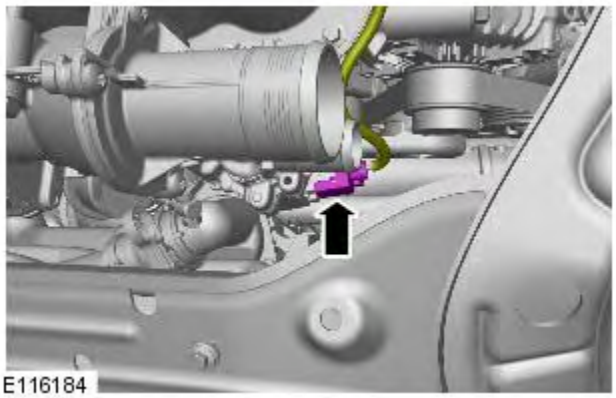

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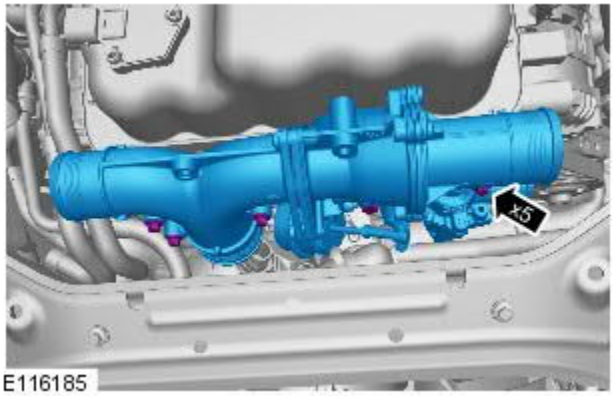
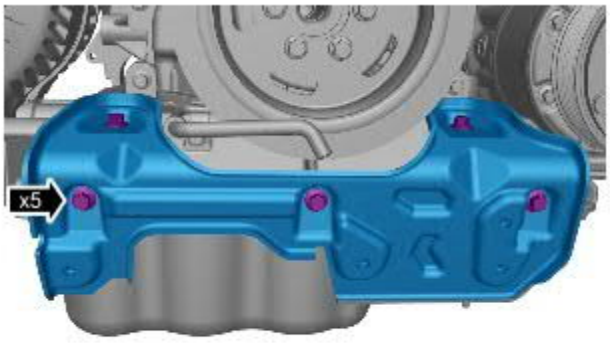


E116185

15.

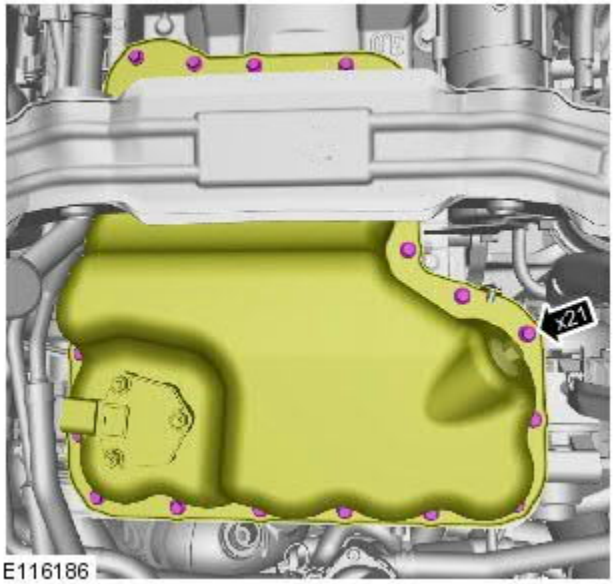


E116949

16. CAUTIONS:

Discard the seal.

Make sure that the mating faces are clean and free of foreign material.



E116186

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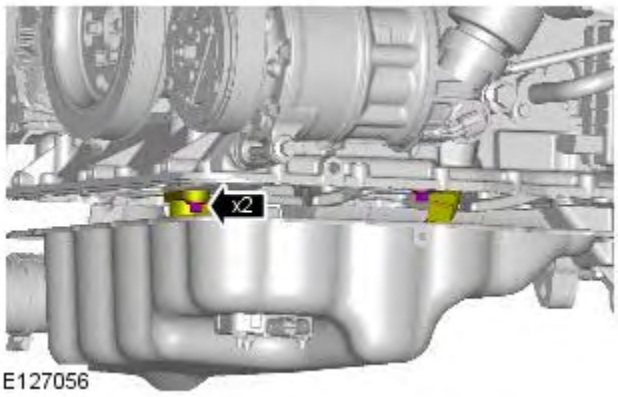
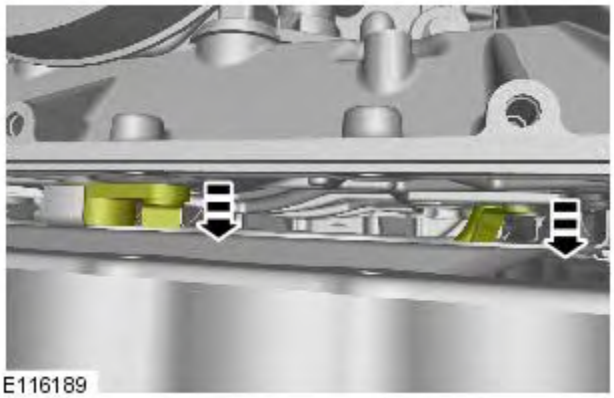
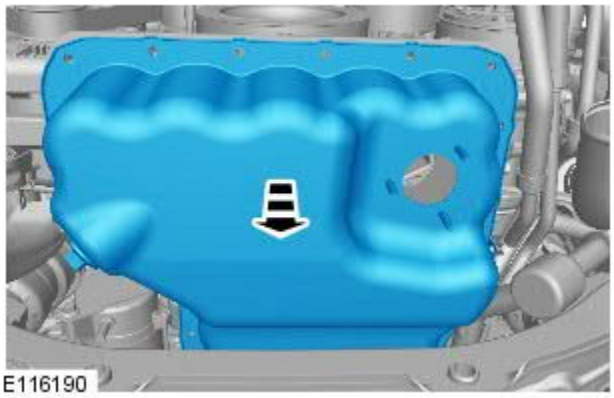


E127056

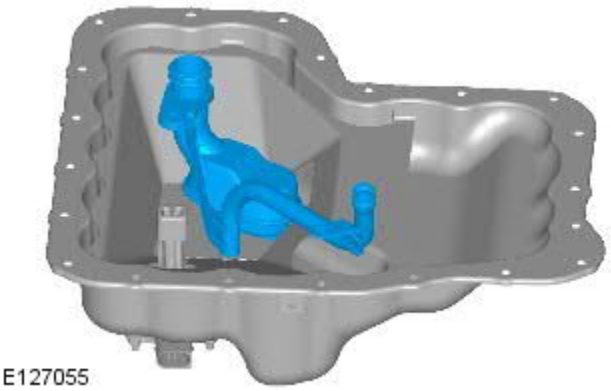
18.

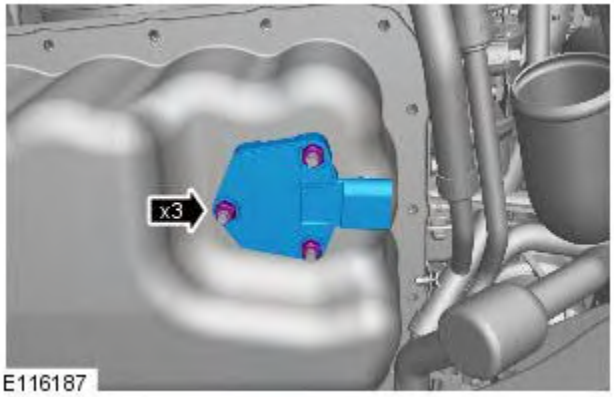

E116189

19. NOTE: Discard the gasket.


E116190

20. CAUTION: Discard the seal.

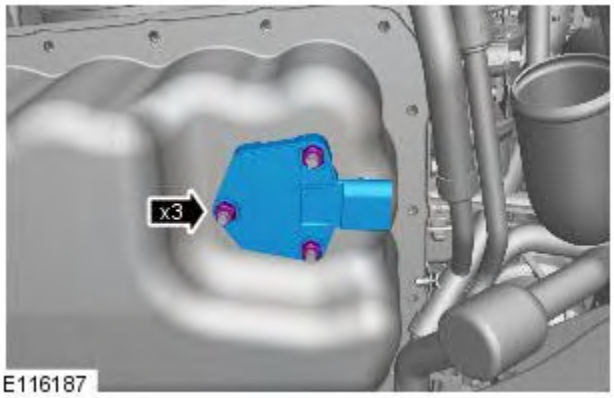

E127055



21. CAUTION: Discard the seal.

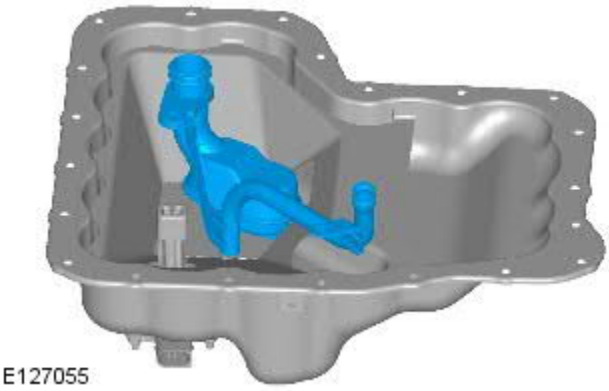
NOTE: Do not disassemble further if the component is removed for access only.

Installation

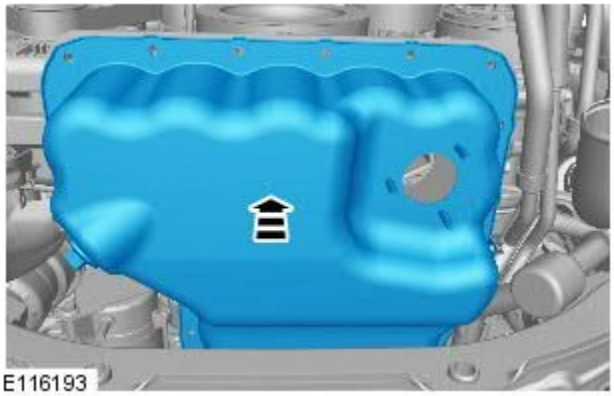


1. CAUTION: Install a new seal.

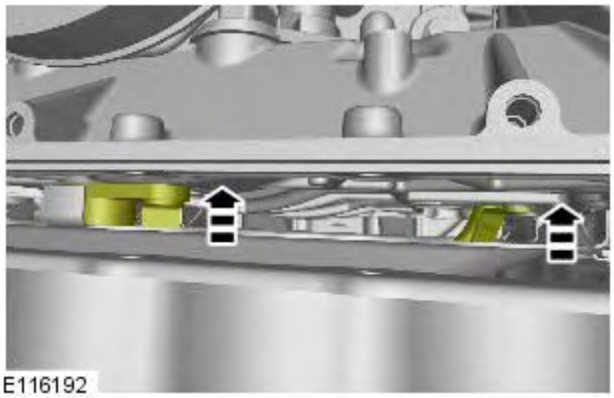
Torque: 10 Nm



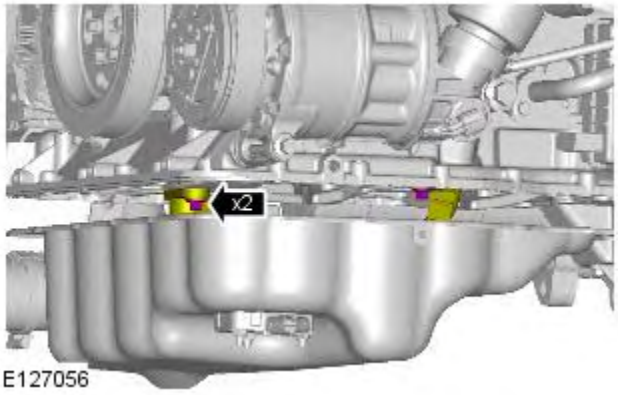
2. CAUTION: Install the new seals.



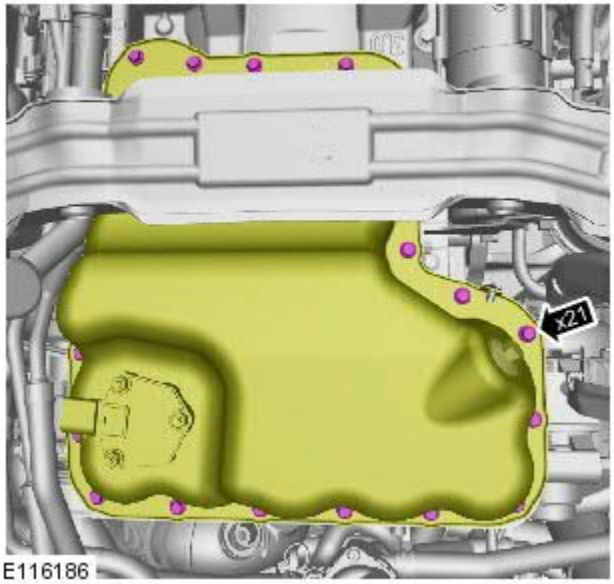
3. NOTE: Install a new gasket.



4.



5. *Torque:* 10 Nm



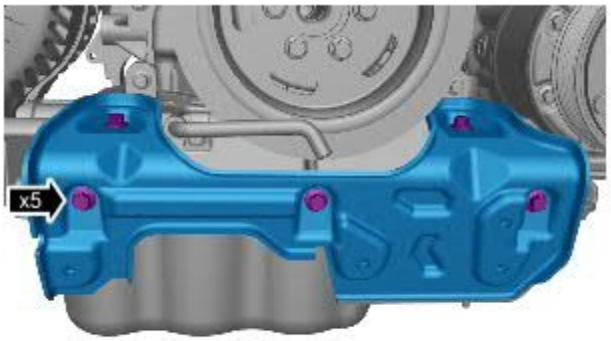
E116186

6. CAUTIONS:

   Install a new seal.

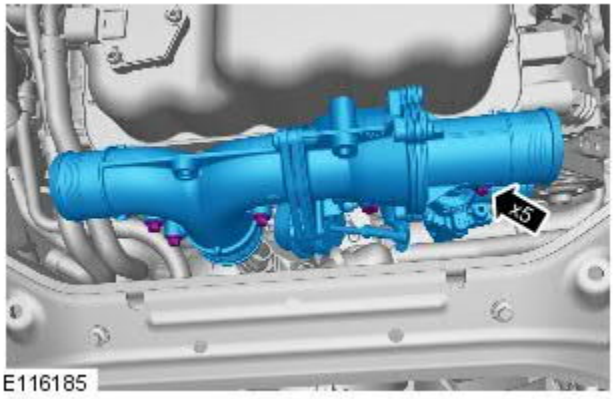
   Make sure that the mating faces are clean and free of foreign material.

   Torque: 10 Nm



E116949

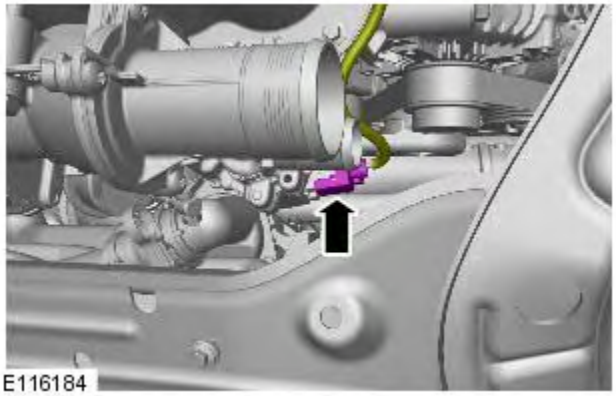
7. *Torque:* 10 Nm



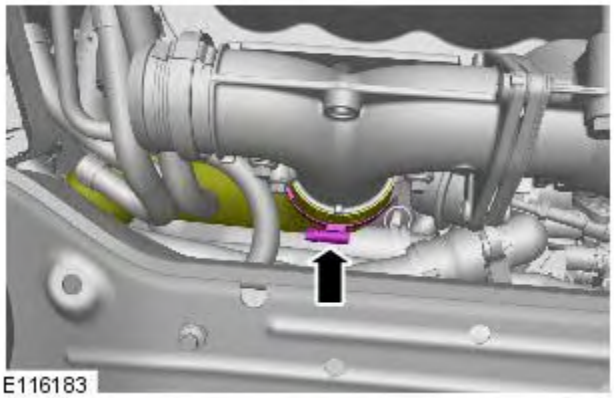
E116185

8. *Torque:* 10 Nm

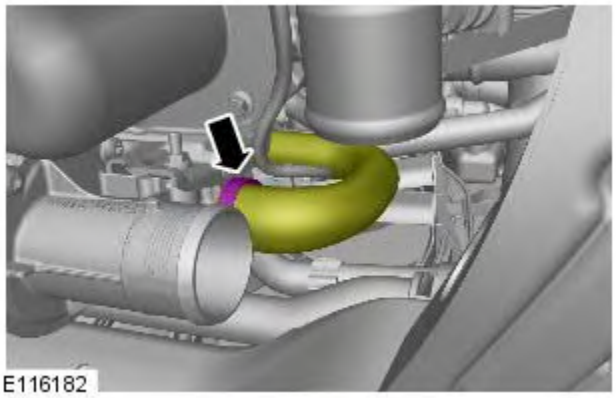
9.



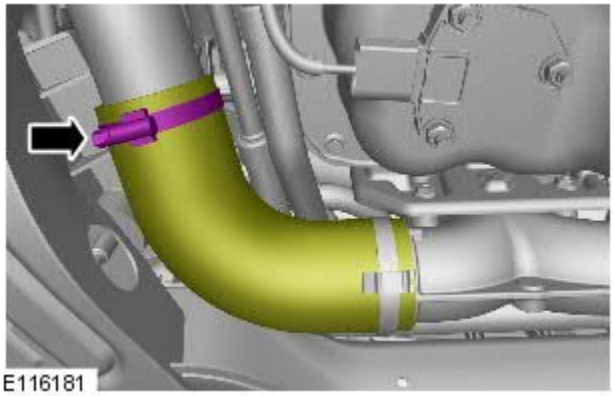
10. *Torque:* 7 Nm

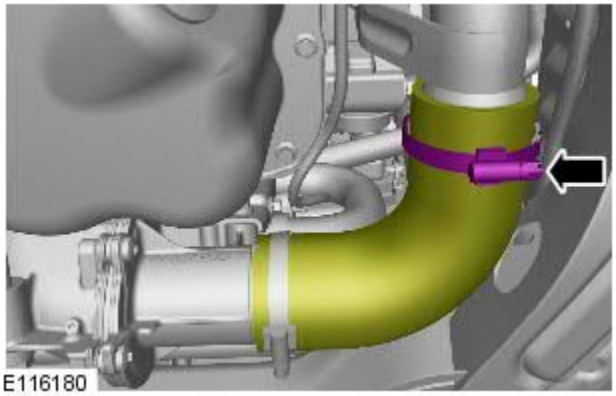


11. *Torque:* 7 Nm

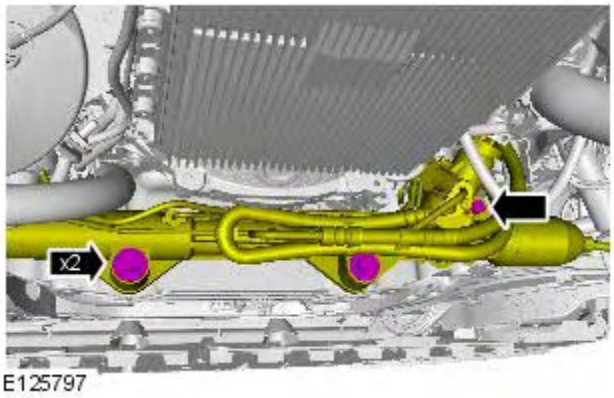


12. *Torque:* 7 Nm



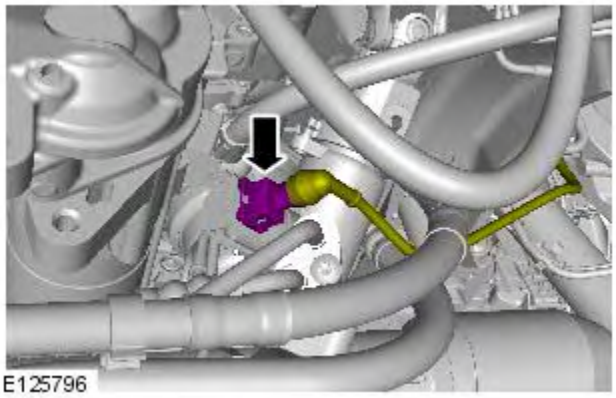


13. *Torque:* 7 Nm

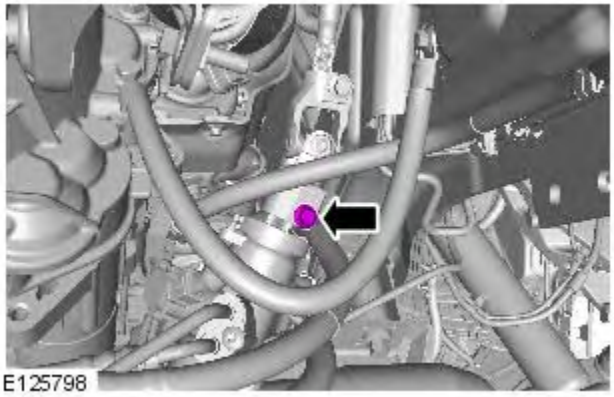


14. NOTE: Support as necessary.

Torque: 100 Nm



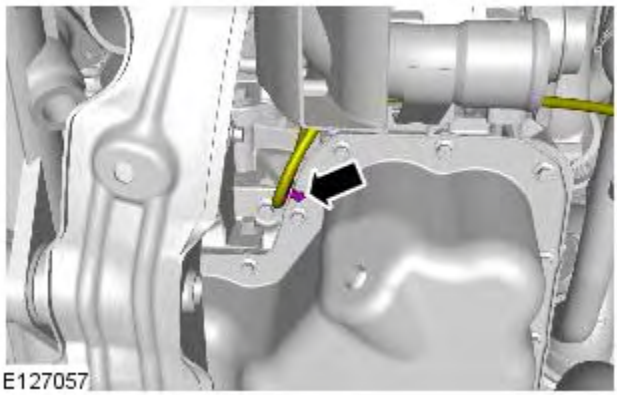
15.



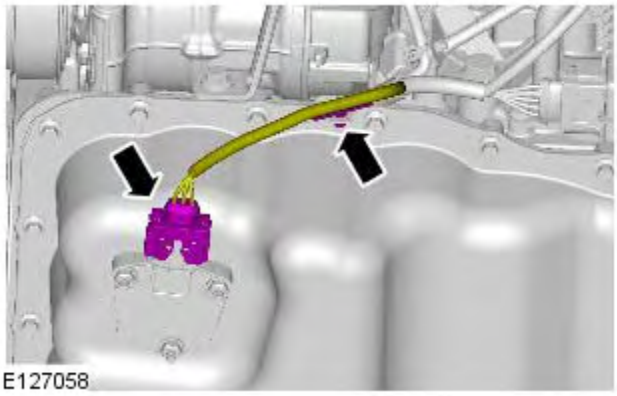
16. CAUTION: Make sure that a new bolt is installed.

Torque: 35 Nm

17.


E127057

18.


E127058

19. Refer to: Engine Oil Draining and Filling (303-01A Engine - TDV6 3.0L Diesel, General Procedures).

20. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 11-May-2011

Engine - TDV6 3.0L Diesel - Oil Pan Extension

Removal and Installation

Removal

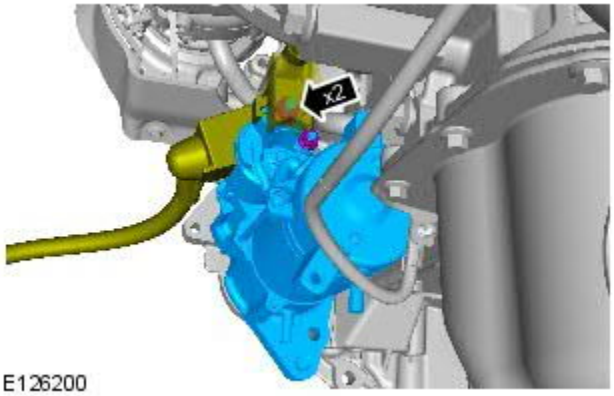
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Refer to: Transmission - TDV6 3.0L Diesel (307-01 Automatic Transmission/Transaxle, Installation).

4. Refer to: Oil Pan (303-01, Removal and Installation).

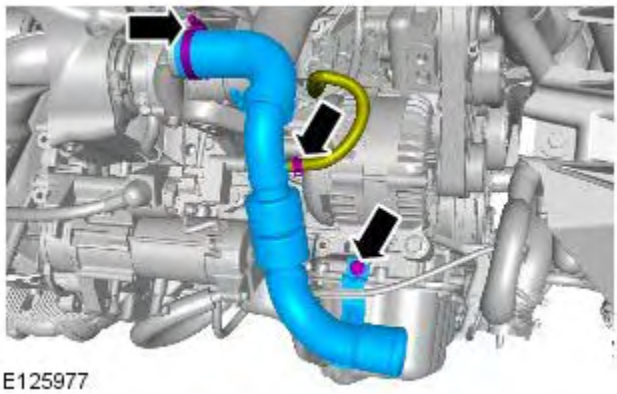


E126200

5. NOTES:

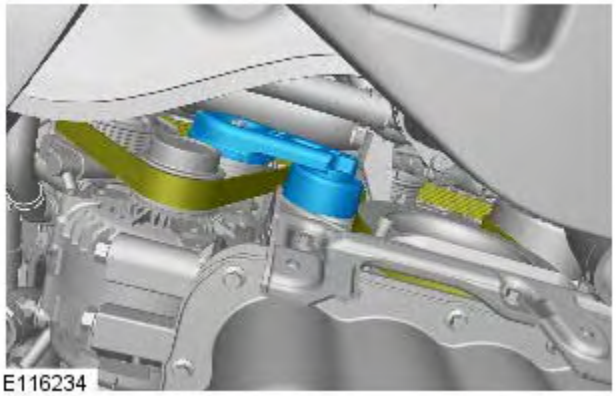
   Some variation in the illustrations may occur, but the essential information is always correct.

   Engine shown removed for clarity.

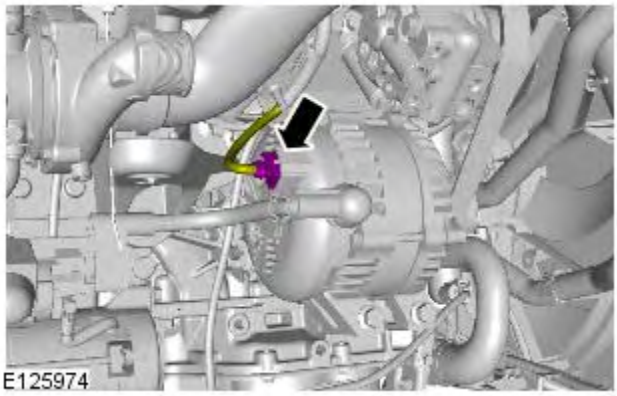

E125977

6. NOTE: Engine shown removed for clarity.

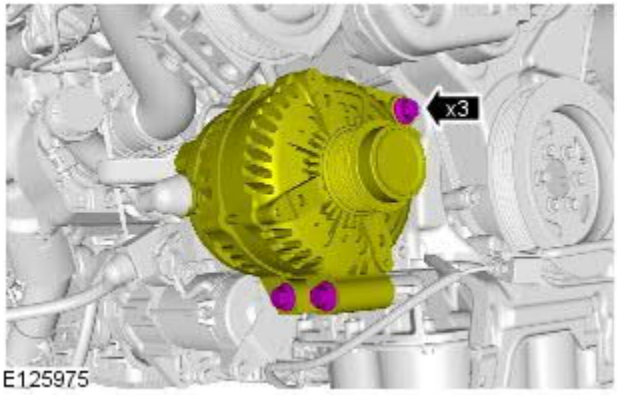
7.



8. NOTE: Engine shown removed for clarity.



9. NOTE: Engine shown removed for clarity.



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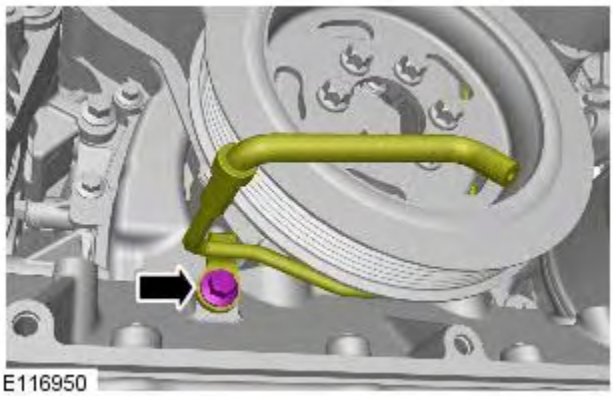

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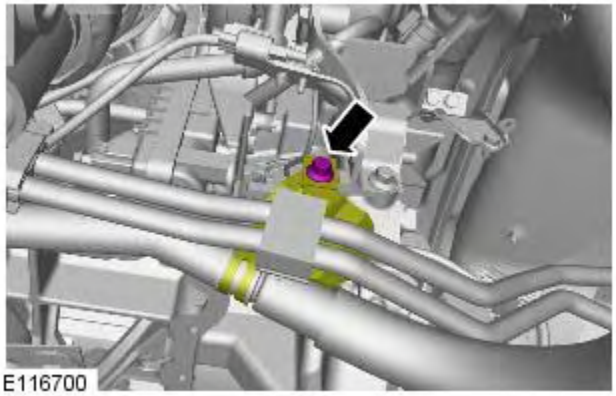

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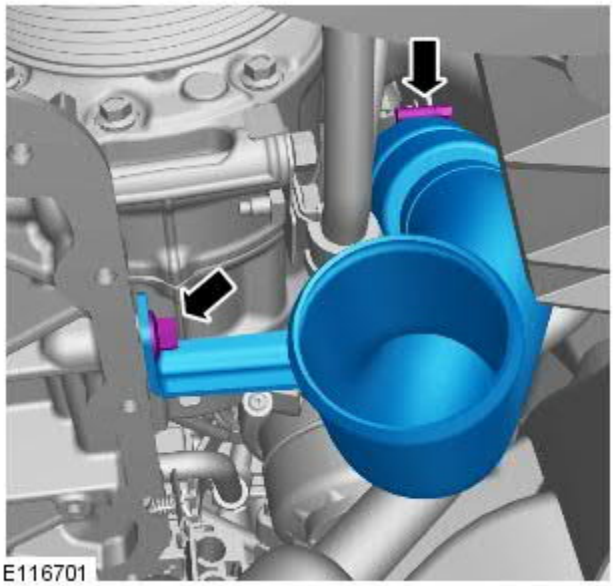

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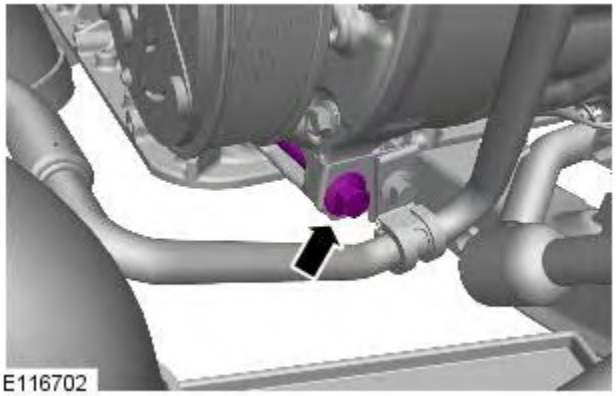
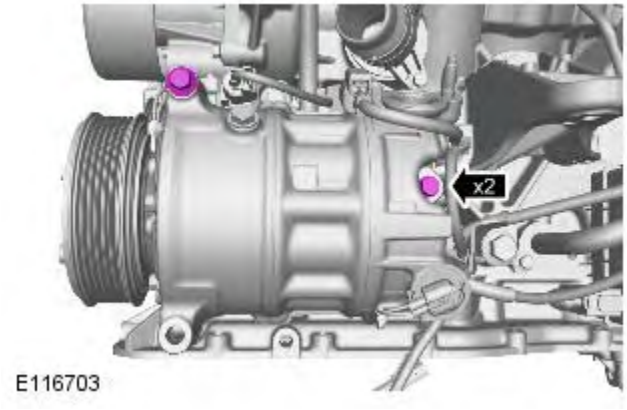
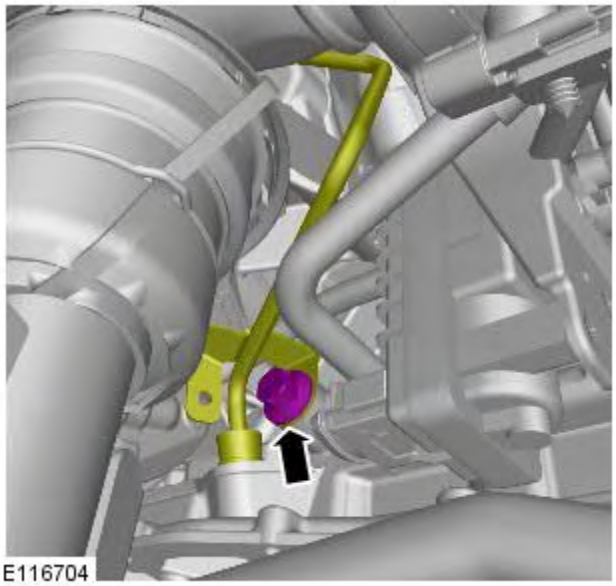




14. NOTE: Loosen the bolt, but do not fully remove.



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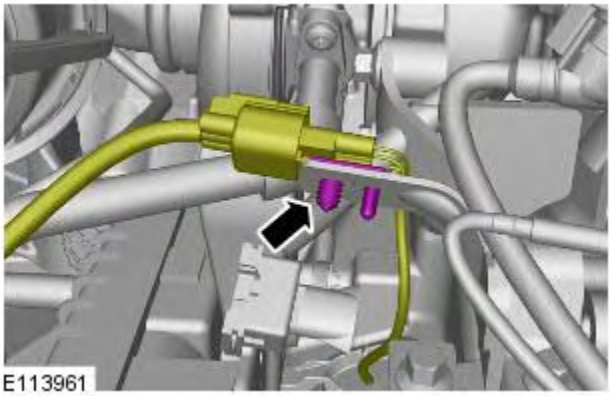
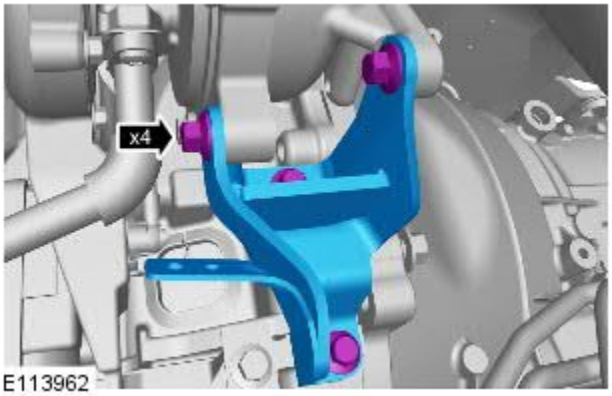
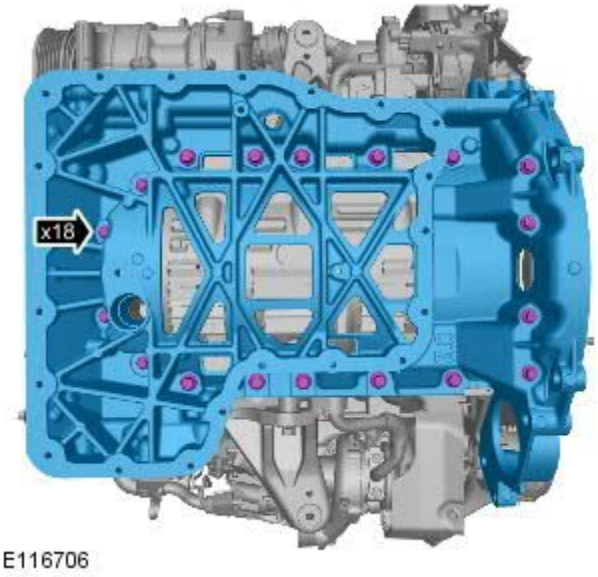


16.

17.



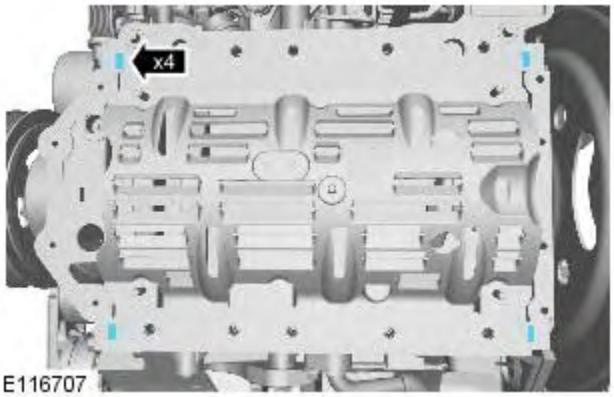
18. NOTE: Discard the gasket.

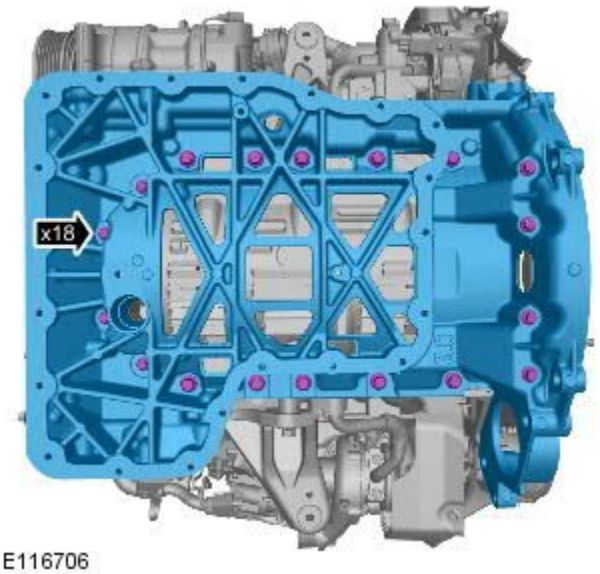


Installation

1. CAUTION: Make sure that the mating faces are clean and free of corrosion and foreign material.

2. Apply the sealant as shown.

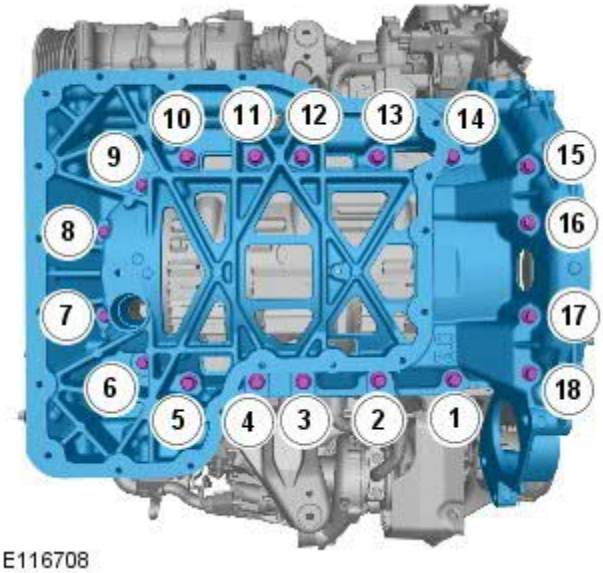




E116706

3. CAUTION: Only tighten the bolts finger-tight at this stage.

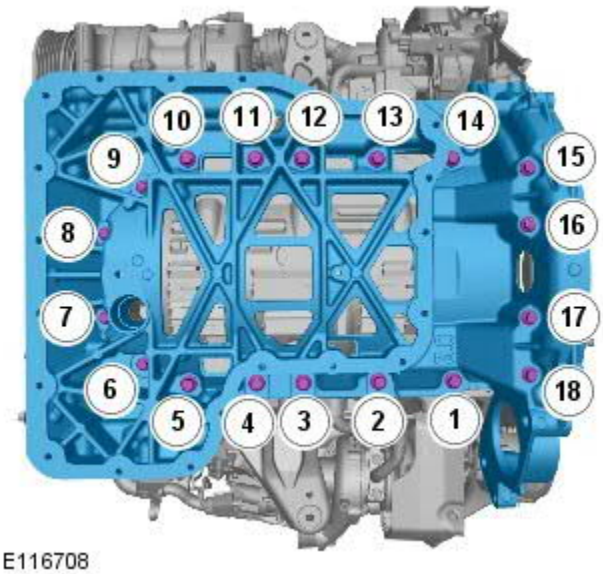
NOTE: Install a new gasket.



E116708

4. NOTE: Tighten the bolts in the indicated sequence.

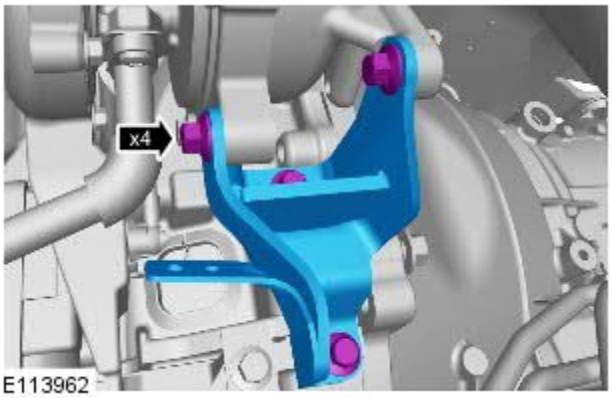
Torque:
M8 10 Nm
M6 4 Nm



E116708

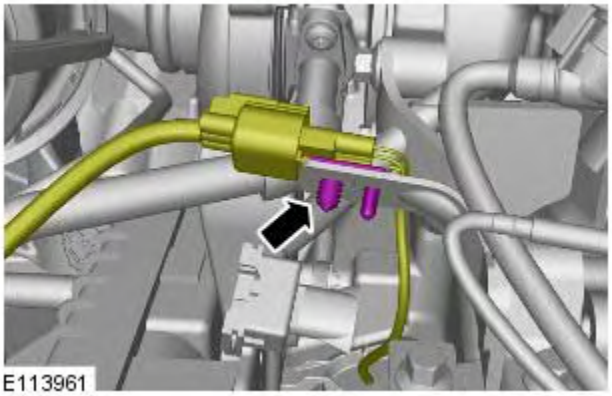
5. NOTE: Tighten the bolts in the indicated sequence.

Torque:
M8 24 Nm
M6 10 Nm

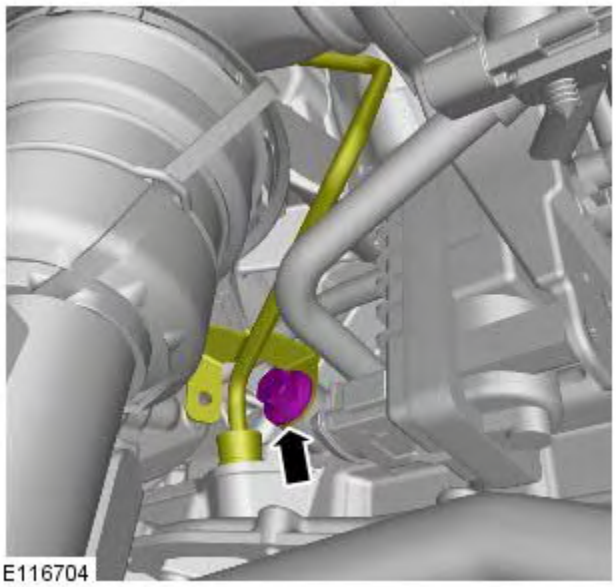


E113962

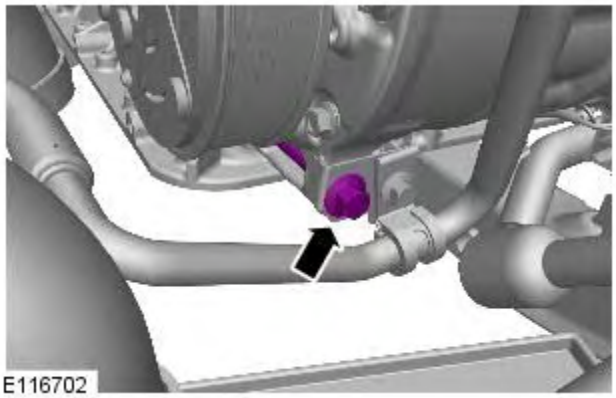
6. *Torque:* 33 Nm


E113961

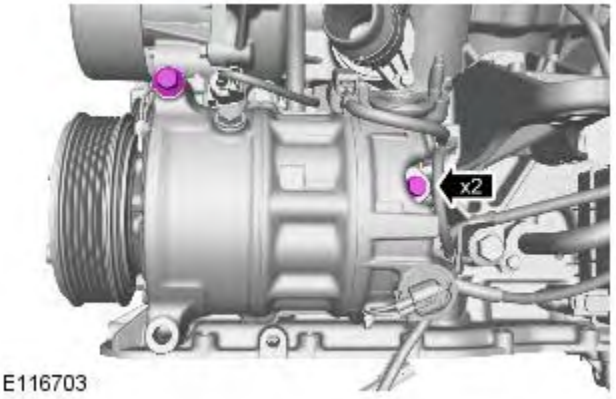
7.


E116704

8. *Torque:* 24 Nm

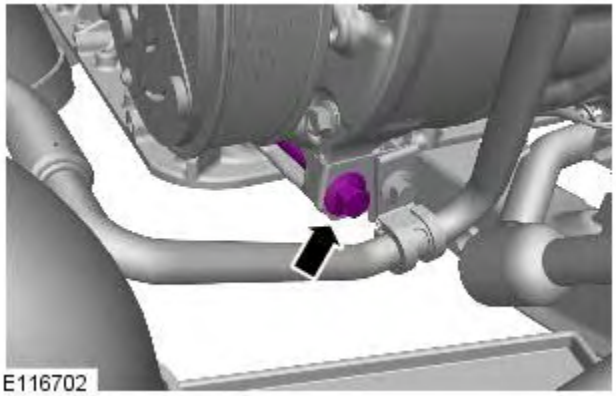

E116702

9. CAUTION: Only tighten the bolt finger-tight at this stage.

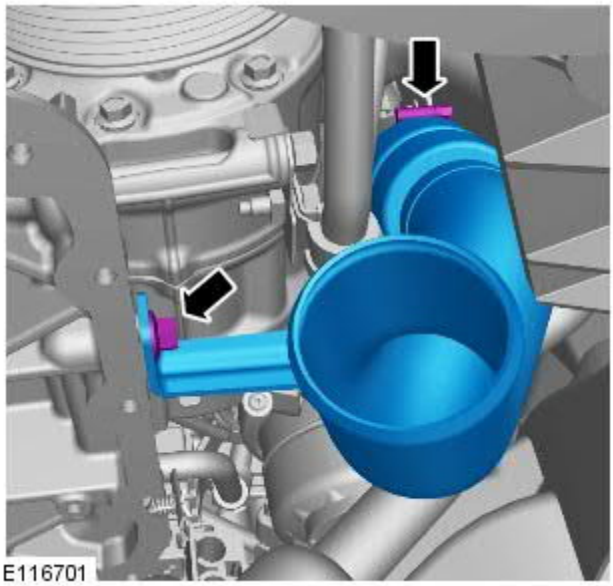


E116703

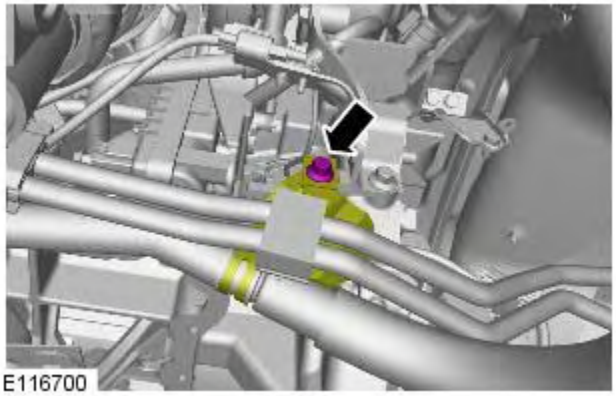
10. *Torque:* 24 Nm



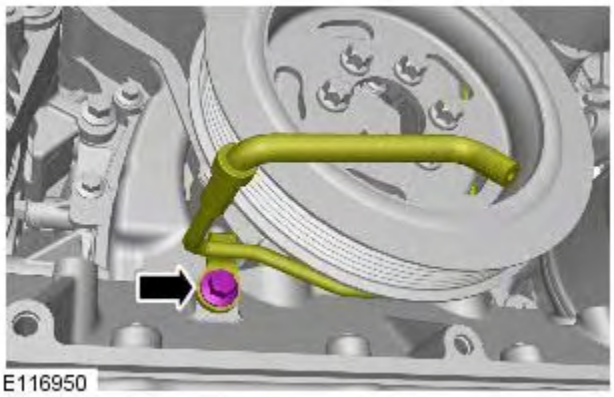
11. *Torque:* 24 Nm



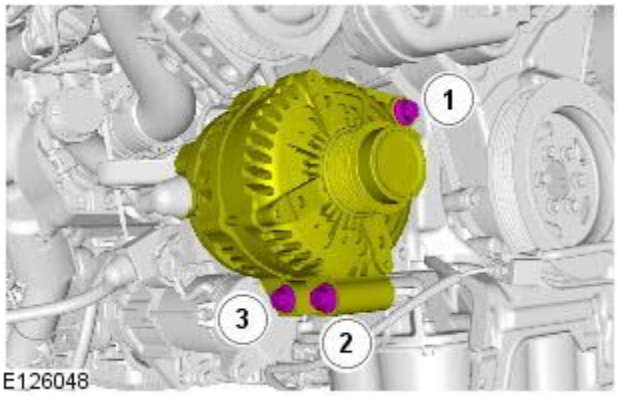
12. *Torque:* 10 Nm



13. *Torque:* 10 Nm



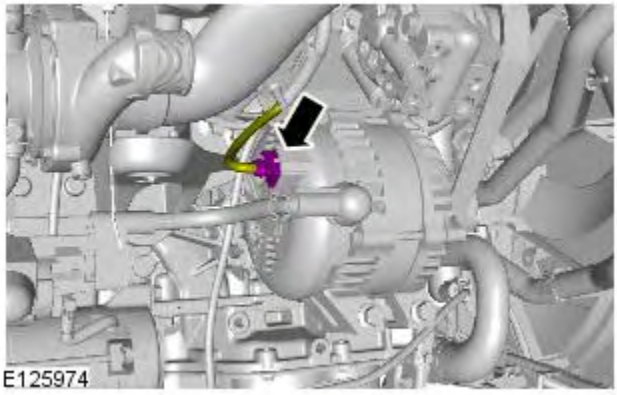
14. *Torque:* 10 Nm



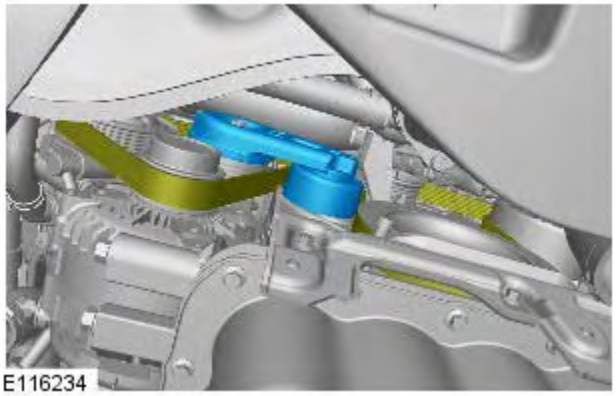
15. CAUTION: Tighten the bolts in the sequence shown.

NOTE: Engine shown removed for clarity.

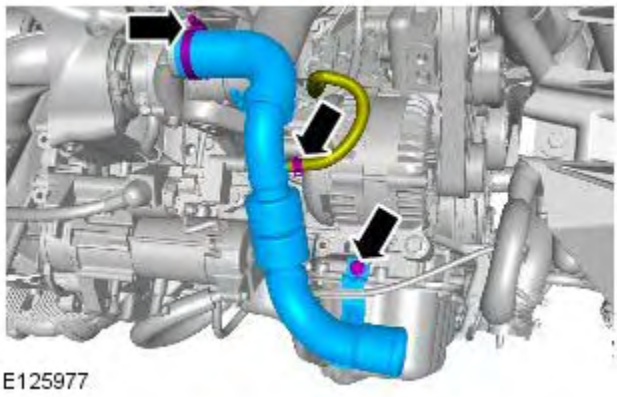
Torque: 47 Nm



16. NOTE: Engine shown removed for clarity.

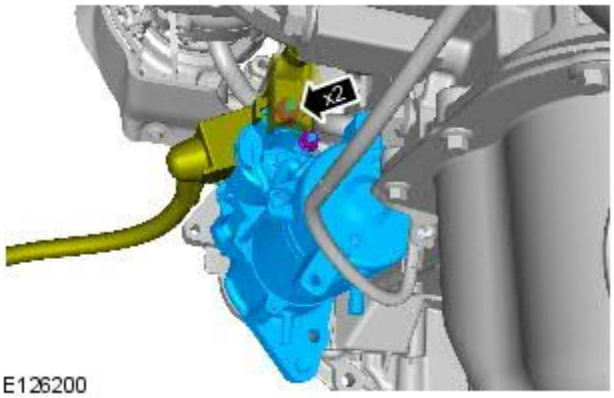


17.


E125977

18. NOTE: Engine shown removed for clarity.

    Torque: 10 Nm



E126200

19. NOTES:

    Some variation in the illustrations may occur, but the essential information is always correct.

    Engine shown removed for clarity.

    Torque:
    M8 10 Nm
    M6 7 Nm

20. Refer to: Oil Pan (303-01, Removal and Installation).

21. Refer to: Transmission - TDV6 3.0L Diesel (307-01 Automatic Transmission/Transaxle, Installation).

22. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 24-Jul-2013

Engine - TDV6 3.0L Diesel - Oil Pump

Removal and Installation

Special Tool(s)

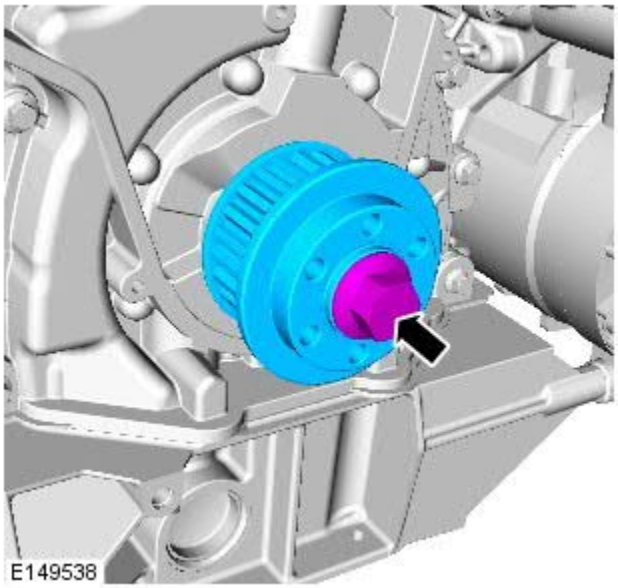
	Crankshaft Front Seal Remover 303-1120
	Crankshaft Front Seal Sleeve 303-1122
	Crankshaft Front Seal Installer 303-1121

Removal

1. Disconnect the battery ground cable.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. For additional information, refer to: Generator (414-02A Generator and Regulator - TDV6 3.0L Diesel, Removal and Installation).

3. For additional information, refer to: Timing Belt (303-01 Engine - TDV6 3.0L Diesel, Removal and Installation).

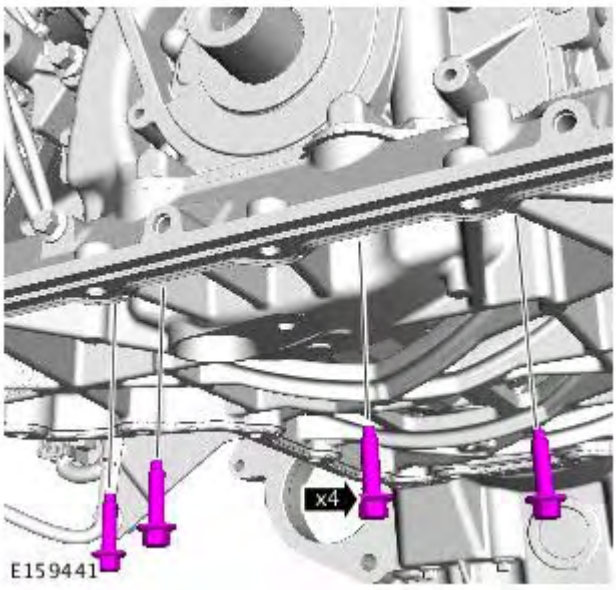


4. Remove the crankshaft pulley.

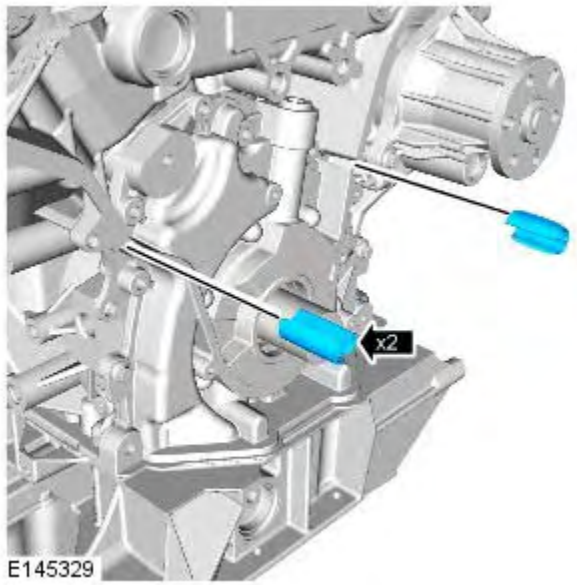
5. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

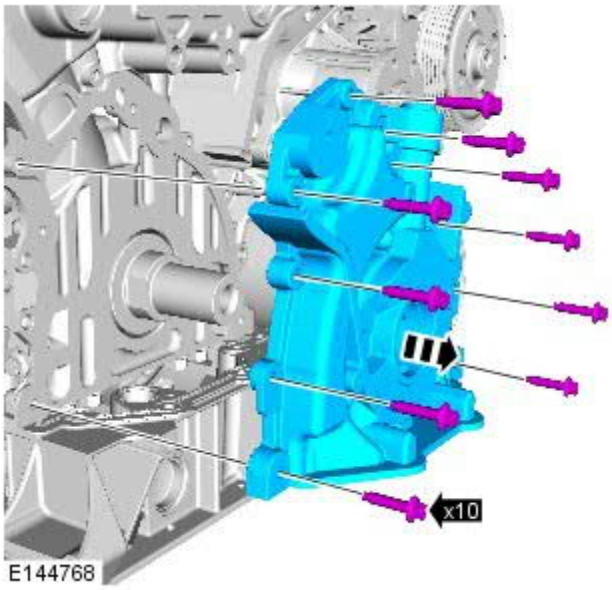
6. For additional information, refer to: Oil Pan (303-01A, Removal and Installation).



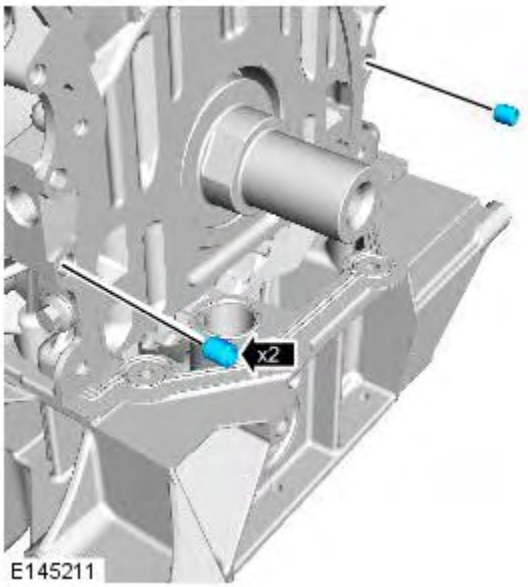
7. Remove the oil pump lower retaining bolts.



8. Remove the timing belt cover sealing strips.

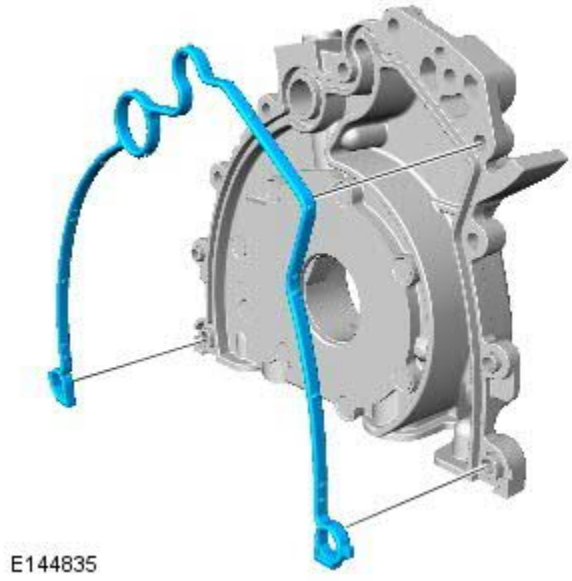


9. Remove the oil pump.
    - Remove the ten retaining bolts.



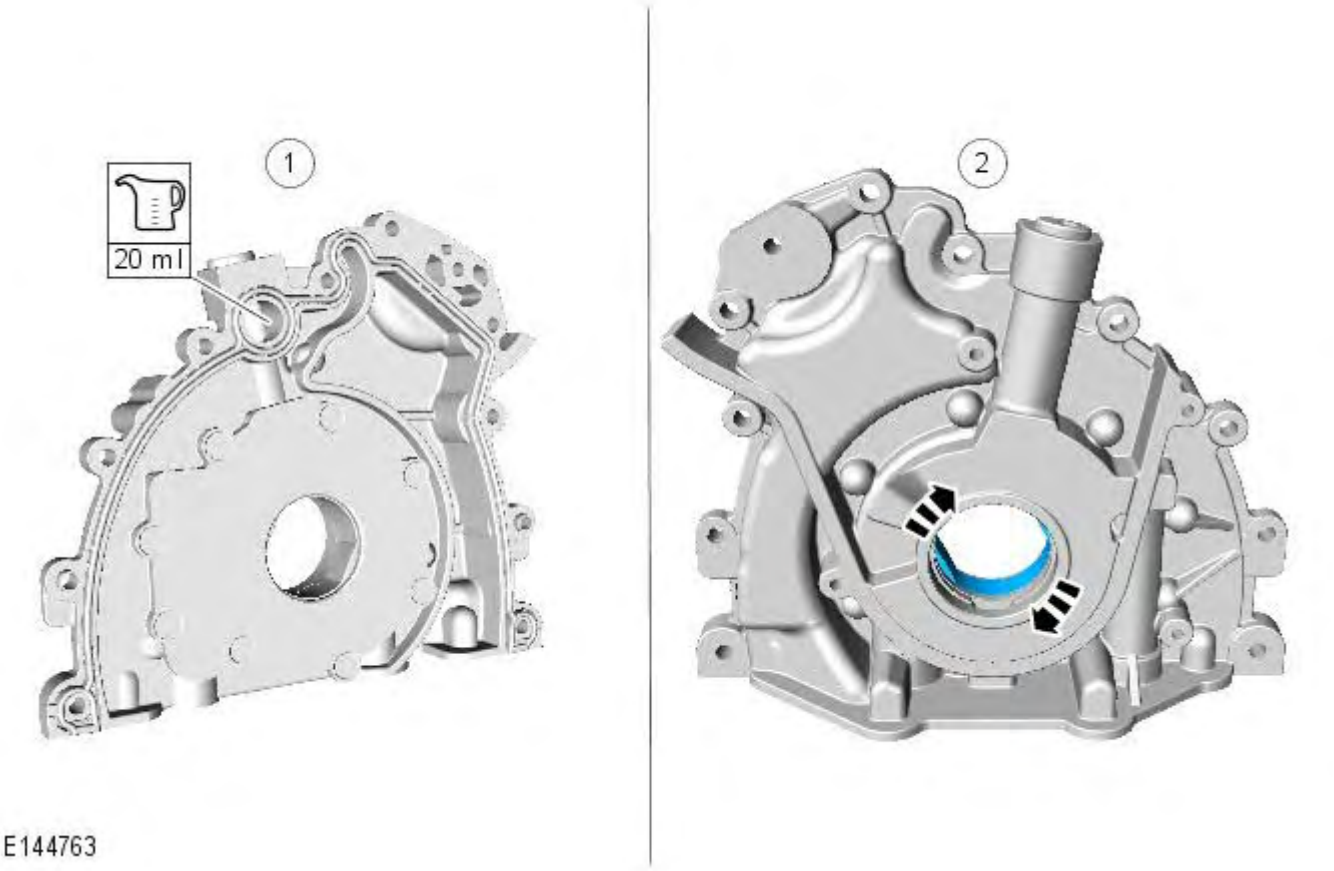
10. Remove the alignment dowels (if equipped).

Installation

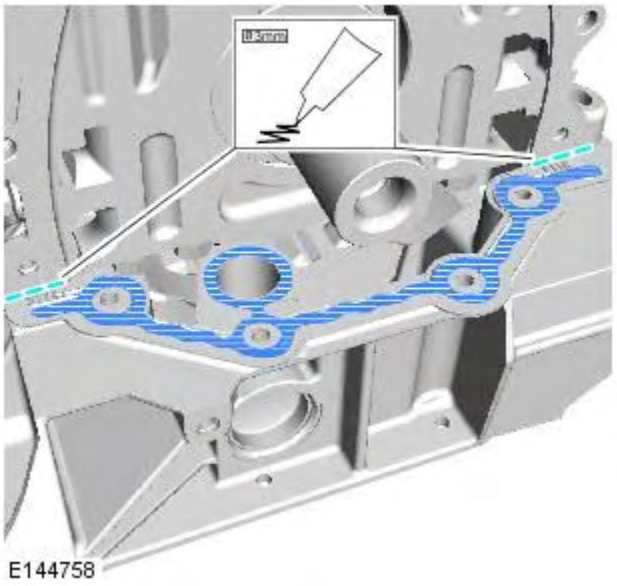


1. Install a new oil pump gasket.

2. Prime the oil pump.
   - Fill the orifice shown with 20 ml of engine oil.
   - Rotate the oil pump drive 2 complete turns.



E144763



E144758

3. CAUTION: Make sure that the mating faces are clean and free of foreign material.

   Apply a 3 mm diameter bead of sealant, to the area shown.

4. CAUTIONS:

   Make sure that the mating faces are clean and free of foreign material.

   Make sure the gasket is installed correctly.

   Install the oil pump.

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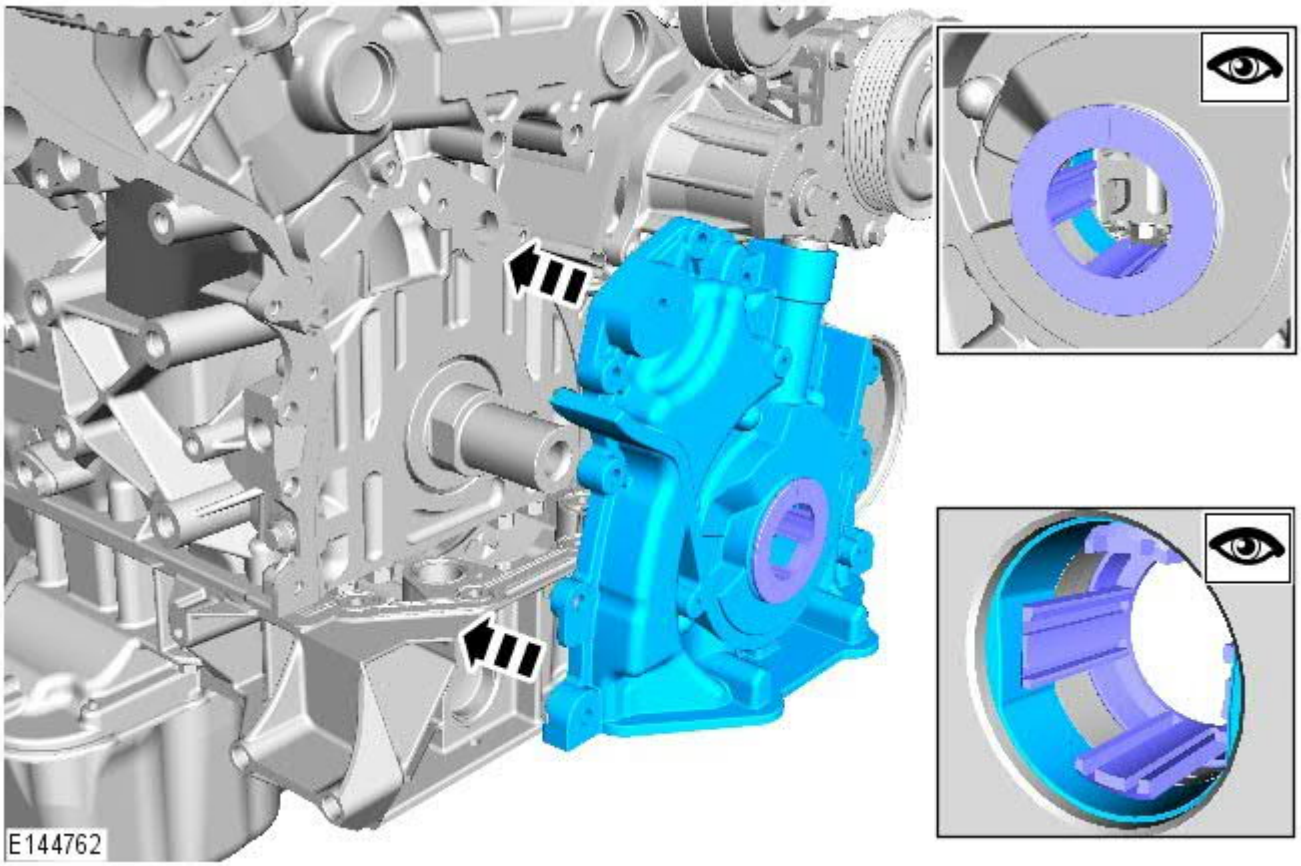
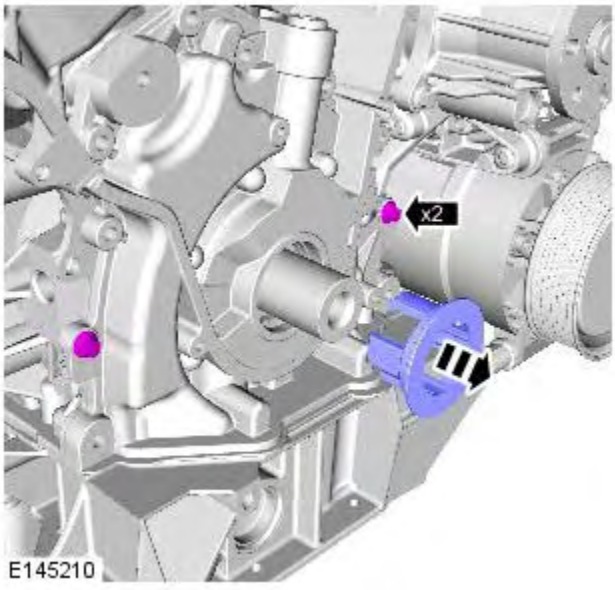
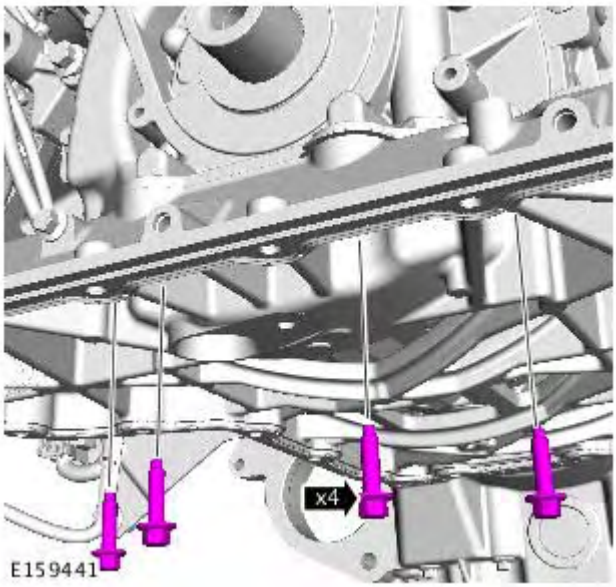
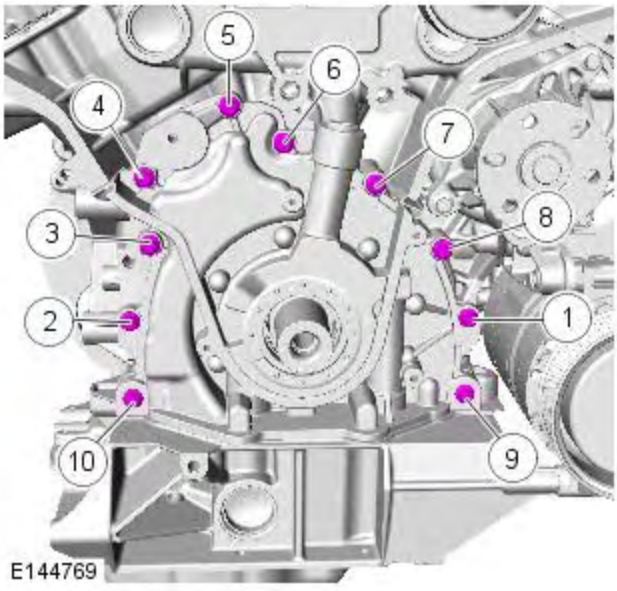




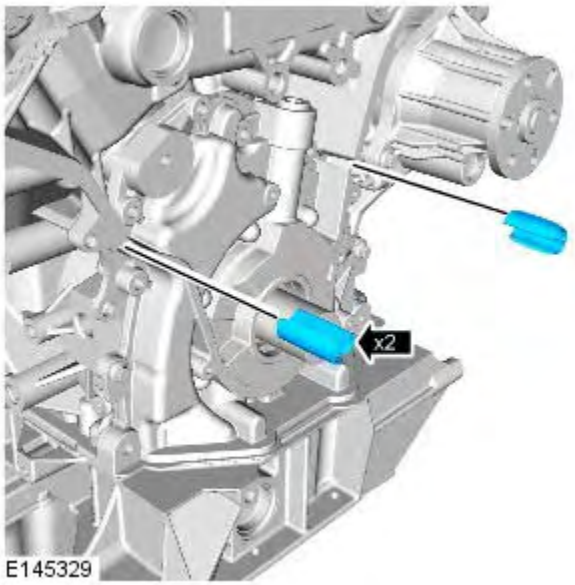
5. Install two bolts to the oil pump, only finger tighten at this stage.
    - Remove the oil pump locator.



6. Install the oil pump lower retaining bolts.
    - Tighten the 4 bolts to 10 Nm.

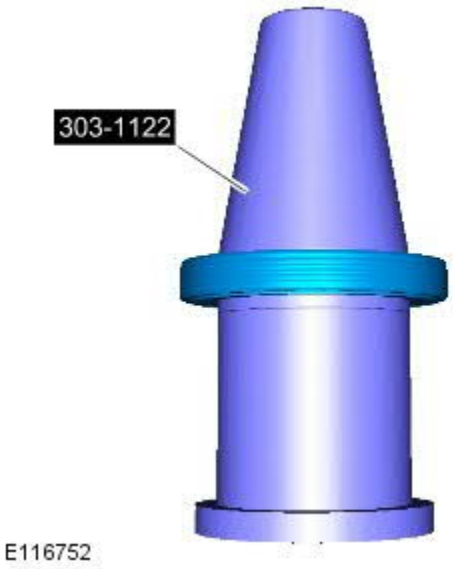


7. Secure the oil pump.
    - Tighten the bolts in the sequence shown to 10 Nm .



8. Install the timing belt cover sealing strips.

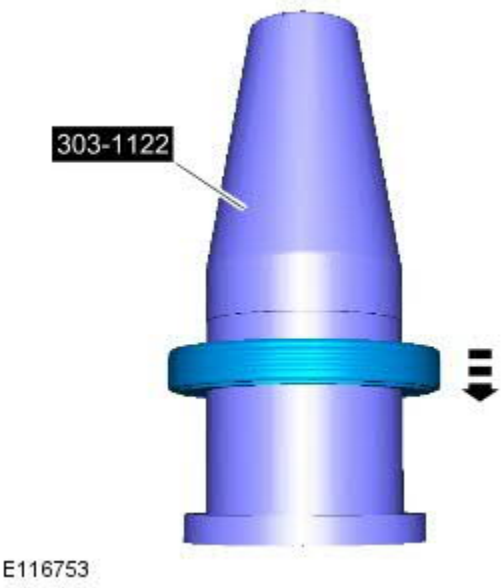
9. For additional information, refer to: Oil Pan (303-01A, Removal and Installation).



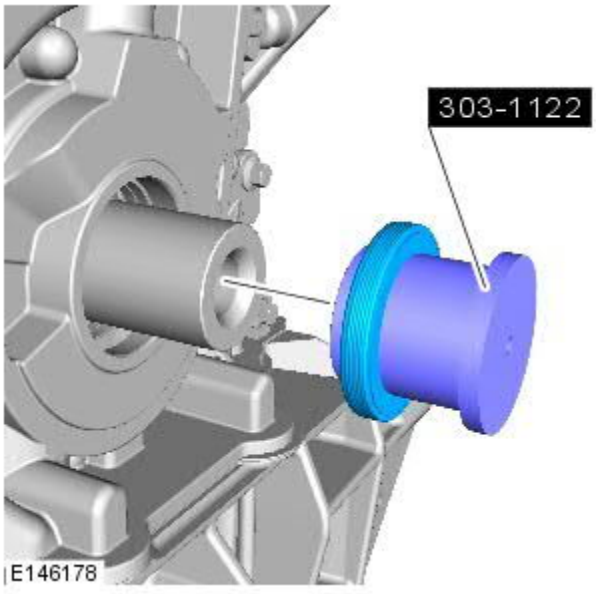
10. CAUTION: Do not use any lubricant on the crankshaft front seal, special tools or the crankshaft. Failure to follow this instruction may result in damage to the vehicle.

NOTE: Make sure all component mating faces are clean.

Install a new crankshaft front seal to the special tool.

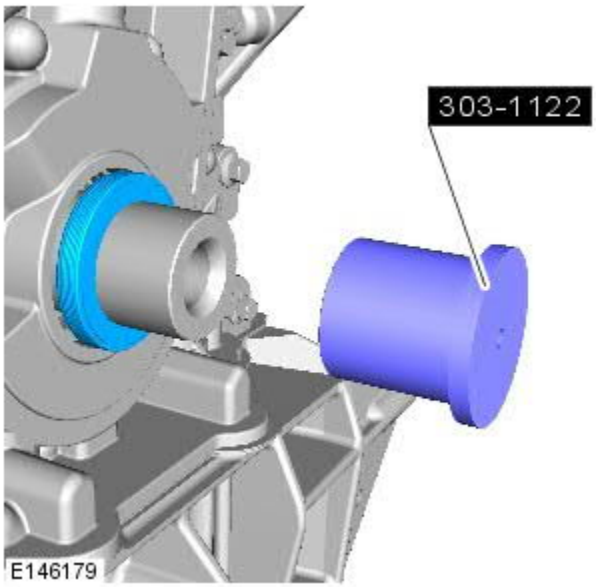


11. Reposition the crankshaft front seal along the special tool.
    - Remove the sleeve from the special tool.

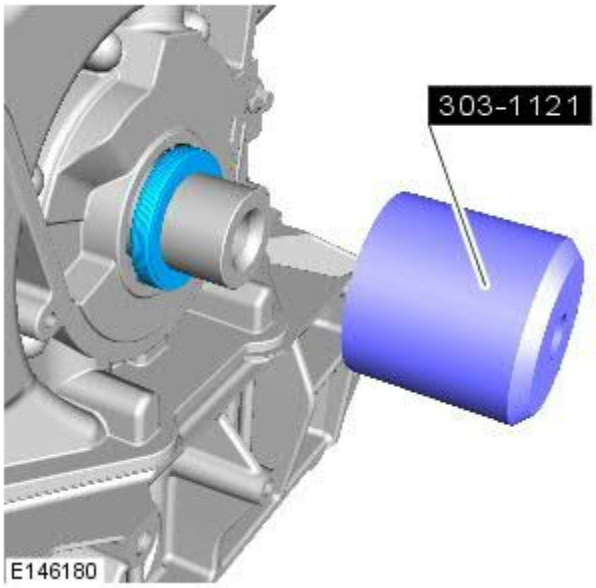


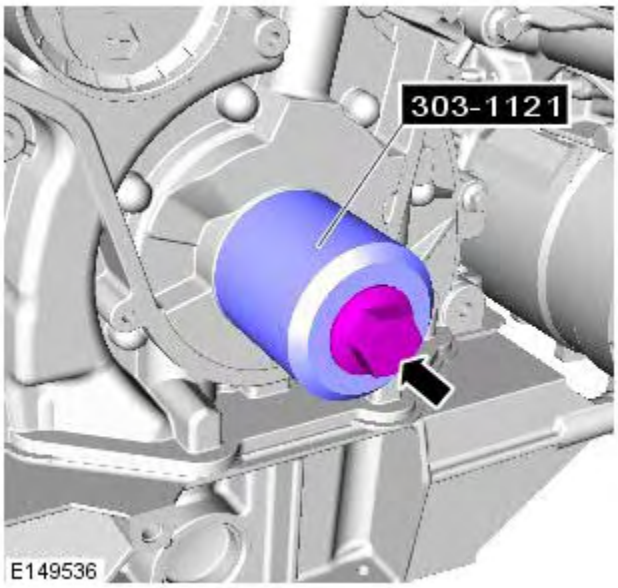
12. Install the special tool to the crankshaft.

13. Remove the special tool from the crankshaft.



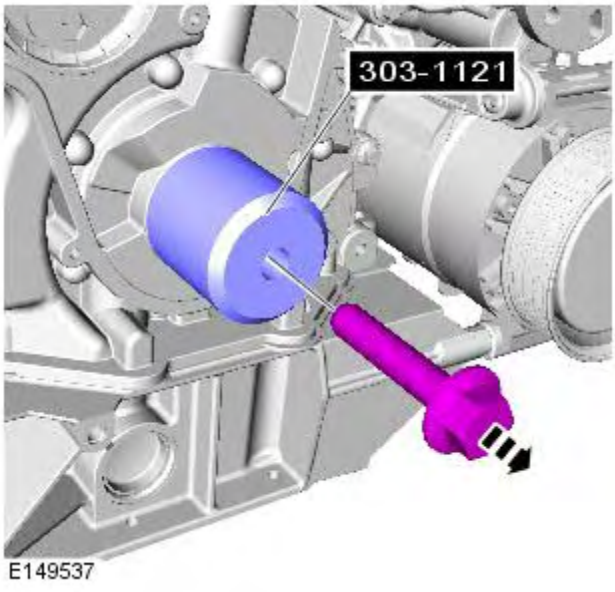
14. Install the special tool to the crankshaft.





15. CAUTION: Make sure the seal is installed correctly.

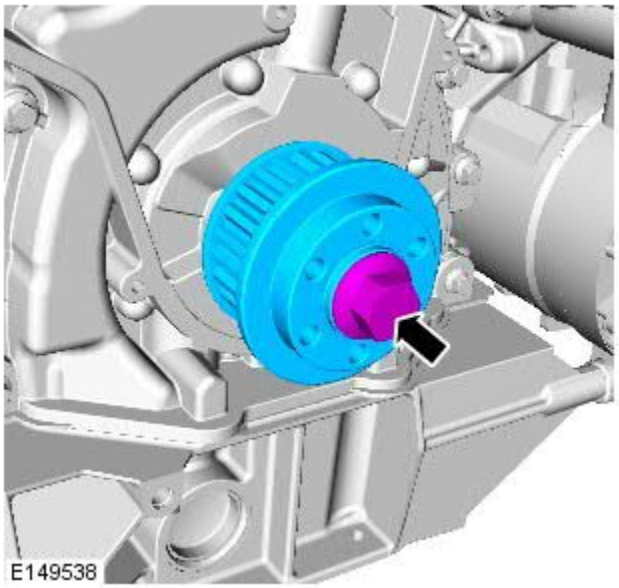
Using the special tool, install the crankshaft front seal.
- Use the crankshaft bolt with the service tool.



16. CAUTION: Make sure the seal is installed correctly.

NOTE: Wait 10 seconds before removing the crankshaft seal installation tool.

Remove the special tool.
- Remove and discard the crankshaft pulley retaining bolt.



17. CAUTION: Make sure that a new crankshaft pulley bolt is installed.

    NOTE: Before installing the crankshaft pulley retaining bolt, note the thread size of the bolt (there are two different sized threads, M14 and M16). Failure to follow this instruction may result in damage to the vehicle.

    Install the crankshaft pulley.
    - **Tighten the M14 retaining bolt in two stages:**
        1. Stage one: Tighten to 140 Nm.
        2. Stage two: Tighten a further 90degrees.
    - **Tighten the M16 retaining bolt in three stages:**
        1. Stage one: Tighten to 150 Nm.
        2. Stage two: Tighten to 300 Nm.
        3. Stage three: Tighten a further 90 degrees.

18. Install the generator.
    For additional information, refer to: Generator (414-02A Generator and Regulator - TDV6 3.0L Diesel, Removal and Installation).

19. Install the new timing belt kit.
    For additional information, refer to: Timing Belt (303-01 Engine - TDV6 3.0L Diesel, Removal and Installation).

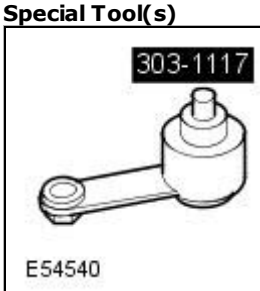
20. Connect the battery ground cable.
    For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 11-May-2011

Engine - TDV6 3.0L Diesel - Timing Belt

Removal and Installation

Special Tool(s)

	303-1117 Timing Peg, Automatic Transmission
	303-1126 Timing Peg, Camshaft Pulley

Removal

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

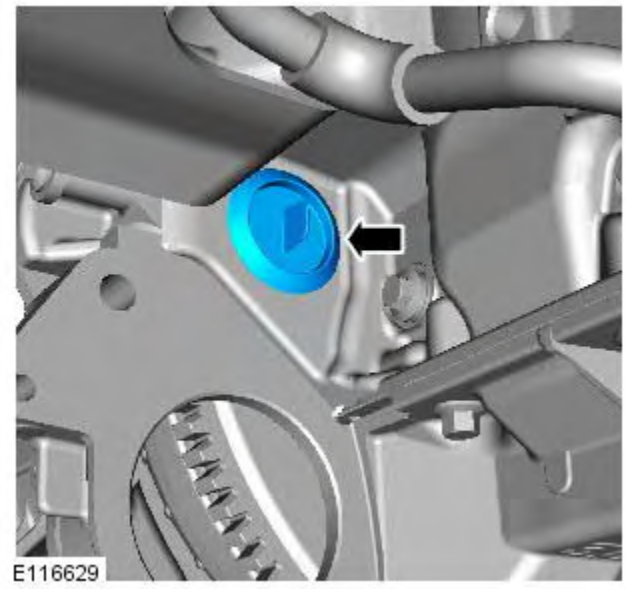
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

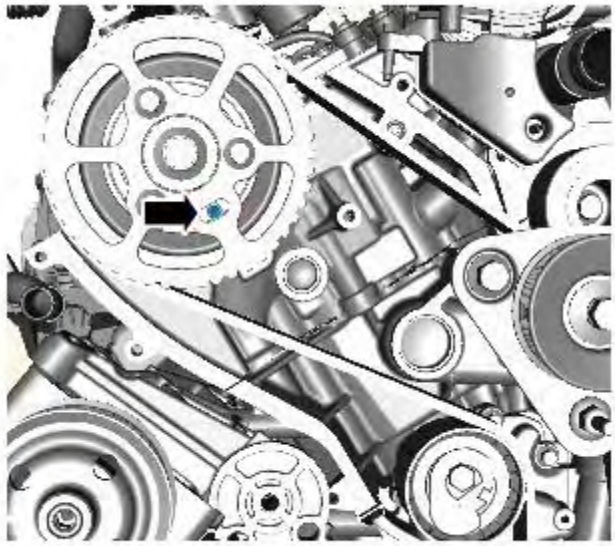
2. Refer to: Timing Cover (303-01, Removal and Installation).

3. Refer to: Starter Motor (303-06A Starting System - TDV6 3.0L Diesel, Removal and Installation).

4.



5. Rotate the crankshaft clockwise to align the crankshaft alignment hole in the flywheel or flexplate with the block aperture.



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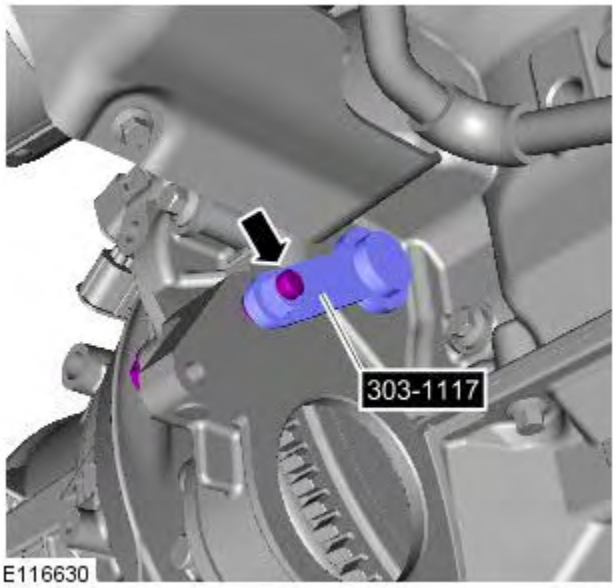
6. Check the camshaft pulley alignment holes are correctly aligned. If the alignment holes are not aligned, rotate the crankshaft one full turn clockwise.



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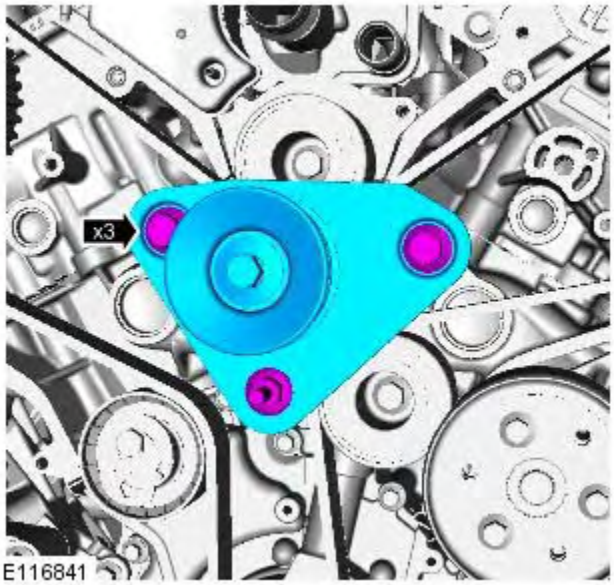
7. Install the special tool.

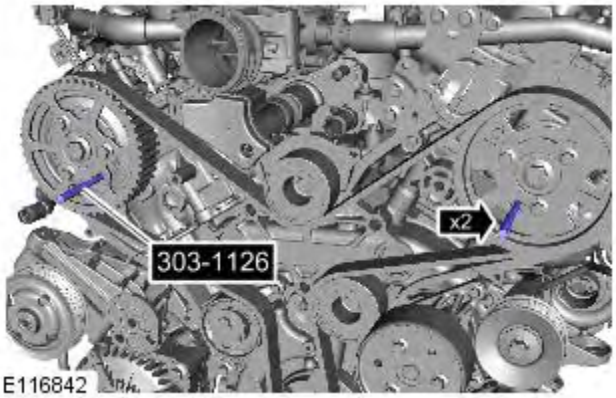
   Special Tool(s): 303-1117

8.



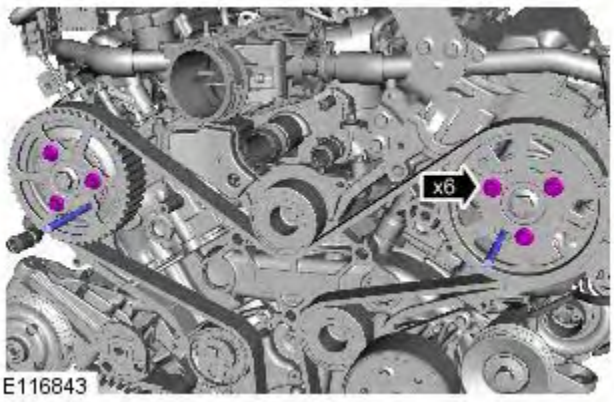
9. Install the special tool.

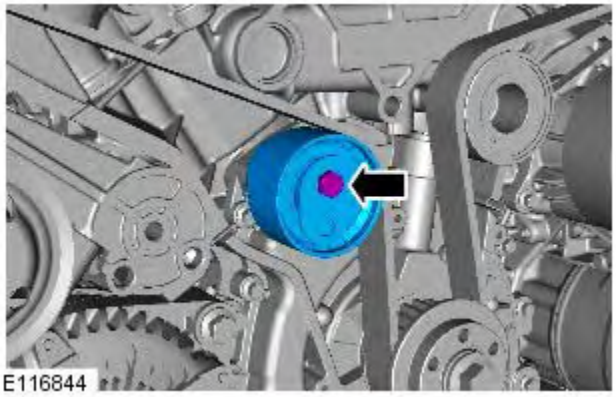
Special Tool(s): 303-1126



10. CAUTION: Do not use the special tools to lock the camshafts. Failure to follow this instruction may result in damage to the engine or the special tools.

NOTE: Do not loosen the bolts more than 2 turns.

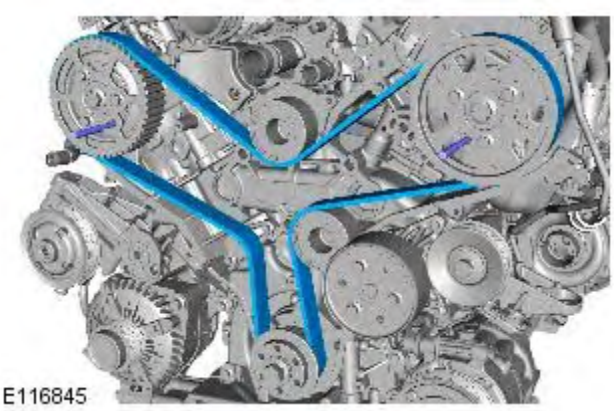




11. CAUTIONS:

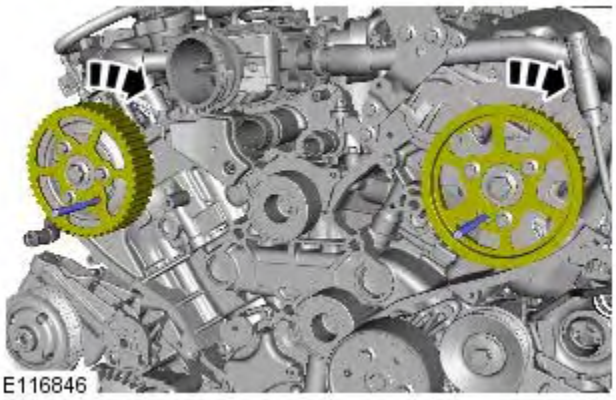
    Discard the component.

    Discard the bolt.

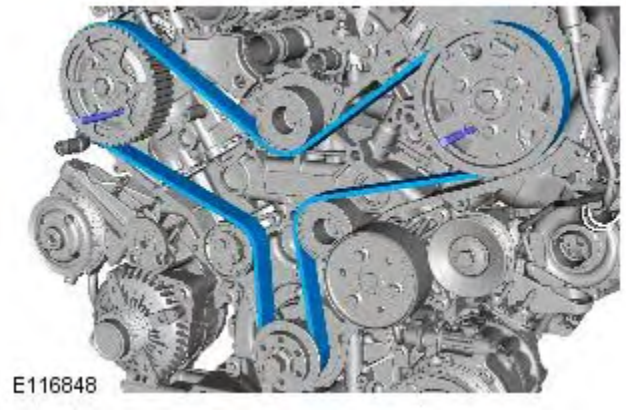


12. CAUTION: Discard the component.

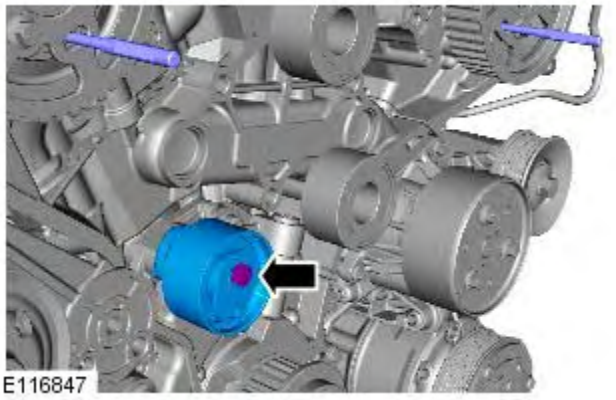
Installation



1.



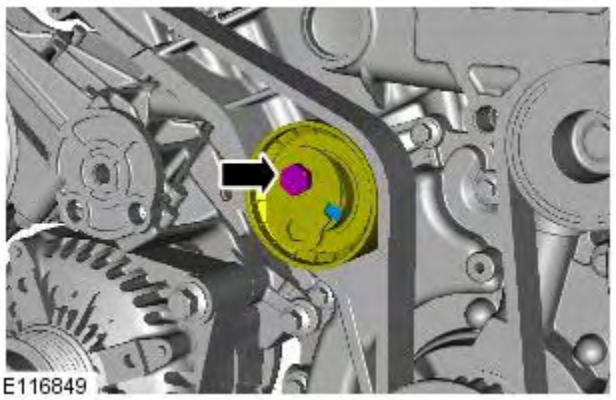
2. CAUTION: Make sure the camshaft pulleys remain in the clockwise position.
    - Install the new timing belt.
    - Starting at the crankshaft pulley, install the timing belt in a counter-clockwise direction, in the sequence shown.
    - Stage one: Attach the timing belt to the crankshaft pulley.
    - Stage two: Attach the timing belt to the idler pulley.
    - Stage three: Attach the timing belt to the left-hand camshaft pulley.
    - Stage four: Attach the timing belt to the idler pulley.
    - Stage five: Attach the timing belt to the RH camshaft pulley.



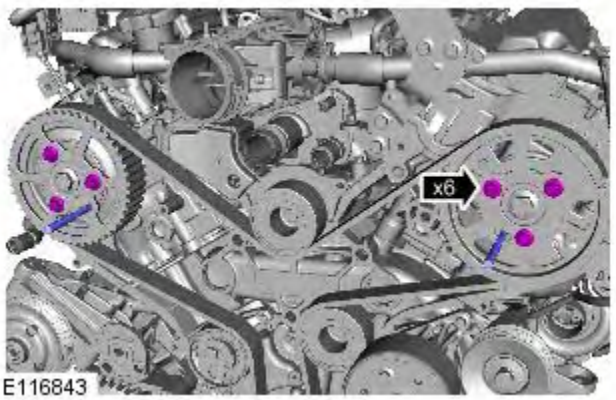
3. CAUTIONS:

    Make sure that a new bolt is installed.

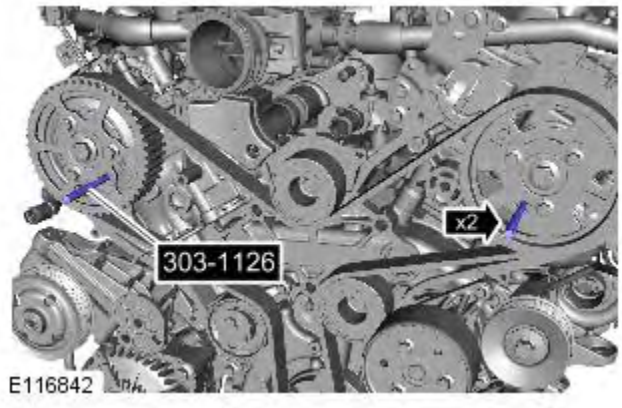
    Only tighten the bolts finger-tight at this stage.



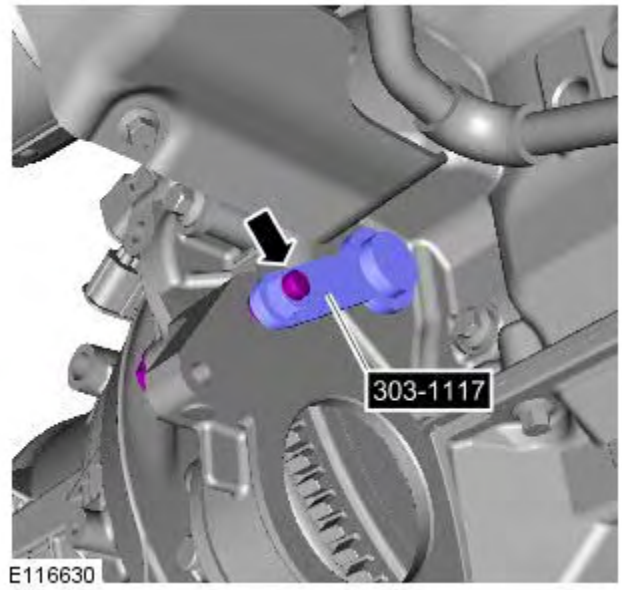
4. CAUTION: Make sure the timing belt tensioner window is aligned with the groove as illustrated.
    - Tension the timing belt.
    - Rotate the tensioner assembly counter-clockwise.
    - *Torque:* 26 Nm



5. CAUTION: Do not use the special tools to lock the camshafts. Failure to follow this instruction may result in damage to the engine or the special tools.
    - Using a suitable tool, counterhold the camshaft pulley center retaining bolts.
    - *Torque:* 23 Nm



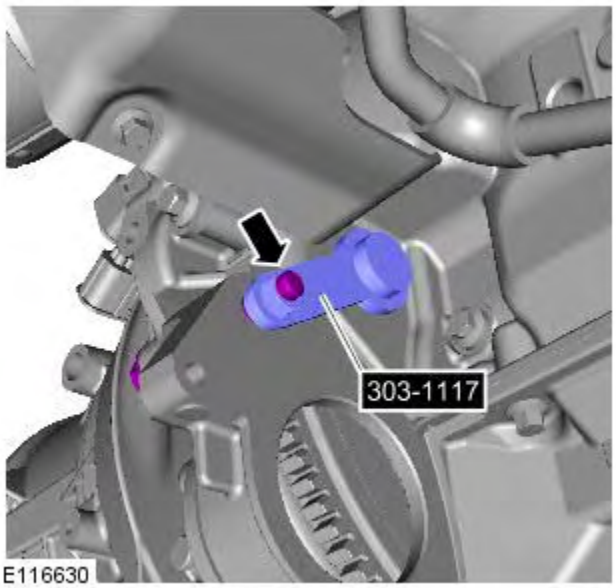
6. Remove the special tool.



7. Remove the special tool.

8. CAUTION: Only rotate the crankshaft clockwise.

   Rotate the engine two complete turns clockwise.



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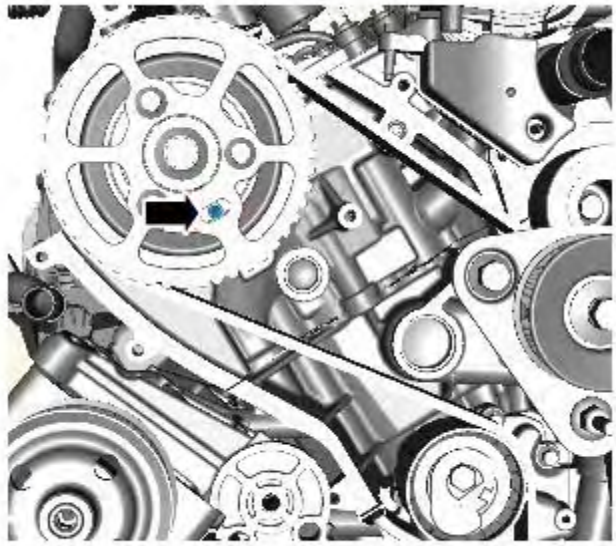
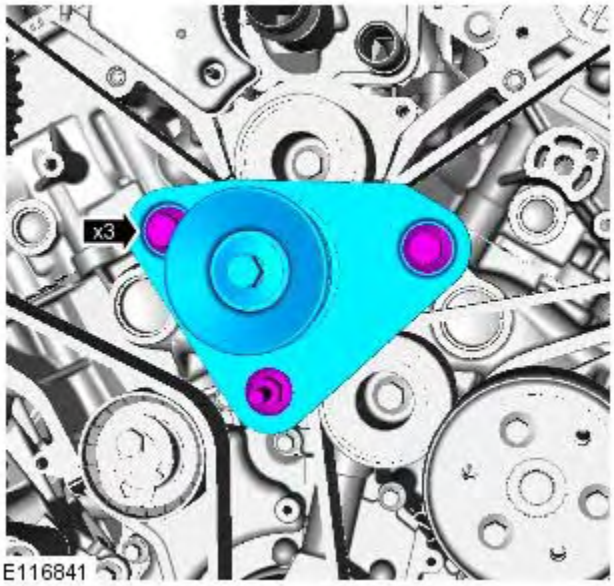
9. Install with the special tool.

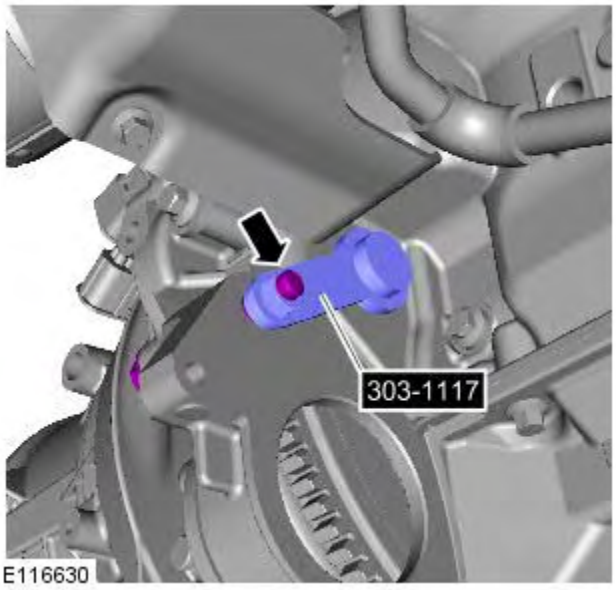
   Special Tool(s): 303-1117


E116840

10.
- Install the special tools to the exhaust camshaft pulleys.
- If the special tool does not fit correctly, repeat the timing belt installation procedure.
- Remove the special tools from the camshaft pulleys.

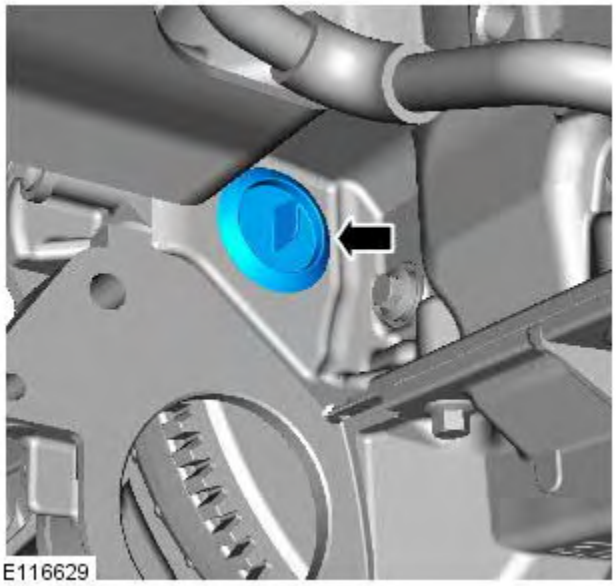


11. *Torque:* 80 Nm



12. Remove the special tool.

13.



14. Refer to: Starter Motor (303-06A Starting System - TDV6 3.0L Diesel, Removal and Installation).

15. Refer to: Timing Cover (303-01, Removal and Installation).

Published: 14-Nov-2013

Engine - TDV6 3.0L Diesel - Timing Cover

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

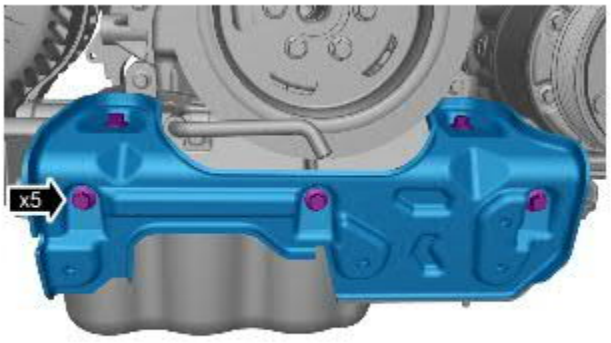
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

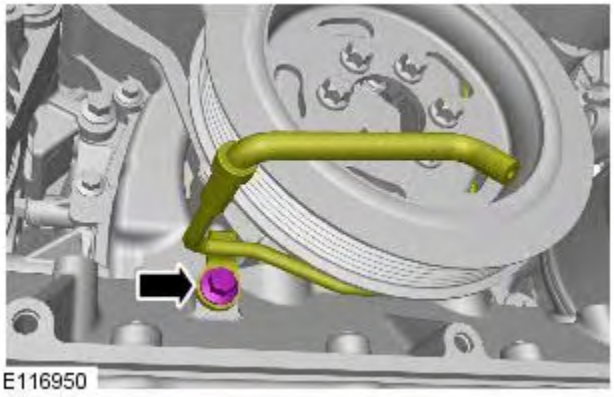
3. Refer to: Cooling System Partial Draining, Filling and Bleeding (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).

4. Refer to: Accessory Drive Belt (303-05A Accessory Drive - TDV6 3.0L Diesel, Removal and Installation).



E116949

5. *Torque:* 14 Nm



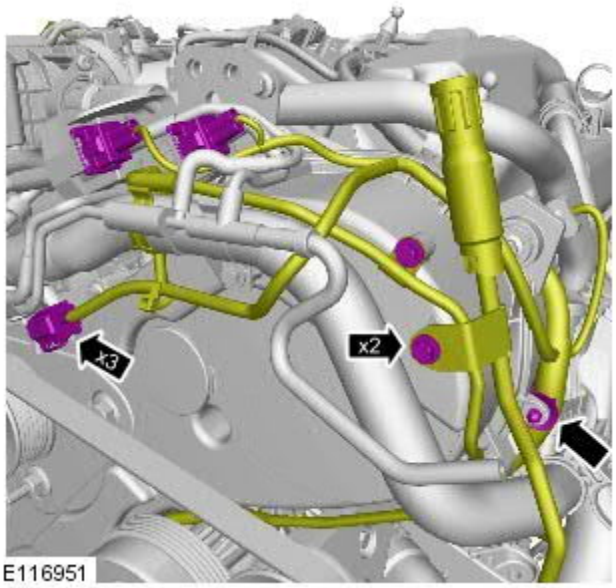
E116950

6. *Torque:* 8 Nm

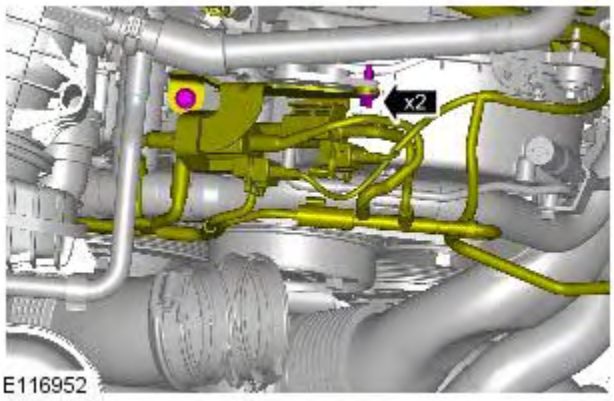
7. Lower the vehicle on the lift.

8. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

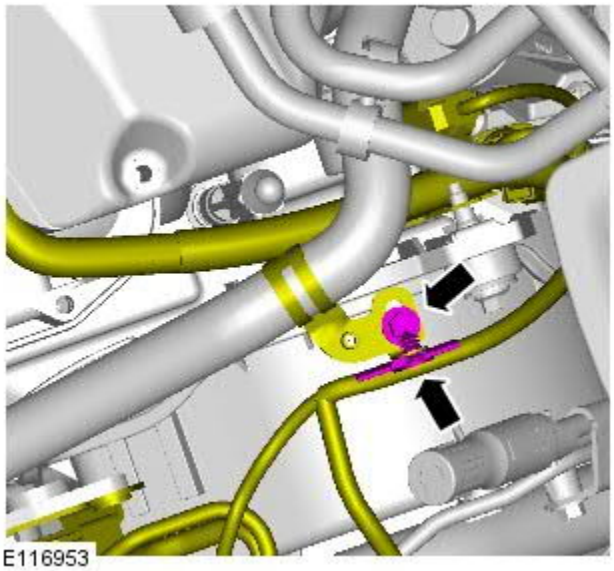
9. *Torque:* 3 Nm

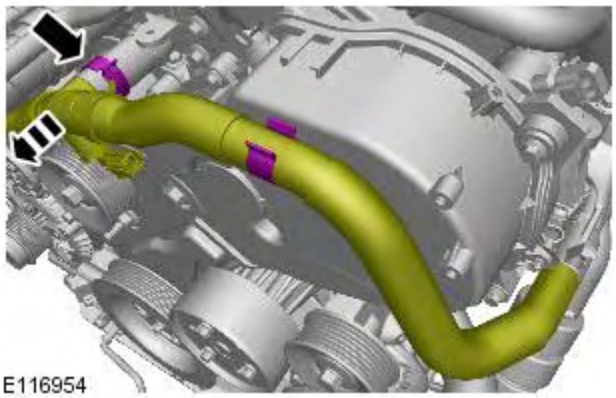


10. *Torque:* 8 Nm



11. *Torque:* 3 Nm





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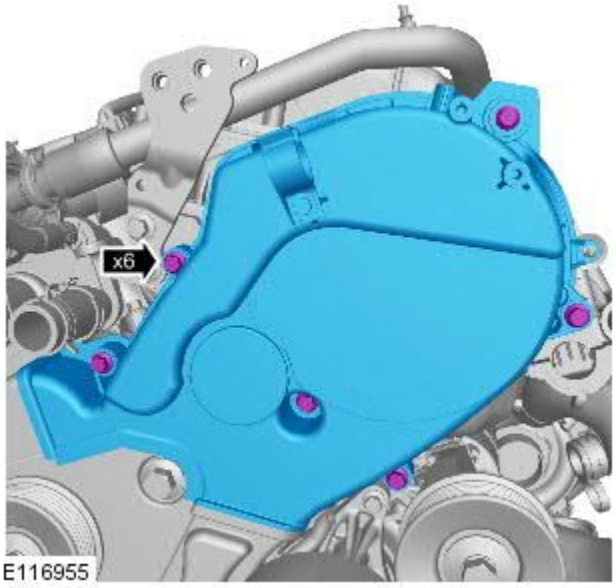
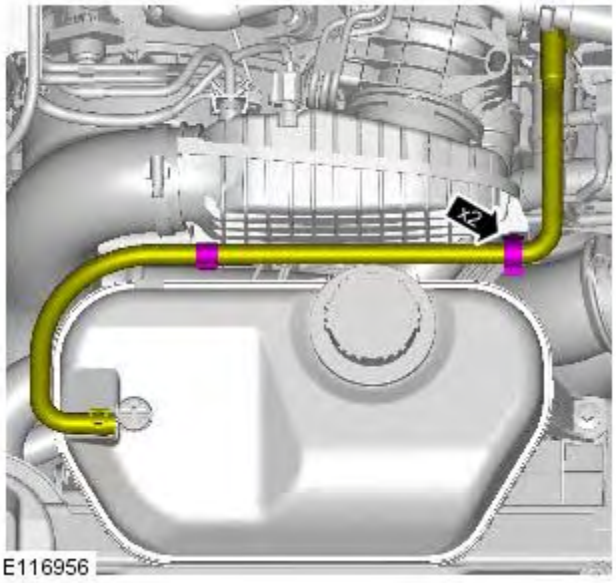


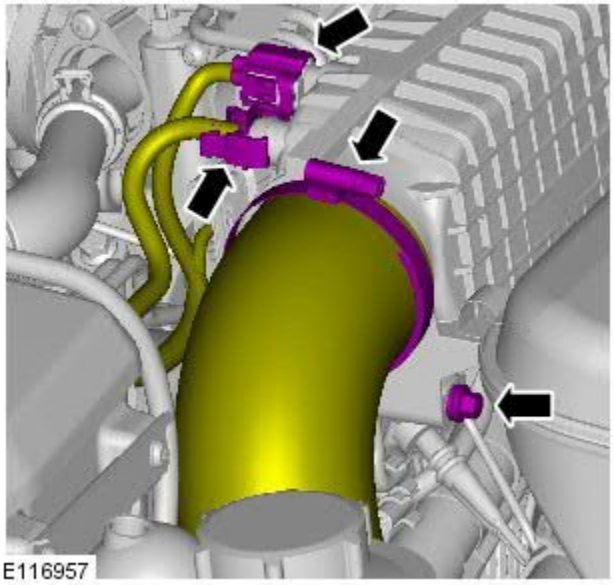
13. NOTE: Discard the gasket.

Torque: 10 Nm



14.

15. *Torque:* 8 Nm


E116957

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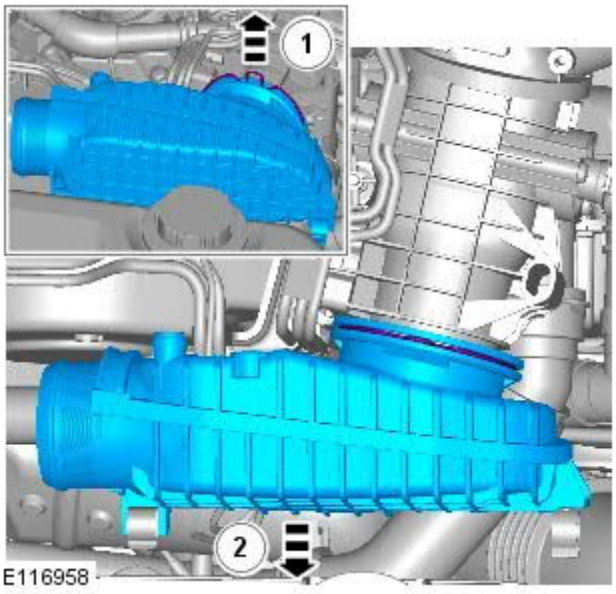
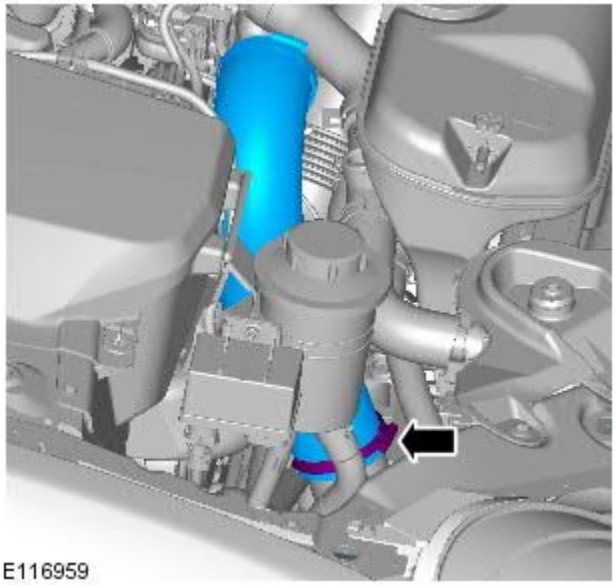
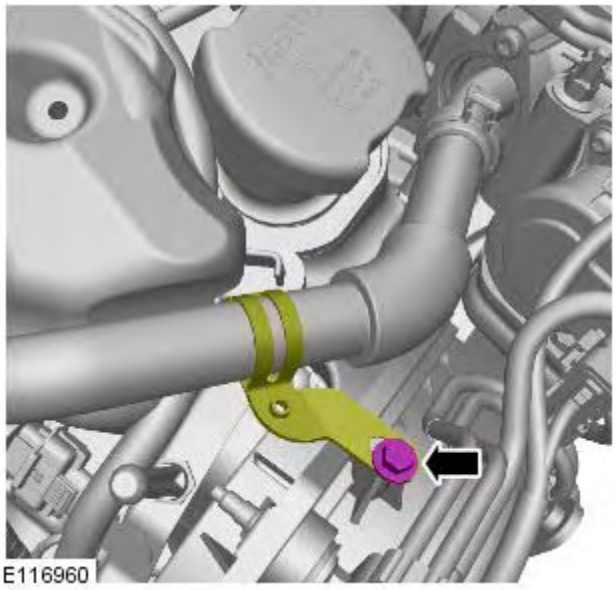


E116958

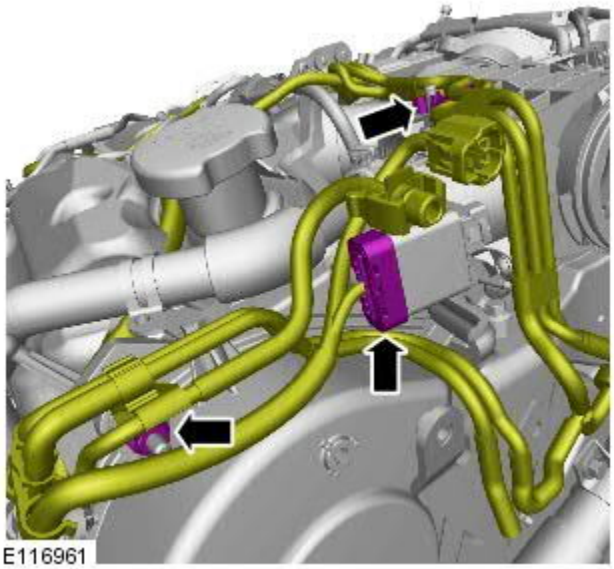
17.


E116959

18. *Torque:* 3 Nm


E116960

19. *Torque:* 10 Nm


E116961

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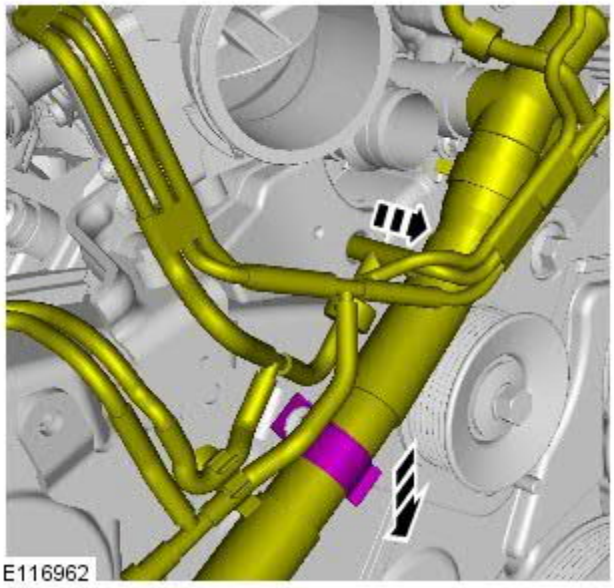
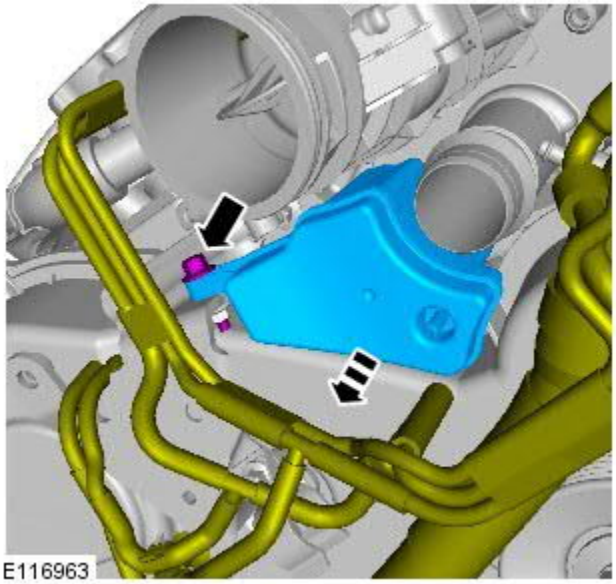
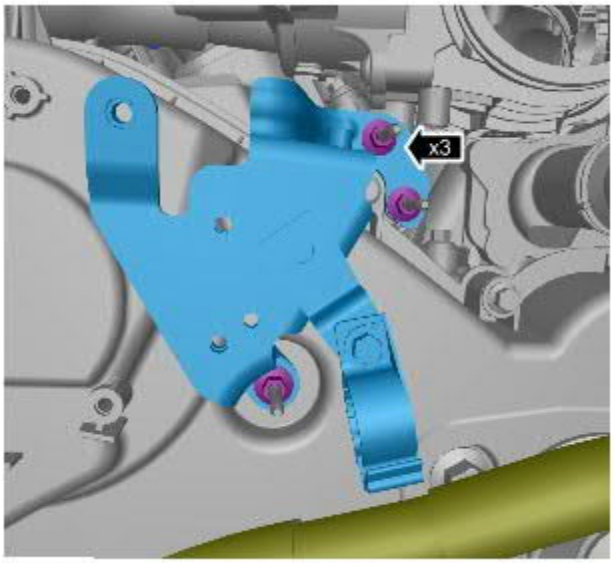

E116962

21. *Torque:* 8 Nm


E116963

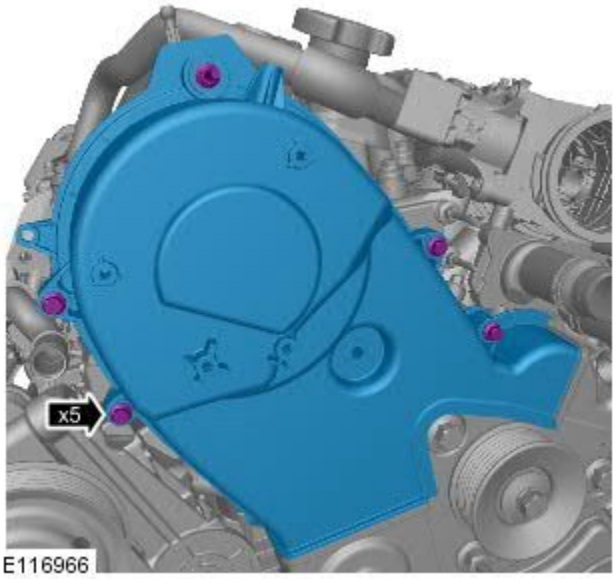
22. *Torque:* 8 Nm



E116964

23. *Torque:* 8 Nm

E116965

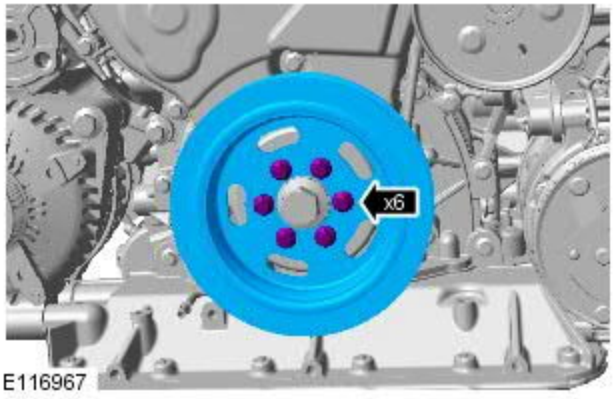


24. NOTE: Discard the gasket.

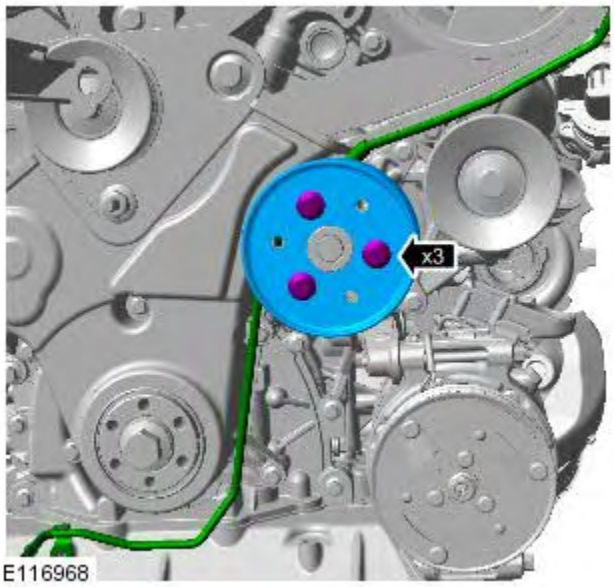
    Torque: 10 Nm

25. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

    Raise and support the vehicle.

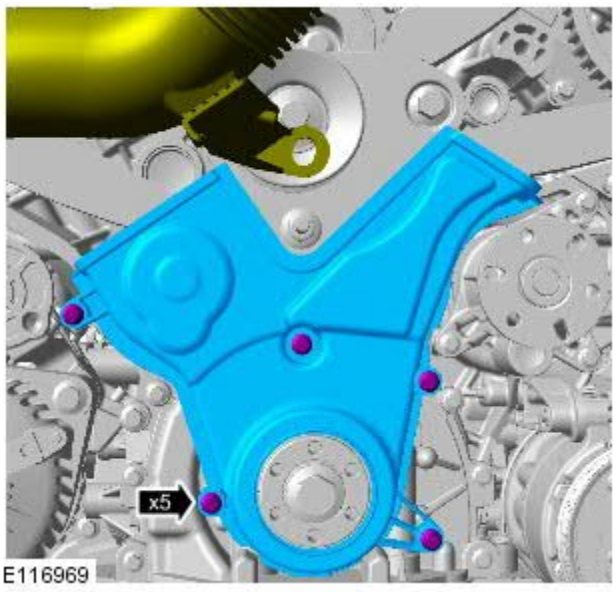


26. *Torque:* 25 Nm



27. CAUTION: Discard the bolts.

Torque: 25 Nm



28. NOTE: Discard the gasket.

Torque: 10 Nm

Installation

1. To install, reverse the removal procedure.

Published: 14-Nov-2013

Engine - TDV6 3.0L Diesel - Valve Cover LH

Removal and Installation

Special Tool(s)

E54135	100-012 Slide Hammer
E116924	310-213 Fuel Injector Removal Adapter

Removal

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNING: Make sure to support the vehicle with axle stands.

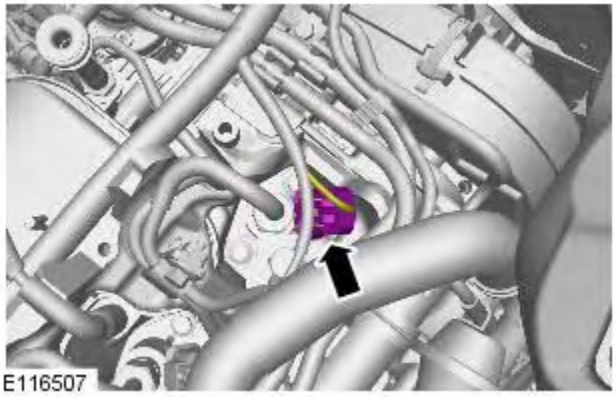
   Raise and support the vehicle.

3. Refer to: Cooling System Partial Draining, Filling and Bleeding (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).

4. Refer to: Intake Air Shutoff Throttle (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).

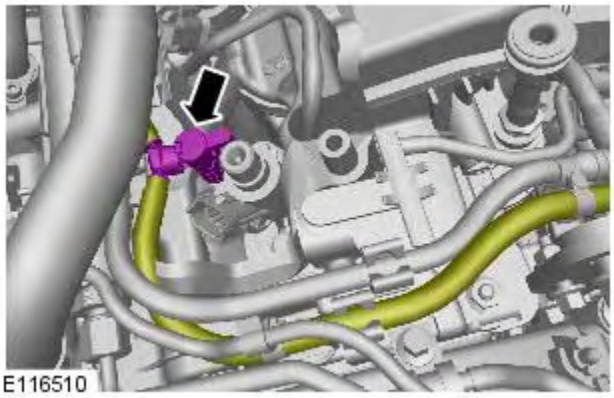
5. Refer to: Fuel Rail LH (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).

6. Refer to: Intake Air Shutoff Throttle (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).



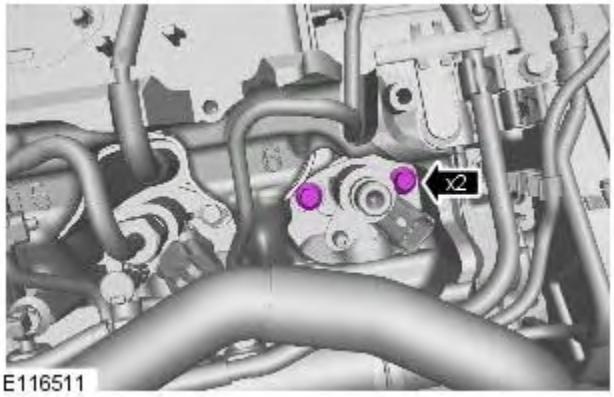
7.

8. Refer to: Fuel Injection Component Cleaning (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, General Procedures).



9. CAUTION: Be prepared to collect escaping fuel.

NOTE: Make sure that the fuel injector return line has a maximum of 8 uses.



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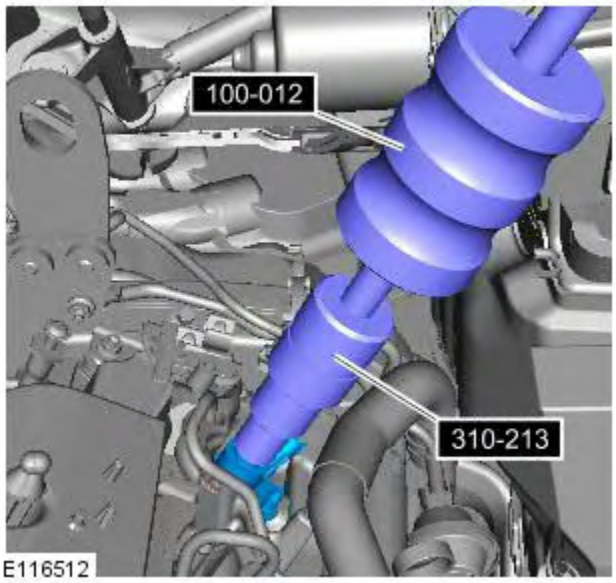
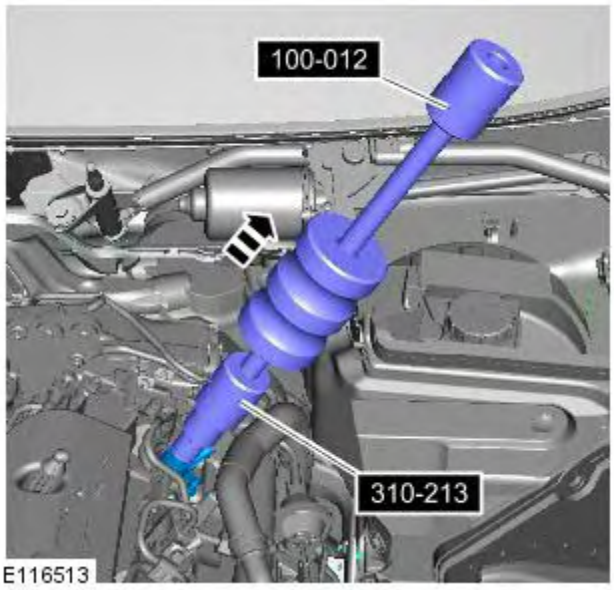


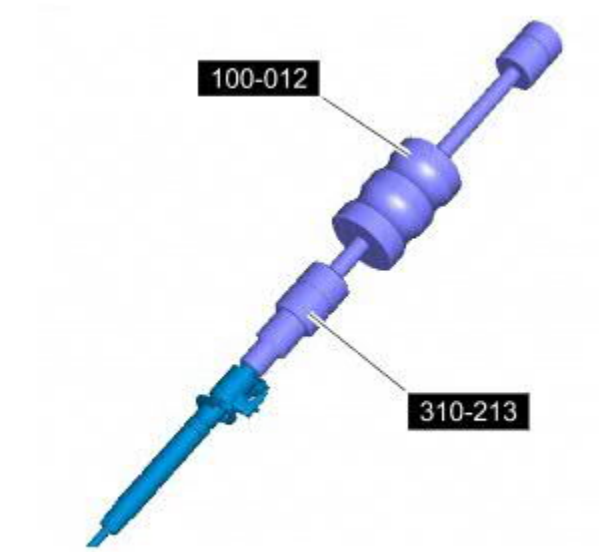
11. Install the special tool.

    Special Tool(s): 100-012, 310-213



12.

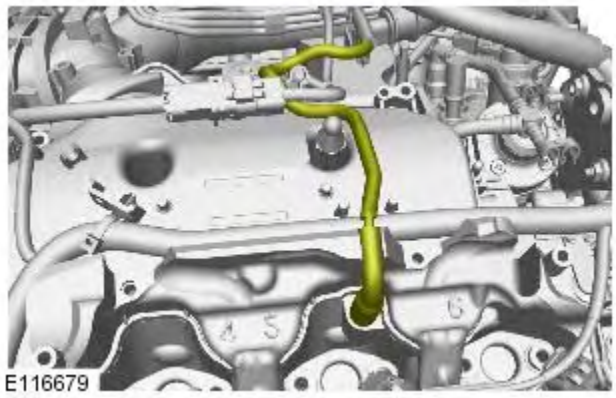
13. Remove the special tool.



E116514

14. Remove the 2 remaining fuel injectors.

15.


E116679

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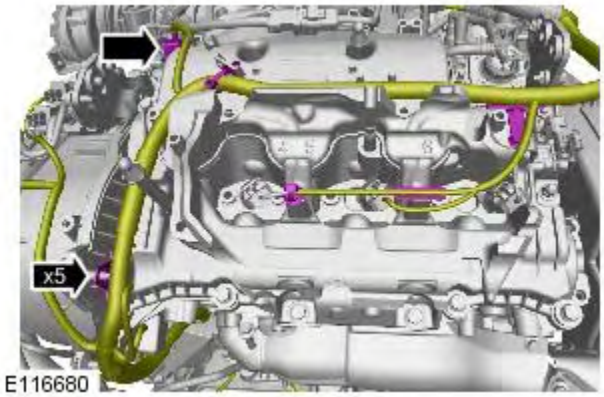

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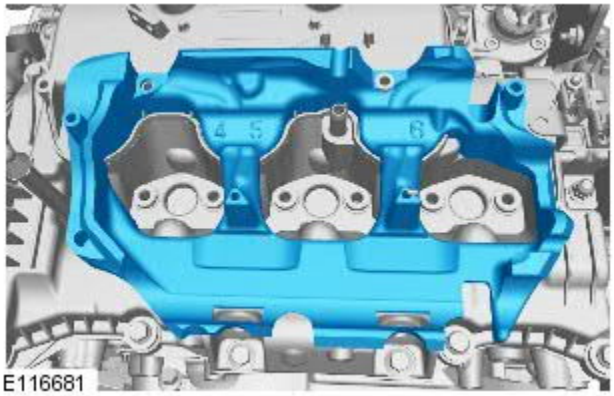

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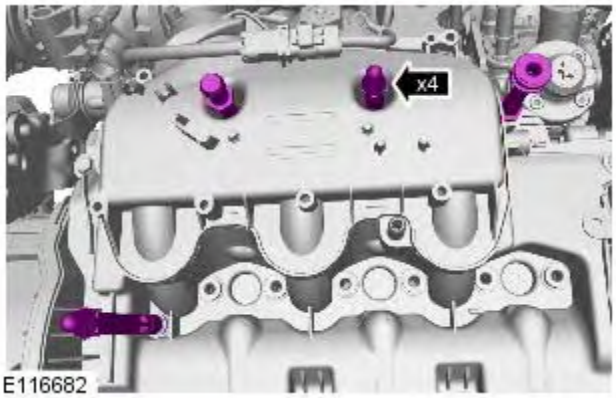

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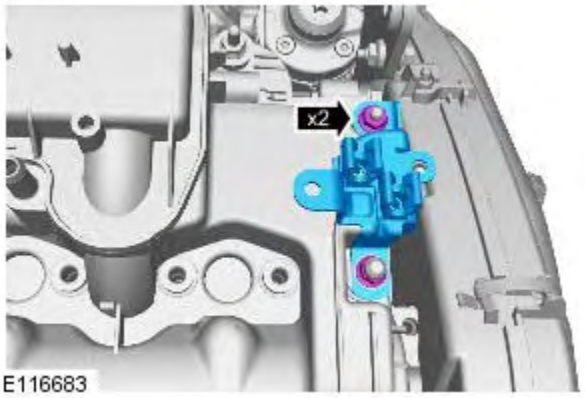

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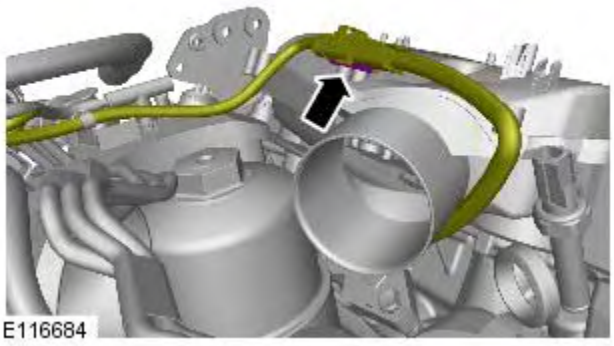

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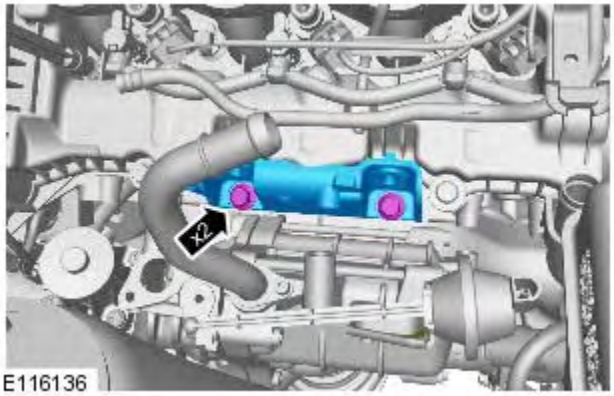
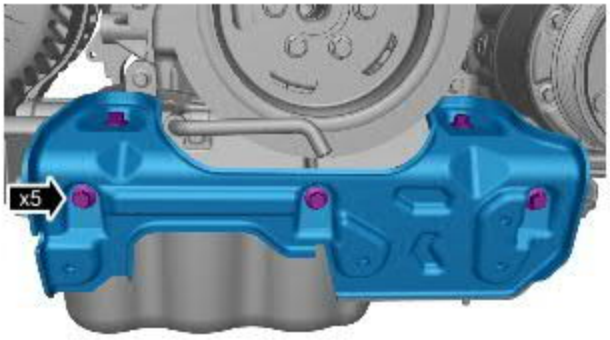


E116136

22. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

23.



E116949

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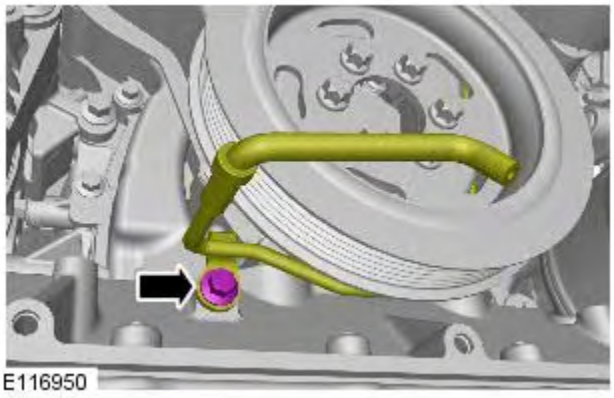
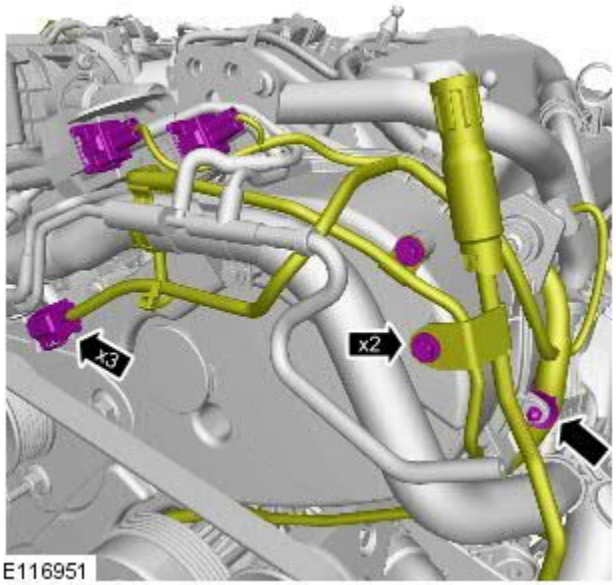

E116950

25. Lower the vehicle.

26.



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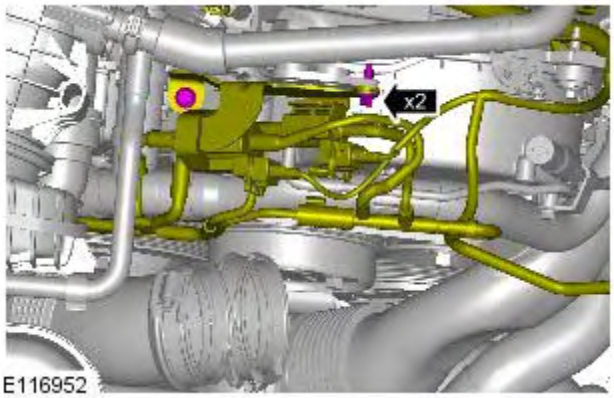

E116952

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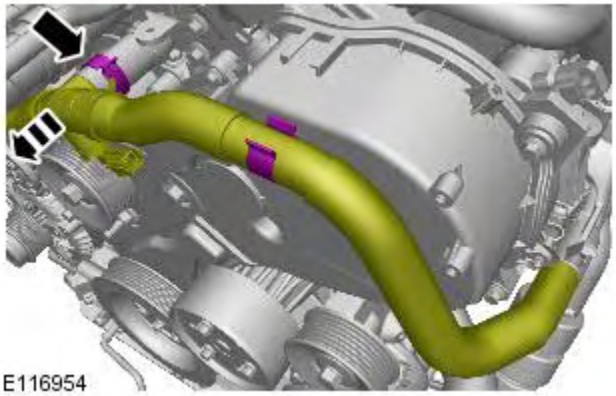
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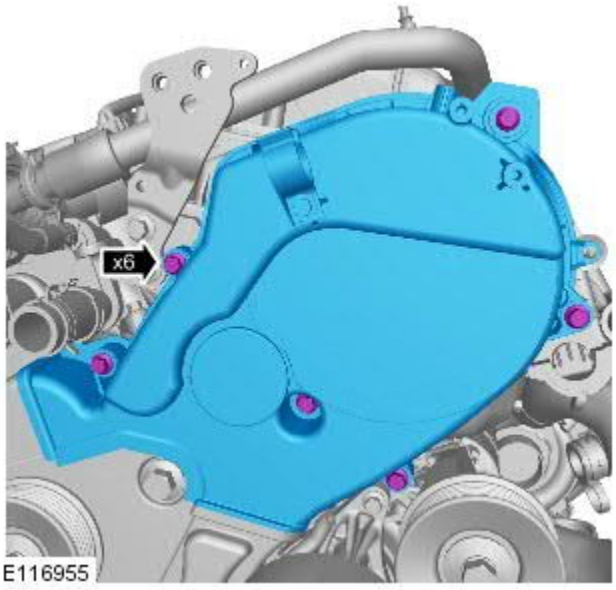
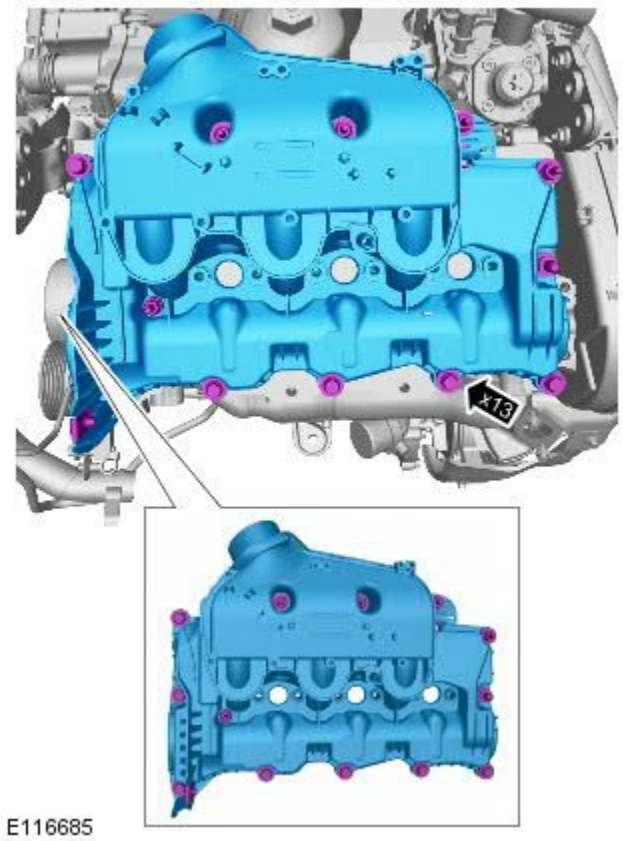


29. NOTE: Discard the gasket.



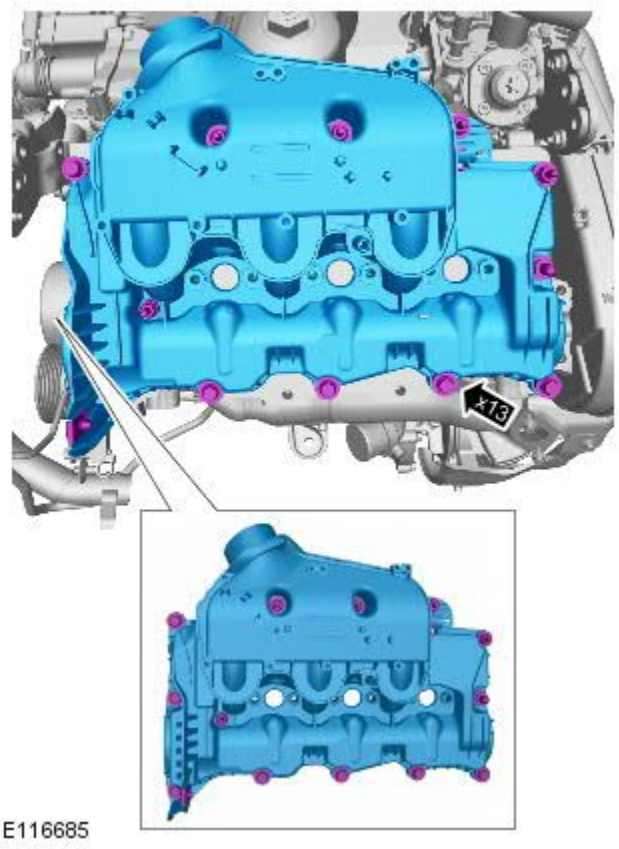
30. CAUTION: Make sure that the mating faces are clean and free of corrosion and foreign material.

NOTES:

Discard the gasket.

Some variation in the illustrations may occur, but the essential information is always correct.

Installation



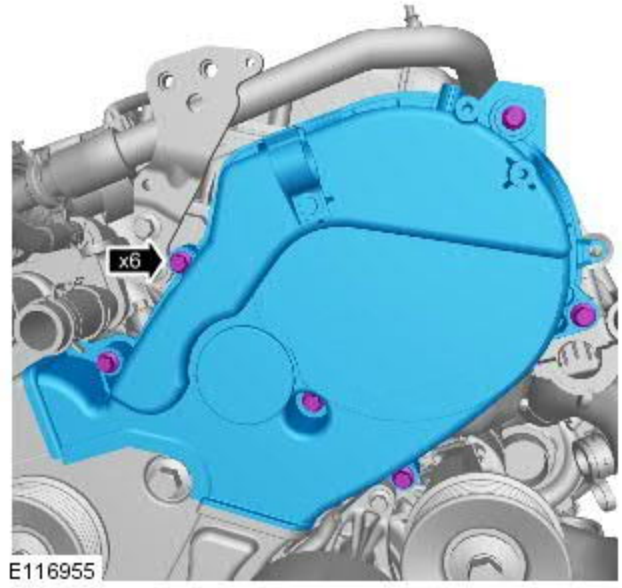
1. CAUTIONS:

   Make sure that the mating faces are clean and free of corrosion and foreign material.

   Install all the bolts finger tight before final tightening.

   NOTE: Install a new gasket.

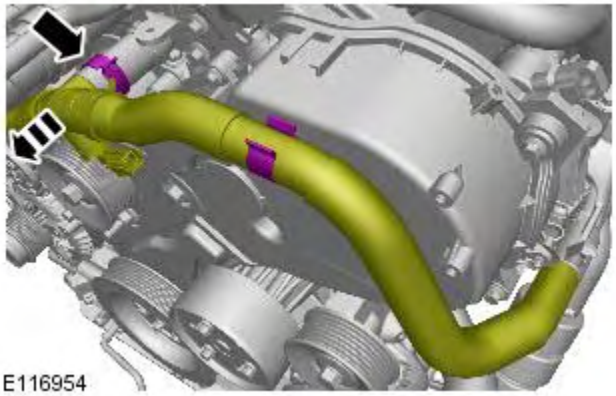
   Torque: 10 Nm



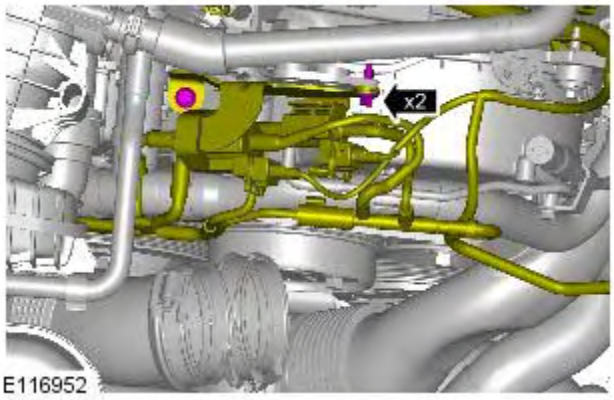
2. NOTE: Install a new gasket.

   Torque: 10 Nm

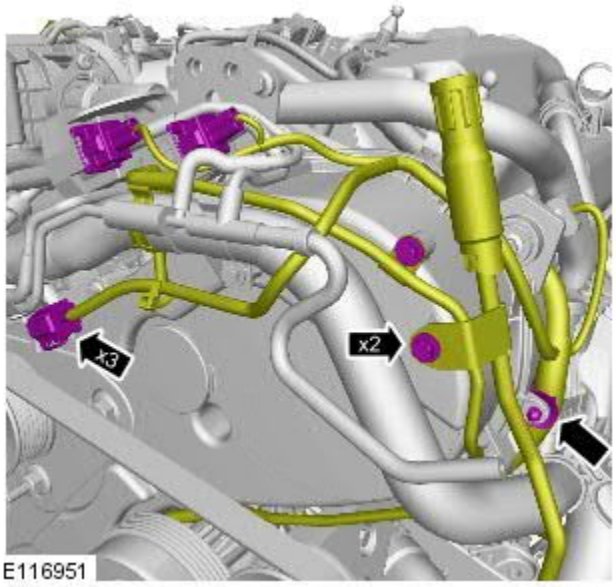
3.



4. *Torque:* 8 Nm

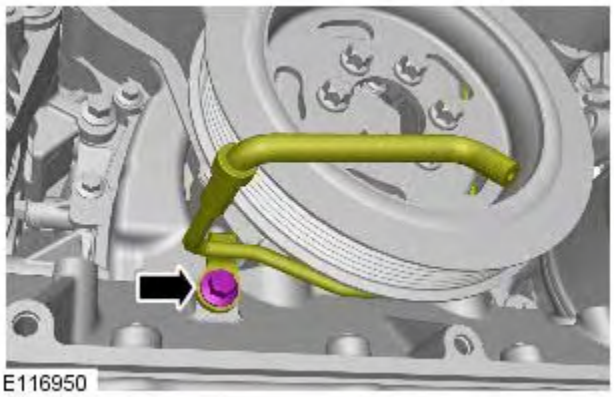


5. *Torque:* 3 Nm

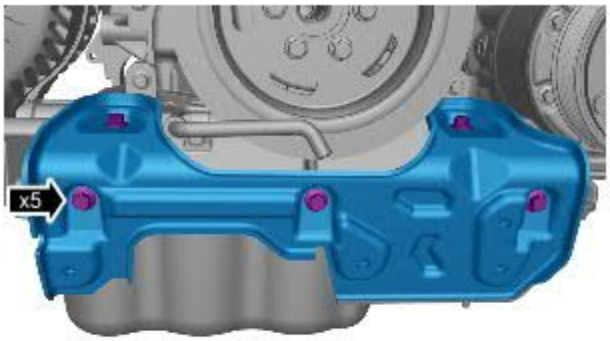


6. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.


E116950

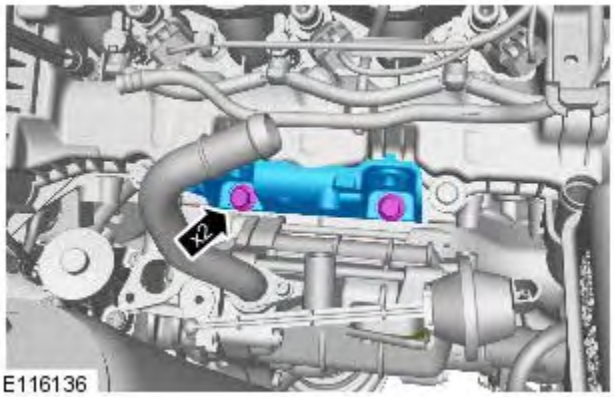
7. *Torque:* 8 Nm



E116949

8. *Torque:* 14 Nm

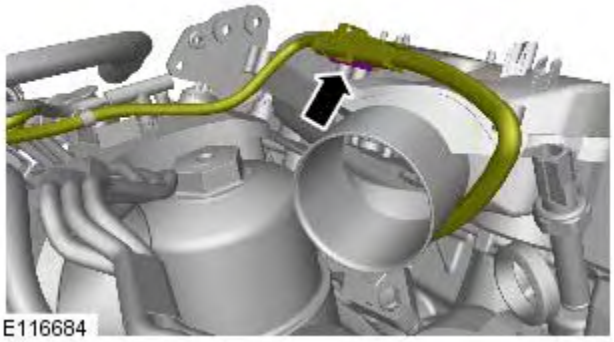
9. Lower the vehicle.



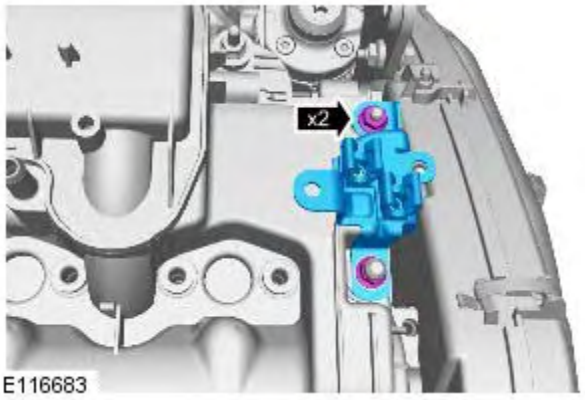
E116136

10. *Torque:* 23 Nm

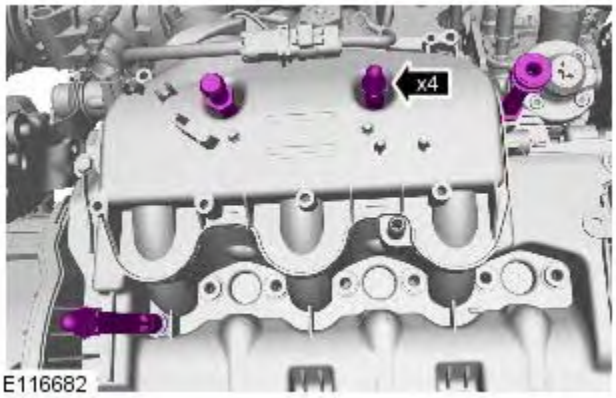
11.



12. *Torque:* 10 Nm



13. *Torque:* 5 Nm



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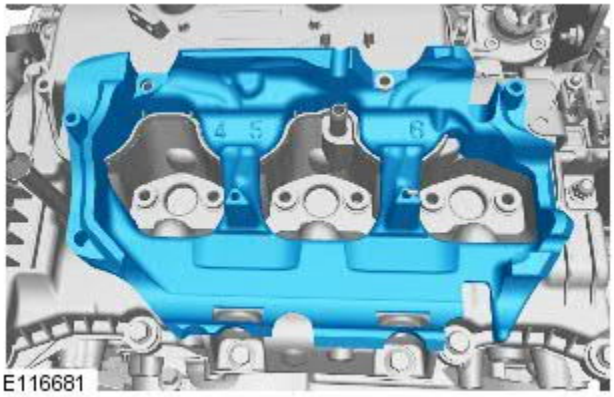

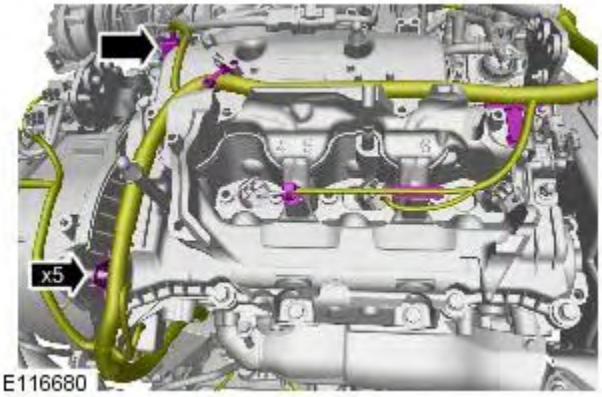

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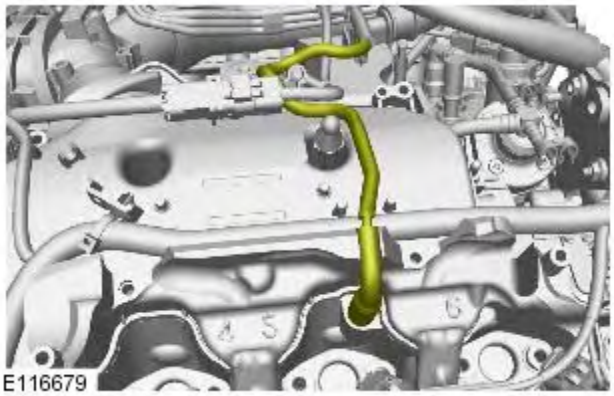

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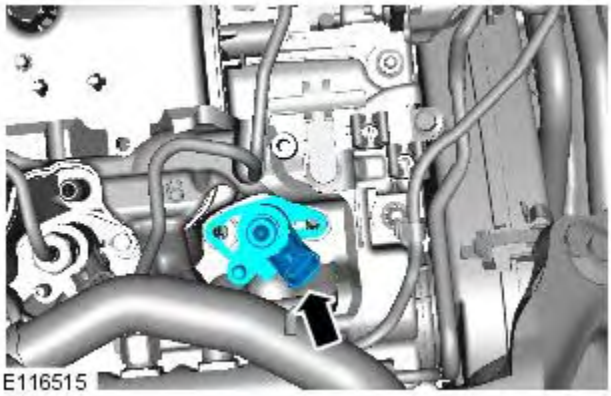
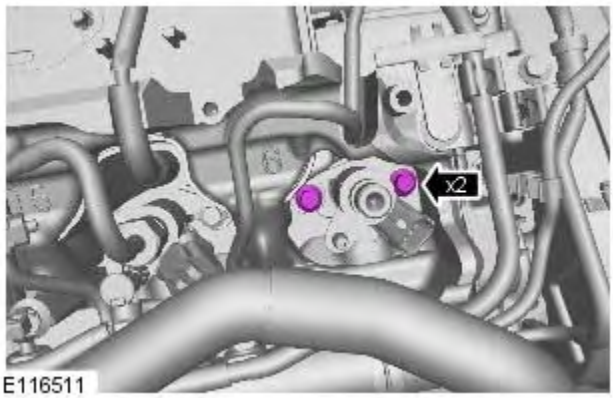
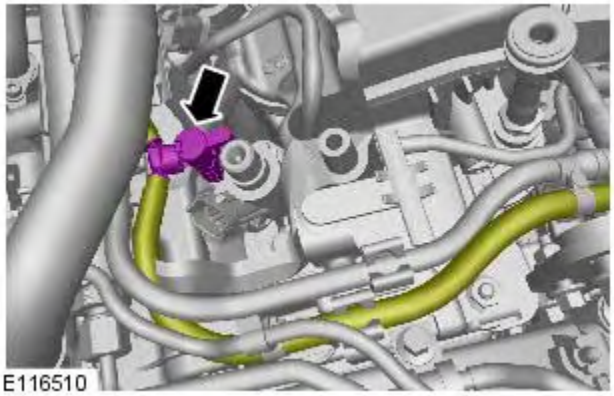


17. CAUTION: Make sure that the area around the open fuel injector ports are clean and free of foreign material and lubricant prior to installing the fuel injector.

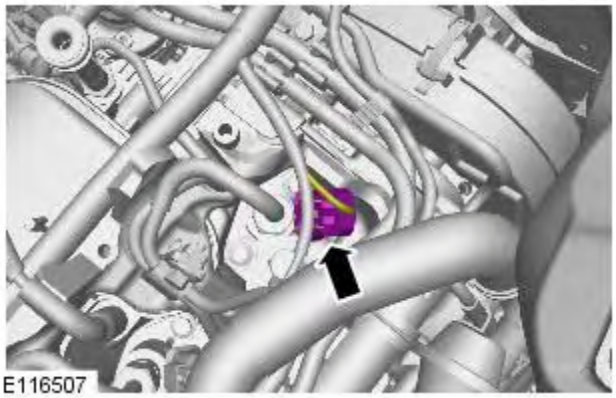


18. NOTE: Tighten the retaining bolts evenly and progressively.

Torque: 9 Nm



19. NOTE: Make sure that the fuel injector return line has a maximum of 8 uses.



20.

21. Install the 2 remaining fuel injectors.

22. Refer to: Intake Air Shutoff Throttle (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).

23. Refer to: Fuel Rail LH (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).

24. Refer to: Accessory Drive Belt (303-05A Accessory Drive - TDV6 3.0L Diesel, Removal and Installation).

25. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 12-Sep-2013

Engine - TDV6 3.0L Diesel - Valve Cover RH

Removal and Installation

Special Tool(s)

E54135	100-012 Slide Hammer
E116924	310-213 Fuel Injector Removal Adapter

Removal

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1. Disconnect the battery ground cable

   Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

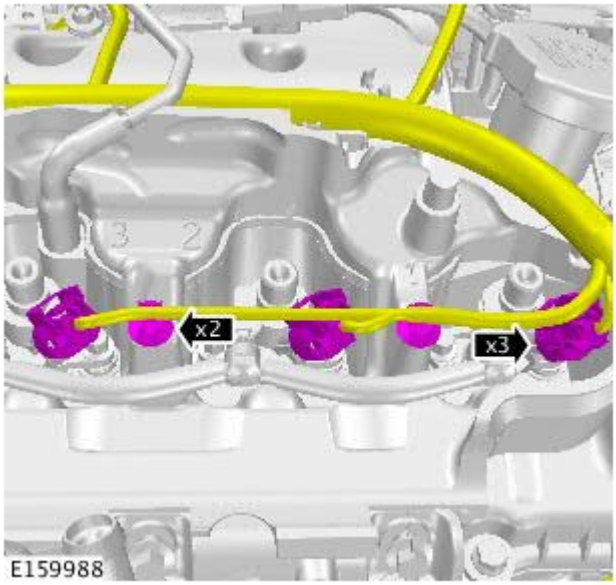
2. Raise and support the vehicle.

3. Refer to: Timing Cover (303-01A Engine - TDV6 3.0L Diesel, Removal and Installation).

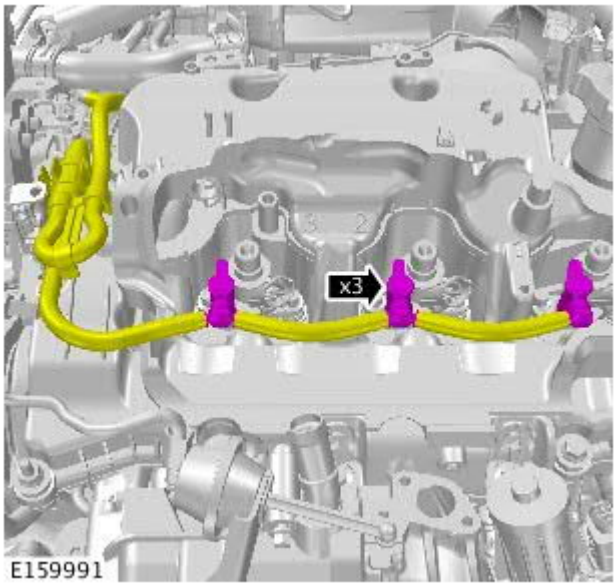
4. Refer to: Fuel Rail RH (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).

5. Refer to: Intake Air Shutoff Throttle (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).

6.

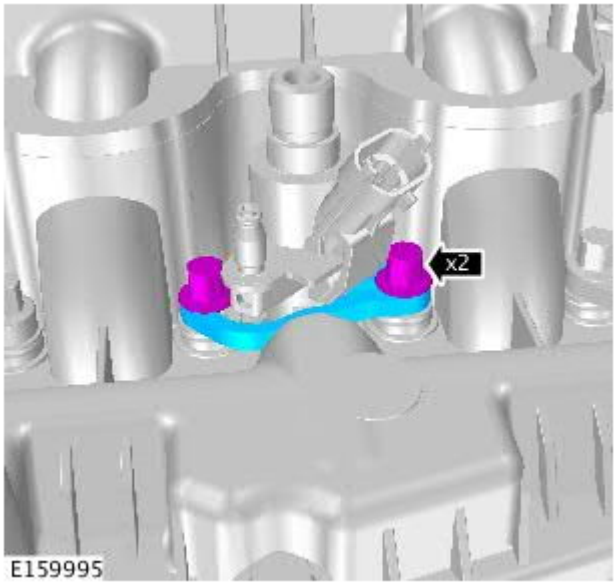


7. Refer to: Fuel Injection Component Cleaning (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, General Procedures).



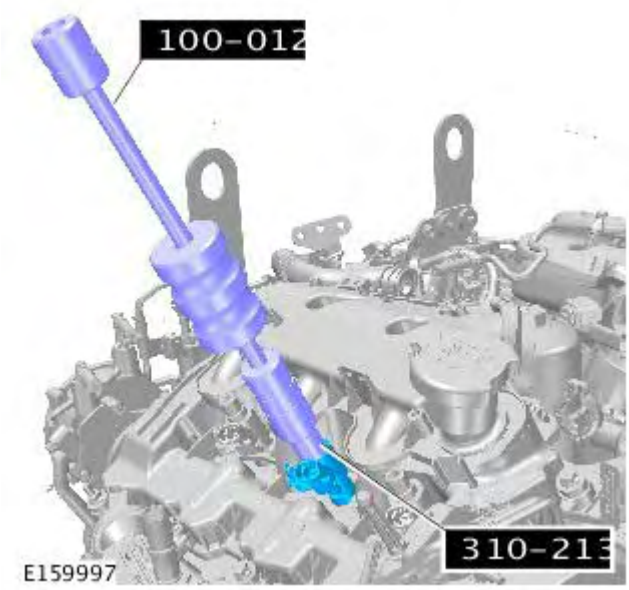
8. CAUTION: Be prepared to collect escaping fuel.

9.

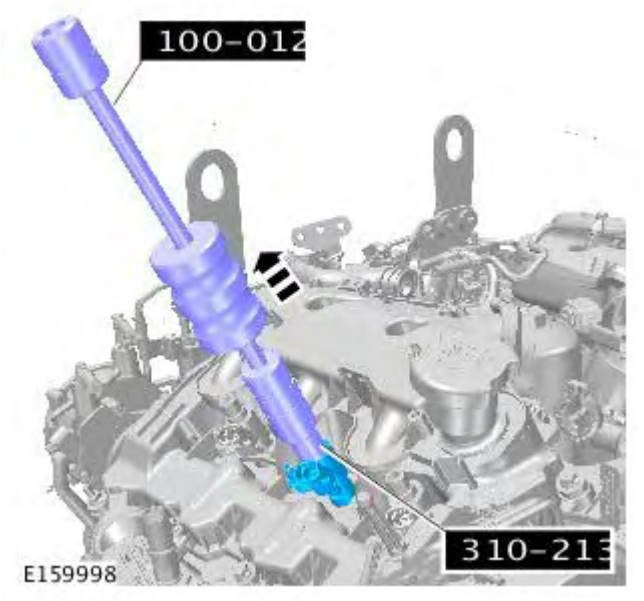


10. Install the special tool.

    Special Tool(s): 100-012, 310-213

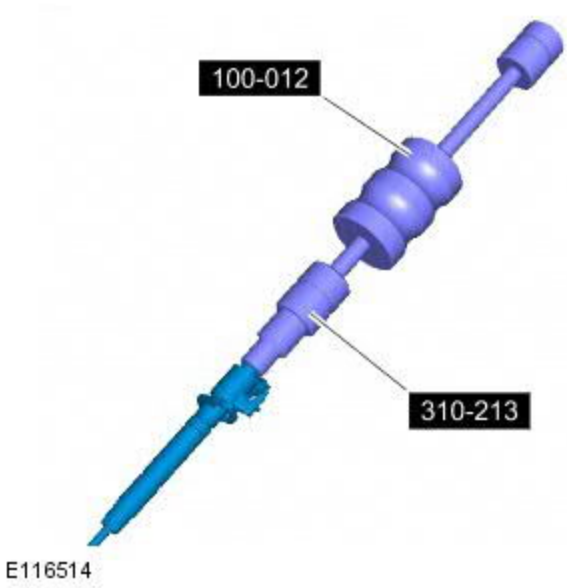


11. *Special Tool(s):* 100-012, 310-213



12. Remove the special tool.

    Special Tool(s): 100-012, 310-213



13. Remove the 2 remaining fuel injectors.

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E130725

14. NOTES:

    This step is only required if new components have not been installed.

    Remove and discard the O-ring seals.

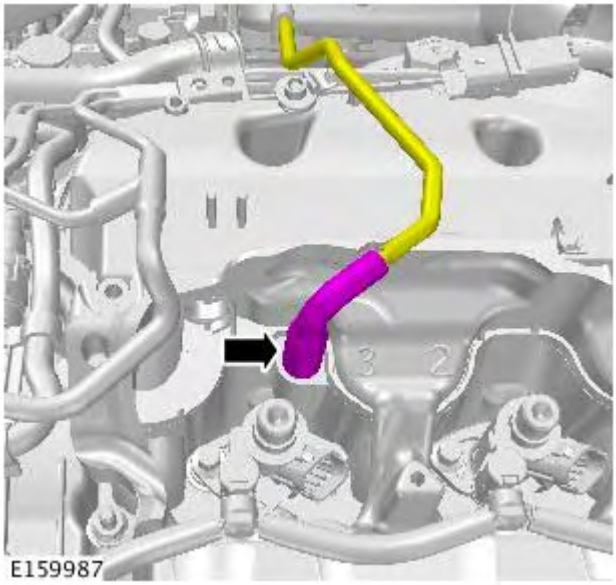
    Discard the sealing washers.

    Repeat this step for each of the fuel injectors.

15. NOTE: This step is only required if new components have not been installed.

E144699

16.



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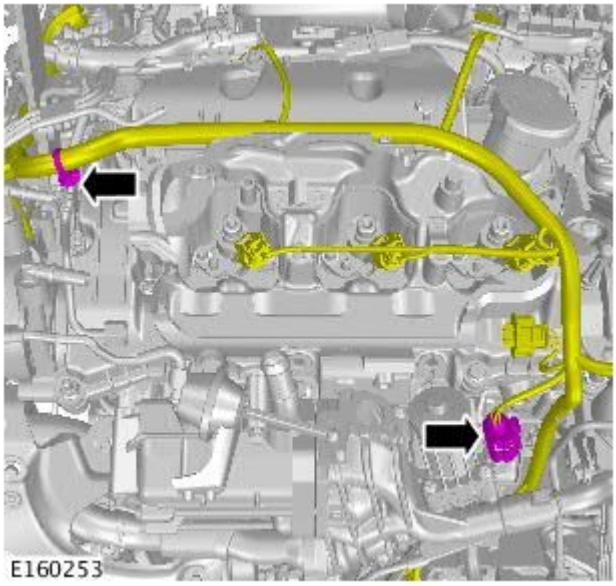

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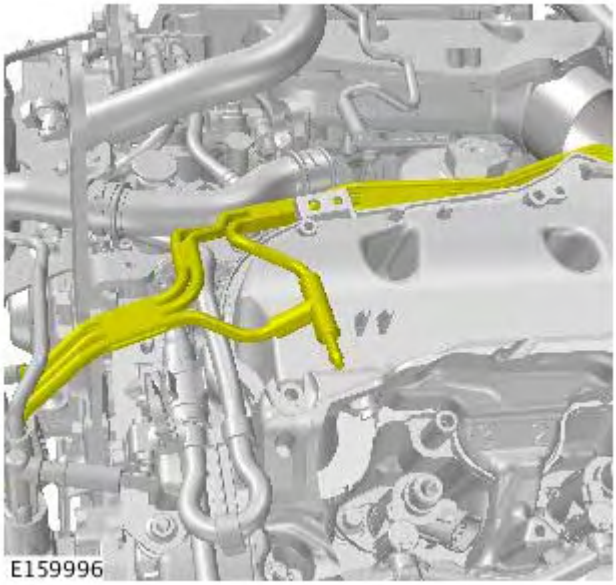

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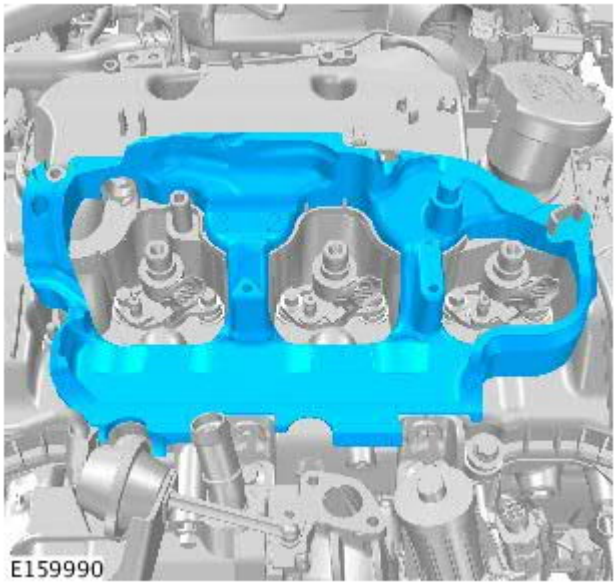

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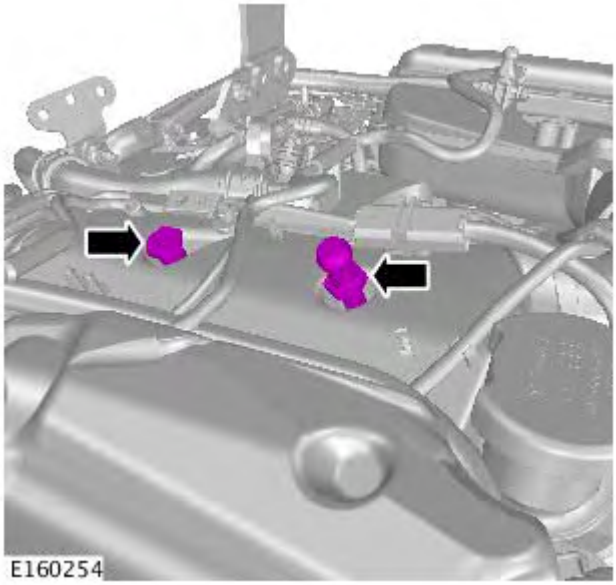

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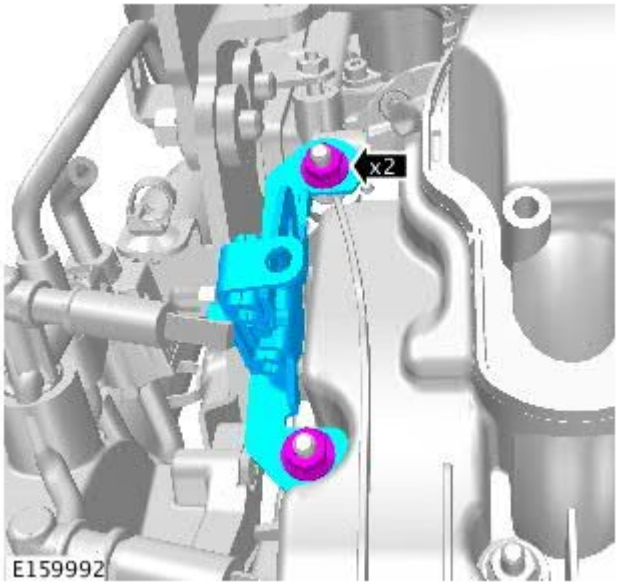

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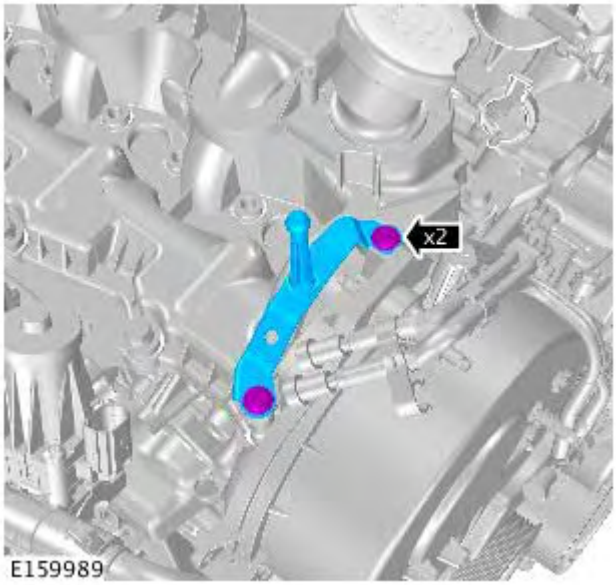

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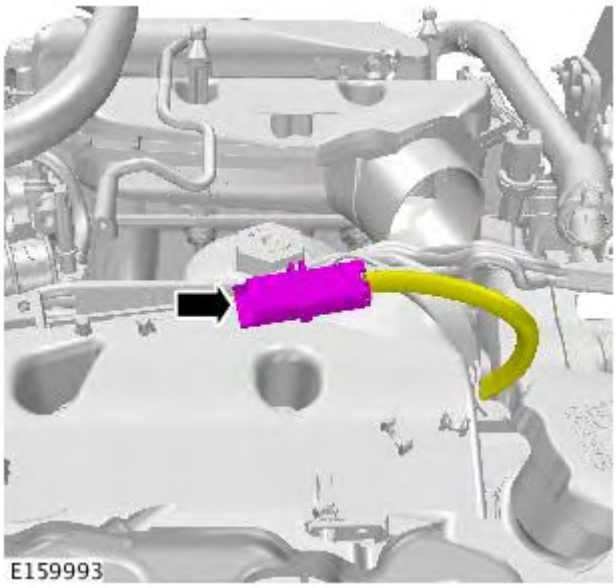

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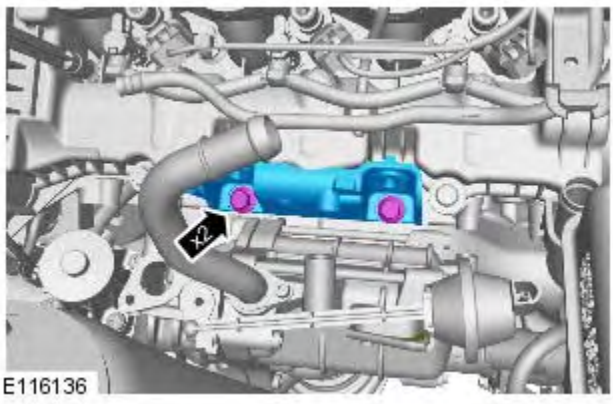


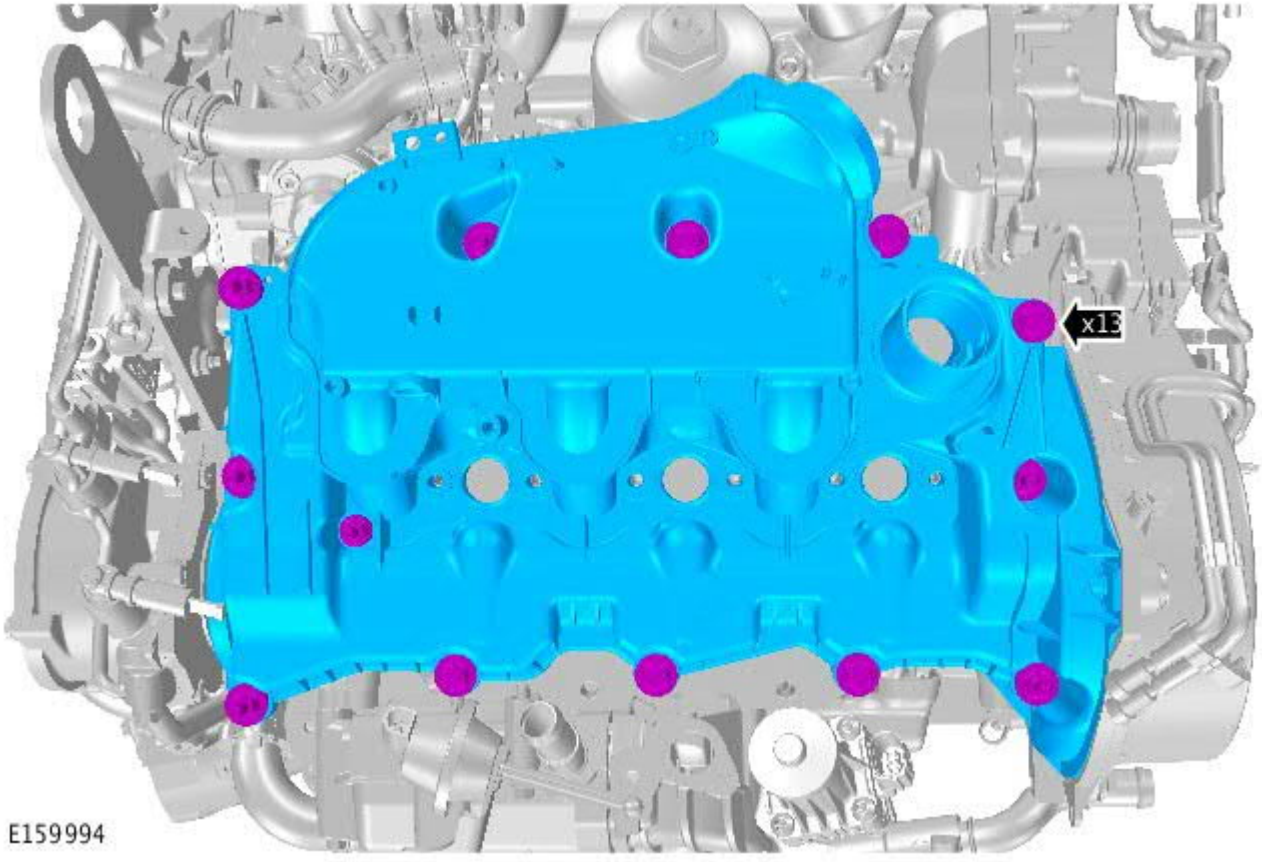
25. CAUTION: Make sure that the mating faces are clean and free of

corrosion and foreign material.

NOTES:

Discard the gasket.

Some variation in the illustrations may occur, but the essential information is always correct.



Installation

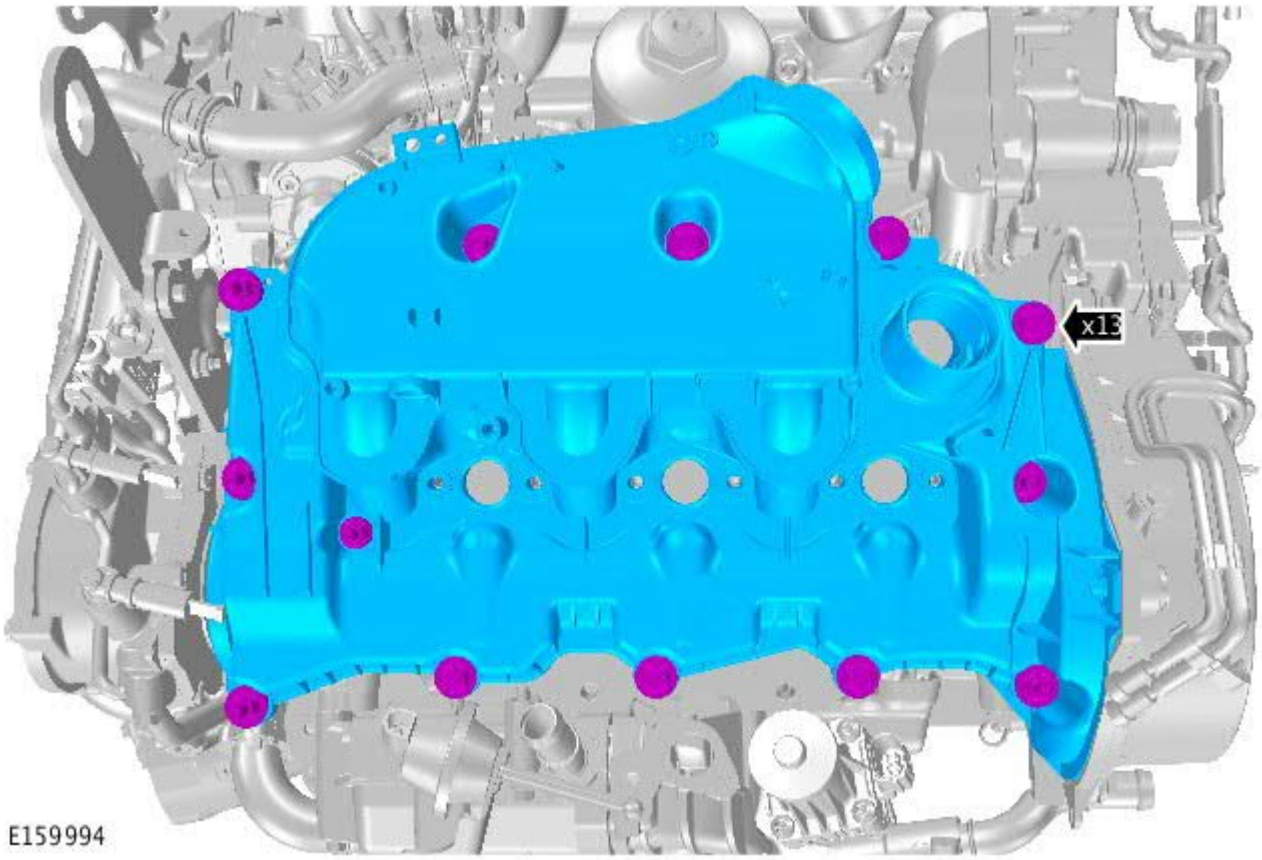
1. CAUTIONS:

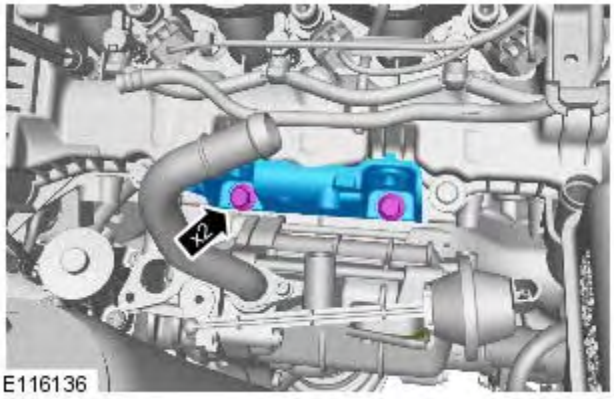
   Make sure that the mating faces are clean and free of corrosion and foreign material.

   Install all the bolts finger tight before final tightening.

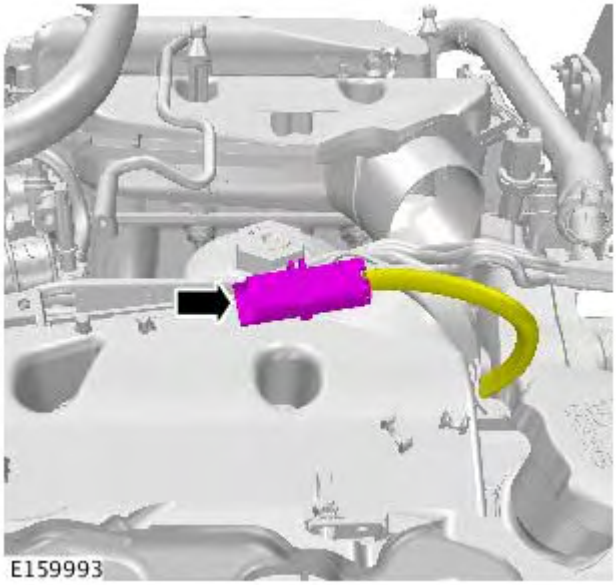
   NOTE: Install a new gasket.

   Torque: 10 Nm





2. *Torque:* 24 Nm



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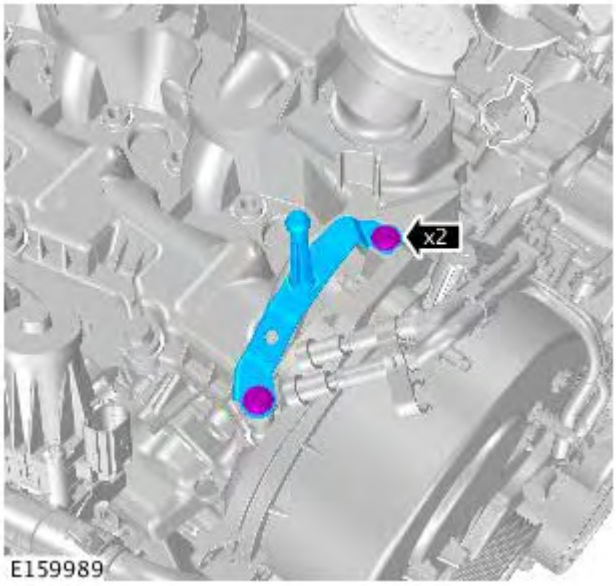
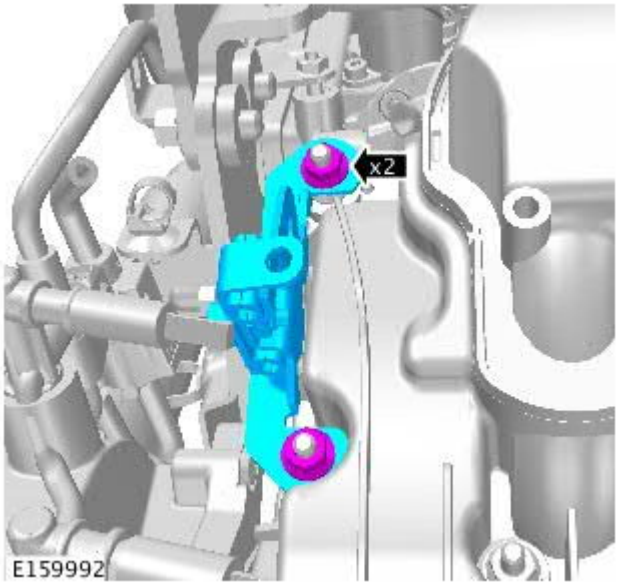
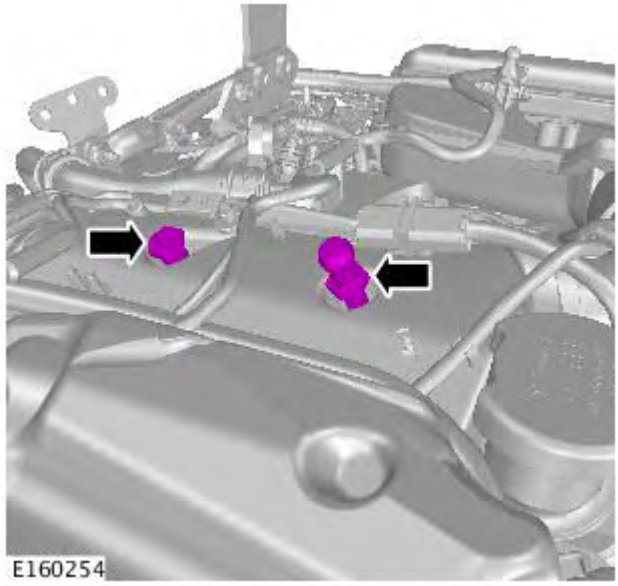


4. *Torque:* 9 Nm

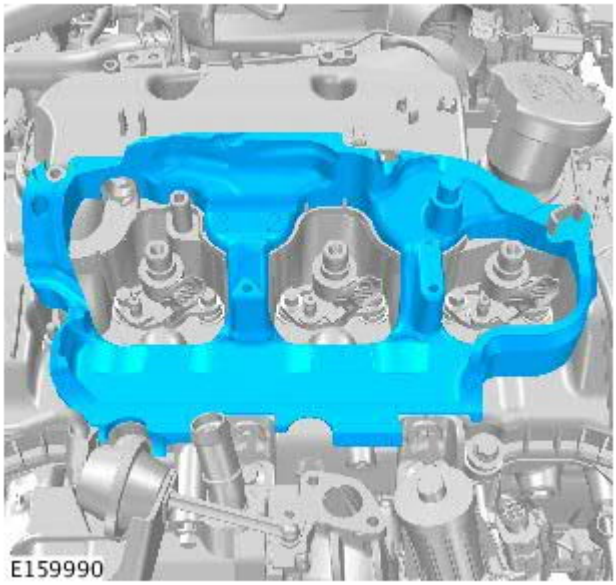


5. *Torque:* 9 Nm



6.

7.



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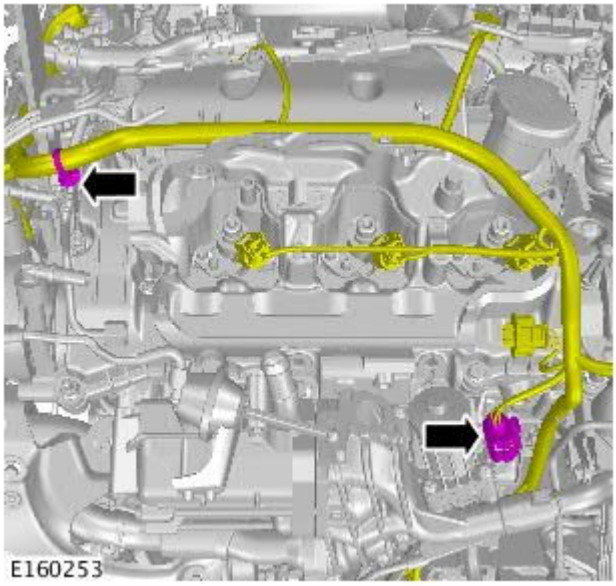

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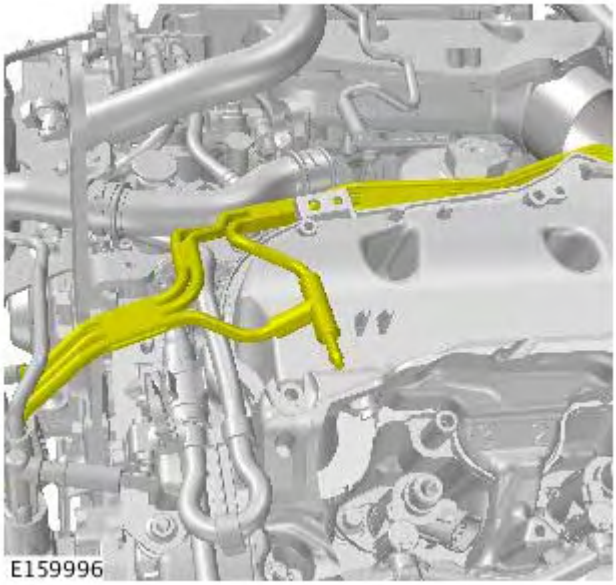

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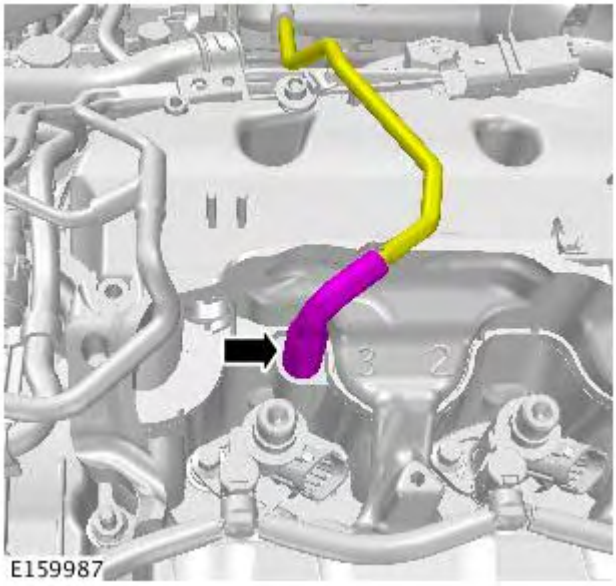
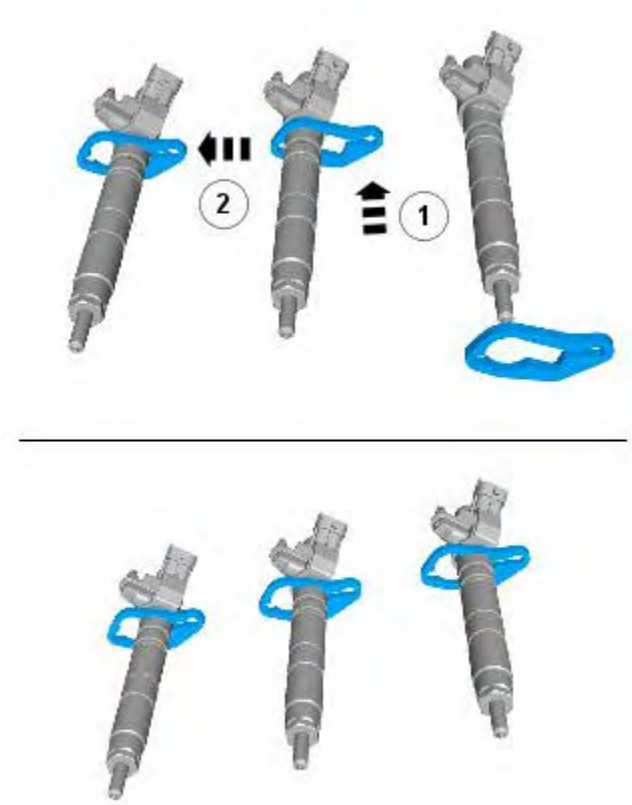




E144700

11. NOTE: This step is only required if previously removed.

E130725

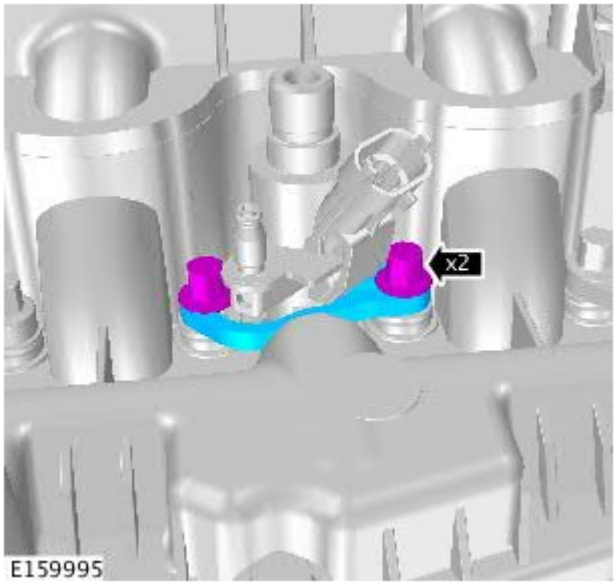
12. CAUTION: Make sure that new sealing washers are installed.

NOTES:

This step is only required if new components are not installed.

Install new O-ring seals.

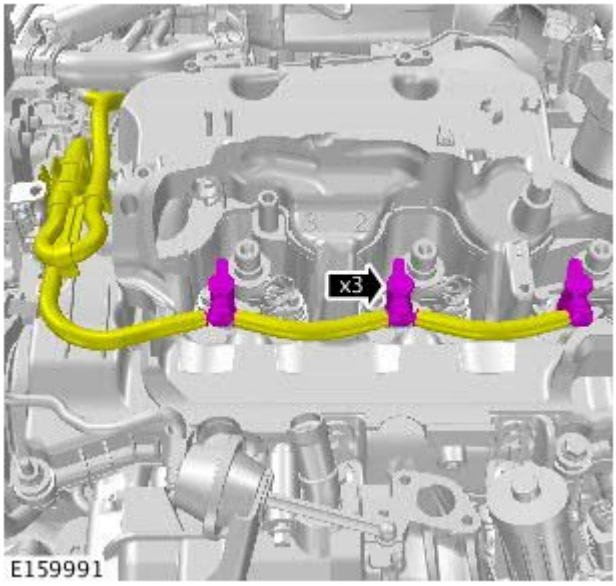
Repeat this step for each of the fuel injectors.



13. CAUTION: Make sure that the area around the open fuel injector ports are clean and free of foreign material and lubricant prior to installing the fuel injector.

NOTE: Tighten the retaining bolts evenly and progressively.

Torque: 9 Nm

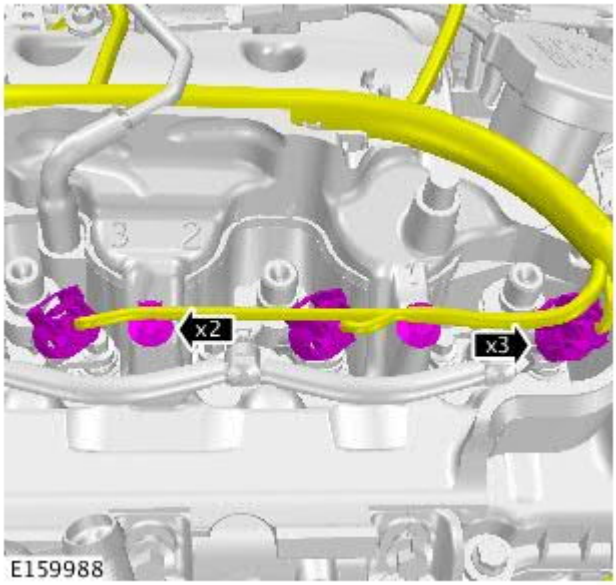


14. CAUTION: Be prepared to collect escaping fuel.

NOTE: Make sure that the fuel injector return line has a maximum of 8 uses.

15. Install the 2 remaining fuel injectors.

16.



17. Refer to: Intake Air Shutoff Throttle (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).

18. Refer to: Fuel Rail RH (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).

19. Refer to: Timing Cover (303-01A Engine - TDV6 3.0L Diesel, Removal and Installation).

20. Reconnect the battery ground cable

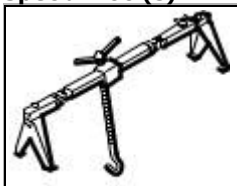
    Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 14-Nov-2013

Engine - TDV6 3.0L Diesel - Engine

Removal

Special Tool(s)

 303-021	303-021 Engine support bracket
E54554	303-1129 Engine Lifting Brackets

CAUTION: Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. Refer to: Hood (501-02 Front End Body Panels, Removal and Installation).

3. Refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

4. Refer to: Secondary Bulkhead Panel RH (501-02 Front End Body Panels, Removal and Installation).

5. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

6. Refer to: Transmission - TDV6 3.0L Diesel (307-01 Automatic Transmission/Transaxle, Removal).

7. Refer to: Turbocharger Bypass Valve (303-04B Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Removal and Installation).

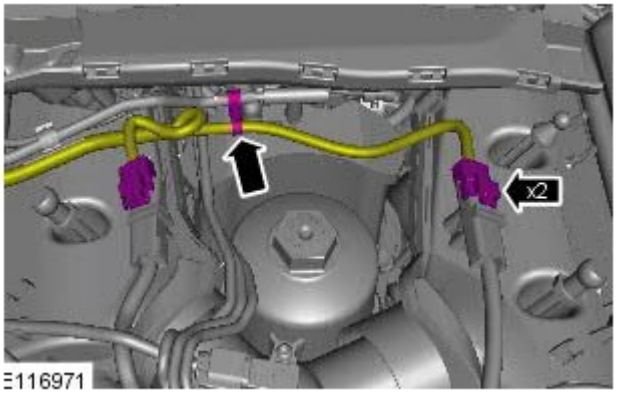
8. Refer to: Cooling System Partial Draining, Filling and Bleeding (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).

9. Refer to: Power Steering System Filling (211-00 Steering System - General Information, General Procedures).

10. Refer to: Coolant Expansion Tank (303-03A Engine Cooling - TDV6 3.0L

Diesel, Removal and Installation).

11. Refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel, Removal and Installation).



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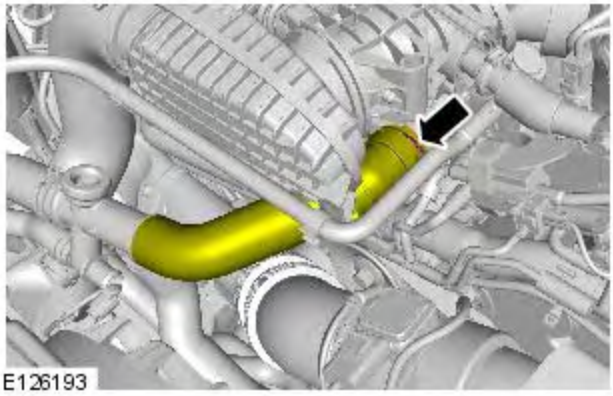
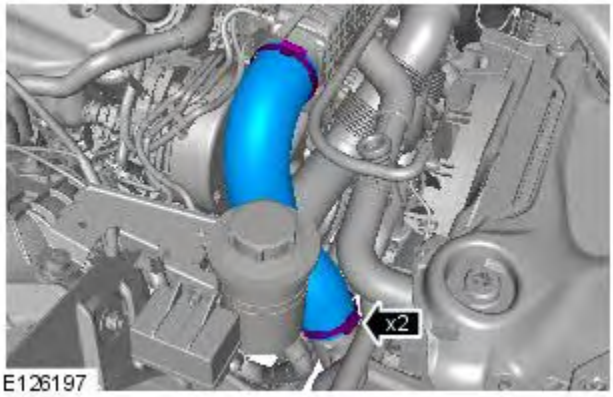


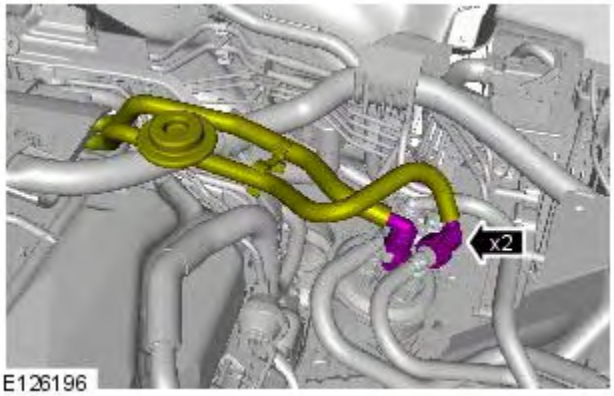
13. CAUTIONS:

Be prepared to collect escaping coolant.

Make sure that all openings are sealed. Use new blanking caps.



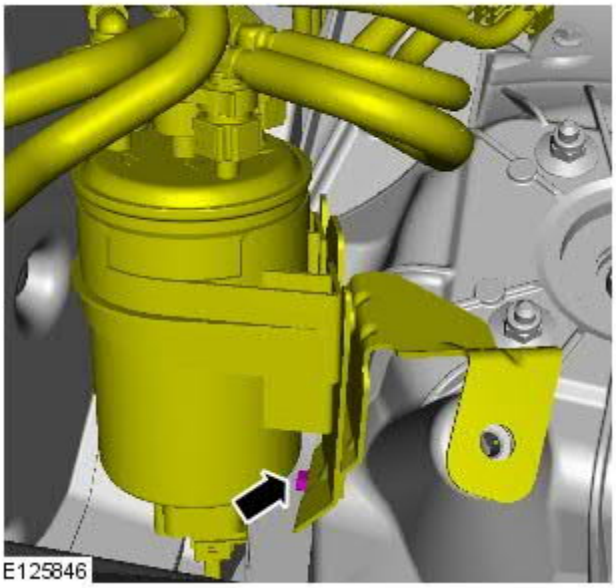
14. CAUTION: Make sure that all openings are sealed. Use new blanking caps.



15. CAUTIONS:

Be prepared to collect escaping fuel.

Make sure that all openings are sealed. Use new blanking caps.



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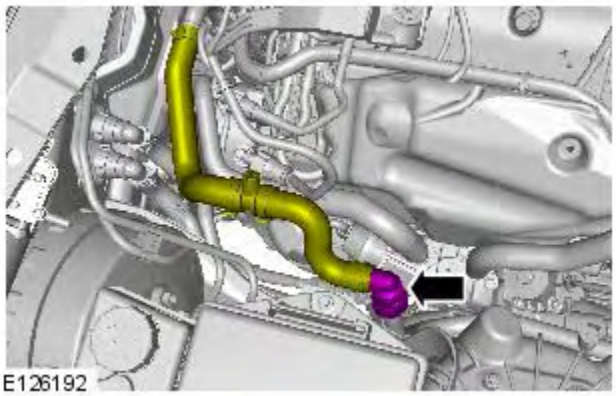
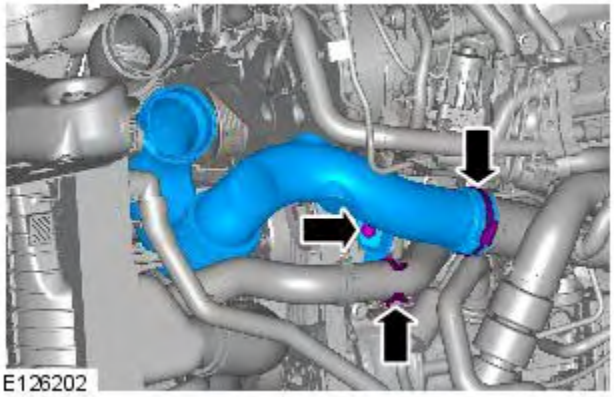


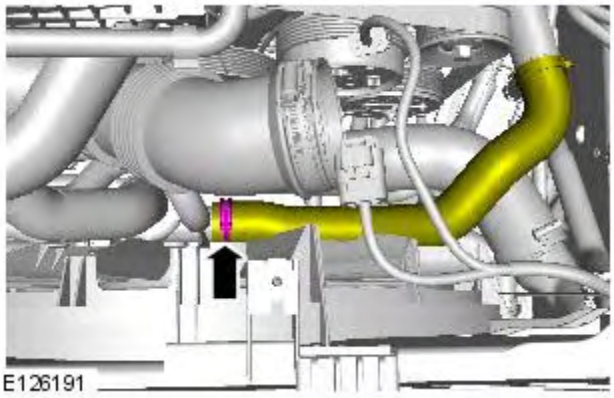
17. CAUTION: Be prepared to collect escaping coolant.

NOTE: Make sure that all openings are sealed. Use new blanking caps.



18. CAUTION: Make sure that all openings are sealed. Use new blanking caps.

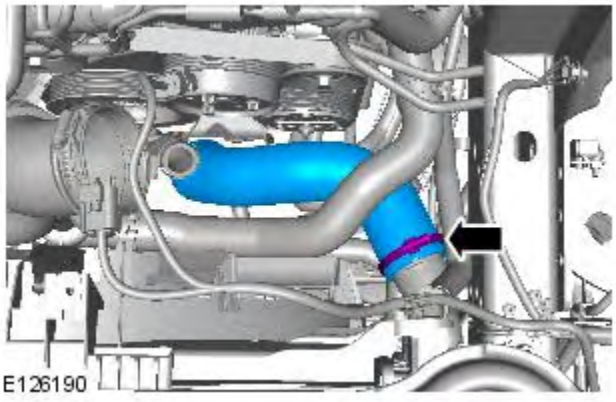
NOTE: Engine shown removed for clarity.



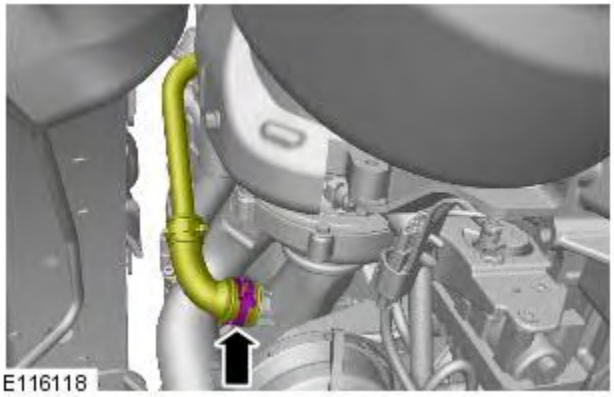
19. CAUTIONS:

Be prepared to collect escaping coolant.

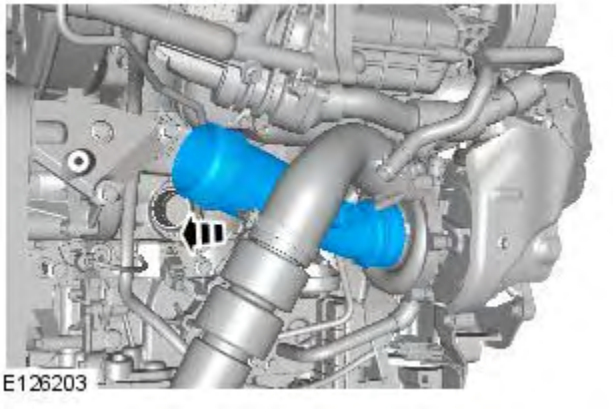
Make sure that all openings are sealed. Use new blanking caps.



20. CAUTION: Make sure that all openings are sealed. Use new blanking caps.

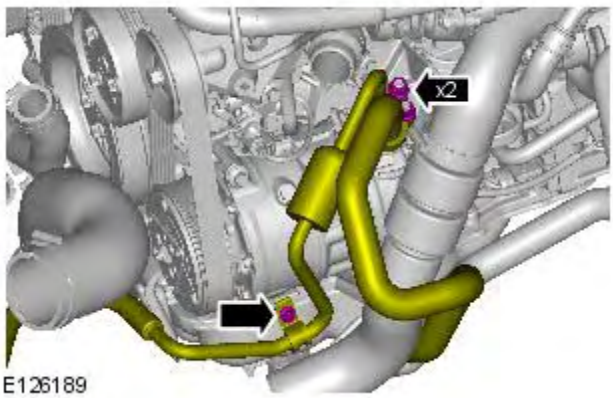


21. CAUTION: Make sure that all openings are sealed. Use new blanking caps.


E126203

22. CAUTION: Make sure that all openings are sealed. Use new blanking caps.

NOTE: Engine shown removed for clarity.



E126189

23. CAUTIONS:

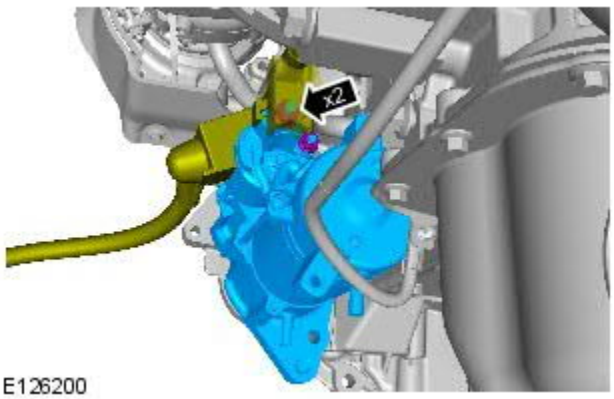
Note the routing of the lines and hoses.

Make sure that all openings are sealed. Use new blanking caps.

NOTES:

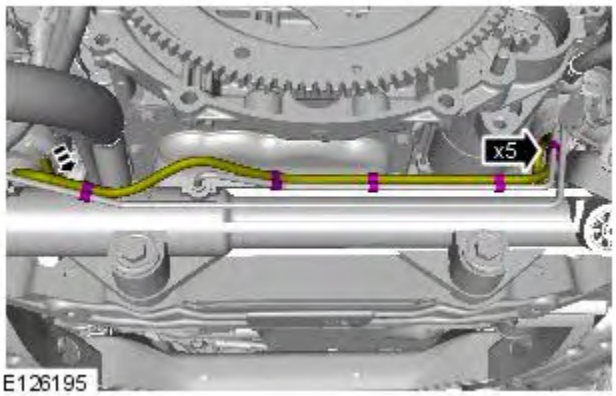
Remove and discard the O-ring seals.

Engine shown removed for clarity.



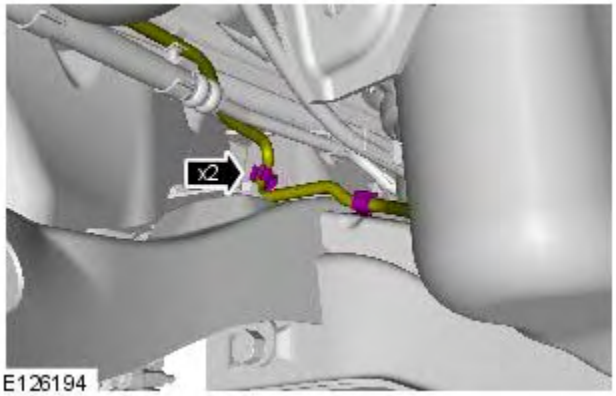
E126200

24. NOTE: Engine shown removed for clarity.

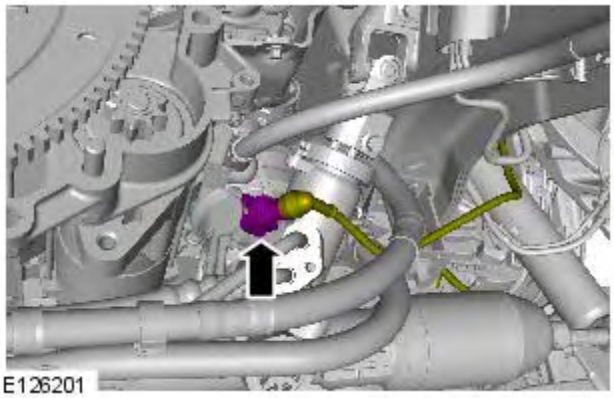


E126195

25. NOTE: Take note of the routing.



26. NOTE: Take note of the routing.



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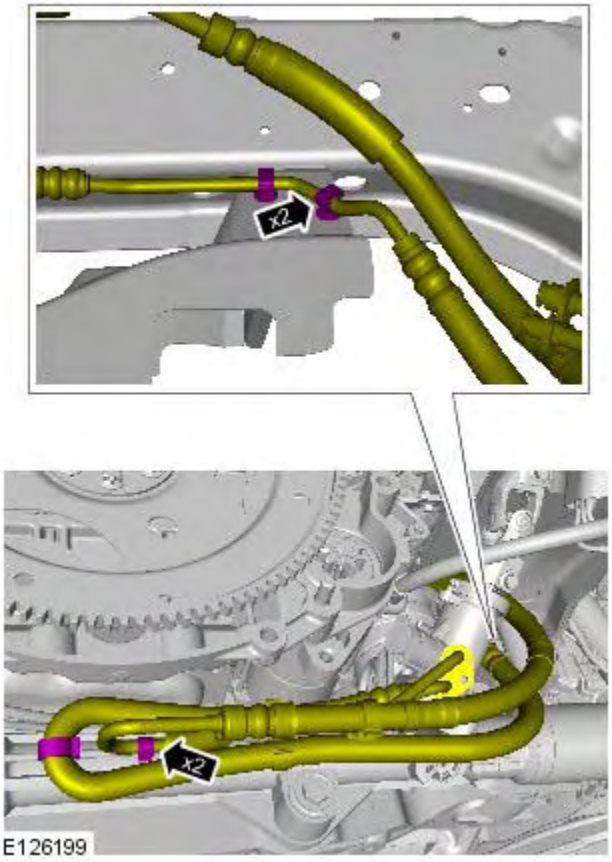
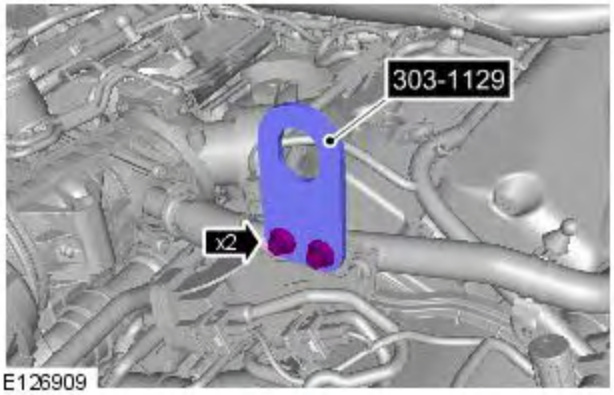
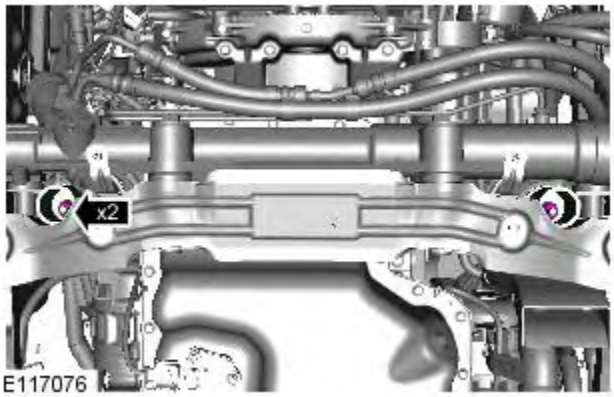


28. NOTE: Take note of the routing.



29. Install the special tool.

    Special Tool(s): 303-1129
    Torque: 22 Nm



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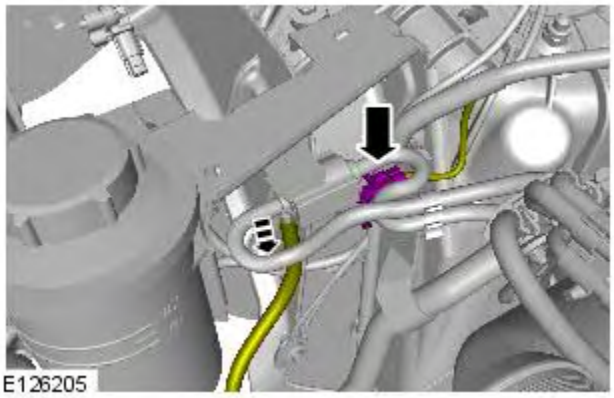

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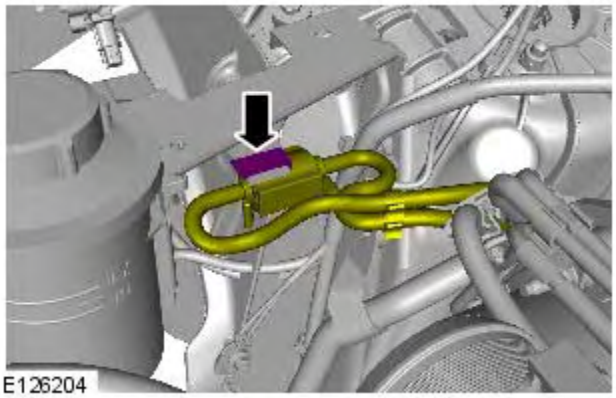

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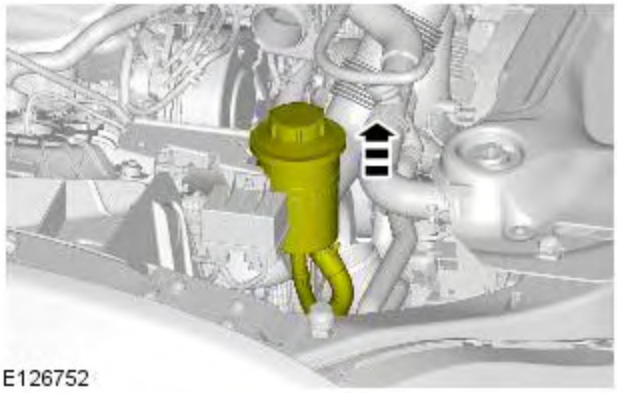
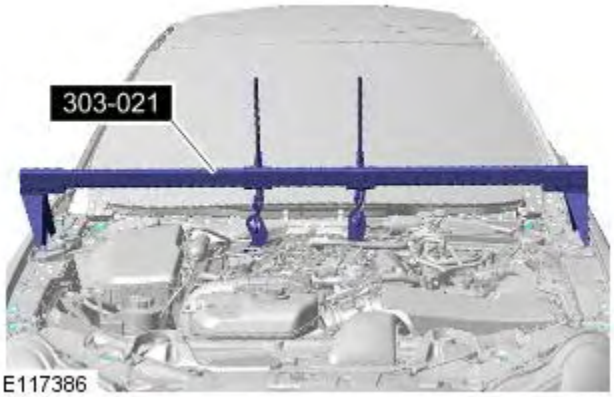

E126752

33.

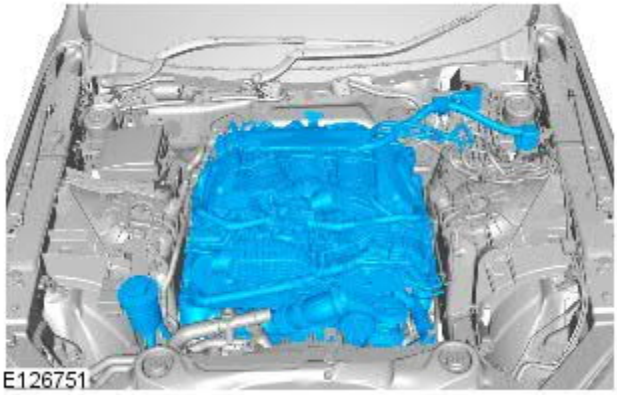


E117386

34. Remove the special tool supporting the engine.

Special Tool(s): 303-021

35. Install the lifting chains.


E126751

36. NOTE: This step requires the aid of another technician.

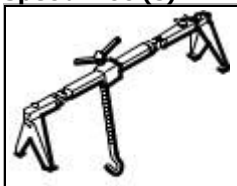
Using a suitable tool, remove the engine.

Published: 14-Nov-2013

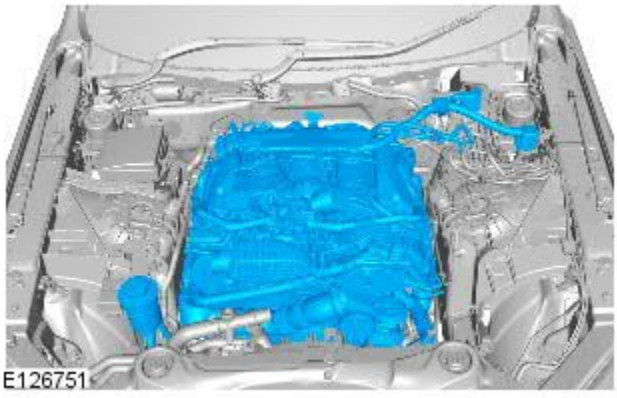
Engine - TDV6 3.0L Diesel - Engine

Installation

Special Tool(s)

 303-021	303-021 Engine support bracket
 E54554	303-1129 Engine Lifting Brackets

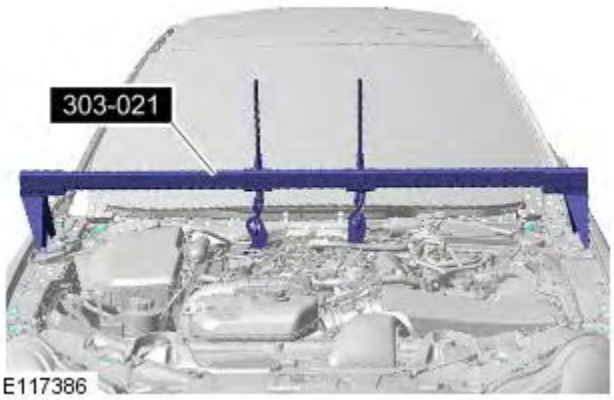
CAUTION: Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.


E126751

1. NOTE: This step requires the aid of another technician.

   Using a suitable tool, install the engine.

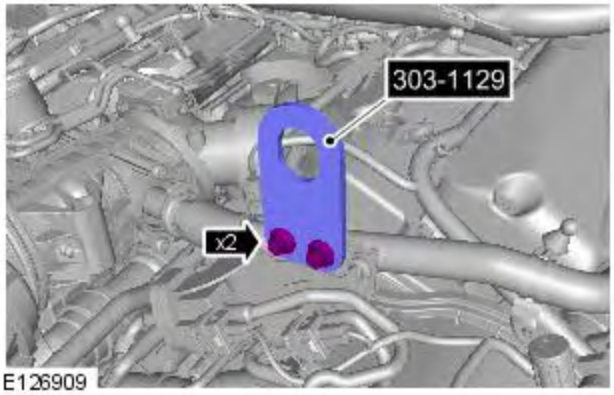
2. Remove the lifting chains.



E117386

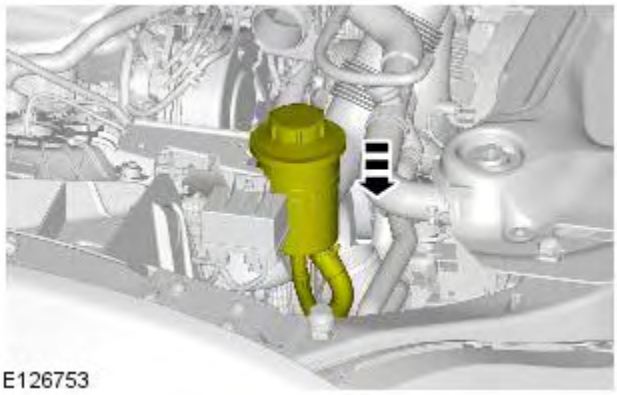
3. Install the engine support tool.

   Special Tool(s): 303-021



4. Remove the special tool.

   Special Tool(s): 303-1129



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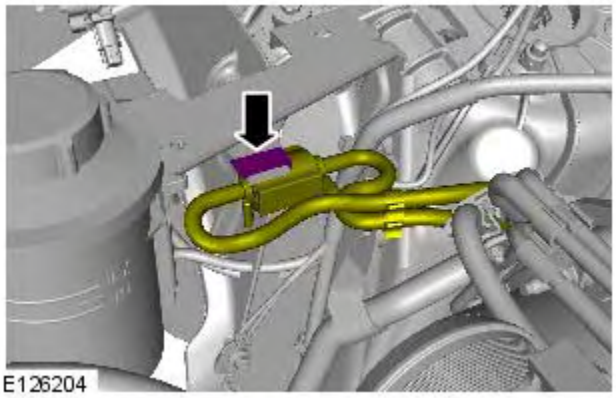

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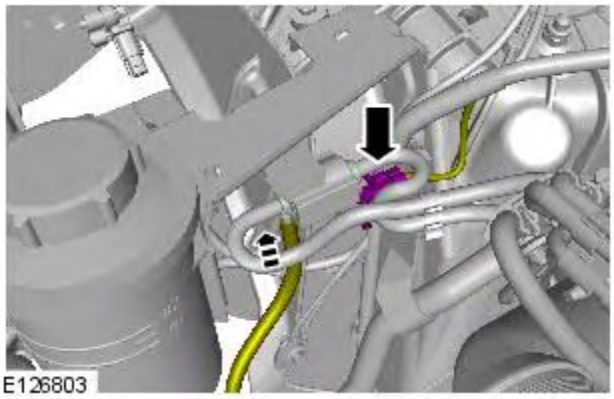

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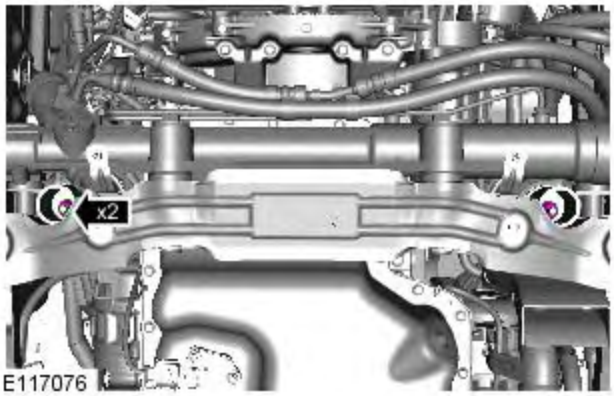
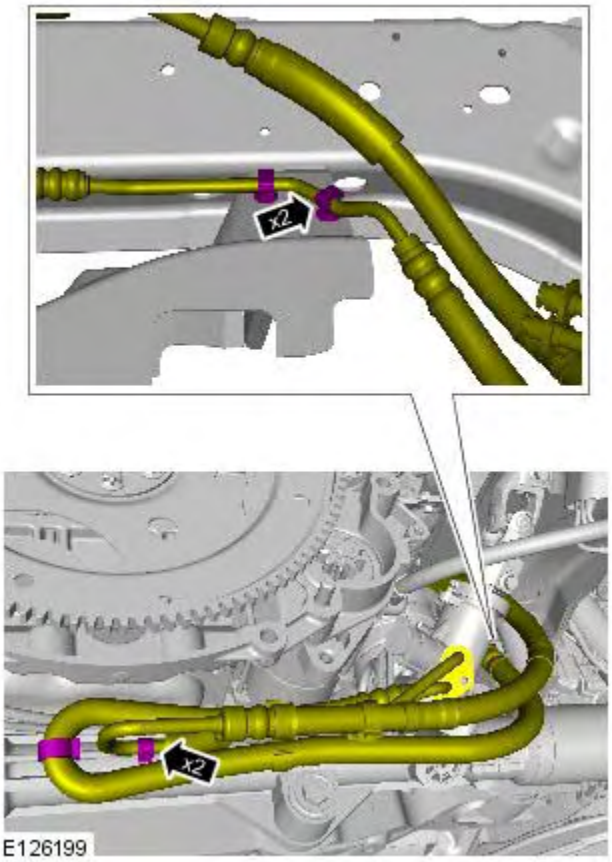


8. *Torque:* 63 Nm

9.



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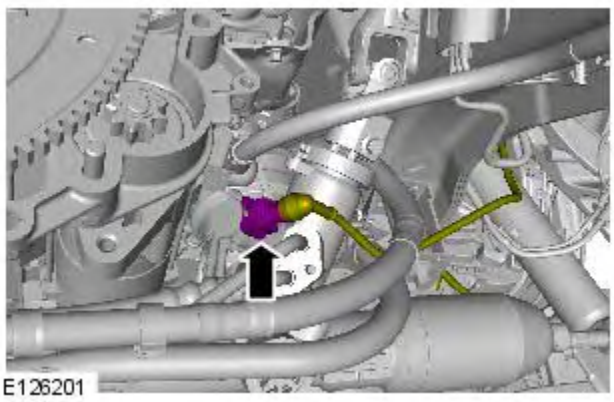

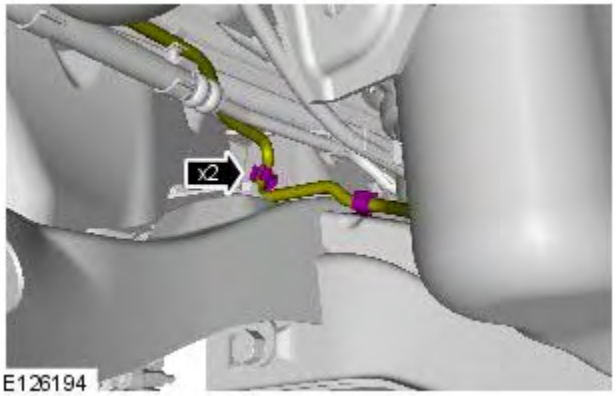

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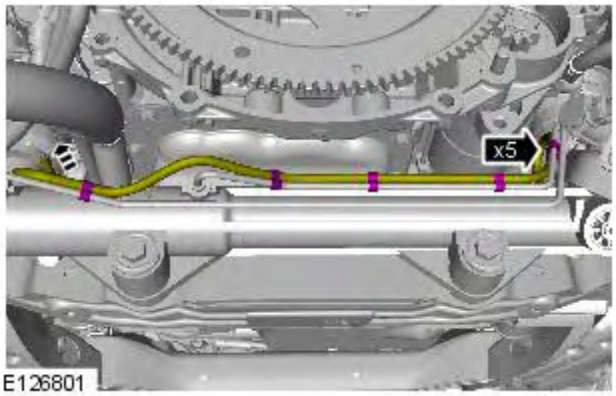

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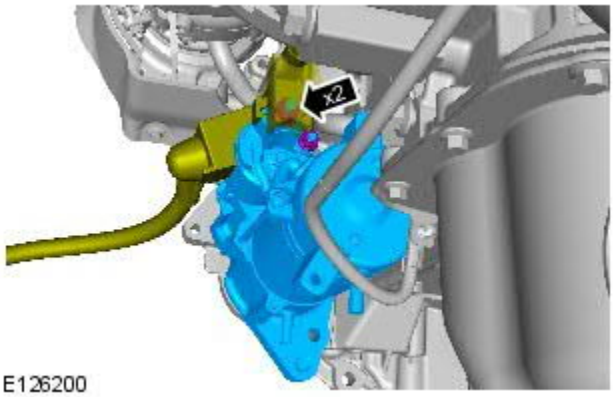
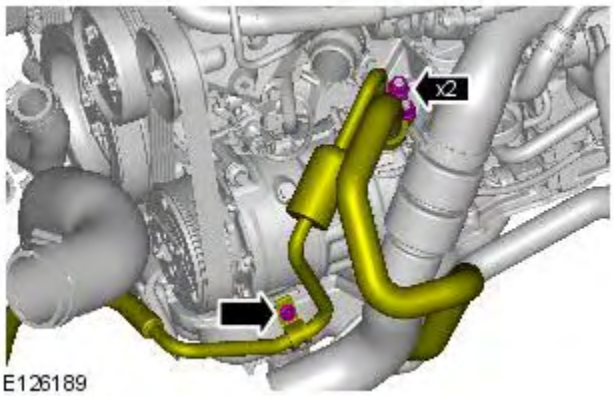
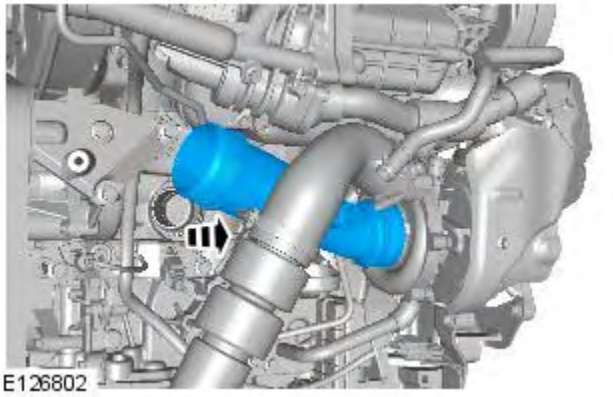


13. *Torque:*
M8 10 Nm
M6 7 Nm

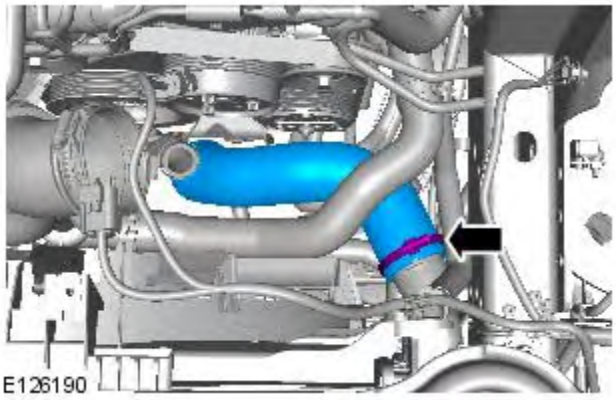


14. CAUTION: Install new o-ring seals

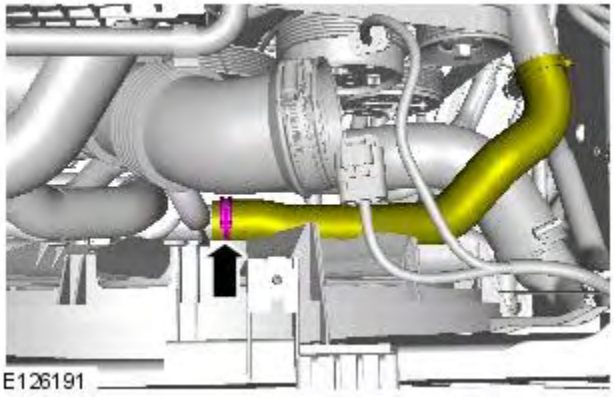
Torque: 10 Nm



15. NOTE: Engine shown removed for clarity.



16. *Torque:* 7 Nm



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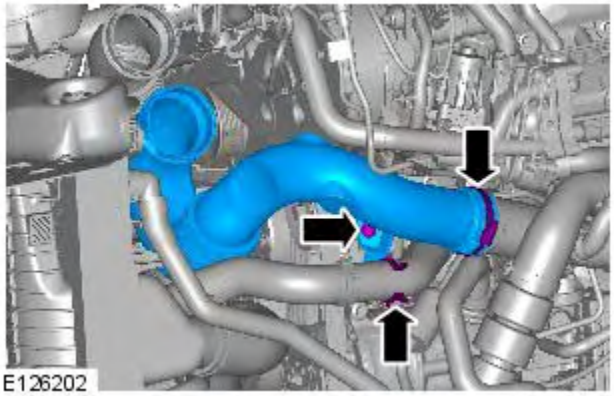
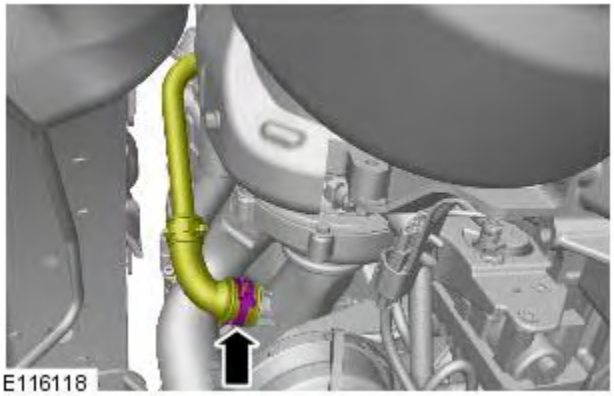


18. NOTE: Engine shown removed for clarity.

Torque:
M6 10 Nm
Clip 7 Nm

19.



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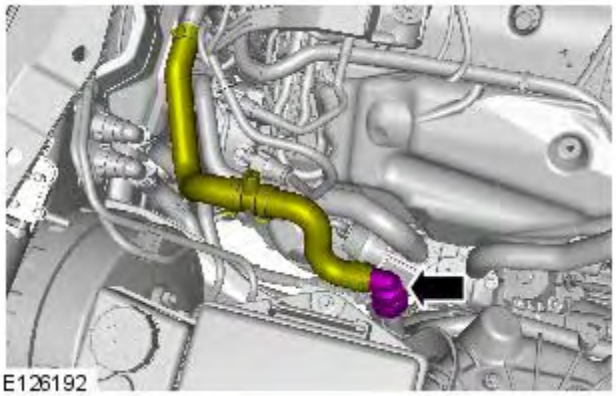
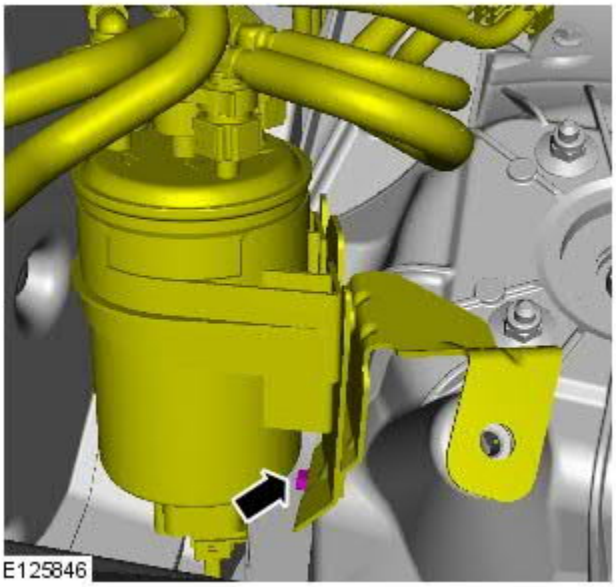


21. *Torque:* 27 Nm



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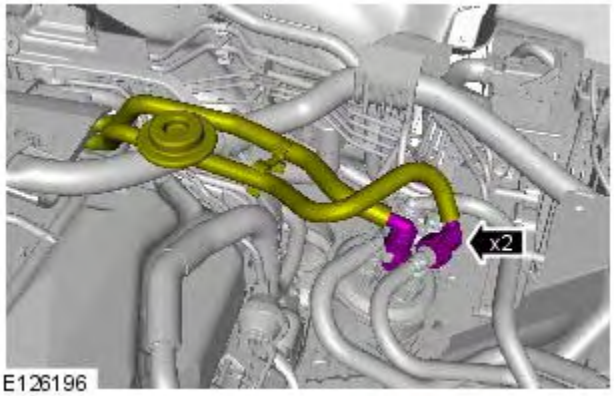
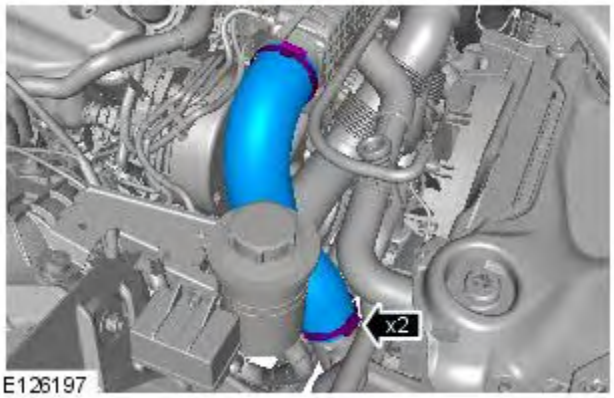


23. *Torque:* 7 Nm



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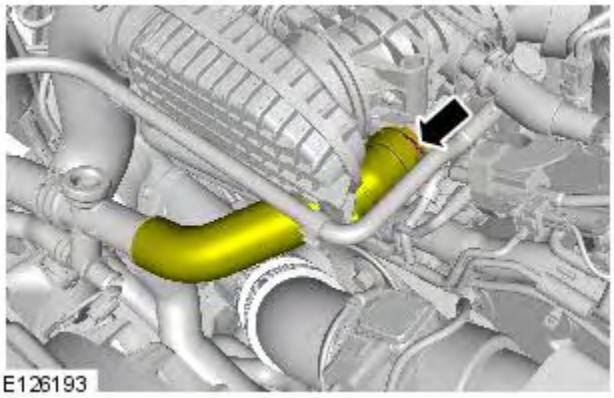

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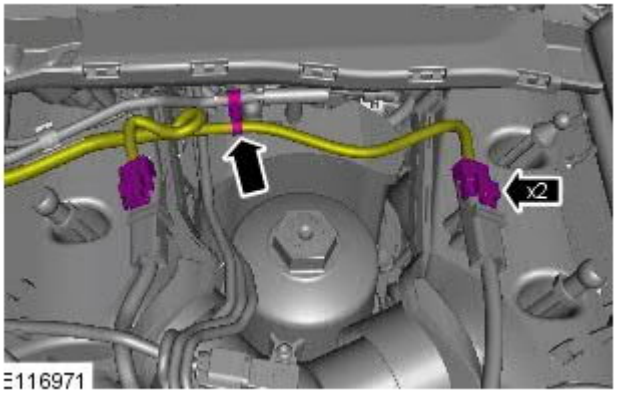


26. Refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel, Removal and Installation).

27. Refer to: Coolant Expansion Tank (303-03A Engine Cooling - TDV6 3.0L Diesel, Removal and Installation).

28. Refer to: Turbocharger Bypass Valve (303-04B Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Removal and Installation).

29. Refer to: Transmission - TDV6 3.0L Diesel (307-01 Automatic Transmission/Transaxle, Installation).

30. Refer to: Secondary Bulkhead Panel RH (501-02 Front End Body Panels, Removal and Installation).

31. Refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

32. Refer to: Cooling System Partial Draining, Filling and Bleeding (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).

33. Refer to: Hood (501-02 Front End Body Panels, Removal and Installation).

34. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

35. Refer to: Power Steering System Filling (211-00 Steering System - General Information, General Procedures).

Published: 11-May-2011

Engine Cooling - TDV6 3.0L Diesel -

Description	Specification
Jaguar Premium Cooling System Fluid	WSS M97B44-D
Jaguar Premium Cooling System Flush	EGR-M14P7-A

Engine	Capacity (Dry)	Capacity (Fill)
3.0D	12.53 Liters	9.7 Liters

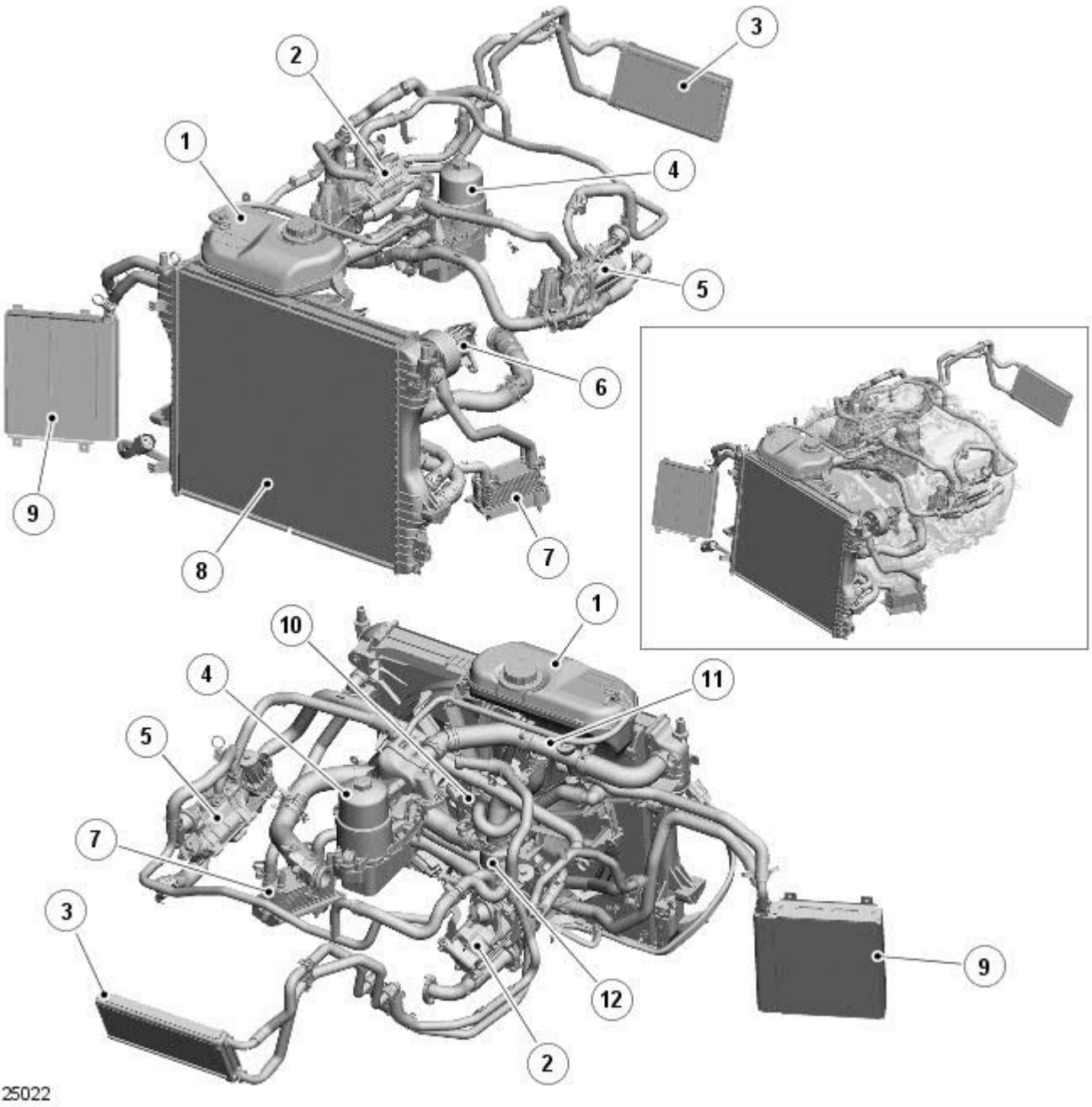
Description	Nm	lb-ft	lb-in
Coolant expansion tank retaining bolt	7	-	62
Coolant expansion tank bleed bolt	3	-	27
Cooling fan motor and shroud retaining nuts	7	-	62
Thermostat housing to shroud bolt	7	-	62
Coolant pump retaining bolts	25	18	-
Thermostat housing upper to lower bolts	4	-	35
Radiator panel bolts	9	-	80
Radiator drain plug	2	-	18

Published: 11-May-2011

Engine Cooling - TDV6 3.0L Diesel - Engine Cooling - Component Location

Description and Operation

Component Location - 3.0L V6 Diesel



Item	Description
1	Expansion tank
2	RH (right-hand)EGR (exhaust gas recirculation) cooler
3	Heater core
4	Engine oil cooler
5	LH (left-hand)EGR cooler
6	Coolant pump
7	Transmission oil cooler
8	Radiator
9	Auxiliary radiator

10	Cooling fan
11	5 Way connector
12	Pressure relief thermostat

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Published: 11-May-2011

Engine Cooling - TDV6 3.0L Diesel - Engine Cooling - Overview

Description and Operation

OVERVIEW

The engine cooling system maintains the engine within an optimum temperature range under changing ambient and engine operating conditions. It also provides:

- Heating for the passenger compartment. For additional information refer to Heating and Ventilation 412-01.
- Cooling for:
  - The engine oil
  - The fuel
  - The EGR (exhaust gas recirculation) system - Refer to: Engine Emission Control (303-08A Engine Emission Control - TDV6 3.0L Diesel, Description and Operation).
  - The transmission fluid.

Published: 11-May-2011

Engine Cooling - TDV6 3.0L Diesel - Engine Cooling - System Operation and Component Description

Description and Operation

System Operation

COOLANT CIRCUIT FLOW

When the engine is running the coolant is circulated around the engine cooling system by the coolant pump. From the coolant pump, coolant flows through the cylinder block and the cylinder heads. Some of the coolant in the cylinder block is diverted through the engine oil cooler before returning to the 5-way connector via the water outlet.

From the 5-way connector, the majority of the coolant flows to the pressure relief thermostat, either directly or via the radiator, depending on the temperature of the coolant. Some of the coolant is also directed through the auxiliary cooling radiators returning the cooled coolant to the Pressure Relief Thermostat (PRT) via the radiator bottom hose. From the outlet of the thermostat the coolant flows to the inlet of the coolant pump.

A separate hose from the radiator allows extra-cooled coolant from the radiator to flow through the transmission oil cooler. The coolant from the cooler is returned to the system via a branch in the bottom radiator hose.

Coolant from the water outlet also flows through the EGR (exhaust gas recirculation) coolers and then to the heater core. From the heater core outlet, the coolant flows to the outlet zone of the pressure relief thermostat.

The expansion tank allows expansion of coolant due to temperature increases to pass excess coolant back to the expansion tank. A small hose is connected from the water outlet to the expansion tank for this purpose. As the coolant cools, the coolant is allowed back into the system from the tank via a hose from the expansion tank into the radiator bottom hose.

PRESSURE RELIEF THERMOSTAT (PRT)

The thermostat is closed at temperatures below approximately 82°C (179°F). When the coolant temperature reaches approximately 82°C the thermostat starts to open and is fully open at approximately 96°C (204°F). In this condition the full flow of coolant is directed through the radiator. The thermostat is exposed to 90% hot coolant from the engine on one side and 10% cold coolant returning from the radiator bottom hose on the other side. Hot coolant from the engine passes from the by-pass pipe through four sensing holes in the flow valve into a tube surrounding 90% of the thermostat sensitive area. Cold coolant returning from the engine, cooled by the radiator, conducts through 10% of the sensitive area.

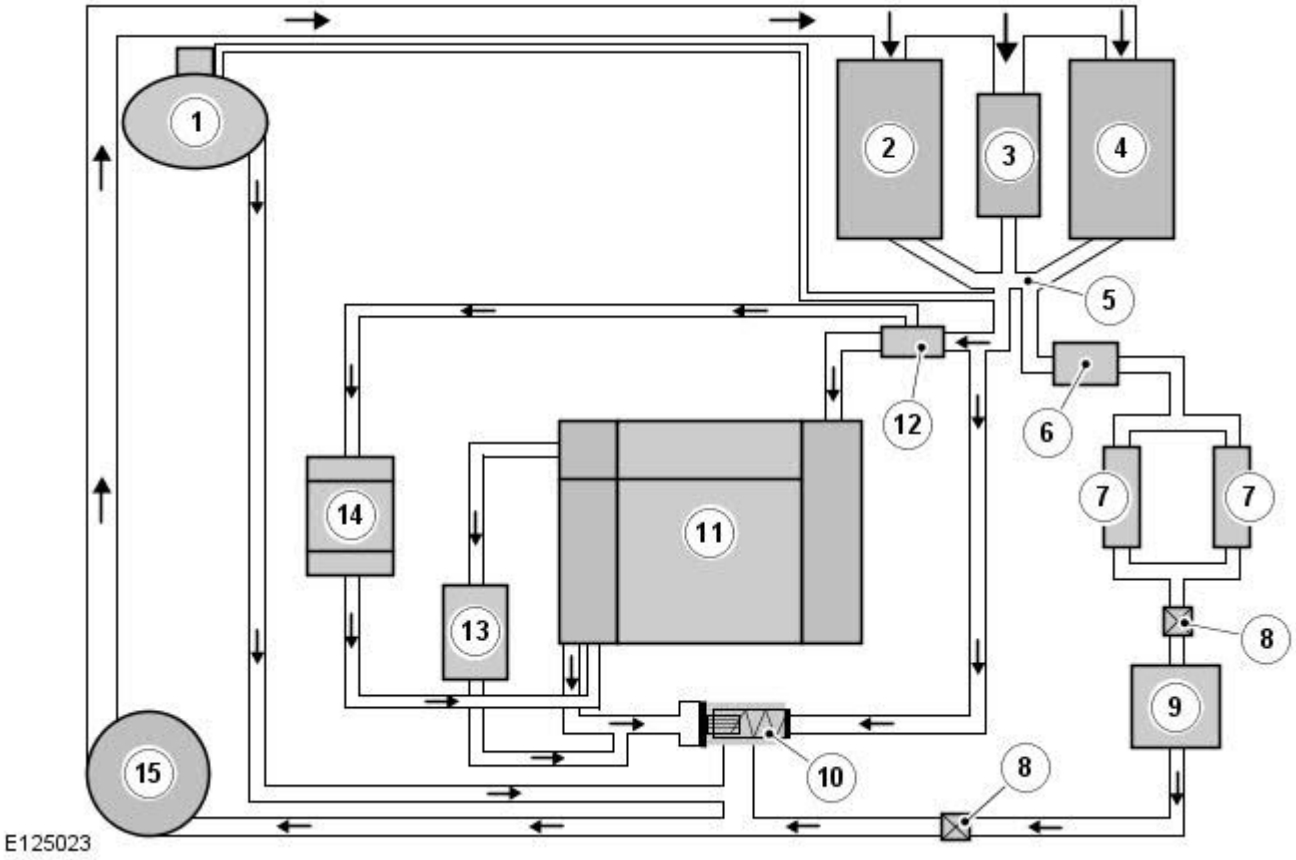
In cold ambient temperatures, the engine temperature is raised by approximately 10°C (50°F) to compensate for the heat loss of 10% exposure to the cold coolant returning from the bottom hose.

The by-pass flow valve is held closed by a light spring. It operates to further aid heater warm-up. When the main valve is closed and the engine speed is at idle, the coolant pump does not produce sufficient flow and pressure to open the valve. In this condition the valve prevents coolant circulating through the by-pass circuit and forces the coolant through the heater matrix only. This provides a higher flow of coolant through the heater matrix to improve passenger comfort in cold conditions. When the engine speed increases above idle, the coolant pump produces a greater flow and pressure than the heater circuit can take. The pressure acts on the by-pass flow valve and overcomes the valve spring pressure, opening the valve and limiting the pressure in the heater circuit. The valve modulates to provide maximum coolant flow through the heater core and yet allowing excess coolant to flow into the by-pass circuit to provide the engine's cooling needs at higher engine speeds.

COOLING FAN

The cooling fan is operated by a fan control module integrated into the cooling fan motor. The fan control module regulates the voltage, and subsequently the speed, of the cooling fan motor in response to a PWM (pulse width modulation) signal from the ECM (engine control module). The ECM calculates the required fan speed from the engine temperature, A/C (air conditioning) system pressure and transmission oil temperature. Under hot operating conditions, the fan may continue to operate for up to four minutes after the engine has been switched off.
Refer to: Electronic Engine Controls (303-14A Electronic Engine Controls - TDV6 3.0L Diesel, Description and Operation).

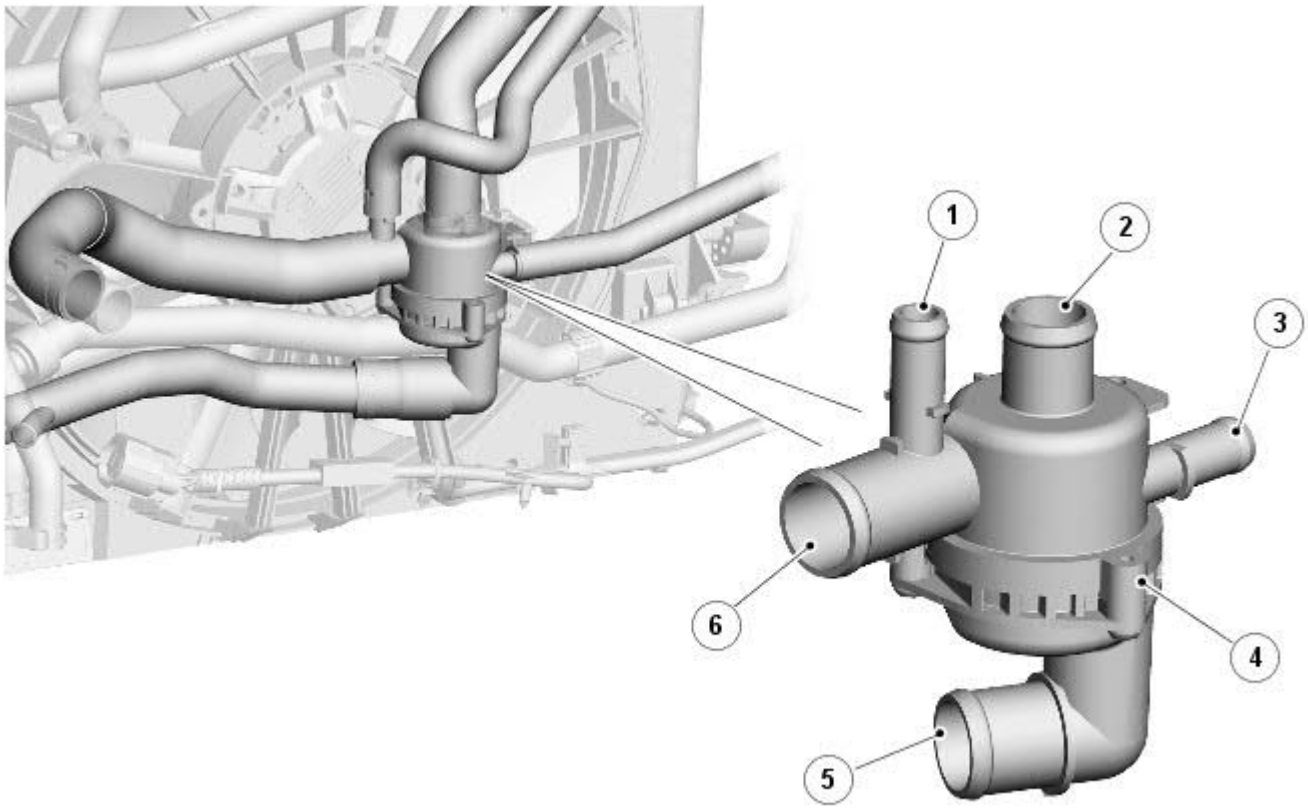
ENGINE COOLING - SCHEMATIC FLOW DIAGRAM



Item	Description
1	Expansion tank
2	Engine LH (left-hand) cylinder bank
3	Engine oil and fuel cooler
4	Engine RH (right-hand) cylinder bank
5	Engine water outlet
6	ECT (engine coolant temperature) sensor
7	EGR coolers
8	Bleed screw
9	Heater core
10	Pressure Relief Thermostat
11	Radiator
12	5 Way connector
13	Transmission fluid cooler
14	Auxiliary radiator
15	Coolant pump

Component Description

PRESSURE RELIEF THERMOSTAT (PRT)



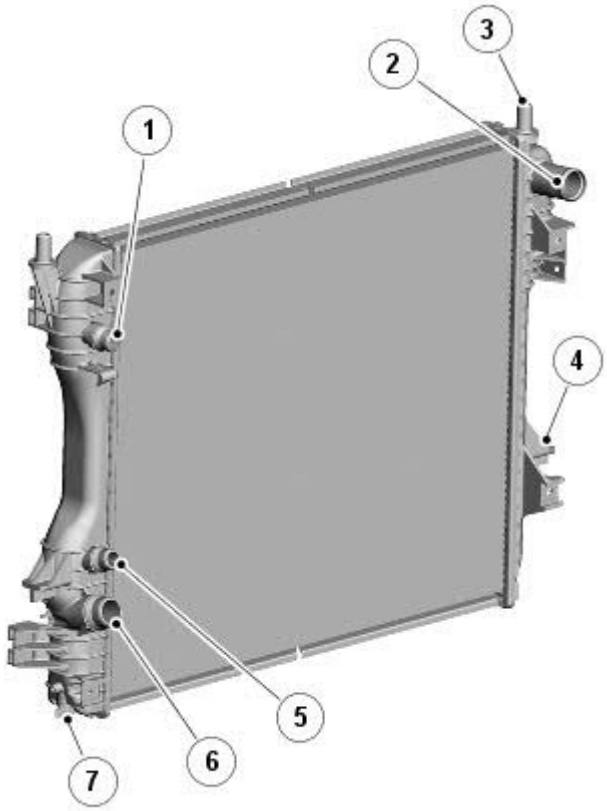
E115003

Item	Description
1	Connection to expansion tank
2	Connection to radiator top hose
3	Heater core return connection
4	PRT body
5	Connection from radiator bottom hose
6	Connection to cylinder block water inlet

A plastic thermostat housing is located behind the radiator. The housing has 5 connections which locate the radiator bottom hose, top hose from the 5-way connector, coolant pump feed hose to the cylinder block and return feed from the heater core. The housing contains a wax element and a spring loaded by-pass flow valve.

The thermostat is used to maintain the coolant at the optimum temperature for efficient combustion and to aid engine warm-up.

RADIATOR



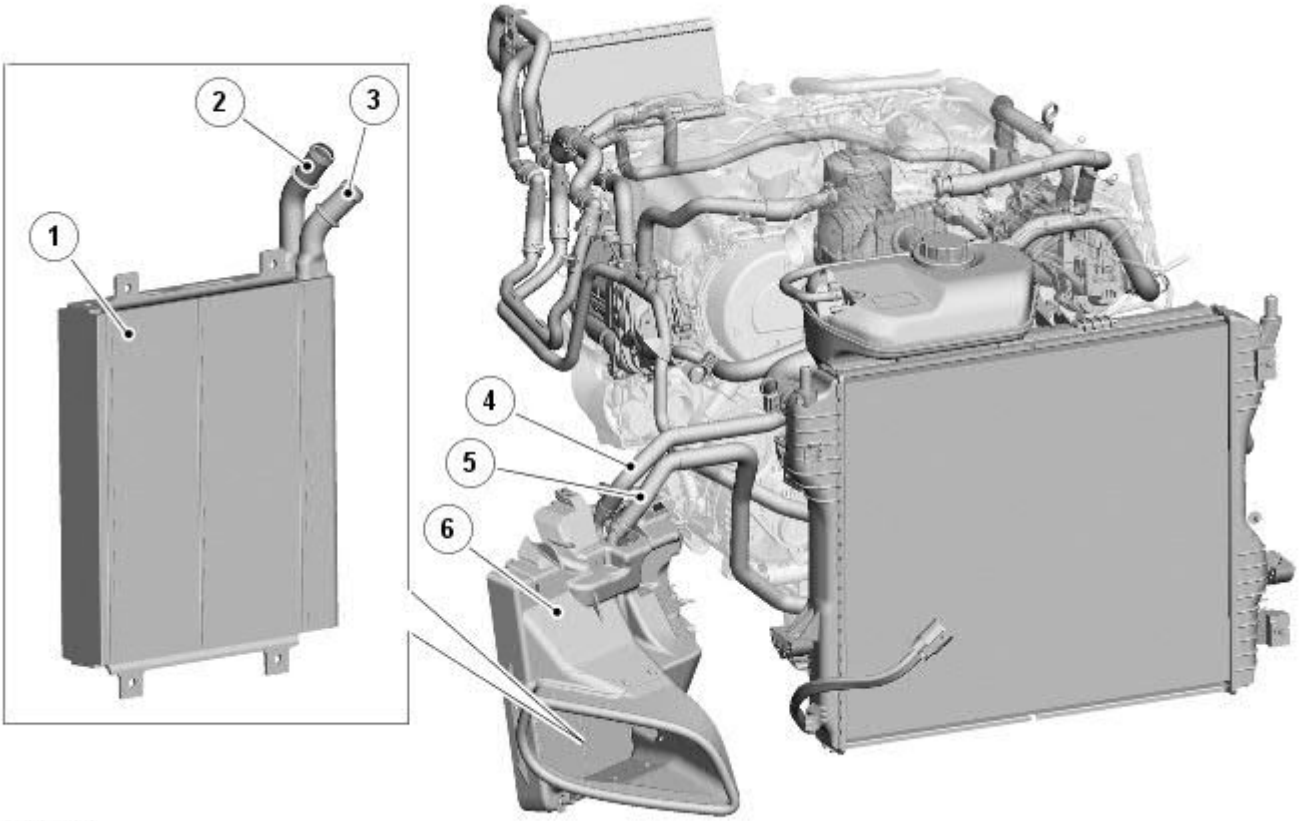
E115004

Item	Description
1	Coolant outlet to transmission fluid cooler
2	Coolant inlet
3	Locating spigot (2 off)
4	Support (2 off)
5	Coolant inlet from auxiliary coolers
6	Coolant outlet to pressure relief thermostat
7	Drain plug

The radiator is a cross-flow type with an aluminum core and plastic end tanks. The radiator is located in the vehicle by locating spigots and supports integrated into the end tanks. The supports are installed in rubber bushes in the upper chassis rails. The locating spigots are installed in rubber bushes in the front end carrier. A drain plug is integrated into the LH end tank. Coolant inlet and outlet connections are incorporated into the RH and LH end tanks respectively.

The LH end tank also has connections for coolant inlet from the auxiliary coolers and a coolant outlet to the transmission fluid cooler.

AUXILIARY COOLING RADIATOR



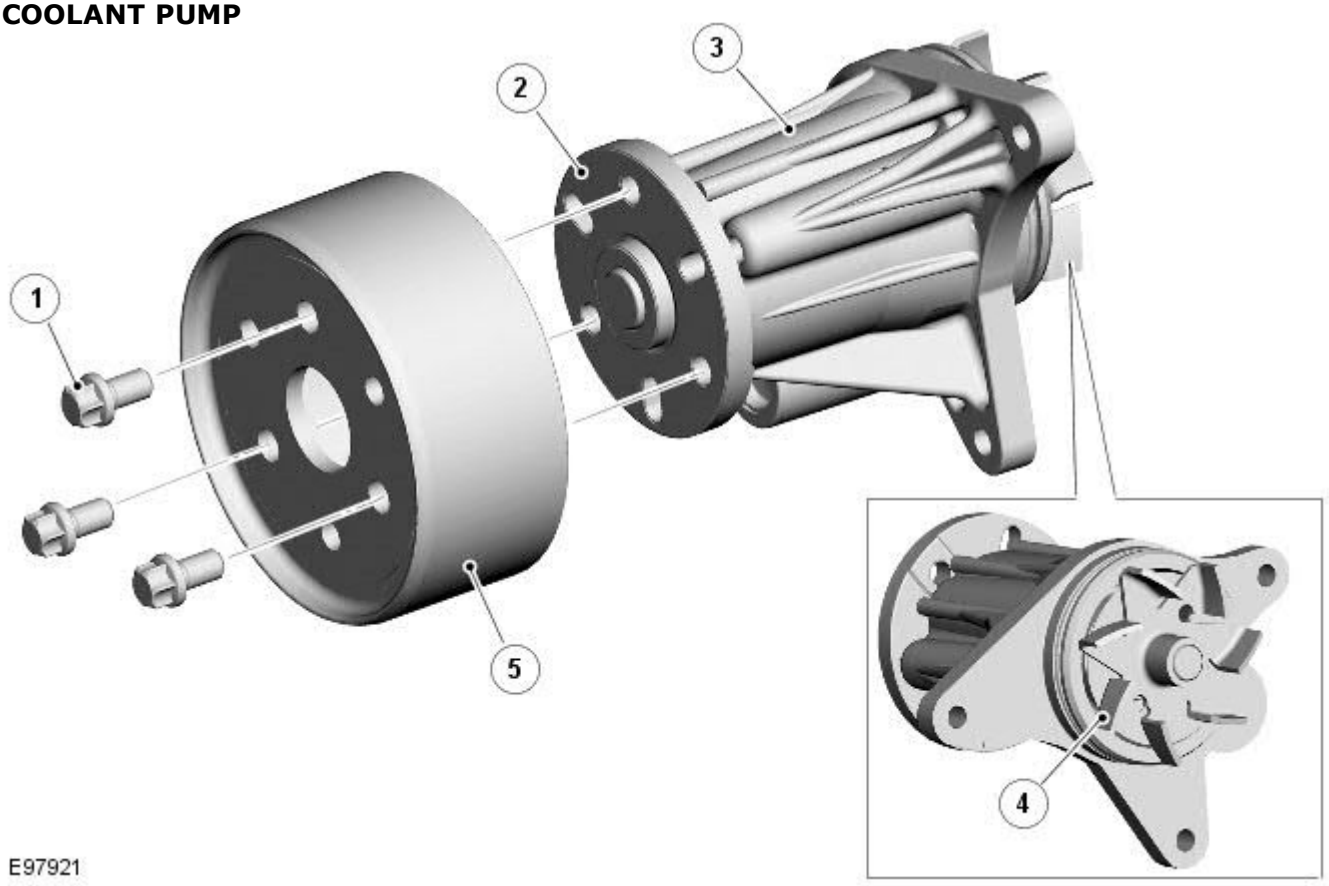
E125024

Item	Description
1	Auxiliary cooling radiator
2	Coolant outlet
3	Coolant inlet
4	Coolant outlet hose to radiator
5	Coolant inlet hose from 5 way connector
6	Ducting from front bumper

One auxiliary cooling radiator is used to maintain the optimum engine coolant temperature for performance driving.

The radiator is located behind the RH side of the front bumper and ducting provides are flow to the radiator via an aperture in the bumper. The auxiliary radiator is connected to the main radiator with flow through the system controlled by the PRT.

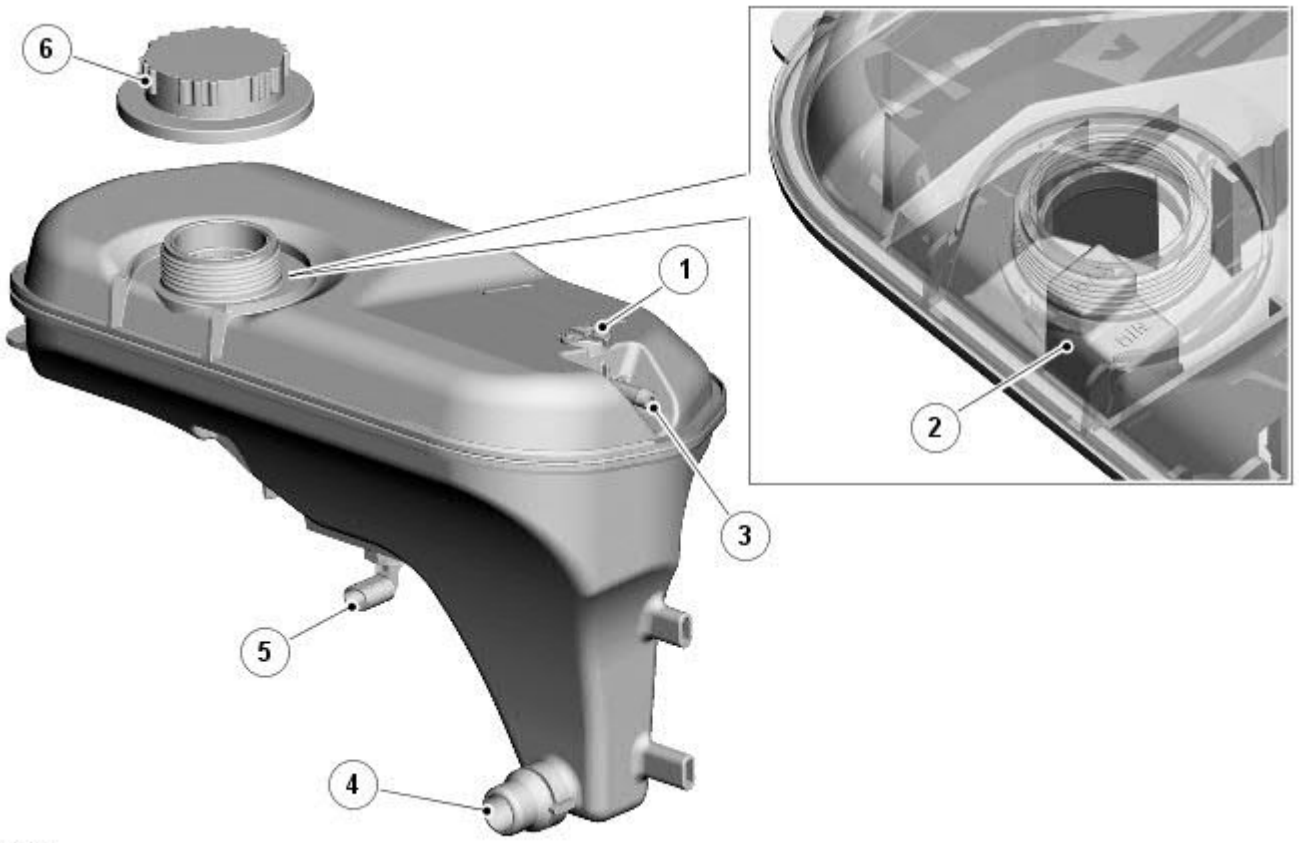
COOLANT PUMP



Item	Description
1	Bolt (3 off)
2	Drive hub
3	Housing
4	Impeller
5	Pulley

The coolant pump has a housing that supports a shaft with an impeller attached to one end and a drive hub at the other. The housing is attached to the front of the cylinder block with the impeller located in a pumping chamber. The pump is driven by a pulley attached to the drive hub and driven by the accessory drive belt.
Refer to: Accessory Drive (303-05A Accessory Drive - TDV6 3.0L Diesel, Description and Operation).

EXPANSION TANK



E97925

Item	Description
1	Bleed screw
2	Level markings
3	Vent hose connection
4	Expansion hose connection
5	Level sensor
6	Filler cap

A pressurized expansion tank system is used which continuously separates the air from the cooling system and replenishes the system through a hose connected between the expansion tank and the heater return hose. A continuous vent into the expansion tank, through a hose connected to the engine's coolant outlet connector, prevents air locks from forming in the cooling system.

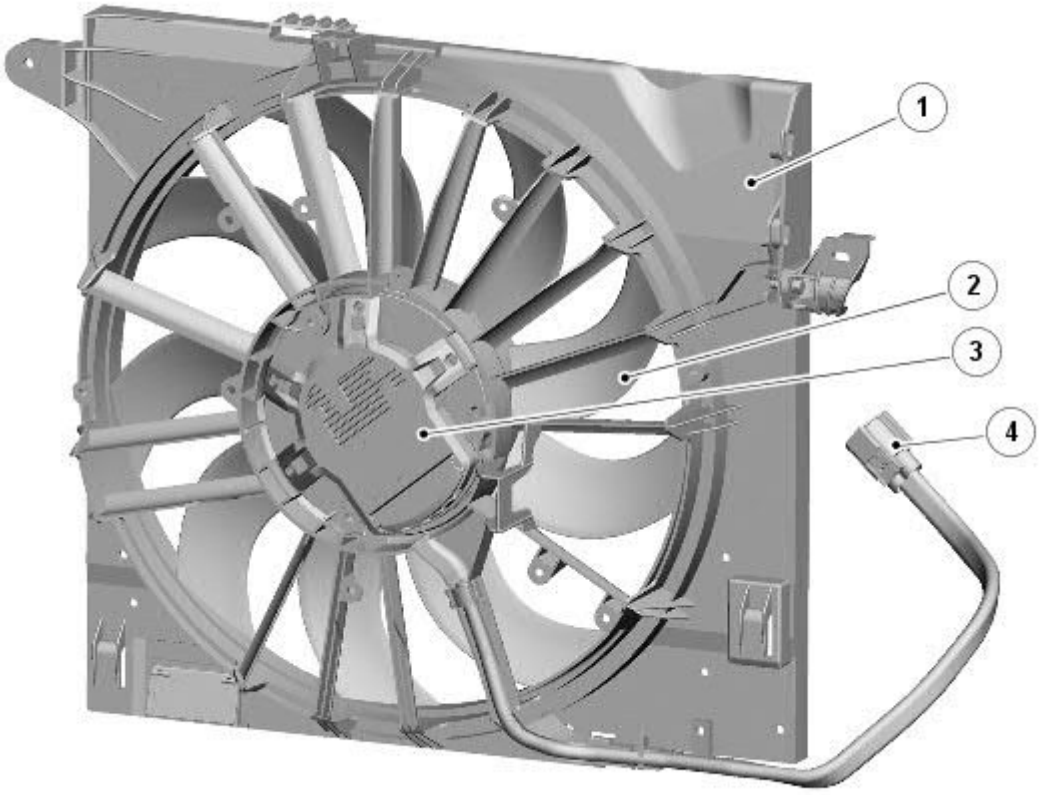
The expansion tank is installed behind the top right corner of the radiator. A filler cap, bleed screw and level sensor are incorporated into the expansion tank. MAX and MIN level markings are molded into the interior of the tank below the filler cap.

The expansion tank provides the following functions:

- Service fill
- Coolant expansion during warm-up
- Air separation during operation
- System pressurization by the filler cap

The expansion tank has an air space of approximately 0.5 to 1 liter (1.06 to 2,11 US pints), above the MAX level, to allow for coolant expansion.

COOLING FAN

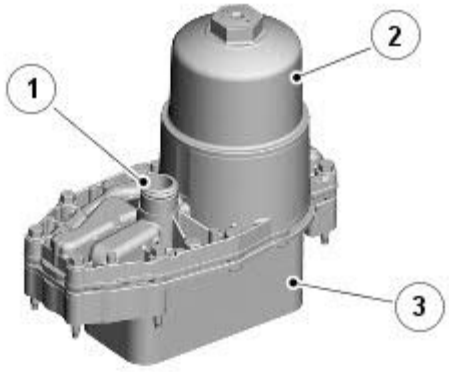


E125532

Item	Description
1	Shroud
2	Fan
3	Motor and fan control module
4	Electrical connector

An electric, variable speed cooling fan is installed in a shroud attached to the rear of the radiator. The cooling fan is operated by a fan control module, integrated into the electric motor, under the control of the ECM. Electrical connectors at the LH side of the shroud provides the interface between the cooling fan harness and the vehicle wiring.

ENGINE OIL COOLER



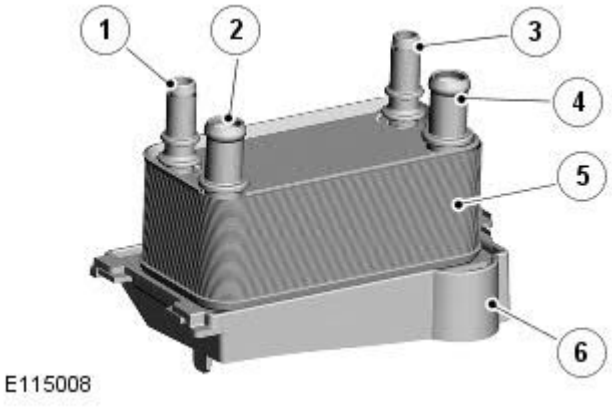
E115007

Item	Description
1	Coolant outlet
2	Engine oil filter
3	Engine oil cooler

The engine oil cooler is attached to a common adapter assembly located in the vee of the cylinder block. Inlet and outlet ports for engine oil, and an inlet port for coolant, are incorporated into the cylinder block mating face of the adapter assembly. A metal gasket seals the joint between the adapter assembly and the cylinder block. From the cylinder block, coolant flows

through the adapter assembly and into the cooler. After passing through the cooler, the coolant then flows into the engine coolant water outlet.

TRANSMISSION FLUID COOLER



Item	Description
1	Transmission fluid inlet
2	Coolant outlet to radiator bottom hose
3	Transmission fluid outlet
4	Coolant inlet from radiator
5	Transmission fluid cooler
6	Mounting bracket

The transmission fluid cooler is located near the lower LH corner of the radiator. The cooler is connected to the cooling system with 2 hoses and receives cooled fluid from the upper section of the radiator, which flows through the cooler, reducing the temperature of the transmission fluid.

ENGINE COOLANT

The coolant is silicate free and must not be mixed with conventional engine coolant.

Published: 17-Jun-2013

Engine Cooling - TDV6 3.0L Diesel - Engine Cooling

Diagnosis and Testing

Principles of Operation

For a detailed description of the engine cooling system and operation, refer to the relevant Description and Operation section in the workshop manual. REFER to: (303-03A Engine Cooling - TDV6 3.0L Diesel)

Engine Cooling (Description and Operation),
Engine Cooling (Description and Operation),
Engine Cooling (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
• Coolant leaks • Coolant hoses • Coolant expansion tank • Radiator • Heater core • Primary drive belt • Viscous fan	• Fuses • Harnesses • Loose or corroded connector(s) • Engine coolant temperature (ECT) sensor

3. If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the symptom chart.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Coolant loss	• Hoses • Hose connections • Radiator • Water pump • Heater core • Gaskets • Engine casting cracks • Engine block core plugs	Carry out a visual inspection. If there are no obvious leaks, carry out a pressure test. Rectify as necessary. Refer to the relevant section of the workshop manual
Overheating	• Low/contaminated coolant • Thermostat • Viscous fan • Engine coolant temperature sensor • Restricted air flow over the radiator	Check the coolant level and condition. Check the thermostat and rectify as necessary. Carry out a cooling system pressure test. Refer to the relevant section of the workshop manual. Check the viscous fan operation, make sure the viscous fan rotates freely. Check for obstructions to the air flow over the radiator
Engine not reaching normal temperature	• Thermostat • Viscous fan • Thermostat • Electric fan • Fan speed module	Check the thermostat operation. Check the viscous fan operation, make sure the viscous fan is not seized

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - TDV6 3.0L Diesel , DTC: Engine Control Module (100-00 General Information, Description and Operation).

Published: 20-Jul-2012

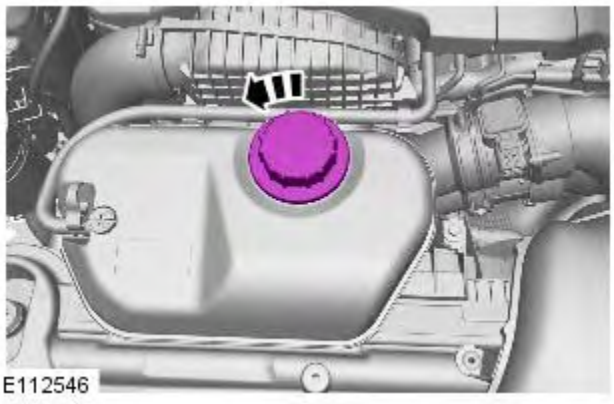
Engine Cooling - TDV6 3.0L Diesel - Cooling System Partial Draining, Filling and Bleeding

General Procedures

Draining

1. WARNING: Make sure to support the vehicle with axle stands.

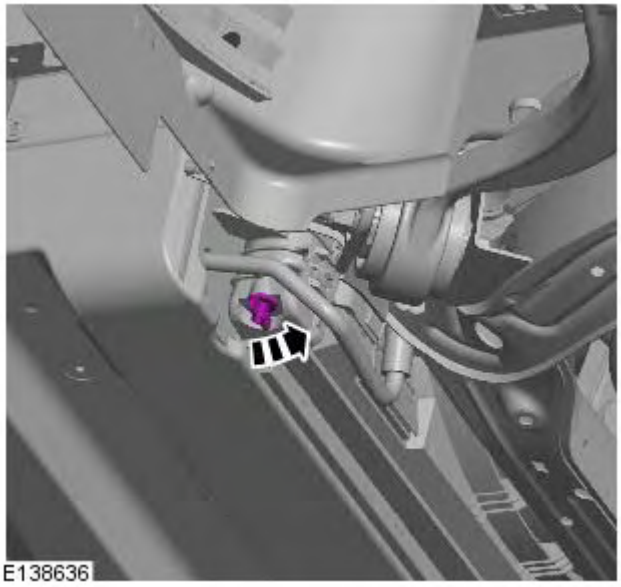
   Raise and support the vehicle.


E112546

2. WARNING: When releasing the cooling system pressure, cover the coolant expansion tank cap with a thick cloth.

   CAUTION: Since injury such as scalding could be caused by escaping steam or coolant, make sure the vehicle cooling system is cool prior to carrying out this procedure.

3. Refer to: Radiator Splash Shield (501-02 Front End Body Panels, Removal and Installation).

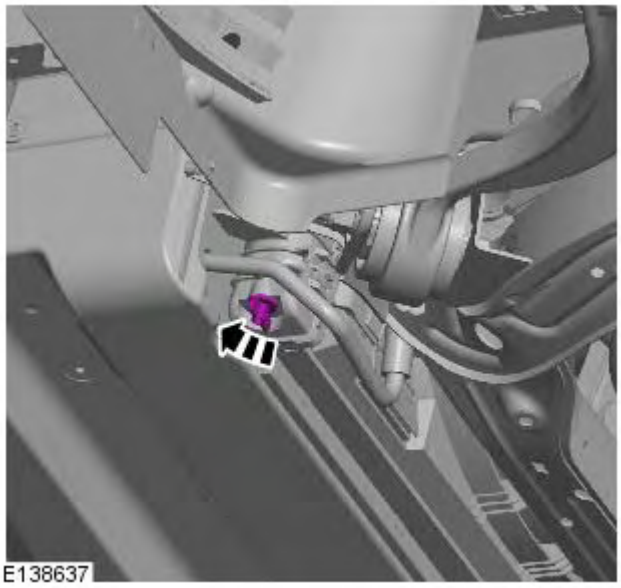

E138636

4. NOTE: Allow at least 15 minutes for the coolant to drain from the radiator drain plug.

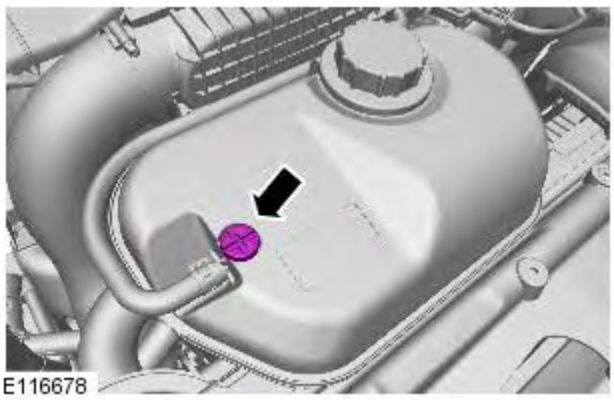
Filling

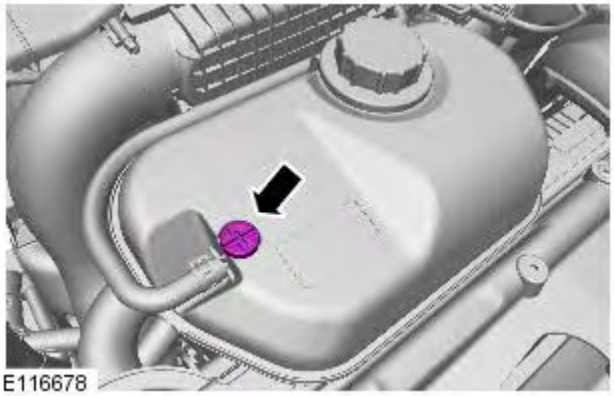
1.

2.



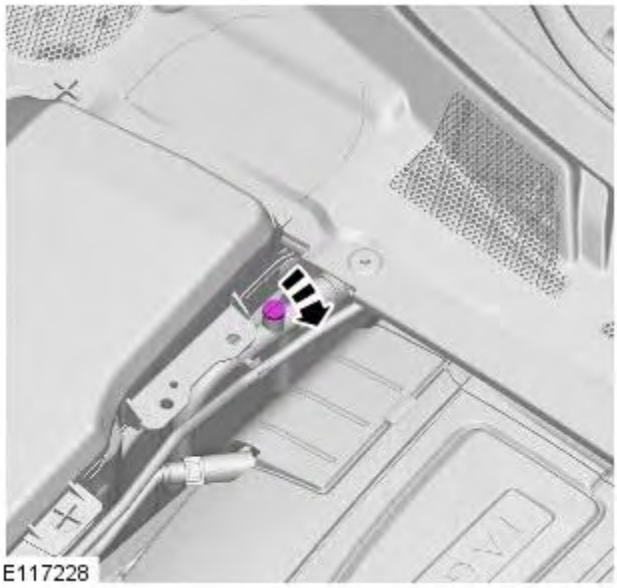
3.




E116678

4. CAUTION: Anti-freeze concentration must be maintained at 50%.

   Fill the cooling system, keeping coolant to the upper level mark of the expansion tank until a steady stream of coolant is seen running from the coolant hose bleed point. Tighten the bleed screw.


E117228

5.

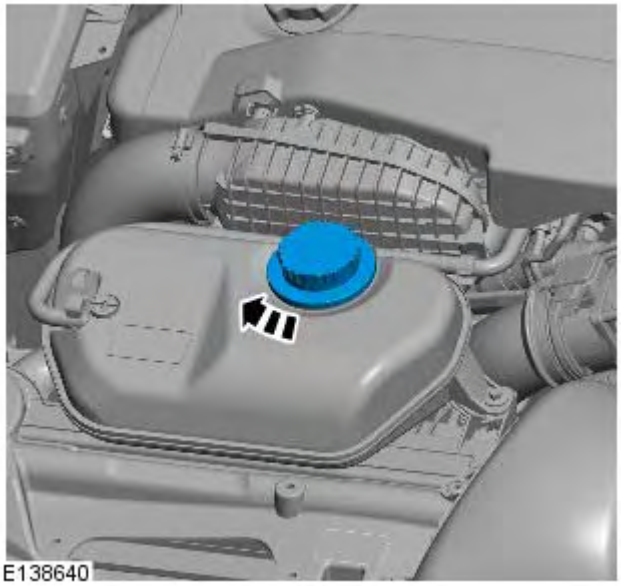
6. Continue to fill the coolant until the maximum level is reached.

7. Set the heating to the HOT position.

8. Start and run the engine.

9. Raise the engine to 2500 RPM for 30 seconds.

10.
   - Continue to top-up with coolant with engine idling until hot air is emitted from face vents.
   - When the coolant stops dropping, continue to fill the coolant untill the maximum level is reached.



11. CAUTION: Correct installation of the Coolant expansion tank cap can be obtained by tightening the cap until an audible click is heard.

12. Increase the engine speed to 3000rpm.

13.
    - When hot air is emitted from the vents, switch the heater off.
    - Hold the engine speed at 3000 RPM for a further 2 minutes.

14.
    - When the thermostat is opened increase the engine speed from idle to 4000 RPM for 5 times.
    - Hold the engine at 3000 rpm for 1 minute.

15. Allow the engine to idle for 2 minutes.

16. Switch the engine off and allow to cool.

17. Check and top up the cooling system as required when cool.

18. Visually check the engine and cooling system for signs of coolant leakage.

19. Refer to: Radiator Splash Shield (501-02 Front End Body Panels, Removal and Installation).

Published: 20-Jul-2012

Engine Cooling - TDV6 3.0L Diesel - Cooling System Draining, Filling and Bleeding

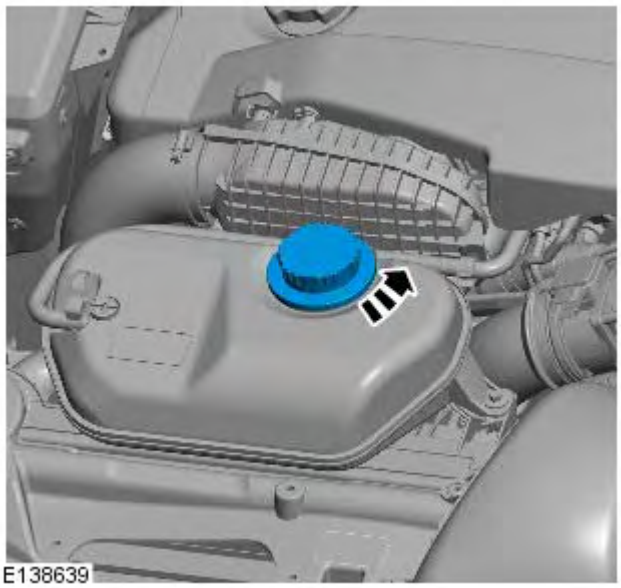
General Procedures

Draining

1. WARNING: Make sure to support the vehicle with axle stands.

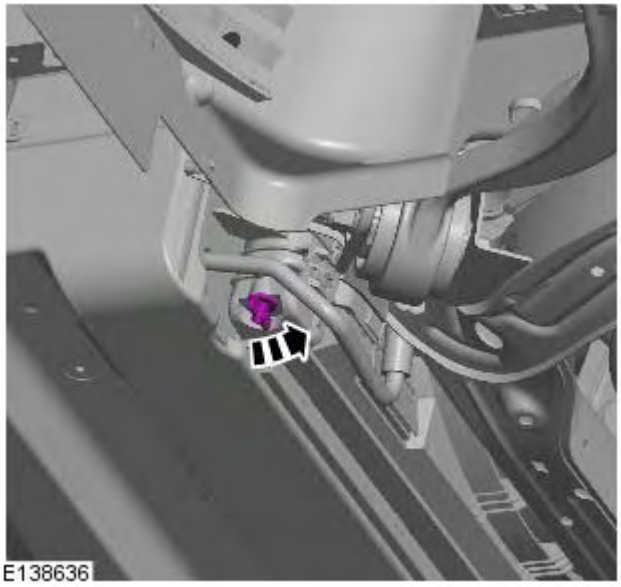
   Raise and support the vehicle.

2. Refer to: Radiator Splash Shield (501-02 Front End Body Panels, Removal and Installation).

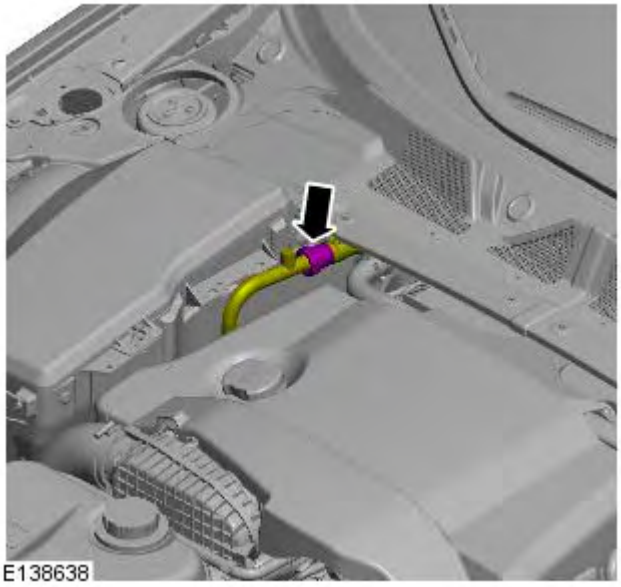

E138639

3. WARNING: When releasing the cooling system pressure, cover the coolant expansion tank cap with a thick cloth.

   CAUTION: Since injury such as scalding could be caused by escaping steam or coolant, make sure the vehicle cooling system is cool prior to carrying out this procedure.


E138636

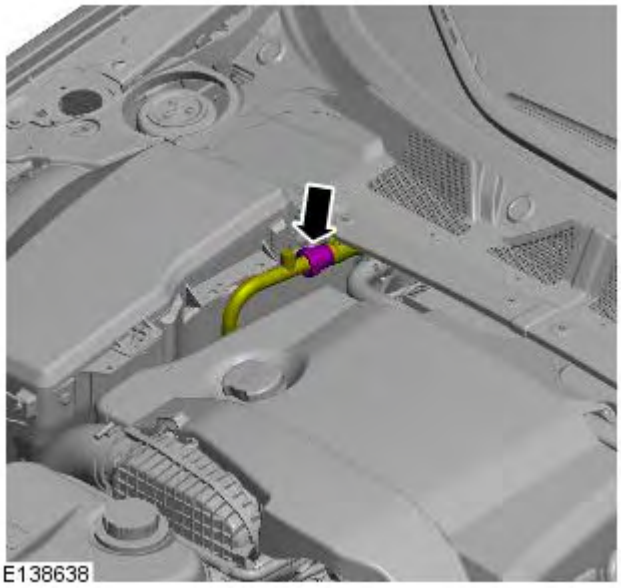
4. CAUTION: Be prepared to collect escaping coolant.



5. CAUTION: Be prepared to collect escaping coolant.

6. Carry out the procedure up to step 1 in the filling section three times, filling the cooling system with clean water at the first two drains. At the third refill, use a suitable measuring tool to make sure that the cooling system maintains a 50% mix.

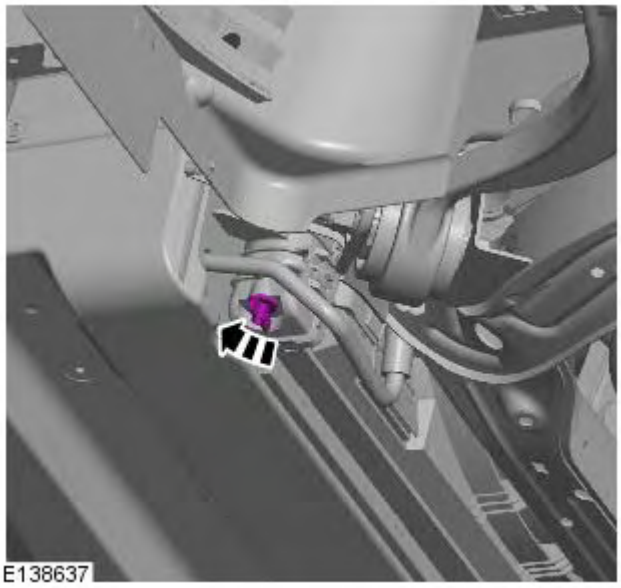
Filling



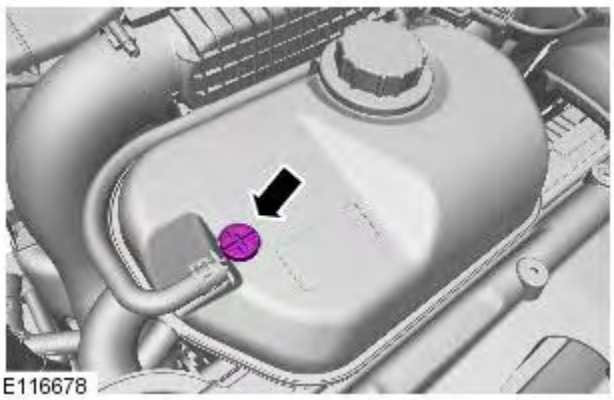
1.

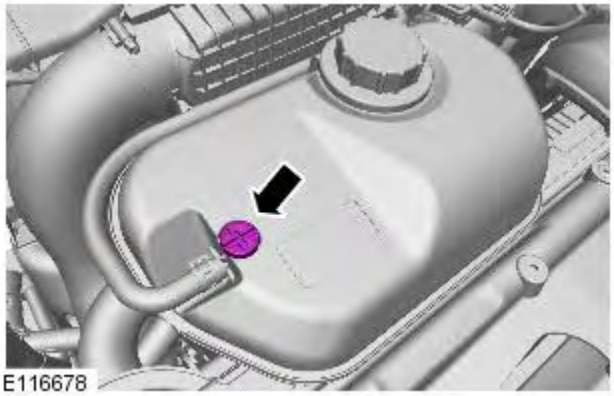
2.

3.



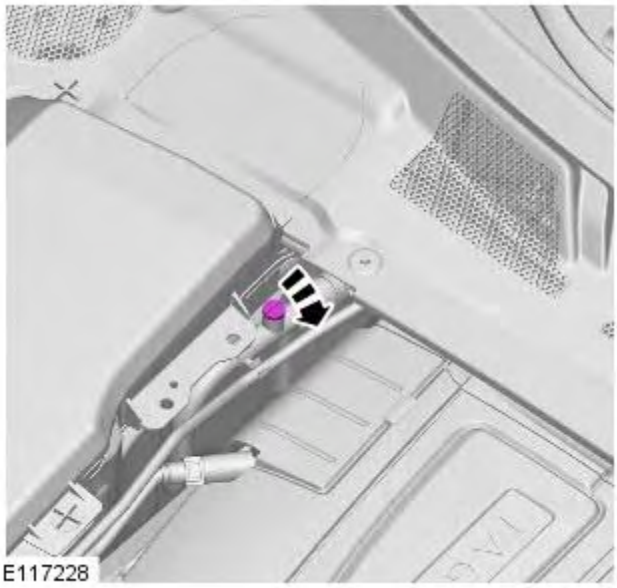
4.




E116678

5. CAUTION: Anti-freeze concentration must be maintained at 50%.

   Fill the cooling system, keeping coolant to the upper level mark of the expansion tank until a steady stream of coolant is seen running from the coolant hose bleed point. Tighten the bleed screw.


E117228

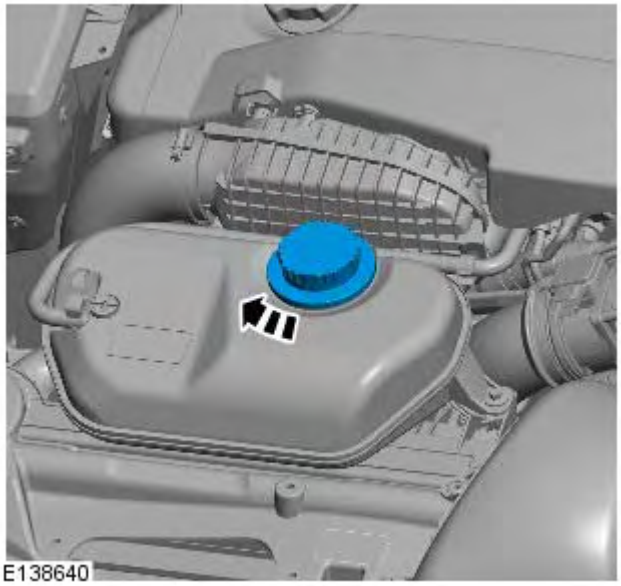
6.

7. Set the heating to the HOT position.

8. Start and run the engine.

9. Raise the engine to 2500 RPM for 30 seconds.

10.
    - Continue to top-up with coolant with engine idling until hot air is emitted from face vents.
    - When the coolant stops dropping, continue to fill the coolant untill the maximum level is reached.



11. CAUTION: Correct installation of the Coolant expansion tank cap can be obtained by tightening the cap until an audible click is heard.

12. Increase the engine speed to 3000rpm.

13.
    - When hot air is emitted from the vents, switch the heater off.
    - Hold the engine speed at 3000 RPM for a further 2 minutes.

14.
    - When the thermostat is opened increase the engine speed from idle to 4000 RPM for 5 times.
    - Hold the engine at 3000 rpm for 1 minute.

15. Allow the engine to idle for 2 minutes.

16. Switch the engine off and allow to cool.

17. Check and top up the cooling system as required when cool.

18. Visually check the engine and cooling system for signs of coolant leakage.

19. Refer to: Radiator Splash Shield (501-02 Front End Body Panels, Removal and Installation).

Published: 14-Nov-2013

Engine Cooling - TDV6 3.0L Diesel - Auxiliary Radiator

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

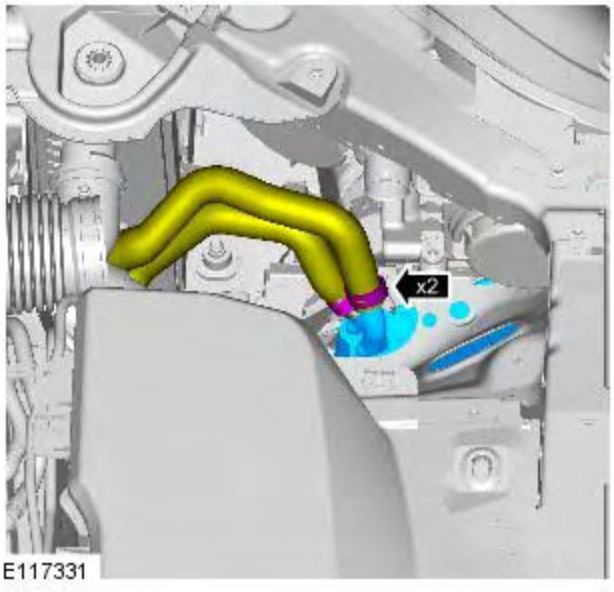
Some variation in the illustrations may occur, but the essential information is always correct.

1. WARNING: Make sure to support the vehicle with axle stands.

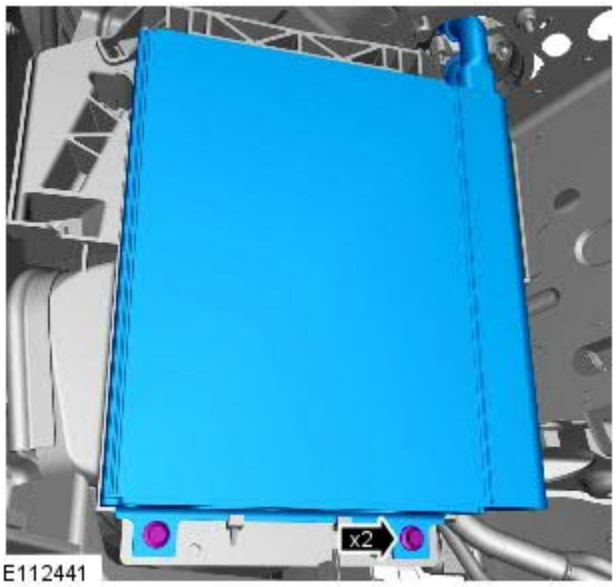
   Raise and support the vehicle.

2. Refer to: Cooling System Partial Draining, Filling and Bleeding (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).

3. Refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).



4. CAUTION: Be prepared to collect escaping coolant.

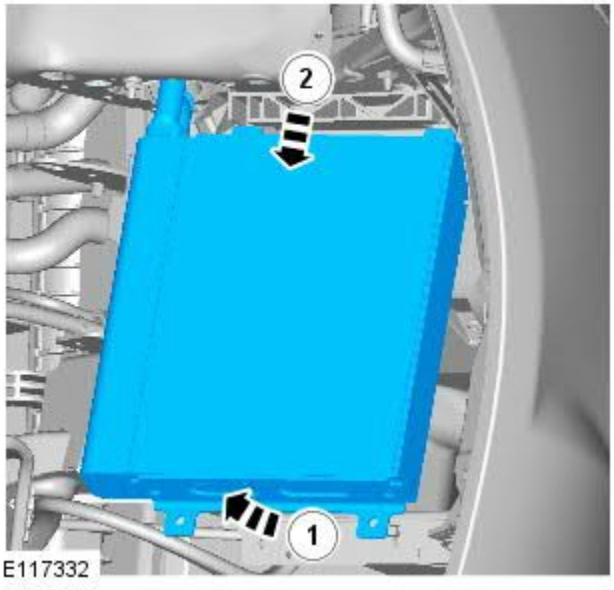


E112441

5. *Torque:* 9 Nm

E112442

6.



7. CAUTION: Be prepared to collect escaping coolant.

Installation

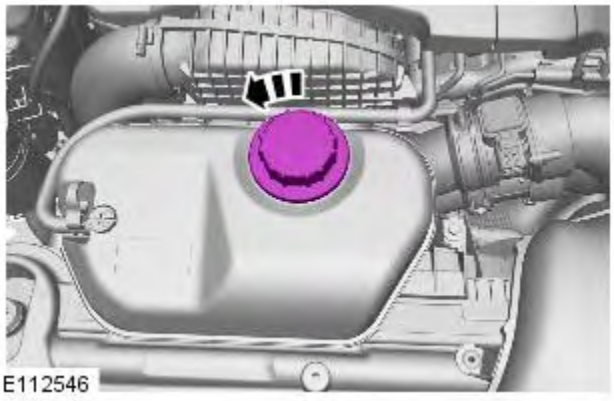
1. To install, reverse the removal procedure.

Published: 19-Nov-2013

Engine Cooling - TDV6 3.0L Diesel - Coolant Expansion Tank

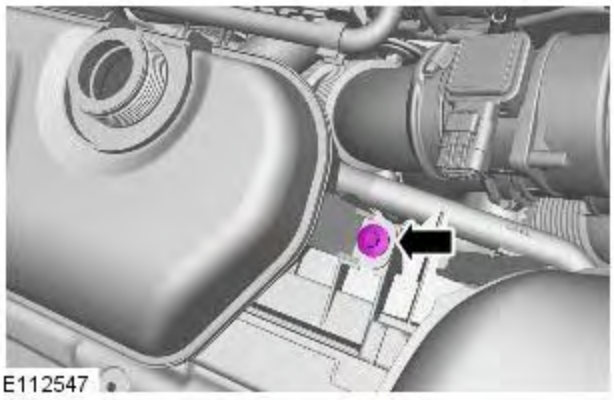
Removal and Installation

Removal

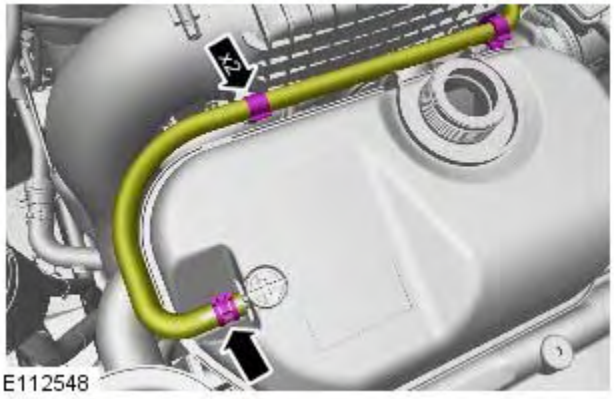


1.

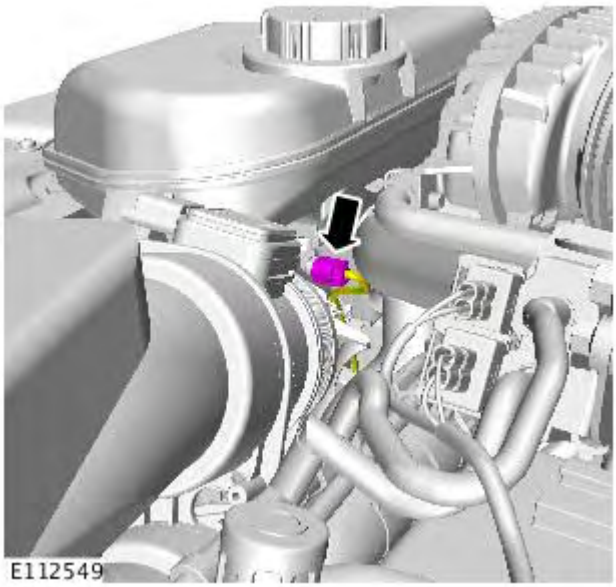
2. Using a syringe, remove the cooling fluid from the expansion tank.



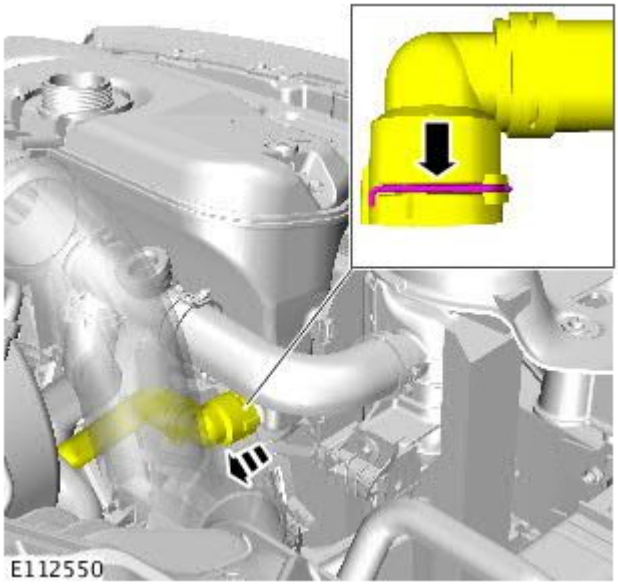
3. *Torque:* 7 Nm



4.



5. Disconnect the coolant low level sensor electrical connector.



6. CAUTION: Be prepared to collect escaping coolant.

   Release the clip and disconnect the coolant hose.

7.

Installation

1. To install, reverse the removal procedure.
2. Fill the cooling system to the upper level mark of the coolant expansion tank.

Published: 14-Nov-2013

Engine Cooling - TDV6 3.0L Diesel - Coolant Pump

Removal and Installation

Removal

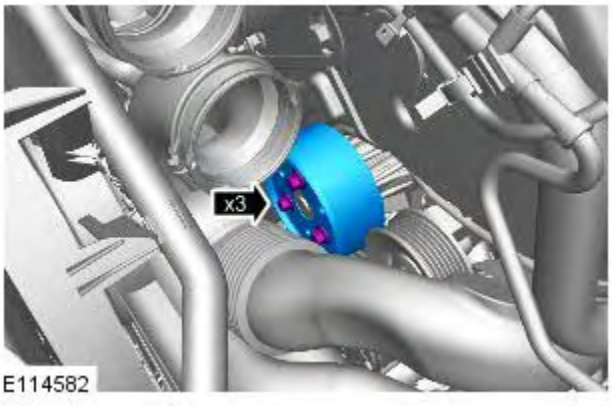
NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

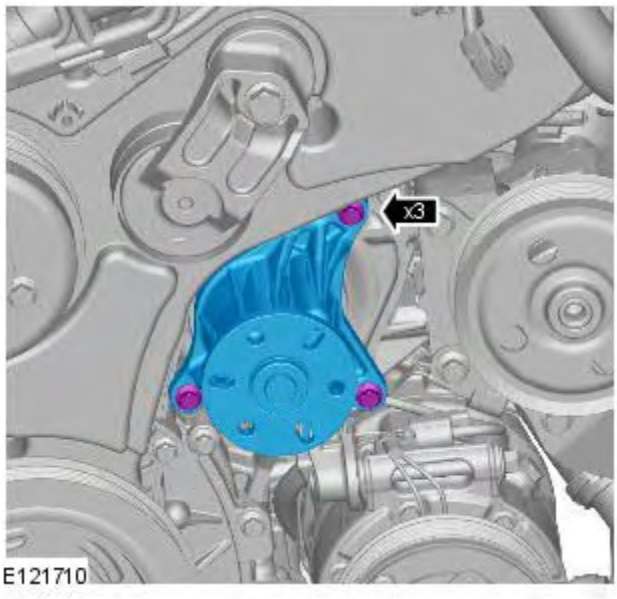
2. Refer to: Cooling System Partial Draining, Filling and Bleeding (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).

3. Refer to: Accessory Drive Belt (303-05A Accessory Drive - TDV6 3.0L Diesel, Removal and Installation).



4. CAUTION: Discard the bolts.

   Torque: 25 Nm



5. NOTES:

   Remove and discard the O-ring seal.

   Some variation in the illustrations may occur, but the essential information is always correct.

   Torque: 10 Nm

Installation

1. NOTE: Lubricate the O-ring seal with clean coolant.

   To install, reverse the removal procedure.

Published: 11-May-2011

Engine Cooling - TDV6 3.0L Diesel - Cooling Fan Motor and Shroud

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

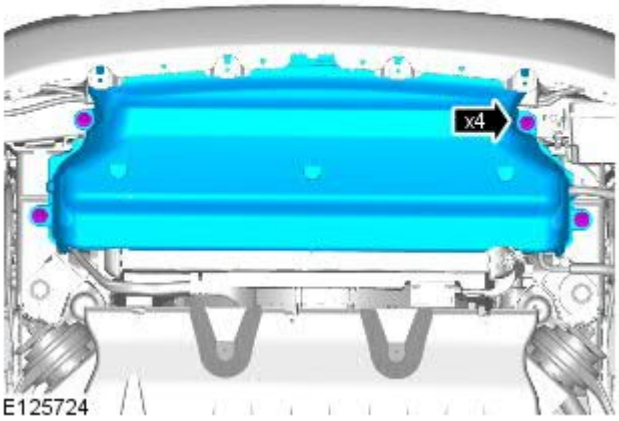
2. Refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel, Removal and Installation).

3. Refer to: Coolant Expansion Tank (303-03A Engine Cooling - TDV6 3.0L Diesel, Removal and Installation).

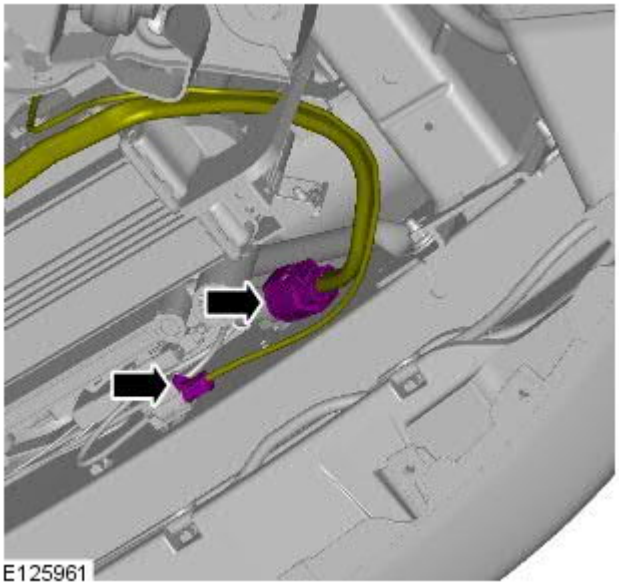
4. Refer to: Radiator Splash Shield (501-02 Front End Body Panels, Removal and Installation).

5. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

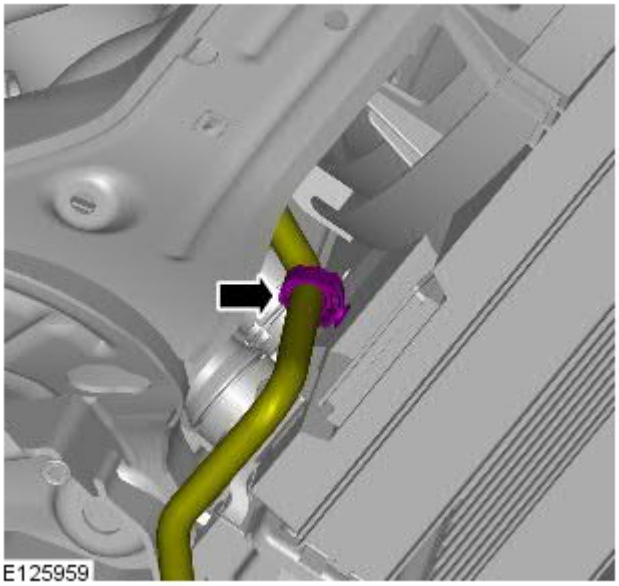
6.



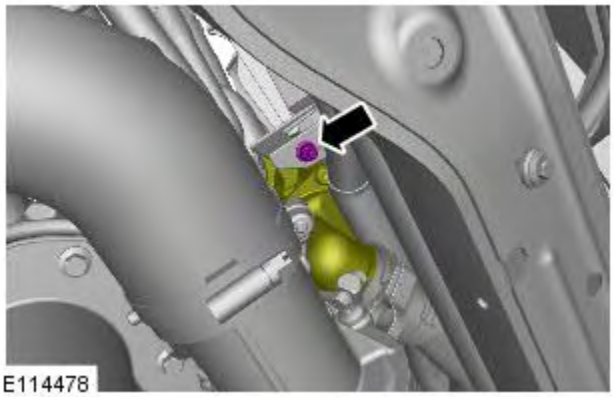
7.


E125961

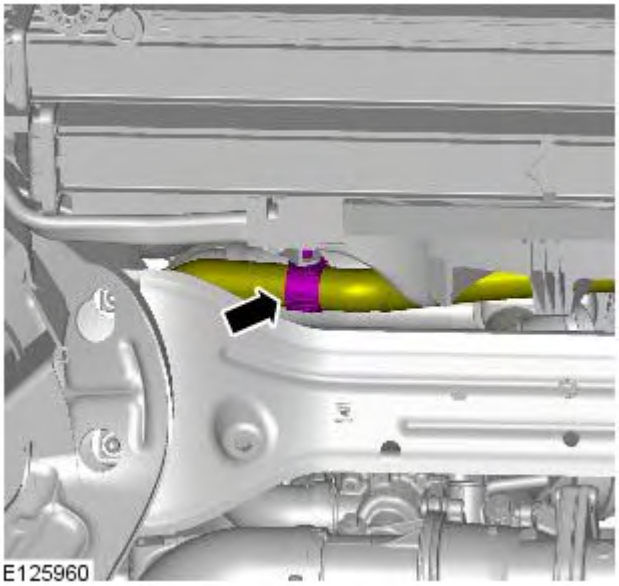
8.


E125959

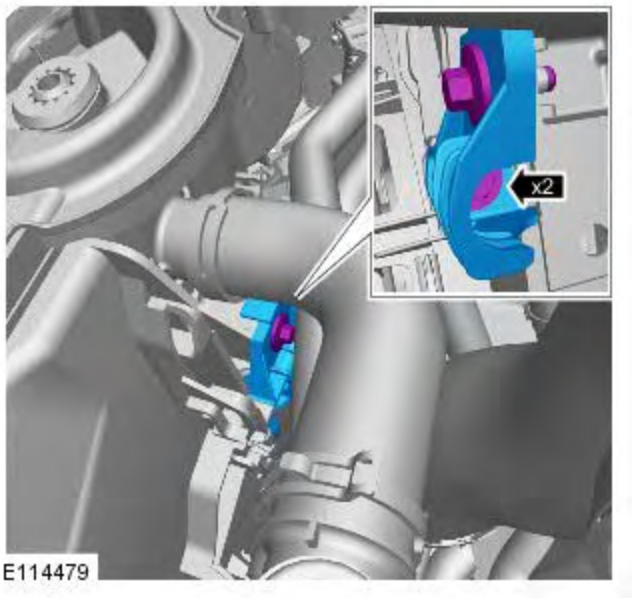
9. *Torque:* 7 Nm

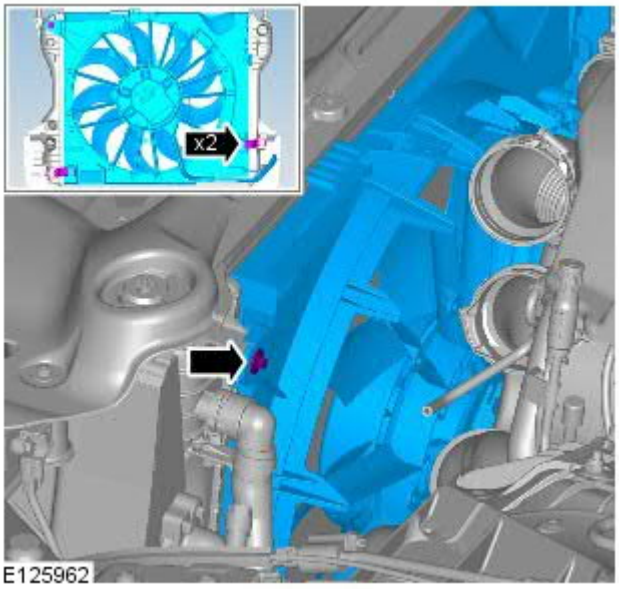

E114478

10.

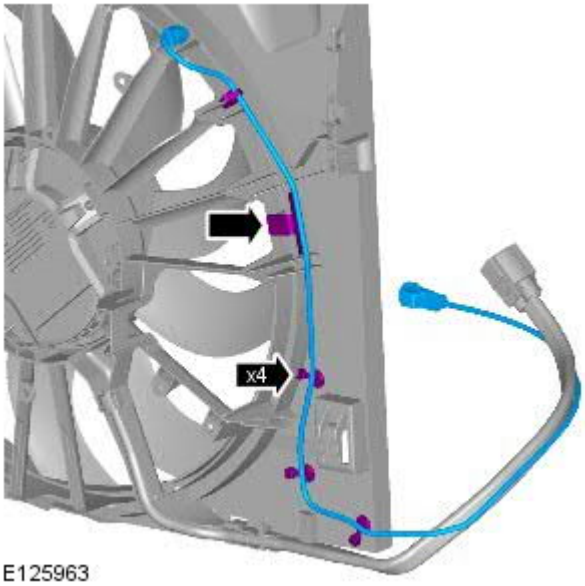


11. *Torque:* 10 Nm





12. *Torque:* 10 Nm



13. NOTE: Do not disassemble further if the component is removed for access only.

Installation

1. To install, reverse the removal procedure.

Published: 14-Nov-2013

Engine Cooling - TDV6 3.0L Diesel - Radiator

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

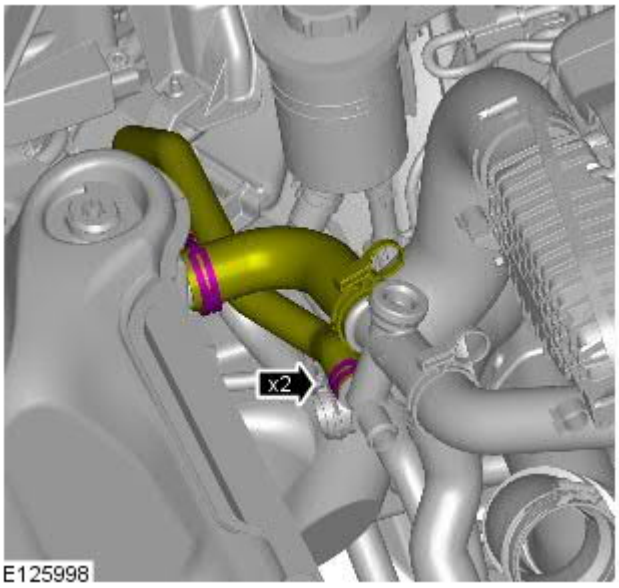
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Cooling Fan Motor and Shroud (303-03A Engine Cooling - TDV6 3.0L Diesel, Removal and Installation).

3. Refer to: Cooling System Partial Draining, Filling and Bleeding (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).

4.



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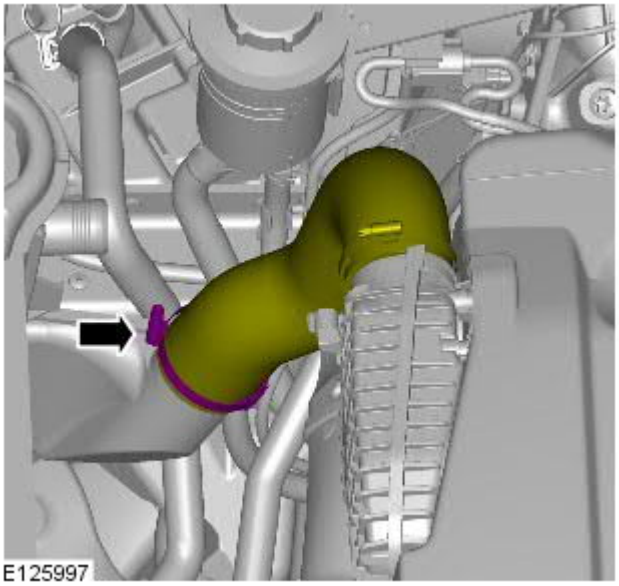

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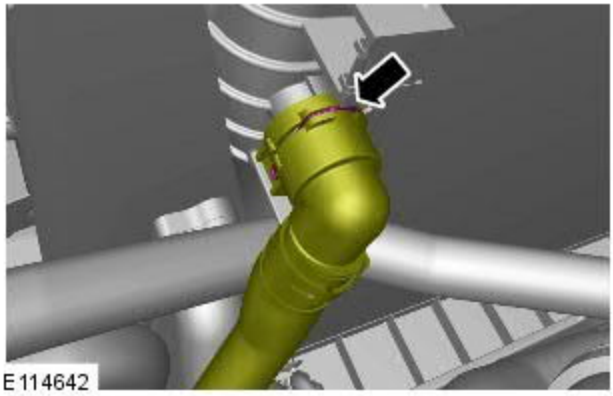
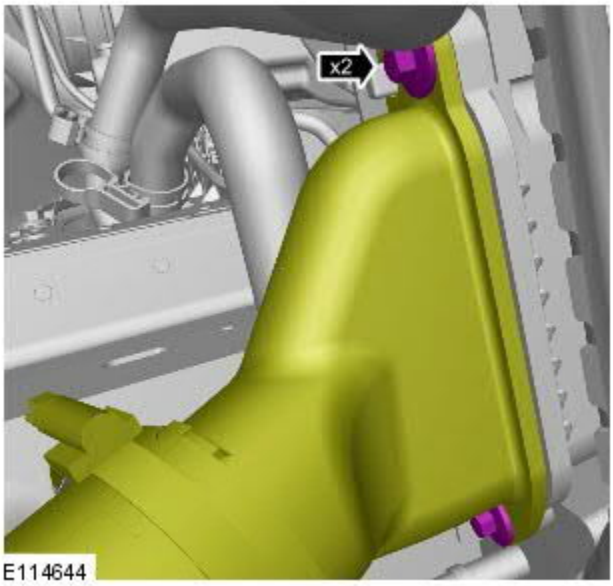
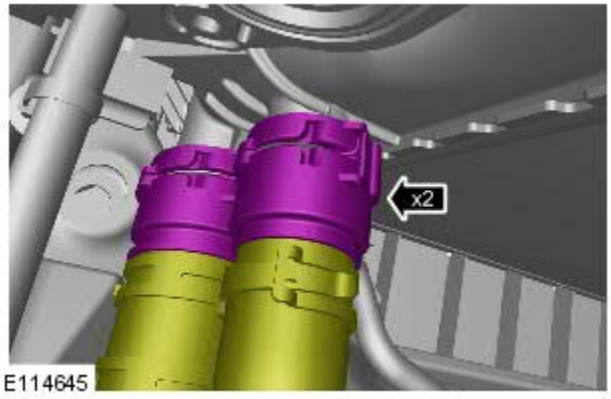
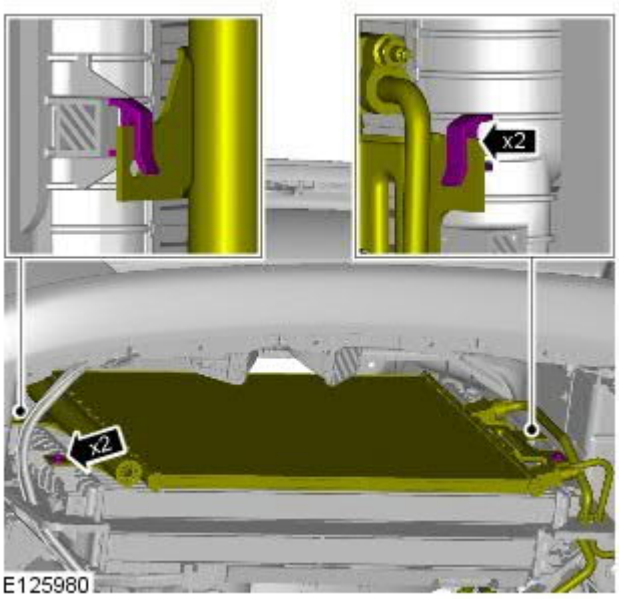


7. *Torque:* 7 Nm





8. CAUTION: Be prepared to collect escaping coolant.

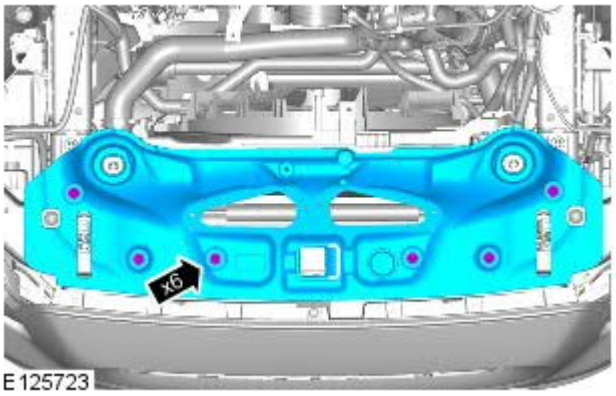


9. CAUTIONS:

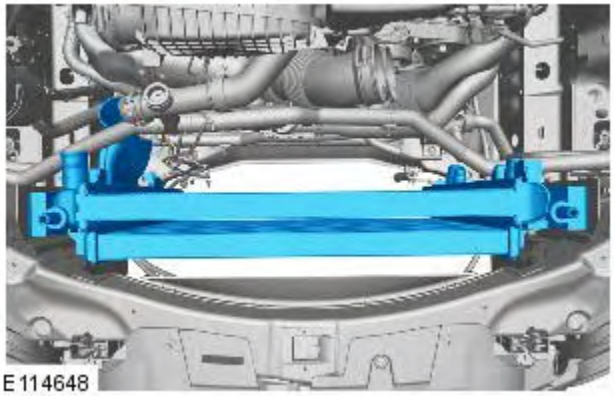
   Protect the air conditioning (A/C) condenser.

   Using suitable cable tie secure the A/C condenser away from the radiator.

   Torque: 7 Nm



10. *Torque:* 9 Nm

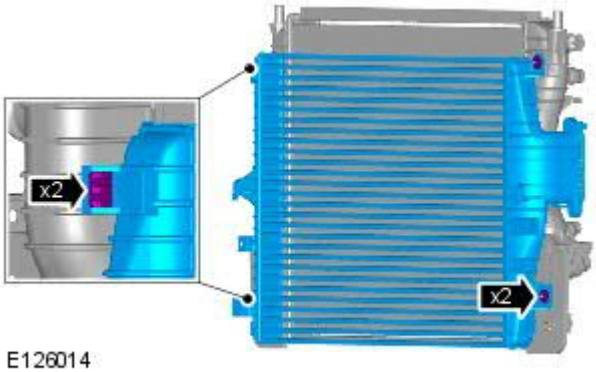

E114648

11. CAUTION: Be prepared to collect escaping coolant.

12. NOTE: Do not disassemble further if the component is removed for access only.

E114649

13. *Torque:* 7 Nm



E126014

14. *Torque:* 7 Nm

E125996

Installation

1. To install, reverse the removal procedure.

Published: 14-Nov-2013

Engine Cooling - TDV6 3.0L Diesel - Thermostat

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

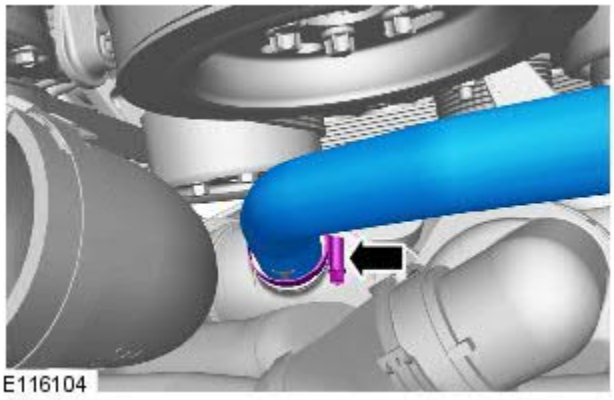
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

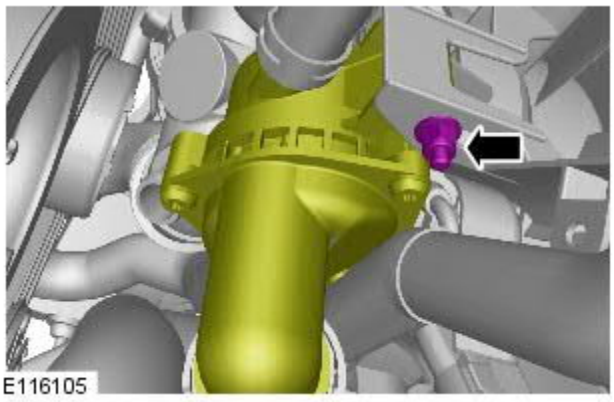
2. Refer to: Turbocharger Bypass Valve (303-04B Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Removal and Installation).

3. Refer to: Cooling System Partial Draining, Filling and Bleeding (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).

4.



5. *Torque:* 7 Nm



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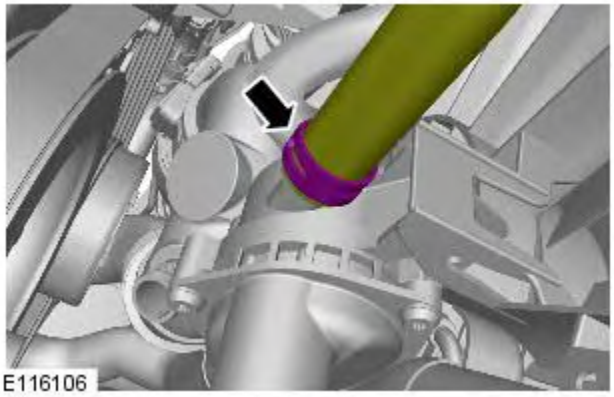

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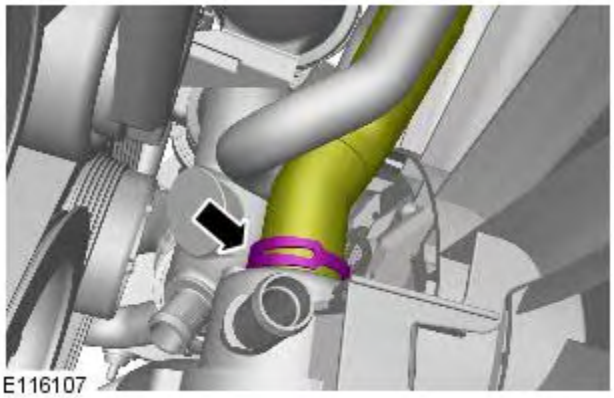
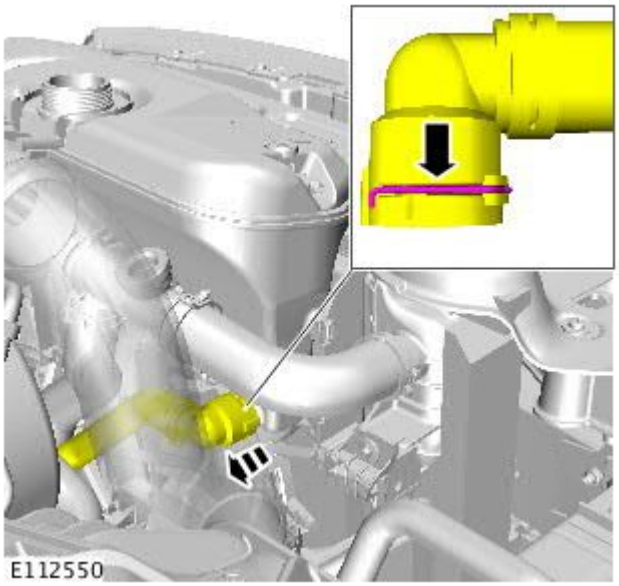


8. Release the clip and disconnect the coolant hose.



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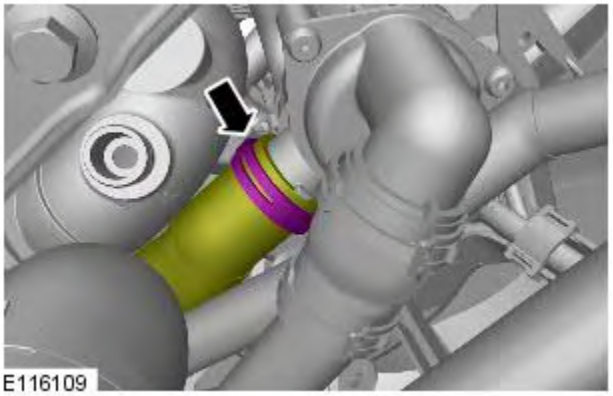
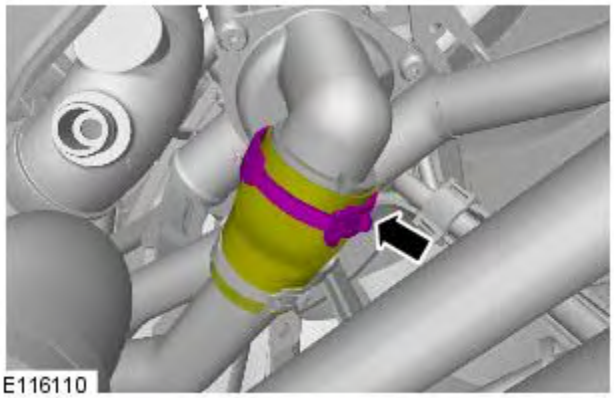

E116109

10. CAUTION: Be prepared to collect escaping fluids.


E116110

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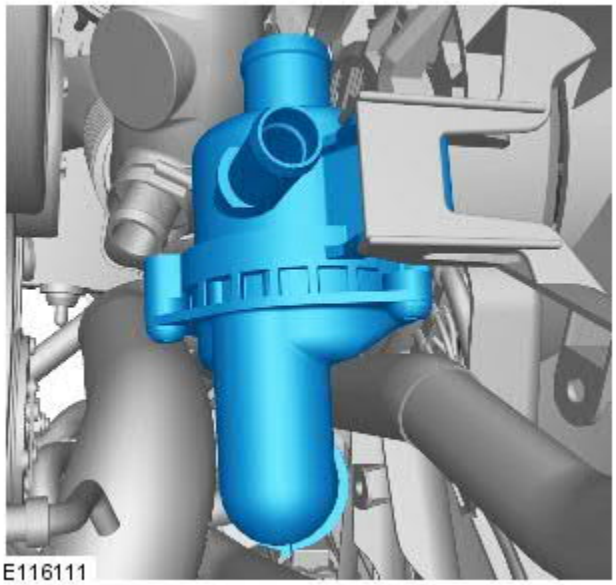
E116111

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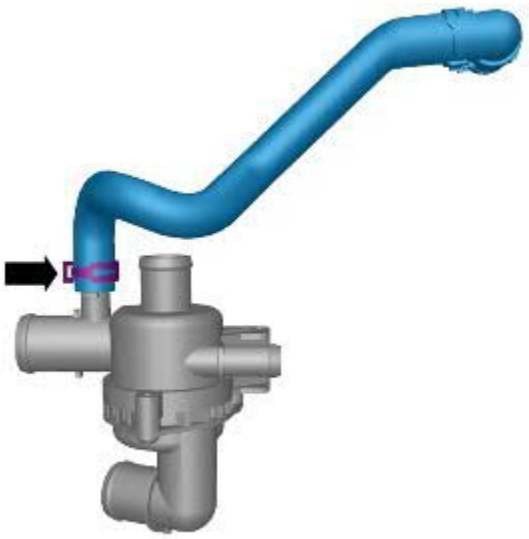
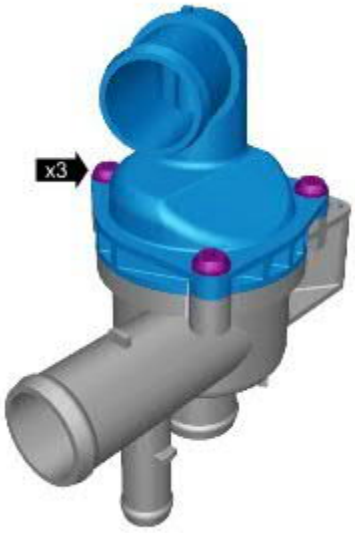


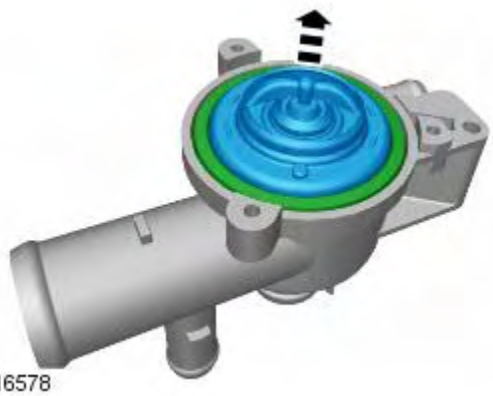
E116112

13. *Torque:* 4 Nm



E116577

14. CAUTION: Discard the seal.



E116578

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Fuel Charging and Controls - TDV6 3.0L Diesel -

Torque Specification

NOTE: A = refer to procedure for the correct torque sequence.

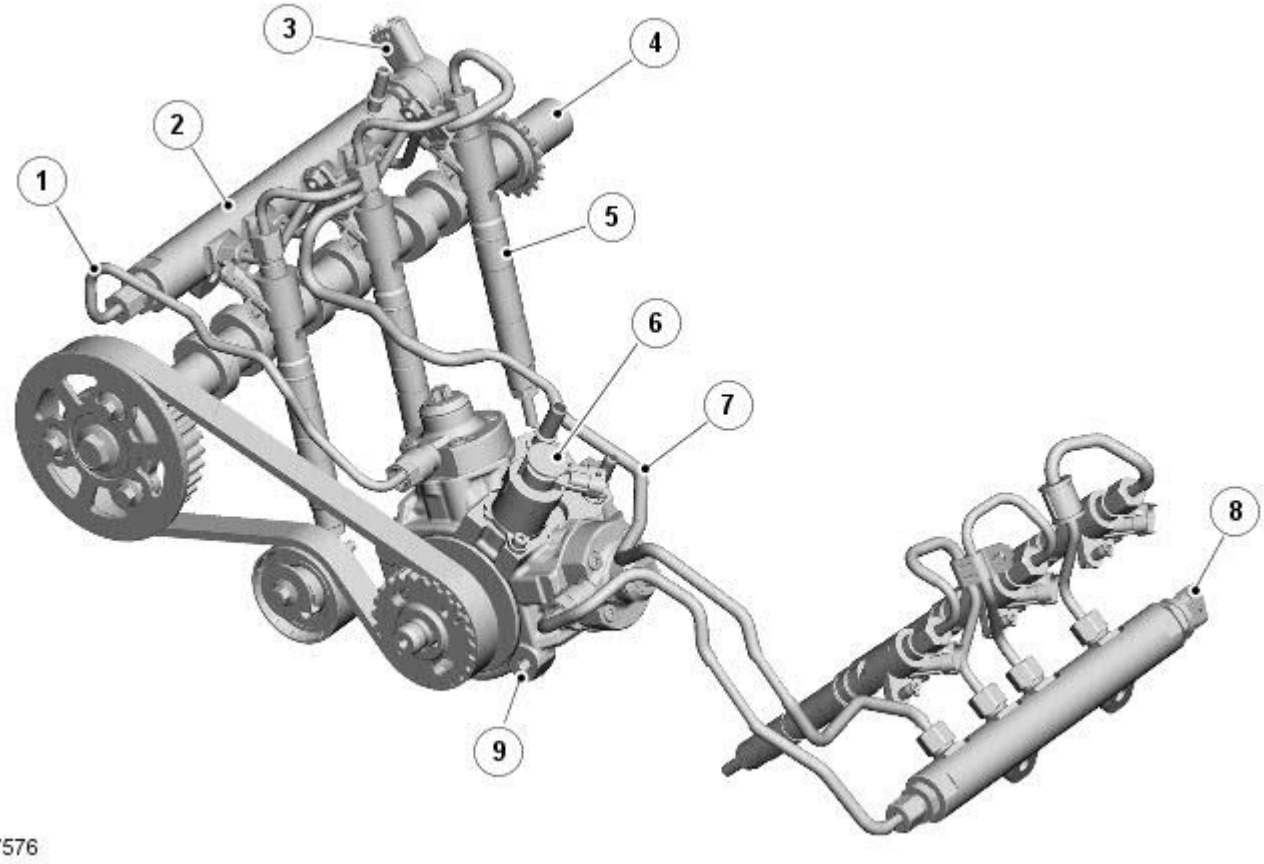
Description	Nm	lb-ft	lb-in
Wiring harness bracket to left-hand cylinder head retaining bolts	23	16	-
Fuel injection pump retaining bolts	23	16	-
Fuel injection pump bracket retaining bolts	3	-	27
Fuel injection pump bracket(s) to cylinder head retaining bolts	10	7	-
Turbocharger heat shield(s) retaining bolts	10	7	-
Fuel injection pump sprocket retaining bolt	50	37	-
Fuel injection pump belt rear cover retaining bolts	9	-	80
Rear end accessory drive (READ) pulley hub retaining bolt	A	-	-
Fuel injection pump belt tensioner retaining bolt	23	16	-
READ pulley retaining bolts	A	-	-
Wiring harness and coolant pipe retaining bracket bolts	10	7	-
Fuel injector retaining bolts	9	-	80
High-pressure fuel line bracket retaining bolts	10	7	-
Fuel rail retaining bolts	24	18	-
High-pressure fuel line union nuts	A	-	-
Fuel rail supply tube union nuts	A	-	-
Fuel crossover line union nuts	A	-	-
Exhaust gas recirculation (EGR) valve retaining bolts	10	7	-
Intake air shutoff throttle elbow retaining bolt	10	7	-
Intake air shutoff throttle retaining stud	10	7	-

Published: 11-May-2011

Fuel Charging and Controls - TDV6 3.0L Diesel - Fuel Charging and Controls - Component Location

Description and Operation

Component Location



E107576

Item	Description
1	High pressure fuel supply
2	Common fuel rail
3	Fuel pressure control valve
4	Exhaust camshaft
5	Injectors
6	Volume control valve
7	Fuel rail balance pipe
8	Fuel pressure sensor
9	High pressure fuel pump

Published: 11-May-2011

Fuel Charging and Controls - TDV6 3.0L Diesel - Fuel Charging and Controls - Overview

Description and Operation

OVERVIEW

The 3.0L V6 diesel engine is equipped with a High Pressure (HP) common rail fuel injection system. With this fuel injection process, a HP pump delivers a uniform level of pressure to the shared fuel lines (the common rails), which serve all 6 fuel injectors. Pressure is controlled to the optimum level for smooth operation.

The common rail system supports a pre and pilot injection depending on engine operating conditions, which reduces combustion noise levels, more commonly referred to as 'diesel knock'.

Fuel injection pressure is generated independently of engine speed and fuel injection events.

The fuel injection timing and volume are calculated by the ECM (engine control module), which then energizes the appropriate piezo actuated injector. The common rail fuel injection system has the following features:

- High fuel injection pressures of up to 2000 bar (29007 lbf/in^2) for greater atomization of fuel (increasing performance and lowering emissions).
- Variable injection to optimize combustion in all engine operating conditions
- Low tolerances and high precision throughout the life of the system.

The fuel system is divided into two sub systems:

- Low Pressure (LP) system
- HP system.

The LP system features the following components:

- In-tank fuel pump
- Fuel pressure regulator (integral to the fuel delivery module)
- Fuel filter
- Return pipes
- Injector return pipes
- Fuel coolers (engine and vehicle).

The LP system is regulated to 0.5 bar (7.25 lbf/in^2).

The HP system features the following components:

- HP pump
- Fuel rails and diverter rail
- HP fuel pipes
- Injectors.

Published: 11-May-2011

Fuel Charging and Controls - TDV6 3.0L Diesel - Fuel Charging and Controls - System Operation and Component Description

Description and Operation

System Operation

ENGINE STARTING

During starting, the fuel rail pressure must be at least 150 bar (2175 lbf/in^2). Should the pressure be below this figure, the injectors will not operate, resulting in the vehicle not starting.

ENGINE STOPPING

To stop the engine the ECM (engine control module) stops energizing the actuators in the fuel injectors, therefore, no fuel is injected and the engine speed drops to zero.
Refer to: Electronic Engine Controls (303-14A Electronic Engine Controls - TDV6 3.0L Diesel, Description and Operation).

HP FUEL PUMP

When the HP fuel pump is rotated, pressure is created when the volume control valve is open and the pressure control valve is closed. Both valves are electronically controlled by the ECM to allow variable fuel delivery and pressure control. When the ECM actuates the piezo actuators, the fuel rail pressure drop is off-set by additional fuel being delivered to the fuel rails by the pressure control valve. The fuel pressure in the system is reduced within a few seconds after the engine has stopped as the pressure control valve no longer has the holding current it requires, and therefore opens. No residual pressure remains in the system and the fuel is returned to the LP fuel return line to the fuel filter through the open pressure control valve.

Component Description

LOW PRESSURE (LP) SYSTEM

LP Fuel Pump

The electric fuel pump is located inside the fuel tank. Fuel is pumped from the tank via the in-tank fuel pump, to the HP pump via the fuel filter.
Refer to: Fuel Tank and Lines (310-01A Fuel Tank and Lines - TDV6 3.0L Diesel, Description and Operation).

Fuel Filter

The fuel filter is located on a bracket on the LH (left-hand) suspension turret in the engine compartment. Incorporated in the fuel filter housing is a bimetallic, temperature sensing, regulating valve which will start to close at 30 °C (86 °F) and will fully close at 50 °C (122 °F). This allows pre-heated diesel fuel, returning from the HP pump, to circulate inside the fuel filter to prevent waxing in cold operating conditions. When the valve is closed the fuel from the HP pump is passed through the fuel cooler before returning to filter to maintain the fuel at an optimum temperature.

The filter has an air bleed return to the fuel tank which returns excess air and fuel to the tank.

The fuel filter is also fitted with a water sensor to detect when moisture which has collected in the filter has reached an unacceptable level.
Refer to: Fuel Tank and Lines (310-01A Fuel Tank and Lines - TDV6 3.0L Diesel, Description and Operation).

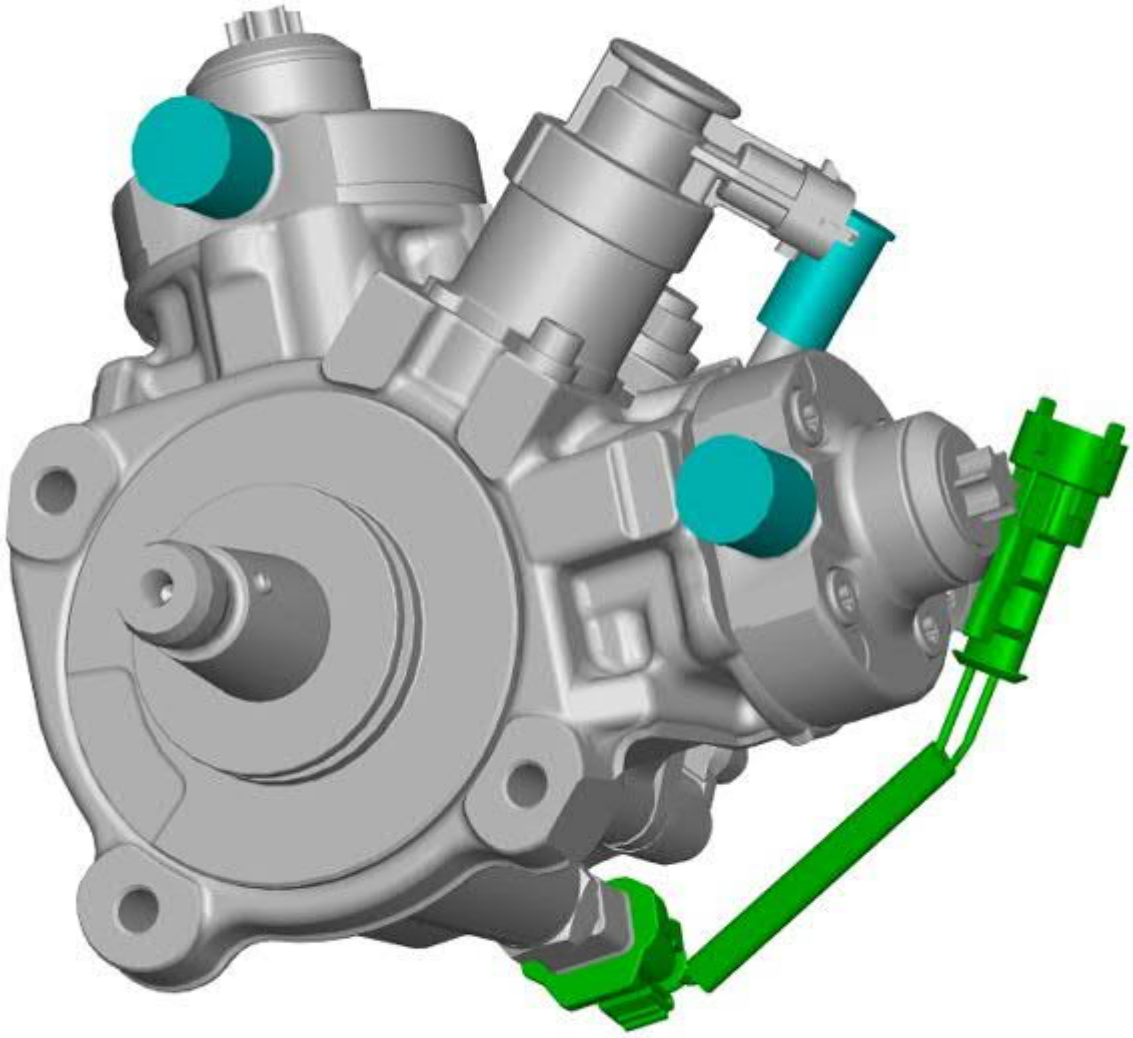
Fuel Cooler

An air blast fuel cooler is located under the LH side of the vehicle floor pan. The fuel cooler has 2 connections; one is an inlet which allows heated fuel from the HP pump to be cooled, the second allows the cooled fuel to be fed from the cooler into the supply pipe from the LP fuel pump in the fuel tank, via a 'Y' connector back to the fuel filter.

When the regulating valve in the fuel filter is open, the heated fuel from the HP pump is routed direct to the fuel cooler before returning to the fuel filter.

HIGH PRESSURE (HP) SYSTEM

HP Fuel Pump



E108848

The HP pump is a 2 piston radial plunger pump. The pump has the ability to produce a maximum pressure of 2000 bar (29007 lbf/in²). The housing is cast from iron, the flange is cast from aluminum.

The HP pump is driven from the LH cylinder bank exhaust camshaft via a toothed belt. The drive from the belt rotates a cam within the pump which operate a plunger within each pumping element. A procedure and special tools are required for pump or belt replacement to time the pump.

The high-pressure pump comprises 2 high pressure pumping elements, a volume control valve, an internal transfer pump and a fuel temperature sensor.

The fuel is delivered to the internal transfer pump via the external fuel filter and an electric fuel pump which is located in the fuel tank.

The volume control valve is mounted on the high-pressure pump, and located in the feed port between the high pressure pump elements and the internal transfer pump. The volume control valve is a variable position solenoid-operated valve that is controlled by the ECM. The volume control valve determines the amount of fuel that is delivered from the internal transfer pump to the HP pumping elements. When there is no signal to the volume control valve, the valve is closed and there is no fuel delivery.

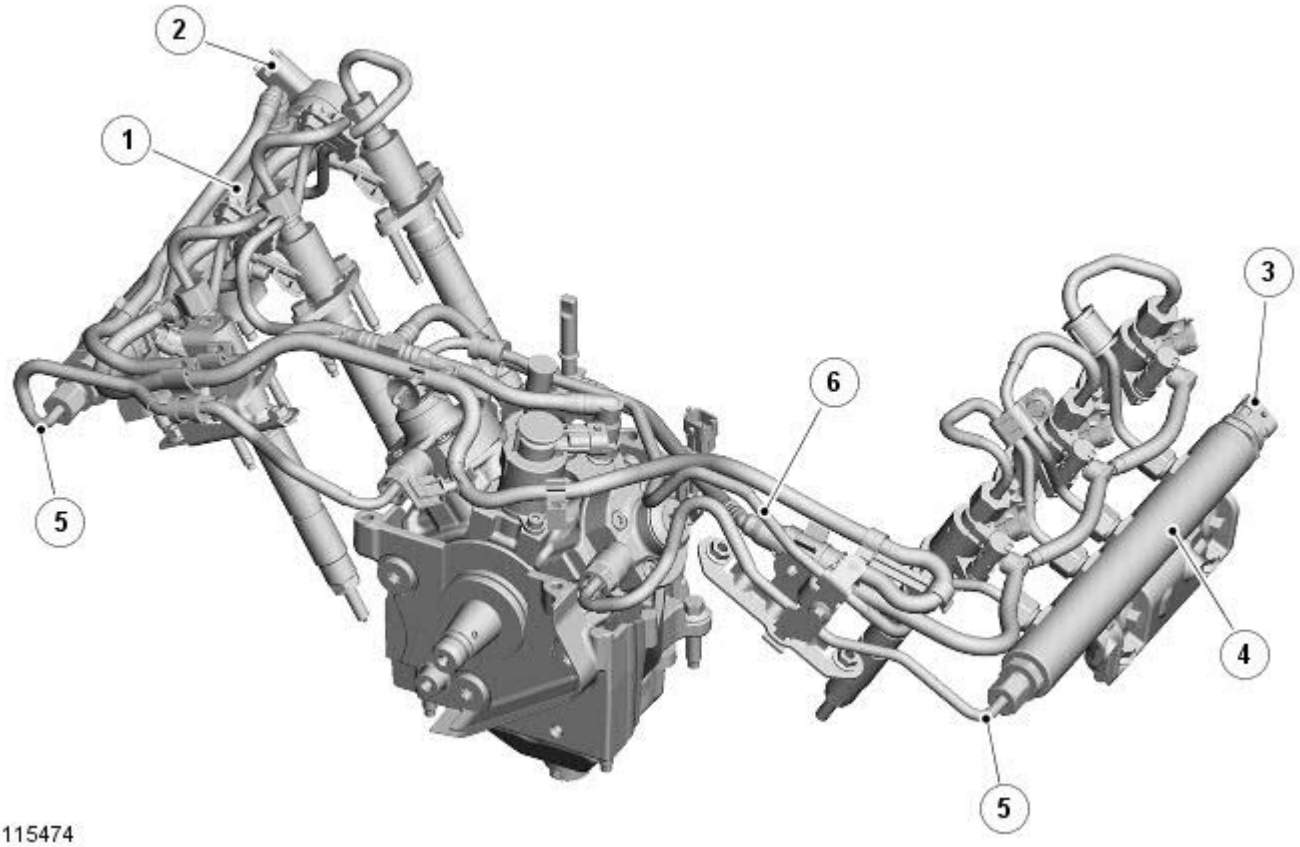
The fuel from the internal transfer pump is passed to the HP pumping elements at a constant pressure known as transfer pressure. The transfer pressure is controlled by an internal pressure relief valve. Once the fuel enters each of the HP pump elements the pressure rises rapidly, with each element providing a HP supply to one of the fuel rails. The high pressure is controlled by the high pressure regulator valve and the fuel rail pressure sensor.

A controlled amount of fuel is allowed to leak-off from the internal transfer pump. This fuel is delivered to the pump internal components to provide cooling and lubrication and is passed back the fuel filter via the LP feed line.

The pressure control valve is located in one of the fuel rails. The fuel pressure is monitored by a pressure sensor located in the other fuel rail. The ECM controls the pressure control valve using the received signals from the pressure sensor. Reducing the pressure in the fuel rails via the pressure control valve results in fuel returning from the fuel rails to the LP fuel return to the fuel filter.

The fuel temperature sensor is located on the rear of the HP pump. It measures the fuel temperature in the low-pressure side of the HP pump. The ECM continually monitors this signal to determine the fuel temperature to prevent overheating of the fuel system. The ECM will also make fine adjustments to fuel injection quantity to adjust for fuel temperature.

Fuel Rails



E115474

Item	Description
1	LH fuel rail
2	Fuel pressure control valve
3	Fuel pressure sensor
4	RH (right-hand) fuel rail
5	HP fuel connection from HP pump
6	Fuel rail balance pipe

The fuel rails are steel fabrications and are similar in their construction. Two fuel rails are used with each rail supplying high pressure fuel to 3 fuel injectors.

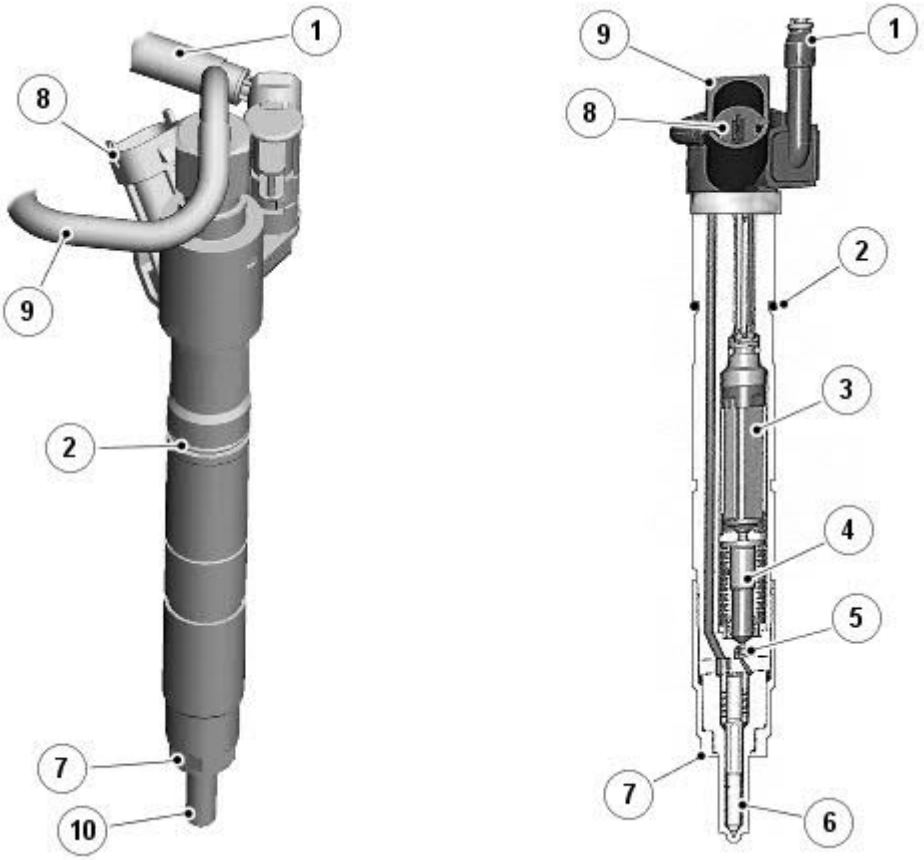
Each rail has 5 threaded connections which provide for the attachment of the high pressure fuel supply from the HP pump, the balance pipe and connections for the 3 injectors supplied with fuel from that rail.

The fuel pressure in the rails is detected by a fuel pressure sensor which is located in the end of the RH rail. The LH rail houses a pressure control valve. The ECM controls the pressure control valve using signals from the pressure sensor.

The fuel rail pressure sensor is a piezo-resistive type sensor containing an actuating diaphragm. Deflection of the diaphragm provides a proportional signal (output) voltage to the ECM, dependant on the fuel pressure within the fuel rail.

Both rails are connected together with a balance pipe which ensures the pressure in both rails is equal, even though each rail is supplied from a different pumping element in the HP pump.

Fuel Injectors



E115475

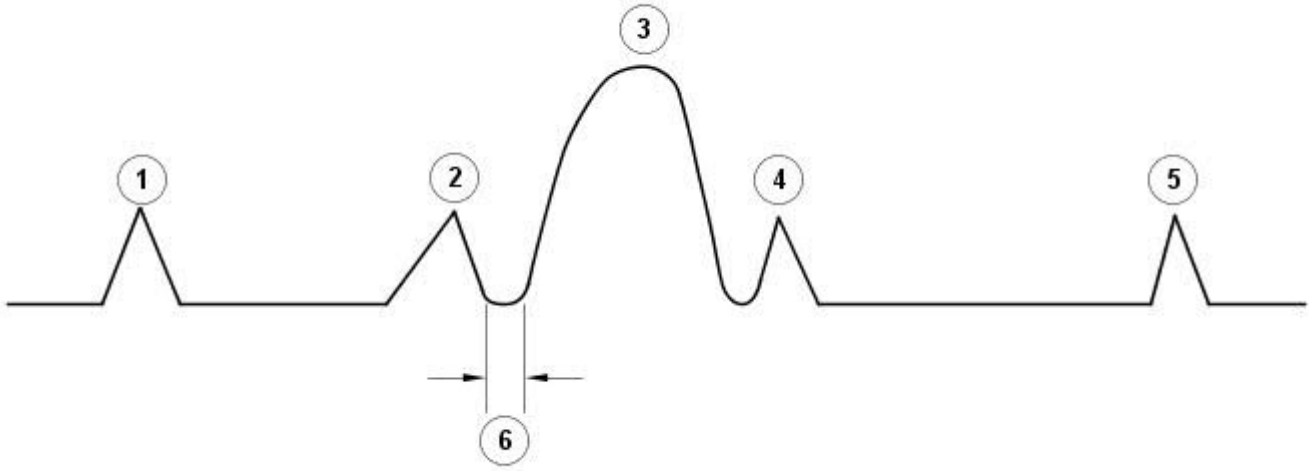
Item	Description
1	Fuel return
2	O-ring seal
3	Piezo stack actuator
4	Hydraulic coupler
5	Control valve
6	Nozzle body
7	Copper sealing washer
8	Electrical connector
9	High pressure feed
10	Nozzle

Six fuel injectors are used in the fuel system. A piezo actuator in each injector is electronically controlled by the ECM to operate the injector in response to engine speed and load conditions.

Each injector has an electrical connector which connects the injector to the engine harness. A fuel connection on the top of the injector provides for the high pressure fuel inlet from the HP pump. A second fuel connection allows fuel leakage within the injector to return to the HP pump.

Each injector is located in a machined hole in the cylinder head and is sealed in the cylinder head with a copper sealing washer and an O-ring seal. The injector is retained in the cylinder head with a clamp plate and 2 bolts. If an injector is removed or replaced, a new copper sealing washer and a clamp plate must be used when refitting the injector.

The injector can operate up to 5 times during one combustion cycle depending on engine speed and load. The injection sequence can occur as follows:



E107577

1. Pilot injection - occurs before the main injection and improves fuel and air mixing
2. Pre-injection - shortens the main injection's ignition delay and therefore reduces the generation of nitrous oxides
3. Main injection - delivers the required engine torque
4. After injection - occurs after the Main injection and assists the re-burn of any remaining particulate matter
5. Post injection - helps manage the temperature of the exhaust gas for more effective exhaust-gas after-treatment
6. Injection delay 0.4 ms.

Each injector is calibrated to the ECM and applicable the cylinder to which it is fitted. Therefore, if an injector is removed it must be refitted to the cylinder from which it was removed. If a new injector is fitted, a calibration routine using a Jaguar approved diagnostic system must be performed to calibrate the injector unique code to the ECM.

The operating voltage of the injector is between 110 and 163 volts depending on engine speed and load and care must be taken when working in the vicinity of the injectors. The voltage increases linearly from 200 to 2000 bar (2900 to 29007 lbf/in²).

Each injector has an electrical resistance value of between 150 - 250 kOhms.

CAUTION: Each injector operation is controlled by a charge and discharge cycle allowing energy to dissipate in, and recover from the injector. Never disconnect the wiring connection when the engine is running. The injector can remain open thus causing engine damage.

Published: 11-May-2011

Fuel Charging and Controls - TDV6 3.0L Diesel - Fuel Charging and Controls

Diagnosis and Testing

Principles of Operation

For a detailed description of the fuel charging and controls system and operation, refer to the relevant Description and Operation section in the workshop manual. REFER to: (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel)

Fuel Charging and Controls (Description and Operation),
Fuel Charging and Controls (Description and Operation),
Fuel Charging and Controls (Description and Operation).

Inspection and Verification

WARNINGS:

Do **NOT** carry out any work on the fuel system with the engine running. The fuel pressure within the system can be as high as 2000 bar (29,008 lb/in²). Failure to follow this instruction may result in personal injury.

Eye protection must be worn at all times when working on or near any fuel related components. Failure to follow this instruction may result in personal injury.

This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow this instruction may result in personal injury.

After carrying out repairs, the fuel system must be checked visually for leaks. This should be done after the engine has been run, but with the engine switched **OFF**. Failure to follow this instruction may result in personal injury.

If taken internally, **DO NOT** induce vomiting. Seek immediate medical attention. Failure to follow this instruction may result in personal injury.

If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek medical attention. Failure to follow this instruction may result in personal injury.

Wash hands thoroughly after handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention. Failure to follow this instruction may result in personal injury.

CAUTIONS:

Before disconnecting any part of the system, it is imperative that all dust, dirt and debris is removed from around components to prevent ingress of foreign matter into the fuel system. Failure to follow this instruction may result in damage to the vehicle.

The fuel pipes between the injectors and the rail must be discarded after each use, and new pipes installed. Failure to follow this instruction may result in damage to the vehicle.

It is essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in damage to the vehicle.

Make sure that the workshop area in which the vehicle is being worked on is as clean and dust-free as possible. Areas in which work on clutches, brakes or where welding or machining are carried out are not suitable in view of the risk of contamination to the fuel system. Failure to follow this instruction may result in damage to the vehicle.

Make sure that any protective clothing worn is clean and made from lint-free non-flocking material. Failure to follow this instruction may result in damage to the vehicle.

Make sure that any protective gloves worn are new and are of the non-powdered latex type. Failure to follow this instruction may result in damage to the vehicle.

Make sure that clean, non-plated tools are used. Clean tools using a new brush that will not lose it's bristles and fresh cleaning fluid prior to starting work on the vehicle. Failure to follow this instruction may result in damage to the vehicle.

Use a steel-topped work bench and cover it with clean, lint-free, non-flocking material. Failure to follow this instruction may result in damage to the vehicle.

Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to 3 decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
• Fuel level • Contaminated fuel • Fuel supply line(s) • Fuel return line(s) • High-pressure fuel supply line(s) • Fuel tank filler pipe • Fuel leak(s) • Fuel tank • Fuel filler cap • Fuel filter • Push connect fittings • Fuel rail • Fuel injection pump • Exhaust Gas Recirculation (EGR) system	• Glow plug indicator • Inertia fuel shutoff (IFS) switch • Fuel pump module • Sensor(s) • Engine Control Module (ECM) • Fuel volume control valve (FVCV) • Fuel pressure control valve (FPCV) • Fuel rail pressure (FRP) sensor • Fuel temperature sensor • Fuel injector(s) • Exhaust Gas Recirculation (EGR) system

3. If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the symptom chart.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible causes	Action
Engine cranks, but does not start	• Inertia fuel shutoff switch • Low/Contaminated fuel • Air leakage • Low-pressure fuel system fault • Fuel pump module (lift pump) fault • Blocked fuel filter • Fuel volume regulator blocked/contaminated • Fuel pressure control valve blocked/contaminated • Fuel pump fault • Crankshaft Position (CKP) sensor	Check that the inertia switch has not tripped. Check the fuel level and condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the intake air system for leaks. Check the lift pump operation, check the low-pressure fuel system for leaks/damage. Check the fuel filter, check for DTCs indicating a fuel volume or pressure control valve fault. Check the fuel pump. Check the crankshaft position sensor circuits. Refer to the electrical guides.
Difficult to start	• Glow plug system fault (very cold conditions) • Low/Contaminated fuel • Air leakage • Fuel pump module (lift	Check the glow plug circuits. Refer to the electrical guides. Check the fuel level/condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the intake air system for leaks. Check the lift pump operation, check the low-pressure fuel system for leaks/damage. Check the fuel filter, check for DTCs indicating a fuel volume or

Symptom	Possible causes	Action
	pump) fault • Low-pressure fuel system fault • Blocked fuel filter • Fuel volume control valve blocked/contaminated • Fuel pressure control valve blocked/contaminated • Exhaust gas recirculation (EGR) valve(s) fault	pressure control valve fault. Carry out EGR valve checks.
Rough idle	• Intake air system fault • Low/Contaminated fuel • Low-pressure fuel system fault • Blocked fuel filter • Fuel volume control valve blocked/contaminated • Fuel pressure control valve blocked/contaminated • Exhaust gas recirculation (EGR) valve(s) fault	Check the intake air system for leaks. Check the fuel level/condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the low-pressure fuel system for leaks/damage. Check the fuel filter, check for DTCs indicating a fuel volume or pressure control valve fault. Carry out EGR valve checks.
Lack of power when accelerating	• Intake air system fault • Restricted exhaust system • Low fuel pressure • Exhaust gas recirculation (EGR) valve(s) fault • Turbocharger actuator fault	Check the intake air system for leakage or restriction. Check for a blockage/restriction in the exhaust system, install new components as necessary. Check for DTCs indicating a fuel pressure fault. Carry out EGR valve checks. Carry out turbocharger actuator checks.
Engine stops/stalls	• Air leakage • Low/Contaminated fuel • Low-pressure fuel system fault • High pressure fuel leak • Fuel volume control valve blocked/contaminated • Fuel pressure control valve blocked/contaminated • Exhaust gas recirculation (EGR) valve fault	Check the intake air system for leaks. Check the fuel level/condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the fuel system for leaks/damage: Check for DTCs indicating a fuel volume or pressure control valve fault. Carry out EGR valve checks.
Engine judders	• Low/Contaminated fuel • Air ingress • Low-pressure fuel system fault • Fuel metering valve blocked/contaminated • Fuel volume control valve blocked/contaminated • Fuel pressure control valve blocked/contaminated • High pressure fuel leak • Fuel pump fault	Check the fuel level/condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the intake air system for leaks. Check the low-pressure fuel system for leaks/damage. Check the high pressure fuel system for leaks, check for DTCs indicating a fuel volume or pressure control valve fault. Check the fuel pump.
Excessive fuel consumption	• Low-pressure fuel system fault • Fuel volume control valve blocked/contaminated	Check the low-pressure fuel system for leaks/damage. Check for DTCs indicating a fuel volume or pressure control valve fault. Check the fuel temperature sensor, fuel pump, etc for leaks. Check for injector DTCs. Carry out EGR valve checks.

Symptom	Possible causes	Action
	• Fuel pressure control valve blocked/contaminated • Fuel temperature sensor leak • High pressure fuel leak • Injector(s) fault • Exhaust gas recirculation (EGR) valve(s) fault	

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Engine Control Module 3.0L Tdv6 (PCM) (100-00 General Information, Description and Operation).

Published: 11-May-2011

Fuel Charging and Controls - TDV6 3.0L Diesel - Fuel Injection Component Cleaning

General Procedures

WARNINGS:

Do not carry out any repairs to the fuel system with the engine running. The fuel pressure within the system can be as high as 2000 bar. Failure to follow this instruction may result in personal injury.

Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek immediate medical attention.

Place the vehicle in a well ventilated, quarantined area and arrange ' No Smoking/Petrol Fumes' signs about the vehicle.

Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury.

Wash hands thoroughly after fuel handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.

Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

CAUTIONS:

Before using the cleaning fluid, protect all electrical components and connectors with lint-free non-flocking material.

Make sure that all parts removed from the vehicle are placed on the lint-free non-flocking material.

Make sure that any protective clothing worn is clean and made from lint-free non-flocking material.

Make sure that clean non-plated tools are used. Clean tools using a new brush that will not lose its bristles and fresh cleaning fluid, prior to starting work on the vehicle.

Use a steel topped workbench and cover it with clean, lint-free non-flocking material.

Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

NOTE: Pneumatic vacuum gun

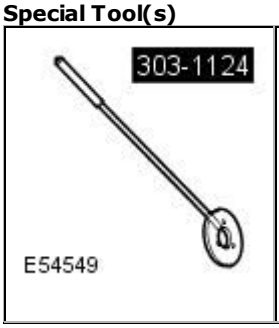
1. Using a new brush that will not lose its bristles, brush cleaning fluid onto the components being removed and onto the surrounding area.
2. Using a pneumatic vacuum gun, remove all traces of cleaning fluid and foreign material.
3. Dispose of any used cleaning fluid and the brush after completing the repair.

Published: 11-May-2011

Fuel Charging and Controls - TDV6 3.0L Diesel - Fuel Injection Pump

Removal and Installation

Special Tool(s)

	303-1124 Holding Tool, Camshaft Front Pulley

Removal

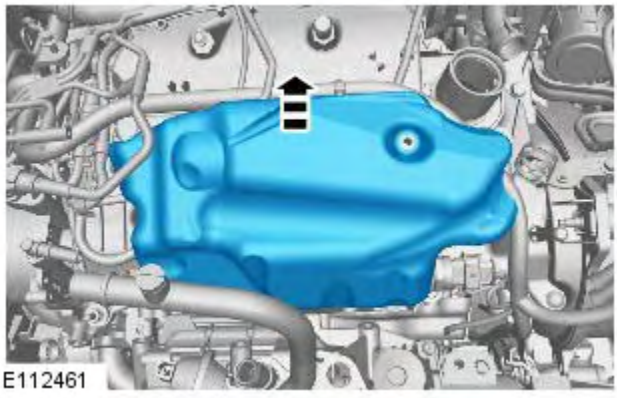
NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

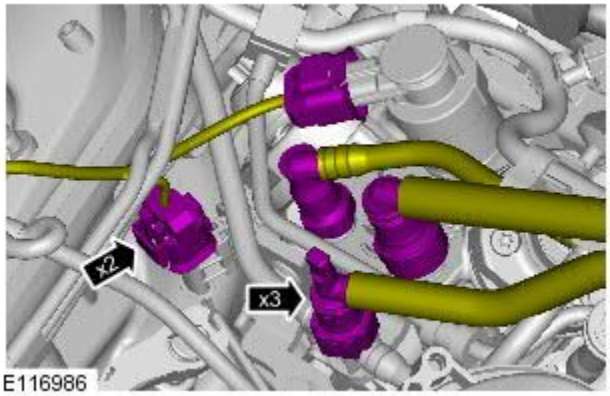


3. NOTE: Left-hand shown, right-hand similar.

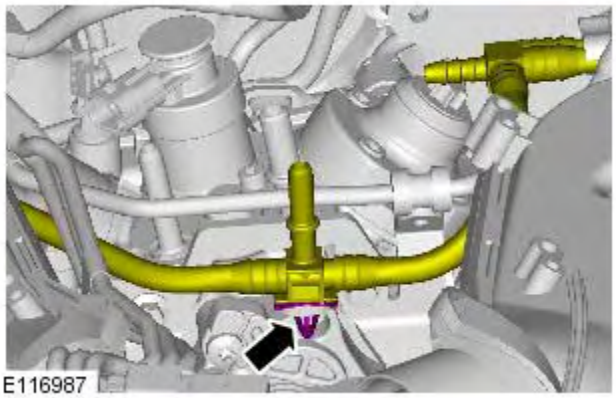
4. Refer to: Fuel Injection Component Cleaning (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, General Procedures).

5. Refer to: Fuel Injection Pump Pulley (303-05A Accessory Drive - TDV6 3.0L Diesel, Removal and Installation).

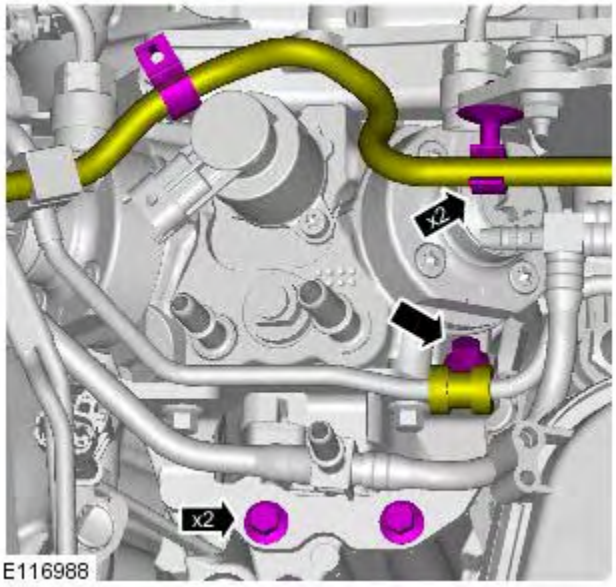
6. Refer to: Crankcase Vent Oil Separator (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).



7. CAUTION: Be prepared to collect escaping fuel.



8. CAUTION: Be prepared to collect escaping fuel.



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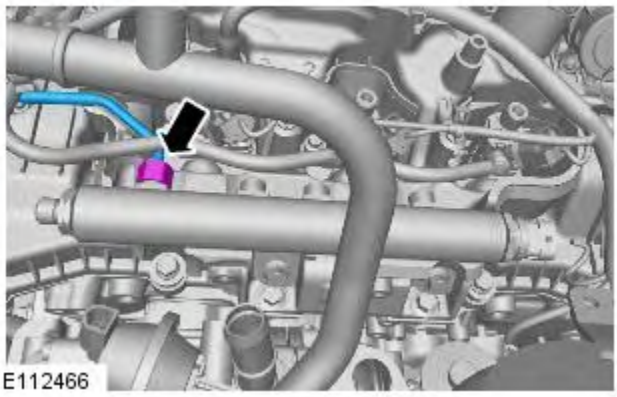
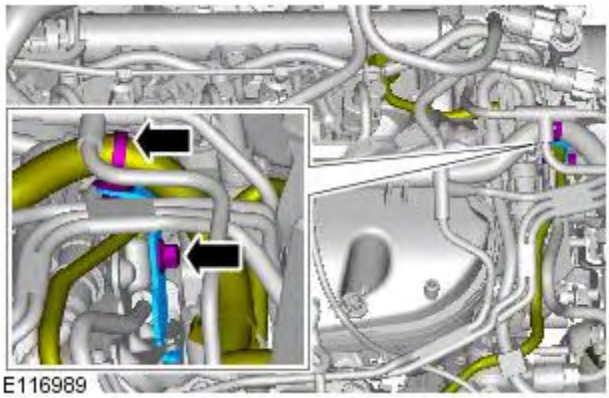


10. CAUTIONS:

Be prepared to collect escaping fuel.

Discard the component.

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



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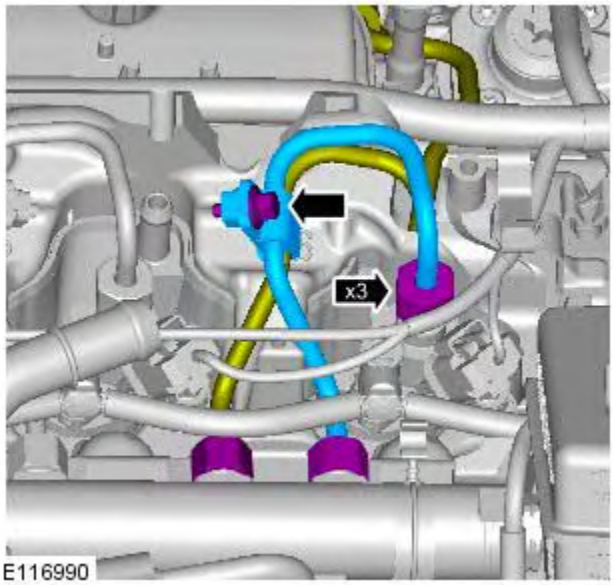
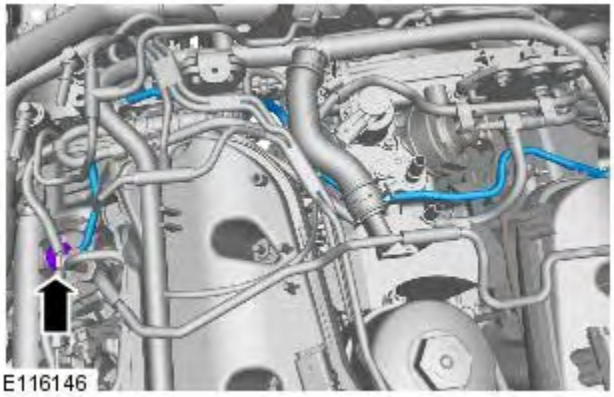


12. CAUTIONS:

Be prepared to collect escaping fuel.

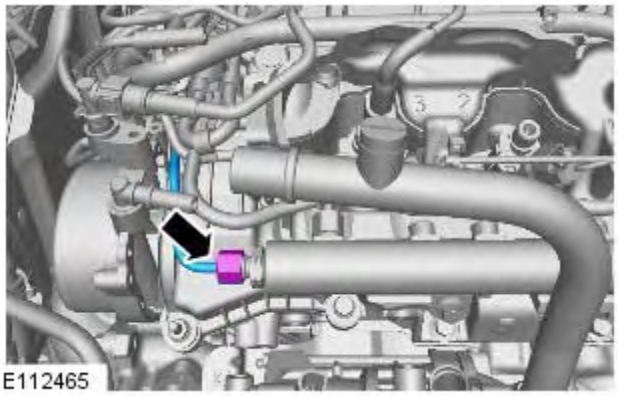
Discard the component.



13. CAUTIONS:

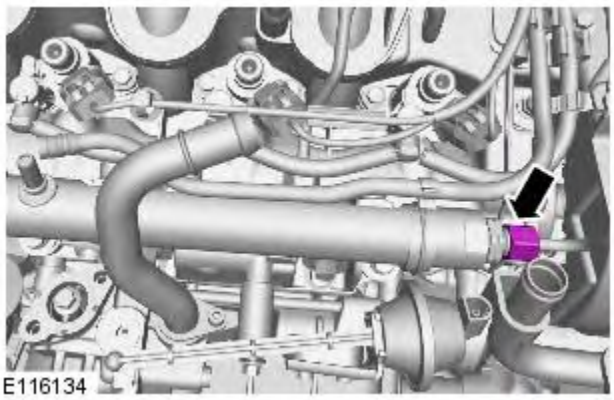
Be prepared to collect escaping fuel.

Discard the component.



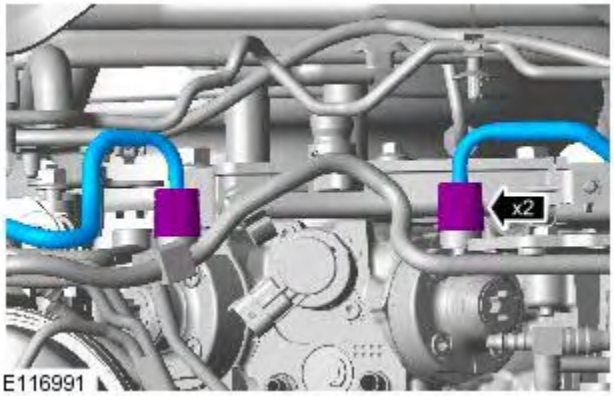
14. CAUTION: Be prepared to collect escaping fuel.

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



15. CAUTION: Be prepared to collect escaping fuel.

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

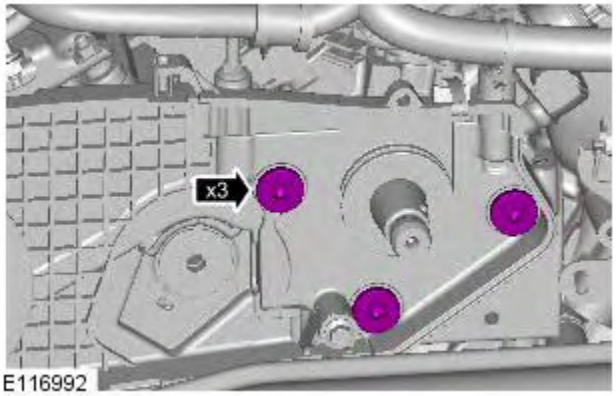


16. CAUTIONS:

Be prepared to collect escaping fuel.

Discard the components.

17.



E116992

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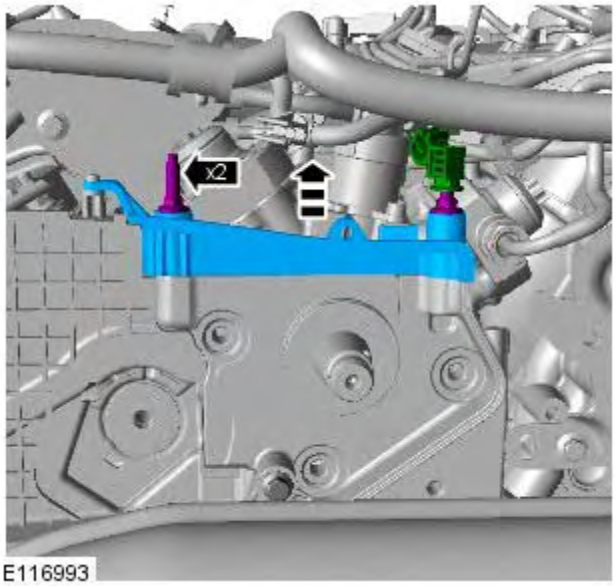

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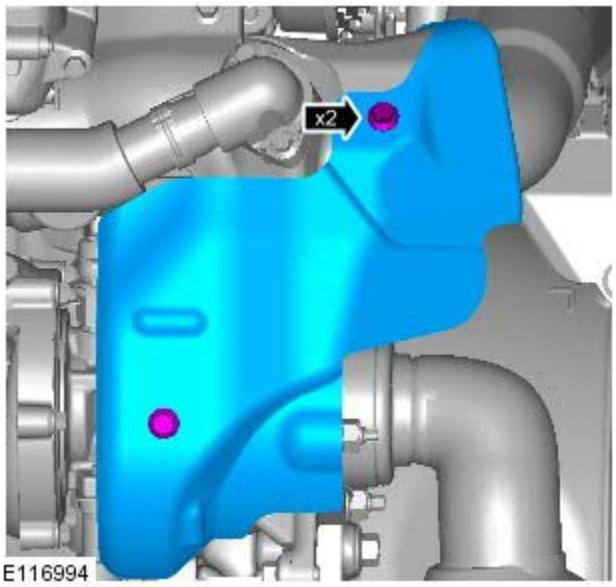

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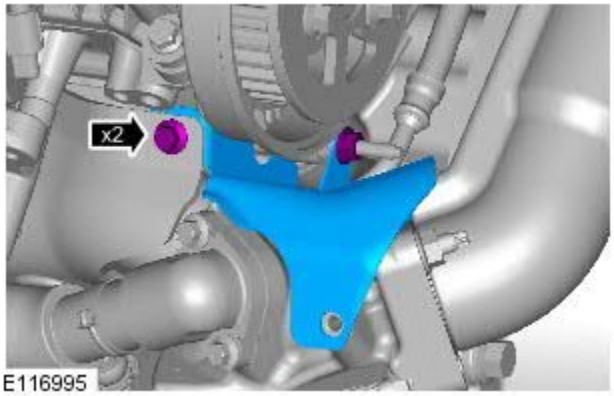

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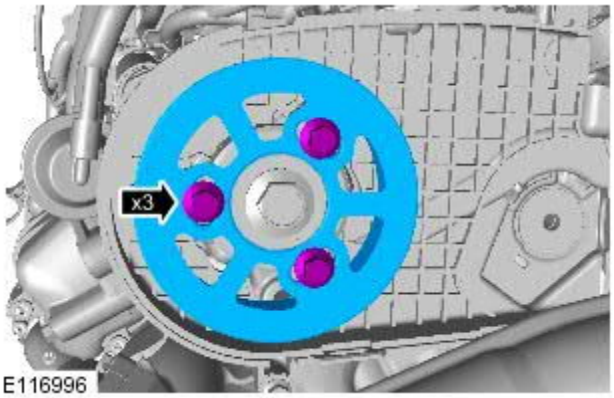
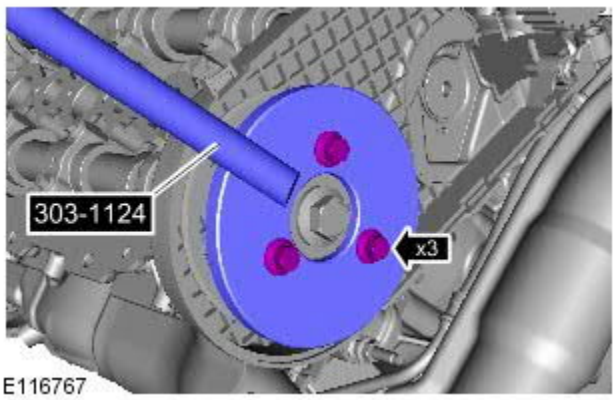


22. *Special Tool(s):* 303-1124



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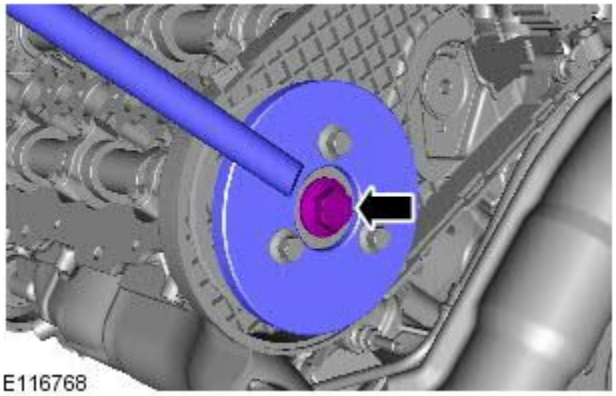

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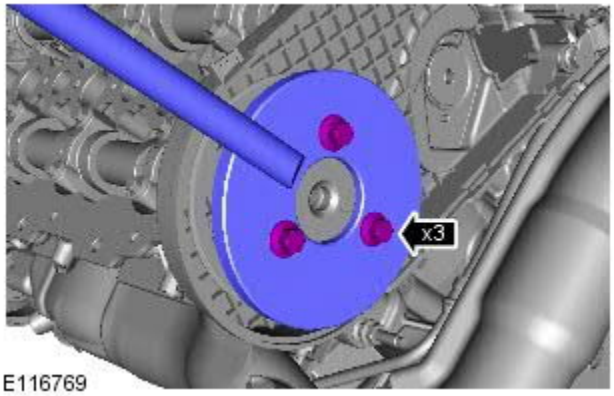

E116769

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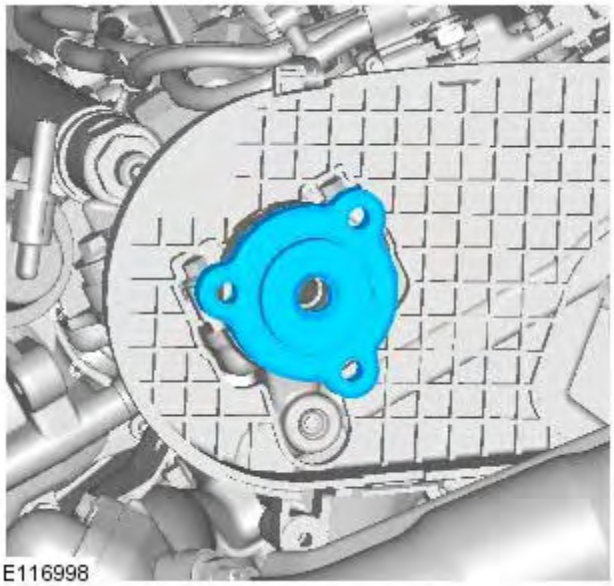
E116998

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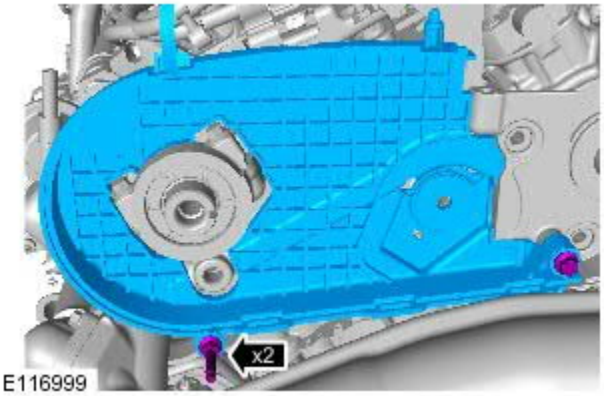

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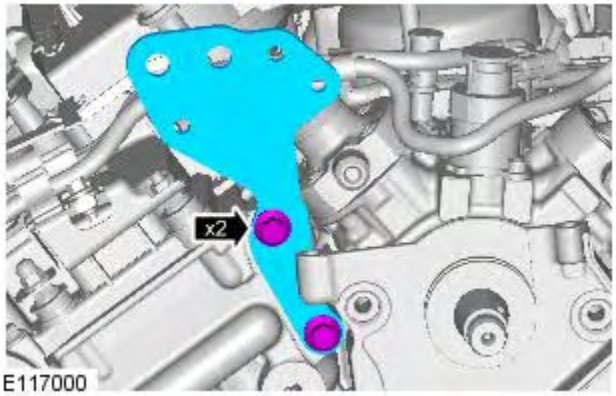

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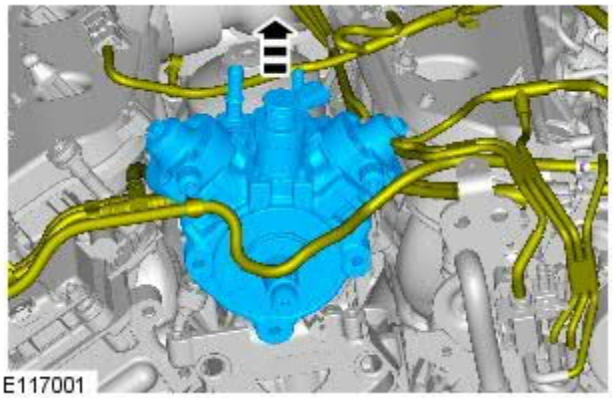
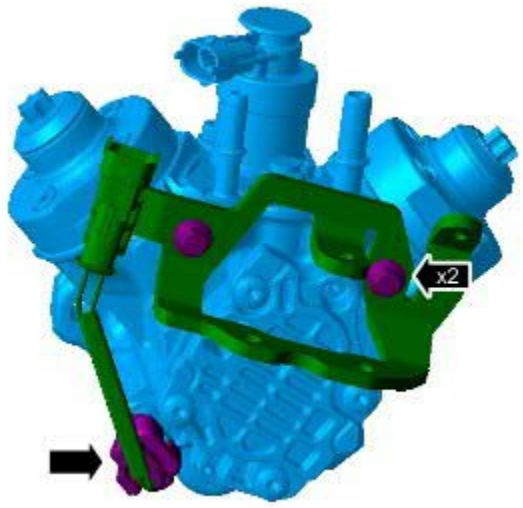

E117001

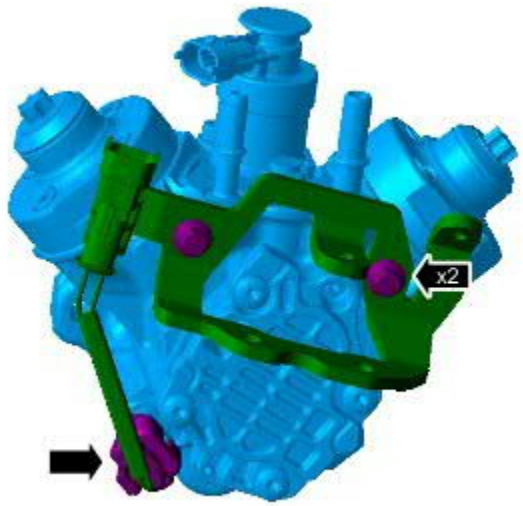
29. NOTE: Do not disassemble further if the component is removed for access only.



E117002

Installation

1. *Torque:* 3 Nm



E117002

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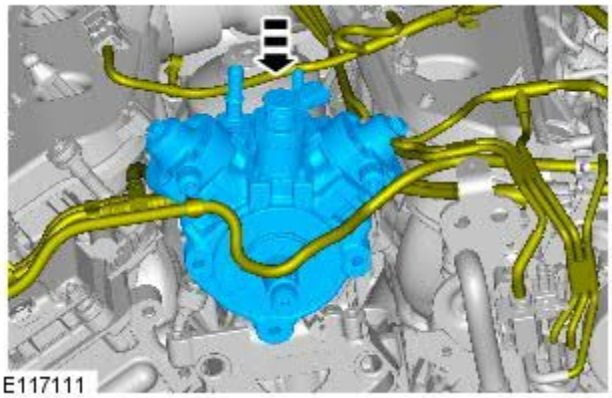
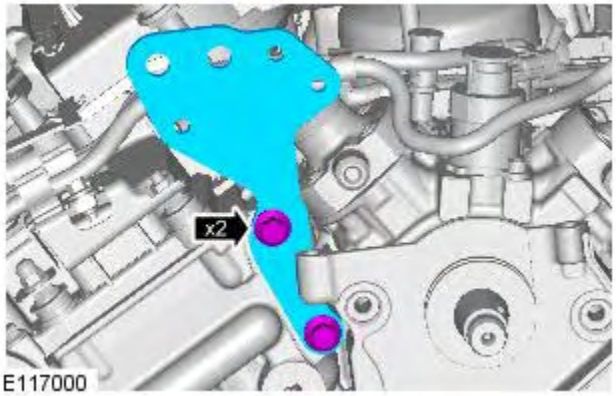


E117111

3. *Torque:* 23 Nm



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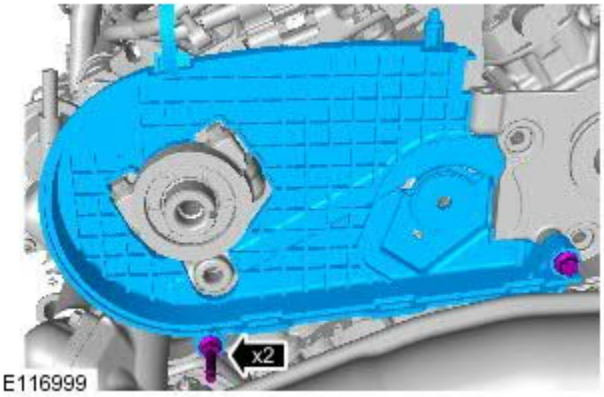
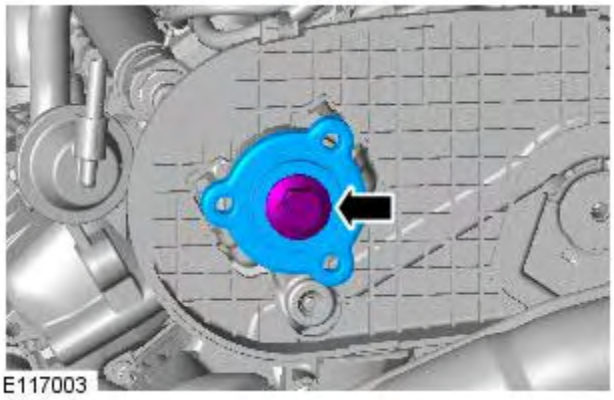


4. *Torque:* 10 Nm



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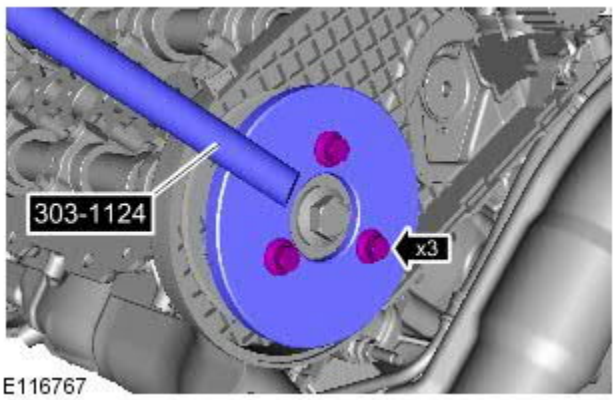
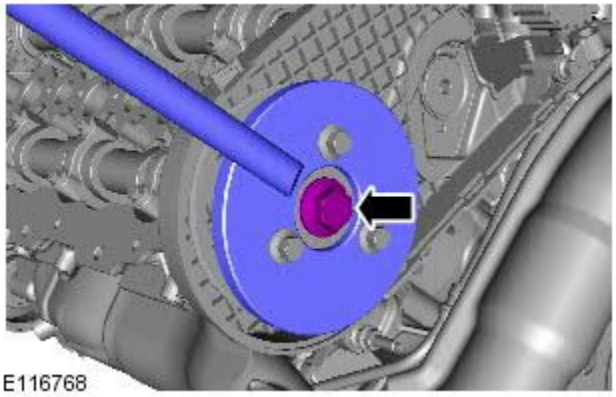
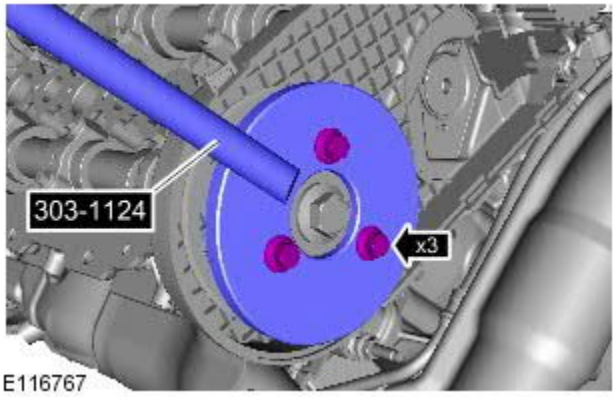


6. *Special Tool(s):* 303-1124

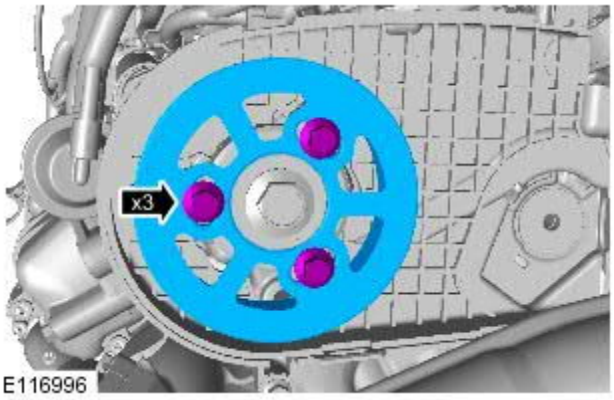


7. *Torque:*
   Stage 1:80 Nm
   Stage 2:80°

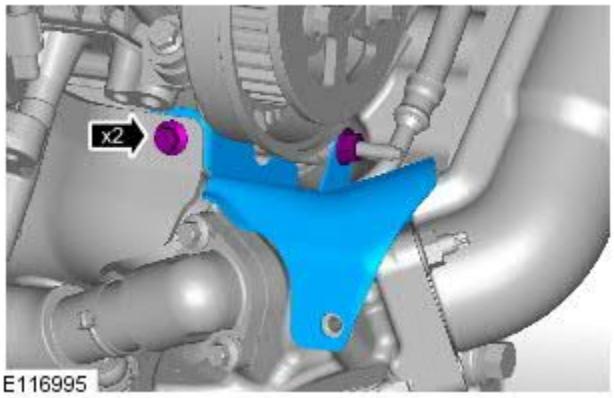
8.

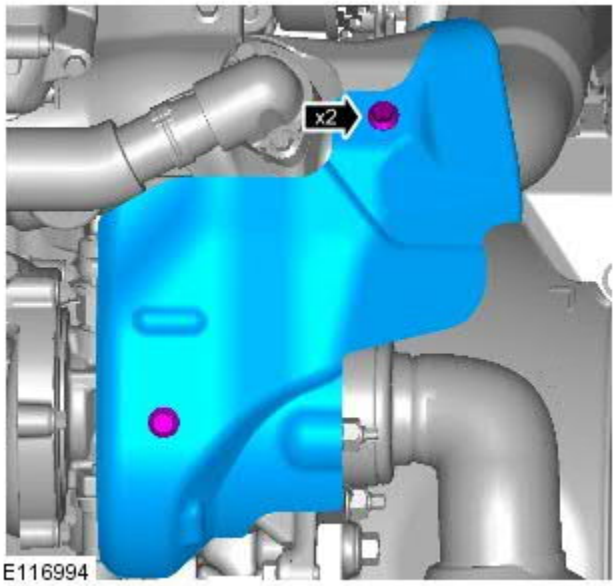


9. *Torque:* 23 Nm

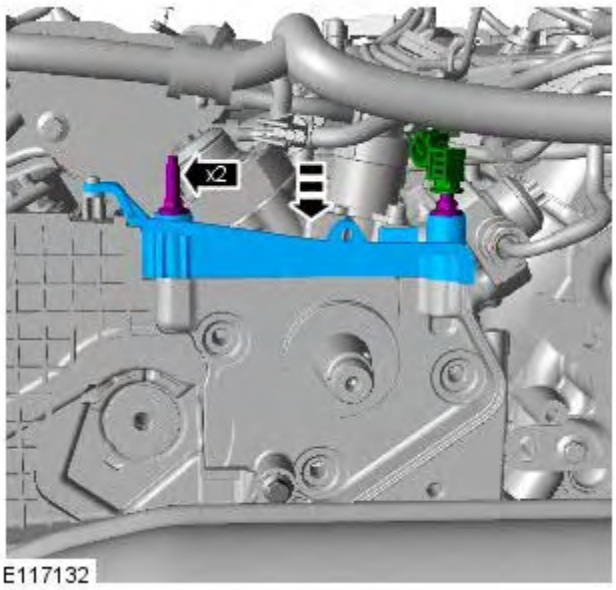


10. *Torque:* 10 Nm

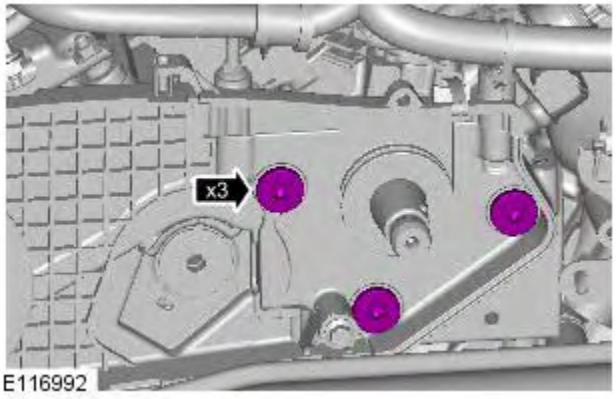




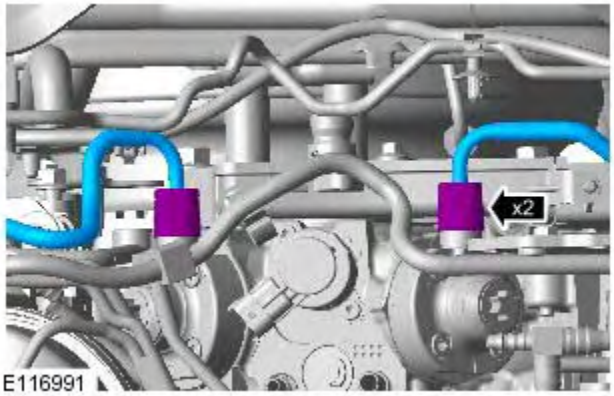
11. *Torque:* 10 Nm



12. *Torque:* 10 Nm



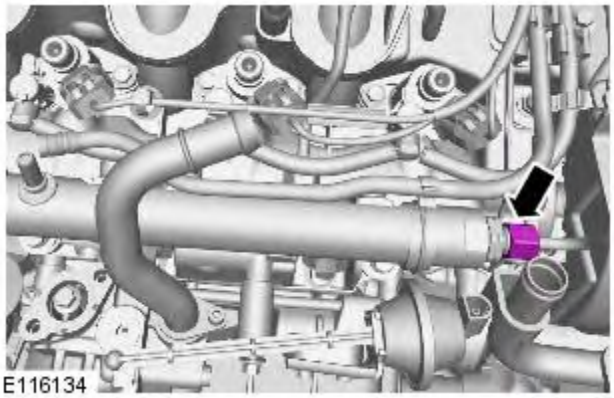
13. *Torque:* 23 Nm



14. CAUTIONS:

⚠ Tighten the fuel supply line unions finger tight.

⚠ Make sure that a new component is installed.

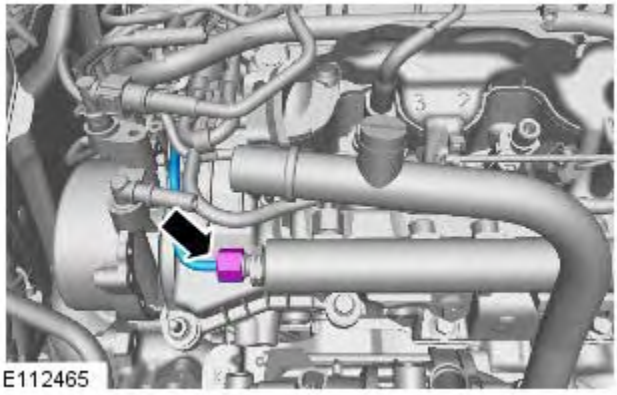


15. CAUTIONS:

⚠ Make sure that a new component is installed.

⚠ Tighten the fuel supply line unions finger tight.

△ NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

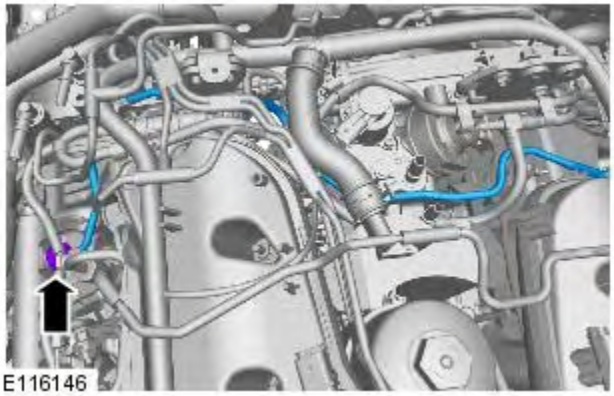


16. CAUTIONS:

⚠ Make sure that a new component is installed.

⚠ Tighten the fuel supply line unions finger tight.

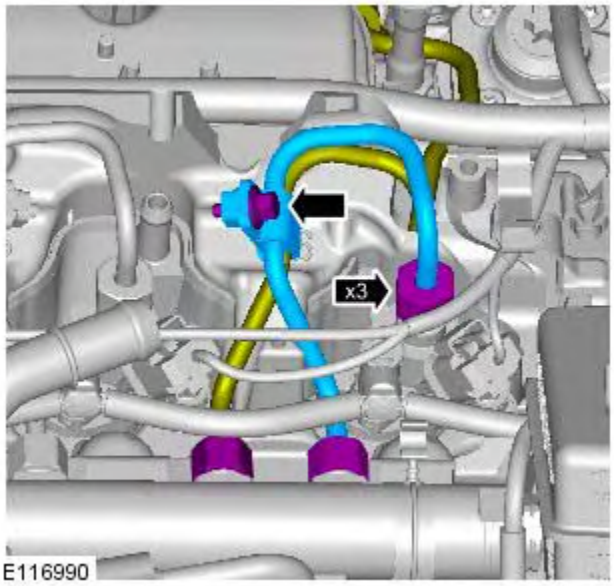
△ NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



17. CAUTIONS:

⚠ Make sure that a new component is installed.

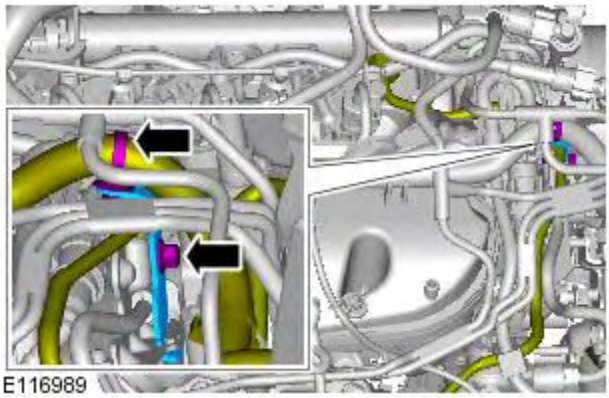
⚠ Tighten the fuel supply line unions finger tight.



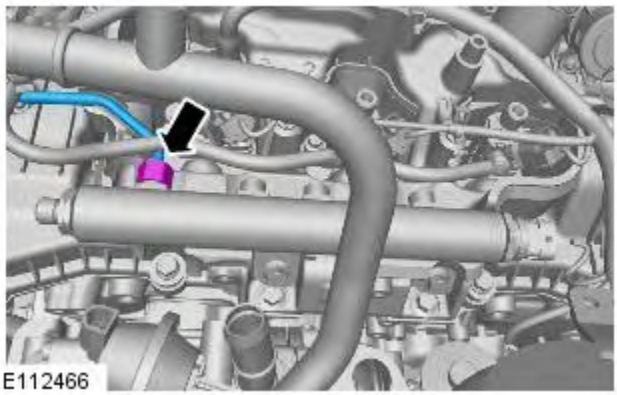
18. CAUTIONS:

⚠ Tighten the fuel supply line unions finger tight.

⚠ "Make sure that new components are installed. "



19. *Torque:* 10 Nm

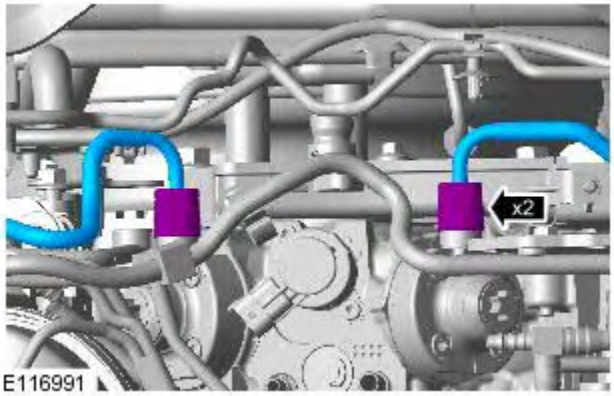


20. CAUTIONS:

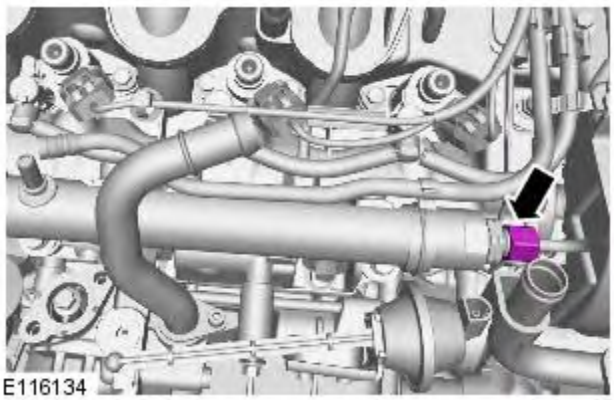
⚠ Make sure that a new component is installed.

⚠ Tighten the fuel supply line unions finger tight.

△ NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

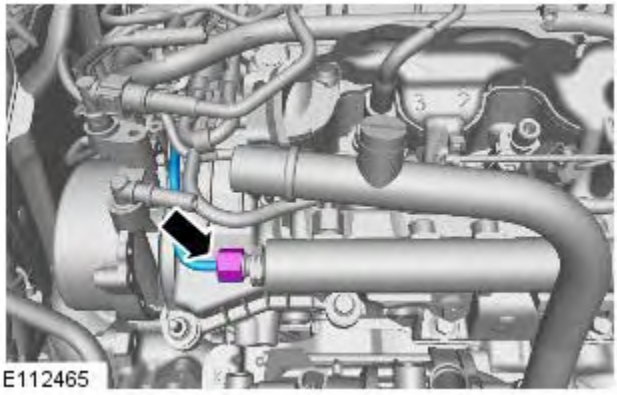


21. Tighten the high-pressure fuel lines union to 15Nm.



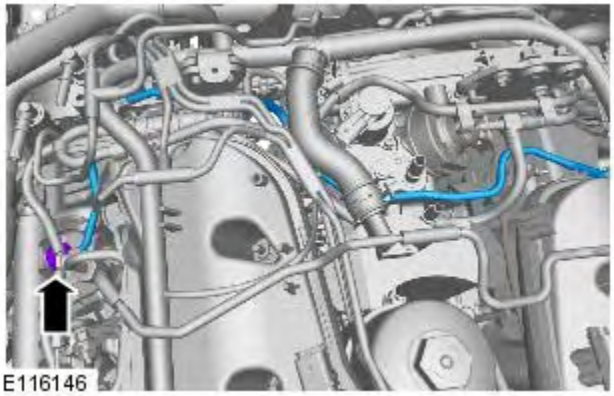
22. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Tighten the high-pressure fuel lines union to 15Nm.

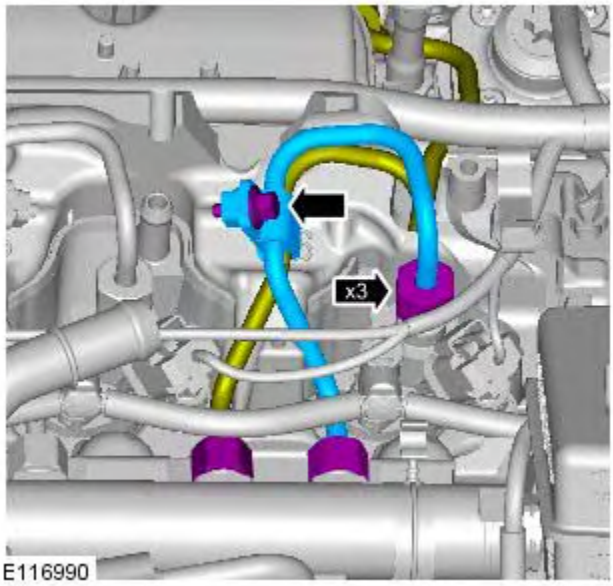


23. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

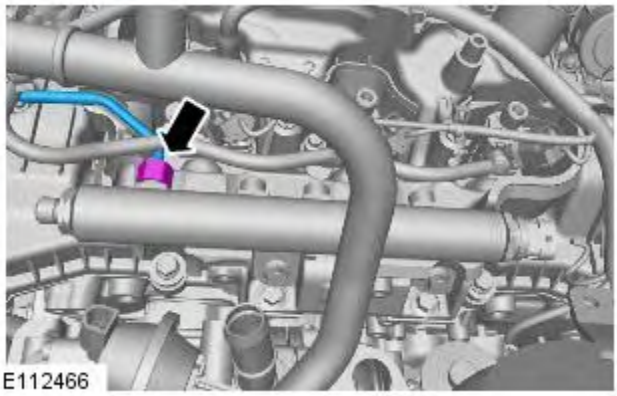
Tighten the high-pressure fuel lines union to 15Nm.



24. Tighten the high-pressure fuel lines union to 15Nm.

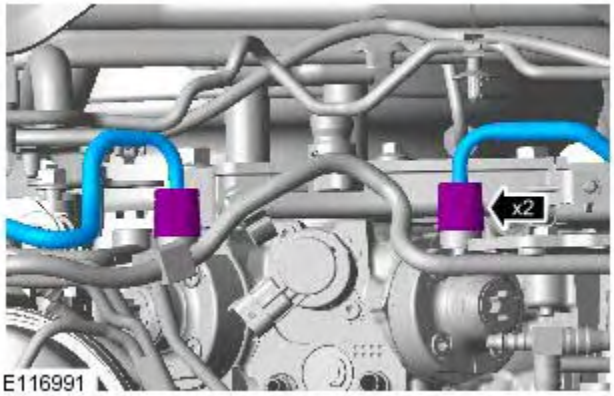


25. Tighten the high-pressure fuel lines union to 15Nm.

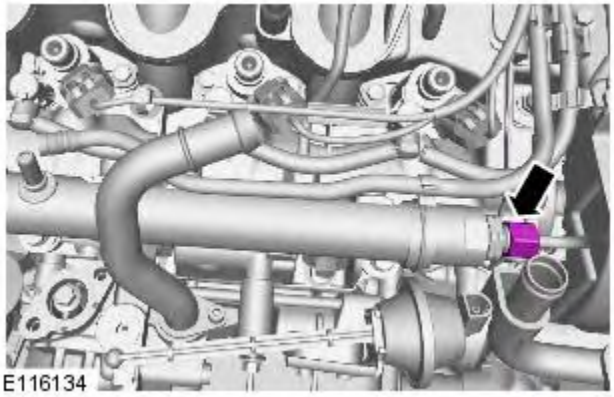


26. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Tighten the high-pressure fuel lines union to 15Nm.

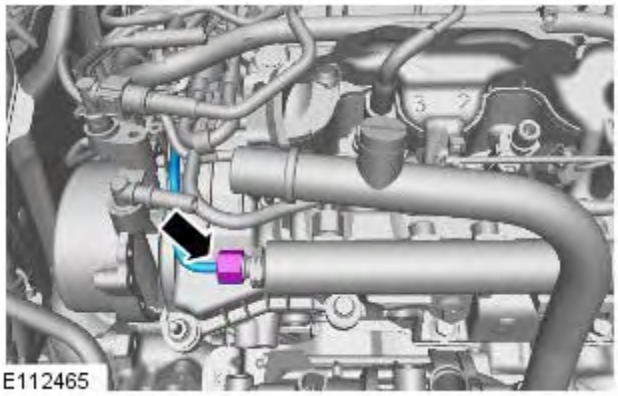


27. Tighten the high-pressure fuel line union to 30Nm.



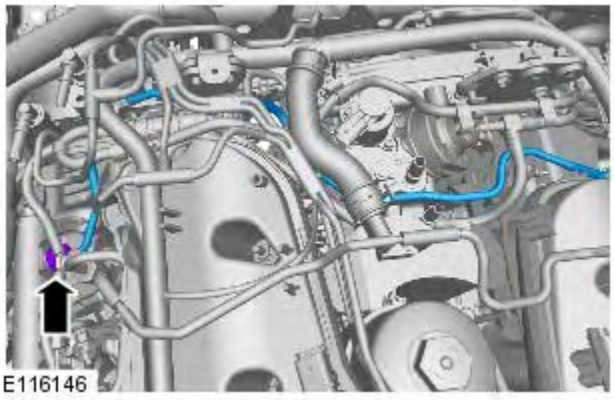
28. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

    Tighten the high-pressure fuel line union to 30Nm.

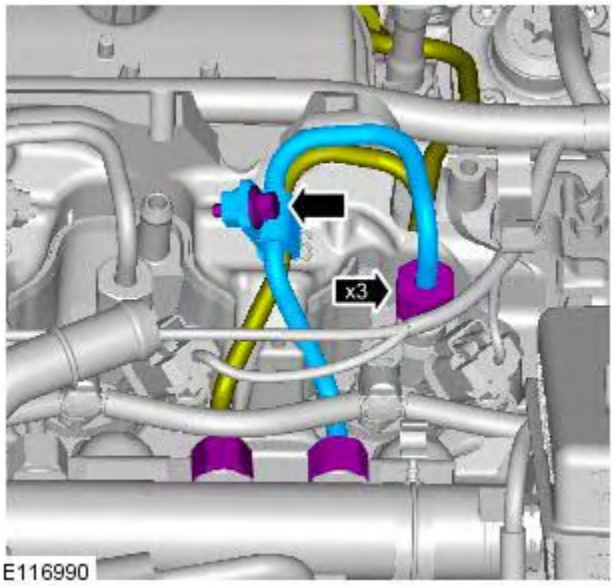


29. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

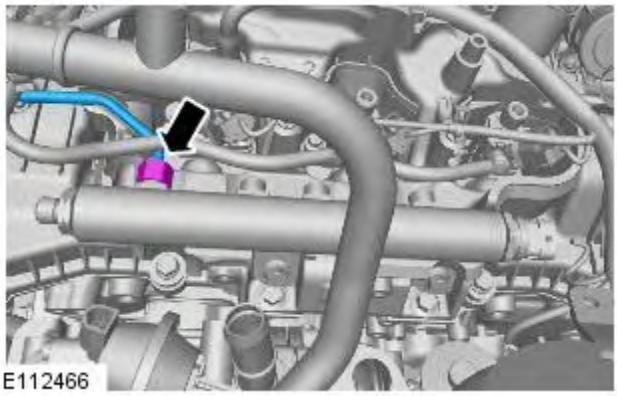
    Tighten the high-pressure fuel line union to 30Nm.



30. Tighten the high-pressure fuel line union to 30Nm.

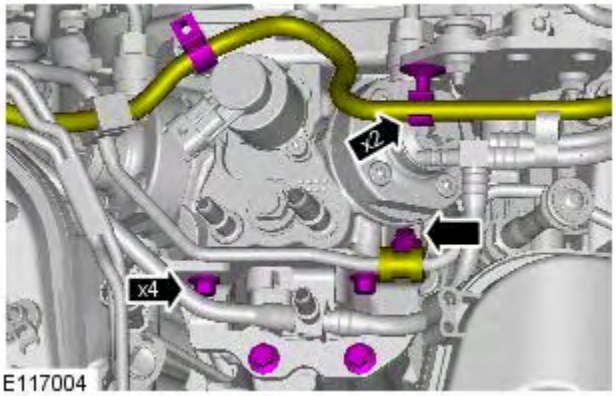


31. Tighten the high-pressure fuel line union to 30Nm.



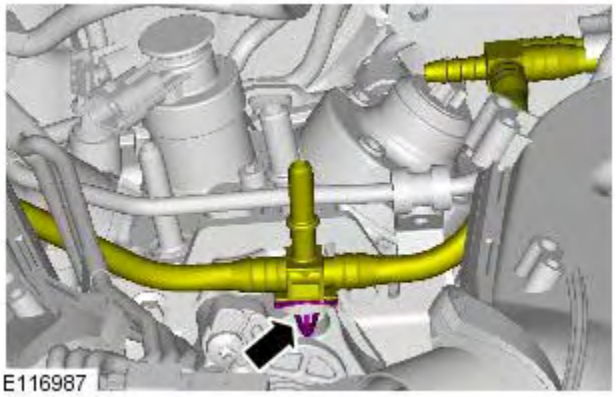
32. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Tighten the high-pressure fuel line union to 30Nm.



33. *Torque:* 10 Nm

34.



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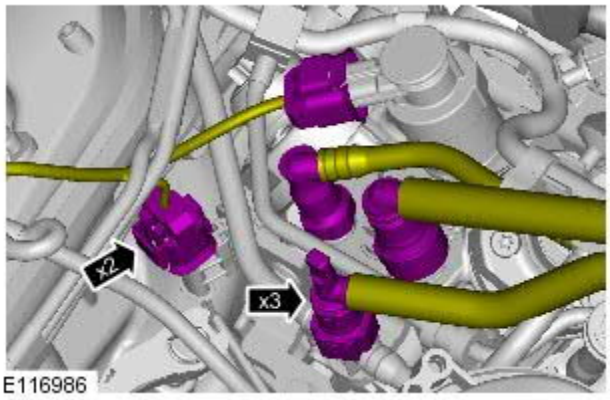
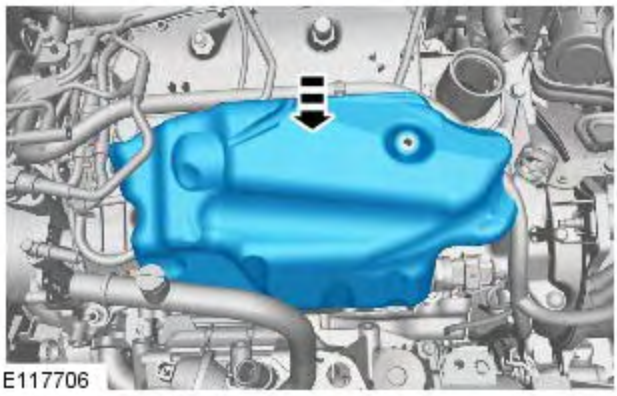


36. Refer to: Crankcase Vent Oil Separator (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).

37. Refer to: Fuel Injection Pump Pulley (303-05A Accessory Drive - TDV6 3.0L Diesel, Removal and Installation).



38. NOTE: Left-hand shown, right-hand similar.

39. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

40. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

41.

1. NOTE: A minimum of 12 litres of fuel in the fuel tank is required for the following Steps.

   Make sure the fuel tank has a sufficiant amount of fuel to carry out the following Steps.
2. NOTES:

   Do not start the vehicle.

   Allow 15 seconds between **each** ignition cycle (between each ignition **ON** and ignition **OFF**) to allow the fuel tank pump to pump fuel to the fuel injection pump correctly.

   Turn the ignition on and off four times.
3. Crank the engine until it starts.
4. Road test the vehicle for at least 10 miles (16 Km).
5. Check the diagnostic trouble codes (DTC)s using the approved diagnostic tool. Clear or repair as necessary.

Published: 11-May-2011

Fuel Charging and Controls - TDV6 3.0L Diesel - Fuel Injector

Removal and Installation

Special Tool(s)

E54135	100-012 Slide Hammer
E116924	310-213 Fuel Injector Removal Adapter

Removal

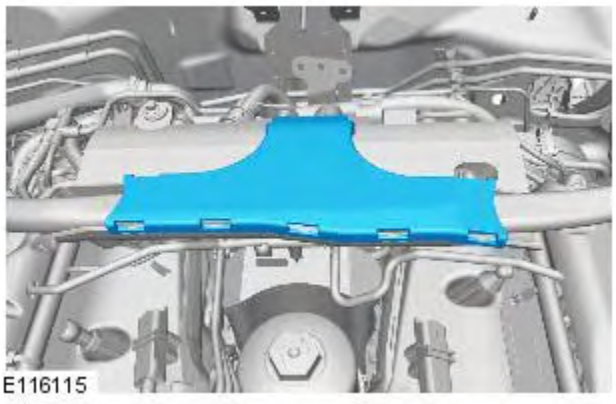
NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

All vehicles

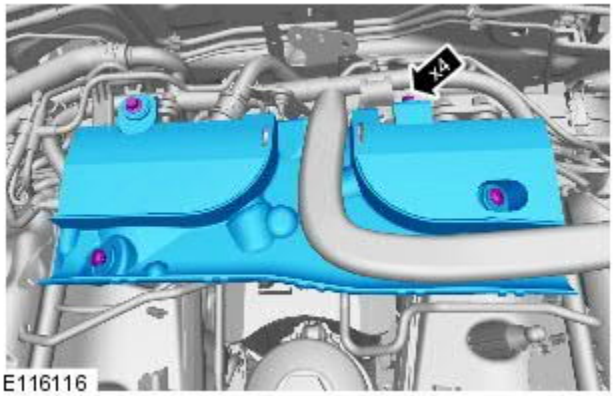
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

3.

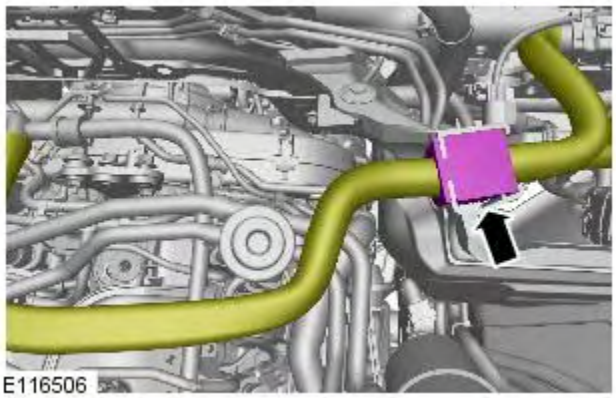

E116115

4.

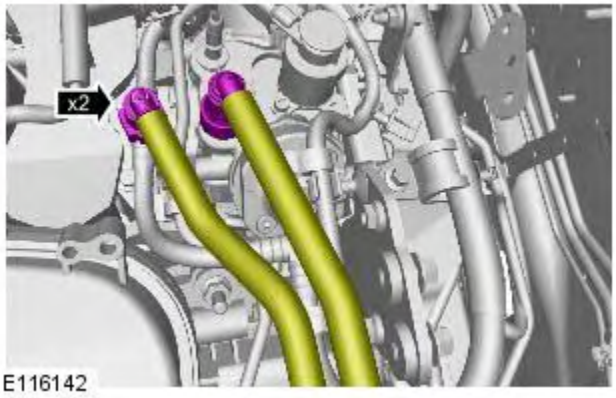


Right-hand drive vehicles

5.

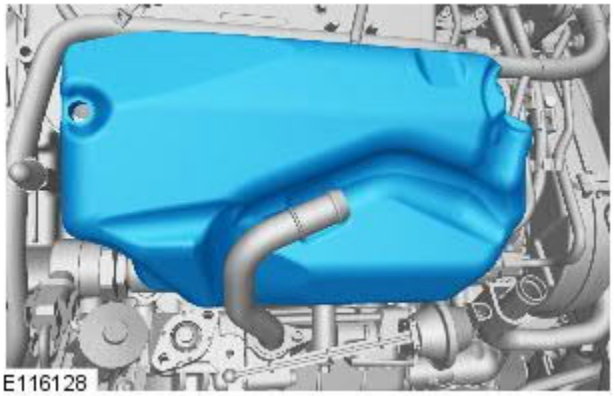


All vehicles



6. CAUTION: Be prepared to collect escaping fuel.

7.



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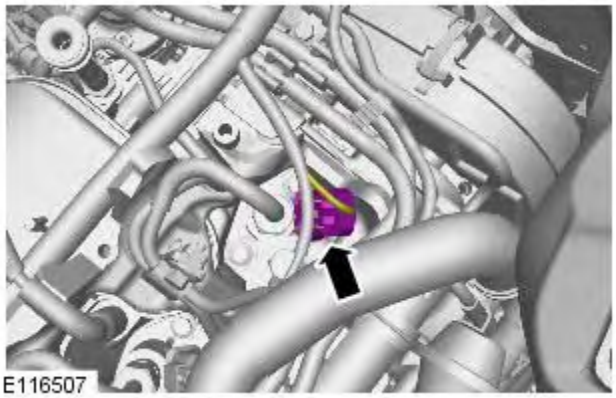
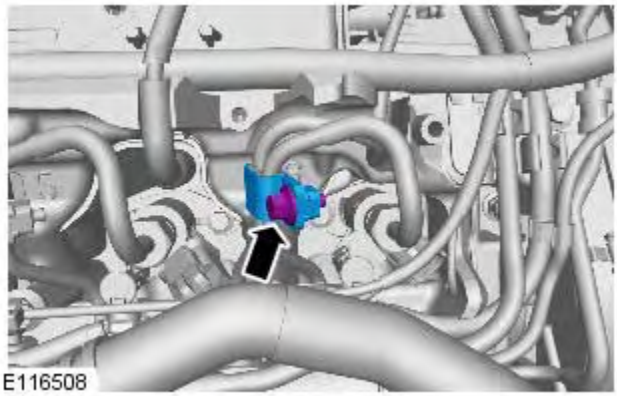
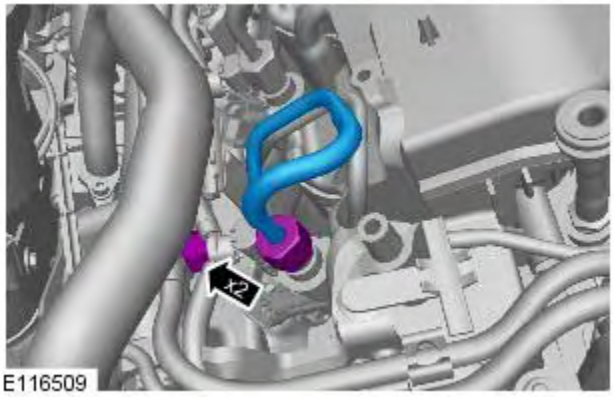


9. Refer to: Fuel Injection Component Cleaning (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, General Procedures).

10.

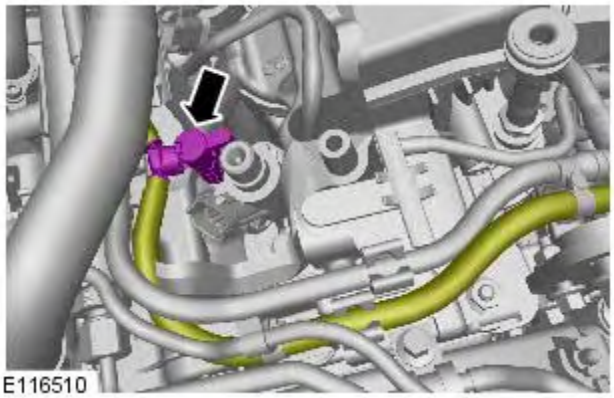




11. CAUTIONS:

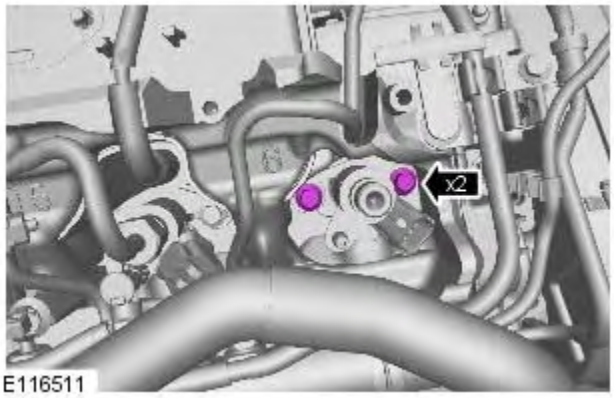
    Be prepared to collect escaping fuel.

    Remove and discard the high-pressure fuel supply lines.



12. CAUTION: Be prepared to collect escaping fuel.

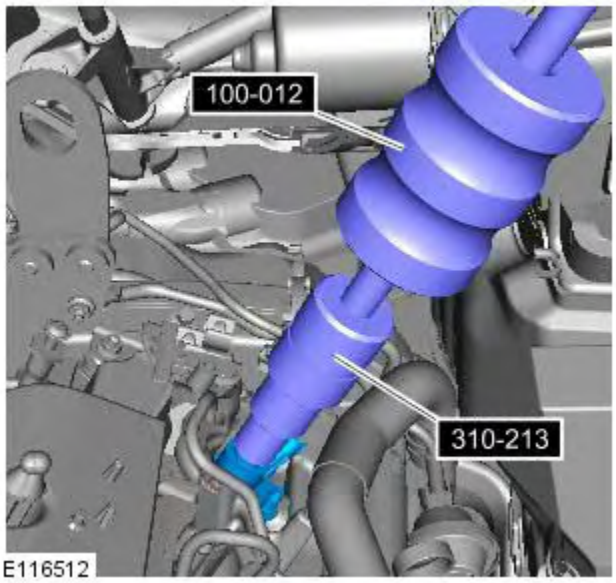
    NOTE: Make sure that the fuel injector return line has a maximum of 8 uses.



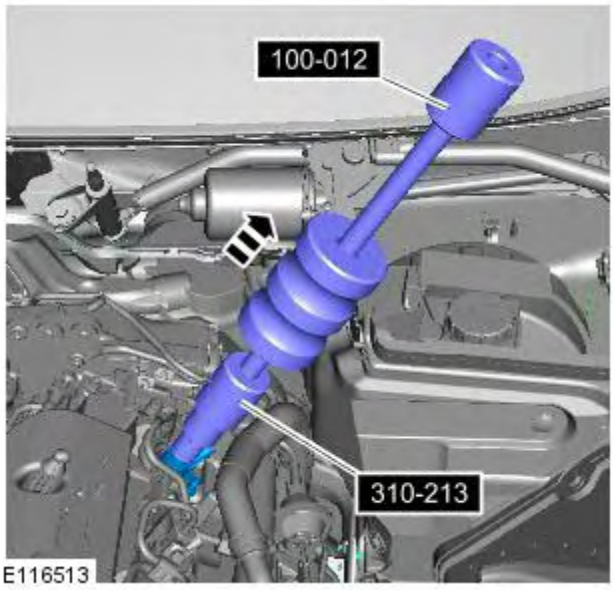
13.

14.

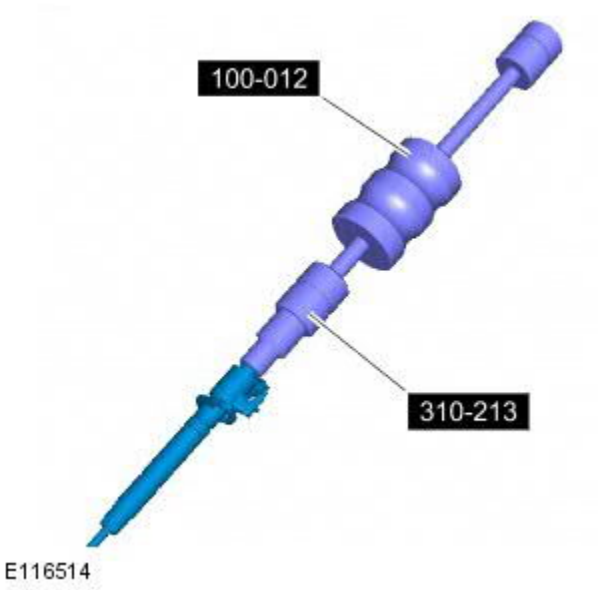
- Install the special tool.
- *Special Tool(s):* 310-213
- *Special Tool(s):* 100-012



15.

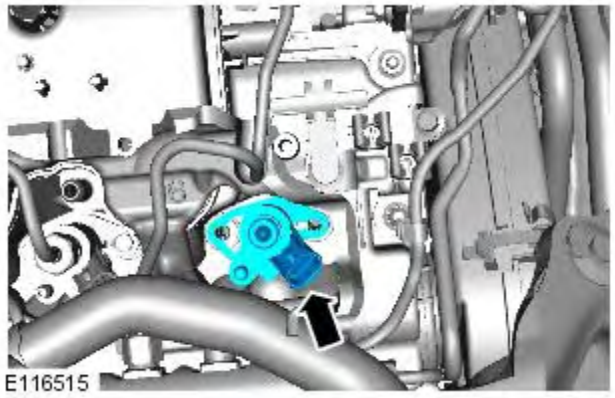


16. Remove the special tool.

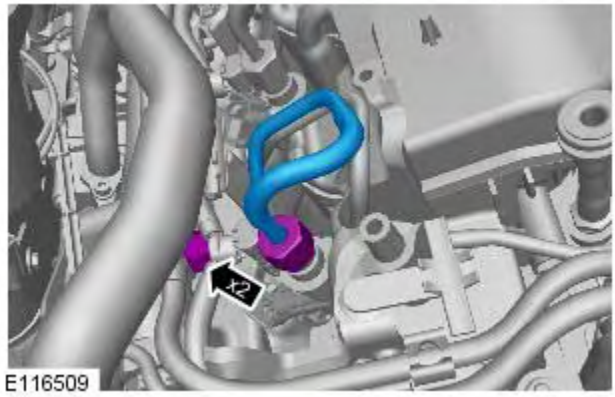


Installation

All vehicles



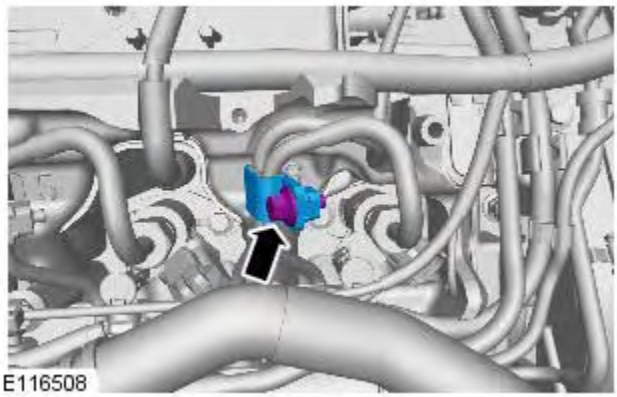
1. CAUTION: Make sure that the area around the open fuel injector ports are clean and free of foreign material and lubricant prior to installing the fuel injector.



2. CAUTIONS:

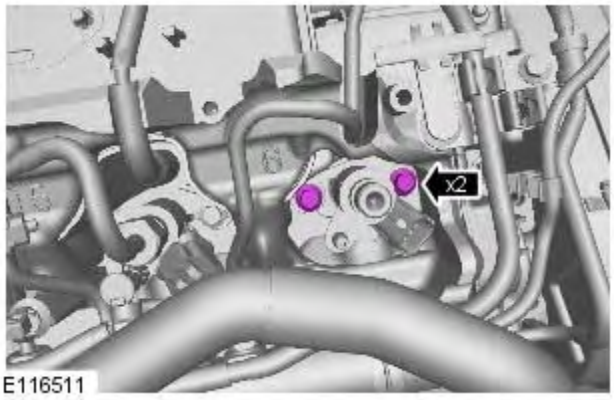
   Make sure that a new component is installed.

   Only tighten the unions finger-tight at this stage.



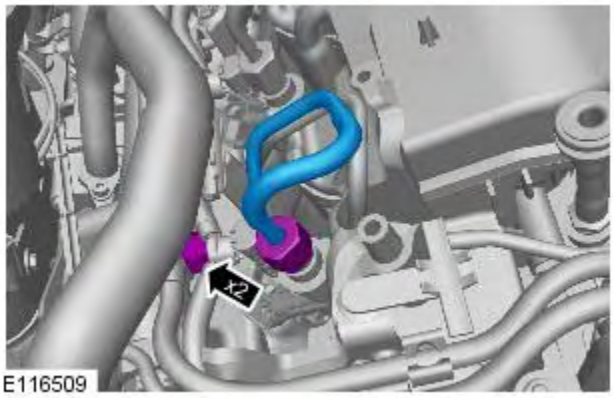
3. CAUTION: Make sure that a new component is installed.

   Torque: 10 Nm

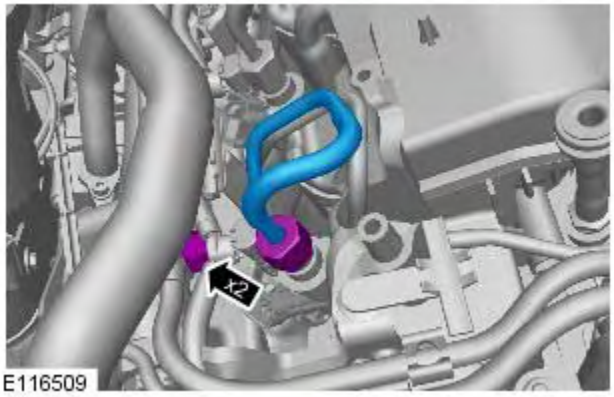


4. NOTE: Tighten the retaining bolts evenly and progressively.

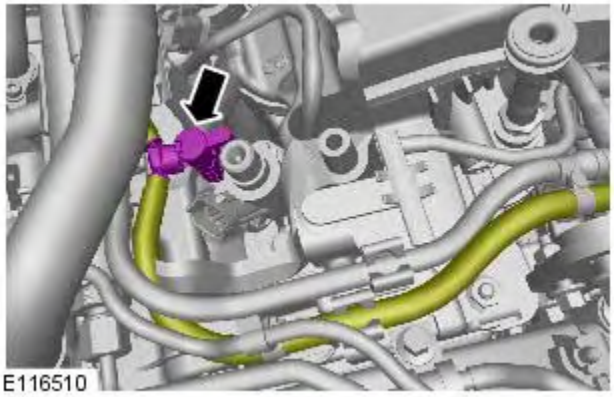
   Torque: 9 Nm



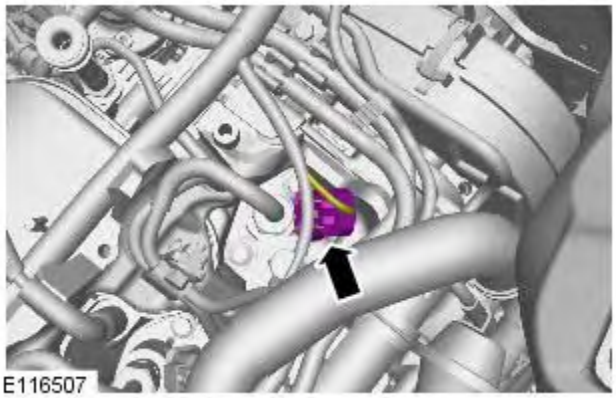
5.
- Stage 1:Tighten the high-pressure fuel supply line unions at the fuel rail to 15Nm.
- Stage 2: Tighten the high-pressure fuel supply line unions at the injector to 15Nm.



6.
- Stage 1: Tighten the high-pressure fuel supply line unions at the fuel rail to 30Nm.
- Stage 2: Tighten the high-pressure fuel supply line unions at the injector to 30Nm.



7. NOTE: Make sure that the fuel injector return line has a maximum of 8 uses.



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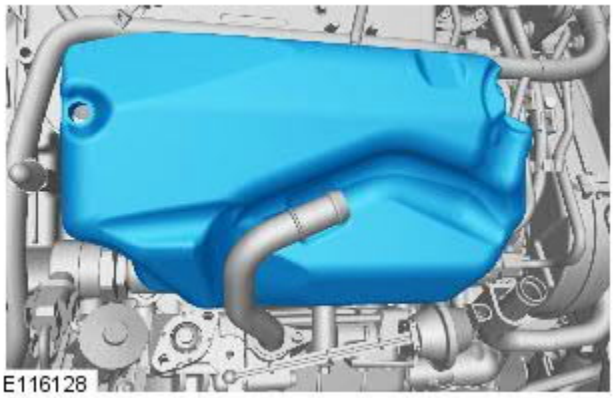

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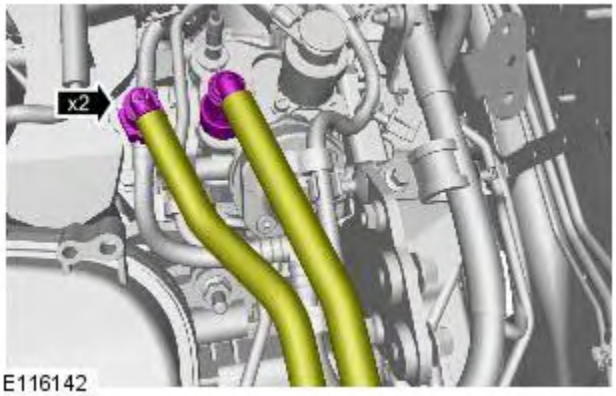
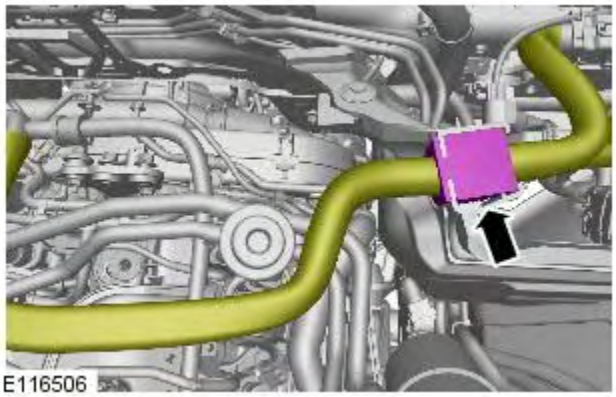


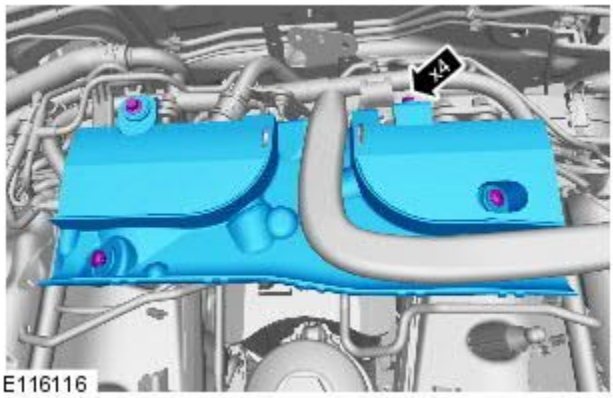
10. CAUTION: Be prepared to collect escaping fuel.

Right-hand drive vehicles


E116506

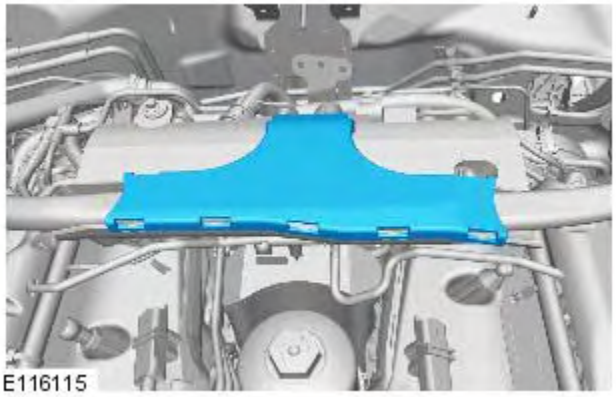
11.

All vehicles



E116116

12. *Torque:* 10 Nm


E116115

13.

14. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

15. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 11-May-2011

Fuel Charging and Controls - TDV6 3.0L Diesel - Fuel Rail LH

Removal and Installation

Removal

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

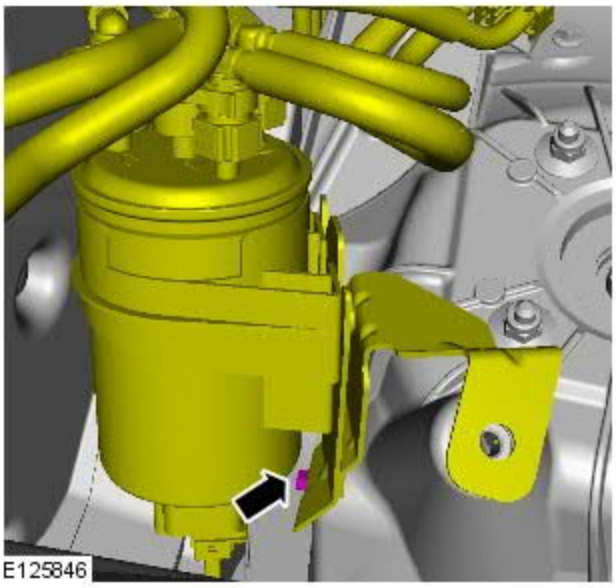
3. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

4. Refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel, Removal and Installation).

5. Refer to: Secondary Bulkhead Panel LH (501-02 Front End Body Panels, Removal and Installation).

6. Refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube LH (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).

7.



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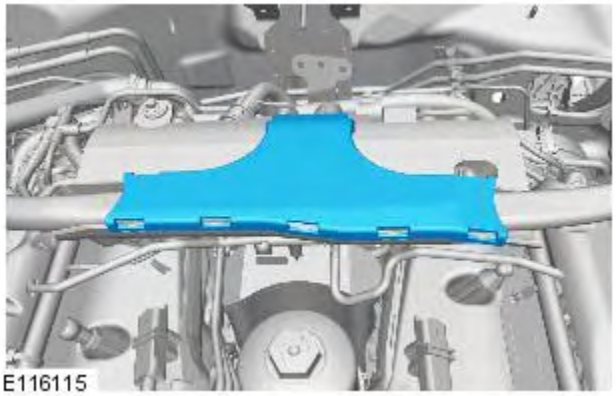

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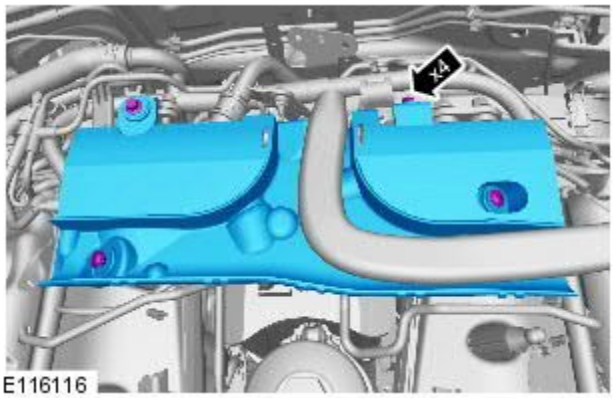

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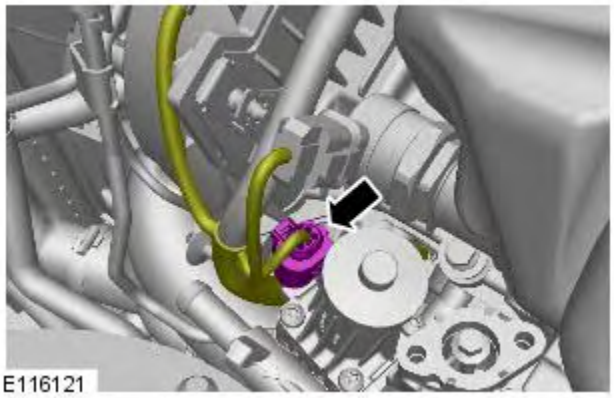

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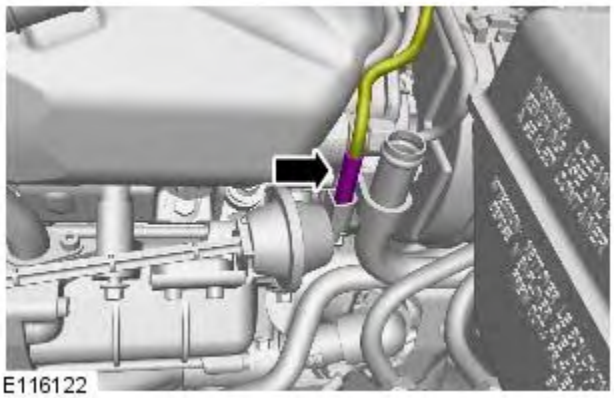

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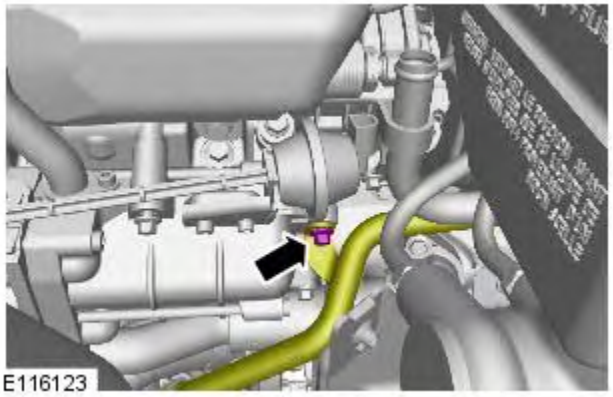

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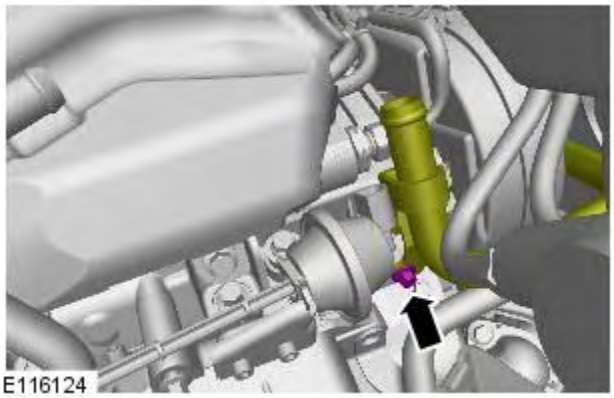

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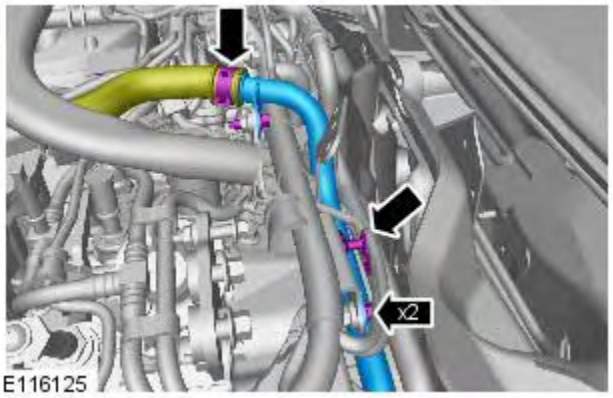
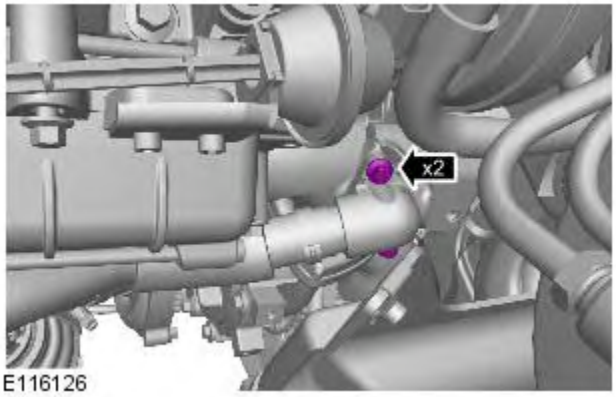


15. NOTE: Discard the gasket.



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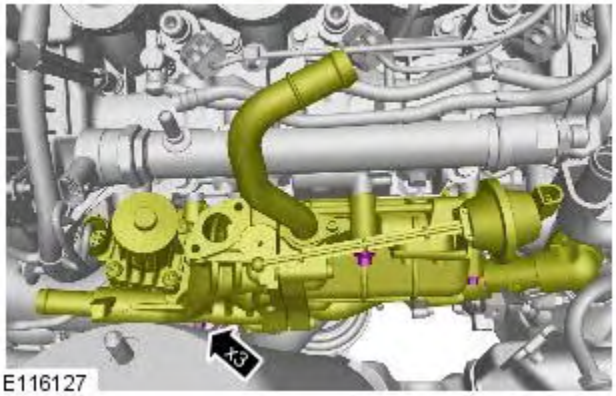
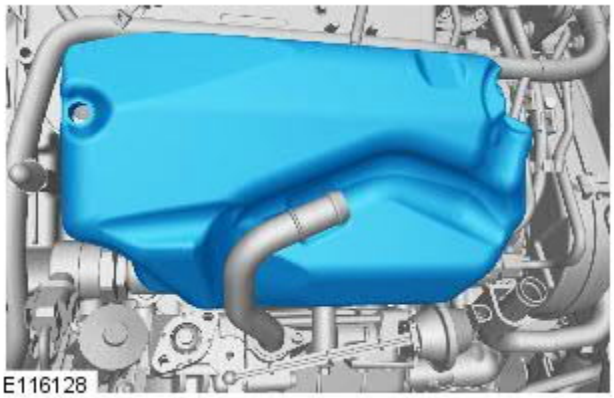


17. NOTE: Left-hand shown, right-hand similar.



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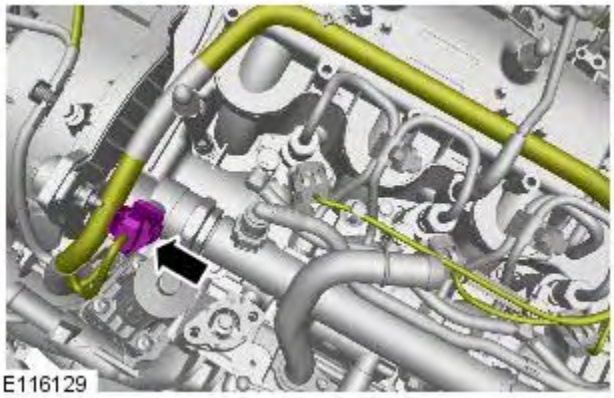

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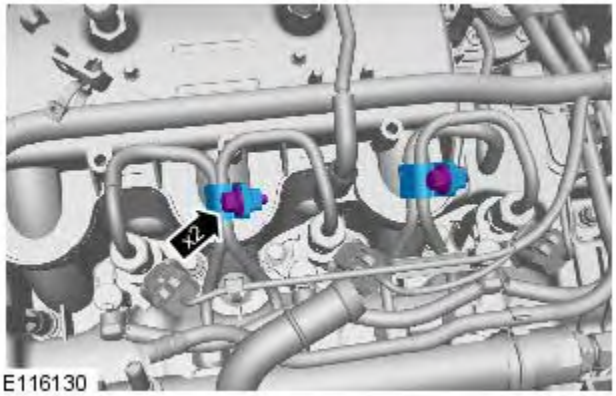
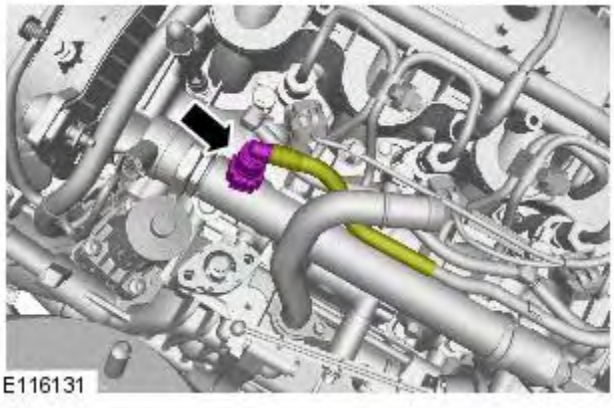
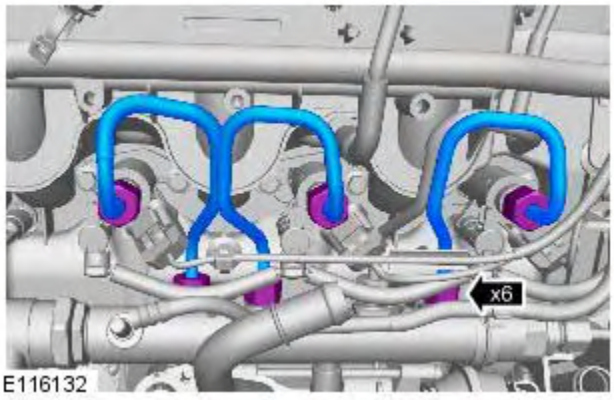


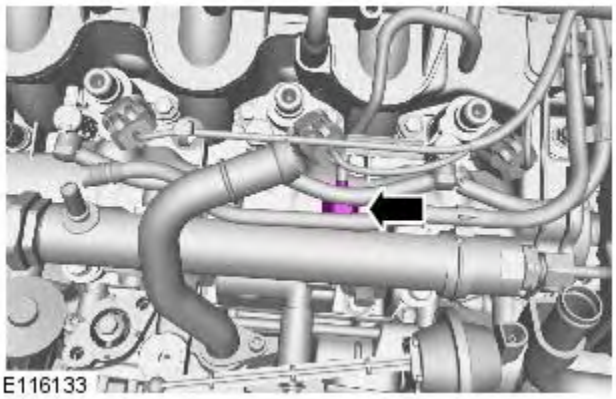
20. Refer to: Fuel Injection Component Cleaning (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, General Procedures).



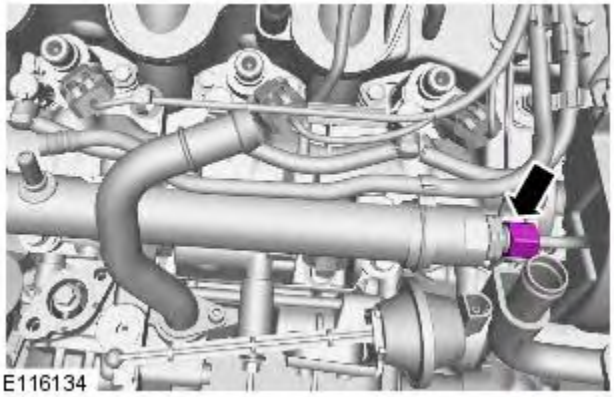
21. CAUTION: Be prepared to collect escaping fuel.



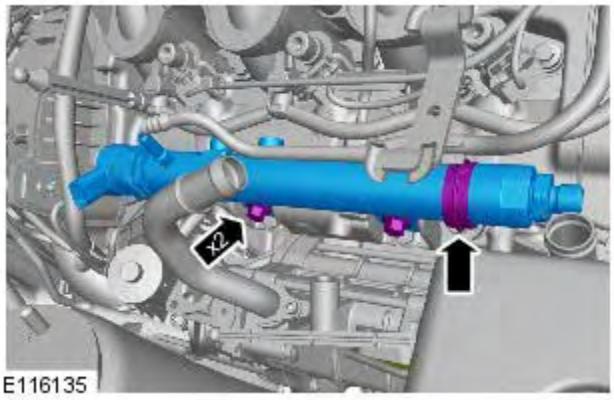
22. CAUTION: Be prepared to collect escaping fuel.



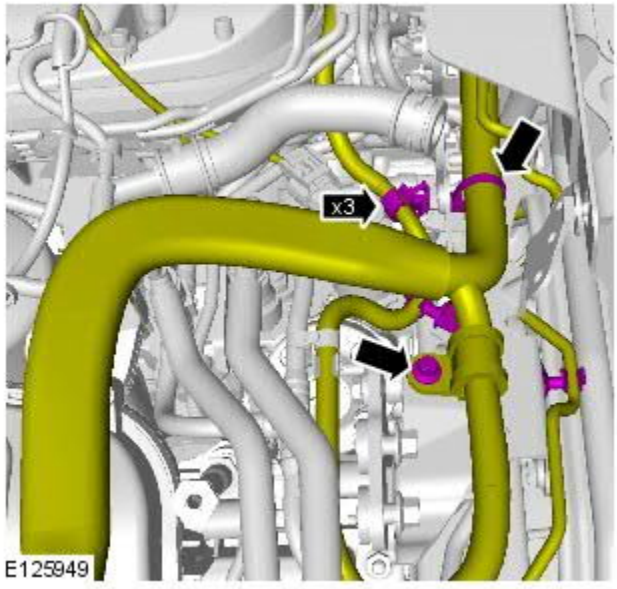
23. CAUTION: Be prepared to collect escaping fuel.



24. CAUTION: Be prepared to collect escaping fuel.

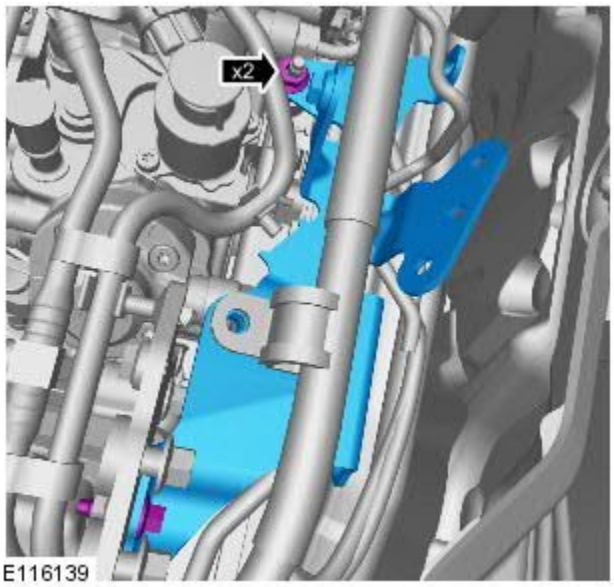


25. CAUTION: Be prepared to collect escaping fuel.



26.

27.



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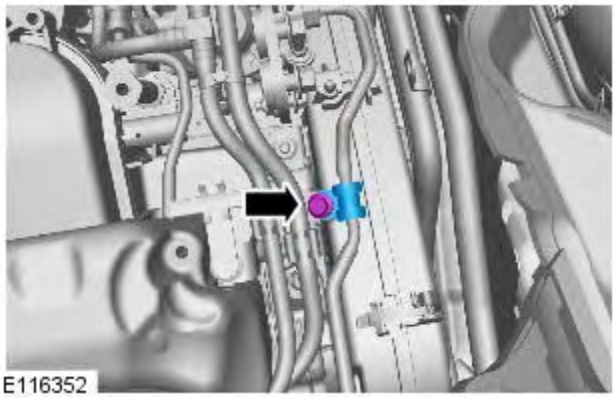
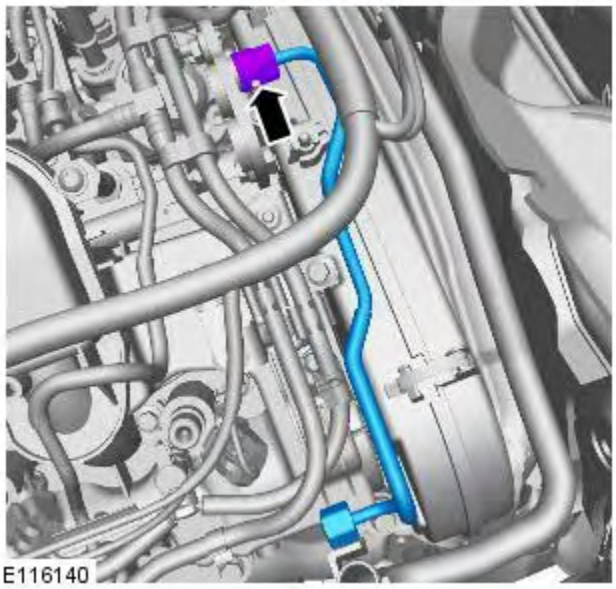


29. CAUTION: Be prepared to collect escaping fuel.



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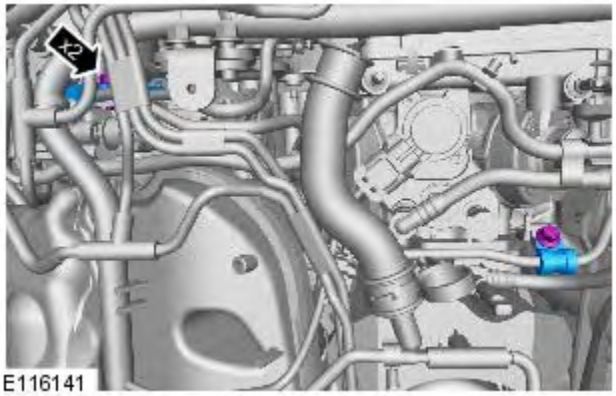
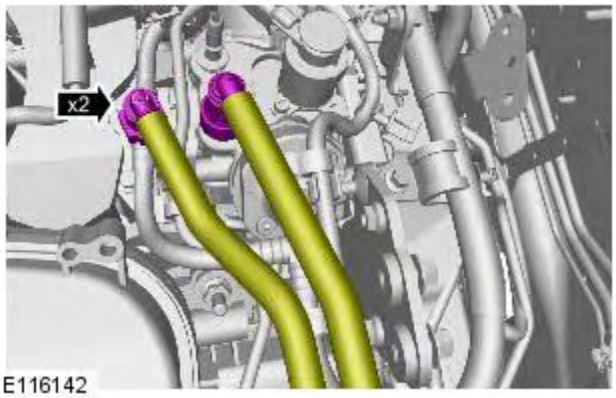
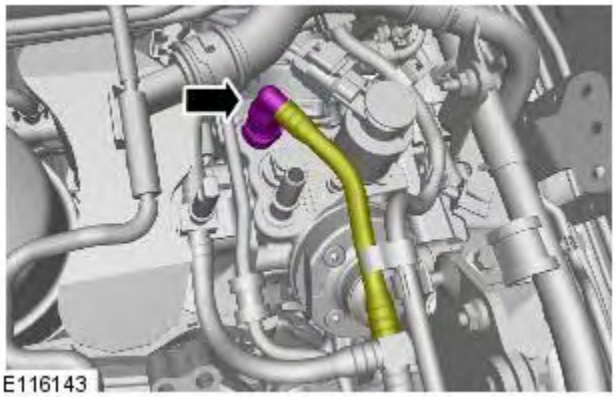


31. CAUTION: Be prepared to collect escaping fuel.



32. CAUTION: Be prepared to collect escaping fuel.



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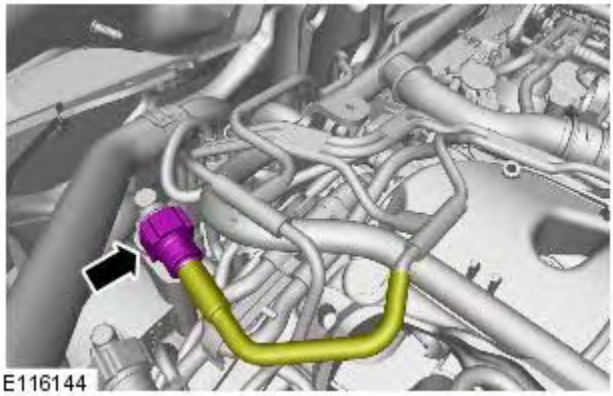
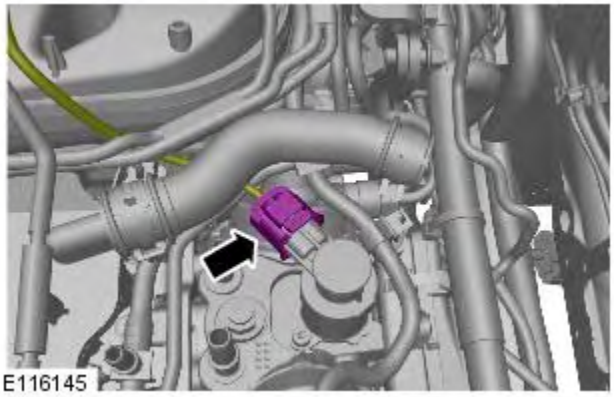
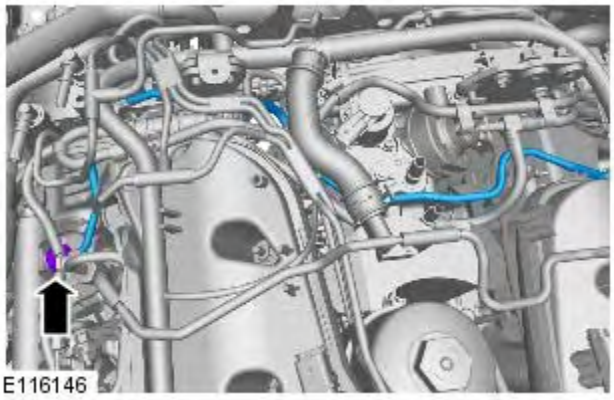


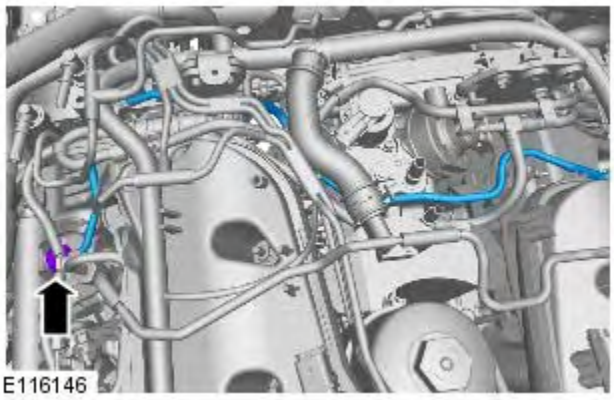


34.



35. CAUTION: Be prepared to collect escaping fuel.

Installation

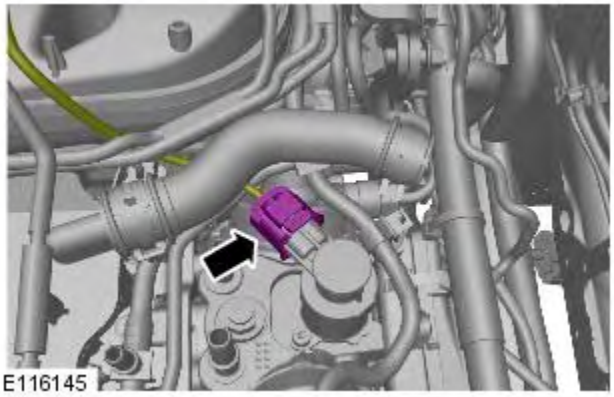


1. CAUTIONS:

   Make sure that a new component is installed.

   Tighten the fuel supply line unions finger tight.

2.



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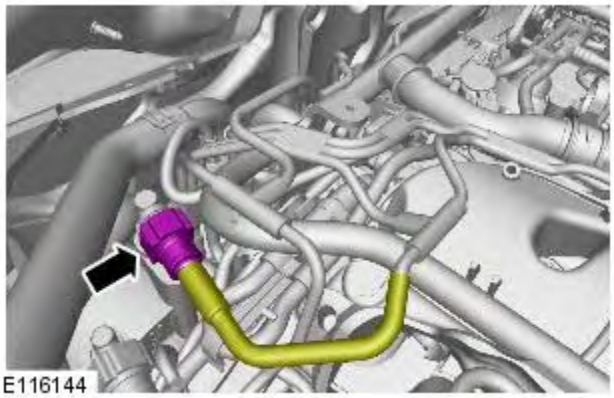

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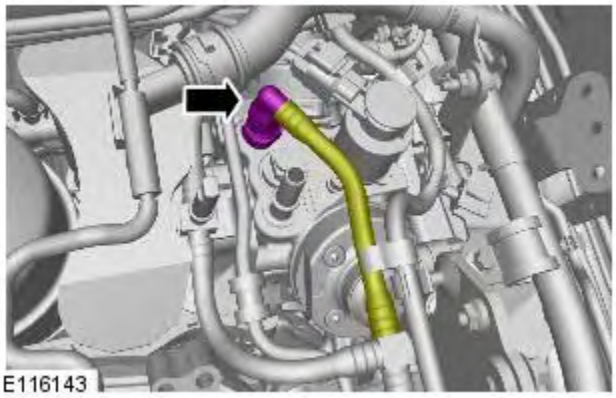

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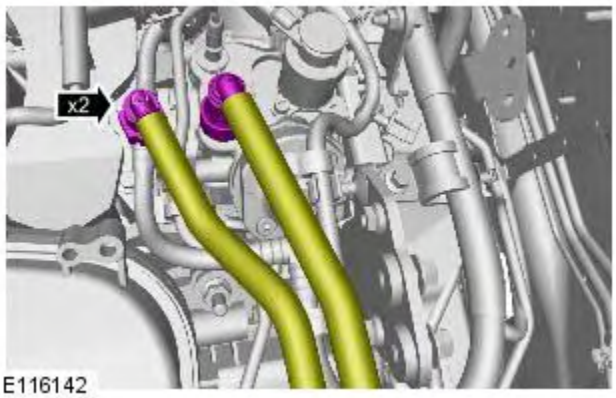
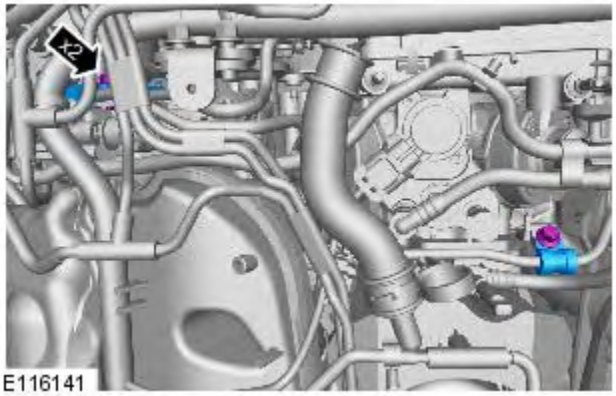
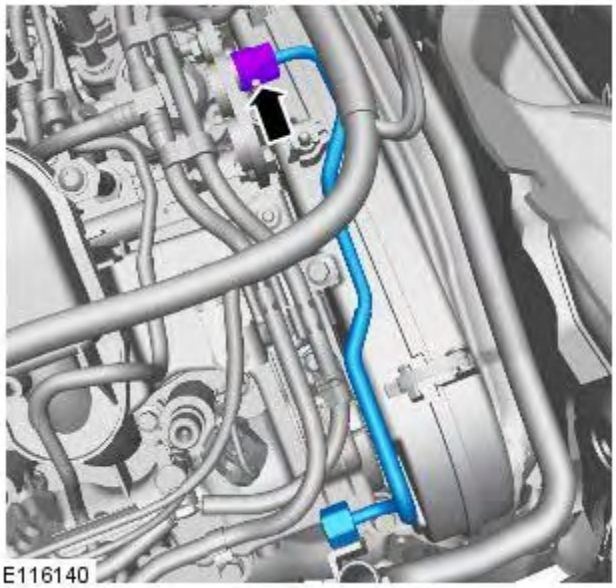




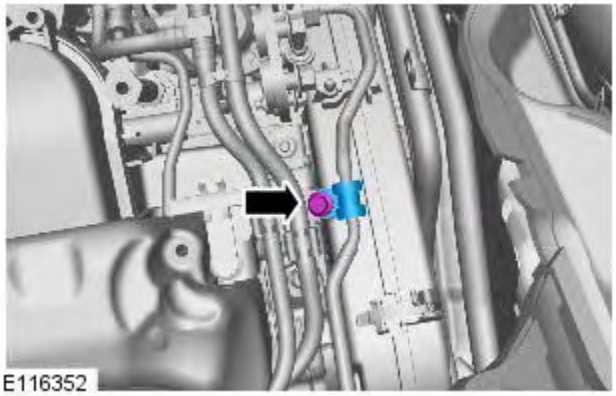
6. CAUTION: Only tighten the bolts finger-tight at this stage.



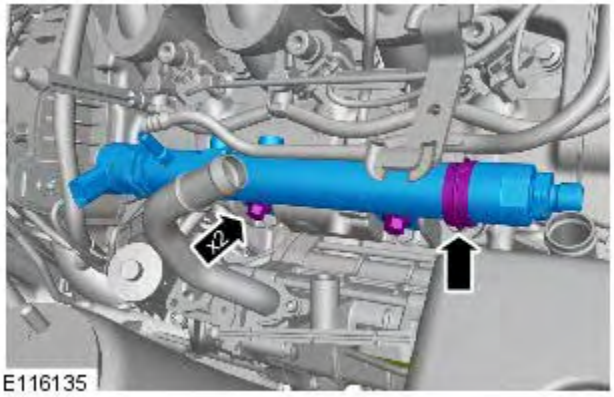
7. CAUTIONS:

   Make sure that a new component is installed.

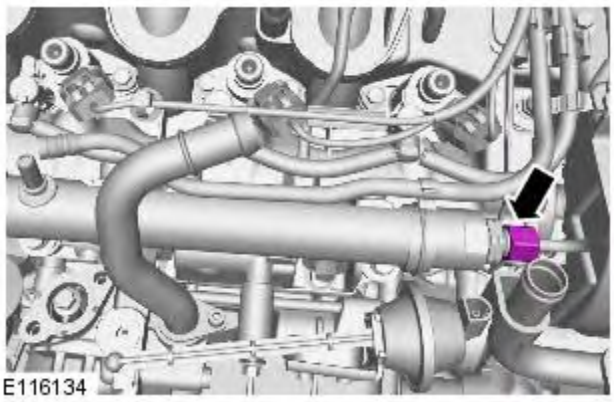
   Tighten the fuel supply line unions finger tight.



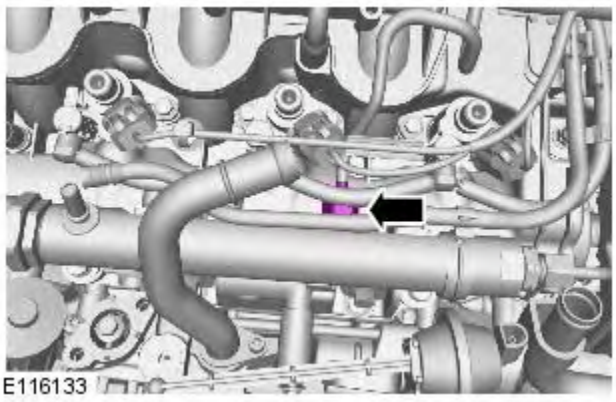
8. CAUTION: Only tighten the bolts finger-tight at this stage.



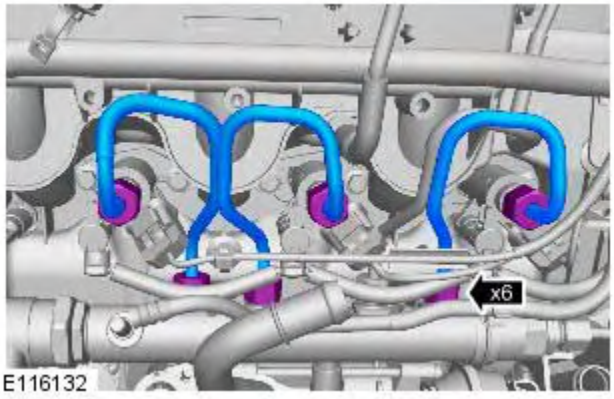
9. *Torque:* 24 Nm



10. CAUTION: Tighten the fuel supply line unions finger tight.



11. CAUTION: Tighten the fuel supply line unions finger tight.

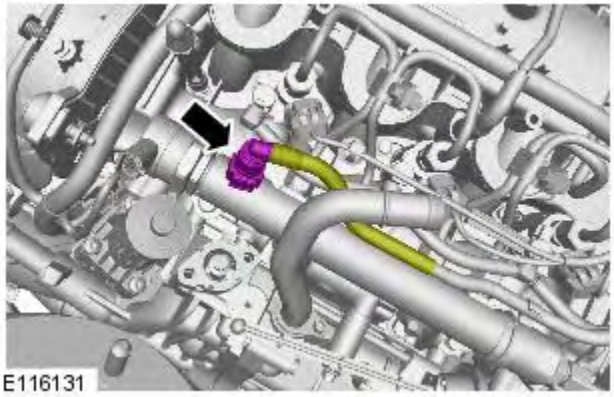


12. CAUTIONS:

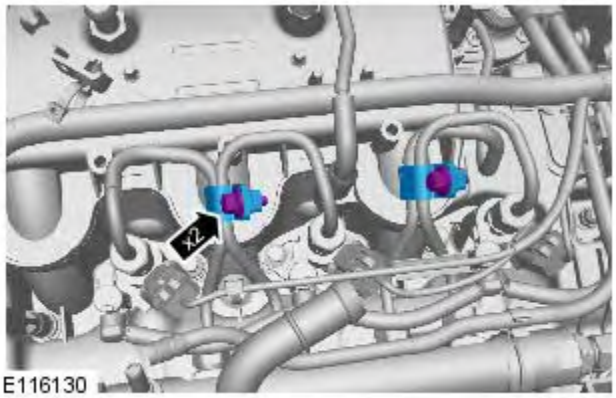
CAUTION: Make sure that a new component is installed.

CAUTION: Tighten the fuel supply line unions finger tight.

13.

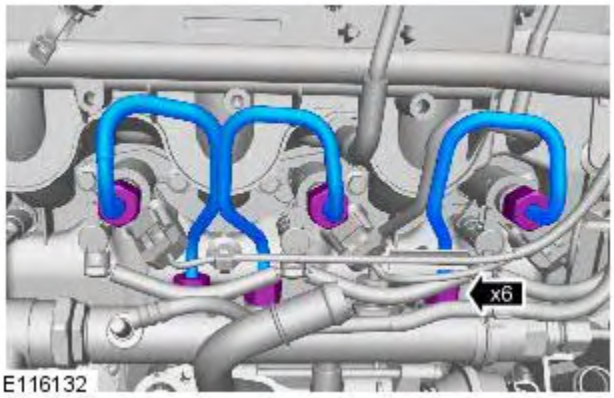


14.

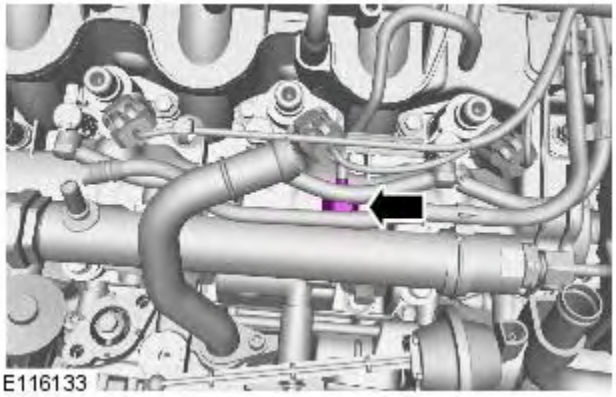


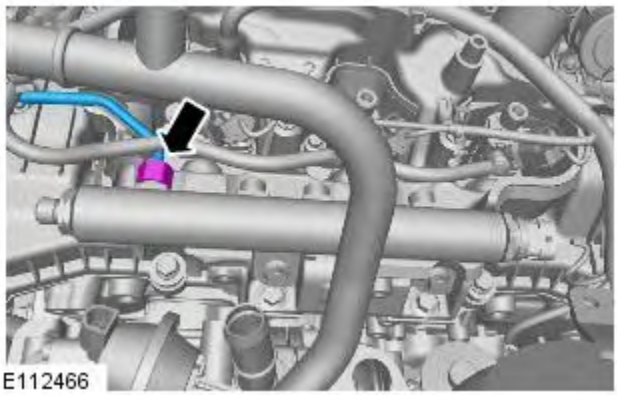
15.

- Stage 1:Tighten the high-pressure fuel supply line unions at the fuel rail to 15Nm.
- Stage 2: Tighten the high-pressure fuel supply line unions at the injector to 15Nm.

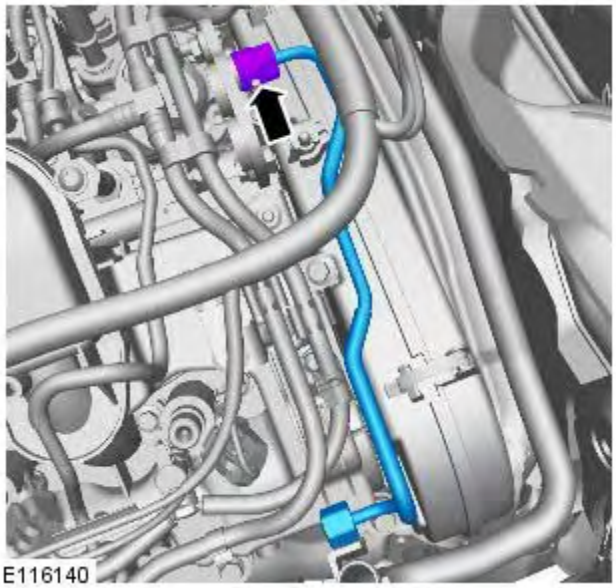


16. Tighten the high-pressure fuel lines union to 15Nm.

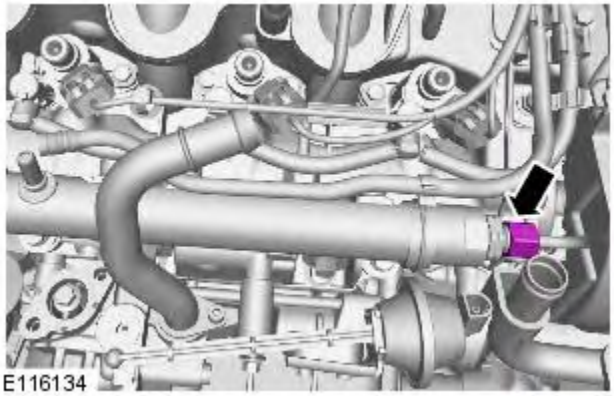



E112466

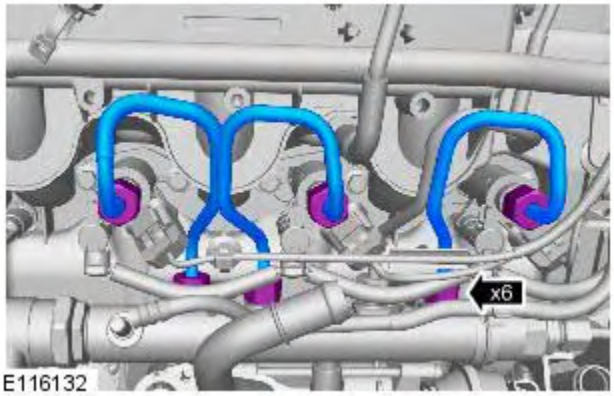
17. Tighten the high-pressure fuel lines union to 15Nm.


E116140

18. Tighten the high-pressure fuel lines union to 15Nm.

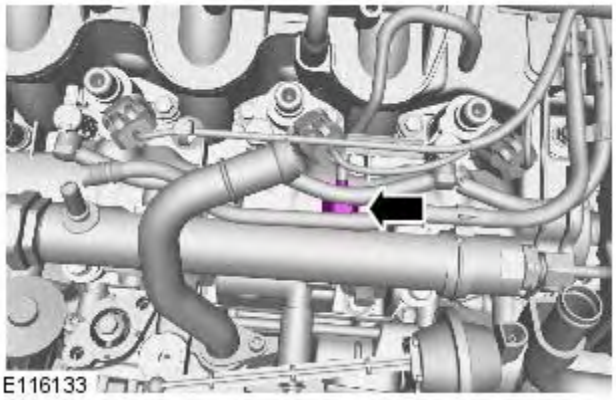

E116134

19. Tighten the high-pressure fuel lines union to 15Nm.

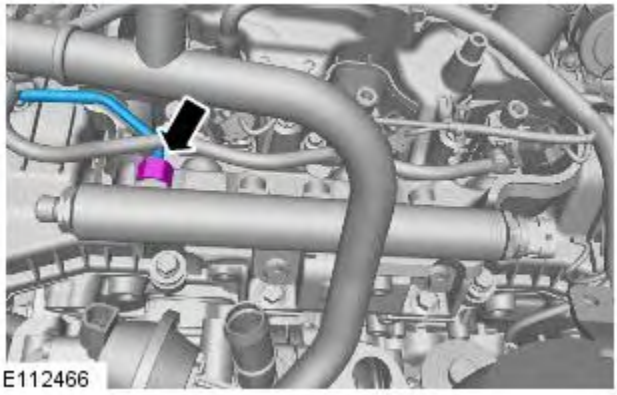


20.

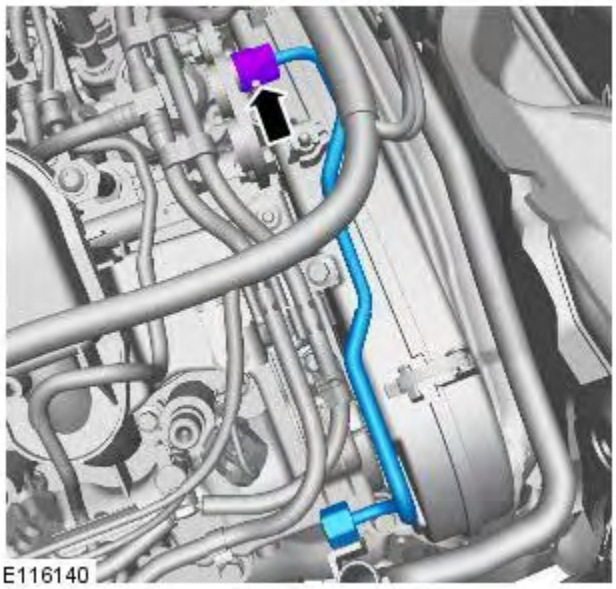
- Stage 1: Tighten the high-pressure fuel supply line unions at the fuel rail to 30Nm.
- Stage 2: Tighten the high-pressure fuel supply line unions at the injector to 30Nm.



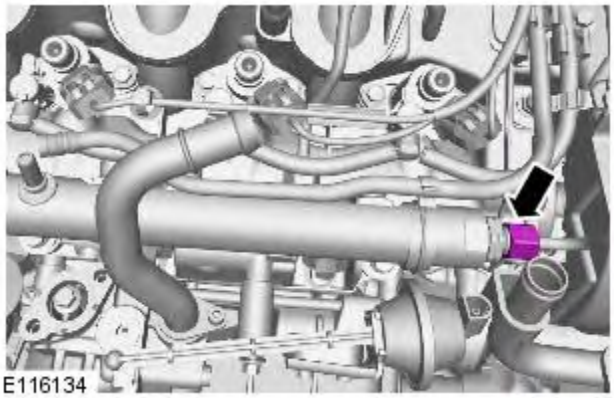
21. Tighten the high-pressure fuel line union to 30Nm.



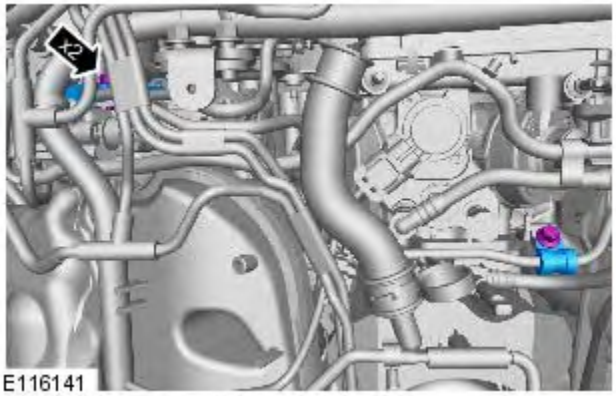
22. Tighten the high-pressure fuel line union to 30Nm.


E116140

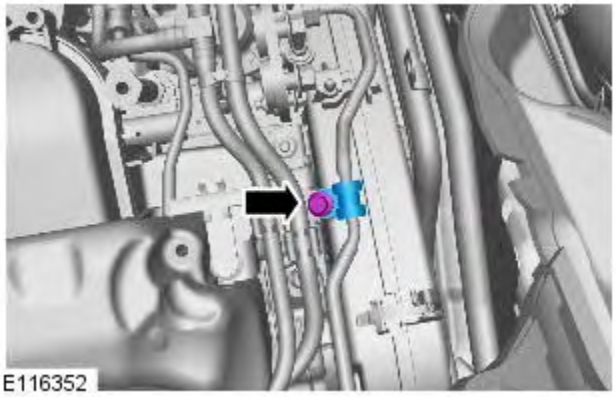
23. Tighten the high-pressure fuel line union to 30Nm.


E116134

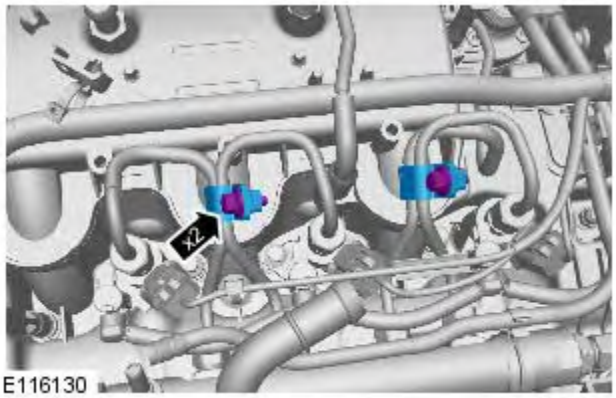
24. Tighten the high-pressure fuel line union to 30Nm.


E116141

25. *Torque:* 10 Nm

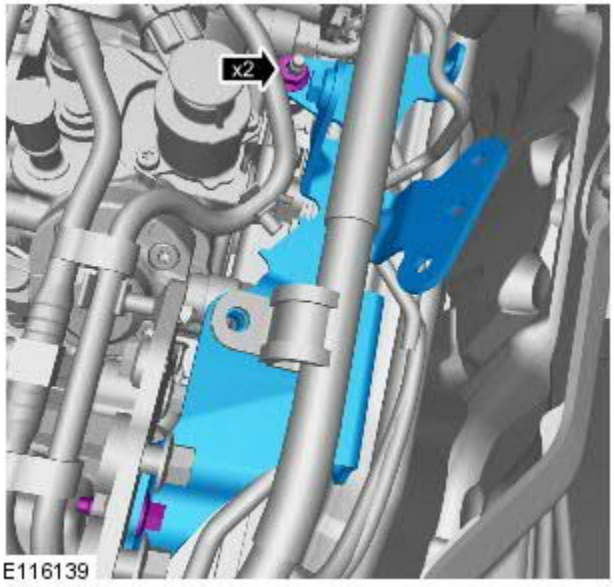

E116352

26. *Torque:* 10 Nm



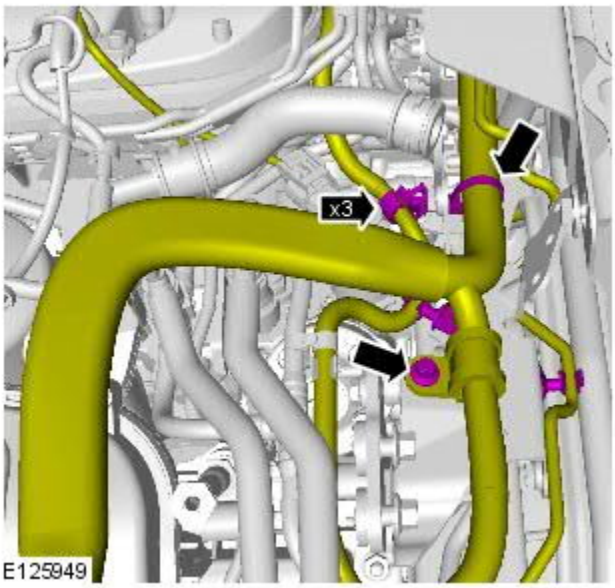
E116130

27. *Torque:* 10 Nm

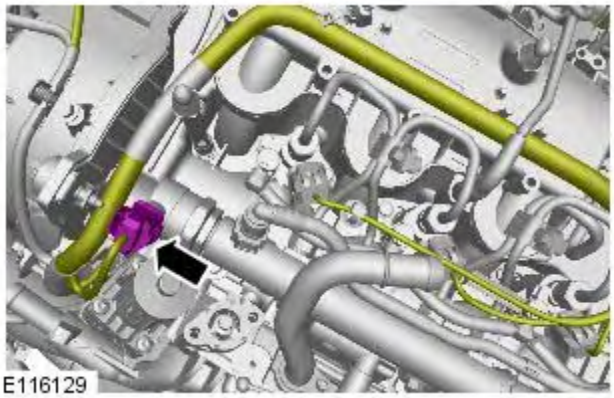


E116139

28. *Torque:* 10 Nm



29. *Torque:* 10 Nm



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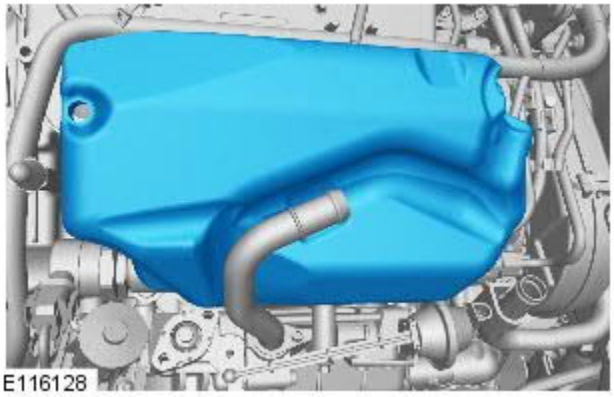
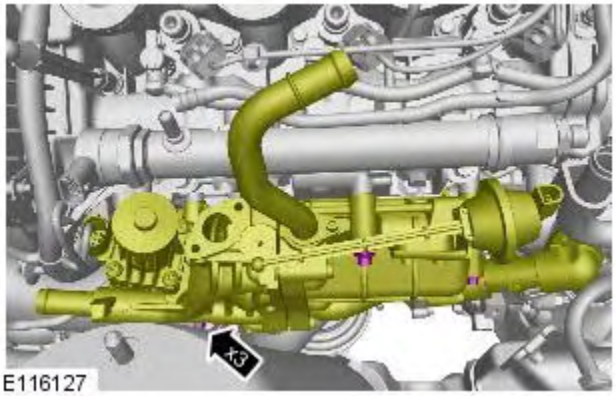
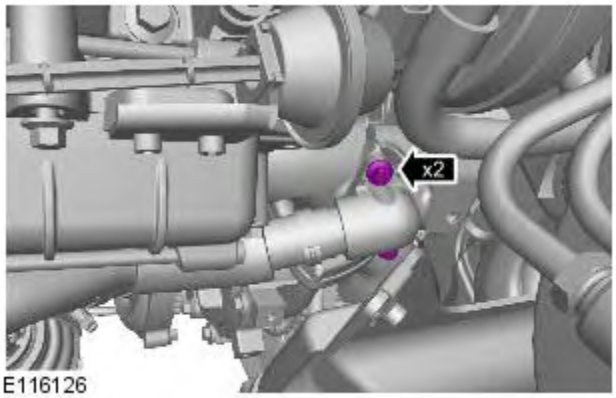


31. NOTE: Left-hand shown, right-hand similar.

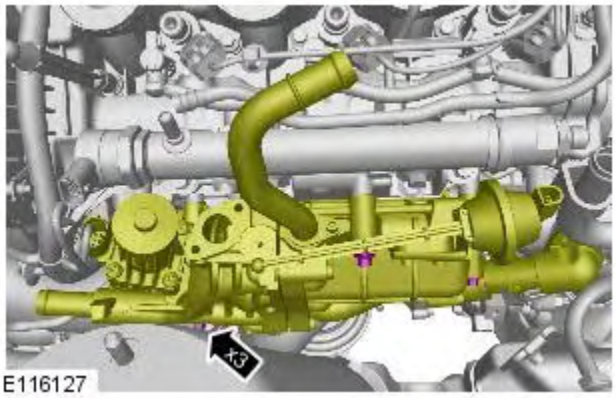


32. CAUTION: Only tighten the bolts finger tight at this stage.

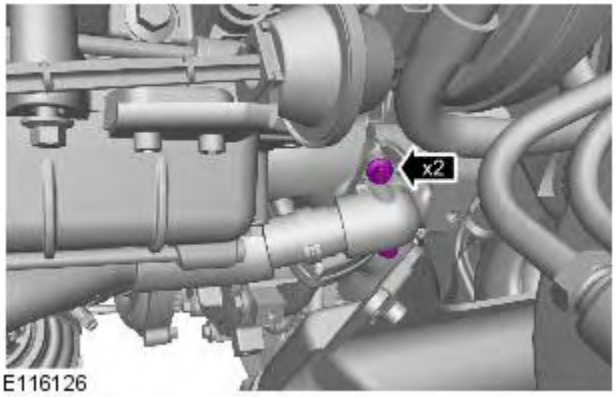


33. CAUTION: Only tighten the bolts finger tight at this stage.

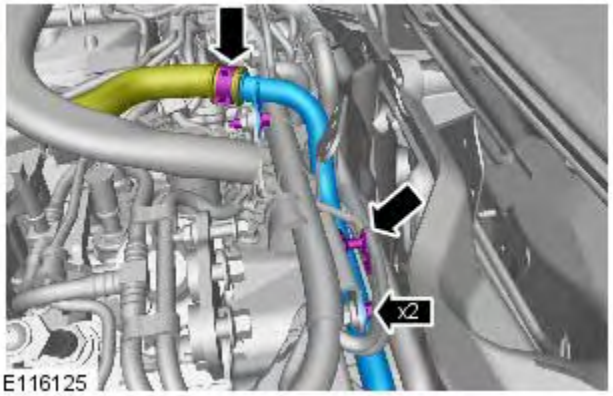
NOTE: Install a new gasket.



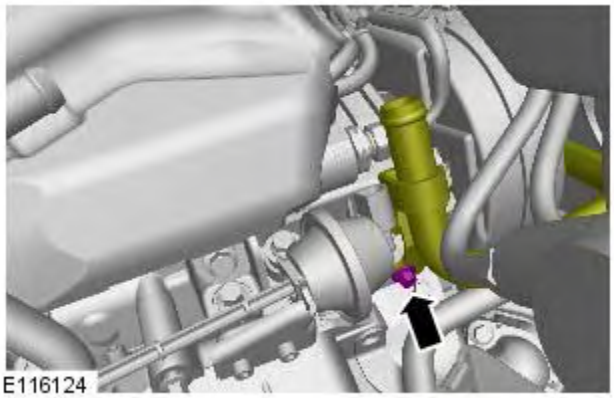
34. *Torque:* 10 Nm



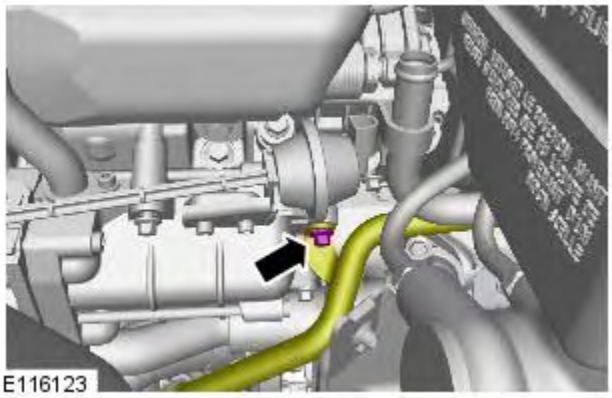
35. *Torque:* 10 Nm



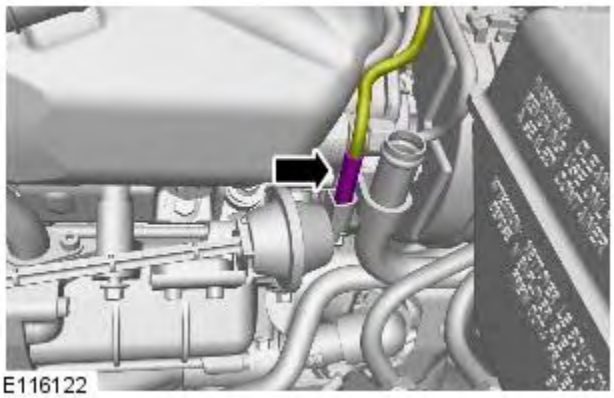
36. *Torque:* 10 Nm



37. *Torque:* 10 Nm

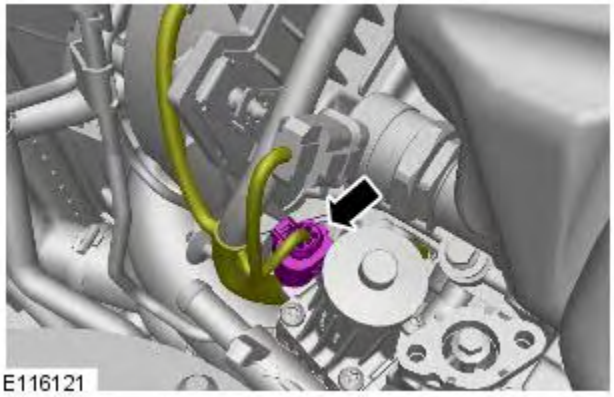


38. *Torque:* 10 Nm



39.

40.



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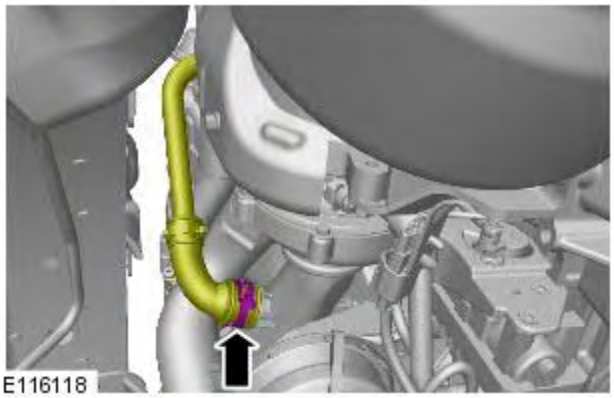
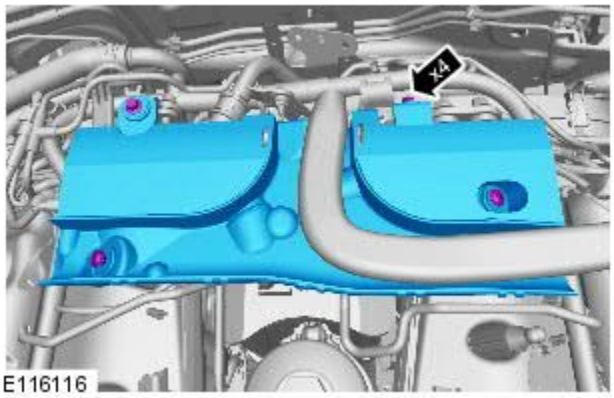


42. *Torque:* 10 Nm



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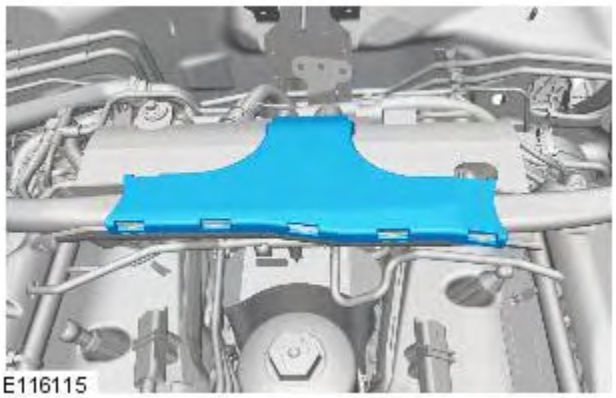
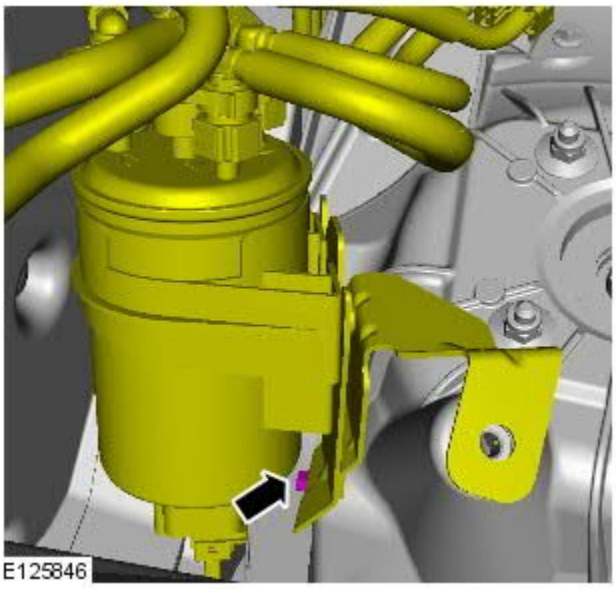




44. *Torque:* 27 Nm

45. Refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube LH (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).

46. Refer to: Secondary Bulkhead Panel LH (501-02 Front End Body Panels, Removal and Installation).

47. Refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel, Removal and Installation).

48. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

49. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 11-May-2011

Fuel Charging and Controls - TDV6 3.0L Diesel - Fuel Rail RH

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1. WARNING: Make sure to support the vehicle with axle stands.

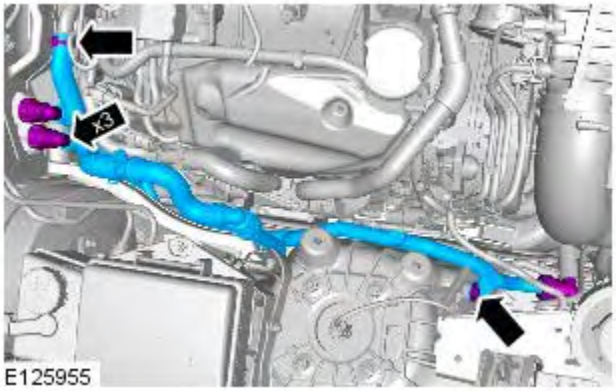
   Raise and support the vehicle.

2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

3. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

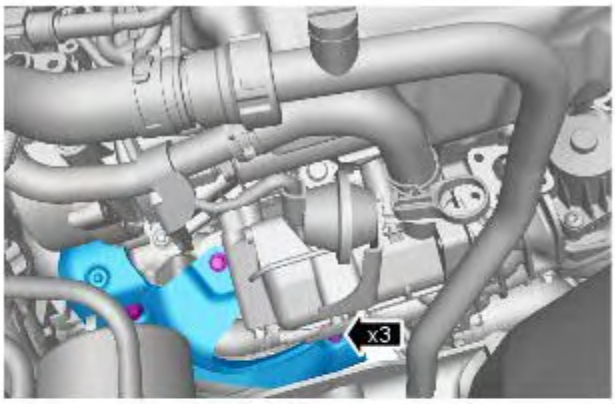
4. Refer to: Secondary Bulkhead Panel RH (501-02 Front End Body Panels, Removal and Installation).

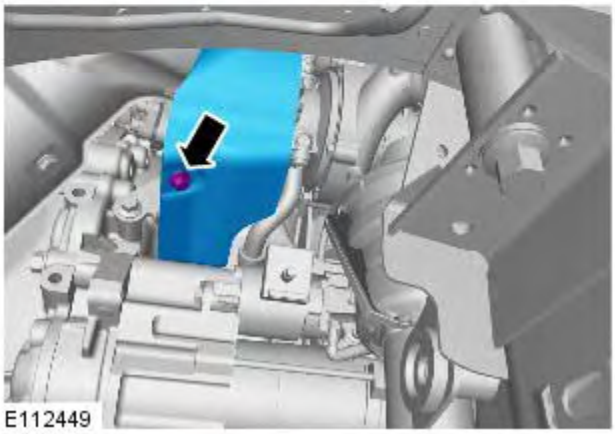
5. Refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube RH (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).



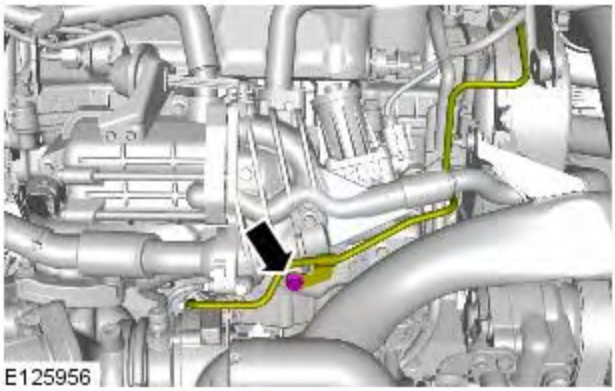
6. CAUTION: Be prepared to collect escaping coolant.

7.





8. NOTE: Engine shown removed for clarity.



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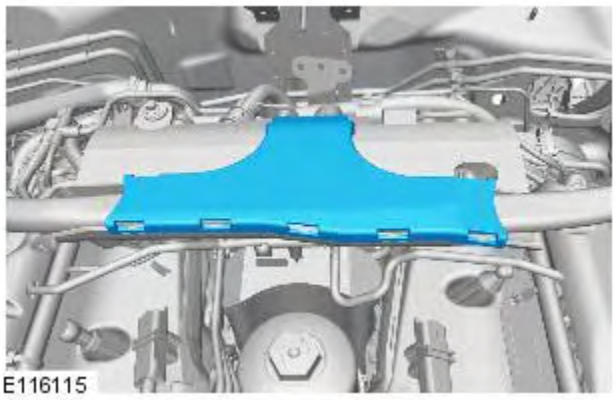

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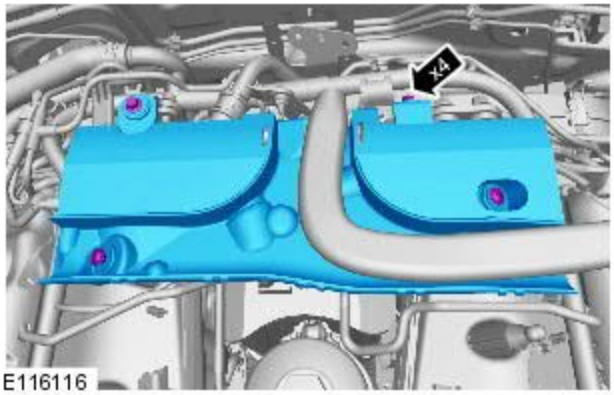

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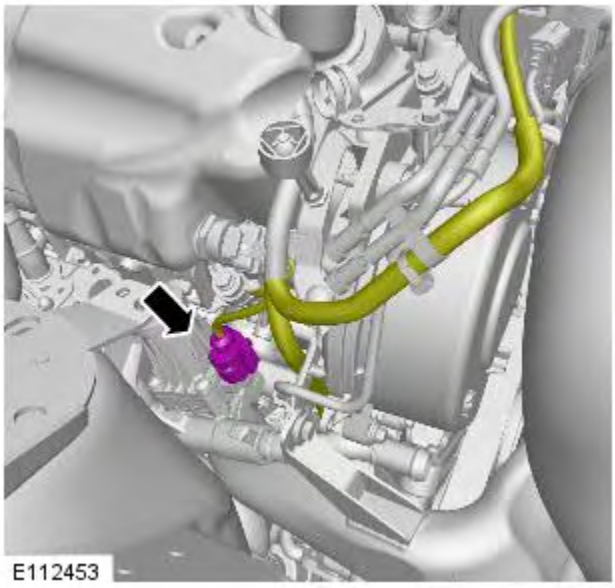

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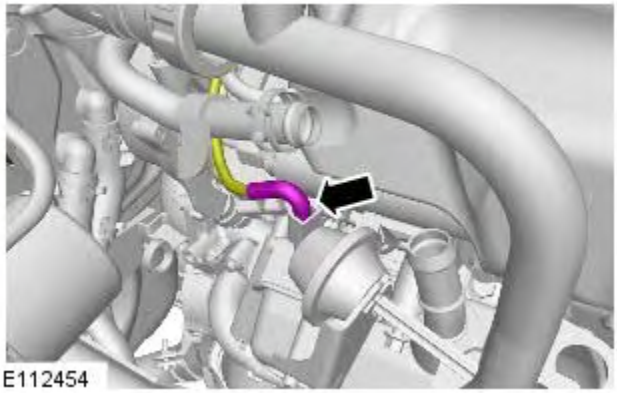

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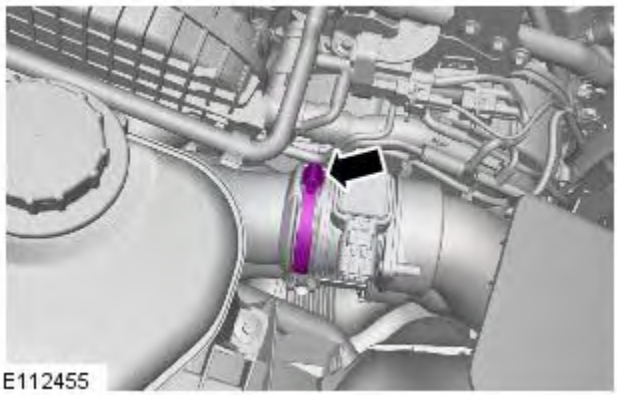

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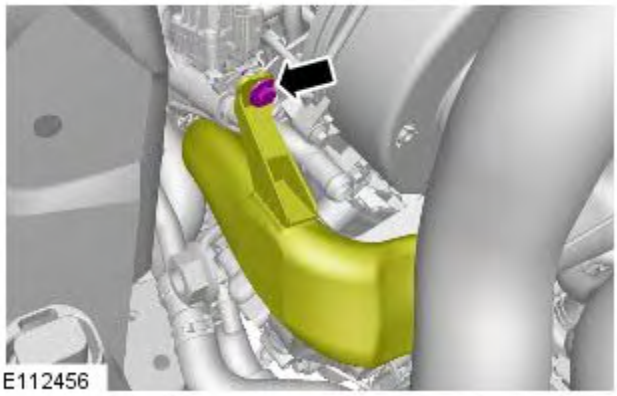

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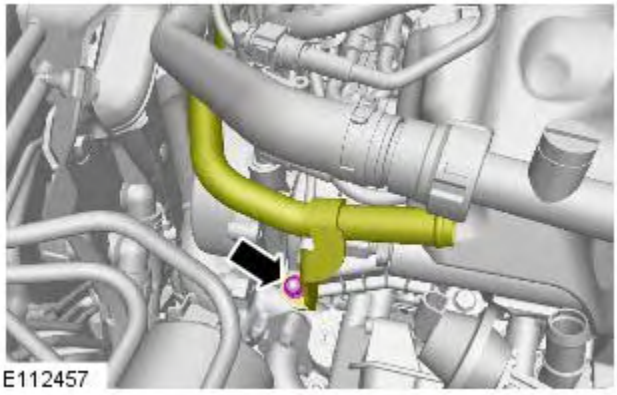
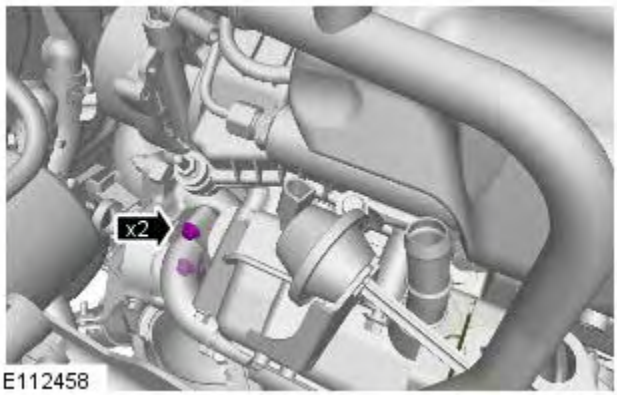
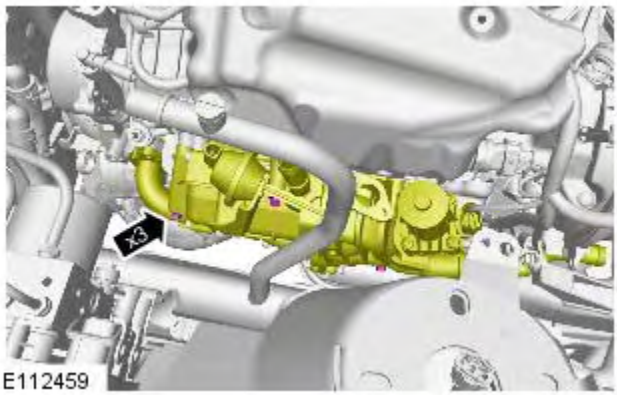


16. NOTE: Discard the gasket.

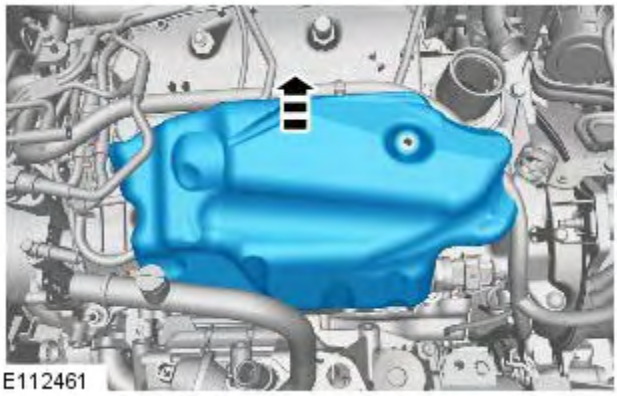


17.



E112459

18. NOTE: Right-hand shown, Left-hand similar.


E112461

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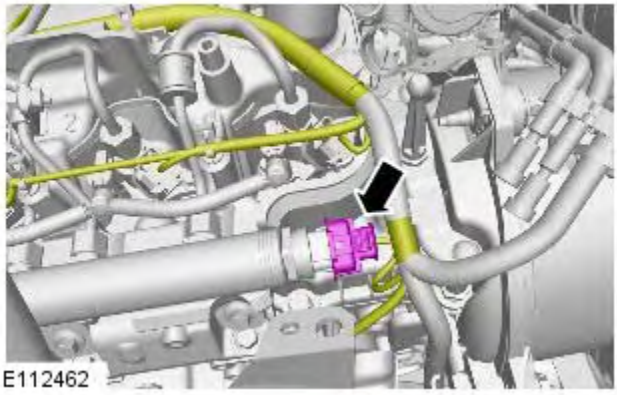
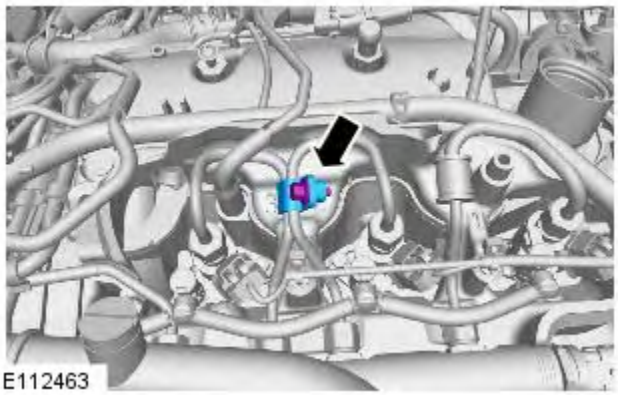
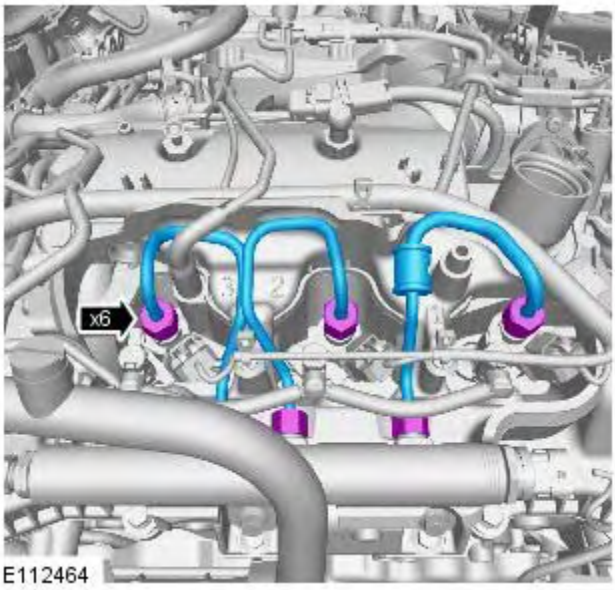

E112462

20.


E112463

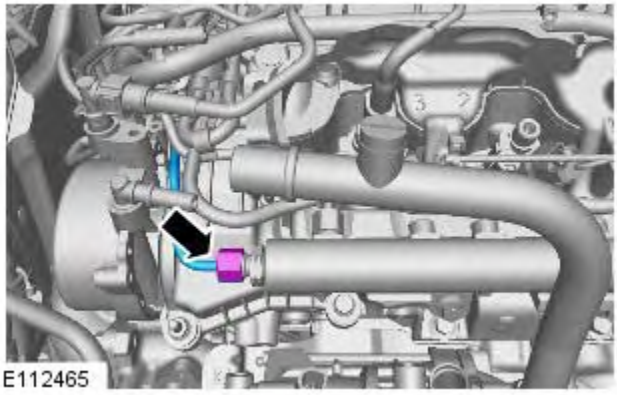
21. Refer to: Fuel Injection Component Cleaning (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, General Procedures).



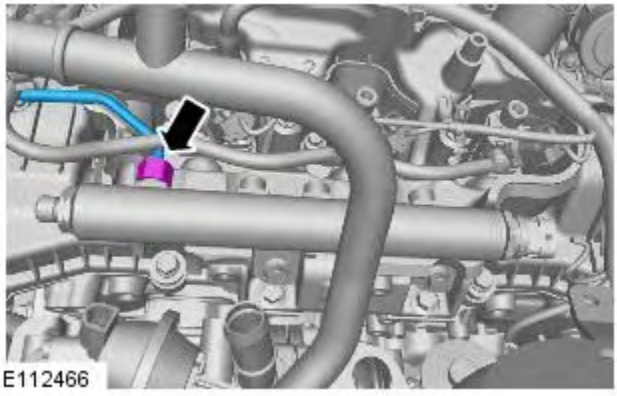
22. CAUTIONS:

Be prepared to collect escaping fuel.

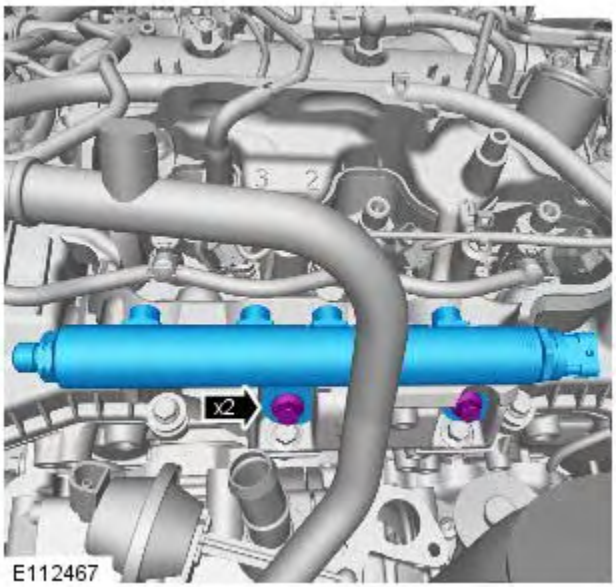
Discard the component.



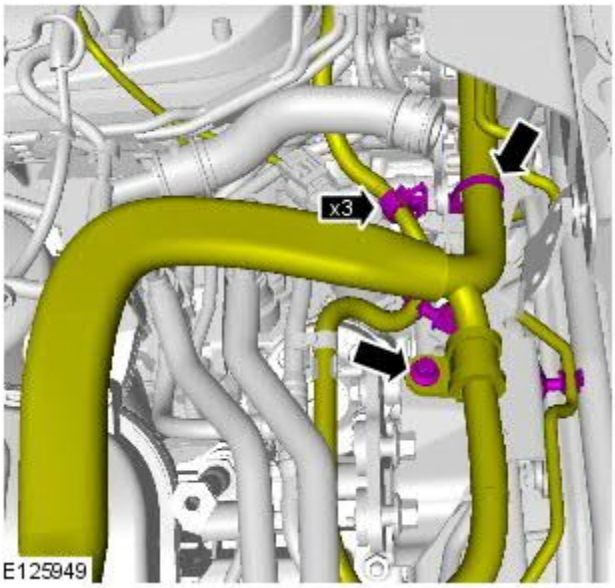
23. CAUTION: Be prepared to collect escaping fuel.



24. CAUTION: Be prepared to collect escaping fuel.

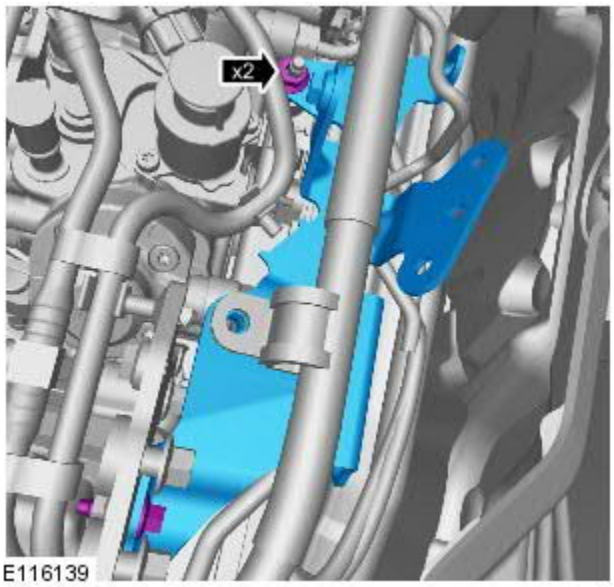


25. CAUTION: Be prepared to collect escaping fuel.

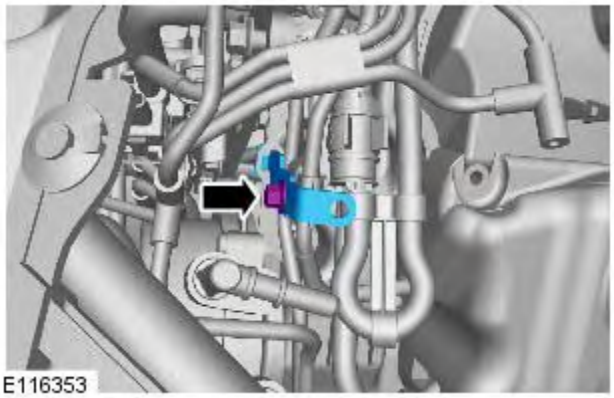


26.

27.



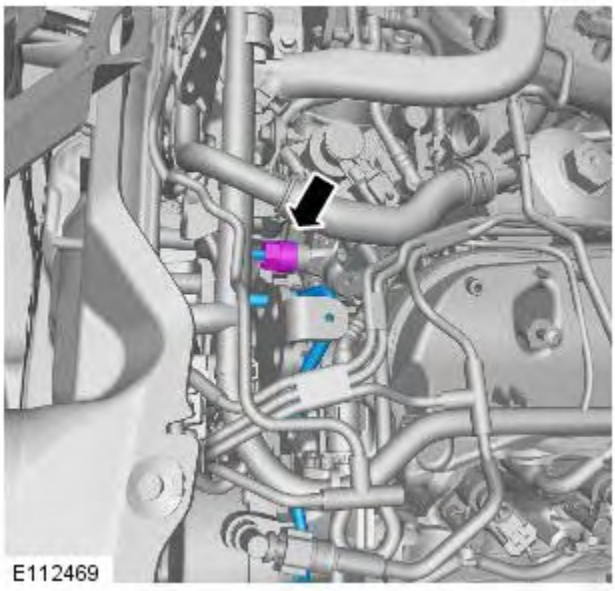
28.



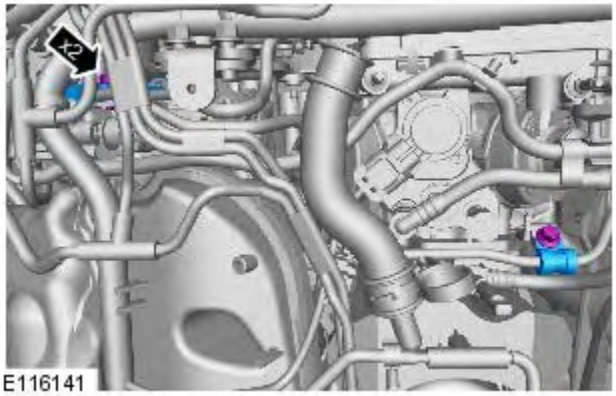
29. CAUTIONS:

Be prepared to collect escaping fuel.

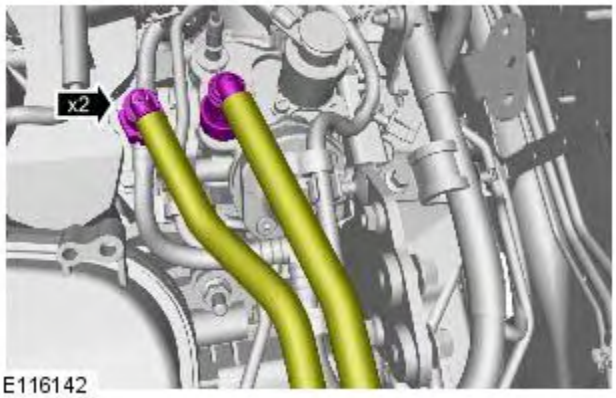
Discard the component.



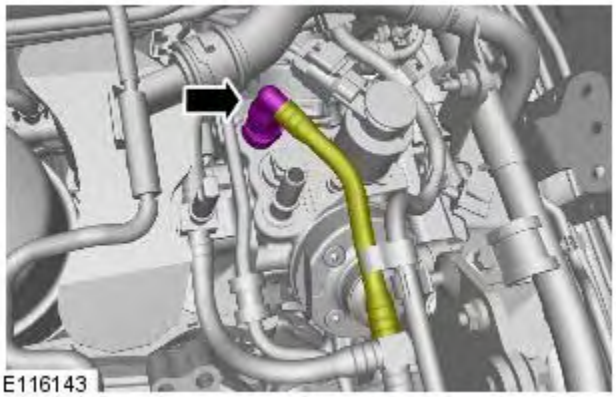
30.



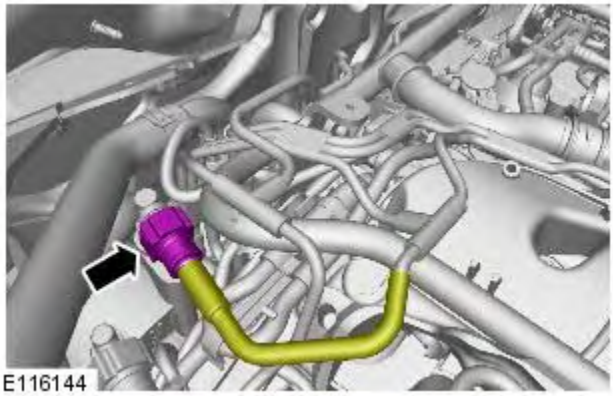
31. CAUTION: Be prepared to collect escaping fuel.

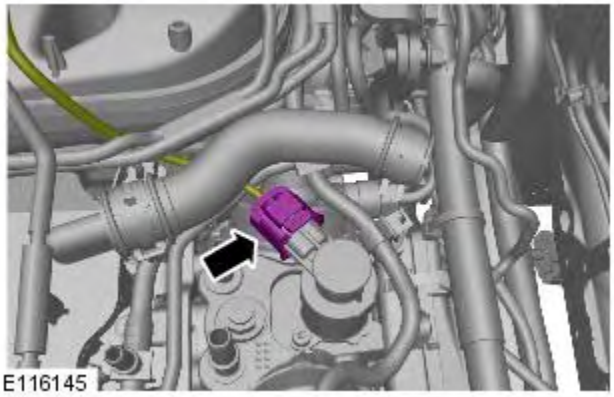


32. CAUTION: Be prepared to collect escaping fuel.

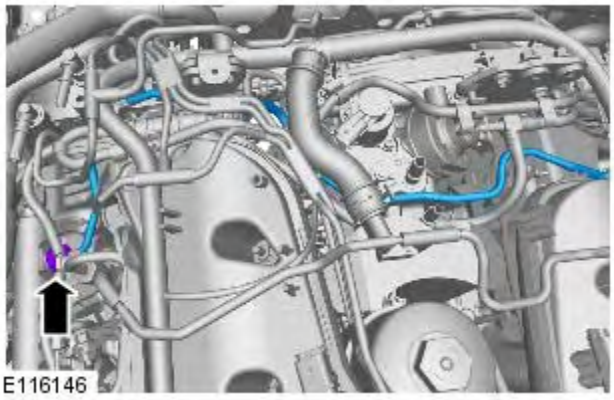


33.





34.

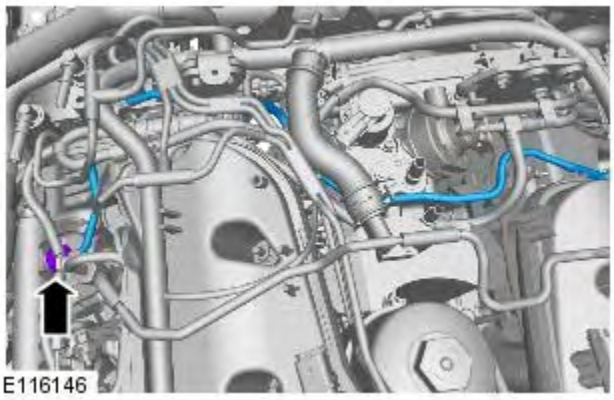


35. CAUTIONS:

Be prepared to collect escaping fuel.

Discard the component.

Installation

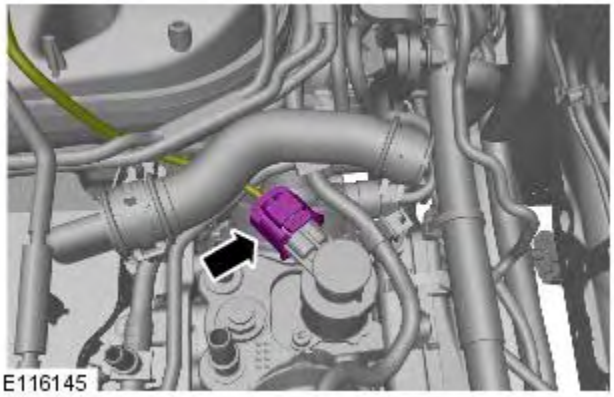


1. CAUTIONS:

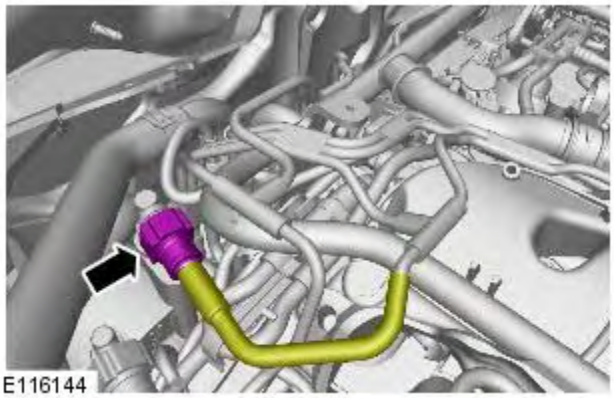
Make sure that a new component is installed.

Tighten the fuel supply line unions finger tight.

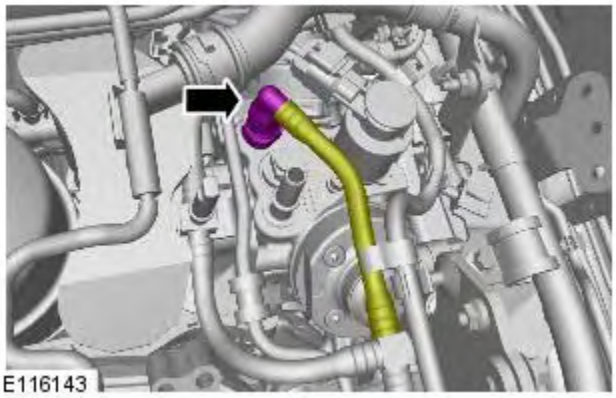
2.



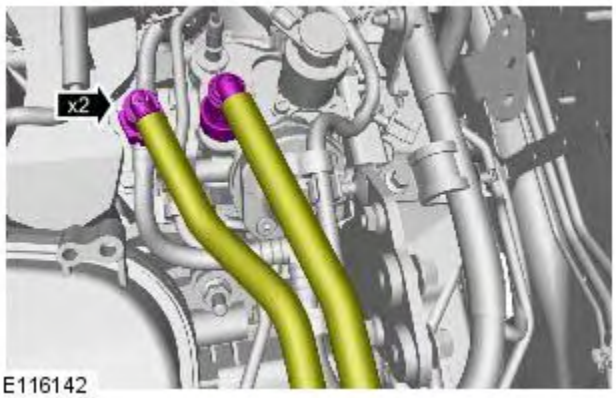
3.

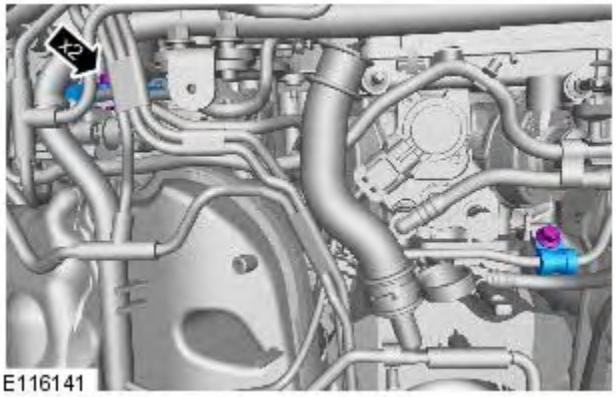


4.

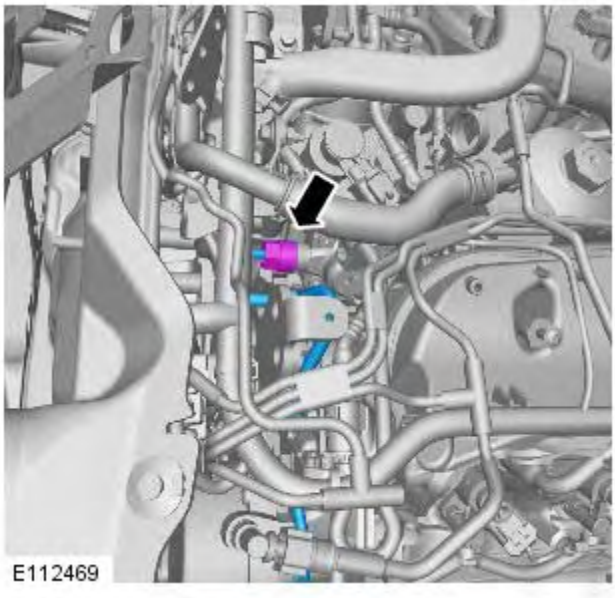


5.





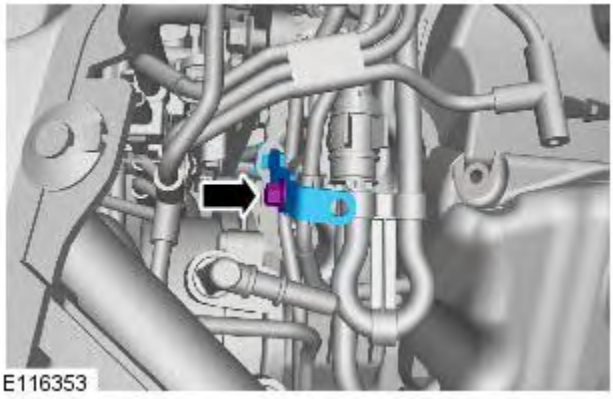
6. CAUTION: Only tighten the bolt finger-tight at this stage.



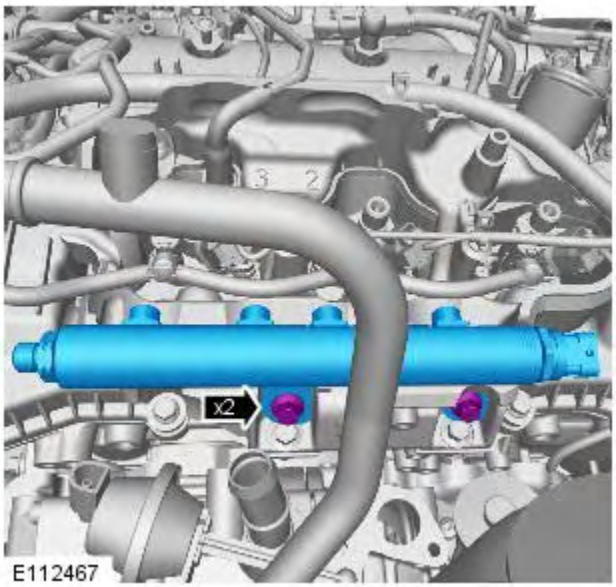
7. CAUTIONS:

   Make sure that a new component is installed.

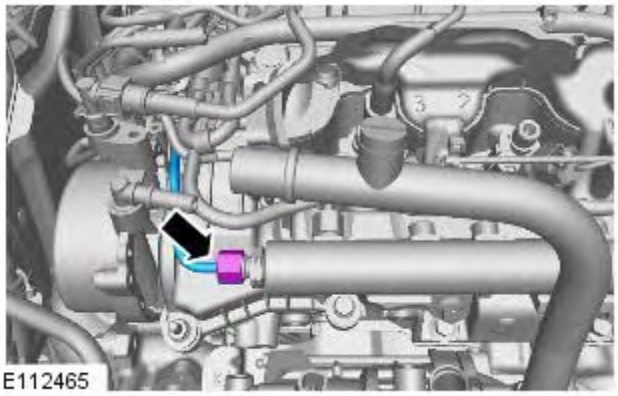
   Tighten the fuel supply line unions finger tight.



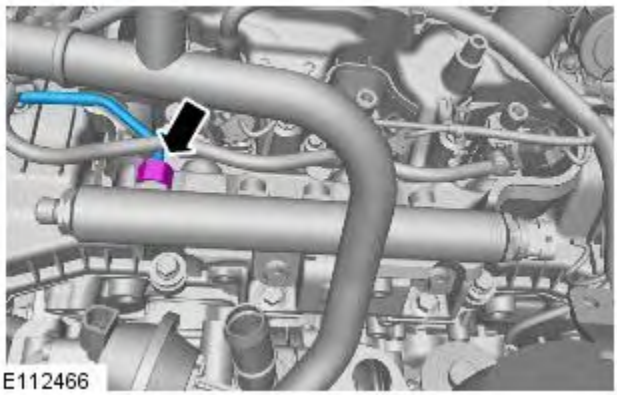
8. CAUTION: Only tighten the bolt finger-tight at this stage.



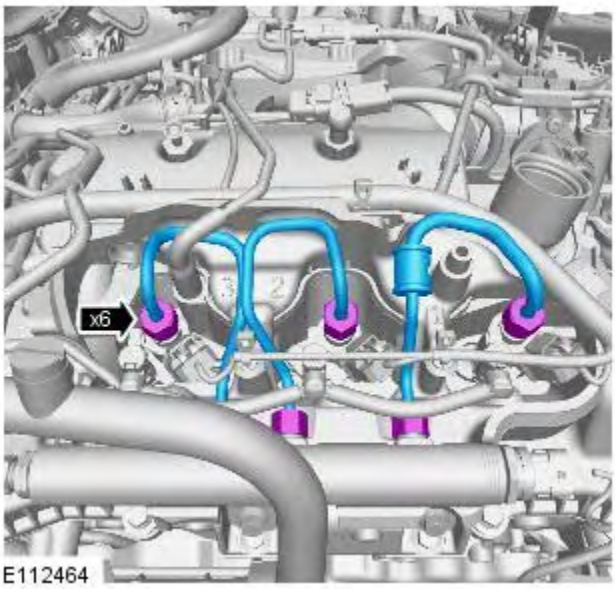
9. *Torque:* 24 Nm



10. CAUTION: Tighten the fuel supply line unions finger tight.



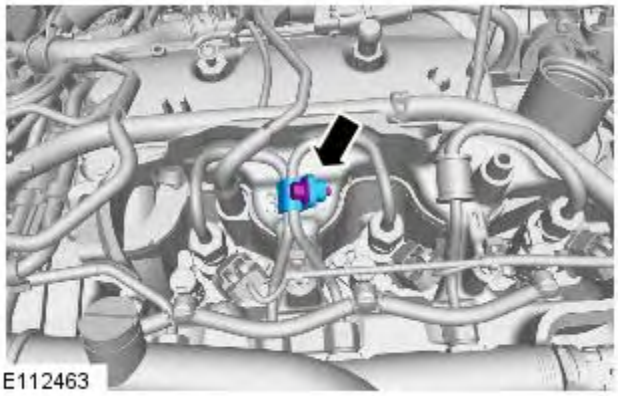
11. CAUTION: Tighten the fuel supply line unions finger tight.



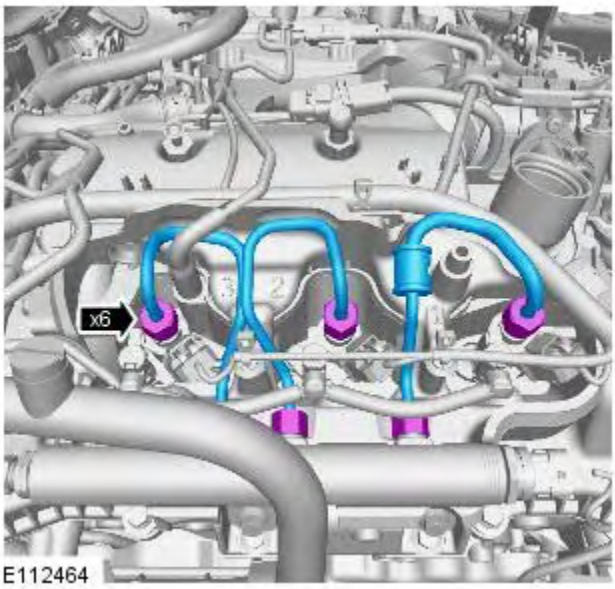
12. CAUTIONS:

    Make sure that a new component is installed.

    Tighten the fuel supply line unions finger tight.

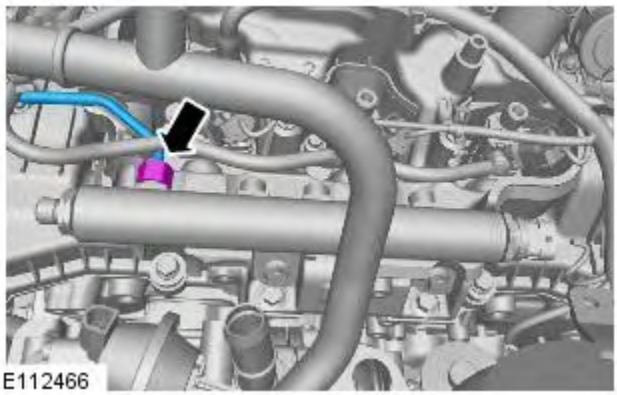


13. CAUTION: Tighten the fuel supply line unions finger tight.

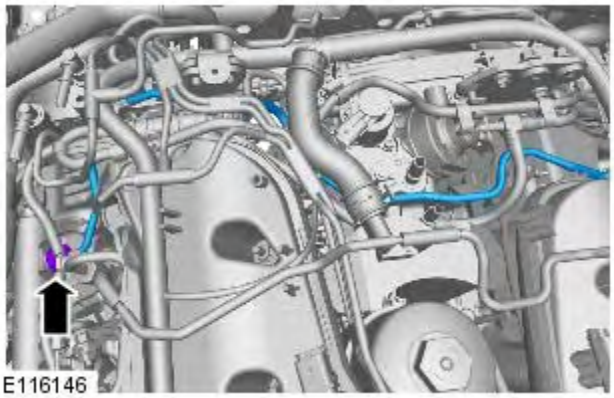


14.

- Stage 1:Tighten the high-pressure fuel supply line unions at the fuel rail to 15Nm.
- Stage 2: Tighten the high-pressure fuel supply line unions at the injector to 15Nm.

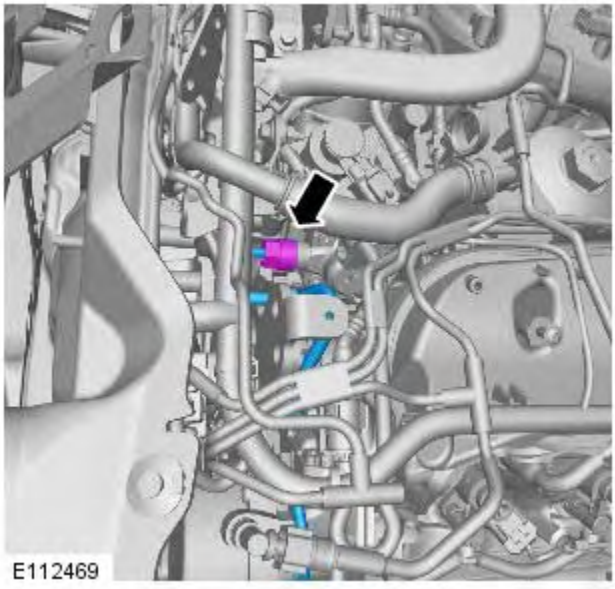


15. Tighten the high-pressure fuel lines union to 15Nm.

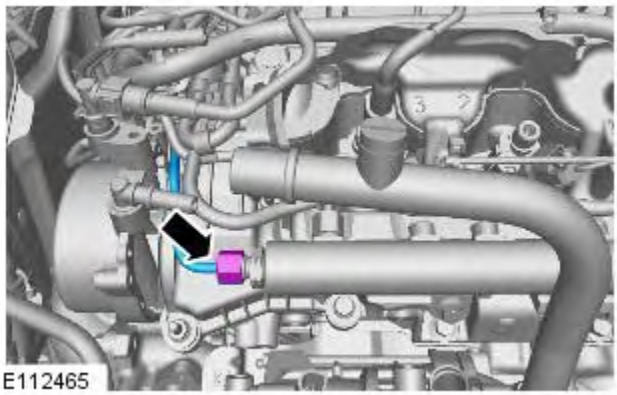


16. CAUTION: Make sure that a new component is installed.

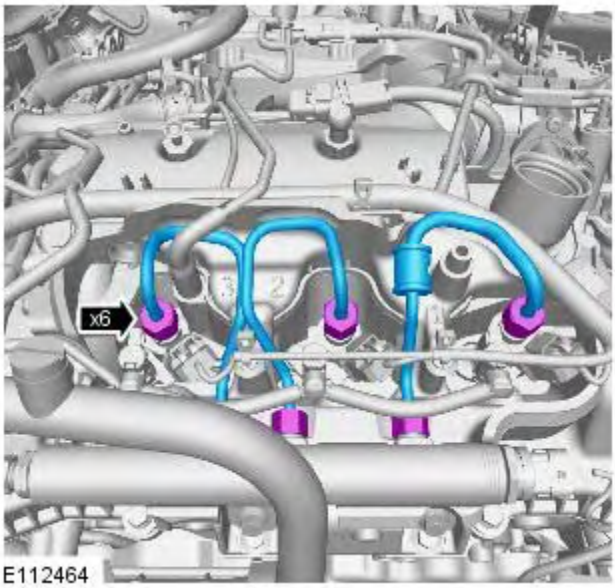
    Tighten the high-pressure fuel lines union to 15Nm.



17. Tighten the high-pressure fuel lines union to 15Nm.

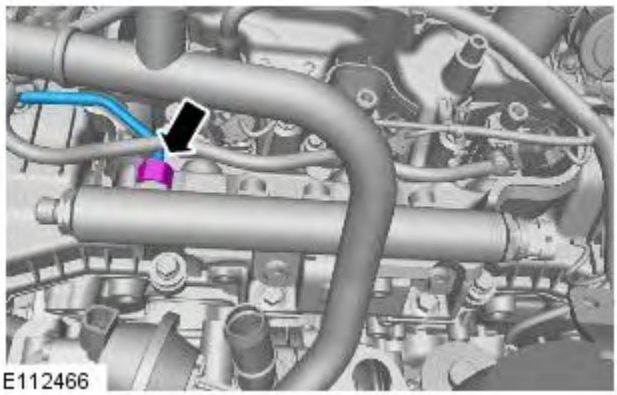

E112465

18. Tighten the high-pressure fuel lines union to 15Nm.

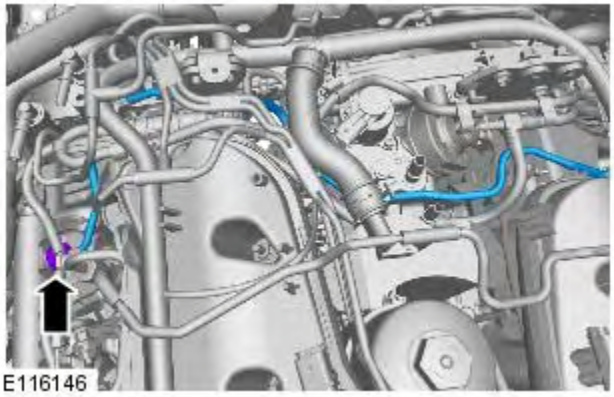


E112464

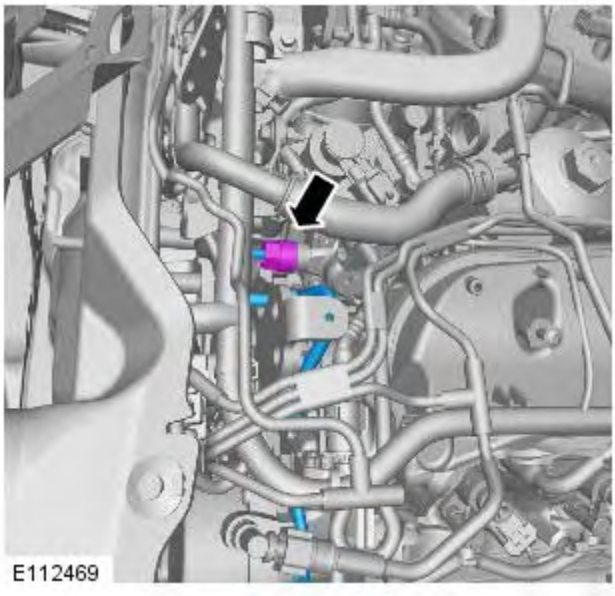
19.
- Stage 1: Tighten the high-pressure fuel supply line unions at the fuel rail to 30Nm.
- Stage 2: Tighten the high-pressure fuel supply line unions at the injector to 30Nm.


E112466

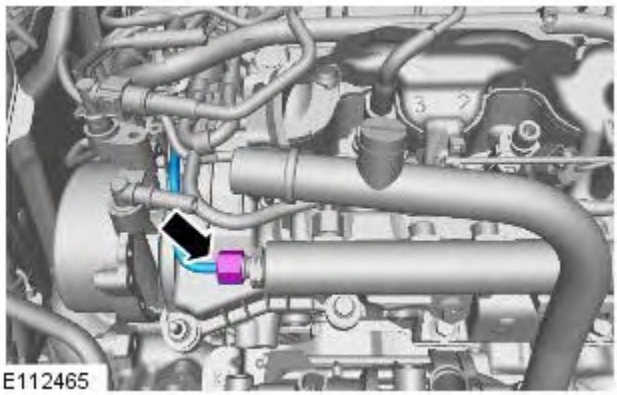
20. Tighten the high-pressure fuel line union to 30Nm.



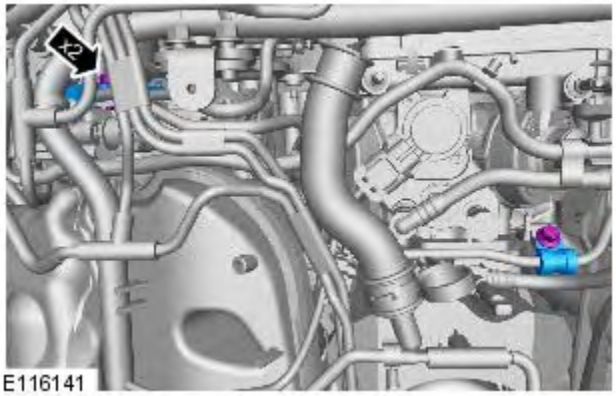
21. Tighten the high-pressure fuel line union to 30Nm.



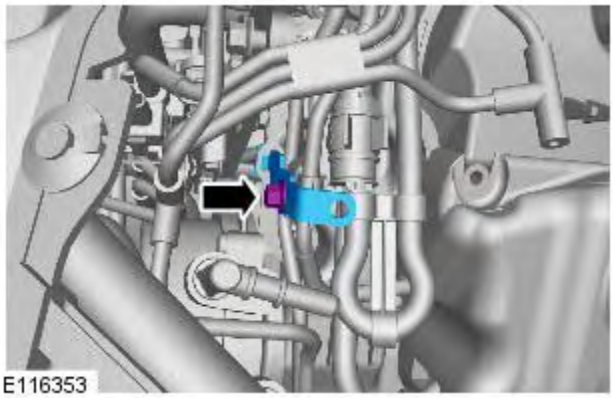
22. Tighten the high-pressure fuel line union to 30Nm.



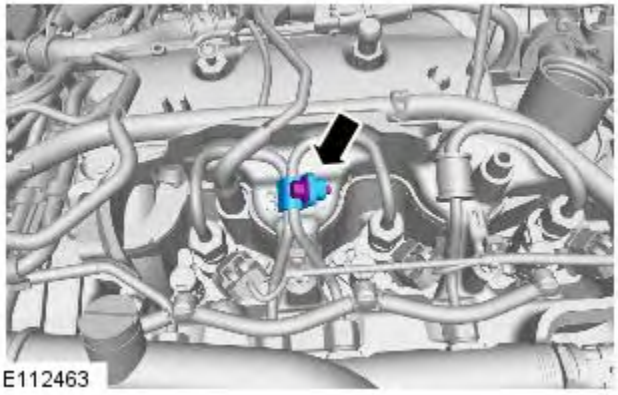
23. Tighten the high-pressure fuel line union to 30Nm.



24. *Torque:* 10 Nm



25. *Torque:* 10 Nm



26. *Torque:* 10 Nm

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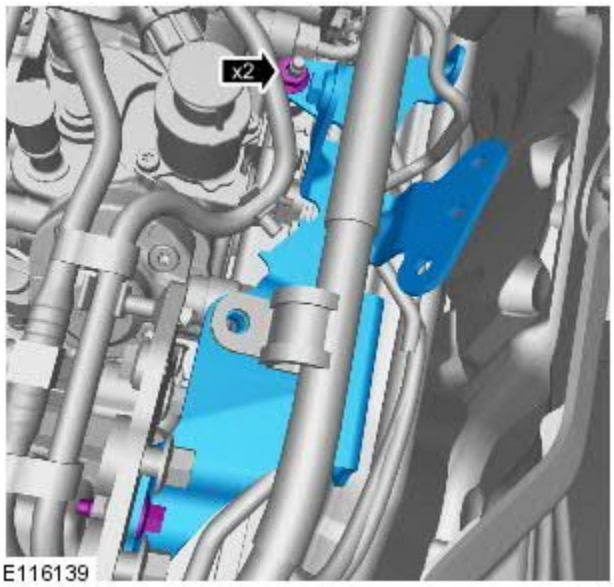
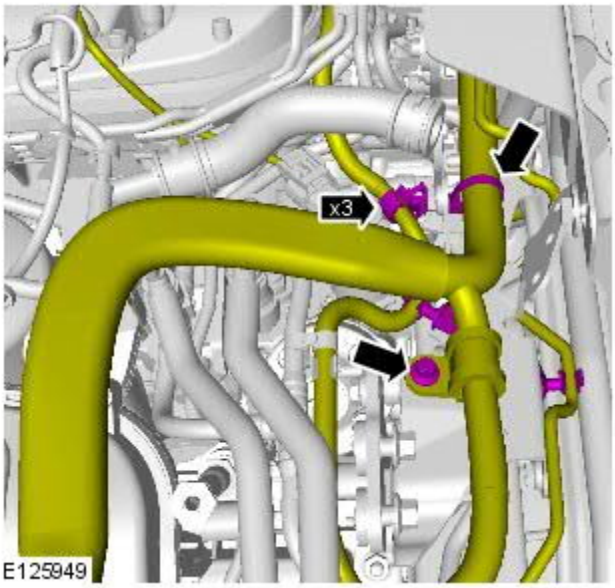
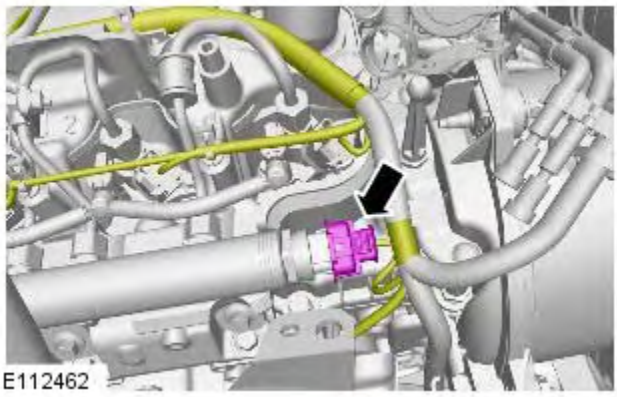


27. *Torque:* 10 Nm

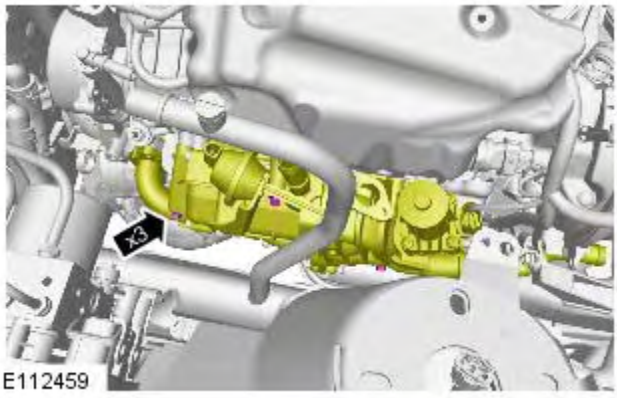


28. *Torque:* 10 Nm

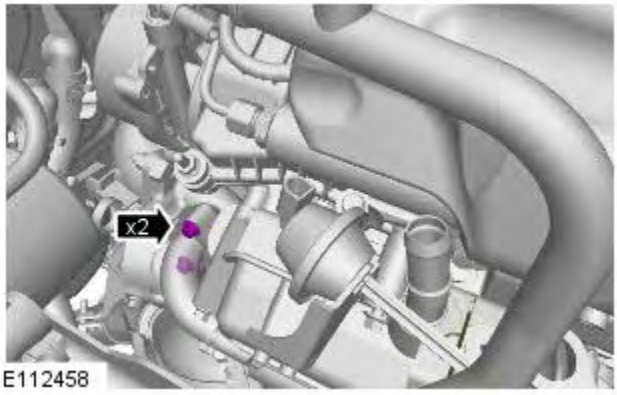


29.

30. NOTE: Right-hand shown, Left-hand similar.

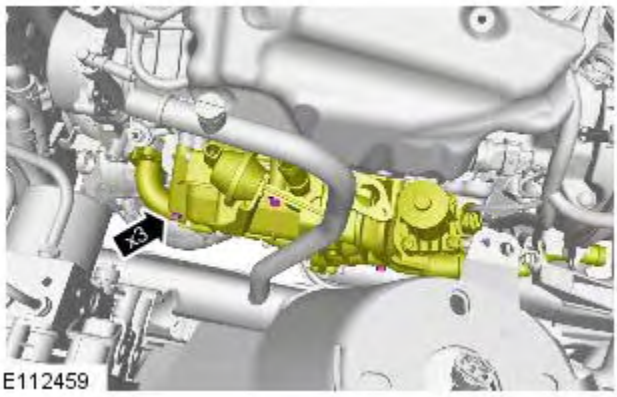


31. CAUTION: Only tighten the bolts finger-tight at this stage.

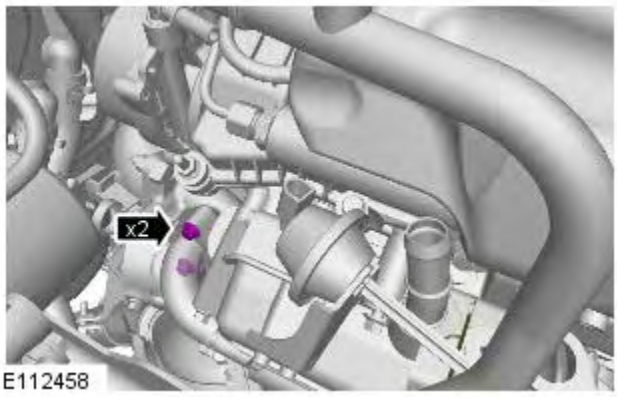


32. CAUTION: Only tighten the bolts finger-tight at this stage.

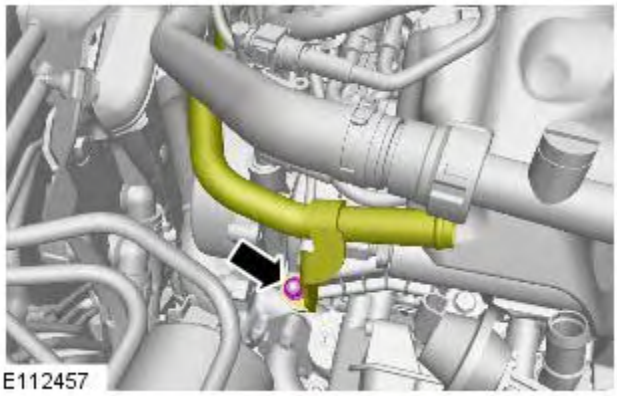
NOTE: Install a new gasket.



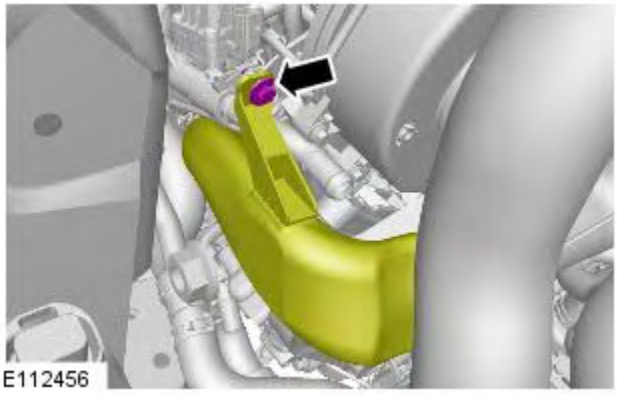
33. *Torque:* 10 Nm



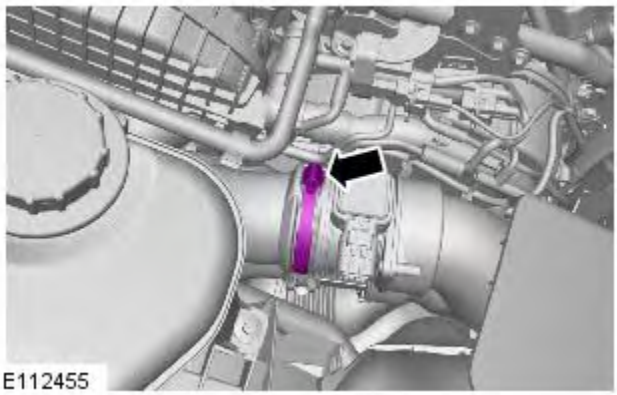
34. *Torque:* 10 Nm



35. *Torque:* 10 Nm

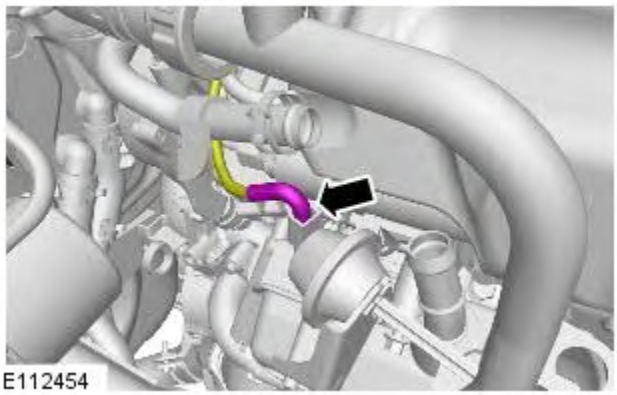


36. *Torque:* 10 Nm

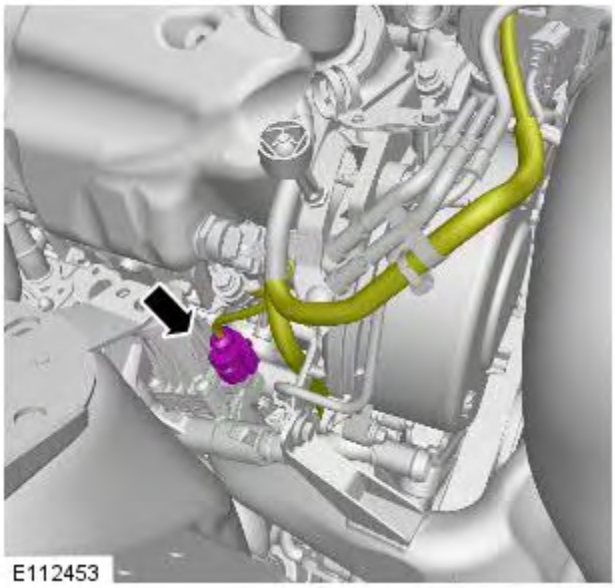


37. *Torque:* 7 Nm

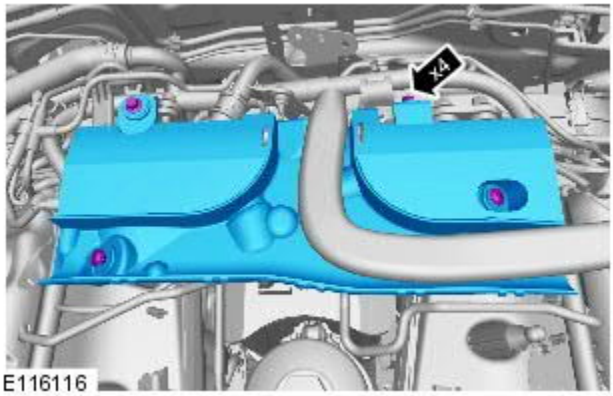
38.

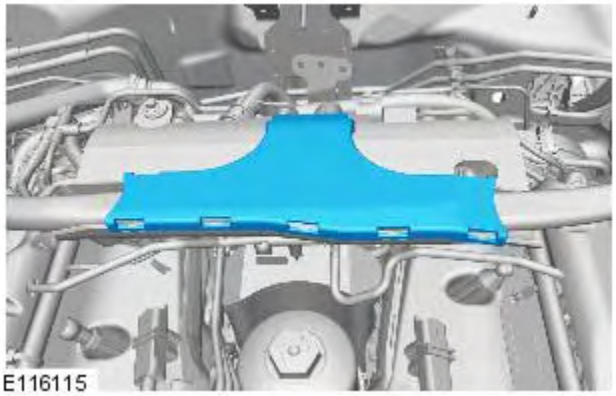


39.

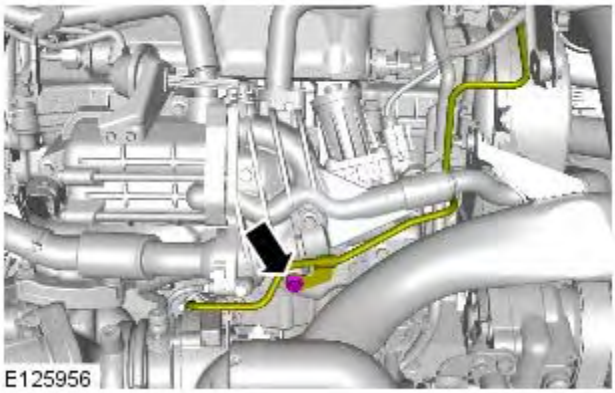


40. *Torque:* 10 Nm



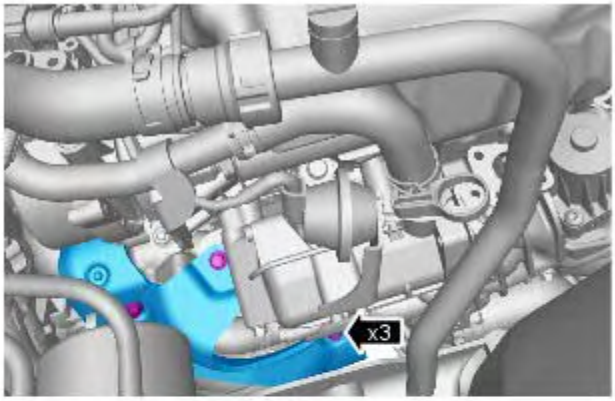


41.

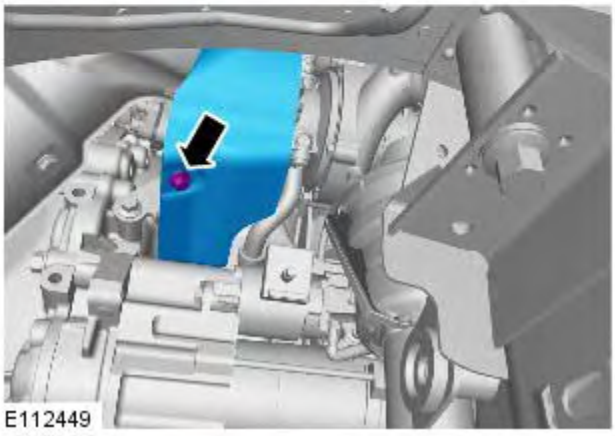


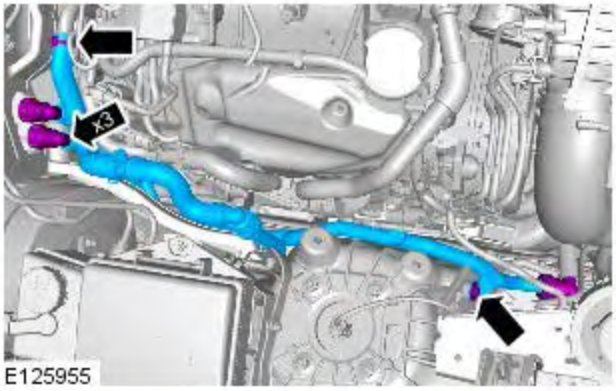
42. NOTE: Engine shown removed for clarity.

Torque: 10 Nm



43. *Torque:* 10 Nm





44.

45. Refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube RH (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).

46. Refer to: Secondary Bulkhead Panel RH (501-02 Front End Body Panels, Removal and Installation).

47. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

48. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

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Fuel Charging and Controls - TDV6 3.0L Diesel - Intake Air Shutoff Throttle

Removal and Installation

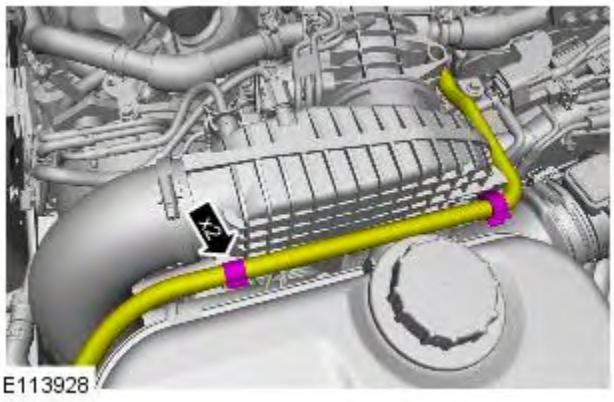
Removal

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).



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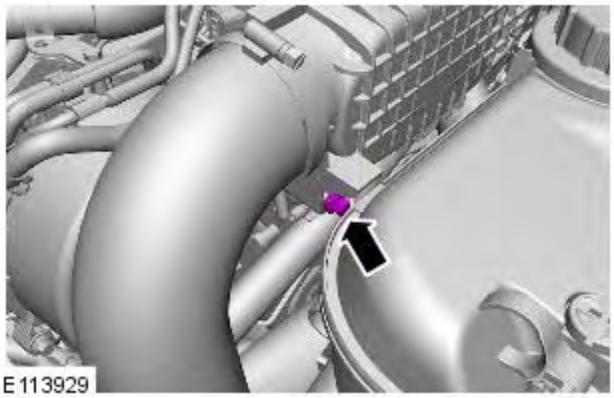
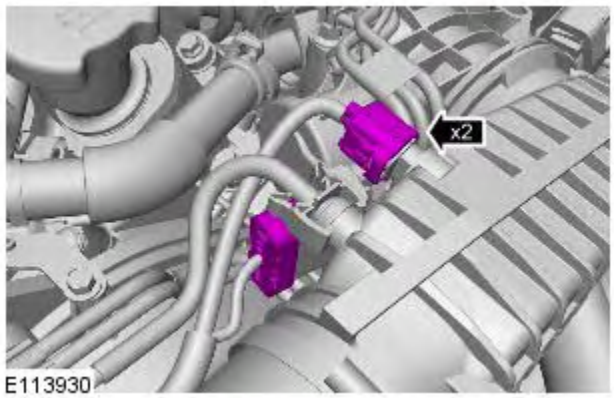


3. *Torque:* 10 Nm



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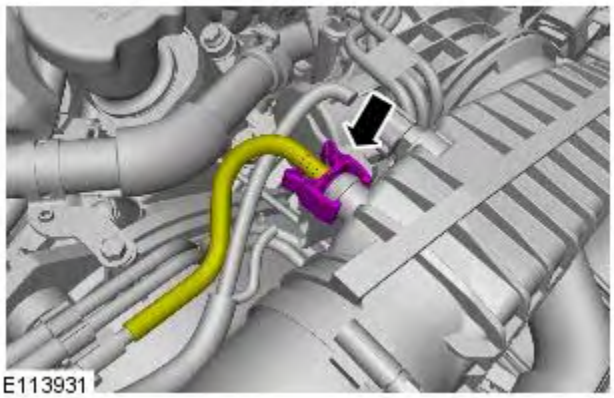

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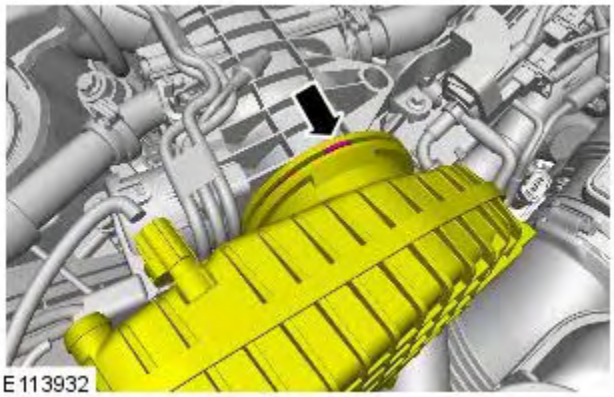

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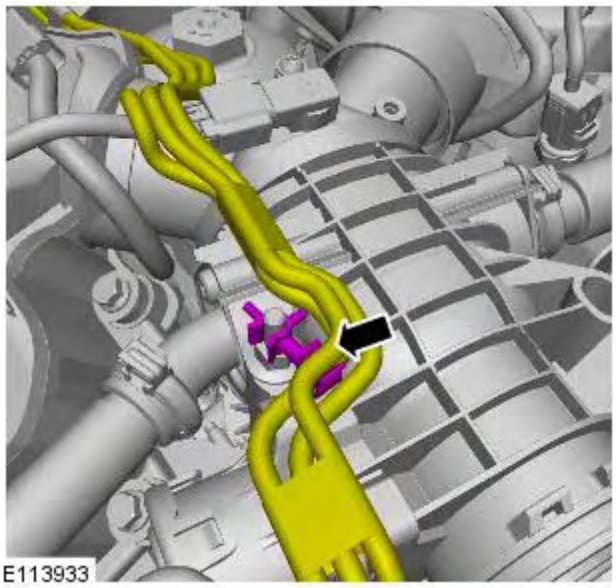
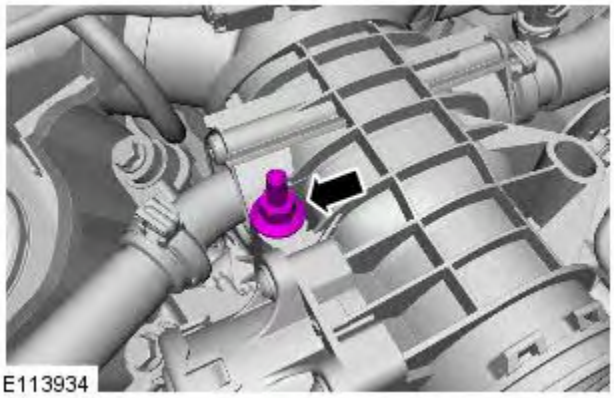
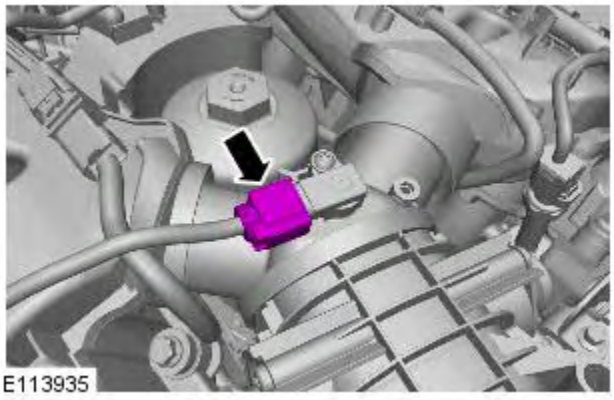




8. *Torque:* 10 Nm

9. Refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube LH (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).

10. Refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube RH (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).



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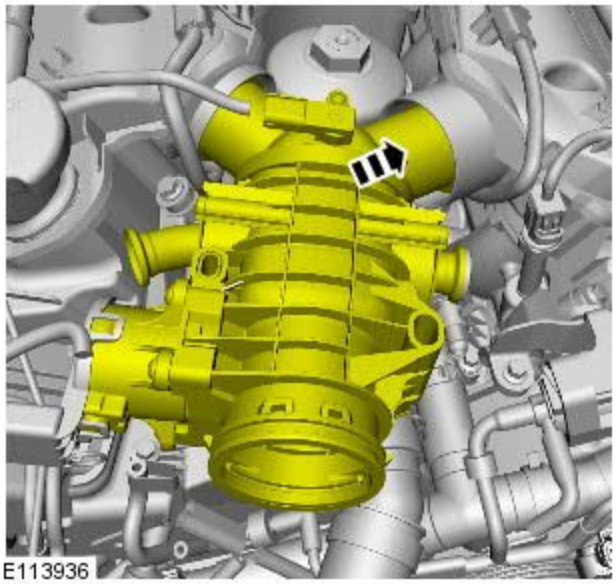
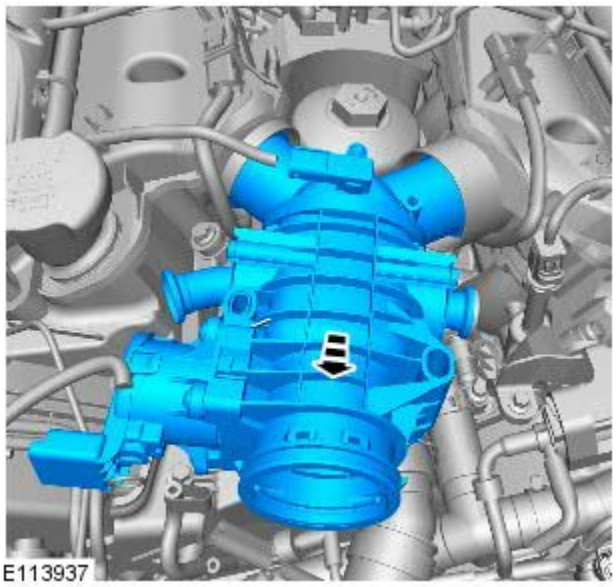
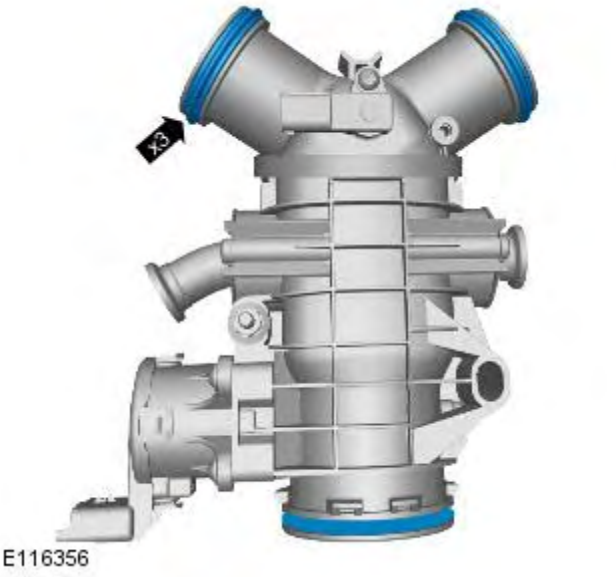


12.

13.





14. CAUTION: Install the new seals.

Installation

1. To install, reverse the removal procedure.

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Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel -

Torque Specification

Description	Nm	lb-ft	lb-in
Exhaust manifold threaded stud	13	10	-
Exhaust manifold retaining nuts	24	18	-
Turbocharger oil return tube to turbocharger retaining bolt	9	-	80
Turbocharger oil return tube to engine retaining bolt	9	-	80
Turbocharger bracket retaining bolts	23	17	-
Turbocharger to exhaust manifold retaining nuts	24	18	-
Exhaust manifold heatshield retaining bolt	11	8	-
Exhaust heatshield retaining bolt	9	-	80
Exhaust heatshield retaining nut	10	-	7
Turbocharger oil supply tube retaining bolt	9	-	80
Turbocharger oil supply tube union bolt	30	22	-
Exhaust gas recirculation (EGR) valve retaining bolts	9	-	80
EGR valve tube to exhaust manifold retaining bolts	9	-	80

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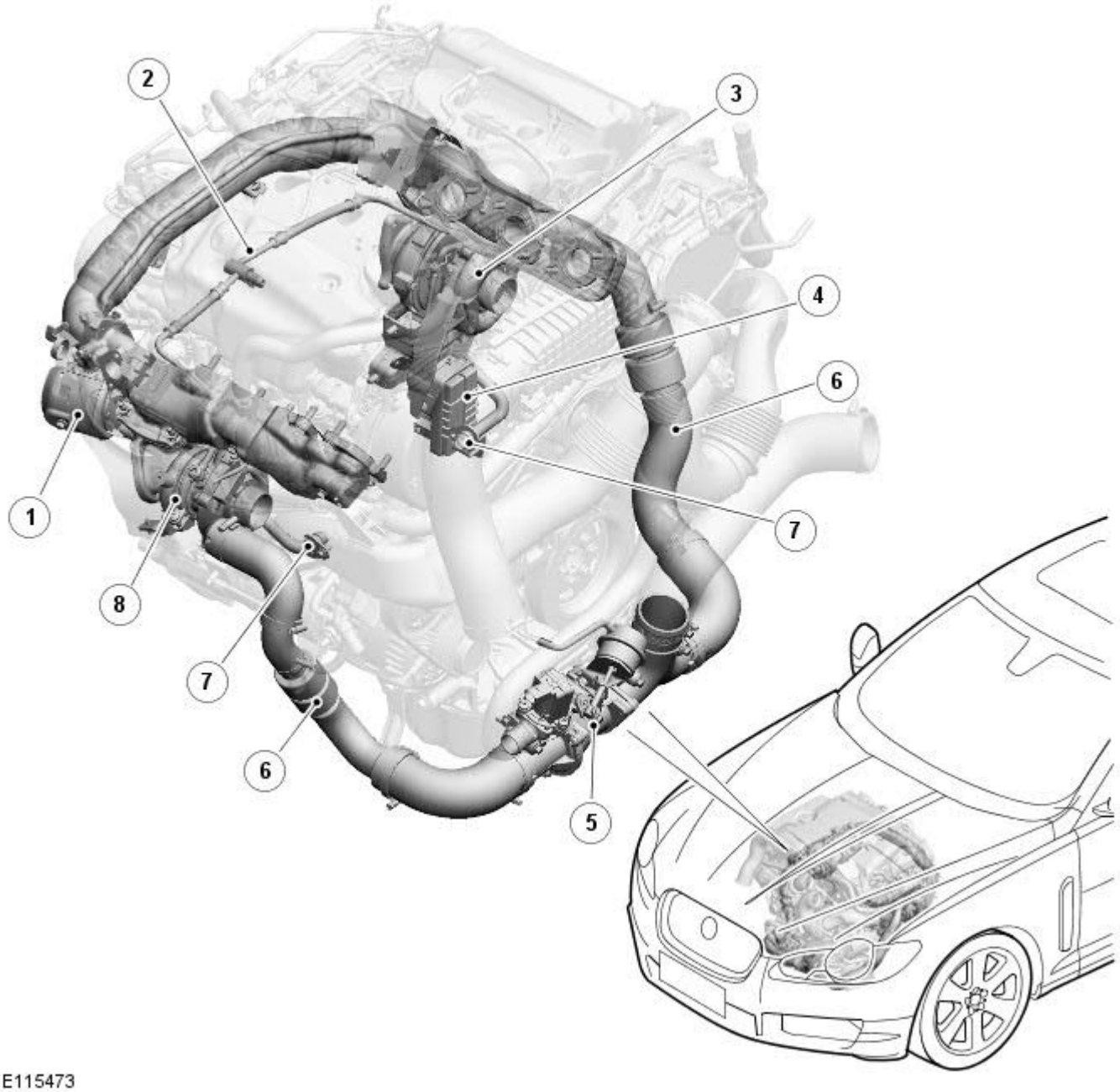
Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel - Turbocharger - Component Location

Description and Operation

COMPONENT LOCATION



E115473

Item	Description
1	Secondary turbocharger turbine shut-off valve
2	Turbocharger oil supply
3	Primary turbocharger (variable vane)
4	Primary turbocharger control module (variable vane actuator)
5	Secondary turbocharger recirculation valve and shut-off valve
6	Charge air tube
7	Turbocharger oil drain
8	Secondary turbocharger (fixed vane)

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Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel - Turbocharger - Overview

Description and Operation

INTRODUCTION

The 3.0L V6 diesel engine uses two turbochargers; a fixed vane type (secondary) and a variable vane (primary) type. The fixed vane turbocharger is fitted to the RH (right-hand) cylinder bank and the variable vane turbocharger is fitted to the LH (left-hand) cylinder bank.

Both turbochargers are used in a parallel sequential turbocharging system which enables the engine to achieve quick throttle response at low engine speeds and efficient use of exhaust gas energy at high engine speeds.

The variable vane turbocharger has an ECM (engine control module) controlled electronic rotary actuator. The rotary actuator adjusts the turbine vanes to optimize the exhaust gas flow and velocity onto the turbine wheel to maintain the required boost pressure.

The parallel sequential turbocharging system comprises the two turbochargers and the ECM. The primary variable nozzle turbine operates through the entire engine speed range but is at its most efficient at engine speeds of up to 2800 rpm. At engine speeds above 2800 rpm under load, the fixed vane secondary turbine comes into operation, with both of the turbochargers now running in a parallel bi-turbo mode.

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Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel - Turbocharger - System Operation and Component Description

Description and Operation

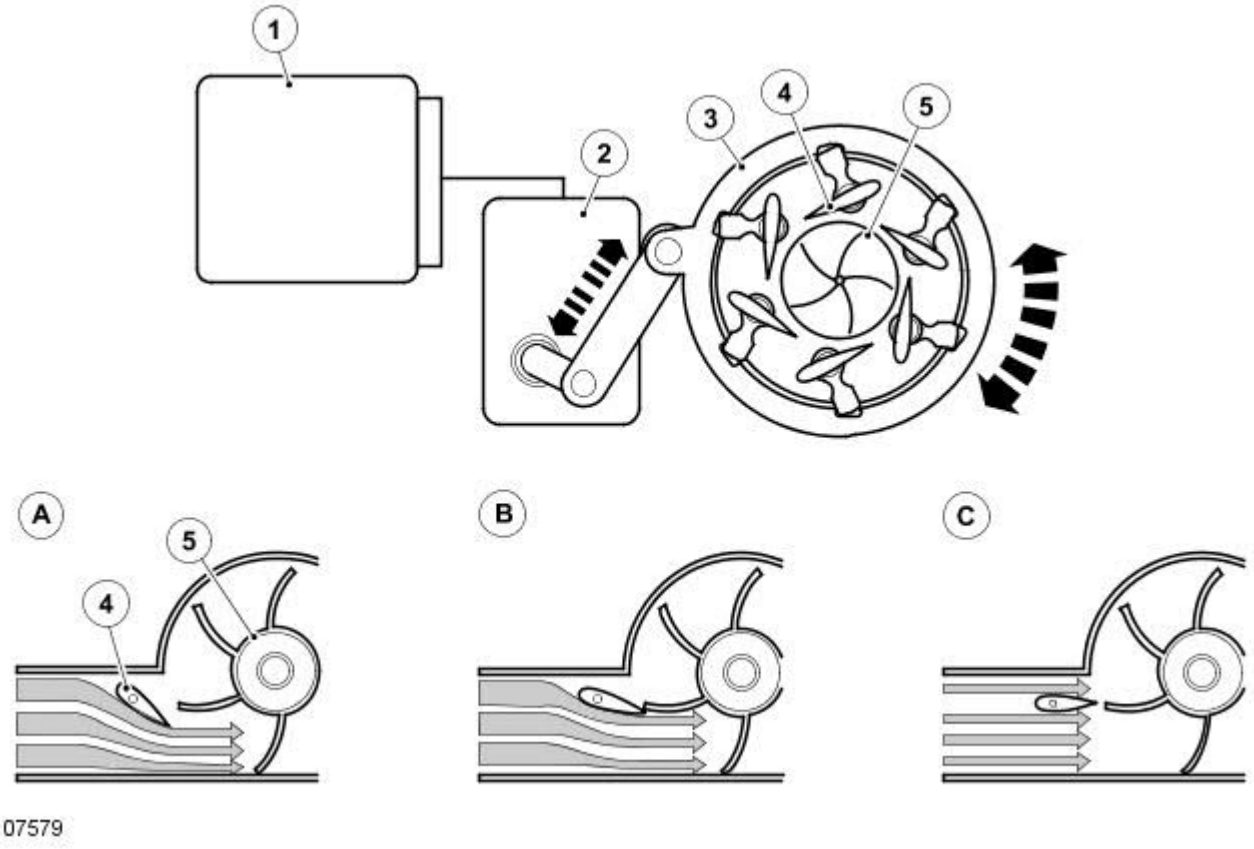
System Operation

TURBOCHARGERS

The turbine wheel of the turbocharger uses the engine's exhaust gasses to drive the compressor wheel. The compressor wheel draws in fresh air which is supplied to the engine cylinders in a compressed form.

The primary variable vane turbocharger allows the optimum inlet geometry (inlet area and flow angle) to be used over a wide range of engine operating conditions. This allows a rapid speed of response and higher boost pressures at low engine speeds. The variable vane angle determines both the inlet area as well as the flow angle, as controlled by the ECM (engine control module). The variable vanes allow efficient use of the exhaust gas energy which in turn improves turbocharger and engine efficiency.

Principles of Variable Vane Operation



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Item	Description
A	Low engine speed
B	Intermediate engine speed
C	High engine speed
1	ECM
2	Electronic rotary actuator
3	Turbine housing
4	Variable vanes
5	Compressor wheel

The variable vanes in the primary turbocharger are controlled by the ECM. The ECM controls a rotary electronic actuator attached to the primary turbocharger which is used to adjust the pitch angle of the vanes by rotating the turbine housing. The electronic rotary actuator also provides the ECM with a feedback signal to determine the pitch angle of the vanes.

The variable vanes in the primary turbocharger improve the exhaust gas power transfer to the turbine wheel which in turn drives the compressor wheel. At low engine speeds this greatly assists the increase in turbocharger boost pressure.

As engine speed, and therefore the exhaust gas velocity, increases, the vanes are opened. The amount of opening is determined by the ECM to ensure that the power transfer from the turbine wheel to the compressor wheel is within the turbocharger speed and boost pressure requirements.

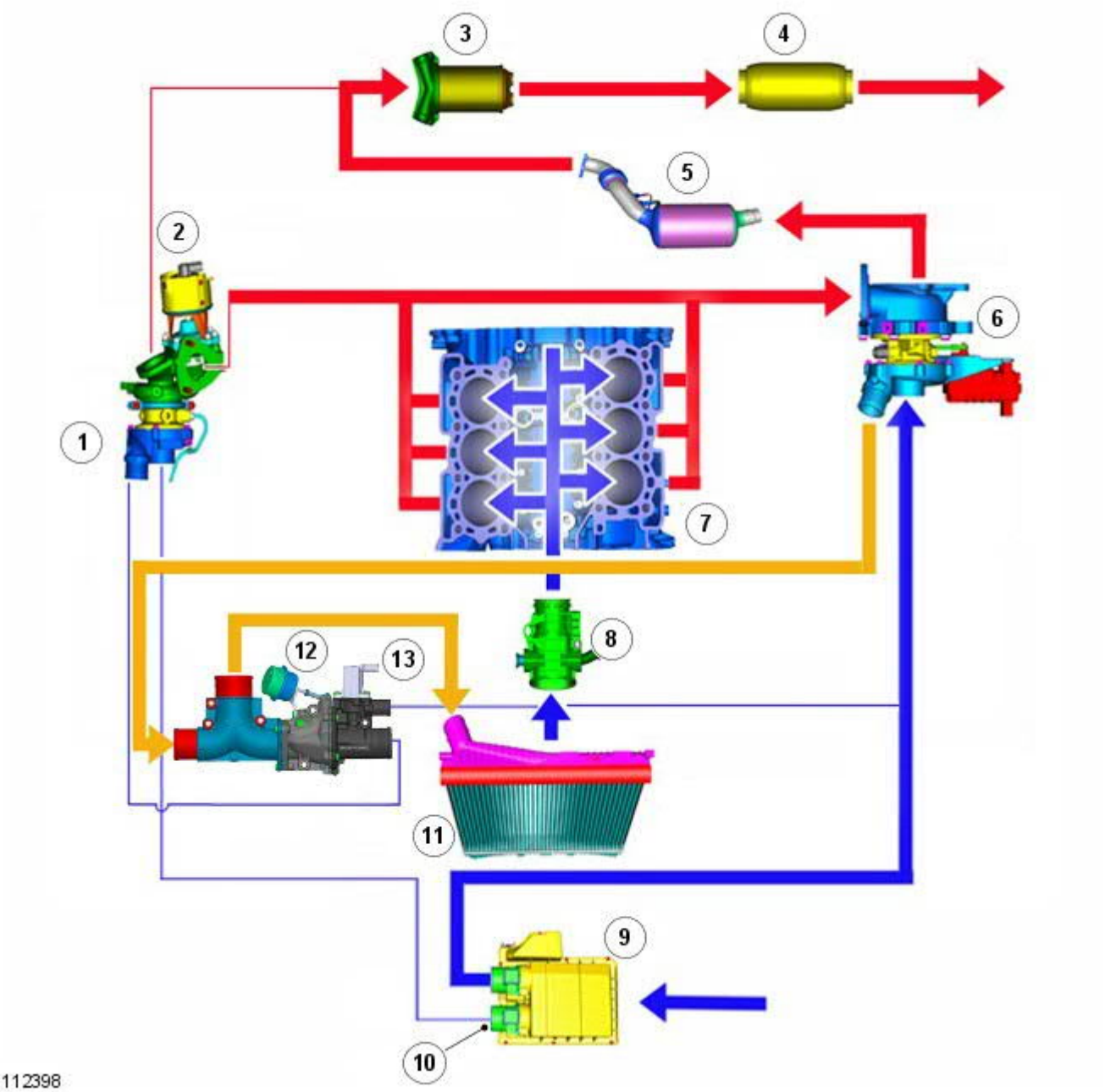
At high engine speed and exhaust gas flow, the ECM increases the vane opening to avoid overspeed of the turbines and provide a smooth high speed operation. At this point the dual mode boosting system comes into affect by utilizing the secondary (fixed vane) turbocharger.

Dual Mode Boosting

The dual mode boosting system comprises two turbochargers and software within the ECM. The two turbochargers can operate in two modes; mono turbocharger operation or bi-turbocharger operation.

Mono Turbocharger Operation

Mono Turbocharger Schematic Diagram



Item	Description
1	Fixed vane turbine
2	Turbine shut-off valve
3	Diesel Particulate Filter (DPF)

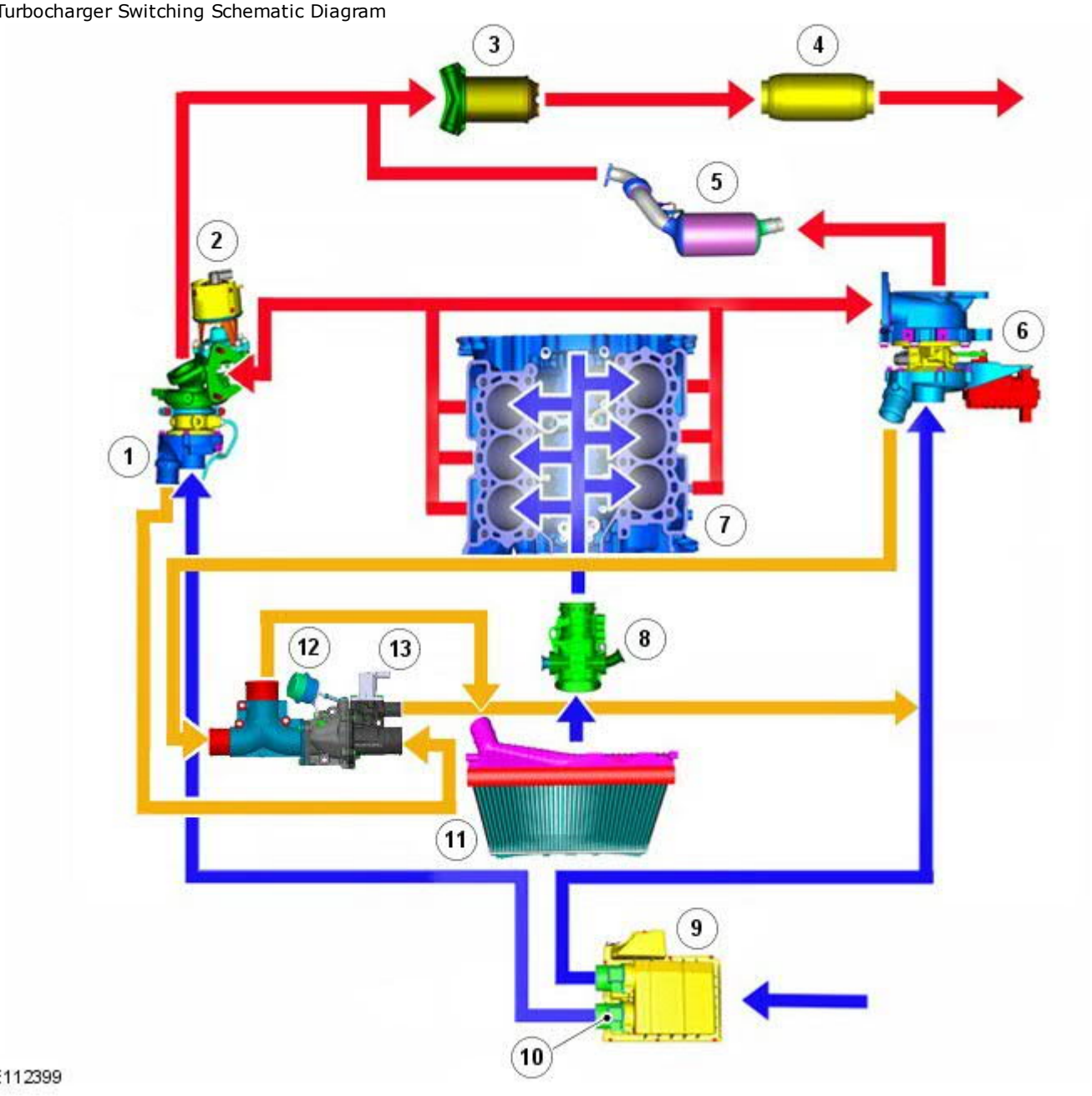
4	Flexible center resonators
5	Catalytic Converter
6	Variable vane turbocharger
7	Engine
8	Throttle
9	Air filter
10	MAF (mass air flow) meter
11	Charge air cooler
12	Compressor shut-off valve
13	Recirculation valve

Fresh air is drawn through the air filter and the MAF meter to the primary turbocharger compressor. The compressed air is then passed through the charge air cooler and into the engine.

The turbine shut-off valve on the secondary turbocharger is closed and therefore exhaust gasses are unable to operate the secondary turbocharger turbine. In this condition all turbocharging boost pressure is produced by the primary turbocharger.

Bi-Turbocharger Switching Operation

Bi-Turbocharger Switching Schematic Diagram



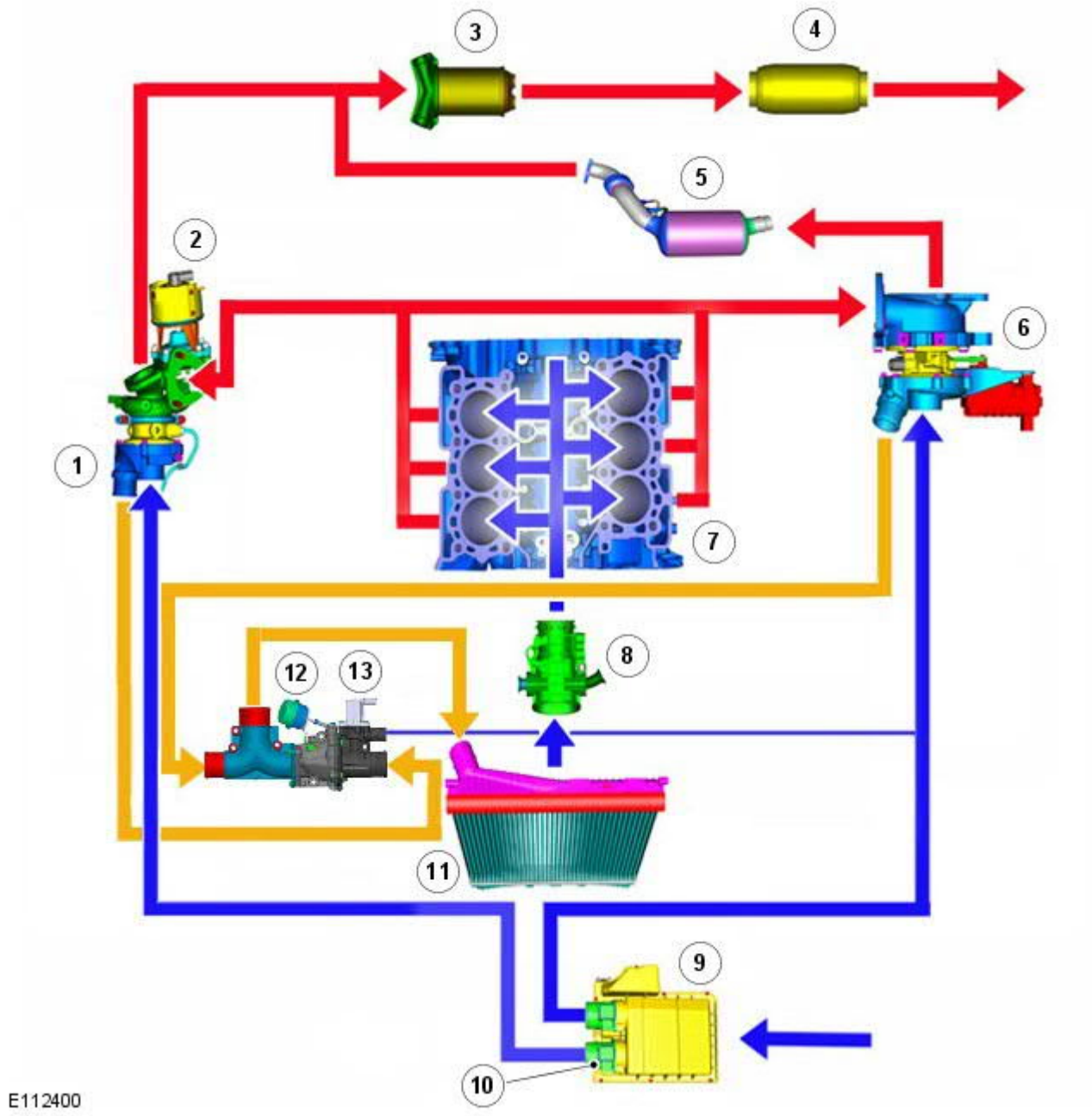
Item	Description
1	Fixed vane turbine
2	Turbine shut-off valve
3	Diesel Particulate Filter (DPF)
4	Flexible center resonators
5	Catalytic Converter
6	Variable vane turbocharger
7	Engine
8	Throttle
9	Air filter
10	MAF meter
11	Charge air cooler
12	Compressor shut-off valve
13	Recirculation valve

When the engine operating parameters approach the limits (approximately 2800 rpm under load) of the primary turbocharger,

dual mode boosting control software within the ECM begins the switch to parallel bi-turbocharger operation. The secondary turbocharger is brought into operation by the opening of the turbine shut-off valve which allows exhaust gasses to flow through the turbine.

Initially, the secondary turbocharger does not produce a boost pressure to equal that of the primary turbocharger. Therefore, the initial boost pressure from the secondary turbocharger is fed via the recirculation valve into the clean air inlet for the primary turbocharger. As the secondary turbocharger boost pressure output increases, the recirculation valve is then closed and the compressor shut-off valve opened to increase the boost pressure from the secondary turbocharger which is directed into the charge air cooler.

Bi-Turbocharger Schematic Diagram



Item	Description
1	Fixed vane turbine
2	Turbine shut-off valve
3	Diesel Particulate Filter (DPF)
4	Flexible center resonators
5	Catalytic Converter
6	Variable vane turbocharger

7	Engine
8	Throttle
9	Air filter
10	MAF meter
11	Charge air cooler
12	Compressor shut-off valve
13	Recirculation valve

When the secondary turbocharger has reached the required operating parameters, the recirculation valve is closed and the compressor shut-off valve is opened. The ECM will maintain the engine operating in bi-turbocharger operation with both primary and secondary turbochargers contributing to the air charge induction. When the dual mode boosting software determines that the engine operating parameters no longer require the use of dual mode boosting, the system switches back to mono turbocharger operation.

If the engine idles for more than 3 minutes, the secondary turbocharger is actuated to ensure correct lubrication. This is achieved by pressurizing the turbine shaft bearing cavities through a pipe, which is connected to the air intake system and periodically opening the turbine shut-off valve to operate the turbocharger.

CAUTION: Ensure both ends of the pipe are securely connected to the secondary turbo and the air intake system to prevent damage to the turbo components.

Component Description

Each turbocharger consists of two turbo elements, a turbine wheel and compressor wheel, enclosed separately in cast housings and mounted on a common shaft, which rotates in two semi-floating bearings.

VARIABLE VANE TURBOCHARGER (PRIMARY)

The variable vane turbocharger is attached to the LH (left-hand) exhaust manifold and secured to 3 studs on a flange on the manifold with nuts. On production, no gasket is used to seal the joint between turbocharger and the manifold. In-service vehicles will require a service gasket to be fitted if the joint between the turbocharger and the manifold is disturbed.

A second flange on the turbocharger has 3 integral studs and provides for the attachment of the LH catalytic converter inlet pipe. Three nuts secure the inlet pipe to the flange studs and a gasket seals the joint between the components.

The compressor end of the turbocharger has two hose connections. The central connection provides a clean air supply from the air filter to the compressor. The second connection on the outside of the housing provides for a pipe connection from the turbocharger to the charge air cooler

The turbocharger is a conventional design with both the turbine wheel and the compressor wheel sharing a common shaft which is supported on bearings. The turbocharger receives an engine oil feed via a pipe from the cylinder block. The pipe supplies both turbochargers with an oil supply for lubrication purposes. An oil drain pipe from the turbocharger allows oil to drain from the turbocharger into the cylinder block.

An integral bracket houses the variable vane electronic rotary actuator. The rotary actuator is connected to an eccentric lever which moves the turbine housing to adjust the position of the vanes. When the rotary actuator operates a boss is rotated, which in turn moves the lever and changes rotary motion into linear motion. The lever is connected to the outside of the turbine housing and the linear motion is converted back to rotary motion of the housing. Operation of the electronic rotary actuator is controlled by the ECM.

FIXED VANE TURBOCHARGER (SECONDARY)

The fixed vane turbocharger is attached to the RH (right-hand) exhaust manifold and is secured to 3 studs on a flange on the manifold with nuts. On production, no gasket is used to seal the joint between turbocharger and the manifold. In-service vehicles will require a service gasket to be fitted if the joint between the turbocharger and the manifold is disturbed.

A second flange on the turbocharger has 2 integral studs and provides for the attachment of the RH exhaust system downpipe. Two nuts secure the downpipe to the flange studs and a gasket seals the joint between the downpipe and the turbocharger.

The compressor end of the turbocharger has two hose connections; the central connection provides the clean air supply from the air filter. The second connection on the outside of the turbocharger housing allows the connection from the turbocharger to the charge air cooler

Attached to the rear of the turbocharger is a turbine shut-off valve. The valve is vacuum operated and electronically controlled by the ECM. The valve is closed when the system is operating in mono-turbocharger mode, diverting exhaust gasses from the RH exhaust manifold, via the exhaust cross-over duct to the LH exhaust manifold. When bi-turbocharger operation is required, the ECM electronically operates the valve allow vacuum to open the shut-off valve allowing exhaust gasses from the RH exhaust manifold to drive the turbine of the fixed vane turbocharger.

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Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel - Turbocharger LH

Removal and Installation

Removal

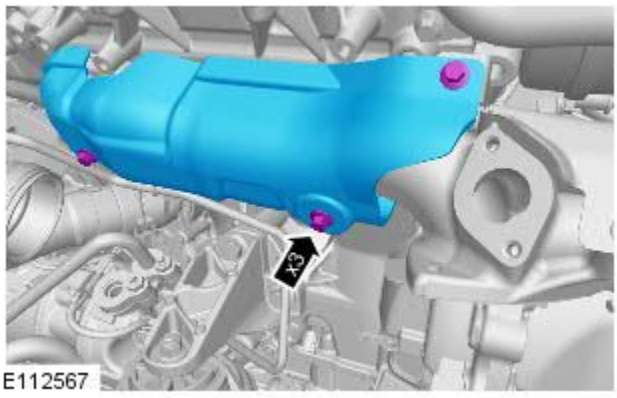
CAUTION: Do not turn the steering wheel with the steering column lower shaft disconnected as damage to the clockspring and steering wheel switches may occur.

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

All vehicles

1. Refer to: Catalytic Converter (309-00A Exhaust System - TDV6 3.0L Diesel, Removal and Installation).

2. Refer to: Exhaust Gas Recirculation (EGR) Valve LH (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).



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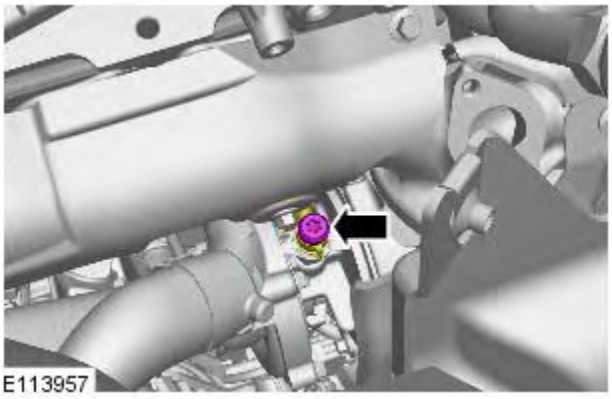
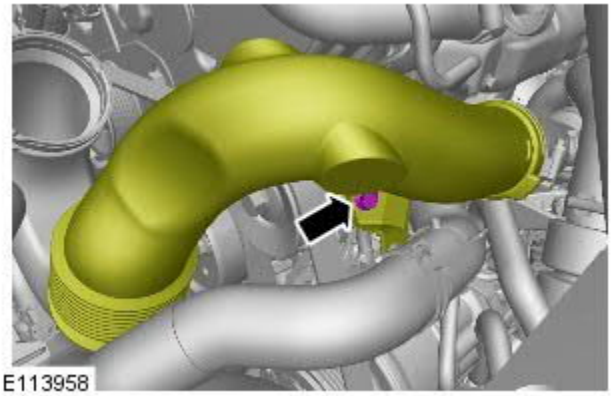


4. NOTE: Discard the sealing washers.

5.



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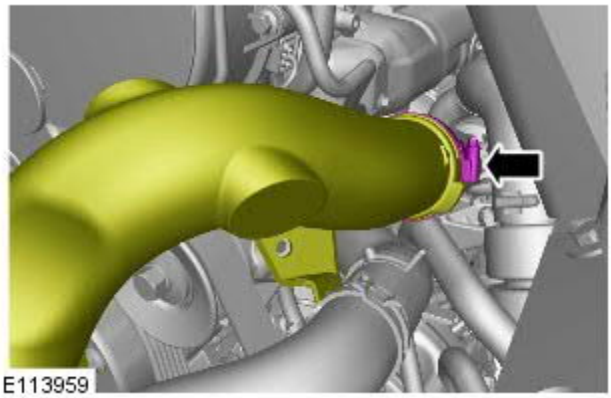
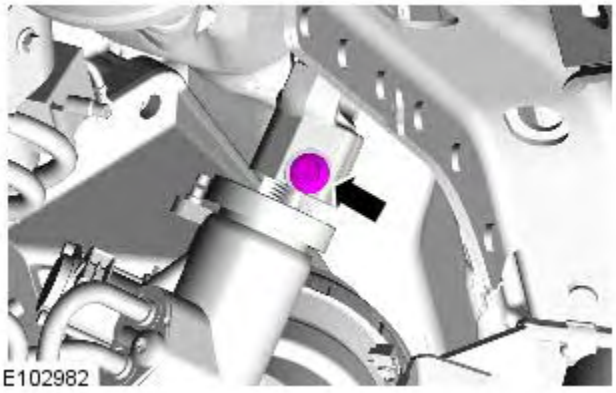


7. WARNING: Make sure to support the vehicle with axle stands.

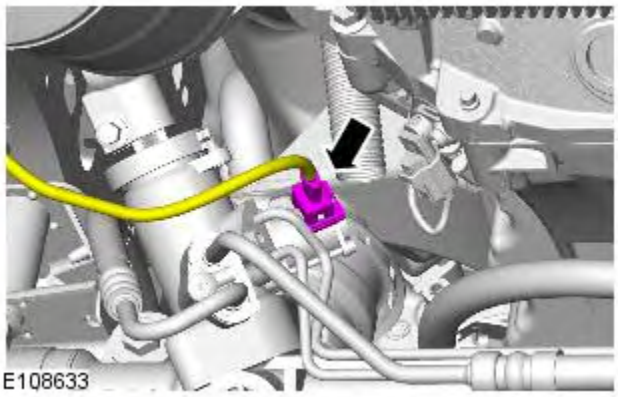
Raise and support the vehicle.

Left-hand drive vehicles

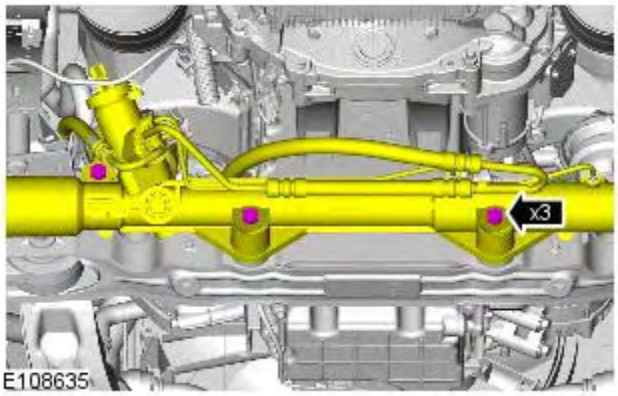


8. CAUTION: Make sure that the road wheels are in the straight ahead position.

9.

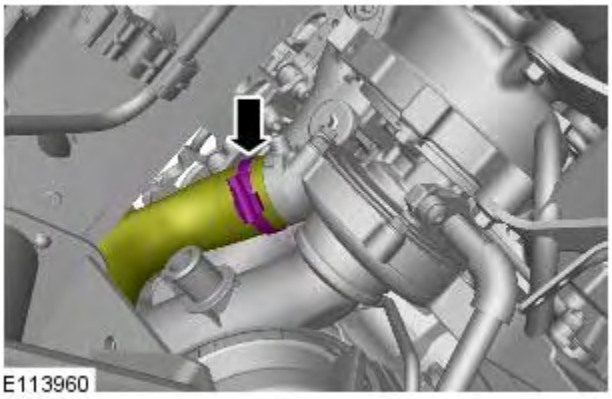


10. CAUTION: Make sure to support the steering gear.



All vehicles

11.



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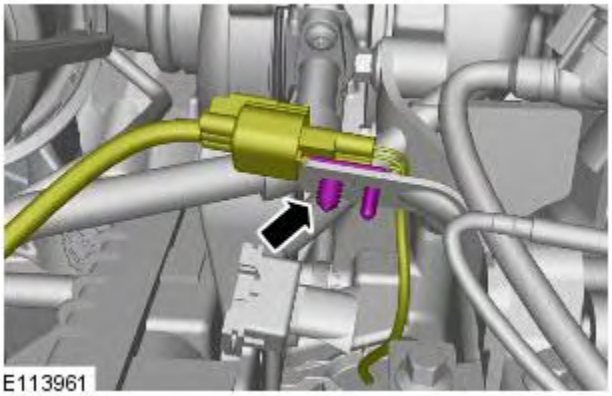

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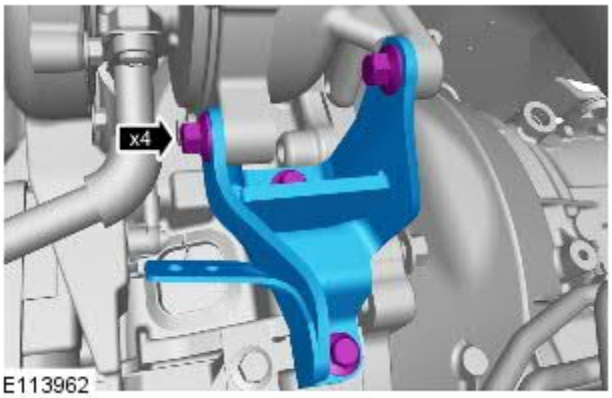
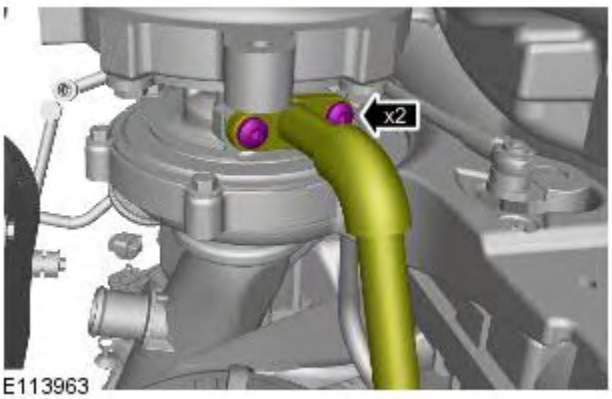
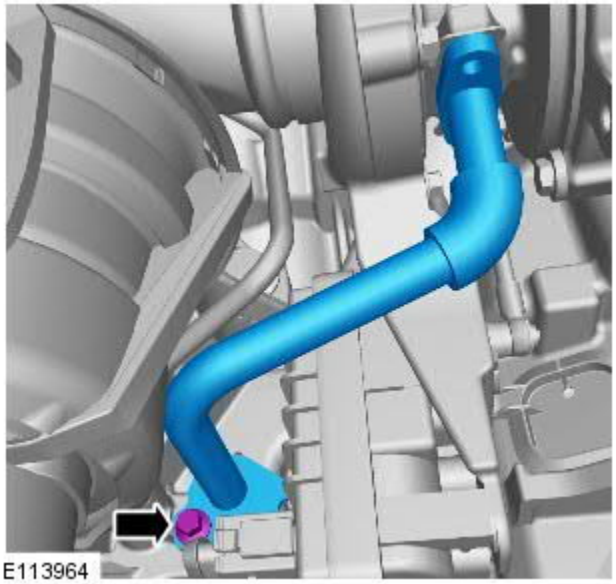
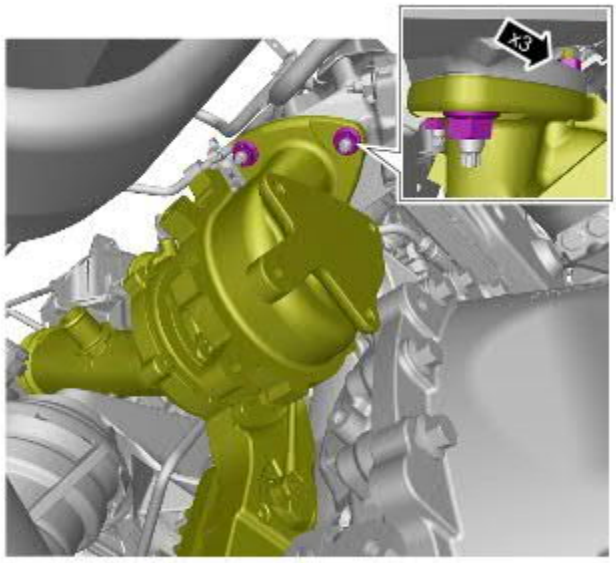


14. NOTE: Discard the gasket.



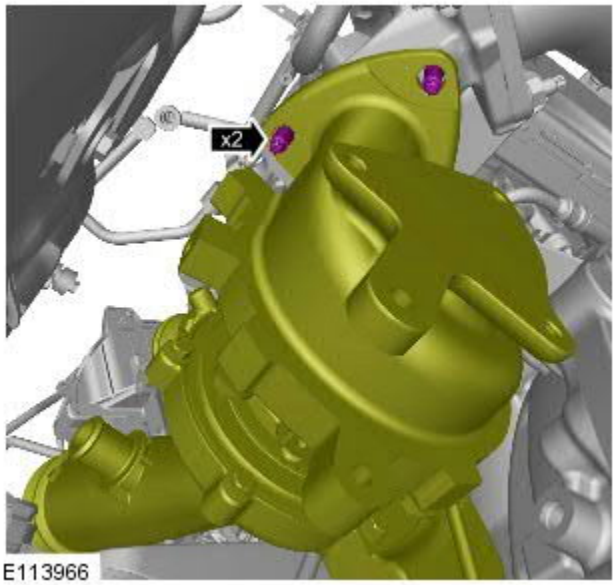

E113964

15. CAUTION: Discard the seal.

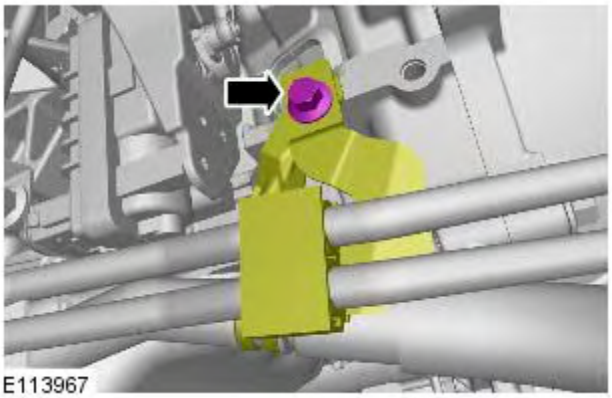


E113965

16. CAUTION: Discard the nuts.



17. CAUTION: Discard the studs.

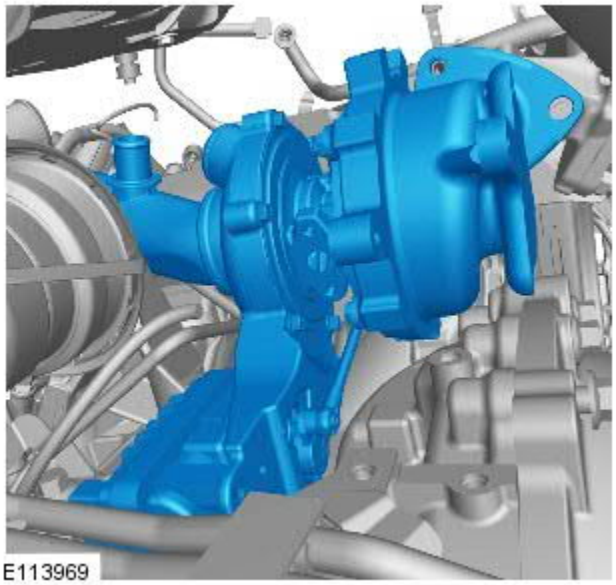


18.

19.

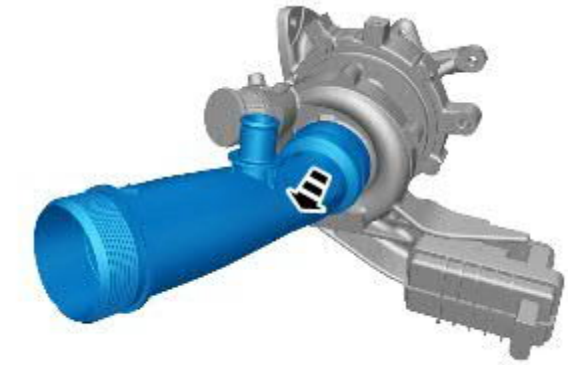
- Position the turbocharger to one side.

20.

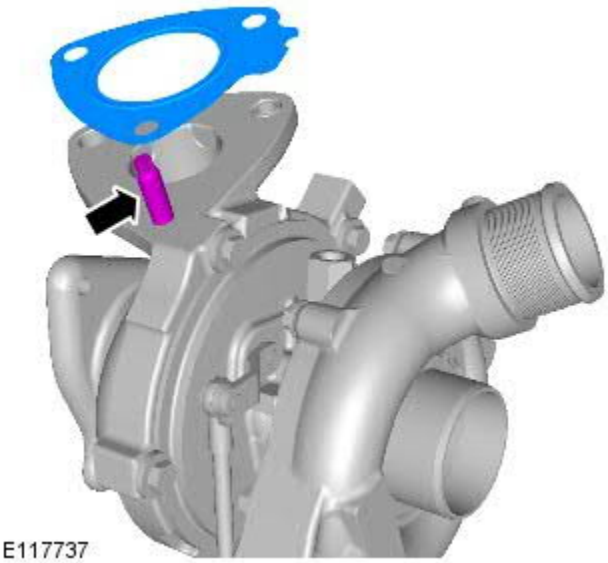

E113969

21.

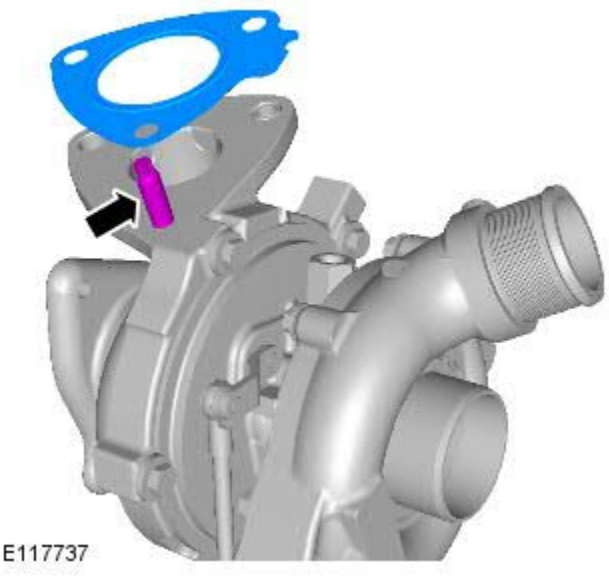
- Do not disassemble further if removed for access only


E113970

22.


E117737

Installation All vehicles


E117737

1. CAUTIONS:

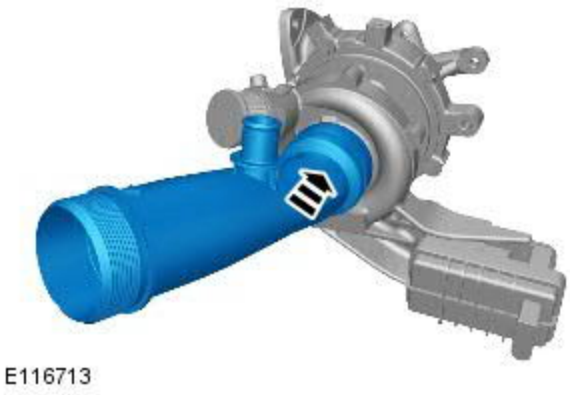
   Install new studs.

   Check the turbocharger and exhaust manifold mating faces for distortion.

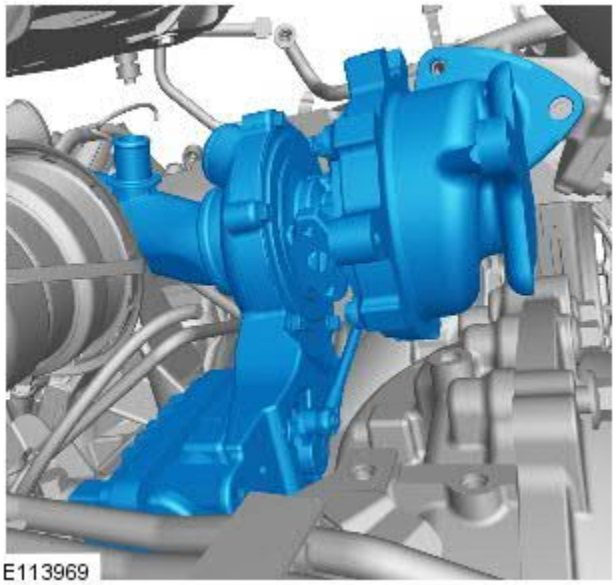
   Install a new turbocharger to exhaust manifold gasket every time the turbocharger is removed.

   Make sure that the mating faces are clean and free of corrosion and foreign material.

   Torque: 13 Nm


E116713

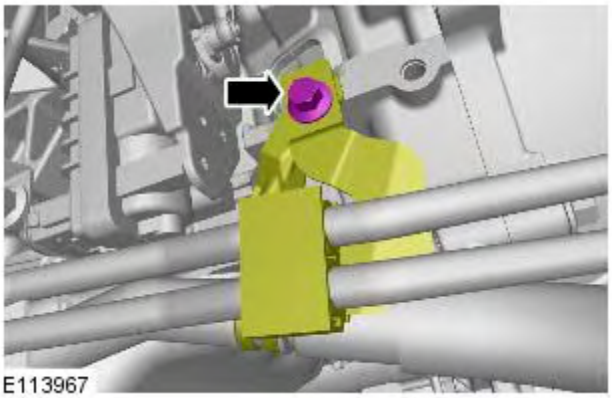
2.


E113969

3.

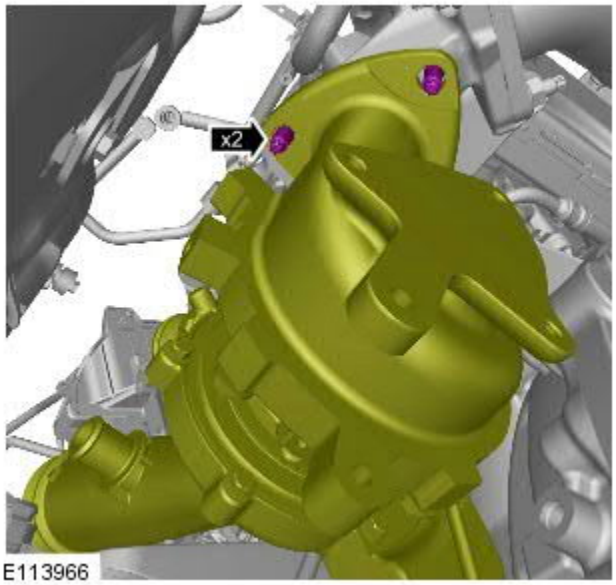
4.

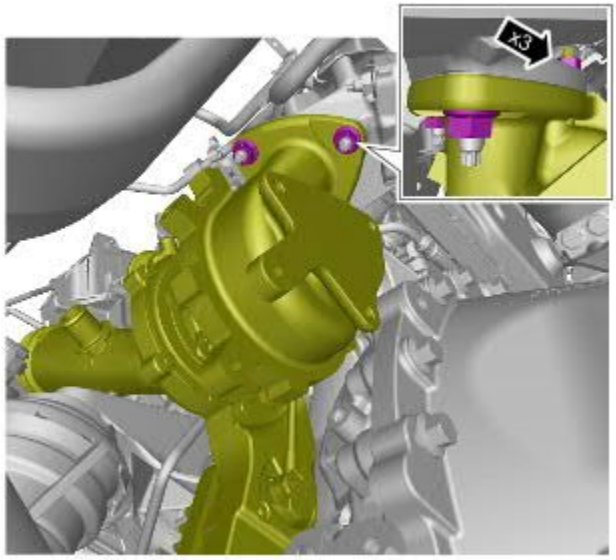
5. *Torque:* 10 Nm



6. CAUTION: Install new studs.

   Torque: 13 Nm

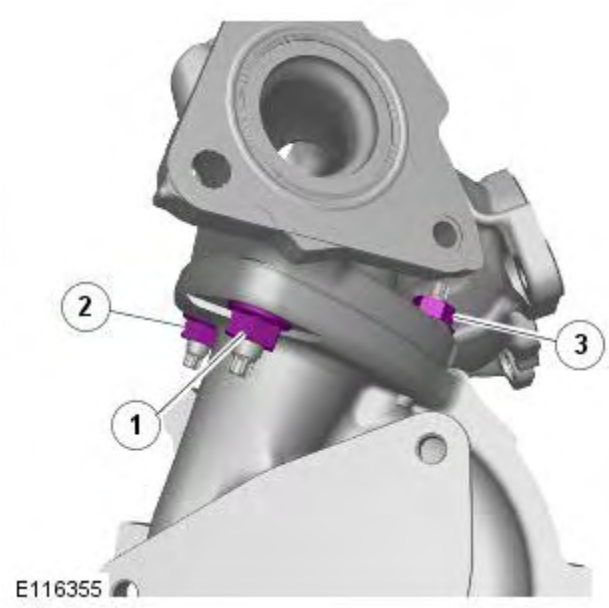




E113965

7. WARNING: Make sure that new nuts are installed.

CAUTION: Only tighten the nut finger tight at this stage.



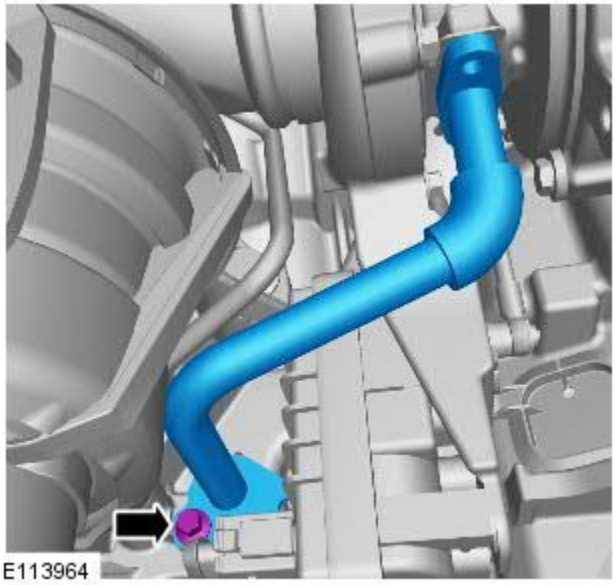
E116355

8. NOTES:

Tighten the bolts in the indicated sequence.

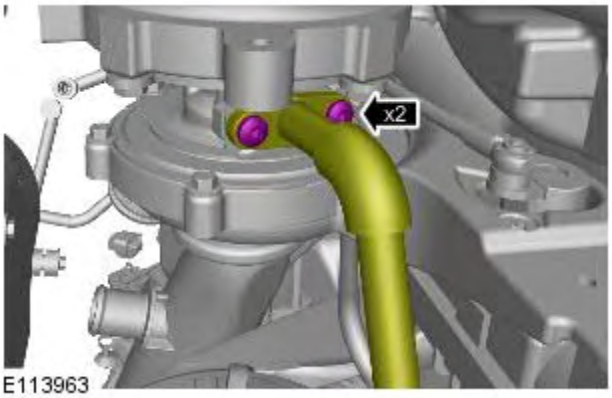
Engine shown removed for clarity.

Torque: 24 Nm



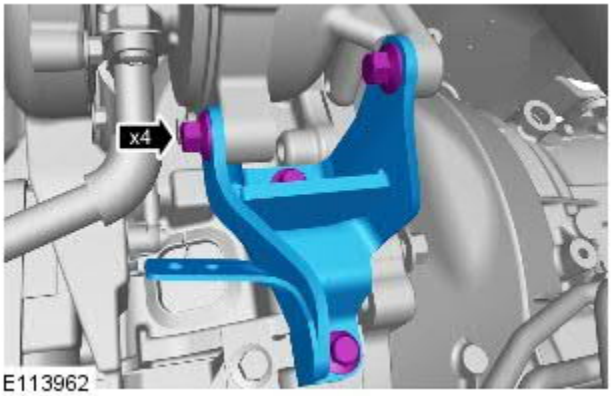
9. CAUTION: Install a new seal.

   Torque: 10 Nm



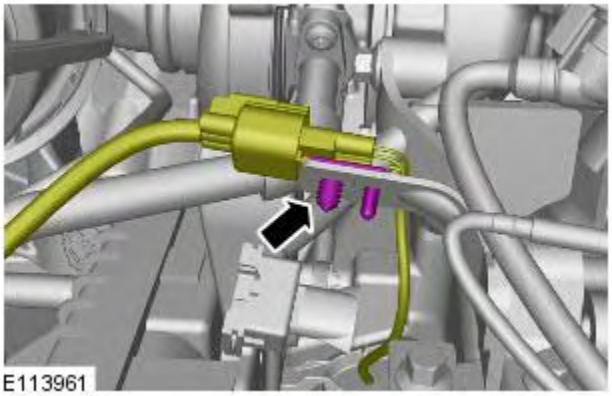
10. NOTE: Install a new gasket.

    Torque: 10 Nm

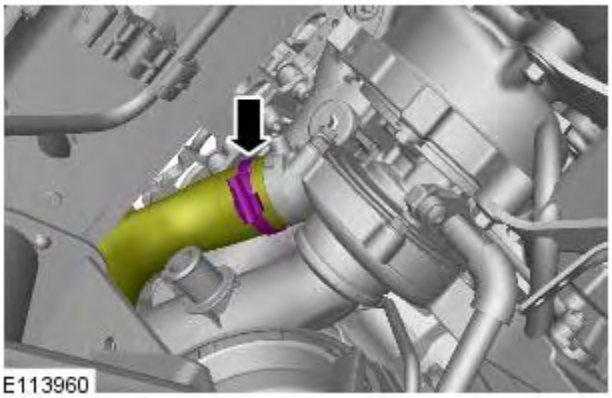


11. *Torque:* 24 Nm

12.

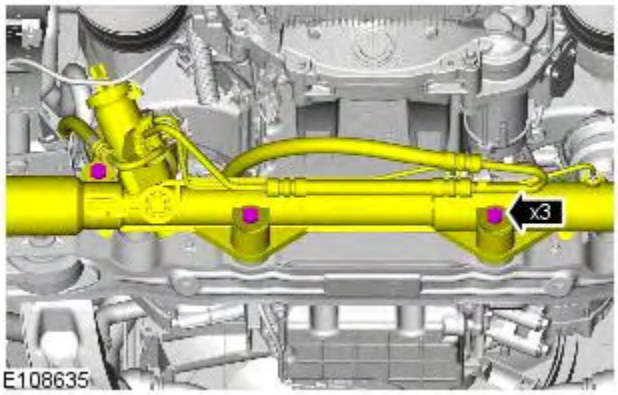


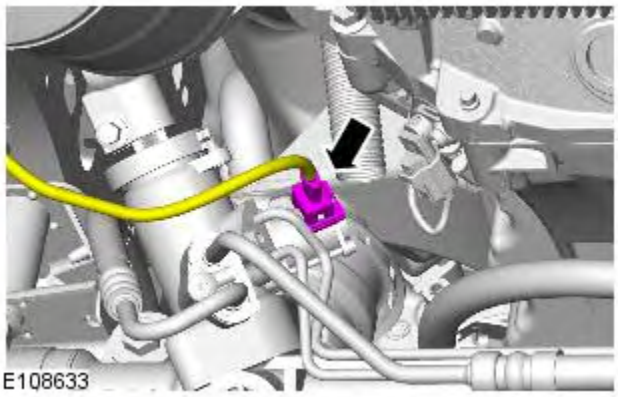
13. *Torque:* 7 Nm



Left-hand drive vehicles

14. *Torque:* 100 Nm





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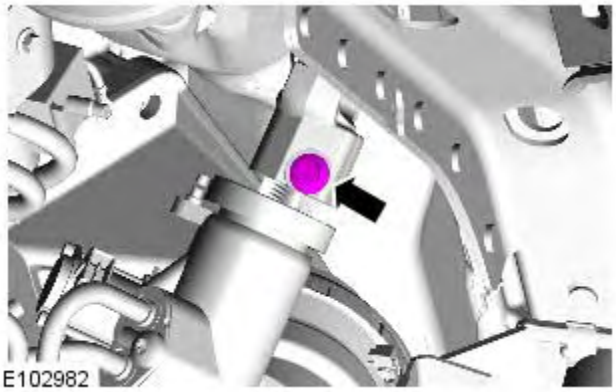
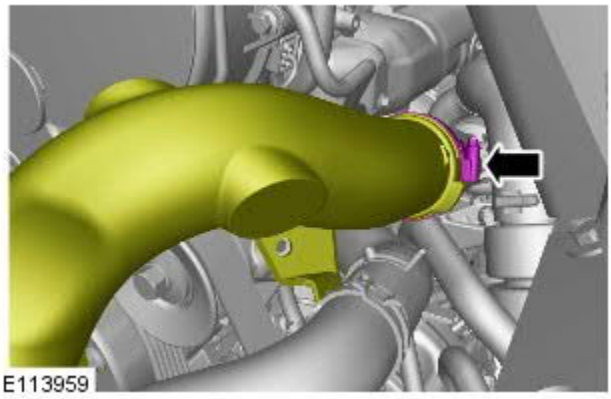


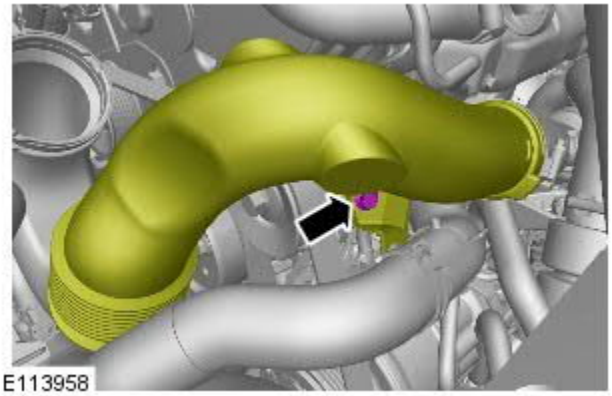
16. CAUTION: Make sure that the road wheels are in the straight ahead position.

Torque: 35 Nm

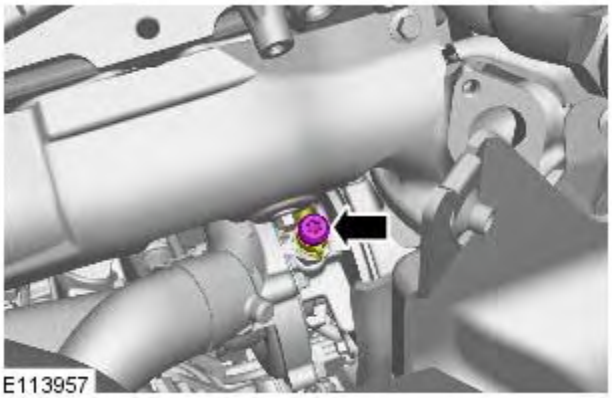
All vehicles



17. *Torque:* 7 Nm

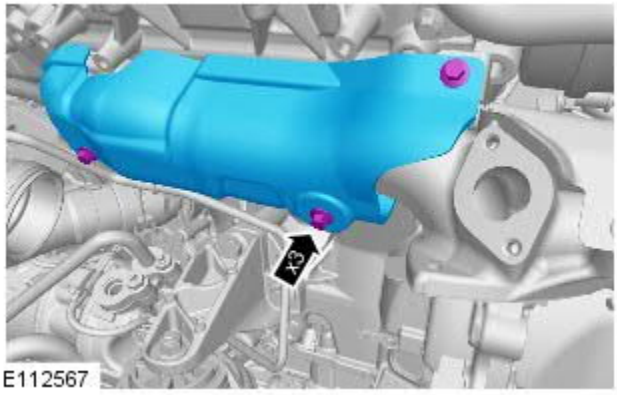


18. *Torque:* 10 Nm



19. CAUTION: Make sure that a new sealing washer is installed.

    Torque: 30 Nm



20. *Torque:* 10 Nm

21. Refer to: Exhaust Gas Recirculation (EGR) Valve LH (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).

22. Refer to: Catalytic Converter (309-00A Exhaust System - TDV6 3.0L Diesel, Removal and Installation).

Published: 11-May-2011

Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel - Turbocharger RH

Removal and Installation

Removal

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

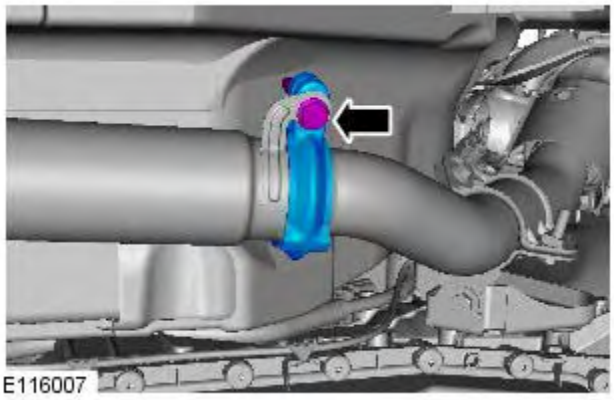
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Exhaust Gas Recirculation (EGR) Valve RH (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).

3. Refer to: Starter Motor (303-06A Starting System - TDV6 3.0L Diesel, Removal and Installation).

4.



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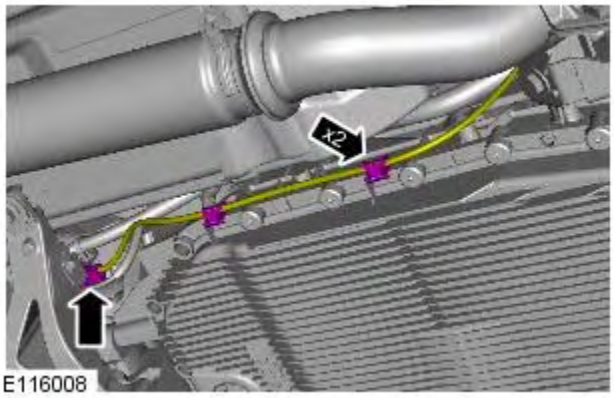
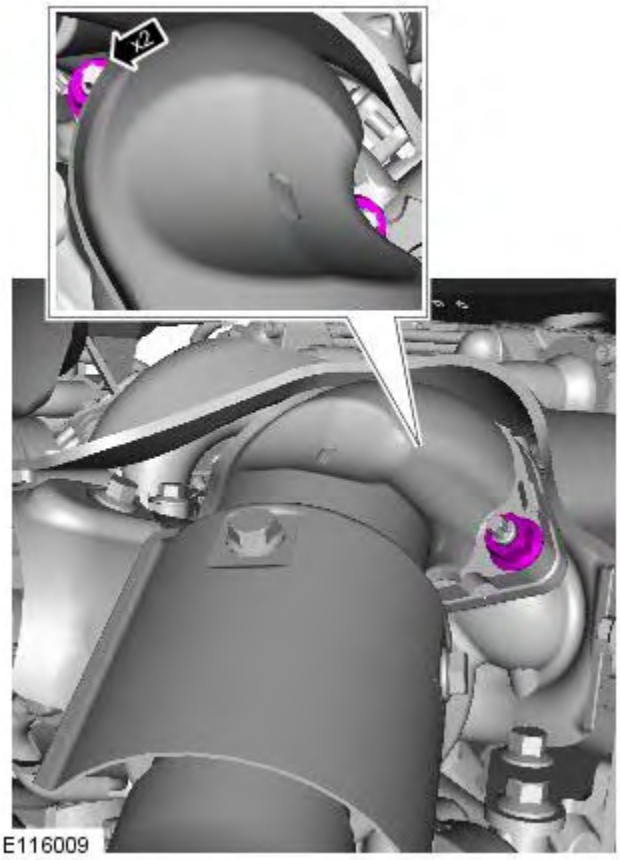


6.



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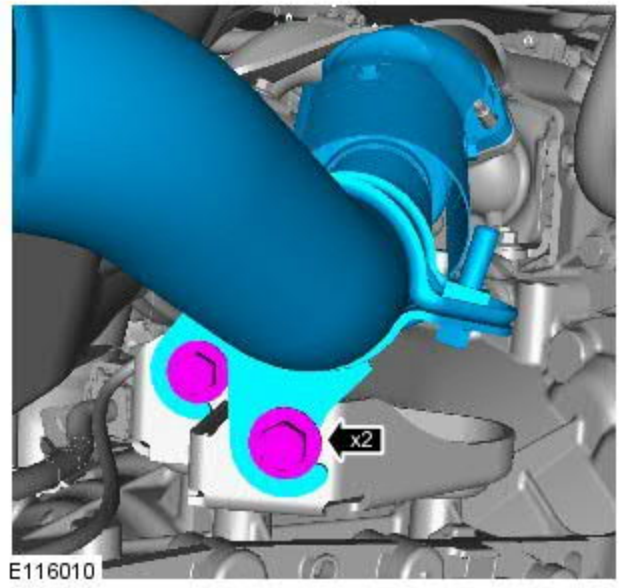
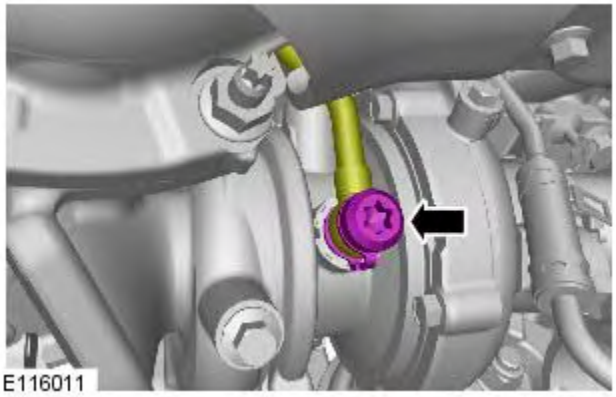
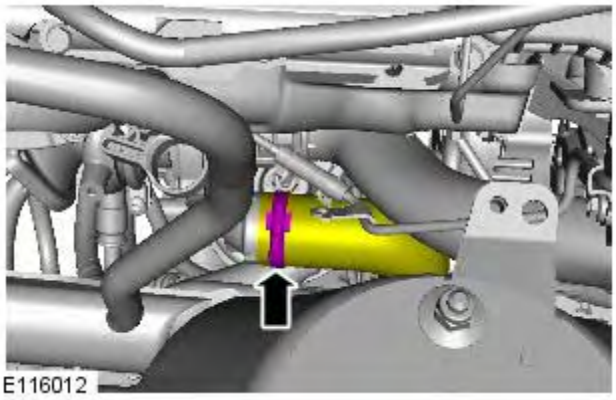




8. NOTE: Discard the sealing washers.



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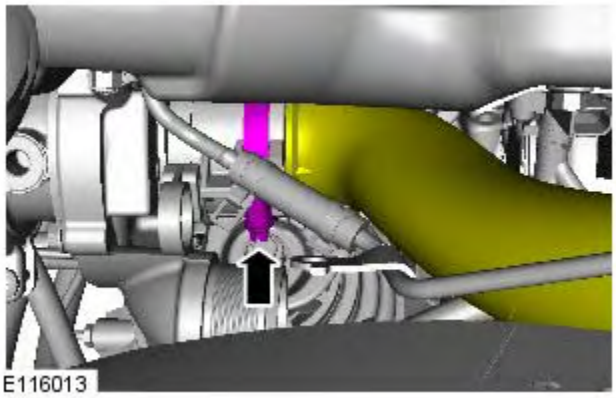

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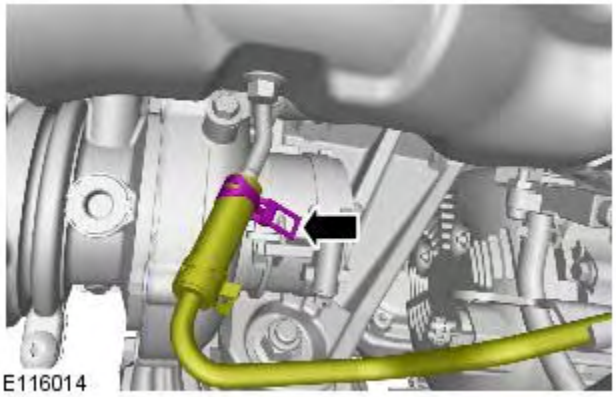
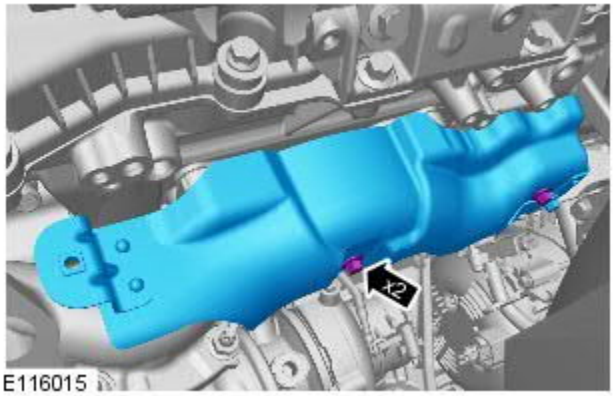
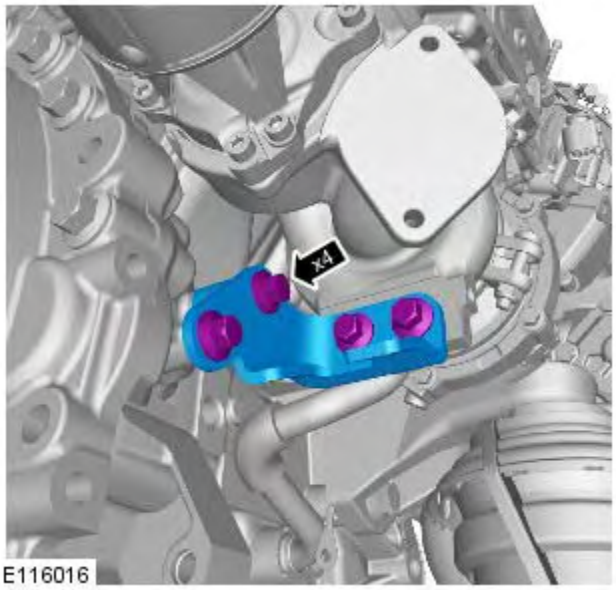


11.

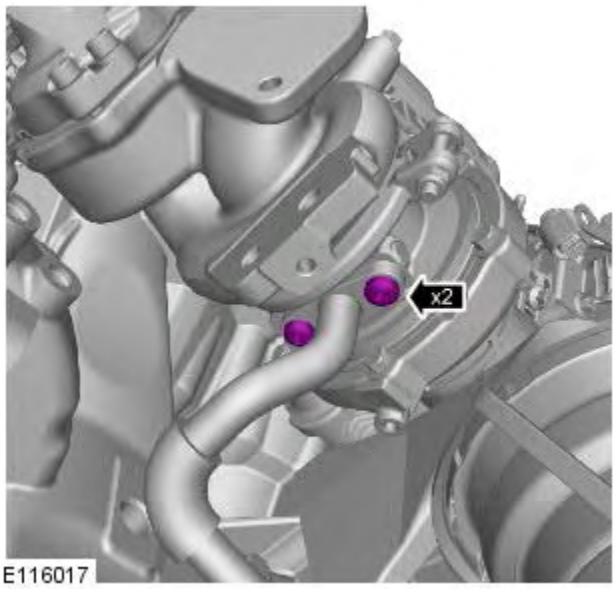
12.

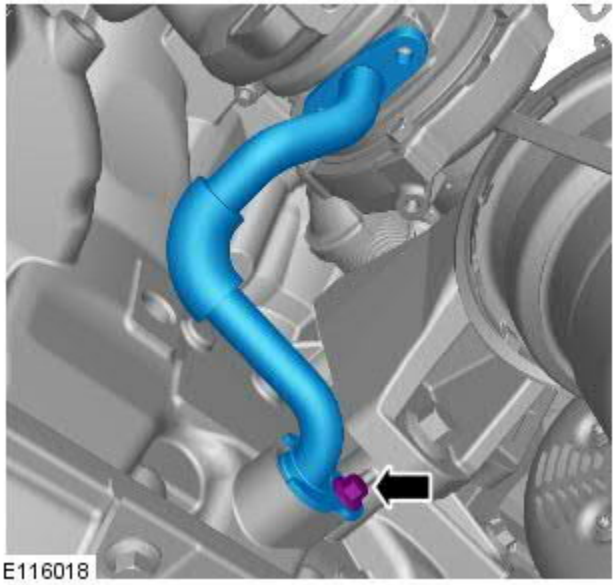


13.

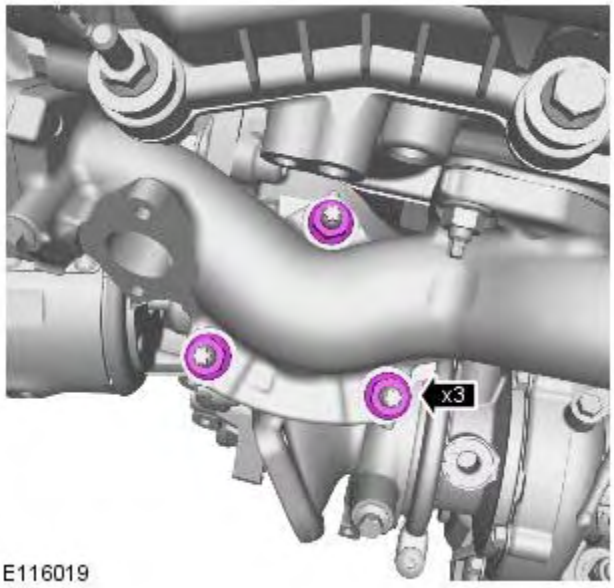


14. NOTE: Discard the gasket.



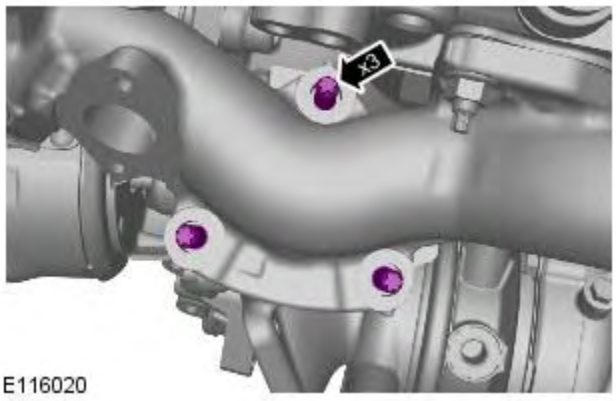

E116018

15. CAUTION: Discard the seal.



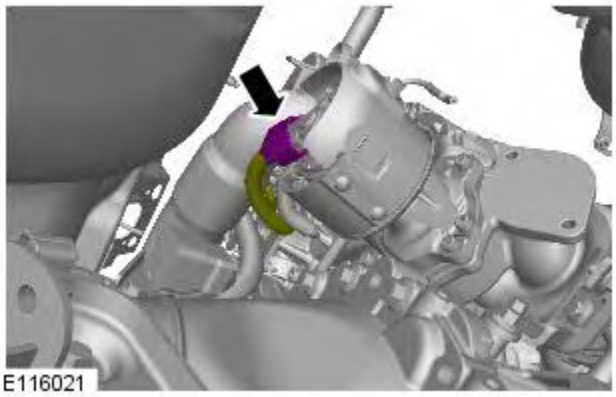
E116019

16. CAUTION: Discard the nuts.



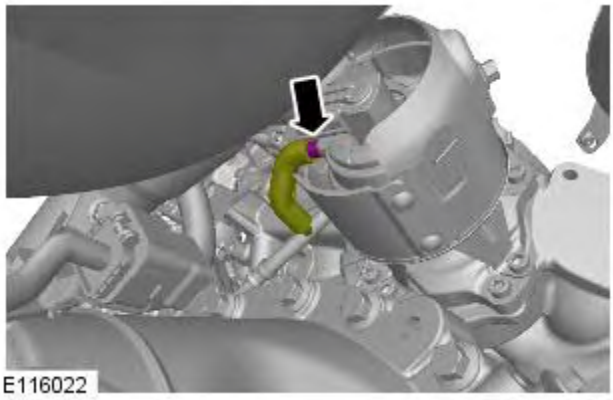
E116020

17. CAUTION: Discard the studs.



18.

- Reposition the turbocharger.



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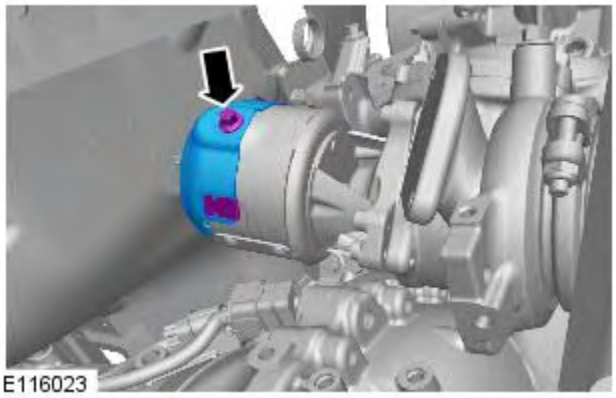

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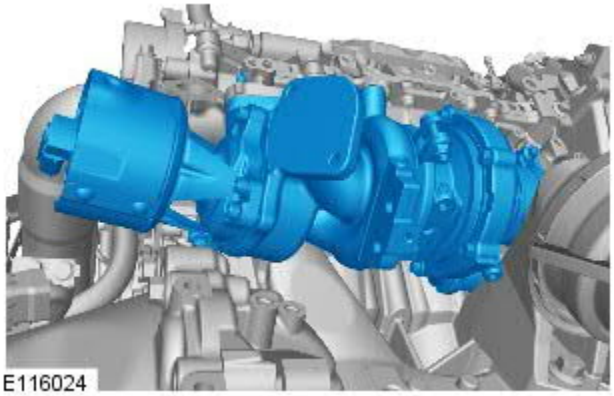
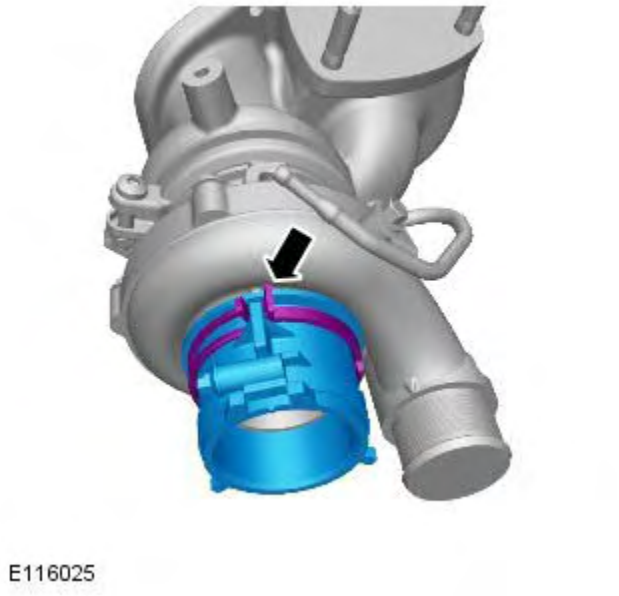


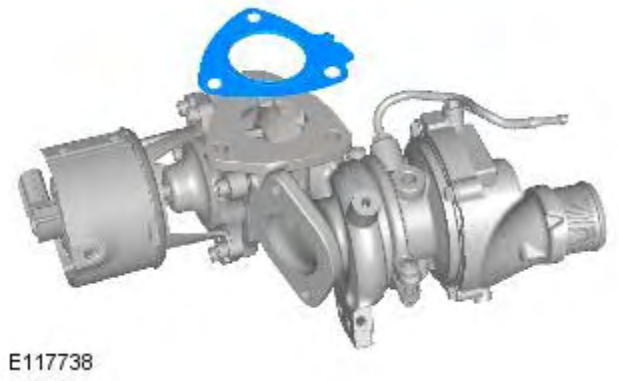
21. NOTE: Do not disassemble further if the component is removed for access only.

22.



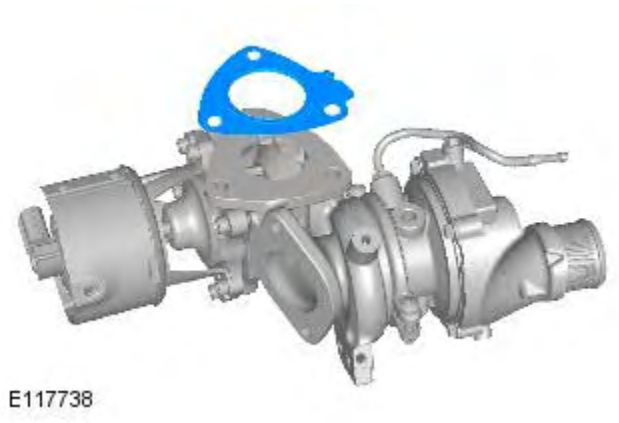
E116025

23.



E117738

Installation



E117738

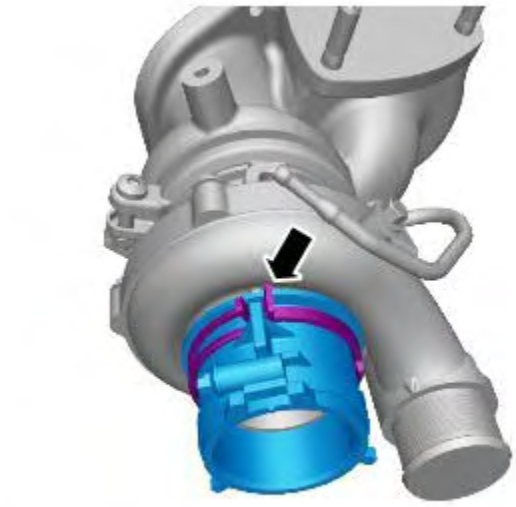
1. CAUTIONS:

   Check the turbocharger and exhaust manifold mating faces for distortion.

   Install a new turbocharger to exhaust manifold gasket every time the turbocharger is removed.

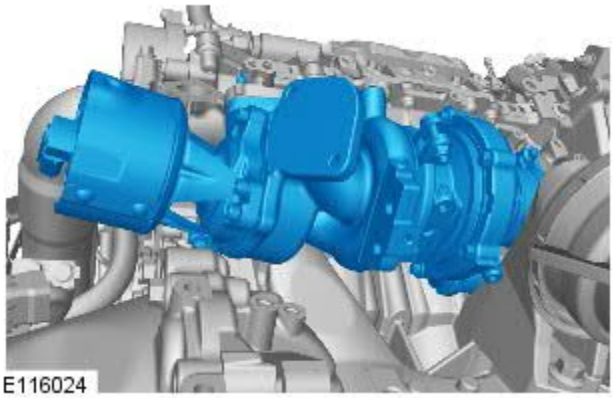
   Make sure that the mating faces are clean and free of corrosion and foreign material.

2.



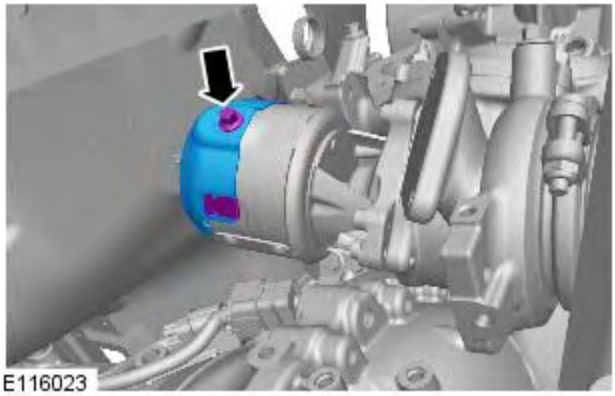
E116025

3.



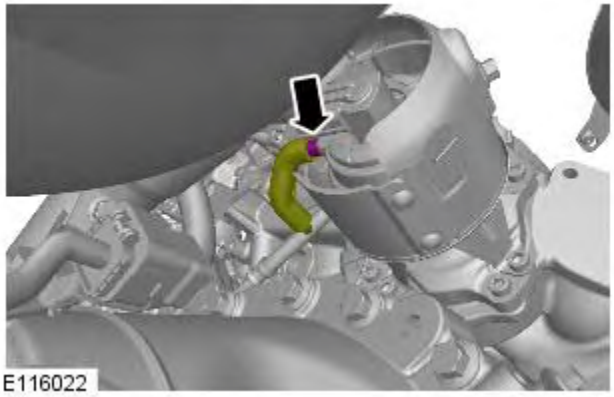
E116024

4. *Torque:* 10 Nm



E116023

5.



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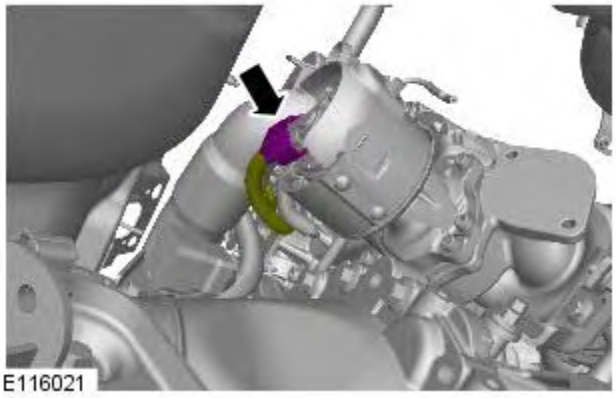
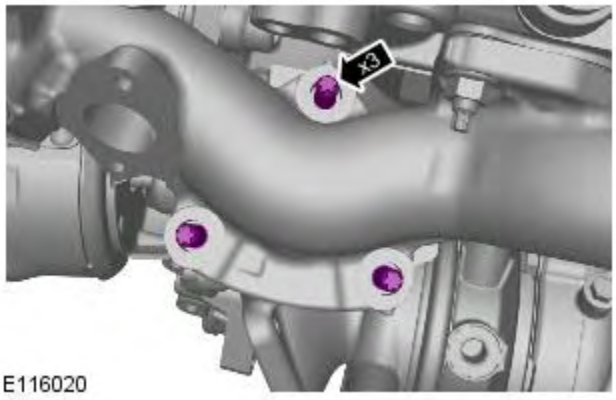
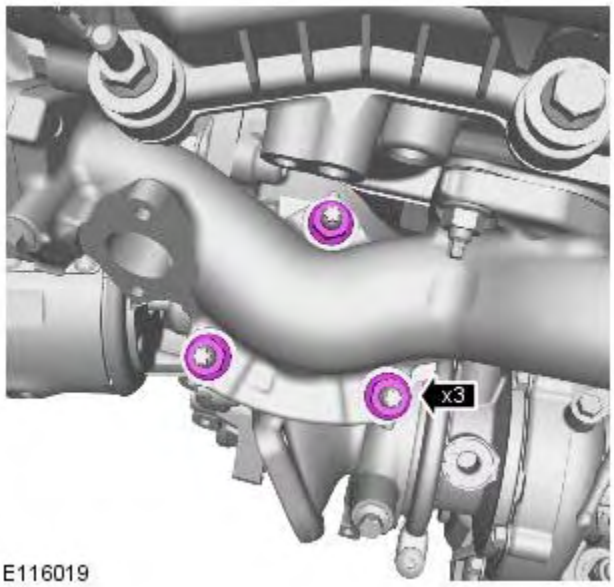


7. CAUTION: Install new studs.

Torque: 13 Nm

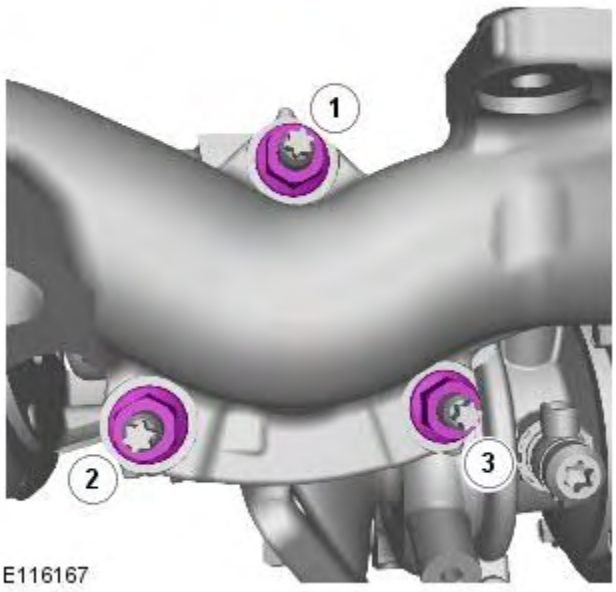




E116019

8. WARNING: Make sure that new nuts are installed.

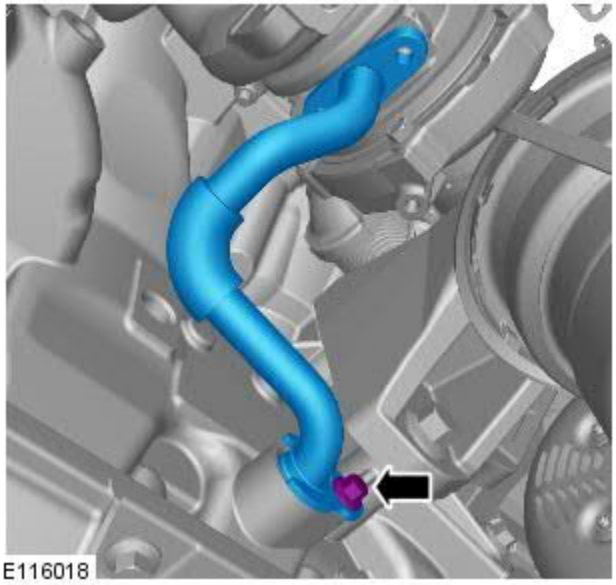
   CAUTION: Only tighten the nut finger tight at this stage.



E116167

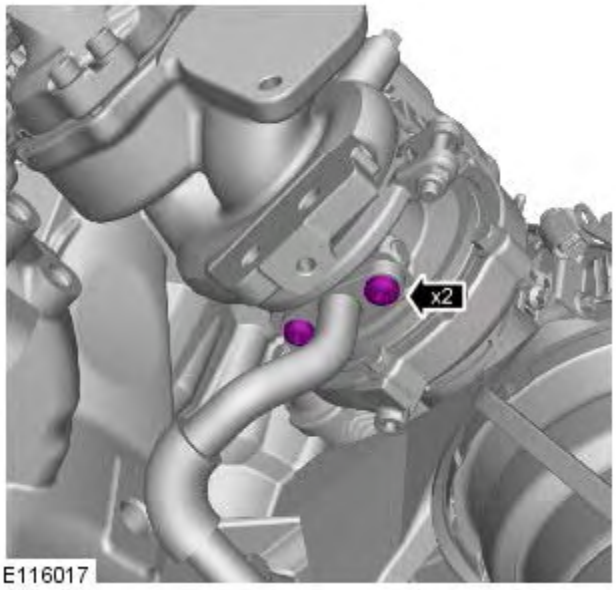
9. NOTE: Tighten the bolts in the indicated sequence.

   Torque: 24 Nm



10. CAUTION: Install a new seal.

Torque: 10 Nm

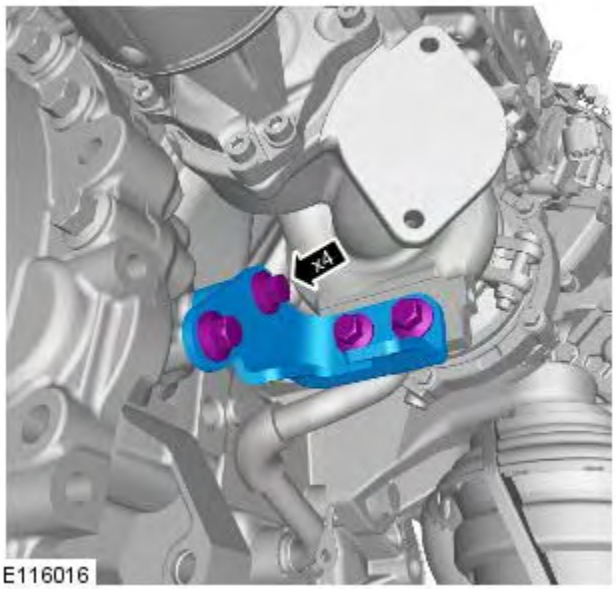


11. NOTE: Install a new gasket.

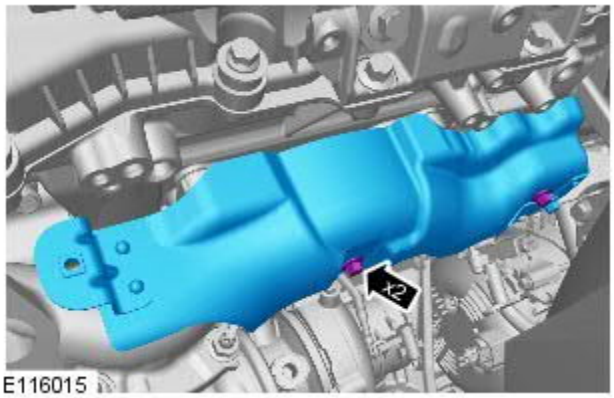
Torque: 10 Nm

www.JagDocs.com

12. *Torque:* 33 Nm



13. *Torque:* 10 Nm



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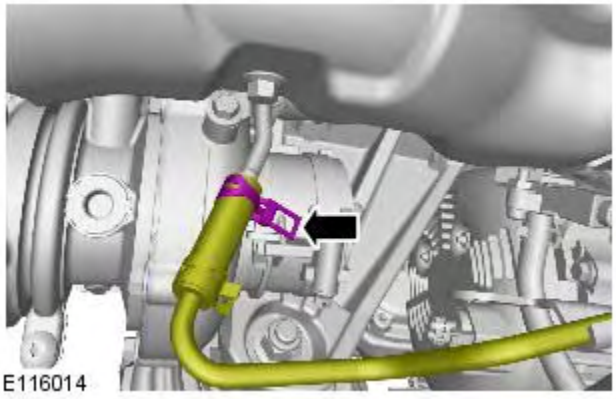
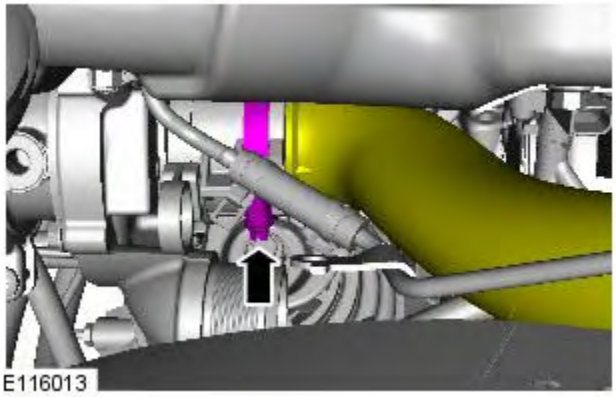
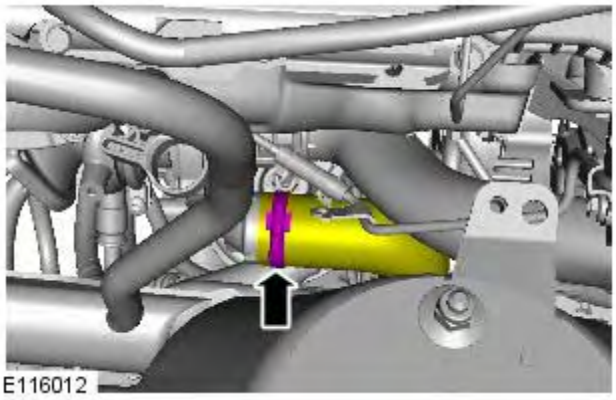
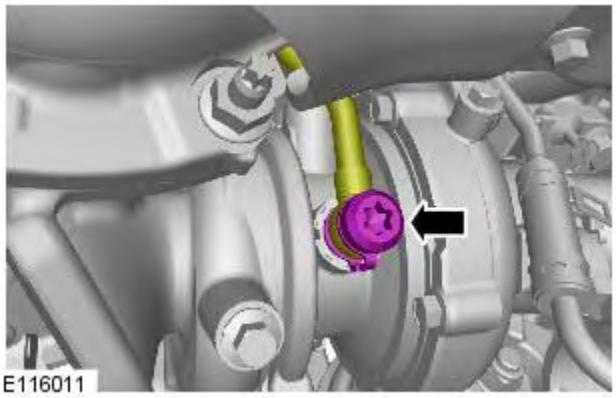




15. *Torque:* 7 Nm



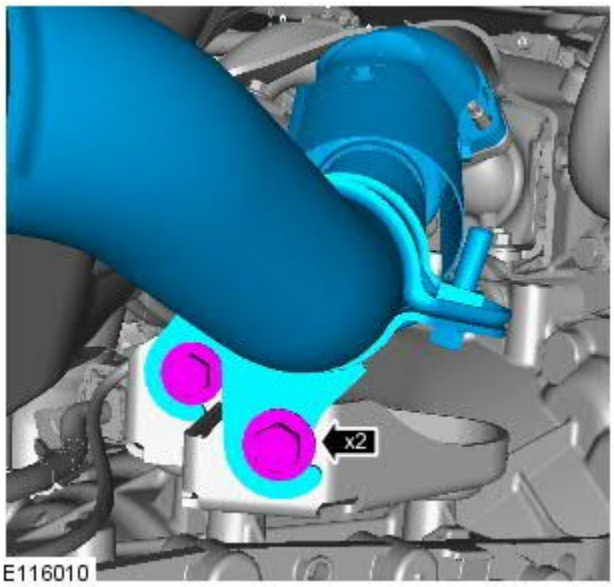
16. *Torque:* 7 Nm



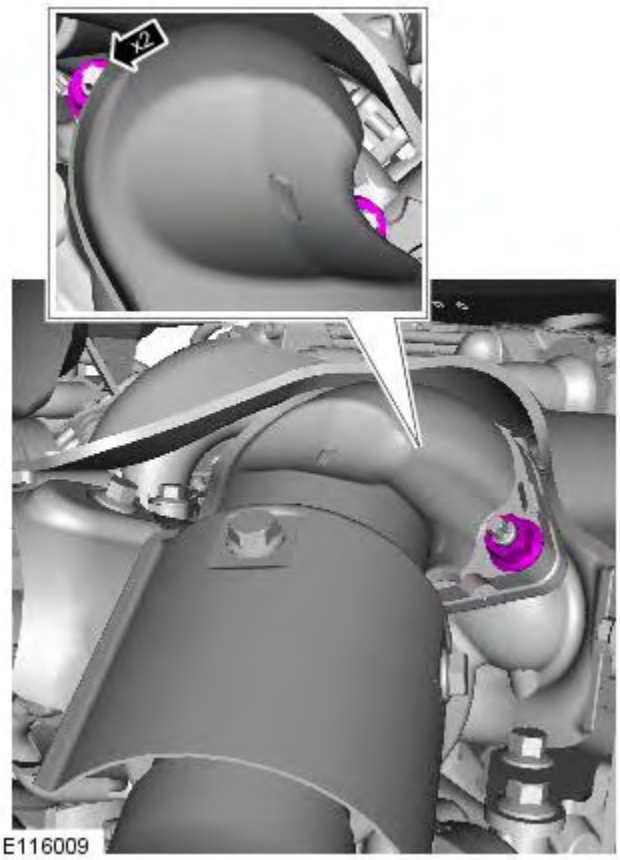
17. CAUTION: Install a new seal.

Torque: 30 Nm

18. *Torque:* 25 Nm



19. *Torque:* 22 Nm



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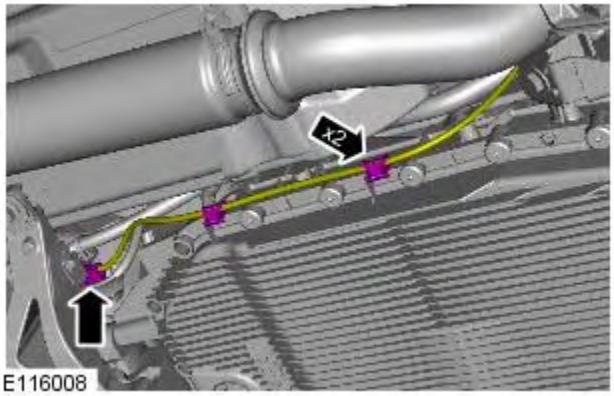
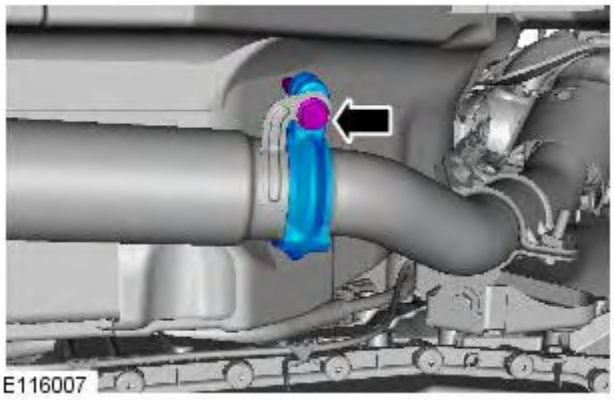


21. *Torque:* 11 Nm



22. Refer to: Starter Motor (303-06A Starting System - TDV6 3.0L Diesel, Removal and Installation).

23. Refer to: Exhaust Gas Recirculation (EGR) Valve RH (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).

Published: 11-May-2011

Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel - Turbocharger Bypass Valve

Removal and Installation

Removal

NOTES:

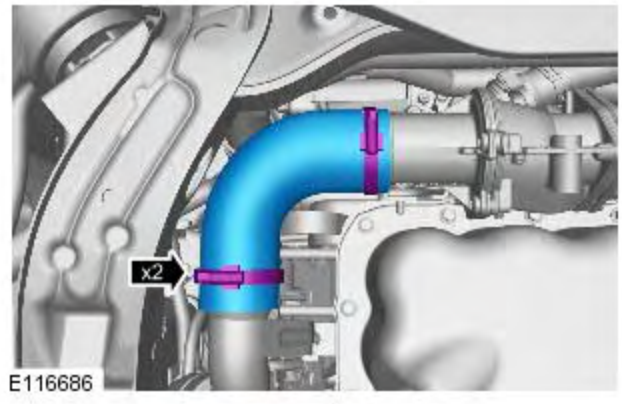
Some variation in the illustrations may occur, but the essential information is always correct.

Removal steps in this procedure may contain installation details.

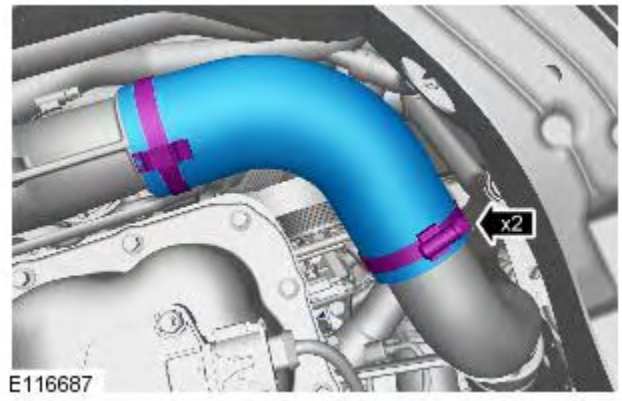
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

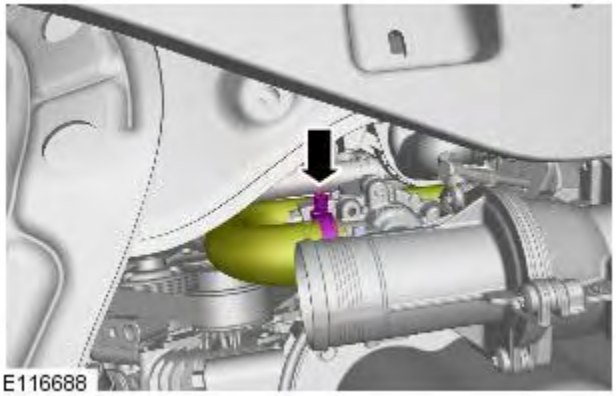
2. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).



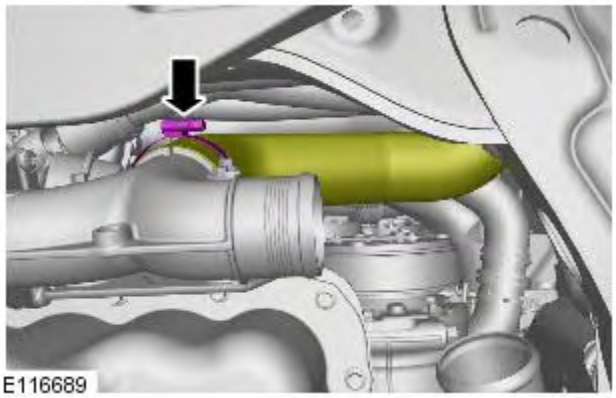
3. *Torque:* 7 Nm



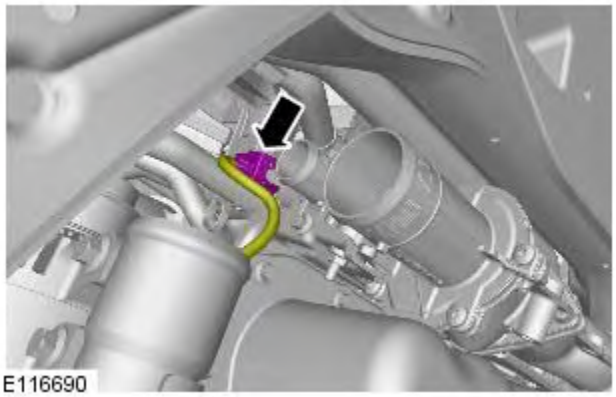
4. *Torque:* 7 Nm


E116688

5. *Torque:* 7 Nm


E116689

6. *Torque:* 7 Nm


E116690

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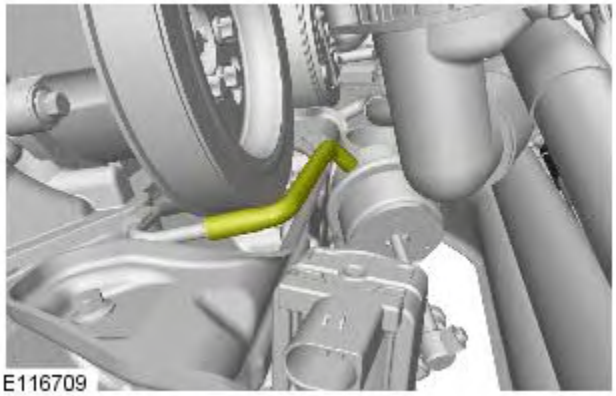
E116709

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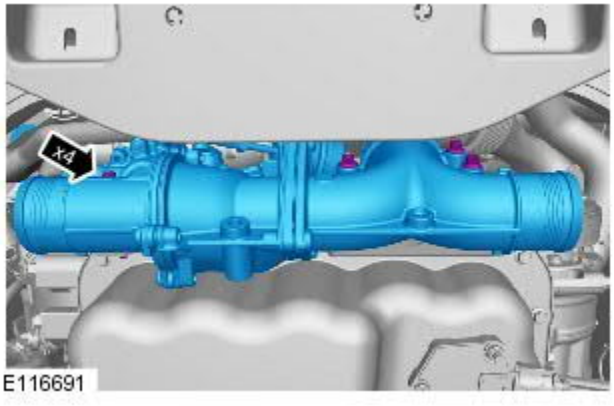


9. *Torque:* 10 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel - Fixed Vane Turbocharger Actuator

Removal and Installation

Removal

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

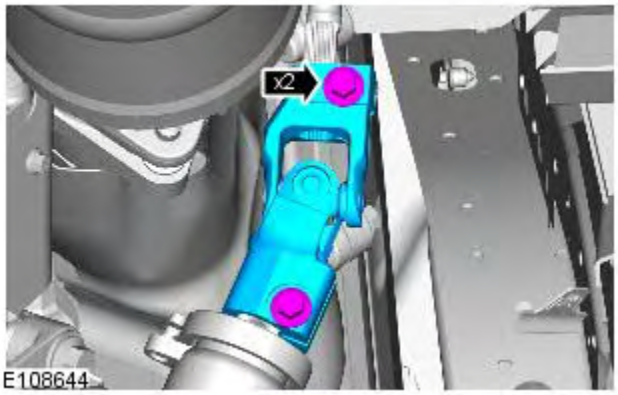
All vehicles

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

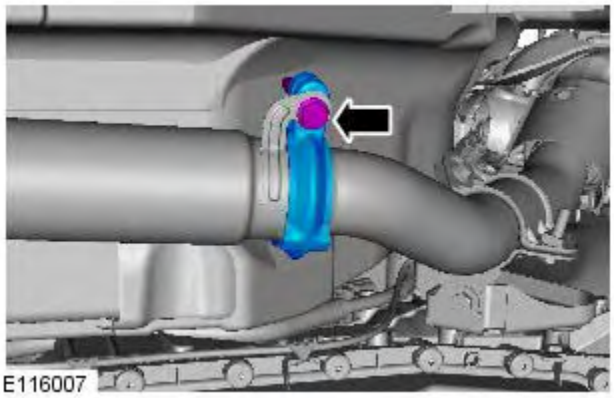
2. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

Right-hand drive vehicles



3. CAUTION: Discard the bolts.

All vehicles



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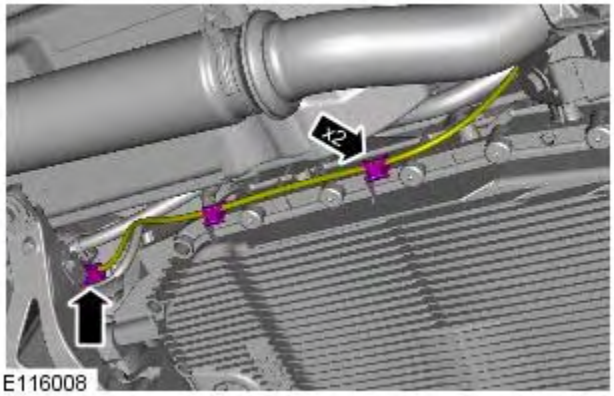
5.



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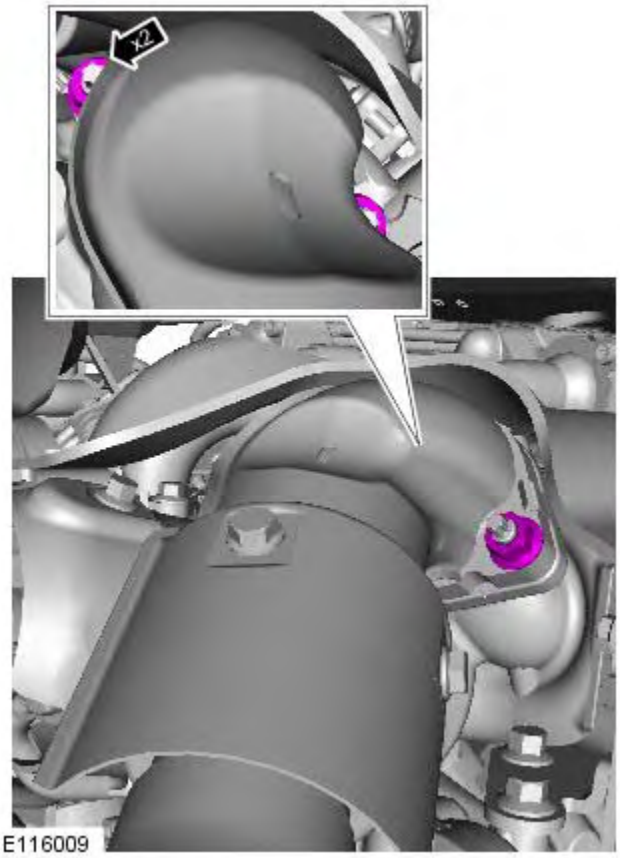
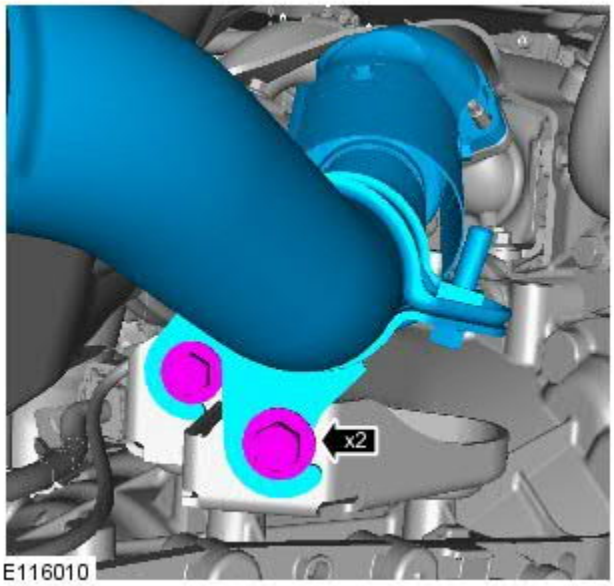
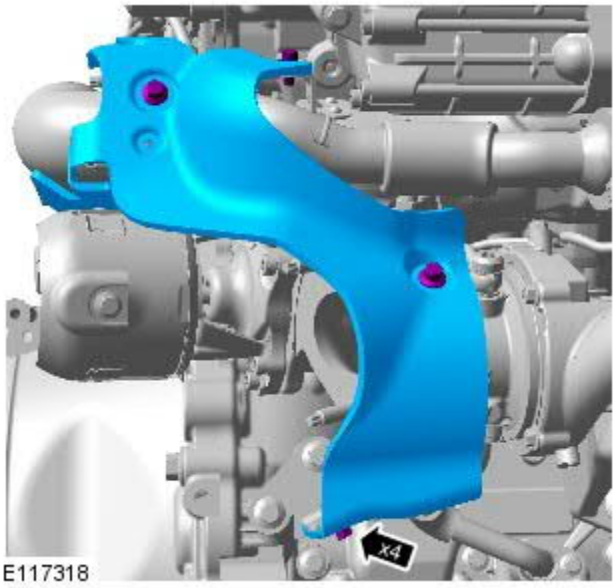
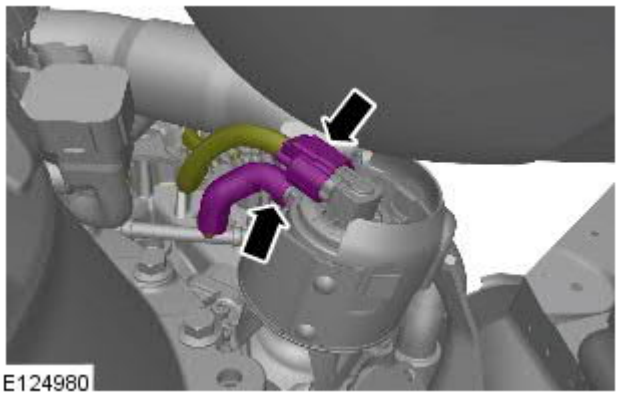




7. NOTE: Remove and discard the gasket.

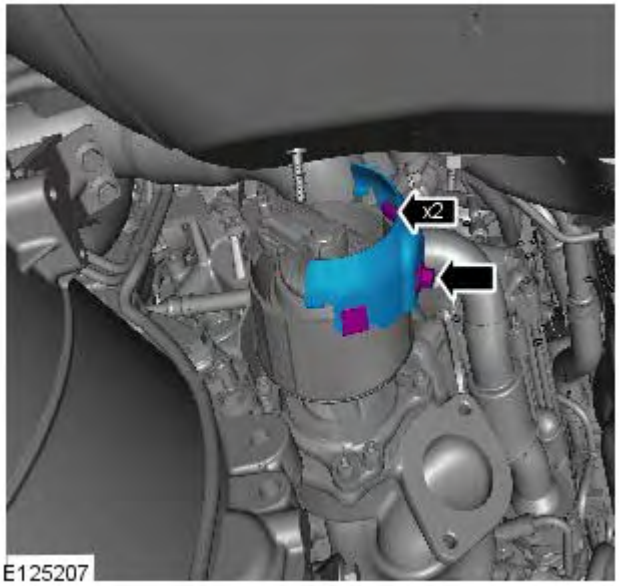


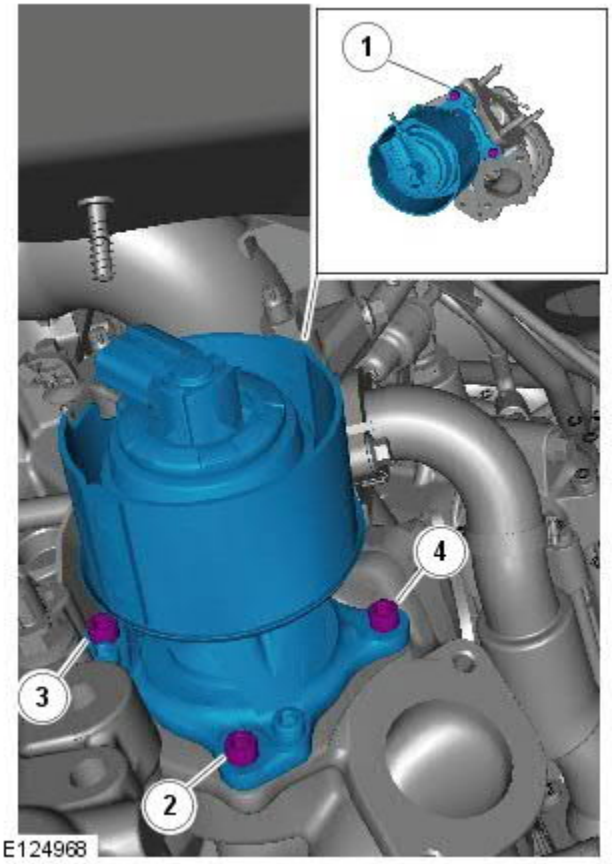
8. NOTE: Engine shown removed for clarity.



9.

10.



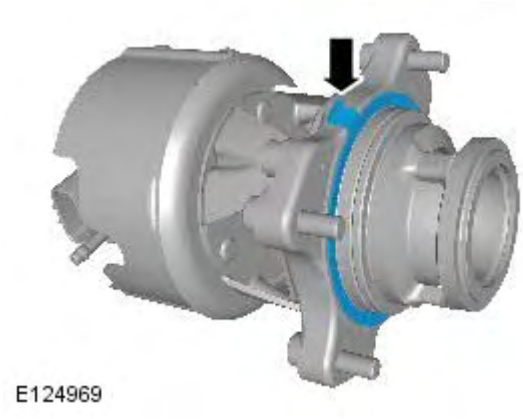


11. CAUTIONS:

Remove the Torx screws evenly and progressively.

Make sure component mating faces are not damaged during removal.

Using a suitable 130mm T30 Torx socket, remove the retaining bolts.



12. NOTES:

    Make a note of the orientation of the gasket tang.

    Remove and discard the gasket using the gasket tang.

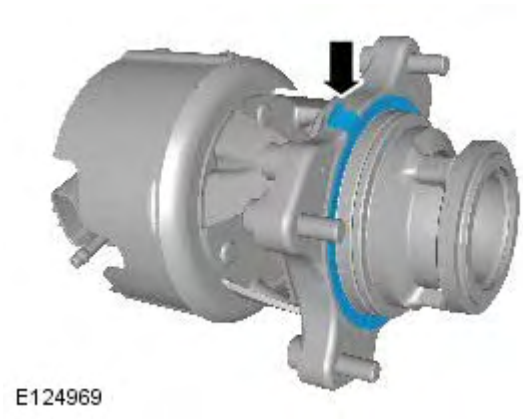
13. NOTES:

    Remove and discard the gasket.

    Turbocharger shown removed for clarity.

Installation

All vehicles

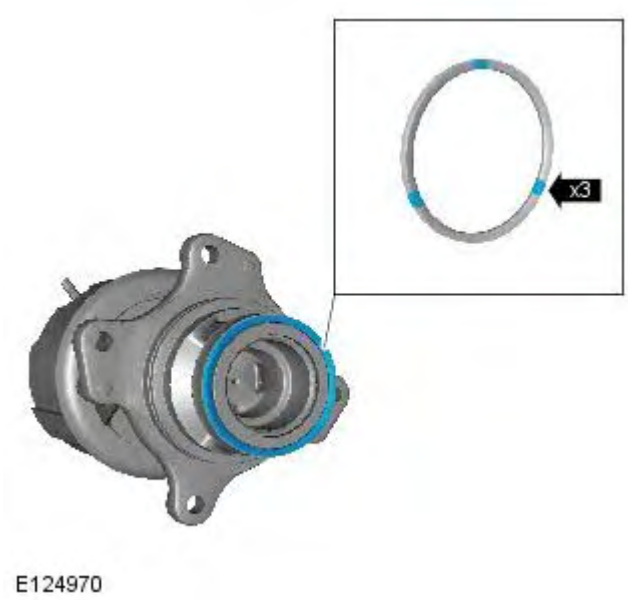


1. CAUTION: Make sure that the mating faces are clean and free of corrosion and foreign material.

   NOTES:

   Install a new gasket.

   Make sure that the gasket tang is installed in the correct orientation as noted in the removal step.



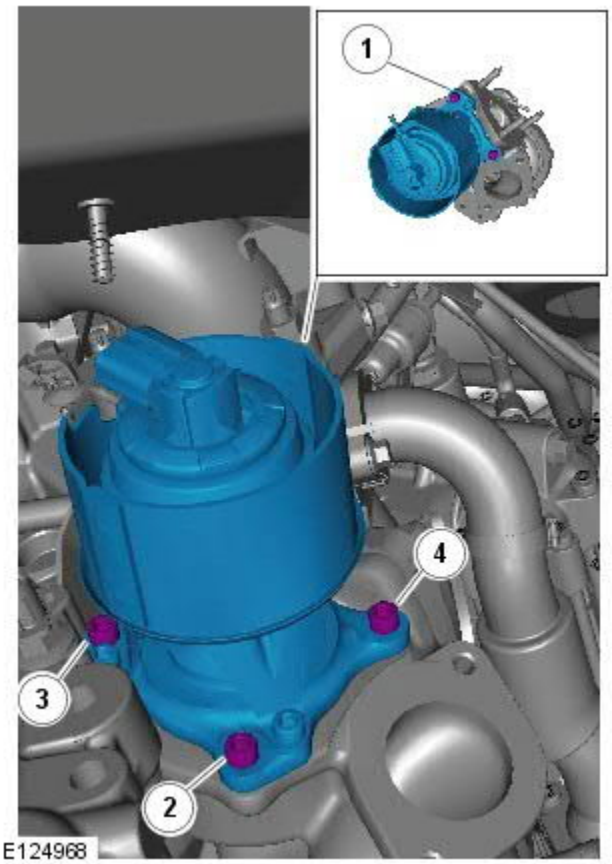
E124970

2. CAUTION: Make sure that the mating faces are clean and free of corrosion and foreign material.

   NOTES:

   Install a new gasket.

   Apply a small amount of grease in the areas indicated to allow the gasket to remain in the position for installation.



E124968

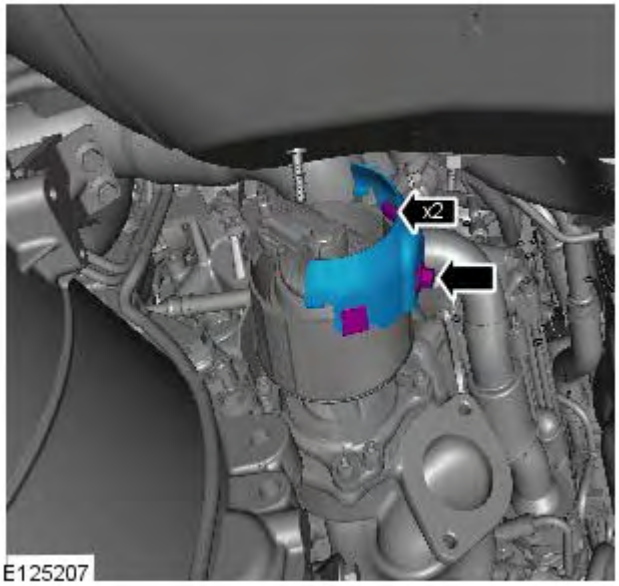
3. CAUTIONS:

   Install all the bolts finger tight before final tightening.

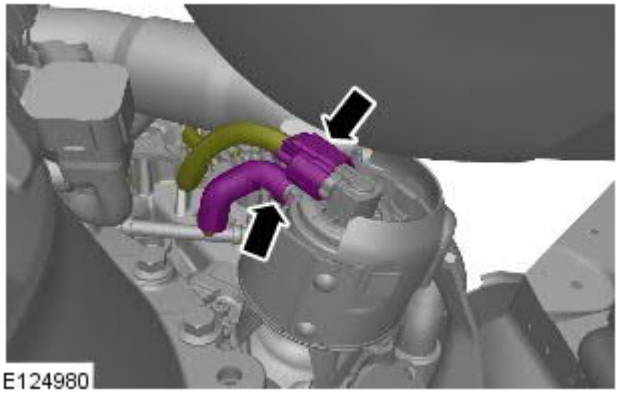
   Tighten the Torx screws evenly and progressively.

   Using a suitable 130mm T30 Torx socket, Install the retaining bolts.

   Torque: 12 Nm



4. *Torque:* 9 Nm



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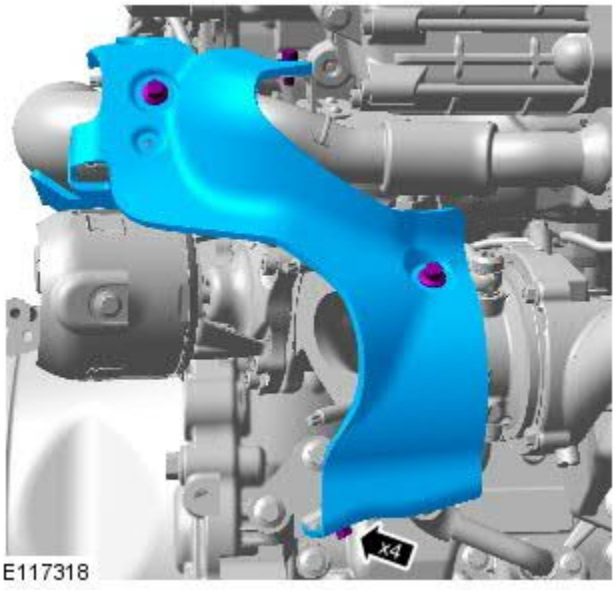
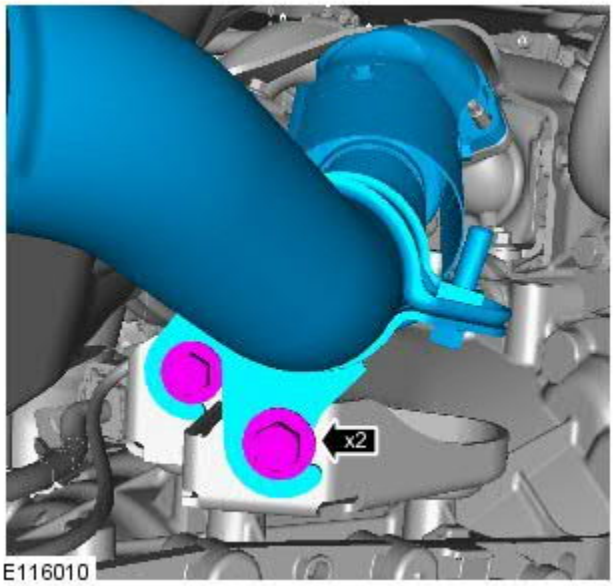


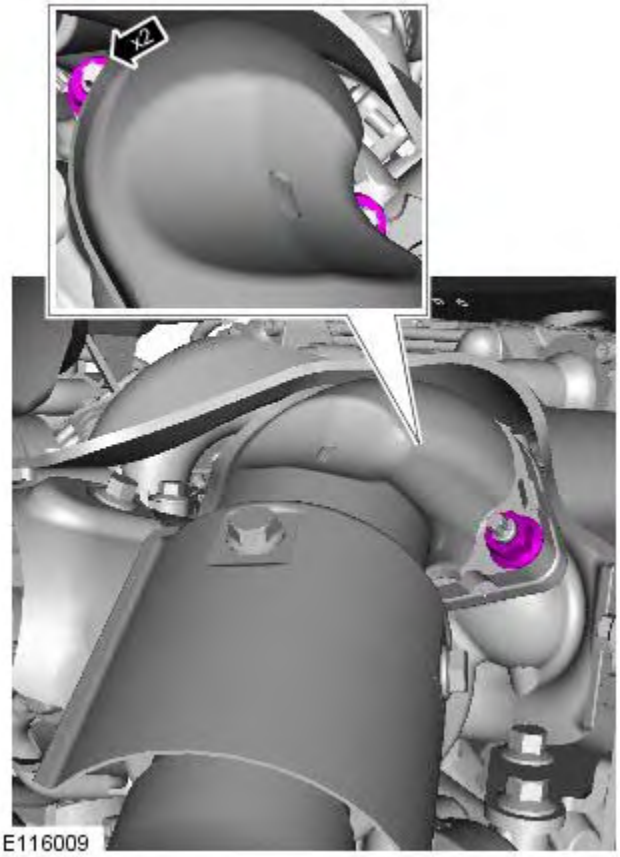
6. NOTE: Engine shown removed for clarity.

Torque: 9 Nm



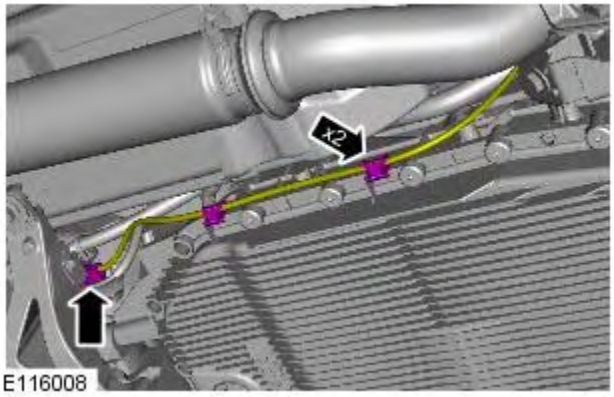
7. NOTE: Install a new gasket.

   Torque: 25 Nm

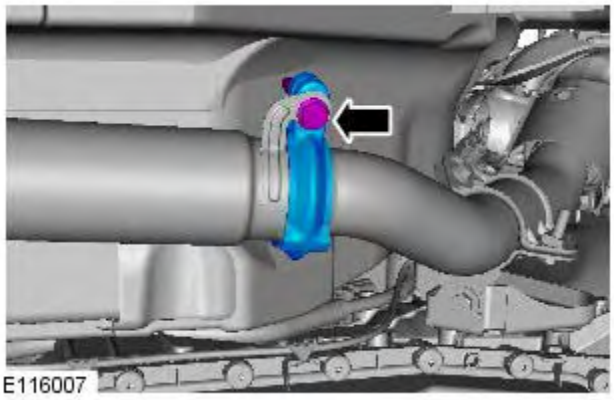


8. *Torque:* 22 Nm

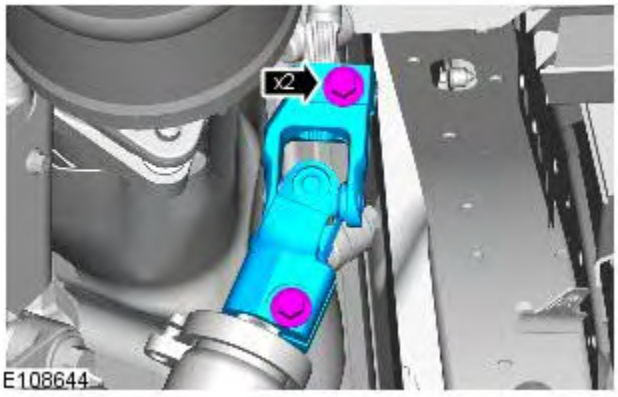
9.



10. *Torque:* 11 Nm



Right-hand drive vehicles



11. CAUTION: Make sure that new bolts are installed.

Torque: 30 Nm

All vehicles

12. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

13. If a new fixed vane turbocharger actuator is installed, carry out the reset procedure for the fixed vane turbocharger actuator using approved diagnostic tool.

Published: 11-May-2011

Accessory Drive - TDV6 3.0L Diesel -

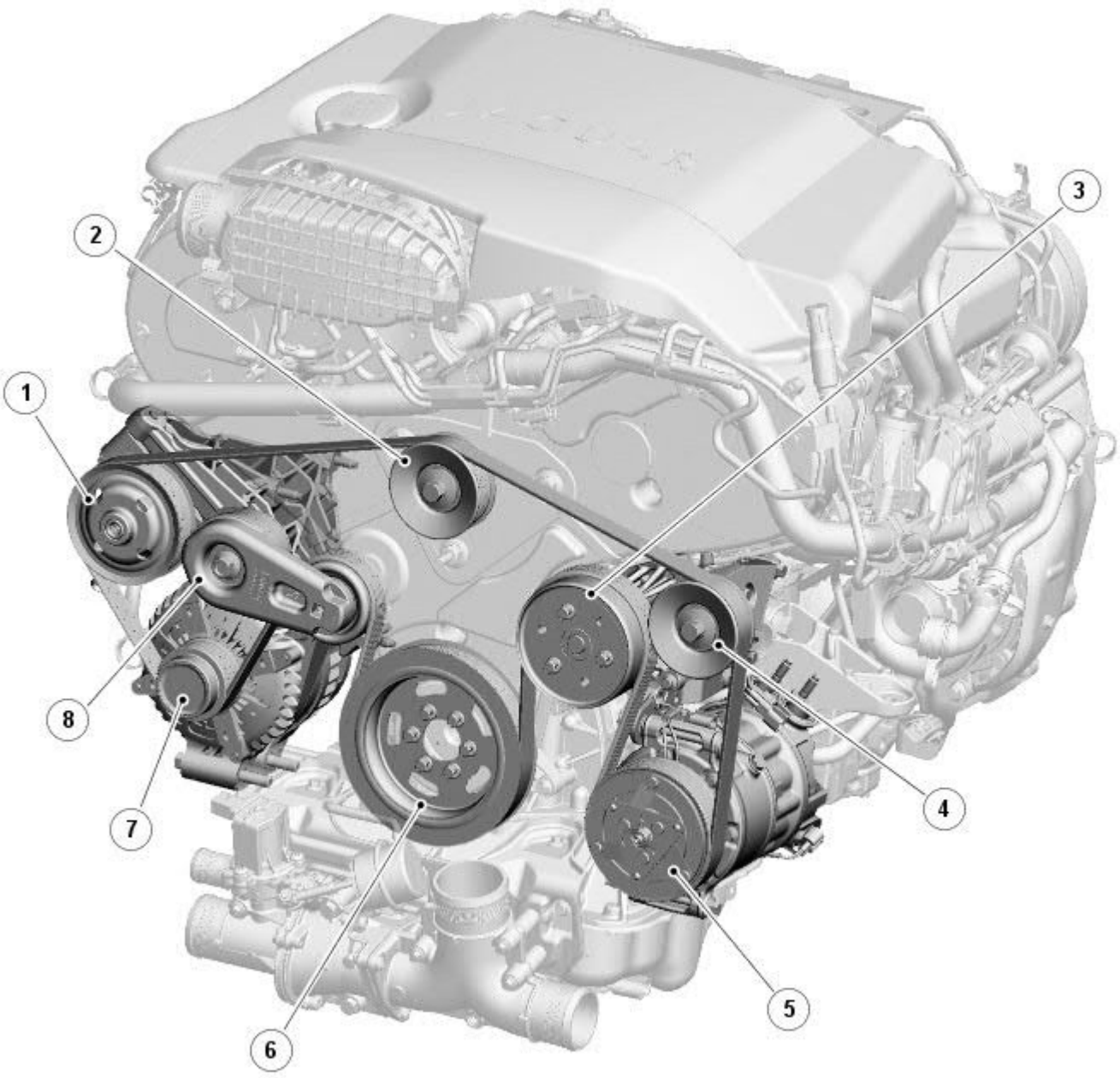
Torque Specification

Description	Nm	lb-ft	lb-in
Accessory drive belt tensioner retaining bolt	47	35	-
Accessory drive belt central idler pulley retaining bolt	47	35	-
Accessory drive belt idler pulley retaining bolt	47	35	-
Fuel injection pump sprocket retaining nut	50	37	-
Rear end accessory drive belt (READ) cover retaining bolts	9	-	80
Camshaft rear hub bolt	Stage 1 - 80 Stage 2 - 80 degrees	Stage 1 - 59 Stage 2 - 80 degrees	-
Camshaft rear pulley retaining bolts	23	16	-
READ belt tensioner retaining bolt	23	16	-

Published: 11-May-2011

Accessory Drive - TDV6 3.0L Diesel - Accessory Drive - Component Location

Description and Operation



E115645

Item	Description
1	Power steering pump
2	Idler
3	Coolant pump
4	Idler
5	A/C (air conditioning) compressor
6	Crankshaft pulley
7	Generator
8	Belt tensioner

Published: 11-May-2011

Accessory Drive - TDV6 3.0L Diesel - Accessory Drive - Overview

Description and Operation

OVERVIEW

The crankshaft pulley drives a single ribbed belt which in turn drives all of the engine mounted accessories.

Published: 11-May-2011

Accessory Drive - TDV6 3.0L Diesel - Accessory Drive - System Operation and Component Description

Description and Operation

System Operation

OPERATION

The crankshaft pulley is attached to and rotates with the crankshaft. The pulley provides the drive for the accessory drive vee belt which in turn provides rotational power for the front mounted accessories such as the generator, power steering pump, coolant pump and the A/C (air conditioning) compressor.

The crankshaft pulley is a combined pulley and torsional vibration damper.

Component Description

DESCRIPTION

The accessory drive belt, which is a maintenance free poly-V type belt, is automatically pre-loaded by the belt tensioner and routed over idlers in order to maintain sufficient friction around the drive wheels. This ensures slip-free drive of the accessory components.

The torsional vibration damper incorporates compressed rubber between its inner and outer diameters to absorb vibration and shock loads.

The belt tensioner is calibrated to provide the correct amount of tension to the belt for a given drive system. Unless a spring within the tensioner assembly breaks, or some other mechanical part of the tensioner fails, there is no need to check the tensioner for correct tension.

The accessory drive belt should be inspected at every routine service for excessive wear and damage.

The belt tensioner consists of an idler pulley, which is free to rotate on a bearing located at the end of a spring-loaded pivot arm. The accessory drive belt has wear indicators which are incorporated on the bottom of the accessory drive belt tensioner. When the indicators are aligned the accessory drive belt requires replacing.

Published: 18-Jun-2013

Accessory Drive - TDV6 3.0L Diesel - Accessory Drive

Diagnosis and Testing

Principles of Operation

For a detailed description of the drive belt and operation, refer to the relevant Description and Operation section in the Workshop Manual. REFER to: (303-05A Accessory Drive - TDV6 3.0L Diesel)

Accessory Drive (Description and Operation),
Accessory Drive (Description and Operation),
Accessory Drive (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical damage.

Visual Inspection

Mechanical
• Drive belt condition (cracking/damage/contamination) • Idler assembly • Generator • Engine cooling fan • Tensioner assembly • Engine coolant pump • Power steering pump • Air conditioning (A/C) compressor • Torsional vibration damper • Tensioner assembly • Primary front drive belt • Security/correct installation of the fuel injection pump cover • Fuel injection pump belt condition (cracking/damage/contamination) • Fuel injection pump belt tensioner assembly • Fuel injection pump • Fuel injection pump belt

3. If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the symptom chart.

CAUTION: If the engine is run without the drive belt(s) connected to eliminate driven components, diagnostic trouble codes, (DTCs) may be set which must be cleared before the vehicle is returned to the owner. The engine should not be run for more than 2-3 minutes with the belts disconnected. Failure to follow this instruction may result in damage to the vehicle

4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart (Primary Drive Belt)

Symptom	Possible Causes	Action
Noise	• Belt condition • Belt tension • Pulleys misaligned • Driven components (including tensioners)	Check the belt condition (see visual inspection). Check the tensioner function. Check the pulley alignment. Check the driven components for excessive resistance to rotation. Rectify as necessary
Drive belt does not hold tension	• Belt condition • Tensioner fault	Check the belt condition (see visual inspection). Check the tensioner function. Rectify as necessary

Symptom Chart (Fuel Injection Pump Belt)

Symptom	Possible Causes	Action
Noise	• Belt condition • Belt fouling cover • Tensioner bearing failure • Fuel injection pump failure	Check the belt condition (see visual inspection). Check the belt cover for indications of fouling (this may indicate a pump misalignment), refer to the relevant workshop manual section. The belt tensioner must be renewed if the belt is removed, making a check of the bearing impractical. Remove the belt, check the fuel injection pump pulley for security. Check the fuel injection pump for excessive resistance to rotation (excessive resistance in the pump will cause the pulley securing nut to loosen as a design feature). Check for diagnostic trouble codes (DTCs) indicating a pump malfunction
Drive belt does not hold tension	• Belt condition • Tensioner fault	Check the belt condition (see visual inspection). Check the tensioner function. Rectify as necessary
Loss of drive (with no drive to the fuel injection pump, the engine will not run)	• Belt broken/stripped teeth • Drive pulley(s) loose	Investigate the cause of the belt breakage/damage (a belt broken at a 45 degree angle normally indicates a shear, a break straight across the belt normally indicates that the belt has been crimped). Check the fuel injection pump for excessive resistance to rotation (excessive resistance in the pump will cause the pulley securing nut to loosen as a design feature). Check for DTCs indicating a pump malfunction

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - TDV6 3.0L Diesel, DTC: Engine Control Module (ECM) (100-00, Description and Operation).

Published: 11-May-2011

Accessory Drive - TDV6 3.0L Diesel - Accessory Drive Belt

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

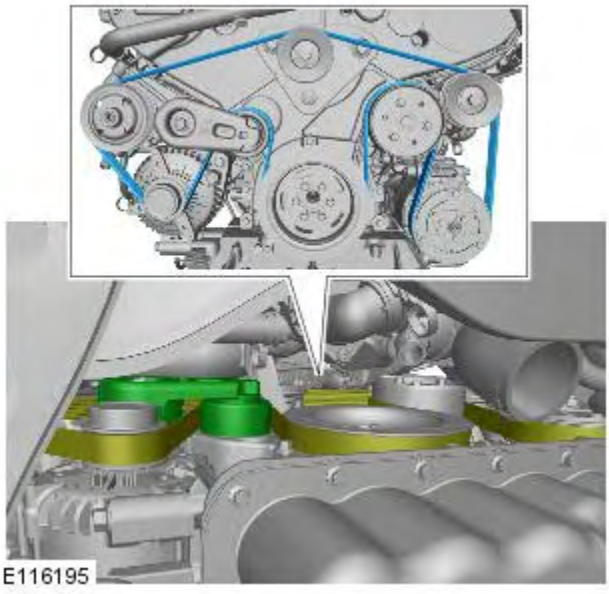
1. Refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel, Removal and Installation).

2. WARNING: Make sure to support the vehicle with axle stands.

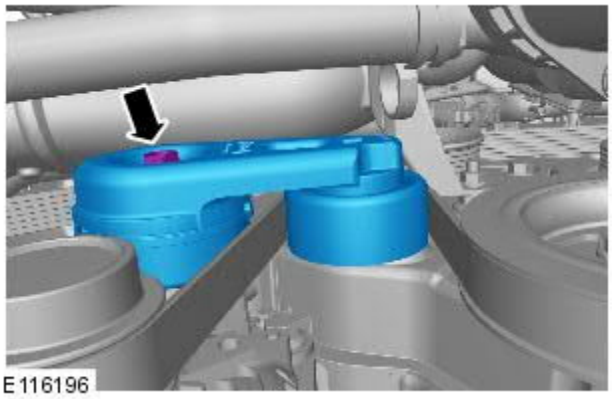
   Raise and support the vehicle.

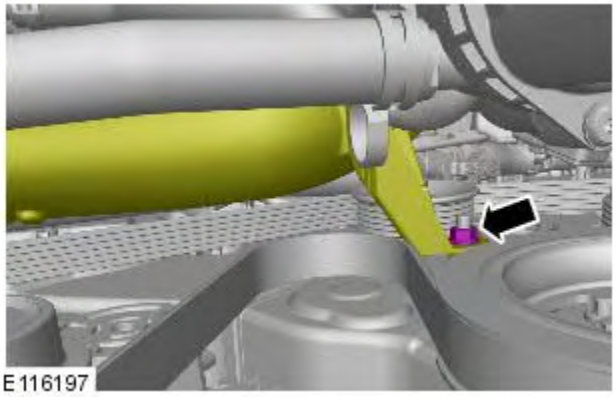
3. Refer to: Turbocharger Bypass Valve (303-04B Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Removal and Installation).

4.

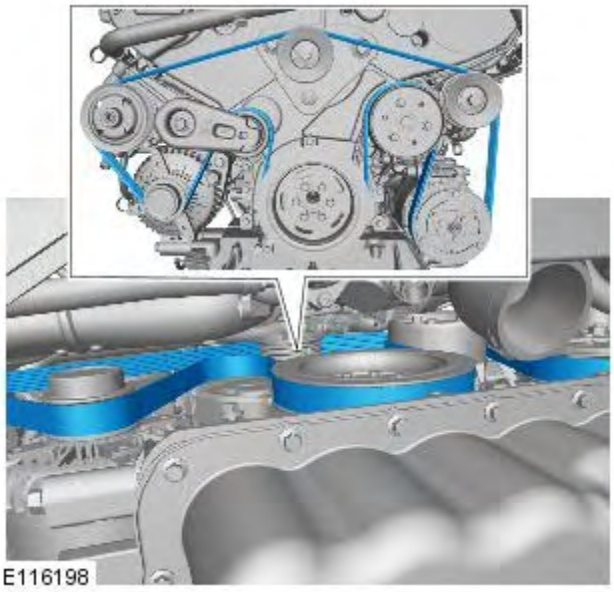


5. *Torque:* 47 Nm





6. *Torque:* 25 Nm



7. CAUTION: Clean and inspect the accessory drive belt pulleys for damage.

   NOTES:

   Note the fitted position of the accessory drive belt.

   Engine shown removed for clarity.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Accessory Drive - TDV6 3.0L Diesel - Accessory Drive Belt Idler Pulley

Removal and Installation

Removal

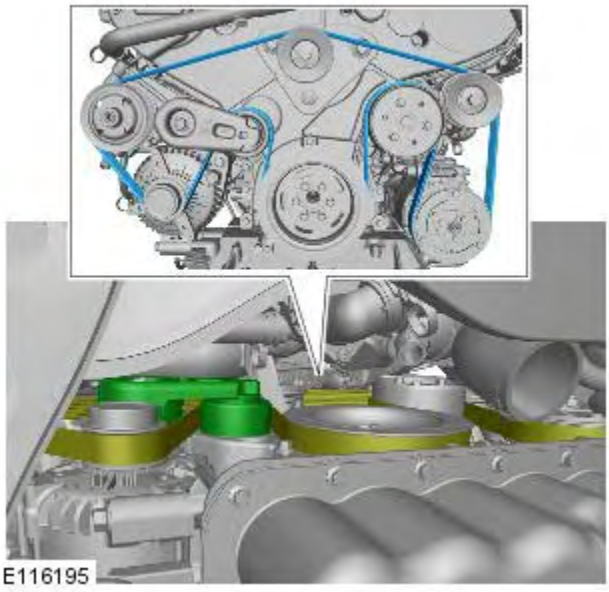
NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

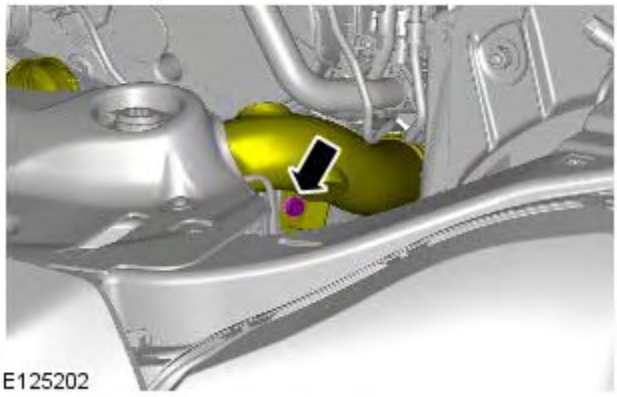
   Raise and support the vehicle.

2. Refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel, Removal and Installation).

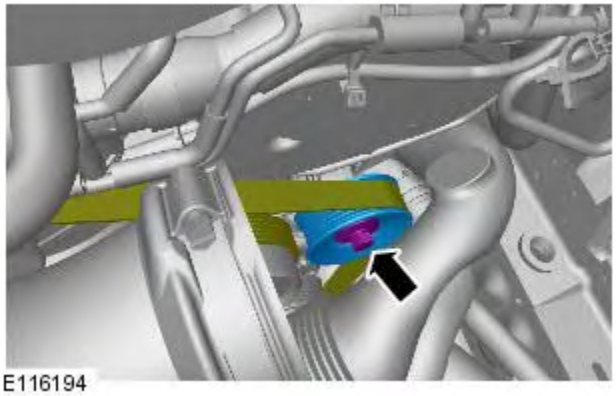
3. Refer to: Turbocharger Bypass Valve (303-04B Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Removal and Installation).



4. NOTE: Note the fitted position of the accessory drive belt.



5. *Torque:* 8 Nm


E116194

6. *Torque:* 47 Nm

Installation

1. CAUTIONS:

   Make sure that the accessory drive belt is correctly located on each pulley.

   Clean and inspect the accessory drive belt pulleys for damage.

   To install, reverse the removal procedure.

Published: 11-May-2011

Accessory Drive - TDV6 3.0L Diesel - Accessory Drive Belt Tensioner

Removal and Installation

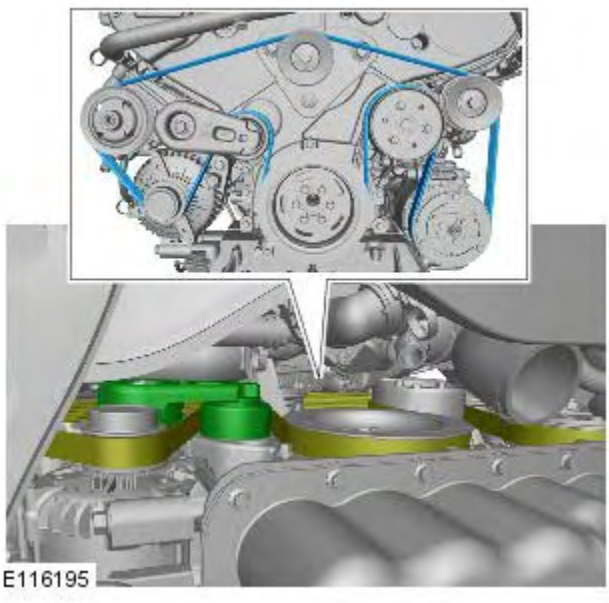
Removal

NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

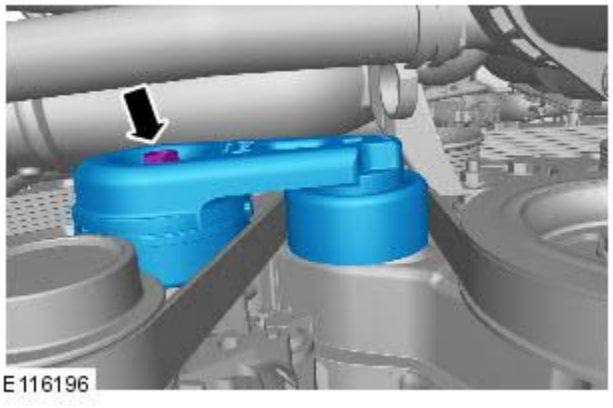
2. Refer to: Turbocharger Bypass Valve (303-04B Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Removal and Installation).



3. NOTES:

   Note the fitted position of the accessory drive belt.

   Engine shown removed for clarity.



4. CAUTION: Clean and inspect the accessory drive belt pulleys for damage.

   Torque: 47 Nm

Installation

1. CAUTION: Make sure that the accessory drive belt is correctly located on each pulley.

   To install, reverse the removal procedure.

Published: 11-May-2011

Accessory Drive - TDV6 3.0L Diesel - Fuel Injection Pump Pulley

Removal and Installation

Special Tool(s)

E117205	310-138A Holding Tool, Fuel Pump Pulley
E117206	310-139A Holding Tool, Fuel Pump Pulley

Removal

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

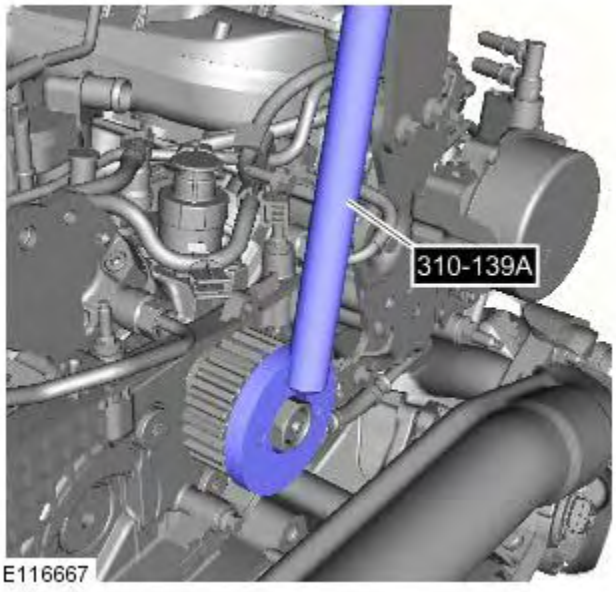
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

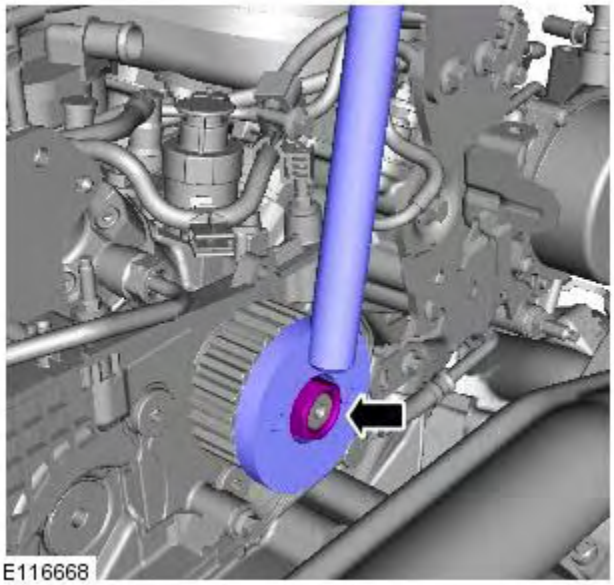
3. Refer to: Rear End Accessory Drive (READ) (303-05A Accessory Drive - TDV6 3.0L Diesel, Removal and Installation).

4. Install the special tool.

   Special Tool(s): 310-139A



E116667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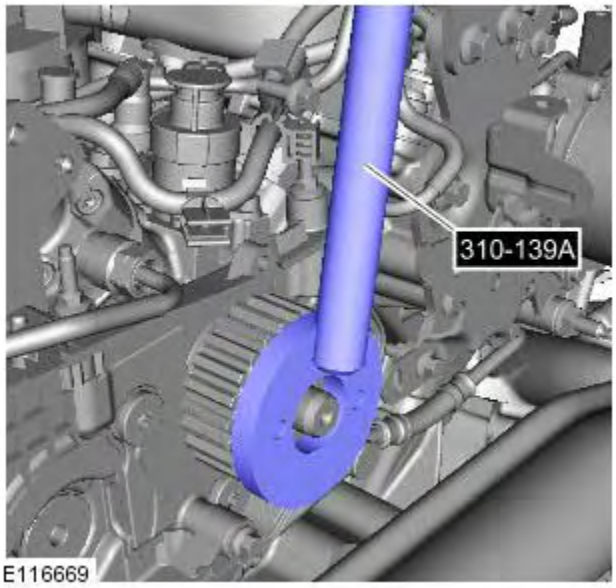
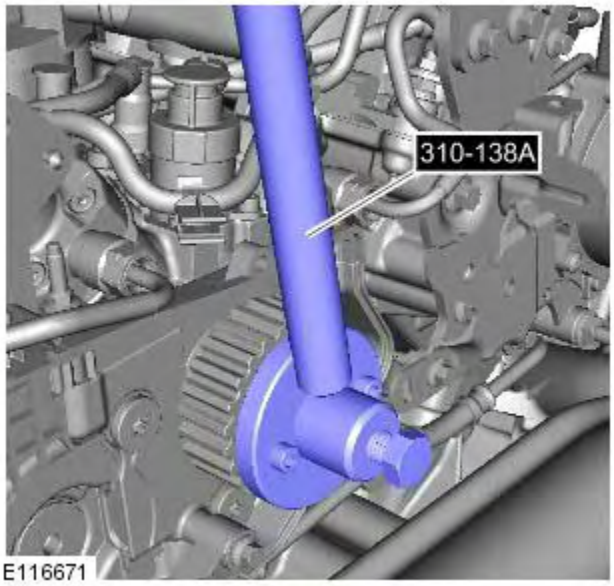


E116669

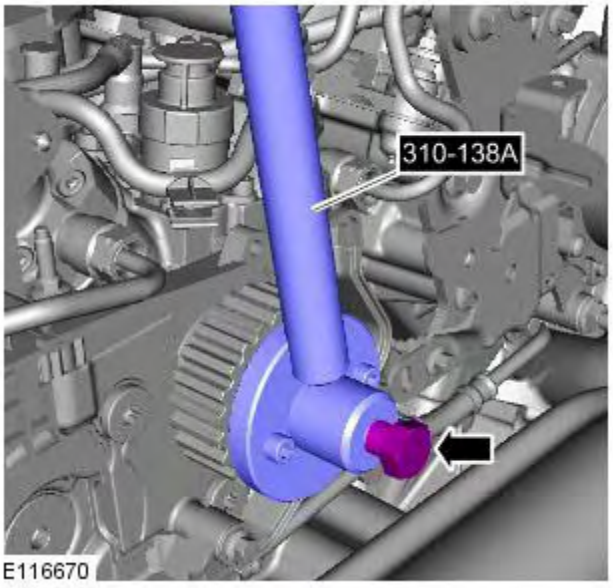
6. Remove the special tool.

   Special Tool(s): 310-139A



7. Install the special tool.

   Special Tool(s): 310-138A



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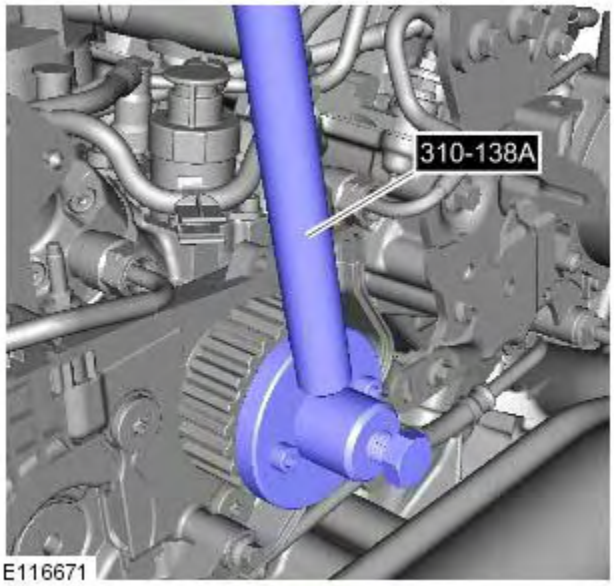
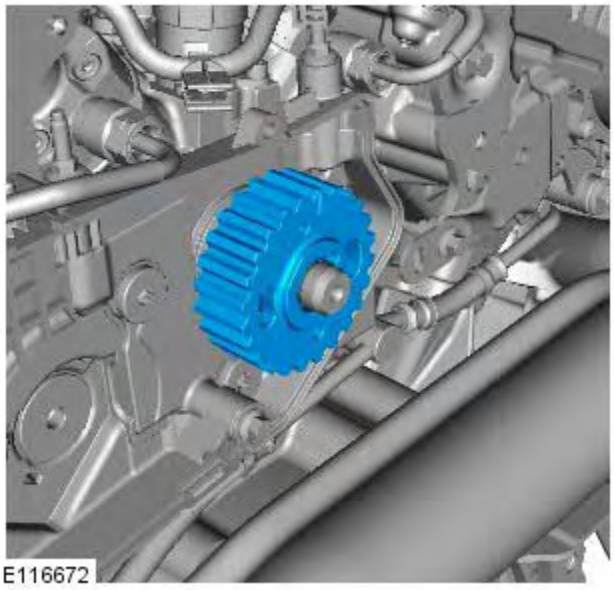


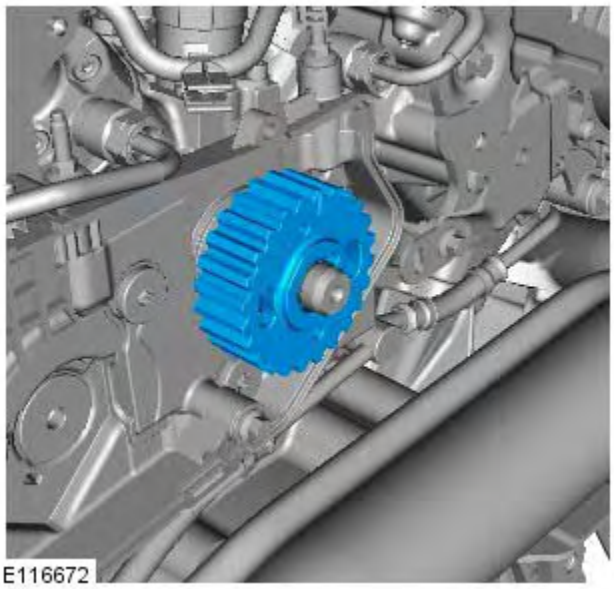
9. Remove the special tool.

   Special Tool(s): 310-138A



10.

Installation



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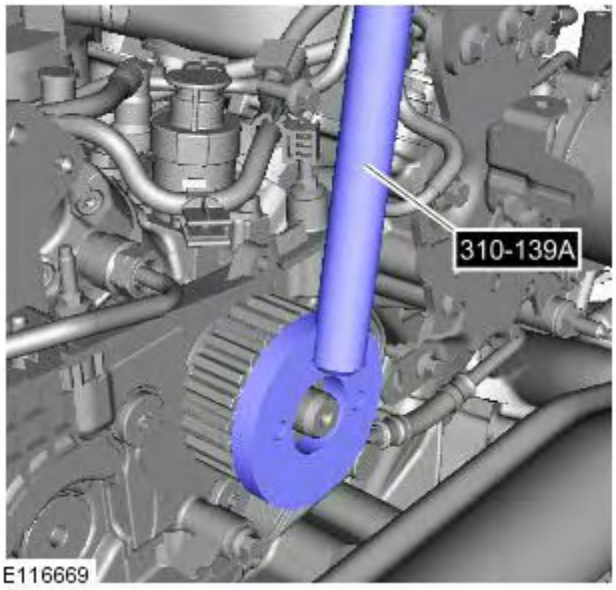
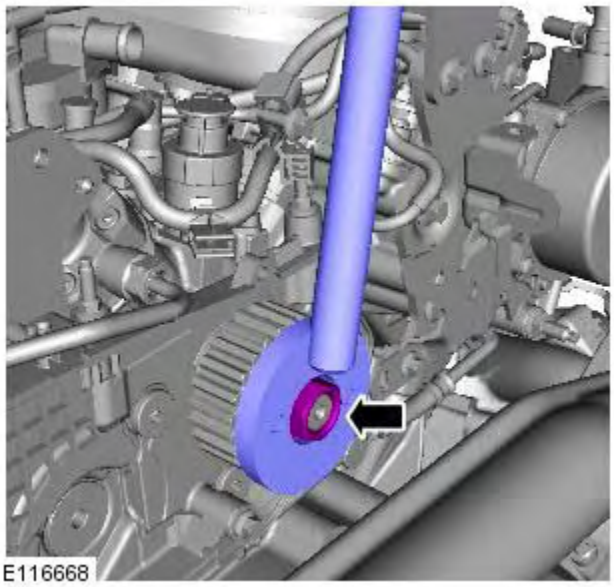
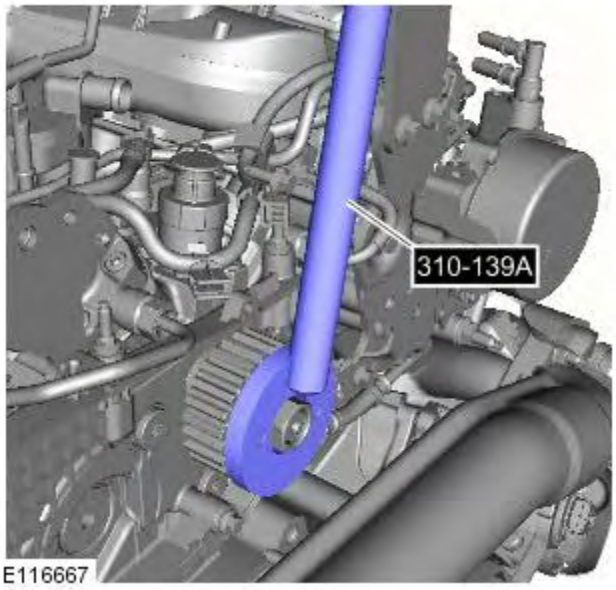


2. Install the special tool.

   Special Tool(s): 310-139A



3. *Torque:* 50 Nm



4. Remove the special tool.

   Special Tool(s): 310-139A

5. Refer to: Rear End Accessory Drive (READ) (303-05A Accessory Drive - TDV6 3.0L Diesel, Removal and Installation).

6. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

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Accessory Drive - TDV6 3.0L Diesel - Rear End Accessory Drive (READ)

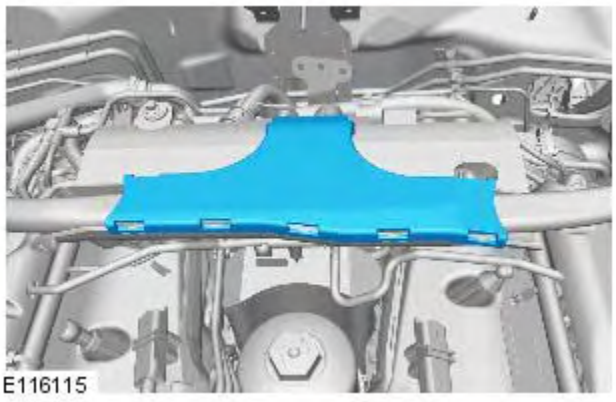
Removal and Installation

Special Tool(s)

E54540	303-1117 Timing Peg, Automatic Transmission
E116926	310-212 Rear End Accessory Drive (READ) belt Timing Tool

Removal

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: Secondary Bulkhead Panel LH (501-02 Front End Body Panels, Removal and Installation).
3. Refer to: Starter Motor (303-06A Starting System - TDV6 3.0L Diesel, Removal and Installation).
4.  E116115

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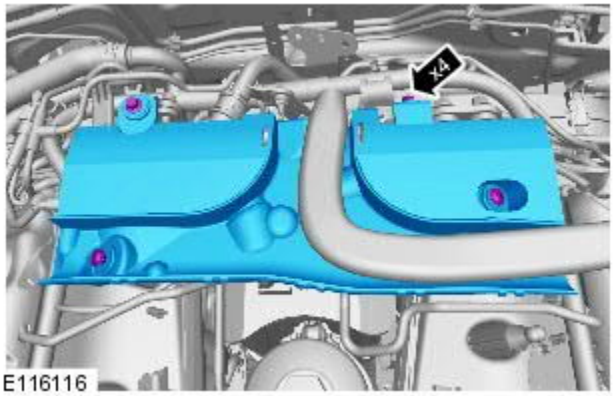

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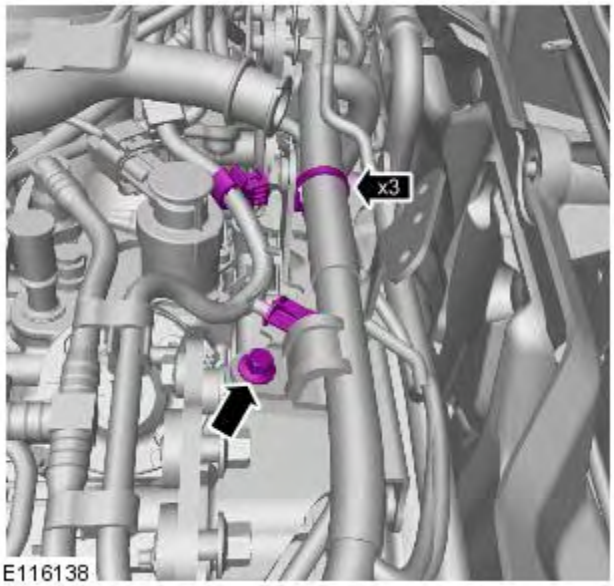

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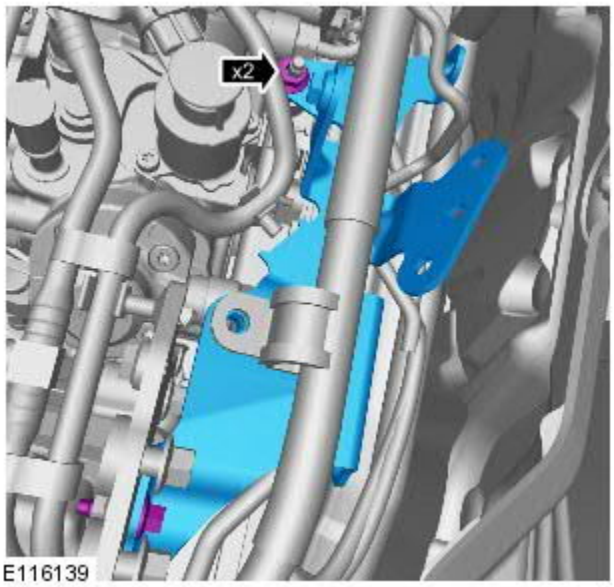

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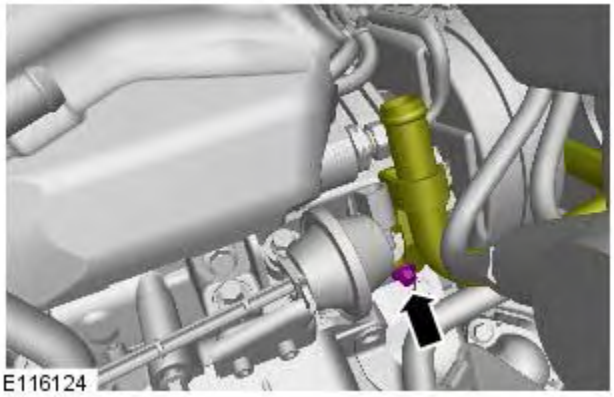

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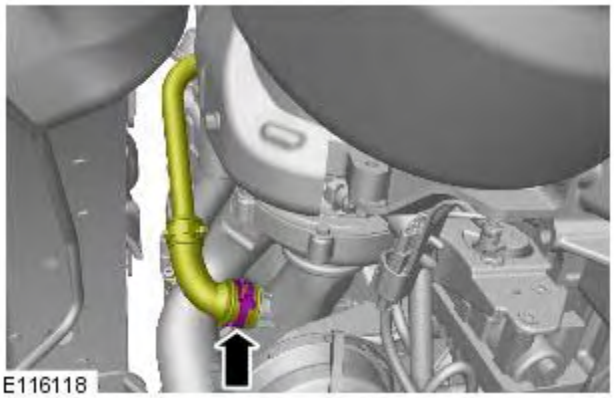

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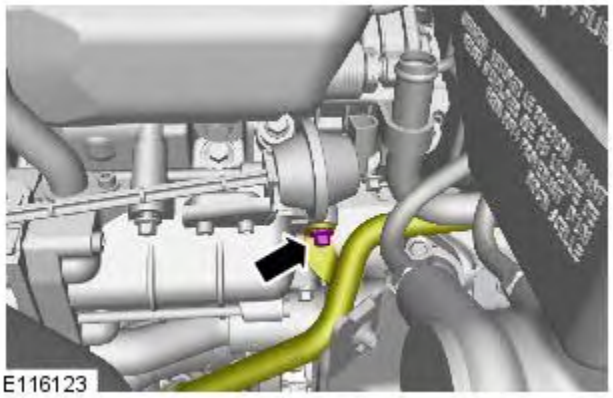

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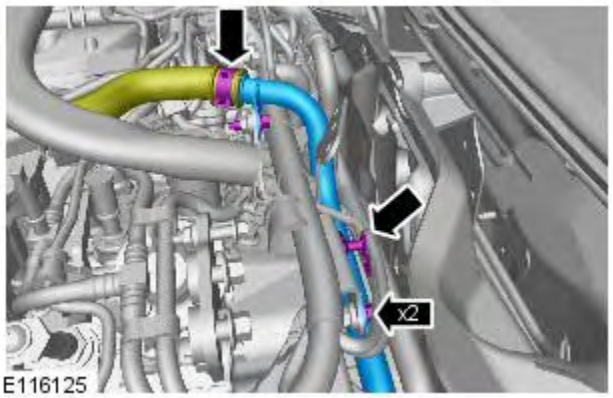

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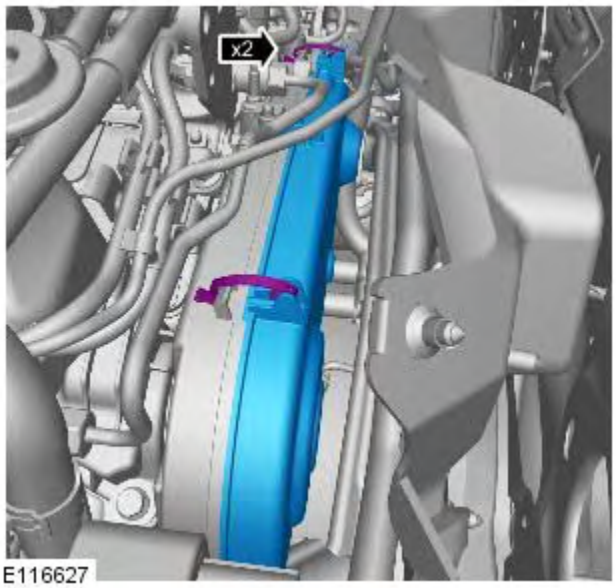
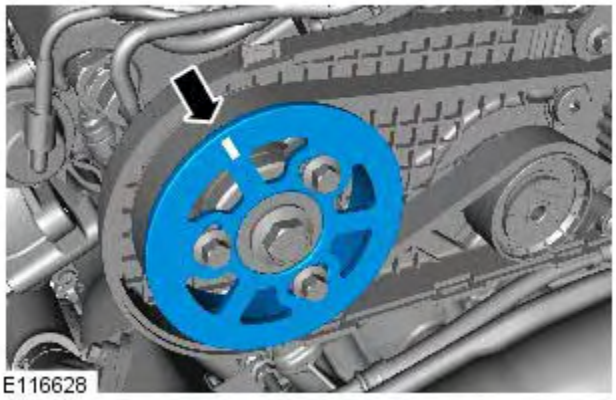




13. CAUTION: Only rotate the crankshaft clockwise.

NOTES:

This step requires the aid of another technician.

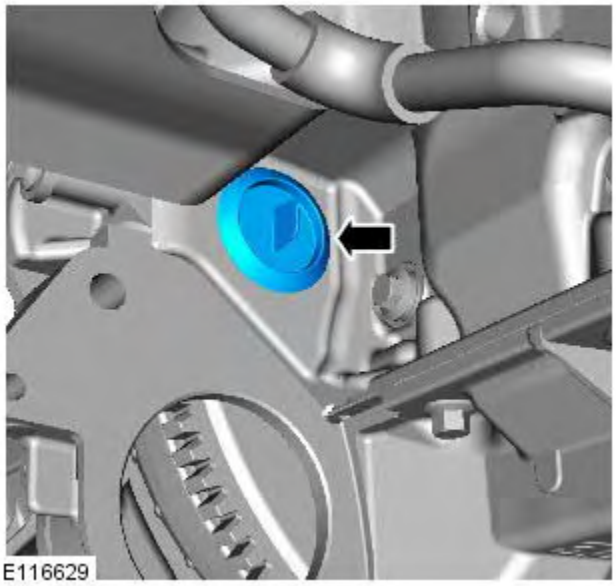
Engine shown removed for clarity.

Rotate the crankshaft until the mark on the rear camshaft pulley is in the illustrated position.

14. WARNING: Make sure to support the vehicle with axle stands.

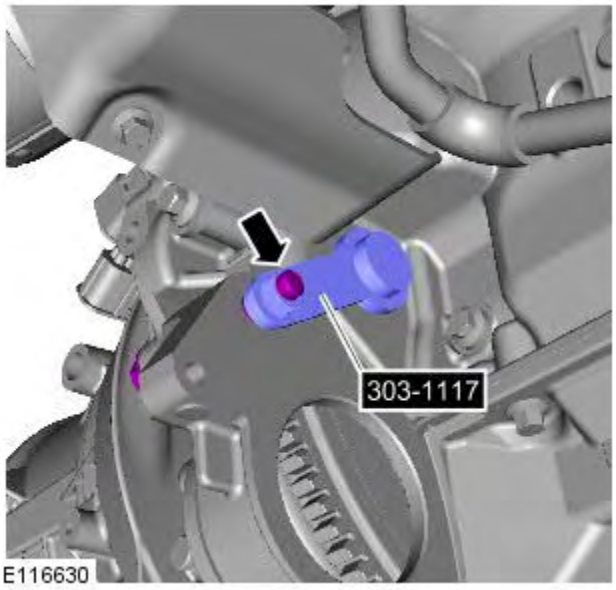
Raise and support the vehicle.

15.

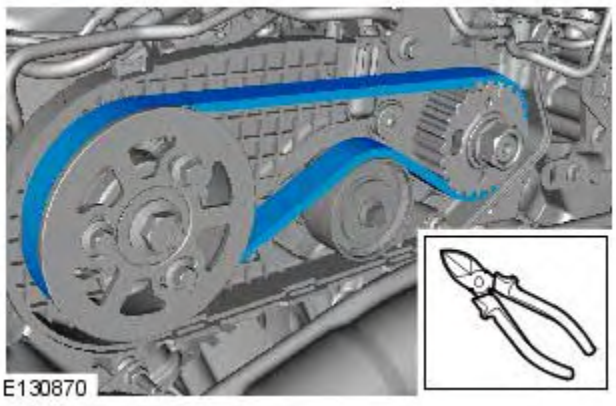


16.

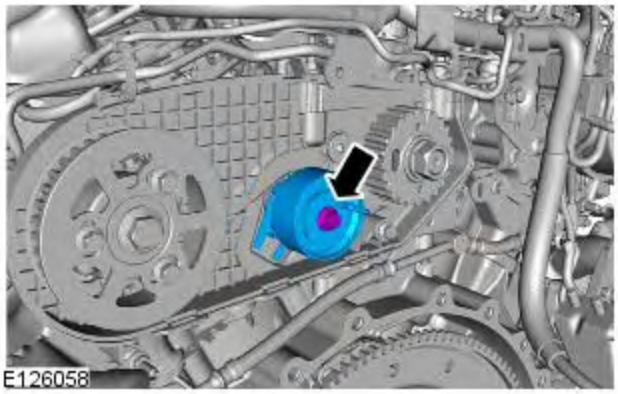
- *Special Tool(s):* 303-1117



17. Lower the vehicle.

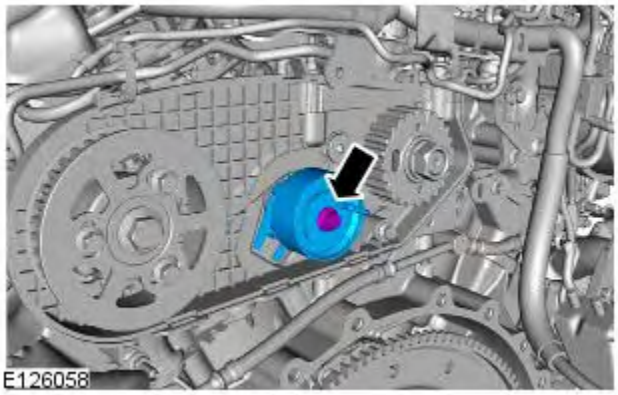


18. CAUTION: Discard the component.



19.

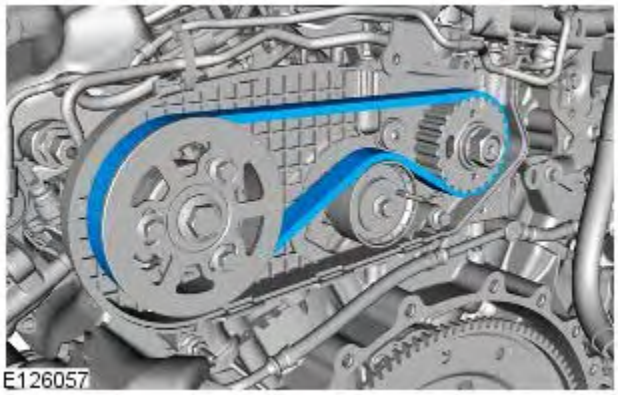
Installation



1. CAUTION: Make sure that the READ belt tensioner tang is correctly located to the READ belt rear cover. Failure to follow this instruction may result in damage to the engine.

   NOTE: Make sure that the rear end accessory drive (READ) belt tensioner locking pin is not removed until the READ belt tensioner is fully installed.

   - *Torque:* 23 Nm

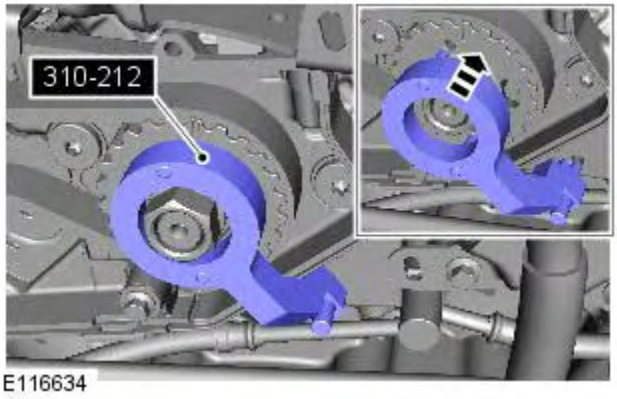


2. CAUTION: Do not install the new READ belt to the pulleys with the READ belt tensioner installed. Failure to follow this instruction may result in damage to the READ belt.

   NOTES:

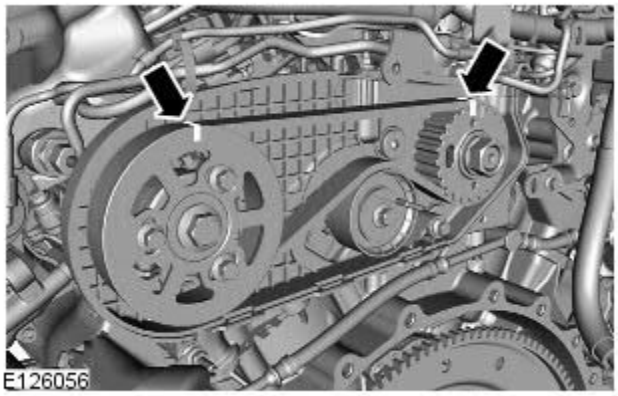
   The READ rotates in a counter-clockwise direction when viewed from the rear of the engine.

   Make sure the new READ belt is correctly seated onto the camshaft and fuel pump pulleys.



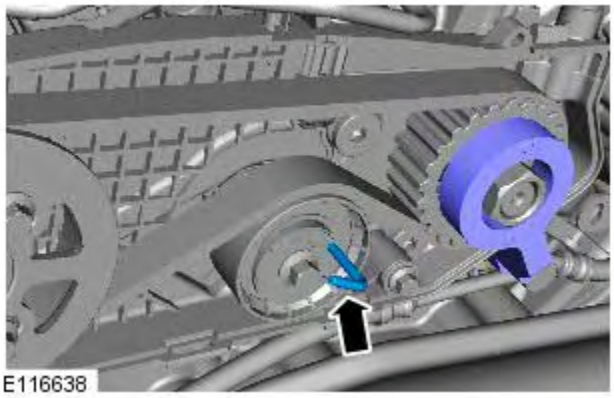
3. Install the special tool.

   Special Tool(s): 310-212



4. NOTE: Make sure that the READ belt tensioner locking pin is not removed until the READ belt tensioner is fully installed.

   Make sure that the READ belt is aligned with the marks on the rear camshaft pulley and READ pulley as illustrated.



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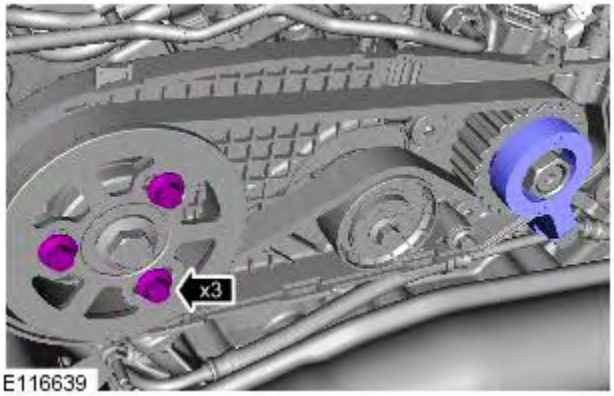
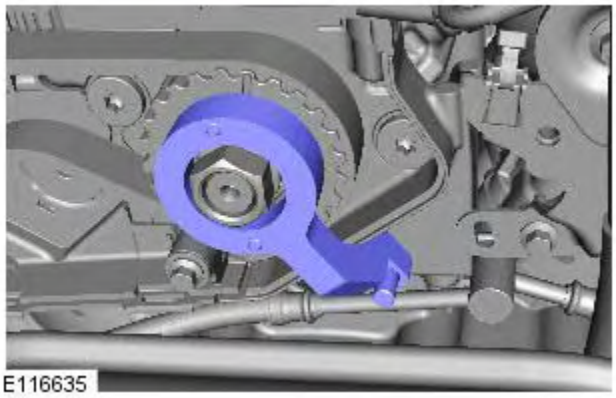


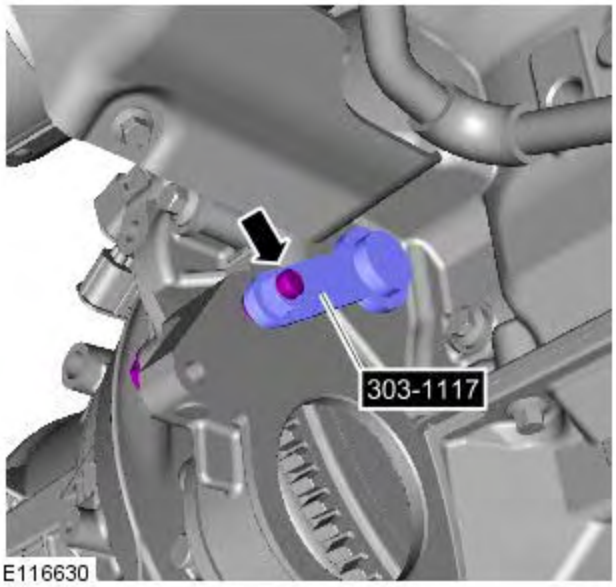
6. *Torque:* 23 Nm



7.
- Remove the special tool.

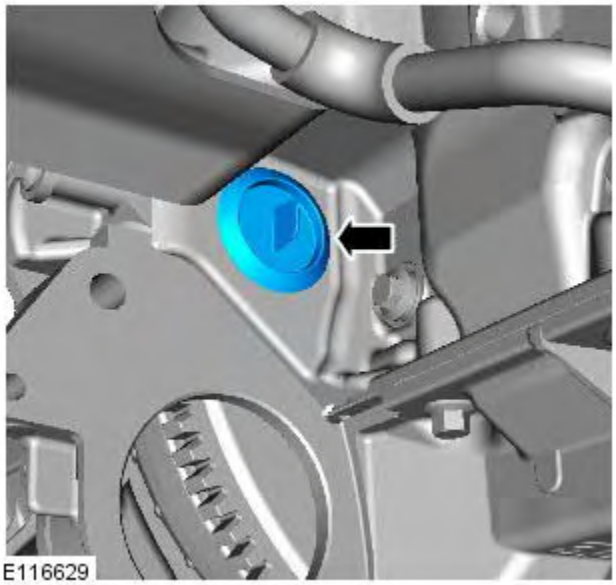
8. WARNING: Make sure to support the vehicle with axle stands.

Raise and support the vehicle.



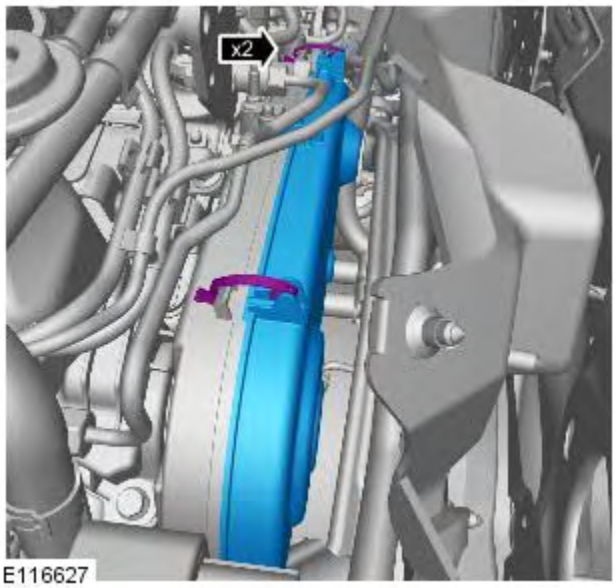
9.
- Remove the special tool.
- *Special Tool(s):* 303-1117

10.



11. Lower the vehicle.

12.



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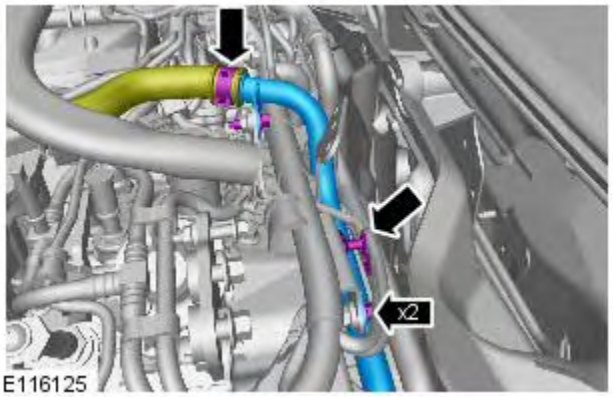
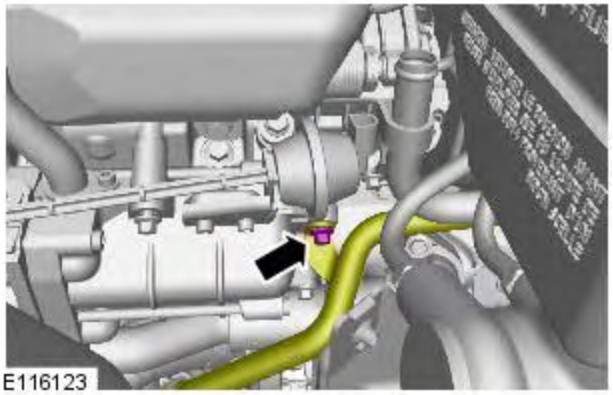
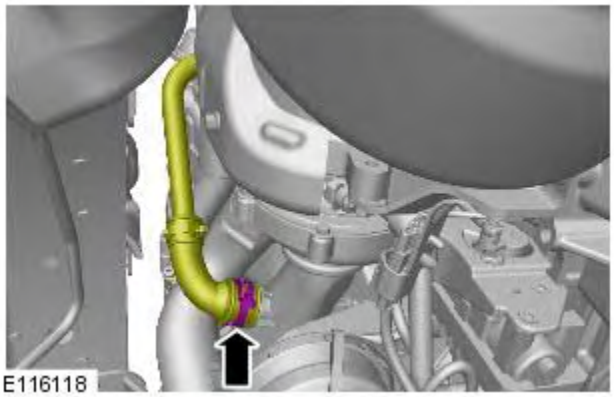




14. *Torque:* 10 Nm



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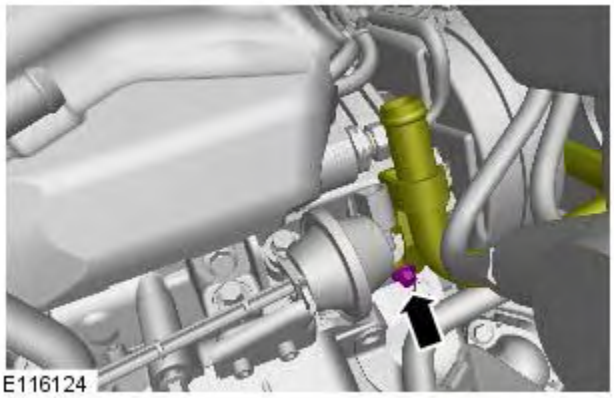
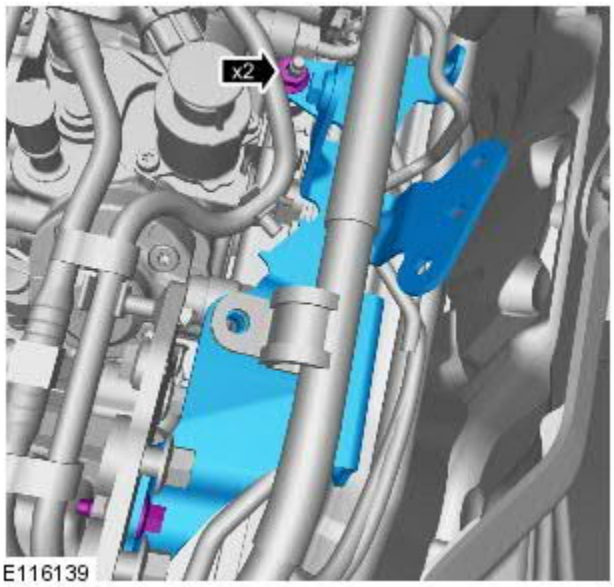
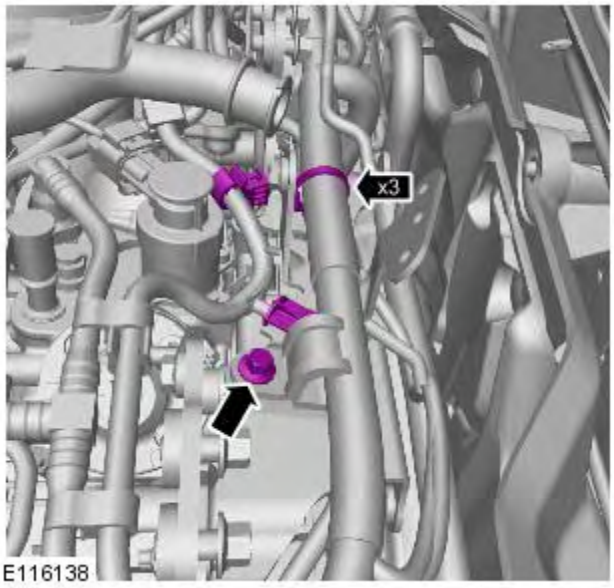


16. *Torque:* 10 Nm

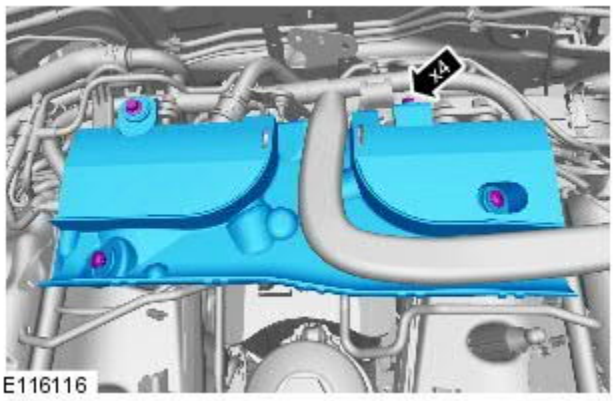
17. *Torque:* 10 Nm



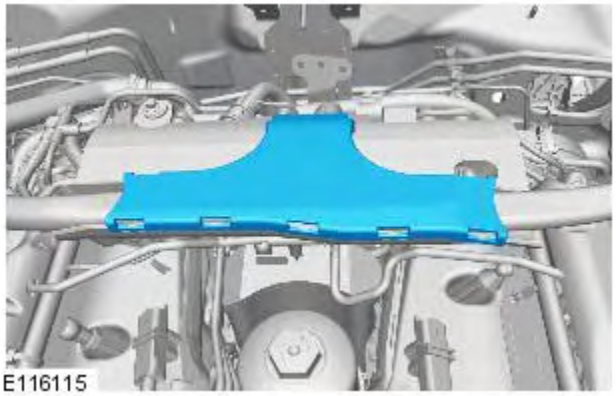
18. *Torque:* 5 Nm



19. *Torque:* 10 Nm



20.



21. Refer to: Starter Motor (303-06A Starting System - TDV6 3.0L Diesel, Removal and Installation).

22. Refer to: Secondary Bulkhead Panel LH (501-02 Front End Body Panels, Removal and Installation).

23. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 11-May-2011

Starting System - TDV6 3.0L Diesel -

Description	Nm	lb-ft	lb-in
Starter motor to oil pan bolts	47	35	-
Battery positive terminal integral connector retaining nut	10	7	-
Solenoid terminal integral connector nut	7	-	62

Published: 18-Jun-2013

Starting System - TDV6 3.0L Diesel - Starting System

Diagnosis and Testing

Principles of Operation

For information on the operation of the system, refer to the relevant workshop manual section. REFER to: (303-06A)

Starting System (Description and Operation),
Starting System (Description and Operation),
Starting System (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern
2. Visually inspect for obvious signs of mechanical or electrical damage

Visual Inspection

Mechanical	Electrical
• Starter motor • Engine (turns freely)	• Battery • Fuses • Starter relay • Wiring harness(s) • Damaged, loose or corroded connectors • Ignition switch • Generator • Transmission Control Module (TCM) • Engine Control Module (ECM)

3. If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the symptom chart
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC index
5. Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as needed

Symptom Chart

Symptom	Possible Causes	Action
The engine does not crank (starter motor does **not** turn)	• Gear selector not in **P** or **N** position (vehicles with automatic transmission) • Battery • Starter relay • Invalid key code received by Central Junction Box (CJB) • Harness/Connectors • Starter motor • Ignition switch • Generator • Transmission Control Module (TCM) • Engine Control Module (ECM) • Engine seized	Make sure the gear selector is in the **P** or **N** position and correctly adjusted. Check the battery condition and state of charge. Check for DTCs indicating an immobilizer fault. Check the starter motor relay, ignition switch and generator circuits. Refer to the electrical guides. Check for TCM and ECM DTCs. Check that the engine turns freely.
The engine does not crank (starter motor **does** turn)	• Starter motor installation • Starter motor • Flywheel/Drive plate ring gear	Check the starter motor installation (fasteners tight, starter motor square to engine, etc). Check the flywheel/drive plate ring gear teeth for damage, foreign objects, etc.

Symptom	Possible Causes	Action
Engine cranks too slowly	• Battery • Harness/Connectors • Starter motor • Oil grade	Check the battery condition and state of charge. Check the starter motor circuits. Refer to the electrical guides. Check the engine oil grade and condition.
Engine cranks too fast	• Low engine compression	Check the engine compressions.
Excessive starter motor noise	• Starter motor • Flywheel/Drive plate ring gear • Starter motor installation/casing	Check the starter motor installation (fasteners tight, motor square to engine, etc). Check the starter motor casing condition. Check the flywheel/drive plate ring gear teeth for damage, foreign objects, etc.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - TDV6 3.0L Diesel, DTC: Engine Control Module (ECM) (100-00, Description and Operation).

Published: 06-Apr-2013

Starting System - TDV6 3.0L Diesel - Starting System Vehicles With: Smart Key

Diagnosis and Testing

Principles of Operation

For a detailed description of the starting system, refer to the relevant Description and Operation section in the workshop manual.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
• Steering column • Brake pedal • Smart key • Steering Wheel	• Fuses • Harnesses and connectors • Warning lamp operation • Smart key operation • Engine start operation

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTC's) and refer to the DTC Index.
5. Check DDW for open campaigns. Refer to the corresponding bulletins and SSM's which may be valid for the specific customer complaint and carry out the recommendations as needed.

CAUTIONS:

Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system)

When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the digital multimeter leads into account

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests

Inspect connectors for signs of water ingress, and pins for damage and/or corrosion

If diagnostic trouble codes are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals

Symptom Chart

Symptom - Message Displayed	Symptom - Possible Cause	Action
Smart key not found - Refer to handbook	Ignition mode fails to switch on	GO to Pinpoint Test A.

Symptom - Message Displayed	Symptom - Possible Cause	Action
NOTE: Back up start - 10MY onwards Smart key not found - Refer to handbook	Ignition mode fails to switch on	GO to Pinpoint Test B.
Press start and brake	Engine fails to crank	GO to Pinpoint Test C.
Steering column locked	Ignition switches off after 3 seconds	GO to Pinpoint Test D.
NOTE: For diesel engines Engine still not cranking	Ambient temperatures below zero	GO to Pinpoint Test E.

Pin Point Test

PINPOINT TEST A : SMART KEY NOT FOUND - REFER TO HANDBOOK	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: IGNITION MODE FAILS TO SWITCH ON	
NOTES: In normal operation, pressing the start button for one second will cause the vehicle to enter the ignition mode. If the procedures below are followed the engine should crank	
For automatic transmission vehicles, ensure the brake pedal is depressed and the park or neutral selected	
	1 Ensure the smart Key is within the cabin area. Check the smart key is not close to any electrical devices e.g. Smart phones, laptops, laptop cases, games consoles and game console bags, briefcases, metal objects etc. All can affect the system performance and may block its communication with the vehicle. If the smart key battery low warning message has been displayed it is likely that the smart key battery has insufficient charge. Refer to section 'Back Up Start' for 10MY onwards
	Has the vehicle started? **Yes** No further action required **No** Check and install a new battery as required. Clear the DTC and retest. If the problem persists, contact dealer technical support

PINPOINT TEST B : BACK UP START - 10MY ONWARDS - SMART KEY NOT FOUND - REFER TO HANDBOOK	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
B1: IGNITION MODE FAILS TO SWITCH ON	
NOTES: In normal operation, pressing the start button for one second will cause the vehicle to enter the ignition mode. If the procedures below are followed the engine should crank	
For automatic transmission vehicles, ensure the brake pedal is depressed and the park or neutral selected	
	1 On pressing the start button, **smart key not found**. When this warning is displayed the smart key should be brought into close proximity with the immobilize antenna unit. Hold the key in the location and press the start button again. If this process fails the first time, try repositioning the key around the immobilize antenna unit location, repeat the sequence again
	Has the vehicle started? **Yes** No further action required **No** Contact dealer technical support

PINPOINT TEST C : PRESS START AND BRAKE	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
C1: ENGINE FAILS TO CRANK	
NOTES: Conditions for starting in addition to pressing the start button are	

PINPOINT TEST D : STEERING COLUMN LOCKED	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
D1: IGNITION SWITCHES OFF AFTER 3 SECONDS	
NOTES: Conditions for starting in addition to pressing the start button are For automatic transmission vehicles, ensure the brake pedal is depressed and the park or neutral selected For manual transmission vehicles ensure the clutch is fully depressed If the engine can be heard to crank there is no fault with the smart key If the locking pin is still engaged, turn the steering wheel to overcome the side load Start authorisation defined as Ignition functions, Steering column lock engagement, Engine immobilize and smart key authorisation	
	1 Unlock the vehicle using the key fob, within 3 minutes of unlocking ensure the steering wheel can rotate freely. Perform a further lock and unlock check and attempt to start vehicle. If the steering 'column locked' message is still displayed, Lock the vehicle with the key fob and ensure the column is locked **(If installed)** by turning the steering wheel. Then unlock the vehicle ensuring the column Steering wheel can turn freely. Now perform another start attempt
	Did the engine start? **Yes** No further action required **No** Contact dealer technical support

PINPOINT TEST E : ENGINE STILL NOT CRANKING	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
E1: AMBIENT TEMPERATURES BELOW ZERO	
	1 Hold the start button down for at least 4 seconds while starting the vehicle
	2 Switch the ignition on, wet the windscreen and activate the wipers. when the wipers are in operation press the start button, If the wipers stop, the Engine is allowed to start
	Did the engine start? **Yes** No further action required **No** Contact dealer technical support

Published: 11-May-2011

Starting System - TDV6 3.0L Diesel - Starter Motor

Removal and Installation

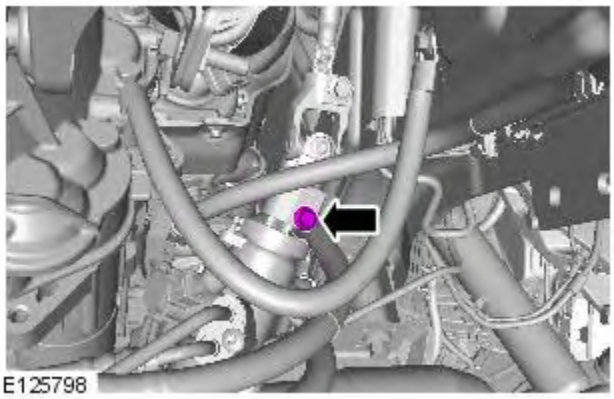
Removal

NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

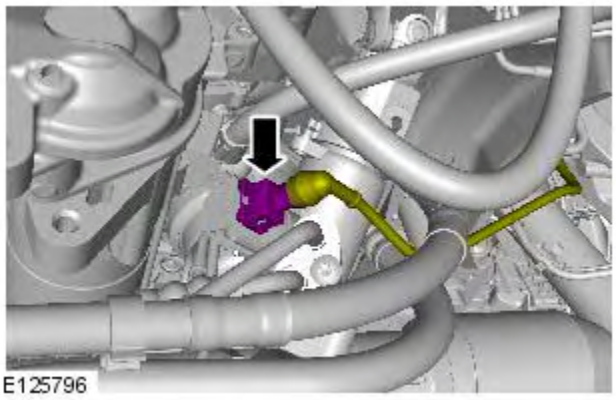
   Raise and support the vehicle.

2. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

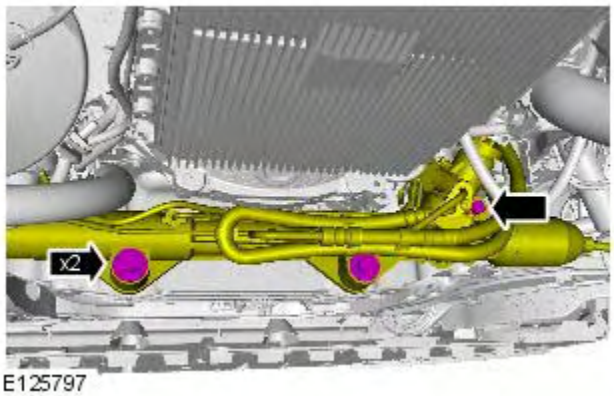


3. CAUTION: Note the fitted position of the component prior to removal.

   Torque: 35 Nm



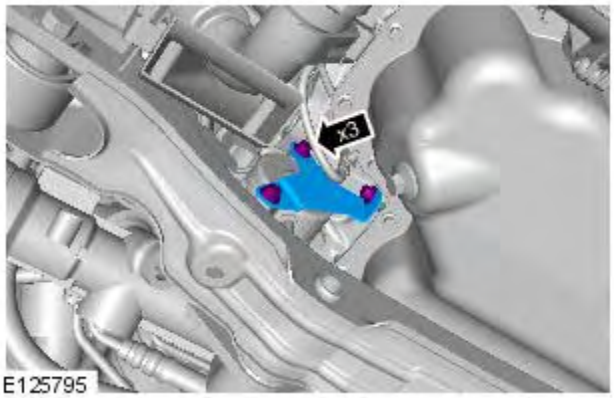
4.



E125797

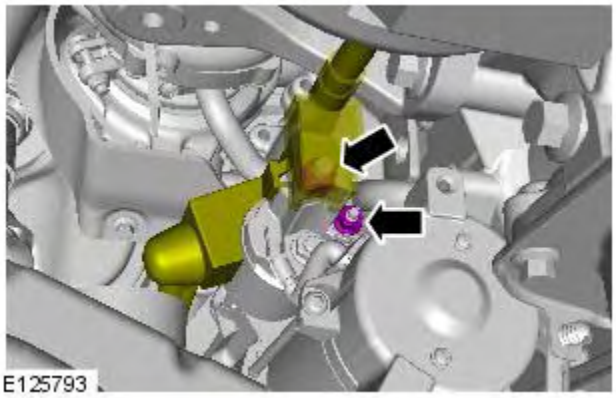
5. NOTE: Support as necessary.

   Torque: 100 Nm

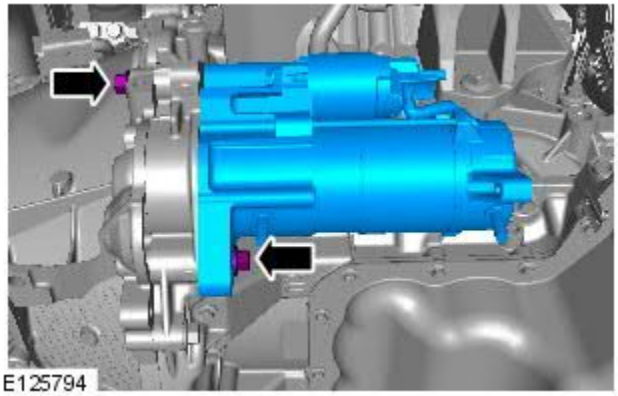


E125795

6. *Torque:* 47 Nm


E125793

7. *Torque:*
   M8 10 Nm
   M6 7 Nm


E125794

8. NOTE: Engine shown removed for clarity.

   Torque: 47 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Glow Plug System - TDV6 3.0L Diesel -

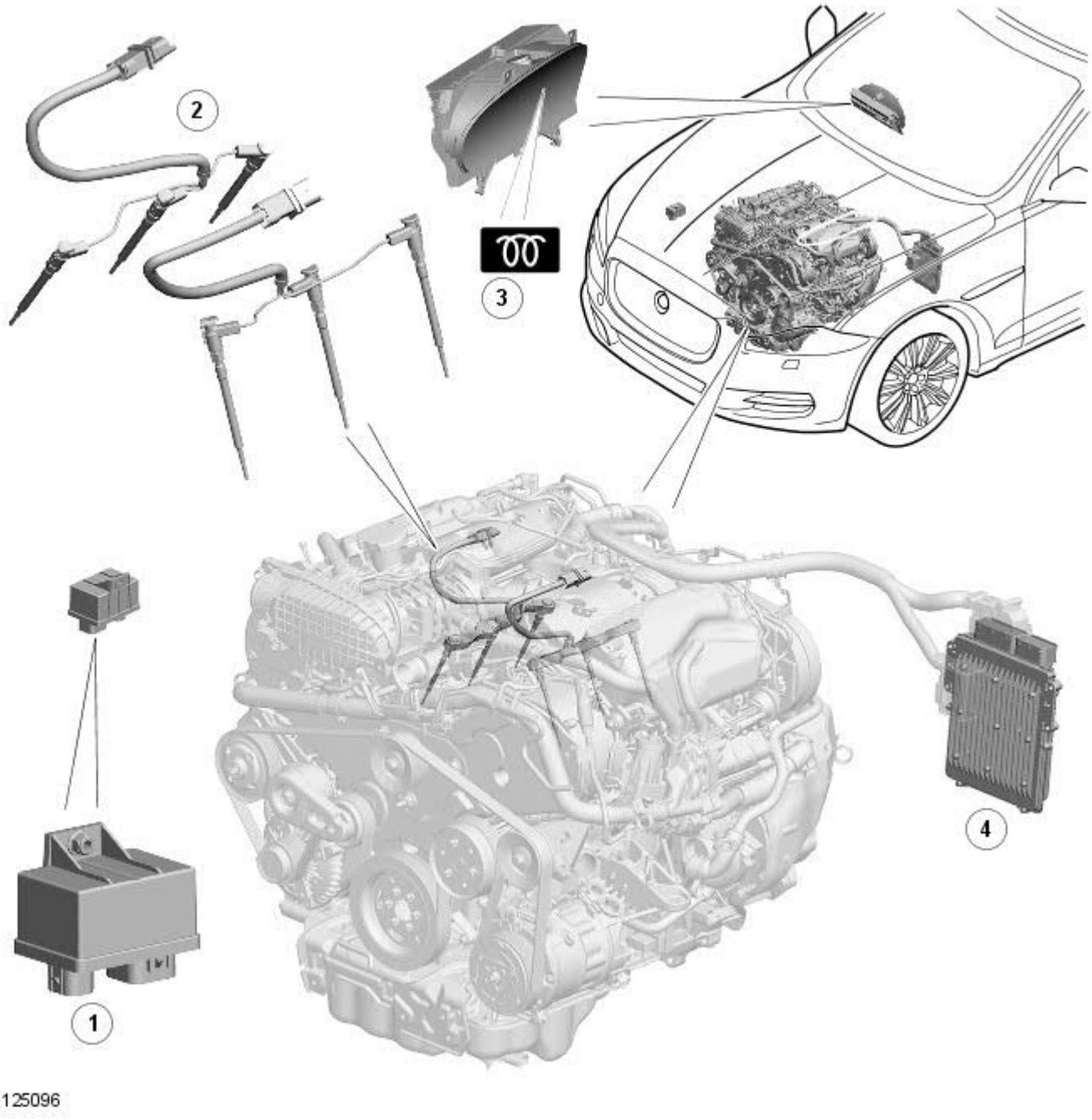
Description	Nm	lb-ft	lb-in
Glow plug	10	-	89

Published: 11-May-2011

Glow Plug System - TDV6 3.0L Diesel - Glow Plug System - Component Location

Description and Operation

COMPONENT LOCATION



Item	Description
1	Glow plug module
2	Glow plugs
3	Glow plug warning lamp
4	ECM (engine control module)

Published: 11-May-2011

Glow Plug System - TDV6 3.0L Diesel - Glow Plug System - Overview

Description and Operation

OVERVIEW

The glow plug system has a glow plug installed in the inlet side of each cylinder. The glow plugs heat the combustion chambers before and during cranking, to aid cold starting, and after the engine starts to reduce emissions and engine noise when idling with a cold engine.

The glow plugs are connected for each bank by a common harness which is connected into the main engine harness. The harness for each bank connects into a connector block which attaches to each of the glow plugs for that bank. The glow plugs are connected directly to the glow plug module which is controlled by glow plug software contained within the ECM (engine control module).

Each glow plug is a tubular heating element which contains a spiral filament encased in magnesium oxide powder. At the tip of the tubular heating element is the heater coil. Behind the heater coil, and connected in series, is a control coil. The control coil regulates the current to the heater coil to safeguard against overheating.

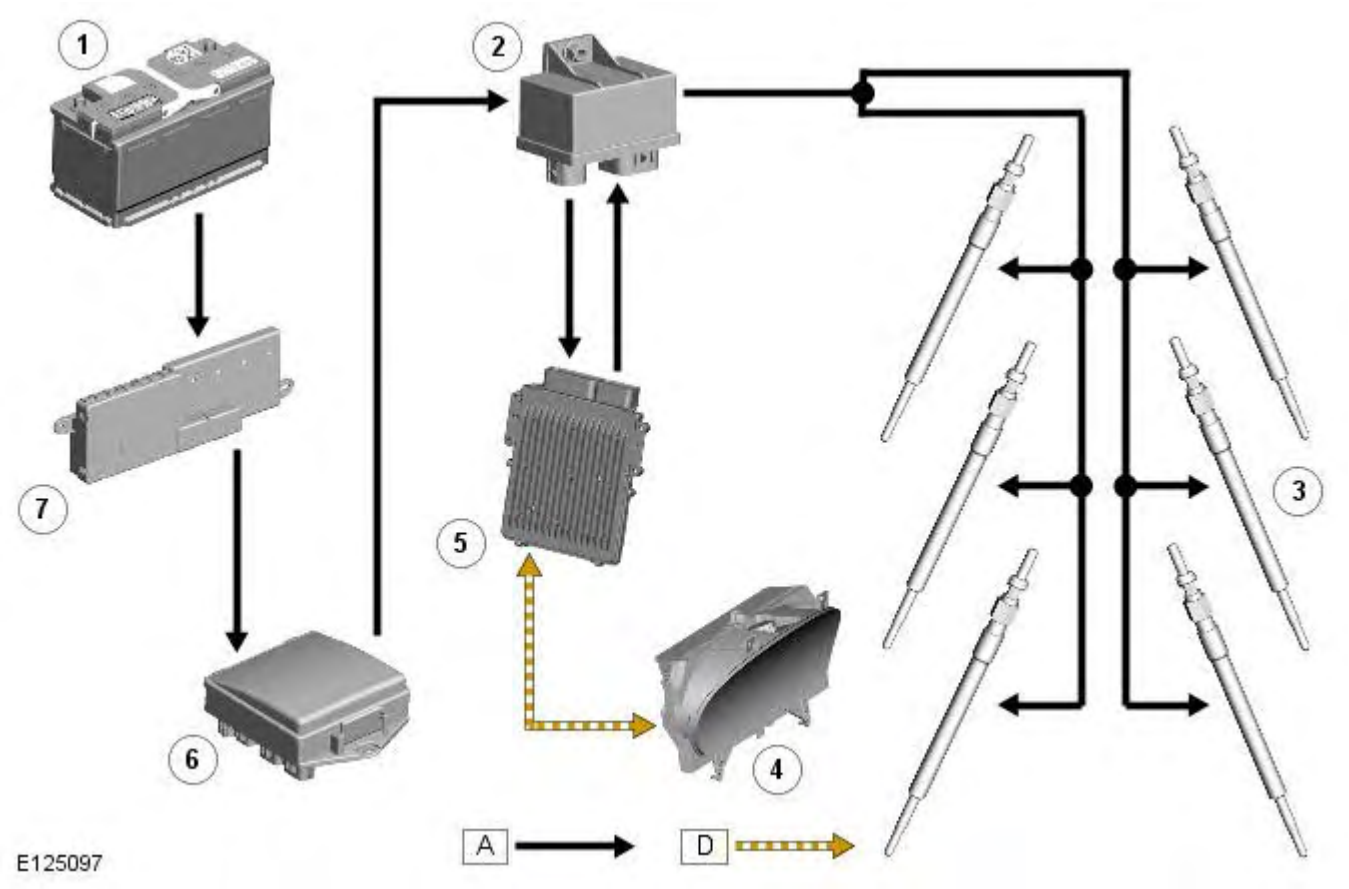
Published: 11-May-2011

Glow Plug System - TDV6 3.0L Diesel - Glow Plug System - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: **A** = Hardwired; **D** = HS CAN (controller area network)



Item	Description
1	Battery
2	Glow plug module
3	Glow plug (6 off)
4	Instrument cluster
5	Engine Control Module (ECM)
6	Engine Junction Box (EJB) - (100A Midi-Fuse)
7	Battery Junction Box (BJB) - (250A Megafuse)

System Operation

System Operation

There are three phases of glow plug heating:

- Pre heating
- Crank heating
- Post heating

The ECM (engine control module) determines the heating times from the ECT (engine coolant temperature). The lower the ECT, the longer the heating times.

When the ignition is switched to power mode 9 (engine crank), the ECM calculates any required heating times and, if heating is required, energizes the glow plug relay in the BJB (battery junction box). The glow plug relay supplies an ignition power supply to the glow plug module. The glow plug module is controlled by the ECM which determines the pre-heat time required.

The module then supplies power to each of the glow plugs for the required time.

When pre-heating is required, the ECM also sends a message to the instrument cluster, on the high speed CAN, to request illumination of the glow plug indicator. The glow plug indicator remains illuminated for the duration of the pre heating phase, or until the ignition is switched to crank, whichever occurs first. If required, the ECM keeps the glow plug module energized during cranking and for the duration of any post heating phase.

The ECM monitors the drive circuit of the glow plug module, via a direct diagnostic connection with the module, for plausibility of operation, continuity, and short and open circuits. If a fault is detected, the glow plug module passes the fault information to the ECM, which stores a related fault code and permanently illuminates the glow plug indicator while the ignition is in power mode 9.

Pre Heating

Pre-heat is the length of time the glow plugs operate prior to engine cranking. The ECM controls the pre-heat time based on ECT sensor output and battery voltage. If the ECT sensor fails, the ECM will use the IAT (intake air temperature) sensor value as a default value. The pre-heat duration is extended if the coolant temperature is low and the battery is not fully charged.

The ECM receives the corresponding temperature signal from the ECT sensor.

The pre heating period is dependent on the temperature signal (low temperature = longer pre heating period).

The driver is informed that pre heating is in operation by the glow plug indicator light in the instrument cluster coming on. The pre heating times become longer as the coolant temperature falls.

The BARO (barometric pressure) also has an influence on activation and deactivation of the glow plugs in the event of large altitude differences.

Crank Heating

Crank heating is carried out at every start where the coolant temperature is below the predefined threshold of 20° C. Crank heating begins if the engine speed exceeds 42 rpm for longer than 50ms, or the starter is active for longer than 4 sec. If the coolant temperature sensor is defective, a default temperature of 0° C is used.

Post Heating

Post heat is the length of time the glow plugs operate after the engine starts. The ECM controls the post heating time based on ECT sensor output. The post heat phase reduces engine noise, improves idle quality and reduces hydrocarbon emissions.

Preheating is followed by the post heating phase once the engine has started. The post heating phase depends upon how the vehicle is driven.

In addition to ECT, BARO and engine speed, the injected fuel quantity is significant in this context. For example, if the injected fuel quantity is 70 mg per piston stroke and the coolant temperature is below 20 °C, post heating is performed at engine speeds between 1100 and 3500 rpm.

In the case of greater injection quantities and considerably lower engine temperatures, the post heating phase is also activated depending on the engine speed. At 14 mg per piston stroke and an ECT of below 0 °C, for example, post heating is performed at engine speeds between 1100 and 1500 rpm.

Component Description

Glow Plug

The ceramic sheathed element glow plugs are made from a heat-resistant, electrically conductive ceramic material. The ceramic sheathed-element glow plugs outer layer is heated directly and is self regulating. The self regulation allows the resistance of the sheathed element to automatically increase as the heat increases preventing the glow plug from overheating. In addition, during the heating process and under the control of the glow plug relay, the glow plugs can be operated above their nominal voltages. This permits heat-up speeds of 1000°C per second. The sheathed-element glow plugs reach a maximum glow temperature of 1300°C and can hold a temperature of 1150°C for several minutes after the first-start glow or at intervening times.

The glow plug is a tubular heating element that protrudes into the combustion chamber of the engine. The heating element contains a spiral filament encased in magnesium oxide powder. At the tip of the tubular heating element is the heater coil. Behind the heater coil is a control coil. The control coil is connected in series and regulates the heater coil to ensure that it does not overheat.

Each cylinder bank has a separate harness connecting the three glow plugs. The harness connects into the engine wiring harness and each harness has a connector block which attaches to each of the glow plugs for that bank.

The glow plug module receives a battery voltage feed via a 250A megafuse in the BJB and a 100A midi-fuse in the EJB (engine junction box). Operation of the glow plug module is controlled by the ECM, which also controls the illumination of the glow plug indicator in the instrument cluster.

The system has been designed as a low-voltage glow system. At 7 volts, the nominal voltage of the sheathed-element glow plugs is significantly lower than the 12 volts of the main electrical circuit. The electronic glow plug module matches the voltage to the sheathed-element glow plugs and controls their glow temperature precisely to the specific requirements of the engine. This produces the optimum glow temperature even when the main circuit voltage is interrupted during engine starting. The lower power consumption of the ceramic glow plugs and their time-staggered activation reduce to a minimum the peak load on

the main circuit during the cold start and immediate post-start periods.

In the event of glow plug failure, the engine may be difficult to start and excessive smoke emissions may be observed after starting.

Glow Plug Module

The glow plug module is located in the RH (right-hand) side of the engine compartment. The module is attached to the power steering reservoir bracket with a bolt and nut.

Two connectors are used on the module. One connector receives the power supplies from the battery via the BJB and EJB and also provides for the connections to/from the ECM. The second connector supplies the outputs to the glow plugs.

Published: 11-May-2011

Glow Plug System - TDV6 3.0L Diesel - Glow Plug System

Diagnosis and Testing

Principles of Operation

For a detailed description of the glow plug system and operation, refer to the relevant Description and Operation section in the workshop manual. REFER to: (303-07B Glow Plug System - TDV6 3.0L Diesel)

Glow Plug System (Description and Operation),
Glow Plug System (Description and Operation),
Glow Plug System (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern.
2. Visually inspect for obvious signs of electrical damage.

Visual Inspection

Electrical
• Glow plug lamp • Fuses • Glow plug relays • Engine management control relay • Wiring harness(es) • Electrical connector(s) • Glow plug(s) • Engine Control Module (ECM)

3. If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the symptom chart.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Poor starting (extreme weather conditions)	• Glow plugs inoperative/inefficient • Fuel temperature too low	Check the glow plug harnesses at the glow plugs and at the connection to the main harness. Refer to the electrical guides. Check for glow plug DTCs. The fuel system recycles fuel until operating temperature is reached to reduce this possibility.
High cold-engine emissions	• After-glow phase inoperative	Check the glow plug harnesses at the glow plugs and at the connection to the main harness. Refer to the electrical guides. Check for glow plug DTCs. After-glow is designed to function at engine temperatures below 50 degrees C (122 degrees F), and below 2,500 rpm.
High cold-engine noise, vibration or harshness	• After-glow phase inoperative	Check the glow plug harnesses at the glow plugs and at the connection to the main harness. Refer to the electrical guides. Check for glow plug DTCs. After-glow is designed to function at engine temperatures below 50 degrees C (122 degrees F), and below 2,500 rpm.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Engine Control Module 3.0L Tdv6 (PCM) (100-00, Description and Operation).

Published: 11-May-2011

Glow Plug System - TDV6 3.0L Diesel - Glow Plugs

Removal and Installation

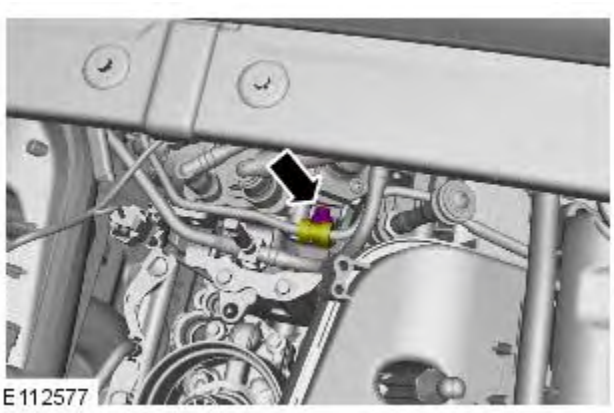
Removal

NOTES:

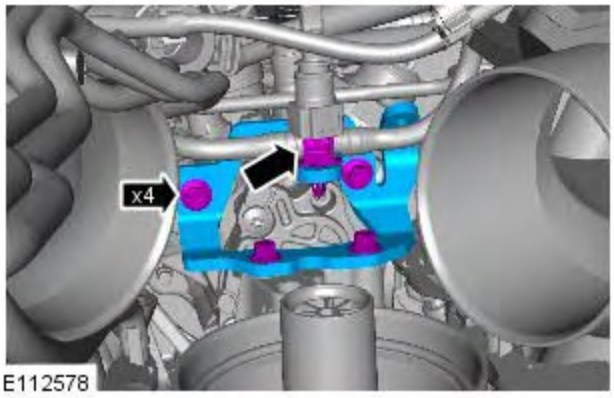
Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

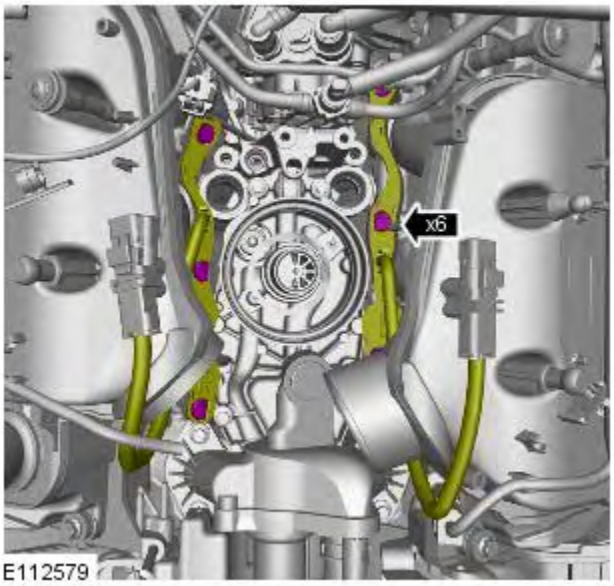
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: Intake Air Shutoff Throttle (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).
3. Refer to: Crankcase Vent Oil Separator (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).
4. Refer to: Oil Filter Element (303-01, Removal and Installation).



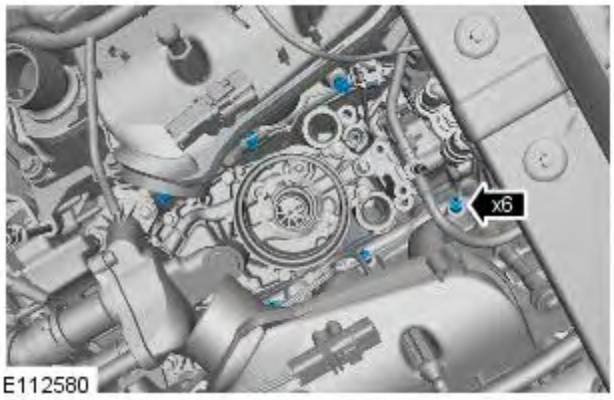
5. *Torque:* 10 Nm



6. *Torque:* 10 Nm



7. CAUTION: Take extra care not to damage the component.



8. *Torque:* 10 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Engine Emission Control - TDV6 3.0L Diesel -

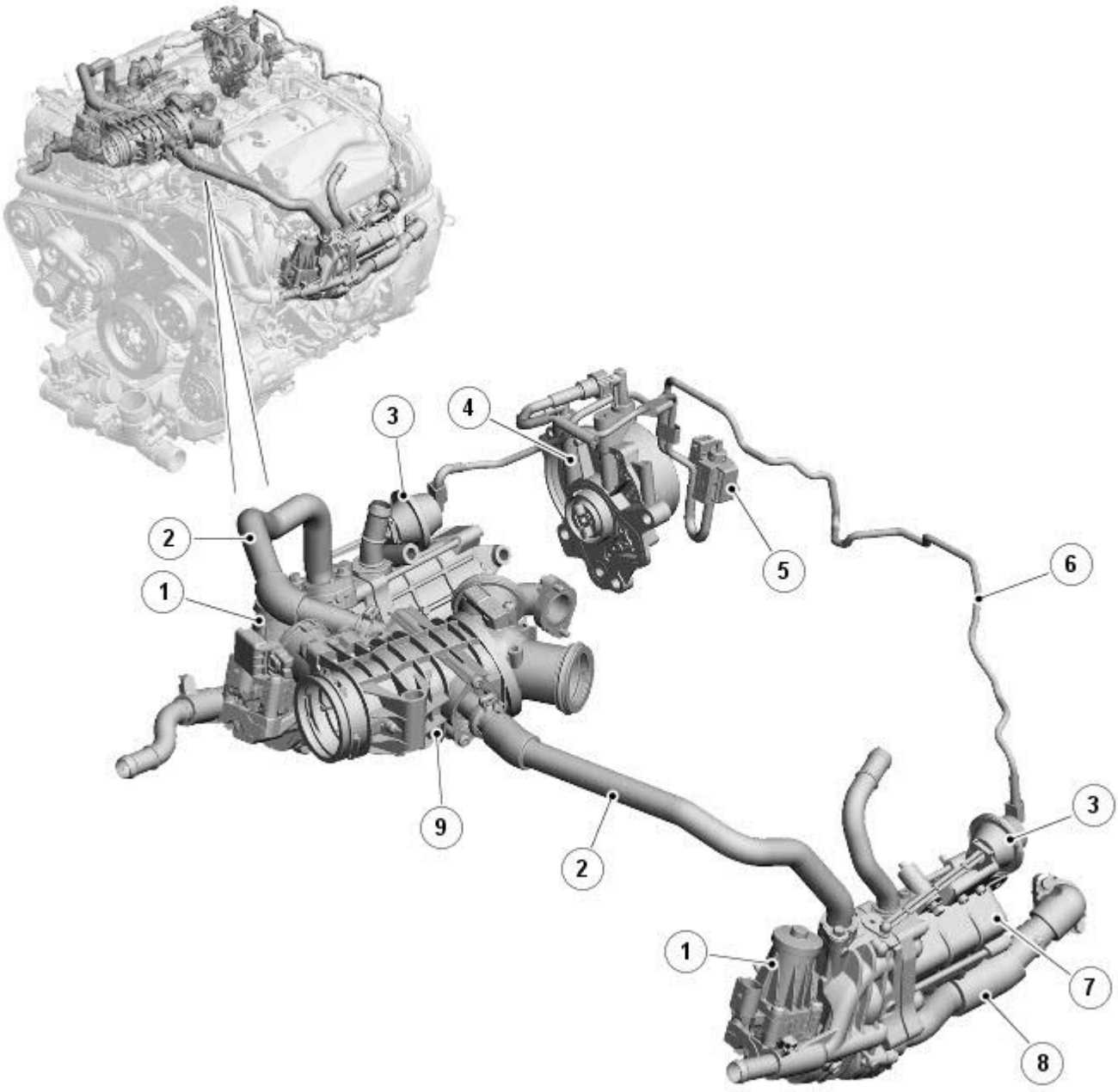
Description	Nm	lb-ft	lb-in
Exhaust gas recirculation (EGR) valve to cylinder head retaining bolts	10	-	89
EGR valve to EGR cooler retaining bolts	10	-	89
EGR valve tube to exhaust manifold retaining bolts	10	-	89
EGR valve cooler mounting bracket retaining bolt	10	-	89
EGR valve outlet tube to EGR valve retaining bolts	10	-	89
EGR valve outlet tube to timing cover retaining bolt	4	-	35
Fuel filter mounting bracket retaining M8 nuts	27	20	-
Fuel filter mounting bracket retaining M6 bolt	2	-	18

Published: 11-May-2011

Engine Emission Control - TDV6 3.0L Diesel - Engine Emission Control - Component Location

Description and Operation

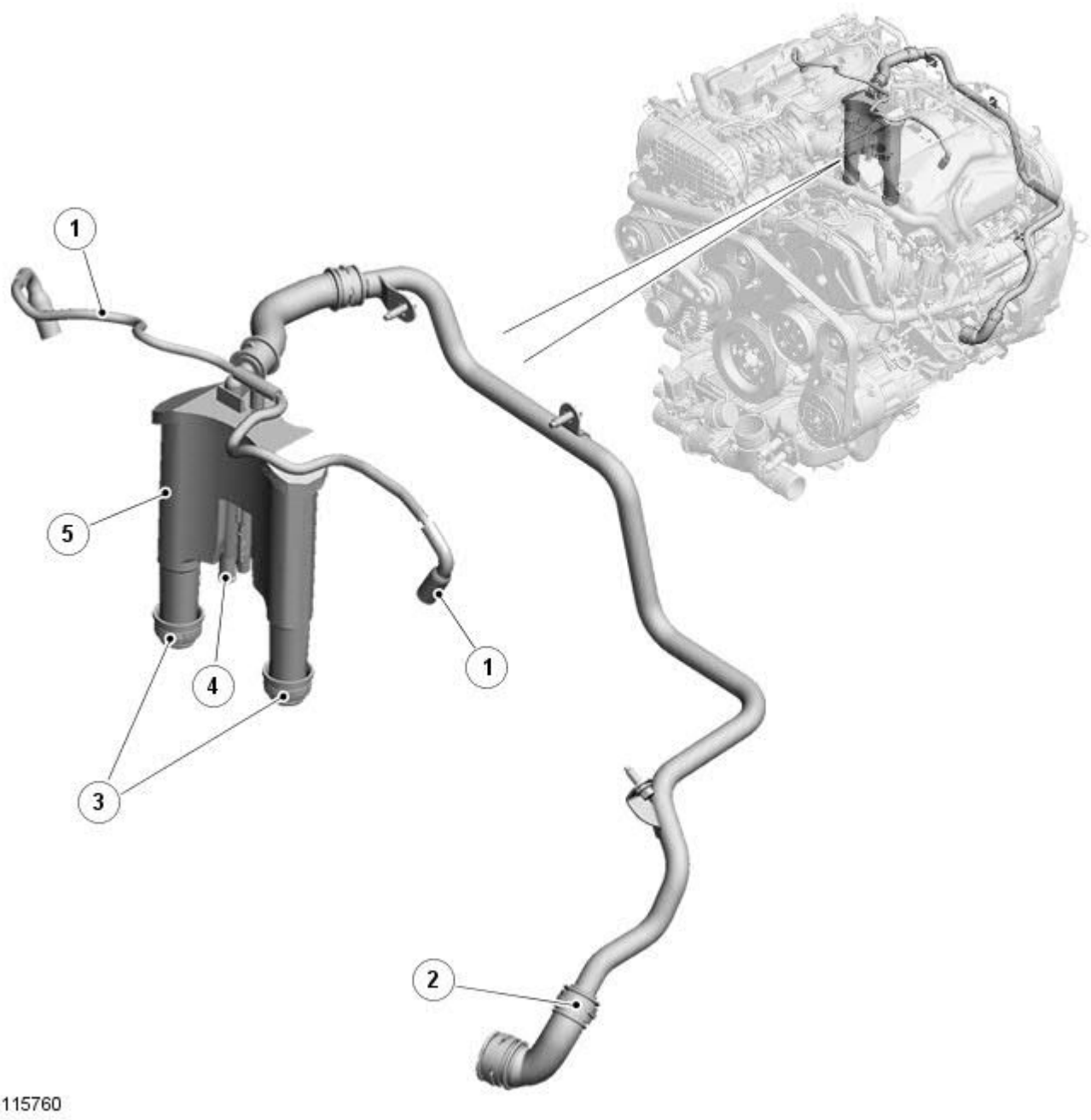
Exhaust Gas Recirculation (EGR) Component Location



E115759

Item	Description
1	EGR (exhaust gas recirculation) valve motor
2	EGR outlet pipe
3	By-pass valve vacuum actuator
4	Vacuum pump
5	Solenoid valve
6	Vacuum pipe (2 off)
7	EGR cooler
8	EGR inlet pipe from exhaust manifold
9	Throttle intake manifold

Crankcase Ventilation Component Location



Item	Description
1	Cylinder ventilation scavenger hose (2 off)
2	Crankcase gas to air intake hose
3	Crankcase breather cylinder block connections
4	Oil drain to oil filter housing
5	Crankcase breather and oil separator

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Engine Emission Control - TDV6 3.0L Diesel - Engine Emission Control - Overview

Description and Operation

OVERVIEW

Exhaust Gas Recirculation (EGR) System

The EGR (exhaust gas recirculation) system is used to control the amount of exhaust gas being recirculated in order to reduce exhaust emissions and combustion noise. EGR is enabled when the engine is at normal operating temperature and under cruising conditions.

Crankcase Ventilation System

The crankcase ventilation system ensures that all gasses emitted from the crankcase during engine running are separated from any oil particles and recirculated via the clean air induction system.

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Engine Emission Control - TDV6 3.0L Diesel - Engine Emission Control - System Operation and Component Description

Description and Operation

System Operation

EXHAUST GAS RECIRCULATION (EGR) SYSTEM OPERATION

If small volumes of fuel are injected into a combustion chamber full of pure air, the effect is to create a very lean mixture. This burns at a high temperature, which in turn causes the excess oxygen in the mixture to combine with the naturally occurring nitrogen in the air to create nitrogen oxides (NOx), a noxious class of pollutants associated with acid rain. This is a particular problem for diesel engines at low to medium loads (as the engine has no throttle, the cylinder is replenished with a full charge of 'air' at every induction stroke). Exhaust gas is blended into the intake air charge to create the cylinder charge. As the exhaust gas effectively contains no oxygen, it prevents the formation of a very lean mixture, so lowering combustion temperatures and minimizing the formation of NOx.

At low engine speeds and loads, over 50 percent of the cylinder charge can be made up of recycled exhaust gas. This is routed directly from the exhaust manifold and passes through a gas-water heat exchanger before being supplied to the inlet manifold. The volume of exhaust gas added to the intake charge is regulated by an electronically controlled EGR (exhaust gas recirculation) valve, actuated according to precise engine speed and load by the engine management system.

CRANKCASE VENTILATION SYSTEM OPERATION

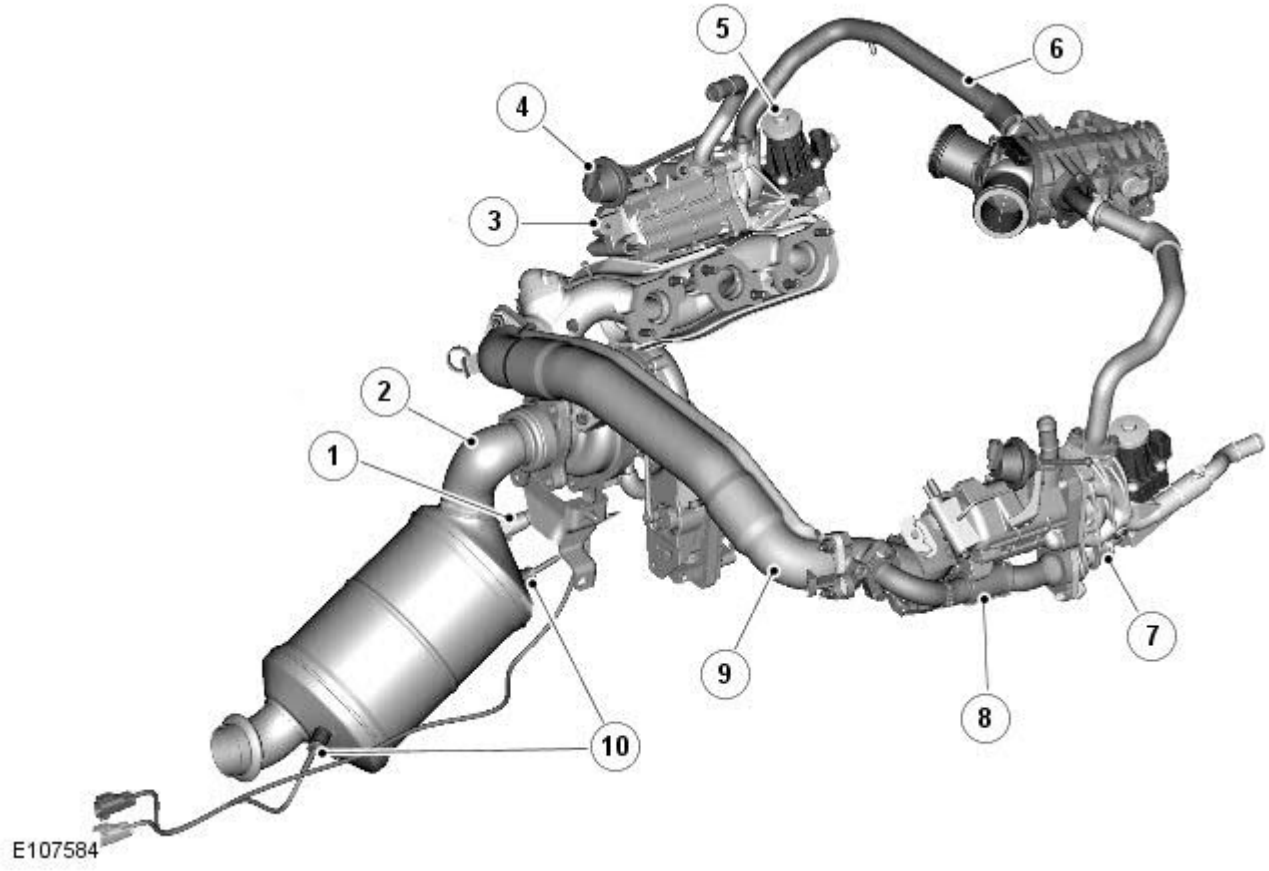
Crankcase gasses are drawn into the oil separator unit from the crankcase and the cylinder head covers (both banks) by a vacuum created by a connection into the air induction system.

The crankcase gasses are circulated around the oil separator where the gas and oil are separated. The gas is returned to the inlet side of the air induction system prior to the primary turbocharger. The collected oil is drained down to the sump via the oil cooler and filter housing on the cylinder block.

Component Description

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

EGR System Control Components



Item	Description
1	HO2S (heated oxygen sensor)
2	LH (left-hand) exhaust pipe
3	EGR cooler
4	By-pass valve vacuum actuator
5	EGR valve motor
6	EGR outlet pipe
7	EGR cooler and valve housing
8	EGR inlet pipe
9	Exhaust system cross-over pipe
10	Pre and post catalyst exhaust gas temperature sensors

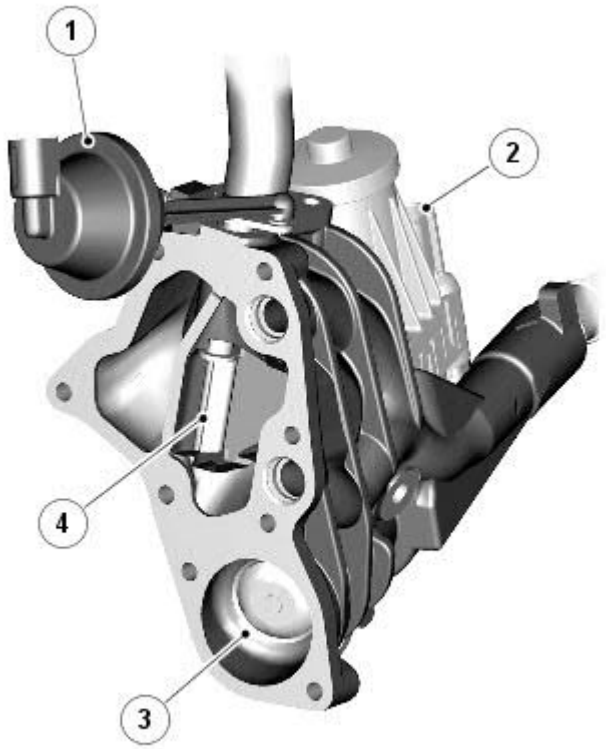
The EGR system comprises an EGR cooler and housing assembly which is bolted to the cylinder head, above the exhaust manifold. Each EGR assembly comprises an EGR cooler, a by-pass housing, a by-pass valve motor and a by-pass valve vacuum actuator.

A pipe is connected to the exhaust manifold and directs exhaust gasses into the by-pass housing. A second pipe from the by-pass housing connects to the throttle intake manifold and passes the cooled exhaust gasses into the intake manifold to mix with the clean air entering the engine from the air filter.

The EGR cooler is attached to the by-pass housing with a gasket and 5 screws. The by-pass housing has an engine coolant connection which allows coolant to flow from the engine oil cooler into the by-pass housing. Engine coolant flows from the by-pass housing into a water jacket within the cooler which in cools the exhaust gasses by heat transfer within the cooler. The engine coolant flows from the cooler through an outlet pipe and is passed back into the cooling system via the heater core.

The by-pass housing contains the EGR valve motor, the EGR valve and the by-pass valve.

By-pass Housing Components



E107585

Item	Description
1	By-pass valve vacuum actuator
2	EGR valve motor
3	EGR valve
4	By-pass valve

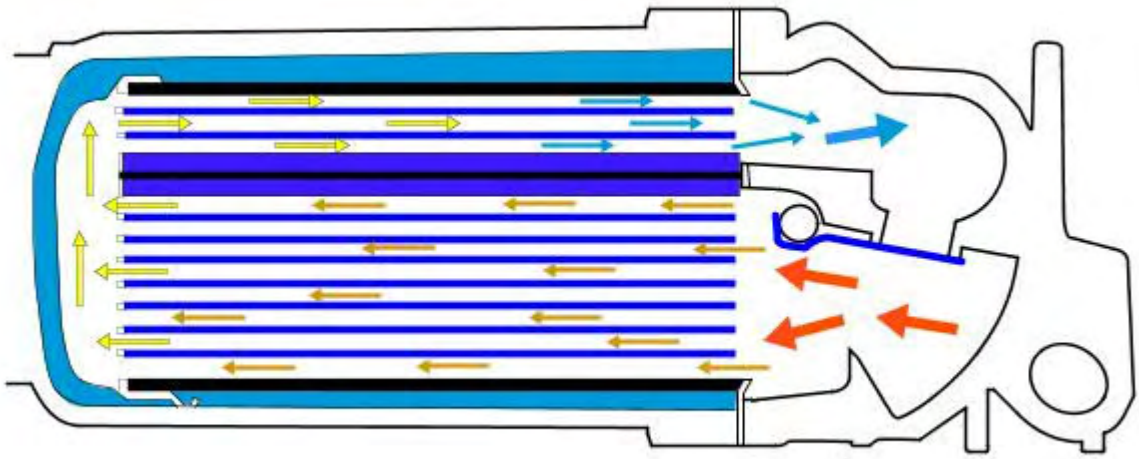
By-Pass Valve

The by-pass valve is a vacuum operated valve which directs the flow of exhaust gasses either through the EGR cooler or by-passes the cooler and directs the gasses directly to the intake manifold.

A vacuum actuator is located on a bracket attached to each EGR cooler. The actuator receives a vacuum which is produced by the vacuum pump located at the rear of the engine. The vacuum actuator is connected to the by-pass valve within the by-pass housing by a connecting rod.

The vacuum supply to the actuator is controlled by the ECM (engine control module). When by-pass control is required, the ECM energizes a vacuum solenoid valve which applies vacuum to the vacuum actuators. The vacuum causes the actuators to move the connecting rods in a linear direction. The linear movement of the rod is transferred to rotary movement of the by-pass valve within the by-pass housing.

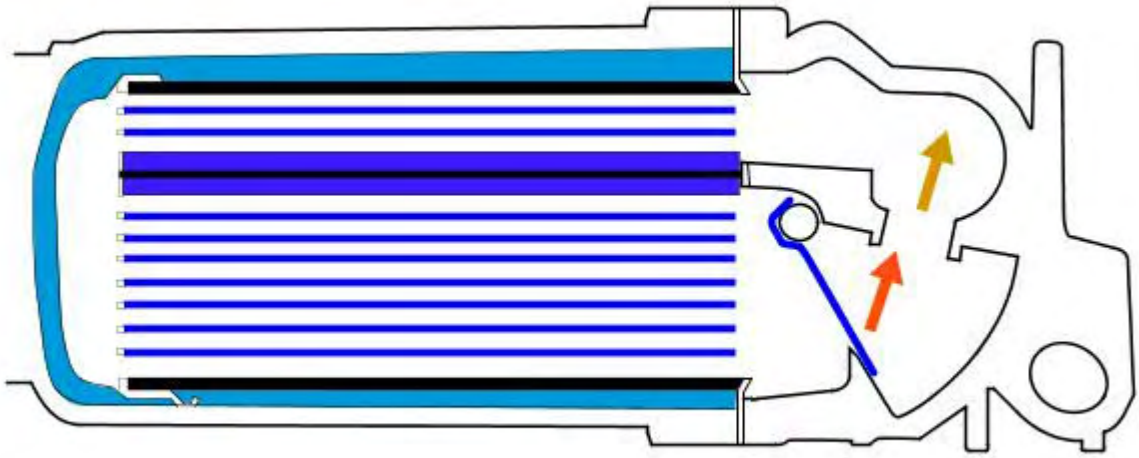
By-Pass Valve Closed



E112407

When the by-pass valve is closed, exhaust gasses are directed through the cooler before being passed to the intake manifold.

By-Pass Valve Open



E112408

When the by-pass valve is open, exhaust gasses are passed directly through the by-pass housing into the intake manifold with no cooling applied to the gasses.

EGR Valve

The EGR valve motor is located on the by-pass housing. A 5 pin connector provides the power, ground and ECM signal and feedback connections for the motor.

The motor is secured to the by-pass housing with 4 torx screws. A pinion gear on the motor spindle drives a geared rack which

is connected to the EGR valve in the by-pass housing.

The motor is controlled by the ECM which provides power supply to operate the motor as required. A 5 Volt feedback signal is passed to the ECM which is used to establish motor position for precise control.

CRANKCASE VENTILATION

The crankcase ventilation system comprises an oil breather and separator. The breather receives crankcase directly from the crankcase and also from the cylinder heads.

The breather is connected to the top of the cylinder block with two seals. Two scavenge pipes located on the top of the breather are connected to the cylinder head covers. A breather pipe is connected from the top of the breather to the clean air intake hose at a point prior to the primary turbocharger.

Clean air being drawn into the engine when it is running creates a vacuum in the breather pipe. This vacuum in turn creates a vacuum in the oil breather and separator which draws gasses from the crankcase and cylinder heads into the breather. These gasses are circulated around the breather, allowing oil particles to be separated from the gas. The gasses are drawn into the breather pipe and are mixed with the clean air being drawn into the turbocharger.

The oil particles separated from the gasses accumulate in the oil separator and drain through a third connection at the bottom of the oil breather and separator, through a connection on the oil cooler housing to the oil pan.

Published: 11-May-2011

Engine Emission Control - TDV6 3.0L Diesel - Engine Emission Control

Diagnosis and Testing

Principles of Operation

For a detailed description of the engine emission system and operation, refer to the relevant Description and Operation section in the workshop manual. REFER to: (303-08A Engine Emission Control - TDV6 3.0L Diesel)

Engine Emission Control (Description and Operation),
Engine Emission Control (Description and Operation),
Engine Emission Control (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
• Engine breather hoses • Oil separator • Exhaust gas recirculation (EGR) pipes (check for cracks) • EGR valve(s) • EGR cooler(s)	• Fuse(s) • Wiring harness • Loose or corroded electrical connector(s) • Intake air shut off throttle • Exhaust gas recirculation (EGR) valve(s) • Engine Control Module (ECM)

3. If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the symptom chart.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Difficult to start Poor/Erratic idle Lack of power when accelerating	• Exhaust gas recirculation (EGR) valve stuck open	Check the Exhaust gas recirculation (EGR) valve.
Engine stops/stalls	• Exhaust gas recirculation (EGR) valve stuck open • Breather system disconnected/restricted/blocked	Check the Exhaust gas recirculation (EGR) valve. Check the engine breather system. Check the oil separator. Check for Exhaust gas recirculation (EGR) DTCs.
Excessive fuel consumption Excessive black smoke Excessive emissions	• Exhaust gas recirculation (EGR) valve stuck open • Exhaust gas recirculation (EGR) not operating • Breather system restricted/blocked	
Excessive blow-by	• Breather system restricted/blocked	Check the engine breather hoses. Check the oil separator.
Engine oil leaks	• Breather system restricted/blocked	Check the engine breather hoses. Check the oil separator.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Engine Control Module 3.0L Tdv6 (PCM) (100-00, Description and Operation).

Published: 11-May-2011

Engine Emission Control - TDV6 3.0L Diesel - Crankcase Vent Oil Separator

Removal and Installation

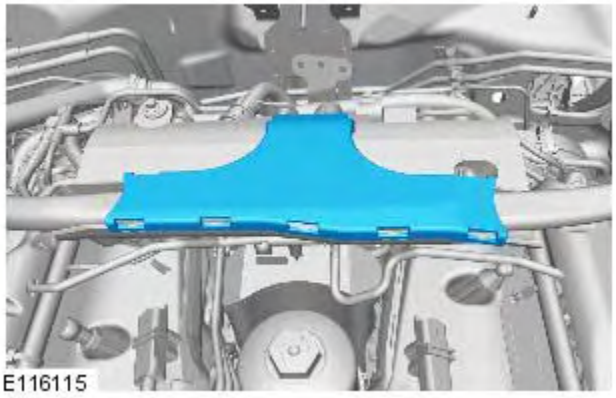
Removal

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).



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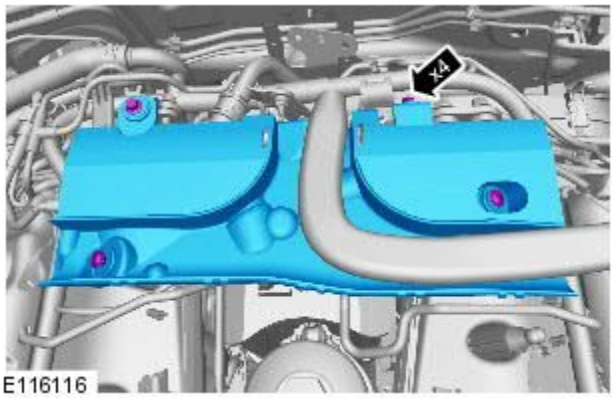
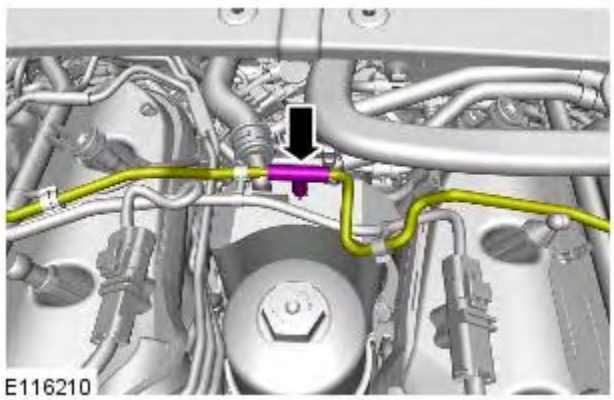


3. *Torque:* 10 Nm



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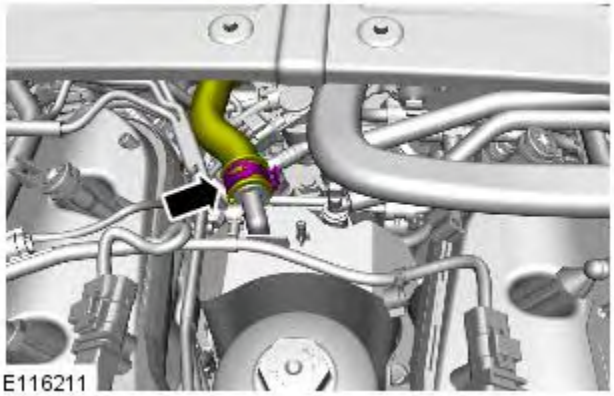

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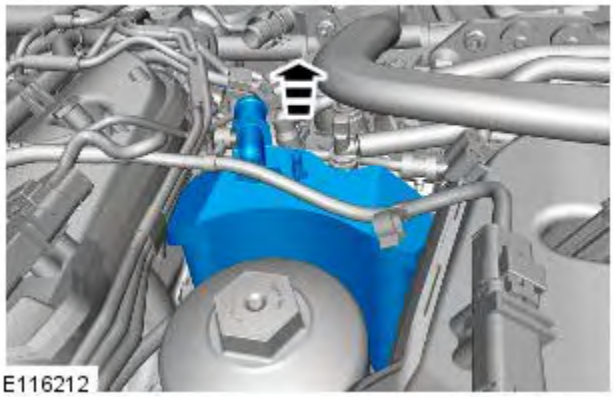


6. CAUTIONS:

   Discard the seals.

   Make sure that all openings are sealed.

Installation

1. To install, reverse the removal procedure.

Published: 14-Nov-2013

Engine Emission Control - TDV6 3.0L Diesel - Exhaust Gas Recirculation (EGR) Valve LH

Removal and Installation

Removal

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

3. Refer to: Cooling System Partial Draining, Filling and Bleeding (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).

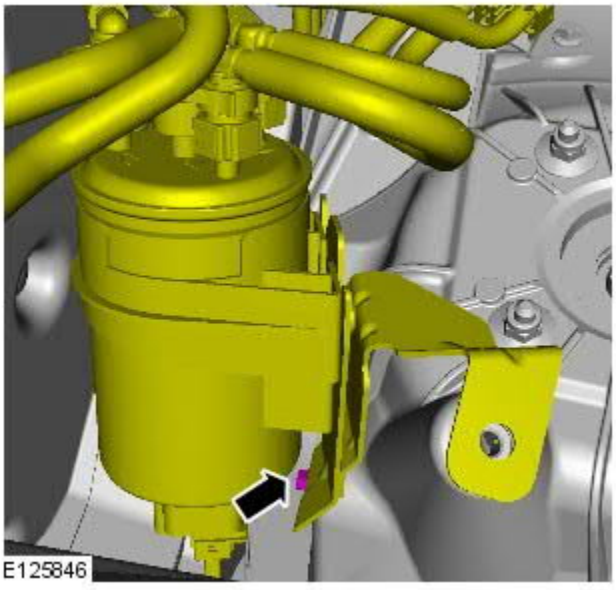
4. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

5. Refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel, Removal and Installation).

6. Refer to: Secondary Bulkhead Panel LH (501-02 Front End Body Panels, Removal and Installation).

7. Refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube LH (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).

8.



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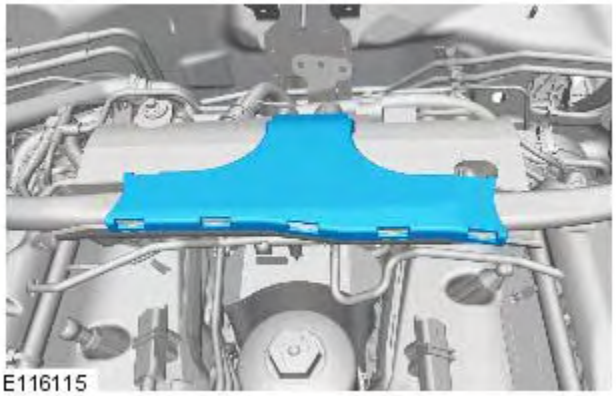

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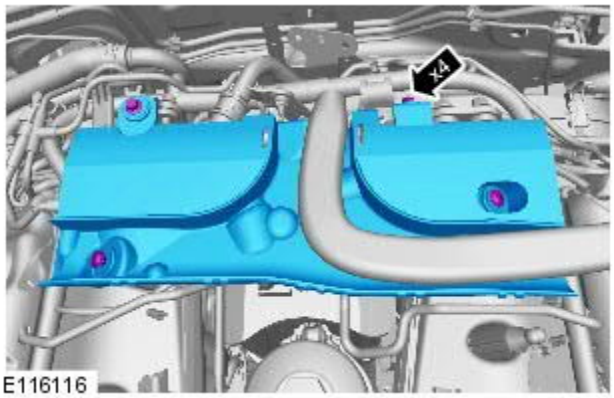

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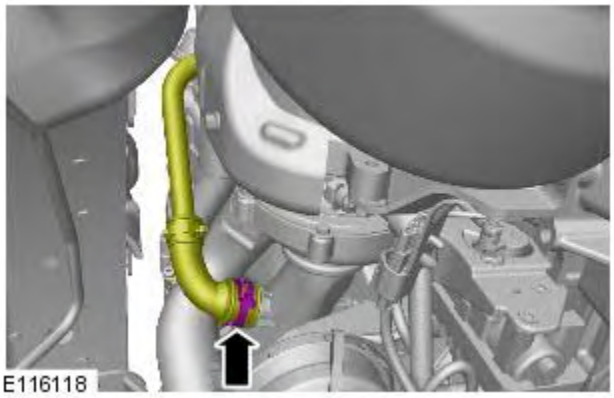
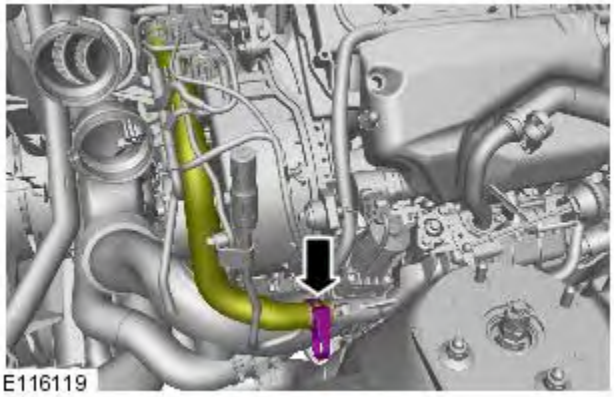
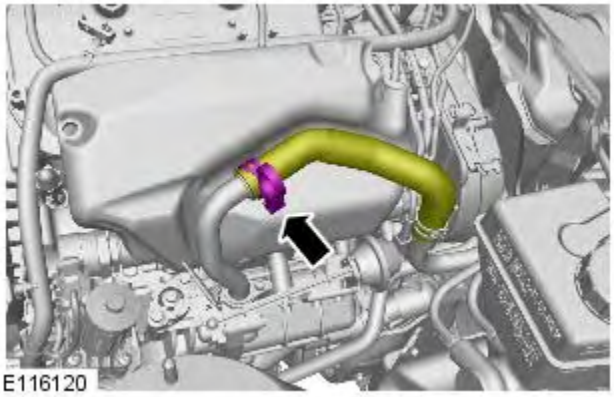
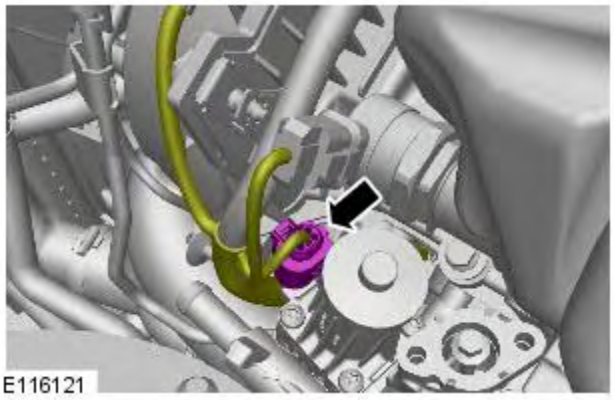


12. CAUTION: Be prepared to collect escaping coolant.





13. CAUTION: Be prepared to collect escaping coolant.



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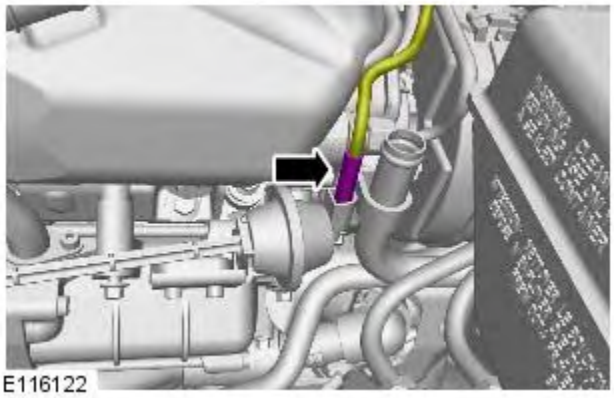

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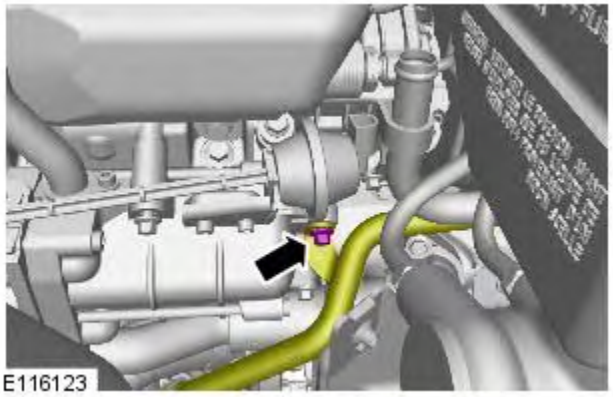

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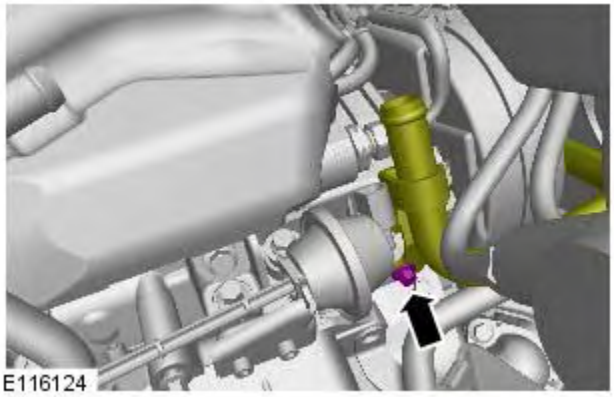

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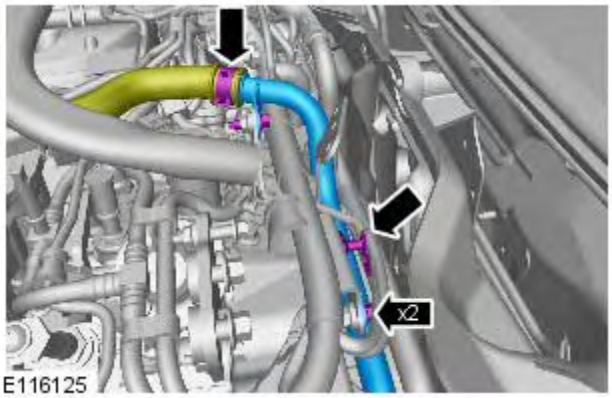
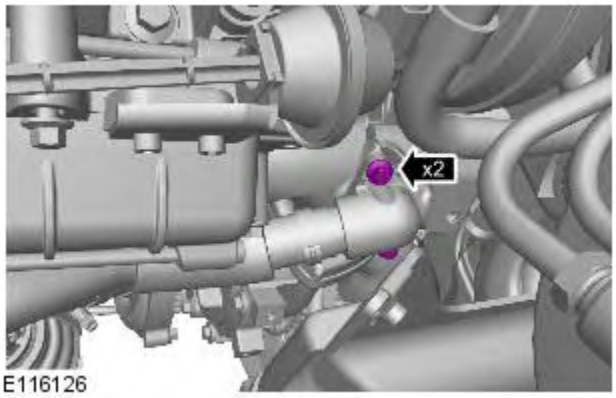


19. NOTE: Discard the gasket.



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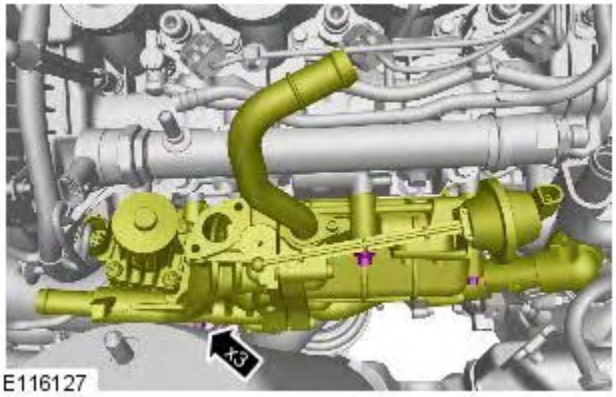
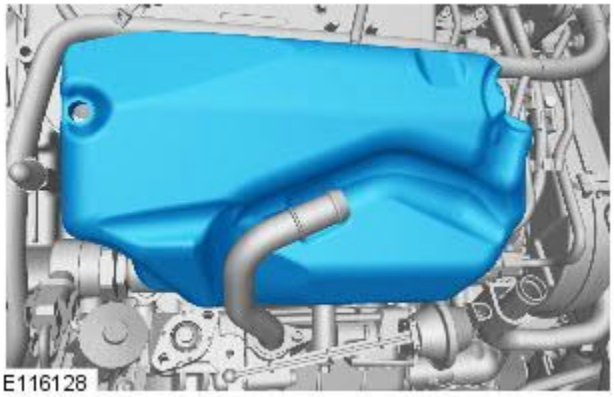
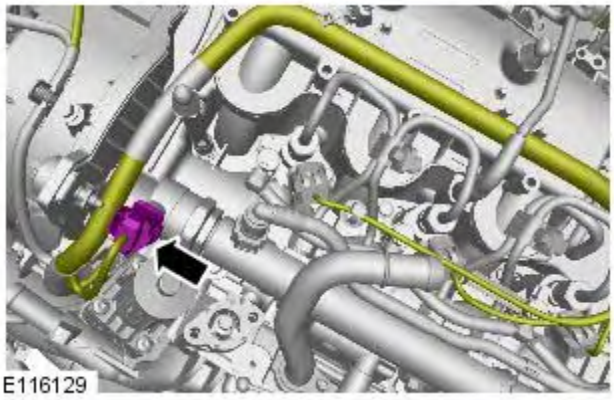
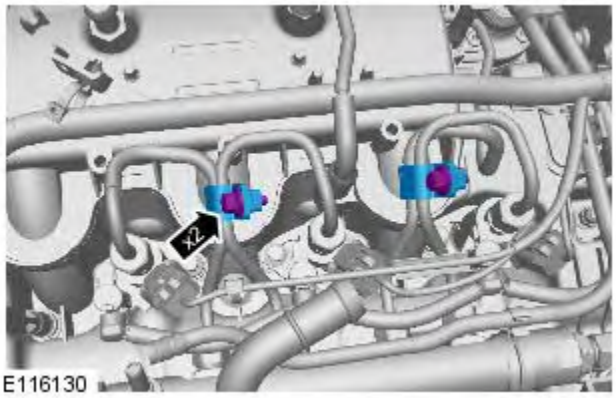




21. NOTE: Left-hand shown, right-hand similar.

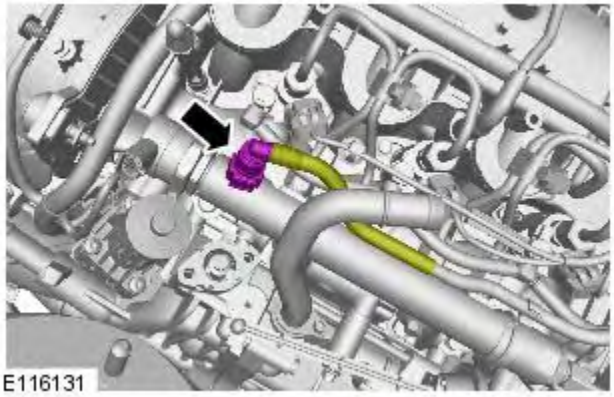


22.

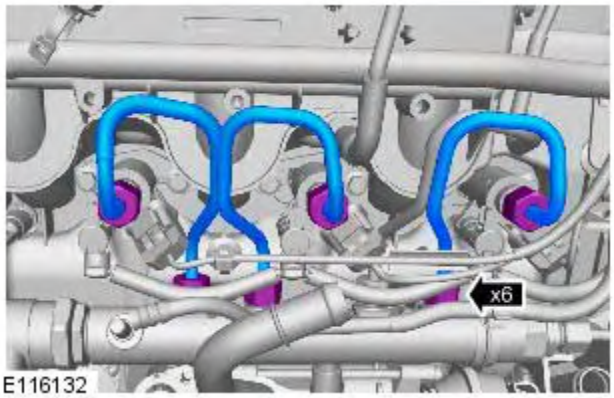


23.

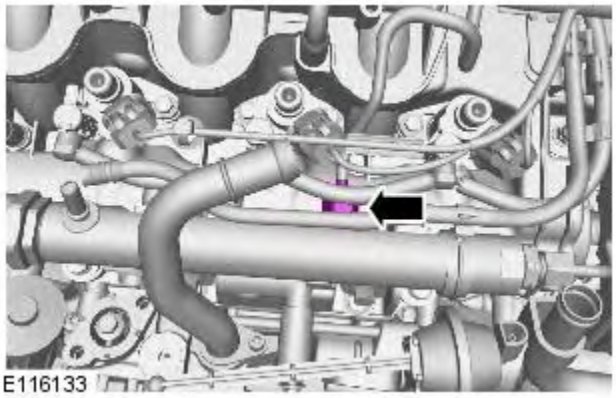
24. Refer to: Fuel Injection Component Cleaning (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, General Procedures).



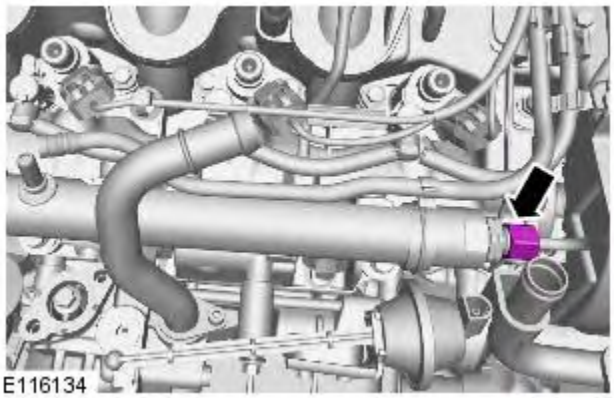
25. CAUTION: Be prepared to collect escaping fuel.



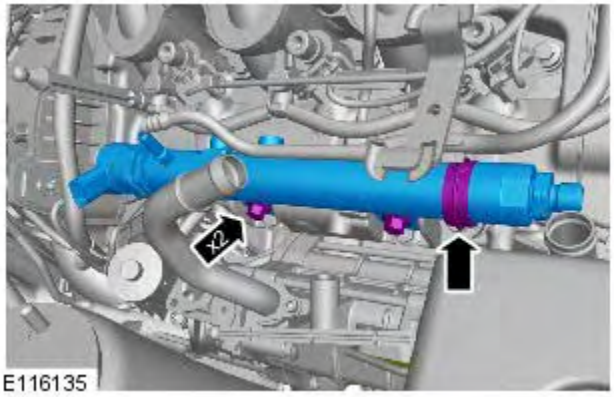
26. CAUTION: Be prepared to collect escaping fuel.



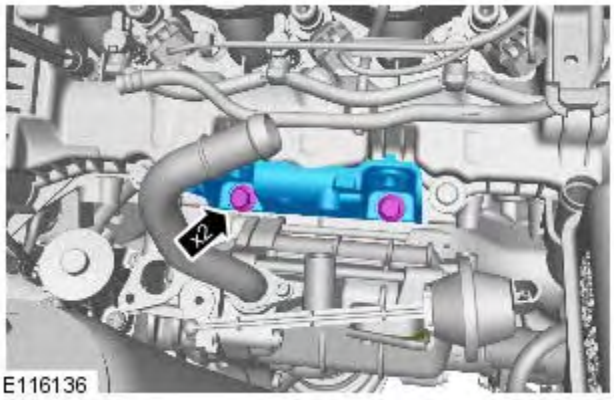
27. CAUTION: Be prepared to collect escaping fuel.



28. CAUTION: Be prepared to collect escaping fuel.



29. CAUTION: Be prepared to collect escaping fuel.



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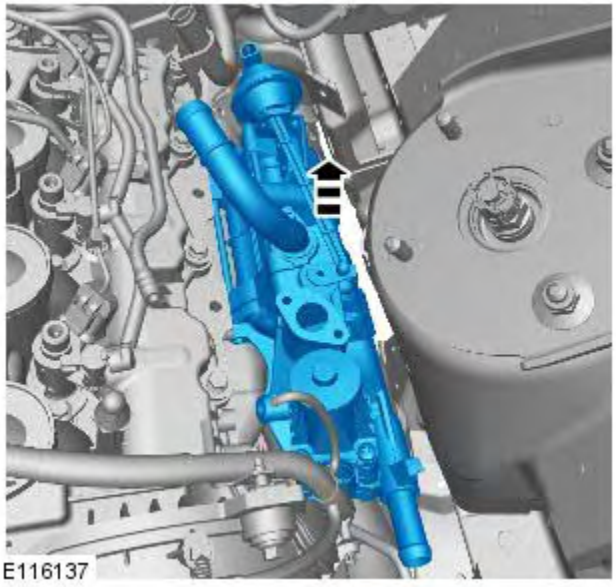
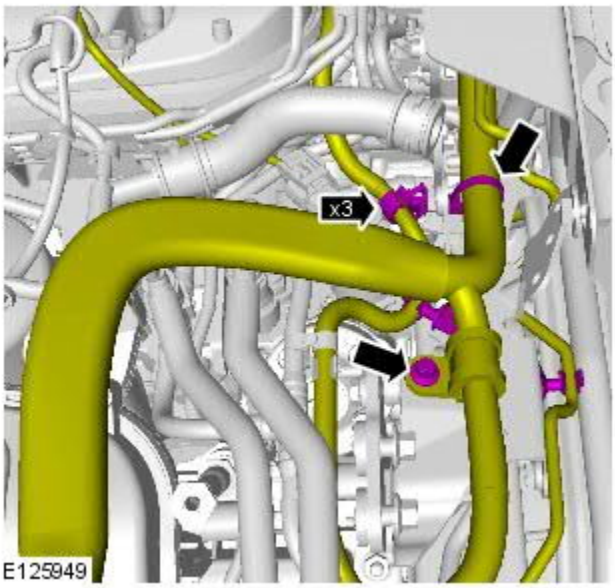
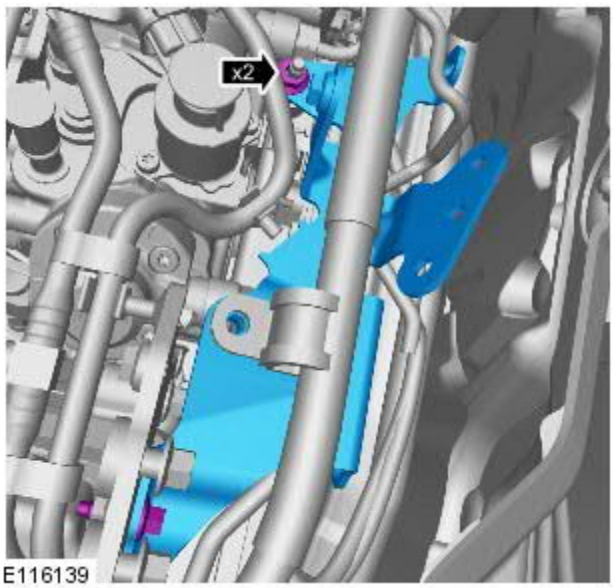


31.

32.



33.



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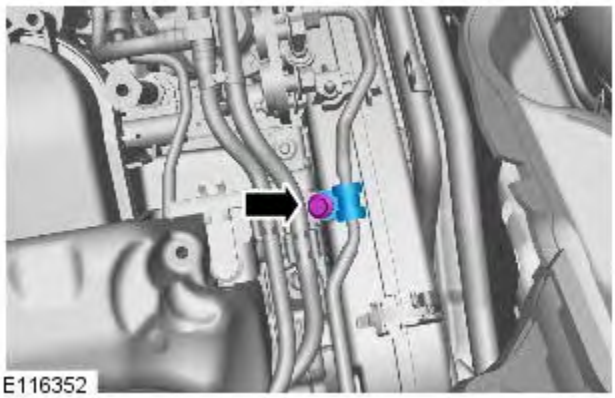
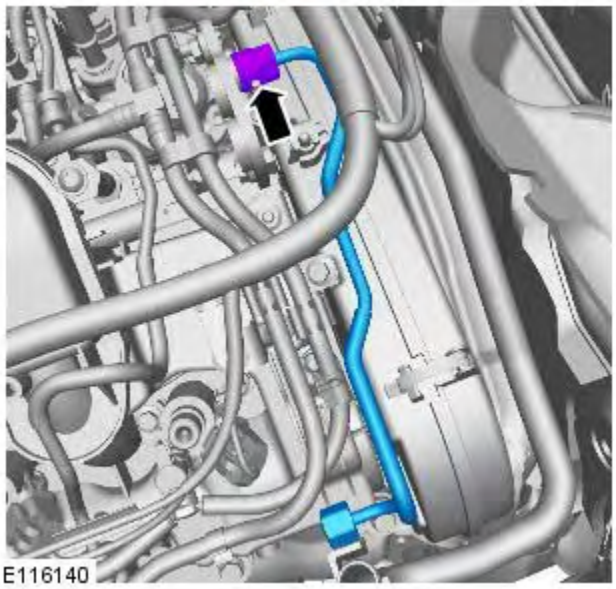
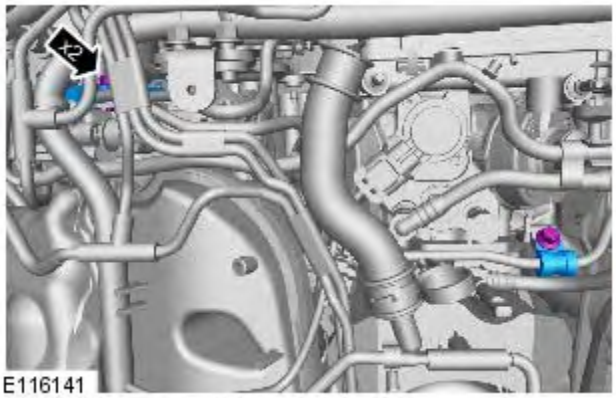


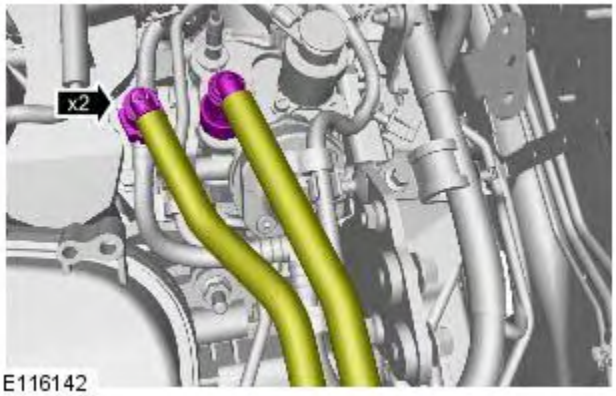

E116140

35. CAUTION: Be prepared to collect escaping fuel.



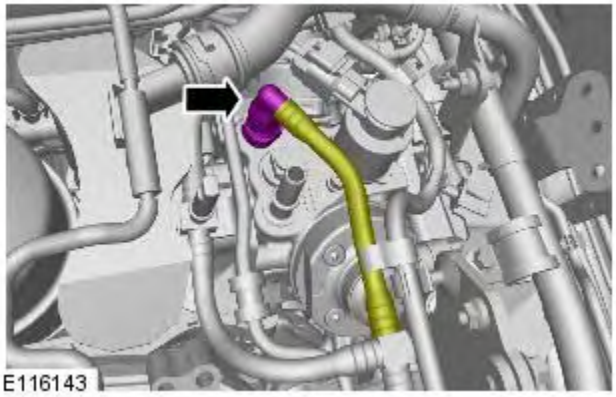
E116141

36.

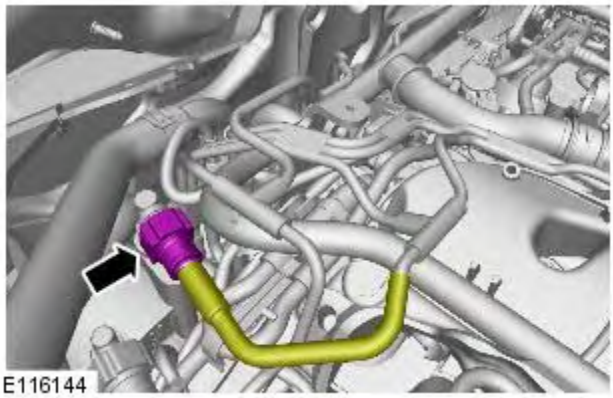


E116142

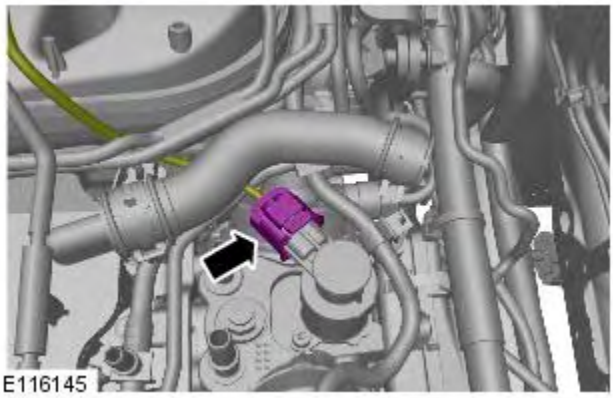
37. CAUTION: Be prepared to collect escaping fuel.



38. CAUTION: Be prepared to collect escaping fuel.



39.



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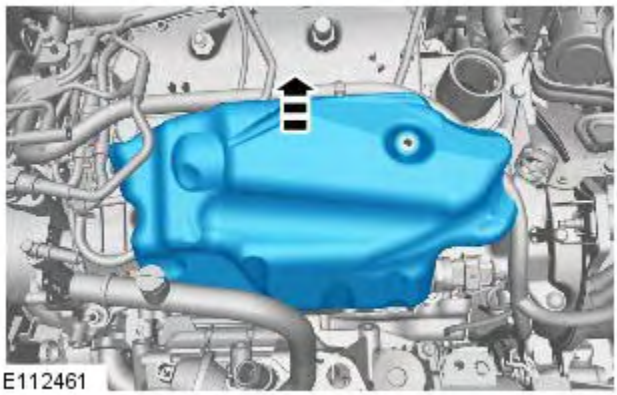
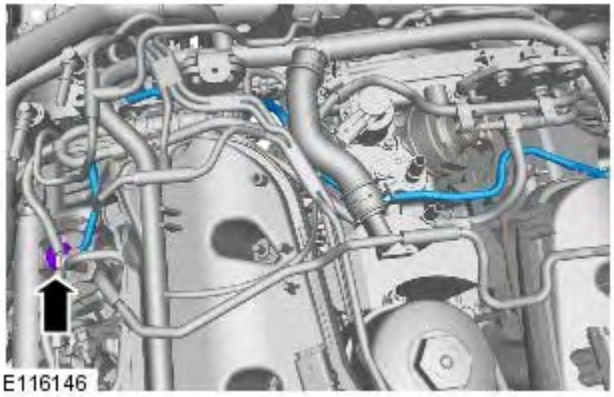
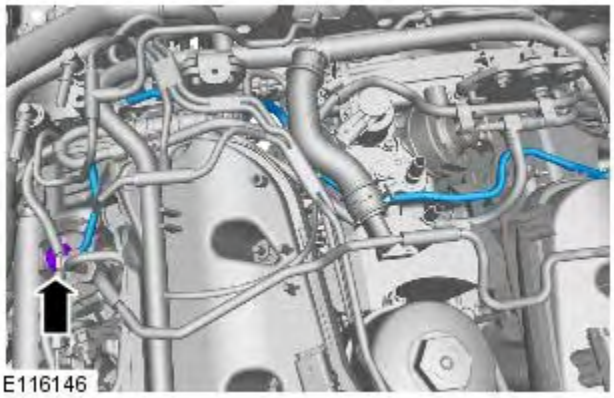


41.



42. CAUTION: Be prepared to collect escaping fuel.

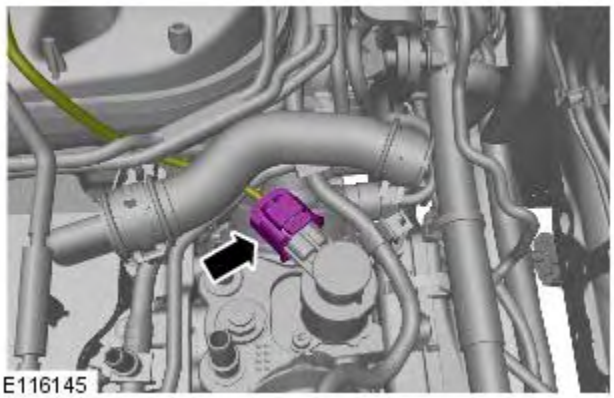
Installation



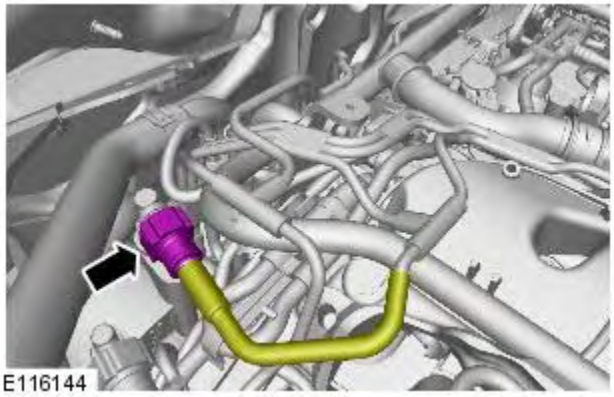
1. CAUTIONS:

   Make sure that a new component is installed.

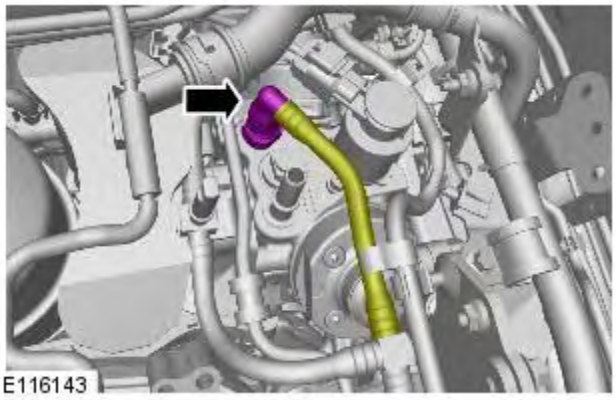
   Tighten the fuel supply line unions finger tight.



2.



3.



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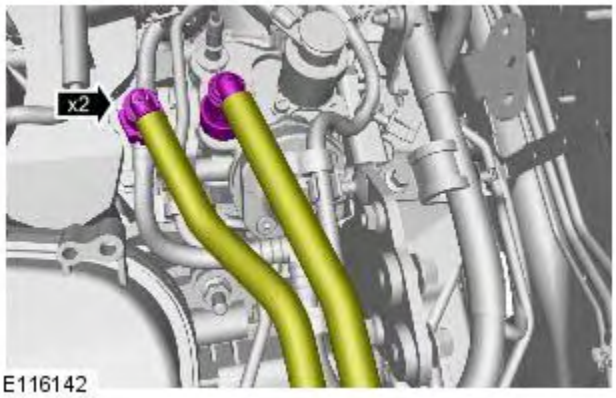

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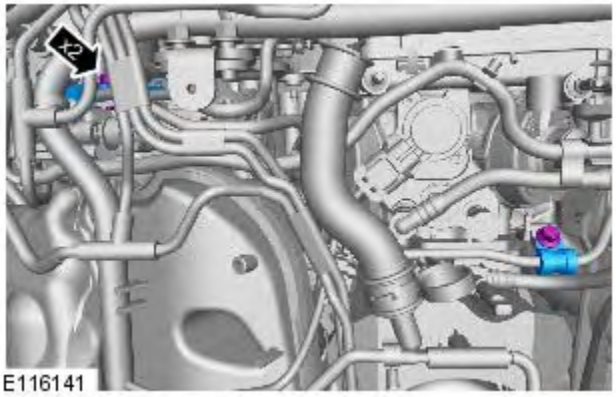
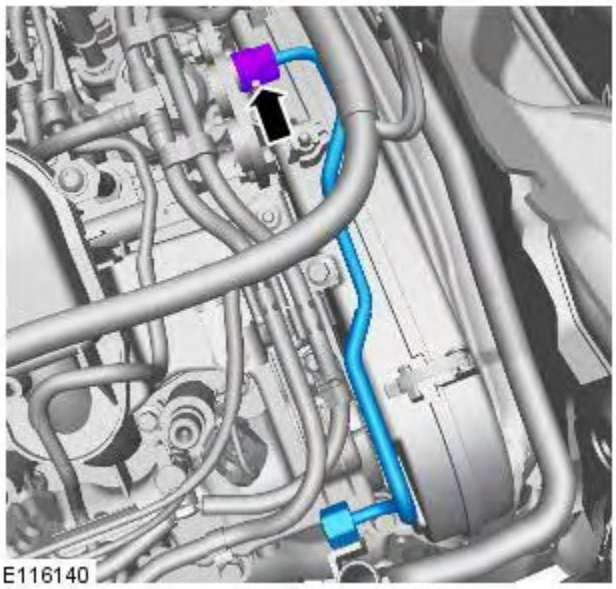


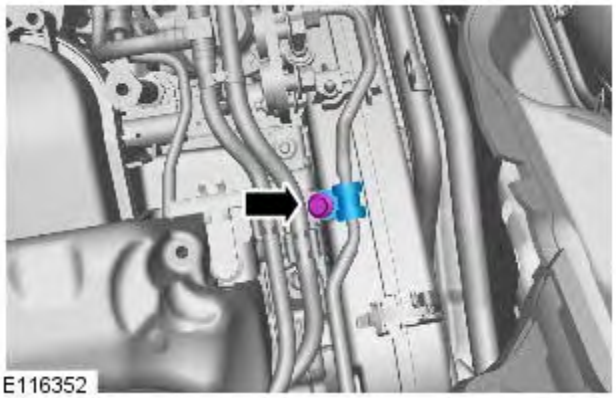
6. CAUTION: Only tighten the bolt finger-tight at this stage.


E116140

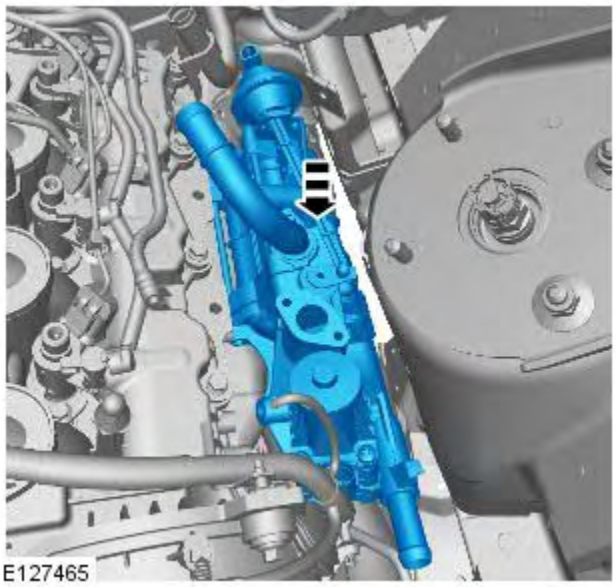
7. CAUTIONS:

   Make sure that a new component is installed.

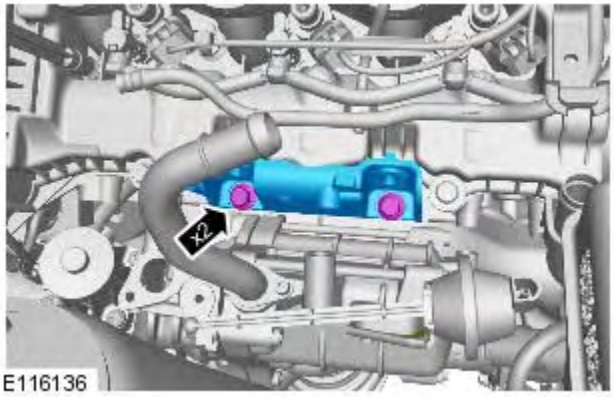
   Tighten the fuel supply line unions finger tight.


E116352

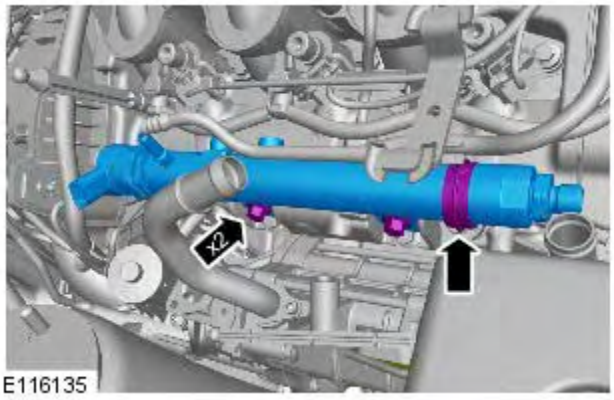
8. CAUTION: Only tighten the bolt finger-tight at this stage.


E127465

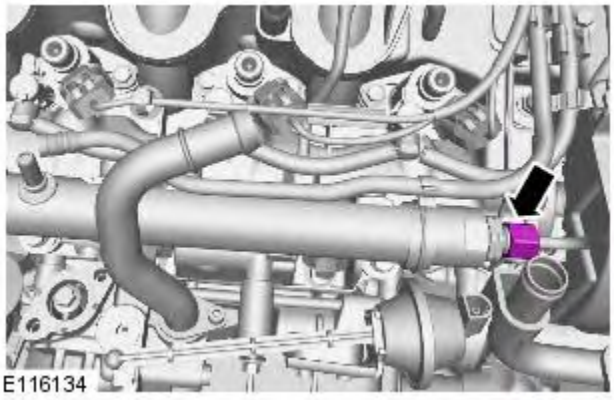
9.



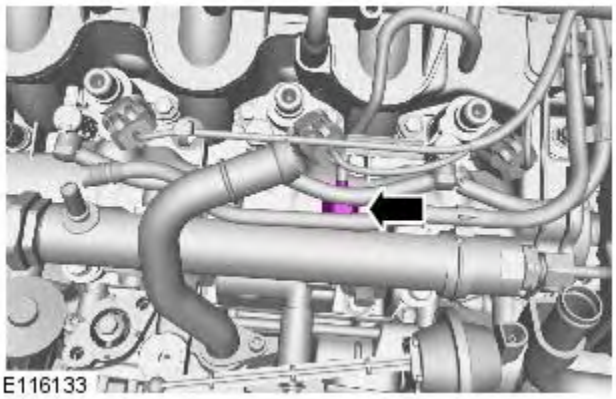
10. *Torque:* 24 Nm



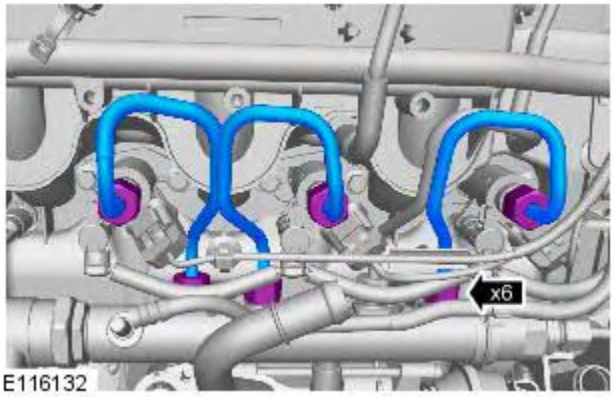
11. *Torque:* 24 Nm



12. CAUTION: Tighten the fuel supply line unions finger tight.



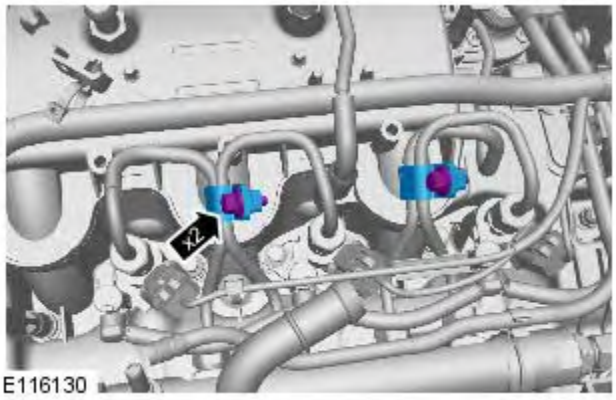
13. CAUTION: Tighten the fuel supply line unions finger tight.



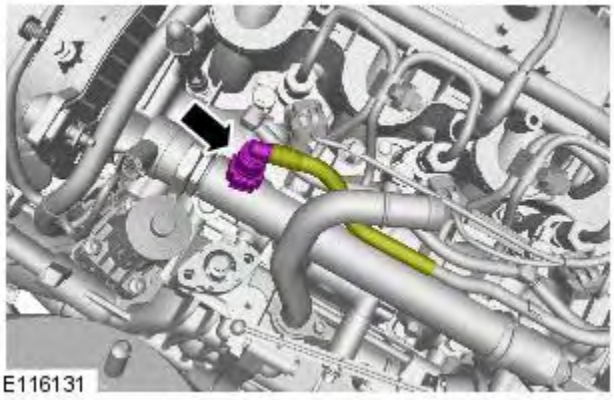
14. CAUTIONS:

Make sure that a new component is installed.

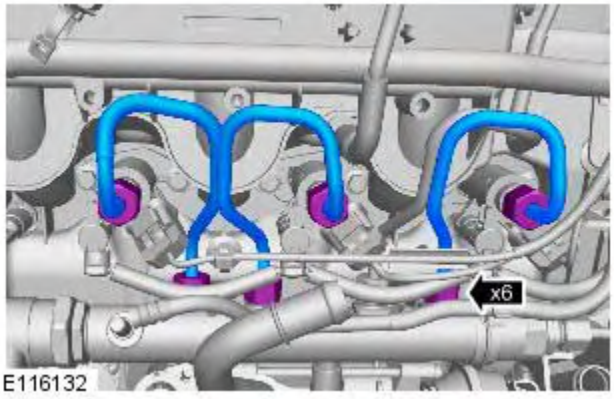
Tighten the fuel supply line unions finger tight.



15. CAUTION: Only tighten the bolt finger-tight at this stage.

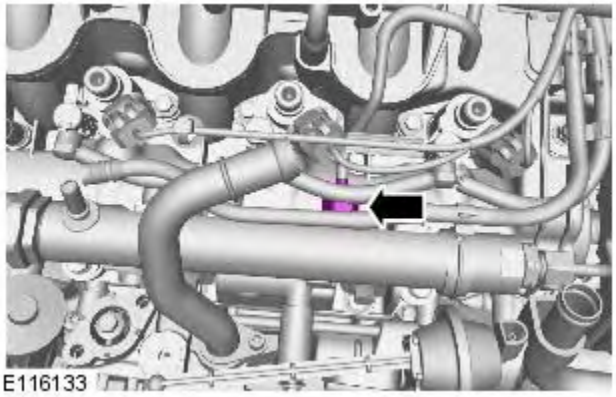


16.

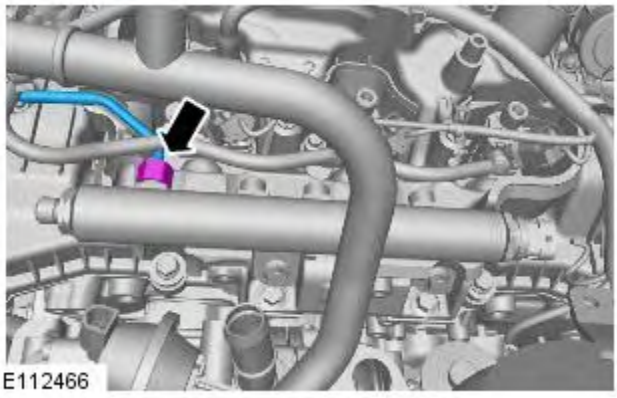


17.

- Stage 1:Tighten the high-pressure fuel supply line unions at the fuel rail to 15Nm.
- Stage 2: Tighten the high-pressure fuel supply line unions at the injector to 15Nm.

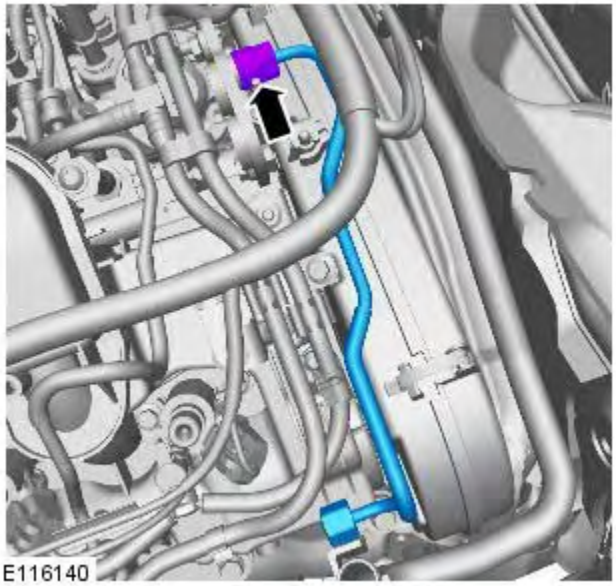

E116133

18. Tighten the high-pressure fuel lines union to 15Nm.

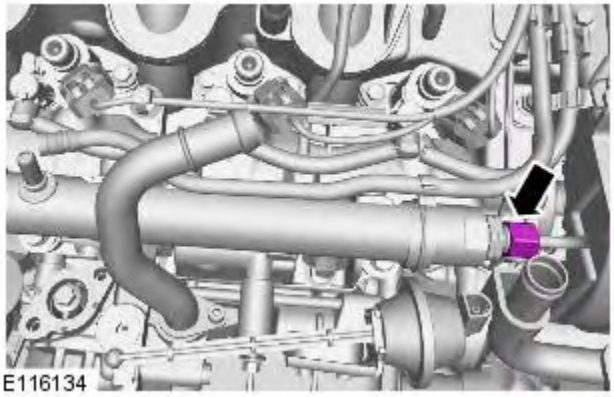

E112466

19. CAUTION: Make sure that a new component is installed.

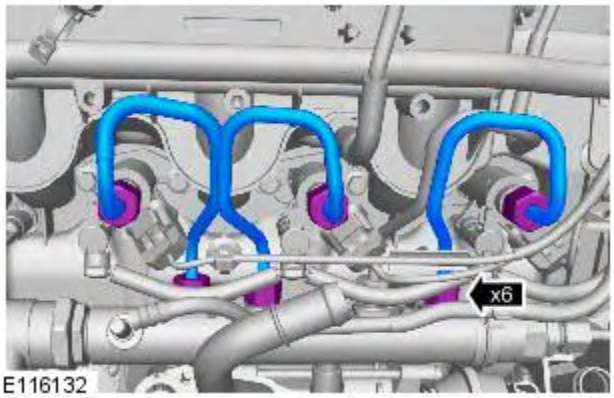
    Tighten the high-pressure fuel lines union to 15Nm.


E116140

20. Tighten the high-pressure fuel lines union to 15Nm.

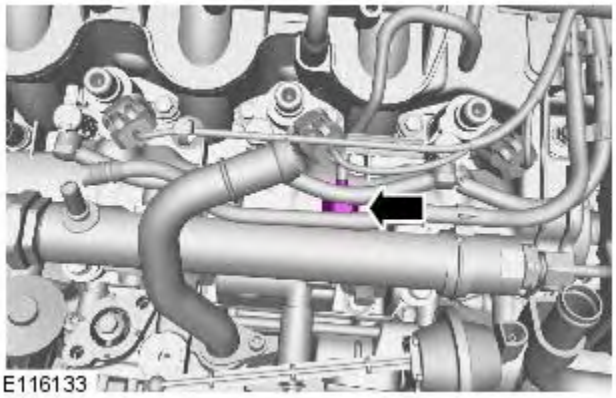


21. Tighten the high-pressure fuel lines union to 15Nm.

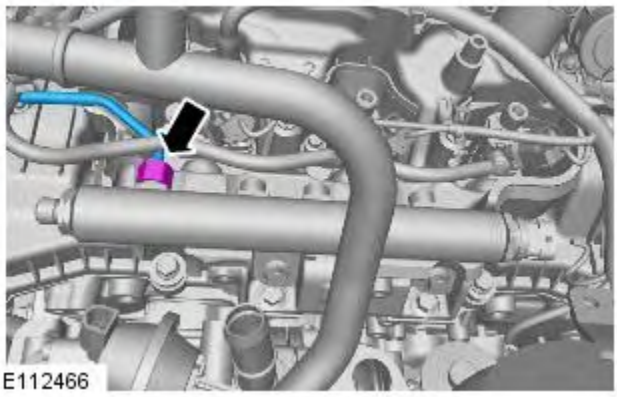


22.

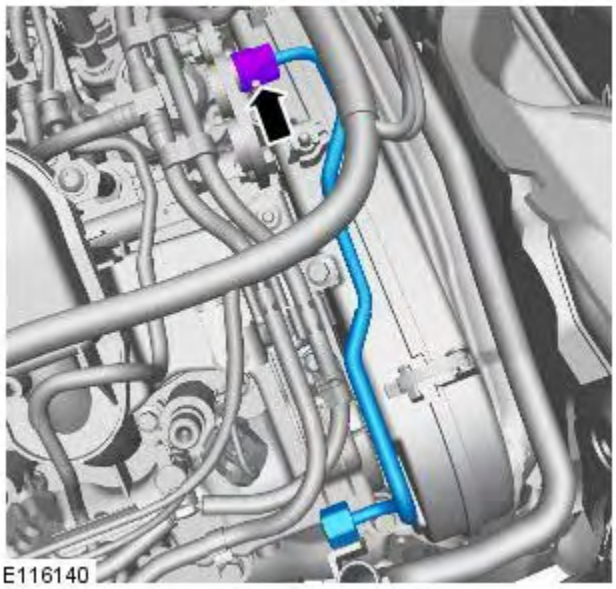
- Stage 1: Tighten the high-pressure fuel supply line unions at the fuel rail to 30Nm.
- Stage 2: Tighten the high-pressure fuel supply line unions at the injector to 30Nm.



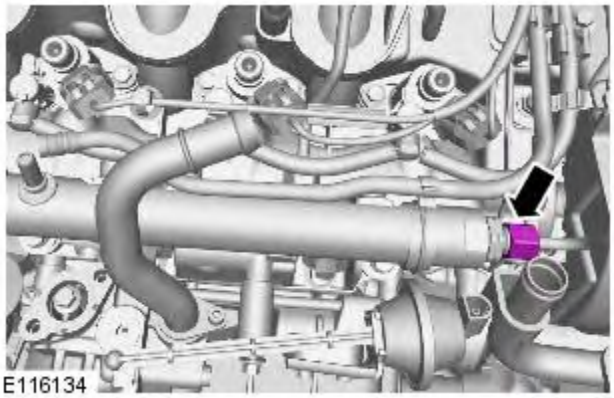
23. Tighten the high-pressure fuel line union to 30Nm.



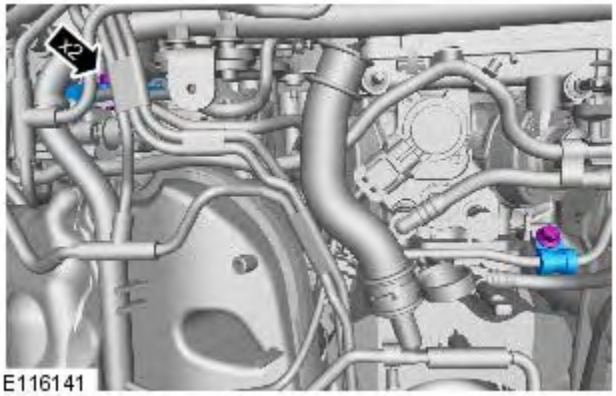
24. Tighten the high-pressure fuel line union to 30Nm.


E116140

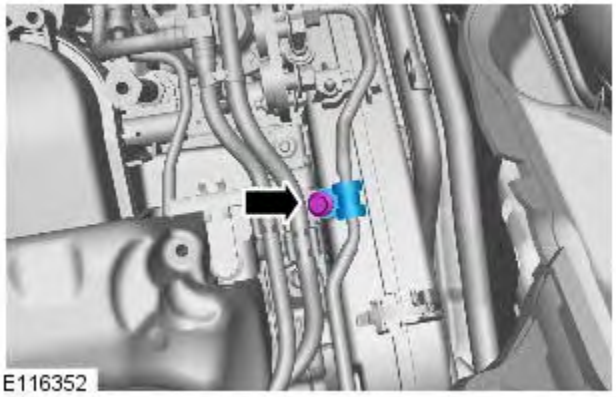
25. Tighten the high-pressure fuel line union to 30Nm.


E116134

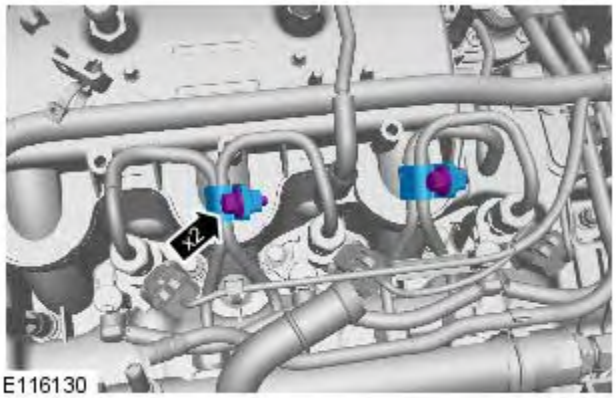
26. Tighten the high-pressure fuel line union to 30Nm.


E116141

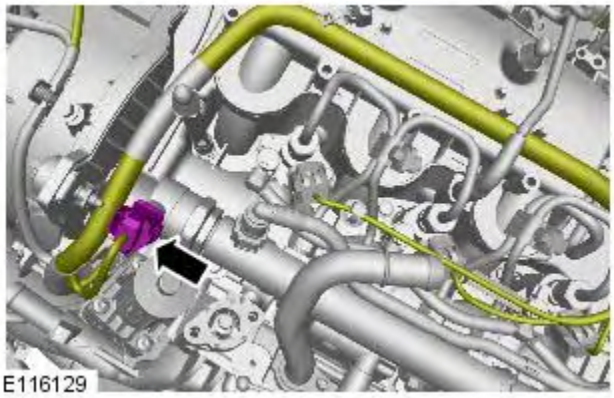
27. *Torque:* 10 Nm



28. *Torque:* 10 Nm

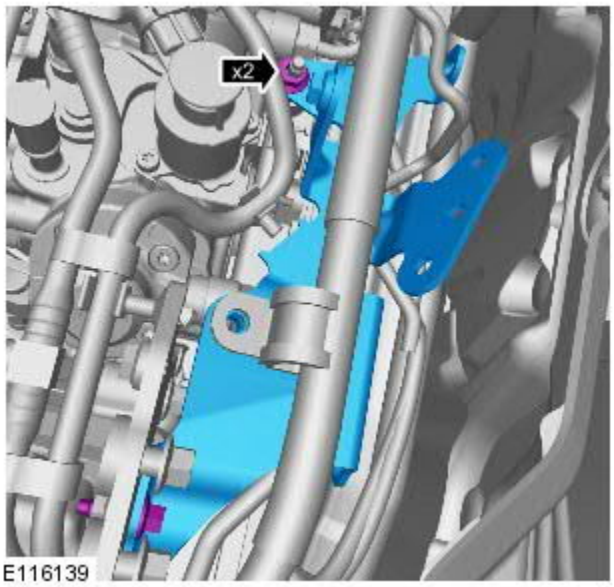


29. *Torque:* 10 Nm

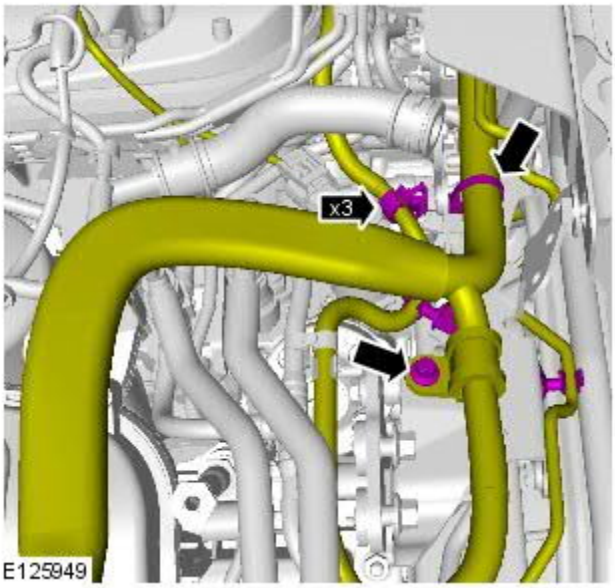


30.

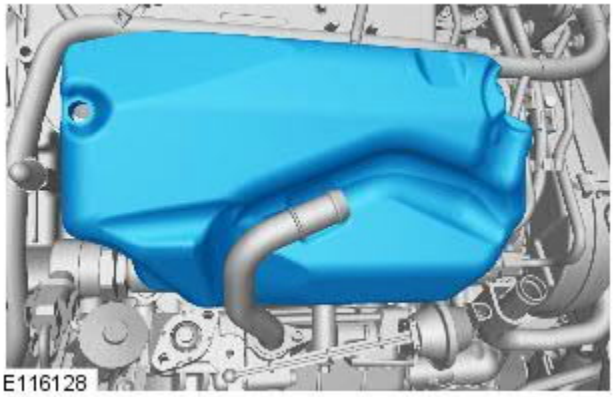
31. *Torque:* 10 Nm



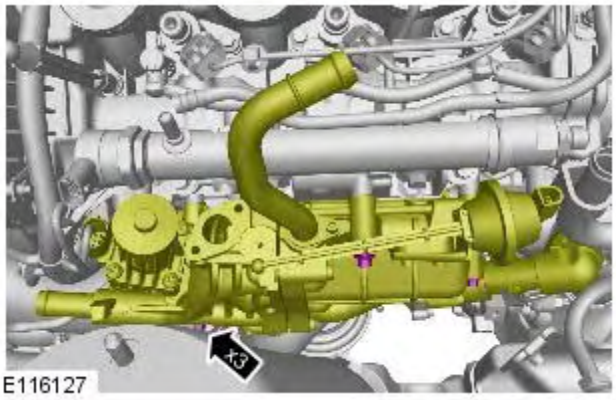
32. *Torque:* 10 Nm



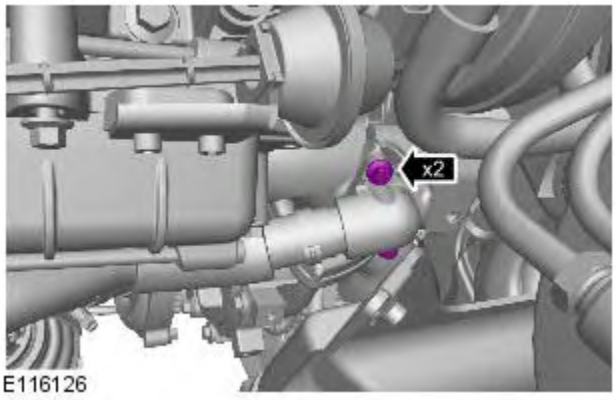
33.



34. NOTE: Left-hand shown, right-hand similar.

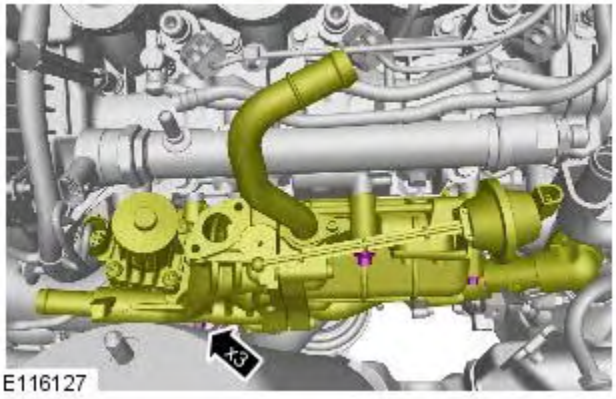


35. CAUTION: Only tighten the bolts finger-tight at this stage.

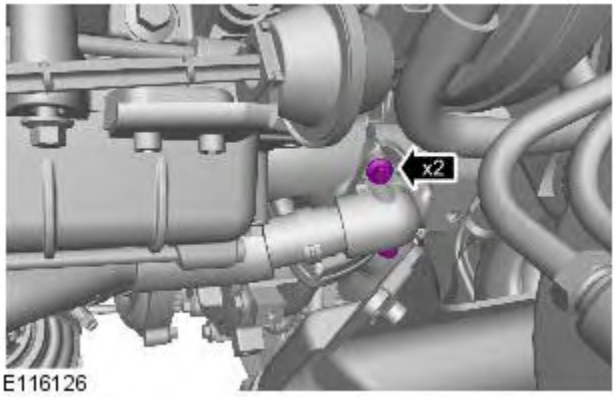


36. CAUTION: Only tighten the bolts finger-tight at this stage.

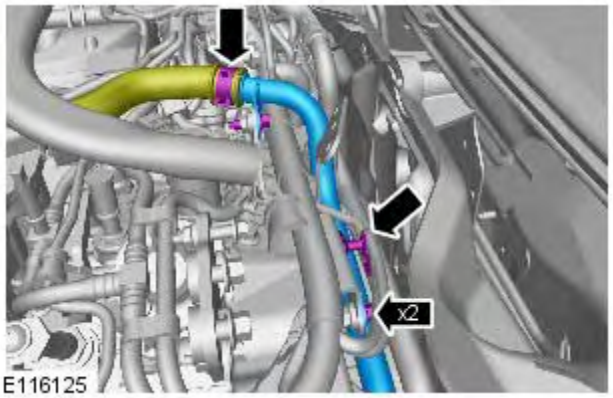
NOTE: Install a new gasket.



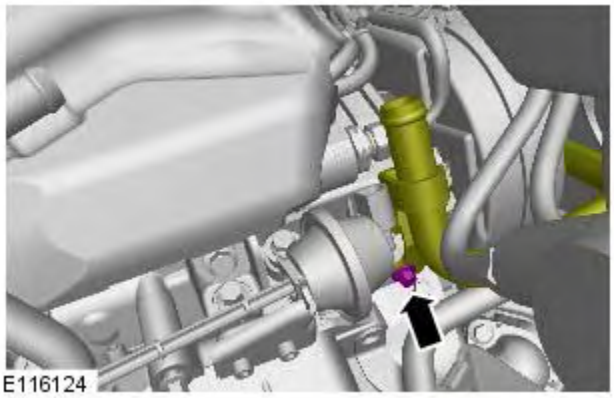
37. *Torque:* 10 Nm



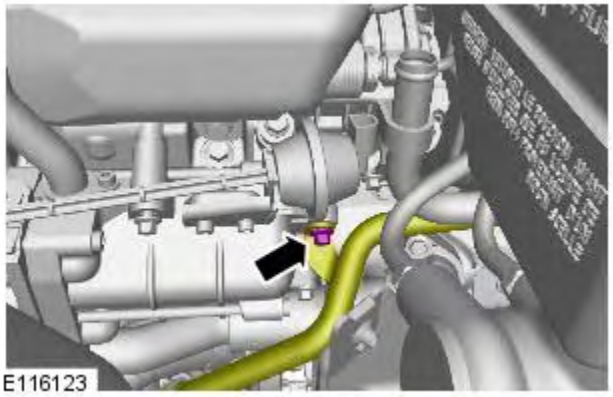
38. *Torque:* 10 Nm



39. *Torque:* 10 Nm

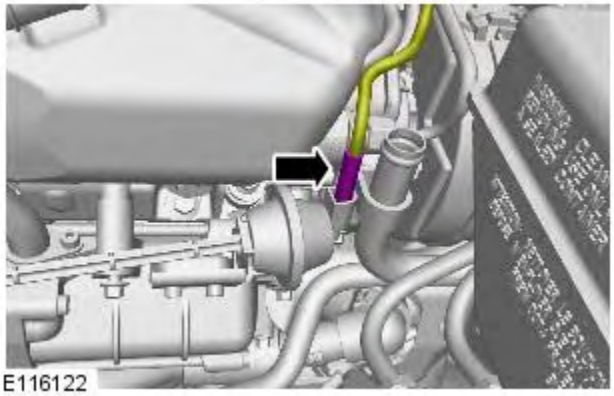


40. *Torque:* 10 Nm

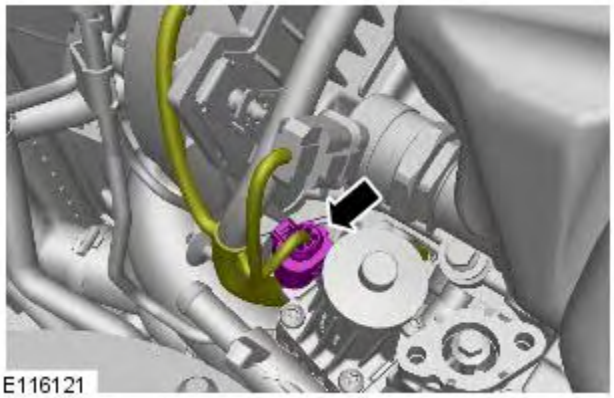


41. *Torque:* 10 Nm

42.



43.



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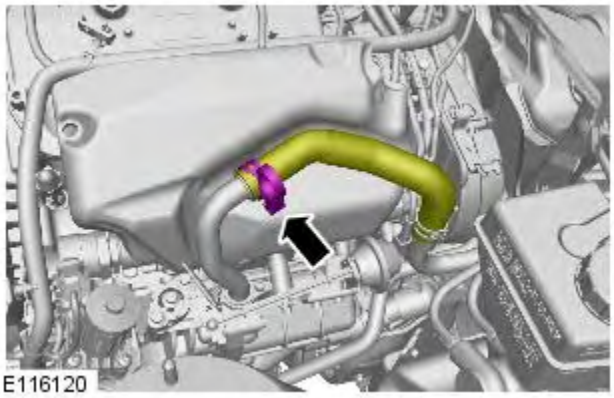

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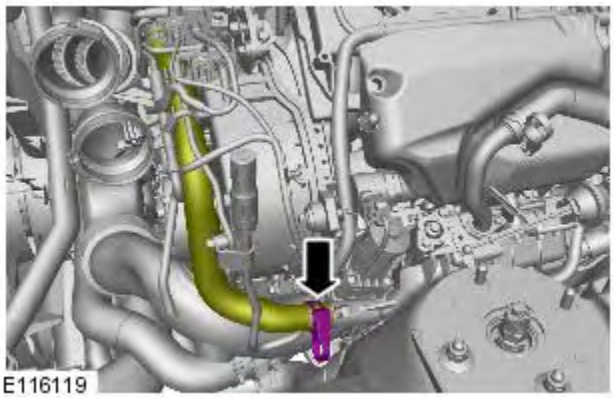
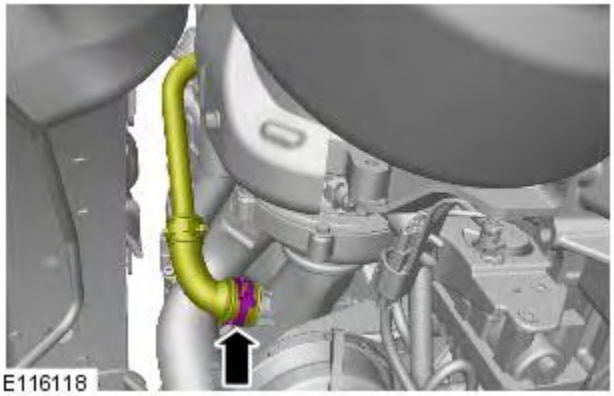
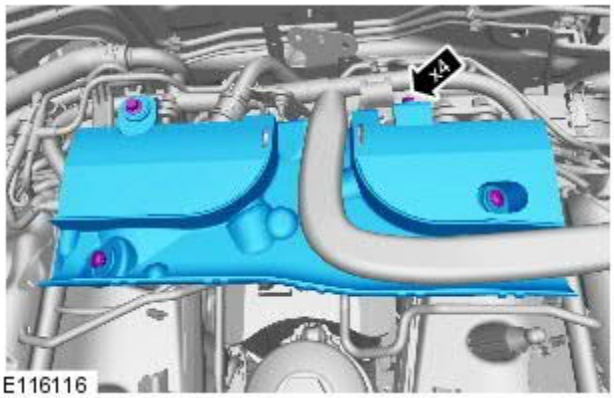


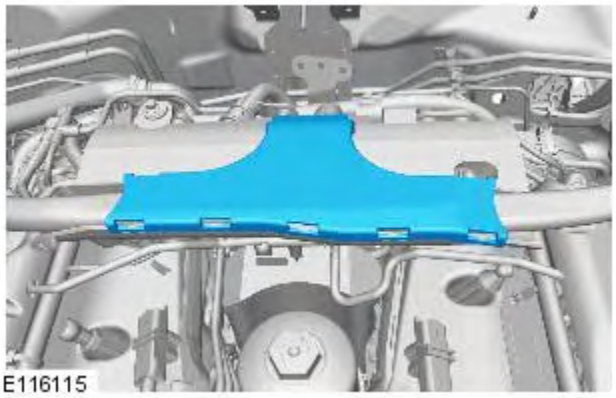
46.

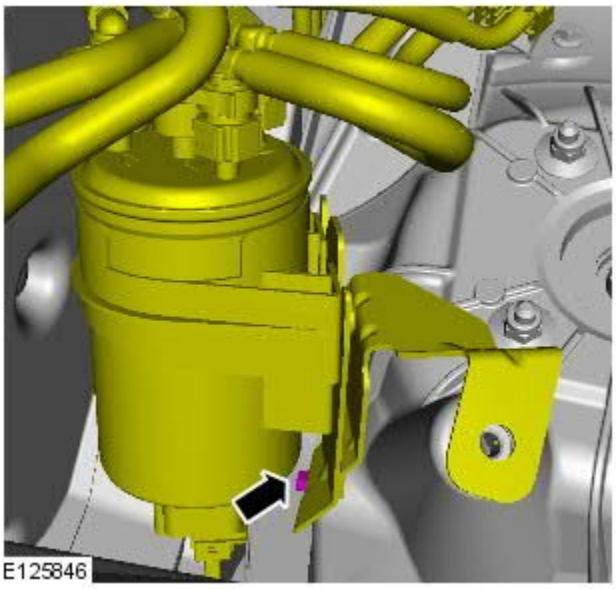


47. *Torque:* 10 Nm



48.





49. *Torque:* 27 Nm

50. Refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube LH (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).

51. Refer to: Secondary Bulkhead Panel LH (501-02 Front End Body Panels, Removal and Installation).

52. Refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel, Removal and Installation).

53. Refer to: Cooling System Partial Draining, Filling and Bleeding (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).

54. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

55. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 11-May-2011

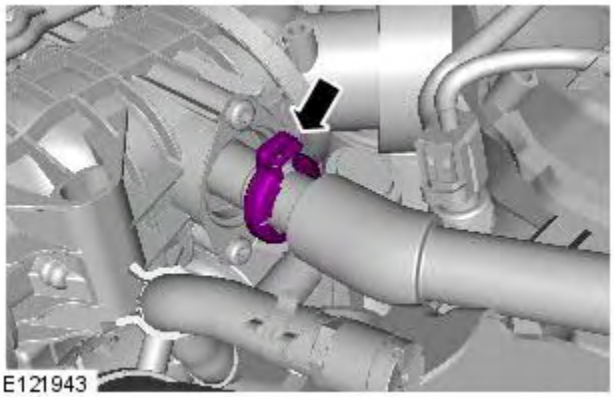
Engine Emission Control - TDV6 3.0L Diesel - Exhaust Gas Recirculation (EGR) Valve Outlet Tube LH

Removal and Installation

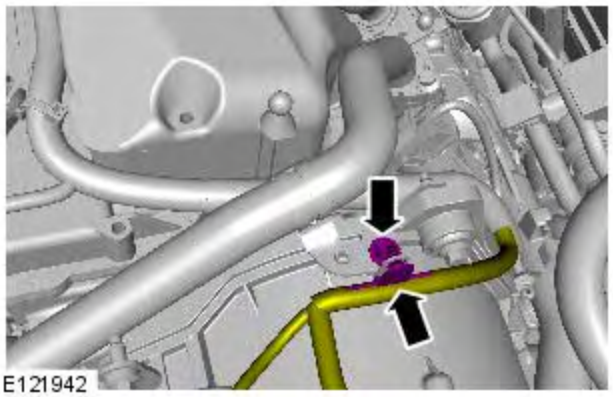
Removal

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

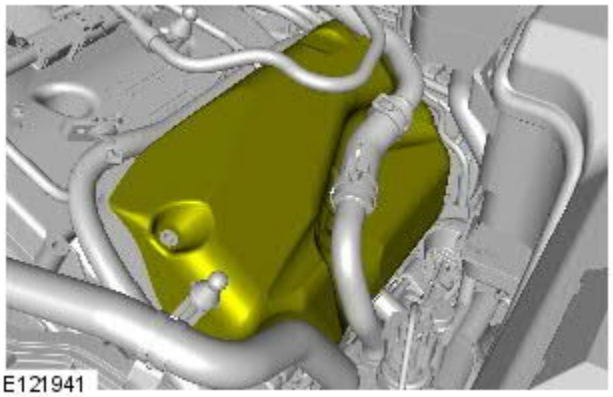
1. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).


E121943

2. NOTE: Discard the retaining clips.


E121942

3.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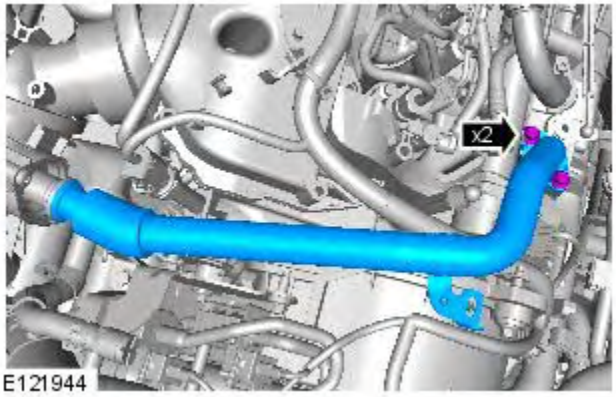
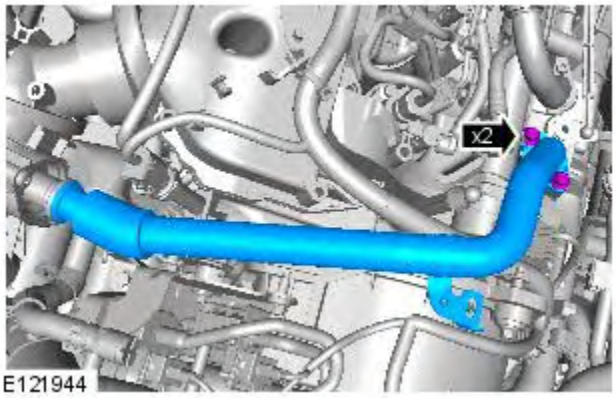
4.



5. CAUTION: Make sure that all openings are sealed.

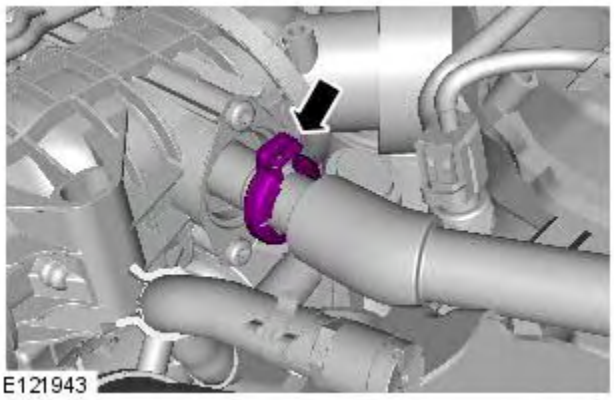
NOTE: Discard the gasket.

Installation

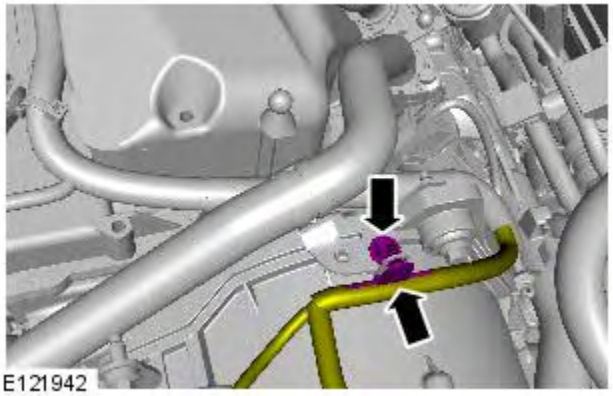


1. CAUTION: Only tighten the bolts finger-tight at this stage.

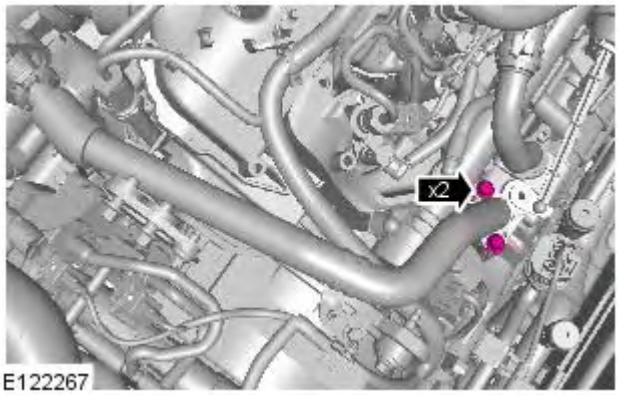
NOTE: Install a new gasket.



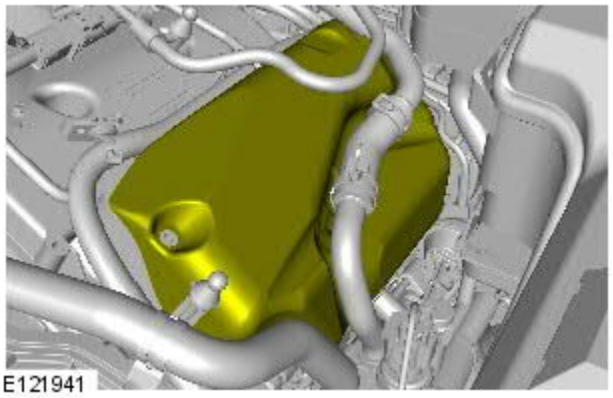
2. CAUTION: Install a new clamp. Close the clamp to the first audible click by hand. Making sure that the clamp is in a central position to the joint, close to the second audible click using a suitable tool.



3. *Torque:* 5 Nm



4. *Torque:* 10 Nm



5.

6. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

Published: 11-May-2011

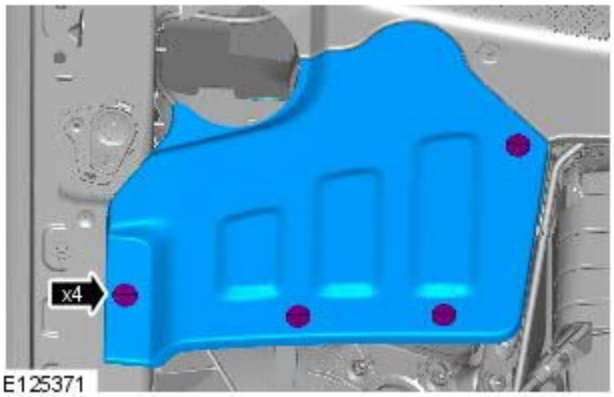
Engine Emission Control - TDV6 3.0L Diesel - Exhaust Gas Recirculation (EGR) Valve Outlet Tube RH

Removal and Installation

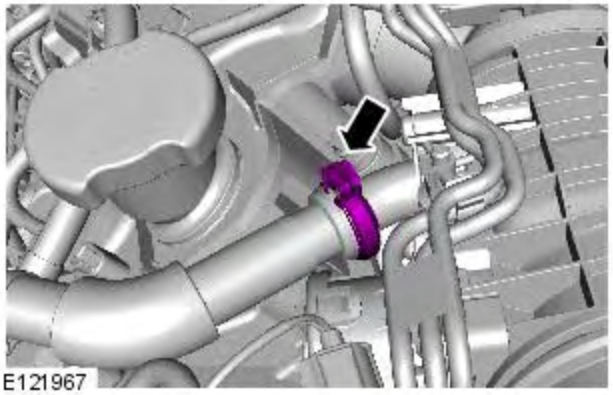
Removal

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

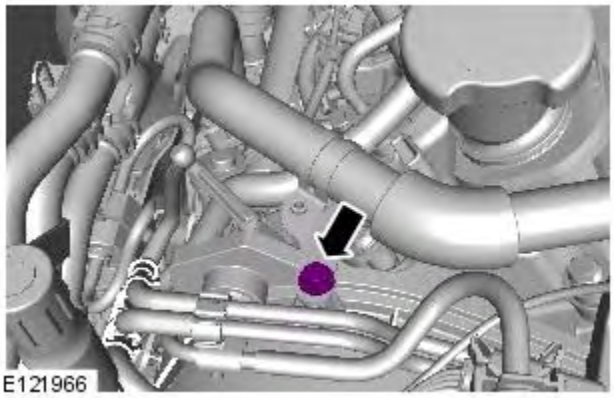
1. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).



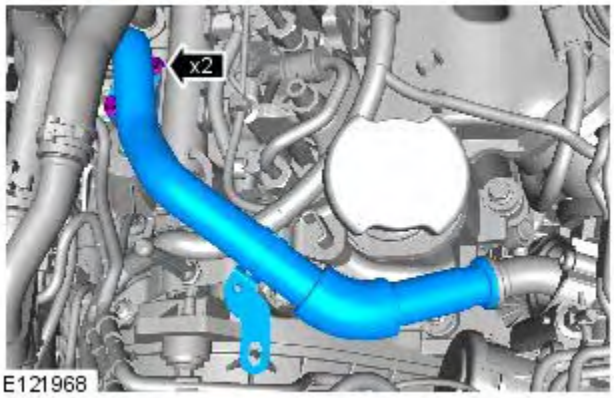
2.



3. NOTE: Discard the retaining clips.



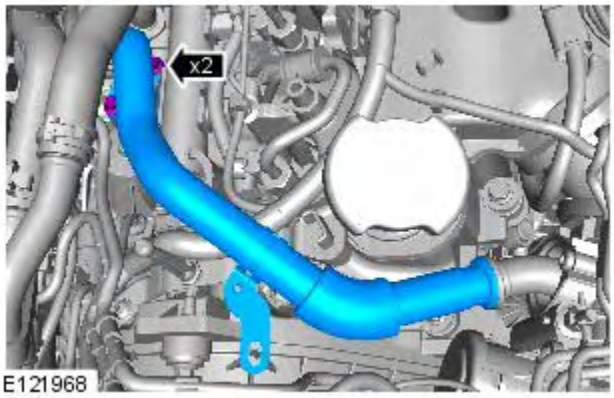
4.



5. CAUTION: Make sure that all openings are sealed.

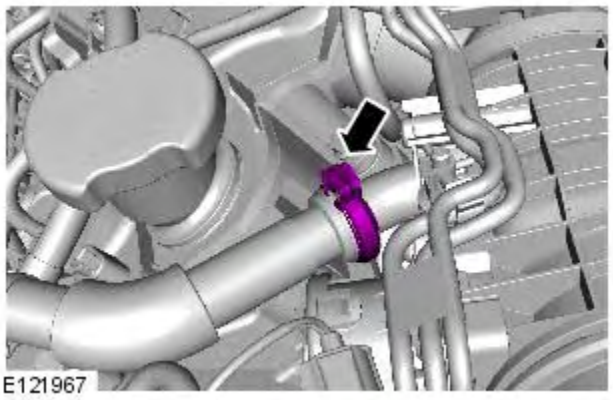
NOTE: Discard the gasket.

Installation

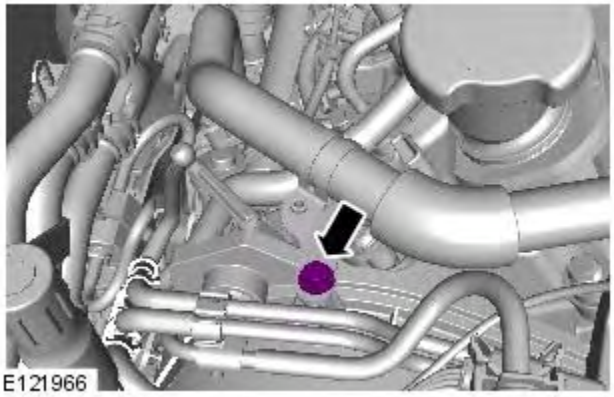


1. CAUTION: Only tighten the bolts finger-tight at this stage.

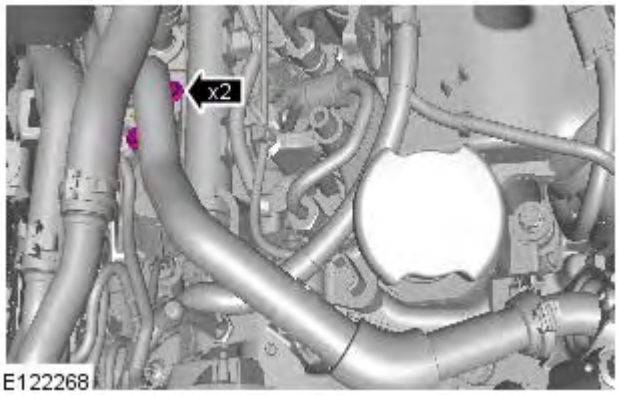
NOTE: Install a new gasket.



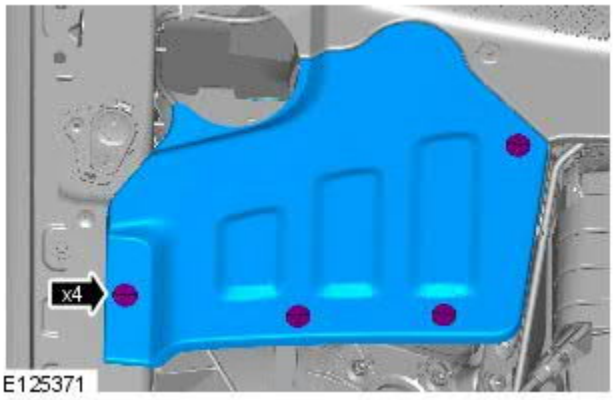
2. CAUTION: Install a new clamp. Close the clamp to the first audible click by hand. Making sure that the clamp is in a central position to the joint, close to the second audible click using a suitable tool.



3. *Torque:* 5 Nm



4. *Torque:* 10 Nm



5.

6. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

Published: 14-Nov-2013

Engine Emission Control - TDV6 3.0L Diesel - Exhaust Gas Recirculation (EGR) Valve RH

Removal and Installation

Removal

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNING: Make sure to support the vehicle with axle stands.

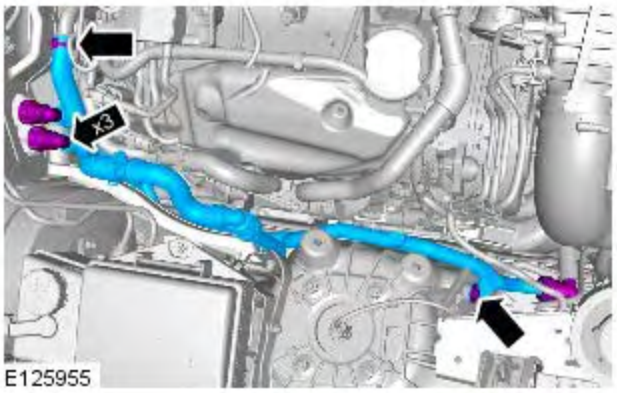
   Raise and support the vehicle.

3. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

4. Refer to: Secondary Bulkhead Panel RH (501-02 Front End Body Panels, Removal and Installation).

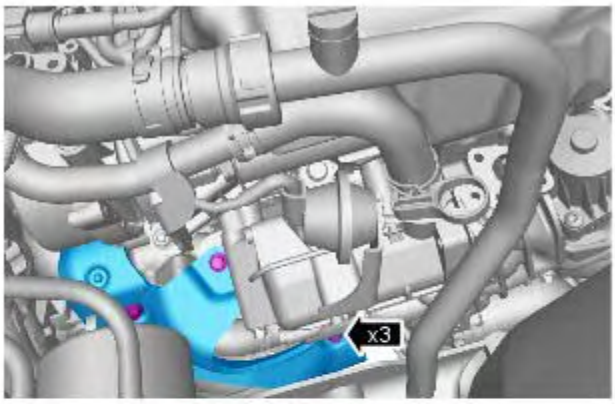
5. Refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube RH (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).

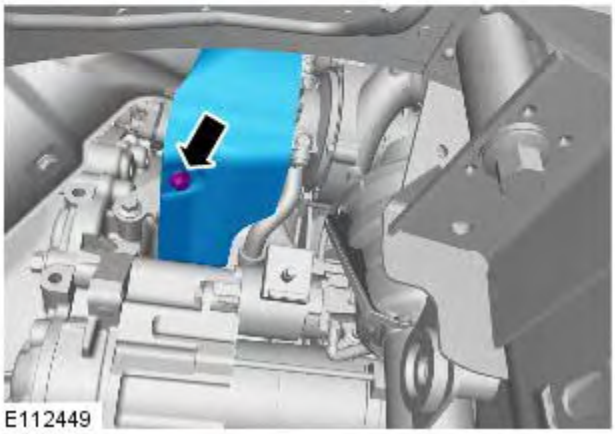
6. Refer to: Cooling System Partial Draining, Filling and Bleeding (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).



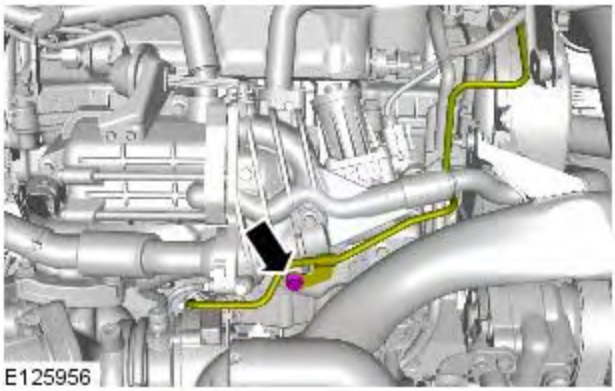
7. CAUTION: Be prepared to collect escaping coolant.

8.

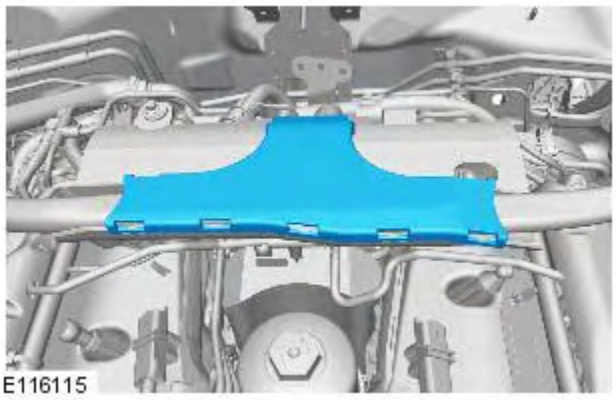


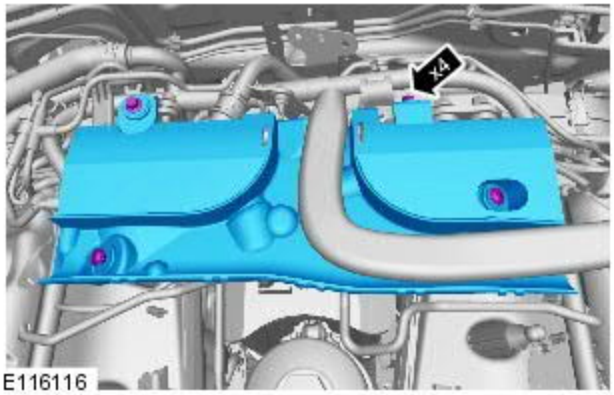


9. NOTE: Engine shown removed for clarity.

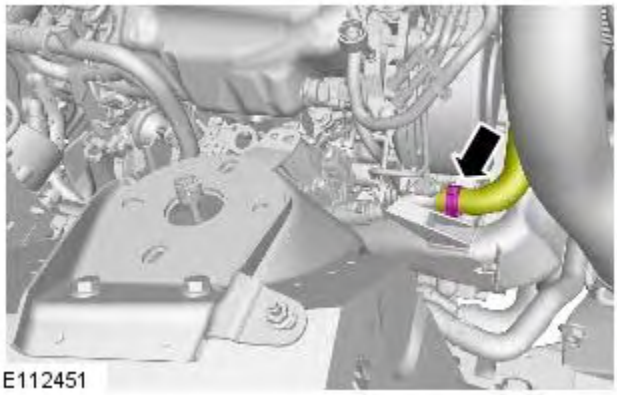


10.

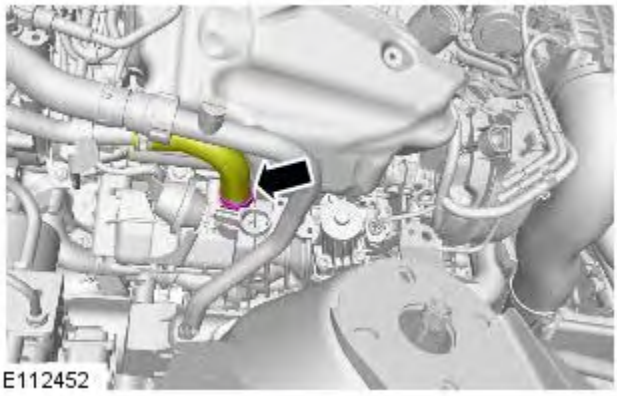




11.

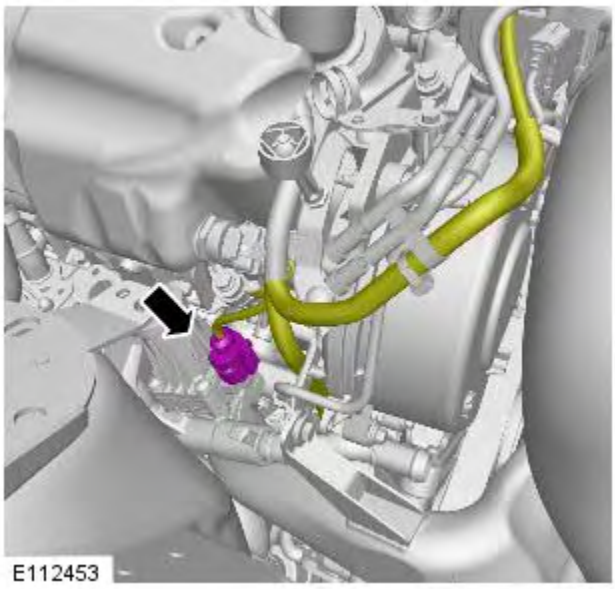


12. CAUTION: Be prepared to collect escaping coolant.



13. CAUTION: Be prepared to collect escaping coolant.

14.



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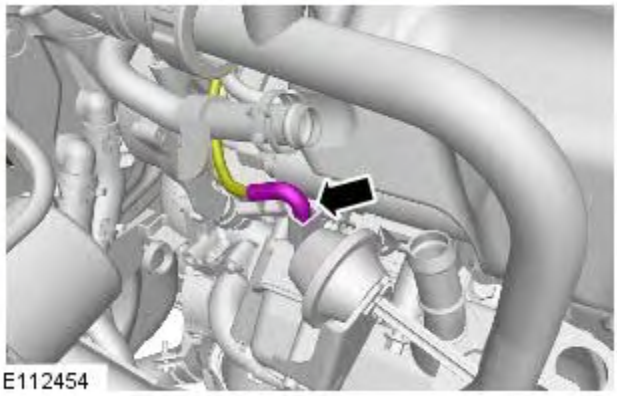
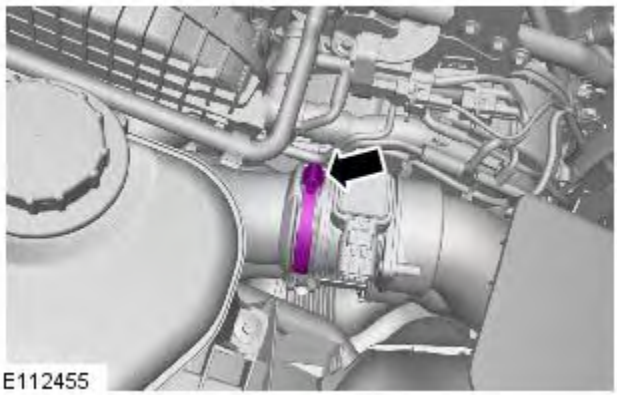


16.



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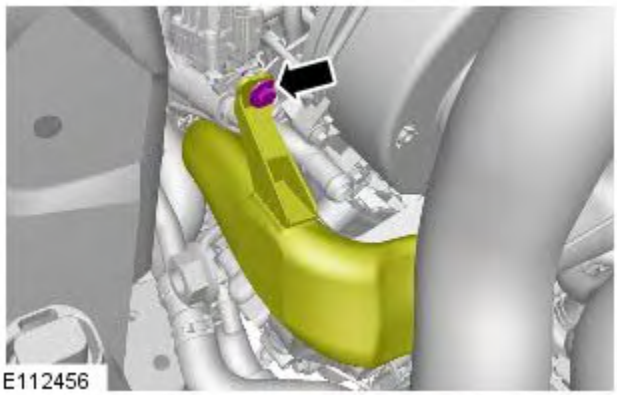

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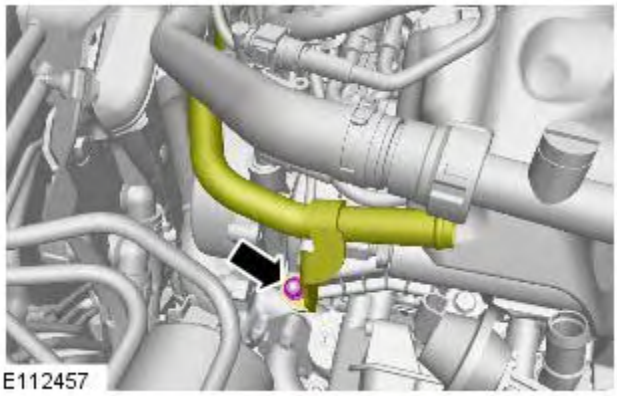
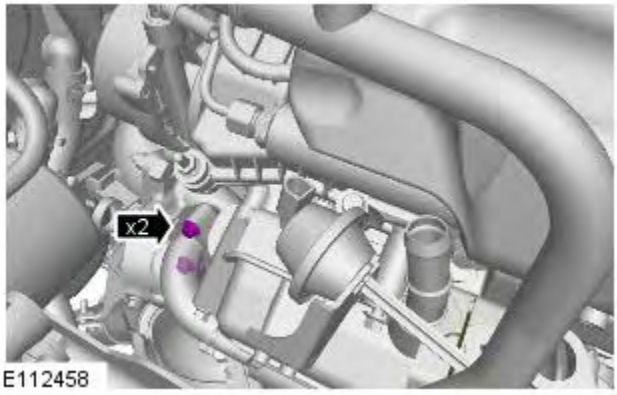


19. NOTE: Discard the gasket.



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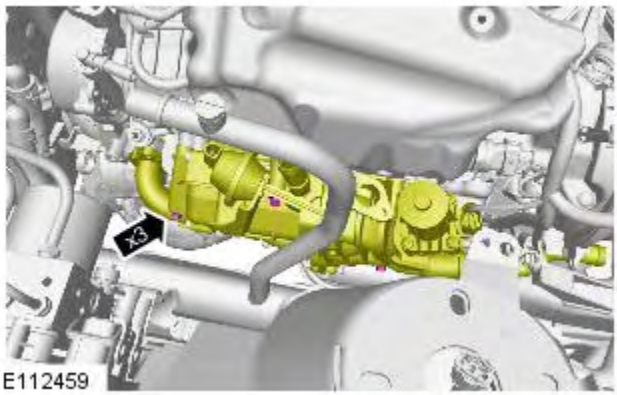
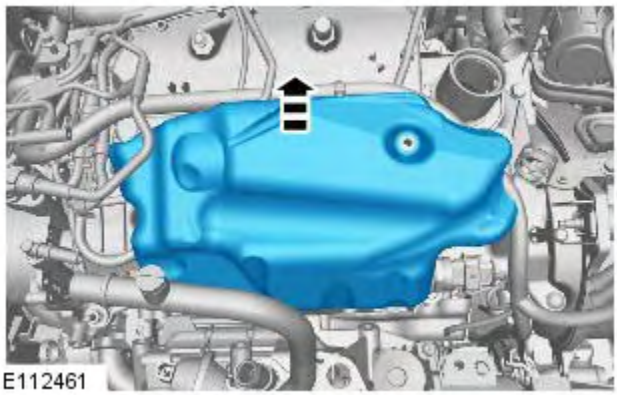
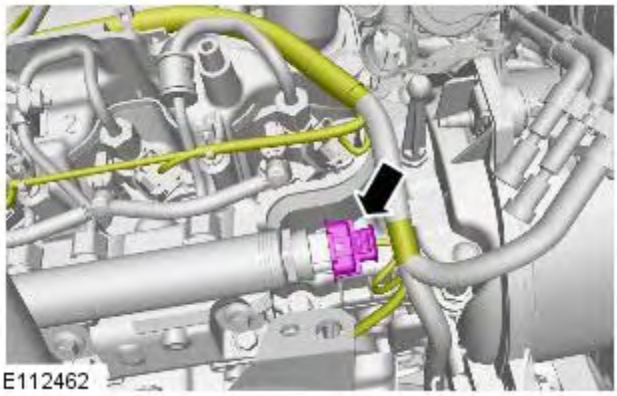



E112461

21. Left-hand shown, right-hand similar.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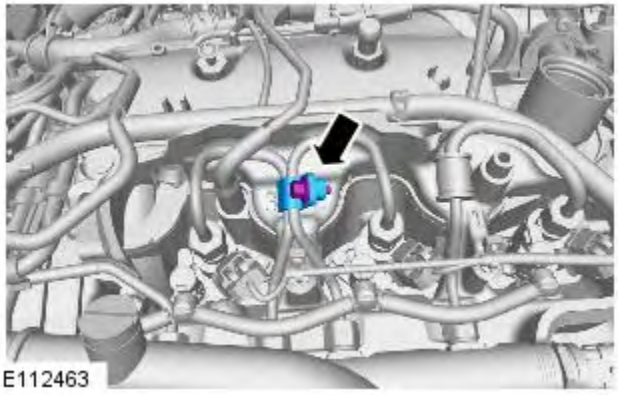
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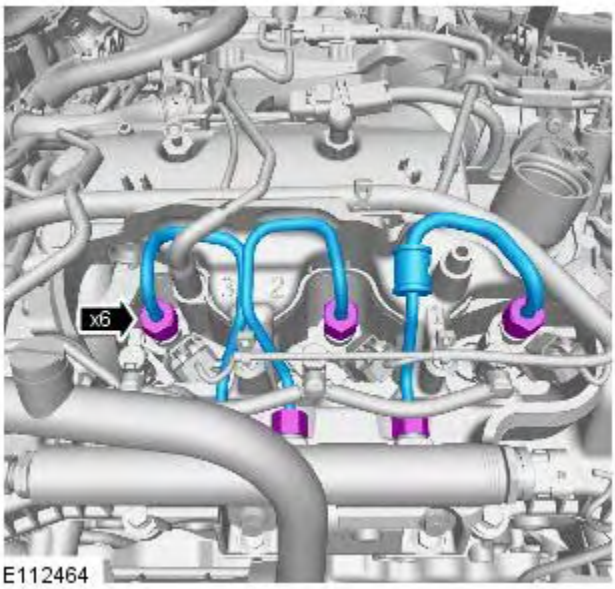
23.

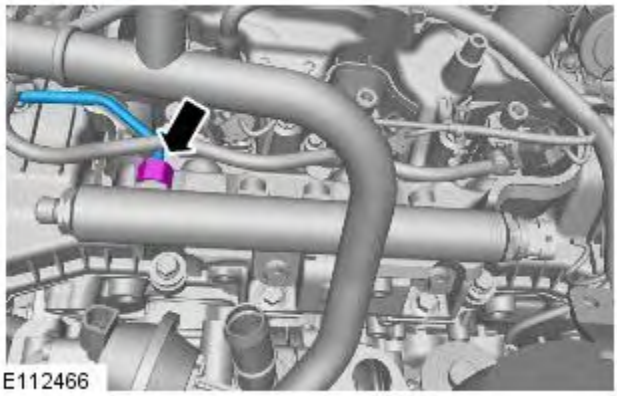
24. Refer to: Fuel Injection Component Cleaning (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, General Procedures).



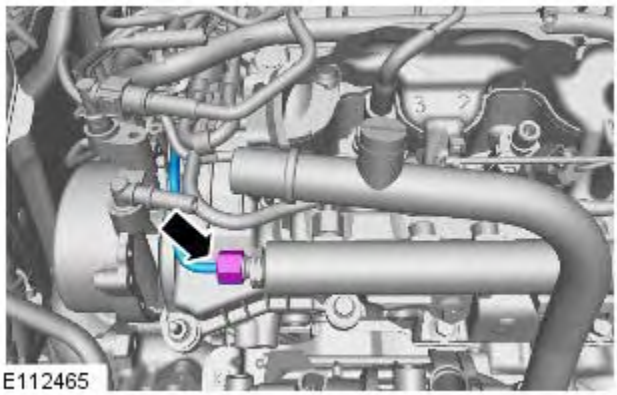
25. CAUTIONS:

Be prepared to collect escaping fuel.

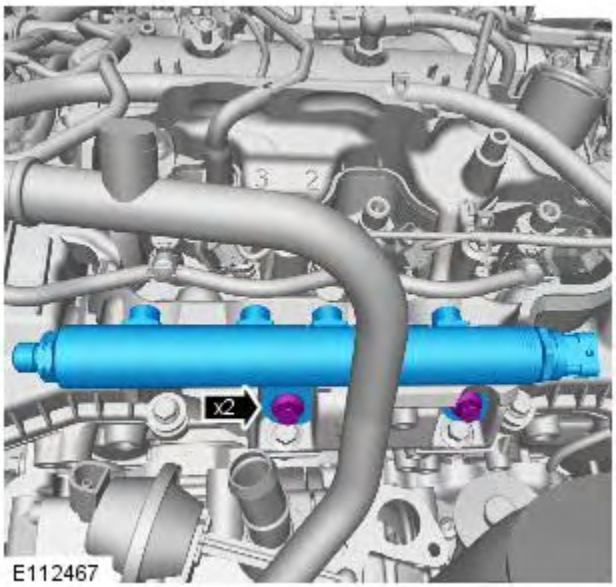
Discard the component.



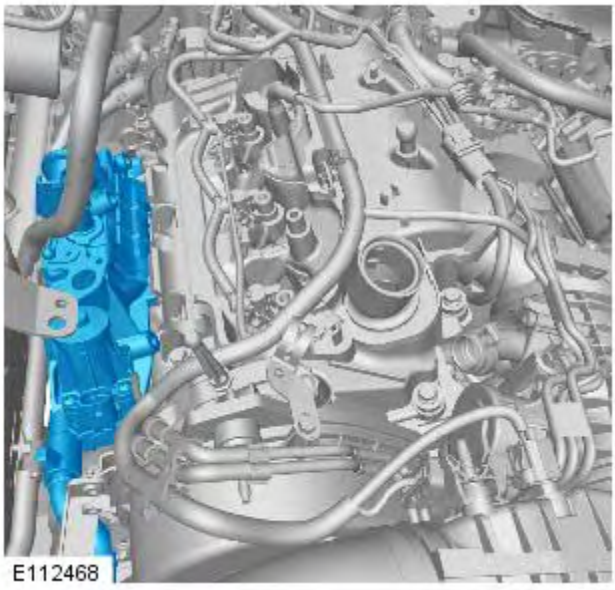
26. CAUTION: Be prepared to collect escaping fuel.



27. CAUTION: Be prepared to collect escaping fuel.



28. CAUTION: Be prepared to collect escaping fuel.



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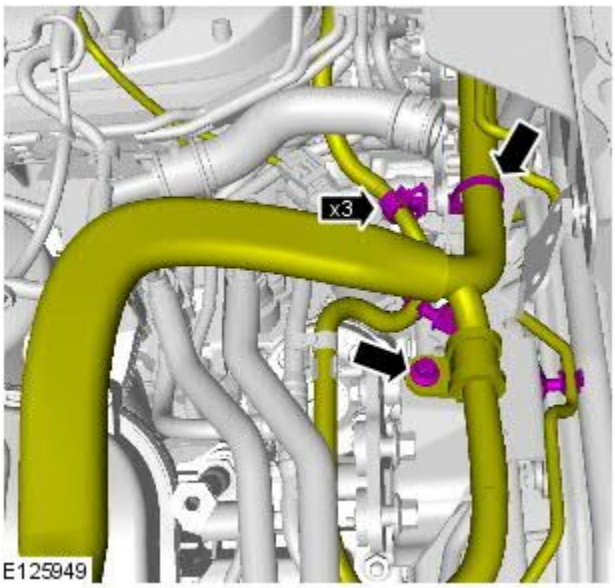
30.



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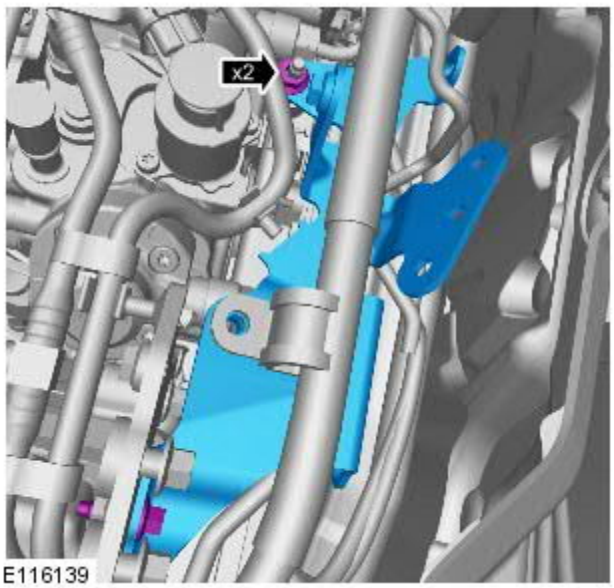

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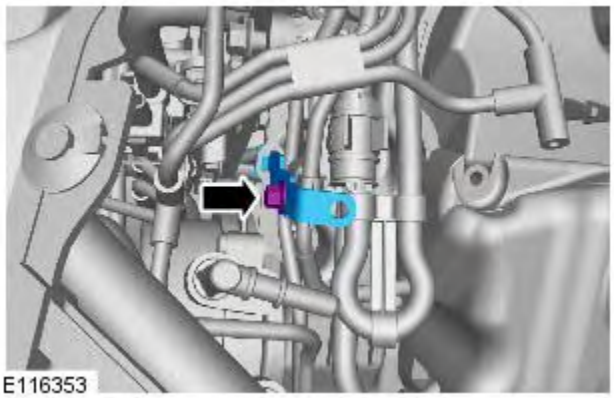
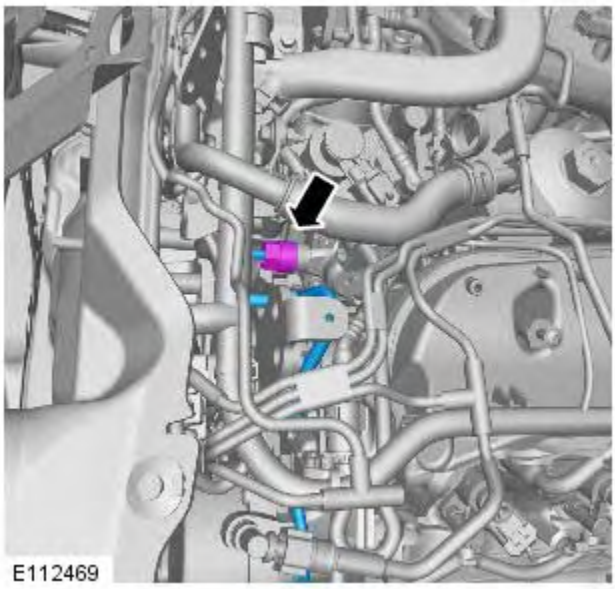
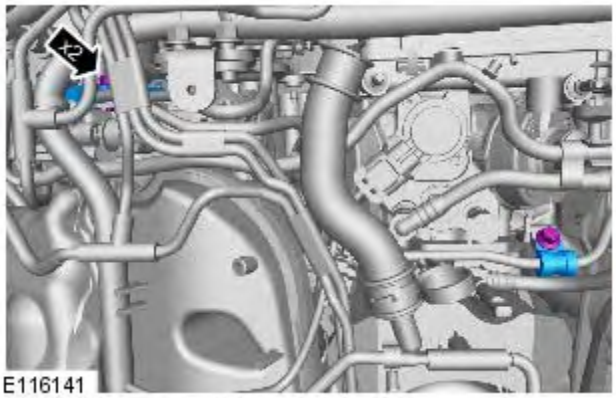




33. CAUTIONS:

⚠ Be prepared to collect escaping fuel.

⚠ Discard the component.



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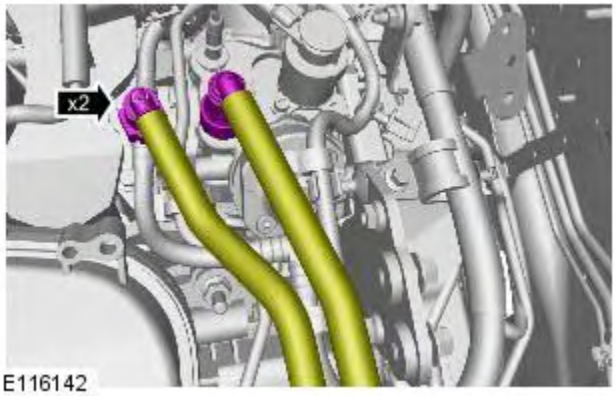
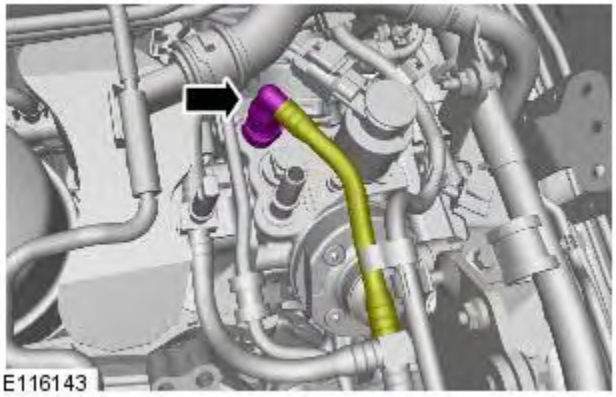
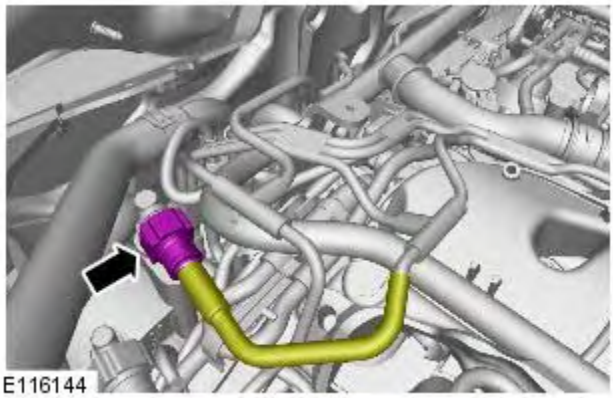


35. ⚠ CAUTION: Be prepared to collect escaping fuel.



36. CAUTION: Be prepared to collect escaping fuel.



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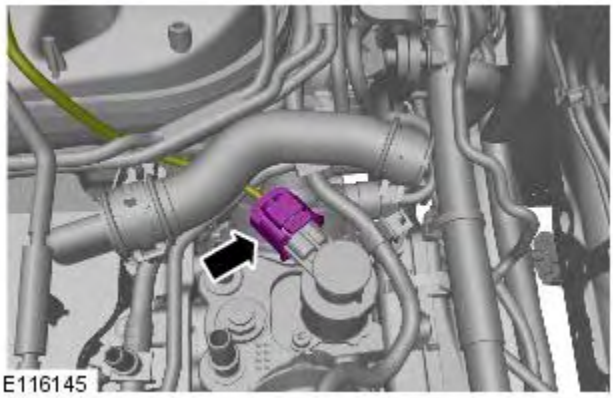

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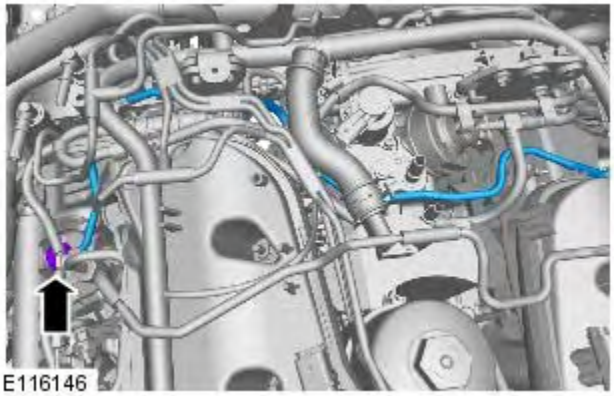


39. CAUTIONS:

Be prepared to collect escaping fuel.

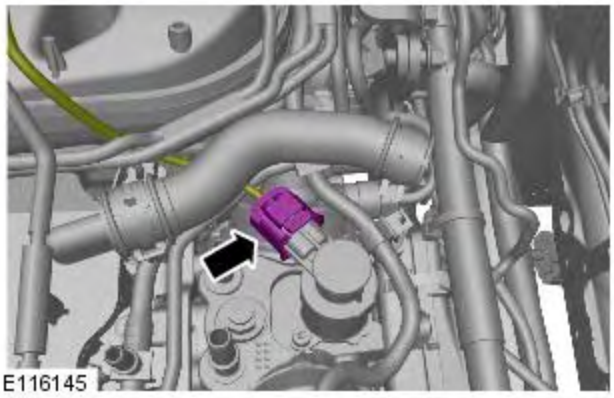
Discard the component.

Installation

1. CAUTIONS:

   Make sure that a new component is installed.

   Tighten the fuel supply line unions finger tight.



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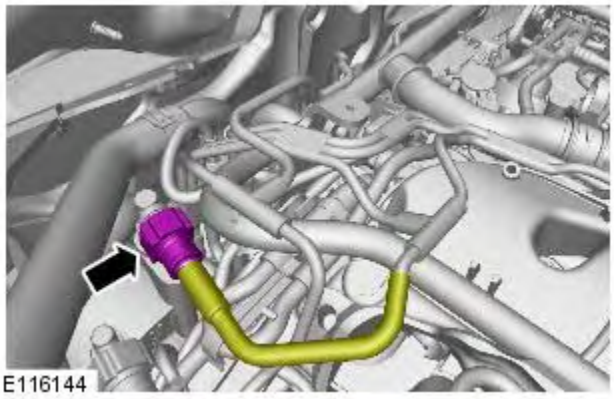

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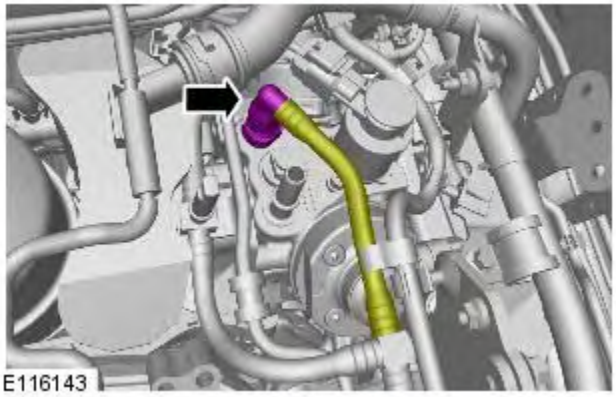

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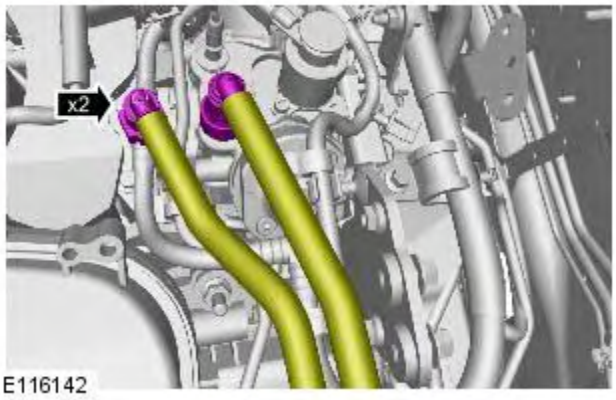

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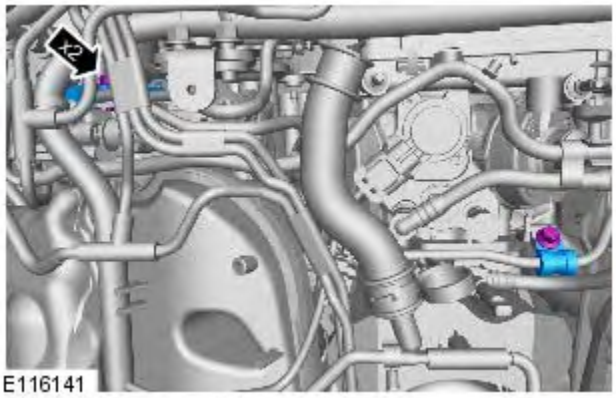
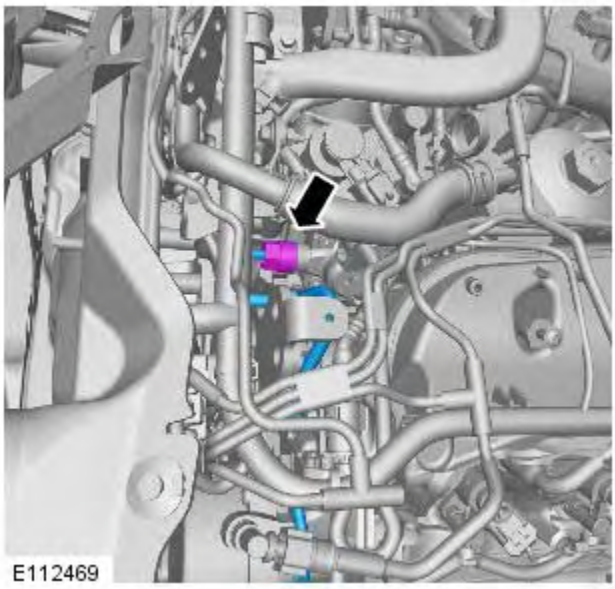


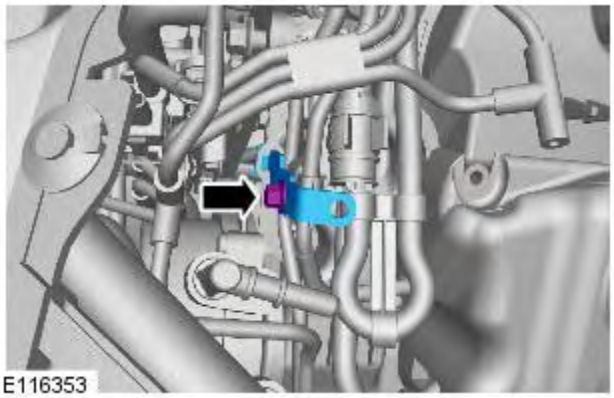
6. CAUTION: Only tighten the bolt finger-tight at this stage.



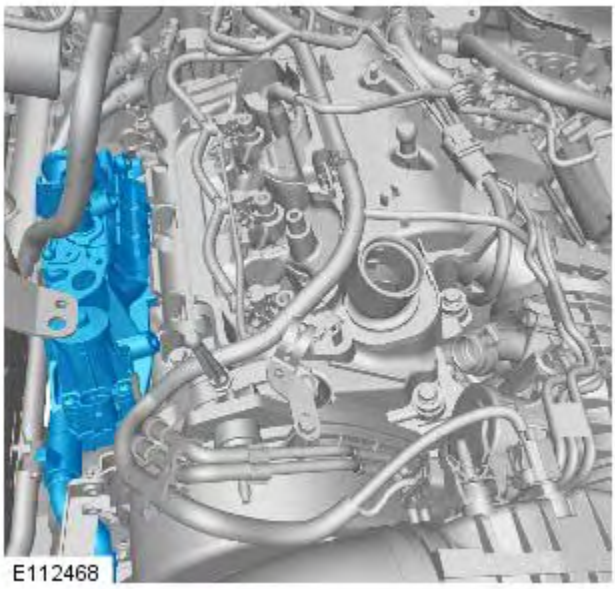
7. CAUTIONS:

   Make sure that a new component is installed.

   Tighten the fuel supply line unions finger tight.



8. CAUTION: Only tighten the bolt finger-tight at this stage.



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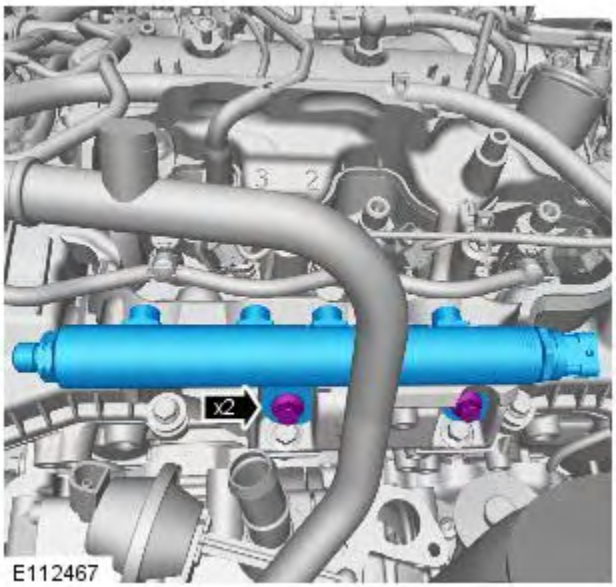
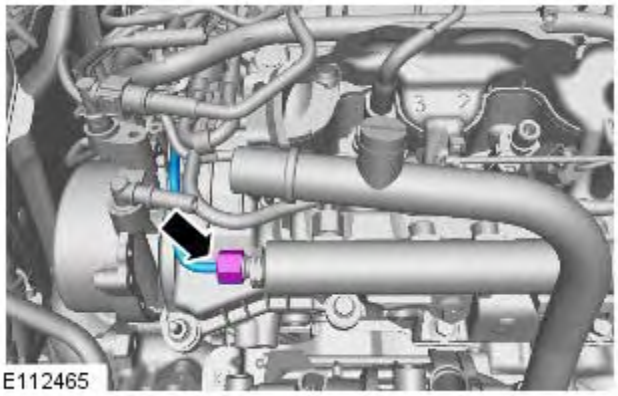
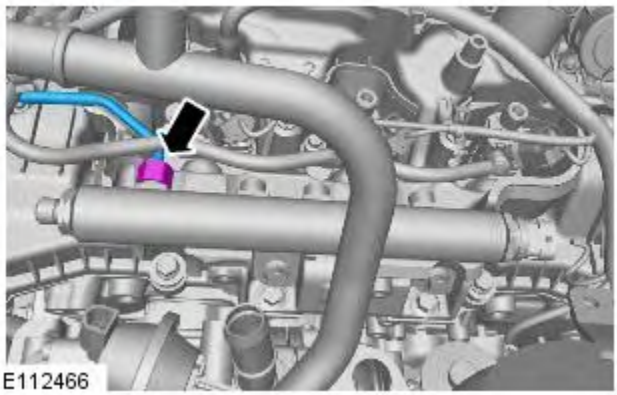


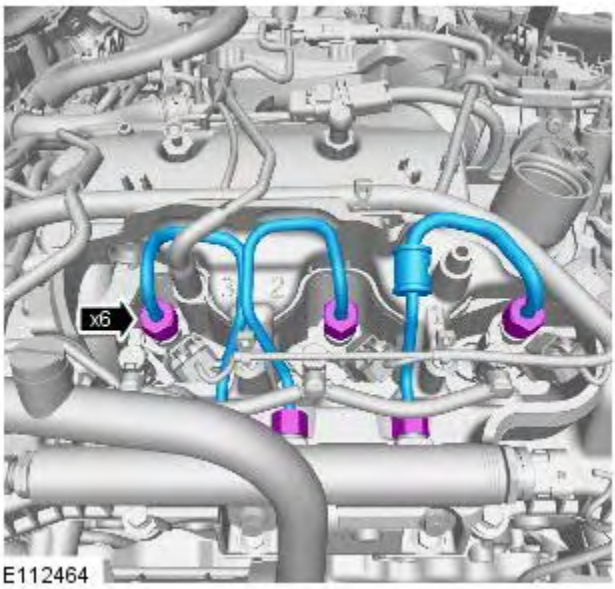
10. *Torque:* 24 Nm



11. CAUTION: Tighten the fuel supply line unions finger tight.



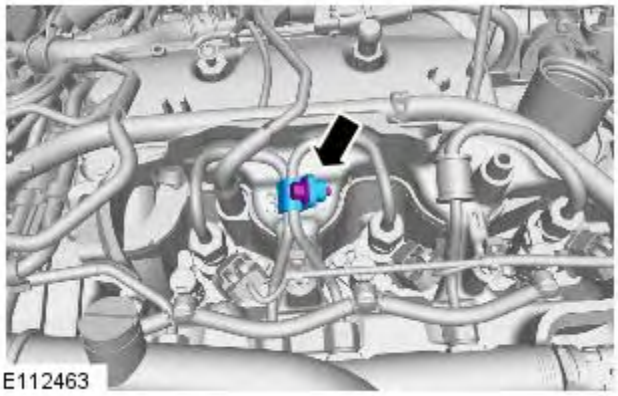
12. CAUTION: Tighten the fuel supply line unions finger tight.



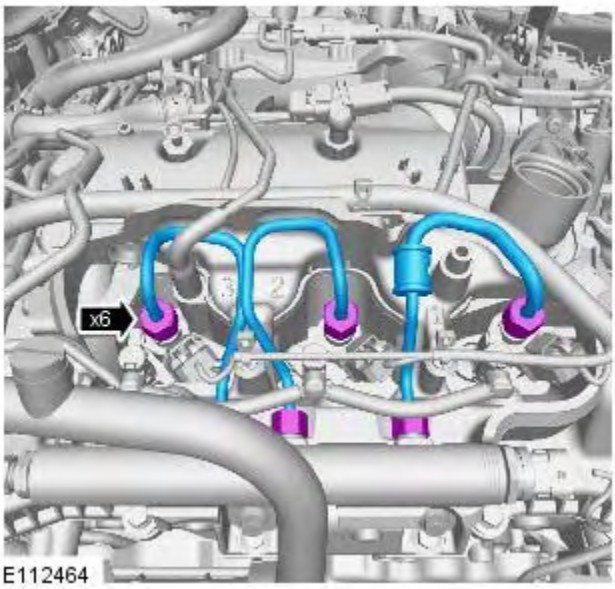
13. CAUTIONS:

Make sure that a new component is installed.

Tighten the fuel supply line unions finger tight.



14. CAUTION: Tighten the fuel supply line unions finger tight.



15.

- Stage 1:Tighten the high-pressure fuel supply line unions at the fuel rail to 15Nm.
- Stage 2: Tighten the high-pressure fuel supply line unions at the injector to 15Nm.

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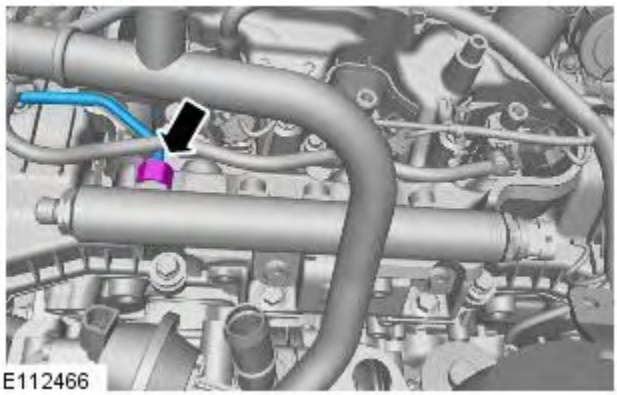
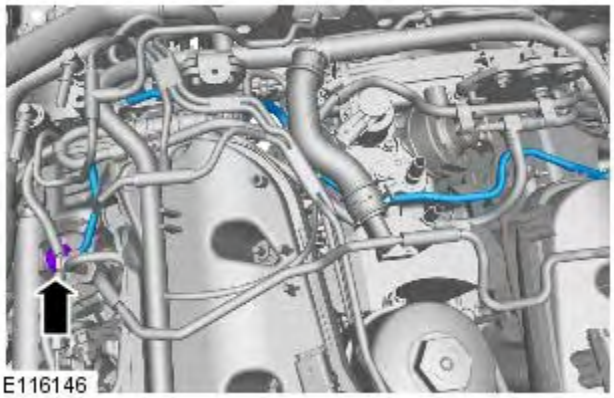
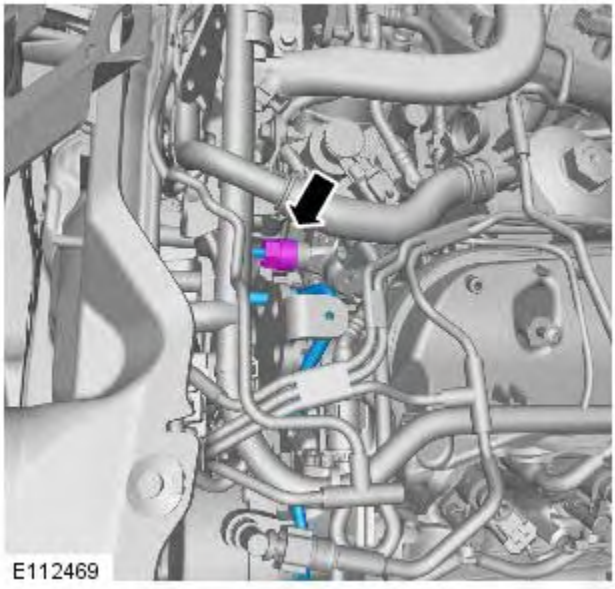


16. Tighten the high-pressure fuel lines union to 15Nm.

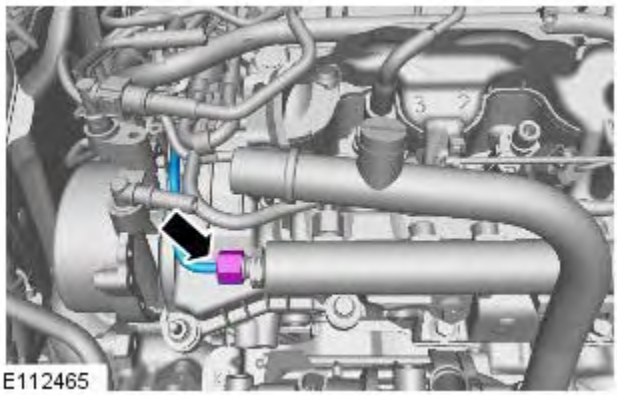


17. CAUTION: Make sure that a new component is installed.

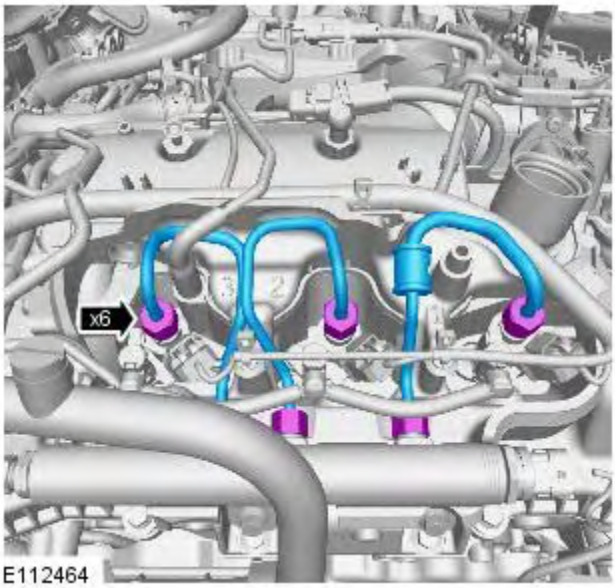
    Tighten the high-pressure fuel lines union to 15Nm.



18. Tighten the high-pressure fuel lines union to 15Nm.

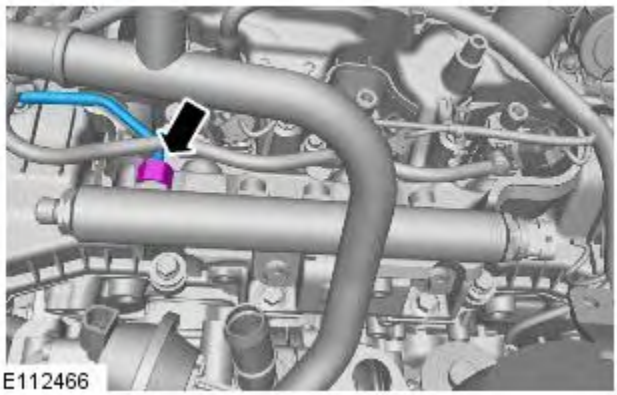


19. Tighten the high-pressure fuel lines union to 15Nm.

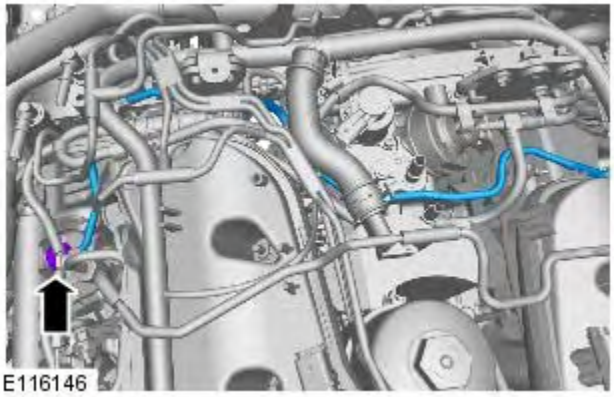


20.

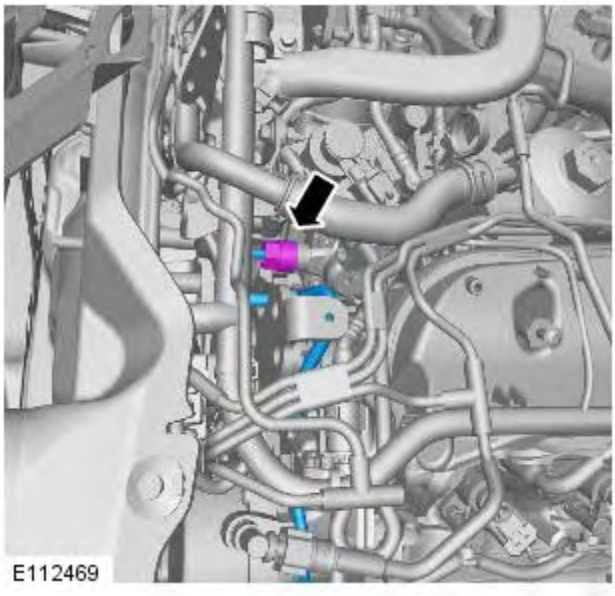
- Stage 1: Tighten the high-pressure fuel supply line unions at the fuel rail to 30Nm.
- Stage 2: Tighten the high-pressure fuel supply line unions at the injector to 30Nm.



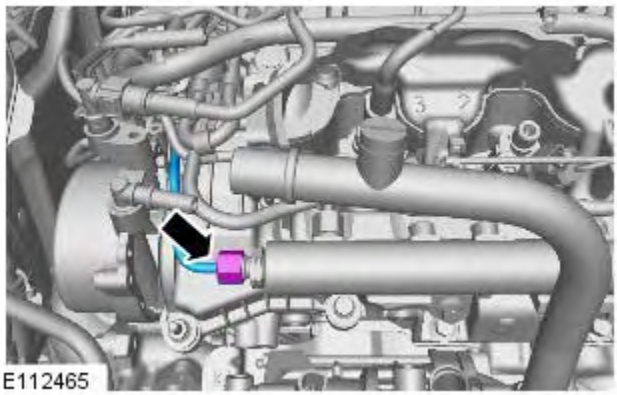
21. Tighten the high-pressure fuel line union to 30Nm.



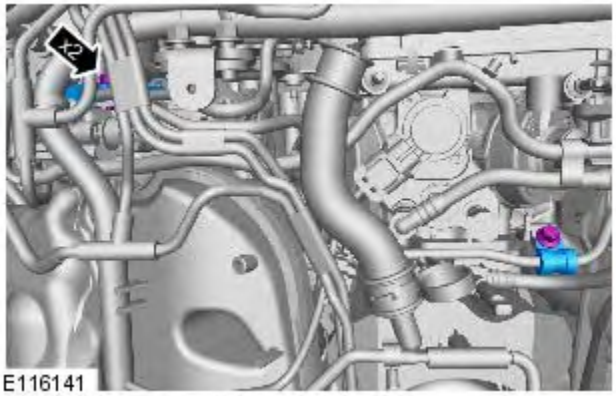
22. Tighten the high-pressure fuel line union to 30Nm.



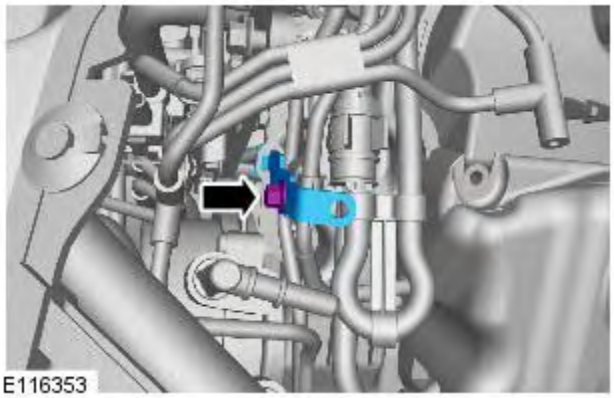
23. Tighten the high-pressure fuel line union to 30Nm.



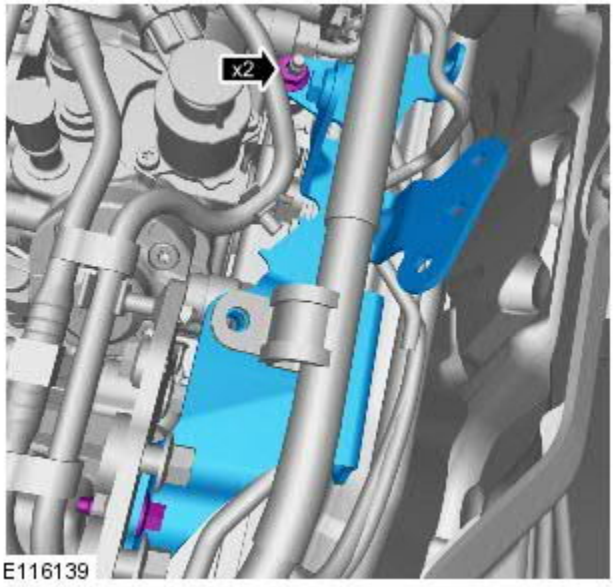
24. Tighten the high-pressure fuel line union to 30Nm.



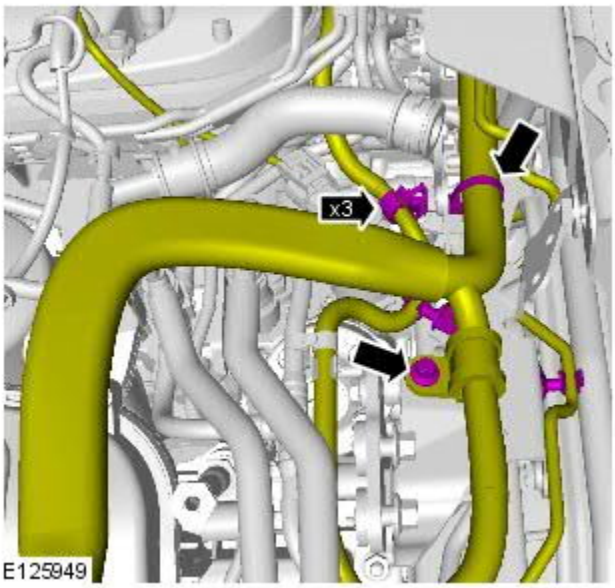
25. *Torque:* 10 Nm



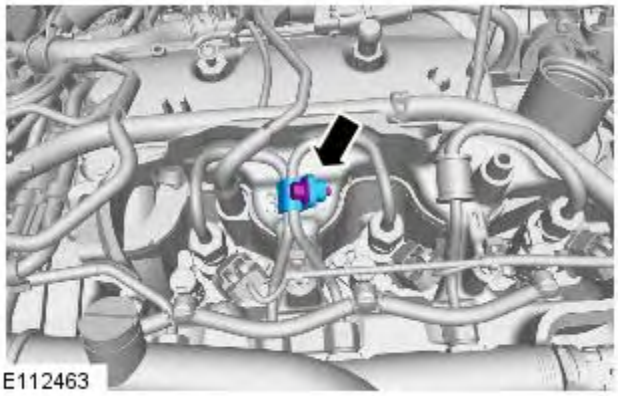
26. *Torque:* 10 Nm



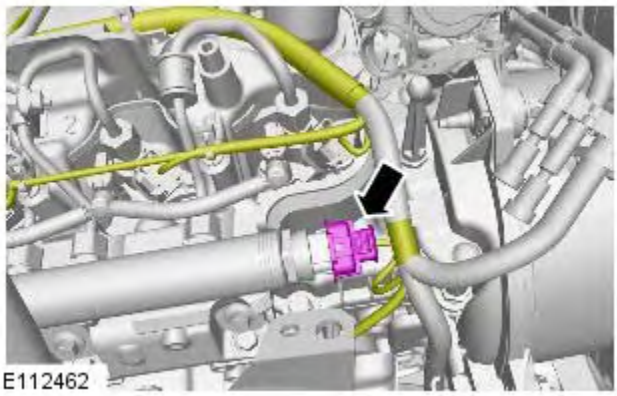
27. *Torque:* 10 Nm



28. *Torque:* 10 Nm



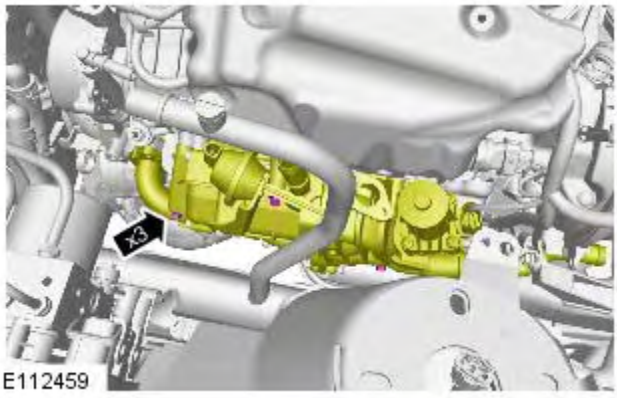
29. *Torque:* 10 Nm



30.

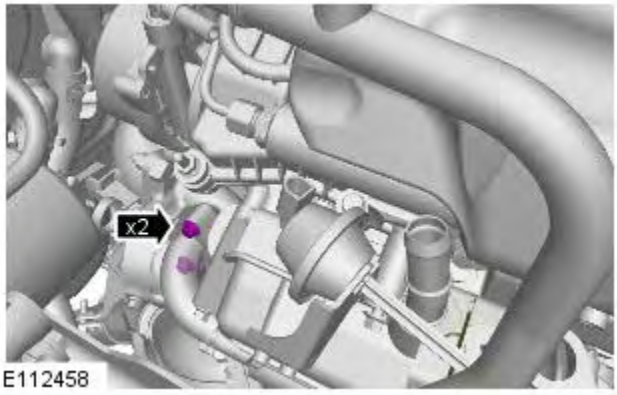
E117706

31.



E112459

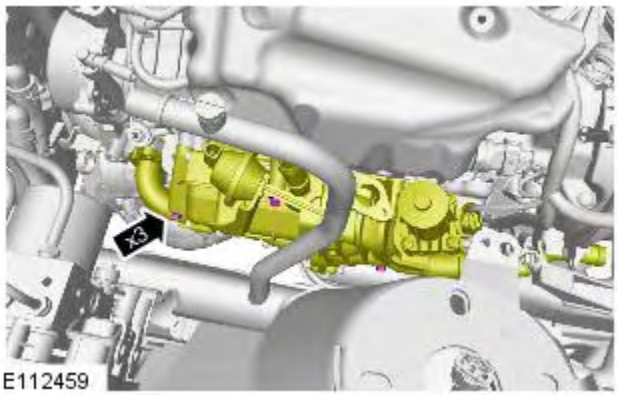
32. CAUTION: Only tighten the bolts finger-tight at this stage.



E112458

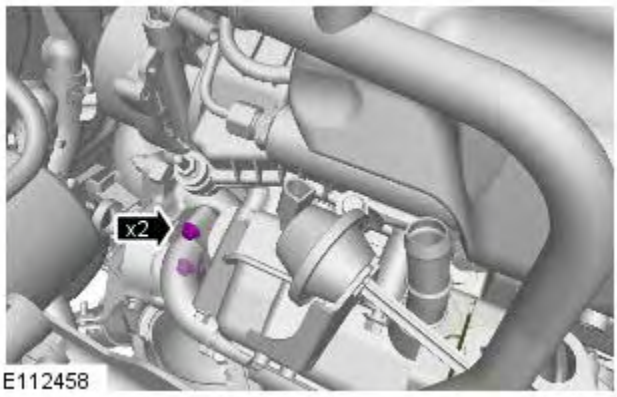
33. CAUTION: Only tighten the bolts finger-tight at this stage.

NOTE: Install a new gasket.

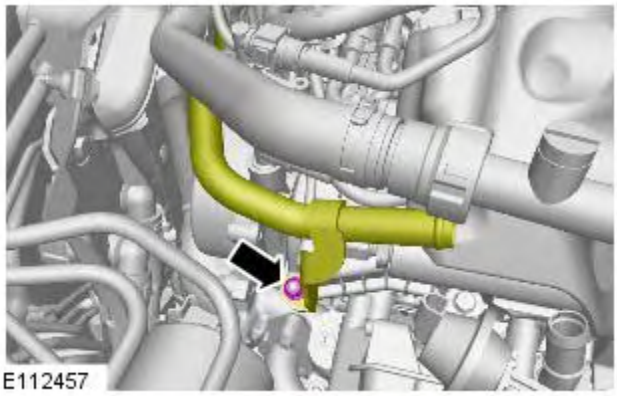


E112459

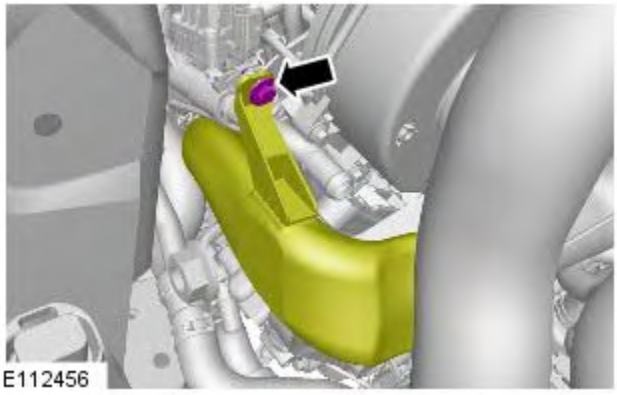
34. *Torque:* 10 Nm



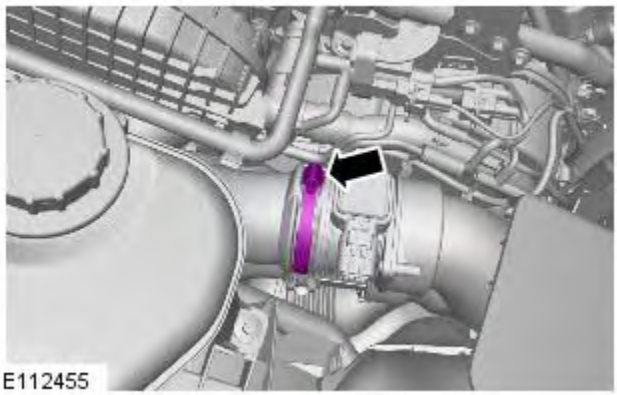
35. *Torque:* 10 Nm



36. *Torque:* 10 Nm

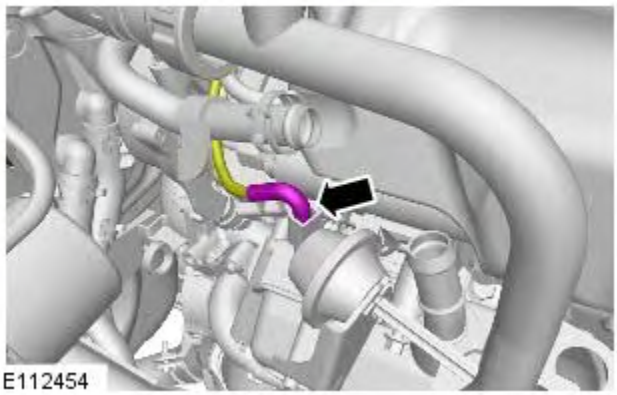


37. *Torque:* 10 Nm



38. *Torque:* 7 Nm

39.



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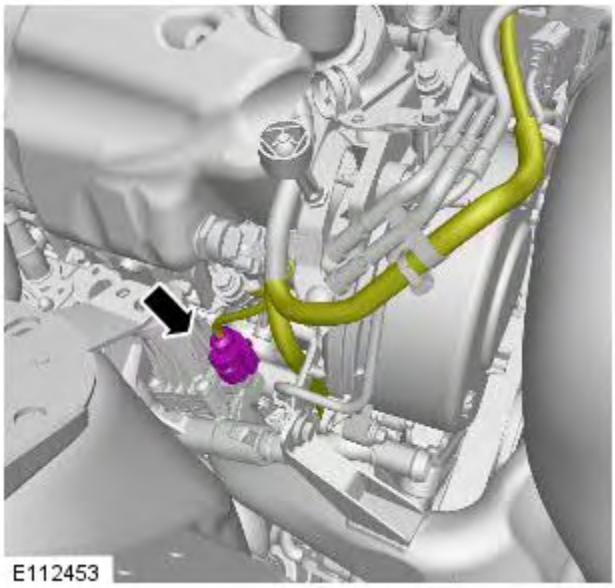

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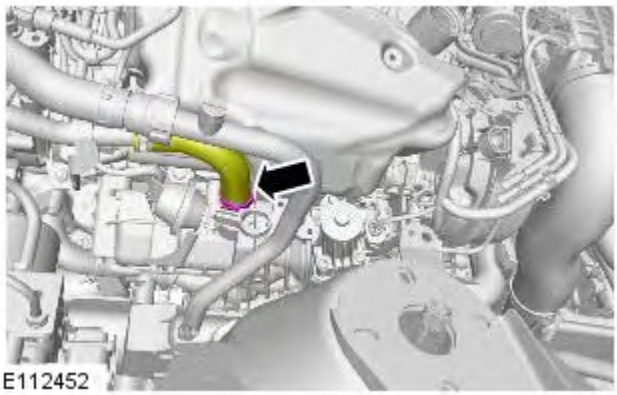

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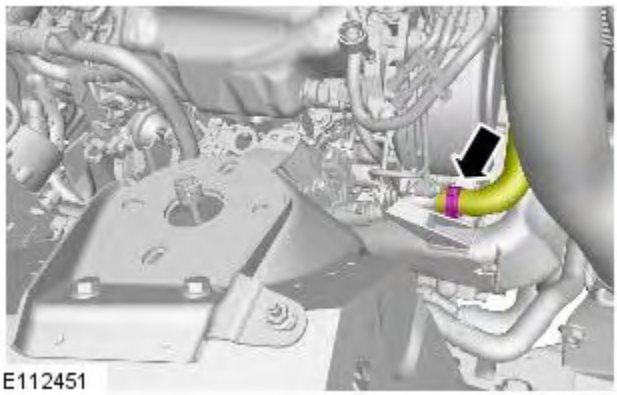
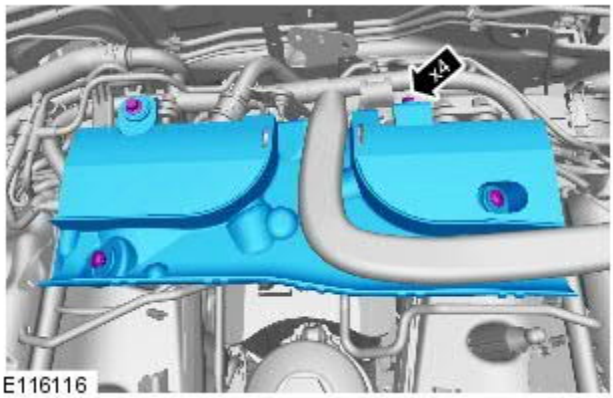


43. *Torque:* 10 Nm



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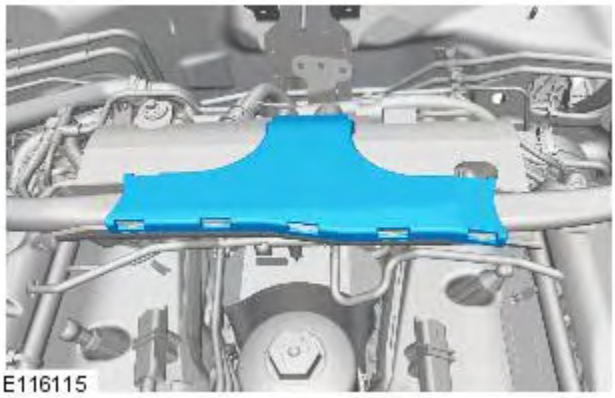
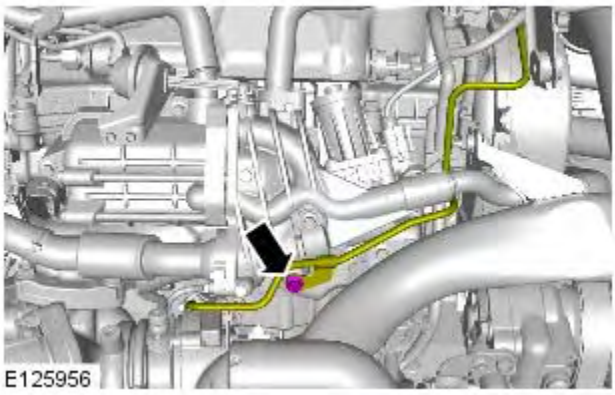
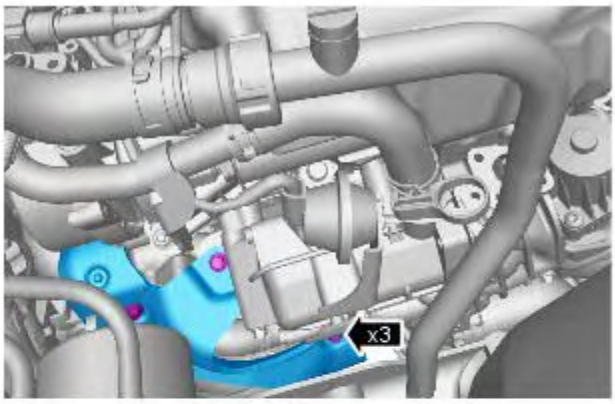
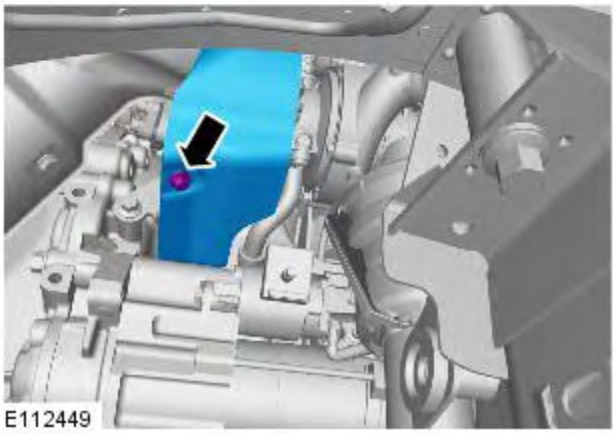


45. NOTE: Engine shown removed for clarity.

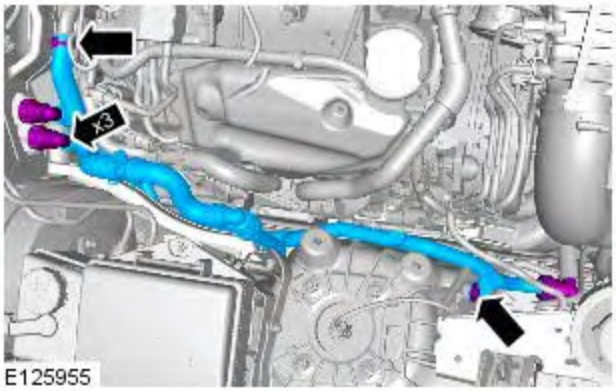
Torque: 10 Nm







46. *Torque:* 10 Nm



47.

48. Refer to: Cooling System Partial Draining, Filling and Bleeding (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).

49. Refer to: Exhaust Gas Recirculation (EGR) Valve Outlet Tube RH (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).

50. Refer to: Secondary Bulkhead Panel RH (501-02 Front End Body Panels, Removal and Installation).

51. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

52. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 11-May-2011

Intake Air Distribution and Filtering - TDV6 3.0L Diesel -

Torque Specification

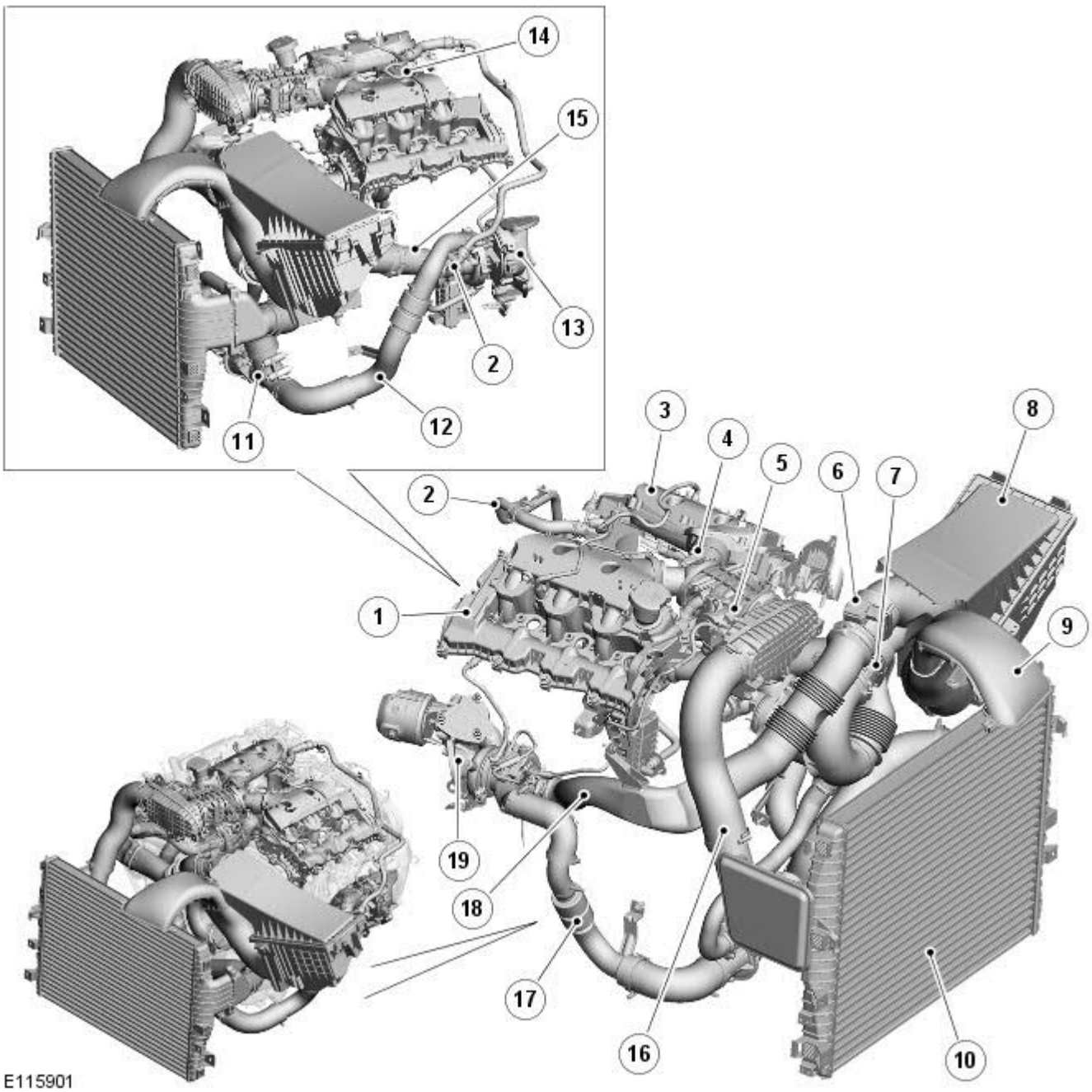
Description	Nm	lb-ft	lb-in
Air cleaner housing retaining bolt	8	-	71
Charge air cooler to radiator retaining bolts	7	-	62

Published: 11-May-2011

Intake Air Distribution and Filtering - TDV6 3.0L Diesel - Intake Air Distribution and Filtering TDV6 3.0L Diesel - Component Location

Description and Operation

Component Location



Item	Description
1	RH (right-hand) intake manifold
2	Crankcase gas to clean air intake pipe
3	LH (left-hand) intake manifold
4	Charge air MAPT (manifold absolute pressure and temperature) sensor
5	Intake manifold throttle actuator
6	MAF (mass air flow) sensor (secondary turbocharger)
7	MAF / IAT (intake air temperature) sensor (primary turbocharger)
8	Air cleaner housing

9	Air intake scoop
10	Charge air cooler
11	Turbocharger inlet valve assembly
12	Pipe - Compressed air from primary turbocharger to charge air cooler
13	Primary turbocharger
14	Crankcase breather and separator
15	Intake air to primary turbocharger pipe
16	Charge air cooler to throttle intake manifold pipe
17	Pipe - Compressed air from secondary turbocharger to charge air cooler
18	Intake air to secondary turbocharger pipe
19	Secondary turbocharger

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Intake Air Distribution and Filtering - TDV6 3.0L Diesel - Intake Air Distribution and Filtering TDV6 3.0L Diesel - Overview

Description and Operation

OVERVIEW

The intake air distribution and filtering system comprises:

- Two MAF (mass air flow) / IAT (intake air temperature) sensor
- Charge air temperature sensor
- Air cleaner and housing
- Charge air cooler
- Primary and secondary turbochargers.

The system cleans, cools and compresses the intake air. The turbochargers compress the air which is then cooled in the charge air cooler before being mixed with the injected fuel in the cylinder producing a high energy combustion increasing engine performance.

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Intake Air Distribution and Filtering - TDV6 3.0L Diesel - Intake Air Distribution and Filtering TDV6 3.0L Diesel - System Operation and Component Description

Description and Operation

System Operation

OPERATION

Air is drawn into the air intake system via the air intake scoop located at the front of the vehicle. The air passes into the air cleaner housing and passes through the air cleaner. The air cleaner is a pleated, paper type filter which removes dust, pollen etc. from the intake air.

The filtered clean air passes from the air cleaner housing to the turbocharger inlet valve assembly. Depending on engine load and operating conditions, the intake air can be passed to only the primary turbocharger or to both the primary and secondary turbochargers.

Exhaust gasses leaving the exhaust manifolds are used to drive a turbine in the turbocharger which is turn drives a compressor. The rotational speed of the compressor is directly related to the speed of the exhaust gasses leaving the engine. Increased exhaust gas emission drives the turbine, and subsequently the compressor, faster, further compressing the intake air delivered to the engine.

The compression of the air by the turbocharger also heats the air which increases the air volume (density). The intake air is passed into the charge air cooler which reduces the air temperature as it passes through the cooler. This in turn decreases the air volume allowing more air molecules to be passed into the cylinders. The cooled and compressed air is mixed with the injected fuel in the cylinder producing a high energy combustion increasing engine performance.

Component Description

DESCRIPTION

Air Cleaner and Housing

The air cleaner housing is located in the front LH (left-hand) side of the engine compartment. The housing has a water drain with a grommet which is located in a hole in the LH chassis longitudinal structure. A bolt secures the air cleaner housing to a captive nut in a bracket on the LH inner fender.

The air cleaner element is a pleated paper type element with an rubber seal around its perimeter. The seal locates in a groove in the housing and prevents air by-passing the element. The housing upper lid can be removed by pulling back 2 plastic clips to release the lid.

Charge Air Cooler

The charge air cooler is located at the front of the engine compartment, between the A/C (air conditioning) condenser and the engine cooling radiator.

Turbochargers are designed to force more air mass into the engine intake manifold and combustion chambers. This compression process by the turbocharger produces heat which can reduce the performance gains of turbocharging due to reduced density of the intake air and an increase the cylinder combustion temperature. To counteract this the charge air cooler is used to reduce the intake air temperature which increases the density of the air allowing more air molecules to be delivered to the combustion chamber.

The cooler is a cross flow type cooler and has inlet and outlet connections. The LH connection is the inlet for the compressed air deliver from the turbocharger compressors. The RH (right-hand) connection is the outlet for the cooled compressed air to be delivered to the throttle intake manifold.

The charge air cooler is an air-to-air type cooler. Heated air from the turbochargers is passed through tubes in the cooler. Ambient air passing over the tubes cools the intake air as it passes through the cooler.

Air Intake Components

The air intake components comprise 3 main components; airbox, intake manifolds and a throttle intake manifold.

Airbox

The airbox allows for the connection of the cooled intake air from the charge air cooler to the throttle intake manifold. The airbox houses a charge air temperature sensor which measures the temperature of the air entering the combustion chambers and passes this information to the ECM (engine control module).
Refer to: Electronic Engine Controls (303-14A Electronic Engine Controls - TDV6 3.0L Diesel, Description and Operation).

A single pipe from the airbox connects to the secondary turbocharger. Boost pressure is applied via this pipe to the turbine shaft of the secondary turbocharger to maintain the correct lubrication of the turbocharger during driving conditions where the secondary turbocharger is inactive.

Throttle Intake Manifold

The throttle intake manifold is located between the 2 intake manifolds and the airbox. The manifold splits the air entering the engine between the 2 intake manifolds.

The throttle intake manifold houses a DC electric throttle actuator which controls a flap in the body of the manifold. The flap is controlled by the ECM and is constantly adjusted in response to driver inputs via the throttle pedal to precisely control the amount of air allowed into the intake manifolds.
Refer to: Electronic Engine Controls (303-14A Electronic Engine Controls - TDV6 3.0L Diesel, Description and Operation).

Pipe connections on either side of the throttle intake manifold allow for the attachment of the exhaust gas outlet pipes from the EGR (exhaust gas recirculation) valves
Refer to: Engine Emission Control (303-08A Engine Emission Control - TDV6 3.0L Diesel, Description and Operation).

A boost pressure sensor is located on the top of the manifold where the air flow splits for the 2 intake manifolds. The pressure sensor measures the pressure of the intake air as delivered from the one or both of the turbochargers and passes this information to the ECM for turbocharger control.
Refer to: Electronic Engine Controls (303-14A Electronic Engine Controls - TDV6 3.0L Diesel, Description and Operation).

Intake Manifolds

The intake manifolds are an integral part of the cylinder head covers. Each intake manifold is connected to the throttle intake manifold via a push fit, sealed connection. The intake manifolds direct intake air to the inlet valves for each combustion chamber.

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Intake Air Distribution and Filtering - TDV6 3.0L Diesel - Intake Air Distribution and Filtering

Diagnosis and Testing

Principles of Operation

For a detailed description of the intake air distribution and filtering system and operation, refer to the relevant Description and Operation section in the workshop manual. REFER to: (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel)

Intake Air Distribution and Filtering - TDV6 3.0L Diesel (Description and Operation),
Intake Air Distribution and Filtering - TDV6 3.0L Diesel (Description and Operation),
Intake Air Distribution and Filtering - TDV6 3.0L Diesel (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
• Hoses and ducts condition and installation • Air cleaner element condition and installation • Restricted air intake • Vacuum hoses condition and installation • Pipework to turbocharger condition and installation • Turbocharger condition and installation • Charge air coolers	• Fuse(s) • Wiring harness • Loose or corroded electrical connector(s) • Mass Air Flow (MAF) sensor • Air Charge Temperature (ACT) sensor • Manifold absolute pressure (MAP) sensor • Intake Air Temperature (IAT) sensor • Intake air shut-off throttle solenoid

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Causes	Action
Vehicle does not start/hard starting	• Restricted/Blocked air intake • Restricted/Blocked air cleaner element	Clear the restriction. Replace the air cleaner element as necessary.
Poor performance	• Turbocharger fault • Throttle body fault • Intercooler hoses	Check the turbocharger. Check the intake air shutoff throttle function (make sure the throttle body returns to the open position). Check the intercooler hoses.
Excessive intake noise	• Intake air leak after the turbocharger • Intake pipe disconnected/damaged after the air cleaner • Air cleaner assembly incorrectly assembled/damaged	Check the joint between the air intake elbow and the intake air shutoff throttle. Check the joints between the throttle body outlets and the intake manifolds. Check the charge air cooler seals. Check the intake system and hoses for correct installation/damage.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Engine Control Module 3.0L Tdv6 (PCM) (100-00, Description and Operation).

Published: 11-May-2011

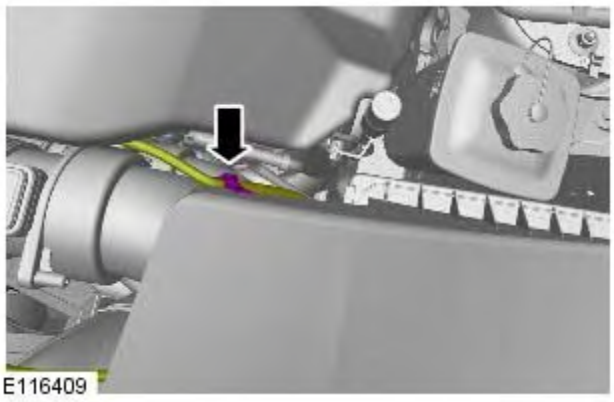
Intake Air Distribution and Filtering - TDV6 3.0L Diesel - Air Cleaner

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1.



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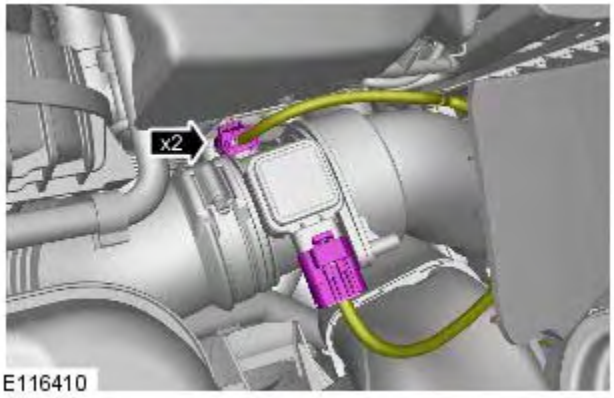

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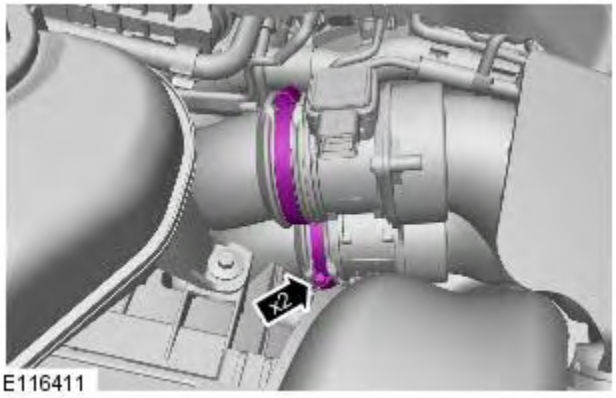

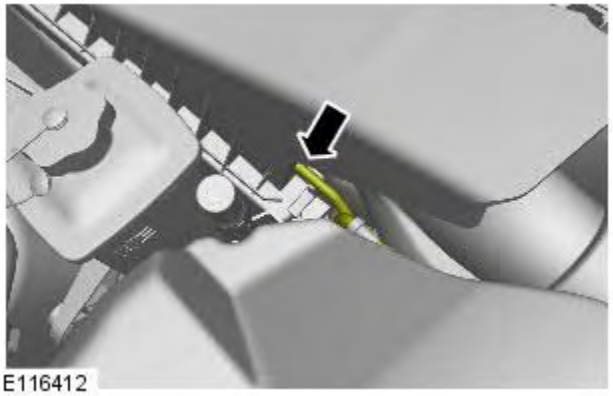

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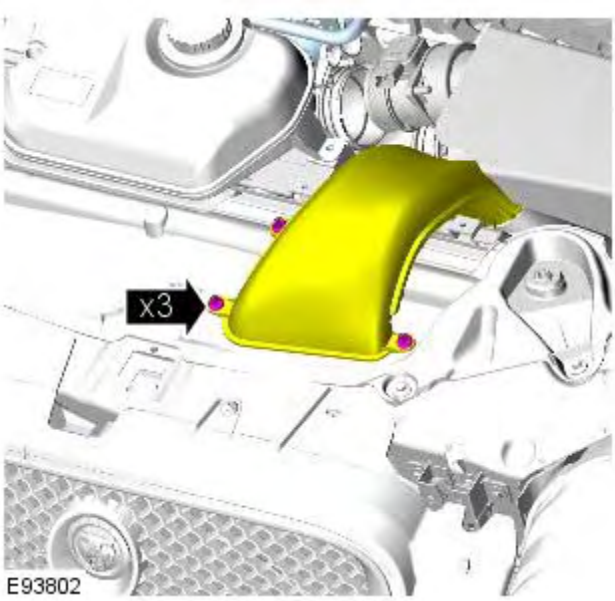
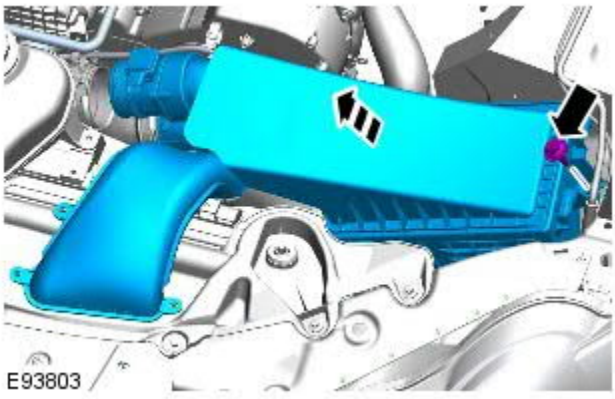
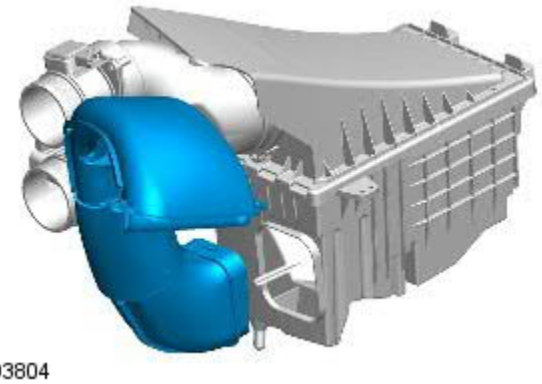


5. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



6. *Torque:* 8 Nm


E93804

7. NOTE: Do not disassemble further if the component is removed for access only.

Installation

1. To install, reverse the removal procedure.

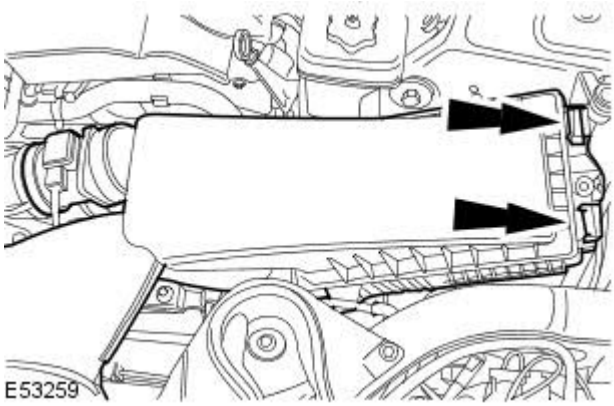
Published: 11-May-2011

Intake Air Distribution and Filtering - TDV6 3.0L Diesel - Air Cleaner Element

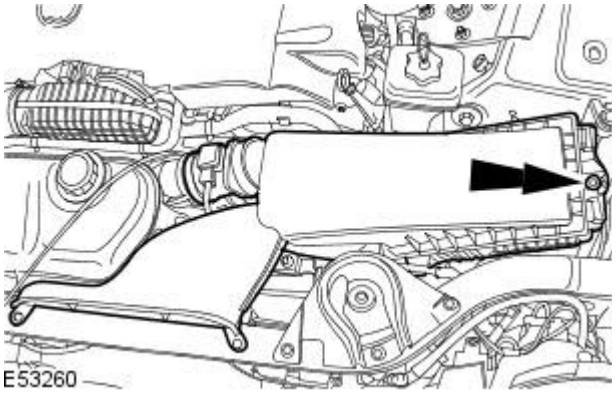
Removal and Installation

Removal

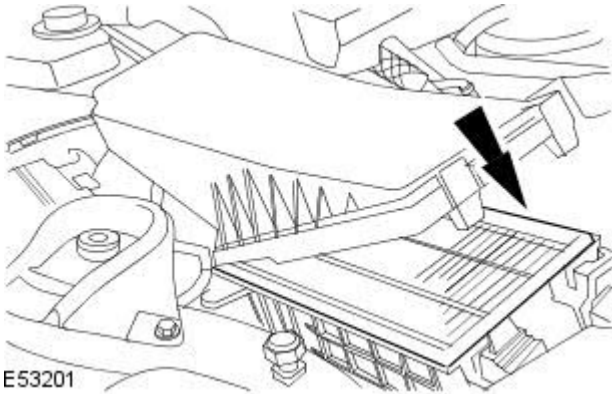
NOTE: Removal steps in this procedure may contain installation details.



1.



2. TORQUE: 8 Nm



3.

Installation

1. To install, reverse the removal procedure.

Published: 18-Jun-2014

Intake Air Distribution and Filtering - TDV6 3.0L Diesel - Charge Air Cooler

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

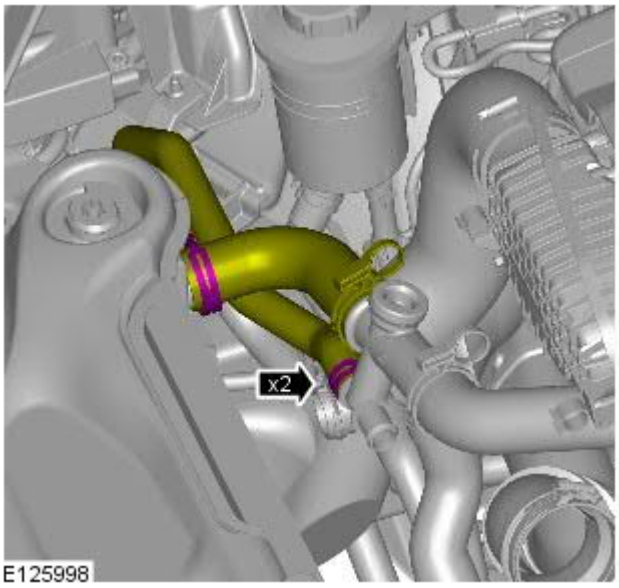
1. WARNING: Make sure to support the vehicle with axle stands.

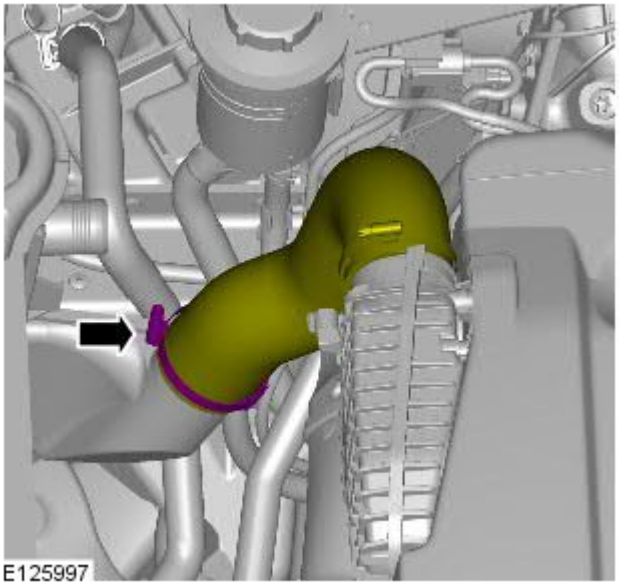
   Raise and support the vehicle.

2. Refer to: Cooling Fan Motor and Shroud (303-03A Engine Cooling - TDV6 3.0L Diesel, Removal and Installation).

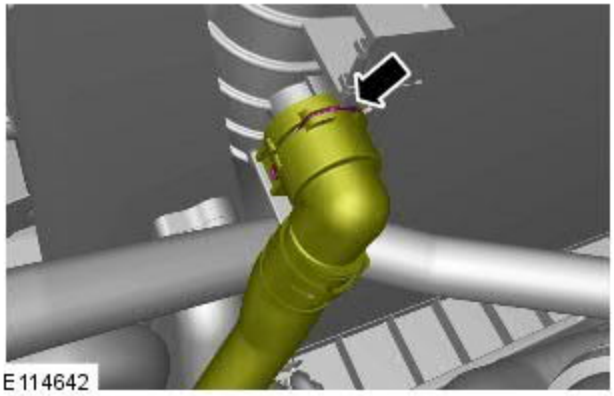
3. Refer to: Cooling System Partial Draining, Filling and Bleeding (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).

4.





5. *Torque:* 4.5 Nm



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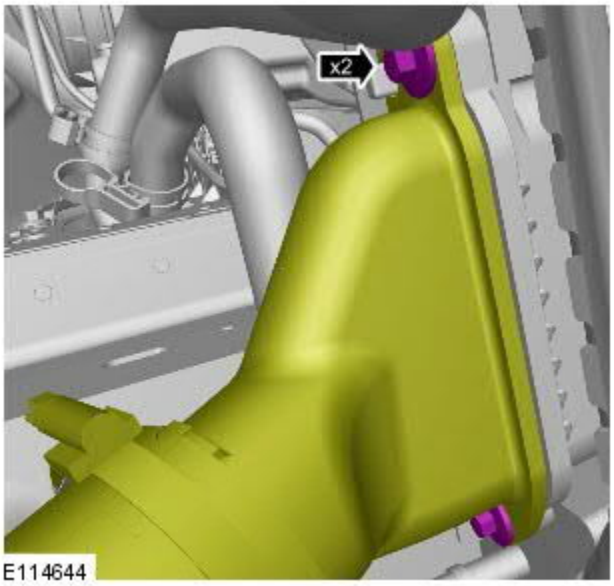
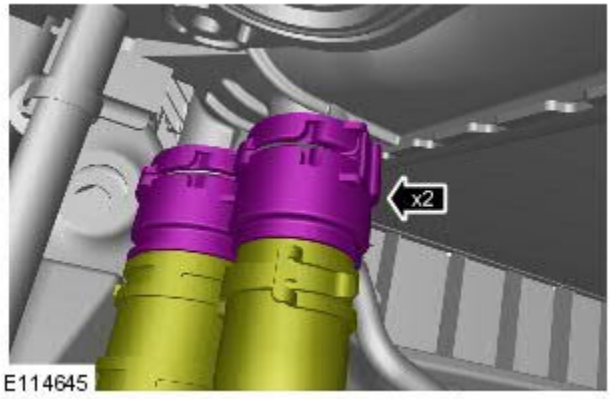
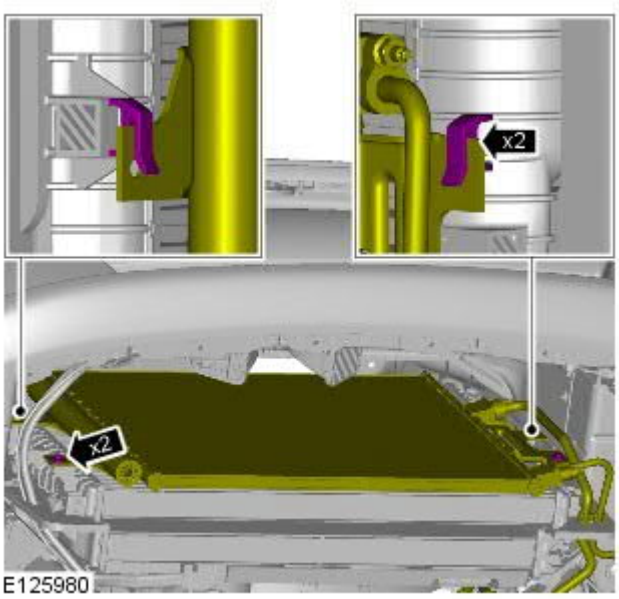


7. *Torque:* 7 Nm



8. CAUTION: Be prepared to collect escaping coolant.

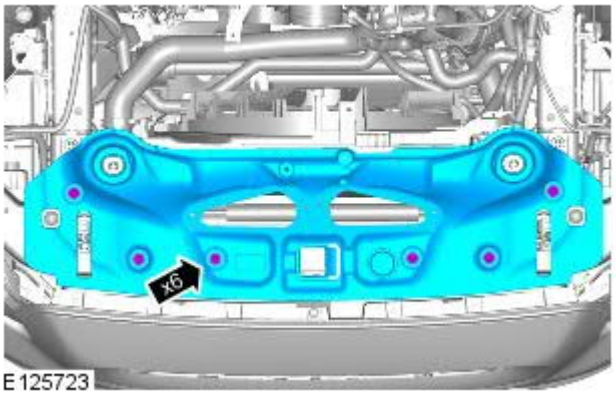


9. CAUTIONS:

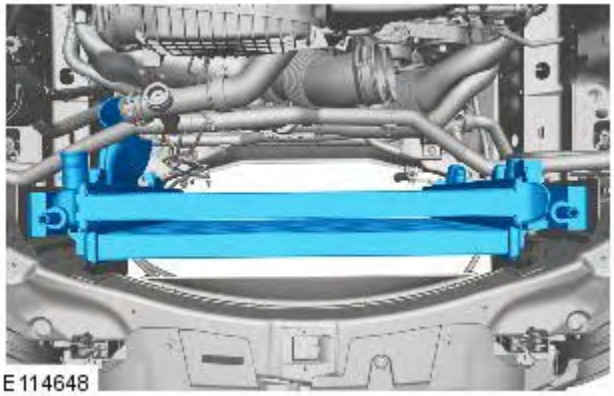
   Protect the air conditioning (A/C) condenser.

   Using suitable cable tie secure the A/C condenser away from the radiator.

   Torque: 7 Nm



10. *Torque:* 9 Nm

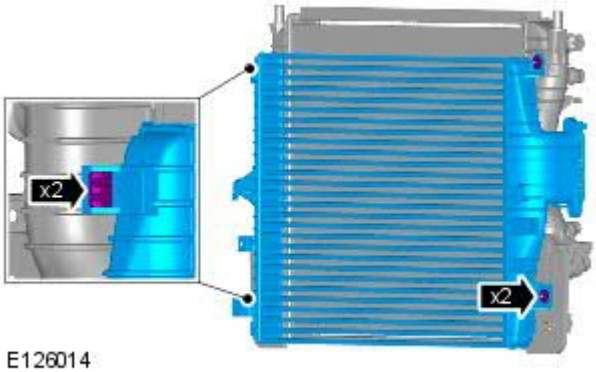

E114648

11. CAUTION: Be prepared to collect escaping coolant.

12. NOTE: Do not disassemble further if the component is removed for access only.

E114649

13. *Torque:* 7 Nm



E126014

Installation

1. To install, reverse the removal procedure.

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Electronic Engine Controls - TDV6 3.0L Diesel -

Torque Specification

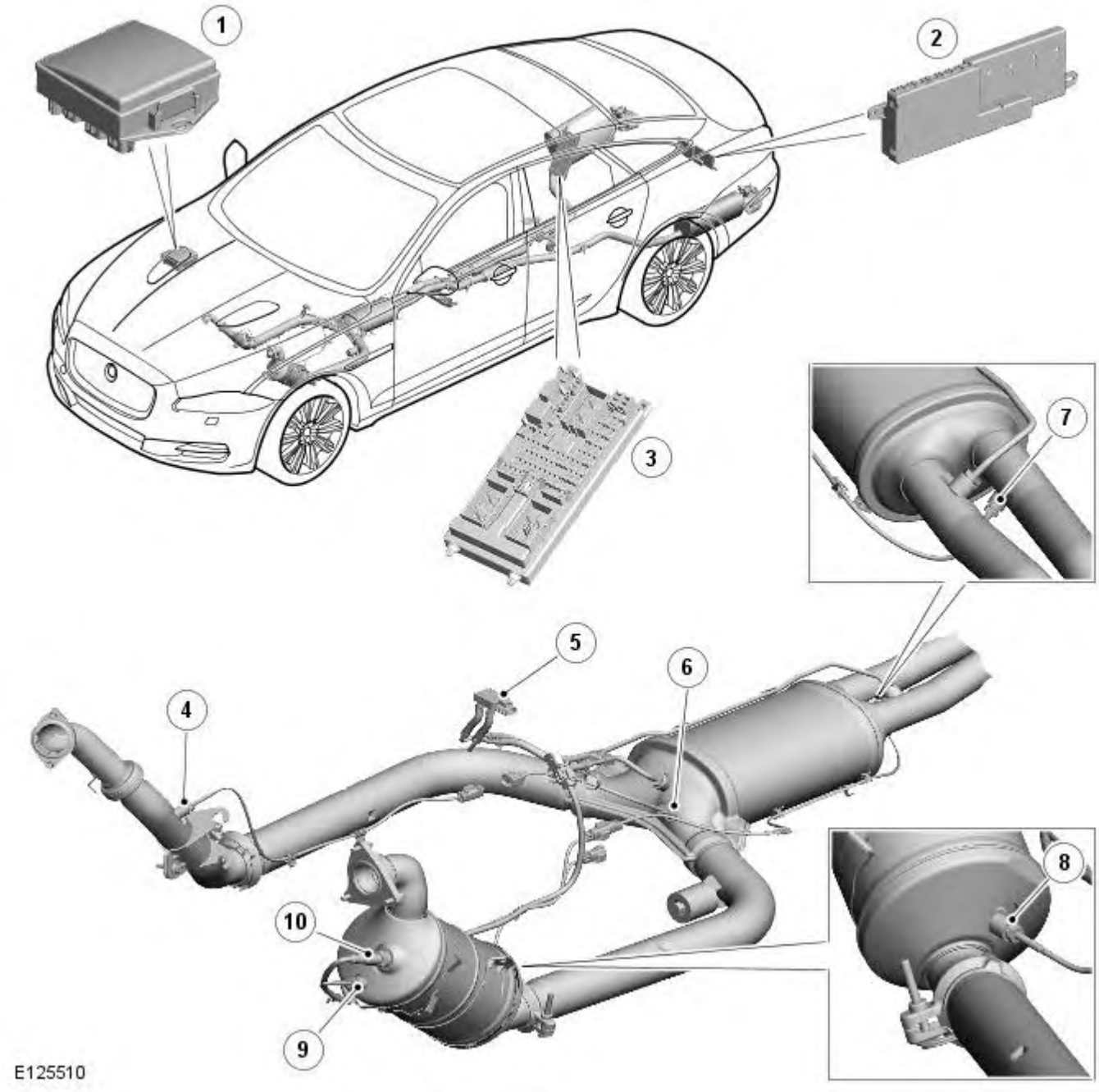
Description	Nm	lb-ft	lb-in
Camshaft position (CMP) sensor retaining bolt	10	7	-
Crankshaft position (CKP) sensor retaining bolt	5	-	44
Engine control module (ECM) retaining bolts	7	-	5
ECM to bracket retaining nuts	7	-	5
Engine oil pressure (EOP) sensor	14	11	-
Engine oil level sensor retaining nut	11	8	-
Mass air flow (MAF) sensor	2	-	18
Manifold absolute pressure (MAP) sensor	3	-	27
Exhaust gas temperature sensor RH	35	26	-
Pre catalytic converter temperature sensor	35	26	-
Post catalytic converter temperature sensor	35	26	-
Pre diesel particulate filter (DPF) exhaust gas temperature sensor	35	26	-
Post DPF exhaust gas temperature sensor	35	26	-
Heated oxygen sensor (HO2S)	48	35	-
Steering gear to subframe retaining bolts	100	74	-
Lower steering column to steering gear pinch bolt	35	26	-
Toe link ball joint to wheel knuckle retaining nut	133	98	-

Published: 11-May-2011

Electronic Engine Controls - TDV6 3.0L Diesel - Electronic Engine Controls - Component Location

Description and Operation

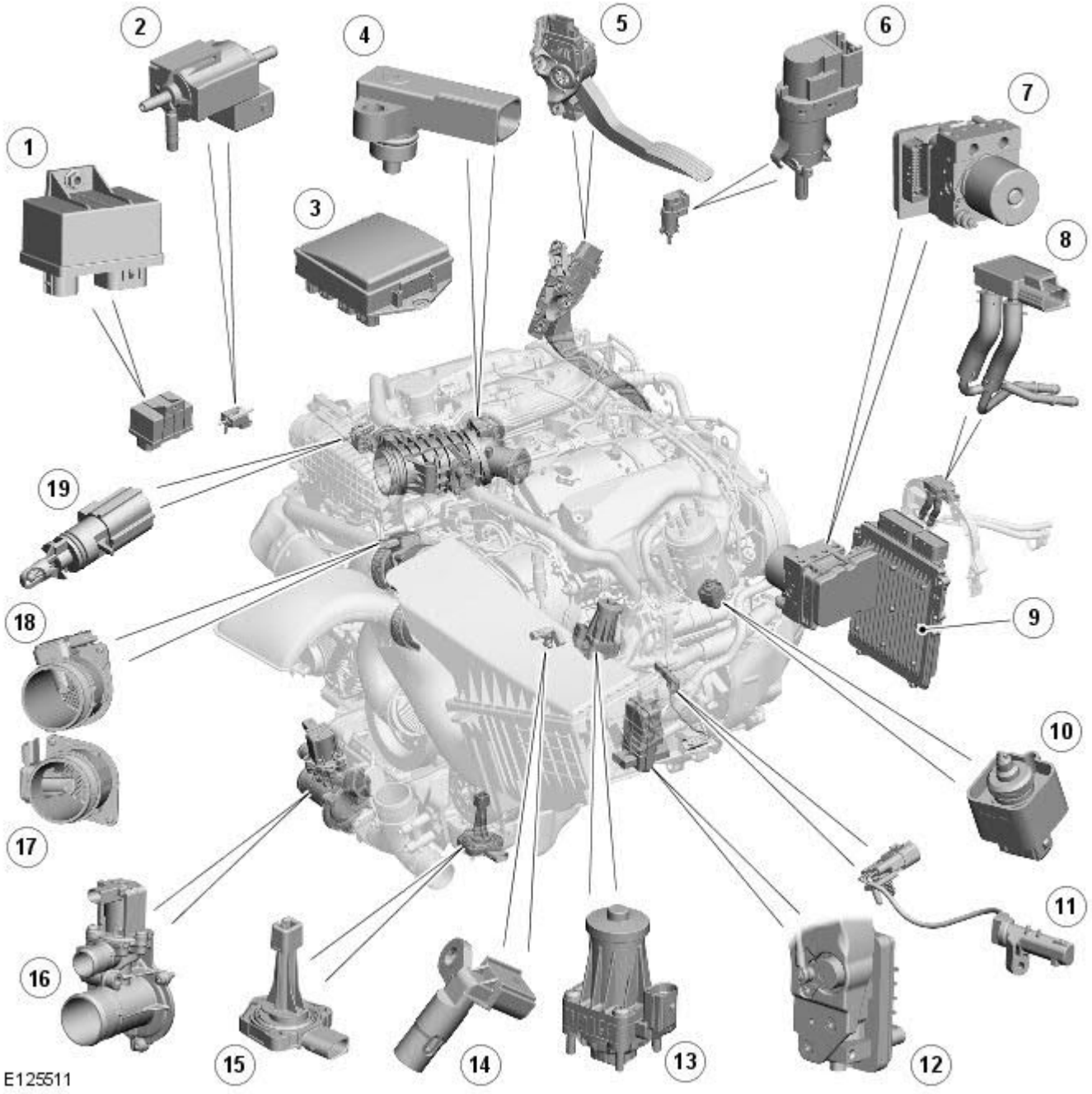
Component Location - Sheet 1 of 3



Item	Description
1	Engine Junction Box (EJB)
2	Battery Junction Box (BJB)
3	Central Junction Box (CJB)
4	Exhaust gas temperature sensor
5	Differential pressure sensor
6	Pre Diesel Particulate Filter (DPF) temperature sensor
7	Post DPF temperature sensor
8	Post catalyst temperature sensor

9	Pre-catalyst temperature sensor
10	Heated Oxygen sensor (HO2S)

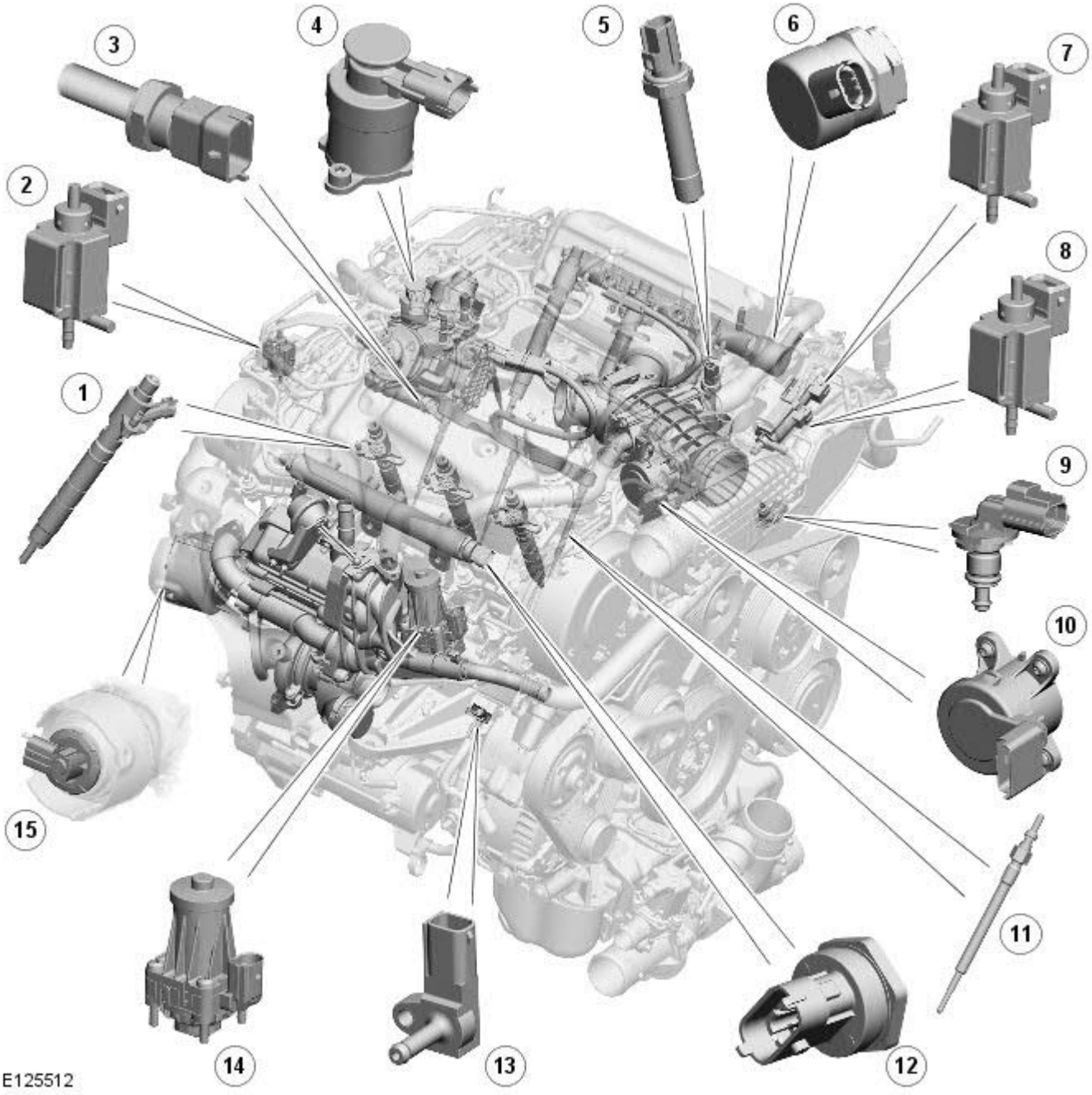
Component Location - Sheet 2 of 3



Item	Description
1	Glow plug module
2	Active engine mount solenoid valve
3	Engine Junction Box (EJB)
4	Manifold Absolute Pressure (MAP) sensor
5	Accelerator Pedal Position (APP) sensor
6	Brake lamp/brake test switch
7	Anti-lock Brake System (ABS) module
8	Differential pressure sensor
9	Engine Control Module (ECM)
10	Water in fuel sensor

11	Crankshaft Position (CKP) sensor
12	Primary turbocharger control module
13	Left Hand (LH) Exhaust Gas Recirculation (EGR) valve
14	Camshaft Position (CMP) sensor
15	Engine oil level/temperature sensor
16	Secondary turbocharger recirculation valve
17	Mass Air Flow (MAF) / Intake Air Temperature (IAT) sensor (primary turbocharger)
18	Mass Air Flow (MAF) sensor (secondary turbocharger)
19	Charge air temperature sensor

Component Location - Sheet 3 of 3



Item	Description
1	Fuel injector (6 off)
2	EGR cooler bypass vacuum solenoid valve
3	Fuel temperature sensor

4	Fuel volume control valve
5	Engine oil pressure sensor
6	Fuel pressure control valve
7	Secondary turbocharger compressor shut-off solenoid valve
8	Secondary turbocharger turbine shut-off solenoid valve
9	Engine Coolant Temperature (ECT) sensor
10	Throttle actuator
11	Glow plug (6 off)
12	Fuel pressure sensor
13	Secondary turbocharger boost pressure sensor
14	Right Hand (RH) EGR valve
15	Secondary turbocharger turbine shut-off valve and position sensor

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Electronic Engine Controls - TDV6 3.0L Diesel - Electronic Engine Controls - Overview

Description and Operation

OVERVIEW

The 3.0L V6 diesel engine has an ECM controlled engine management system. Multiple sensor inputs and precision control of actuators are used by the ECM to achieve optimum performance during all driving conditions.

The ECM receives and processes information from the following input sources:

- Oil level sensor
- Secondary turbocharger shut-off sensor
- Secondary turbocharger boost pressure sensor
- Alternator
- Differential pressure sensor
- Camshaft Position (CMP) sensor
- Crankshaft Position (CKP) sensor
- Fuel rail pressure sensor
- Fuel temperature sensor
- Air charge temperature sensor
- Engine Coolant Temperature (ECT) sensor
- Throttle Position (TP) sensor
- Mass Air Flow (MAF) / Intake Air Temperature (IAT) sensor
- Manifold Absolute Pressure (MAP) sensor
- EGR sensors
- HO2S
- Catalyst and Diesel Particulate Filter (DPF) temperature sensors
- Brake lamp switch

The Engine Control Module (ECM) outputs controlling signals to the following sensors and actuators:

- Air Conditioning (A/C) compressor clutch solenoid
- A/C compressor clutch
- Fuel injectors
- Glow plug module
- Fuel pressure control valve
- Fuel volume control valve
- Fan control module
- Vacuum control valves (EGR cooler by-pass, secondary turbocharger compressor shut-off, secondary turbocharger turbine shut-off)
- ABS module
- Transmission Control Module (TCM)
- Instrument cluster
- Restraints Control Module (RCM)
- Primary turbocharger control module
- EGR recirculation valves
- Alternator
- Throttle actuator
- Secondary turbocharger compressor recirculation valve
- Active engine mount solenoid valve.

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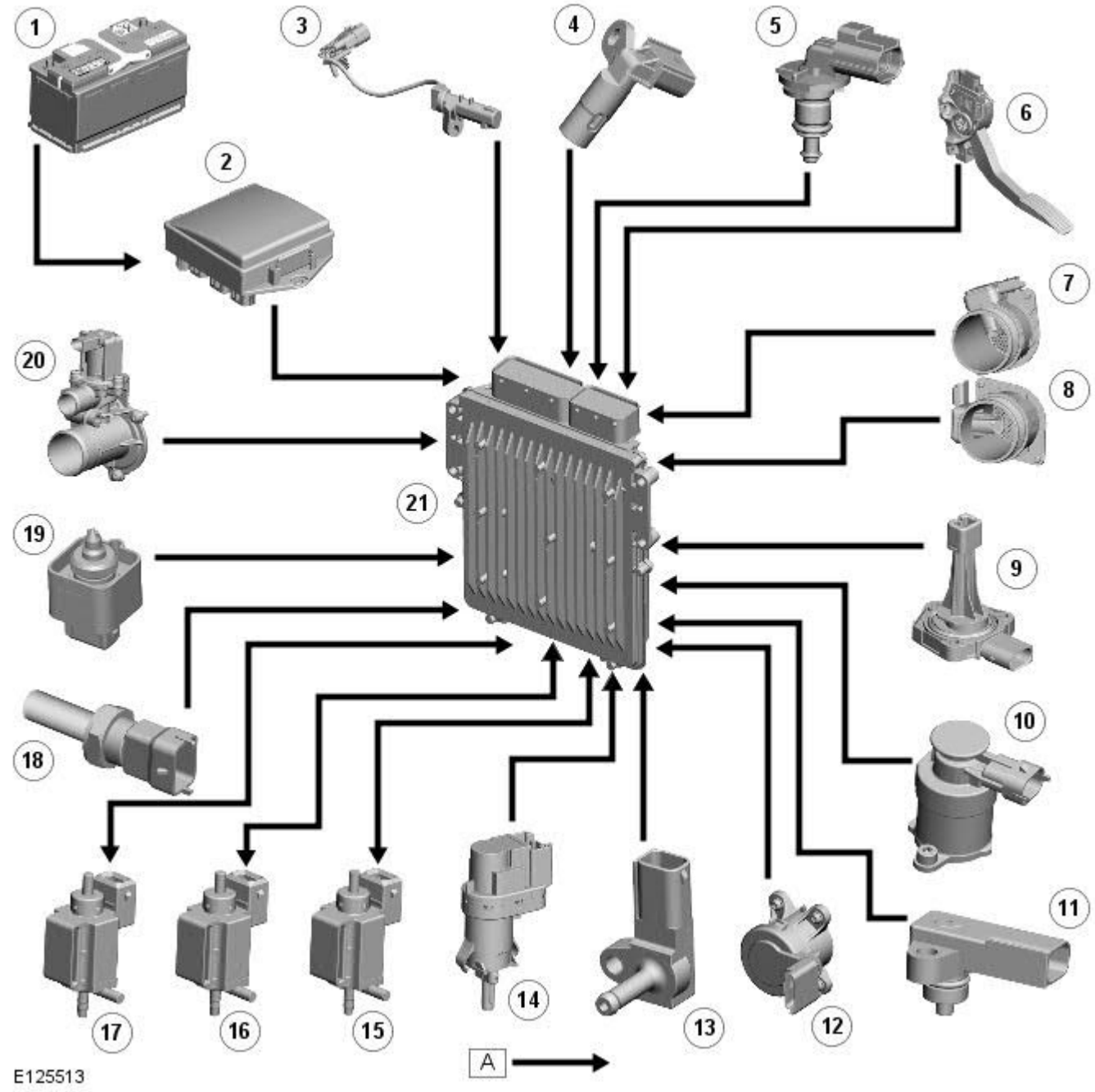
Electronic Engine Controls - TDV6 3.0L Diesel - Electronic Engine Controls - System Operation and Component Description

Description and Operation

Control Diagram

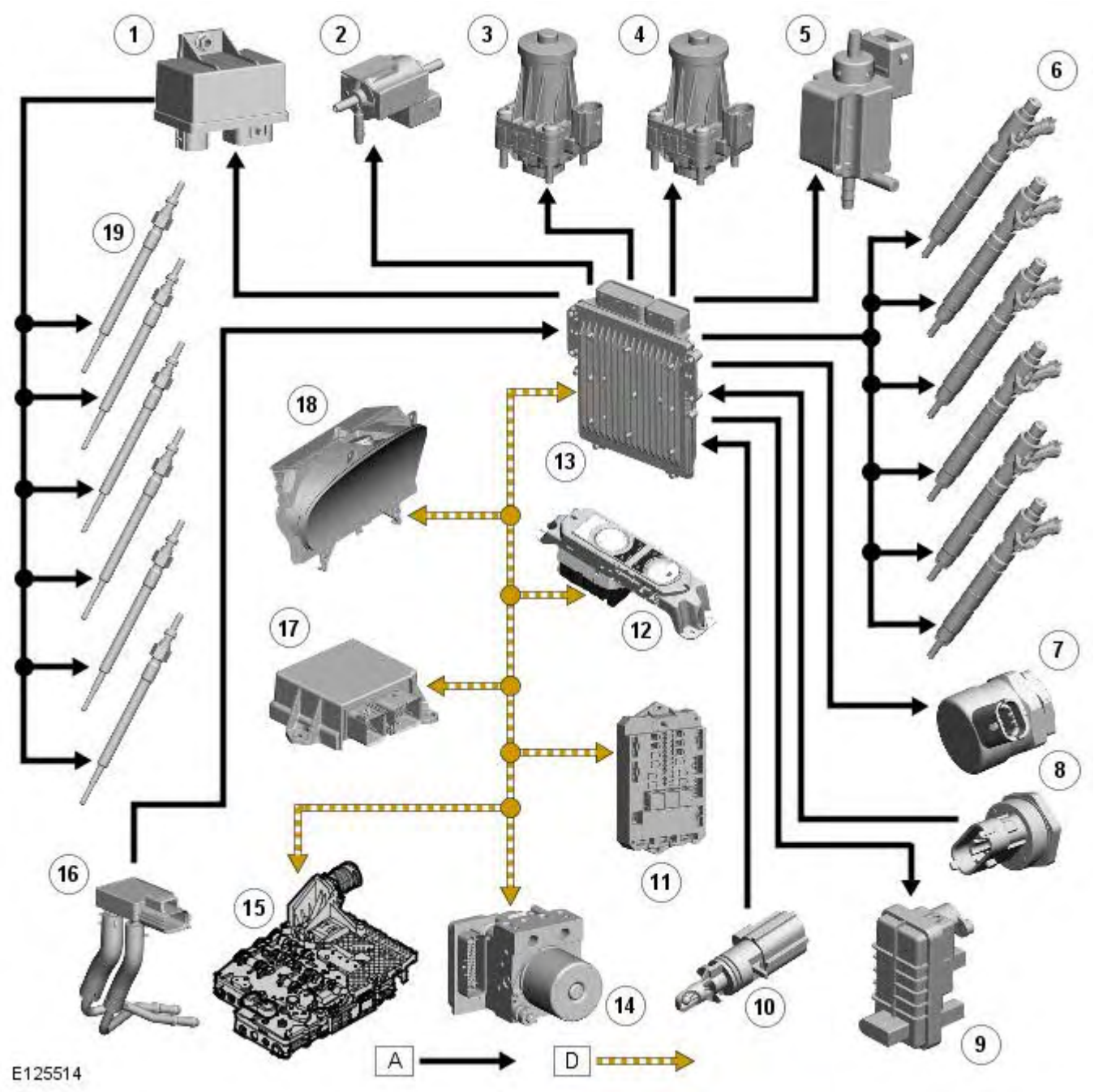
3.0L V6 Diesel Control Diagram - Sheet 1 of 2



Item	Description
NOTE:	**A** = Hardwired
1	Battery
2	Engine Junction Box (EJB)
3	Crankshaft Position (CKP) sensor
4	Camshaft Position (CMP) sensor
5	Engine Coolant Temperature (ECT) sensor
6	Accelerator Pedal Position (APP) sensor

7	Mass Air Flow (MAF)/Intake Air Temperature (IAT) sensor
8	Mass Air Flow (MAF) sensor
9	Engine oil level/temperature sensor
10	Fuel volume control valve
11	Manifold Absolute Pressure (MAP) sensor
12	Throttle actuator
13	Secondary turbocharger boost pressure sensor
14	Brake lamp/brake test switch
15	Exhaust Gas Recirculation (EGR) solenoid valve
16	Secondary turbocharger turbine shut-off solenoid valve
17	Secondary turbine compressor shut-off solenoid valve
18	Fuel temperature sensor
19	Water in fuel sensor
20	Secondary turbocharger recirculation valve
21	Engine Control Module (ECM)

3.0L V6 Diesel Control Diagram - Sheet 2 of 2



Item	Description
NOTE:	**A** = Hardwired; **D** = High Speed Controller Area Network (CAN) bus
1	Glow plug relay
2	Active engine mounts solenoid valve
3	Left Hand (LH) Exhaust Gas Recirculation (EGR) valve
4	Right Hand (RH) Exhaust Gas Recirculation (EGR) valve
5	EGR cooler bypass vacuum solenoid valve
6	Fuel injector (6 off)
7	Fuel pressure control valve
8	Fuel pressure sensor
9	Primary turbocharger control module
10	Charge air temperature sensor
11	Central Junction Box (CJB)
12	JaguarDrive selector
13	Engine Control Module (ECM)

14	Anti-lock Brake System (ABS) module
15	Transmission Control Module (TCM)
16	Differential pressure sensor
17	Restraints Control Module (RCM)
18	Instrument cluster
19	Glow plug (6 off)

System Operation

OPERATION

The 3.0L V6 diesel engine management system is controlled by an ECM (engine control module) and is able to monitor, adapt and precisely control the fuel injection. The ECM uses multiple sensor inputs and precision control of actuators to achieve optimum performance during all driving conditions.

The ECM controls fuel delivery to all six cylinders via a common rail injection system. The common rail system uses a fuel rail to accumulate highly pressurized fuel and feed the six, electronically controlled injectors. The fuel rail is located in close proximity to the injectors, which assists in maintaining full system pressure at each injector at all times.

The ECM uses the drive by wire principle for acceleration control. There are no control cables or physical connections between the accelerator pedal and the engine. Accelerator pedal demand is communicated to the ECM by two potentiometers located in an APP (accelerator pedal position) sensor. The ECM uses the two signals to determine the position, rate of movement and direction of movement of the pedal. The ECM then uses this data, along with other engine information from other sensors, to achieve the optimum engine response.

Component Description

DESCRIPTION

Engine Control Module (ECM)

The ECM is located on a bracket on the passenger side of the engine compartment bulkhead.

The ECM connected to the vehicle harnesses via 2 connectors. The ECM contains data processors and memory microchips. The output signals to the actuators are in the form of ground paths provided by driver circuits within the ECM. The ECM driver circuits produce heat during normal operation and dissipate this heat via the casing. Some sensors receive a regulated voltage supplied by the ECM. This avoids incorrect signals caused by voltage drop during cranking.

The ECM performs self diagnostic routines and stores fault codes in its memory. These fault codes and diagnostics can be accessed using a Jaguar approved diagnostic system. If the ECM is to be replaced, the new ECM is supplied 'blank' and must be configured to the vehicle using a Jaguar approved diagnostic system. A 'flash' EEPROM (electrically erasable programmable read only memory) allows the ECM to be externally configured, using a Jaguar approved diagnostic system, with market specific or new tune information. The current engine tune data can be accessed and read using a Jaguar approved diagnostic system.

When a new ECM is fitted, it must also be synchronized to other system control modules using a Jaguar approved diagnostic system. ECM's cannot be 'swapped' between vehicles as they must be 'matched' with security information to other system modules.

The ECM is connected to the engine sensors which allow it to monitor the engine operating conditions. The ECM processes these signals and decides the actions necessary to maintain optimum engine performance in terms of drive ability, fuel efficiency and exhaust emissions. The memory of the ECM is programmed with instructions for how to control the engine. The memory also contains data in the form of maps which the ECM uses as a basis for fuelling and emission control. By comparing the information from the sensors to the data in the maps, the ECM is able to calculate the various output requirements. The ECM contains an adaptive strategy which updates the system when components vary due to production tolerances or ageing.

The ECM is connected to other system control modules and receives data from these modules on the high speed CAN (controller area network) bus to enable precise engine control under all vehicle operating conditions.

Crankshaft Position (CKP) Sensor

E116415

The CKP (crankshaft position) sensor is located at the rear of the engine block on the LH (left-hand) side. The sensor lead passes through a cover in an aperture on the side of the engine block. The sensor is secured to a bracket on a plate which locates the rear crankshaft oil seal. The sensor tip is aligned with a magnetic trigger reluctor wheel which is attached to the end of the crankshaft. The trigger wheel is a press fit on the end of the crankshaft. The trigger wheel must be carefully aligned to the crankshaft to ensure correct timing. The sensor produces a square wave signal, the frequency of which is proportional to engine speed.

The ECM monitors the CKP sensor signal and can detect engine over-speed. The ECM counteracts engine over-speed by gradually fading out speed synchronized functions. The CKP is a Hall effect sensor. The sensor measures the magnetic field variation induced by the magnetized trigger wheel.

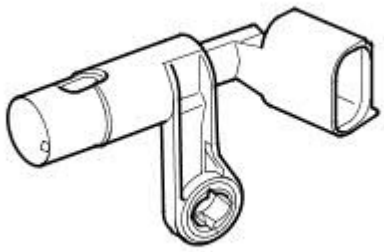
The trigger wheel has a 60 minus 2 tooth pattern. The missing teeth represent 12º of crankshaft rotation and provide a reference point for the angular position of the crankshaft at 21º BTDC (before top dead center) on cylinder 1.

When the space with the two missing teeth pass the sensor tip, a gap in the signal is produced which the ECM uses to determine the crankshaft position. The air gap between the sensor tip and the ring is important to ensure correct signals are output to the ECM. The recommended air gap between the CKP and the trigger wheel is 0.4 mm- 1.5 mm.

The ECM uses the signal from the CKP sensor for the following functions:

- Synchronization
- Determine fuel injection timing
- Produce an engine speed signal which is broadcast on the high speed CAN bus for use by other systems.

Camshaft Position (CMP) Sensor



E46902

The CMP (camshaft position) is located on the front face of the LH cylinder head. The sensor tip protrudes through an aperture in the front face of the cylinder head to pick up on a reluctor behind the camshaft pulley. The CMP sensor is a Hall effect type sensor.

The ECM uses the CMP sensor signal to determine if the piston in No. 1 cylinder is at injection TDC (top dead center) or exhaust TDC. Once this has been established, the ECM can then operate the correct injector to inject fuel into the cylinder when the piston is at injection TDC

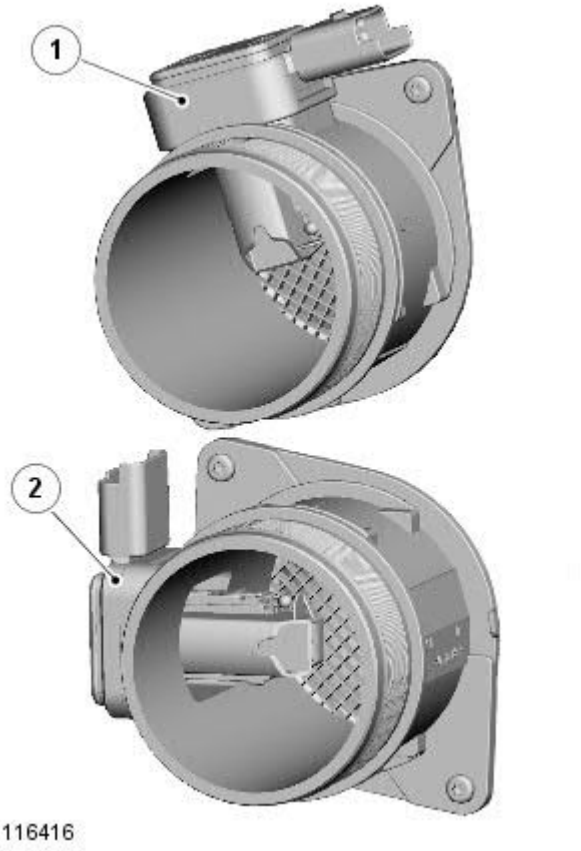
The CMP sensor is a Hall effect sensor which used by the ECM at engine start-up to synchronize the ECM with the CKP sensor signal. The ECM does this by using the CMP sensor signal to identify number one cylinder to ensure the correct injector timing. Once the ECM has established the injector timing, the CMP sensor signal is no longer used.

The CMP sensor receives a 5V supply from the ECM. Two further connections to the ECM provide ground and signal output.

If a fault occurs, an error is registered in the ECM. Two types of failure can occur; no CMP sensor signal or a synchronization error of the CMP and CKP sensors. The error recorded by the ECM can also relate to a total failure of the crankshaft signal or crankshaft signal dynamically implausible. Both components should be checked to determine the cause of the fault.

If a fault occurs with the CMP sensor when the engine is running, the engine will continue to run but the ECM will deactivate boost pressure control. Once the engine is switched off, the engine will crank but will not restart while the fault is present.

Mass Air Flow (MAF) and Inlet Air Temperature (IAT) Sensors



Item	Description
1	MAF (mass air flow) sensor
2	MAF/IAT (intake air temperature) sensor

The MAF/IAT sensors are located on the inlet air duct directly after the air filter box. Two sensors are fitted; the lower sensor is a combined MAF/IAT sensor and the upper sensor is a MAF sensor only.

The MAF sensors work on the hot film principle. Each sensor has 2 sensing elements which are contained within a film. One element is maintained at ambient (air intake) temperature, e.g. 25°Celsius (77°F). The other element is heated to 200°Celsius (392°F) above the ambient temperature, e.g. 225°Celsius (437°F). Intake air entering the engine passes through the MAF sensors and has a cooling effect on the film. The ECM monitors the current required to maintain the 200°Celsius (392°F) differential between the two elements and uses the differential to provide a precise, non-linear, signal which equates to the volume of air being drawn into the engine.

The MAF sensor output is a digital signal proportional to the mass of the incoming air. The ECM uses this data, in conjunction with signals from other sensors and information from stored fuelling maps, to determine the precise fuel quantity to be injected into the cylinders. The signal is also used as a feedback signal for the EGR (exhaust gas recirculation) system.

The IAT sensor in the lower sensor incorporates a NTC (negative temperature coefficient) thermistor in a voltage divider circuit. The NTC thermistor works on the principle of decreasing resistance in the sensor as the temperature of the intake air increases. As the thermistor allows more current to pass to ground, the voltage sensed by the ECM decreases. The change in voltage is proportional to the temperature change of the intake air. Using the voltage output from the IAT sensor, the ECM can correct the fuelling map for intake air temperature. The correction is an important requirement because hot air contains less oxygen than cold air for any given volume.

The MAF sensor receives a 12V supply from the EJB (engine junction box) and a ground connection via the ECM. Two further connections to the ECM provide a MAF signal and IAT signal.

The IAT sensor receives a 3.3V reference voltage from the ECM and shares a ground with the MAF sensor. The signal output from the IAT sensor is calculated by the ECM by monitoring changes in the supplied reference voltage to the IAT sensor voltage divider circuit.

The ECM checks the calculated air mass against the engine speed. If the calculated air mass is not plausible, the ECM uses a default air mass figure which is derived from the average engine speed compared to a stored characteristic map. The air mass value will be corrected using values for boost pressure, atmospheric pressure and air temperature.

If one of the MAF sensor fails the ECM implements the default strategy based on engine speed. In the event of a MAF sensor

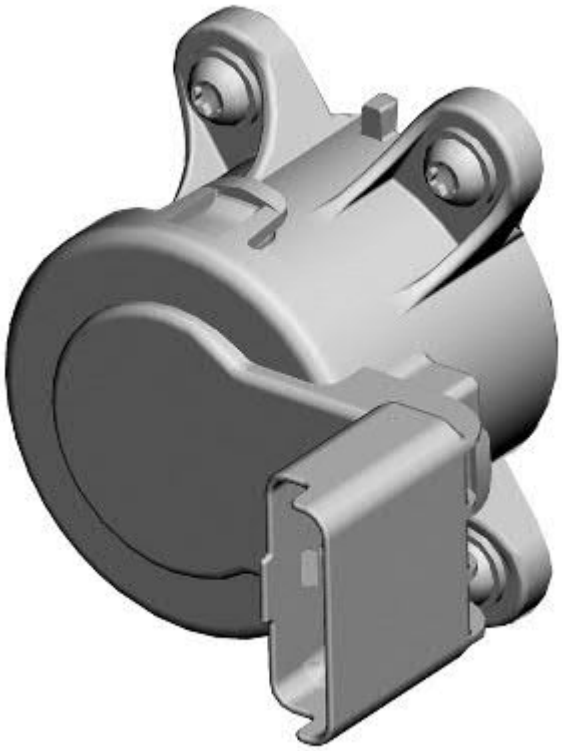
signal failure, the following symptoms may be observed:

- EGR system off
- Delayed engine response
- Reduced engine performance.

If the IAT sensor fails the ECM uses a default intake air temperature of 40° Celsius (104°F). In the event of an IAT sensor failure, the following symptom may be observed:

- Under fuelling, resulting in reduced engine performance.

Electronic Throttle Actuator

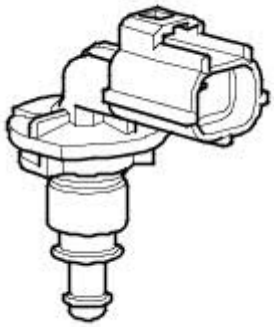


E116417

The electronic throttle actuator is located on the side of the throttle intake manifold.

The electronic throttle actuator controls the volume of air allowed into the inlet manifolds by means of a DC motor which controls a flap in the body of the throttle. The actuator is controlled by the ECM which operates the actuator in response to driver inputs from the APP sensor and other engine related sensors to provide the correct air flow to the intake manifolds.

Engine Coolant Temperature (ECT) Sensor



E46905

The ECT (engine coolant temperature) sensor is located in the LH EGR cooler coolant inlet pipe, at the front of the engine. The ECT sensor provides the ECM and the instrument cluster with engine coolant temperature status.

The ECM uses the temperature information for the following functions:

- Fuelling calculations
- Limit engine operation if engine coolant temperature becomes too high
- Cooling fan operation
- Glow plug activation time.

The instrument cluster uses the temperature information for generation of engine temperature messages. The engine coolant temperature signal is also transmitted on the medium speed CAN bus by the instrument cluster for use by other systems.

The ECT sensor circuit consists of an internal voltage divider circuit which incorporates an NTC thermistor. As the coolant temperature rises the resistance through the sensor decreases and vice versa. The output from the sensor is the change in voltage as the thermistor allows more current to pass to ground relative to the temperature of the coolant.

The ECM compares the signal voltage to stored values and adjusts fuel delivery to ensure optimum drive ability at all times. The engine will require more fuel when it is cold to overcome fuel condensing on the cold metal surfaces inside the combustion chamber. To achieve a richer air/fuel ratio, the ECM extends the injector opening time. As the engine warms up the air/fuel ratio is leaned off.

The input to the sensor is a 3.3V reference voltage supplied from the voltage divider circuit within the ECM. The ground from the sensor is also connected to the ECM which measures the returned current and calculates a resistance figure for the sensor which relates to the coolant temperature.

If the ECT sensor fails, the following symptoms may be observed:

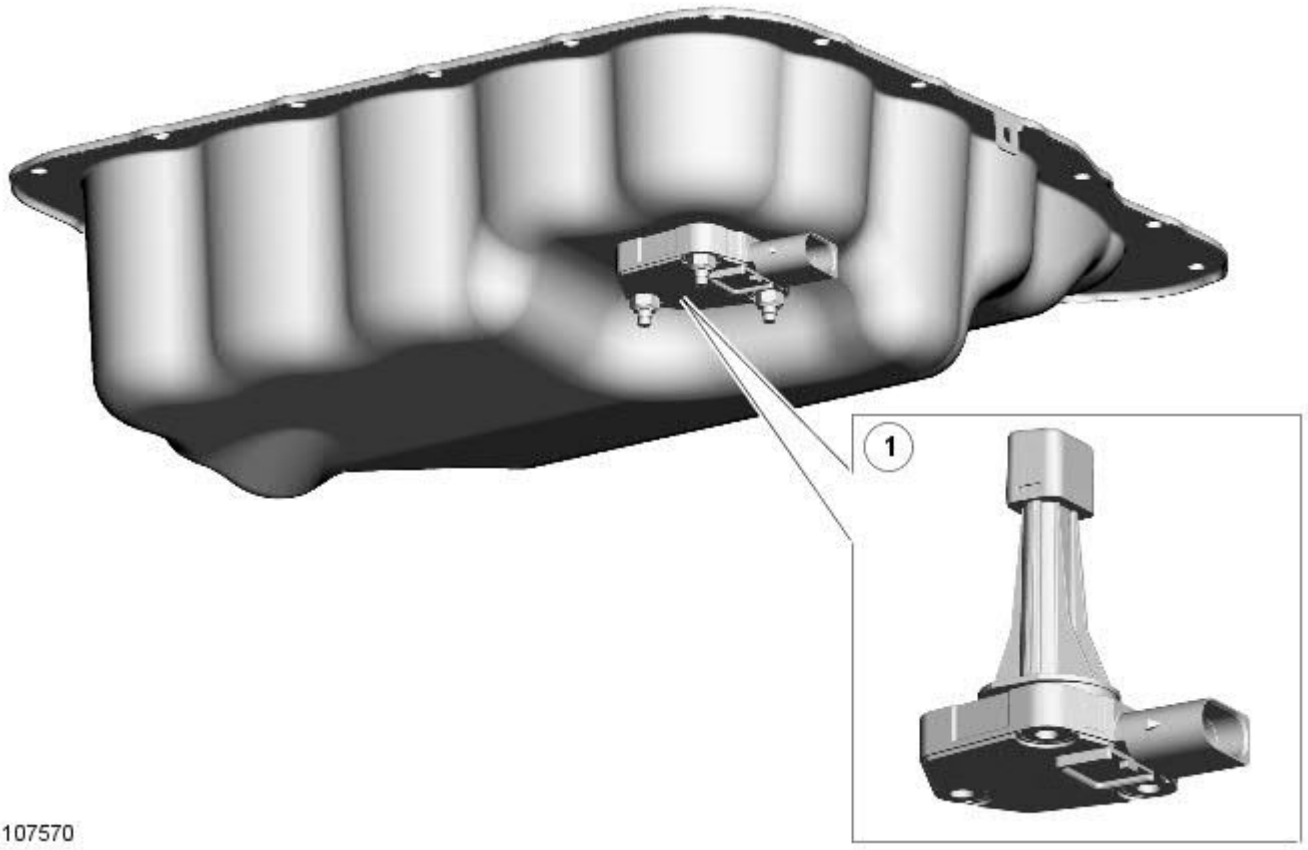
- Difficult cold start
- Difficult hot start
- Engine performance compromised
- Temperature gauge inoperative or inaccurate reading.

In the event of ECT sensor signal failure, the ECM applies a default value of 80°Celsius (176°F) coolant temperature for fuelling purposes. The ECM will also permanently operate the cooling fan at all times when the ignition is switched on, to protect the engine from overheating.

The table that follows shows ECT sensor values and the corresponding sensor resistance and voltage values.

Temperature (Degrees Celsius)	Resistance (KOhms)	Voltage (Volts)
- 40	925	3.23
- 30	496	3.16
- 20	277	3.06
- 10	160	2.91
-0	96	2.70
10	59	2.42
20	37	2.09
30	24	1.75
40	16	1.41
50	11	1.11
60	7.55	0.86
70	5.34	0.66
80	3.84	0.50
90	2.80	0.38
100	2.08	0.29
110	1.56	0.22
120	1.19	0.17
130	0.918	0.14
140	0.715	0.11
150	0.563	0.08

Engine Oil Level and Oil Temperature Sensor



Item	Description
1	Engine oil level and temperature sensor

The 3.0L V6 diesel engine is not fitted with a conventional dipstick. The dipstick is replaced with an ultrasonic oil level and temperature sensor which is located on 3 studs in the underside of the oil pan and secured with 3 locknuts.

The sensor uses ultrasonic pulses to determine the oil level in the oil pan. The level sensor sends an ultrasonic pulse vertically upward and measures the time taken for the pulse to be reflected back to the sensor from the upper surface of the oil. A second reference pulse is also transmitted across a reference distance. The time periods of the first and second pulses are compared and the sensor calculates the oil height in the oil pan. The sensor then converts the results into a PWM (pulse width modulation) signal to the ECM which converts the frequency of the signal into a oil level height.

The sensor uses an NTC type sensor to determine the oil temperature. The sensor measures the oil temperature and converts the sensor signal into a PWM signal to the ECM which converts the frequency of the signal into an oil temperature.

If the oil level is incorrect or a system fault occurs, a warning message is displayed in the instrument cluster message center. The messages that follow can be displayed in the message center:

Warning	System Status
ENGINE OIL LOW (Amber warning triangle displayed)	The oil is at the minimum level for safe operation. Top-up with 1 liter (1.8 pints) of oil.
ENGINE OIL HIGH (Amber warning triangle displayed)	This warning is displayed when the engine is started, if the oil is above the maximum level for safe operation. Stop the vehicle as soon as safety permits and seek qualified assistance to have the engine oil drained, before driving the vehicle.
ENGINE OIL CRITICALLY LOW (Red warning triangle displayed)	The oil is below the minimum level for safe operation. Stop the vehicle as soon as safety permits and top-up with 1.5 liters (2.6 pints) of oil. Wait for 10 minutes, re-check the oil level reading and top-up again if necessary.
ENGINE OIL LEVEL MONITOR SYSTEM FAULT (Amber warning triangle displayed)	A fault with the oil level monitoring system is indicated. Seek qualified assistance as soon as possible.

Oil Level Check

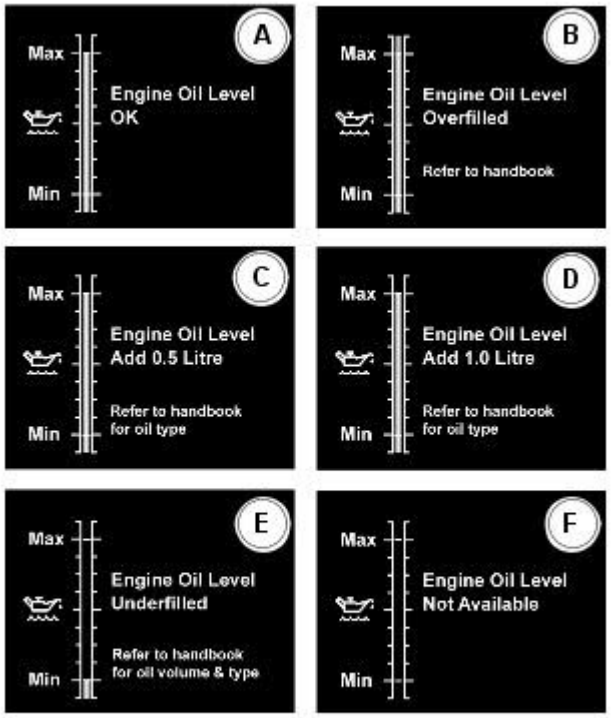
The engine oil level is automatically monitored and is displayed in the trip computer area of the message center.

The steps that follow allow the driver to view the current 'average' engine oil level providing the following parameters are met:

- It is recommended that a reading is taken after a journey (when the oil is hot)
- The engine is stopped and the transmission is in park
- The vehicle is parked on level ground
- 10 minutes has passed after stopping the engine (to allow the oil level to stabilize)

Press the 'TRIP' button on the end of the LH steering column multifunction switch repeatedly, until the oil can icon is displayed at the bottom of the message center.

NOTE: The system will not give a reading until the oil level has stabilized.



E127152

Item	Description
A	Oil at recommended level. No top-up required.
B	Add 0.5 litres (0.9 pint) of oil.
C	Add 1 litre (1.8 pints) of oil.
D	Oil above maximum for safe operation. Do not drive vehicle. Seek qualified assistance.
E	Oil level below minimum for safe operation. Add 1.5 litre (2.6 pints) of oil, then recheck level.
F1	Oil level stabilizing, oil level not available. Wait ten minutes and then recheck the oil level display.
F2	If this display is accompanied by the warning message 'ENGINE OIL LEVEL MONITOR SYSTEM FAULT', a fault with the oil level monitor is indicated. Seek qualified assistance.

Engine Oil Top-Up

CAUTIONS:

Failure to use an oil that meets the required specification, could cause excessive engine wear, a build-up of sludge and deposits and increase pollution. It could also lead to engine failure and invalidation of vehicle warranty.

Overfilling with oil could result in severe engine damage.

Use the procedure that follows to replenish the engine oil level:

- With the ignition on, but the engine not running, unscrew the oil filler cap.
- Add the appropriate quantity of oil (as indicated by the message center oil level display). Wait 10 minutes to allow the oil level stabilize and re-check the level. Clean up any oil spilled during topping up.
- Once the correct level is achieved, refit the filler cap and hand-tighten securely until one click is heard.

NOTES:

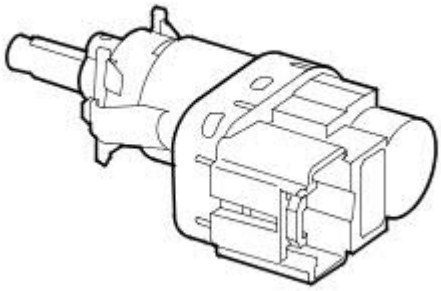
The approximate quantity of oil required to raise the level from the minimum level of safe operation to the maximum, is 1.5 litres (2.6 pints).

The ignition must be left on during the top-up, so that the electronic dipstick can register and display the new oil level. This enables an accurate level re-check.

Live Reading/Average Reset

A procedure is available to allow the technician to access the actual engine oil level, rather than the average engine oil level which is available to the driver. An additional procedure is also available to reset the average engine oil level. Refer to Engine - 3.0L Diesel - General Procedures -
Refer to: Engine Oil Draining and Filling (303-01A Engine - TDV6 3.0L Diesel, General Procedures).

Brake Lamp/Brake Test Switch



E46910

The brake lamp/brake test switch is located on the pedal box and is operated by the brake pedal. The 2 pole switch has a normally open circuit switch connected to battery voltage which closes the circuit when the driver has depressed the brake pedal and a normally closed circuit which is connected to ground when the driver depresses the brake pedal. The switch contacts are connected directly to the ECM and the ECM also receives a brake pressure signal on the high speed CAN bus from the ABS (anti-lock brake system) module.

The ECM uses the brake signal for the following:

- To limit fuelling during braking
- To inhibit/cancel Speed control if the brakes are applied.

In the event of a brake switch failure, the following symptoms may be observed:

- Speed control inactive
- Increased fuel consumption.

Fuel Pressure Control Valve

E116419

The fuel pressure control valve is incorporated into the forward end of the common fuel rail for the LH cylinder bank. The control valve regulates the fuel pressure within the fuel rails and is controlled by the ECM. The control valve is a PWM controlled solenoid valve.

When the solenoid is de-energized, an internal spring holds an internal valve closed. At fuel pressure of 100 bar (1450 lbf/in^2) or higher, the force of the spring is overcome, opening the valve and allowing fuel pressure to decay into the fuel return pipe. When the pressure in the fuel rail decays to approximately 100 bar (1450 lbf/in^2) or less, the spring force overcomes the fuel pressure and closes the valve. When the ECM energizes the solenoid, the valve is closed allowing the fuel pressure to build. The pressure in the fuel rail in this condition can reach approximately 2000 bar (29000 lbf/in^2).

The ECM constantly monitors the fuel pressure and activates the fuel pressure control valve accordingly to control the fuel rail pressure within the require parameters. Relieved fuel from the fuel rails is directed through the fuel rail leak-off pipe to the fuel filter return circuit.

The ECM controls the fuel rail pressure by operating the control valve solenoid using a PWM signal. By varying the duty cycle of the PWM signal, the ECM can accurately control the fuel rail pressure and hence the pressure delivered to the injectors according to engine load. This is achieved by the control valve allowing a greater or lesser volume of fuel to pass from the high pressure side of the pump to the un-pressurized fuel return line, regulating the pressure on the high pressure side.

The fuel pressure control valve receives a PWM signal from the ECM of between 0 and 12V. The ECM controls the operation of the control valve using the following information to determine the required fuel pressure:

- Fuel rail pressure
- Engine load
- APP sensor position
- Engine coolant temperature
- Engine speed.

In the event of a total failure of the fuel pressure control valve, the engine will not start. In the event of a partial failure of the fuel pressure control valve, the ECM will activate the solenoid with the minimum duty cycle which results in the injection quantity being limited.

Fuel Pressure Sensor

E116418

The fuel pressure sensor is located in the forward end of the common fuel rail for the RH (right-hand) cylinder bank. The sensor is screwed into a threaded port in the end of the fuel rail.

The fuel pressure sensor is a piezo-resistive type sensor containing an actuating diaphragm. Deflection of the diaphragm provides a proportional signal (output) voltage to the ECM, dependant on the fuel pressure within the fuel rails.

Accelerator Pedal Position (APP) Sensor

E116420

The APP sensor allows the ECM to determine the driver requests for vehicle speed, acceleration and deceleration. The ECM uses this information to determine the torque demand from the engine via injection control.

The APP sensor is installed on the pedal box and secured to a bracket with 3 screws.

The APP sensor is incorporated into the pedal box assembly. The APP sensor is a twin track rotary potentiometer type sensor which is integral with the throttle pedal housing.

A six pin electrical connector provides the interface with the vehicle harness. The accelerator pedal is connected to a spindle on the RH side of the APP sensor. The APP sensor receives two separate electrical supplies and generates two different outputs.

Both tracks are analogue output signals connected to the ECM. Both signals contain the same positional information, but the secondary track has half the voltage output of the primary track.

If there is a fault with the primary track, the secondary track is used and the vehicle/engine response to pedal demand will be sluggish. If both analogue signals have a fault, the engine adopts a constant high speed of 1300 rpm to allow the vehicle to move. Torque application and reduction of engine speed back to normal idle speed can be subsequently controlled via brake lamp/brake test switch operation.

The ECM constantly checks the range and plausibility of the two signals and stored a fault code if it detects a fault.

EGR Cooler Bypass Vacuum Solenoid Valve

E116421

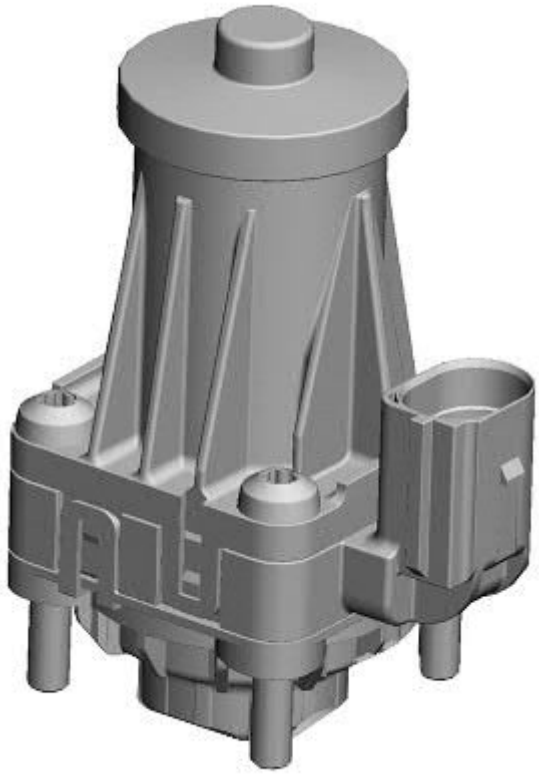
The EGR cooler bypass solenoid valve is located on a bracket at the rear of the engine, adjacent to the vacuum pump.

The solenoid valve has a vacuum pipe connection to the vacuum pump which provides the vacuum when the engine is running. Two outlets from the solenoid valve each connect to an EGR bypass vacuum actuator.

When the EGR cooler bypass solenoid valve is energized, vacuum created by the vacuum pump is applied to each EGR bypass vacuum actuator and exhaust gasses by-pass the EGR cooler. The default position is for exhaust gas cooling. The actuators move under the influence of the vacuum and move a valve within the EGR cooler to divert the exhaust gasses straight through the cooler. This system is used when the engine management system determines that exhaust gas cooling is not required.

The EGR cooler bypass solenoid valve receives a 12 volt supply from the EJB. The ECM controls the operation of the solenoid valve by controlling the ground path for the solenoid.

Exhaust Gas Recirculation (EGR) Valve Motor



E116422

The EGR valve motors each receive a 12 volt supply and ground from the ECM.

The 12 volt power supply from the ECM operates the EGR valve motor. Three further wires connect the EGR valve to the ECM a 5 volt reference voltage, a ground and a position signal feedback.

The valve is used to direct a calculated proportion of exhaust gas back into the combustion chamber.

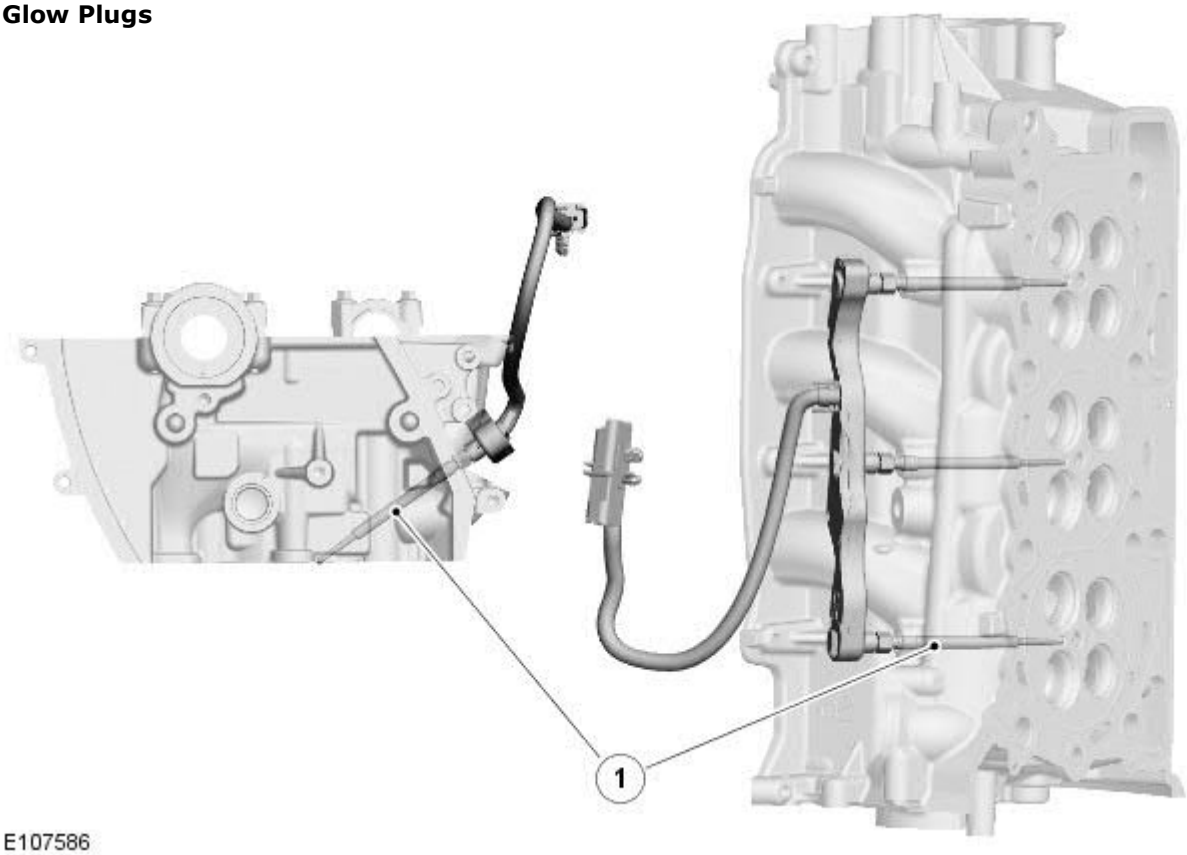
Oil Pressure Sensor

E116423

The oil pressure sensor is located in a threaded port in the LH cylinder head. The sensor is connected directly to the instrument cluster.

The sensor is not connected to the ECM but is supplied with a reference voltage from the instrument cluster. The sensor ground is through the sensor body and the engine. When the oil pressure falls to below a predetermined threshold, the sensor internal switch contacts close, completing a circuit from the instrument cluster. This circuit is sensed by the instrument cluster which displays and appropriate warning message and warning lamp to alert the driver.

Glow Plugs



E107586

Item	Description
1	Glow plug

Three glow plugs are located in each of the cylinder heads, on the inlet side. The glow plugs and the glow plug module are a vital part of the engine starting strategy. The glow plugs heat the air inside the cylinder during cold starts to assist combustion. The use of glow plugs helps reduce the amount of additional fuel required on start-up, and consequently reduces the emission of black smoke. The use of glow plugs also reduces the amount of injection advance required, which reduces engine noise, particularly when idling with a cold engine.

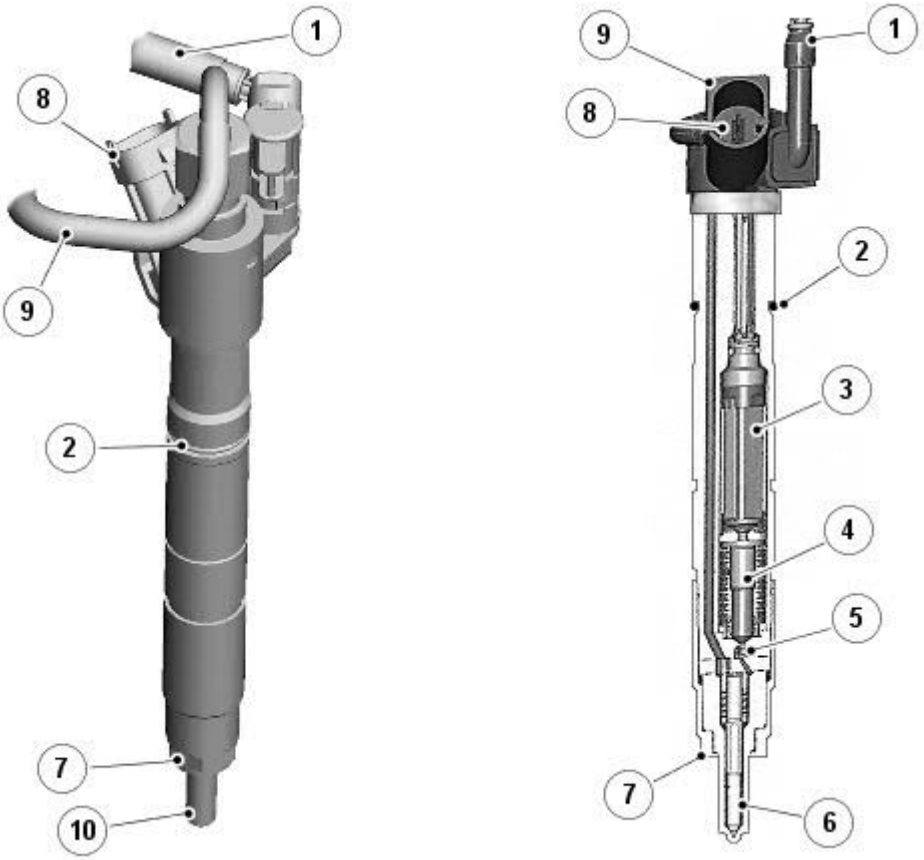
There are three phases of glow plug activity:

- Pre-heat
- During crank
- Post heat.

The ceramic sheathed element glow plugs are made from a heat-resistant, electrically conductive ceramic material. The ceramic sheathed-element glow plugs outer layer is heated directly and is self regulating. The self regulation allows the resistance of the sheathed element to automatically increase as the heat increases preventing the glow plug from overheating. In addition, during the heating process and under the control of the glow plug module, the glow plugs can be operated above their nominal voltages. This permits heat-up speeds of 1000°C per second. The sheathed-element glow plugs reach a maximum glow temperature of 1300°C and can hold a temperature of 1150°C for several minutes after the first-start glow or at intervening times.

The glow plugs are controlled by the ECM using the glow plug module and external sensor values to control the glow plug operation via internal software.

Fuel Injectors



E115475

Item	Description
1	Fuel return
2	O-ring seal
3	Piezo stack actuator
4	Hydraulic coupler
5	Control valve
6	Nozzle body
7	Copper sealing washer
8	Electrical connector
9	High pressure feed
10	Nozzle

Six fuel injectors are used in the fuel system. A piezo actuator in each injector is electronically controlled by the ECM to operate the injector in response to engine speed and load conditions.

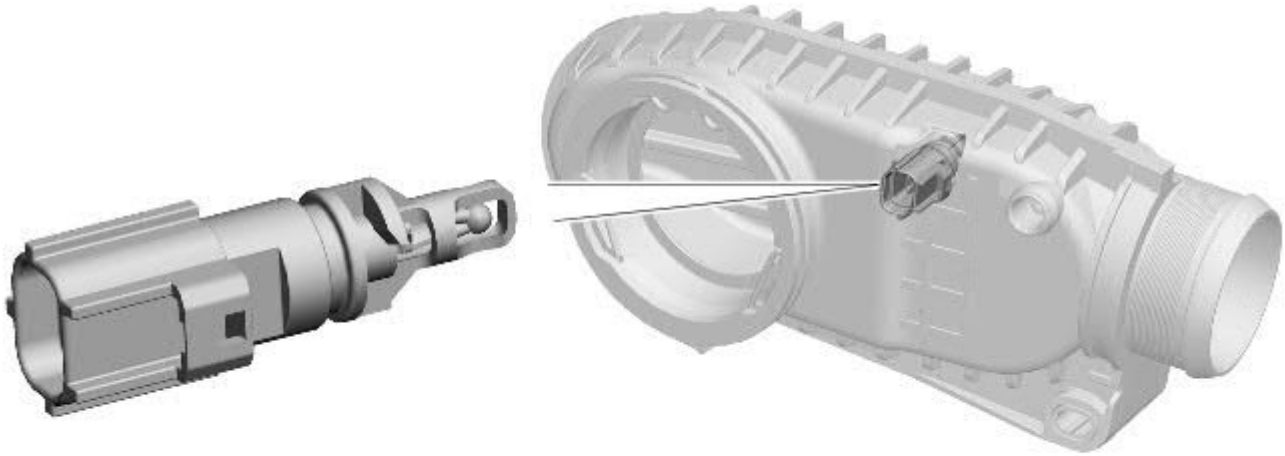
Each injector is calibrated to the ECM and applicable the cylinder to which it is fitted. Therefore, if an injector is removed it must be refitted to the cylinder from which it was removed. If a new injector is fitted, a calibration routine using a Jaguar approved diagnostic system must be performed to calibrate the injector unique code to the ECM

The operating voltage of the injector is between 110 and 163 volts depending on engine speed and load and care must be taken when working in the vicinity of the injectors. The voltage increases linearly with the injector operating pressure from 200 to 2000 bar (2900 to 29000 lbf/in^2).

Each injector has an electrical resistance value of between 150 - 250 kOhms.

CAUTION: Each injector operation is controlled by a charge and discharge cycle allowing energy to dissipate in, and recover from the injector. Never disconnect the wiring connection when the engine is running. The injector can remain open causing engine damage.

Charge Air Temperature Sensor



E116759

The is charge air temperature sensor is located in the rear of the intake chamber immediately preceding the throttle intake manifold. The sensor is used to measure the intake air temperature from the turbochargers in order to calculate the required amount of fuelling.

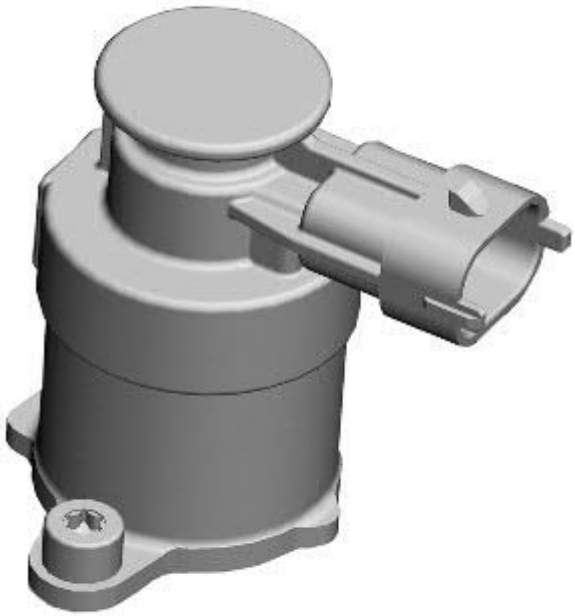
The charge air temperature sensor incorporates a NTC thermistor in a voltage divider circuit. The NTC thermistor works on the principle of decreasing resistance in the sensor as the temperature of the charge air increases. As the thermistor allows more current to pass to ground, the voltage sensed by the ECM decreases. The change in voltage is proportional to the temperature change of the charge air. Using the voltage output from the charge air temperature sensor, the ECM can correct the fuelling map for charge air temperature. The correction is an important requirement because hot air contains less oxygen than cold air for any given volume.

The charge air temperature sensor receives a 3.3V reference voltage from the ECM. The signal output from the charge air temperature sensor is calculated by the ECM by monitoring changes in the supplied reference voltage to the charge air temperature sensor voltage divider circuit.

If the charge air temperature sensor fails the ECM uses a default charge air temperature of -5°C (23°F). In the event of an charge air temperature sensor failure, any of the following symptoms may be observed:

- Over fuelling, resulting black smoke emitting from the exhaust
- Idle speed control inoperative.

High Pressure Fuel Pump Volume Control Valve



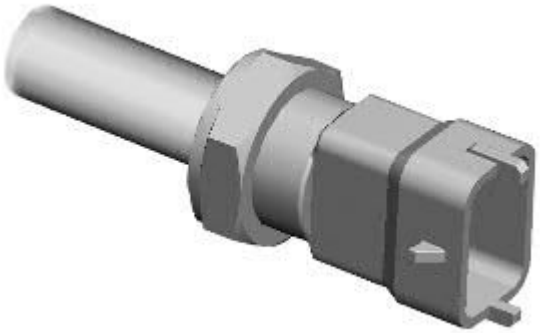
E116761

The volume control valve is mounted on the high pressure pump, and located in the feed port between the high-pressure pump elements and the internal transfer pump. The volume control valve is a variable position solenoid-operated valve that is controlled by the ECM.

The volume control valve is controlled by a PWM signal from the ECM to allow a defined amount of 'leak off' from the high pressure fuel pump. The leak off fuel provides cooling and lubrication for the high-pressure pump internal components. The fuel is returned through a leak off pipe to the fuel filter, where it cools and is returned into the fuel filter via the low pressure return line.

The volume control valve determines the amount of fuel that is delivered from the internal transfer pump to the high pressure pumping elements. When there is no signal to the volume control valve, the valve is closed and there is no fuel delivery. The ECM applies a varying PWM signal of between 0 to 100% to control the required fuel volume.

High Pressure Fuel Pump Inlet Temperature Sensor



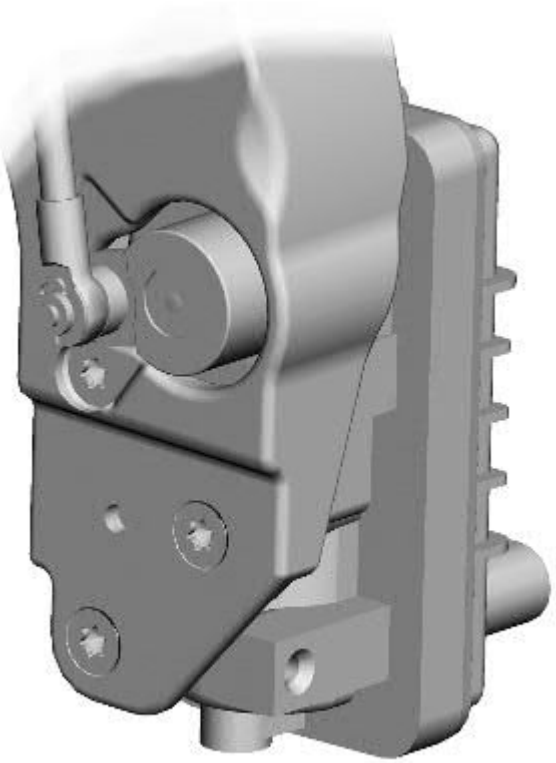
E116762

The fuel temperature sensor is located on the rear of the high pressure fuel pump. It measures the fuel temperature in the low-pressure side of the high pressure fuel pump.

The ECM continually monitors this signal to determine the fuel temperature to prevent overheating of the fuel system. The ECM will also make fine adjustments to fuel injection quantity to adjust for fuel temperature.

The inlet temperature sensor is an NTC thermistor. As the fuel temperature rises the resistance through the sensor decreases and visa versa. The ECM measures the change in voltage as the thermistor allows more current to pass to ground relative to the fuel temperature.

Primary Turbocharger Control Module



E116424

The primary turbocharger control module is attached to a bracket which is an extension of the turbocharger body.

The primary turbocharger control module comprises a stepper motor which electronically controls the primary turbocharger variable vanes by moving an actuating lever. When the stepper motor drive shaft turns, a position signal is created. The ECM receives the position signal to determine the angular position of the vanes.

The stepper motor is connected to an output shaft. The output shaft has a connecting rod attached eccentrically which converts the rotary motion of the shaft into linear motion of the connecting rod. The opposite end of the connecting rod is attached to an actuating lever. The actuating lever moves with the connecting rod and adjusts the variable vanes mechanically.

The ECM provides the stepper motor with a power and ground for stepper motor operation and also a reference voltage, ground and position signal connections for variable vane position control.

Secondary Turbocharger Boost Pressure Sensor

E116425

The secondary turbocharger boost pressure sensor is located on the steering pump mounting bracket on the RH side of the engine. The sensor is connected via a hose to the charge air outlet pipe from the primary turbocharger compressor.

The sensor provides a voltage signal to the ECM relative to the output charge air pressure from the secondary turbocharger. The boost pressure sensor has a 3 pin connector which is connected to the ECM and provides a 5V reference supply from the ECM, a signal input to the ECM and a ground for the sensor.

The boost pressure sensor uses a diaphragm transducer to measure pressure. The ECM uses the boost pressure sensor signal for the following functions:

- Maintain manifold boost pressure
- Reduce exhaust smoke emissions when driving at high altitude
- Control of the EGR system
- To help smooth control of the mono to bi and bi to mono turbo transitions
- To aid the air path diagnostics.

Ive

Secondary Turbocharger Turbine Shut-off Solenoid Va

E123687

The secondary turbine shut-off solenoid valve is located on a bracket at the front of the engine, above the LH front cylinder cover assembly. The bracket is shared with the secondary turbocharger recirculation solenoid valve. The secondary turbine shut-off solenoid valve is the innermost of the two solenoid valves.

The secondary turbine shut-off solenoid receives a vacuum supply from the vacuum pump. The valve is connected by a pipe to the turbine shut-off valve vacuum actuator which is located on the rear of the secondary turbocharger. A position sensor is attached to the turbine shut-off valve vacuum actuator to inform the ECM of the turbine shut-off position.

Operation of the valve vacuum actuator is controlled by a PWM signal from the ECM and the secondary turbocharger turbine shut-off valve solenoid. When the shut-off solenoid is energized by the ECM a 4.5V PWM current is applied to operate the solenoid, vacuum is then applied to the shut-off valve vacuum actuator. The valve is opened allowing the secondary turbocharger turbine to be driven by the exhaust gasses for as long as the valve is open. When the valve is to be closed the ECM applies a 0.5V PWM current to the solenoid.

Valve

Secondary Turbocharger Compressor Shut-off Solenoid

E123687

The secondary turbocharger compressor shut-off solenoid valve is located on a bracket at the front of the engine, above the LH front cylinder cover assembly. The bracket is shared with the secondary turbocharger turbine shut-off solenoid valve. The secondary turbocharger compressor shut-off solenoid valve is the outermost of the two solenoid valves.

The secondary turbocharger compressor shut-off solenoid valve receives a vacuum supply from the vacuum pump. The valve is connected by a pipe to the compressor shut-off vacuum actuator located on the charge air intake manifold tube. When the vacuum is applied to the vacuum actuator, the actuator operates to open the shut-off valve allowing charge air to flow into the air intake pipe.

Operation of the secondary turbocharger compressor shut-off valve is controlled by a PWM signal from the ECM; 0% is off and 100% is on (solenoid activated). The solenoid valve is opened when bi-turbocharger operation is required allowing compressed charge air from the secondary turbocharger compressor to enter the air intake system.

ve

Secondary Turbocharger Compressor Recirculation Val

E116426

The secondary turbocharger compressor recirculation valve motor is located on the compressor recirculation valve housing, adjacent to the compressor shut-off valve. The solenoid valve is attached to the compressor recirculation valve with 3 screws.

The secondary turbocharger compressor recirculation valve motor is controlled by the ECM. The valve is used during operation of the secondary turbocharger. When the ECM is switching to bi-turbocharger operation, the valve motor is operated which opens the recirculation path to the primary turbocharger. This allows the secondary turbocharger to increase its speed. When the secondary turbocharger has reached its optimum operating speed the recirculation valve motor is operated, closing the recirculation path to the primary turbocharger.

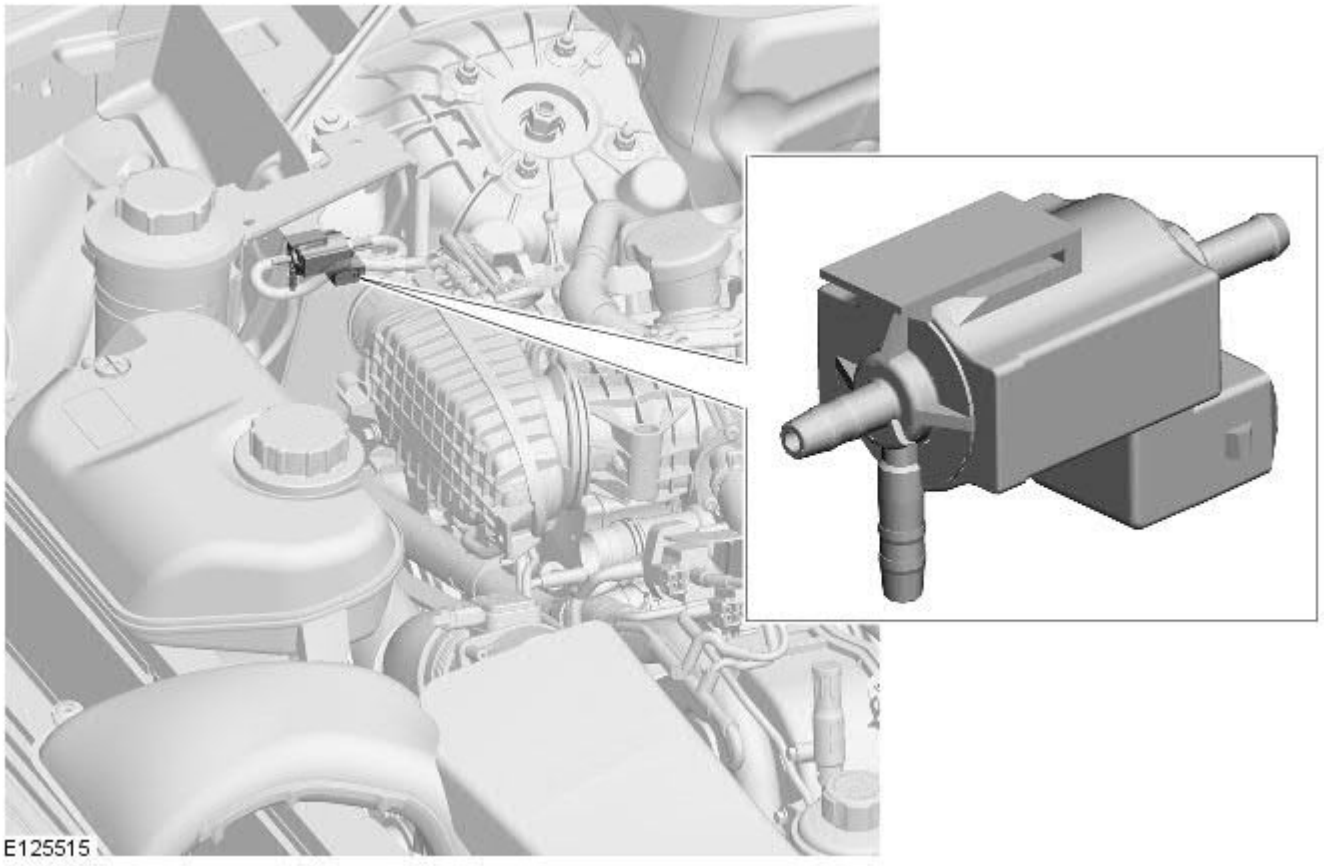
Secondary Turbocharger Turbine Position Sensor

E116760

The secondary turbocharger turbine position sensor is located on the turbine vacuum shut-off valve. The sensor has three connections to the ECM; a 5V reference voltage, a ground and a signal return.

The sensor is connected to the turbine shut-off vacuum actuator and senses when the actuator has operated. The sensor returns a 0 - 5V analogue position signal to the ECM to confirm that the vacuum actuator has operated.

Active Engine Mounts Solenoid



The active engine mount solenoid is attached to the power steering reservoir bracket, adjacent to the glow plug module. The solenoid is connected to the vacuum pump, located at the rear of the engine, by pipes. Further pipes connect the solenoid to the active engine mounts.

The active engine mount system is designed to reduce force transmitted to the body of the car by engine vibration at idle. The engine mounts are 2 state hydromounts. They are operational throughout the operating range of the engine and can change from soft (on) to hard (off) between engine idle speed and engine load conditions respectively, via a control output from the ECM.

This output controls a single solenoid that either softens or stiffens the LH and RH engine mounts by applying or removing a vacuum through the solenoid.

When the engine is at idle speed, the solenoid is energized (on) and vacuum from the pump is applied, via the solenoid, to the engine mounts, changing their state to soft. At engine speeds above idle speed, the solenoid is de-energized (off) and the vacuum is lost, changing the engine mounts state to hard. The ECM strategy is designed to control when the active engine mounts solenoid should be energized or de-energized in relation to the following vehicle operating parameters:

- Engine speed
- Vehicle speed
- Engine speed gradient
- Vehicle speed gradient
- Engine coolant temperature
- Ignition state
- Cranking state
- Engine running status
- Transmission selector position.

Published: 11-May-2011

Electronic Engine Controls - TDV6 3.0L Diesel - Electronic Engine Controls

Diagnosis and Testing

Principles of Operation

For a detailed description of the 3.0L Diesel electronic engine controls and operation, refer to the relevant Description and Operation section in the workshop manual. REFER to: (303-14A Electronic Engine Controls - TDV6 3.0L Diesel)

Electronic Engine Controls (Description and Operation),
Electronic Engine Controls (Description and Operation),
Electronic Engine Controls (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Engine oil level • Cooling system coolant level • Fuel level • Fuel contamination • Fuel leaks • Air ingress into fuel system • Fuel filter • Front End Accessory Drive (FEAD) belt • Air filter and induction hoses • Boost air circuit and intercooler • Exhaust system including oxidation catalyst and particulate filter • Primary turbocharger vane control linkage	• Battery charge and condition • Fuses • Wiring harness • Electrical connector(s) • Sensor(s) • Actuator(s) • Engine Control Module (ECM) • Transmission Control Module (TCM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

WARNINGS:

Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury.

Place the vehicle in a well ventilated, quarantined, area and arrange "No Smoking/Fuel Fumes" signs about the vehicle.

Before any work is carried out on the fuel system, ground the vehicle to earth and maintain the ground connection until the work is complete.

Do not carry out any repairs to the fuel injection system with the engine running. The fuel pressure within the system can be as high as 2000 bar. Failure to follow this instruction may result in personal injury.

Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapours are always present and may ignite. Failure to follow these instructions may result in personal injury.

After carrying out repairs, the fuel system must be checked visually for leaks. Failure to follow these instructions may result in personal injury

If taken internally do not induce vomiting, seek immediate medical attention. Failure to follow these instructions may result in personal injury.

If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek medical attention.

Wash hands thoroughly after handling fuel, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.

This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

CAUTIONS:

Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always fit blanking plugs to any open orifices or lines.

Always carry out the cleaning process before carrying out any repairs to the fuel injection system components. Failure to follow these instructions may result in foreign matter ingress to the fuel injection system.

Do not disconnect an injector wiring connector when the engine is running. The fuel injectors are operated by piezo elements controlled by an electrical signal, they can latch open if disconnected when the engine is running. Failure to observe this caution may result in severe engine damage.

The low pressure fuel system bleeding procedure must be carried out before this procedure is carried out, or the engine is attempted to be started, following removal or replacement of any low pressure fuel system component. Failure to follow this instruction may result in damage to the fuel injection pump.

NOTE: If the module or a component is suspect and the vehicle remains under the Manufacturers warranty, refer to the Warranty Policy and Procedure manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Symptom	Possible Cause	Action
Engine does not crank	• Battery discharged/charging fault • Starting system fault/power distribution fault • Security system/immobilizer engaged • Engine Control Module (ECM) relay • Transmission Shift Control module • Pedal switch fault • Engine seized/hydraulically locked	Refer to the owner literature and ensure that the correct start up procedure is being adhered to. Refer to the battery care manual, ensure the vehicle battery is in fully charged and serviceable condition. Check battery cables are correctly connected. Check high current power distribution fusible links are in serviceable condition. Check for DTCs and refer to the relevant DTC index. Check that the security system/immobilizer is disarmed. Check transmission shift controls and pedal switches to ensure starter operation is not being inhibited. Check the engine is not seized or hydraulically locked.
Engine cranks, but does not start	• The common 5 volt sensor power to both crankshaft position sensor and camshaft position sensor is missing • Battery discharged, starter circuit or motor fault • Low/contaminated fuel • Air leakage • Fuel system low pressure circuit fault • Fuel pump module fault • Blocked fuel filter • Fuel Volume Control Valve (FVCV) blocked/contaminated • Fuel Pressure Control Valve (FPCV) blocked/contaminated • Fuel injection pump failure	Check the 5 volt sensor power is present at both crankshaft position sensor and camshaft position sensor. Refer to the battery care manual and the workshop manual, check that the battery is fully charged and serviceable. Check that the cranking speed is within specification. Investigate and repair start and charge faults as required. Check that the fuel level is sufficient and that the fuel is not contaminated. Check the fuel pump module operation, check the fuel system low pressure circuit for leaks/damage/air ingress. Check the fuel filter for water, blockage. Check the Fuel Volume Control Valve and Fuel Pressure Control Valve. Check the fuel injection high pressure pump. Check the integrity of the air intake system and boost air circuit for correct installation. Check the crankshaft position sensor and circuits. In cold conditions with no indications of combustion when cranking, check the glow plug circuits. Refer to the new module/component installation note at the top of the Symptom Chart if an Engine Control Module (ECM) is suspect.

Symptom	Possible Cause	Action
	• Crankshaft position (CKP) sensor • Engine Control Module (ECM) fault	
Engine stops, will crank, but will not start, no DTCs logged in Engine Control Module (ECM)	• The common 5 volt sensor power to both crankshaft position sensor and camshaft position sensor is missing	Check the 5 volt sensor power is present at both crankshaft position sensor and camshaft position sensor.
Difficult to start	• Glow plug system fault (cold engine start) • Low/contaminated fuel • Air leakage • Fuel pump module fault • Fuel system low pressure circuit fault • Blocked fuel filter • Fuel Volume Control Valve (FVCV) blocked/contaminated • Fuel Pressure Control Valve (FPCV) blocked/contaminated • Exhaust Gas Recirculation (EGR) valve(s) fault	If the fault is related to cold starts only check the glow plugs and associated circuits first. Check the fuel level/possibility of contamination. Check the integrity of the air intake system and for correct installation. Check the fuel pump module operation, check the fuel system low pressure circuit for leaks/damage. Check the fuel filter, Fuel Volume Control Valve (FVCV) and Fuel Pressure Control Valve FPCV). Check the Exhaust Gas Recirculation (EGR) system valves/actuators.
Rough idle	• Glow plug system fault (cold engine start) • Low/contaminated fuel • Air ingress into fuel system low pressure circuit • Fuel system low pressure circuit delivery fault • Blocked fuel filter • Fuel Volume Control Valve (FVCV) blocked/contaminated • Fuel Pressure Control Valve (FPCV) blocked/contaminated • Exhaust Gas Recirculation (EGR) valve(s) fault • Exhaust Gas Recirculation (EGR) electric throttle valve fault	If the rough idle is from cold, and improves as the engine warms up, check the glow plug system is operating correctly on all cylinders. Check the fuel level/condition. Check the fuel system low pressure circuit for leaks/damage. Check the fuel filter, Fuel Volume Control Valve and Fuel Pressure Control Valve. Check the integrity of the air intake system and for correct installation. Check the Exhaust Gas Recirculation (EGR) system valves/actuators.
Lack of power when accelerating	• Low fuel level (in torque derate mode) • Fuel level sender fault • Blocked fuel filter • Low fuel pressure • Blocked air filter • Air intake system fault • Boost air circuit leak or blockage • Restricted exhaust system • Diesel particulate filter (DPF) blocked/restricted • Exhaust Gas Recirculation (EGR) valve(s) fault • Exhaust Gas Recirculation (EGR) electric throttle valve fault • Secondary Variable Geometry Turbocharger (VGT) fault • Primary Fixed Geometry Turbocharger fault • Turbine shut off valve fault • Compressor recirculation valve fault	Check the fuel system for level/contamination/drain water from filter. Validate fuel level sender reading against actual tank contents. Check fuel filter for blockage. Check the fuel pressure. Check the integrity of the air intake system and for correct installation. Check for a blocked Diesel Particulate Filter or catalytic converter, Check the Exhaust Gas Recirculation (EGR) system. Check the turbochargers for operation including all valves/actuators used to control mono-turbo and bi-turbo mode transitions.

Symptom	Possible Cause	Action
	• Compressor shut off valve fault	
Engine stops/stalls	• Fuel level low (in run dry mode) • Fuel level sender fault • Contaminated fuel • Air ingress into fuel system • Fuel system low pressure circuit fault • Fuel Volume Control Valve (FVCV) blocked/contaminated • Fuel Pressure Control Valve (FPCV) blocked/contaminated • High pressure fuel leak • Exhaust Gas Recirculation (EGR) valve(s) fault • Exhaust Gas Recirculation (EGR) electric throttle valve fault	Check the fuel level/condition/drain water from filter. Validate fuel level sender reading against actual tank contents. Check the fuel system low pressure circuit for leaks/damage. Check for fuel system leaks, Fuel Volume Control Valve and Fuel Pressure Control Valve. Check the Exhaust Gas Recirculation (EGR) system.
Engine judders	• Low fuel level (in torque derate mode) • Fuel level sender fault • Contaminated fuel • Fuel filter blocked • Air ingress into fuel system • Fuel system low pressure circuit fault • Fuel Volume Control Valve (FVCV) blocked/contaminated • Fuel Pressure Control Valve (FPCV) blocked/contaminated • High pressure fuel leak • Fuel injection pump fault • Injector fault	Check the fuel level/condition/drain water from filter and check for blockage. Validate fuel level sender reading against actual tank contents. Check the fuel system low pressure circuit for leaks/damage. Check for fuel system leaks, Fuel Volume Control Valve and Fuel Pressure Control Valve. Check the fuel injection high pressure pump. Check fuel injector(s).
Excessive fuel consumption	• Tire pressures are incorrect • Vehicle brakes are binding/not releasing • Fuel system leak • Fuel system low pressure circuit fault • Fuel Volume Control Valve (FVCV) blocked/contaminated • Fuel Pressure Control Valve (FPCV) blocked/contaminated • Fuel temperature sensor leak • High pressure fuel leak • Injector(s) failure • Exhaust Gas Recirculation (EGR) valve(s) fault • Exhaust Gas Recirculation (EGR) electric throttle valve fault	Check and adjust tire pressures. Check brakes are releasing correctly and do not cause excessive drag. Check the fuel system for obvious leaks/damage. Check the Fuel Volume Control Valve and Fuel Pressure Control Valve. Check for injector DTCs. Check for restricted induction system and air filter. Check the Exhaust Gas Recirculation (EGR) system including electric throttle plate. Check boost air circuit and intercooler for ineffective cooling or partial blockage. Check for restricted exhaust flow including catalytic converter and diesel particulate filter.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Engine Control Module 3.0L Tdv6 (PCM) (100-00 General Information, Description and Operation).

Published: 11-May-2011

Electronic Engine Controls - TDV6 3.0L Diesel - Camshaft Position (CMP) Sensor

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Disconnect the battery ground cable.

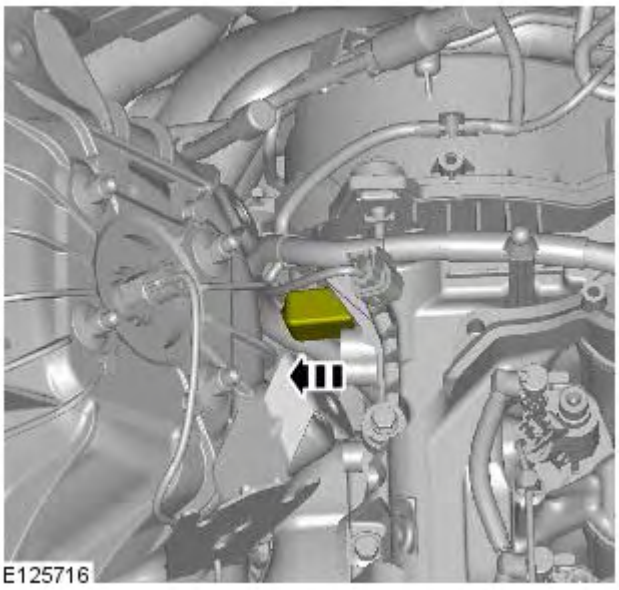
   Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

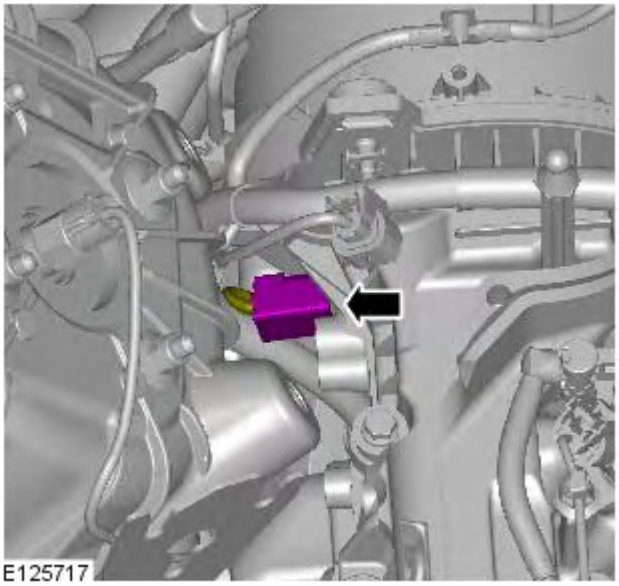
2. Refer to: Exhaust Gas Recirculation (EGR) Valve LH (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).

3. WARNING: Make sure to support the vehicle with axle stands.

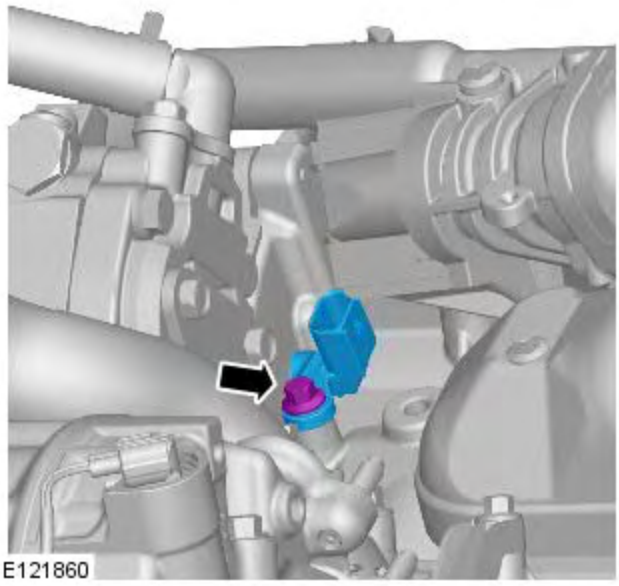
   Raise and support the vehicle.

4.





5. CAUTION: Before the disconnection or removal of any components, make sure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

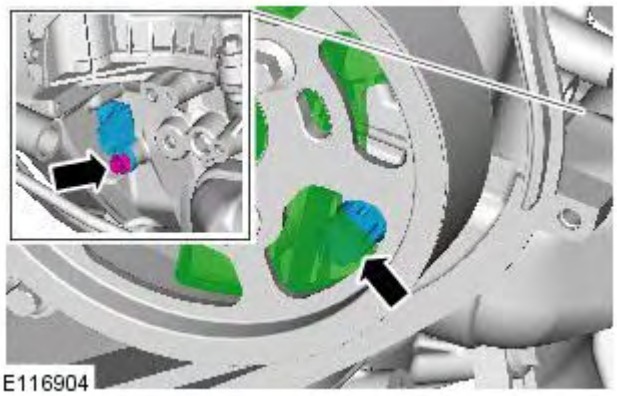


6. NOTES:

Engine shown removed for clarity.

Some variation in the illustrations may occur, but the essential information is always correct.

Installation



1. CAUTIONS:

Make sure that the mating faces are clean and free of foreign material.

The CMP sensor tip must rest on one of the three webs on the back of the camshaft pulley. Incorrect installation may result in the CMP sensor being damaged.

NOTES:

Only turn the engine in the normal direction of rotation.

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Timing belt left hand cover shown removed for clarity.

Turn the engine until one of the three webs on the back of the camshaft pulley is visible through the CMP sensor housing.

Torque: 10 Nm

2. To install, reverse the removal procedure.

Published: 11-May-2011

Electronic Engine Controls - TDV6 3.0L Diesel - Crankshaft Position (CKP) Sensor

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

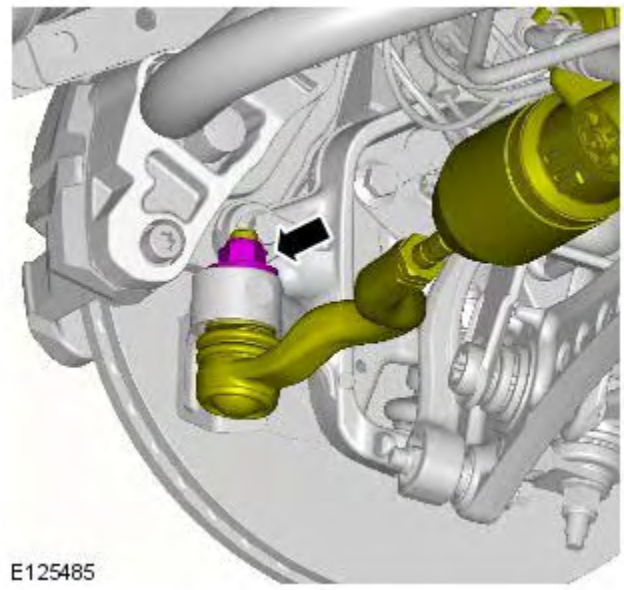
All vehicles

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

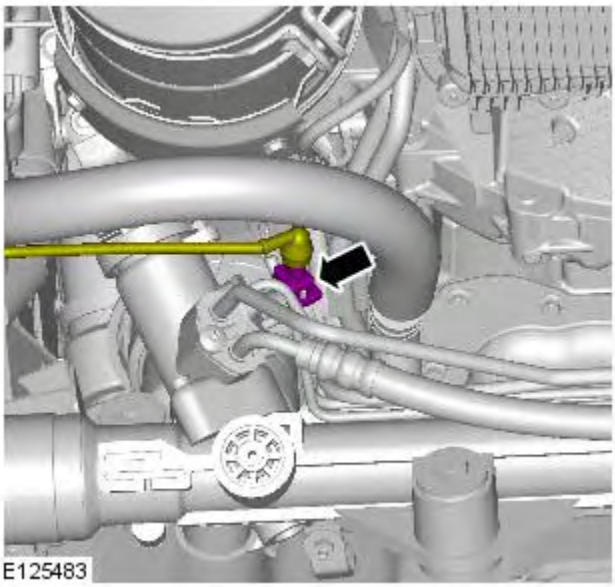
2. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

Left-hand drive vehicles

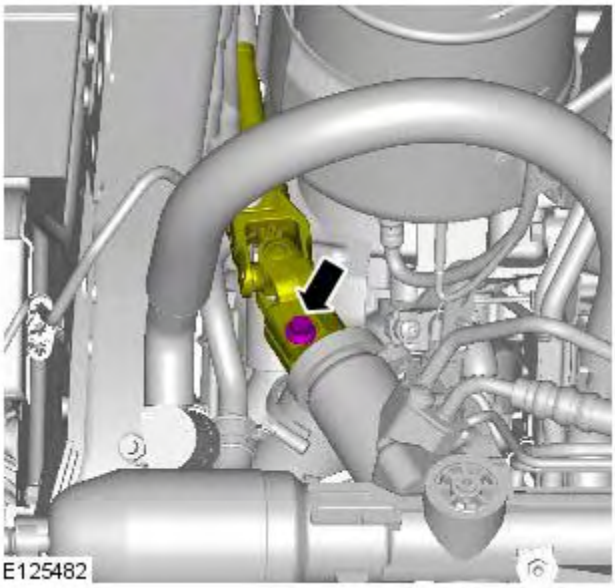


3. *Torque:* 133 Nm

4.



5. *Torque:* 35 Nm



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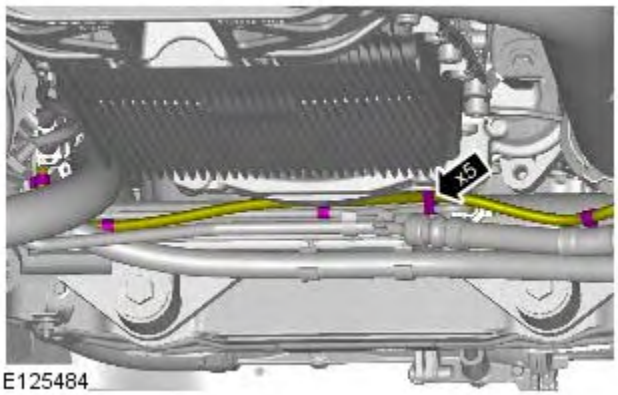
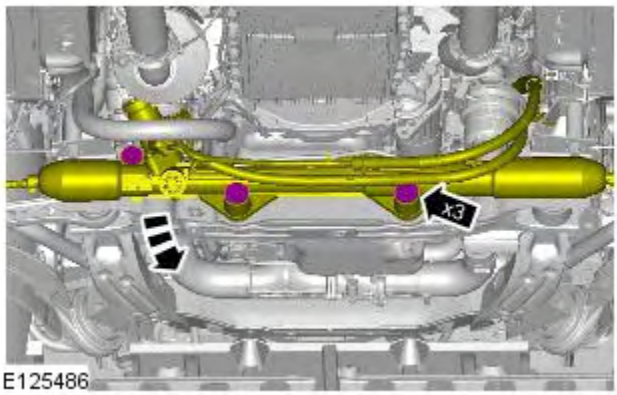
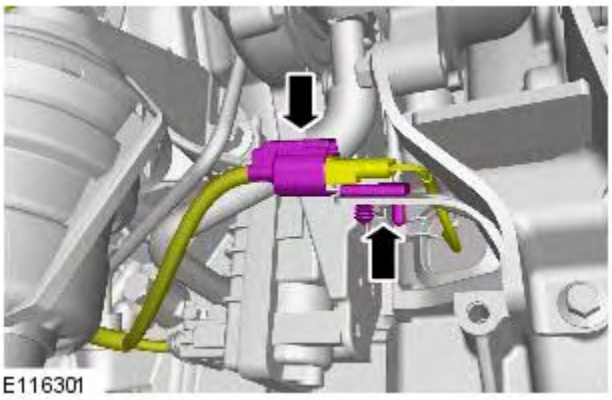




7. *Torque:* 100 Nm

All vehicles



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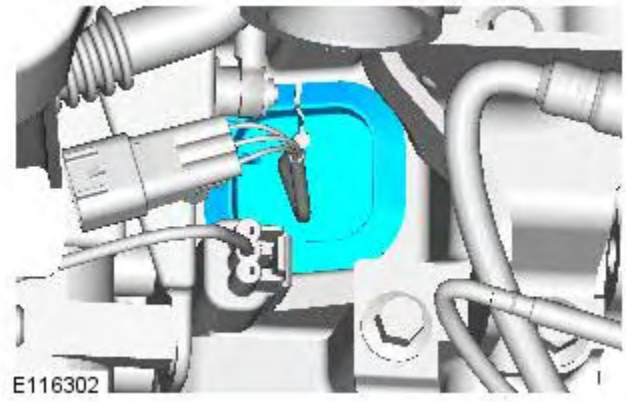

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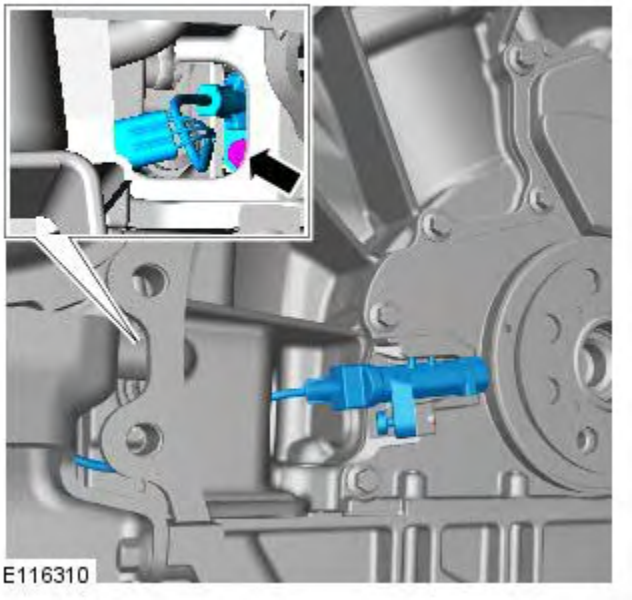

10. CAUTION: Before the disconnection or removal of any components, make sure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

    NOTES:

    The CKP sensor retaining bolt should not be removed from the CKP sensor.

    Engine shown removed for clarity.

    Torque: 5 Nm

Installation

1. CAUTIONS:

   Install the CKP sensor correctly into the housing. Failure to follow this instruction may result in damage to the CKP sensor.

   Make sure that the mating faces are clean and free of foreign material.

   Make sure that the component is clean, free of foreign material and lubricant.

   To install, reverse the removal procedure.

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Electronic Engine Controls - TDV6 3.0L Diesel - Crankshaft Position (CKP) Sensor Ring

Removal and Installation

Special Tool(s)

	303-1130 Installer - Crankshaft Position (CKP) Sensor Ring

Removal

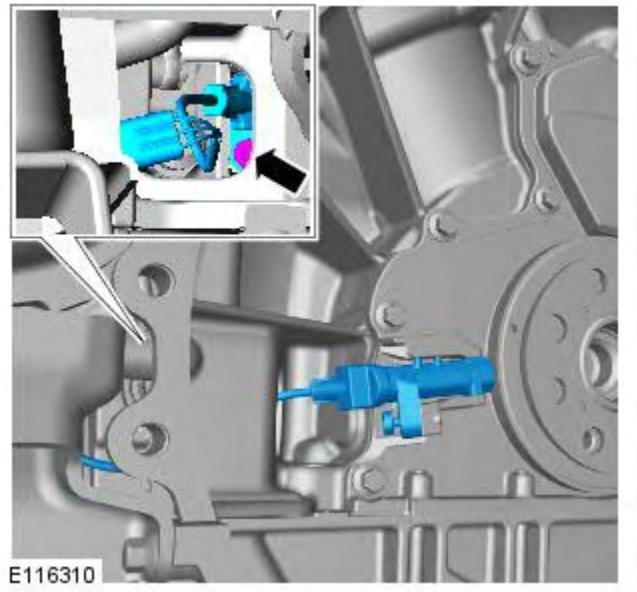
1. Disconnect the battery ground cable.

   Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNING: Make sure to support the vehicle with axle stands.

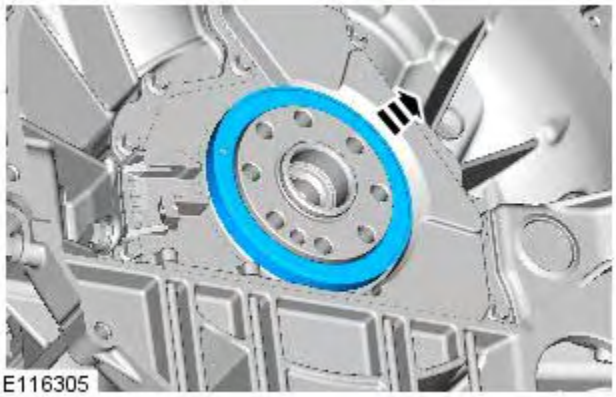
   Raise and support the vehicle.

3. Refer to: Flexplate (303-01, Removal and Installation).



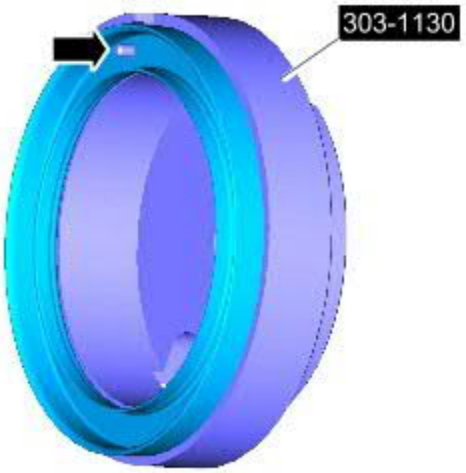
4. CAUTION: Before the disconnection or removal of any components, make sure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

   NOTE: The CKP sensor retaining bolt should not be removed from the CKP sensor.



5.

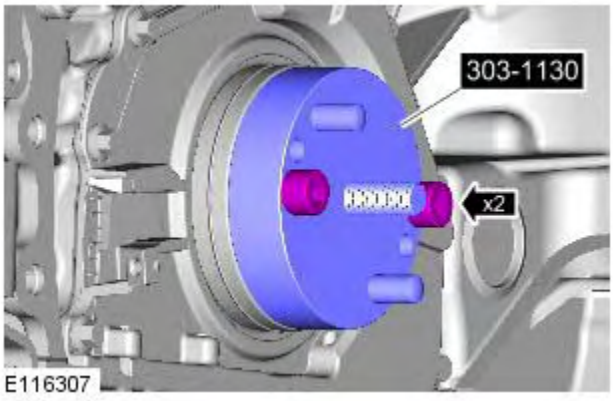
Installation



E116306

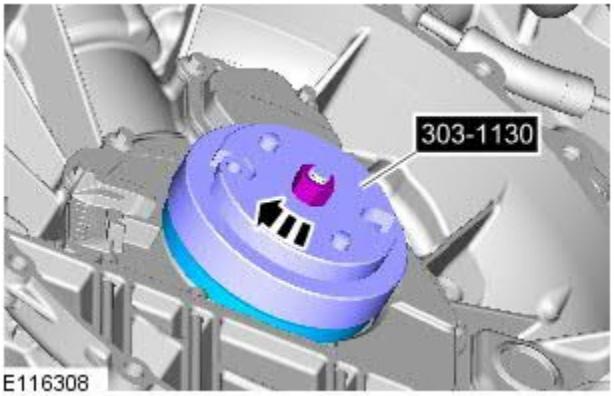
1. CAUTION: Make sure that the CKP sensor ring is aligned correctly with the special tool pip and that both mating surfaces are fully seated.

   Special Tool(s): 303-1130

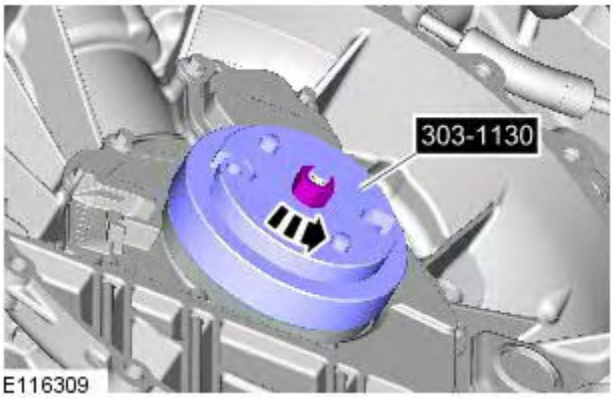


2. Install the special tool.

3.

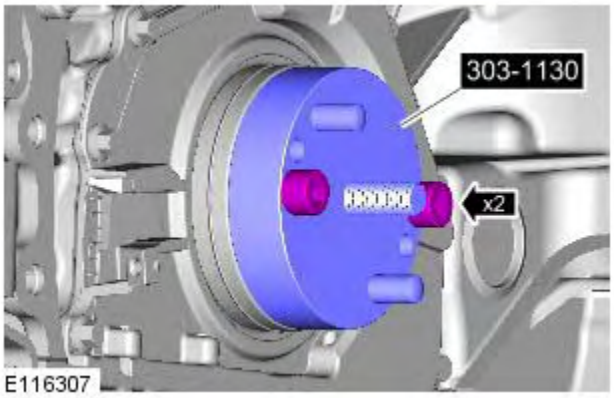


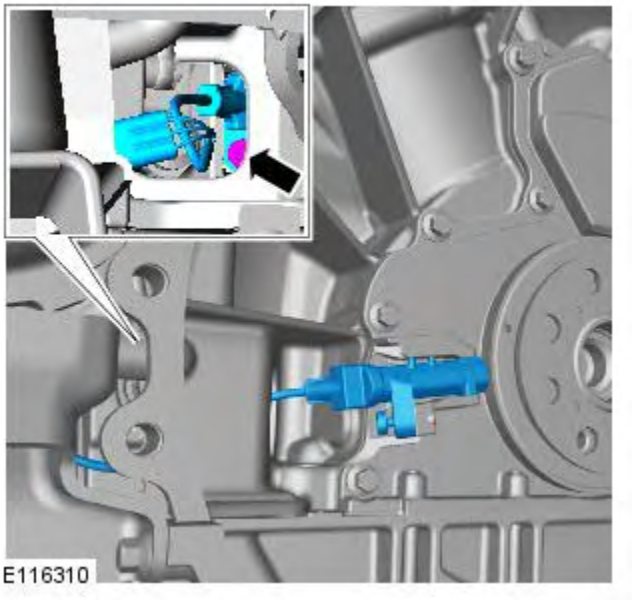
4.



5. Remove the special tool.

   Special Tool(s): 303-1130





6. CAUTIONS:

   Make sure that the mating faces are clean and free of foreign material.

   Make sure that the component is clean, free of foreign material and lubricant.

   Install the CKP sensor correctly into the housing. Failure to follow this instruction may result in damage to the CKP sensor.

   Torque: 5 Nm

7. Refer to: Flexplate (303-01, Removal and Installation).

8. Connect the battery ground cable.

   Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

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Electronic Engine Controls - TDV6 3.0L Diesel - Diesel Particulate Filter (DPF) Differential Pressure Sensor

Removal and Installation

Removal

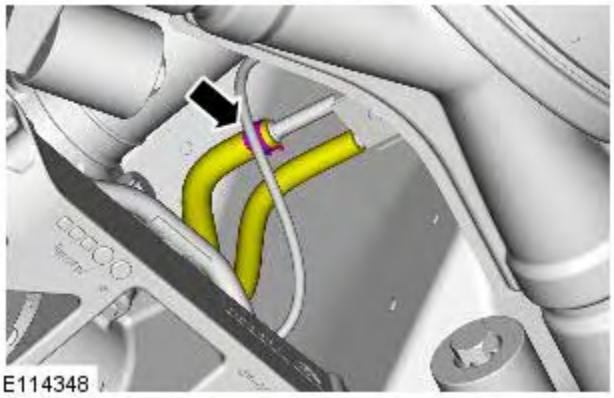
NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

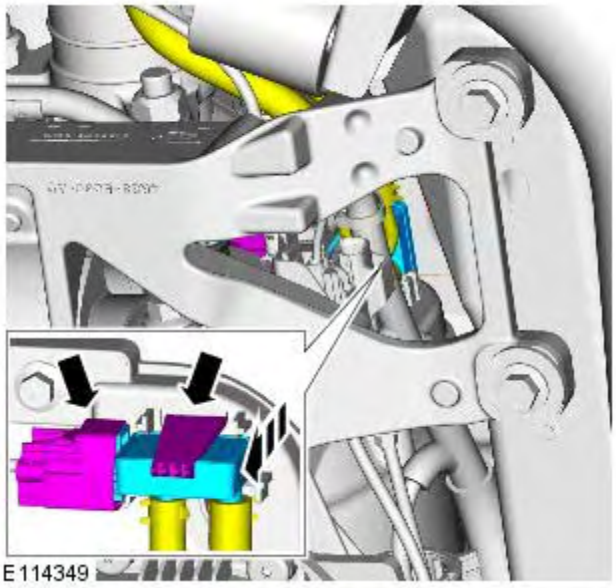
   Raise and support the vehicle.

2. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

3.



4.



5.

Installation

1. To install, reverse the removal procedure.

2. NOTE: This step is only necessary when installing a new component.

    - Using the diagnostic tool, clear diagnostic trouble codes (DTCs) from the engine control module (ECM).
    - Using the data logger, check the engine oil temperature.
    - Make sure the selector lever is in the 'P' position.
    - Start and run the engine.
    - Make sure that the engine oil is at a minimum temperature of 50 degrees C.
    - Allow the engine to idle for 2 minutes and 30 seconds.
    - Make sure that the engine cooling fan is not running.
    - Turn off the ignition.
    - Wait for 30 seconds.
    - Repeat steps 4 to 9, a further 5 times.
    - Disconnect the Jaguar approved diagnostic system.

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Electronic Engine Controls - TDV6 3.0L Diesel - Engine Coolant Temperature (ECT) Sensor

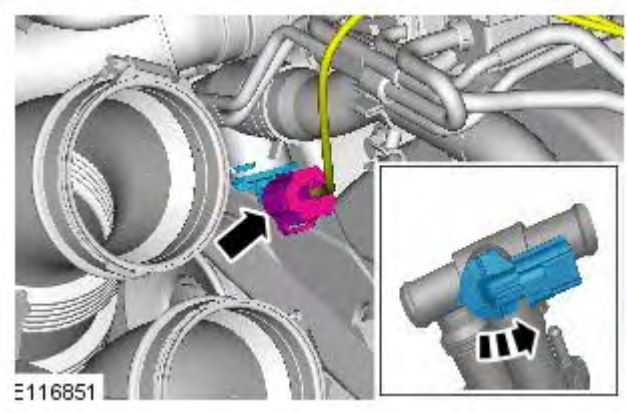
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

2. Refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel, Removal and Installation).



3. CAUTIONS:

   Be prepared to collect escaping fluids.

   The seal is to be reused unless damaged.

   Make sure that the mating faces are clean and free of foreign material.

   NOTE: Release the locking tang to remove the ECT sensor.

Installation

1. NOTE: Make sure that all the component mating faces are clean.

   To install, reverse the removal procedure.

2. Fill the cooling system, keeping coolant to the upper level mark of the expansion tank.

Published: 11-May-2011

Electronic Engine Controls - TDV6 3.0L Diesel - Engine Control Module (ECM)

Removal and Installation

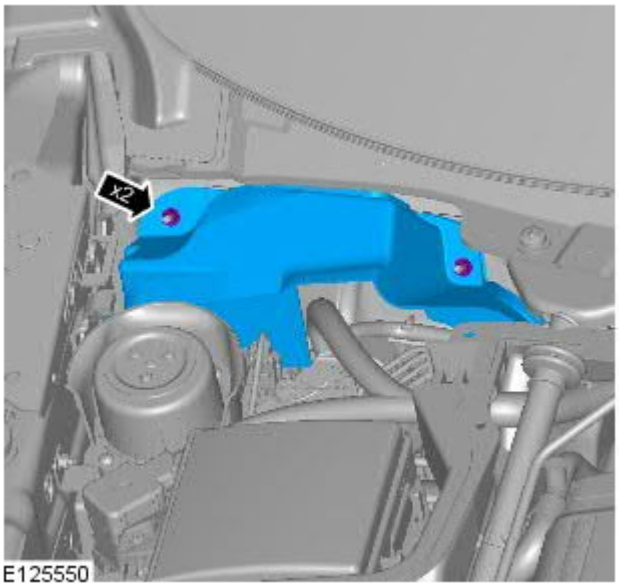
Removal

NOTE: Removal steps in this procedure may contain installation details.

All vehicles

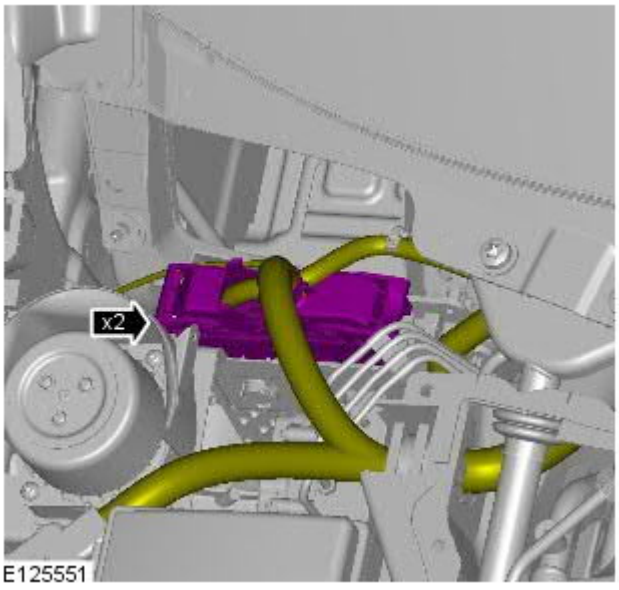
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. Refer to: Cowl Vent Screen (501-02 Front End Body Panels, Removal and Installation).



3. CAUTION: RH illustration shown, LH is similar.

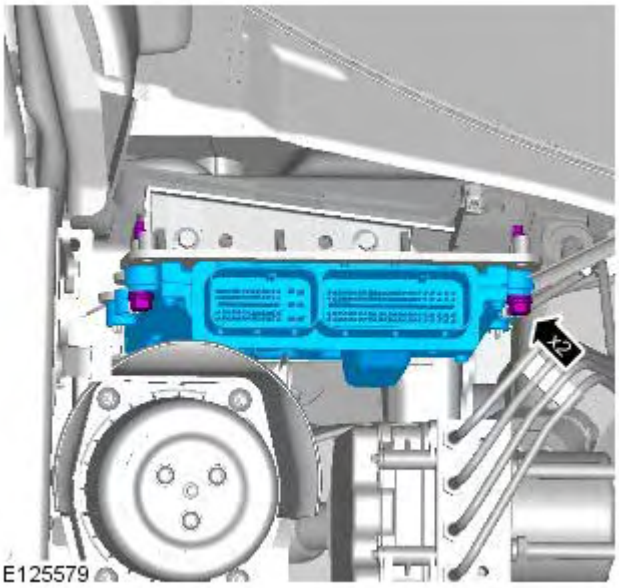
   Torque: 7 Nm



4. CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean.

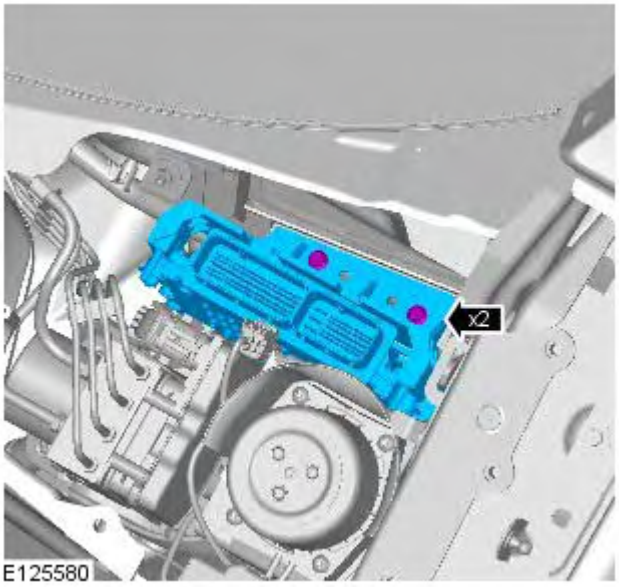
   NOTE: RH illustration shown, LH is similar.

Left-hand drive vehicles



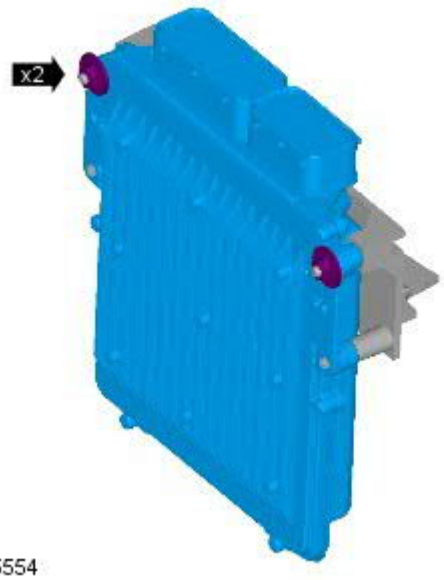
5. *Torque:* 7 Nm

Right-hand drive vehicles



6. *Torque:* 7 Nm

7. *Torque:* 7 Nm



E125554

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Electronic Engine Controls - TDV6 3.0L Diesel - Engine Oil Level Sensor

Removal and Installation

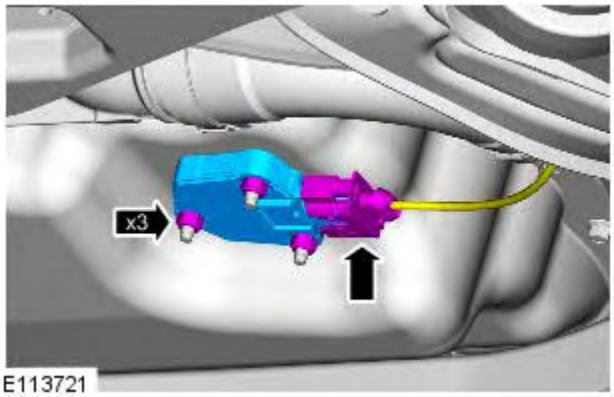
Removal

NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Engine Oil Draining and Filling (303-01A Engine - TDV6 3.0L Diesel, General Procedures).



3. CAUTIONS:

   Before the disconnection or removal of any components, make sure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

   Be prepared to collect escaping oil.

   Torque: 11 Nm

Installation

1. NOTE: Install a new O-ring seal.

   To install, reverse the removal procedure.

Published: 11-May-2011

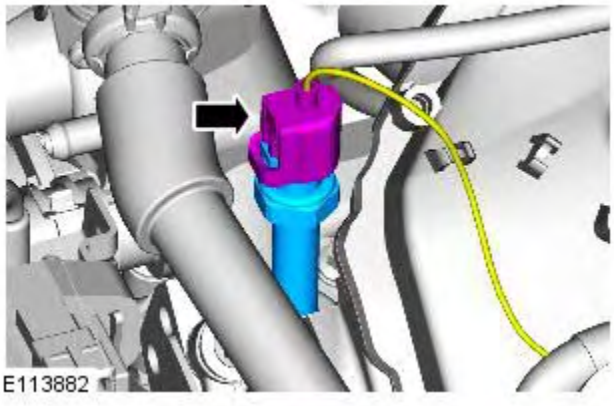
Electronic Engine Controls - TDV6 3.0L Diesel - Engine Oil Pressure (EOP) Sensor

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).



2. CAUTION: Before the disconnection or removal of any components, make sure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

   Torque: 14 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Electronic Engine Controls - TDV6 3.0L Diesel - Exhaust Gas Temperature Sensor RH

Removal and Installation

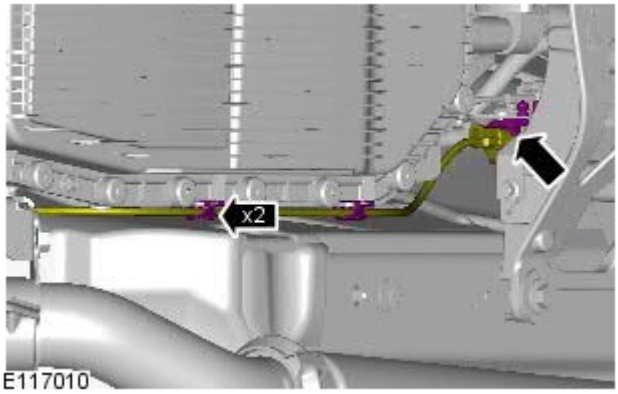
Removal

NOTE: Removal steps in this procedure may contain installation details.

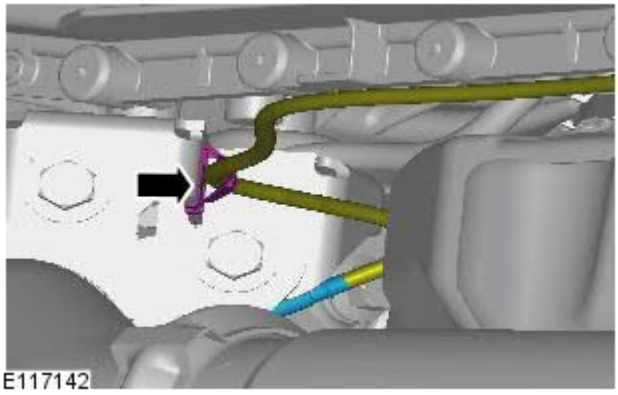
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).



3. CAUTION: Note the fitted position of the component prior to removal.



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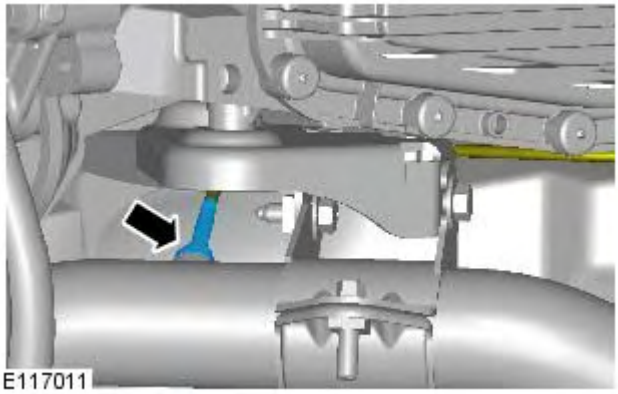


5. CAUTION: Make sure that the mating faces are clean and free of corrosion and foreign material.

   Torque: 35 Nm

Installation

1. CAUTIONS:

   Make sure the anti-seize compound does not contact the catalyst monitor sensor tip.

   If accidentally dropped or knocked install a new sensor.

   Make sure that the wiring harness is not twisted or damaged on installation. Failure to follow this instruction may result in damage to the vehicle.

   NOTE: If the original sensor is to be installed, apply lubricant meeting specification ESE-M12A4-A to the thread of the sensor.

   To install, reverse the removal procedure.

Published: 11-May-2011

Electronic Engine Controls - TDV6 3.0L Diesel - Heated Oxygen Sensor (HO2S)

Removal and Installation

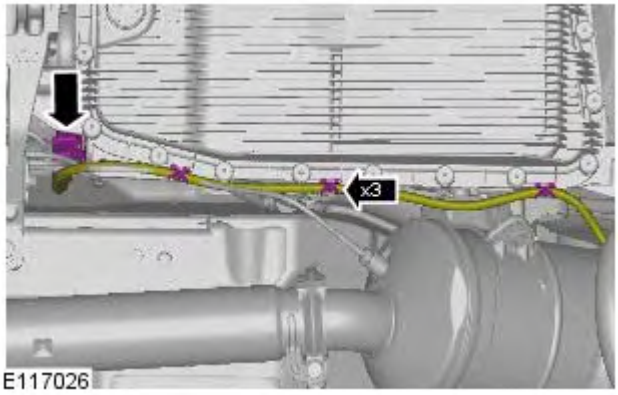
Removal

NOTE: Removal steps in this procedure may contain installation details.

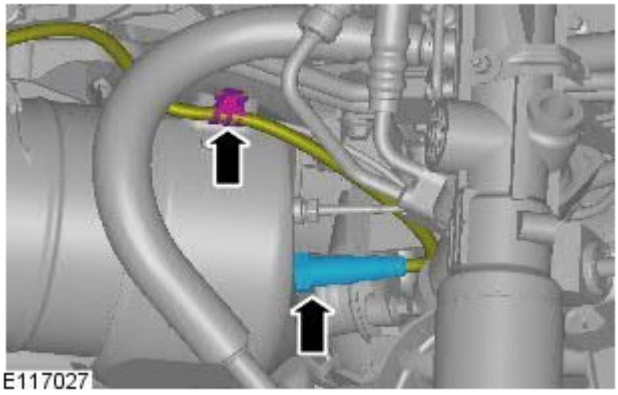
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).



3. CAUTION: Note the fitted position of the component prior to removal.



4. CAUTION: Make sure that the mating faces are clean and free of corrosion and foreign material.

   Torque: 48 Nm

Installation

1. CAUTIONS:

   Make sure the anti-seize compound does not contact the catalyst monitor sensor tip.

   If accidentally dropped or knocked install a new sensor.

   Make sure the catalyst monitor sensor wiring harness is not twisted

more than 180 degrees and is not in contact with either the exhaust or driveshaft.

Do not clean the internals of the sensor or electrical connector.

Do not apply any products to the internals of the sensor or electrical connector.

NOTE: If the original sensor is to be installed, apply lubricant meeting specification ESE-M12A4-A to the thread of the sensor.

To install, reverse the removal procedure.

Published: 11-May-2011

Electronic Engine Controls - TDV6 3.0L Diesel - Intake Air Temperature (IAT) Sensor

Removal and Installation

Removal

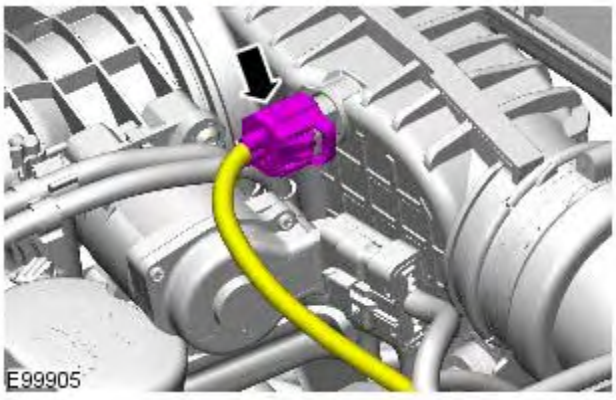
NOTES:

Removal steps in this procedure may contain installation details.

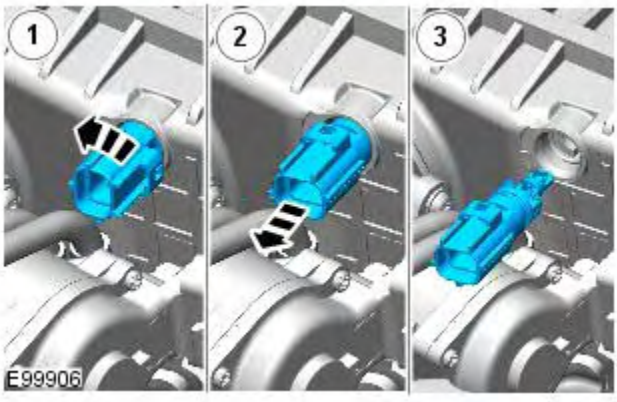
Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

2.



3.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

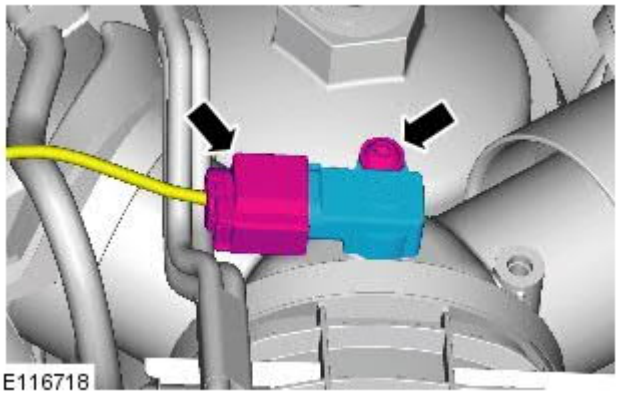
Electronic Engine Controls - TDV6 3.0L Diesel - Manifold Absolute Pressure (MAP) Sensor

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).



2.
   - *Torque:* 3 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Electronic Engine Controls - TDV6 3.0L Diesel - Mass Air Flow (MAF) Sensor

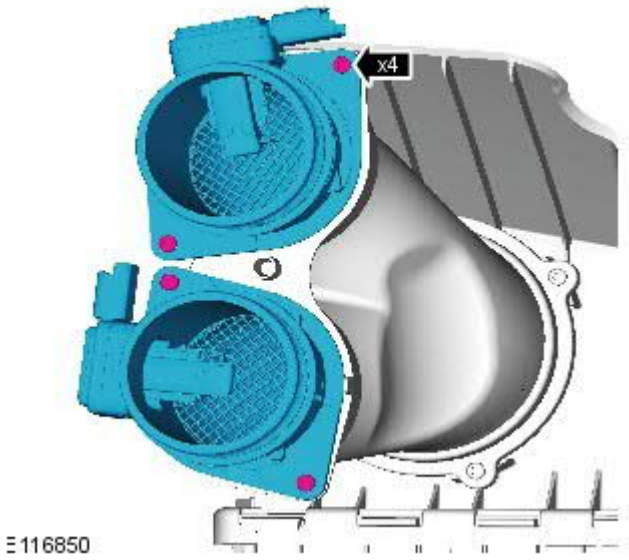
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel, Removal and Installation).

2.
   - *Torque:* 2 Nm



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Electronic Engine Controls - TDV6 3.0L Diesel - Oil Temperature Sensor

Removal and Installation

Removal

1. The oil temperature sensor is an integrated part of the engine oil level sensor.

   Refer to: Engine Oil Level Sensor (303-14A Electronic Engine Controls - TDV6 3.0L Diesel, Removal and Installation).

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Electronic Engine Controls - TDV6 3.0L Diesel - Post Catalytic Converter Temperature Sensor

Removal and Installation

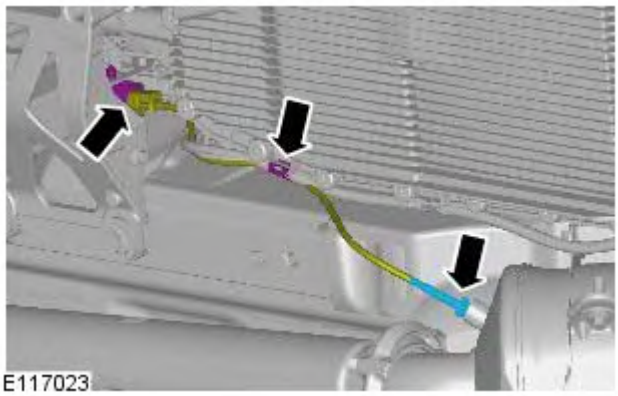
Removal

NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).



3. CAUTION: Make sure that the mating faces are clean and free of corrosion and foreign material.

   Torque: 35 Nm

Installation

1. CAUTIONS:

   Make sure the anti-seize compound does not contact the catalyst monitor sensor tip.

   If accidentally dropped or knocked install a new sensor.

   Make sure that the wiring harness is not twisted or damaged on installation. Failure to follow this instruction may result in damage to the vehicle.

   NOTE: If the original sensor is to be installed, apply lubricant meeting specification ESE-M12A4-A to the thread of the sensor.

   To install, reverse the removal procedure.

Published: 11-May-2011

Electronic Engine Controls - TDV6 3.0L Diesel - Post DPF Exhaust Gas Temperature Sensor

Removal and Installation

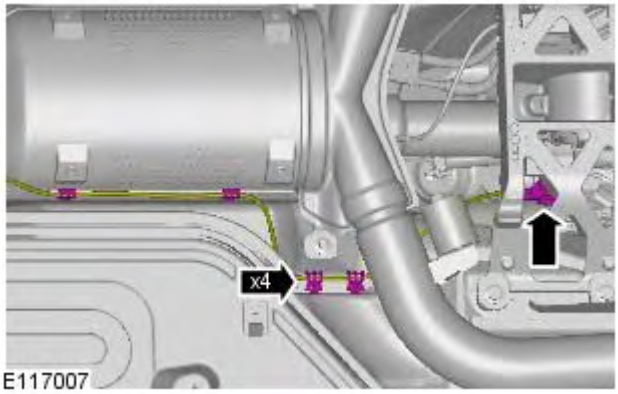
Removal

NOTE: Removal steps in this procedure may contain installation details.

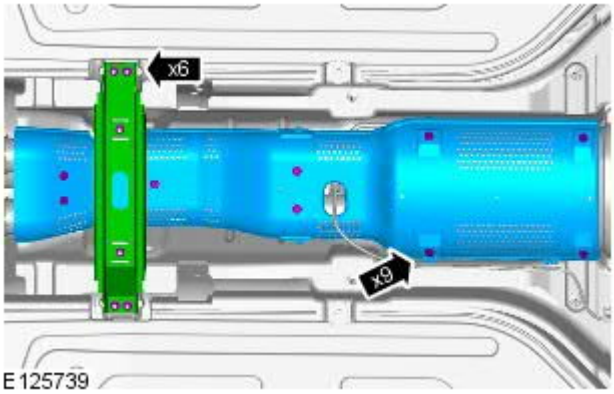
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

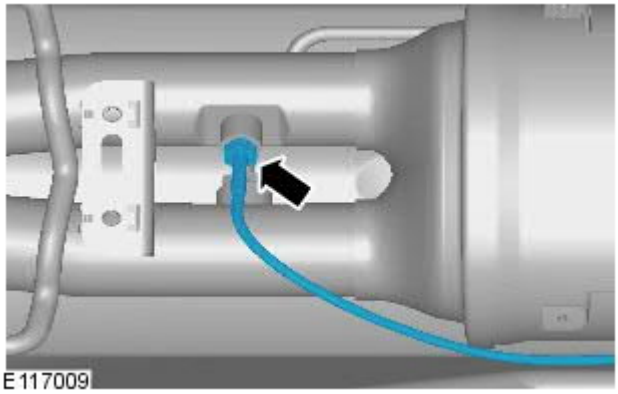
2. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).



3. CAUTION: Note the fitted position of the component prior to removal.



4. *Torque:* 9 Nm



5. CAUTION: Make sure that the mating faces are clean and free of corrosion and foreign material.

   Torque: 35 Nm

Installation

1. CAUTIONS:

   Make sure the anti-seize compound does not contact the catalyst monitor sensor tip.

   If accidentally dropped or knocked install a new sensor.

   Make sure that the wiring harness is not twisted or damaged on installation. Failure to follow this instruction may result in damage to the vehicle.

   NOTE: If the original sensor is to be installed, apply lubricant meeting specification ESE-M12A4-A to the thread of the sensor.

   To install, reverse the removal procedure.

Published: 11-May-2011

Electronic Engine Controls - TDV6 3.0L Diesel - Pre Catalytic Converter Temperature Sensor

Removal and Installation

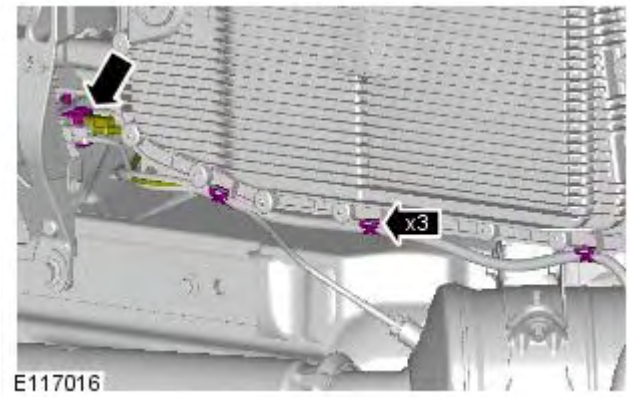
Removal

NOTE: Removal steps in this procedure may contain installation details.

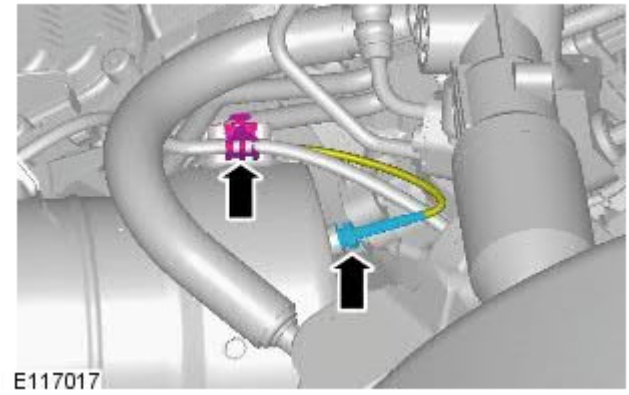
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).



3. CAUTION: Note the fitted position of the component prior to removal.



4. CAUTION: Make sure that the mating faces are clean and free of corrosion and foreign material.

   Torque: 35 Nm

Installation

1. CAUTIONS:

   Make sure the anti-seize compound does not contact the catalyst monitor sensor tip.

   If accidentally dropped or knocked install a new sensor.

   Make sure that the wiring harness is not twisted or damaged on

installation. Failure to follow this instruction may result in damage to the vehicle.

NOTE: If the original sensor is to be installed, apply lubricant meeting specification ESE-M12A4-A to the thread of the sensor.

To install, reverse the removal procedure.

Published: 11-May-2011

Electronic Engine Controls - TDV6 3.0L Diesel - Pre DPF Exhaust Gas Temperature Sensor

Removal and Installation

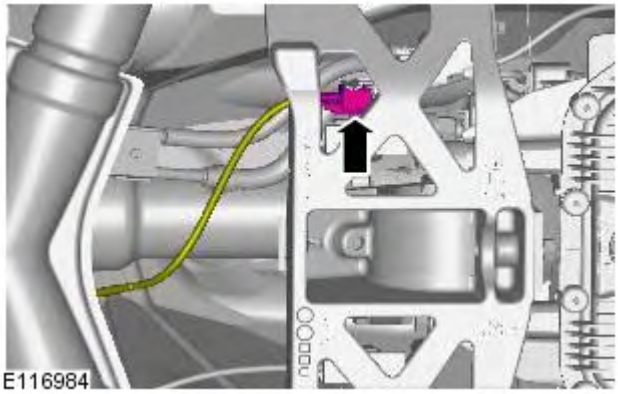
Removal

NOTE: Removal steps in this procedure may contain installation details.

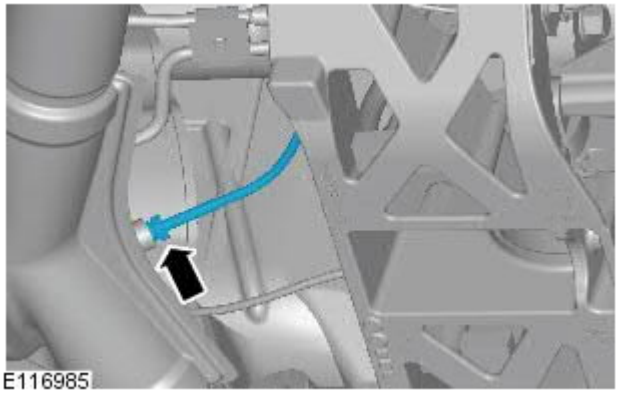
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).



3. CAUTION: Note the fitted position of the component prior to removal.



4. CAUTION: Make sure that the mating faces are clean and free of corrosion and foreign material.

   Torque: 35 Nm

Installation

1. CAUTIONS:

   Make sure the anti-seize compound does not contact the catalyst monitor sensor tip.

   If accidentally dropped or knocked install a new sensor.

   Make sure that the wiring harness is not twisted or damaged on

installation. Failure to follow this instruction may result in damage to the vehicle.

NOTE: If the original sensor is to be installed, apply lubricant meeting specification ESE-M12A4-A to the thread of the sensor.

To install, reverse the removal procedure.

Published: 11-May-2011

Automatic Transmission/Transaxle -

CAUTION: CAUTION: Use only Shell M1375.4 Automatic transmission fluid. Use of any other fluids may result in a transmission malfunction or failure.

Description	Intervals
Normal maintenance	Filled for life.
Severe duty maintenance	Change the fluid at 48,000 km (30,000 miles) intervals.

NOTE: Lubricants, Fluids, Sealers and Adhesives

Description	Specification
Transmission fluid	Shell M1375.4
Sealant	WSS-M4G323-A6
Metal surface cleaner	WSW-M5B392-A
High temperature grease	Molecote FB180

NOTE: General Specifications

Vehicle	Engine	Approximate Liters	Refill capacity approximate dry capacity, includes cooler and tubes. Check the level at normal operating temperature. DO NOT OVERFILL. If it is necessary to add or change fluid, use only fluid which has been certified by the supplier as meeting the Jaguar Cars Ltd specification shown. U.S. Quarts
XJ	All vehicles	10.0	10.57

NOTE: Torque Specifications

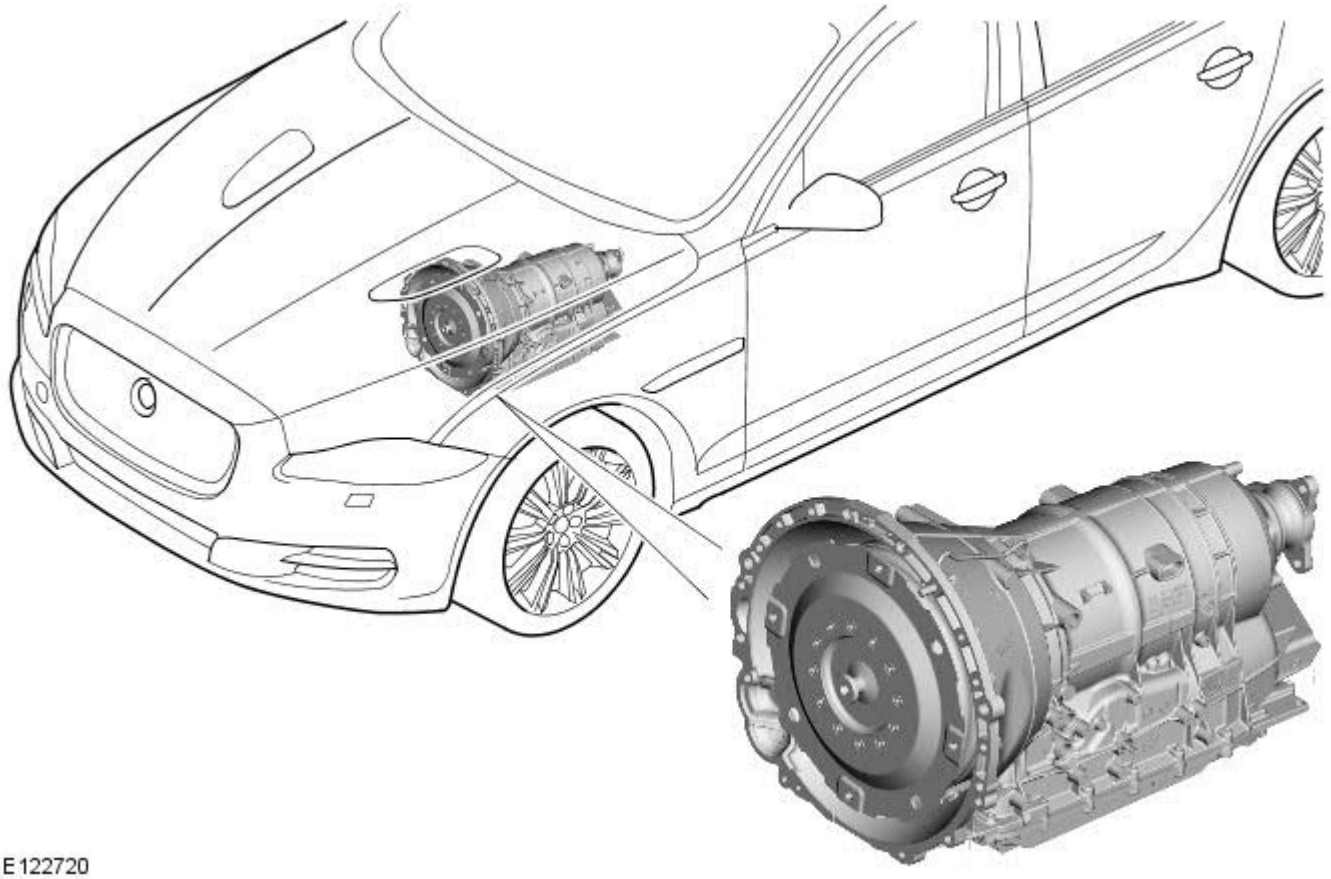
Description	Nm	lb-ft	lb-in
Transmission retaining bolts	48	35	-
Transmission mount retaining bolts	51	38	-
Transmission fluid fill plug	A	A	A
Transmission control module (TCM) and main control valve body retaining bolts	8	-	53
Output shaft flange retaining nut	60	44	-
Torque converter retaining bolts	62	46	-
Transmission fluid cooler tube retaining bolt	22	16	-
Transmission fluid drain plug	8	-	53
Transmission fluid pan, gasket and filter retaining bolts	8	-	53
A = refer to the procedure for correct torque sequence			

Published: 11-May-2011

Automatic Transmission/Transaxle - Transmission Description - Component Location

Description and Operation

COMPONENT LOCATION



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Published: 11-May-2011

Automatic Transmission/Transaxle - Transmission Description - Overview

Description and Operation

OVERVIEW

The ZF 6HP28 transmission is an electronically controlled, hydraulically operated, six speed automatic unit. The hydraulic and electronic control elements of the transmission, including the TCM (transmission control module), are incorporated in a single unit located inside the transmission and is known as 'Mechatronic'.

5.0L SC (supercharger) and 3.0L diesel models use an uprated derivative of the ZF 6HP28 transmission used in the 5.0L naturally aspirated models.

The ZF 6HP28 transmission has the following features:

- Designed to be maintenance free
- Transmission fluid is 'fill for life'
- The torque converter features a controlled slip feature with electronically regulated control of lock-up, creating a smooth transition to the fully locked condition
- Shift programs controlled by the TCM
- Electronic park lock, controlled by the TCM, with a mechanical emergency release
- ASIS (adaptive shift strategy), to provide continuous adaptation of shift changes to suit the driving style of the driver, which can vary from sporting to economical.
- Connected to the ECM (engine control module) via the high speed CAN (controller area network) bus for communications
- Default mode if major faults occur
- Diagnostics available from the TCM via the high speed CAN bus.

The transmission selections are made using the rotary JaguarDrive selector in the floor console and two paddle switches on the steering wheel. Refer to: External Controls (307-05, Description and Operation).

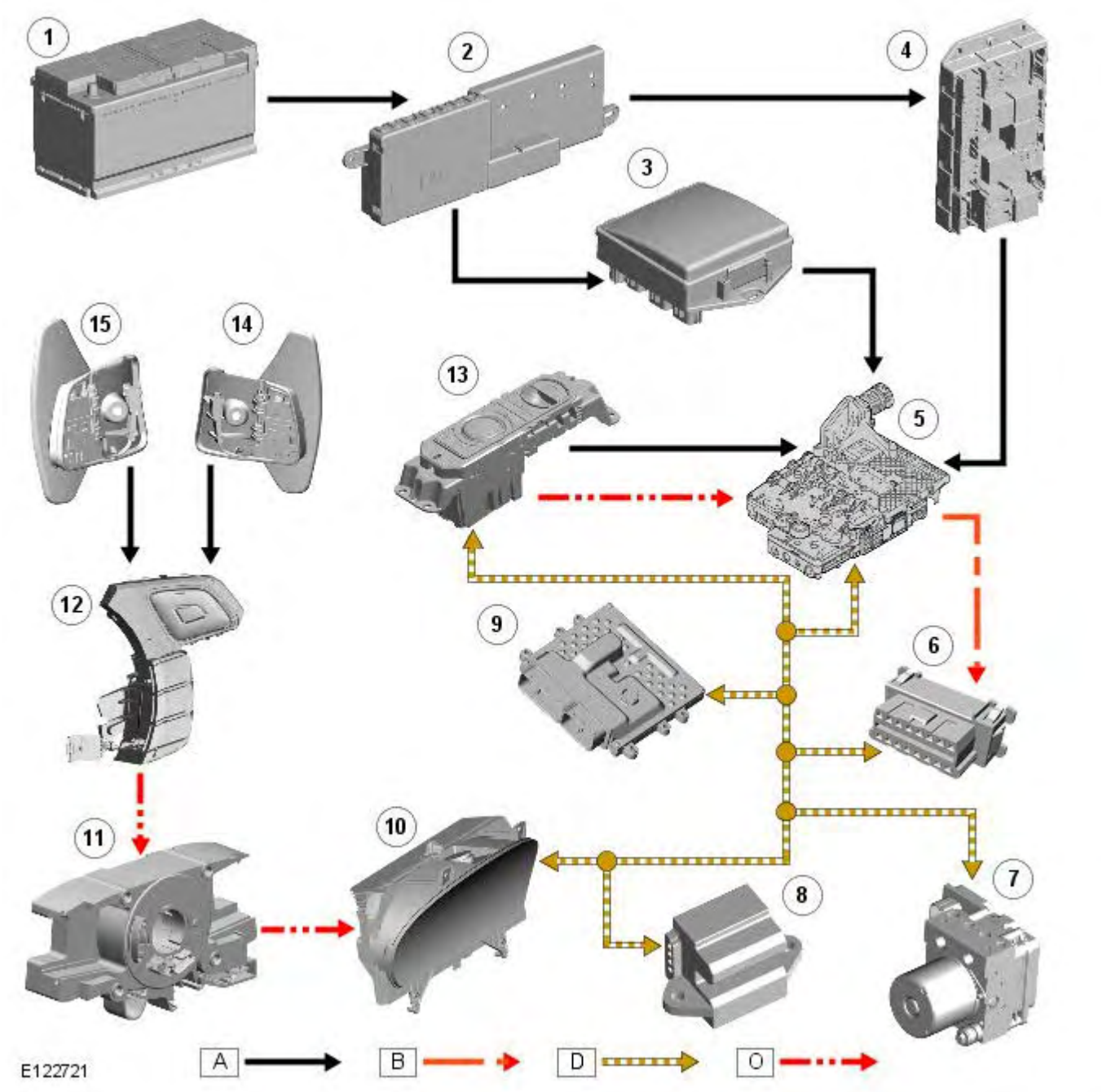
Published: 11-May-2011

Automatic Transmission/Transaxle - Transmission Description - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: A = Hardwired; B = K bus; D = High speed CAN (controller area network) bus; O = LIN (local interconnect network) bus.



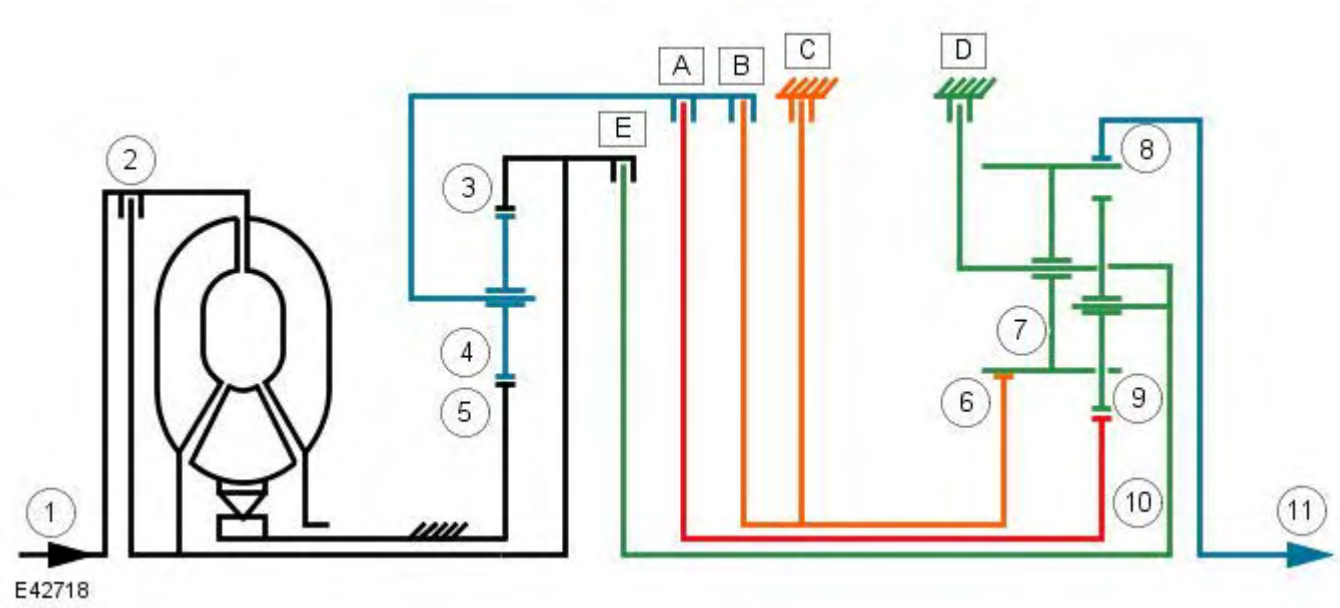
Item	Description
1	Battery
2	BJB (battery junction box) (250 A megafuse for EJB supply; 50 A megafuse for CJB supply)
3	EJB (engine junction box)
4	CJB (central junction box)
5	TCM (transmission control module)

6	Diagnostic socket
7	ABS module
8	Steering angle sensor
9	ECM (engine control module)
10	Instrument cluster
11	Clockspring
12	Steering wheel RH switchpack
13	JaguarDrive selector
14	Upshift paddle switch
15	Downshift paddle switch

System Operation

POWER FLOWS

Operation of the transmission is controlled by the TCM (transmission control module), which electrically activates various solenoids to control the transmission gear selection. The sequence of solenoid activation is based on programmed information in the TCM memory and physical transmission operating conditions such as vehicle speed, throttle position, engine load and JaguarDrive selector position.



Item	Description
1	Torque input from engine
2	Torque converter lock-up clutch
3	Single web planetary gear carrier
4	Single web planetary gears
5	Single web sunwheel 1
6	Double web sunwheel 2
7	Double web planetary gears - long
8	Double web planetary gear carrier
9	Double web planetary gears - short
10	Double web sunwheel 3
11	Torque output from transmission
A	Multiplate clutch
B	Multiplate clutch
C	Multiplate brake
D	Multiplate brake
E	Multiplate clutch

Engine torque is transferred, via operation of single or combinations of clutches to the 2 planetary gear trains. Both gear trains are controlled by reactionary inputs from brake clutches to produce the 6 forward gears and 1 reverse gear. The ratios are as

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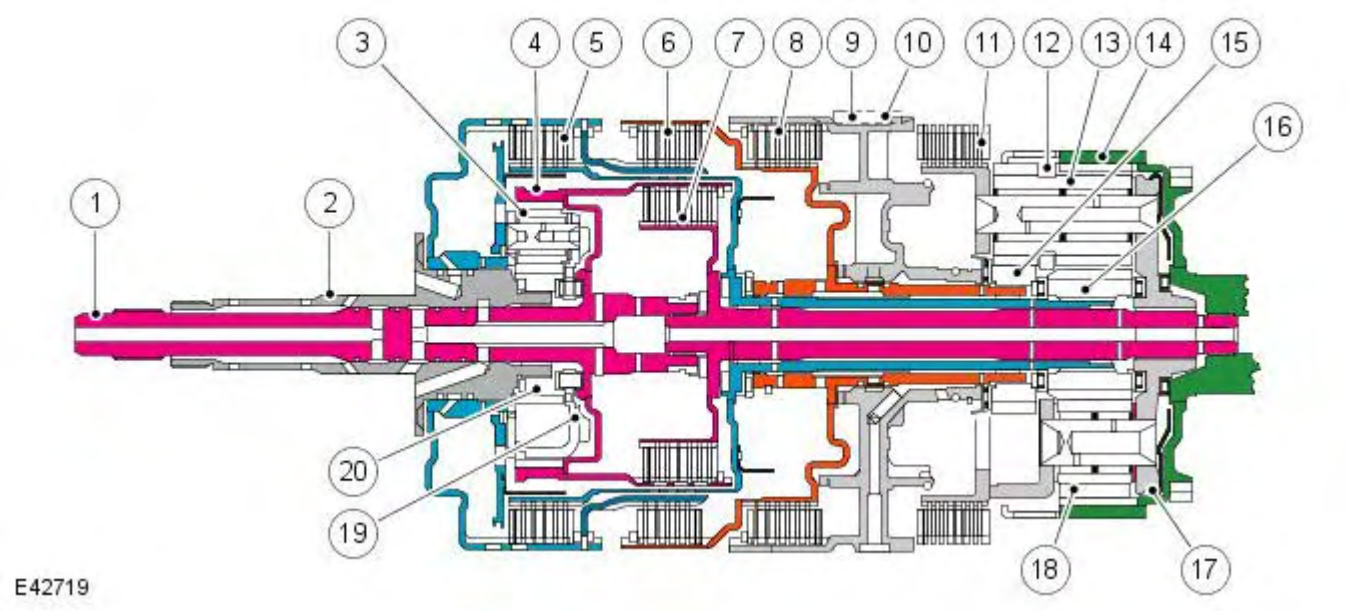
follows:

Gear	1st	2nd	3rd	4th	5th	6th	Reverse
Ration	4.171	2.340	1.521	1.143	0.867	0.691	3.403

Shift Elements

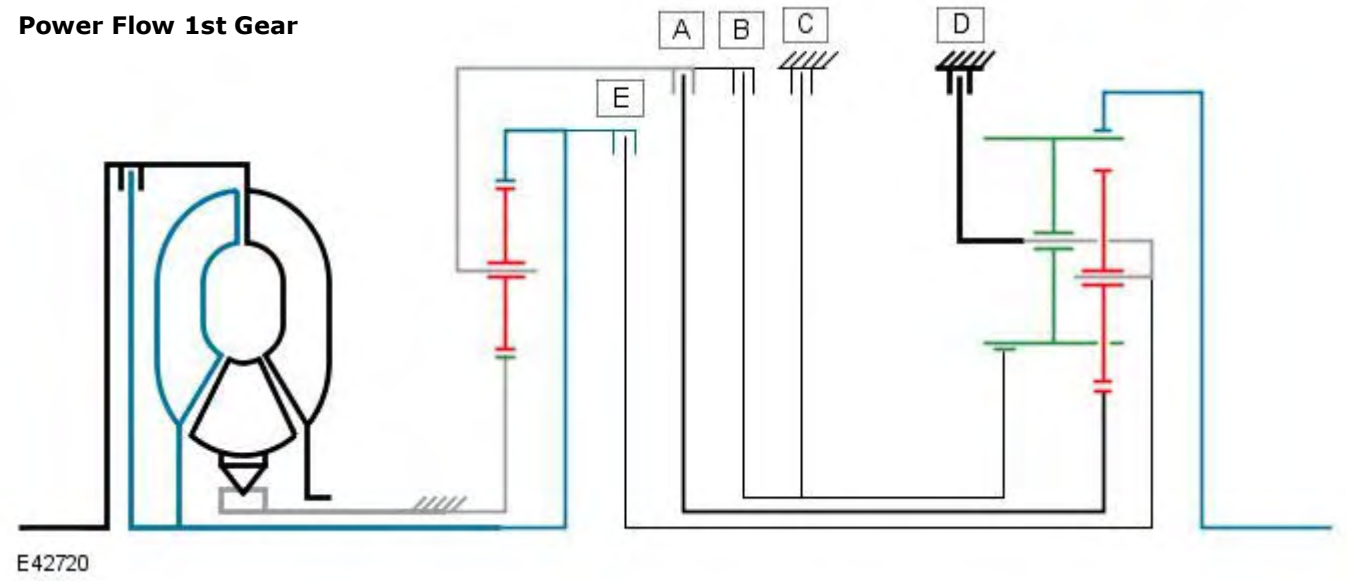


Item	Description
1	Turbine shaft
2	Stator shaft
3	Single web planetary gear train
4	Ring gear 1
5	Clutch A
6	Clutch B
7	Clutch E
8	Brake clutch C
9	Fixed connection to transmission housing
10	Shaft key
11	Brake clutch D
12	Double web planetary gear train
13	Planetary gears - long
14	Ring gear 2
15	Sunwheel 2
16	Sunwheel 3
17	Double web planetary gear carrier
18	Planetary gears - short
19	Single web planetary gear carrier
20	Sunwheel 1

The shift elements are three rotating multiplate clutches (A, B and E) and two fixed multiplate brakes (C and D). All shifts from 1st to 6th gears are power-on overlapping shifts. Overlapping shifts can be described as one of the clutches continuing to transmit drive at a lower main pressure until the next required clutch is able to accept the input torque.

The shift elements, clutches and brakes are actuated hydraulically. Fluid pressure is applied to the required clutch and/or brake, pressing the plates together and allowing drive to be transmitted through the plates. The purpose of the shift elements is to perform power-on shifts with no interruption to traction and smooth transition between gear ratios.

Power Flow 1st Gear



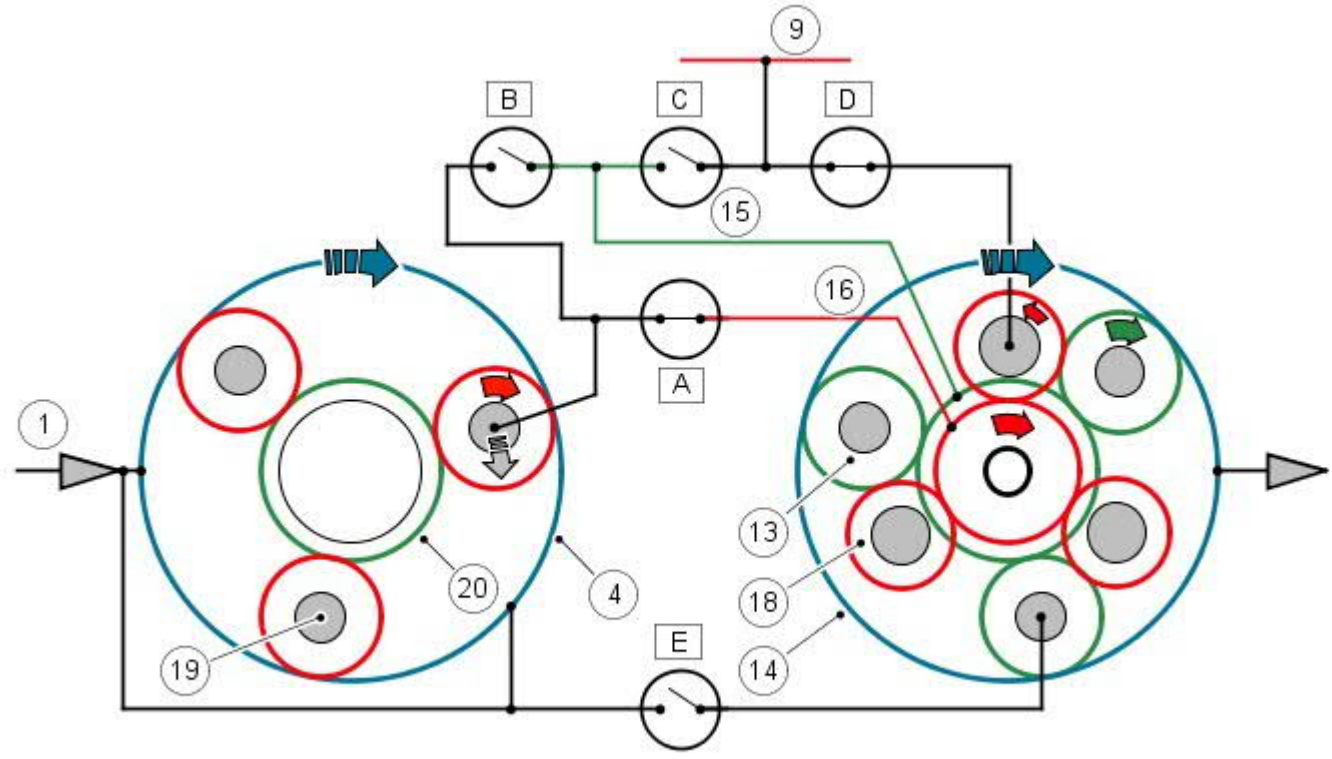
The JaguarDrive selector and the selector valve spool are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to the ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Ring gear 1 drives the planetary gears which rotate around sunwheel 1. This drives the planetary gear carrier 1 and also the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

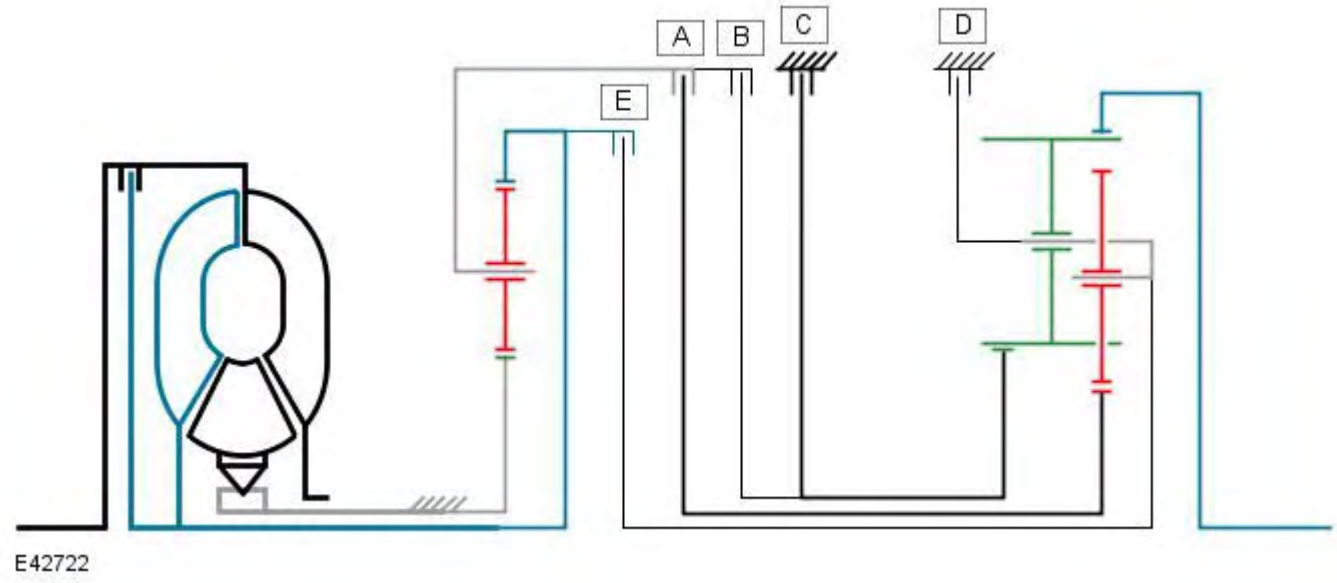
When clutch 'A' is engaged, sunwheel 3 in the double web planetary gear train is driven and meshes with the short planetary gears.

The double web planetary gear train is locked against the transmission housing by brake 'D'. This allows ring gear 2 (output shaft) to be driven in the same direction as the engine via the long planetary gears.

NOTE: Refer to 'Shift Elements' illustration for key



Power Flow 2nd Gear



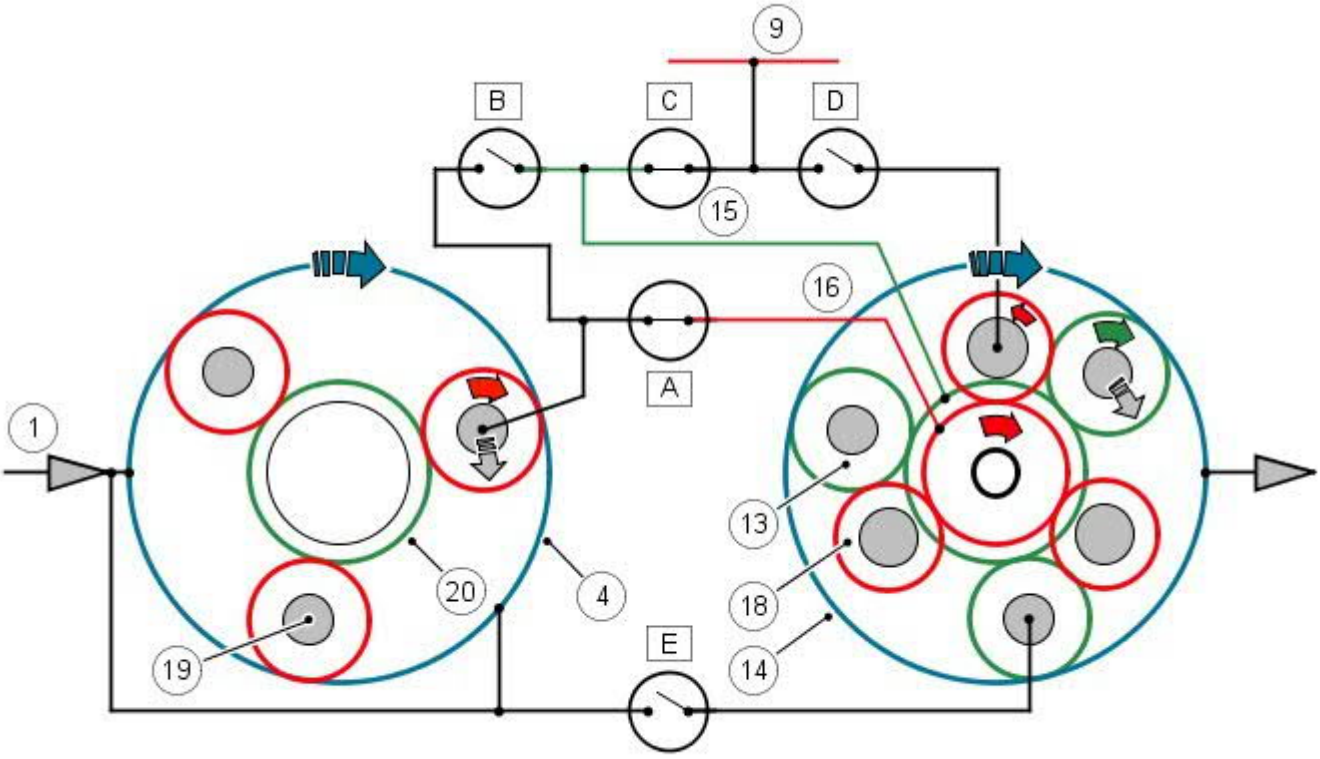
The JaguarDrive selector and the selector spool valve are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to the ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Ring gear 1 drives the planetary gears which rotate around sunwheel 1. This drives the planetary gear carrier 1 and also the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

When clutch 'A' is engaged, sunwheel 3 in the double web planetary gear train is driven and meshes with the short planetary gears.

Sunwheel 2 is locked to the transmission housing by brake clutch 'C'. The long planetary gears, which are also meshed with the short planetary gears, roll around the fixed sunwheel 2 and transmit drive to the double web planetary gear train carrier and ring gear 2 in the direction of engine rotation.

NOTE: Refer to 'Shift Elements' illustration for key



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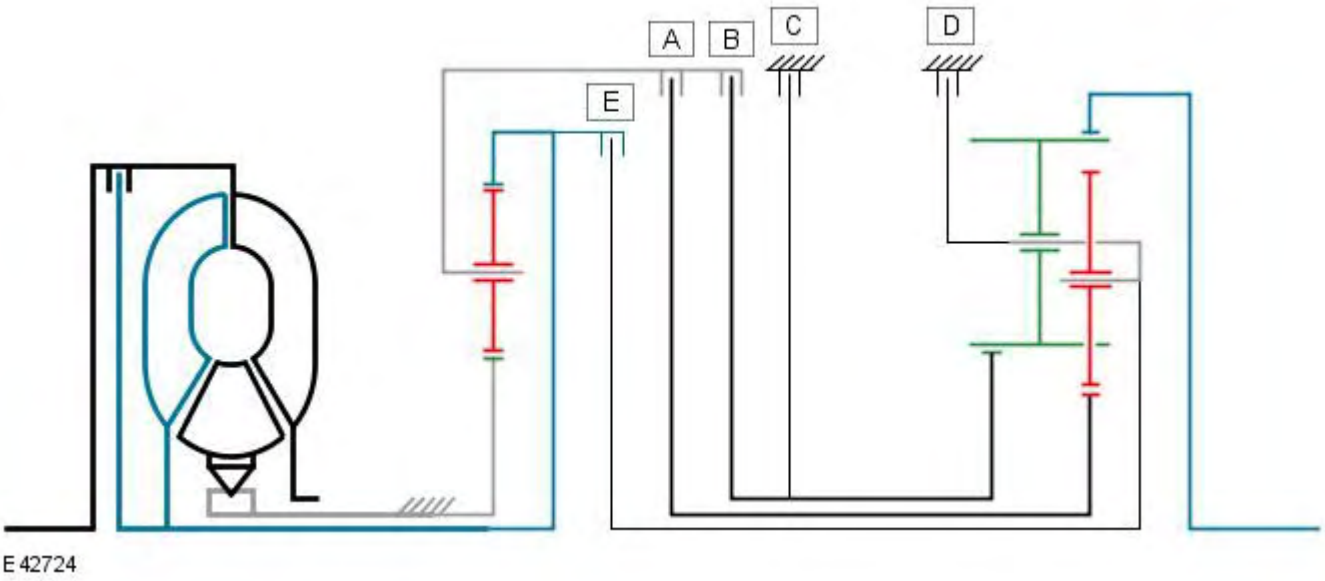
Power Flow 3rd Gear



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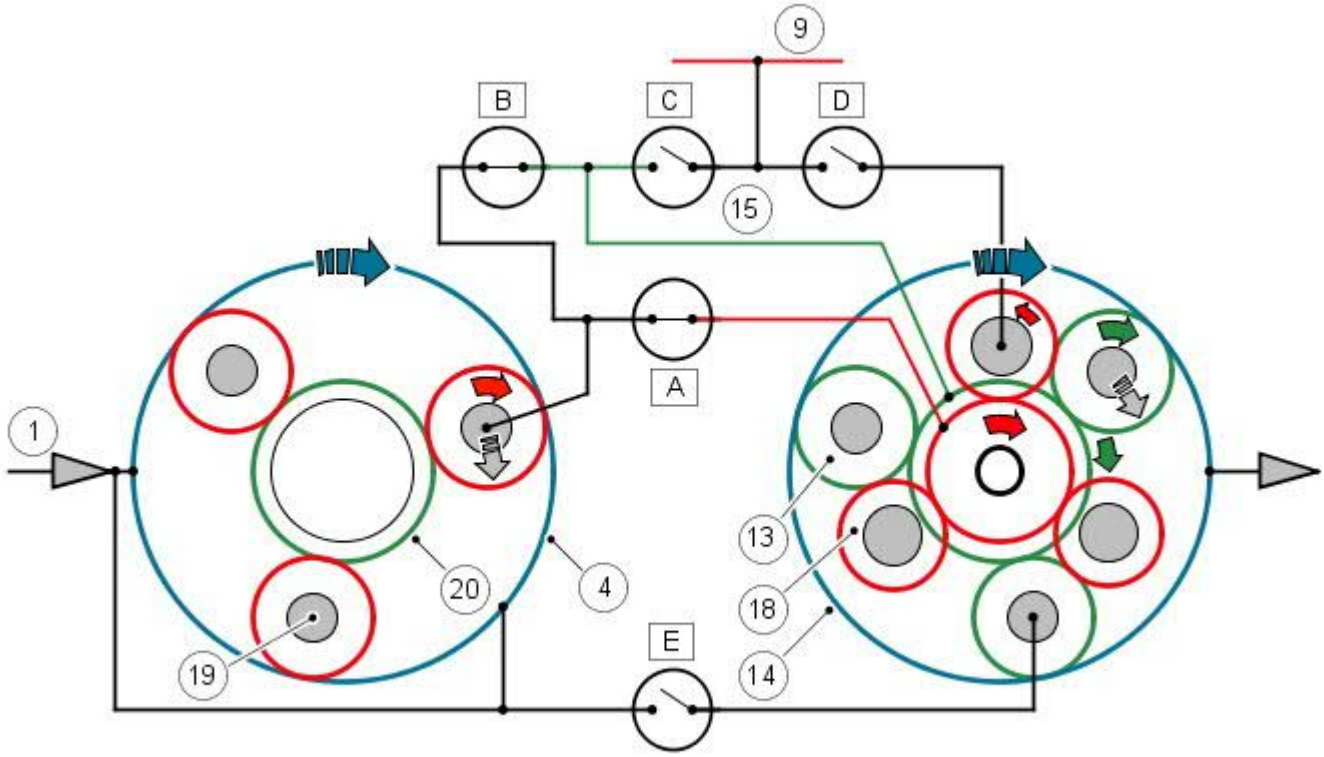
The JaguarDrive selector and the selector spool valve are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to the ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Ring gear 1 drives the planetary gears which rotate around sunwheel 1. This drives the planetary gear carrier 1 and also the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

When clutch 'A' is engaged, sunwheel 3 in the double web planetary gear train is driven and meshes with the short planetary gears.

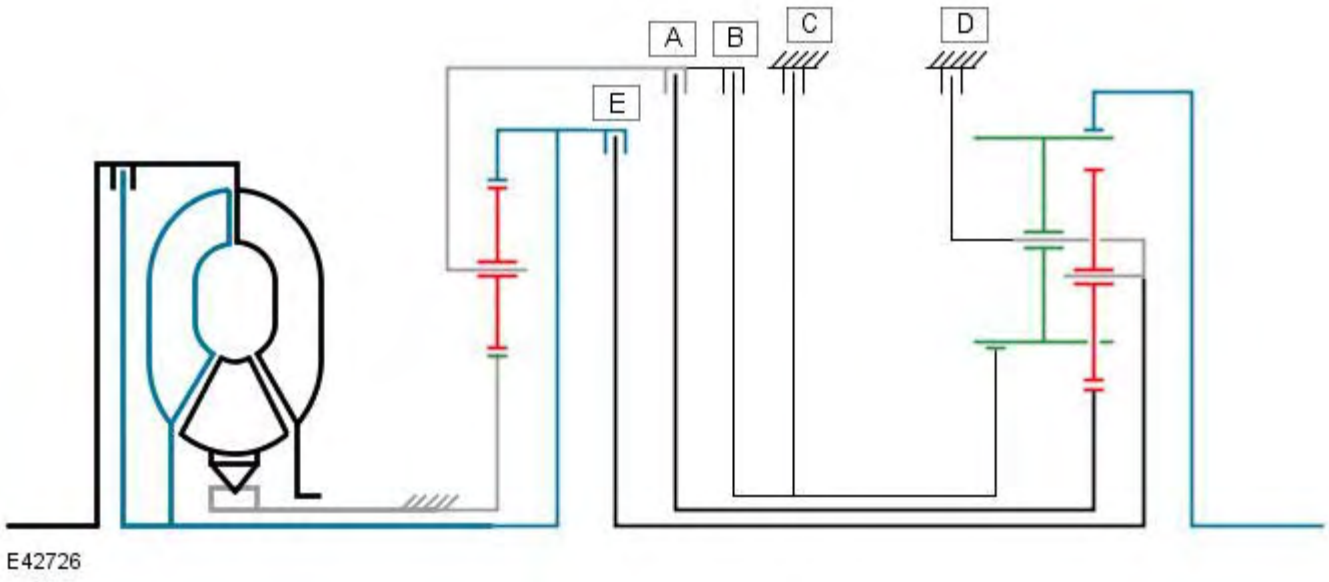
Sunwheel 2 is driven via clutch 'B' which is engaged. The long planetary gears, which are also meshed with the short planetary gears, cannot roll around the fixed sunwheel 2 and therefore transmit drive to the locked double web planetary gear train carrier in the direction of engine rotation.

NOTE: Refer to 'Shift Elements' illustration for key



E42725

Power Flow 4th Gear



E42726

The JaguarDrive selector and the selector spool valve are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

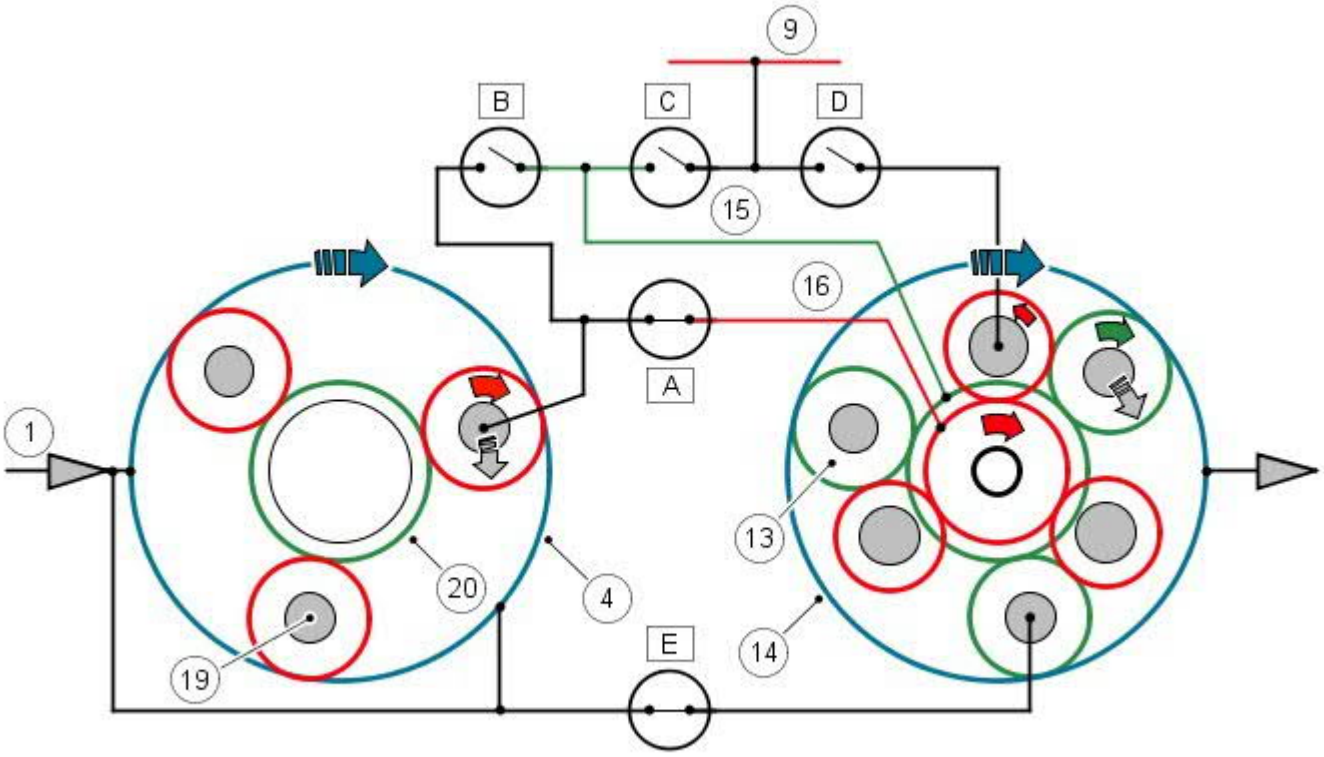
Ring gear 1 drives the planetary gears which rotate around sunwheel 1. This drives the planetary gear carrier 1 and also the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

When clutch 'A' is engaged, sunwheel 3 in the double web planetary gear train is driven and meshes with the short planetary gears.

The double web planetary gear carrier is driven via clutch 'E' which is engaged. The long planetary gears, which are also

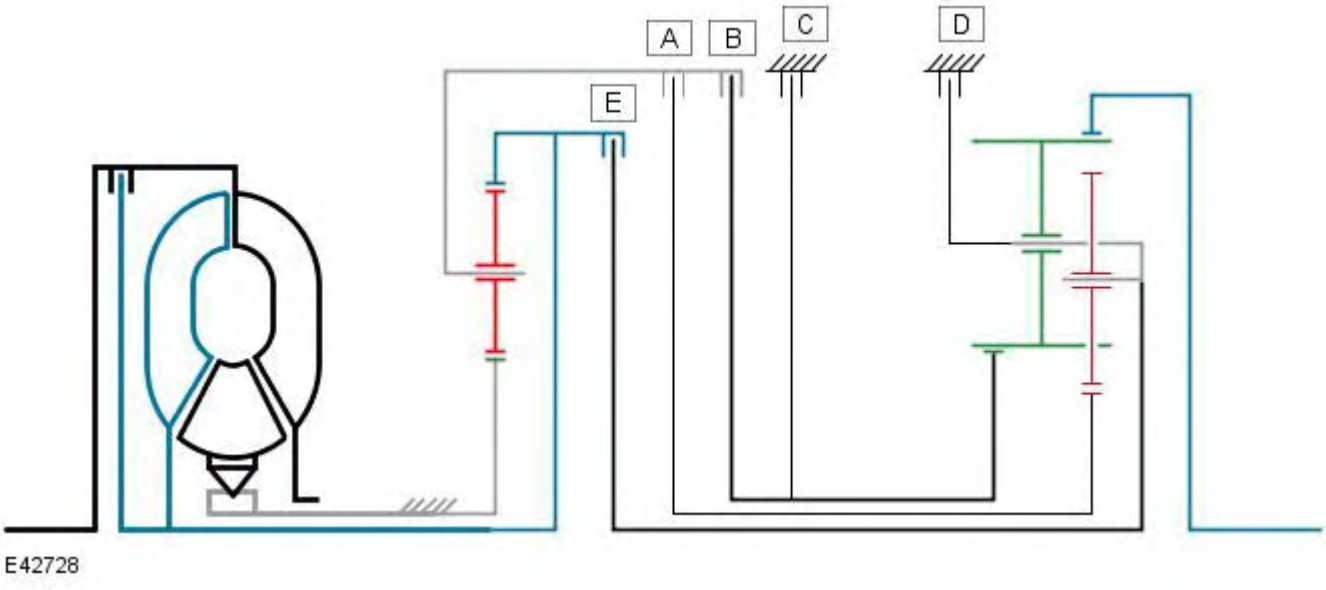
meshed with the short planetary gears and the double web planetary gear carrier, drive ring gear 2 in the direction of engine rotation.

NOTE: Refer to 'Shift Elements' illustration for key



E42727

Power Flow 5th Gear



E42728

The JaguarDrive selector and the selector spool valve are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

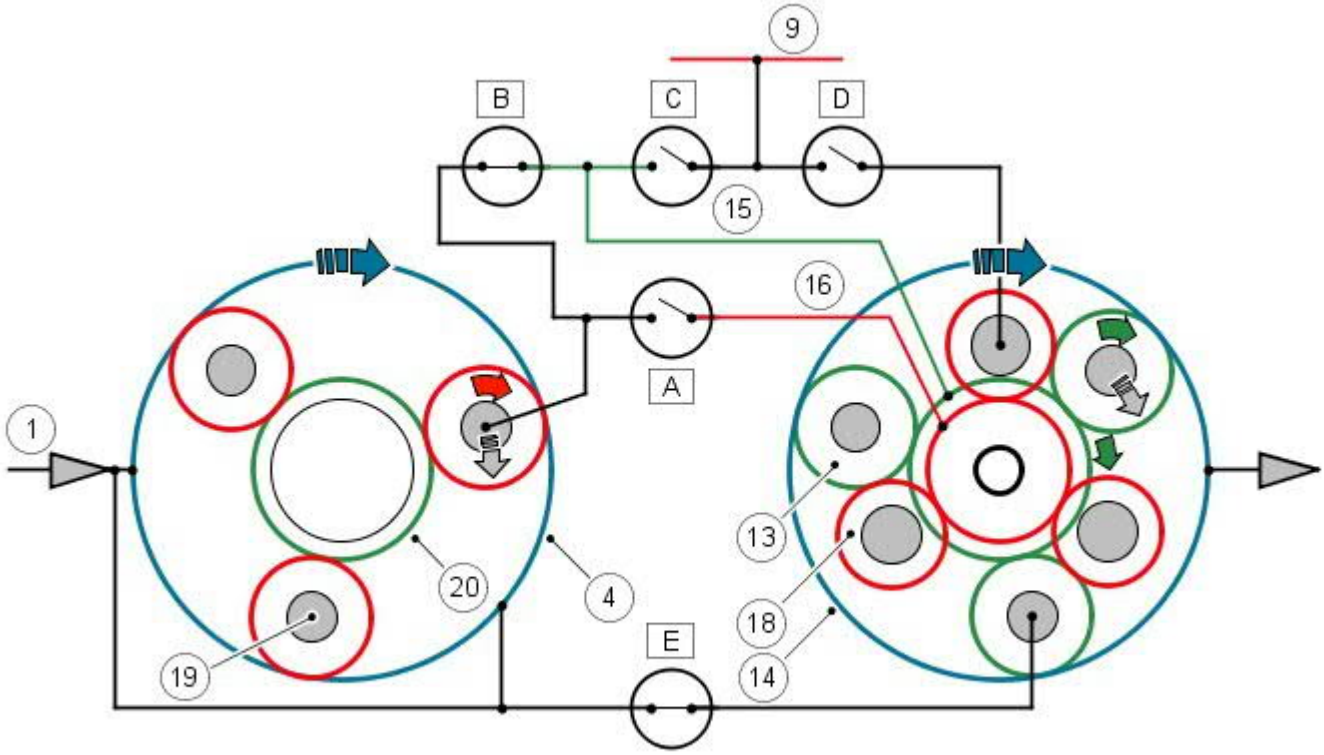
Ring gear 1 drives the planetary gears which rotate around sunwheel 1. This drives the planetary gear carrier 1 and also the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

When clutch 'A' is engaged, sunwheel 3 in the double web planetary gear train is driven and meshes with the short planetary

gears.

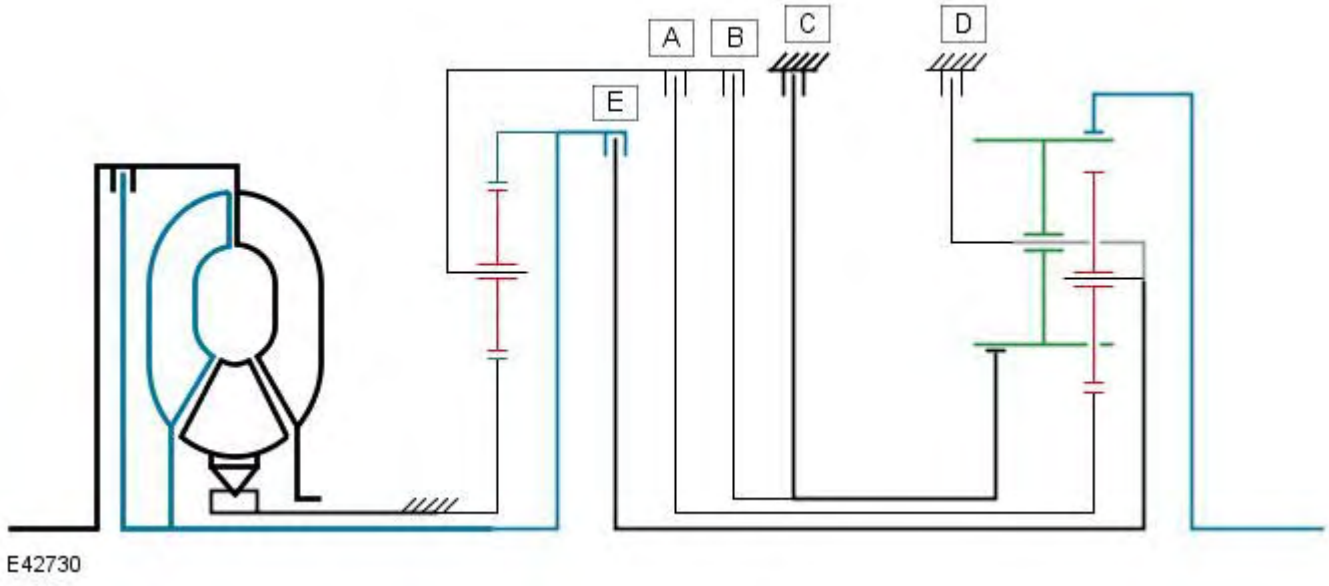
The long planetary gears, which are also meshed with the short planetary gears and the double web planetary gear carrier, drive ring gear 2 in the direction of engine rotation.

NOTE: Refer to 'Shift Elements' illustration for key



E42729

Power Flow 6th Gear



E42730

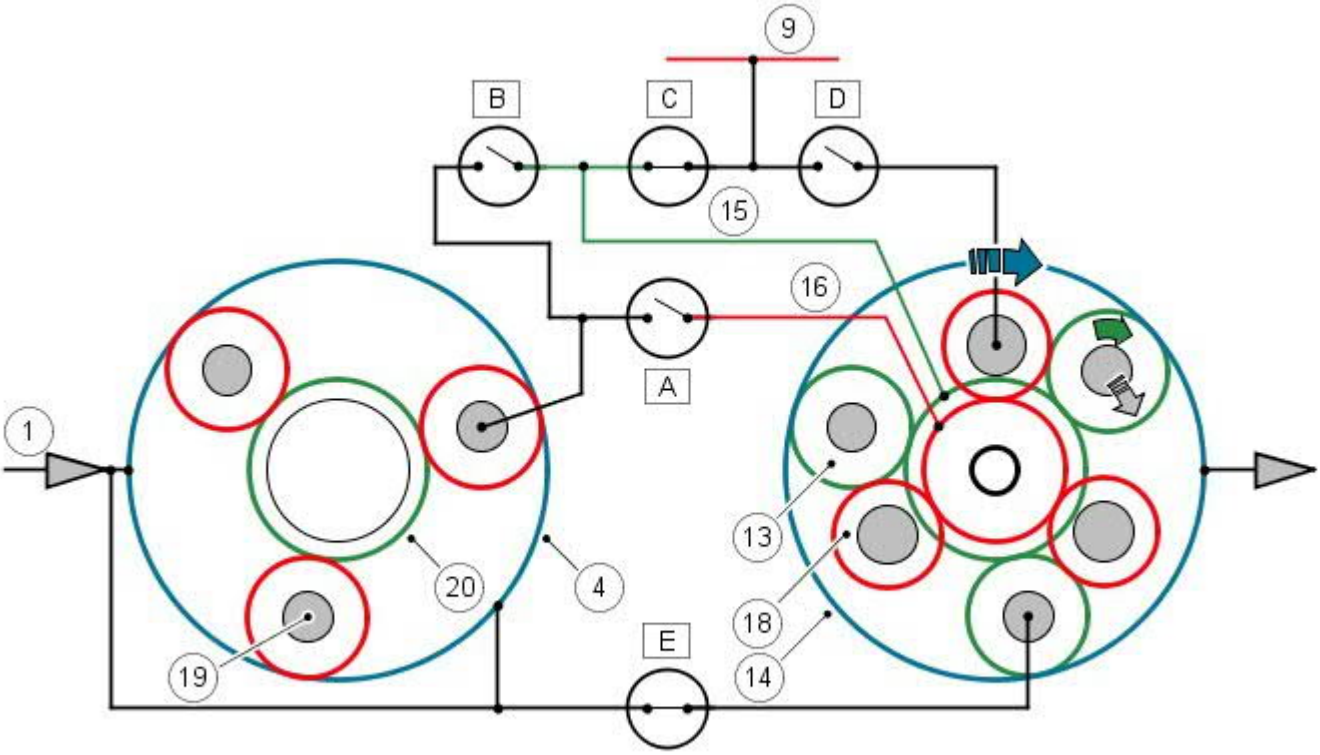
The JaguarDrive selector and the selector spool valve are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Clutches 'A' and 'B' are released, removing the effect of the single web planetary gear train.

Clutch brake 'C' is applied which locks sunwheel 2 to the transmission housing.

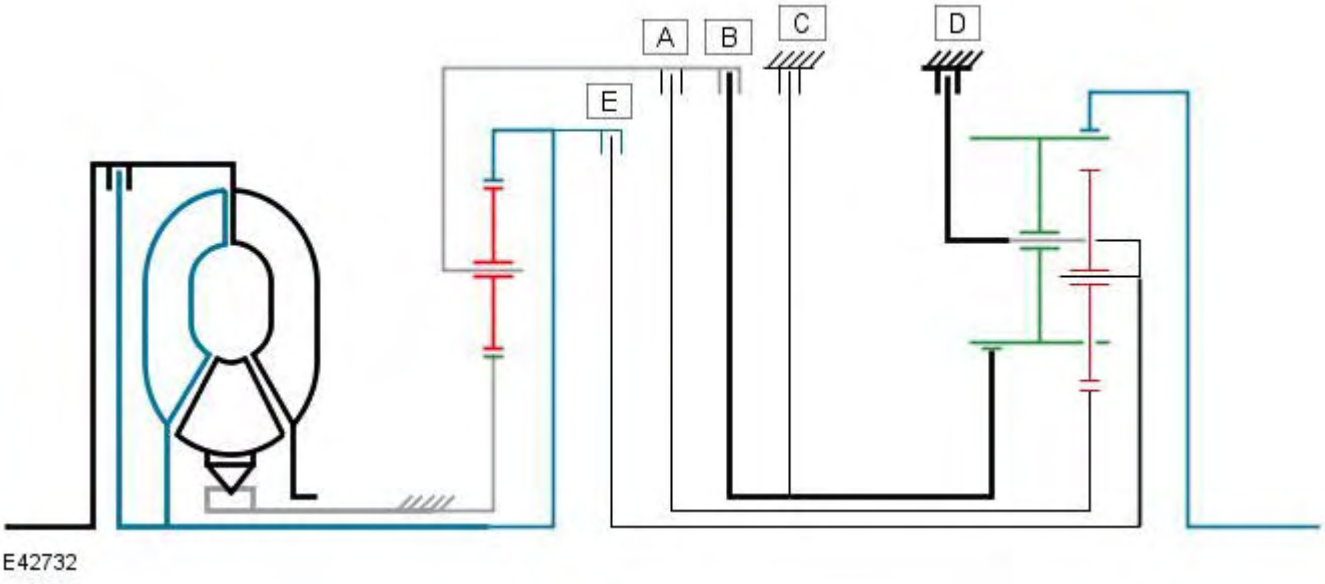
Clutch 'E' is engaged and drives the double web planetary gear carrier. This causes the long planetary gears to rotate around the fixed sunwheel 2 and transmit drive to ring gear 2 which is driven in the direction of engine rotation.

NOTE: Refer to 'Shift Elements' illustration for key



E42731

Power Flow Reverse Gear



E42732

The JaguarDrive selector and the selector spool valve are in the 'R' position. Engine torque is transmitted from the torque converter turbine shaft to ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

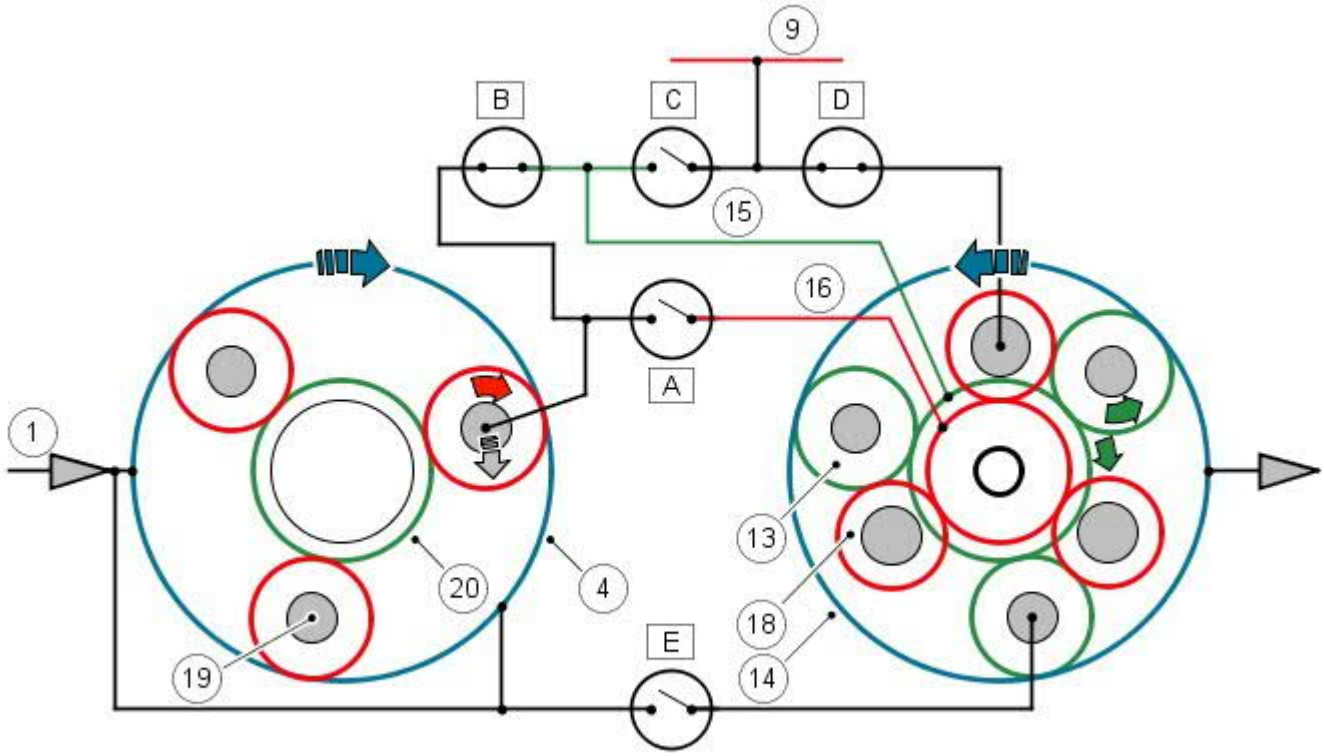
Ring gear 1 drives the planetary gears of the single web planetary gear train which rotate around the fixed sunwheel 1. This transmits the drive to the single web planetary gear carrier, the outer plate carrier of clutch 'A' and the inner plate carrier of

clutch 'B'.

With clutch 'B' applied, sunwheel 2 in the double web planetary gear train is driven and meshes with the long planetary gears.

The double web planetary gear carrier is locked to the transmission housing by brake clutch 'D'. This allows ring gear 2 to be driven in the opposite direction to engine rotation by the long planetary gears.

NOTE: Refer to 'Shift Elements' illustration for key



E42733

INSTRUMENT CLUSTER

Instrument Cluster in Standard Mode

E122722

Item	Description
1	Information display
2	Tachometer/Message center
3	Transmission status display
4	MIL (malfunction indicator lamp)

The instrument cluster is connected to the TCM via the high speed CAN bus. Transmission status is transmitted by the TCM and displayed to the driver in the instrument cluster.
Refer to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation).

Malfunction Indicator Lamp

Transmission related faults that effect the vehicle emissions output will illuminate the MIL (malfunction indicator lamp). The MIL is illuminated by the ECM (engine control module) on receipt of a relevant fault message from the TCM on the high speed CAN. The nature of the fault can be diagnosed using a Jaguar approved diagnostic system, which reads the fault codes stored in the TCM memory.

Transmission Status Display

The transmission status display is located in the tachometer. The display shows the JaguarDrive selector position. When the transmission is in the Jaguar sequential shift mode the current gear is displayed in the information window.

Message Center

The right side of the instrument cluster, which normally shows the tachometer, changes to a message center to display warnings and temporary alerts. If a transmission fault occurs, the message center will display the message 'GEARBOX FAULT'.

Instrument Cluster in Dynamic Mode

E121541

Gearshift Points

When the transmission is in the Jaguar sequential shift mode, the appearance of the instrument cluster changes to the dynamic mode and the current gear is displayed in the information window.

TRANSMISSION CONTROL MODULE

The TCM outputs signals to control the shift control solenoid valve and the EPRS (electronic pressure regulating solenoid) to control the hydraulic operation of the transmission.

The TCM processes signals from the transmission speed and temperature sensors, the ECM and other vehicle systems. From the received signal inputs and pre-programmed data, the module calculates the correct gear, torque converter clutch setting and optimum pressure settings for gear shift and lock-up clutch control.

The ECM supplies the engine management data over the high speed CAN bus. The TCM requires engine data to efficiently control the transmission operation, for example; flywheel torque, engine speed, accelerator pedal angle, engine temperature. The steering angle sensor and the ABS (anti-lock brake system) module also supply data to the TCM on the high speed CAN bus. The TCM uses data from these systems to suspend gear changes when the vehicle is cornering and/or the ABS module is controlling braking or traction control.

Using the signal inputs and the memorized data, the TCM control program computes the correct gear and torque converter lock-up clutch setting and the optimum pressure settings for gear shift and lock-up clutch control. Special output-side modules (power output stages, current regulator circuits), allow the TCM to control the solenoid valves and pressure regulators and consequently precisely control the hydraulics of the automatic transmission. In addition, the amount and duration of engine interventions are supplied to the engine management by way of the CAN bus.

The transmission has a fully electronic JaguarDrive selector with no Bowden cable connection to the transmission. The transmission selections are made using a rotary JaguarDrive selector which rises from the floor console once the engine is running. Rotation of the JaguarDrive selector to any of the five positions is sensed by the TCM via the high speed CAN bus. The TCM then reacts according to the selected position. The 'S' (sport) position selection allows the TCM to operate the transmission using the semi-automatic 'Jaguar Sequential Shift'.

Gear selections are sensed by the TCM when the driver operates the steering wheel paddle switches. Once the JaguarDrive selector position is confirmed, the TCM outputs appropriate information on the high speed CAN bus.

If the JaguarDrive selector is in 'D', 'Jaguar Sequential Shift' is temporary and will cancel after a time period or can be cancelled by pressing and holding the + paddle for approximately 2 seconds.

If the JaguarDrive selector is in 'S', 'Jaguar Sequential Shift' is permanent and can only be cancelled by pressing and holding the + paddle for approximately 2 seconds or by moving the JaguarDrive selector to the 'D' position.

The TCM can be reprogrammed using a Jaguar approved diagnostic system using a flash code. The TCM processor has a 440 kb internal flash memory. Of this capacity, approximately 370 kb are used by the basic transmission program. The remainder, approximately 70 kb is used to store vehicle-specific application data.

Engine Stall

If the vehicle stalls it will coast down in gear, with the transmission providing drive to the engine. A restart can be attempted at this point and the engine may start and the driver can continue.

If the coast down speed reduces such that the speed of the engine is less than 600 rev/min, the transmission will go to neutral, D illumination will flash in the instrument cluster. The driver needs to select neutral or park and then press the brake pedal to restart the engine.

If the start/stop button is pressed when driving, the message ENGINE STOP BUTTON PRESSED is displayed in the message center but there will be no change to the ignition state. If the driver requires to switch off the engine, the start/stop button must be pressed for a second time. The engine will be stopped and will be back driven by the transmission as the vehicle coasts down. When the engine speed is less than 600 rev/min the transmission engages neutral (flashing D illumination in the instrument cluster). When vehicle speed is less than 2 km/h (1.2 mph) Park is engaged. The JaguarDrive selector automatically rotates back to its lowered P position and the vehicle ignition is switched off.

The park engagement is prevented in a stall case as the ignition power is on and D was the last selected gear. The park engagement speed at ignition off is from the least value of the wheel speeds (CAN signal) and transmission output speed (internal signal).

Component Description

TRANSMISSION

The transmission comprises the main casing which houses all of the transmission components. The main casing also incorporates an integral bell housing.

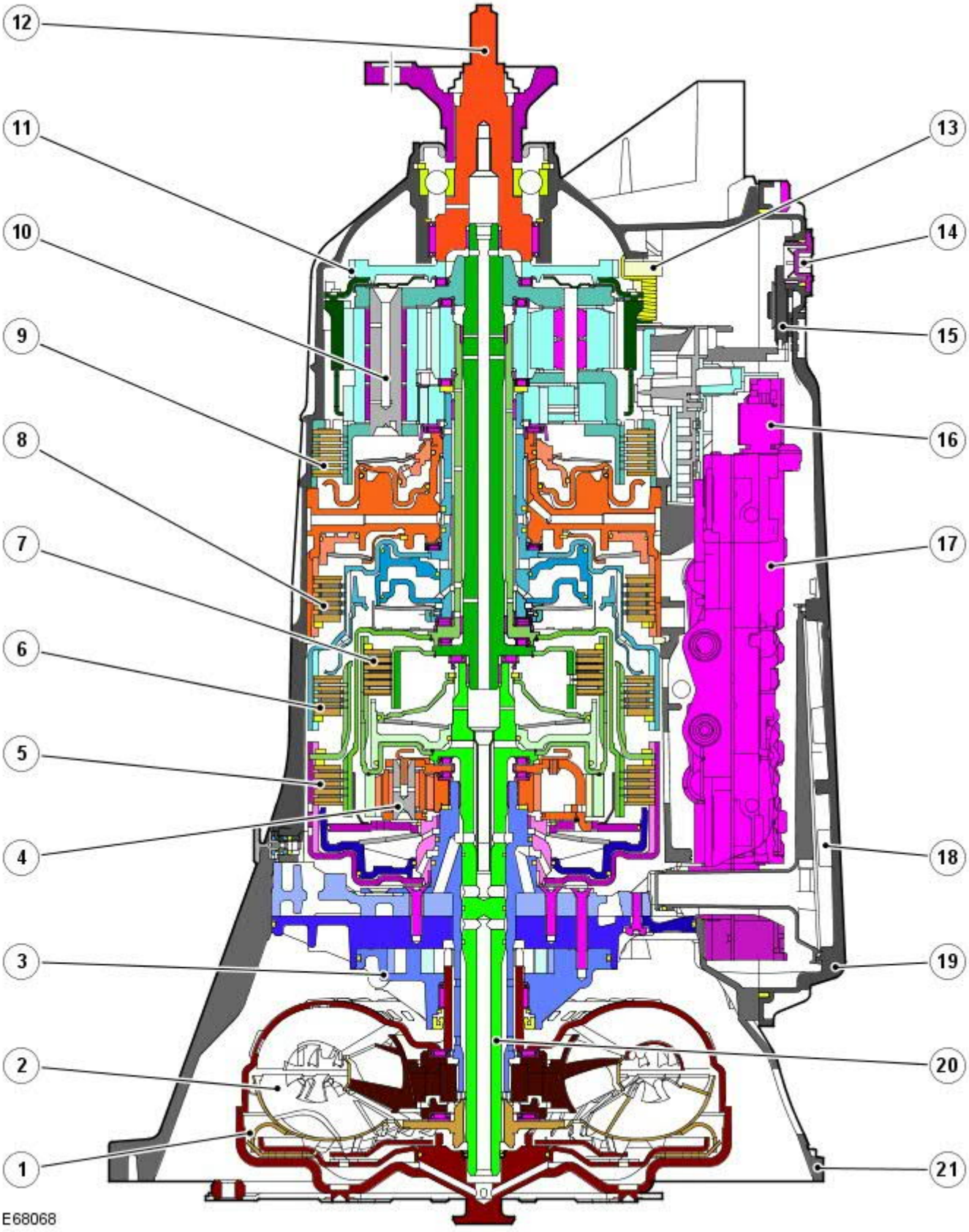
A fluid pan is attached to the lower face of the main casing and is secured with bolts. The fluid pan is sealed to the main casing with a gasket. Removal of the fluid pan allows access to the Mechatronic valve block. The fluid pan has a magnet located around the drain plug which collects any metallic particles present in the transmission fluid.

A fluid filter is located inside the fluid pan. If the transmission fluid becomes contaminated or after any service work, the fluid pan with integral filter must be replaced.

The integral bell housing provides protection for the torque converter assembly and also provides the attachment for the gearbox to the engine cylinder block. The torque converter is a non-serviceable assembly which also contains the lock-up clutch mechanism. The torque converter drives a crescent type pump via drive tangs. The fluid pump is located in the main casing, behind the torque converter.

The main casing contains the following major components:

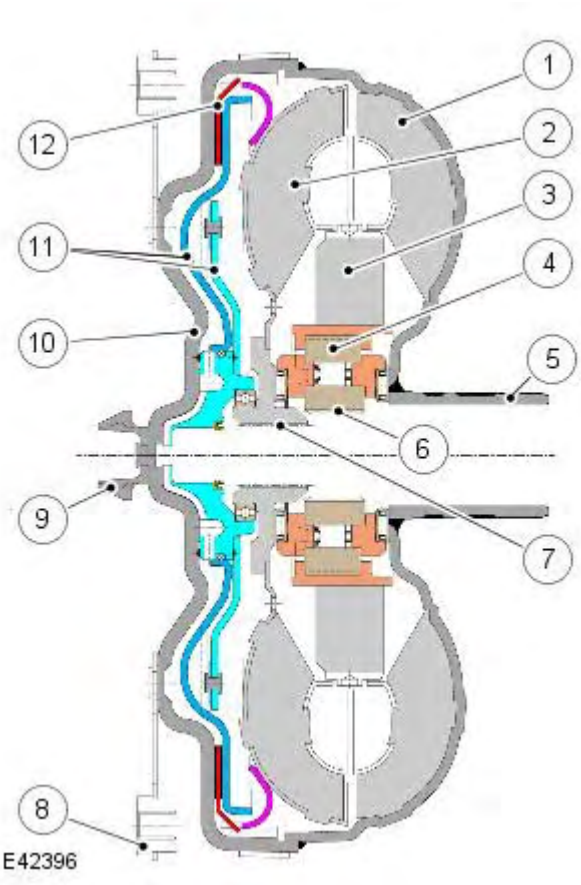
- Input shaft
- Output shaft
- Mechatronic valve block which contains the solenoids, speed sensors and the TCM
- Three rotating multiplate drive clutches
- Two fixed multiplate brake clutches
- A single planetary gear train and a double planetary gear train.



Item	Description
1	Torque converter lock-up clutch
2	Torque converter
3	Fluid pump
4	Single planetary gearset

5	Clutch A
6	Clutch B
7	Clutch E
8	Brake C
9	Brake D
10	Double planetary gearset
11	Park lock gear
12	Output shaft
13	Park lock pawl
14	Drain plug
15	Magnet
16	Pressure regulator
17	Mechatronic valve block
18	Fluid filter
19	Fluid pan
20	Input shaft
21	Bell housing

TORQUE CONVERTER



Item	Description
1	Impeller
2	Turbine
3	Stator
4	Freewheel clutch
5	Torque converter hub
6	Stator shaft
7	Turbine shaft

8	Drive plate
9	Journal - Drive plate/crankshaft location
10	Torque converter cover
11	Lock-up clutch piston
12	Lock-up clutch plate

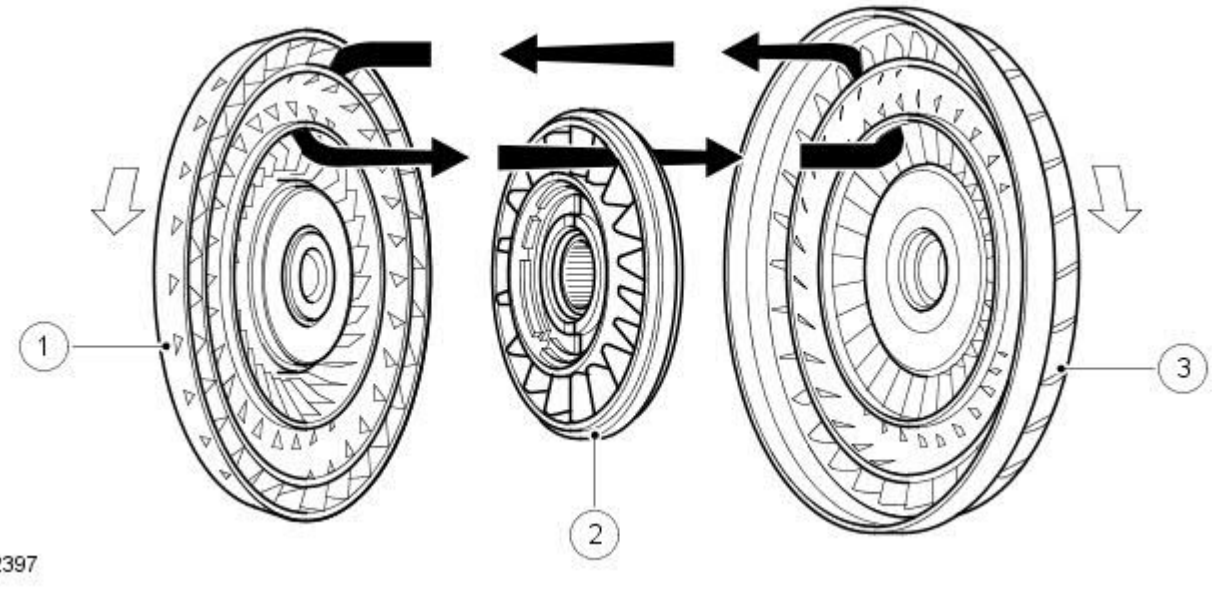
The torque converter is the coupling element between the engine and the transmission and is located in the bell housing, on the engine side of the transmission. The driven power from the engine crankshaft is transmitted hydraulically and mechanically through the torque converter to the transmission. The torque converter is connected to the engine by a drive plate attached to the rear of the crankshaft.

The torque converter comprises an impeller, a stator and a turbine. The torque converter is a sealed unit with all components located between the converter housing cover and the impeller. The two components are welded together to form a sealed, fluid filled housing. With the impeller welded to the converter housing cover, the impeller is therefore driven at engine crankshaft speed.

The converter housing cover has four threaded bosses, which provide for attachment of the engine drive plate. The threaded bosses also provide for location of special tools which are required to remove the torque converter from the bell housing.

Impeller

Fluid Flow



Item	Description
1	Turbine
2	Stator
3	Impeller

When the engine is running the rotating impeller acts as a centrifugal pump, picking up fluid at its center and discharging it at high velocity through the blades on its outer rim. The design and shape of the blades and the curve of the impeller body cause the fluid to rotate in a clockwise direction as it leaves the impeller. This rotation improves the efficiency of the fluid as it contacts the outer row of blades on the turbine.

The centrifugal force of the fluid leaving the blades of the impeller is passed to the curved inner surface of the turbine via the tip of the blades. The velocity and clockwise rotation of the fluid causes the turbine to rotate.

Turbine

The turbine is similar in design to the impeller with a continuous row of blades. Fluid from the impeller enters the turbine through the tip of the blades and is directed around the curved body of the turbine to the root of the blades. The curved surface redirects the fluid back in the opposite direction to which it entered the turbine, effectively increasing the turning force applied to the turbine from the impeller. This principle is known as torque multiplication.

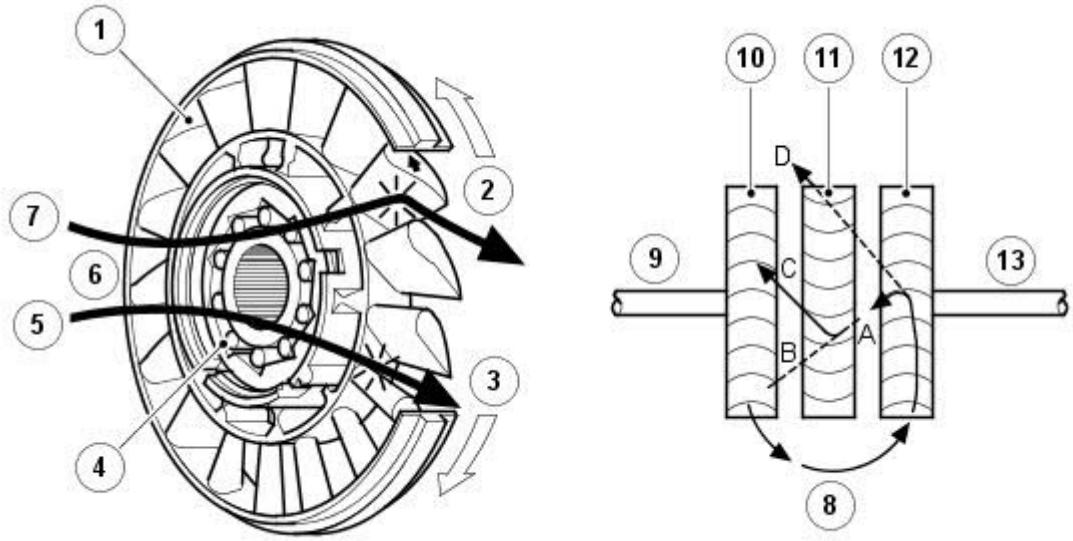
When engine speed increases, turbine speed also increases. The fluid leaving the inner row of the turbine blades is rotated in a counter-clockwise direction due to the curve of the turbine and the shape of the blades. The fluid is now flowing in the opposite direction to the engine rotation and therefore the impeller. If the fluid was allowed to hit the impeller in this condition, it would have the effect of applying a brake to the impeller, eliminating the torque multiplication effect. To prevent this, the stator is located between the impeller and the turbine.

Stator

The stator is located on the splined transmission input shaft via a freewheel clutch. The stator comprises a number of blades which are aligned in an opposite direction to those of the impeller and turbine. The main function of the stator is to redirect the returning fluid from the turbine, changing its direction to that of the impeller.

The redirected fluid from the stator is directed at the inner row of blades of the impeller, assisting the engine in turning the impeller. This sequence increases the force of the fluid emitted from the impeller and thereby increases the torque multiplication effect of the torque converter.

Stator Functions



E 42398

Item	Description
1	Blades
2	Stator held – fluid flow redirected
3	Stator rotates freely
4	Roller
5	Converter at coupling speed
6	Fluid flow from turbine
7	Converter multiplying
8	Fluid flow from impeller
9	Drive from engine
10	Impeller
11	Stator
12	Turbine
13	Output to transmission

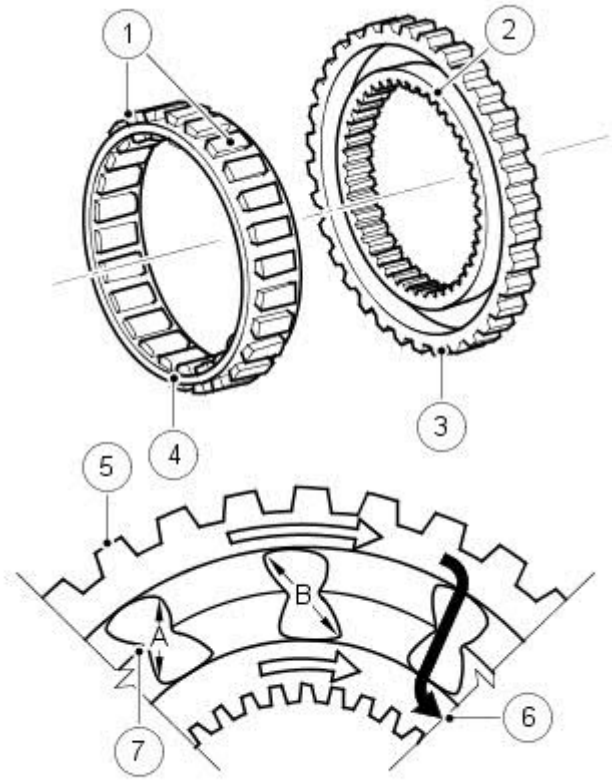
Fluid emitted from the impeller acts on the turbine. If the turbine is rotating at a slower speed than the fluid from the impeller, the fluid will be deflected by the turbine blades in the path **'A'**. The fluid is directed at and deflected by the stator blades from path **'B'** to path **'C'**. This ensures that the fluid is directed back to the pump in the optimum direction. In this condition the sprag clutch is engaged and the force of the fluid on the stator blades assists the engine in rotating the impeller.

As the rotational speed of the engine and therefore the turbine increases, the direction of the fluid leaving the turbine changes to path **'D'**. The fluid is now directed from the turbine to the opposite side of the stator blades, rotating the stator in the opposite direction. To prevent the stator from resisting the smooth flow of the fluid from the turbine, the sprag clutch releases, allowing the stator to rotate freely on its shaft.

When the stator becomes inactive, the torque converter no longer multiplies the engine torque. When the torque converter reaches this operational condition it ceases to multiply the engine torque and acts solely as a fluid coupling, with the impeller and the turbine rotating at approximately the same speed.

The stator uses a sprag type, one way, freewheel clutch. When the stator is rotated in a clockwise direction the sprags twist and are wedged between the inner and outer races. In this condition the sprags transfer the rotation of the outer race to the inner race which rotates at the same speed.

One Way Free Wheel Clutch – Typical



E42712

Item	Description
1	Sprags
2	Inner race
3	Outer race
4	Sprag and cage assembly
5	Sprag outer race
6	Sprag inner race
7	Retaining ring

The free wheel clutch can perform three functions; hold the stator stationary, drive the stator and free wheel allowing the stator to rotate without a drive output. The free wheel clutch used in the ZF 6HP28 transmission is of the sprag type and comprises an inner and outer race and a sprag and cage assembly. The inner and outer races are pressed into their related components with which they rotate. The sprag and cage assembly is located between the inner and outer races.

The sprags are located in a cage which is a spring which holds the sprags in the 'wedge' direction and maintains them in contact with the inner and outer races.

Referring to the illustration, the sprags are designed so that the dimension **'B'** is larger than the distance between the inner and outer race bearing surfaces. When the outer race rotates in a clockwise direction, the sprags twist and the edges across the dimension **'B'** wedge between the races, providing a positive drive through each sprag to the inner race. The dimension **'A'** is smaller than the distance between the inner and outer race bearing surfaces. When the outer race rotates in an anti-clockwise direction, the dimension **'A'** is too small to allow the sprags to wedge between the races, allowing the outer race to rotate freely.

On the illustration shown, when the outer race is rotated in a clockwise direction, the sprags twist and are 'wedged' between the inner and outer races. The sprags then transfer the rotation of the outer race to the inner race, which rotates at the same speed.

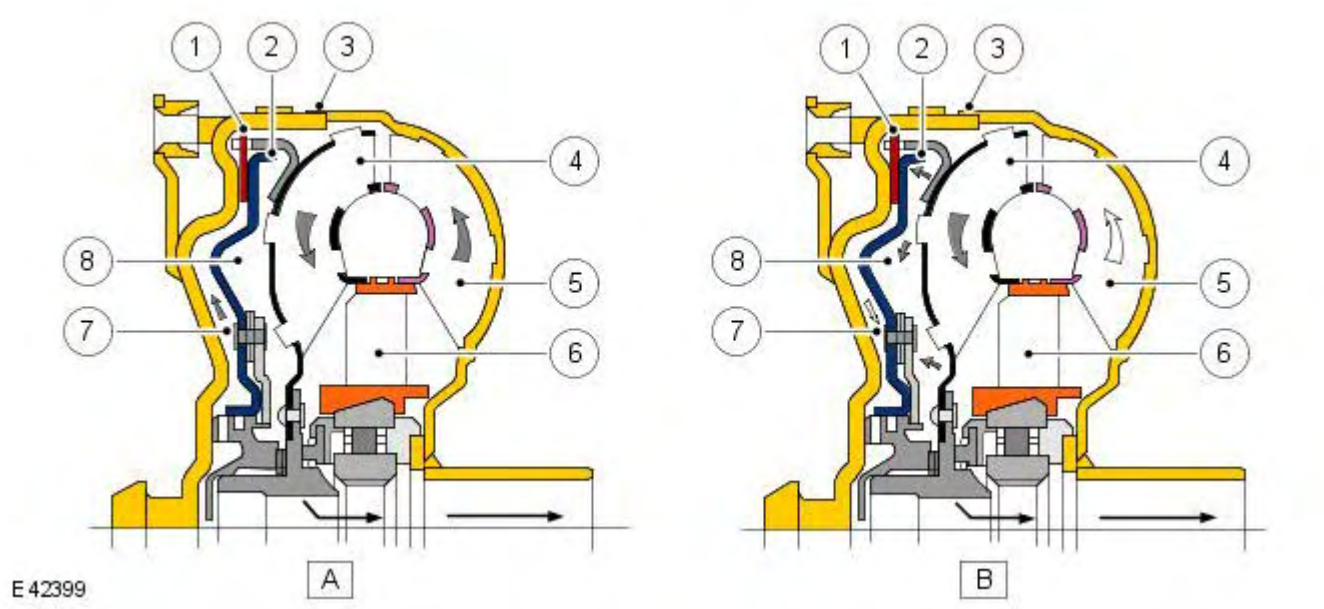
Lock-Up Clutch Mechanism

The TCC (torque converter clutch) is hydraulically controlled by an EPRS, which is controlled by the TCM. This allows the torque converter to have three states of operation as follows:

- • Fully engaged
- • Controlled slip variable engagement
- • Fully disengaged.

The TCC is controlled by two hydraulic spool valves located in the valve block. These valves are actuated by pilot pressure supplied via a solenoid valve which is also located in the valve block. The solenoid valve is operated by PWM (pulse width

modulation) signals from the TCM to give full, partial or no lock-up of the torque converter.



Item	Description
A	Unlocked condition
B	Locked condition
1	Clutch plate
2	Clutch piston
3	Torque converter body
4	Turbine
5	Impeller
6	Stator
7	Piston chamber
8	Turbine chamber

The lock-up clutch is a hydro-mechanical device which eliminates torque converter slip, improving fuel consumption. The engagement and disengagement is controlled by the TCM to allow a certain amount of controlled 'slip'. This allows a small difference in the rotational speeds of the impeller and the turbine which results in improved shift quality. The lock-up clutch comprises a piston and a clutch friction plate.

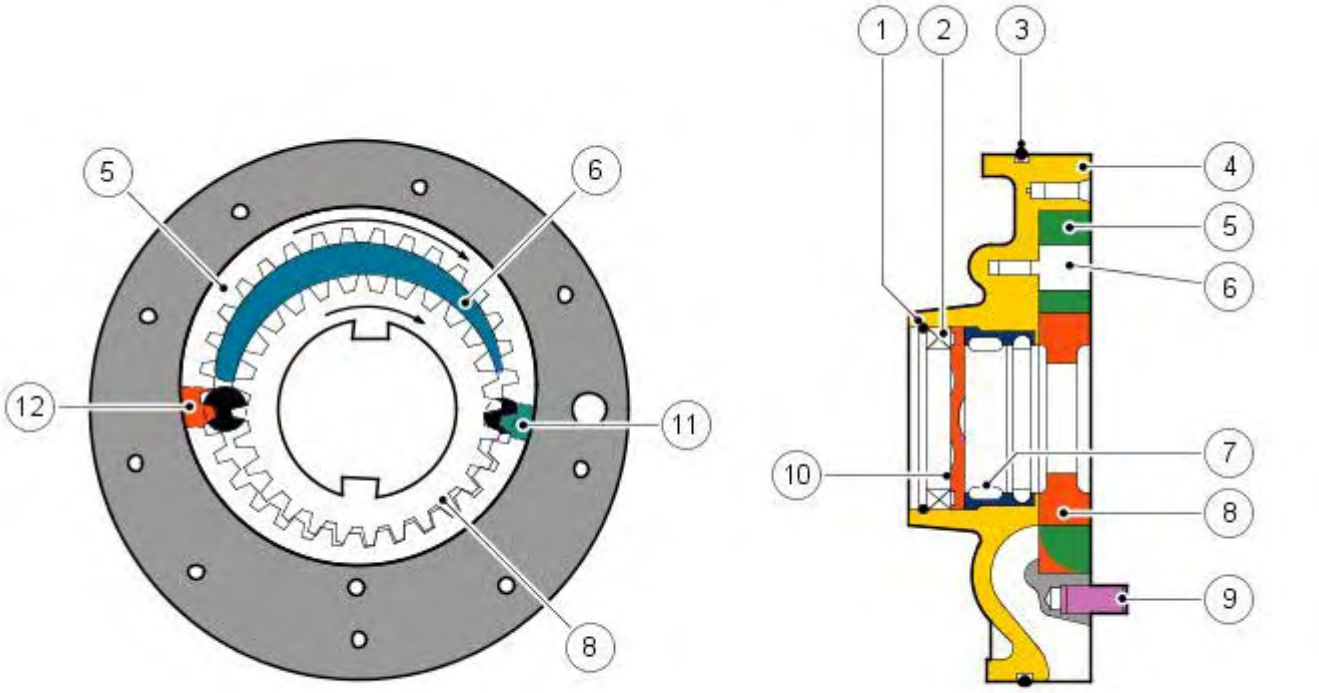
In the unlocked condition, the oil pressure supplied to the piston chamber and the turbine chamber is equal. Pressurized fluid flows through a drilling in the turbine shaft and through the piston chamber to the turbine chamber. In this condition the clutch plate is held away from the torque converter body and torque converter slip is permitted.

In the locked condition, the TCC spool valves are actuated by the EPRS. The fluid flow in the unlocked condition is reversed and the piston chamber is vented. Pressurized fluid is directed into the turbine chamber and is applied to the clutch piston. The piston moves with the pressure and pushes the clutch plate against the torque converter body. As the pressure increases, the friction between the clutch plate and the body increases, finally resulting in full lock-up of the clutch plate with the body. In this condition there is direct mechanical drive from the engine crankshaft to the transmission planetary gear train.

FLUID PUMP

The fluid pump is an integral part of the transmission. The fluid pump is used to supply hydraulic pressure for the operation of the control valves and clutches, to pass the fluid through the transmission cooler and to lubricate the gears and shafts.

The ZF 6HP28 fluid pump is a crescent type pump and is located between the intermediate plate and the torque converter. The pump has a delivery rate of 16 cm^3 per revolution.



E42400

Item	Description
1	Securing ring
2	Shaft oil seal
3	O-ring seal
4	Pump housing
5	Ring gear
6	Crescent spacer
7	Roller bearing
8	Impeller
9	Centering pin
10	Spring washer
11	Outlet port (high pressure)
12	Inlet port (low pressure)

The pump comprises a housing, a crescent spacer, an impeller and a ring gear. The housing has inlet and outlet ports to direct flow and is located in the intermediate plate by a centering pin. The pump action is achieved by the impeller, ring gear and crescent spacer.

The crescent spacer is fixed in its position by a pin and is located between the ring gear and the impeller. The impeller is driven by drive from the torque converter hub which is located on a needle roller bearing in the pump housing. The impeller teeth mesh with those of the ring gear. When the impeller is rotated, the motion is transferred to the ring gear which rotates in the same direction.

The rotational motion of the ring gear and the impeller collects fluid from the intake port in the spaces between the teeth. When the teeth reach the crescent spacer, the oil is trapped in the spaces between the teeth and is carried with the rotation of the gears. The spacer tapers near the outlet port. This reduces the space between the gear teeth causing a build up of fluid pressure as the oil reaches the outlet port. When the teeth pass the end of the spacer the pressurized fluid is released into the outlet port.

The fluid emerging from the outlet port is passed through the fluid pressure control valve. At high operating speeds the pressure control valve maintains the output pressure to the gearbox at a predetermined maximum level. Excess fluid is relieved from the pressure control valve and is directed, via the main pressure valve in the valve block, back to the pump inlet port. This provides a pressurized feed to the pump inlet which prevents cavitation and reduces pump noise.

MECHATRONIC VALVE BLOCK

The Mechatronic valve block is located in the bottom of the transmission and is covered by the fluid pan. The valve block houses the TCM, electrical actuators, speed sensors and control valves which provide all electro-hydraulic control for all transmission functions. The Mechatronic valve block comprises the following components:

- TCM
- Pressure regulator solenoids
- Shift control solenoid
- Damper
- Hydraulic spool valves
- Selector valve
- Temperature sensor
- Turbine speed sensor
- Output shaft speed sensor.

Sensors

Speed Sensors

The turbine speed sensor and the output shaft speed sensor are Hall effect type sensors located in the Mechatronic valve block and are not serviceable items. The TCM monitors the signals from each sensor to determine the input (turbine) speed and the output shaft speed.

The turbine speed is monitored by the TCM to calculate the slip of the torque converter clutch and internal clutch slip. This signal allows the TCM to accurately control the slip timing during shifts and adjust clutch application or release pressure for overlap shift control.

The output shaft speed is monitored by the TCM and compared to engine speed signals received on the CAN bus from the ECM. Using a comparison of the two signals the TCM calculates the transmission slip ratio for plausibility and maintains adaptive pressure control.

Temperature Sensor

The temperature sensor is also located in the Mechatronic valve block. The TCM uses the temperature sensor signals to determine the temperature of the transmission fluid. These signals are used by the TCM to control the transmission operation to promote faster warm-up in cold conditions or to assist with fluid cooling by controlling the transmission operation when high fluid temperatures are experienced. If the sensor fails, the TCM will use a default value and a fault code will be stored in the TCM.

Damper

There is one damper located in the valve housing. The damper is used to regulate and dampen the regulated pressure supplied via EPRS. The damper is load dependent through modulation of the damper against return spring pressure.

The damper comprises a piston, a housing bore and a spring. The piston is subject to the pressure applied by the spring. The bore has a connecting port to the function to which it applies. Fluid pressure applied to the applicable component (i.e. a clutch) is also subjected to the full area of the piston, which moves against the opposing force applied by the spring. The movement of the piston creates an action similar to a shock absorber, momentarily delaying the build up of pressure in the circuit. This results in a more gradual application of clutches improving shift quality.

Spool Valves

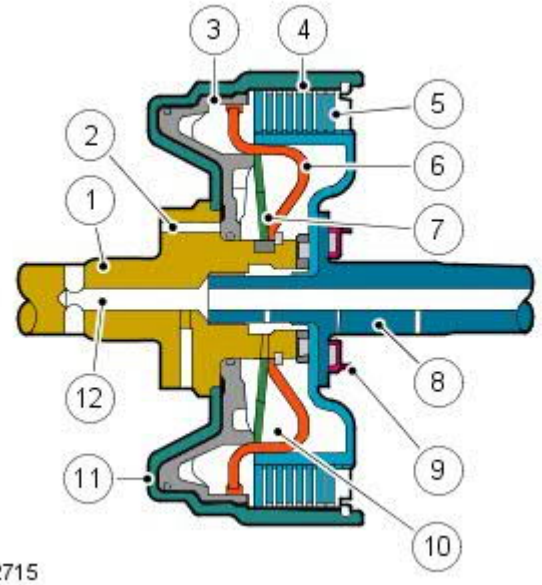
The valve block spool valves control various functions of the transmission. The spool valves are of conventional design and are operated by fluid pressure.

Each spool valve is located in its spool bore and held in a default (unpressurized) position by a spring. The spool bore has a number of ports which allow fluid to flow to other valves and clutches to enable transmission operation. Each spool has a piston which is waisted to allow fluid to be diverted into the applicable ports when the valve is operated.

When fluid pressure moves a spool, one or more ports in the spool bore are covered or uncovered. Fluid is prevented from flowing or is allowed to flow around the applicable waisted area of the spool and into another uncovered port. The fluid is either passed through galleries to actuate another spool, operate a clutch or is returned to the fluid pan.

DRIVE CLUTCHES

Multiplate Drive or Brake Clutch – Typical



E42715

Item	Description
1	Input shaft
2	Main pressure supply port
3	Piston
4	Cylinder – external plate carrier
5	Clutch plate assembly
6	Baffle plate
7	Diaphragm spring
8	Output shaft
9	Bearing
10	Dynamic pressure equalization chamber
11	Piston chamber
12	Lubrication channel

There are three drive clutches and two brake clutches used in the ZF 6HP28 transmission. Each clutch comprises one or more friction plates dependent on the output controlled. A typical clutch consists of a number of steel outer plates and inner plates with friction material bonded to each face.

On 5.0L SC (supercharger) and 3.0L diesel models, the uprated transmission includes additional clutch plates to enable the transmission to manage the additional power output from these engines.

The clutch plates are held apart mechanically by a diaphragm spring and hydraulically by dynamic pressure. The pressure is derived from a lubrication channel which supplies fluid to the bearings etc. The fluid is passed via a drilling in the output shaft into the chamber between the baffle plate and the piston. To prevent inadvertent clutch application due to pressure build up produced by centrifugal force, the fluid in the dynamic pressure equalization chamber overcomes any pressure in the piston chamber and holds the piston off the clutch plate assembly.

When clutch application is required, main pressure from the fluid pump is applied to the piston chamber from the supply port. This main pressure overcomes the low pressure fluid present in the dynamic pressure equalization chamber. The piston moves, against the pressure applied by the diaphragm spring, and compresses the clutch plate assembly. When the main pressure falls, the diaphragm spring pushes the piston away from the clutch plate assembly, disengaging the clutch.

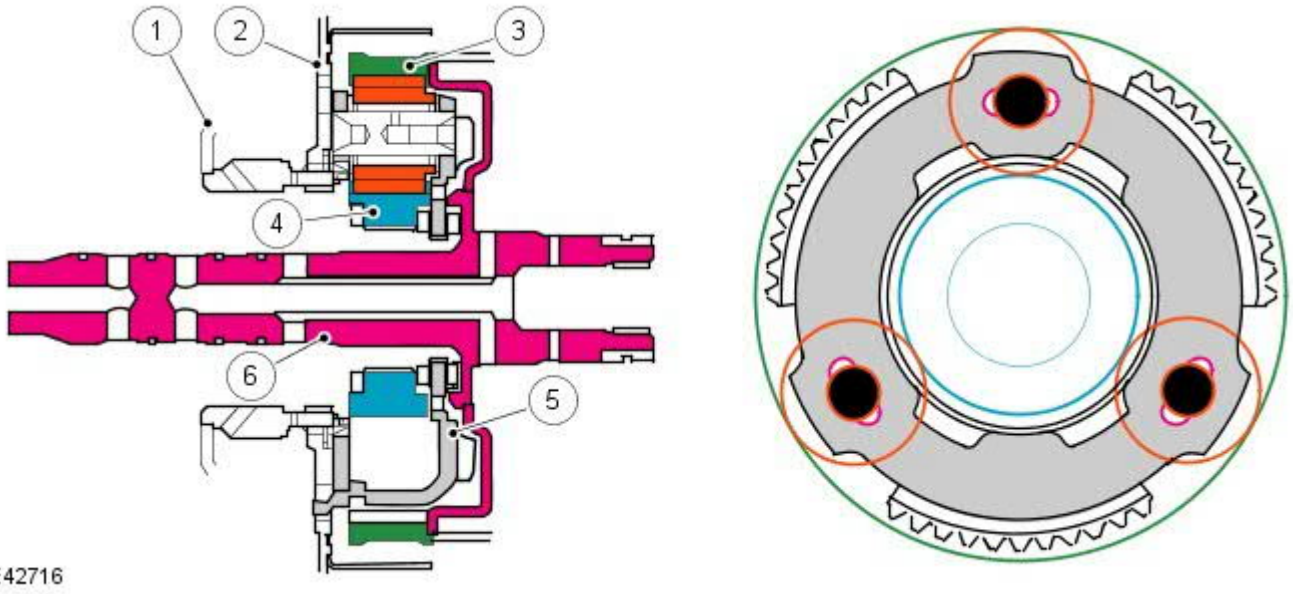
PLANETARY GEAR TRAINS

The planetary gear trains used on the ZF 6HP28 transmission comprise a single web planetary gear train and a double web planetary gear train. These gear trains are known as Lepelletier type gear trains and together produce the six forward gears and the one reverse gear.

Single Web Planetary Gear Train

The single web planetary gear train comprises:

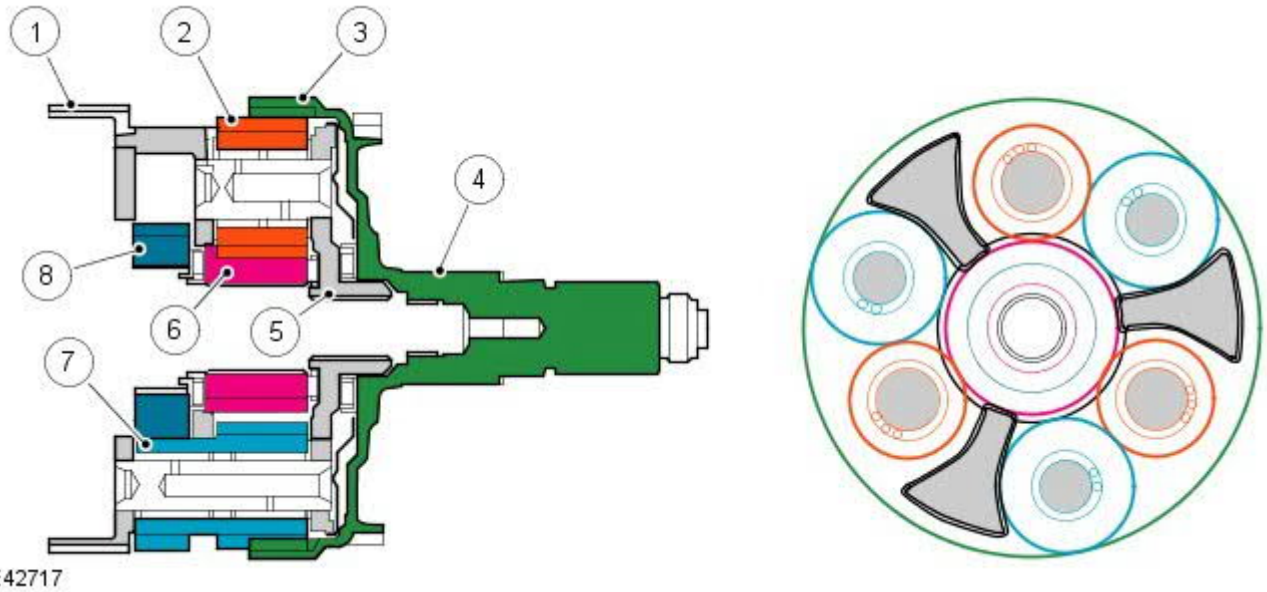
- Sunwheel
- Three (naturally aspirated versions) or four (5.0L SC and 3.0L diesel versions) planetary gears
- Planetary gear carrier (spider)
- Ring gear or annulus.



E42716

Item	Description
1	Cylinder
2	Baffle plate
3	Ring gear
4	Sun gear
5	Planetary gear spider
6	Torque converter input shaft

Torque Converter Input Shaft



E42717

Item	Description
1	Planetary gear spider
2	Planetary gears (short)
3	Ring gear
4	Output shaft
5	Planetary gear carrier
6	Sunwheel
7	Double planetary gears (long)
8	Sunwheel

The double planetary gear train comprises:

- Two sunwheels
- Three short planetary gears
- Three long planetary gears
- Planetary gear carrier
- Ring gear or annulus

ELECTRONIC PARK LOCK

The park lock is electronically actuated by solenoid valve located in the valve block. The park lock is engaged by a mechanical spring system comprising a parking disc and a lock cylinder controlled by a solenoid valve.

The park lock is engaged when the TCM receives a park request from the JaguarDrive selector. When the park lock is released, a solenoid valve in the valve housing directs hydraulic pressure to the lock cylinder, which moves the piston within the cylinder and releases the park lock pawl at the rear of the transmission by means of a connecting rod. The solenoid on the lock cylinder is energized and locks the cylinder piston in the unlocked position. Additional locking of the piston is achieved with ball catches within the lock cylinder.

When park is selected, the solenoid on the lock cylinder is de-energized, the ball catches are released and the piston is free to move in the lock cylinder. The solenoid in the valve housing is also de-energized. The spring loaded parking disc pulls the cylinder piston in the park direction which allows the park disc to move on its mounting. This movement is transferred via the connecting rod to parking pawl, which is engaged in the park lock gear.

If an electrical failure occurs, the park lock can be manually released by means of an emergency park release lever located in the floor console. The lever is connected to the parking disc by a cable and allows the park lock to be released manually. Refer to: External Controls (307-05, Description and Operation).

TRANSMISSION CONTROL MODULE

The TCM is an integral part of the Mechatronic valve block which is located at the bottom of the transmission, within the fluid pan. The TCM is the main controlling component of the transmission.

The TCM processes signals from the transmission speed and temperature sensors, ECM and other vehicle systems. From the received signal inputs and pre-programmed data, the module calculates the correct gear, torque converter clutch setting and optimum pressure settings for gear shift and lock-up clutch control.

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Automatic Transmission/Transaxle - Diagnostic Strategy

Diagnosis and Testing

Principles of Operation

For a detailed description of the automatic transmission/transaxle and operation, refer to the relevant Description and Operation section in the workshop manual. REFER to:

Transmission Description (307-01 Automatic Transmission/Transaxle, Description and Operation),
Transmission Description (307-01 Automatic Transmission/Transaxle, Description and Operation),
Electronic Engine Controls (303-14C Electronic Engine Controls - V8 5.0L Petrol, Description and Operation).

Fluid Level and Condition Check

CAUTION: The vehicle should not be driven if the fluid level is low as internal failure can result.

NOTE: The transmission fluid temperature must not be allowed to exceed 50°C (122°F) whilst checking level. Should the temperature rise above this figure, abort the check and allow the transmission fluid to cool to below 30°C (86°F).

This vehicle is not equipped with a fluid level indicator. An incorrect level may affect the transmission operation and could result in transmission damage. To correctly check and add fluid to the transmission.

High Fluid Level

A fluid level that is too high may cause the fluid to become aerated due to the churning action of the rotating internal parts. This will cause erratic control pressure, foaming, loss of fluid from the vent tube and possible transmission damage. If an overfill condition is identified, with the engine at idle ensure the fluid temperature is within the specified range and allow the excess fluid to drain until a small thread of fluid runs from the filler/level plug hole.

Low Fluid Level

A low fluid level could result in poor transmission engagement, slipping, or damage. This could also indicate a leak in one of the transmission seals or gaskets.

Adding Fluid

CAUTION: The use of any other type of transmission fluid other than that specified can result in transmission damage.

If fluid needs to be added, add fluid in 0.50 litre increments through the fill hole Opening. Do not overfill the fluid. For fluid type, refer to the General Specification chart in this section.

Fluid Condition Check

1. Check the fluid level.
2. Observe the colour and the odour of the fluid. The colour under normal circumstances should be Honey.
3. Allow the fluid to drip onto a facial tissue and examine the stain.
4. If evidence of solid material is found, the transmission fluid pan should be removed for further inspection.

NOTE: In the event of a transmission unit replacement for internal failure, the oil cooler and pipes must also be replaced.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical	Hydraulic
• Damaged/stuck shift mechanism • Damaged automatic transmission casing	• Blown fuse(s) • Damaged, loose or corroded connectors • Wiring harness	• Fluid level too high/low • Poor condition of fluid • Fluid leak

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Transmission Control Module (TCM) (100-00 General Information, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - DTC: Transmission Shift Module (GSM) (100-00 General Information, Description and Operation).

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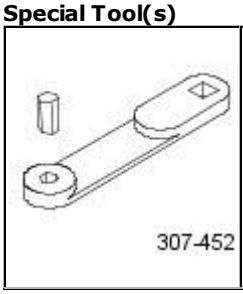
Automatic Transmission/Transaxle - Transmission Fluid Level Check

General Procedures

Special Tool(s)

	307-452 Wrench, Transmission Filler Plug

Check

WARNINGS:

Observe due care when draining, as the fluid can be very hot.

Observe due care when working near a hot exhaust system.

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1.
   - The following steps must be observed before starting the transmission fluid level check.
   - The vehicle must be on a horizontal ramp.
   - The parking brake must be applied.
   - The engine must be running for 2 minutes with the transmission control switch (TCS) in the "P" position.

2. CAUTION: Make sure that the transmission fluid temperature is below 30 degrees before starting the fluid level check.

   Connect the diagnostic tool to the vehicle.

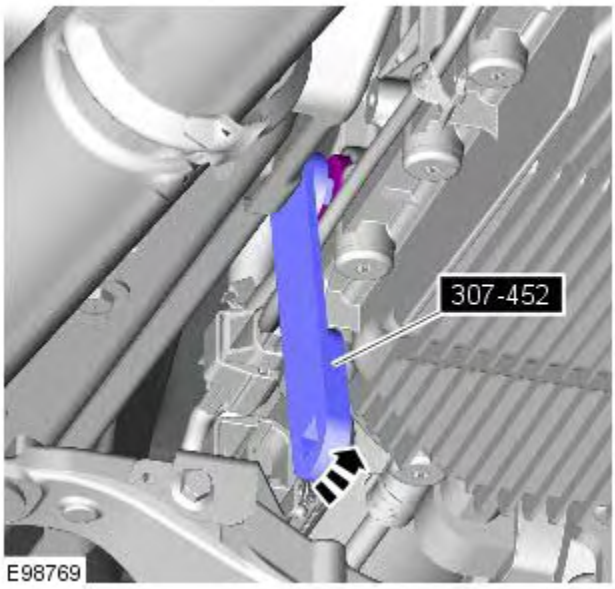
3.
   - Start the engine.
   - Apply, and hold, the footbrake.
   - Move the selector lever from 'P' through all gear positions, pausing in each gear position for 2-3 seconds and return to the 'P' position.

4. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

5. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

6. Place a suitable container under the transmission fluid fill plug.



7. CAUTIONS:

   The transmission fluid level must only be checked when the temperature of the fluid is between 30 degrees and 50 degrees. The fluid level obtained will be incorrect if the reading is outside this temperature range.

   Discard the seal.

   - *Special Tool(s):* 307-452
   - Clean the area around the transmission fluid level plug.

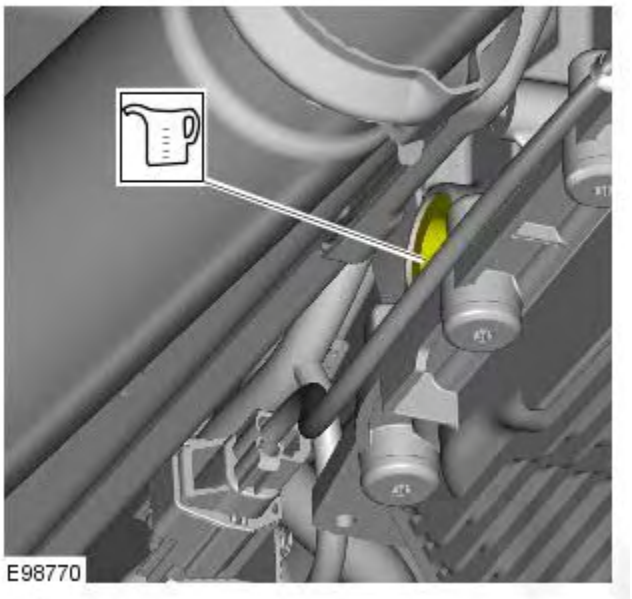
Adjustment

WARNINGS:

Observe due care when draining, as the fluid can be very hot.

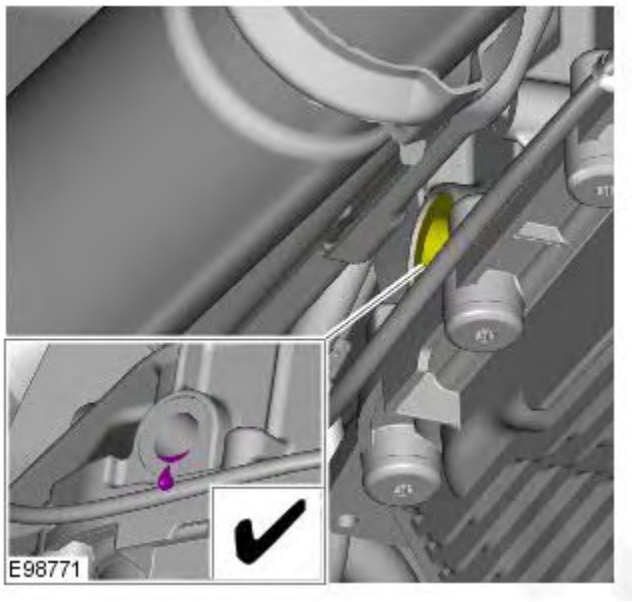
Observe due care when working near a hot exhaust system.

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



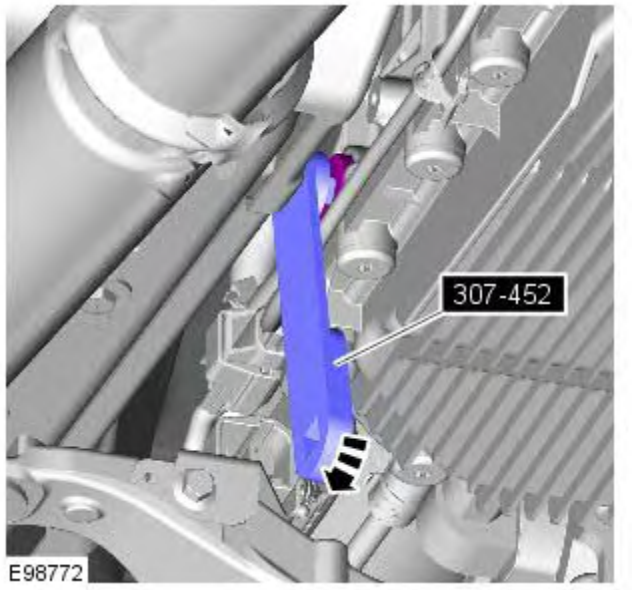
1. NOTE: Use transmission fluid meeting Jaguar specification.

   If the transmission fluid does not come out of the transmission fluid fill plug hole the transmission fluid level is insufficient. If this is the case add the transmission fluid in 0.5 liter units into the transmission fluid fill plug hole until fluid comes out.



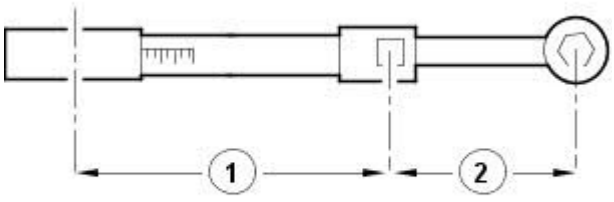
2. NOTE: Make sure the transmission fluid temperature does not exceed 50 °C (122 °F). If the transmission fluid temperature does exceed 50 °C (122 °F) stop the transmission fluid level check and allow the transmission fluid to cool until the temperature is below 30 °C (86 °F).

   Allow the transmission fluid to drain from the transmission fluid filler plug hole until the flow almost stops.



3. NOTE: Install a new sealing washer.

   Using the special tool, install the new transmission fluid fill plug.



4. CAUTION: Make sure the transmission fluid fill plug is tightened to the correct specification. Failure to follow this instruction may result in damage to the vehicle.

   - To make sure the transmission fill plug is torqued to the correct specification. Using the special tool and torque wrench the following calculation steps must be followed.
   - Step 1. Multiply 35 Nm by the effective length of the torque wrench (1).
   - Step 2. Add the effective length of the special tool (2) to the effective length of the torque wrench (1).
   - Step 3. Divide the total of step 1 by the total of step 2.
   - Step 4. Set the torque wrench to the figure arrived at in step 3.
   - Tighten the transmission fluid fill plug to the torque given by the calculation.

5. Remove the special tool.

6. Remove the container.

7. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

8. Lower the vehicle.

9. Disconnect the diagnostic tool.

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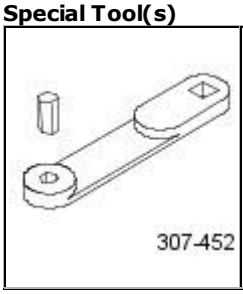
Automatic Transmission/Transaxle - Transmission Fluid Drain and Refill

General Procedures

Special Tool(s)

	307-452 Wrench, Transmission Filler Plug

WARNINGS:

Observe due care when draining, as the fluid can be very hot.

Observe due care when working near a hot exhaust system.

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

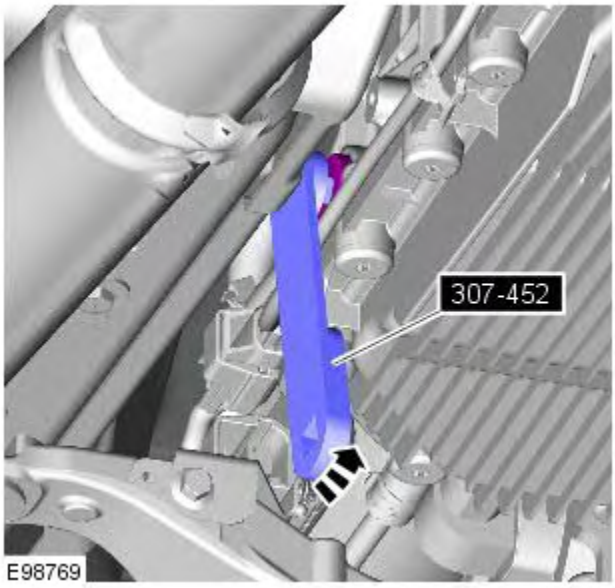
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

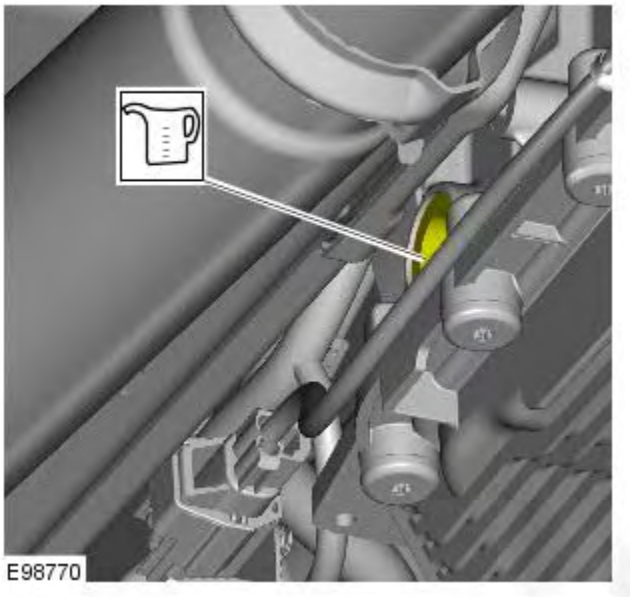
3. Place a container under the transmission.

4. *Special Tool(s):* 307-452

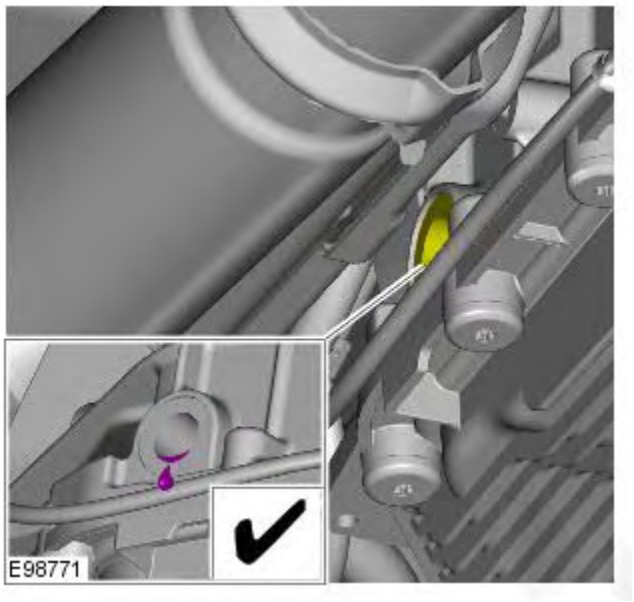


5.
- Allow the fluid to drain.
- Discard the component.

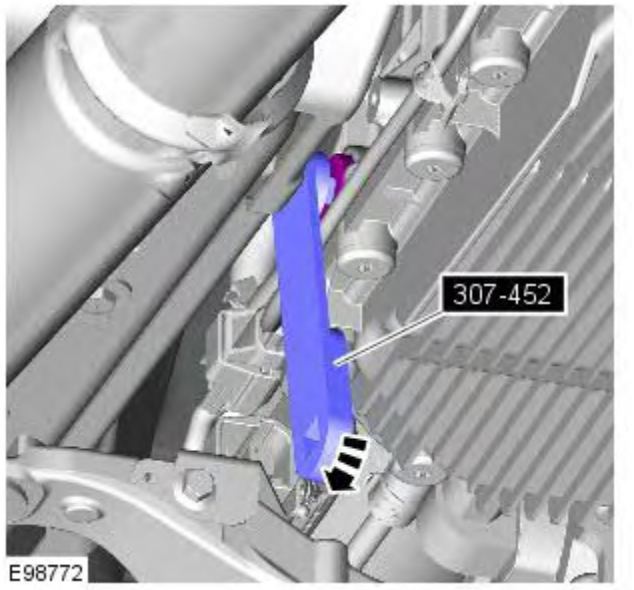
6. *Torque:* 8 Nm



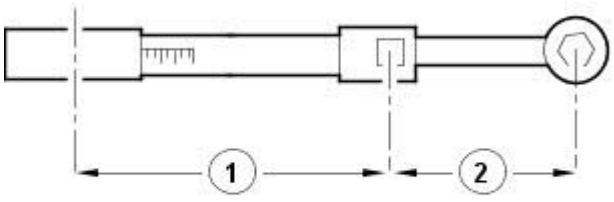
7. NOTE: Use transmission fluid meeting Jaguar specification.
- Refill the transmission with fluid.



8. Allow the transmission fluid to drain from the transmission fluid filler plug hole until the flow almost stops.



9. NOTE: Install a new sealing washer.
   - Loosely install the transmission fluid fill plug.



10. CAUTION: Make sure the transmission fluid fill plug is tightened to the correct specification. Failure to follow this instruction may result in damage to the vehicle.
    - To make sure the transmission fill plug is torqued to the correct specification. Using the special tool and torque wrench the following calculation steps must be followed.
    - Step 1. Multiply 35 Nm by the effective length of the torque wrench (1).
    - Step 2. Add the effective length of the special tool (2) to the effective length of the torque wrench (1).
    - Step 3. Divide the total of step 1 by the total of step 2.
    - Step 4. Set the torque wrench to the figure arrived at in step 3.
    - Tighten the transmission fluid fill plug to the torque given by the calculation.

11. Carry out a transmission fluid level check.

Refer to: Transmission Fluid Level Check (307-01 Automatic Transmission/Transaxle, General Procedures).

12. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

13. Lower the vehicle.

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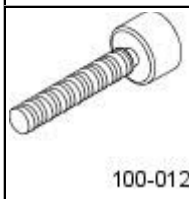
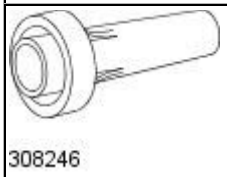
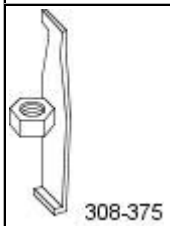
Automatic Transmission/Transaxle - Input Shaft Seal

Removal and Installation

Special Tool(s)

	100-012 Slide Hammer
	100-012-01 Slide Hammer Adapter
	307-613 Holding Pins, Torque Converter
	308-246 Installer, Front Seal
	308-375 Remover, Input and Output Seal

Removal

NOTE: Removal steps in this procedure may contain installation details.

All vehicles

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

Vehicles with 3.0L diesel engine

3. Refer to: Transmission - TDV6 3.0L Diesel (307-01 Automatic Transmission/Transaxle, Removal).

Vehicles with 3.0L engine

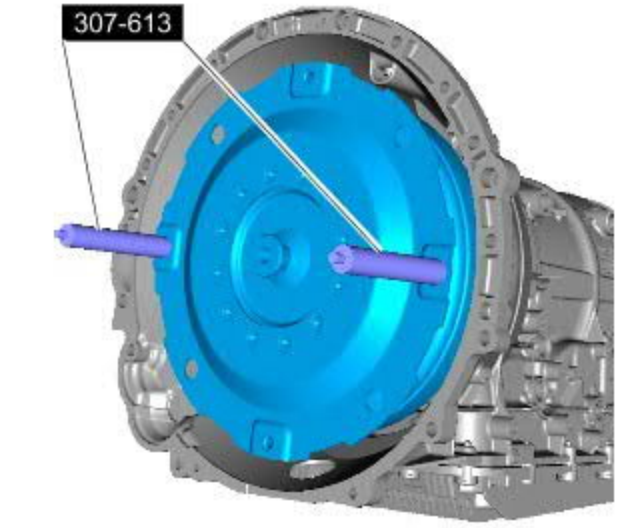
4. Refer to: Transmission - 3.0L NA V6 - AJ27 (307-01, Removal).

Vehicles with 5.0L NA or 5.0L SC engine

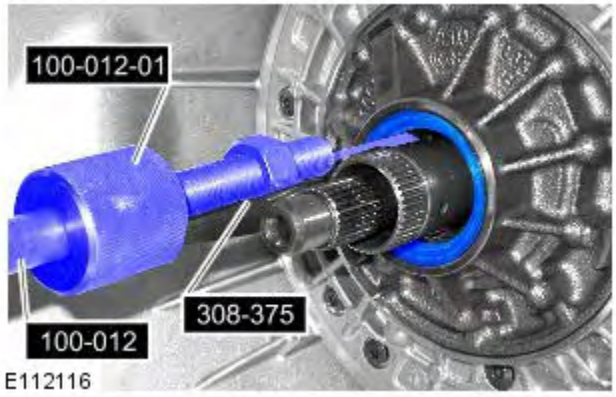
5. Refer to: Transmission - V8 5.0L Petrol/V8 S/C 5.0L Petrol (307-01 Automatic Transmission/Transaxle, Removal).

All vehicles

6. *Special Tool(s):* 307-613



E112115



E112116

7. CAUTIONS:

   Take extra care not to damage the edges of the component.

   Discard the seal.

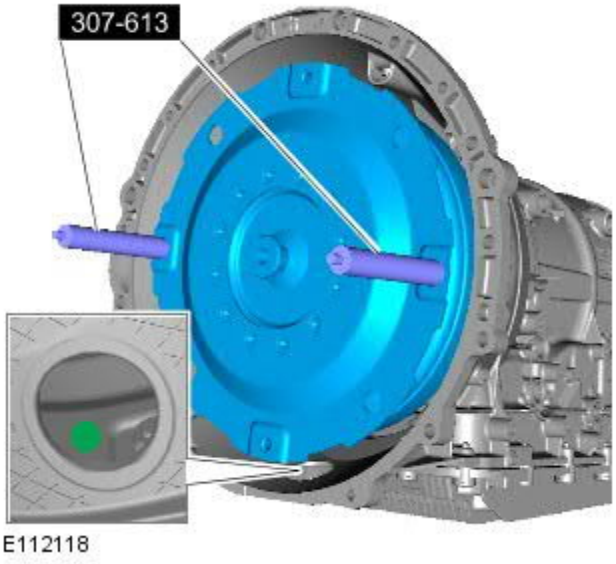
   Special Tool(s): 100-012, 100-012-01, 308-375

Installation

All vehicles

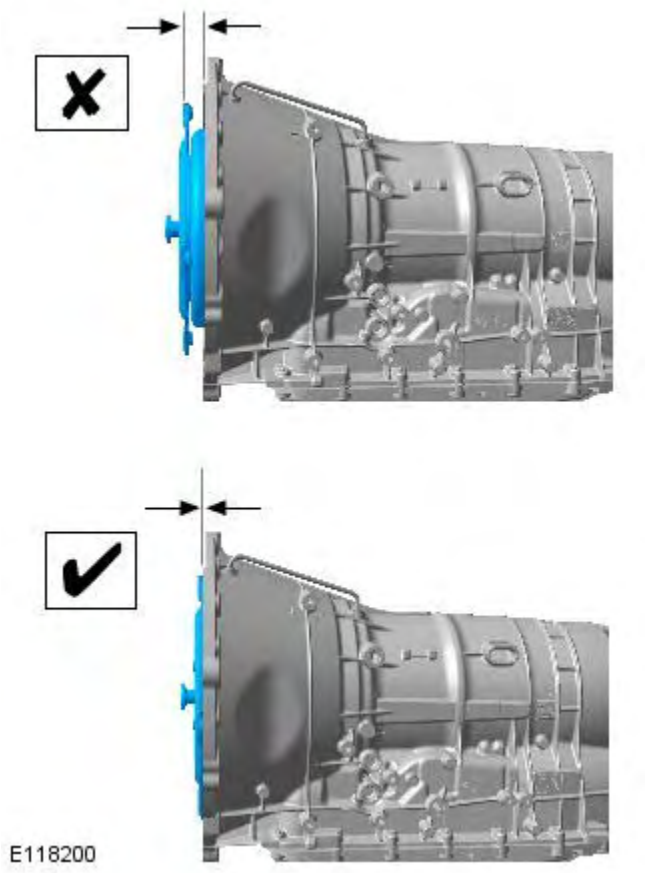
1. CAUTION: Install a new seal.

   Special Tool(s): 308-246



2. NOTE: Make sure that the alignment mark is visable through the inspection hole as illustrated.

   Special Tool(s): 307-613



3. CAUTION: Make sure the torque converter is fully located into the oil pump drive.

Vehicles with 5.0L NA or 5.0L SC engine

4. Refer to: Transmission - V8 5.0L Petrol/V8 S/C 5.0L Petrol (307-01 Automatic Transmission/Transaxle, Installation).

Vehicles with 3.0L engine

5. Refer to: Transmission - 3.0L NA V6 - AJ27 (307-01, Installation).

Vehicles with 3.0L diesel engine

6. Refer to: Transmission - TDV6 3.0L Diesel (307-01 Automatic Transmission/Transaxle, Installation).

All vehicles

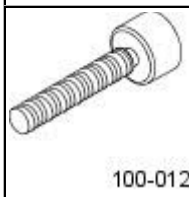
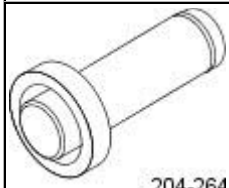
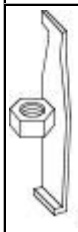
7. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 11-May-2011

Automatic Transmission/Transaxle - Extension Housing Seal

Removal and Installation

Special Tool(s)

	100-012 Slide Hammer
	100-012-01 Slide Hammer Adapter
	204-264 Pinion Seal Replacer
	205-053 Retainer, Drive Flange
	303-D121 Puller, General Purpose
	308-375 Remover, Input and Output Seal

Removal

All vehicles

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and

Cables, General Procedures).

2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

Vehicles with diesel engine

3. Refer to: Driveshaft - TDV6 3.0L Diesel (205-01 Driveshaft, Removal and Installation).

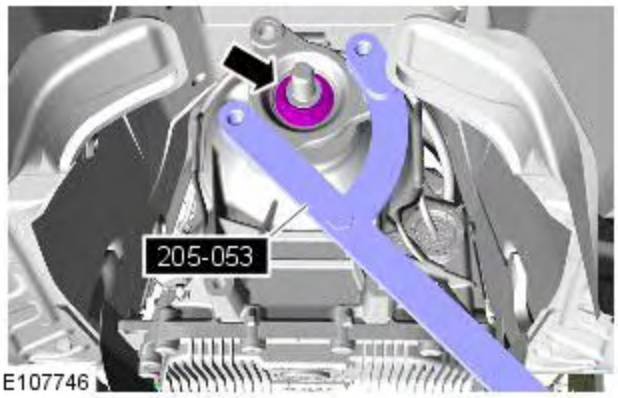
4. Refer to: Transmission Support Insulator - TDV6 3.0L Diesel (307-01 Automatic Transmission/Transaxle, Removal and Installation).

Vehicles with petrol engine

5. Refer to: Driveshaft - V8 5.0L Petrol/V8 S/C 5.0L Petrol (205-01 Driveshaft, Removal and Installation).

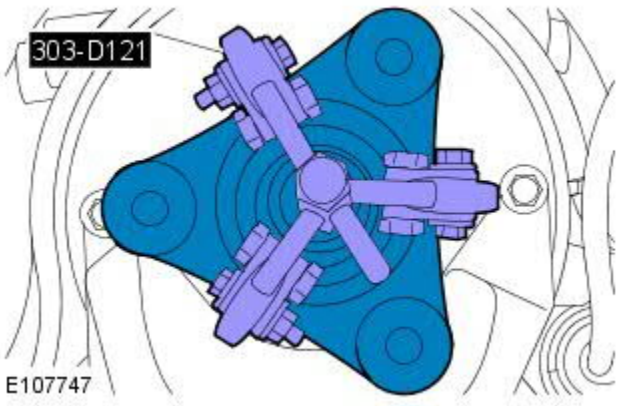
6. Refer to: Transmission Support Insulator - V8 5.0L Petrol/V8 S/C 5.0L Petrol (307-01 Automatic Transmission/Transaxle, Removal and Installation).

All vehicles

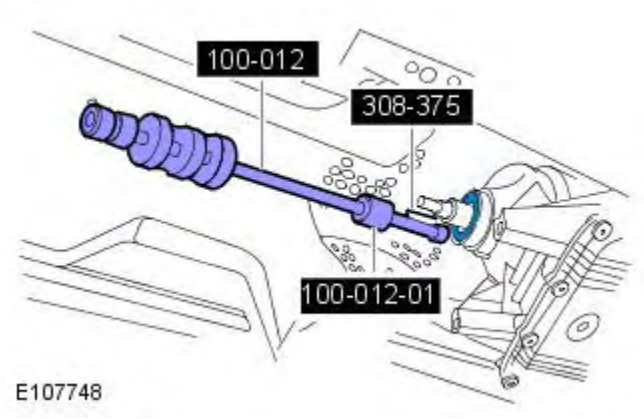


7. CAUTION: Discard the nut.

   Special Tool(s): 205-053



8. *Special Tool(s):* 303-D121

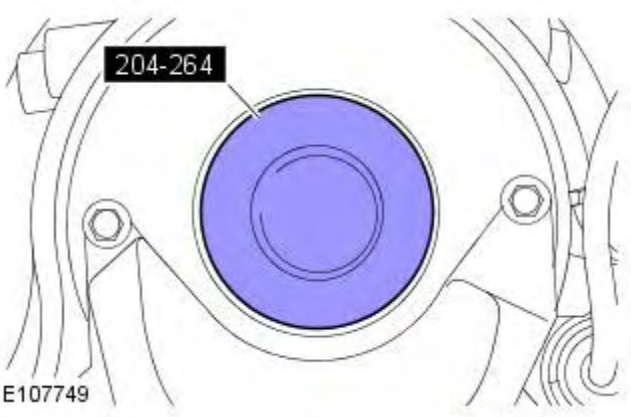


9. CAUTION: Discard the seal.

   Special Tool(s): 100-012, 100-012-01, 308-375

Installation

All vehicles

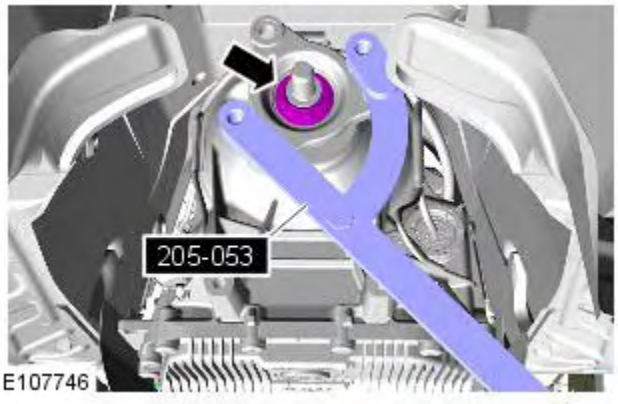


1. CAUTIONS:

   Make sure that the mating faces are clean and free of foreign material.

   Install a new seal.

   Special Tool(s): 204-264



2. WARNING: Make sure that a new nut is installed.

   Torque: 60 Nm

Vehicles with petrol engine

3. Refer to: Transmission Support Insulator - V8 5.0L Petrol/V8 S/C 5.0L Petrol (307-01 Automatic Transmission/Transaxle, Removal and Installation).

4. Refer to: Driveshaft - V8 5.0L Petrol/V8 S/C 5.0L Petrol (205-01 Driveshaft, Removal and Installation).

Vehicles with diesel engine

5. Refer to: Transmission Support Insulator - TDV6 3.0L Diesel (307-01 Automatic Transmission/Transaxle, Removal and Installation).

6. Refer to: Driveshaft - TDV6 3.0L Diesel (205-01 Driveshaft, Removal and Installation).

All vehicles

7. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 11-May-2011

Automatic Transmission/Transaxle - Transmission Control Module (TCM) and Main Control Valve Body

Removal and Installation

Removal

NOTE: The transmission control module (TCM) is part of the main control valve body and cannot be serviced separately.

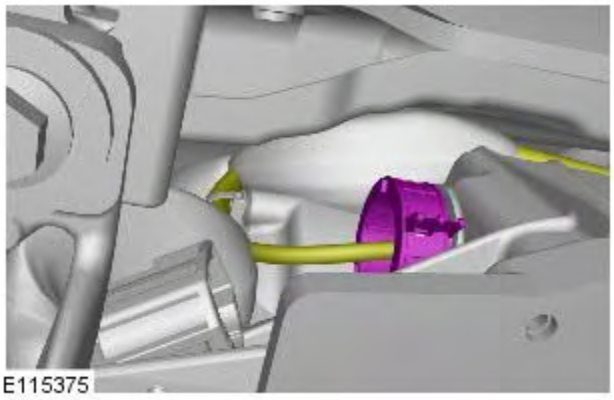
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Refer to: Transmission Fluid Pan, Gasket and Filter (307-01 Automatic Transmission/Transaxle, Removal and Installation).

4.



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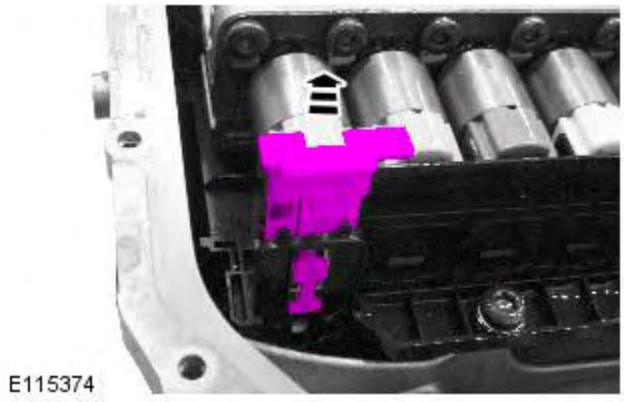
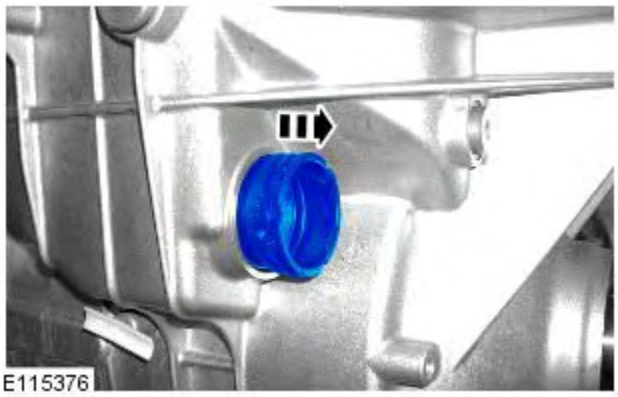
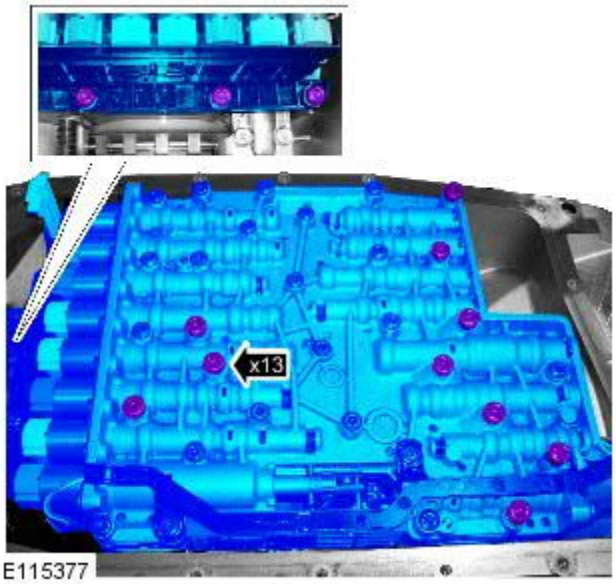




6. CAUTION: Discard the component.



7. CAUTION: Be prepared to collect escaping fluids.

NOTE: Note the position of the manual park brake release.

8.

9.

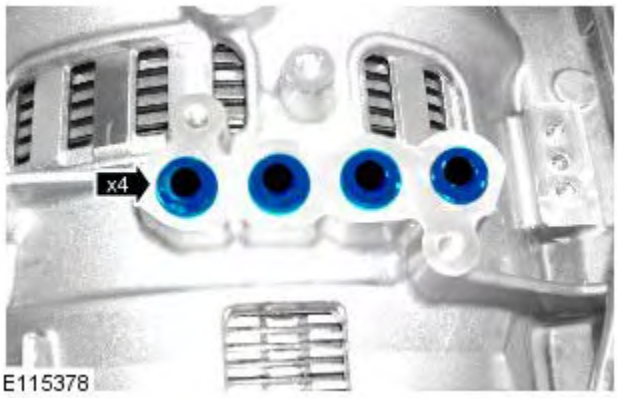
Installation

1. CAUTIONS:

   Make sure that when fully fitted, all seals protrude by the same amount.

   Install the new seals.

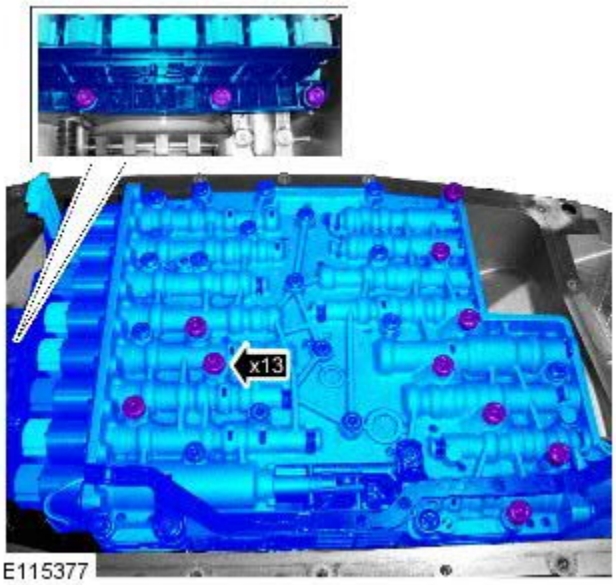
   - Install a new seal block.



2. CAUTIONS:

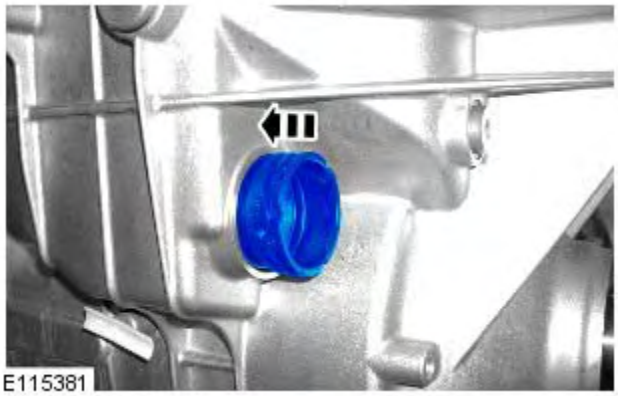
   Install the new seals.

   Make sure that when fully fitted, all seals protrude by the same amount.

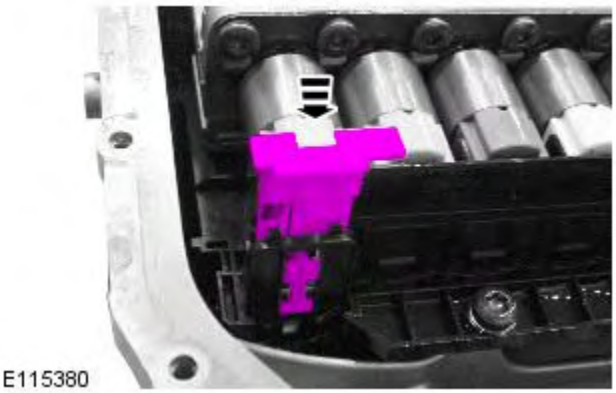


3. CAUTION: Make sure the manual park release is correctly engaged.

   Torque: 8 Nm

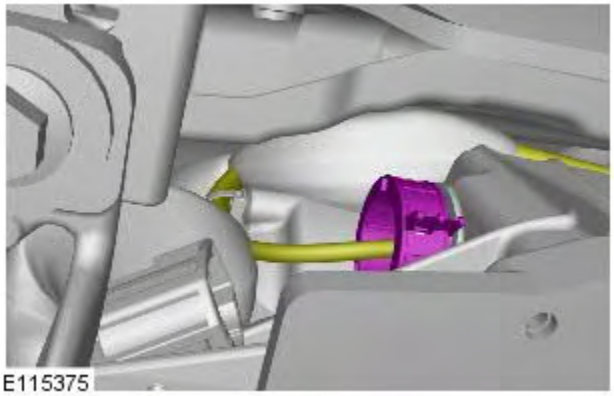


4. CAUTION: Make sure that a new component is installed.



5.

6.



7. Refer to: Transmission Fluid Pan, Gasket and Filter (307-01 Automatic Transmission/Transaxle, Removal and Installation).

8. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

9. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Published: 11-May-2011

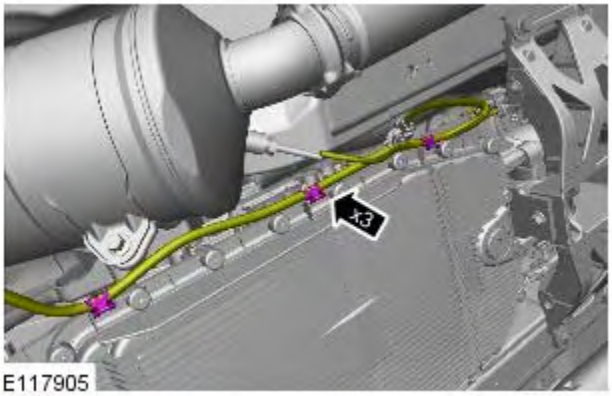
Automatic Transmission/Transaxle - Transmission Fluid Pan, Gasket and Filter

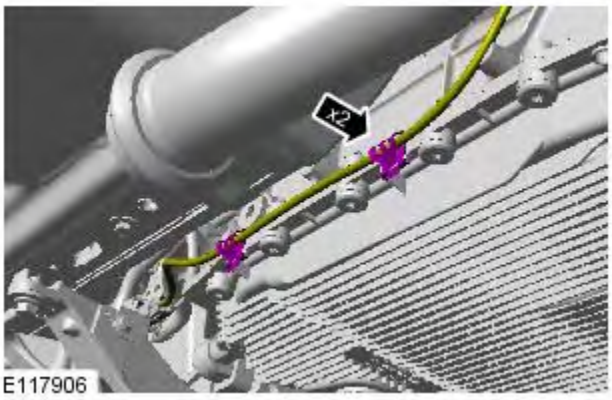
Removal and Installation

Removal

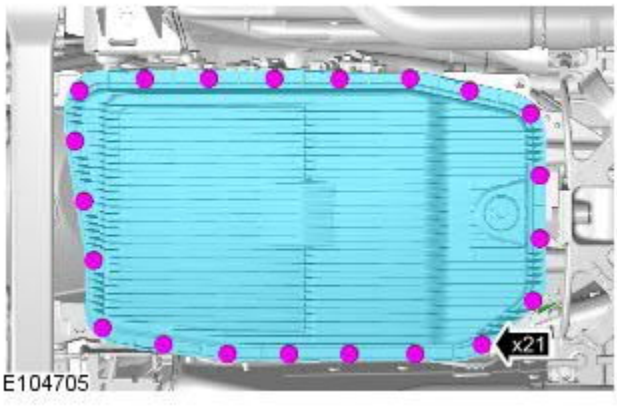
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
2. Raise and support the vehicle.
3. Refer to: Transmission Fluid Drain and Refill (307-01 Automatic Transmission/Transaxle, General Procedures).
4.





5. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



6. CAUTIONS:

   Make sure that the area around the component is clean and free of foreign material.

   Be prepared to collect escaping fluids.

   Torque: 8 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Automatic Transmission/Transaxle - Transmission Support Insulator TDV6 3.0L Diesel

Removal and Installation

Removal

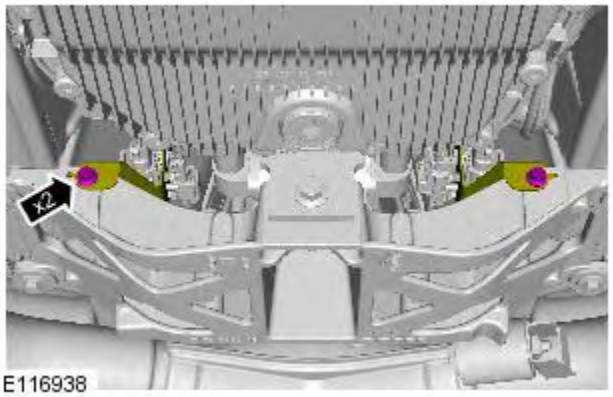
NOTES:

Removal steps in this procedure may contain installation details.

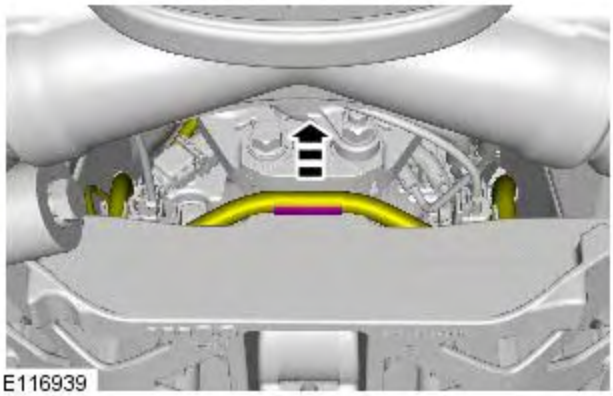
Some variation in the illustrations may occur, but the essential information is always correct.

1. WARNING: Make sure to support the vehicle with axle stands.

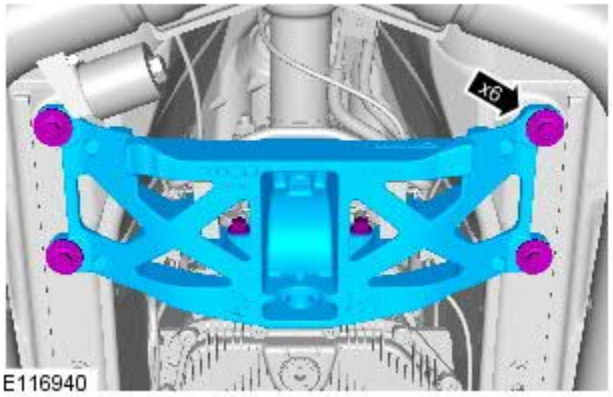
   Raise and support the vehicle.



2. *Torque:* 10 Nm

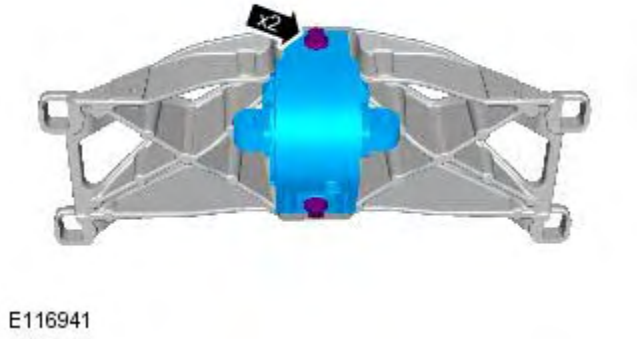


3.



4. CAUTION: During this procedure the transmission crossmember is removed, make sure the transmission is correctly supported to avoid damaging associated components.

   Torque: 48 Nm



5. NOTE: Do not disassemble further if the component is removed for access only.

   Torque: 70 Nm

Installation

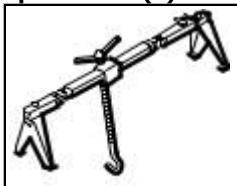
1. To install, reverse the removal procedure.

Published: 12-Sep-2011

Automatic Transmission/Transaxle - Transmission, Transmission Fluid Cooler and Transmission Fluid Cooler Tubes TDV6 3.0L Diesel

Removal and Installation

Special Tool(s)

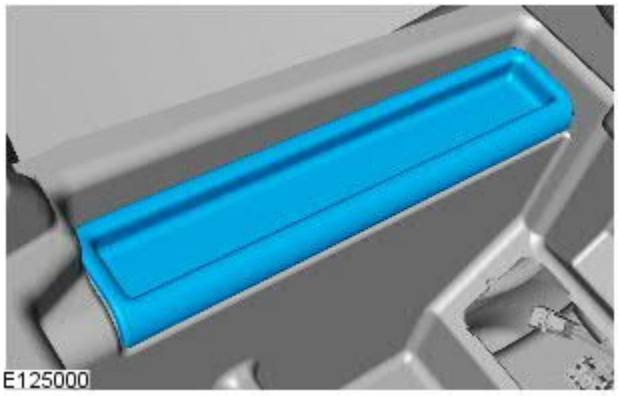
 303-021	303-021 Engine support bracket
E54554	303-1129 Engine Lifting Brackets
E116925	303-1497 Left-Hand Rear Engine Lifting Bracket

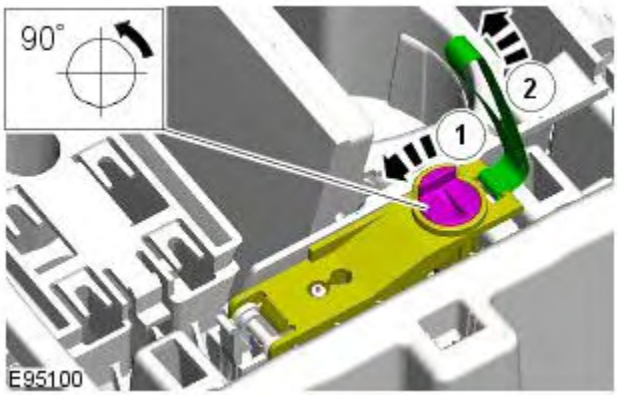
Removal

CAUTION: Make sure that all openings are sealed. Use new blanking caps.

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1.

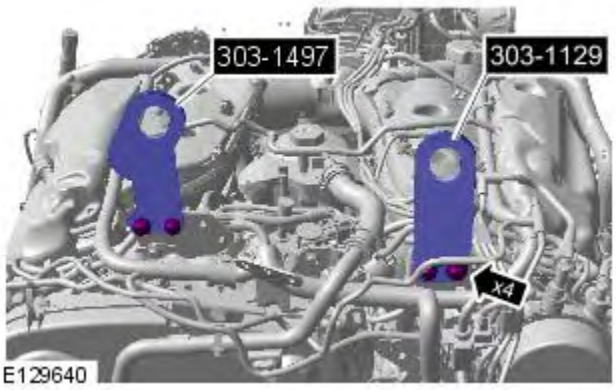

E125000



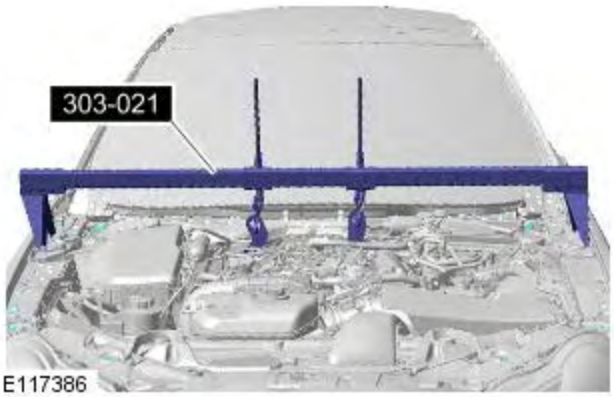
2.

3. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

4. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).



5. *Special Tool(s):* 303-1129, 303-1497

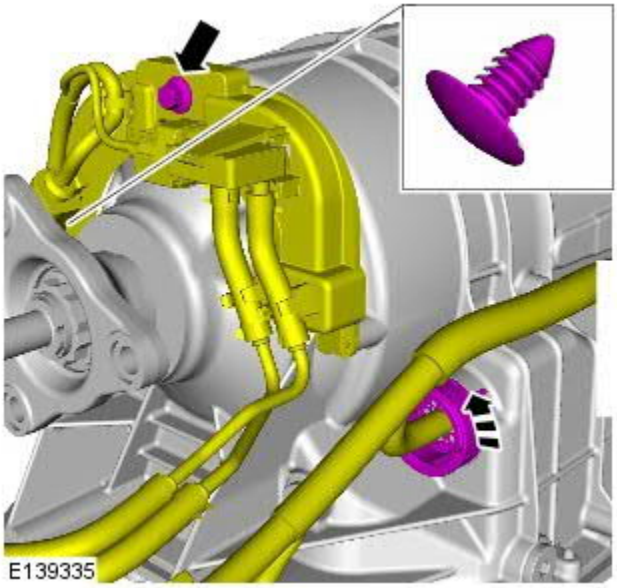


6. *Special Tool(s):* 303-021

7. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

8.



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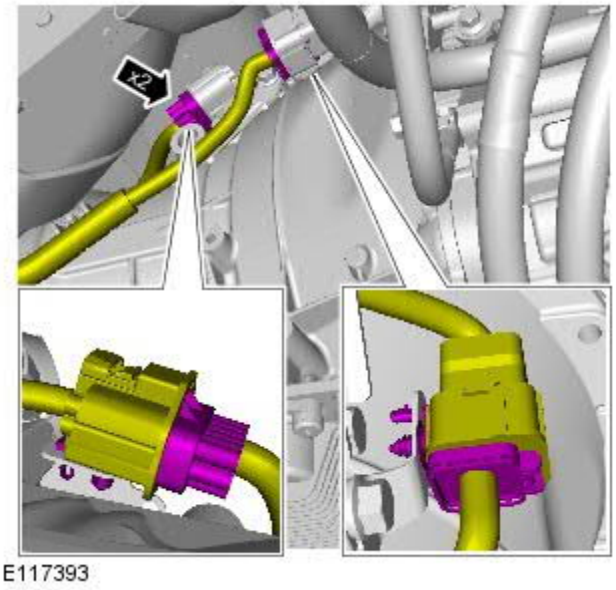
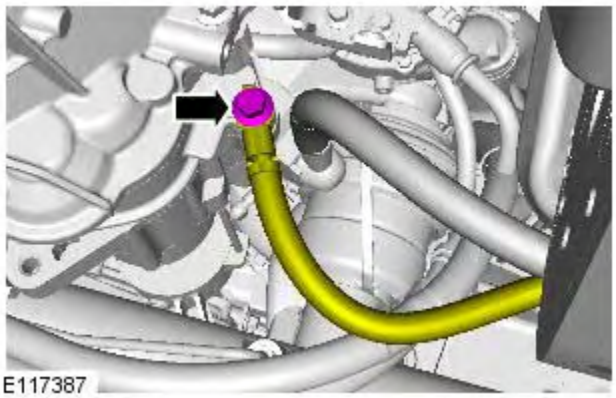
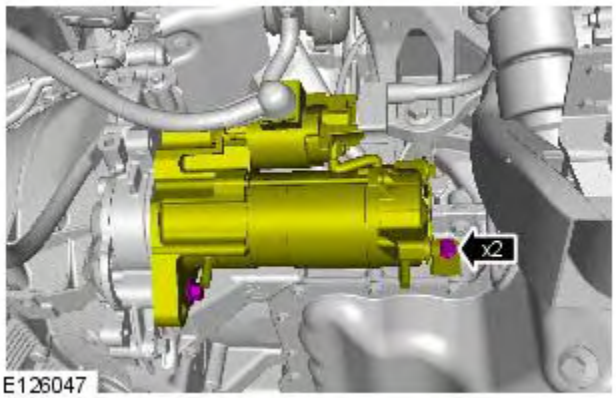


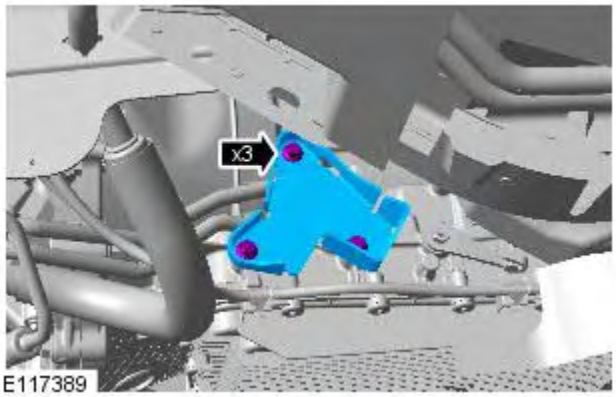
10. Refer to: Exhaust Manifold Crossover Pipe (303-01 Engine - 3.0L V6 - TdV6, Removal and Installation).

11.





12. NOTE: Secure with cable ties.



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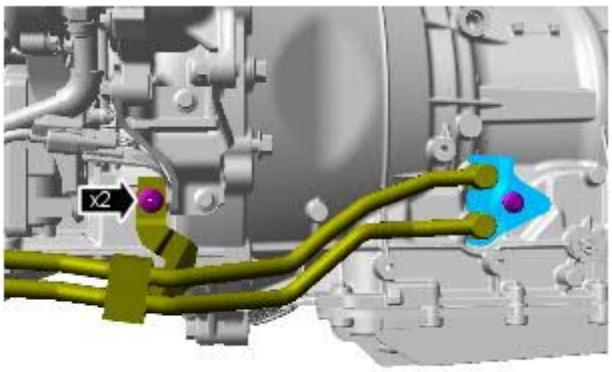
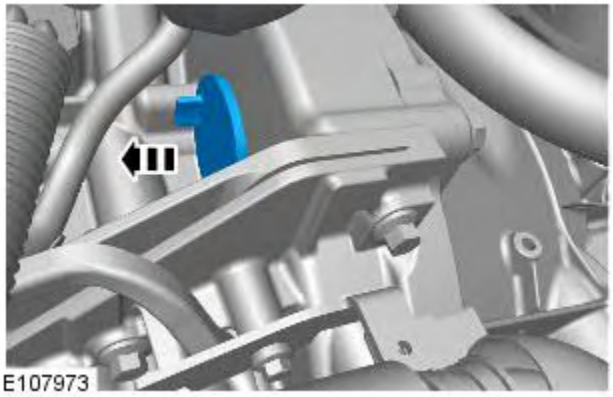


14. NOTE: Remove and discard the O-ring seals.

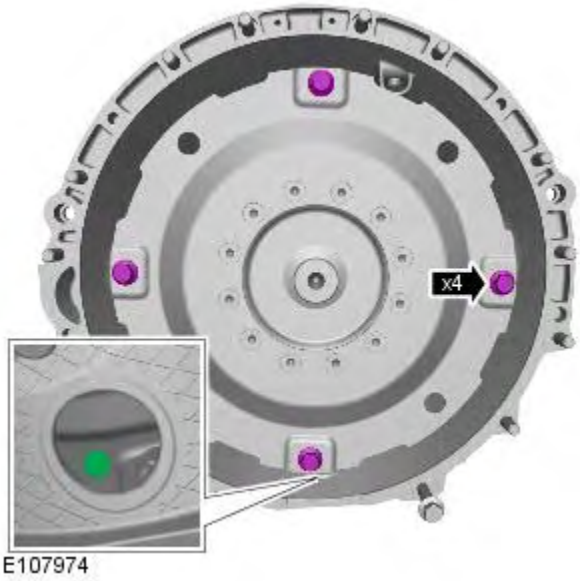
- Install blanking caps to the exposed ports.


E107973

15. Remove the rubber access cover.

E107972

16.

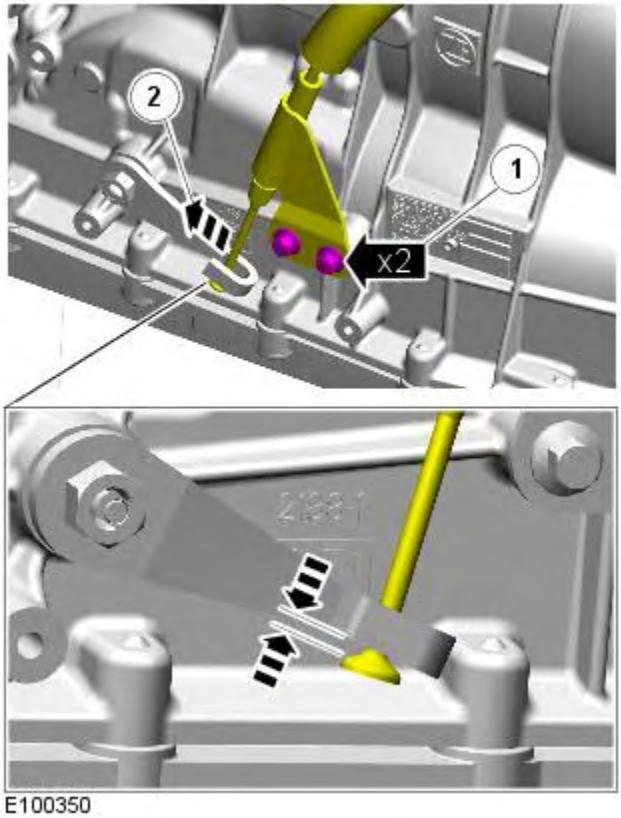


E107974

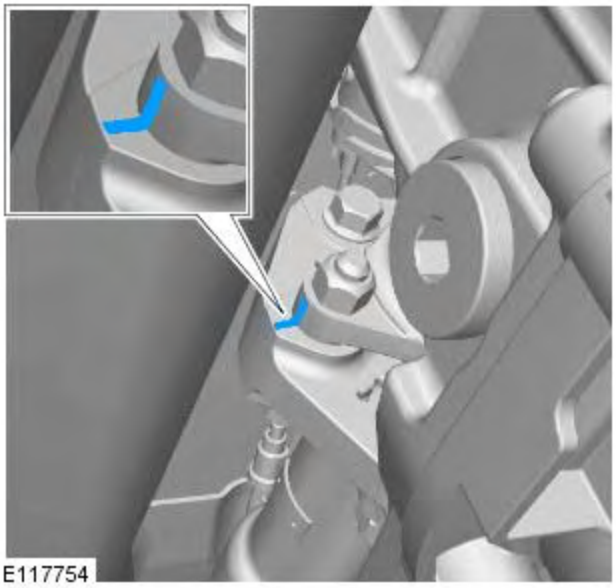
17. CAUTION: Only rotate the crankshaft clockwise.

- Make sure that the alignment mark is visible through the inspection hole on removal of the last torque converter bolt.

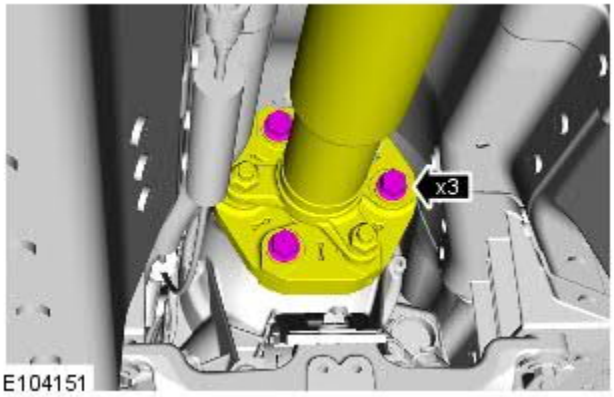
18.



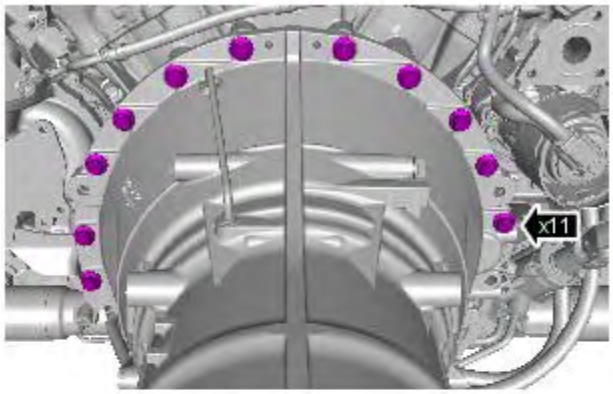
E100350


E117754

19. NOTE: Mark the position of the driveshaft on the transmission flange.

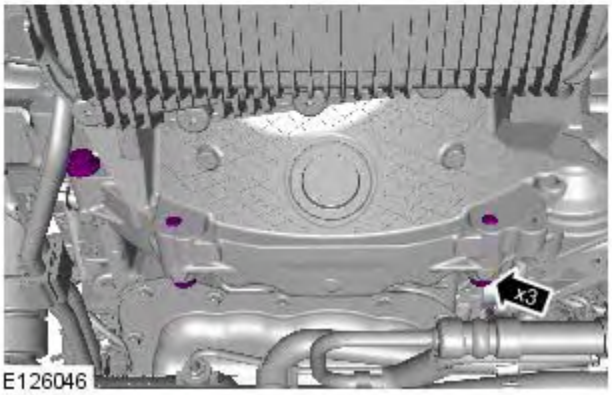


20. CAUTION: Under no circumstances must the flexible coupling (or it's fixings) be loosened or removed from the driveshaft.

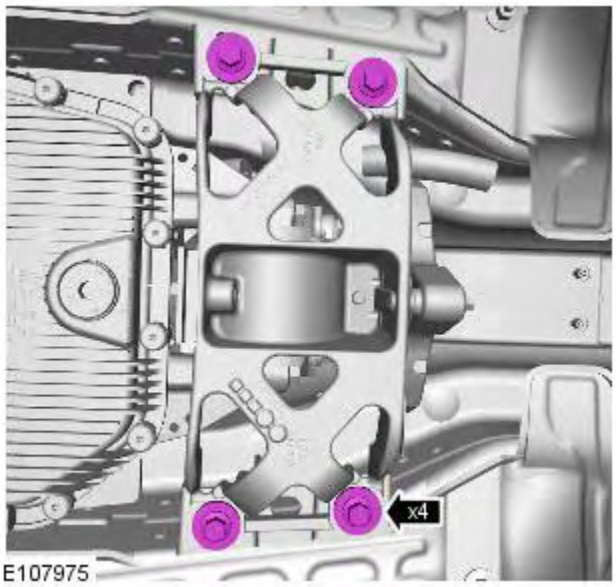


21. WARNING: Make sure that the transmission is secured with suitable retaining straps.

Align the powertrain assembly jack to the transmission.



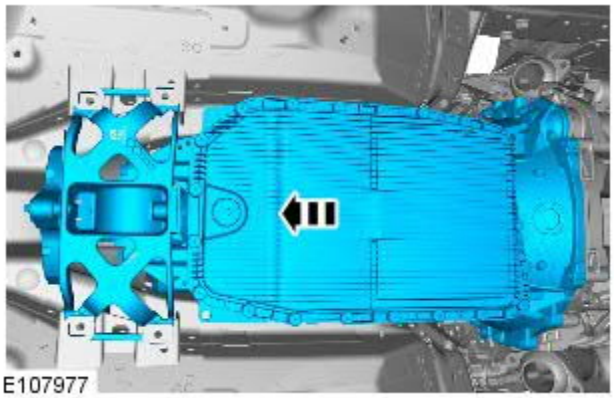
22.



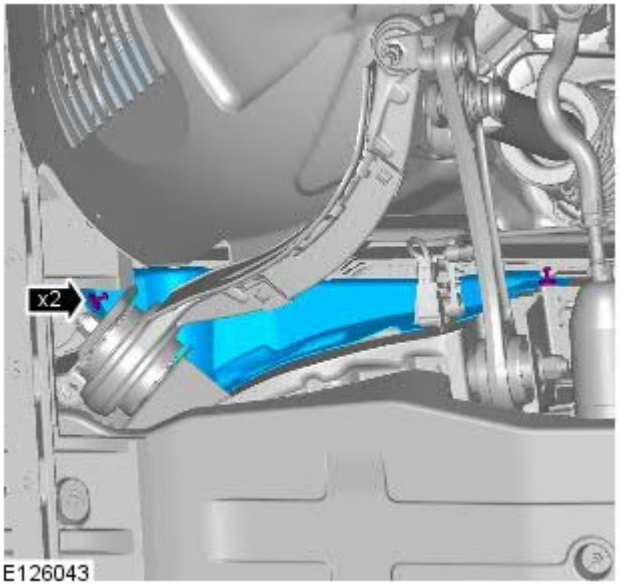
23. CAUTION: Make sure that the torque converter remains in the transmission.

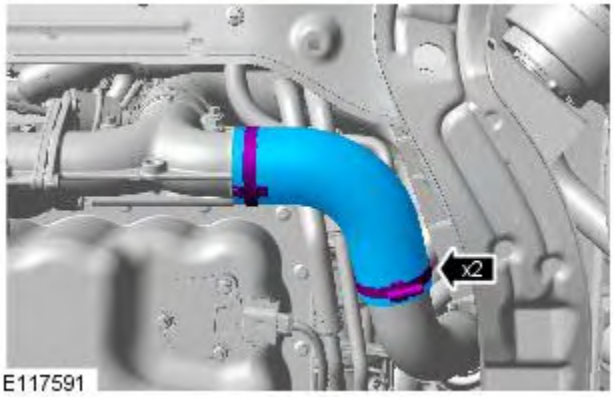
NOTE: This step requires the aid of another technician.

- Install the torque converter retainer.

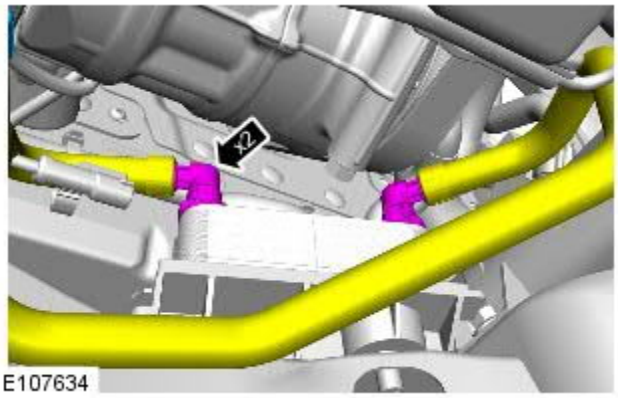


24.





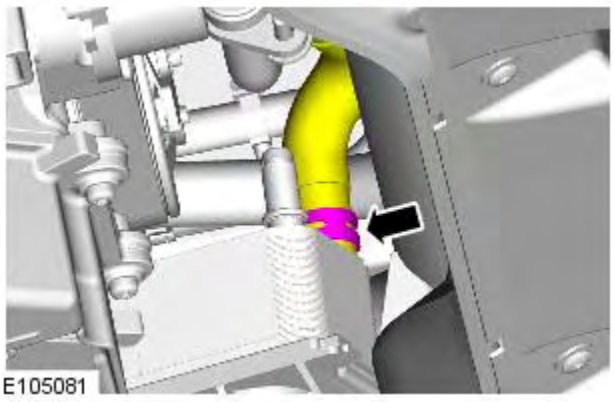
25.



26. CAUTIONS:

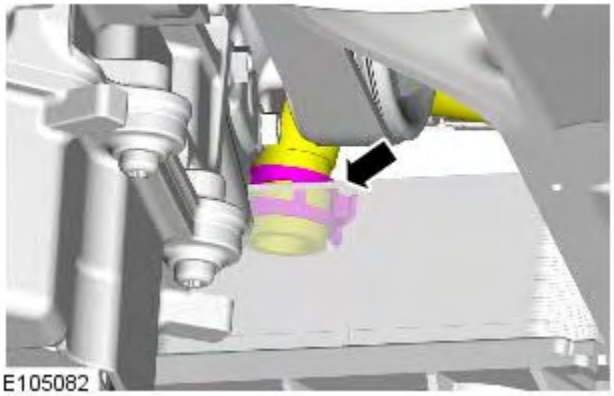
⚠ Be prepared to collect escaping fluids.

⚠ Make sure that all openings are sealed. Use new blanking caps.



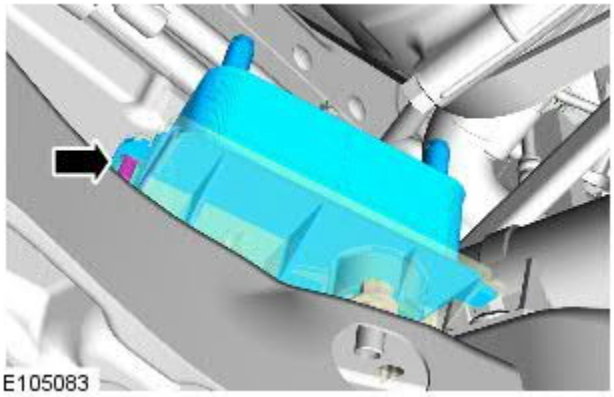
27. ⚠ CAUTION: Be prepared to collect escaping coolant.

△ NOTE: Clamp the hoses to minimize coolant loss.

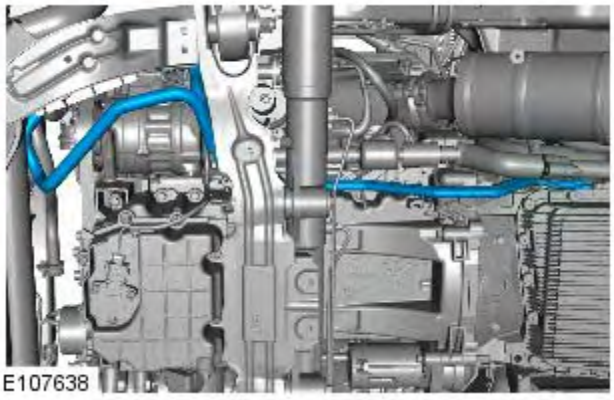


28. ⚠ CAUTION: Be prepared to collect escaping coolant.

△ NOTE: Clamp the hoses to minimize coolant loss.

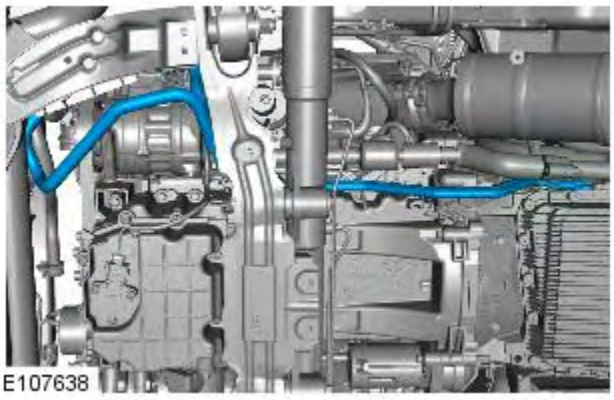


29. CAUTION: Be prepared to collect escaping fluids.



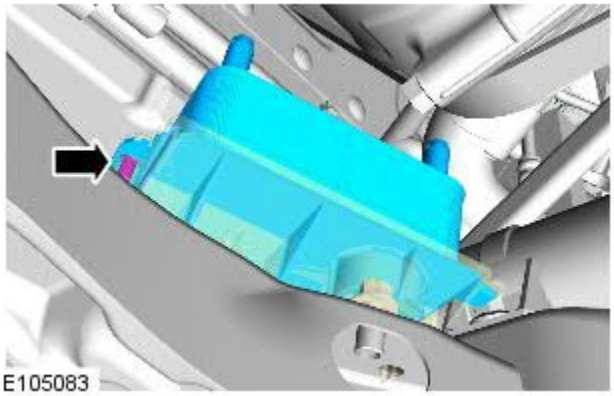
30.

Installation



1.

2. *Torque:* 5 Nm


E105083

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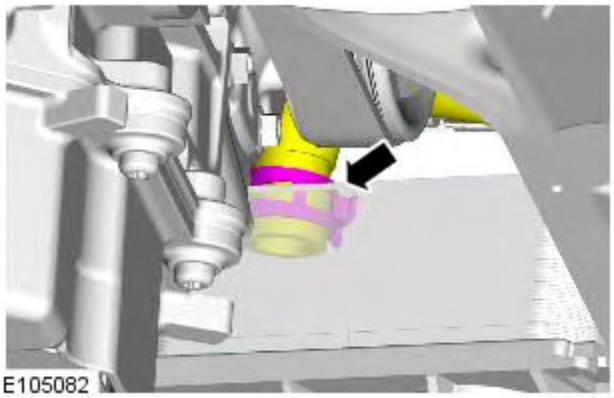
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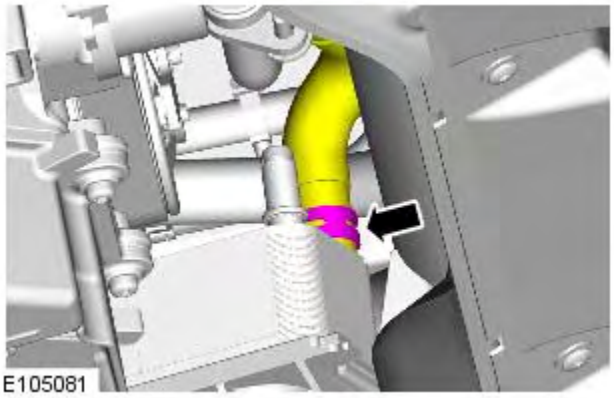
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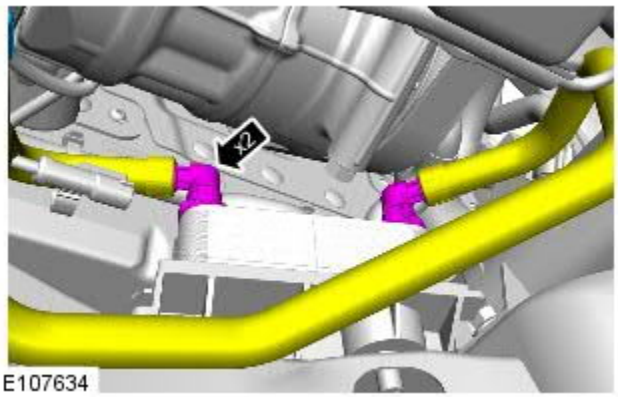
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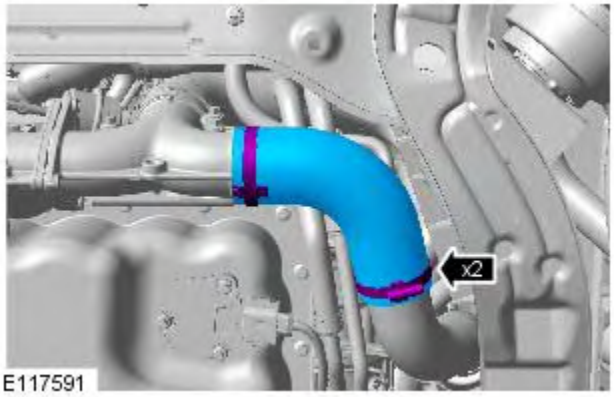
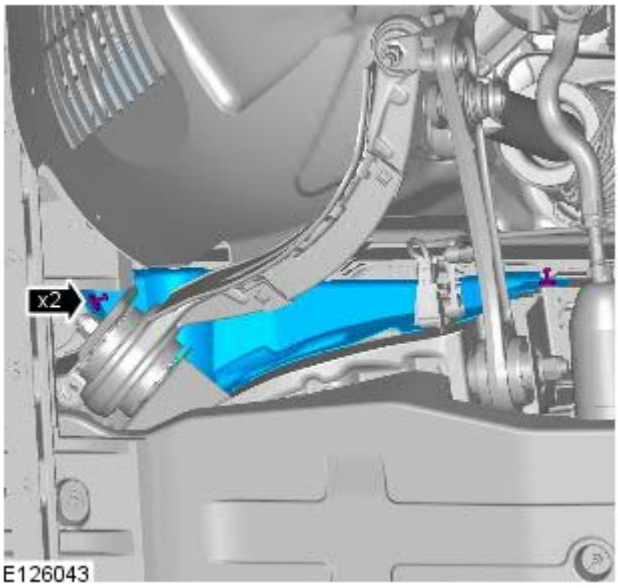


6. *Torque:* 5 Nm



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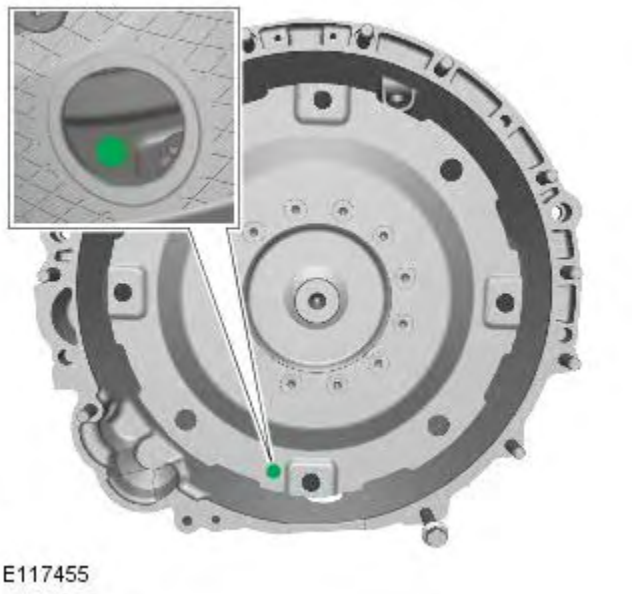
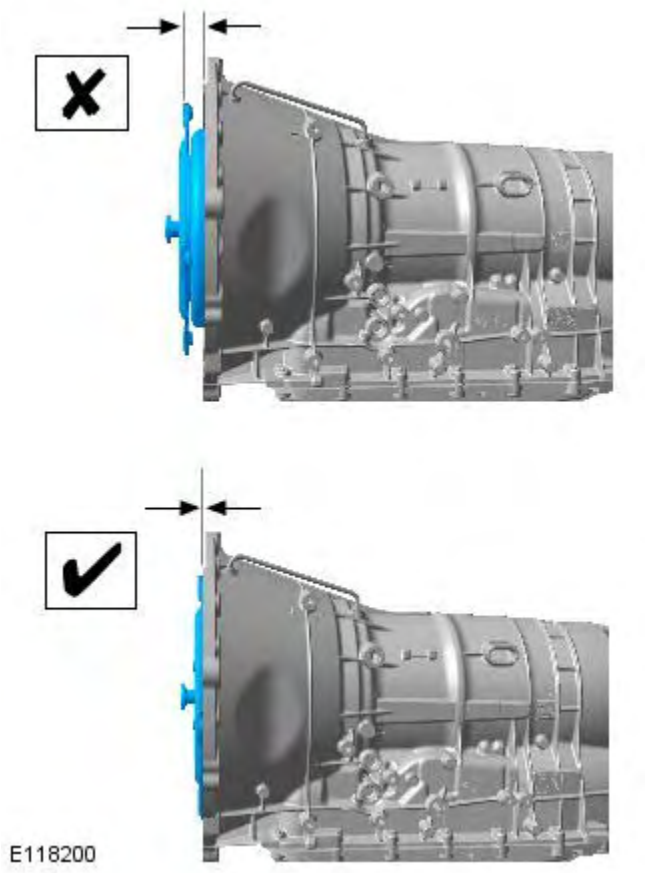
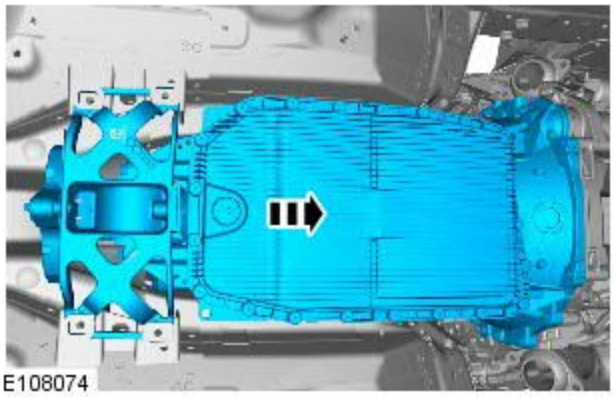


8. Make sure that the alignment mark is visible through the inspection hole on installation of the first torque converter bolt.

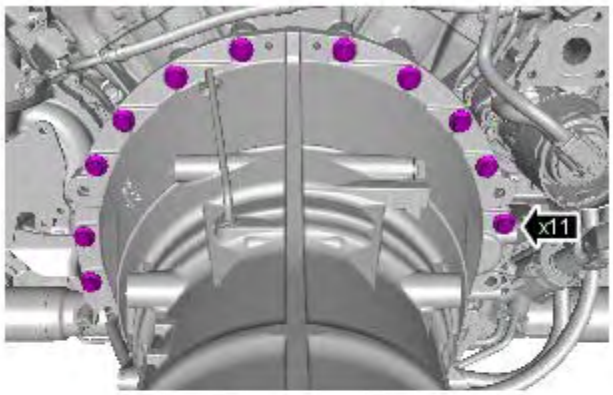


9. CAUTION: Make sure the torque converter is fully located into the oil pump drive.

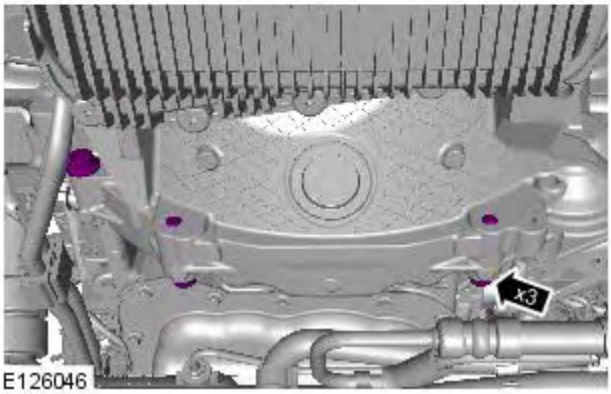


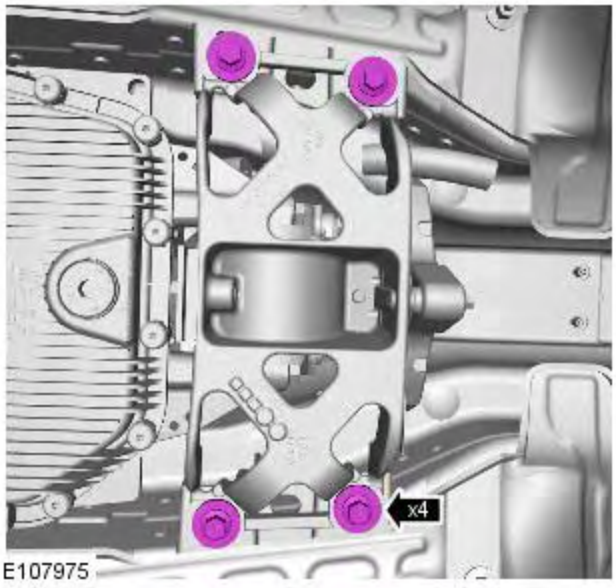
10. CAUTION: Make sure that the torque converter remains in the transmission.

    Raise the powertrain assembly jack and transmission assembly.



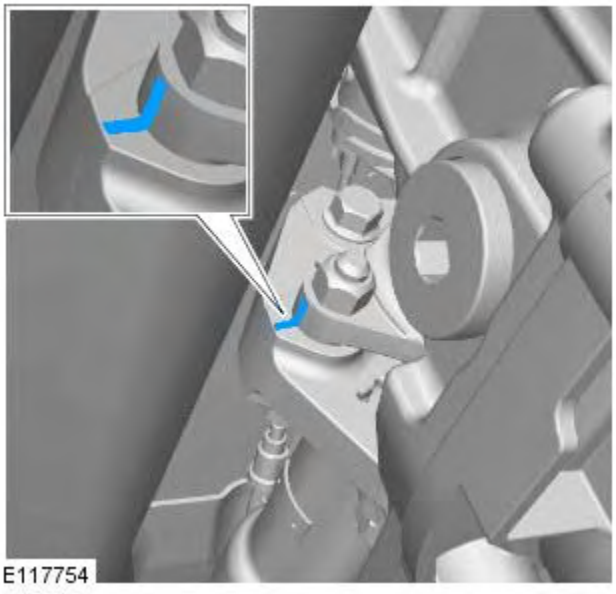
11. *Torque:* 48 Nm



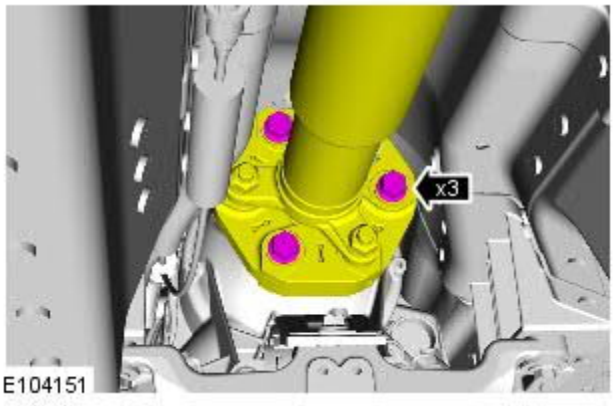


12. *Torque:* 48 Nm

13. Remove the transmission jack.



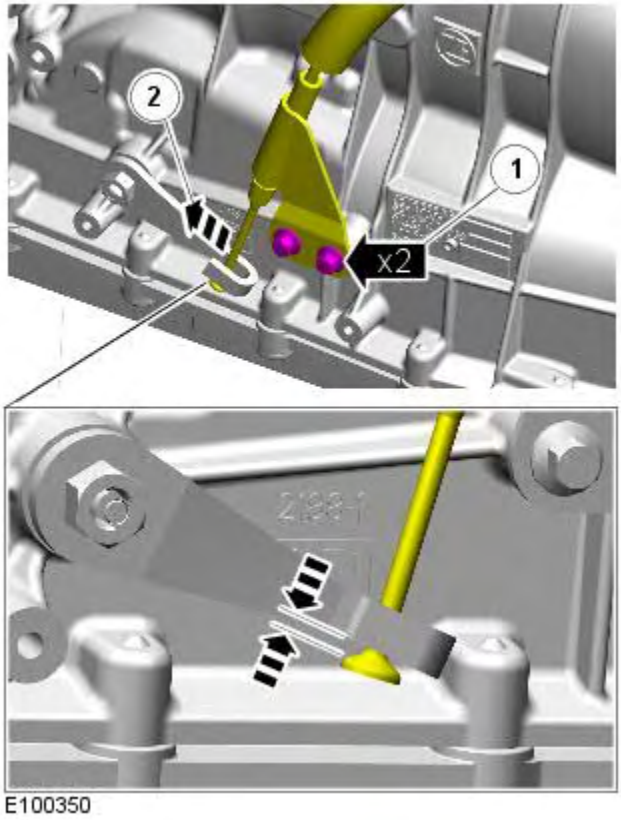
14. NOTE: Make sure that you re-align the driveshaft to the transmission flange using the alignment mark.



15. CAUTION: Under no circumstances must the flexible coupling (or it's fixings) be loosened or removed from the driveshaft.

Torque: 127 Nm

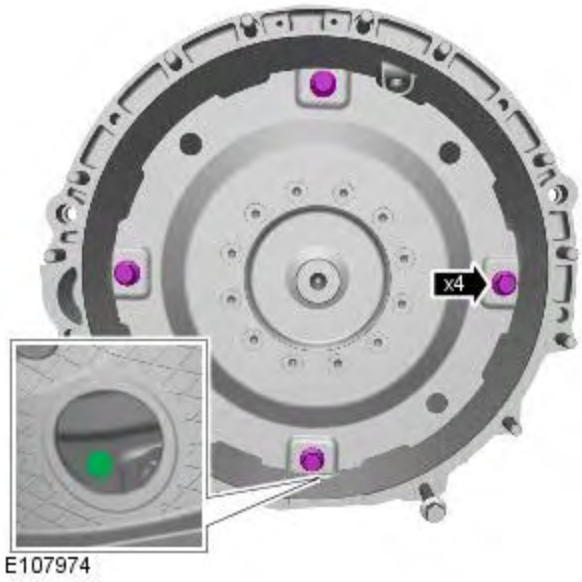
16. *Torque:* 10 Nm



E100350

17. CAUTION: Only rotate the crankshaft clockwise.

Torque: 63 Nm

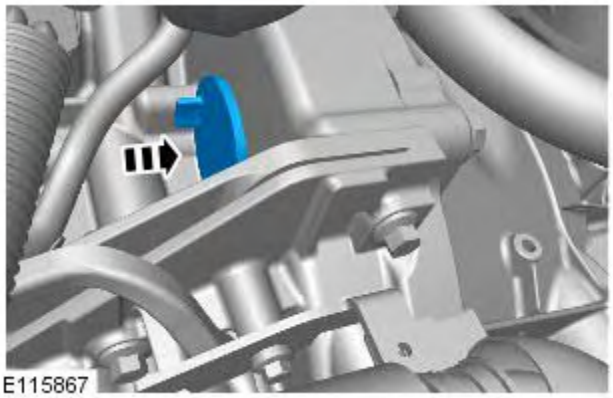


E107974

18.

E107972

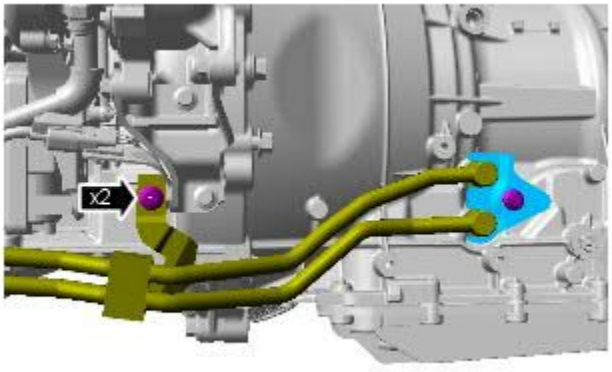
19.



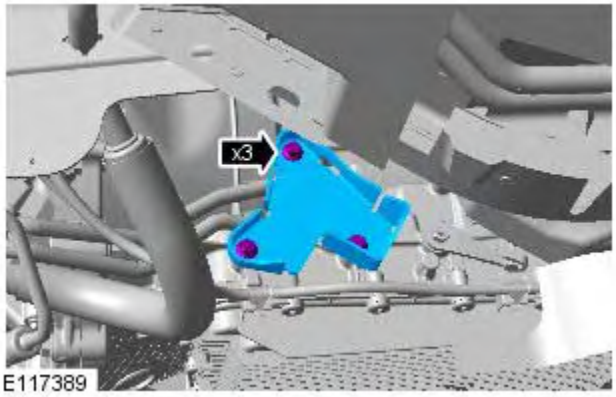
E115867

20. CAUTION: Install new o-ring seals

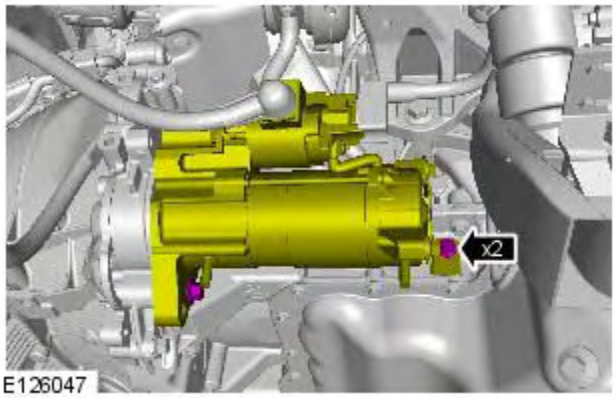
Torque: 10 Nm



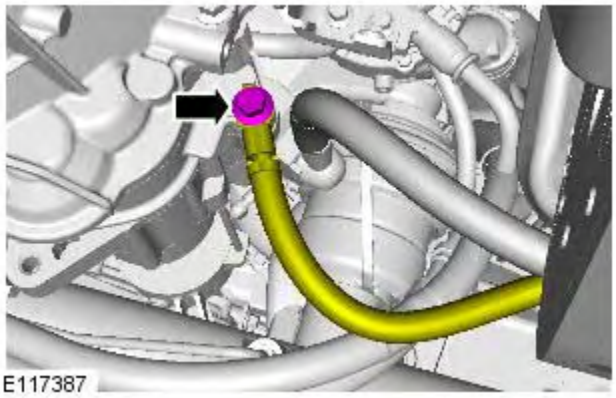
E117390



21. *Torque:* 23 Nm



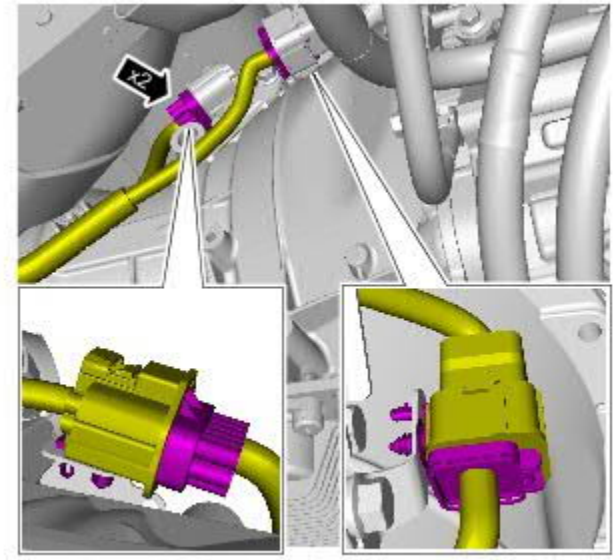
22. *Torque:* 48 Nm



23. *Torque:* 30 Nm

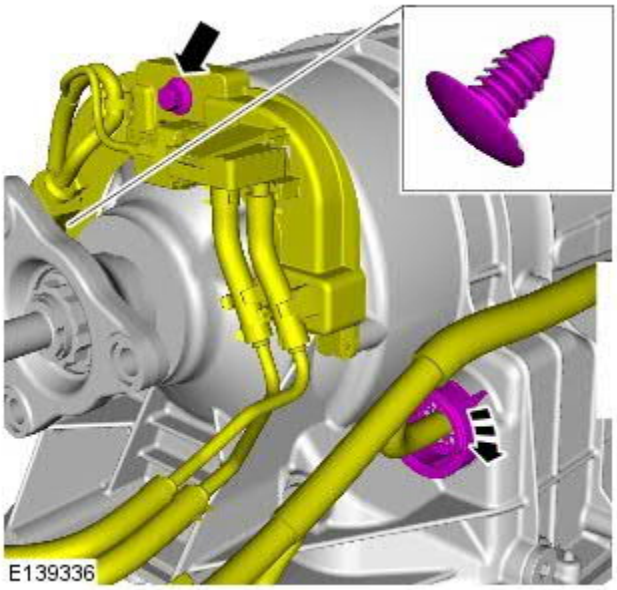
24. Refer to: Exhaust Manifold Crossover Pipe (303-01 Engine - 3.0L V6 - TdV6, Removal and Installation).

25.



E117393

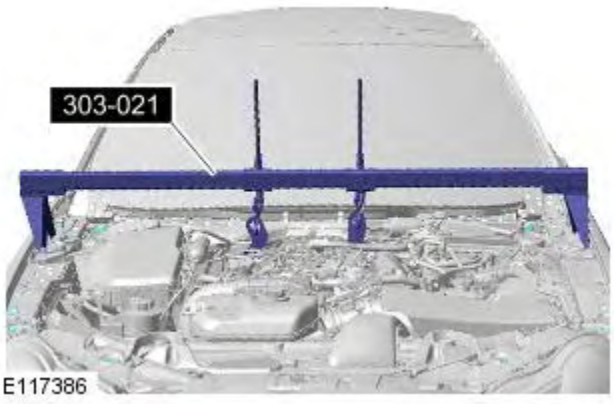
26.


E139336

27. Lower the vehicle.

28.

- Remove the special tool supporting the engine.
- *Special Tool(s):* 303-021



E117386

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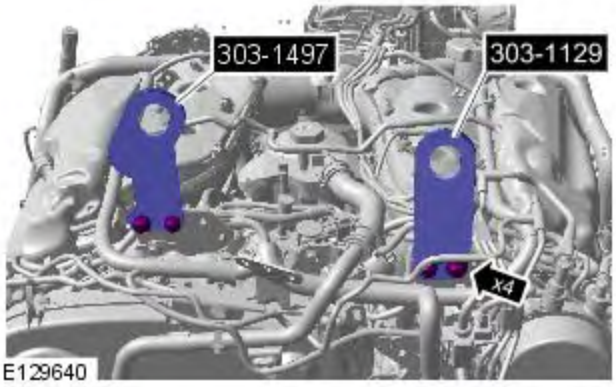
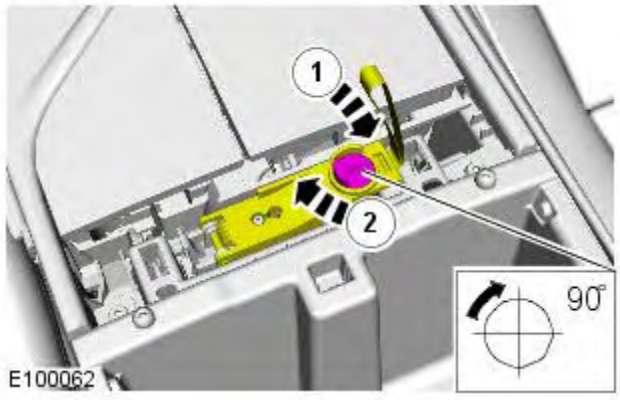


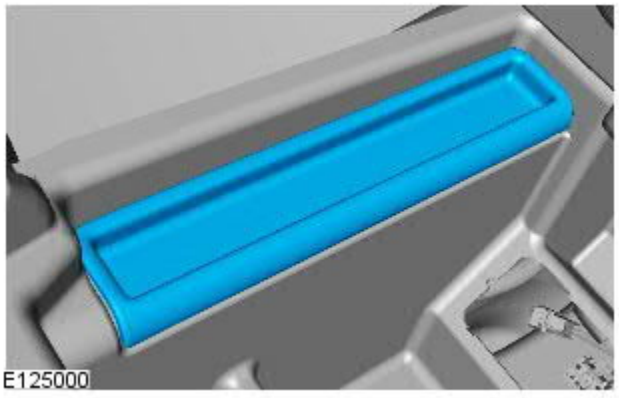
29.
- Remove the special tools from the engine.
- *Special Tool(s):* 303-1129, 303-1497

30. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

31. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).



32.



33.

34. Check and top up the cooling system as required.

35. Set the heater controls to HOT.

36. CAUTION: Observe the engine temperature warning light. If the warning light is displayed, switch off immediately and allow to cool. Failure to follow this instruction may cause damage to the vehicle.

Start the engine and allow to idle until hot air is emited at the face registers.

37. CAUTION: Observe the engine temperature warning light. If the warning light is displayed, switch off immediately and allow to cool. Failure to follow this instruction may cause damage to the vehicle.

    Raise the engine speed to 2000 RPM and maintain at 2000 RPM until the engine cooling fan operates.

38. CAUTION: Switch off the engine and allow the coolant temperature to go cold.

    Switch the engine off and allow to cool.

39. Visually check the engine and cooling system for signs of coolant leakage.

40. WARNINGS:

    When releasing the cooling system pressure, cover the coolant expansion tank cap with a thick cloth.

    Since injury such as scalding could be caused by escaping steam or coolant, make sure the vehicle cooling system is cool prior to carrying out this procedure.

    CAUTIONS:

    Make sure the coolant level remains above the "COLD FILL RANGE" lower level mark.

    Anti-freeze concentration must be maintained at 50%.

    NOTE: When the cooling system is warm, the coolant will be approximately 10mm above the upper level mark on the expansion tank with the cap removed.

    Check and top-up the coolant if required.

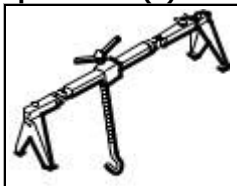
41. Refer to: Transmission Fluid Level Check (307-01 Automatic Transmission/Transaxle, General Procedures).

Published: 12-Sep-2011

Automatic Transmission/Transaxle - Transmission and Transmission Fluid Cooler TDV6 3.0L Diesel

Removal and Installation

Special Tool(s)

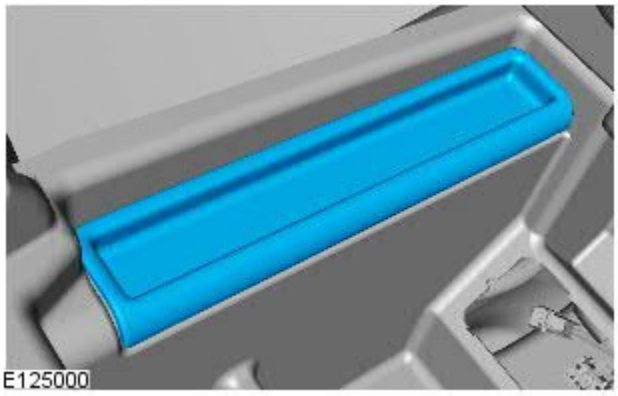
 303-021	303-021 Engine support bracket
E54554	303-1129 Engine Lifting Brackets
E116925	303-1497 Left-Hand Rear Engine Lifting Bracket

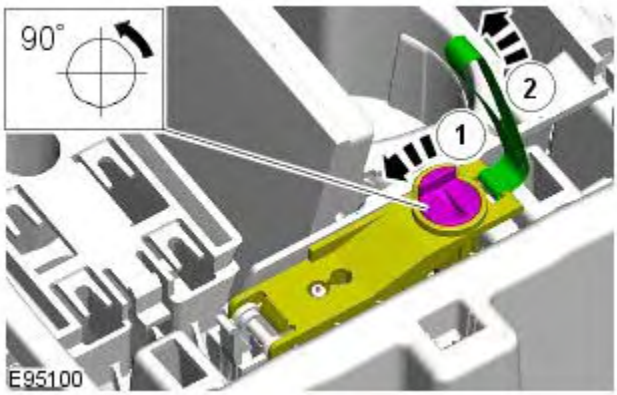
Removal

CAUTION: Make sure that all openings are sealed. Use new blanking caps.

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1.

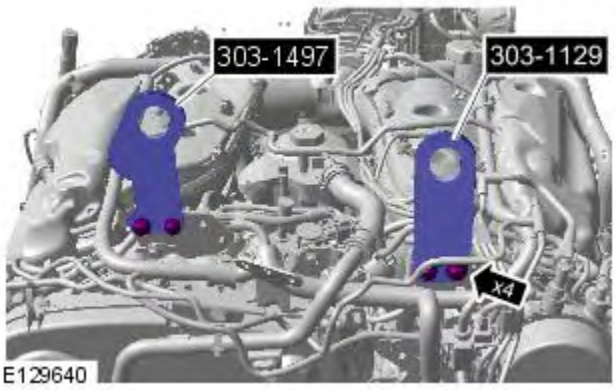

E125000



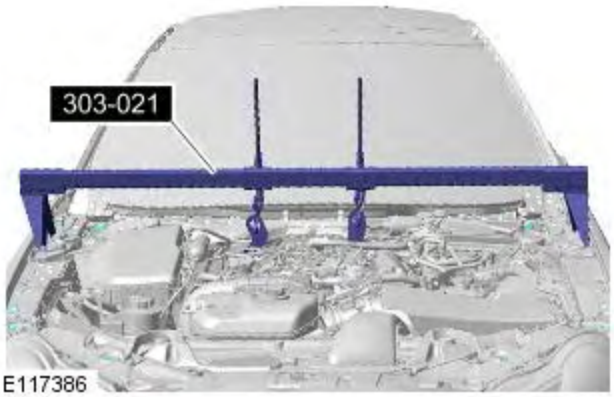
2.

3. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

4. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).



5. *Special Tool(s):* 303-1129, 303-1497

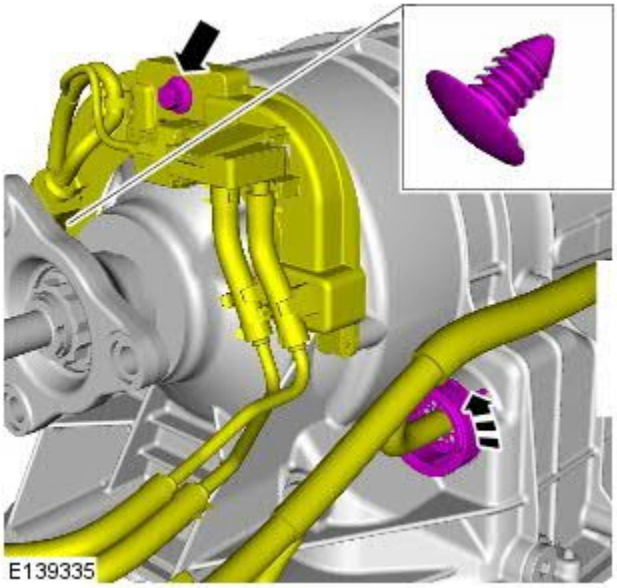


6. *Special Tool(s):* 303-021

7. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

8.



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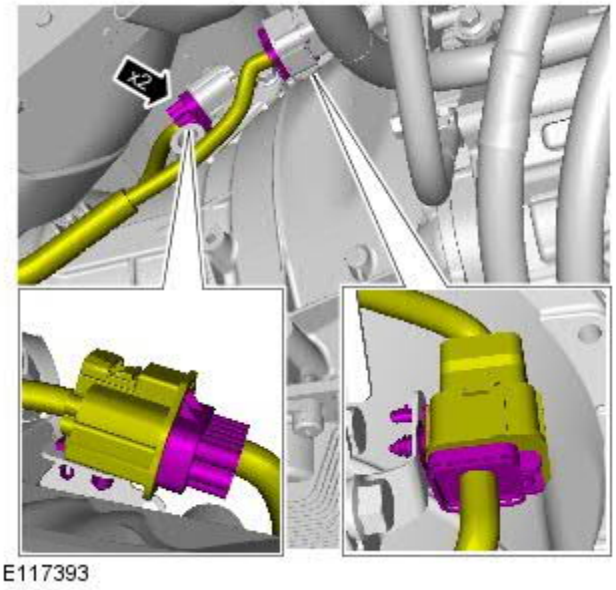
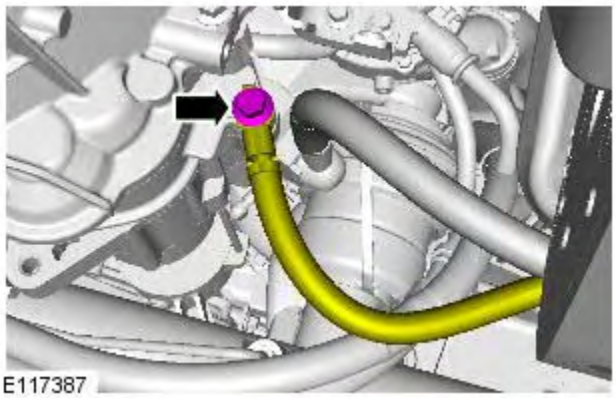
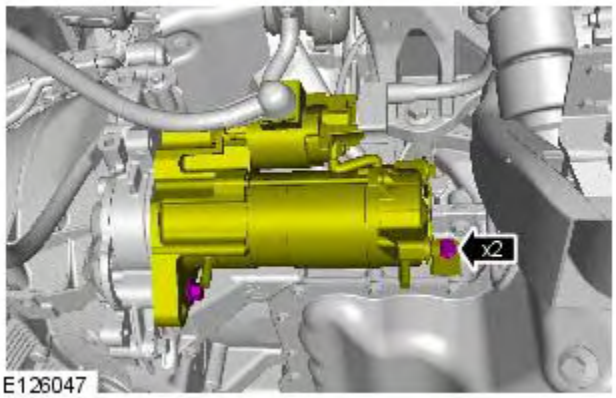


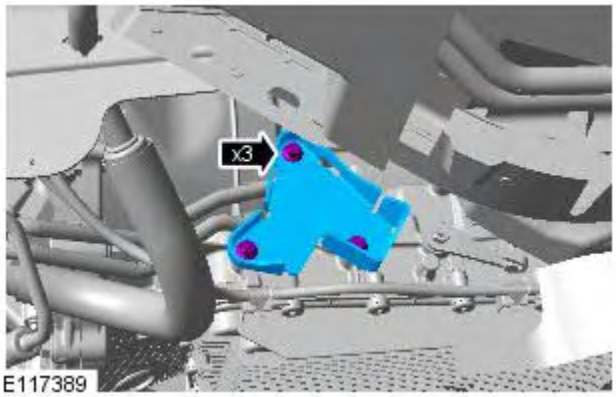
10. Refer to: Exhaust Manifold Crossover Pipe (303-01 Engine - 3.0L V6 - TdV6, Removal and Installation).

11.





12. NOTE: Secure with cable ties.



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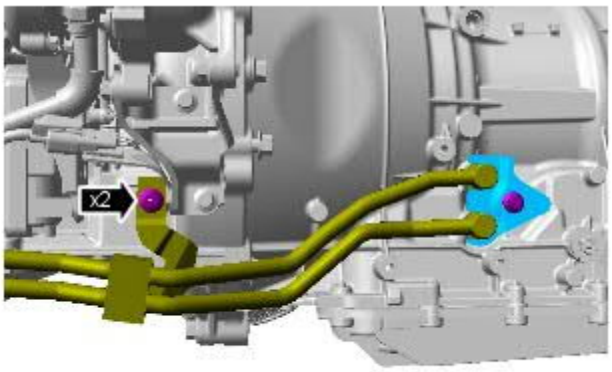
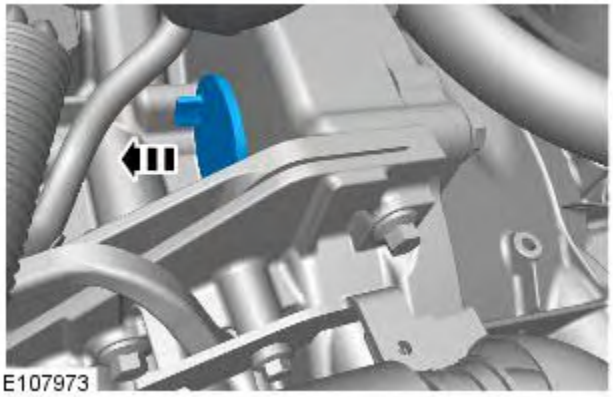


14. NOTE: Remove and discard the O-ring seals.

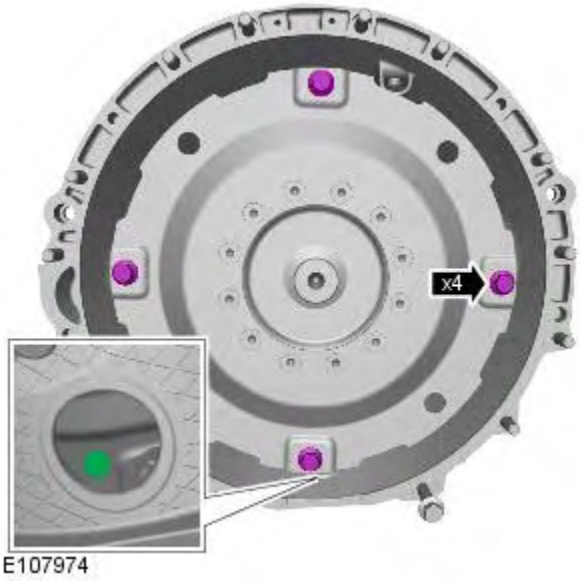
- Install blanking caps to the exposed ports.


E107973

15. Remove the rubber access cover.

E107972

16.

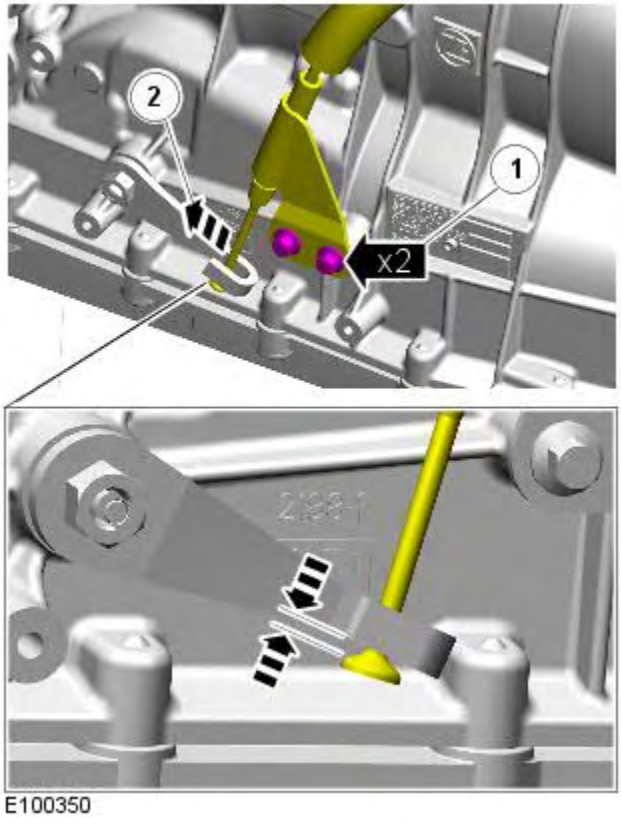


E107974

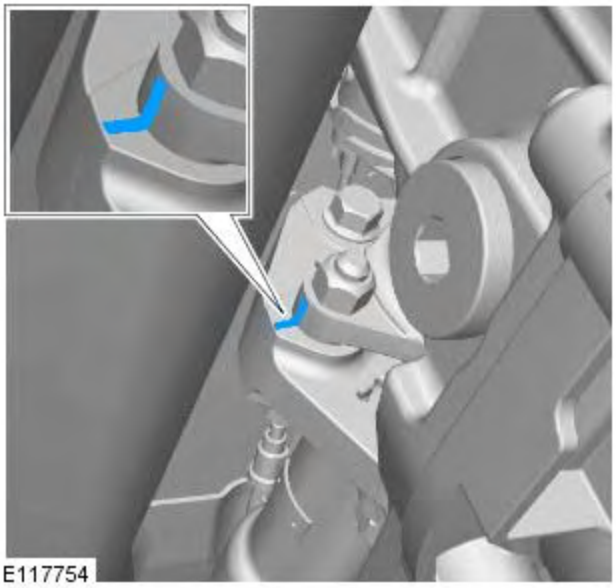
17. CAUTION: Only rotate the crankshaft clockwise.

- Make sure that the alignment mark is visible through the inspection hole on removal of the last torque converter bolt.

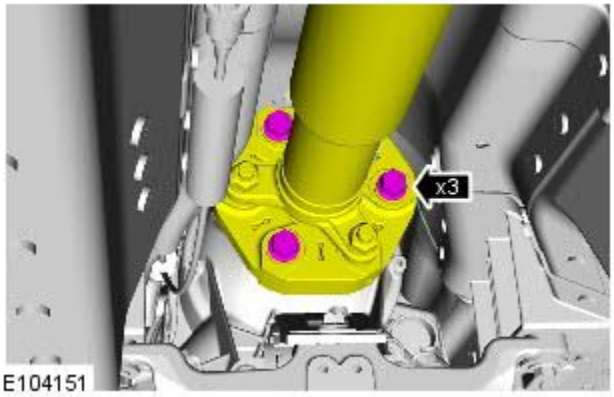
18.



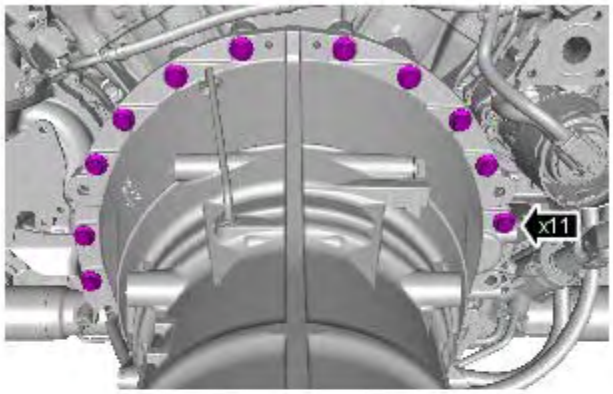
E100350


E117754

19. NOTE: Mark the position of the driveshaft on the transmission flange.

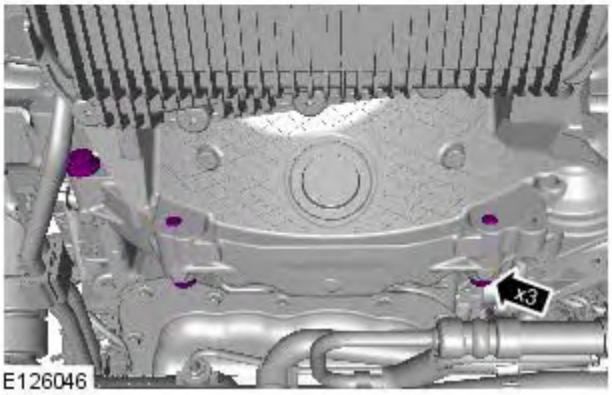


20. CAUTION: Under no circumstances must the flexible coupling (or it's fixings) be loosened or removed from the driveshaft.



21. WARNING: Make sure that the transmission is secured with suitable retaining straps.

Align the powertrain assembly jack to the transmission.



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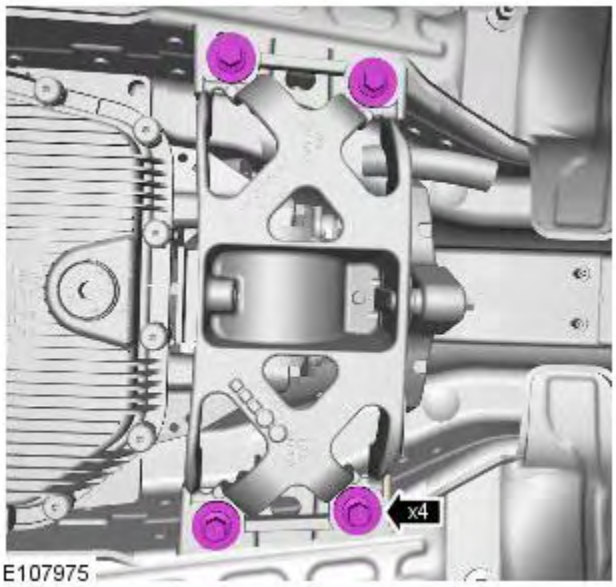
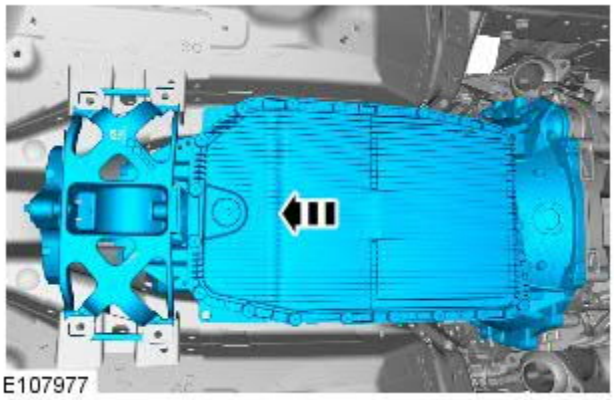


23. CAUTION: Make sure that the torque converter remains in the transmission.

NOTE: This step requires the aid of another technician.

- Install the torque converter retainer.



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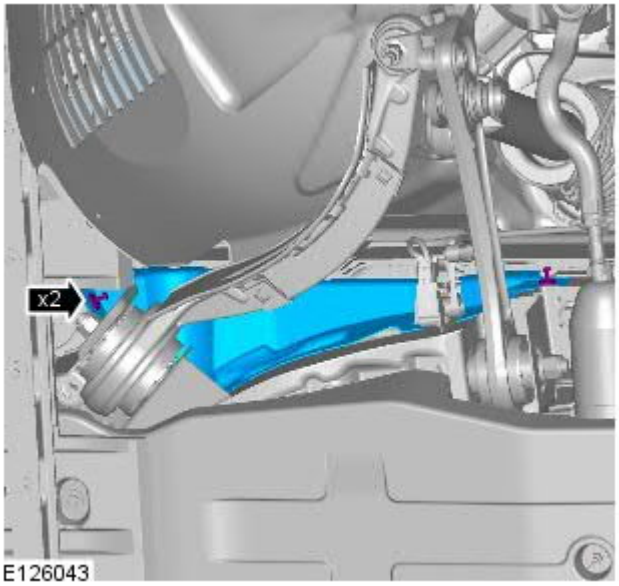

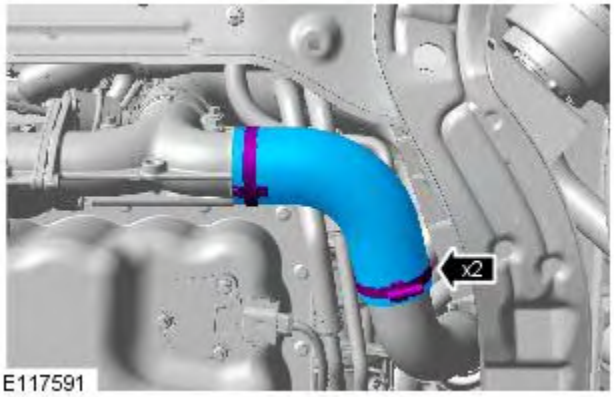

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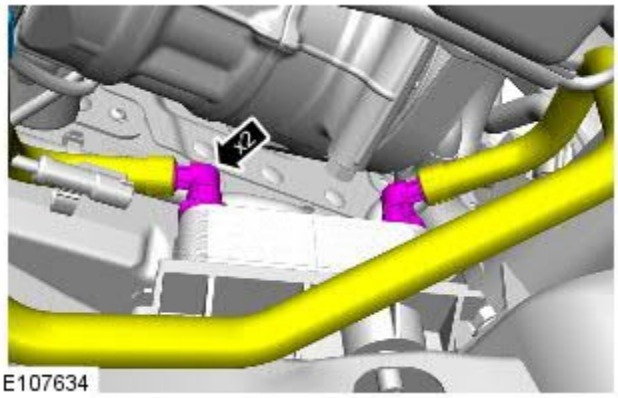
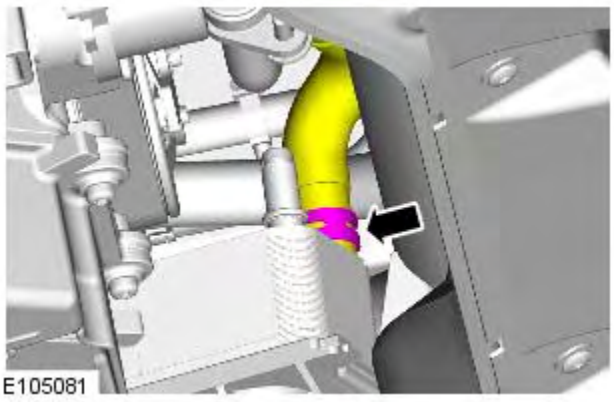


26. CAUTIONS:

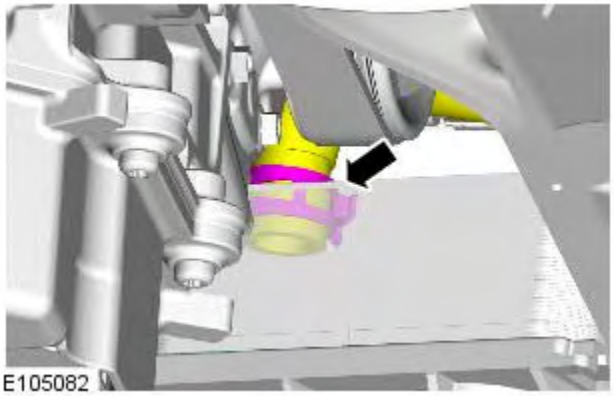
⚠ Be prepared to collect escaping fluids.

⚠ Make sure that all openings are sealed. Use new blanking caps.



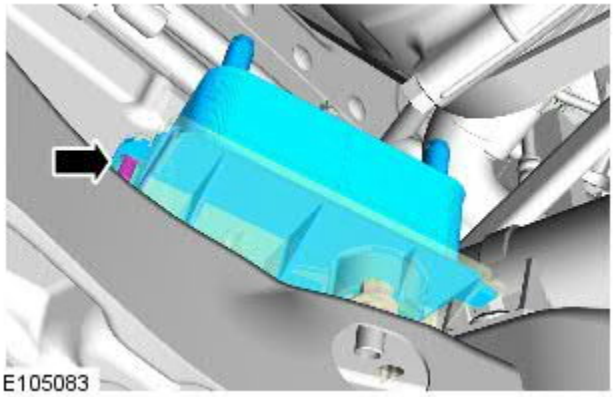
27. ⚠ CAUTION: Be prepared to collect escaping coolant.

△ NOTE: Clamp the hoses to minimize coolant loss.



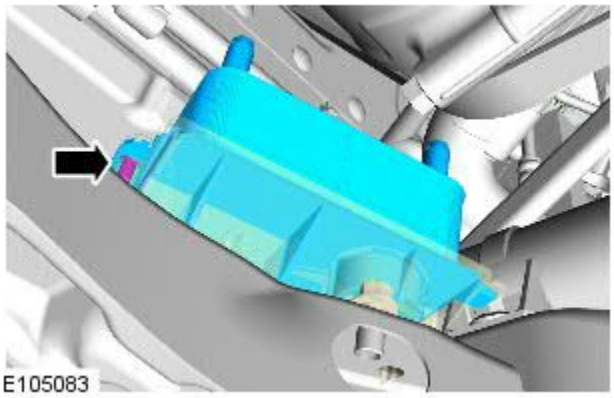
28. ⚠ CAUTION: Be prepared to collect escaping coolant.

△ NOTE: Clamp the hoses to minimize coolant loss.

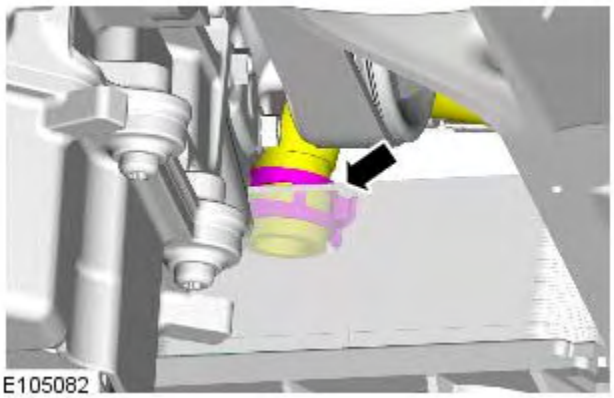


29. CAUTION: Be prepared to collect escaping fluids.

Installation

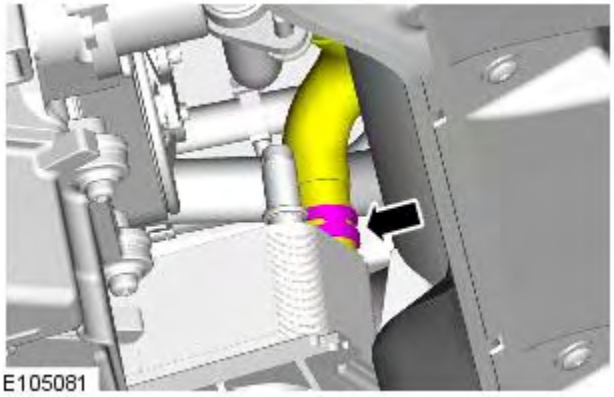


1. *Torque:* 5 Nm



2.

3.



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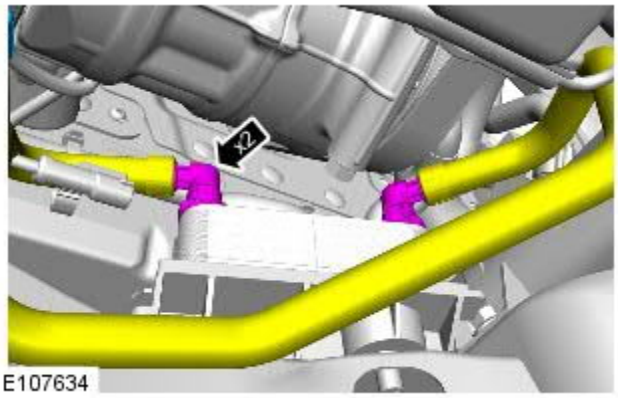
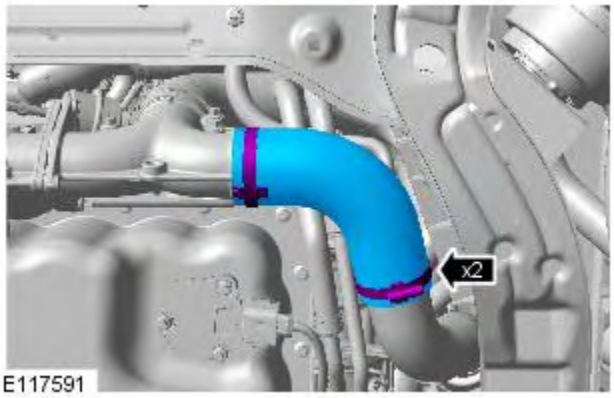


5. *Torque:* 5 Nm



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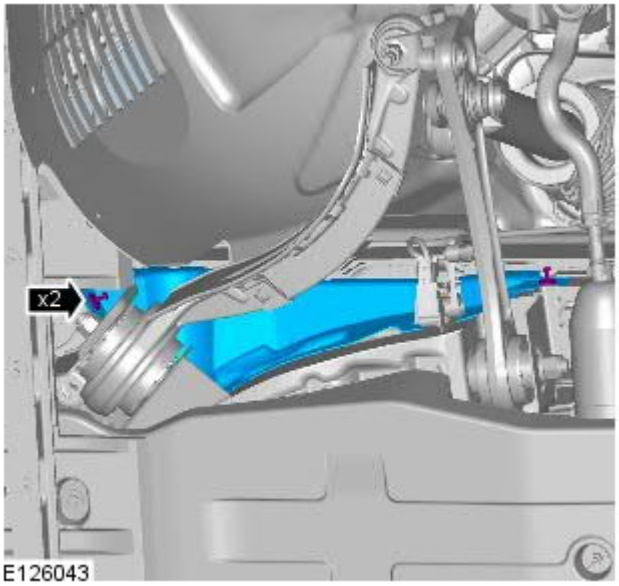
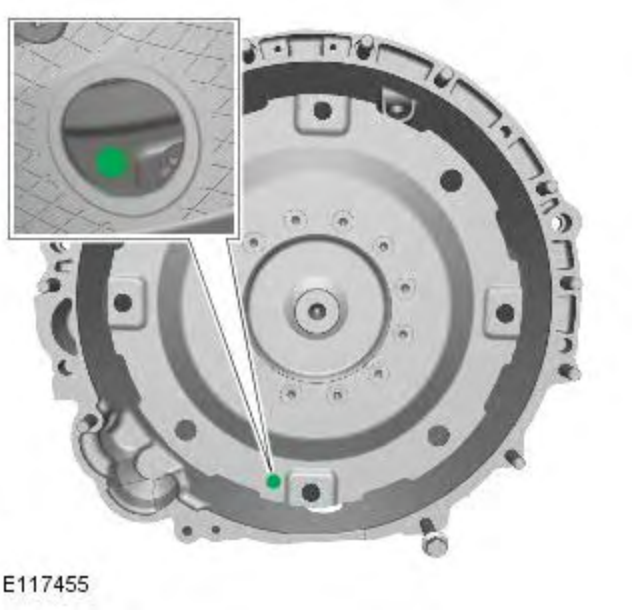
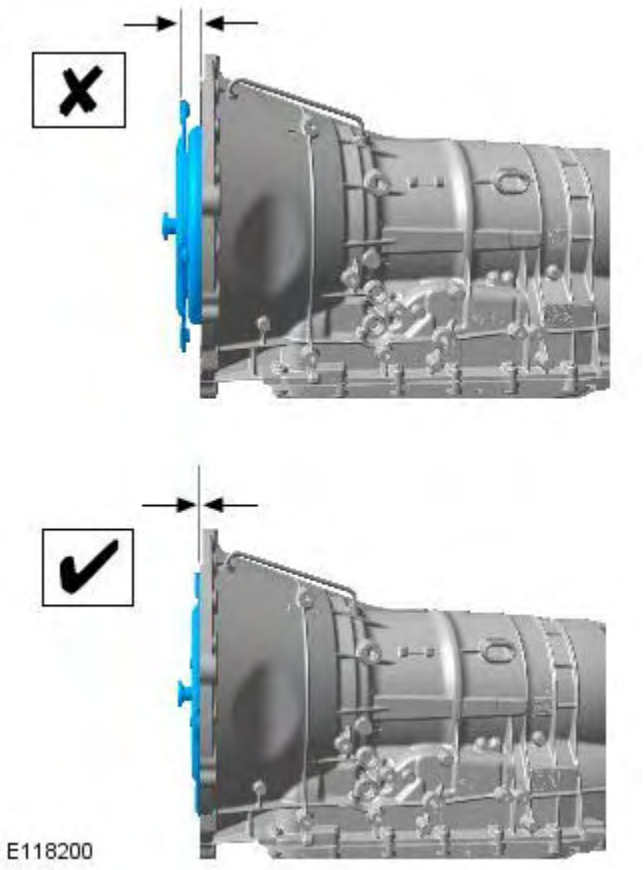
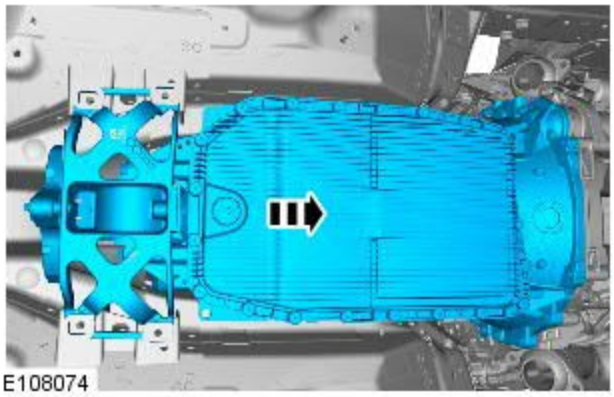


7. Make sure that the alignment mark is visible through the inspection hole on installation of the first torque converter bolt.



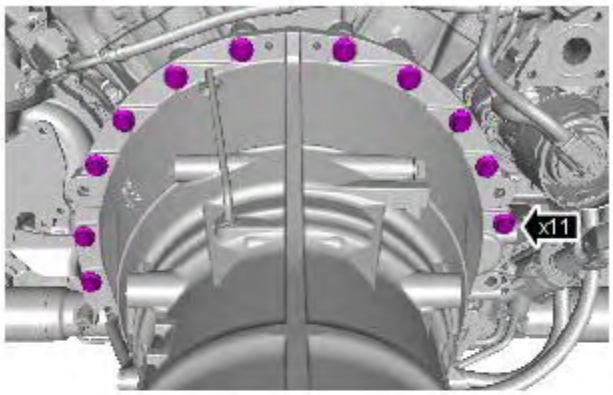


8. CAUTION: Make sure the torque converter is fully located into the oil pump drive.

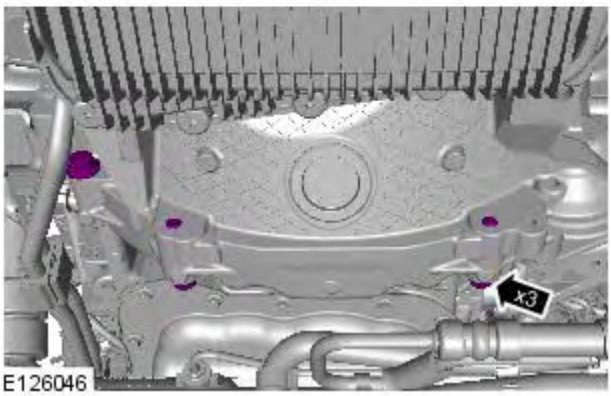


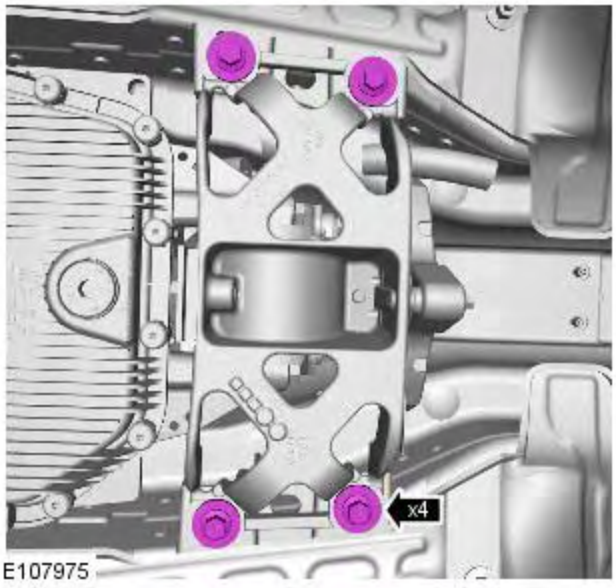
9. CAUTION: Make sure that the torque converter remains in the transmission.

   Raise the powertrain assembly jack and transmission assembly.



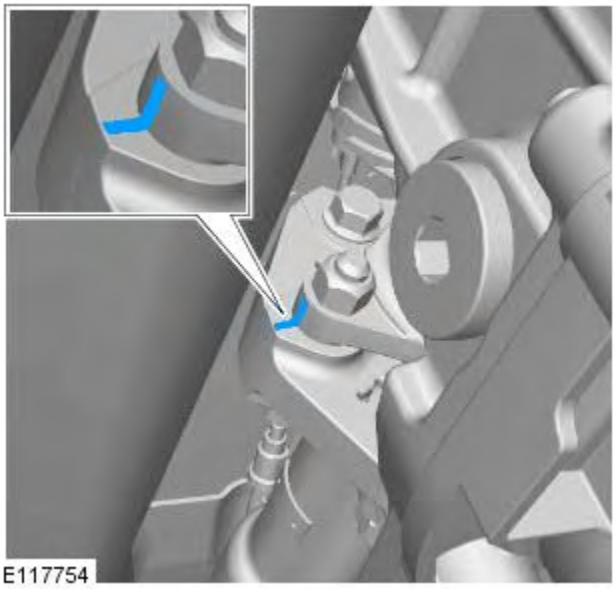
10. *Torque:* 48 Nm



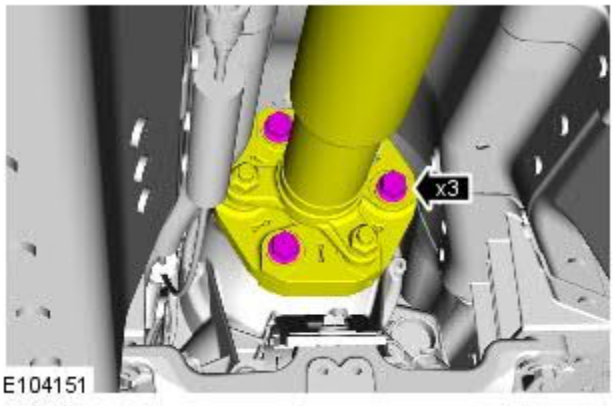


11. *Torque:* 48 Nm

12. Remove the transmission jack.



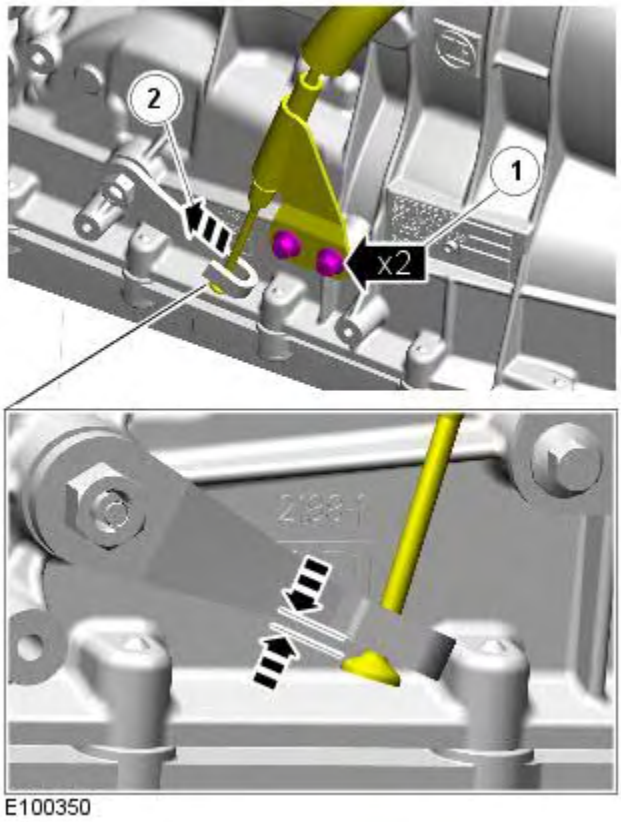
13. NOTE: Make sure that you re-align the driveshaft to the transmission flange using the alignment mark.



14. CAUTION: Under no circumstances must the flexible coupling (or it's fixings) be loosened or removed from the driveshaft.

Torque: 127 Nm

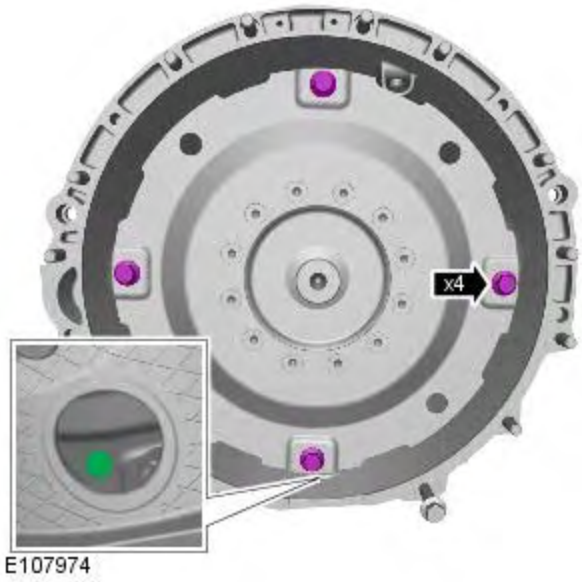
15. *Torque:* 10 Nm



E100350

16. CAUTION: Only rotate the crankshaft clockwise.

Torque: 63 Nm

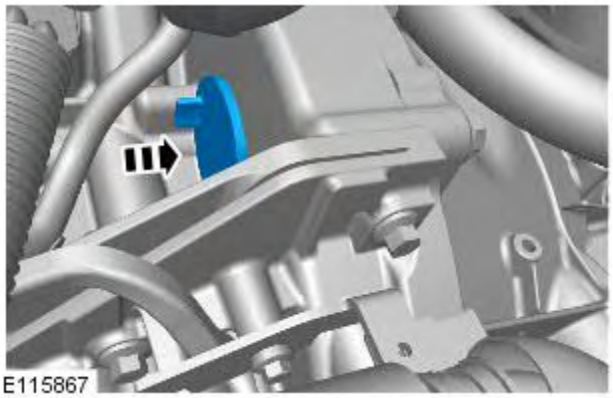


E107974

17.

E107972

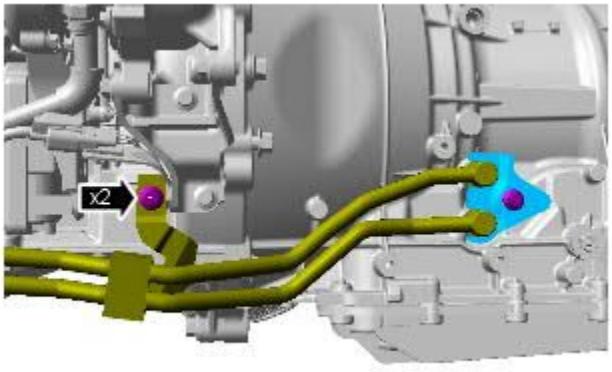
18.



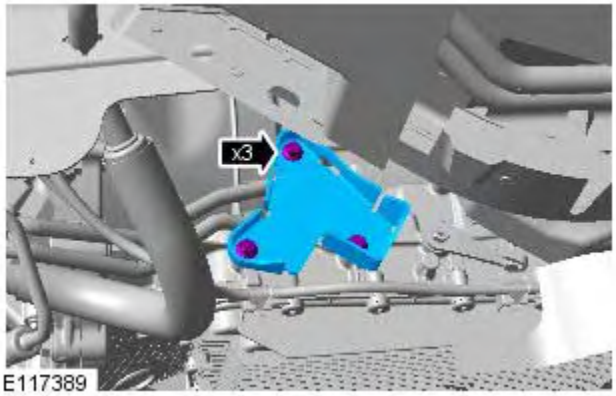
E115867

19. CAUTION: Install new o-ring seals

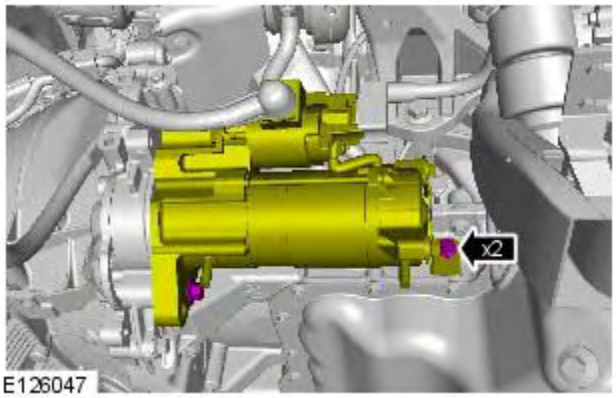
Torque: 10 Nm



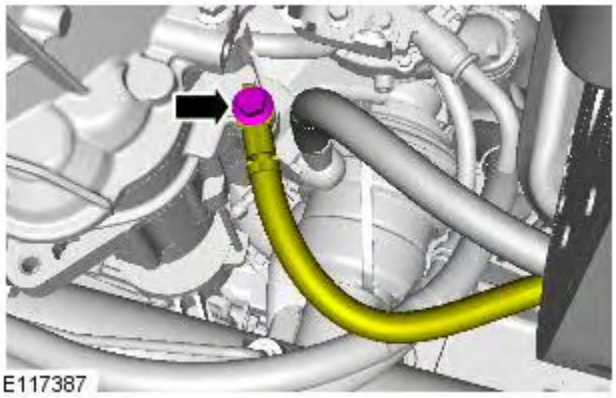
E117390



20. *Torque:* 23 Nm



21. *Torque:* 48 Nm



22. *Torque:* 30 Nm

23. Refer to: Exhaust Manifold Crossover Pipe (303-01 Engine - 3.0L V6 - TdV6, Removal and Installation).

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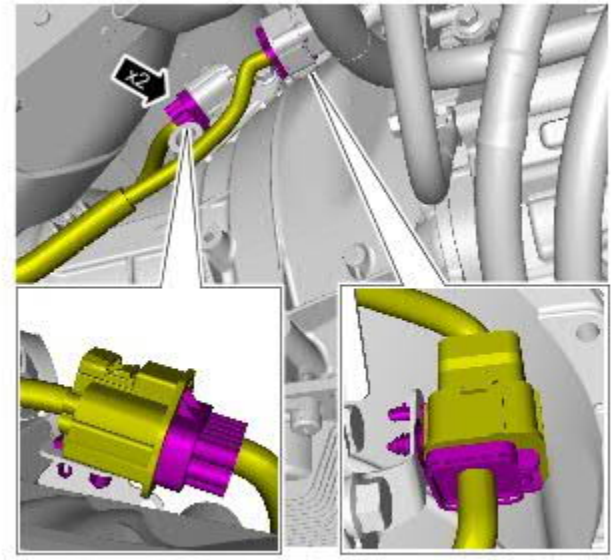
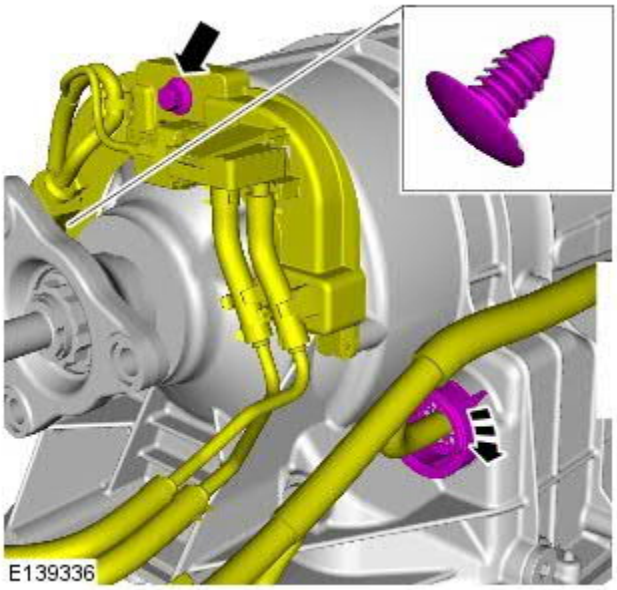
24.



E117393

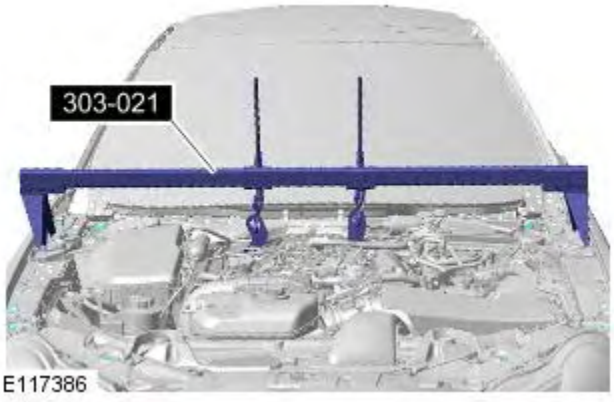
25.


E139336

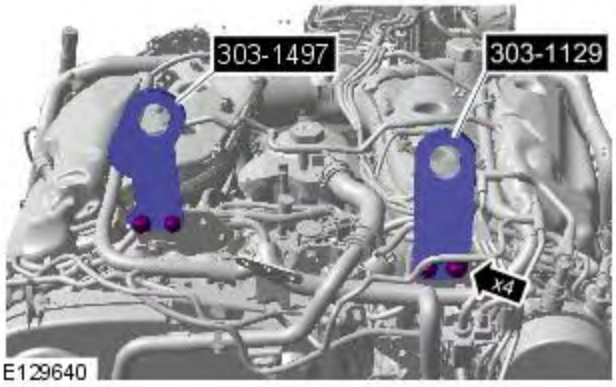
26. Lower the vehicle.

27.

- Remove the special tool supporting the engine.
- *Special Tool(s):* 303-021



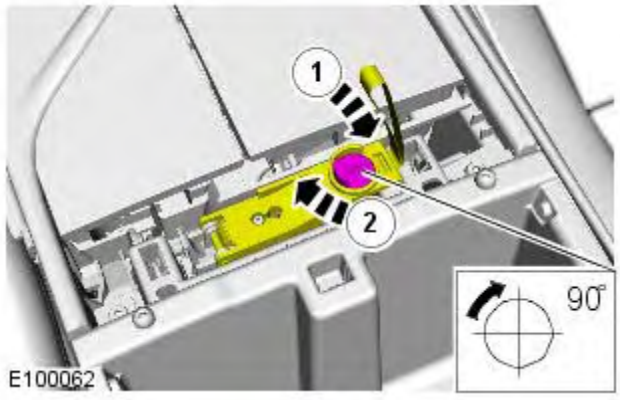
E117386



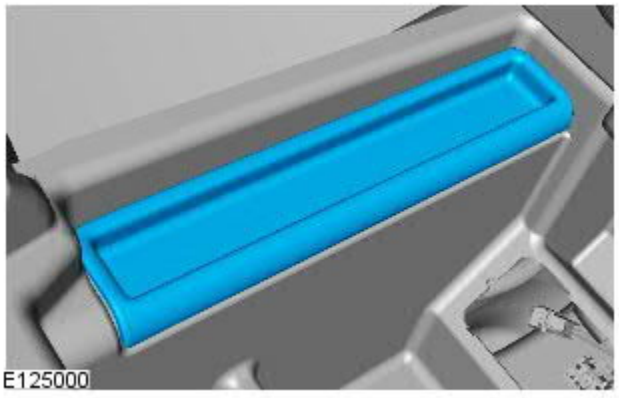
28.
- Remove the special tools from the engine.
- *Special Tool(s):* 303-1129, 303-1497

29. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

30. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).



31.



32.

33. Check and top up the cooling system as required.

34. Set the heater controls to HOT.

35. CAUTION: Observe the engine temperature warning light. If the warning light is displayed, switch off immediately and allow to cool. Failure to follow this instruction may cause damage to the vehicle.

Start the engine and allow to idle until hot air is emited at the face registers.

36. CAUTION: Observe the engine temperature warning light. If the warning light is displayed, switch off immediately and allow to cool. Failure to follow this instruction may cause damage to the vehicle.

    Raise the engine speed to 2000 RPM and maintain at 2000 RPM until the engine cooling fan operates.

37. CAUTION: Switch off the engine and allow the coolant temperature to go cold.

    Switch the engine off and allow to cool.

38. Visually check the engine and cooling system for signs of coolant leakage.

39. WARNINGS:

    When releasing the cooling system pressure, cover the coolant expansion tank cap with a thick cloth.

    Since injury such as scalding could be caused by escaping steam or coolant, make sure the vehicle cooling system is cool prior to carrying out this procedure.

    CAUTIONS:

    Make sure the coolant level remains above the "COLD FILL RANGE" lower level mark.

    Anti-freeze concentration must be maintained at 50%.

    NOTE: When the cooling system is warm, the coolant will be approximately 10mm above the upper level mark on the expansion tank with the cap removed.

    Check and top-up the coolant if required.

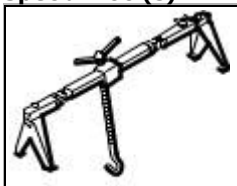
40. Refer to: Transmission Fluid Level Check (307-01 Automatic Transmission/Transaxle, General Procedures).

Published: 06-Jun-2013

Automatic Transmission/Transaxle - Transmission TDV6 3.0L Diesel

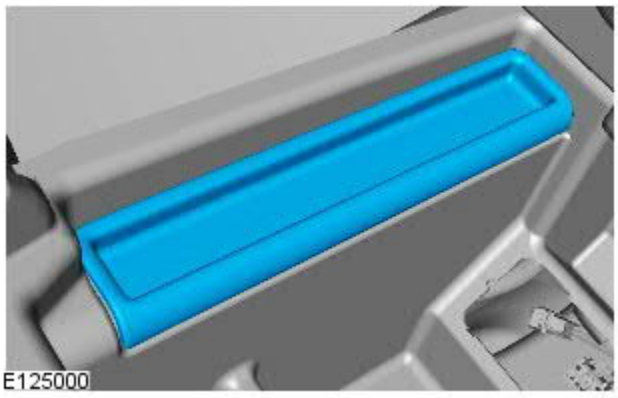
Removal

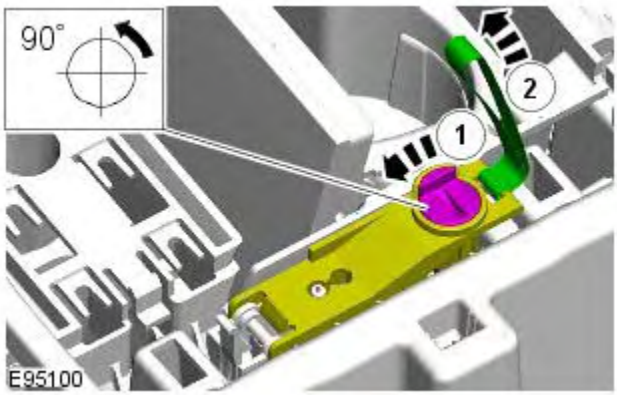
Special Tool(s)

 303-021	303-021 Engine support bracket
 E54554	303-1129 Engine Lifting Brackets
 E116925	303-1497 Left-Hand Rear Engine Lifting Bracket

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1.

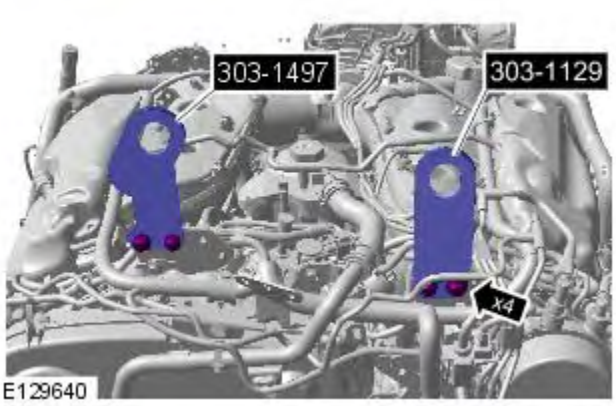

E125000



2.

3. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

4. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).



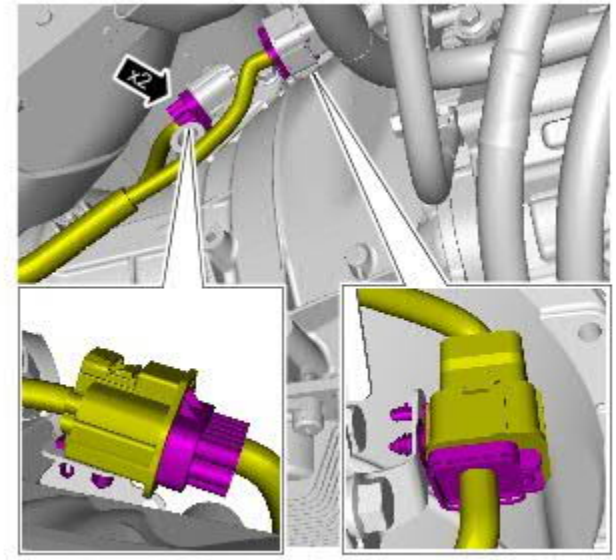
5. *Special Tool(s):* 303-1129, 303-1497
Torque: 22 Nm

6. *Special Tool(s):* 303-021

7. WARNING: Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

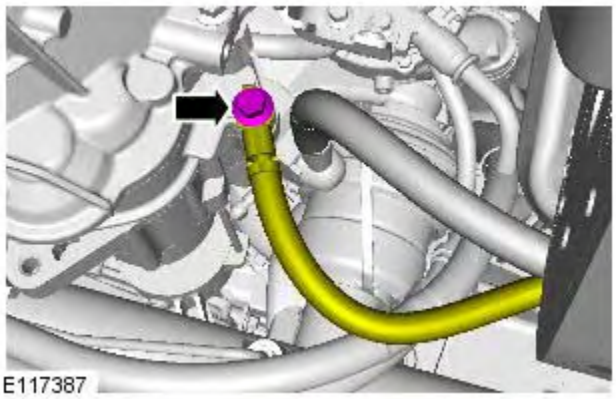
8.

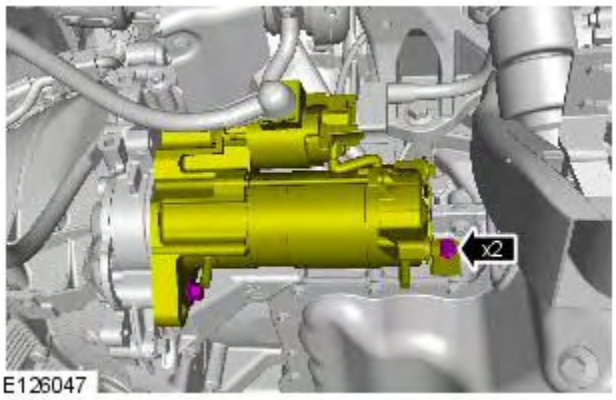


E117393

9. Refer to: Exhaust Manifold Crossover Pipe (303-01 Engine - 3.0L V6 - TdV6, Removal and Installation).

10.

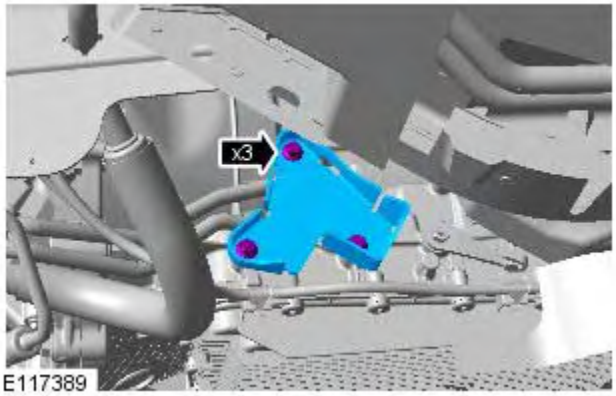

E117387



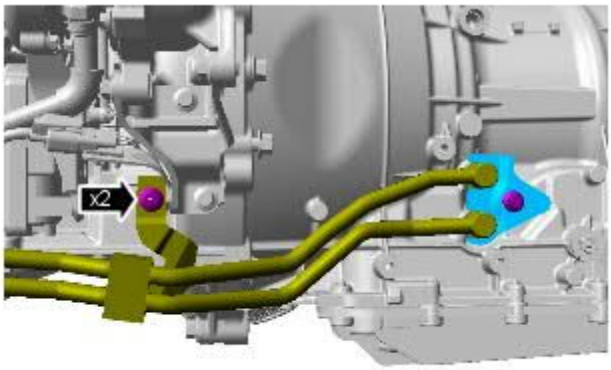
E126047

11. NOTE: Secure with cable ties.

12.

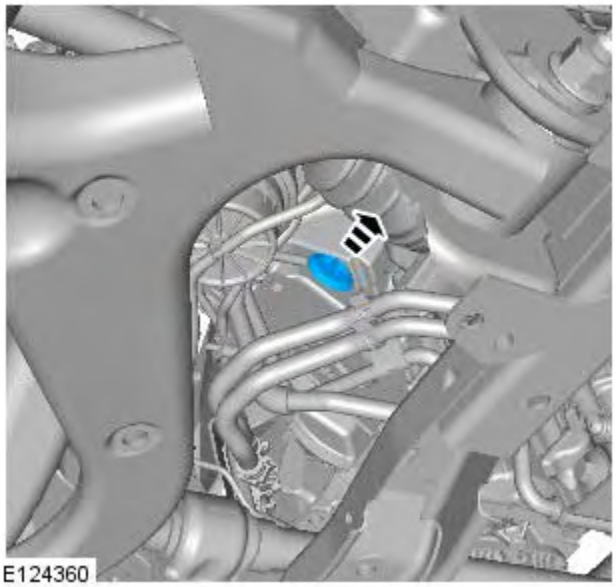


E117389

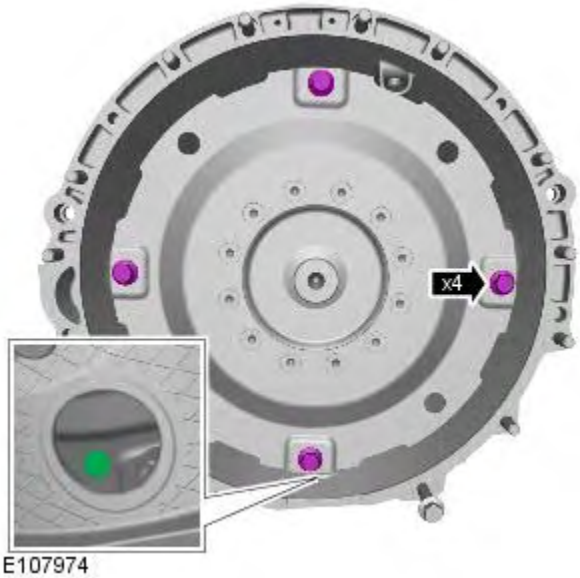


E117390

13. NOTE: Remove and discard the O-ring seals.
    - Install blanking caps to the exposed ports.


E124360

14. Remove the rubber access cover.

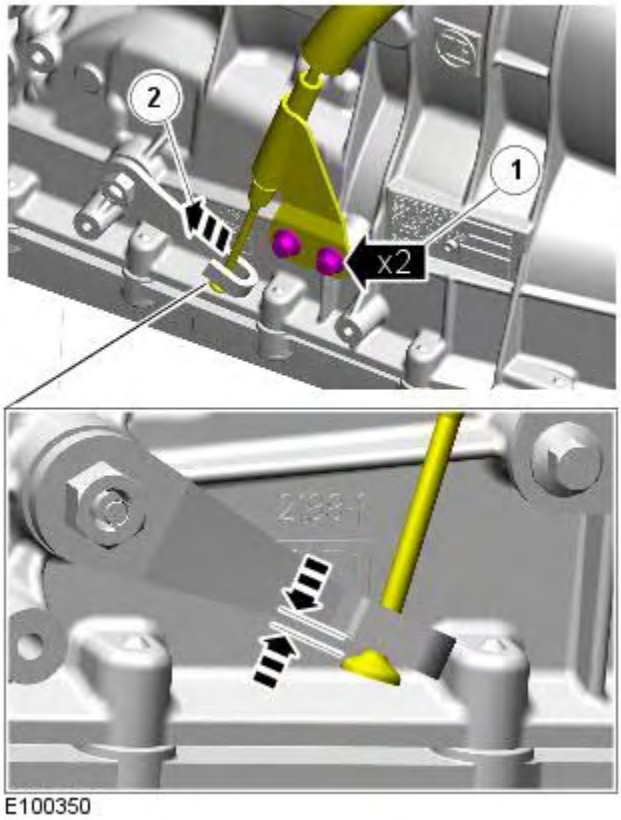


E107974

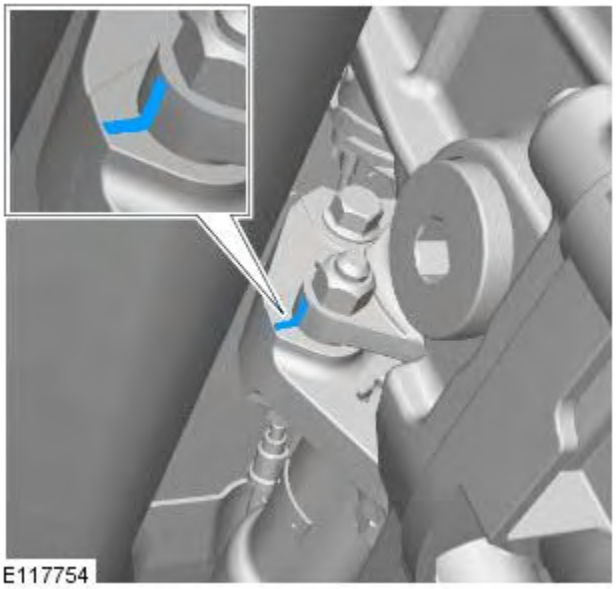
15. CAUTION: Only rotate the crankshaft clockwise.

- Make sure that the alignment mark is visable through the inspection hole on removal of the last torque converter bolt.

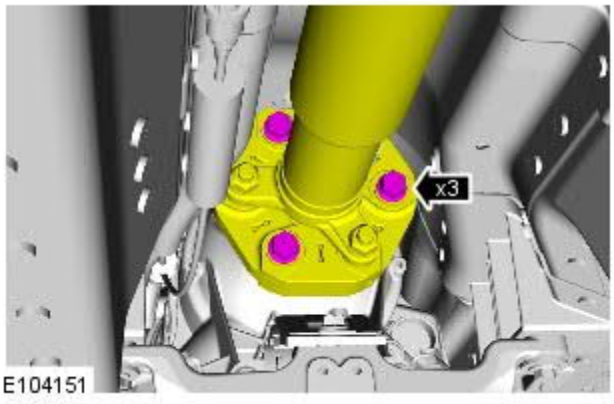
16.



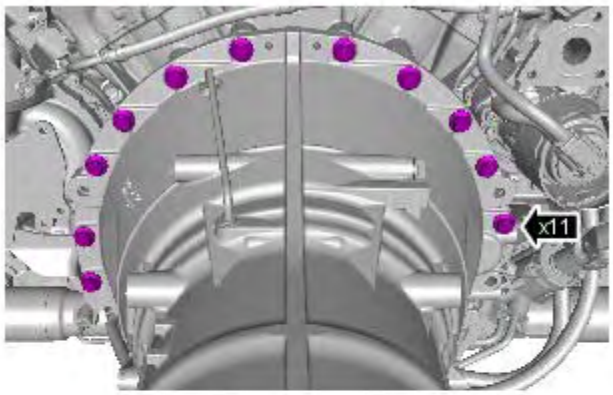
E100350



17. NOTE: Mark the position of the driveshaft on the transmission flange.

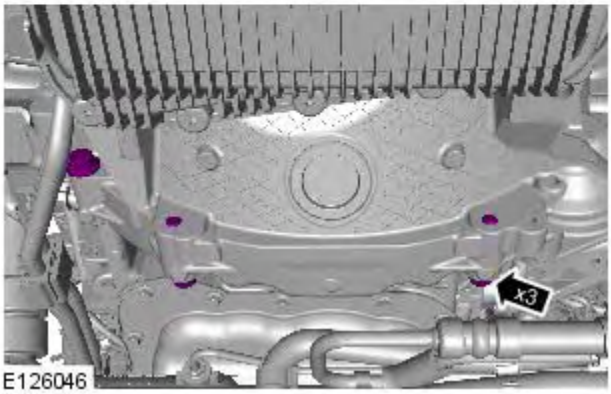


18. CAUTION: Under no circumstances must the flexible coupling (or it's fixings) be loosened or removed from the driveshaft.



19. WARNING: Make sure that the transmission is secured with suitable retaining straps.

    Align the powertrain assembly jack to the transmission.



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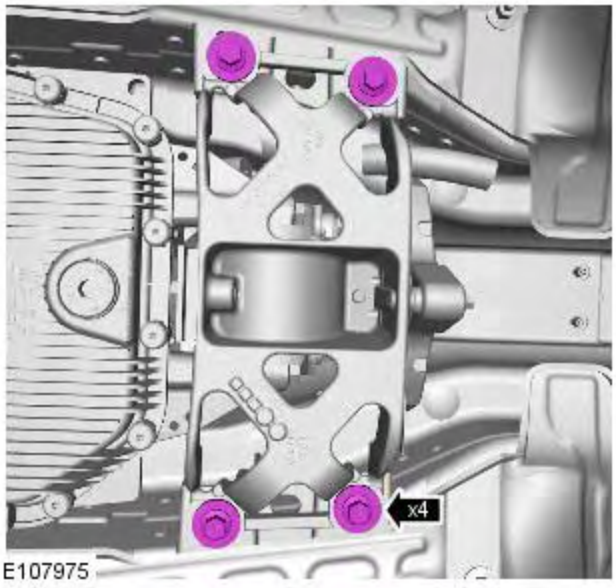
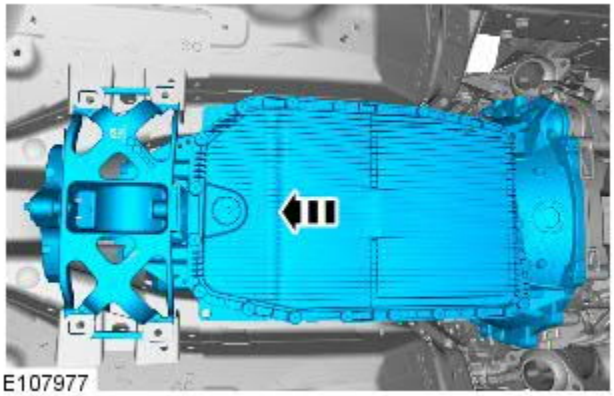



E107977

21. CAUTION: Make sure that the torque converter remains in the transmission.

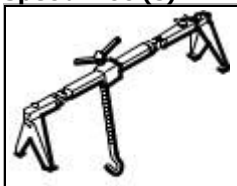
    Lower the transmission jack.

Published: 11-May-2011

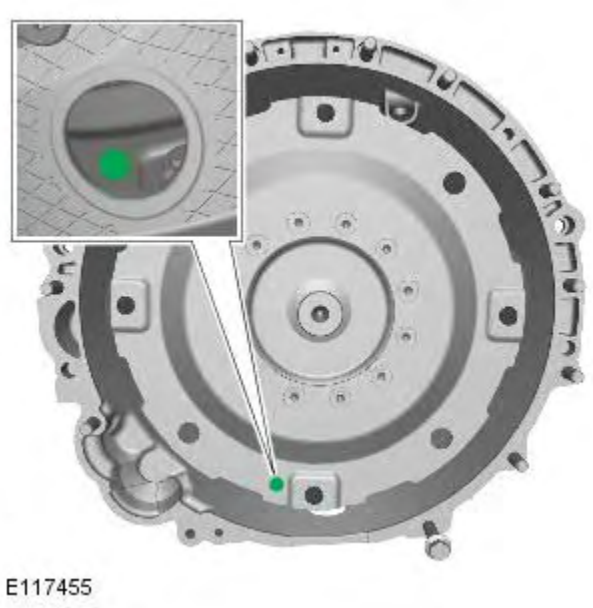
Automatic Transmission/Transaxle - Transmission TDV6 3.0L Diesel

Installation

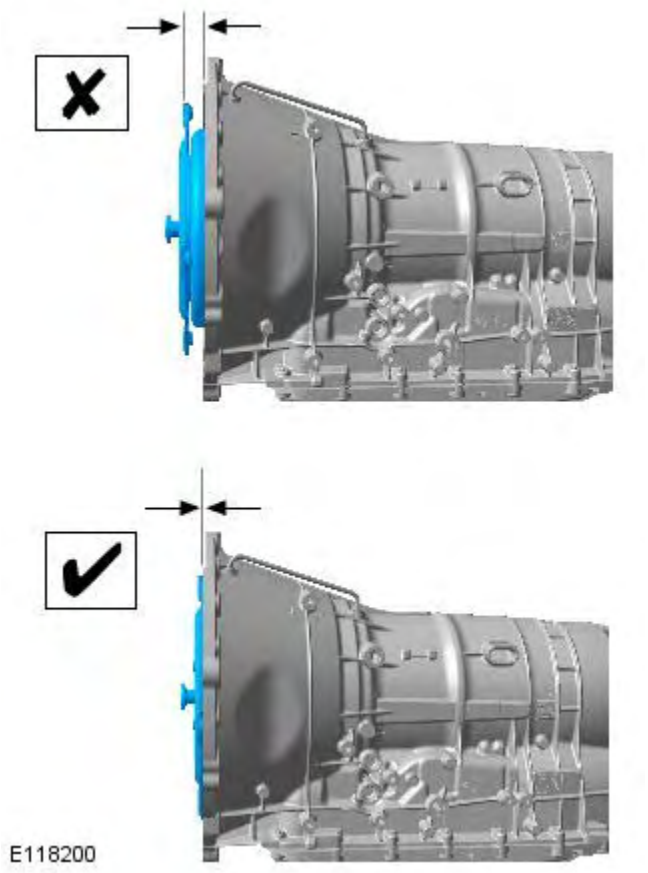
Special Tool(s)

 303-021	303-021 Engine support bracket
E54554	303-1129 Engine Lifting Brackets
E116925	303-1497 Left-Hand Rear Engine Lifting Bracket

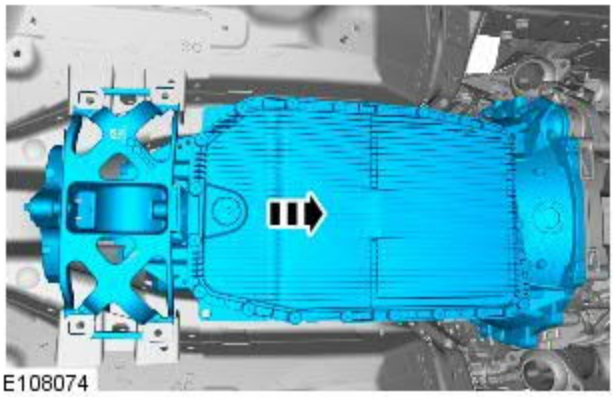
NOTE: Some variation in the illustrations may occur, but the essential information is always correct.


E117455

1. Make sure that the alignment mark is visable through the inspection hole on installation of the first torque converter bolt.

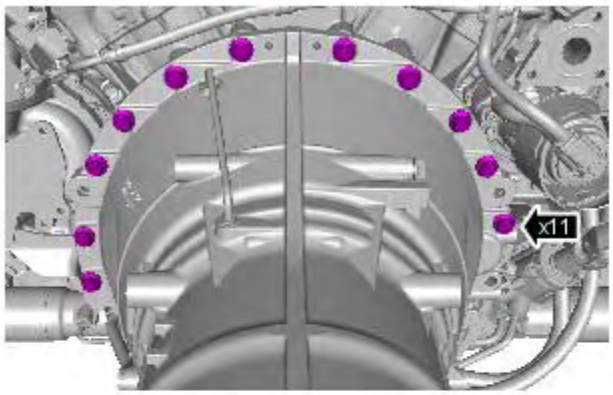


2. CAUTION: Make sure the torque converter is fully located into the oil pump drive.

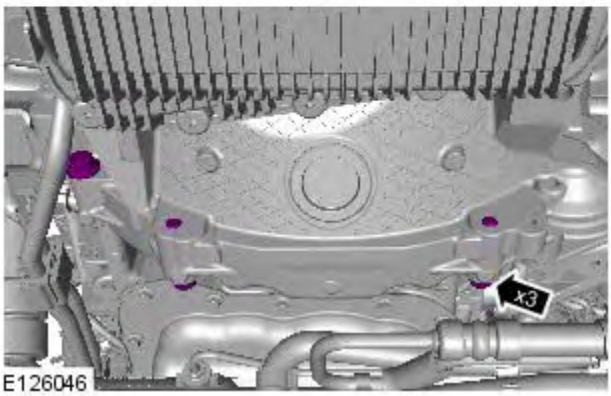


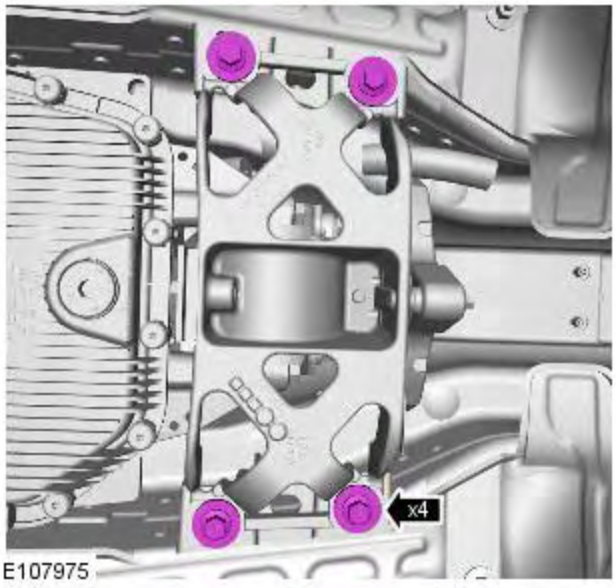
3. CAUTION: Make sure that the torque converter remains in the transmission.

   Raise the powertrain assembly jack and transmission assembly.



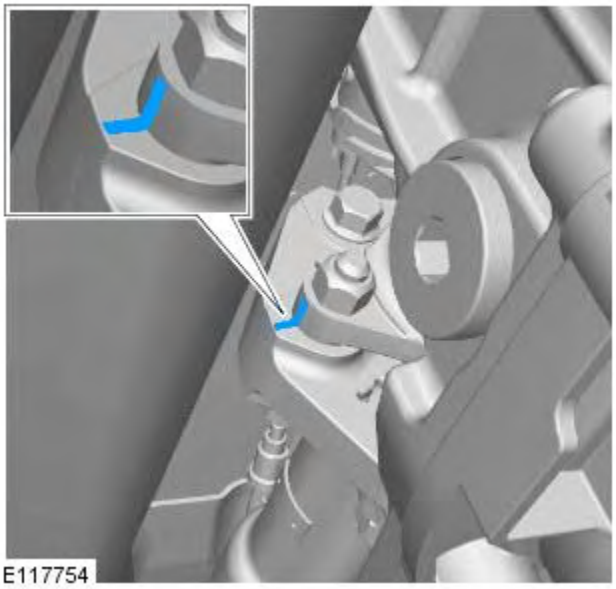
4. *Torque:* 48 Nm



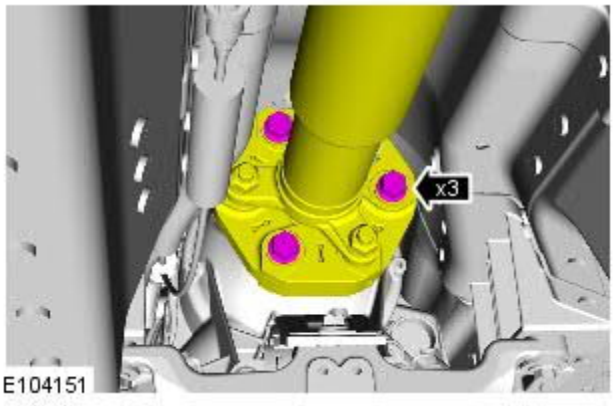


5. *Torque:* 48 Nm

6. Remove the transmission jack.



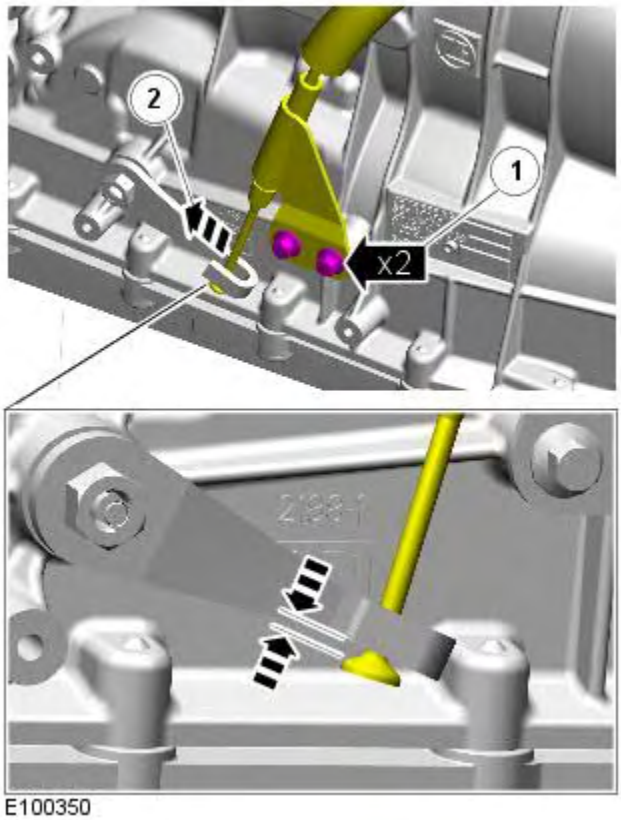
7. NOTE: Make sure that you re-align the driveshaft to the transmission flange using the alignment mark.



8. CAUTION: Under no circumstances must the flexible coupling (or it's fixings) be loosened or removed from the driveshaft.

Torque: 127 Nm

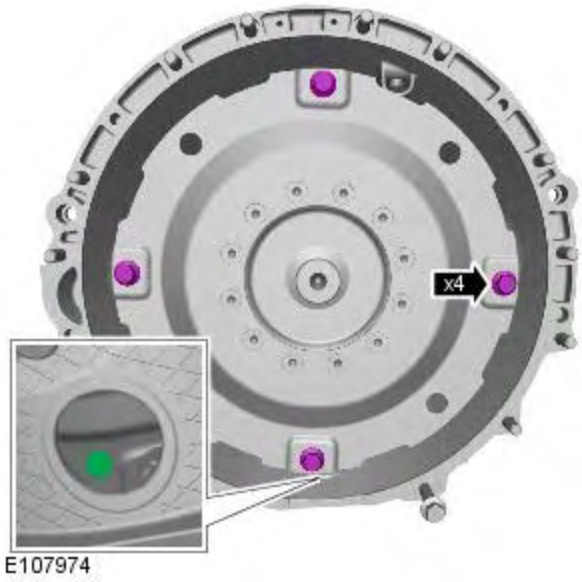
9. *Torque:* 10 Nm



E100350

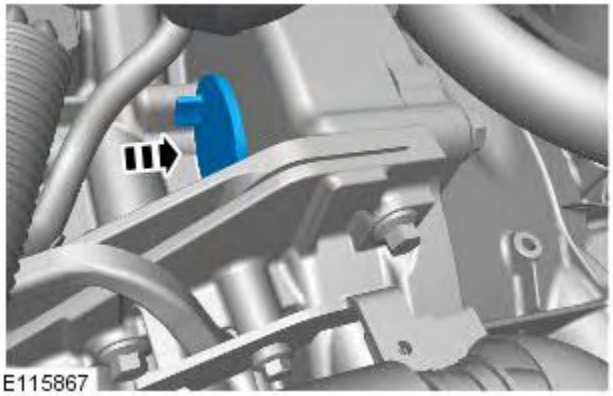
10. CAUTION: Only rotate the crankshaft clockwise.

Torque: 63 Nm



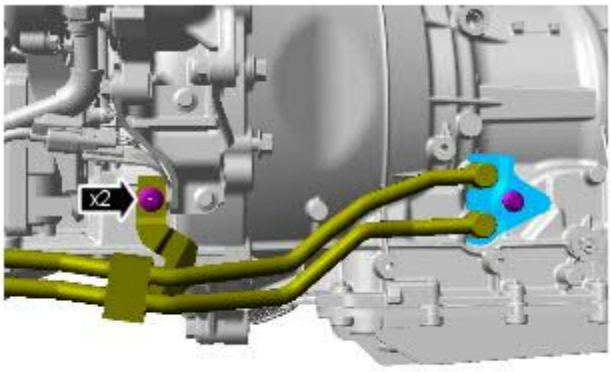
E107974

11.


E115867

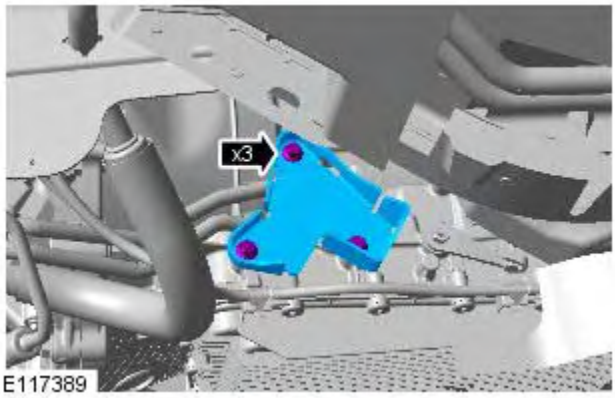
12. CAUTION: Install new o-ring seals

Torque: 10 Nm



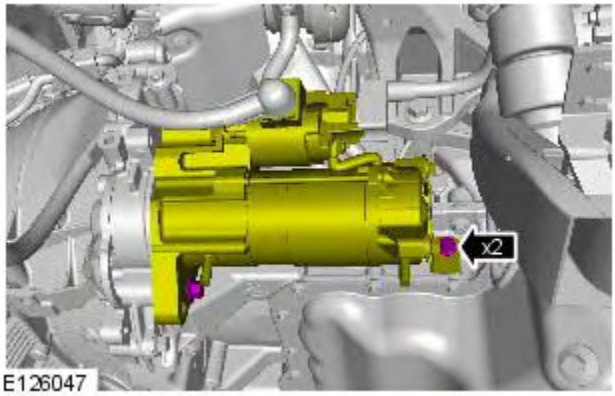
E117390

13. *Torque:* 23 Nm

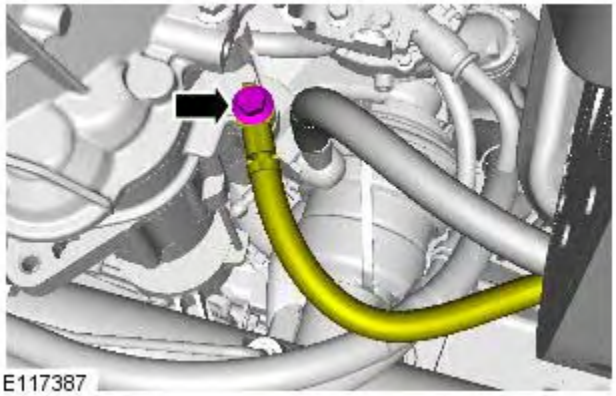


E117389

14. *Torque:* 48 Nm

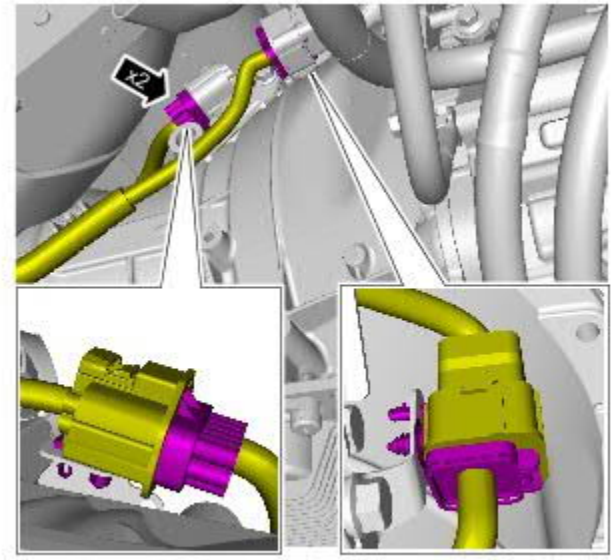


E126047


E117387

15. *Torque:* 30 Nm

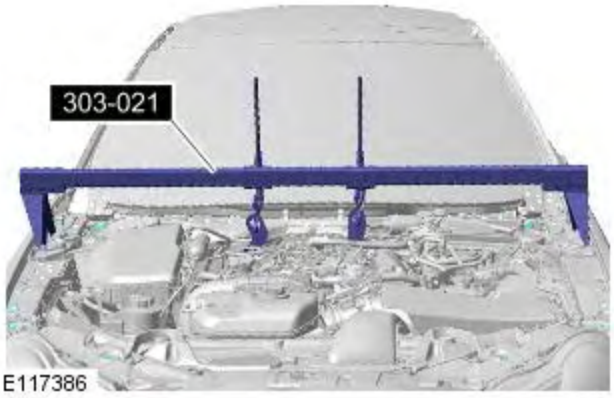
16. Refer to: Exhaust Manifold Crossover Pipe (303-01 Engine - 3.0L V6 - TdV6, Removal and Installation).



E117393

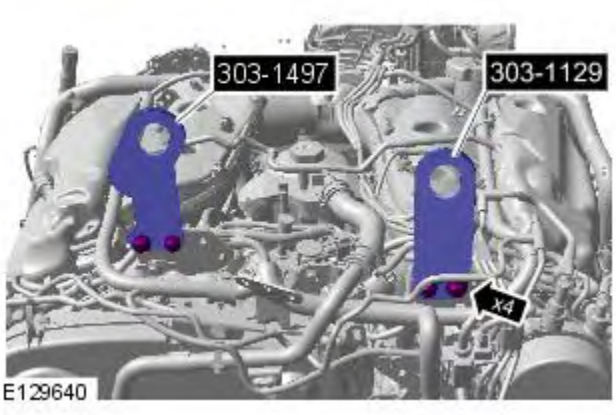
17.

18. Lower the vehicle.



E117386

19.
- Remove the special tool supporting the engine.
- *Special Tool(s):* 303-021

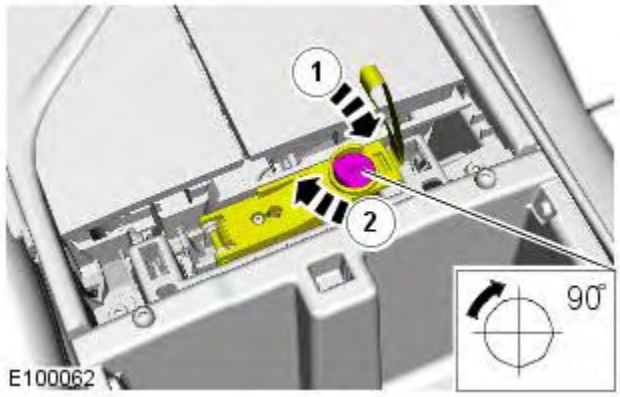


20.

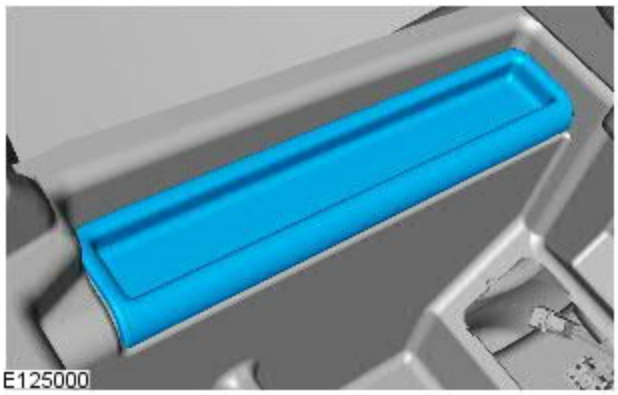
- Remove the special tools from the engine.
- *Special Tool(s):* 303-1129, 303-1497

21. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

22. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).



23.



24.

Published: 22-Nov-2012

Transmission/Transaxle Cooling -

Item	Specification
Transmission fluid	ATF Shell M 1375.4

Vehicles with 3.0L diesel engine

Description	Nm	lb-ft	lb-in
Transmission fluid cooler tube to transmission housing bolt	23	17	-
Transmission fluid cooler tube bracket to engine oil pan retaining bolt	23	17	-
Transmission fluid cooler retaining bolt	5	-	44

Vehicles with 5.0L and 3.0L S/C petrol engine

Description	Nm	lb-ft	lb-in
Transmission fluid cooler tube to transmission housing bolt	23	17	-
Transmission fluid cooler tube bracket to engine oil pan retaining nut	11	8	-
Transmission fluid cooler retaining bolt	5	-	44

Vehicles with 3.0L N/A petrol engine

Description	Nm	lb-ft
Transmission fluid cooler tube to transmission housing bolt	22	16
Transmission fluid cooler tube bracket to engine oil pan retaining nut	8	6
Transmission fluid cooler tube to cooler unions	20	15

Vehicles with 2.0L petrol engine

Description	Nm	lb-ft	lb-in
Transmission fluid cooler tube to transmission housing bolt	23	17	-
Transmission fluid cooler tube bracket to engine oil pan retaining nut	11	8	-
Transmission fluid cooler retaining bolt	5	-	44

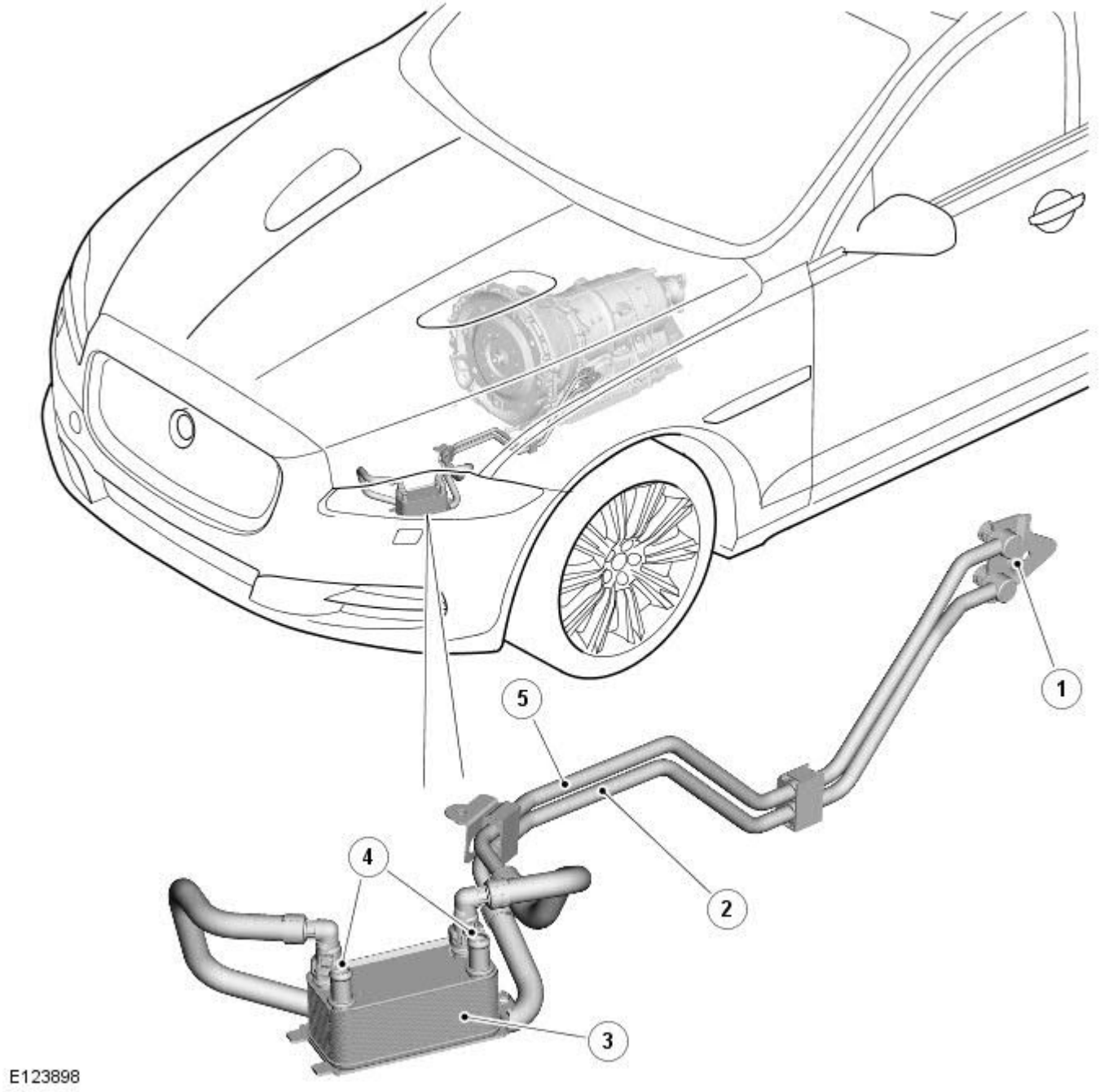
Published: 11-May-2011

Transmission/Transaxle Cooling - Transmission Cooling - Component Location

Description and Operation

NOTE: Installation for 5.0L engines shown; installation for 3.0L diesel similar.

COMPONENT LOCATION



Item	Description
1	Latch-plate
2	Feed hose and pipe (from transmission)
3	Transmission fluid cooler
4	Engine coolant hose connections
5	Return hose and pipe (to transmission)

Published: 11-May-2011

Transmission/Transaxle Cooling - Transmission Cooling - Overview

Description and Operation

OVERVIEW

Transmission cooling is provided by a transmission fluid cooler, which transfers heat from the transmission to the engine cooling system. The transmission fluid cooler is attached to a mounting bracket on the front subframe, in the front left corner of the engine compartment.

Two hose and pipe assemblies connect the transmission fluid cooler to the automatic transmission. Two engine coolant hose connections are incorporated into the top of the transmission fluid cooler for the supply and return of coolant from the engine cooling system. For additional information, refer to:

Engine Cooling (303-03A Engine Cooling - TDV6 3.0L Diesel, Description and Operation),
Engine Cooling (303-03B Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Description and Operation).

Published: 11-May-2011

Transmission/Transaxle Cooling - Transmission Cooling - System Operation and Component Description

Description and Operation

System Operation

Fluid from the pump in the automatic transmission flows through the feed hose and pipe to the transmission fluid cooler. The fluid then flows through the transmission fluid cooler, and the return hose and pipe, to the sump of the automatic transmission.

Published: 11-May-2011

Transmission/Transaxle Cooling - Transmission Cooling

Diagnosis and Testing

Principle of Operation

For a detailed description of the automatic transmission cooling system and operation, refer to the relevant Description and Operation sections in the workshop manual. REFER to: (307-02 Transmission/Transaxle Cooling)

Transmission Cooling (Description and Operation),
Transmission Cooling (Description and Operation),
Transmission Cooling (Description and Operation).

Inspection and Verification

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical
• Feed and return tubes • Connections to the automatic transmission and the automatic transmission fluid cooler • Automatic transmission fluid level

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Condition	Possible Causes	Action
Over heating of the automatic transmission	Obstruction in the automatic transmission fluid cooler	Flush out the automatic transmission fluid cooler with new automatic transmission fluid. If the flushing is unsuccessful, install a new transmission fluid cooler.
Over heating of the automatic transmission	Obstruction in the automatic transmission fluid tubes	Flush out the automatic transmission fluid cooler tubes with new automatic transmission fluid. If the flushing is unsuccessful install new automatic transmission fluid cooler tubes.
Loss of automatic transmission fluid	Connections to the automatic transmission and the automatic transmission fluid cooler	Check the integrity of the tubes, connections and seals. Check the torque of the tube fixings.
Loss of automatic transmission fluid	Leak at oil cooler	Check the integrity of tubes, connections and seals. Check the torque of the tube fixings.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Transmission Control Module (TCM) (100-00 General Information, Description and Operation).

Published: 14-Nov-2013

Transmission/Transaxle Cooling - Transmission Fluid Cooler TDV6 3.0L Diesel

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

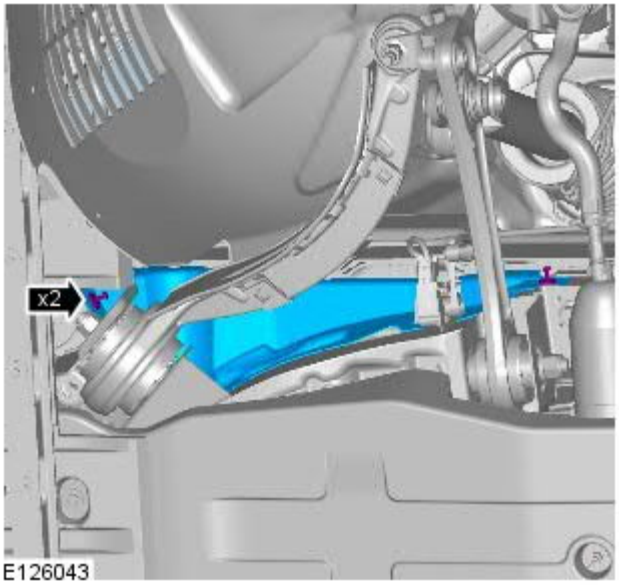
   Raise and support the vehicle.

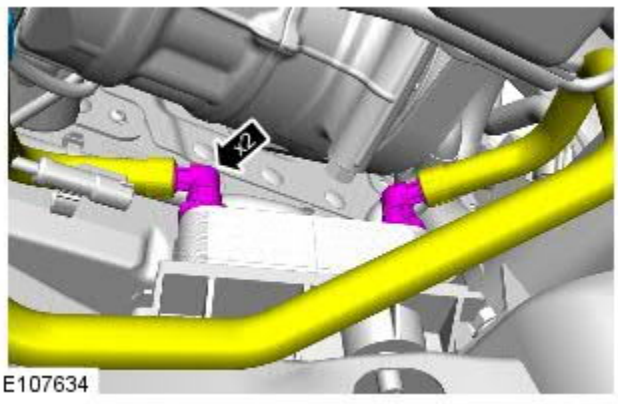
2. Refer to: Transmission Fluid Drain and Refill (307-01 Automatic Transmission/Transaxle, General Procedures).

3. Refer to: Cooling System Partial Draining, Filling and Bleeding (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).

4. Refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel, Removal and Installation).

5.

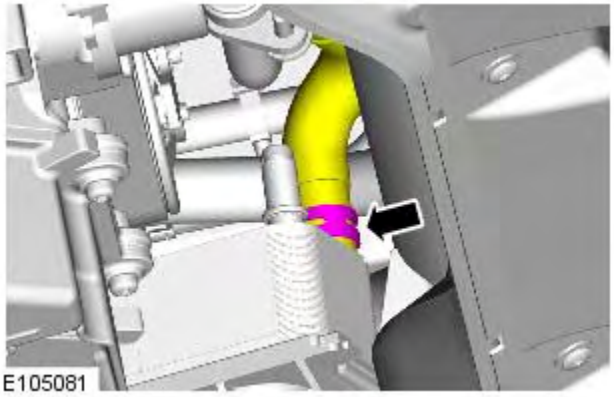




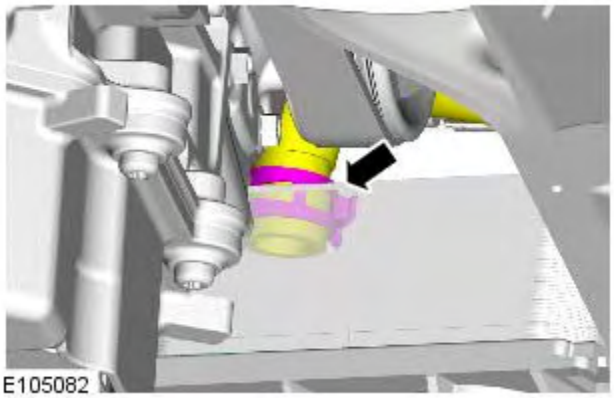
6. CAUTIONS:

   Be prepared to collect escaping fluids.

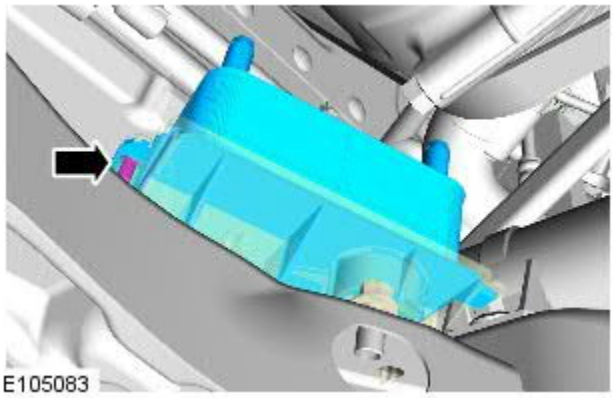
   Make sure that all openings are sealed. Use new blanking caps.



7. CAUTION: Be prepared to collect escaping coolant.



8. CAUTION: Be prepared to collect escaping coolant.



9. CAUTION: Be prepared to collect escaping fluids.

   Torque: 5 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Transmission/Transaxle Cooling - Transmission Fluid Cooler Tubes TDV6 3.0L Diesel

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel, Removal and Installation).

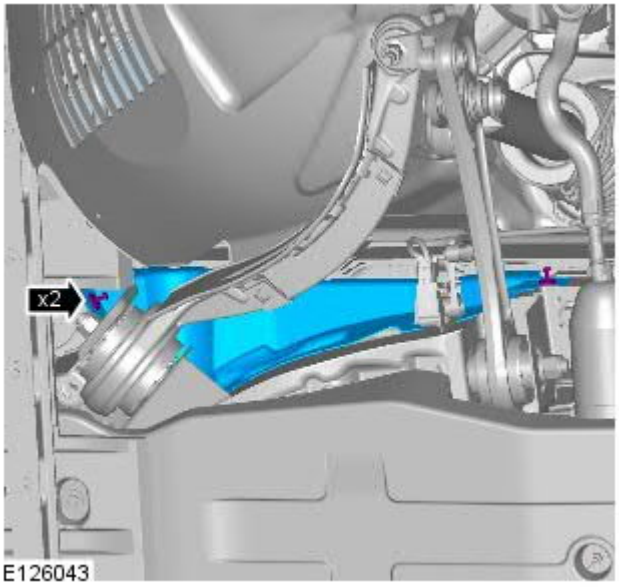
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Refer to: Catalytic Converter (309-00A Exhaust System - TDV6 3.0L Diesel, Removal and Installation).

4. Refer to: Transmission Fluid Drain and Refill (307-01 Automatic Transmission/Transaxle, General Procedures).

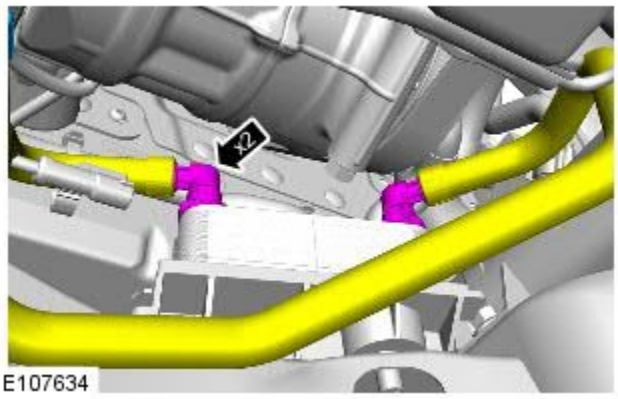
5.

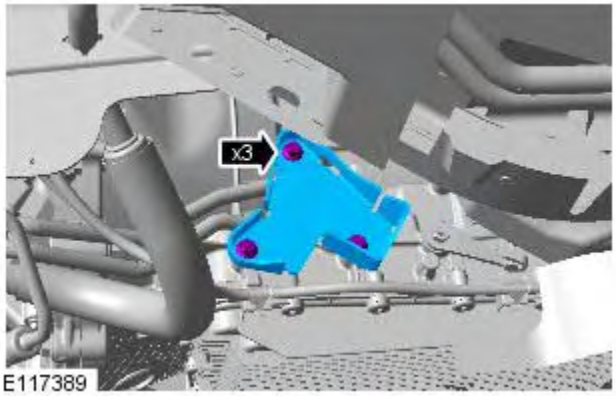


6. CAUTIONS:

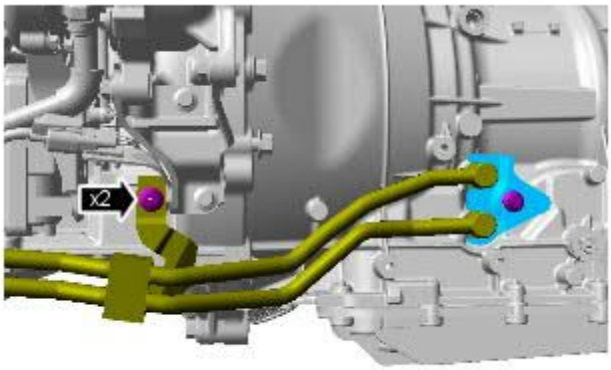
   Be prepared to collect escaping fluids.

   Make sure that all openings are sealed. Use new blanking caps.





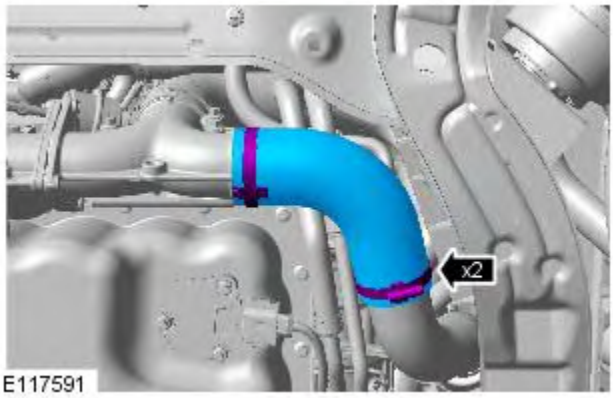
7. *Torque:* 23 Nm



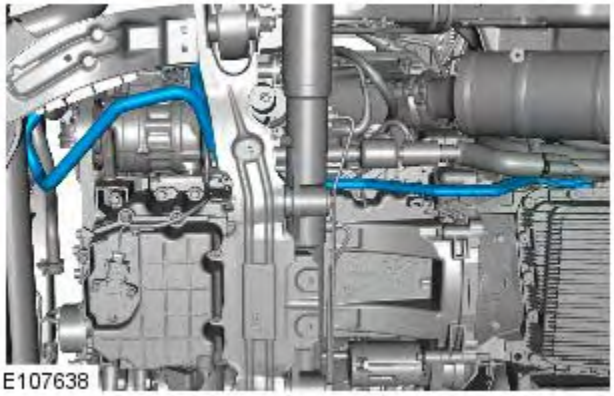
8. WARNING: Be prepared to catch escaping fluid.

NOTE: Remove and discard the O-ring seals.

Torque: 23 Nm



9. *Torque:* 5 Nm



10. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Automatic Transmission/Transaxle External Controls -

Torque Specifications

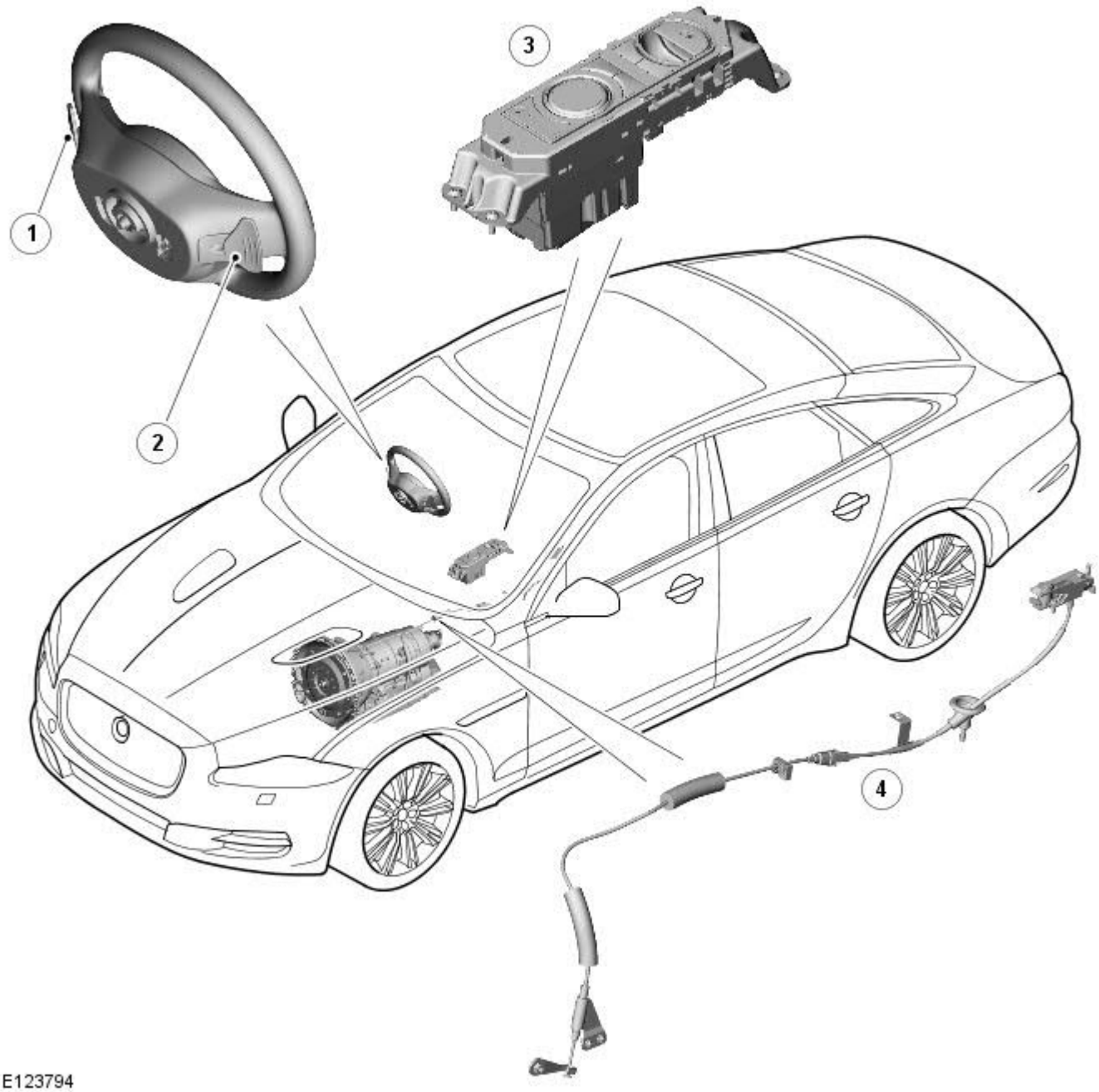
Description	Nm	lb-ft	lb-in
Uppshift paddle switch to steering wheel retaining bolt	3	-	27
Downshift paddle switch to steering wheel retaining bolt	3	-	27
Transmission control switch (TCS) to floor console bracket retaining bolts	4	-	35
Emergency park position release lever cable bracket to transmission housing retaining bolts	11	8	-

Published: 11-May-2011

Automatic Transmission/Transaxle External Controls - External Controls - Component Location

Description and Operation

COMPONENT LOCATION



Item	Description
1	Upshift (+) paddle switch
2	Downshift (-) paddle switch
3	JaguarDrive selector
4	Emergency park release

Published: 11-May-2011

Automatic Transmission/Transaxle External Controls - External Controls - Overview

Description and Operation

OVERVIEW

The external controls for the transmission consist of a JaguarDrive selector, two paddle switches and an emergency park release.

The JaguarDrive selector transmits driver transmission selections to the TCM (transmission control module). The paddle switches can be used to inititiate gear changes, with the JaguarDrive selector in either the D or S position, causing a change of operating mode from automatic gear selection to manual gear selection. The emergency park release ensures the transmission is kept in neutral during vehicle recovery operations.

Four additional switches adjacent to the JaguarDrive selector control the JaguarDrive control functions. Refer to: Ride and Handling Optimization (204-06, Description and Operation).

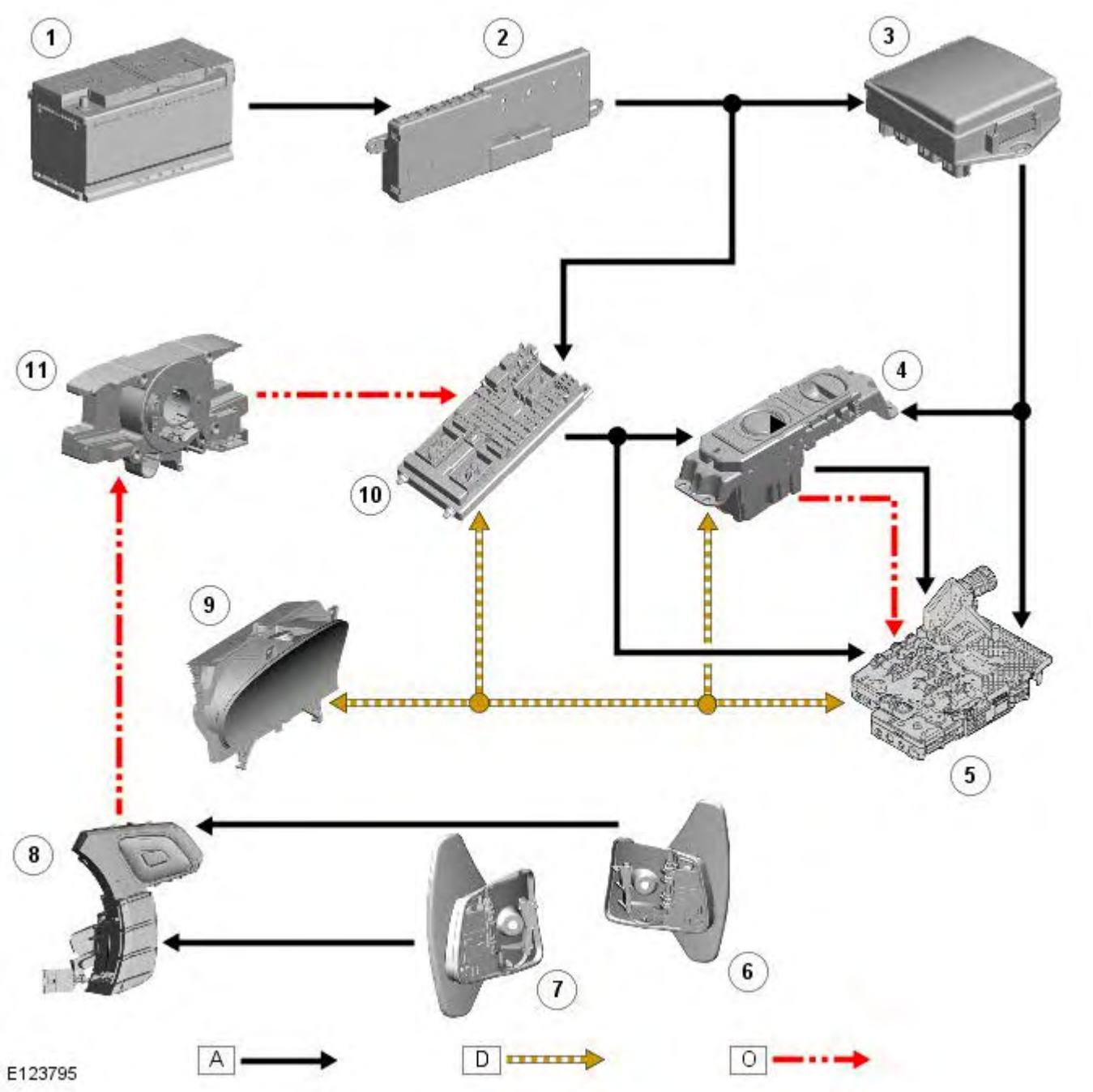
Published: 11-May-2011

Automatic Transmission/Transaxle External Controls - External Controls - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: A = Hardwired; D = High speed CAN (controller area network) bus; O = LIN (local interconnect network) bus.



Item	Description
1	Battery
2	BJB (battery junction box) (250 A megafuse)
3	EJB (engine junction box)
4	JaguarDrive selector
5	TCM (transmission control module)
6	Upshift paddle switch

7	Downshift paddle switch
8	Steering wheel RH switchpack
9	Instrument cluster
10	CJB (central junction box)
11	Clockspring

System Operation

JAGUARDRIVE SELECTOR

Rotation of the JaguarDrive selector to any of the five positions is sensed by the TCM (transmission control module) via the high speed CAN bus. A LIN bus connection is also provided, but is only used in the event of a CAN bus failure as a back-up. The TCM then reacts according to the selected position. The JaguarDrive selector is a magnetic system using Hall effect sensors to determine the position of the selector.

The S (sport) position selection allows the TCM to operate the transmission using the semi-automatic Jaguar sequential shift. Gear selections are sensed by the TCM when the driver operates the steering wheel paddle switches. Once the JaguarDrive selector position is confirmed, the TCM outputs appropriate information on the high speed CAN bus which is received by the instrument cluster to display the gear selection information in the message center.
Refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

The paddles can also be used on a temporary basis when the JaguarDrive selector is in the D (drive) position to override the automatic gear selection if required.

PARK INTERLOCK AND NEUTRAL LOCK

Neutral lock is a requirement for the JaguarDrive selector. The selector is always locked at ignition on when the engine is not running, except after an engine stall when the selector is not in P (park) or N (neutral).

If, when driving with the JaguarDrive selector in S, D or R (reverse) at a speed of more than 5 km/h (3 mph), the driver selects P or N:

- Without the brake pedal pressed, the JaguarDrive selector will be immediately locked once the vehicle speed falls to below 5 km/h (3 mph).
- With the brake pedal pressed, the JaguarDrive selector will remain unlocked for as long as the brake pedal remains pressed, regardless of vehicle speed.

The transmission will only engage park once the vehicle speed is less than 2 km/h (1 mph).

If the driver selects N and releases the brake pedal with a vehicle speed of less than 5 km/h (3 mph), the JaguarDrive selector will be locked 2 seconds after N is selected. The selector will remain locked until the driver presses the brake pedal again.

To ensure that a driver request to change from a non-driving range (N for example) to a driving range (D for example), the park interlock and neutral lock features are used in conjunction with the intermediate position.

If the transmission receives a range change request without the brake pedal pressed, the TCM initiates a soft lock function. The transmission will remain in park or neutral, depending on the starting position.

If a transmission position letter is flashing in the message center and the vehicle has no drive, the driver must:

- Press the brake pedal.
- Reselect N or P on the JaguarDrive selector.
- Select the required driving range, ensuring that the brake pedal is pressed.

Rocking Function

The rocking function compliments the neutral lock function. For all changes from a non-driving range to a driving range, it is necessary to press the brake pedal (to release either the park interlock or neutral lock).

In situations where the driver will require to change the gear selection from R to D, or from D to R, without brake pedal input (car park maneuvering, 3 point turns or 'rocking' the vehicle from a slippery surface for example), the rocking function gives a 2 second lock delay when N is selected on the JaguarDrive selector and the brake pedal is not pressed.

Component Description

JAGUARDRIVE SELECTOR

The Jaguardrive selector is a rotary selector installed in the top of the JaguarDrive selector module. The JaguarDrive selector module is located in the floor console and controls the vehicle optimization functions on the vehicle. Refer to: Ride and Handling Optimization (204-06, Description and Operation).

By selecting P, R, N, D or S on the JaguarDrive selector, the transmission functions as any conventional automatic unit.

Rotation of the JaguarDrive selector allows the selection of P, R, N and D. By depressing the JaguarDrive selector and rotating clockwise from the D position, S mode can be selected. The JaguarDrive selector is fully electronic rotary transmission selector with no mechanical connection to the transmission.

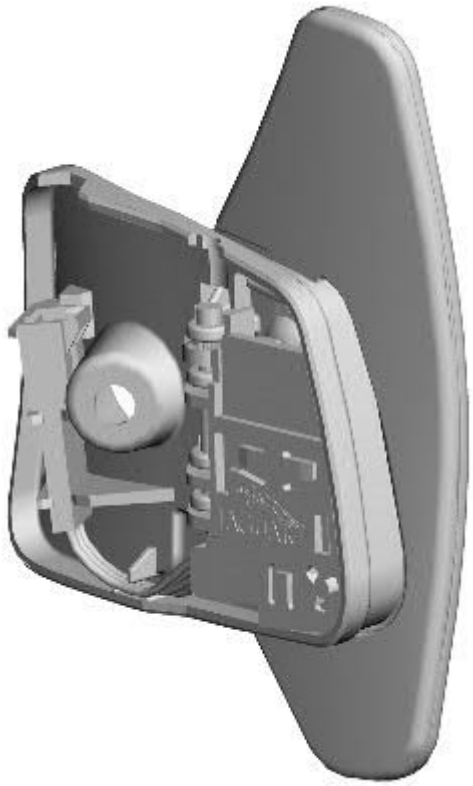
The JaguarDrive selector rises from the JaguarDrive selector module once the engine is running. When the engine is stopped with the JaguarDrive selector in any position other than N, it retracts into the JaguarDrive selector module again. If the selector is in position N when the engine is stopped, it remains in the raised position for up to 10 minutes, for use in a drive through car wash for example. After 10 minutes the selector automatically retracts into the JaguarDrive selector module. The selector also retracts if P is selected within the 10 minute period, or the vehicle is locked.

If the JaguarDrive selector does not rise from the console when the engine is started, but electrical power is supplied to the selector, the retracted selector can still be rotated to make selections. If electrical power to the JaguarDrive selector is lost, the selector will not rise from the console when the engine is started and the retracted selector will not rotate.

The JaguarDrive selector contains an internal interlock solenoid to prevent the selector from being rotated when the engine is not running.

The engine can be stopped with the JaguarDrive selector in any position. Once the engine is stopped the selector will automatically reset to the P position and the transmission park lock will be engaged, except if the selector is moved to the N position when the engine is stopped.

PADDLE SWITCHES



E115235

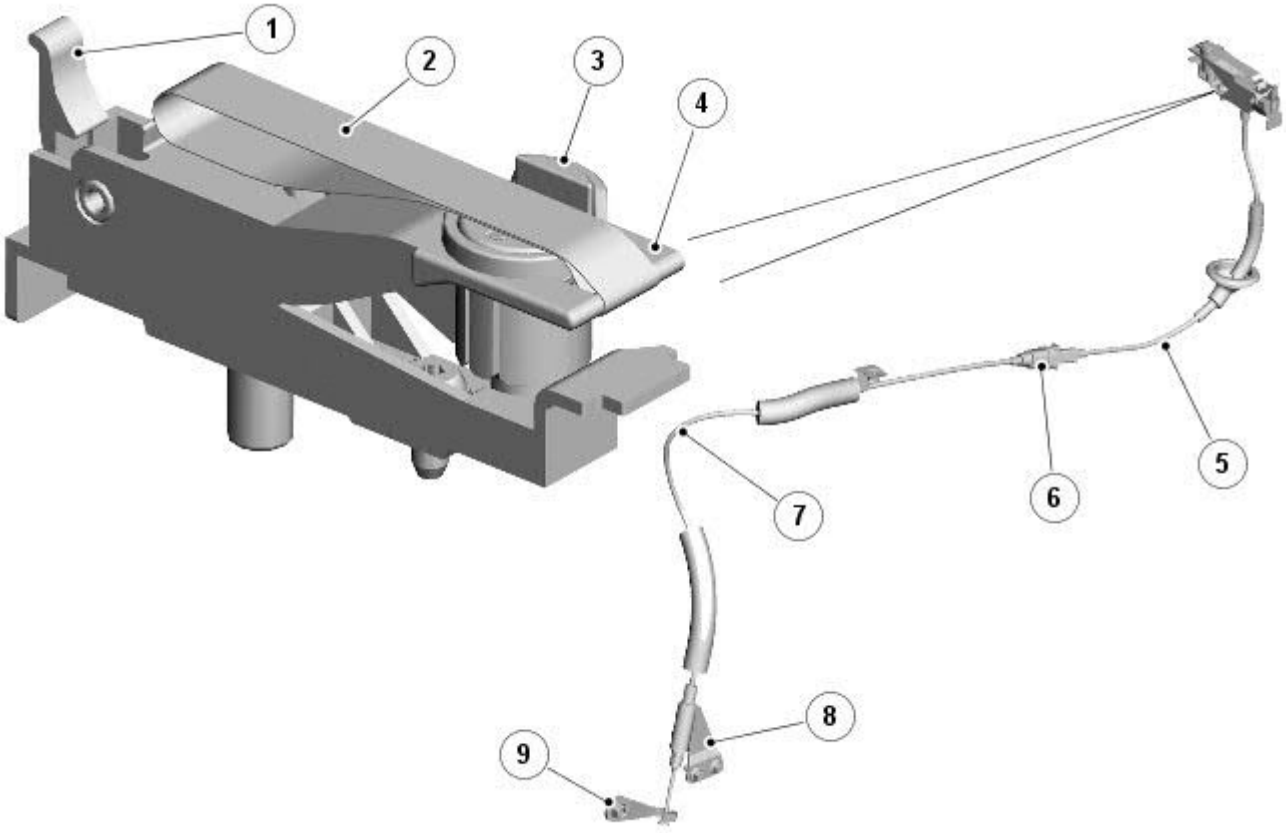
Two gear change 'paddle' switches are fitted at the rear of the steering wheel and allow the driver to operate the transmission as a semi-automatic manual gearbox using the Jaguar sequential shift feature.

Each paddle switch has three connections; ground, illumination PWM (pulse width modulation) supply and ground switch signal. The paddle switches are hardwired to the steering wheel RH (right-hand) switch assembly. Operation of the paddle switch completes a ground path to the switch assembly. The switch assembly converts the completed ground signal into a LIN bus signal which is passed via the clockspring to the CJB (central junction box). The CJB converts the signal into a high speed CAN bus signal to the TCM.

Pulling the LH (left-hand) downshift - paddle provides down changes and pulling the RH upshift (+) paddle provides up changes. The first operation of either paddle, after sport mode is selected, puts the transmission into permanent manual Jaguar sequential shift mode. Rotation of the JaguarDrive selector back to the D position, returns the transmission to conventional automatic operation.

Temporary operation of manual Jaguar sequential shift mode can also be operated with the JaguarDrive selector in the D position. Operation of either the upshift or downshift paddles activates the manual mode operation. If the JaguarDrive selector is in D, Jaguar sequential shift will cancel after a time period or can be cancelled by pressing and holding the + paddle for approximately 1.2 seconds.

EMERGENCY PARK RELEASE



E118503

Item	Description
1	Latch
2	Strap
3	Locking cylinder
4	Operating lever
5	Upper cable
6	Cable joint
7	Lower cable
8	Cable bracket
9	Park interlock lever

If a vehicle requires recovery/transportation, the emergency park release mechanism is used to manually disengage the park lock and engage the transmission in neutral.

The emergency park release mechanism consists of an operating lever that is connected to a park interlock lever on the transmission by an upper and lower cable assembly.

The operating lever is installed in the floor console, under a trim panel in the cubby box. The park interlock lever is attached to the transmission selector shaft.

One end of the operating lever is attached to a base by a hinge pin. A locking cylinder is installed in the other end of the operating lever, to secure the operating lever to the base. The operating lever is raised by pulling on a strap.

When operated, the emergency park release mechanism turns the transmission selector shaft.

To disengage the park lock:

- Open the cubby box lid.
- Remove the trim panel from left side of the cubby box.
- Rotate the locking cylinder of the emergency park release lever 90 degrees counterclockwise.
- Apply the footbrake, pull the operating lever upwards and ensure it locks in the vertical position.

Raising the operating lever causes the emergency park release cable to rotate the park interlock lever on the transmission, which disengages the parking pawl and engages neutral. This allows the vehicle to freewheel.

To re-engage the park lock:

- Hold the strap on the operating lever, release the latch and lower the operating lever to the horizontal position.

- Lock the operating lever by turning the locking cylinder 90 degrees clockwise.
- Install the trim panel.
- Close the cubby box lid.

Published: 19-Jun-2013

Automatic Transmission/Transaxle External Controls - External Controls

Diagnosis and Testing

Principles of Operation

For a detailed description of the transmission external controls, refer to the relevant Description and Operation sections in the workshop manual. REFER to: (307-05)

External Controls (Description and Operation),
External Controls (Description and Operation),
External Controls (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Check for stuck/jammed switches and buttons • Visibly damaged or worn components • Loose or missing fasteners	• Fuse(s) • Loose or corroded electrical connector(s) • Transmission control module • Transmission control switch

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index

For a list of DTCs that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Transmission Control Module (TCM) (100-00, Description and Operation)
/
Diagnostic Trouble Code (DTC) Index - DTC: Transmission Control Switch (TCS) (100-00, Description and Operation).

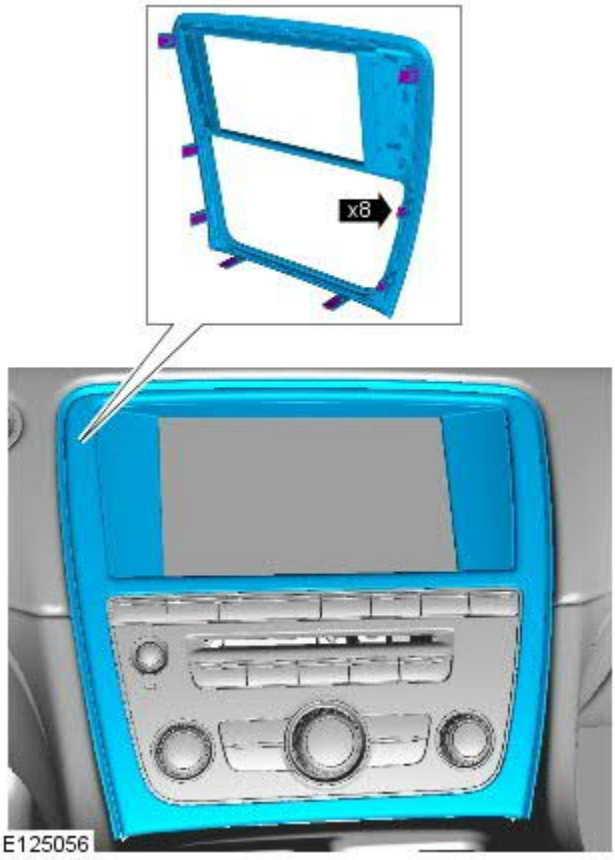
Published: 11-May-2011

Automatic Transmission/Transaxle External Controls - Transmission Control Switch (TCS)

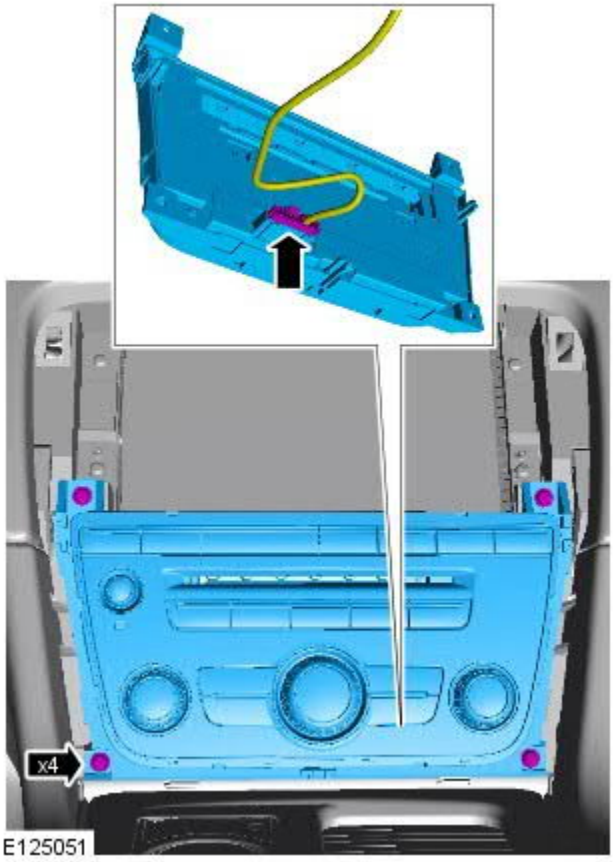
Removal and Installation

Removal

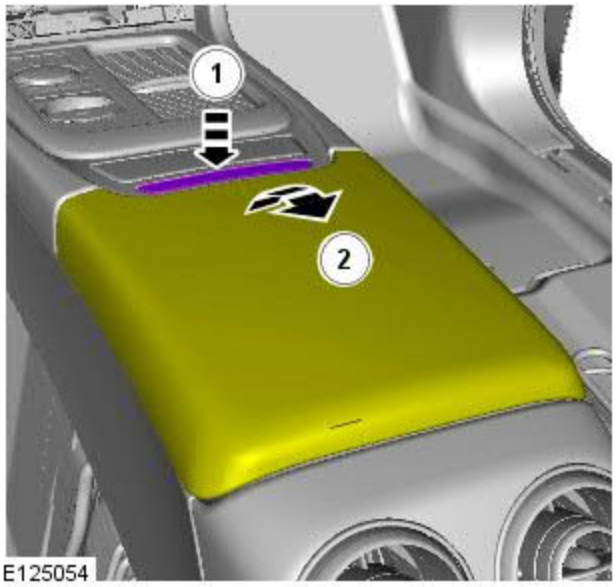
NOTE: Removal steps in this procedure may contain installation details.



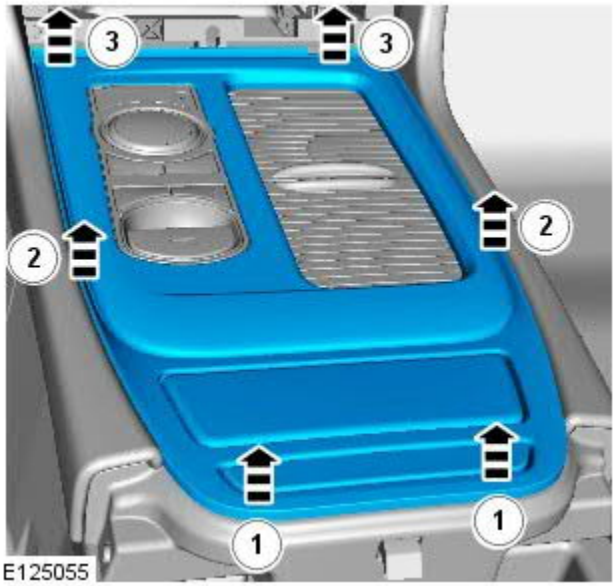
1. CAUTION: Take extra care not to damage the edges of the component.



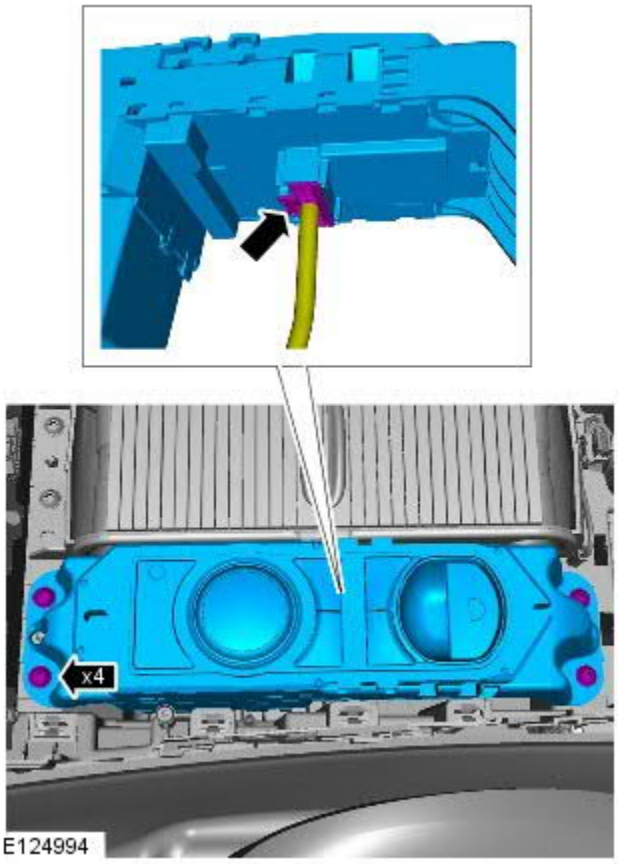
2. *Torque:* 2 Nm



3.



4. CAUTION: Take extra care not to damage the edges of the component.



5. *Torque:* 4 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Automatic Transmission/Transaxle External Controls - Transmission Control Switch (TCS) Knob

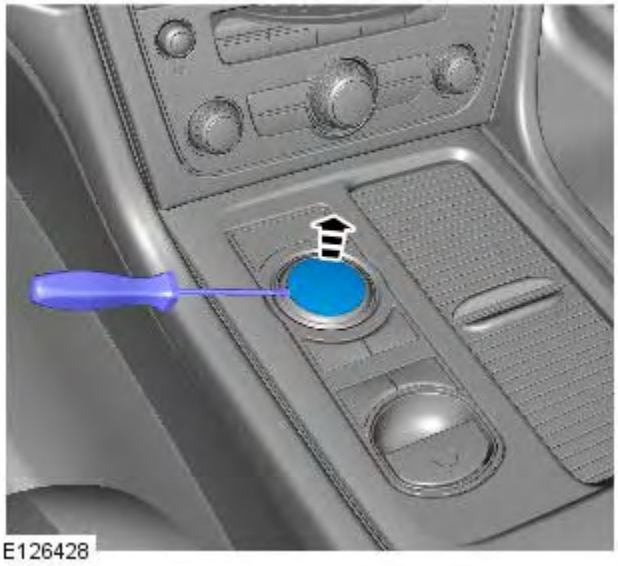
Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

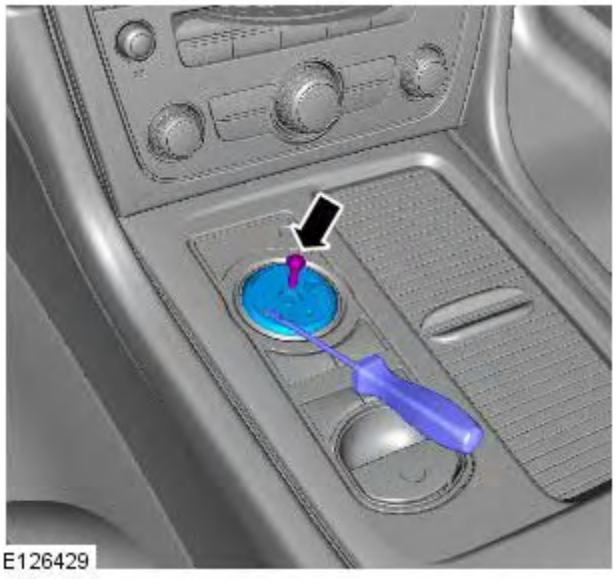
Some variation in the illustrations may occur, but the essential information is always correct.



1. CAUTIONS:

   Do not start the engine.

   Take extra care not to damage the edges of the component.



2. CAUTION: Take extra care not to damage the edges of the component.

   Torque: 2 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Automatic Transmission/Transaxle External Controls - Emergency Park Position Release Lever

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

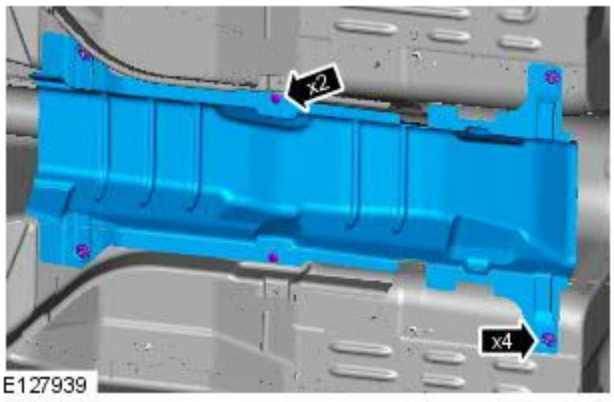
All vehicles

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

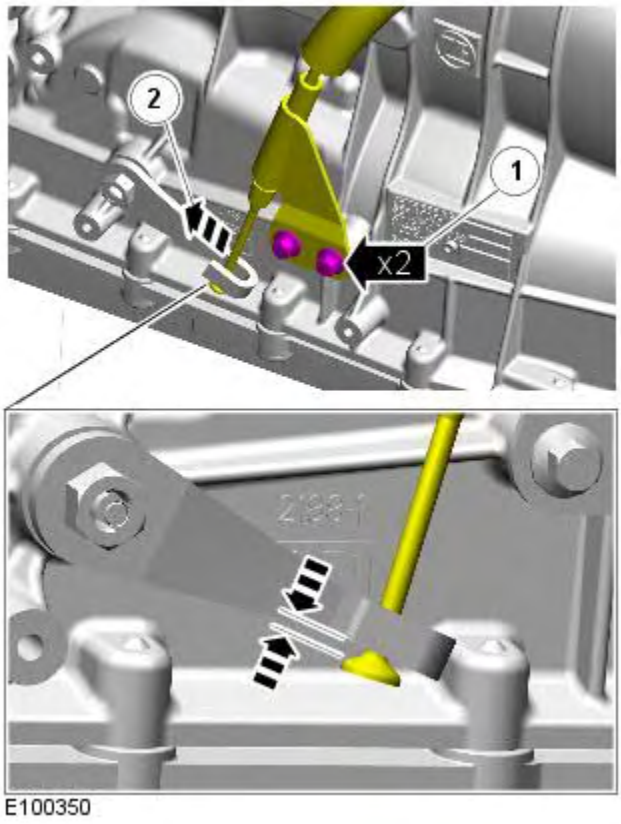
   Raise and support the vehicle.

Vehicles with 3.0L diesel engine

2. Refer to: Diesel Particulate Filter (DPF) (309-00A Exhaust System - TDV6 3.0L Diesel, Removal and Installation).



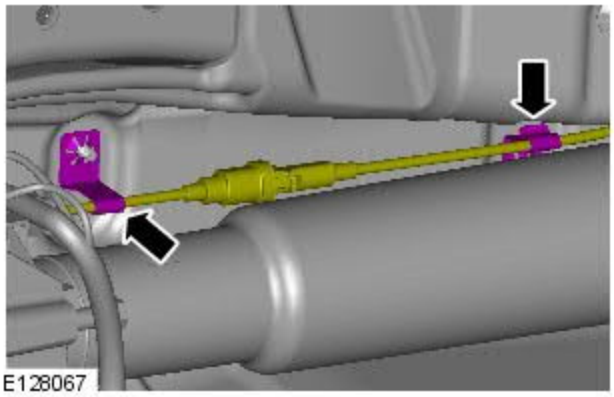
3.
   - Remove the 2 rivets.



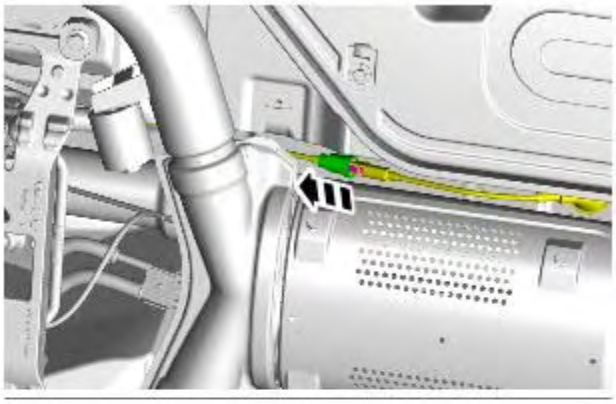
E100350

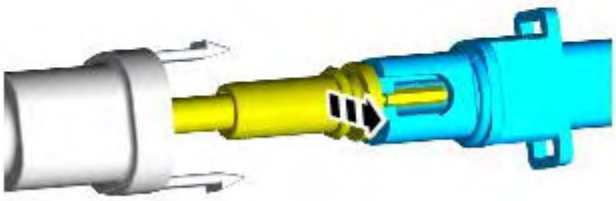
4. WARNING: Make sure to support the vehicle with axle stands.

Torque: 11 Nm


E128067

5.





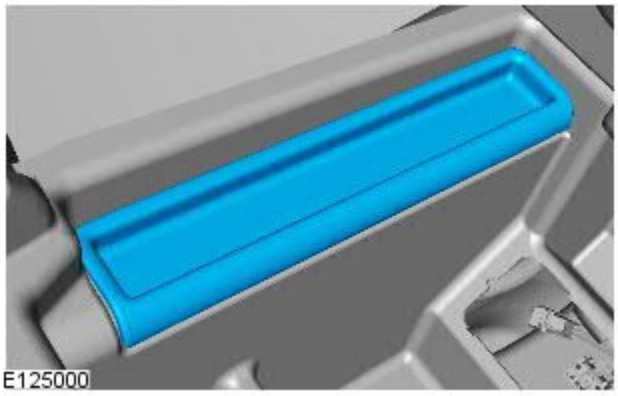
E100061

6. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

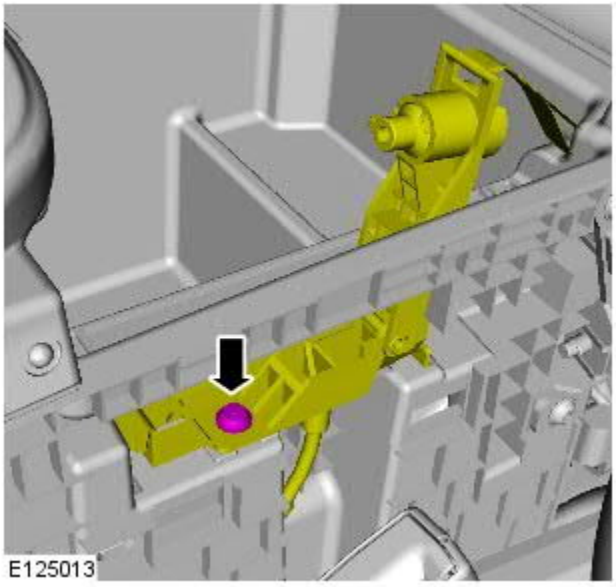
7. Lower the vehicle.

8. Refer to: Floor Console Side Trim Panel (501-12 Instrument Panel and Console, Removal and Installation).

9.



E125000

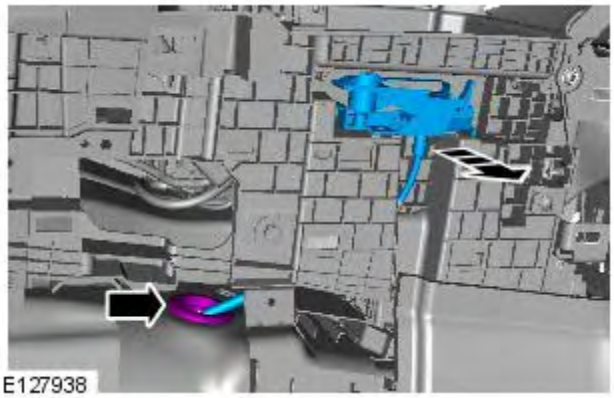


10. CAUTIONS:

    Make sure that the vehicle is parked on level ground.

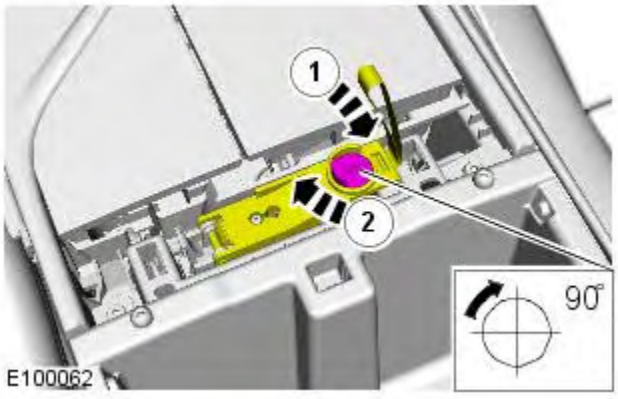
    Apply the parking brake, chock the wheels and ensure that all personnel are clear of the vehicle before carrying out the following procedure.

    Torque: 2.5 Nm



11. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Installation



1. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

   To install, reverse the removal procedure.

Published: 11-May-2011

Automatic Transmission/Transaxle External Controls - Upshift Paddle Switch

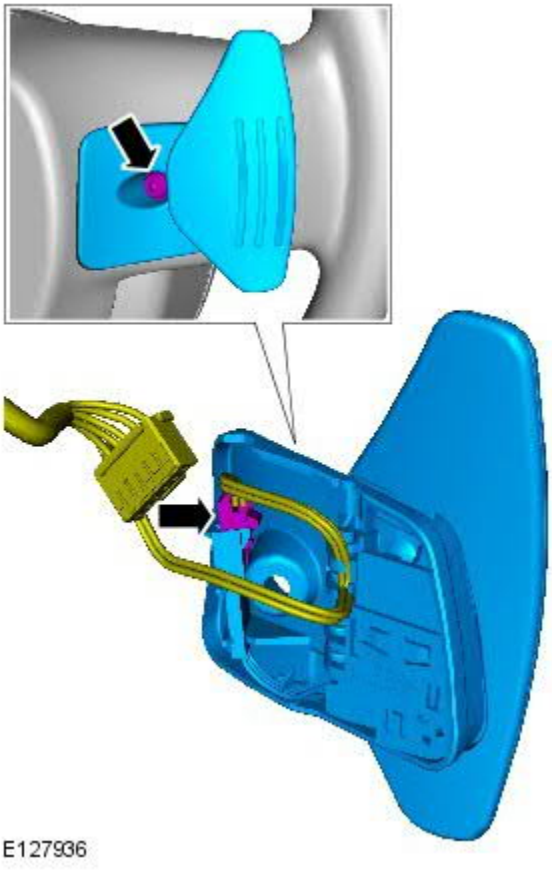
Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.



1. NOTES:

   Make sure that the harness is routed to the position noted on removal.

   LH illustration shown, RH is similar.

   Torque: 3 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Automatic Transmission/Transaxle External Controls - Downshift Paddle Switch

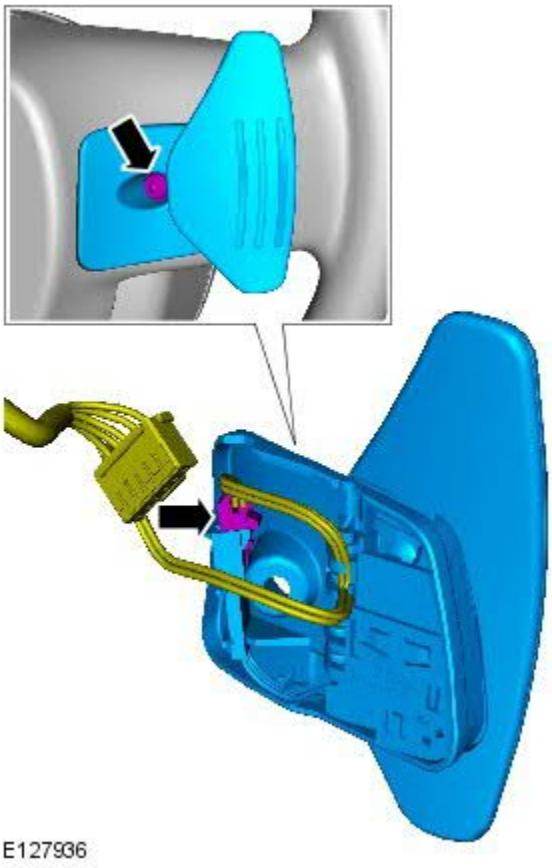
Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.



1. NOTE: Make sure that the harness is routed to the position noted on removal.

   Torque: 3 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Exhaust System - TDV6 3.0L Diesel -

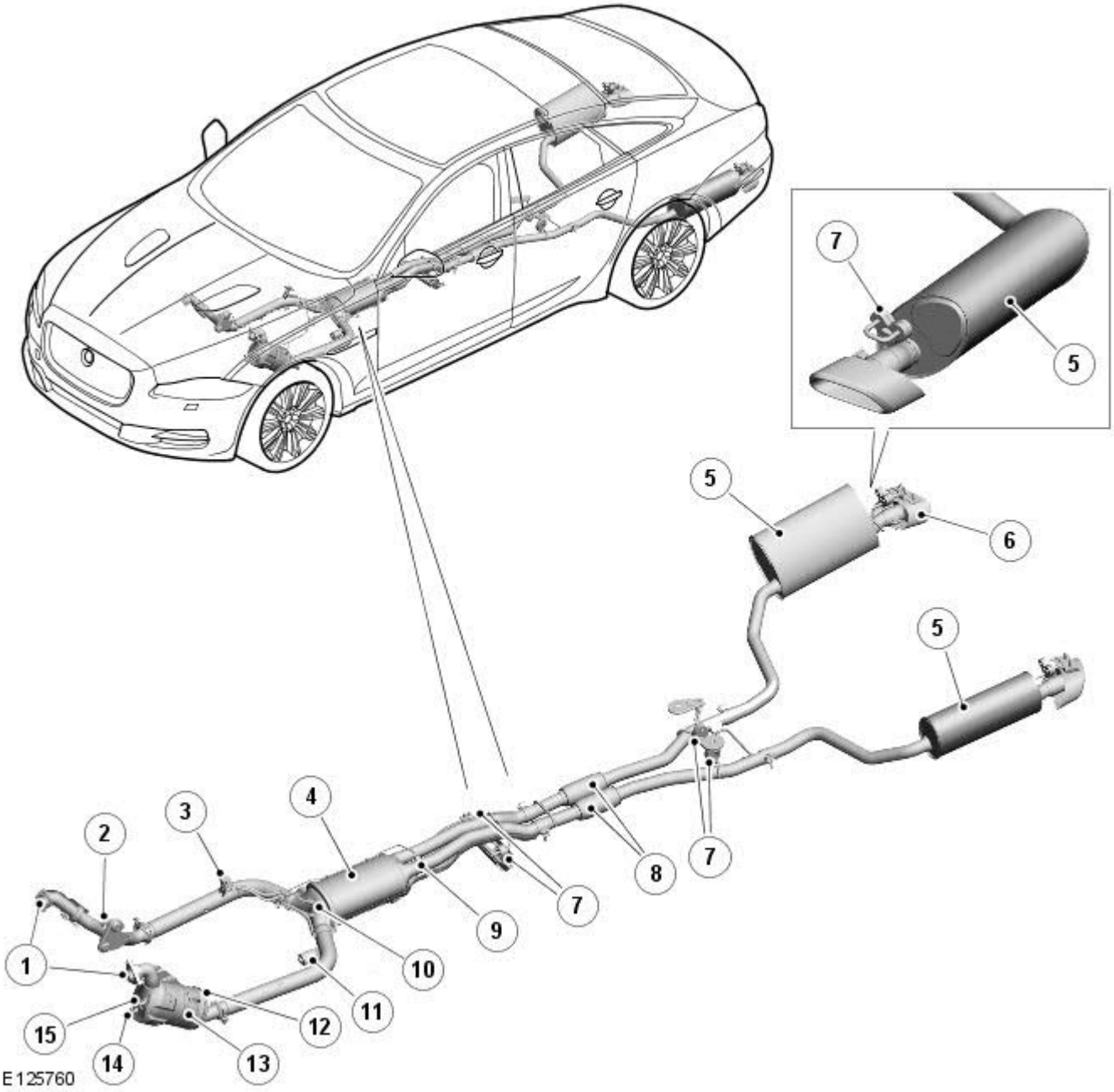
Description	Nm	lb-ft	lb -in
Turbocharger to catalytic converter retaining studs	15	11	-
Turbocharger to catalytic converter retaining nuts	25	18	-
Catalytic converter bracket	25	18	-
Catalytic converter securing strap bolts	9	-	80
Catalytic converter to Diesel particulate filter (DPF) securing strap bolts	11	8	-
DPF support insulator bracket retaining bolts	9	-	80
DPF support insulator to bracket nuts	6	-	53
DPF to front muffler securing strap nuts	55	41	-
Rear muffler support bracket	25	18	-
Catalytic converter temperature sensors	35	26	-
DPF temperature sensor	35	26	-
DPF differential pressure sensor bracket bolt	7	5	-
DPF differential pressure sensor pipe clamp bolt	2	-	18
DPF differential pressure sensor pipe union nuts	17	13	-
DPF heat shield retaining bolts	6	-	53

Published: 11-May-2011

Exhaust System - TDV6 3.0L Diesel - Exhaust System - Component Location

Description and Operation

COMPONENT LOCATION - 3.0L DIESEL FROM 2010MY



Item	Description
1	Manifold flange (2 off)
2	Exhaust gas temperature sensor
3	Differential pressure sensor (located above transmission)
4	Diesel Particulate Filter (DPF)
5	Rear silencer (2 off)
6	Exhaust trim (2 off)
7	Mounting rubber (6 off)
8	Flexible intermediate resonator assembly
9	Post DPF temperature sensor

10	Pre DPF temperature sensor
11	Mass damper
12	Post catalyst exhaust gas temperature sensor (hidden)
13	Catalytic converter
14	HO2S (heated oxygen sensor)
15	Pre catalyst exhaust gas temperature sensor

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Exhaust System - TDV6 3.0L Diesel - Exhaust System - System Operation and Component Description

Description and Operation

System Operation

CATALYTIC CONVERTER

The engine management system provides accurately metered quantities of fuel to the combustion chambers to ensure the most efficient use of fuel and to minimise the exhaust emissions. To further reduce the carbon monoxide and hydrocarbons content of the exhaust gases, a catalytic converter is integrated into each front pipe of the exhaust system. In the catalytic converter the exhaust gases are passed through honeycombed ceramic elements coated with a special surface treatment called 'washcoat'. The washcoat increases the surface area of the ceramic elements by a factor of approximately 7000. On top of the washcoat is a coating containing platinum and palladium, which are the active constituents for converting harmful emissions into inert by-products. The platinum and palladium add oxygen to the carbon monoxide and the hydrocarbons in the exhaust gases, to convert them into carbon dioxide and water respectively.

Component Description

FRONT SECTION

The front section comprises two pipes which connect to each cylinder bank. The two pipes then both connect into the Diesel Particulate Filter (DPF).

The LH (left-hand) front section is connected to the LH bank turbocharger with 3 studs in a flange on the exhaust system The studs are secured to a mating flange on the turbocharger with 3 flange nuts. From the flange, a pipe which is bent through 90 degrees connects to a catalytic converter. A short welded outlet section from the catalytic converter connects to the connecting pipe to the Diesel Particulate filter (DPF). The connection between the 2 pipes is a compressed cone and clamp joint.

The RH (right-hand) front section is connected to the RH bank turbocharger with 2 studs in a flange on the exhaust system. The studs are secured to the mating flange on the turbocharger with 2 flange nuts. From the flange, a pipe with a bend downwards connects to the connecting pipe with the DPF. This pipe also includes a de-coupler assembly to absorb vibrations from the engine. The joint with the connecting pipe with the DPF is a compressed cone and clamp joint.

From each cone and clamp joint for each cylinder bank, the 2 pipes have a straight section and then a curve inwards to a welded connection with the DPF front inlet cone which forms part of the DPF body. These 2 pipes have an inner pipe which is secured to the outer pipe by 2 crimped indentations. The DPF inlet cone has 2 bosses which provide for the connection of a DPF temperature sensor and the high pressure pipe for the differential pressure sensor. The DPF is oval in shape and is closed at the rear by an outlet cone with 2 welded short pipes. The LH pipe has a boss which allows for the attachment of the low pressure pipe for the differential pressure sensor. The 2 pipes are held together by welded hanger brackets which support the front section of the exhaust system on 2 mounting rubbers.

REAR SECTION

The 2 pipes from the DPF connect into 2 pipes which are welded to 2 flexible intermediate assemblies. The joints are secured with 'Torca' type clamps. Exhaust gasses exit each flexible intermediate section via an outlet pipe. Each outlet pipe is braced together with a bracket and also each have a welded hanger bracket which allow the rear section to be supported on mounting rubbers.

The 2 rear silencers each have a welded inlet pipe which mate with the 2 outlet pipes from the center flexible intermediate sections and are each secured with a clamp. The fabricated rear silencers have 3 perforated tubes which are supported on 2 baffle plates. The exhaust gasses are expelled from the rear silencer via a single outlet pipe. The outlet pipe from each silencer has a welded hanger bar which support the rear silencer on mounting rubbers. The outlet pipe is welded to the silencer and covered with a polished stainless steel finisher which is secured to the outlet pipe with a 'Torca' clamp.

CATALYTIC CONVERTER

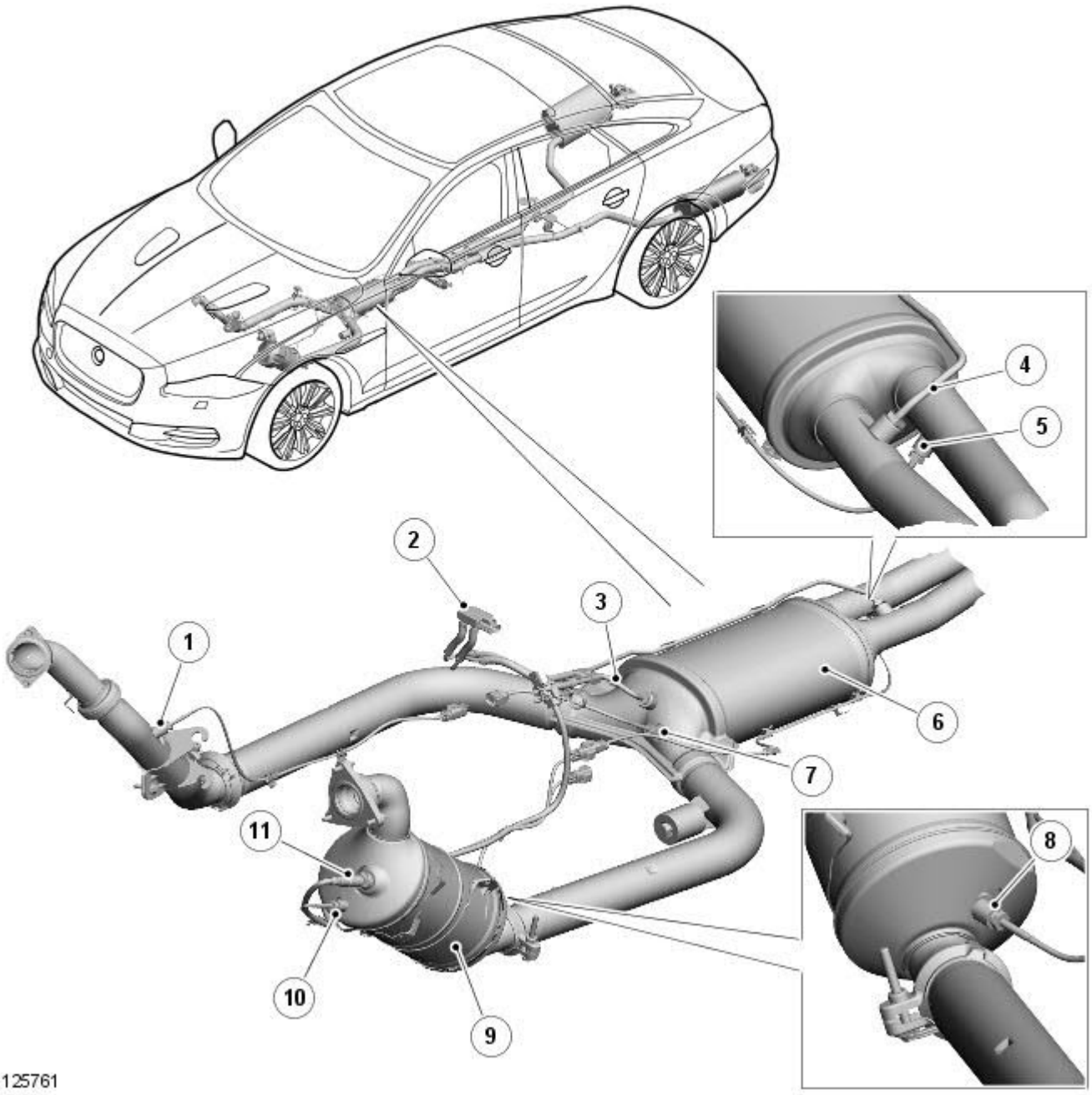
The oxidizing catalytic converter is fitted in the LH front section of the exhaust system, after the pre-catalyst exhaust gas temperature sensor. A HO2S (heated oxygen sensor) is fitted adjacent to the pre-catalyst exhaust gas temperature sensor and is used by the engine management system to ensure the most efficient use of fuel and to minimise the exhaust emissions.

Published: 03-Feb-2012

Exhaust System - TDV6 3.0L Diesel - Diesel Particulate Filter - Component Location

Description and Operation

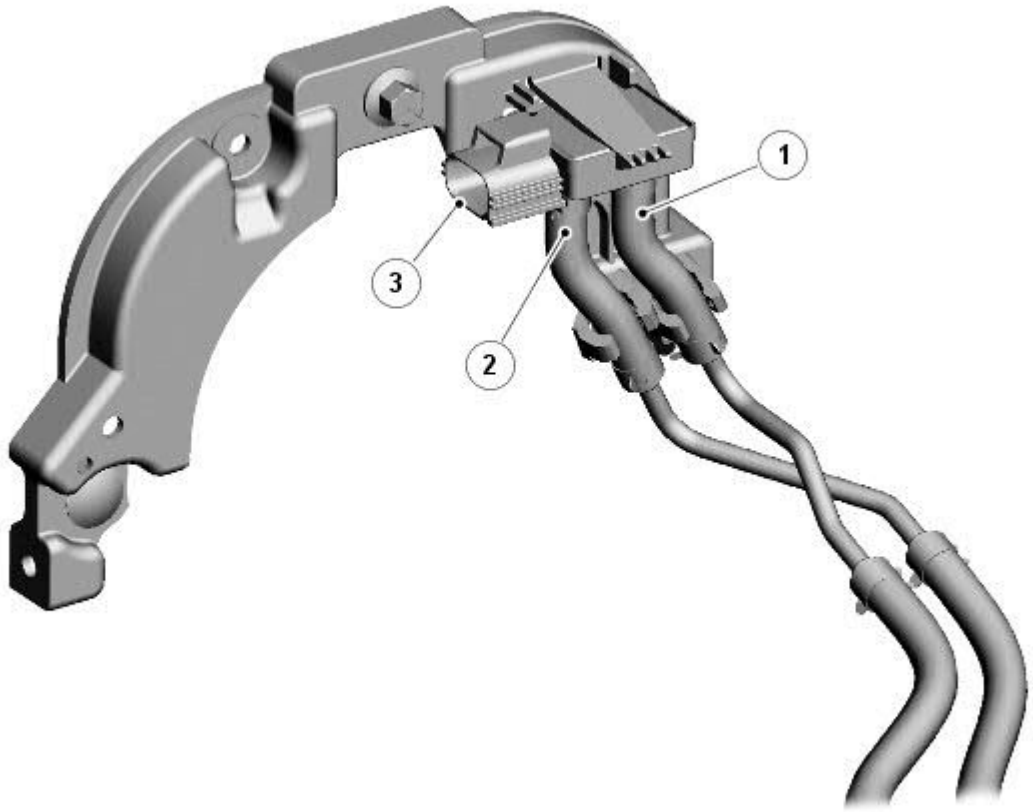
COMPONENT LOCATION - DIESEL PARTICULATE FILTER



Item	Description
1	Exhaust gas temperature sensor
2	Differential pressure sensor
3	High pressure pipe
4	Low pressure pipe
5	Post DPF temperature sensor
6	DPF
7	Pre DPF temperature sensor
8	Post catalyst exhaust gas temperature sensor

9	Catalytic converter
10	Pre-catalyst exhaust gas temperature sensor
11	HO2S (heated oxygen sensor)

COMPONENT LOCATION - DIFFERENTIAL PRESSURE SENSOR



E113795

Item	Description
1	High pressure connection
2	Low pressure connection
3	Electrical connector

Published: 24-May-2013

Exhaust System - TDV6 3.0L Diesel - Diesel Particulate Filter - System Operation and Component Description

Description and Operation

System Operation

DIESEL PARTICULATE FILTER (DPF)

Two processes are used to regenerate the DPF; passive and active.

Passive Regeneration

Passive regeneration requires no special engine management intervention and occurs during normal engine operation. The passive regeneration involves a slow conversion of the particulate matter deposited in the DPF into carbon dioxide. This process occurs when the DPF temperature exceeds 250°C (482°F) and is a continuous process when the vehicle is being driven at higher engine loads and speeds.

During passive regeneration, only a portion of the particulate matter is converted into carbon dioxide. This is because the chemical reaction, which utilises nitrogen dioxide, is slower than the rate of engine production of particulate matter and is effective from 250°C (482°F).

Above 580°C the conversion efficiency of the particulates into carbon dioxide rapidly increases. These temperatures are generally only be achieved using the active regeneration process.

Active Regeneration

Active regeneration starts when the particulate loading of the DPF reaches a threshold as monitored or determined by the DPF control software. The threshold calculation is based on driving style, distance travelled and back pressure signals from the differential pressure sensor.

Active regeneration generally occurs every 250 miles (400 km) although this is dependant on how the vehicle is driven. For example, if the vehicle is driven at low loads in urban traffic regularly, active regeneration will occur more often. This is due to the rapid build-up of particulates in the DPF than if the vehicle is driven at high speeds when passive regeneration will have occurred.

The DPF software incorporates a mileage trigger which is used as back-up for active regeneration. If active regeneration has not been initiated by a back pressure signal from the differential pressure sensor, regeneration is requested based on distance travelled.

Active regeneration of the DPF is commenced when the temperature of the DPF is increased to the combustion temperature of the particles. The DPF temperature is raised by increasing the exhaust gas temperature. This is achieved by introducing post-injection of fuel after the pilot and main fuel injections have occurred.

It is determined by the DPF software monitoring the signals from the two DPF temperature sensors to establish the temperature of the DPF. Depending on the DPF temperature, the DPF software requests the ECM (engine control module) to perform either one or two post-injections of fuel:

- The first post-injection of fuel retards combustion inside the cylinder which increases the temperature of the exhaust gas.
- The second post-injection of fuel is injected late in the power stroke cycle. The fuel partly combusts in the cylinder, but some unburnt fuel also passes into the exhaust where it creates an exothermic event within the catalytic converter, further increasing the temperature of the DPF.

The active regeneration process takes up to 20 minutes to complete. The first phase increases the DPF temperature to 500°C (932°F). The second phase further increases the DPF temperature to 600°C (1112°F) which is the optimum temperature for particle combustion. This temperature is then maintained for 15-20 minutes to ensure complete oxidation of the particles within the DPF. The oxidation process converts the carbon particles to carbon dioxide.

The active regeneration temperature of the DPF is closely monitored by the DPF software to maintain a target temperature of 600°C (1112°F) at the DPF inlet. The temperature control ensures that the temperatures do not exceed the operational limits of the turbocharger and the catalytic converter. The turbocharger inlet temperature must not exceed 830°C (1526°F) and the catalytic converter brick temperature must not exceed 800°C (1472°F) and the exit temperature must remain below 875°C (1382°F).

During the active regeneration process the following ECM controlled events occur:

- The turbocharger is maintained in the fully open position. This minimizes heat transmission from the exhaust gas to the turbocharger and reduces the rate of exhaust gas flow allowing optimum heating of the DPF. If the driver demands an increase in engine torque, the turbocharger will respond by closing the vanes as necessary.
- The throttle is closed as this assists in increasing the exhaust gas temperature and reduces the rate of exhaust gas flow which has the effect of reducing the time for the DPF to reach the optimum temperature.
- The EGR (exhaust gas recirculation) valve is closed. The use of EGR decreases the exhaust gas temperature and therefore prevents the optimum DPF temperature being achieved.

If, due to vehicle usage and/or driving style, the active regeneration process cannot take place or is unable to regenerate the DPF, the dealer can force regenerate the DPF. This is achieved by either driving the vehicle until the engine is at its normal operating temperature and then driving for a further 20 minutes at speeds of not less than 30 mph (48 km/h).

DPF Control

The DPF requires constant monitoring to ensure that it is operating at its optimum efficiency and does not become blocked. The ECM contains DPF software which controls the monitoring and operation of the DPF system and also monitors other vehicle data to determine regeneration periods and service intervals.

The DPF software can be divided into three separate control software modules; a DPF supervisor module, a DPF fuel management module and a DPF air management module.

These three modules are controlled by a fourth software module known as the DPF co-ordinator module. The co-ordinator module manages the operation of the other modules when an active regeneration is requested.

DPF Fuel Management Module

The DPF fuel management module controls the following functions:

- Timing and quantity of the four split injections per stroke (pilot, main and two post injections).
- Injection pressure and the transition between the three different calibration levels of injection.

The above functions are dependant on the condition of the catalytic converter and the DPF.

The controlled injection determines the required injection level in addition to measuring the activity of the catalytic converter and the DPF. The fuel management calculates the quantity and timing for the four split injections, for each of the three calibration levels for injection pressure, and also manages the transition between the levels.

The two post injections are required to separate the functionality of increasing in-cylinder gas temperatures and the production of hydrocarbons. The first post injection is used to generate the higher in-cylinder gas temperature while simultaneously retaining the same engine torque output produced during normal (non-regeneration) engine operation. The second post injection is used to generate hydrocarbons by allowing unburnt fuel into the catalytic converter without producing increased engine torque.

DPF Air Management Module

The DPF air management module controls the following functions:

- EGR control
- Turbocharger boost pressure control
- Intake air temperature and pressure control.

During active regeneration, the EGR operation is disabled -except for overrun conditions - and the closed-loop activation of the turbocharger boost controller is calculated. The air management module controls the air in the intake manifold to a predetermined level of pressure and temperature. This control is required to achieve the correct in-cylinder conditions for stable and robust combustion of the post injected fuel.

The module controls the intake air temperature by actuating the EGR throttle and by adjustment of the turbocharger boost pressure control.

DPF Co-ordinator Module

The DPF co-ordinator module reacts to a regeneration request from the supervisor module by initiating and co-ordinating the following DPF regeneration requests:

- EGR cut-off - except for overrun condition
- Turbocharger boost pressure control
- Engine load increase
- Control of air pressure and temperature in the intake manifold
- Fuel injection control.

When the supervisor module issues a regeneration request, the co-ordinator module requests EGR cut-off and a regeneration specific turbocharger boost pressure control. It then waits for a feedback signal from the EGR system confirming that the EGR valve is closed.

When the EGR valve is closed, the co-ordinator module initiates requests to increase engine load by controlling the intake air temperature and pressure.

Once confirmation is received that intake conditions are controlled or a calibration time has expired, the co-ordinator module then changes to a state awaiting an accelerator pedal release manoeuvre from the driver. If this occurs or a calibration time has expired, the co-ordinator module generates a request to control fuel injections to increase exhaust gas temperature.

DIFFERENTIAL PRESSURE SENSOR

As the amount of particulates trapped by the DPF increases, the pressure at the inlet side of the DPF increases in comparison to the DPF outlet. The DPF software uses this comparison, in conjunction with other data, to calculate the accumulated amount of trapped particulates.

By measuring the pressure difference between the DPF inlet and outlet and the DPF temperature, the DPF software can determine if the DPF is becoming blocked and requires regeneration.

Component Description

DIESEL PARTICULATE FILTER (DPF)

The DPF system reduces diesel particulate emissions to negligible levels to meet current European stage 5 emission standards.

The particulate emissions are the black fumes emitted from the diesel engine under certain load conditions. The emissions are a complex mixture of solid and liquid components with the majority of the particulates being carbon microspheres on which hydrocarbons from the engine's fuel and lubricant condense.

The DPF system comprises the following components:

- Diesel Particulate Filter (DPF)
- DPF control software incorporated in the ECM
- Differential pressure sensor.

The DPF is located in the exhaust system, downstream of the catalytic converter. Its function is to trap particulate matter in the exhaust gases leaving the engine. A major feature of the DPF is its ability for regeneration. Regeneration is the burning of particulates trapped by the filter to prevent obstruction to the free flow of exhaust gasses. The regeneration process takes place at calculated intervals and is not noticeable by the driver of the vehicle.

Regeneration is most important, since an overfilled filter can damage the engine through excessive exhaust back pressure and can itself be damaged or destroyed. The material trapped in the filter is in the most part carbon particles with some absorbed hydrocarbons.

The DPF uses a filter technology based on a filter with a catalytic coating. The DPF is made from silicon carbide housed in a steel container and has excellent thermal shock resistance and thermal conductivity properties. The DPF is designed for the engine's operating requirements to maintain the optimum back pressure requirements.

The porous surface of the filter consists of thousands of small parallel channels positioned in the longitudinal direction of the exhaust system. Adjacent channels in the filter are alternately plugged at the end. This design forces the exhaust gasses to flow through the porous filter walls, which act as the filter medium. Particulate matter which are too big to pass through the porous surface are collected and stored in the channels.

The collected particulate matter, if not removed, can create an obstruction to exhaust gas flow. The stored particles are removed by a regeneration process which incinerates the particles.

Diesel Particulate Filter Temperature Sensors

The sensors measure the temperature of exhaust gas exiting the turbocharger and before it passes through the DPF and provides the information needed to calculate the DPF temperature.

The information is used, in conjunction with other data, to estimate the amount of accumulated particulates and to control the DPF temperature.

Instrument Cluster (IC) Indications

For drivers who make regular short journeys at low speeds, it may not be possible to efficiently regenerate the DPF. In this case, the DPF software will detect a blockage of the DPF from signals from the differential pressure sensor and will alert the driver as follows:

The driver will be alerted to this condition by a message 'EXHAUST FILTER NEARLY FULL'. See 'HANDBOOK'. As detailed in the Owners Handbook, the driver should drive the vehicle until the engine is at its normal operating temperature and then drive for a further 20 minutes at speeds of not less than 30 mph (48 km/h). Successful regeneration of the DPF is indicated to the driver by the 'EXHAUST FILTER NEARLY FULL' message no longer being displayed. If the DPF software detects that the DPF is still blocked, the message will continue to be displayed or an additional message 'EXHAUST FILTER FULL VISIT DEALER' will be displayed. The driver should take the vehicle to an authorized dealer to have the DPF force regenerated using an approved diagnostic system.

Diesel Particulate Filter Side Effects

The following section details some side effects caused by the active regeneration process.

Engine Oil Dilution

Engine oil dilution can occur due to small amounts of fuel entering the engine crankcase during the post-injection phases. This has made it necessary to introduce a calculation based on driving style to reduce oil service intervals if necessary. The driver is alerted to the oil service by a message in the instrument cluster.

The DPF software monitors the driving style and the frequency of the active regeneration and duration. Using this information a calculation can be made on the engine oil dilution. When the DPF software calculates the engine oil dilution has reached a predetermined threshold (fuel being 7% of engine oil volume) a service message is displayed in the IC.

Depending on driving style, some vehicles may require an oil service before the designated interval. If a service message is displayed, the vehicle will be required have a full service and the service interval counter will be reset.

Fuel consumption

During the active regeneration process of the DPF, there will be an increase in fuel consumption.

However, because active regeneration occurs infrequently, the overall effect on fuel consumption is approximately 2%. The additional fuel used during the active regeneration process is accounted for in the instantaneous and average fuel consumption displays in the instrument cluster.

DIFFERENTIAL PRESSURE SENSOR

The differential pressure sensor is used by the DPF software to monitor the condition of the DPF. Two pipe connections on the sensor are connected by pipes to the inlet and outlet ends of the DPF. The pipes allow the sensor to measure the inlet and outlet pressures of the DPF.

Aftermarket DPF cleaning fluids

Recent years have seen the introduction of 'DPF cleaning fluids' to (non JLR approved) aftermarket sales. These products claim to reduce the temperature that the soot reaction takes place. It should be stressed that, during the vehicle development activity, every effort is made to generate DPF regeneration temperatures whilst maintaining safe levels for all other vehicle components. Unauthorized use of the aftermarket fluids produces a significant risk to soot burn rates and DPF peak temperatures real world driving conditions. These fluids are not authorised for JLR use.

Published: 17-Jul-2013

Exhaust System - TDV6 3.0L Diesel - Diesel Particulate Filter

Diagnosis and Testing

Principle of Operation

For a detailed description of the exhaust system, refer to the relevant Description and Operation section of the workshop manual.
REFER to: Diesel Particulate Filter (309-00A Exhaust System - TDV6 3.0L Diesel, Description and Operation) / Diesel Particulate Filter (309-00A Exhaust System - TDV6 3.0L Diesel, Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests

1. Verify the customer concern
2. Visually inspect for obvious signs of mechanical or electrical damage

Visual Inspection

Mechanical	Electrical
• Diesel particulate filter • Differential pressure sensor hoses • Differential pressure sensor metal pipes and unions • Differential pressure sensor mounting position integrity • Metal fatigue • Joints • Mountings • Clearance around components • Damaged diesel particulate filter	• Differential pressure sensor • Differential pressure sensor connector • Differential pressure sensor wiring harness • Electrical connector(s) • Sensor(s) • Engine control module (ECM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for DTCs and refer to the DTC Index

Symptom Chart

Symptom	Possible Causes	Action
Amber warning message on instrument cluster - DPF FULL REFER TO HANDBOOK -	• Blocked regeneration • Customer driving routine does not allow the system to clean the particulate filter	If DTC is P2459-65 or AMBER DPF FULL REFER TO HANDBOOK message is displayed with no other reported messages. No repair is required, if the vehicle is driven on a highway AS DIRECTED IN THE HANDBOOK then the light will be extinguished and the system self healed, nothing more than this is required
Lack of power	• Air intake system fault • Restricted exhaust system • Low fuel pressure • Exhaust Gas Recirculation (EGR) valve(s) fault • Turbocharger fault • Diesel particulate filter fault	Check the air intake system. Check for a blocked catalytic converter or muffler, install new components as necessary. Check the fuel pressure. For EGR and turbocharger tests, refer to the relevant section of the workshop manual

DTC Index

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system)

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests

Inspect connectors for signs of water ingress, and pins for damage and/or corrosion

If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals

DTC	Description	Possible Cause	Action
P0030-11	HO2S Heater Control Circuit (Bank 1, Sensor 1) - Circuit short to ground	• Harness fault - Universal Heated Exhaust Gas Oxygen sensor heater control circuit short to ground • Universal Heated Exhaust Gas Oxygen sensor internal fault	• Using the manufacturer approved diagnostic system check datalogger signals, Oxygen Sensor (O2S) Heater Duty Cycle Bank 1 Sensor 1 (0x03A1). Refer to the electrical circuit diagrams and check the Universal Heated Exhaust Gas Oxygen sensor heater control (heater ground) circuit for short to ground. This circuit runs from the Engine Control Module (ECM) through the transmission harness to the exhaust system. Check for external harness damage due to chafing or heat. Repair harness as required, clear DTC and retest system • Suspect sensor internal fault if DTC resets. Heater circuit resistance measured at the component connector at approximately 20ºC ambient temperature should be 2.4 - 4.0 Ohms. Refer to the new module/component installation note at the top of the DTC Index
P0030-12	HO2S Heater Control Circuit (Bank 1, Sensor 1) - Circuit short to battery	• Harness fault - Universal Heated Exhaust Gas Oxygen sensor heater control circuit short to power • Universal Heated Exhaust Gas Oxygen sensor internal fault	• Using the manufacturer approved diagnostic system check datalogger signals, Oxygen Sensor (O2S) Heater Duty Cycle Bank 1 Sensor 1 (0x03A1). Refer to the electrical circuit diagrams and check the Universal Heated Exhaust Gas Oxygen sensor heater control (heater ground) circuit for short to power. This circuit runs from the Engine Control Module (ECM) through the transmission harness to the exhaust system. Check for external harness damage due to chafing or heat. Repair harness as required, clear DTC and retest system • Suspect sensor internal fault if DTC resets. Heater circuit resistance measured at the component connector at approximately 20ºC ambient temperature should be 2.4 - 4.0 Ohms. Refer to the new module/component installation note at the top of the DTC Index
P0030-13	HO2S Heater Control Circuit (Bank 1, Sensor 1) - Circuit open	• Harness fault - Universal Heated Exhaust Gas Oxygen sensor heater control circuit open • Universal Heated Exhaust Gas Oxygen sensor internal fault	• Using the manufacturer approved diagnostic system check datalogger signals, Oxygen Sensor (O2S) Heater Duty Cycle Bank 1 Sensor 1 (0x03A1). Refer to the electrical circuit diagrams and check the Universal Heated Exhaust Gas Oxygen sensor heater control (heater ground) circuit for open circuit. This circuit runs from the Engine Control Module (ECM) through the transmission harness to the exhaust system. Check for external harness damage due to chafing or heat. Repair harness as required, clear DTC and retest system • Suspect sensor internal fault if DTC resets. Heater circuit resistance measured at the component connector at approximately 20ºC ambient temperature should be 2.4 - 4.0 Ohms. Refer to the new module/component installation note at the top of the DTC Index
P0030-4B	HO2S Heater Control Circuit (Bank 1, Sensor 1) - Over temperature	• Harness fault - Heated Oxygen Sensor heater control circuit short to power • Heated Oxygen Sensor internal fault	• Using the manufacturer approved diagnostic system check datalogger signals, Oxygen Sensor (O2S) Heater Duty Cycle Bank 1 Sensor 1 (0x03A1). Refer to the electrical circuit diagrams and check the Universal Heated Exhaust Gas Oxygen sensor heater control (heater ground) circuit for short to power. This circuit runs from the Engine Control Module (ECM) through the transmission harness to the exhaust system. Check for external harness damage due to chafing or heat. Repair harness as required, clear DTC and retest system

DTC	Description	Possible Cause	Action
			• Suspect sensor internal fault if DTC resets. Heater circuit resistance measured at the component connector at approximately 20ºC ambient temperature should be 2.4 - 4.0 Ohms. Refer to the new module/component installation note at the top of the DTC Index
P0130-00	O2 Circuit (Bank 1, Sensor 1) - No sub type information	• Harness fault - Universal Heated Exhaust Gas Oxygen sensor circuits open circuit • Universal Heated Exhaust Gas Oxygen sensor internal component fault	• Refer to the electrical circuit diagrams and check the Universal Heated Exhaust Gas Oxygen circuits for open circuits on the Nernst Voltage and Pumping Current signal lines. Check harness for signs of damage due to chaffing or heat. Check the other Universal Heated Exhaust Gas Oxygen sensor circuits for short circuits and open circuits • If no fault found in wiring harness suspect Universal Heated Exhaust Gas Oxygen sensor. Refer to the new module/component installation note at the top of the DTC Index
P0130-11	O2 Circuit (Bank 1, Sensor 1) - Circuit short to ground	• The Engine Control Module (ECM) has detected a ground measurement for a period longer than expected or has detected a ground measurement when another value was expected • Harness fault - Universal Heated Exhaust Gas Oxygen sensor circuit short to ground • Universal Heated Exhaust Gas Oxygen sensor internal component fault	• Refer to the electrical circuit diagrams and check the Universal Heated Exhaust Gas Oxygen sensor circuits for short to ground. Repair wiring harness as required, clear DTC and retest system • If no fault found in wiring harness suspect Universal Heated Exhaust Gas Oxygen sensor. Refer to the new module/component installation note at the top of the DTC Index
P0130-12	O2 Circuit (Bank 1, Sensor 1) - Circuit short to battery	• Harness fault - Universal Heated Exhaust Gas Oxygen sensor circuit short to power • Universal Heated Exhaust Gas Oxygen sensor internal component fault	• Refer to the electrical circuit diagrams and check the Universal Heated Exhaust Gas Oxygen sensor circuits for short to power. Repair wiring harness as required, clear DTC and retest system • If no fault found in wiring harness suspect Universal Heated Exhaust Gas Oxygen sensor. Refer to the new module/component installation note at the top of the DTC Index
P0130-13	O2 Circuit (Bank 1, Sensor 1) - Circuit open	• Harness fault - Universal Heated Exhaust Gas Oxygen sensor circuit open circuit • Universal Heated Exhaust Gas Oxygen sensor internal component fault	• Refer to the electrical circuit diagrams and check the Universal Heated Exhaust Gas Oxygen sensor circuits for open circuit. Repair wiring harness as required, clear DTC and retest system • If no fault found in wiring harness suspect Universal Heated Exhaust Gas Oxygen sensor. Refer to the new module/component installation note at the top of the DTC Index
P0130-1A	O2 Circuit (Bank 1, Sensor 1) - Circuit Resistance Below Threshold	• Harness fault - Universal Heated Exhaust Gas Oxygen sensor circuit fault • Universal Heated Exhaust Gas Oxygen sensor internal component fault	• This DTC is set when the Universal Heated Exhaust Gas Oxygen sensor internal trim resistance value is less than that expected by the Engine Control Module. Refer to the electrical circuit diagrams and check the Universal Heated Exhaust Gas Oxygen sensor circuits for short circuits. Repair wiring harness as required, clear DTC and retest system • If no fault found in wiring harness suspect Universal Heated Exhaust Gas Oxygen sensor internal fault. Refer to the new module/component installation note at the top of the DTC Index
P0130-1B	O2 Circuit (Bank 1, Sensor 1) - Circuit Resistance Above Threshold	• Harness fault - Universal Heated Exhaust Gas Oxygen sensor circuit fault	• This DTC is set when the oxygen sensor internal trim resistance value is greater than that expected by the Engine Control Module. Refer to the electrical circuit diagrams and check the Universal Heated Exhaust Gas

DTC	Description	Possible Cause	Action
		• Universal Heated Exhaust Gas Oxygen sensor internal component fault	Oxygen sensor circuits for short circuits, open circuits. Repair wiring harness as required, clear DTC and retest system • If no fault found in wiring harness suspect Universal Heated Exhaust Gas Oxygen sensor internal fault. refer to the new module/component installation note at the top of the DTC Index
P0130-26	O2 Circuit (Bank 1, Sensor 1) - Signal Rate Of Change Below Threshold	• Exhaust system leak • Fuel control system fault • Universal Heated Exhaust Gas Oxygen sensor to Engine Control Module (ECM) circuit short to ground, short to power, high resistance • Universal Heated Exhaust Gas Oxygen sensor failure	• Check for and rectify any exhaust leak between cylinder head and catalytic converter. Check Universal Heated Exhaust Gas Oxygen sensor is correctly installed in exhaust manifold • Check fuel control system for related DTCs and refer to the relevant DTC Index • Refer to the electrical circuit diagrams and check Universal Heated Exhaust Gas Oxygen sensor to Engine Control Module (ECM) circuit for short to ground, short to power, high resistance, open circuit • Check and install a new Universal Heated Exhaust Gas Oxygen sensor as required
P0133-00	O2 Circuit Slow Response (Bank 1, Sensor 1) - No sub type information	• Exhaust system leak • Fuel control system fault • Universal Heated Exhaust Gas Oxygen sensor to Engine Control Module (ECM) wiring shield high resistance • Universal Heated Exhaust Gas Oxygen sensor failure	• Check for and rectify any exhaust leak between cylinder head and catalytic converter. Check Universal Heated Exhaust Gas Oxygen sensor is correctly installed in exhaust manifold • Check fuel control system for related DTCs and refer to the relevant DTC Index • Refer to the electrical circuit diagrams and check Universal Heated Exhaust Gas Oxygen sensor to Engine Control Module (ECM) wiring shield for high resistance • Check and install a new Universal Heated Exhaust Gas Oxygen sensor as required
P0135-16	O2 Heater Circuit (Bank 1, Sensor 1) - Circuit Voltage Below threshold	• Harness fault - Universal Heated Exhaust Gas Oxygen sensor circuit fault • Universal Heated Exhaust Gas Oxygen sensor internal component fault	• This DTC is set when the voltage on the Universal Heated Exhaust Gas Oxygen sensor heater circuit is less than that expected by the Engine Control Module. Refer to the electrical circuit diagrams and check the Universal Heated Exhaust Gas Oxygen sensor heater supply and heater ground circuits for short circuits, open circuits. Repair wiring harness as required, clear DTC and retest system • If no fault found in wiring harness suspect Universal Heated Exhaust Gas Oxygen sensor internal fault. refer to the new module/component installation note at the top of the DTC Index
P0435-00	Catalyst Temperature Sensor Circuit (Bank 2, Sensor Circuit 1) - No sub type information	• Catalyst temperature sensor bank 2, sensor 1 circuit short to ground • Catalyst temperature sensor bank 2, sensor 1 circuit short to power • Catalyst temperature sensor bank 2, sensor 1 circuit high resistance • Catalyst temperature sensor bank 2, sensor 1 circuit open circuit • Catalyst temperature sensor bank 2, sensor 1 circuit disconnected • Catalyst temperature sensor bank 2, sensor 1 failure	• Using the manufacturer approved diagnostic system check datalogger signals, Exhaust Gas Temperature Bank 1 Sensor 1 Voltage (0x03BF), Exhaust Gas Temperature Bank 2 Sensor 1 (0x03F7) • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 1 circuit for short to ground. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 1 circuit for short to power. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 1 circuit for high resistance. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 1 circuit for open circuit. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 1 circuit for disconnected. Repair wiring harness as required, clear DTC and retest system • Check and install a new catalyst temperature sensor - bank 2, sensor 1 as required. Refer to the new module/component installation note at the top of the DTC

DTC	Description	Possible Cause	Action
			Index
P0436-00	Catalyst Temperature Sensor Circuit Range/Performance (Bank 2, Sensor Circuit 1) - No sub type information	• Catalyst temperature sensor bank 2, sensor 1 circuit short to ground • Catalyst temperature sensor bank 2, sensor 1 circuit short to power • Catalyst temperature sensor bank 2, sensor 1 circuit high resistance • Catalyst temperature sensor bank 2, sensor 1 circuit open circuit • Catalyst temperature sensor bank 2, sensor 1 circuit disconnected • Catalyst temperature sensor bank 2, sensor 1 failure	• Using the manufacturer approved diagnostic system check datalogger signals, Exhaust Gas Temperature Bank 1 Sensor 1 Voltage (0x03BF), Exhaust Gas Temperature Bank 2 Sensor 1 (0x03F7) • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 1 circuit for short to ground. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 1 circuit for short to power. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 1 circuit for high resistance. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 1 circuit for open circuit. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 1 circuit for disconnected. Repair wiring harness as required, clear DTC and retest system • Check and install a new catalyst temperature sensor - bank 2, sensor 1 as required. Refer to the new module/component installation note at the top of the DTC Index
P0437-00	Catalyst Temperature Sensor Circuit Low (Bank 2, Sensor Circuit 1) - No sub type information	• Catalyst temperature sensor bank 2, sensor 1 circuit short to ground • Catalyst temperature sensor bank 2, sensor 1 circuit high resistance • Catalyst temperature sensor bank 2, sensor 1 circuit open circuit • Catalyst temperature sensor bank 2, sensor 1 circuit disconnected • Catalyst temperature sensor bank 2, sensor 1 failure	• Using the manufacturer approved diagnostic system check datalogger signals, Exhaust Gas Temperature Bank 1 Sensor 1 Voltage (0x03BF), Exhaust Gas Temperature Bank 2 Sensor 1 (0x03F7) • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 1 circuit for short to ground. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 1 circuit for high resistance. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 1 circuit for open circuit. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 1 circuit for disconnected. Repair wiring harness as required, clear DTC and retest system • Check and install a new catalyst temperature sensor - bank 2, sensor 1 as required. Refer to the new module/component installation note at the top of the DTC Index
P0438-00	Catalyst Temperature Sensor Circuit High (Bank 2, Sensor Circuit 1) - No sub type information	• Catalyst temperature sensor bank 2, sensor 1 circuit short to power • Catalyst temperature sensor bank 2, sensor 1 failure	• Using the manufacturer approved diagnostic system check datalogger signals, Exhaust Gas Temperature Bank 1 Sensor 1 Voltage (0x03BF), Exhaust Gas Temperature Bank 2 Sensor 1 (0x03F7). Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 1 circuit for short to power. Repair wiring harness as required, clear DTC and retest system • Check and install a new catalyst temperature sensor - bank 2, sensor 1 as required. Refer to the new module/component installation note at the top of the DTC Index.
P043A-00	Catalyst Temperature Sensor Circuit (Bank 2, Sensor Circuit 2) - No sub type information	• Catalyst temperature sensor bank 2, sensor 2 circuit short to ground • Catalyst temperature sensor	• Using the manufacturer approved diagnostic system check datalogger signals, Exhaust Gas Temperature Bank 2 Sensor 2 (0x03F8), Exhaust Gas Temperature Sensor Bank 2 Sensor 2 Voltage (0x03E9) • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 2 circuit for short to ground. Repair wiring harness as required, clear DTC and

DTC	Description	Possible Cause	Action
		bank 2, sensor 2 circuit short to power • Catalyst temperature sensor bank 2, sensor 2 circuit high resistance • Catalyst temperature sensor bank 2, sensor 2 circuit open circuit • Catalyst temperature sensor bank 2, sensor 2 circuit disconnected • Catalyst temperature sensor bank 2, sensor 2 failure	retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 2 circuit for short to power. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 2 circuit for high resistance. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 2 circuit for open circuit. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 2 circuit for disconnected. Repair wiring harness as required, clear DTC and retest system • Check and install a new catalyst temperature sensor - bank 2, sensor 2 as required. Refer to the new module/component installation note at the top of the DTC Index
P043B-00	Catalyst Temperature Sensor Circuit Range/Performance (Bank 2, Sensor Circuit 2) - No sub type information	• Catalyst temperature sensor bank 2, sensor 2 circuit short to ground • Catalyst temperature sensor bank 2, sensor 2 circuit short to power • Catalyst temperature sensor bank 2, sensor 2 circuit high resistance • Catalyst temperature sensor bank 2, sensor 2 circuit open circuit • Catalyst temperature sensor bank 2, sensor 2 circuit disconnected • Catalyst temperature sensor bank 2, sensor 2 failure	• Using the manufacturer approved diagnostic system check datalogger signals, Exhaust Gas Temperature Bank 2 Sensor 2 (0x03F8), Exhaust Gas Temperature Sensor Bank 2 Sensor 2 Voltage (0x03E9) • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 2 circuit for short to ground. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 2 circuit for short to power. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 2 circuit for high resistance. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 2 circuit for open circuit. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 2 circuit for disconnected. Repair wiring harness as required, clear DTC and retest system • Check and install a new catalyst temperature sensor - bank 2, sensor 2 as required. Refer to the new module/component installation note at the top of the DTC Index
P043C-00	Catalyst Temperature Sensor Circuit Low (Bank 2, Sensor Circuit 2) - No sub type information	• Catalyst temperature sensor bank 2, sensor 2 circuit short to ground • Catalyst temperature sensor bank 2, sensor 2 circuit high resistance • Catalyst temperature sensor bank 2, sensor 2 circuit open circuit • Catalyst temperature sensor bank 2, sensor 2 circuit disconnected • Catalyst temperature sensor bank 2, sensor 2 failure	• Using the manufacturer approved diagnostic system check datalogger signals, Exhaust Gas Temperature Bank 2 Sensor 2 (0x03F8), Exhaust Gas Temperature Sensor Bank 2 Sensor 2 Voltage (0x03E9) • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 2 circuit for short to ground. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 2 circuit for high resistance. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 2 circuit for open circuit. Repair wiring harness as required, clear DTC and retest system • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 2 circuit for disconnected. Repair wiring harness as required, clear DTC and retest system • Check and install a new catalyst temperature sensor - bank 2, sensor 2 as required. Refer to the new module/component installation note at the top of the DTC Index

DTC	Description	Possible Cause	Action
P043D-00	Catalyst Temperature Sensor Circuit High (Bank 2, Sensor Circuit 2) - No sub type information	• Catalyst temperature sensor bank 2, sensor 2 circuit short to power • Catalyst temperature sensor bank 2, sensor 2 failure	• Using the manufacturer approved diagnostic system check datalogger signals, Exhaust Gas Temperature Bank 2 Sensor 2 (0x03F8), Exhaust Gas Temperature Sensor Bank 2 Sensor 2 Voltage (0x03E9) • Refer to the electrical circuit diagrams and check catalyst temperature sensor bank 2, sensor 2 circuit for short to power. Repair wiring harness as required, clear DTC and retest system • Check and install a new catalyst temperature sensor - bank 2, sensor 2 as required. Refer to the new module/component installation note at the top of the DTC Index
P0544-00	Exhaust Gas Temperature Sensor Circuit - Bank 1 Sensor 1 - No sub type information	• Exhaust gas temperature sensor, bank 1 sensor 1 circuit short to ground • Exhaust gas temperature sensor, bank 1 sensor 1 circuit short to power • Exhaust gas temperature sensor, bank 1 sensor 1 circuit high resistance • Exhaust gas temperature sensor, bank 1 sensor 1 circuit open circuit • Exhaust gas temperature sensor, bank 1 sensor 1 circuit disconnected • Exhaust gas temperature sensor, bank 1 sensor 1 failure	• Refer to the electrical circuit diagrams and check exhaust gas temperature sensor, bank 1 sensor 1 circuit for short to ground • Refer to the electrical circuit diagrams and check exhaust gas temperature sensor, bank 1 sensor 1 circuit for short to power • Refer to the electrical circuit diagrams and check exhaust gas temperature sensor, bank 1 sensor 1 circuit for high resistance • Refer to the electrical circuit diagrams and check exhaust gas temperature sensor, bank 1 sensor 1 circuit for open circuit • Refer to the electrical circuit diagrams and check exhaust gas temperature sensor, bank 1 sensor 1 circuit for disconnected. Repair wiring harness as required, clear DTC and retest system • Check and install a new exhaust gas temperature sensor, bank1 sensor 1 as required. Refer to the new module/component installation note at top of DTC Index
P0545-00	Exhaust Gas Temperature Sensor Circuit Low - Bank 1 Sensor 1 - No sub type information	• Exhaust gas temperature sensor, bank 1 sensor 1 circuit short to ground • Exhaust gas temperature sensor, bank 1 sensor 1 circuit high resistance • Exhaust gas temperature sensor, bank 1 sensor 1 circuit open circuit • Exhaust gas temperature sensor, bank 1 sensor 1 circuit disconnected • Exhaust gas temperature sensor, bank 1 sensor 1 failure	• Refer to the electrical circuit diagrams and check exhaust gas temperature sensor, bank 1 sensor 1 circuit for short to ground • Refer to the electrical circuit diagrams and check exhaust gas temperature sensor, bank 1 sensor 1 circuit for high resistance • Refer to the electrical circuit diagrams and check exhaust gas temperature sensor, bank 1 sensor 1 circuit for open circuit • Refer to the electrical circuit diagrams and check exhaust gas temperature sensor, bank 1 sensor 1 circuit for disconnected. Repair wiring harness as required, clear DTC and retest system • Check and install a new exhaust gas temperature sensor, bank1 sensor 1 as required. Refer to the new module/component installation note at top of DTC Index
P0546-00	Exhaust Gas Temperature Sensor Circuit High - Bank 1 Sensor 1 - No sub type information	• Exhaust gas temperature sensor, bank 1 sensor 1 circuit short to power • Exhaust gas temperature sensor, bank 1 sensor 1 failure	• Refer to the electrical circuit diagrams and check exhaust gas temperature sensor, bank 1 sensor 1 circuit for short to power. Repair wiring harness as required, clear DTC and retest system • Check and install a new exhaust gas temperature sensor, bank1 sensor 1 as required. Refer to the new module/component installation note at top of DTC Index

DTC	Description	Possible Cause	Action
P2002-68	Diesel Particulate Filter Efficiency Below Threshold (Bank 1) - event information	• Diesel particulate filter regeneration disabled by other DTCs logged	• Using the manufacturer approved diagnostic system, check for related DTCs and refer to the relevant DTC Index. Carry out a diesel particulate filter regeneration
P2031-00	Exhaust Gas Temperature Sensor Circuit Bank 1 Sensor 2 - No sub type information	• Harness fault - Particulate filter inlet exhaust gas temperature sensor • Particulate filter inlet exhaust gas temperature sensor internal fault	• Using the manufacturer approved diagnostic system check datalogger signals, Exhaust Gas Temperature Bank 1 Sensor 2 Voltage (0x03C4), Exhaust Gas Temperature Bank 1 Sensor 2 (0x03F5). This DTC is set if the particulate filter inlet exhaust gas temperature sensor fails a plausibility check at cold start. Refer to the workshop manual and check the particulate filter inlet exhaust gas temperature sensor and wiring harness for obvious signs of mechanical damage due to chaffing or heat. The particulate filter inlet exhaust gas temperature sensor is a thermistor located in the inlet to the particulate filter housing with a signal and ground connection. Refer to the electrical circuit diagrams and check the signal circuit for open circuit, short circuit to power, short circuit to ground, high resistance. Check the ground circuit for open circuit, high resistance, short circuit to power. Repair the wiring harness as required • If there are no wiring faults, refer to the workshop manual and check the sensor resistance value. Replace the sensor if required, refer to the new module/component installation note at top of DTC Index
P2032-00	Exhaust Gas Temperature Sensor Circuit Low Bank 1 Sensor 2 - No sub type information	• Harness fault - Particulate filter inlet exhaust gas temperature sensor • Particulate filter inlet exhaust gas temperature sensor internal fault	• Using the manufacturer approved diagnostic system check datalogger signals, Exhaust Gas Temperature Bank 1 Sensor 2 Voltage (0x03C4), Exhaust Gas Temperature Bank 1 Sensor 2 (0x03F5). This DTC is set if the particulate filter inlet exhaust gas temperature sensor fails a diagnostic check due to the circuit voltage being less than the expected value. Refer to the workshop manual and check the particulate filter inlet exhaust gas temperature sensor and wiring harness for obvious signs of mechanical damage due to chaffing or heat. The particulate filter inlet exhaust gas temperature sensor is a thermistor located in the inlet to the particulate filter housing with a signal and ground connection. Refer to the electrical circuit diagrams and check the signal circuit for open circuit, short circuit to power, short circuit to ground, high resistance. Check the ground circuit for open circuit, high resistance, short circuit to power. Repair the wiring harness as required • If there are no wiring faults, refer to the workshop manual and check the sensor resistance value. Replace the sensor if required, refer to the new module/component installation note at top of DTC Index
P2033-00	Exhaust Gas Temperature Sensor Circuit High Bank 1 Sensor 2 - No sub type information	• Harness fault - Particulate filter inlet exhaust gas temperature sensor • Particulate filter inlet exhaust gas temperature sensor internal fault	• Using the manufacturer approved diagnostic system check datalogger signals, Exhaust Gas Temperature Bank 1 Sensor 2 Voltage (0x03C4), Exhaust Gas Temperature Bank 1 Sensor 2 (0x03F5). This DTC is set if the particulate filter inlet exhaust gas temperature sensor fails a diagnostic check due to the circuit voltage being greater than the expected value. Refer to the workshop manual and check the particulate filter inlet exhaust gas temperature sensor and wiring harness for obvious signs of mechanical damage due to chaffing or heat. The particulate filter inlet exhaust gas temperature sensor is a thermistor located in the inlet to the particulate filter housing with a signal and ground connection. Refer to the electrical circuit diagrams and check the signal circuit for open circuit, short circuit to power, short circuit to ground, high resistance. Check the ground circuit for open circuit, high resistance, short circuit to power. Repair the wiring harness as required • If there are no wiring faults, refer to the workshop manual and check the sensor resistance value. Replace the sensor if required, refer to the new module/component installation note at top of DTC Index

DTC	Description	Possible Cause	Action
P2080-00	Exhaust Gas Temperature Sensor Circuit Range/Performance Bank 1 Sensor 1 - No sub type information	• Harness fault - Secondary turbo outlet temperature sensor • Secondary turbo outlet temperature sensor internal fault	• This DTC is set when there is a plausibility error on the signal from the secondary turbo outlet temperature sensor. Refer to the workshop manual and check the secondary turbo outlet temperature sensor and wiring harness for obvious signs of mechanical damage due to chaffing or heat. The secondary turbo outlet temperature sensor is a thermistor with a signal and ground connection. Refer to the electrical circuit diagrams and check the signal circuit for open circuit, short circuit to power, short circuit to ground, high resistance. Check the ground circuit for open circuit, high resistance, short circuit to power. Repair the wiring harness as required • If there are no wiring faults, refer to the workshop manual and check the sensor resistance value. Replace the sensor if required, refer to the new module/component installation note at top of DTC Index
P2084-00	Exhaust Gas Temperature Sensor Circuit Range/Performance Bank 1 Sensor 2 - No sub type information	• Harness fault - close coupled catalyst outlet temperature sensor • Close coupled catalyst outlet temperature sensor internal fault	• This DTC is set when there is a plausibility error on the signal from the close coupled catalyst outlet temperature sensor. Refer to the workshop manual and check the close coupled catalyst outlet temperature sensor and wiring harness for obvious signs of mechanical damage due to chaffing or heat. The close coupled catalyst outlet temperature sensor is a thermistor with a signal and ground connection. Refer to the electrical circuit diagrams and check the signal circuit for open circuit, short circuit to power, short circuit to ground, high resistance. Check the ground circuit for open circuit, high resistance, short circuit to power. Repair the wiring harness as required • If there are no wiring faults, refer to the workshop manual and check the sensor resistance value. Replace the sensor if required, refer to the new module/component installation note at top of DTC Index
P2226-62	Barometric Pressure Sensor A Circuit - Signal compare failure	• The Engine Control Module (ECM) has been submersed in water or mud • The Engine Control Module (ECM) has been sealed in a non approved covering	• Check the Engine Control Module (ECM) is clean and dry. • Check the Engine Control Module (ECM) is not sealed by any non approved covering. • If the DTC does not clear install a new Engine Control Module (ECM) as required. Refer to the new module/component installation note at top of DTC Index.
P2245-00	O2 Sensor Reference Voltage Circuit Low - Bank 1, Sensor 1 - No sub type information	• Harness fault - oxygen sensor circuit • Oxygen sensor internal fault	• This DTC is set if the Engine Control Module (ECM) detects the bank 1, oxygen sensor 1 reference voltage (LPV_A) is lower than expected. Refer to the electrical circuit diagrams and check the oxygen sensor harness for signs of damage caused by chaffing or heat. Check the oxygen sensor circuits for open circuits, high resistance, short to ground. Repair wiring as required, clear the DTC and retest the system • If there are no wiring faults suspect the oxygen sensor. Refer to the new module/component installation note at the top of the DTC Index
P2246-00	O2 Sensor Reference Voltage Circuit High - Bank 1, Sensor 1 - No sub type information	• Harness fault - oxygen sensor circuit • Oxygen sensor internal fault	• This DTC is set if the Engine Control Module (ECM) detects the bank 1, oxygen sensor 1 reference voltage (LPV_A) is greater than expected. Refer to the electrical circuit diagrams and check the oxygen sensor harness for signs of damage caused by chaffing or heat. Check the oxygen sensor circuits for open circuits, high resistance, short to power. Repair wiring as required, clear the DTC and retest the system • If there are no wiring faults suspect the oxygen sensor. Refer to the new module/component installation note at the top of the DTC Index
P242A-00	Exhaust Gas Temperature Sensor Circuit Bank 1 Sensor 3 - No sub type information	• Harness fault - particulate filter outlet temperature sensor • Particulate filter	• Using the manufacturer approved diagnostic system check datalogger signals, Exhaust Gas Temperature Bank 1 Sensor 3 (0x03F6), Exhaust Gas Temperature Bank 1 Sensor 3 Voltage (0x03F8). This DTC is set if the Particulate filter outlet temperature sensor fails a cold

DTC	Description	Possible Cause	Action
		outlet temperature sensor internal fault	start diagnostic check by the Engine Control Module. Refer to the workshop manual and check the particulate filter and sensor for obvious signs of damage. Check the sensor harness for chaffing or heat damage. Refer to the electrical circuit diagrams and check the particulate filter outlet temperature sensor signal circuit for open circuit, short to ground, short to other circuits. Check the sensor ground circuit for open circuit, short to power, high resistance. Repair wiring as required • If there are no wiring faults suspect the particulate filter outlet temperature sensor. Refer to the new module/component installation note at the top of the DTC Index
P242B-00	Exhaust Gas Temperature Sensor Circuit Range/Performance Bank 1 Sensor 3 - No sub type information	• Harness fault - particulate filter outlet temperature sensor • Particulate filter outlet temperature sensor internal fault	• Using the manufacturer approved diagnostic system check datalogger signals, Exhaust Gas Temperature Bank 1 Sensor 3 (0x03F6), Exhaust Gas Temperature Bank 1 Sensor 3 Voltage (0x03F8). This DTC is set if the Particulate filter outlet temperature sensor fails a plausibility check by the Engine Control Module. Refer to the workshop manual and check the particulate filter and sensor for obvious signs of damage. Check the sensor harness for chaffing or heat damage. Refer to the electrical circuit diagrams and check the particulate filter outlet temperature sensor signal circuit for open circuit, short to ground, short to other circuits. Check the sensor ground circuit for open circuit, short to power, high resistance. Repair wiring as required • If there are no wiring faults suspect the particulate filter outlet temperature sensor. Refer to the new module/component installation note at the top of the DTC Index
P242C-00	Exhaust Gas Temperature Sensor Circuit Low Bank 1 Sensor 3 - No sub type information	• Harness fault - particulate filter outlet temperature sensor • Particulate filter outlet temperature sensor internal fault	• Using the manufacturer approved diagnostic system check datalogger signals, Exhaust Gas Temperature Bank 1 Sensor 3 (0x03F6), Exhaust Gas Temperature Bank 1 Sensor 3 Voltage (0x03F8). This DTC is set if the Particulate filter outlet temperature sensor signal voltage is less than the Engine Control Module (ECM) was expecting. Refer to the workshop manual and check the particulate filter and sensor for obvious signs of damage. Check the sensor harness for chaffing or heat damage. Refer to the electrical circuit diagrams and check the particulate filter outlet temperature sensor signal circuit for open circuit, short to ground, short to other circuits. Check the sensor ground circuit for open circuit, short to power, high resistance. Repair wiring as required • If there are no wiring faults suspect the particulate filter outlet temperature sensor. Refer to the new module/component installation note at the top of the DTC Index
P242D-00	Exhaust Gas Temperature Sensor Circuit High Bank 1 Sensor 3 - No sub type information	• Harness fault - particulate filter outlet temperature sensor • Particulate filter outlet temperature sensor internal fault	• Using the manufacturer approved diagnostic system check datalogger signals, Exhaust Gas Temperature Bank 1 Sensor 3 (0x03F6), Exhaust Gas Temperature Bank 1 Sensor 3 Voltage (0x03F8). This DTC is set if the Particulate filter outlet temperature sensor signal voltage is greater than the Engine Control Module (ECM) was expecting. Refer to the workshop manual and check the particulate filter and sensor for obvious signs of damage. Check the sensor harness for chaffing or heat damage. Refer to the electrical circuit diagrams and check the particulate filter outlet temperature sensor signal circuit for open circuit, short to ground, short to other circuits. Check the sensor ground circuit for open circuit, short to power, high resistance. Repair wiring as required • If there are no wiring faults suspect the particulate filter outlet temperature sensor. Refer to the new module/component installation note at the top of the DTC Index.
P242F-00	Diesel Particulate Filter Restriction - Ash Accumulation (Bank 1) - No sub type information	• Maximum ash load	NOTE: The setting value of this DTC is inhibited • Contact dealer technical support

Pinpoint Tests

PINPOINT TEST A : DTC P244A-96 IS STORED	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: CHECK FOR OTHER DTCS	
	1 Using the manufacturer approved diagnostic system, check if any of the following DTCs are stored • P2456-00 • P2226-62 • P2452-95 • P2453-00
	Are any of the additional DTCs stored? **Yes** Refer to the relevant DTC Index and carry out the relevant repair procedure. **Only after the repair,** using the manufacturer approved diagnostic system clear the DTC and retest **No** Proceed to next step
A2: EXHAUST PIPE AND JOINTS	
	1 Check all exhaust pipes and joints for leaks
	2 Check for external damage to the diesel particulate filter metalwork
	Are any of the exhaust pipes leaking, or is there external damage to the diesel particulate filter metalwork? **Yes** Repair leaking exhaust joints as required Check and install a new diesel particulate filter as requiredRefer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component **No** Proceed to next step
A3: DIESEL PARTICULATE FILTER PRESSURE SENSOR PIPES	
	1 Check differential pressure sensor pipes for cracks, mis-routing or hoses crossed
	Are any of the differential pressure sensor pipes cracked, mis-routed or hoses crossed? **Yes** Repair as required, clear DTC and retest **No** Proceed to next step
A4: HARNESS DIFFERENTIAL PRESSURE SENSOR	
	1 Check wiring harness to the differential pressure sensor, include any inline connectors
	Was the wiring harness to the differential pressure sensor damaged? **Yes** Repair wiring harness as required, clear DTC and retest **No** Proceed to next step
A5: CONNECTOR INTEGRITY DIFFERENTIAL PRESSURE SENSOR	
	1 Check differential pressure sensor connector for damage and terminal corrosion
	Was the differential pressure sensor connector damaged or terminal corrosion present? **Yes** Refer to the electrical circuit diagrams and check connections are secure and wiring integrity. Repair as required, clear DTC and retest **No** Proceed to next step
A6: FUNCTIONAL CHECK DIFFERENTIAL PRESSURE SENSOR	
	NOTES: The Particulate Filter Differential Pressure Sensor measured voltage with the ignition on checks the sensor output with no variation/pressure in the exhaust system, checking the Particulate Filter Differential Pressure Sensor adaption is working. The measured voltages at engine idle and 4000 RPM will be considerably different depending on the diesel particulate filter soot loading. The idle value tells us that the Particulate Filter Differential Pressure Sensor is working if it goes up from the ignition on value. The 4000 RPM value tells us how much soot is in the diesel particulate filter. A diesel particulate filter which is recoverable measures less than 1.5volts / 300mbar at 4000 RPM If a new differential pressure sensor or hose lines have been installed, incorrectly routed, or any differential pressure sensor circuit repairs carried out, the Engine Control Module must learn and store the new differential pressure sensor offset value. The following conditions must be met to allow the differential pressure sensor offset value to be learnt and stored: Using the manufacturer approved diagnostic system, clear DTCs from Engine Control Module, then monitor the datalogger signal 'sump oil temperature - measured' ensuring a minimum of 50 degrees C is achieved. Start engine, run above 500RPM for 2 minutes, then a further 30 seconds at idle. Ensure the engine cooling fan is not running. Set vehicle in park and set ignition status to

	off. Wait 30 seconds for the Engine Control Module to power down, learn and store differential pressure sensor offset value. This process must be carried out six times, to allow a large negative offset value to adapt back to 0 Hpa 1 Using the manufacturer approved diagnostic system check datalogger signal - Particulate Filter Differential Pressure Sensor Voltage - Bank 1 - (0x03DB) under the conditions described below. Allow the voltage to stabilize before recording the value for approximately 7 seconds • Ignition is ON and engine speed is 0 RPM • Engine idle speed • Engine speed is 4000 RPM
	Was datalogger signal - Particulate Filter Differential Pressure Sensor Voltage - Bank 1 - (0x03DB) - value approximately 0.75 Volts when ignition ON and engine speed is 0 RPM?Was datalogger signal - Particulate Filter Differential Pressure Sensor Voltage - Bank 1 - (0x03DB) - value less than 1 Volt when engine speed at idle?Was datalogger signal - Particulate Filter Differential Pressure Sensor Voltage - Bank 1 - (0x03DB) - value less than 1.5 Volt when engine speed at 4000 RPM? (1volt = 100mbar, 1.5 volts = 300mbar at 4000RPM) **Yes** Proceed to next step **No** Check and install a new differential pressure sensor as requiredRefer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/componentUsing the manufacturer approved diagnostic system clear the DTC and retest NOTE: If a new differential pressure sensor or hose lines have been installed, incorrectly routed, or any differential pressure sensor circuit repairs carried out, the Engine Control Module must learn and store the new differential pressure sensor offset value. The following conditions must be met to allow the differential pressure sensor offset value to be learnt and stored: Using the manufacturer approved diagnostic system, clear DTCs from Engine Control Module, then monitor the datalogger signal 'sump oil temperature - measured' ensuring a minimum of 50 degrees C is achieved. Start engine, run above 500RPM for 2 minutes, then a further 30 seconds at idle. Ensure the engine cooling fan is not running. Set vehicle in park and set ignition status to off. Wait 30 seconds for the Engine Control Module to power down, learn and store differential pressure sensor offset value. This process must be carried out six times, to allow a large negative offset value to adapt back to 0 Hpa
A7: ACCELERATION SMOKE TEST	
	NOTE: Ensure the engine is at normal operating temperature 1 Increase the engine speed momentarily to 4000RPM and allow the engine to settle back to idle
	2 Carry out above step 3 times
	3 Carry out visual check for excessive black smoke leaving the tailpipe during each of the 3 tests
	Is excessive black smoke visible leaving the tailpipe during each of the 3 tests? **Yes** Note: Only install a new diesel particulate filter if black smoke is visible leaving the tailpipe Check and install a new diesel particulate filter as requiredRefer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/componentUsing the manufacturer approved diagnostic system clear the DTC and retest. Return vehicle to the customer **No** Check and install a new differential pressure sensor as requiredCarry out differential pressure sensor adaption process

PINPOINT TEST B : RED WARNING MESSAGE DPF FULL VISIT DEALER IS DISPLAYED AND DTC P2463-00 IS LOGGED

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: VIN INFORMATION	
	1 Record the full vehicle identification number for the vehicle under test, as this information may later be required by dealer technical support
	Has the vehicle identification number been recorded? **Yes** Proceed to the next step **No** Record the vehicle identification number and proceed to the next step
B2: VEHICLE MILEAGE	
	1 Record the full mileage for the vehicle under test, as this information may later be required by dealer technical support
	Has the mileage been recorded? **Yes** Proceed to the next step **No** Record the mileage and proceed to the next step
B3: VEHICLE SOFTWARE PART NUMBER	

	NOTE: Known software issue on PD software level where Lambda sensor adaption is not complete and the assumed value of O2 in air is 0%, PE software level corrected to 21% This can lead to non recognition of good regenerations of the diesel particulate filter 1 Using the manufacturer approved diagnostic system, record the software part number for the Engine Control Module (ECM)
	Has the software part number been recorded? Is the software installed to the vehicle to the latest relevant level? **Yes** Proceed to the next step **No** Record the software part number and proceed to the next step
B4: RECORD ALL ENGINE CONTROL MODULE (ECM) DTCS	
	1 Using the manufacturer approved diagnostic system, check Engine Control Module (ECM), for related DTCs
	Are other DTCs logged? **Yes** Proceed to the next step **No** Proceed to step 7
B5: DTC P2459-65 IS LOGGED	
	1 Using the manufacturer approved diagnostic system, the logged mileage for DTCs can be seen by viewing the snapshot data
	Was DTC P2459-65 logged at a mileage up to 625 miles (1000KM) before the diagnostic trouble P2463-00 was logged? **Yes** Suspect the customer has ignored the AMBER DPF FULL REFER TO HANDBOOK message. The customer should be advised of this and the repair may become chargeable Proceed to step 7 **No** Proceed to the next step
B6: OTHER RELATED ENGINE CONTROL MODULE (ECM) DTCS	
	1 Related Engine Control Module (ECM) DTCs other than P2459-65 and P2463-00 are logged
	Are related Engine Control Module (ECM) DTCs other than P2459-65 and P2463-00 logged? **Yes** Refer to the relevant DTC Index. Repair as required. Using the manufacturer approved diagnostic system clear the DTCs and retest **No** Proceed to step 7
B7: DIESEL PARTICULATE FILTER REGENERATION CYCLE	
	NOTE: Using the manufacturer approved diagnostic system begin to perform a service regeneration cycle, **DO NOT** drive the cleaning cycle. **Record the grams of soot only** 1 With the engine at running temperature check the pre catalyst oxygen sensor operation as follows:-
	2 Using the manufacturer approved diagnostic system check datalogger signals - Oxygen Sensor Voltage - (0xF424) • Idle vehicle and record, should be (0.9 ~ 1 volt) • Idle to 100% pedal, during acceleration record, should be 0 volts • Accelerate to 4500RPM (stationary) and close throttle, should read 1.2 ~ 1.3 volts
	Does the pre catalyst oxygen sensor meets this criteria? **Yes** Pre catalyst oxygen sensor is operating correctlyNote: **DO NOT** carry out the adaption process on the pre catalyst oxygen sensor, as this resets the adaption to 0Proceed to step 8 **No** Pre catalyst oxygen sensor adaption cycle is required Pre catalyst oxygen sensor adaption cycle is **NOT** possible while DTCs are loggedUsing the manufacturer approved diagnostic system, carry out FIT NEW PARTICULATE FILTER PROCESS only and clear the DTCsAfter completing FIT NEW PARTICULATE FILTER PROCESS continue with pre catalyst oxygen sensor adaption cycle as follows:-1. Idle vehicle for 10 minutes2. Set car in command shift 3rd gear3. Accelerate to 3800RPM (where achievable) and overrun / coastdown without braking until revs drop below 1500 RPM4. Repeat step 3 a further 3 times5. Check for any DTCs, if adaption failed a DTC will be evident and the sensor will require replacement6. Check oxygen sensor adaption is now complete by returning to B7 item 27. Using the manufacturer approved diagnostic system clear the DTC and retest. Return vehicle to the customer
B8: SOOT ESTIMATOR IS ACCURATE AND THE DIFFERENTIAL PRESSURE SENSOR READING IS WORKING CORRECTLY	
	1 Using the manufacturer approved diagnostic system check datalogger signal - Particulate Filter Differential Pressure Sensor Voltage - Bank 1 - (0x03DB) • Record value with ignition ON • Idle engine record value • Hold engine speed at 4000RPM and record value • Note: 1volt = 100mbar, 1.5 volts = 300mbar at 4000RPM

	Have the values been recorded for each of the conditions? **Yes** Proceed to step 9 **No** Record values for each of the conditions and proceed to step 9
B9: EXHAUST GAS TEMPERATURES	
	1 Using the manufacturer approved diagnostic system check datalogger signals • Exhaust Gas Temperature Bank 1 Sensor 2 - (0x03F5) • Exhaust Gas Temperature Bank 1 Sensor 3 - (0x03F6) • Exhaust Gas Temperature Bank 2 Sensor 1 - (0x03F7) • Exhaust Gas Temperature Bank 2 Sensor 2 - (0x03F8)
	2 Hold engine speed at 2000RPM for 5 minutes and record values (By doing this we are trying to establish if the system can recognize heat in the exhaust during regeneration)
	Are all of the exhaust gas temperature sensors showing reasonable values between 120°C and 400°C? **Yes** Proceed to step 10 **No** Check and install new exhaust gas temperature sensors as required. Refer to the new module/component installation note at the top of the DTC Index Using the manufacturer approved diagnostic system clear the DTCs and retest
B10: COMPARISON OF SOOT MASS IN DIESEL PARTICULATE FILTER AND PARTICULATE FILTER DIFFERENTIAL PRESSURE SENSOR VOLTAGE	
NOTE: Using the results from steps 7 and 8 establish if the Soot Mass estimator and the differential pressure sensor are aligned, in terms of their assessment of soot in the filter. If the soot mass is less than 54 grams the diesel particulate filter is recoverable.	
	1 Using the results from step 7 check soot mass is less than 54 grams
	2 Using the results from step 8 check particulate filter differential pressure sensor voltage at 4000RPM is less than 1.5 volts (300mbar)
	Is diesel particulate filter soot mass value less than 54 grams and particulate filter differential pressure sensor voltage at 4000RPM less than 1.5 volts (300mbar)? **Yes** If the diesel particulate filter soot mass value is greater than 50 grams and the differential pressure sensor voltage is between 0.5Volts and 1.1Volts then the diesel particulate filter is low on soot but has not been driven to allow pressure correction of the diesel particulate filter, if other issue from the tests performed are evident. Proceed to next step **No** If the diesel particulate filter soot mass value is greater than 50 grams and the differential pressure sensor voltage greater than 1.5 volts then the diesel particulate filter has a high soot contentIf no other issue from the tests performed are evident then the vehicle has a soot generated fault not detected by DTCs. Refer to the relevant section of the workshop manual and check for boost pressure leakage using the manufacturer approved leak check toolContact dealer technical support for further advice
B11: SOOT MASS REDUCTION	
	1 With the vehicle fully up to temperature and in Park maintain 2500RPM for 10 minutes
	2 Return to step 7, check diesel particulate filter soot mass value
	Has the diesel particulate filter soot mass reduced from the original recorded value? **Yes** Proceed to next step **No** Proceed to step 13
B12: DRIVE VEHICLE	
	CAUTION: At all times during this procedure you should observe all relevant speed limits, laws, and regulations 1 Drive the vehicle until the engine reaches normal operating temperature. The engine should **NOT** be left idling to achieve working temperature. Drive the vehicle for a further twenty minutes, keeping the vehicle at a constant speed between 75 km/h (45 mph) and 120 km/h (75 mph). Keeping a constant speed enables the diesel particulate filter to regenerate more efficiently. It is therefore recommended that cruise control is used to achieve this, if possible (Do NOT carry out diesel particulate filter service regeneration)
	Is the diesel particulate filter soot mass less than 20 grams? **Yes** Using the manufacturer approved diagnostic system clear the DTC and retest. Return vehicle to the customer **No** Contact dealer technical support with all of the recorded values from the above tests
B13: CARRY OUT FIT NEW PARTICULATE FILTER PROCESS	
	WARNING: **DO NOT** carry out this process on any other occasion without first installing a new diesel particulate filter Using the manufacturer approved diagnostic system, select SPECIAL APPLICATIONS ~ POWERTRAIN ~

	1	carry out FIT NEW PARTICULATE FILTER PROCESS
	2	Carry out diesel particulate filter service regeneration. Record grams of soot following diesel particulate filter service regeneration
	Is the diesel particulate filter soot mass less than 20 grams? **Yes** Using the manufacturer approved diagnostic system clear the DTC and retest. Return vehicle to the customer **No** Contact dealer technical support with all of the recorded values from the above tests	

Diesel particulate filter regeneration procedure

If DPF FULL SEE HANDBOOK appears in the message center, carry out the following procedure

CAUTIONS:

The regeneration procedure produces high temperatures in the diesel particulate filter. Heat can be felt radiating from beneath the vehicle, which is normal and not a cause for concern. However, the vehicle should not be parked over combustible material, particularly during dry weather. The heat generated could be sufficient to start a fire when in close proximity to combustible material such as long dry grass, paper etc

At all times during this procedure you should observe all relevant speed limits, laws, and regulations

NOTES:

The ideal speed and conditions for regeneration are 100 km/h (62 mph) ~ 120 km/h (75 mph), in Drive. Keeping a constant speed enables the diesel particulate filter to regenerate more efficiently. It is therefore recommended that cruise control is used to achieve this, if possible

When driving off-road during the regeneration process, greater accelerator pedal use may be required

1. Drive the vehicle until the engine reaches normal operating temperature. The engine should **NOT** be left idling to achieve working temperature
2. Drive the vehicle for a further twenty minutes, keeping the vehicle at a constant speed between 75 km/h (45 mph) and 120 km/h (75 mph)
3. If regeneration is successful the warning message will be extinguished, once the message is extinguished please keep driving for 10 minutes to ensure that the diesel particulate filter is completely clean
4. If the message remains repeat the process

DTC Index

For a complete list of all diagnostic trouble codes that could be logged on this vehicle, please refer to Section 100-00. REFER to: Diagnostic Trouble Code (DTC) Index - TDV6 3.0L Diesel, DTC: Engine Control Module (ECM) (100-00 General Information, Description and Operation).

Published: 08-Apr-2014

Exhaust System - TDV6 3.0L Diesel - Exhaust System

Diagnosis and Testing

Principle of Operation

For a detailed description of the Exhaust System, refer to the relevant Description and Operation section of the workshop manual.

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:

If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
• Leaks • Metal fatigue • Pipes • Catalytic converter • Muffler(s) • Joints • Mountings • Clearance around components	• Fuses • Wiring harnesses and connectors • Engine control module (ECM) • Sensor(s) • Actuator(s)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index
5. Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

Symptom Chart

Symptom	Possible Causes	Action
Noisy or leaking exhaust	• Exhaust system/components	• Install new components as necessary. Refer to the relevant section of the workshop manual
Lack of power	• Air intake system fault • Restricted exhaust system • Low fuel pressure • Exhaust gas recirculation valve(s) fault • Turbocharger fault	• Check the air intake system • Check for a blocked catalytic converter or muffler, install new components as necessary • Check the fuel pressure • Refer to the relevant section of the workshop manual and test the exhaust gas recirculation valve(s) • Refer to the relevant section of the workshop manual and test the turbocharger(s)

DTC Index

For a complete list of all diagnostic trouble codes that could be logged on this vehicle, please refer to Section 100-00.

Published: 11-May-2011

Exhaust System - TDV6 3.0L Diesel - Catalytic Converter

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. WARNINGS:

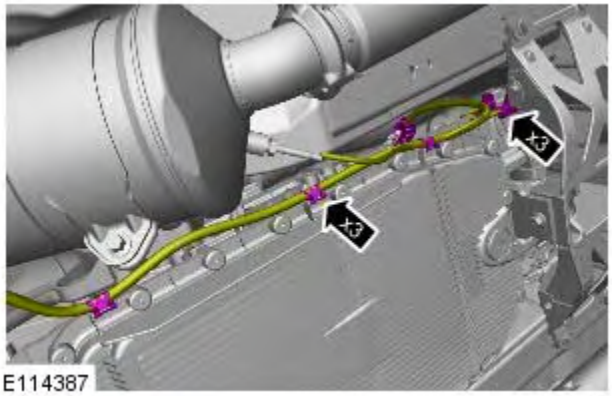
   Make sure to support the vehicle with axle stands.

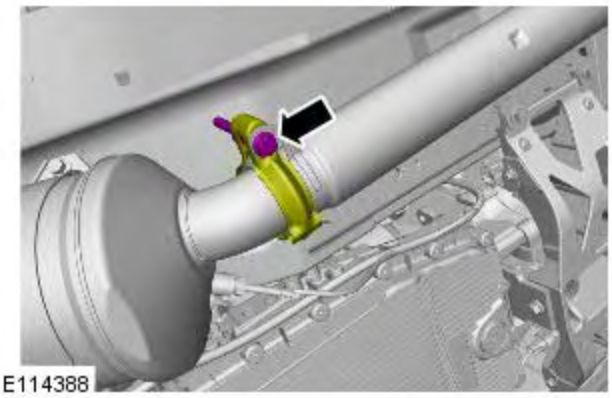
   Observe due care when working near a hot exhaust system.

   Raise and support the vehicle.

2. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

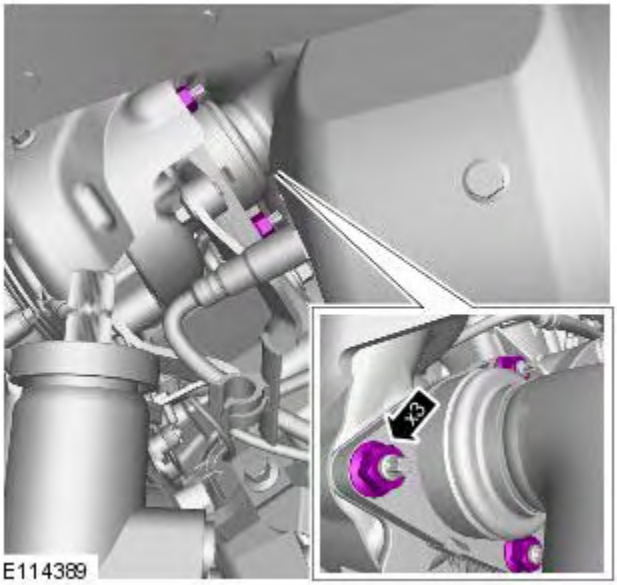
3.





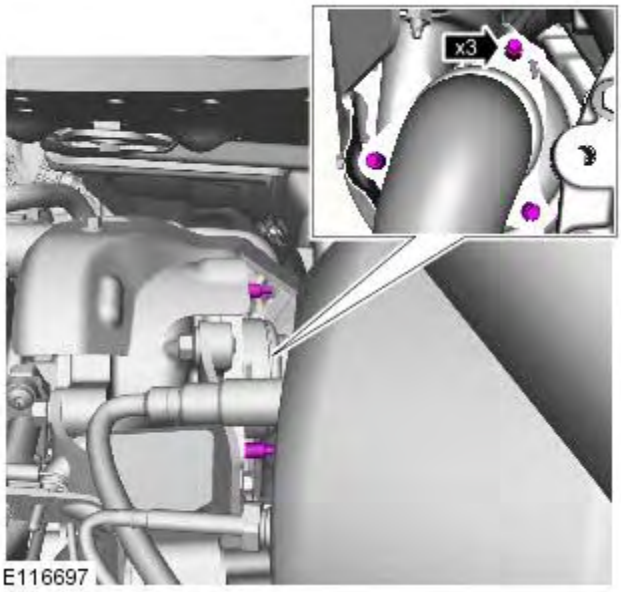
4. CAUTION: Make sure that the exhaust system is supported with suitable retaining straps.

   Torque: 11 Nm



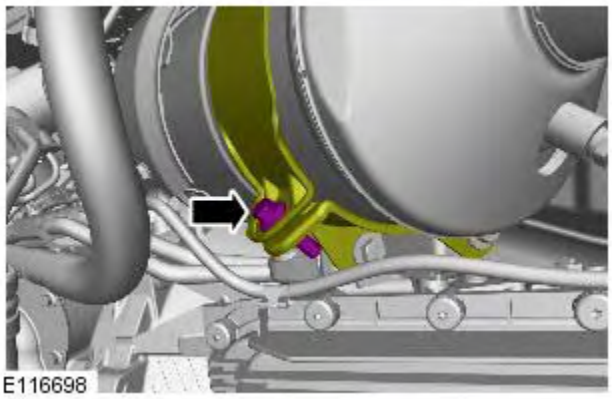
5. CAUTION: Discard the nuts.

Torque: 22 Nm



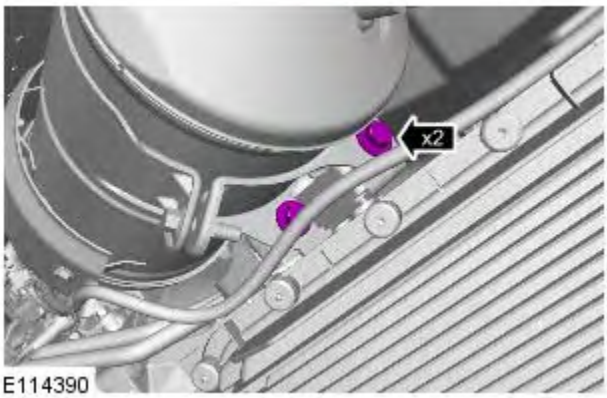
6. CAUTION: Discard the studs.

Torque: 15 Nm



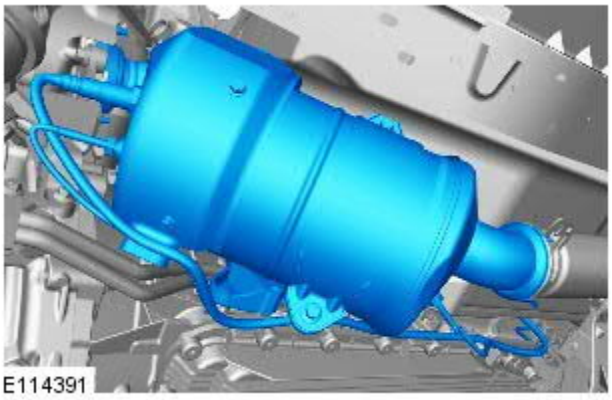
7. NOTE: Loosen the bolt, but do not fully remove.

Torque: 12 Nm



E114390

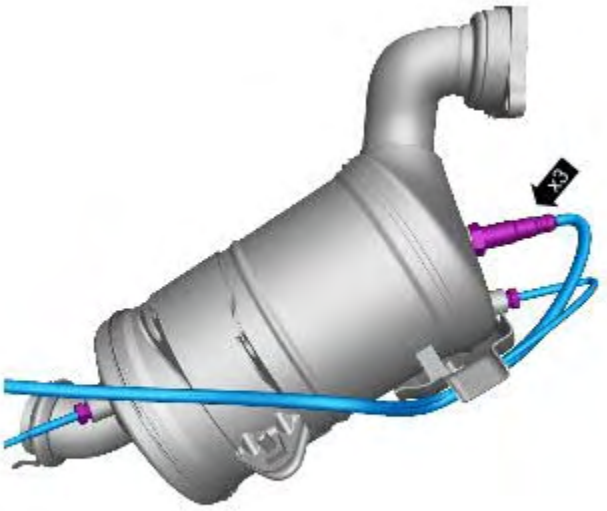
8. *Torque:* 25 Nm


E114391

9. NOTES:

   Do not disassemble further if the component is removed for access only.

   Discard the gasket.


E114392

10. NOTE: Do not disassemble further if the component is removed for access only.

    Torque: 35 Nm

Installation

1. To install, reverse the removal procedure.

Published: 02-Feb-2012

Exhaust System - TDV6 3.0L Diesel - Diesel Particulate Filter (DPF)

Removal and Installation

Removal

WARNING: Observe due care when working near a hot exhaust system.

NOTE: Removal steps in this procedure may contain installation details.

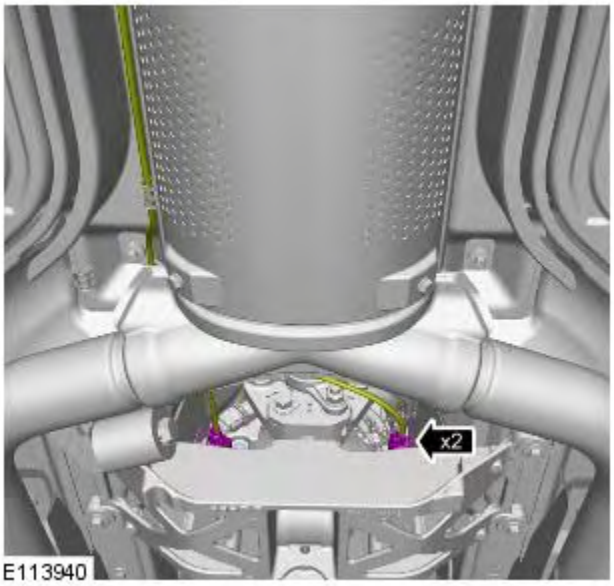
1. WARNING: Make sure to support the vehicle with axle stands.

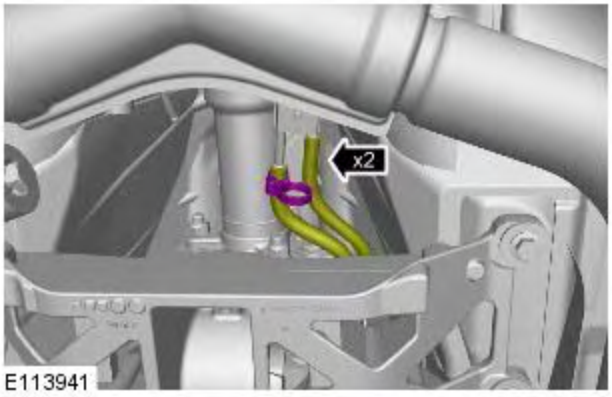
   CAUTION: Make sure that the exhaust system is supported with suitable retaining straps.

   Raise and support the vehicle.

2. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

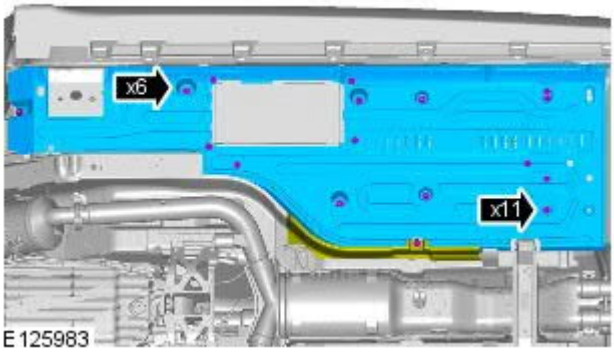
3.





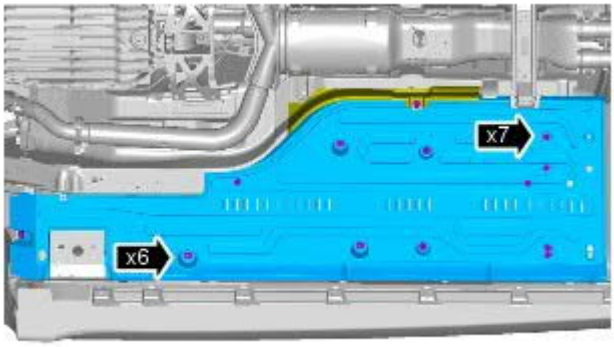
4. CAUTION: Make a note of the connection orientation of the high and low pressure hoses to the sensor ports. Make sure the hoses are located to the correct sensor port when installed. Failure to follow these instructions may result in damage to the vehicle.

5. *Torque:* 7 Nm



E125983

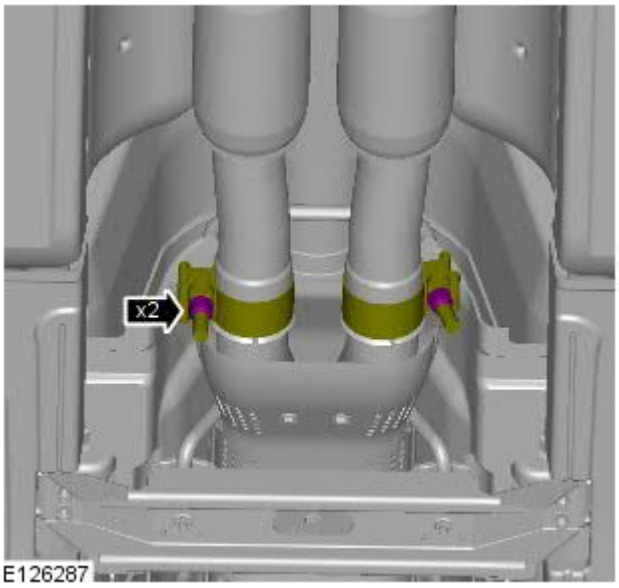
6. *Torque:* 7 Nm



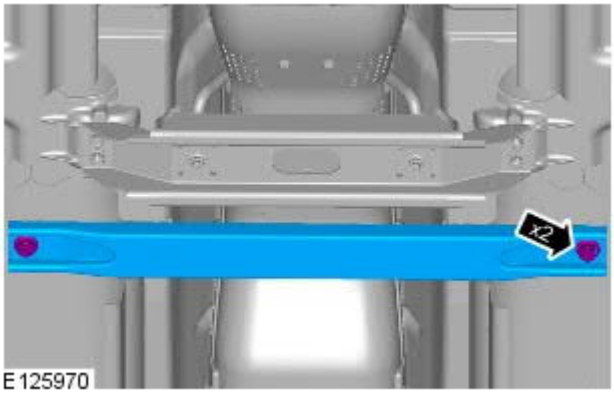
E125984

7. CAUTION: Make sure that these components are installed to the noted removal position.

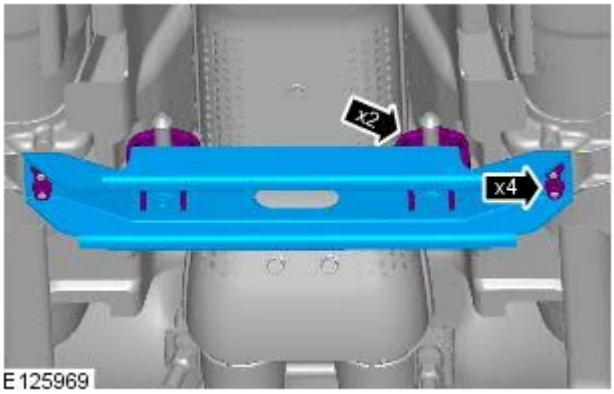
   Torque: 55 Nm



E126287



8. *Torque:* 55 Nm



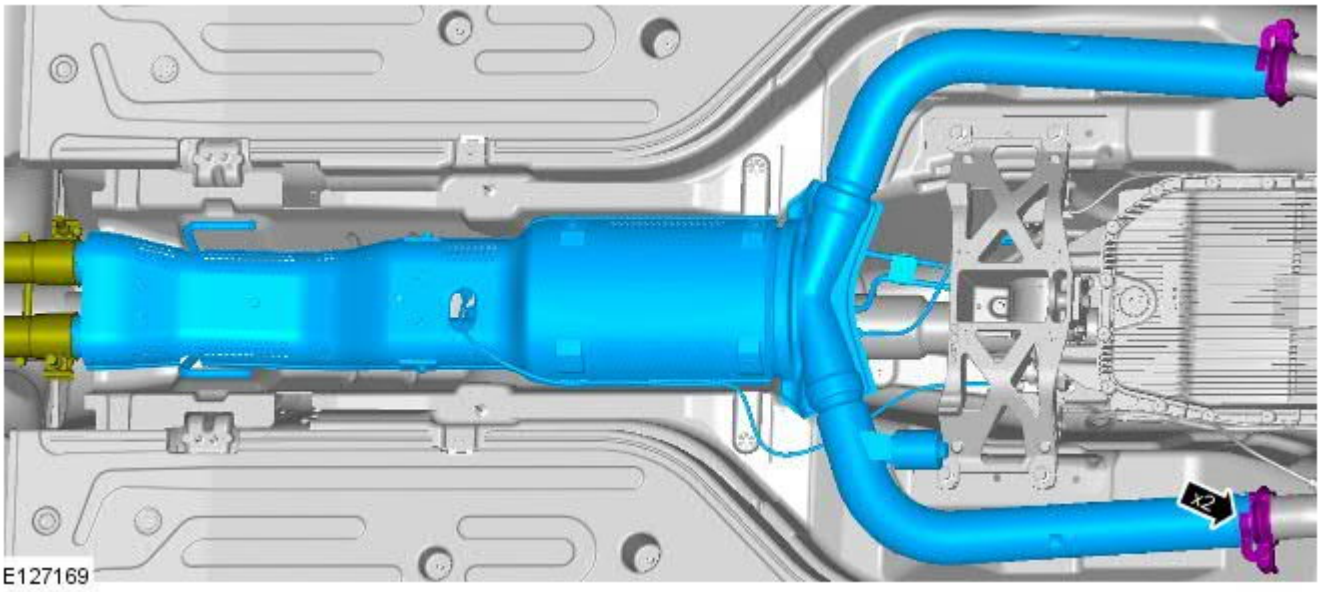
9. CAUTION: Discard the nuts.

   NOTE: Apply lubricant to the exhaust mount to aid installation.

   Torque: 9 Nm

10. NOTE: This step requires the aid of another technician.

    Torque: 11 Nm



Installation

1. To install, reverse the removal procedure.
2. If a new unit is installed, configure using the approved diagnostic tool.

Published: 11-May-2011

Exhaust System - TDV6 3.0L Diesel - Exhaust System

Removal and Installation

General Equipment

Transmission jack

Removal

NOTE: Removal steps in this procedure may contain installation details.

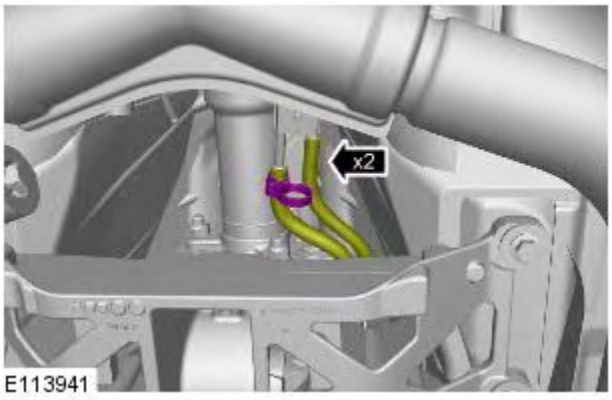
1. WARNINGS:

   Make sure to support the vehicle with axle stands.

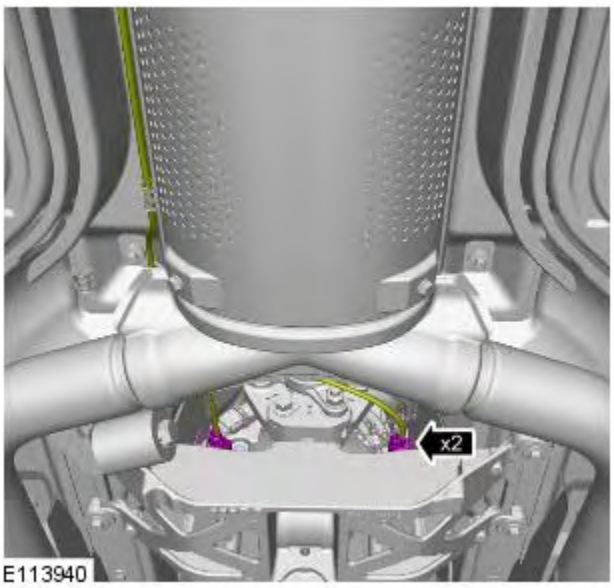
   Observe due care when working near a hot exhaust system.

   Raise and support the vehicle.

2. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

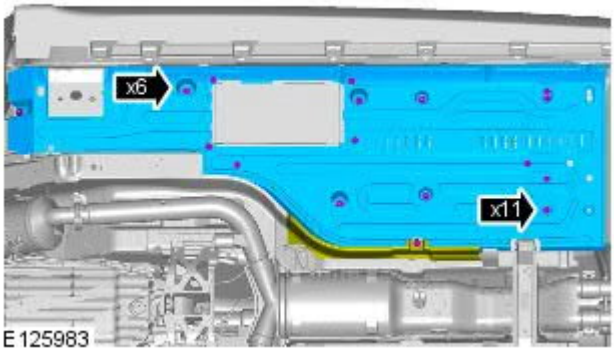


3. CAUTION: Make a note of the connection orientation of the high and low pressure hoses to the sensor ports. Make sure the hoses are located to the correct sensor port when installed. Failure to follow these instructions may result in damage to the vehicle.

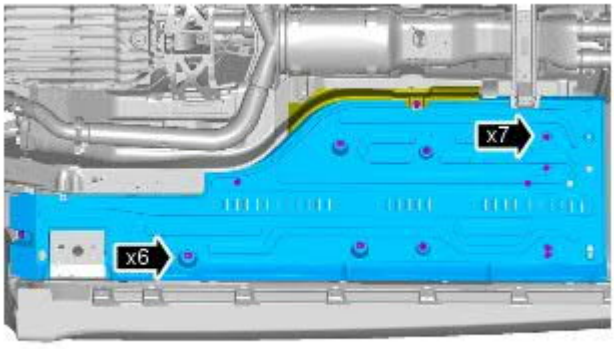


4. CAUTION: Make sure that the wiring harness does not catch.

5. *Torque:* 7 Nm

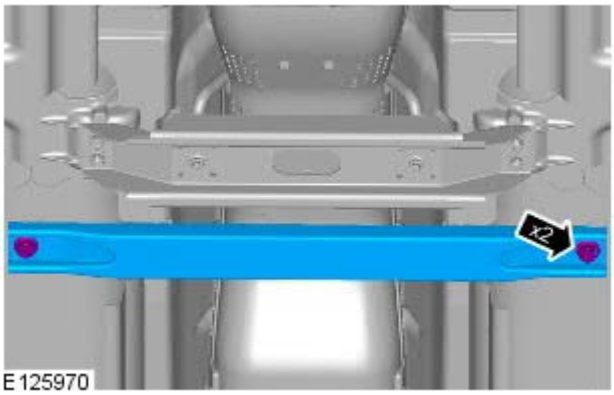


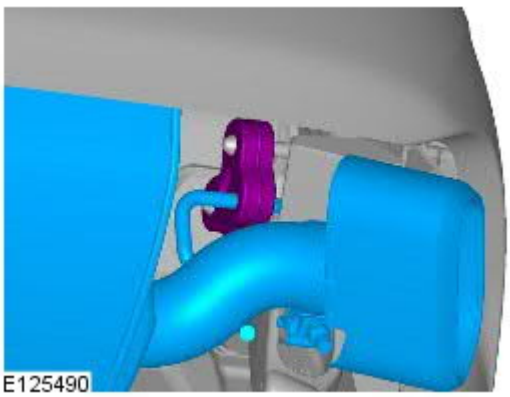
6. *Torque:* 7 Nm



E125984

7. *Torque:* 55 Nm



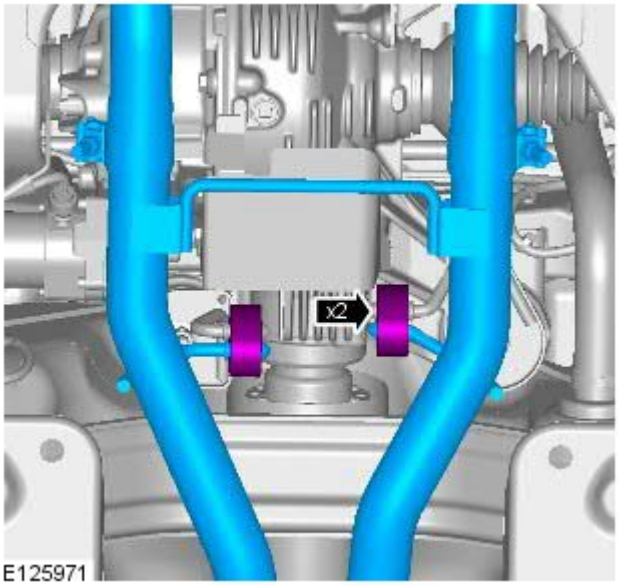


8. CAUTION: Make sure that these components are installed to the noted removal position.

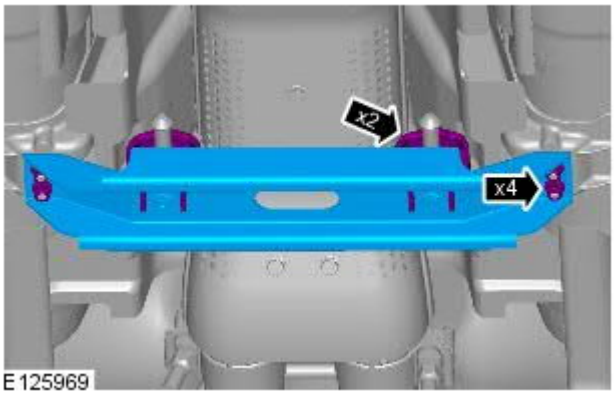
   NOTES:

   Left-hand shown, right-hand similar.

   Apply lubricant to the exhaust mount to aid installation.

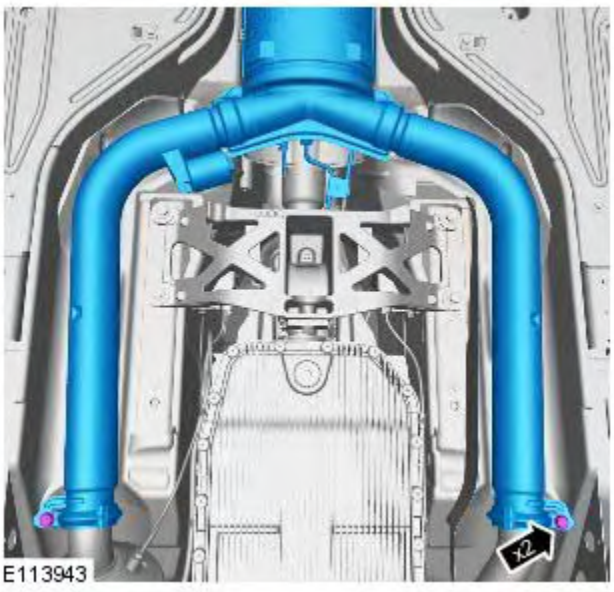


9. NOTE: Apply lubricant to the exhaust mount to aid installation.



10. CAUTION: Discard the nuts.

Torque: 9 Nm



11. CAUTION: Make sure that the exhaust system is supported with suitable retaining straps.

NOTE: This step requires the aid of another technician.

With assistance, remove the exhaust system.

General Equipment: Transmission jack
Torque: 11 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Exhaust System - TDV6 3.0L Diesel - Front Muffler

Removal and Installation

Removal

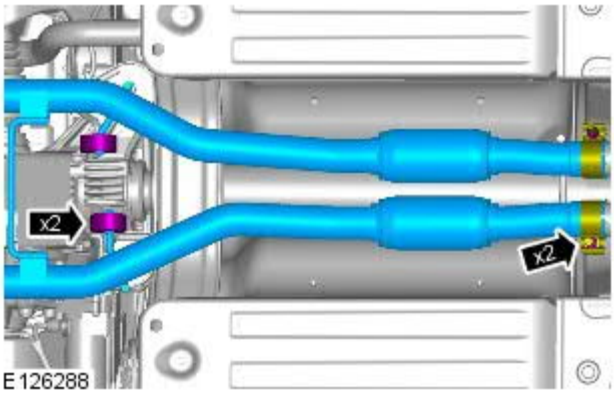
WARNING: Observe due care when working near a hot exhaust system.

NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Rear Muffler (309-00A Exhaust System - TDV6 3.0L Diesel, Removal and Installation).



3. CAUTION: Make sure that these components are installed to the noted removal position.

   NOTE: This step requires the aid of another technician.

   Torque: 55 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Exhaust System - TDV6 3.0L Diesel - Rear Muffler

Removal and Installation

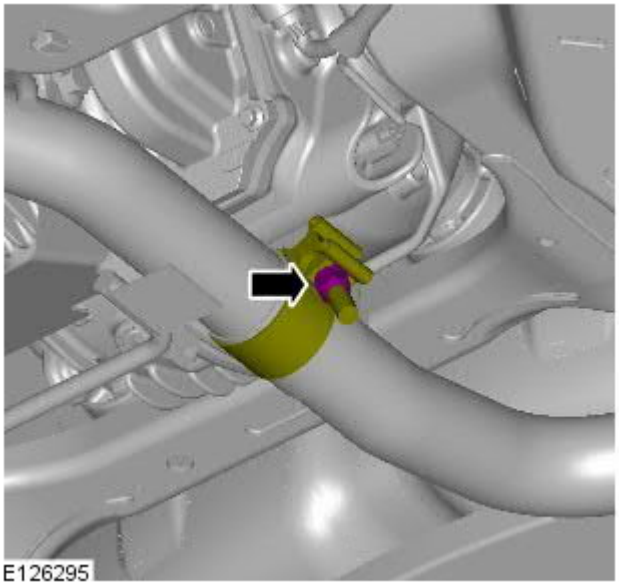
Removal

WARNING: Observe due care when working near a hot exhaust system.

NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

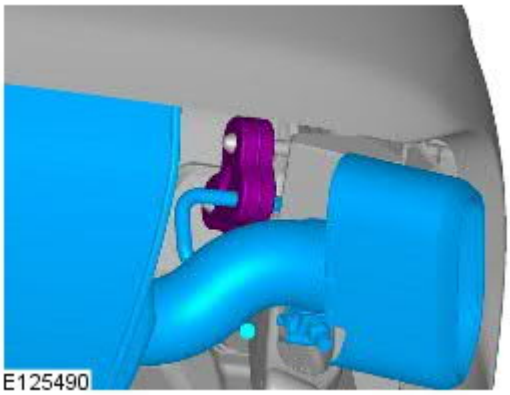
   Raise and support the vehicle.



2. CAUTION: Make sure that these components are installed to the noted removal position.

   NOTE: Left-hand shown, right-hand similar.

   Torque: 55 Nm



3. CAUTION: Make sure that these components are installed to the noted removal position.

   NOTES:

   Left-hand shown, right-hand similar.

   Apply lubricant to the exhaust mount to aid installation.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Fuel System - General Information -

General Specifications

Item	Specification
Fuel tank capacity - vehicles with 5.0L	80 (usable) liters
Fuel tank capacity - vehicles with 3.0L diesel	77 (usable) liters
Fuel tank capacity - when fuel gauge indicates empty - vehicles with 5.0L	74 liters
Fuel tank capacity - when fuel gauge indicates empty - vehicles with 3.0L diesel	68 liters
Reserve capacity - when fuel gauge indicates empty - all vehicles	4 liters

Published: 11-May-2011

Fuel System - General Information - Fuel Tank Draining TDV6 3.0L Diesel

General Procedures

Special Tool(s)

	310-154 Adapter, Fuel drain

Draining

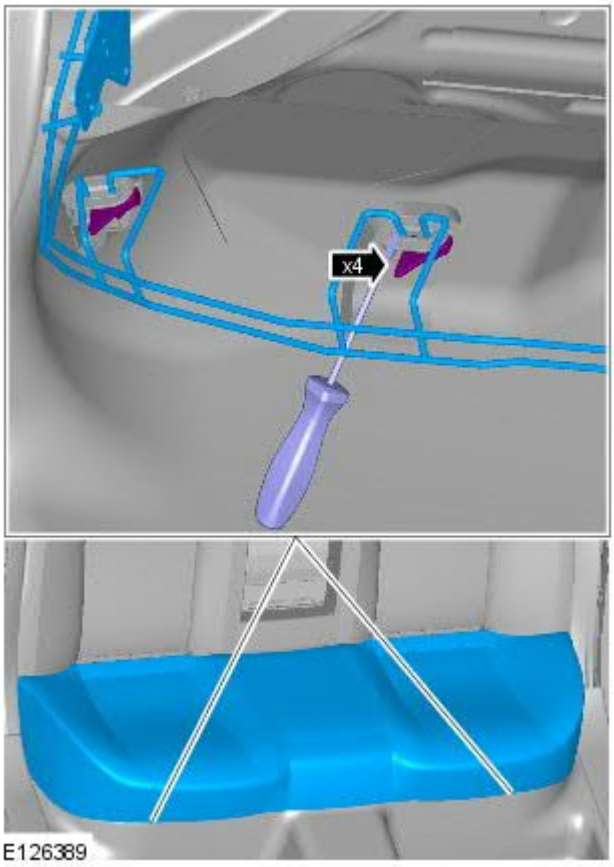
NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Diesel Fuel System Health and Safety Precautions (100-00 General Information, Description and Operation).

2.



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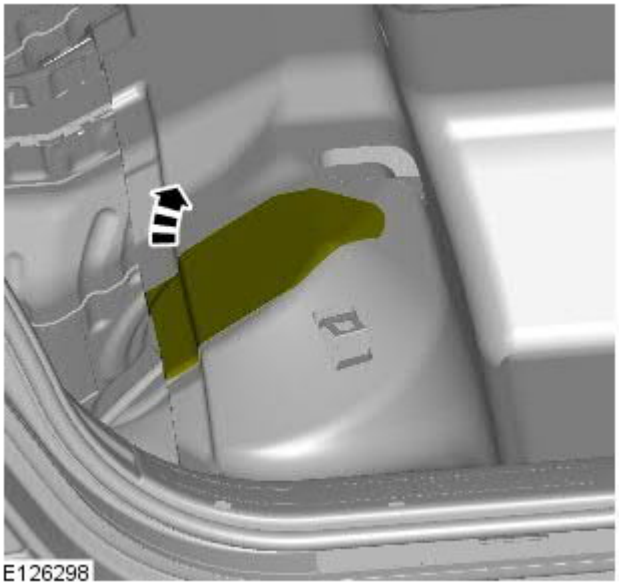

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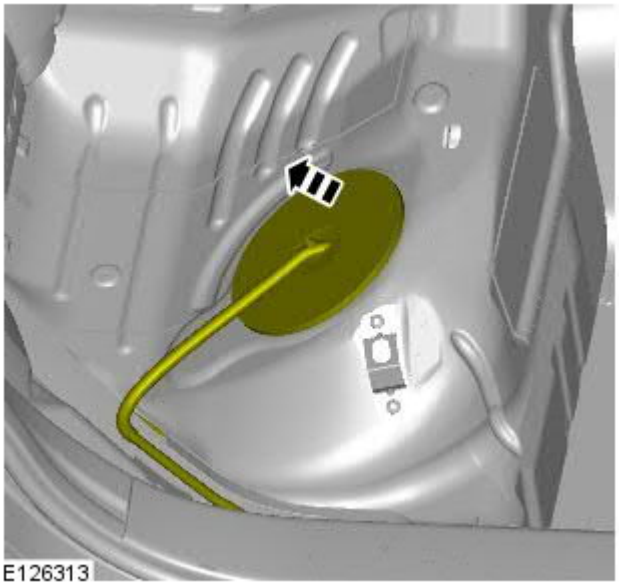
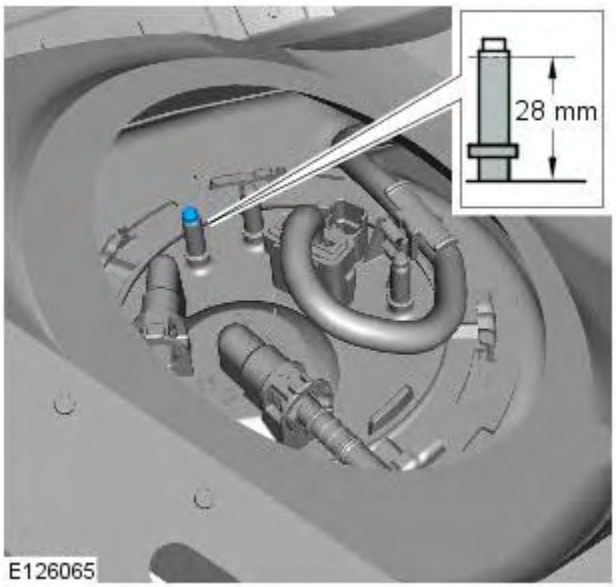
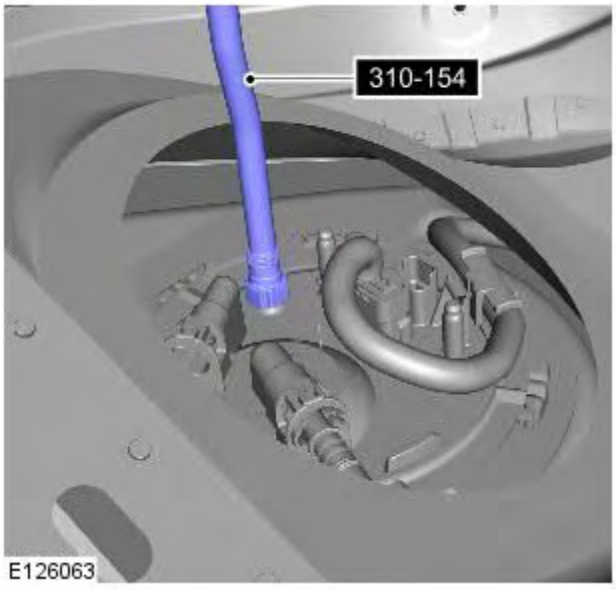




5. CAUTION: The correct measurement must be used to remove the fuel tank drain port top. Failure to follow this instruction may result in damage to the vehicle.

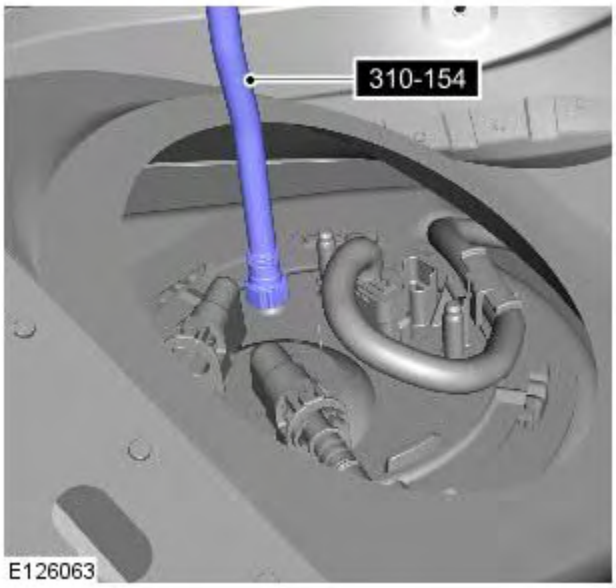
   Using a suitable tool, remove the top of the fuel tank drain port.



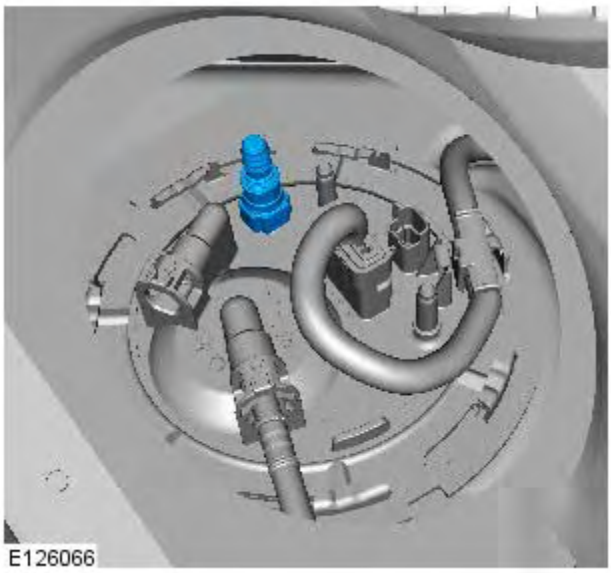
6. NOTE: A fuel vacuum drain unit must be attached to the special tool to achieve full fuel tank drain.

   Using the special tool, drain the right-hand side of the fuel tank.

   Special Tool(s): 310-154



7. Remove the special tool.



8. CAUTION: Make sure the new fuel tank drain port sealing cap is correctly installed. Failure to follow this instruction may result in damage to the vehicle.

NOTE: An audible click can be heard when the fuel tank draining port sealing cap is correctly installed.

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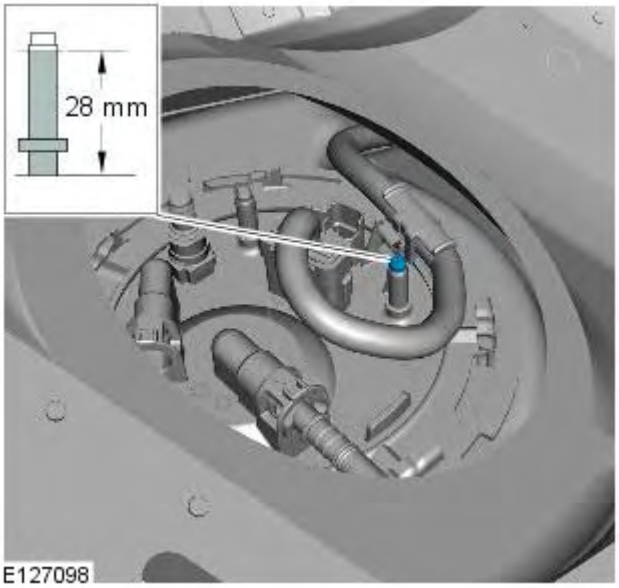
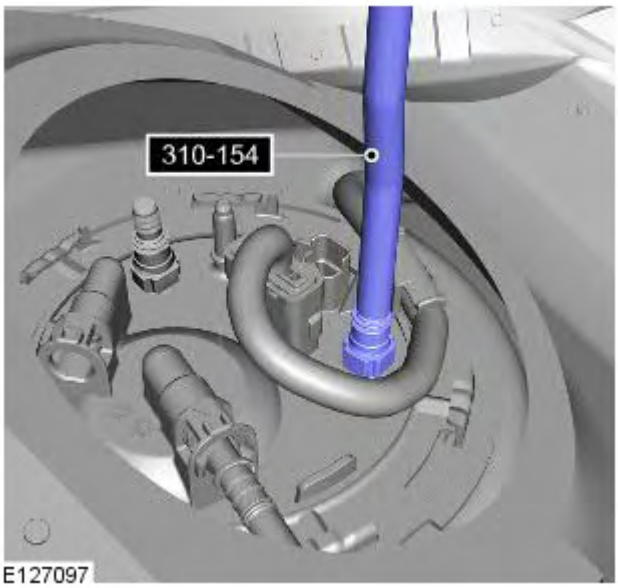


9. CAUTION: The correct measurement must be used to remove the fuel tank drain port top. Failure to follow this instruction may result in damage to the vehicle.

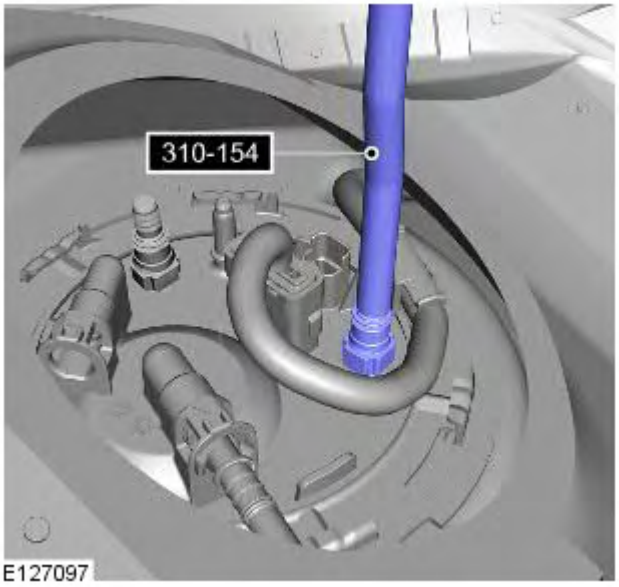
   Using a suitable tool, remove the top of the fuel tank drain port.



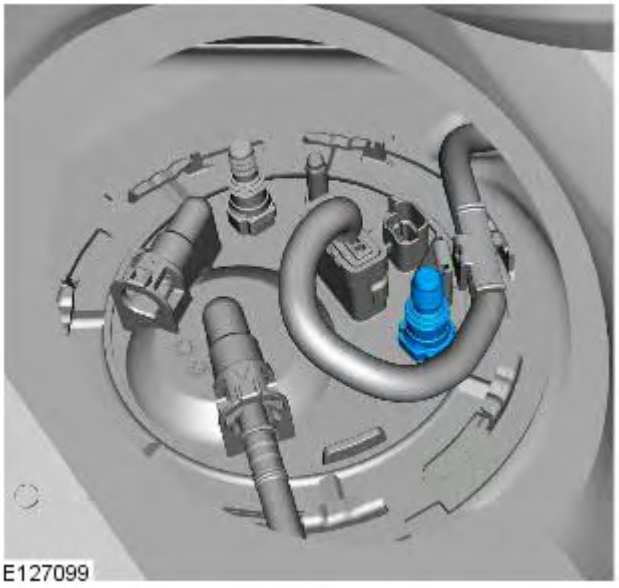
10. NOTE: A fuel vacuum drain unit must be attached to the special tool to achieve full fuel tank drain.

    Using the special tool, drain the left-hand side of the fuel tank.

    Special Tool(s): 310-154



11. Remove the special tool.



12. CAUTION: Make sure the new fuel tank drain port sealing cap is correctly installed. Failure to follow this instruction may result in damage to the vehicle.

NOTE: An audible click can be heard when the fuel tank draining port sealing cap is correctly installed.

13. To install, reverse the removal procedure.

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Fuel System - General Information - Low-Pressure Fuel System Bleeding TDV6 3.0L Diesel

General Procedures

WARNINGS:

Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury.

Before any work is carried out on the fuel system, ground the vehicle to earth and maintain the ground connection until the work is complete.

Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

After carrying out repairs, the fuel system must be checked visually for leaks. Failure to follow this instruction may result in personal injury.

If taken internally, do not induce vomiting, seek immediate medical attention. Failure to follow these instructions may result in personal injury.

If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek immediate medical attention.

Wash hands thoroughly after fuel handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.

This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

CAUTIONS:

Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

This procedure must be carried out before the engine is attempted to be started, following removal or replacement of any fuel system component involving fuel line intrusion. Failure to follow this instruction will result in damage to the fuel injection pump.

NOTE: This procedure is necessary if any low-pressure fuel system components are removed or replaced. These include the fuel filter, fuel lines, fuel tank or fuel cooler.

1. NOTE: If the ignition is switched on for more than 10 seconds without the engine starting the fuel pump will switch off to protect itself.

   Switch ignition on for 10 seconds. The fuel pump in the fuel tank will be audible.

2. Switch the ignition off.

3. NOTES:

   Do not start the vehicle.

Allow 15 seconds between **each** ignition cycle (between each ignition **ON** and ignition **OFF**) to allow the fuel tank pump to pump fuel to the fuel injection pump correctly.

Switch the ignition on and off four times.

4. NOTE: The engine must be allowed to idle for two minutes to allow a full system bleed.

   Crank the engine until it starts and allow to idle.

Published: 11-May-2011

Fuel Tank and Lines - TDV6 3.0L Diesel -

General Specifications

Item	Specification
Fuel system	Mechanical - returnless
Fuel tank	Multi layer plastic
High pressure fuel pump	Located at rear of engine between the cylinder heads, belt driven from the camshafts
Low pressure fuel pump	Located in the fuel tank
Fuel filter	Located on the suspension top mount assembly
Fuel tank sender units	Two - active and passive - passive sender unit is attached to the frame of the fuel pick up tube and the active sender unt is attached to the fuel pump swirl pot
High pressure fuel pump maximum operating pressure	1650 bar - 23931.2 lbf/in²
Low pressure fuel pump operating pressure	0.5 bar - 7.25 lbf/in²

Capacities

Item	Liters
Fuel tank capacity	77 (usable)
Fuel tank capacity - when fuel gauge indicates empty	68
Reserve capacity - when fuel gauge indicates empty	4

Torque Specifications

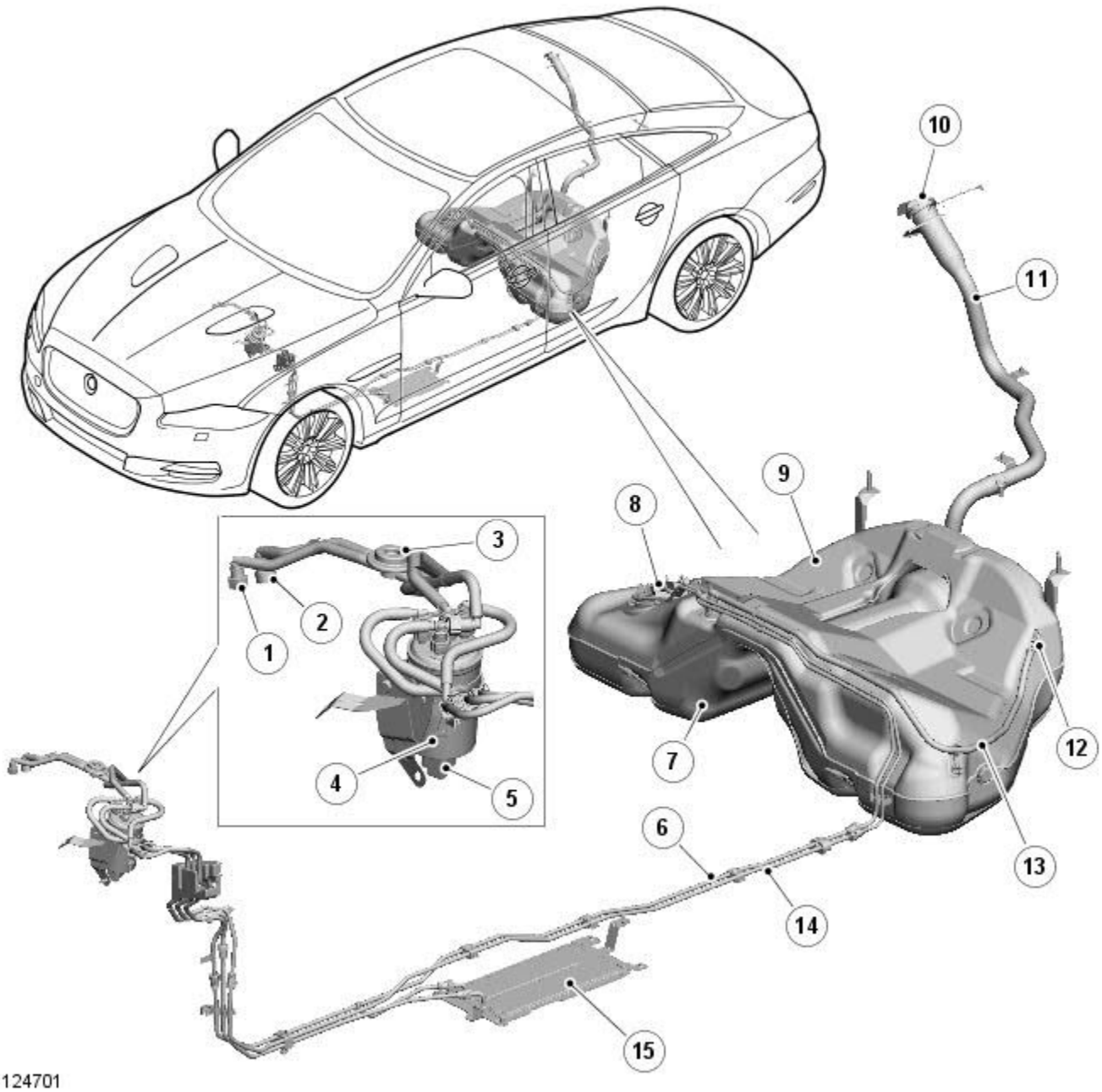
Description	Nm	lb-ft	lb-in
Wheel and tire retaining nut	128	94	-
Fuel tank filler pipe retaining bolt	9	-	80
Fuel tank strap retaining bolt	35	26	-
Rear underbody air deflector retaining nut	7	-	70
Fuel cooler retaining nut	12	9	-
Fuel filter retaining bolt	3	-	27

Published: 11-May-2011

Fuel Tank and Lines - TDV6 3.0L Diesel - Fuel Tank and Lines - Component Location

Description and Operation

3.0L V6 DIESEL COMPONENT LOCATION



E124701

Item	Description
1	Fuel return connection
2	Fuel delivery connection
3	Fuel damperVent pipe connection to fuel vent valve
4	Fuel filter
5	Water in fuel sensor
6	Fuel delivery pipe
7	Tank shield
8	Fuel pump module assembly

9	Fuel tank
10	Filler cap and lanyard
11	Fuel filler pipe
12	Spider trap
13	Vent pipe
14	Fuel return pipe
15	Fuel cooler

Published: 11-May-2011

Fuel Tank and Lines - TDV6 3.0L Diesel - Fuel Tank and Lines - Overview

Description and Operation

OVERVIEW

The major components of the 3.0L V6 diesel fuel system comprise a fuel tank, a fuel pump module, a fuel filter, a fuel cooler, a fuel filler pipe and cap assembly and two fuel level sensors. The fuel system is a high pressure common rail system which uses an engine mounted and driven high pressure pump to deliver a uniform level of pressure to the common fuel rails which supply all 6 fuel injectors.

The fuel tank houses an internal fuel lift pump, located in the fuel pump module. The lift pump is employed to provide a low-pressure supply to the common rail high pressure fuel system.
Refer to: Fuel Charging and Controls (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, Description and Operation).

Two fuel level sensors are installed in either side of the saddle tank. The sensors are a MAPPS (magnetic passive position sensor) which provide a variable resistance to ground for the output from the fuel gauge.

A fuel cooler is located in the low pressure side of the system in the fuel return line and is a fuel to air type cooler.

The fuel tank breather system consists of a fuel vent valve and a fuel tank breather. No Roll Over Valves (ROV's) are fitted.

The fuel filter is a disposable canister type and is located at the rear of the left hand front inner wing turret.

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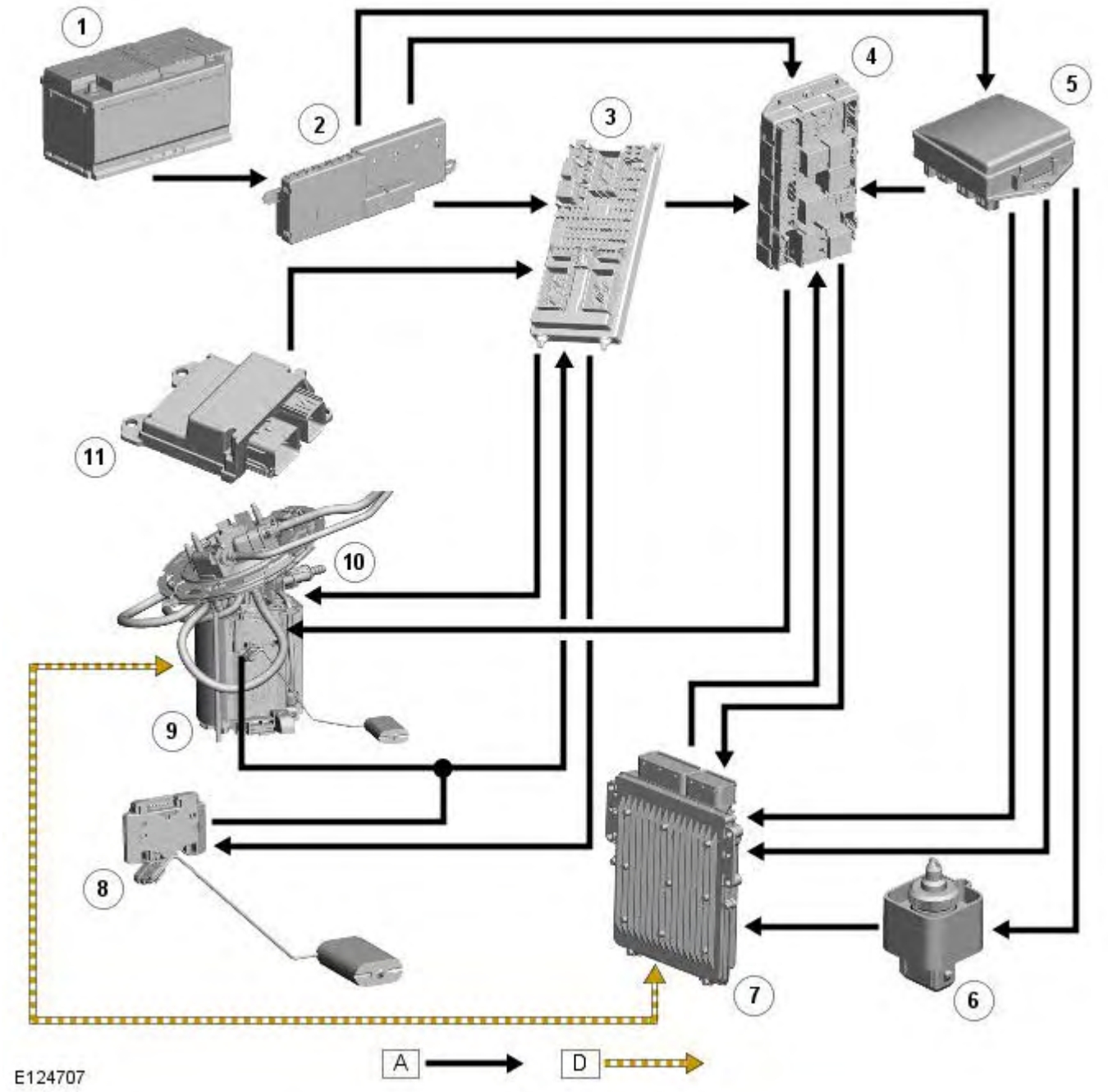
Fuel Tank and Lines - TDV6 3.0L Diesel - Fuel Tank and Lines - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: **A** = Hardwired; **D** = High speed CAN bus

Control Diagram



Item	Description
1	Battery
2	Battery Junction Box (BJB) (Megafuse (250A))
3	Central Junction Box (CJB)
4	Rear Junction Box (RJB)

5	Engine Junction Box (EJB)
5	Water in fuel sensor
6	Engine Control Module (ECM)
7	Left Hand (LH) fuel tank level sensor
8	Right Hand (RH) fuel tank level sensor
9	Fuel lift pump
10	Restraints Control Module (RCM)

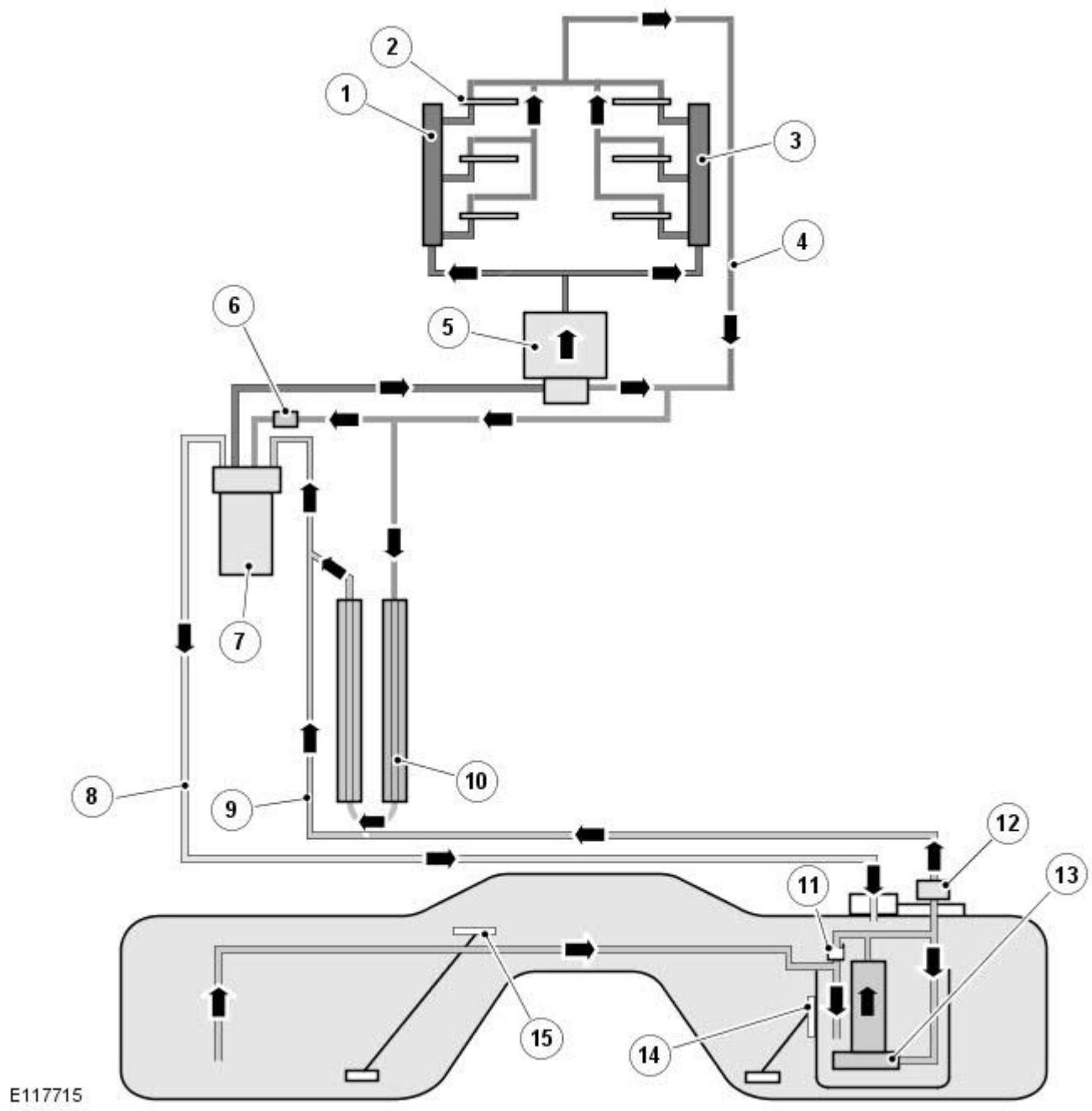
System Operation

Diesel fuel is drawn from the tank by the internal electric lift pump. The fuel pressure regulator located in the fuel pump module assembly regulates the delivery pressure at approximately 0.5 bar to the transfer pump housed in the High Pressure (HP) pump. A Volume Control Valve (VCV) governs the amount of fuel supplied to the HP pump.

The transfer and high pressure pump are driven directly by the engine. Due to the storage volume of the common rail, the injection pressure will remain practically constant over the complete duration of the injection process.

The HP pump has a return pipe circuit which is separate from the injector return pipes.
Refer to: Fuel Charging and Controls (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, Description and Operation).

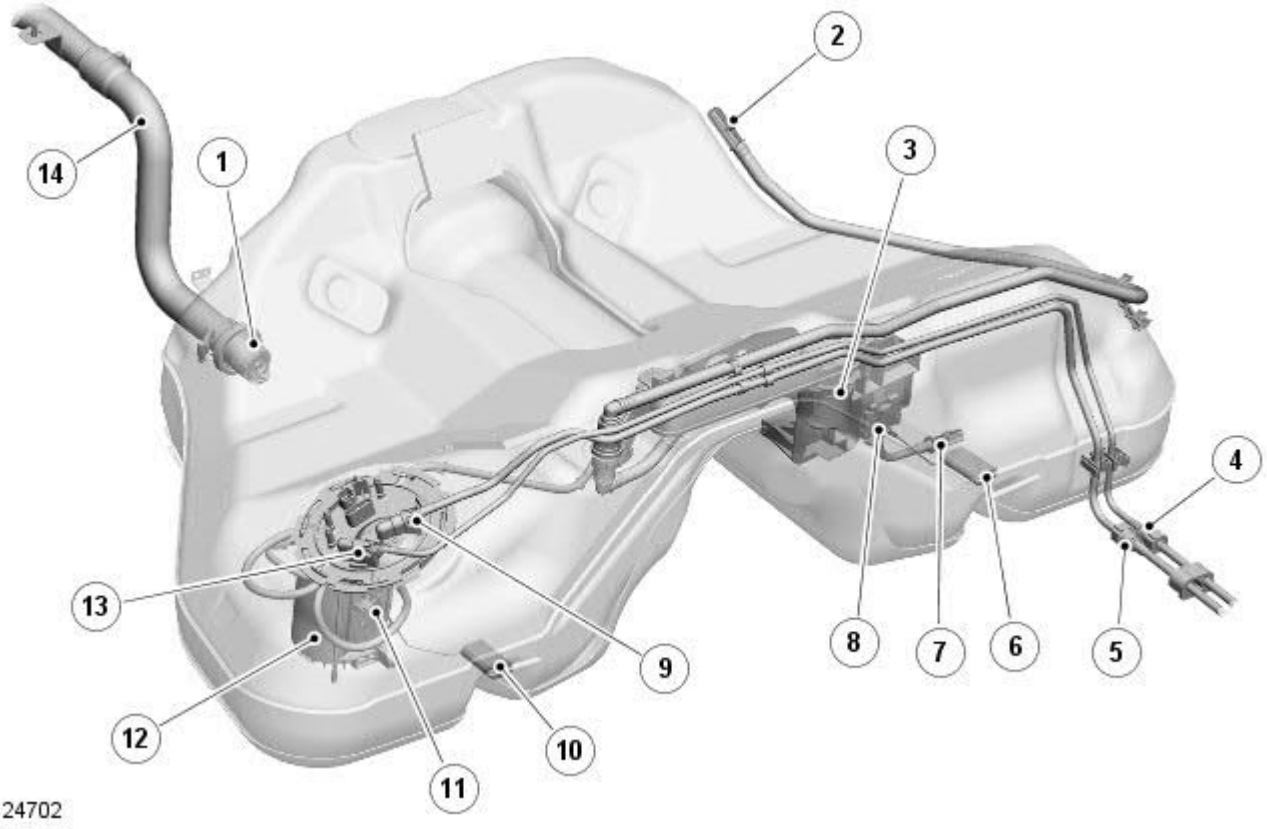
Fuel Delivery Schematic Diagram



Item	Description
1	Left Hand (LH) common rail
2	Fuel injector (6 off)
3	Right Hand (RH) common rail
4	Fuel rail and injector leak-off return line
5	High Pressure (HP) fuel pump
6	Thermostatic diverter valve
7	Fuel filter assembly
8	Fuel return/air bleed pipe
9	Low Pressure (LP) delivery pipe
10	Fuel cooler
11	Jet pump
12	Pressure regulator
13	Fuel pump module
14	Right Hand (RH) fuel level sensor
15	Left Hand (LH) fuel level sensor

Component Description

FUEL TANK



Item	Description
1	Fuel filler pipe connection and spit back flap
2	Vent pipe spider trap
3	Vent valve
4	Fuel return pipe
5	Fuel supply pipe
6	LH level sensor float
7	Suction pipe
8	LH level sensor
9	Fuel supply pipe connection
10	RH level sensor float
11	RH level sensor
12	Fuel pump module
13	Fuel return pipe connection
14	Fuel filler hose

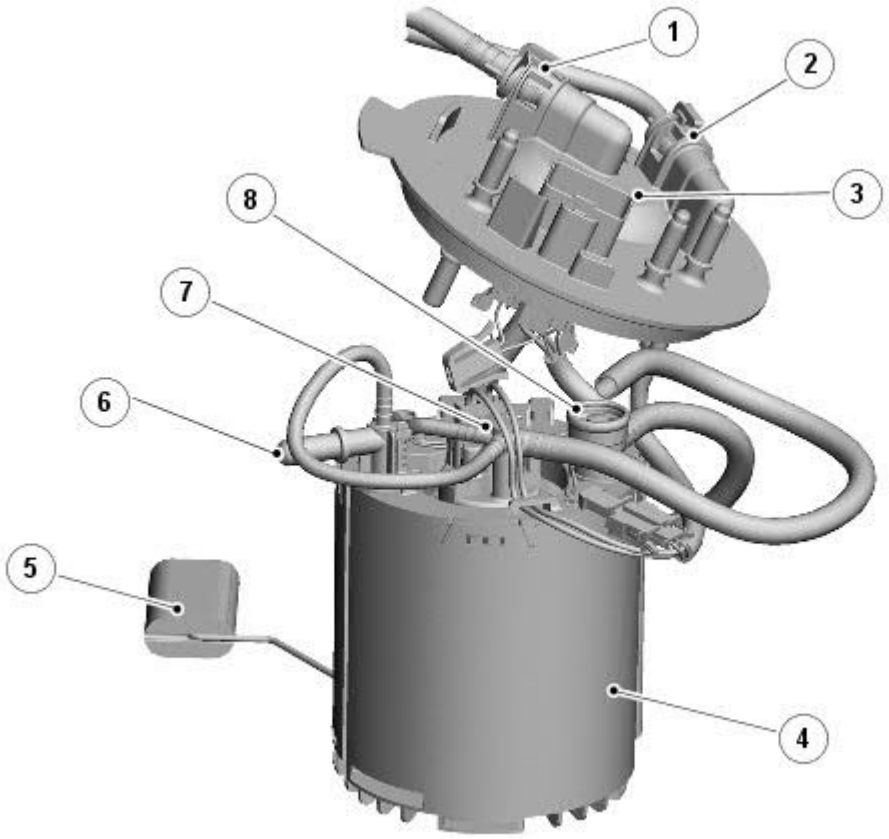
The fuel tank is a saddle type tank, blow moulded from High Density PolyEthylene (HDPE). The tank is located forward of the rear suspension and is mounted is mounted in a shield and secured to the vehicle using two metal straps. The tank is a sealed unit with the only internal access being through the fuel pump module aperture on the top of the tank. The tank has a usable capacity of 77 liters (16.9 gallons) (due to run-dry).

The fuel pump module flange has six pin internal and external connectors for the fuel pump and both fuel level sensors. A quick release connector provides for the connection of the fuel feed and return pipes.

The flange is fitted with a locking ring and seal. The seal locates in a groove on the tank. The locking ring locates and clamps on the encapsulated ring that is moulded into the fuel tank. The flange has a tag which locates in the top of the tank to ensure correct orientation.

The fuel pump module is mounted on a bayonet lock ring which is welded inside the fuel tank. A carrier within the tank provides for the mounting of the fuel suction port, vent valve and liquid vapor separator (LVS), a level sensor and a passive drain.

FUEL PUMP MODULE



E117717

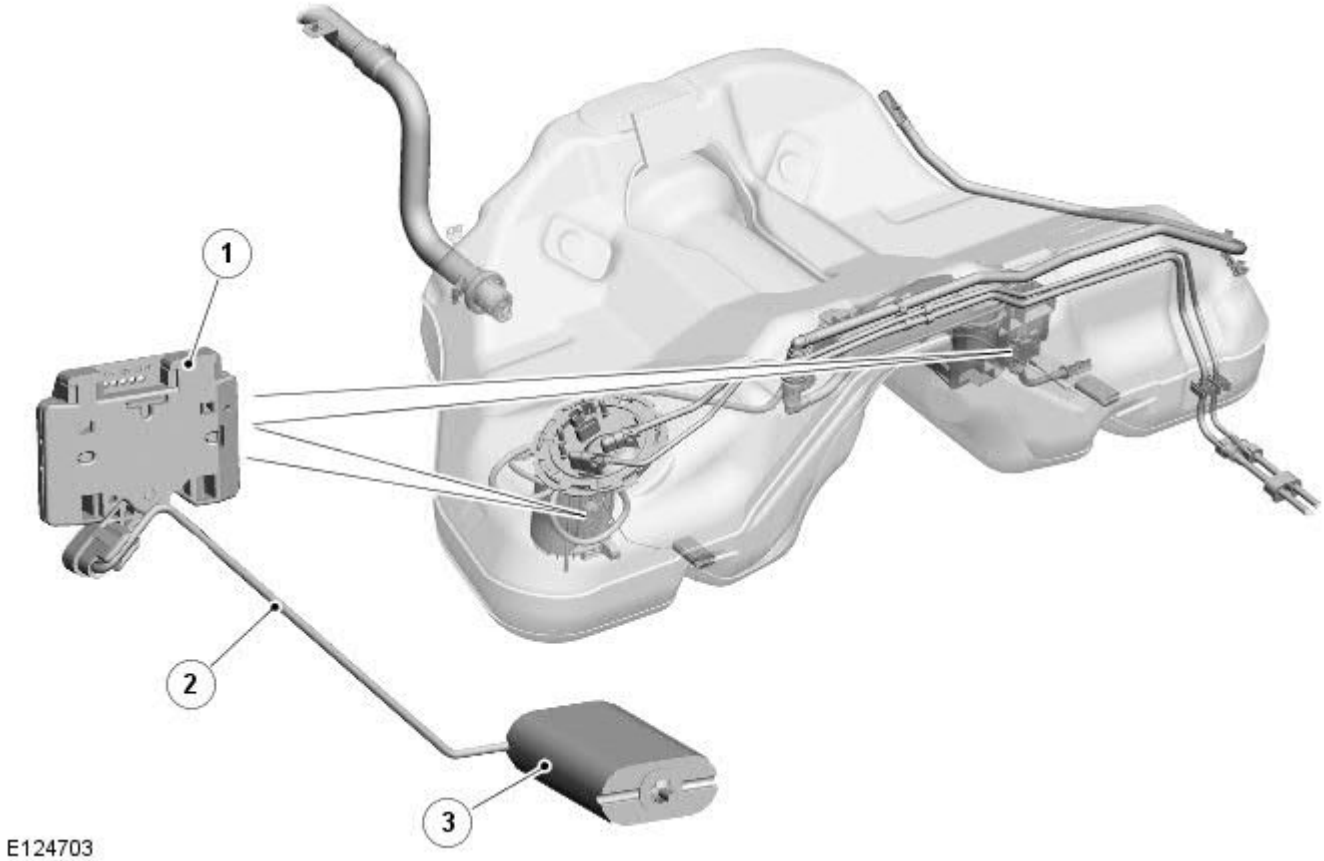
Item	Description
1	Fuel supply connection
2	Fuel return/air bleed connection
3	Electrical connector
4	Swirl pot
5	Fuel level sensor float
6	Fuel suction pipe connection from fuel suction port
7	Three way connection
8	Pressure regulating valve

The low pressure fuel lift pump is located in the fuel pump module. The lift pump is employed to provide a low pressure supply at approximately 0.5 bar, to the common-rail high pressure fuel system and maintain an equal fuel level in both compartments of the saddle tank.

The lift pump operation is controlled by the Engine Control Module (ECM), via the fuel pump relay located in the Rear Junction Box (RJB). When the ignition is switched on, the fuel pump operates for 25 seconds to build up fuel pressure. As engine cranking commences the fuel pump stops running until the engine starts. This function is employed to decrease load on the battery.

A three way connection is located on the top of the module. Two outlets supply the jet pumps, the other outlet is the pressure feed through the pressure regulating valve to the fuel delivery line. The module incorporates a jet pump which draws fuel from the Left Hand (LH) side of the tank to the Right Hand (RH) side to be collected by the fuel pump module.

FUEL LEVEL SENSORS

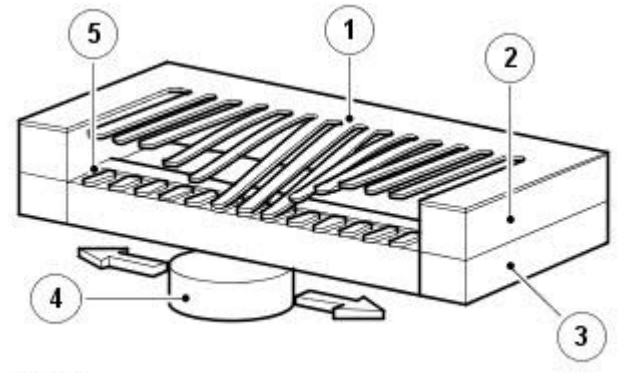


E124703

Item	Description
1	Fuel level sensor
2	Float arm
3	Float

Two fuel level sensors are installed in either side of the saddle tank. One is mounted on the fuel pump module, the other is mounted in a central position on the internal carrier within the tank. The sensors are a MAPPS (magnetic passive position sensor) which provide a variable resistance to ground for the output from the fuel gauge. The sensor is sealed from the fuel preventing contamination of the contacts, increasing reliability. The fuel level sensors are connected to an electrical connector on the underside of the fuel pump module flange.

The sensor comprises a series of 51 film resistors mounted in an arc on a ceramic surface. The resistors are wired in series with individual contacts. A soft magnetic foil with 51 flexible contacts is mounted a small distance above the film resistors. A magnet, located below the ceramic surface, is attached to the sender unit float arm. As the float arm moves, the magnet follows the same arc as the film resistors. The magnet pulls the flexible contacts onto the opposite film resistor contacts forming an electrical circuit.



E44504

Item	Description
1	Magnetic foil
2	Spacer

3	Ceramic surface
4	Magnet
5	Resistance film

The film resistors are arranged in a linear arc with resistance ranging from 51.2 to 992.11 Ohms. The electrical output signal is proportional to the amount of fuel in the tank and the position of the float arm. The measured resistance is processed by the instrument cluster to implement an anti-slosh function. This monitors the signal and updates the fuel gauge pointer position at regular intervals, preventing constant pointer movement caused by fuel movement in the tank due to cornering or braking.

A warning lamp is incorporated in the instrument cluster and illuminates when the fuel level is low.

The fuel level sender signal is converted into a Controller Area Network (CAN) message by the Central Junction Box (CJB) as a direct interpretation of the fuel tank contents in liters and is used by the ECM and the instrument cluster.

In the event that fuel is allowed to run too low, signals transmitted from the fuel level sensors initiate the fuel run-dry strategy. The driver will be notified before the tank is run critically low on fuel. Although this is a simulated run-dry procedure, it provides the symptoms of the vehicle running out of fuel and the driver will perceive it as such. The engine will stop when there is approximately 4 liters (0.87 gallons) of fuel remaining in the fuel tank.

JET PUMP

The fuel system incorporates twin jet pumps which are integral with the fuel pump module. One jet pump collects fuel from the RH side of the tank, and the other draws additional fuel from the LH side of the tank through a suction line that is mounted on the carrier. The jet pump operates on a venturi effect created by the fuel at pump output pressure passing through the jet pump.

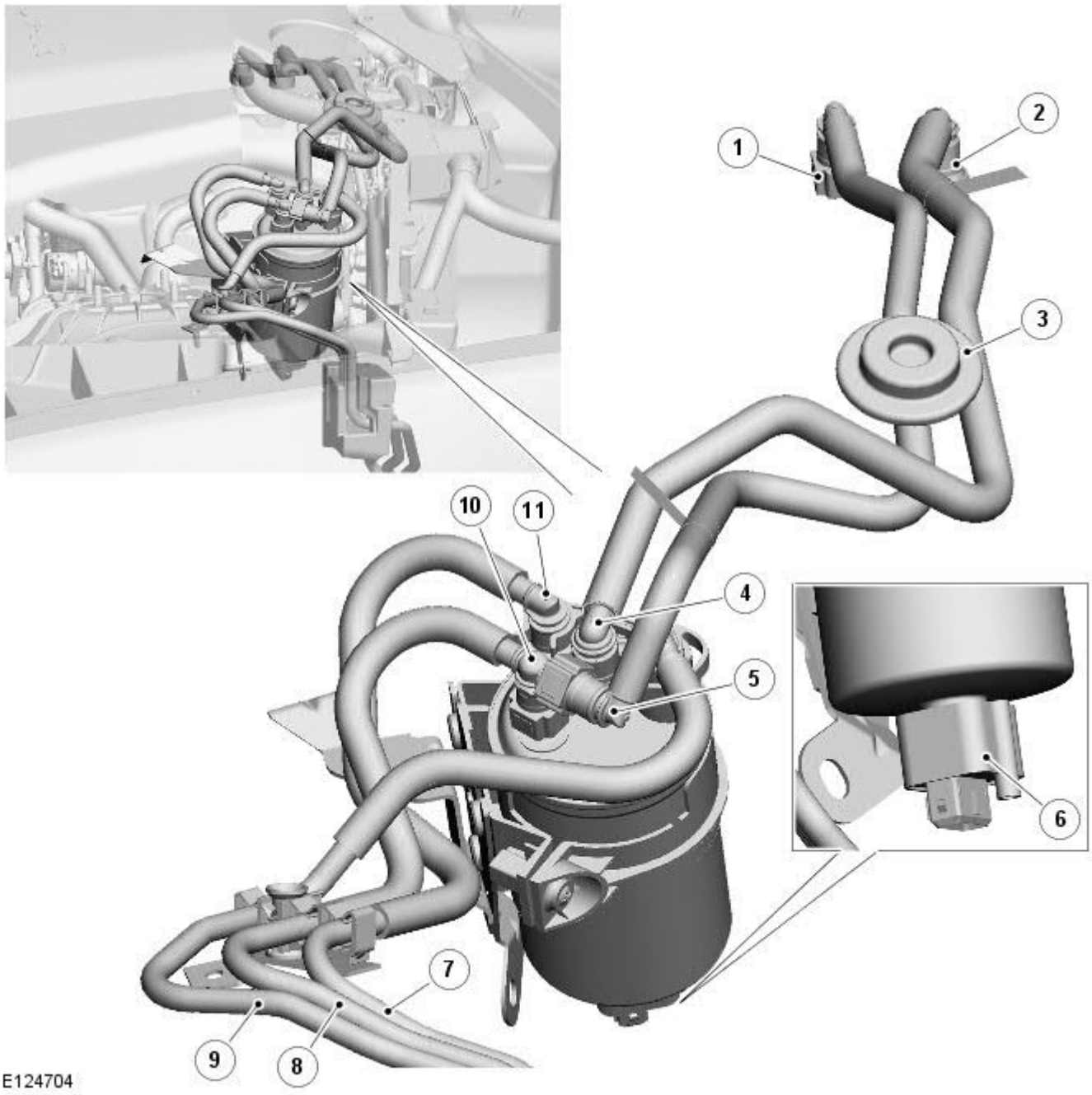
The prime function of the jet pump is to collect fuel from the LH side of the tank and transfer it into the fuel pump module swirl pot on the RH side of the tank. The jet pump feature ensures that fuel is drained from the LH side of the tank before fuel run-out on the RH side of the tank.

FUEL LEVEL VENT VALVE

The fuel level vent valve is located in the upper half of the tank and is connected into a separator that vents via the tank breather. The main purpose of the fuel level vent valve is to control the fill volume of the tank. During filling air, trapped inside the tank and a small amount of vapor is passed via the fuel level vent valve to the tank breather. The air and vapor mix then vents to atmosphere through the breather. During filling, when the tank reaches its full level, the fuel level vent valve closes and prevents air/vapor passing through to the tank breather. The resulting back pressure causes refueling to stop automatically.

The fuel level vent valve is always open when the fuel tank is below full, providing an unrestricted air/vapor outlet to the tank breather.

FUEL FILTER



Item	Description
1	Fuel return from engine
2	Fuel feed to HP common-rail fuel pump
3	Fuel damper
4	Fuel supply connection
5	Fuel return connection
6	Water in fuel sensor (hidden)
7	Air bleed/fuel return to fuel tank
8	Fuel return to under vehicle cooler
9	Fuel supply from fuel tank and under vehicle cooler
10	Fuel diverter connection
11	Air bleed/fuel return to fuel tank connection

The fuel filter is a disposable canister type.

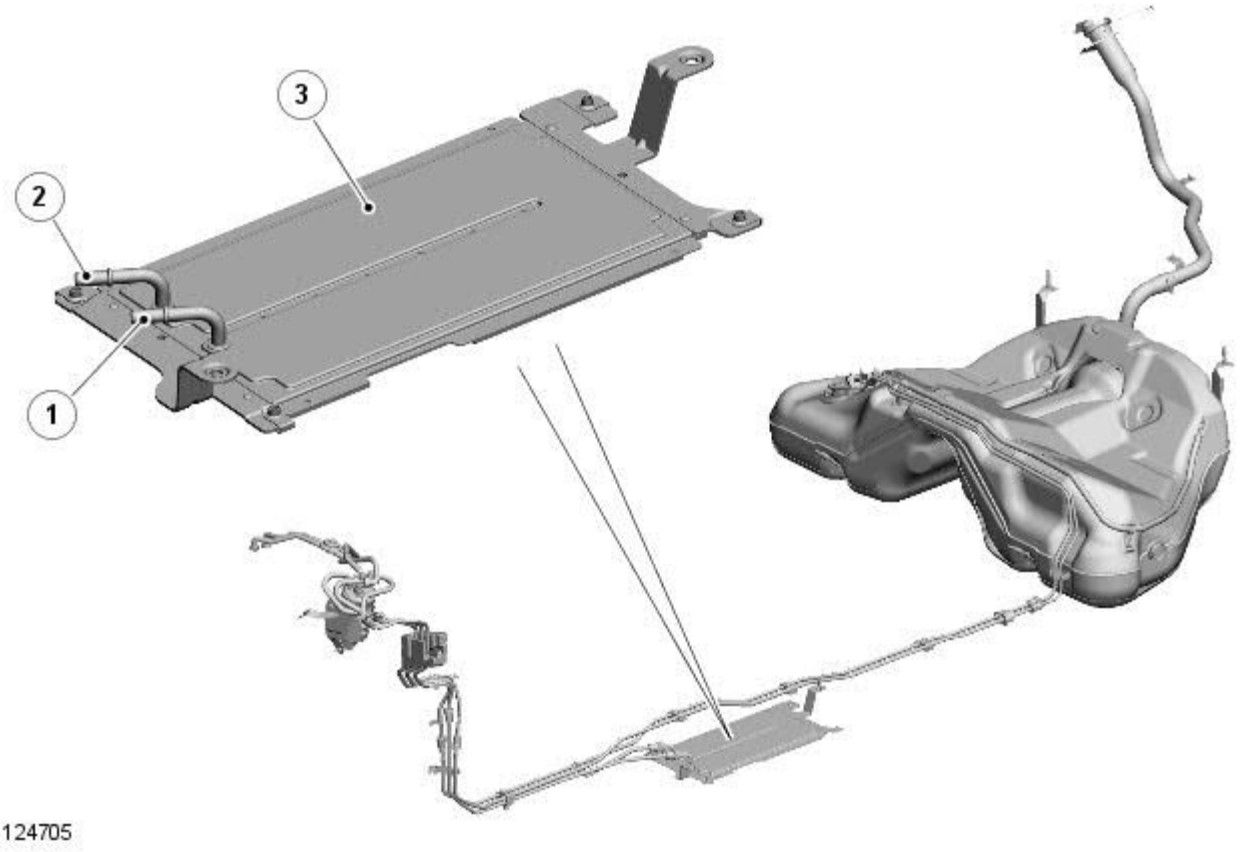
To prevent diesel waxing in cold conditions and to aid warm-up, a temperature sensitive regulating valve incorporated in the fuel filter housing, diverts a portion of the warm fuel returning from the engine into the fuel filter.

The regulating valve commences closing at 30° C (86° F) and fully closes at 50° C (122° F). When the valve is closed the returning fuel is diverted to the fuel filter via the under vehicle fuel cooler to maintain an optimum fuel temperature.

The filter has an air bleed return to the fuel tank which returns excess air and fuel to the tank.

The filter canister incorporates a chamber for collecting moisture. The moisture contained in the diesel fuel collects on the internal filter element and forms droplets, which fall into the moisture chamber. The filter is fitted with a water in fuel sensor to raise a warning that the maximum recommended level of water in the filter has been reached.

FUEL COOLER



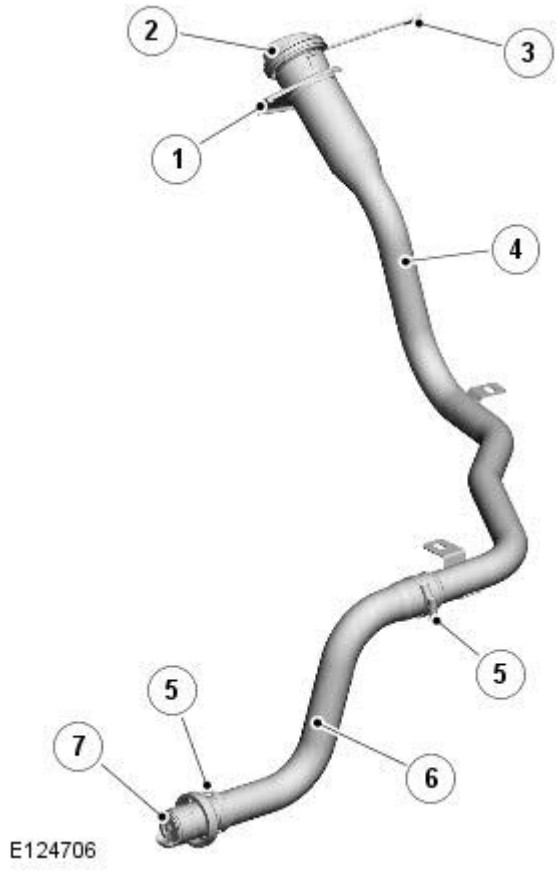
E124705

Item	Description
1	Fuel return from engine
2	Fuel feed outlet
3	Fuel cooler (low pressure side – under vehicle)

The low-pressure-side fuel cooler is situated under the vehicle floorpan, below the LH front seat.

The cooler is fuel to air cooled. Fuel flow through the underfloor cooler is controlled by the fuel filter.

FUEL FILLER PIPE

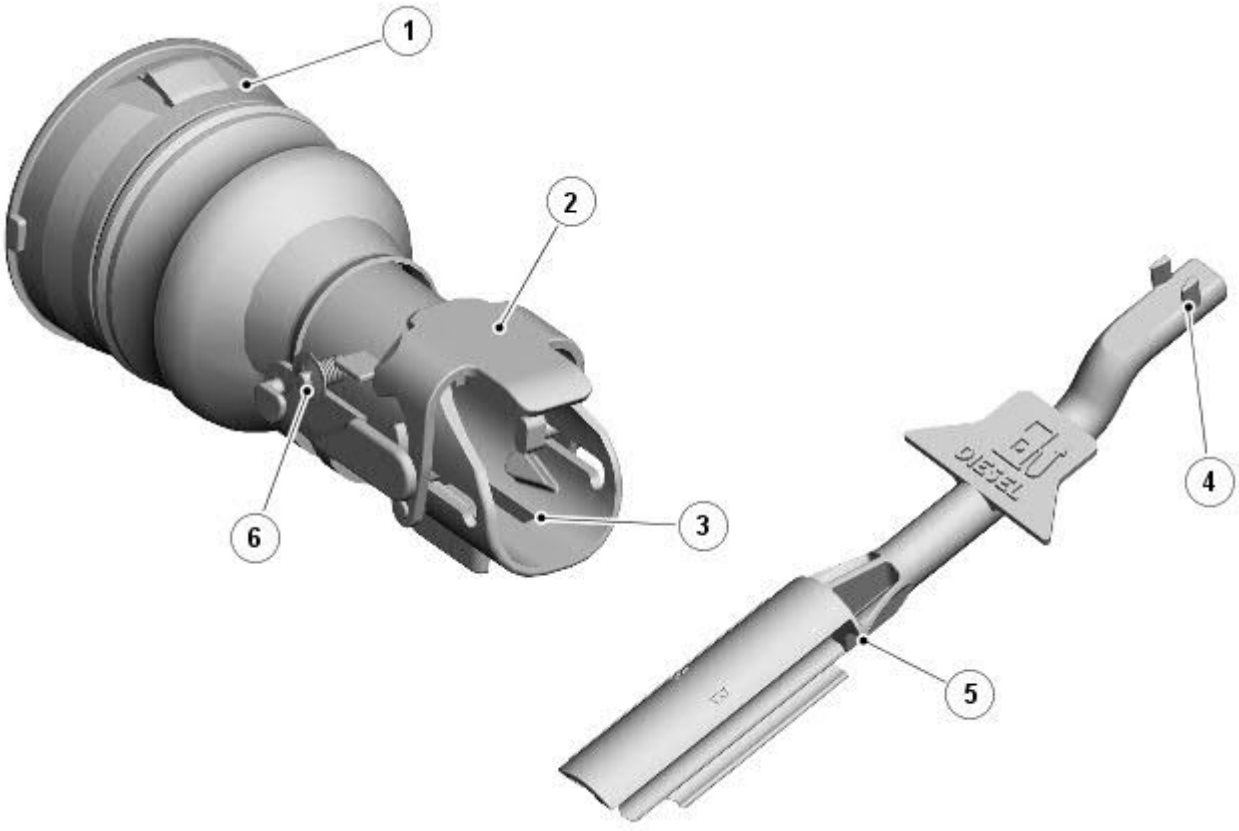


Item	Description
1	Wide bore filler neck
2	Fuel cap
3	Fuel cap lanyard
4	Fuel filler pipe
5	Hose clamp
6	Fuel filler hose
7	Hose connection with fuel tank inlet check valve

The stainless steel filler neck has a wide bore neck specially designed to reduce diesel frothing while the fuel tank is being replenished. The filler pipe is connected at its lower end by a hose which is secured to the pipe with a worm drive clamp. The opposite end of the hose is connected to the fuel tank inlet check valve and secured with another worm drive clamp.

The filler head incorporates the Fuel Guard system to prevent accidental filling of the tank with petrol (gasoline).

Fuel Guard System



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Item	Description
1	Filler head
2	Flap
3	Reset slots
4	Spigots
5	Reset tool
6	Spring

The fuel guard comprises a mechanically operated flap which is triggered when the smaller diameter filler nozzle tube, used on petrol (gasoline) pumps, is inserted in the filler neck. The flap is actuated and blocks the sensor port on the fuel pump nozzle, causing it to automatically switch off. The flap is locked in this position by a latch mechanism.

A reset tool is provided and stored in the luggage compartment. The tool is used to reset the fuel guard device if triggered and release the latch. Two spigots on the tool locate in slots in the filler neck which release a latch and the flap is opened by its own spring. The tool is located in the filler neck and once the two spigots on the tool are located in the slots it can be pulled outwards, releasing a latch and allowing the flap to be opened by its own spring pressure. The tool is stored on the battery mounting clamp.

The flap is colored yellow so that it is clearly visible when activated and has a 'Handbook' symbol on it.

A diesel fuel pump nozzle will not activate the fuel guard because the nozzle stops against two molded lugs. However, if an unleaded gasoline pump nozzle is inserted into the housing, its smaller diameter allows it to pass the two molded lugs. The nozzle strikes two pins on the inside of the filler housing which move forward. This movement rotates the shut-off flap which is then held in place when the nozzle is removed by the latch mechanism.

NOTE: Russian markets do not use the fuel guard system and are fitted with a conventional filler neck.

Published: 28-Jul-2014

Fuel Tank and Lines - TDV6 3.0L Diesel - Fuel Tank and Lines

Diagnosis and Testing

Principle of Operation

For a detailed description of the fuel tank and lines and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (310-01A Fuel Tank and Lines - TDV6 3.0L Diesel)

Fuel Tank and Lines (Description and Operation),
Fuel Tank and Lines (Description and Operation),
Fuel Tank and Lines (Description and Operation).

Inspection and Verification

WARNINGS:

Do **NOT** carry out any work on the fuel system with the engine running. The fuel pressure within the system can be as high as 2000 bar (29,008 lb/in²). Failure to follow this instruction may result in personal injury.

Eye protection must be worn at all times when working on or near any fuel related components. Failure to follow this instruction may result in personal injury.

This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow this instruction may result in personal injury.

After carrying out repairs, the fuel system must be checked visually for leaks. This should be done after the engine has been run, but with the engine switched **OFF**. Failure to follow this instruction may result in personal injury.

If taken internally, **DO NOT** induce vomiting. Seek immediate medical attention. Failure to follow this instruction may result in personal injury.

If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek medical attention. Failure to follow this instruction may result in personal injury.

Wash hands thoroughly after handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention. Failure to follow this instruction may result in personal injury.

CAUTIONS:

Before disconnecting any part of the system, it is imperative that all dust, dirt and debris is removed from around components to prevent ingress of foreign matter into the fuel system. Failure to follow this instruction may result in damage to the vehicle.

The fuel pipes between the injectors and the rail must be discarded after each use, and new pipes installed. Failure to follow this instruction may result in damage to the vehicle.

It is essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in damage to the vehicle.

Make sure that the workshop area in which the vehicle is being worked on is as clean and dust-free as possible. Areas in which work on clutches, brakes or where welding or machining are carried out are not suitable in view of the risk of contamination to the fuel system. Failure to follow this instruction may result in damage to the vehicle.

Make sure that any protective clothing worn is clean and made from lint-free non-flocking material. Failure to follow this instruction may result in damage to the vehicle.

Make sure that any protective gloves worn are new and are of the non-powdered latex type. Failure to follow this instruction may result in damage to the vehicle.

Make sure that clean, non-plated tools are used. Clean tools using a new brush that will not lose it's bristles and fresh cleaning fluid prior to starting work on the vehicle. Failure to follow this instruction may result in damage to the vehicle.

Use a steel-topped work bench and cover it with clean, lint-free, non-flocking material. Failure to follow this instruction may result in damage to the vehicle.

Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

When measuring fuel sender resistance values with a multimeter, it is critical to use the correct multimeter setting. The multimeter should **not** be on the 'Auto' setting and **must** be set to 'Manual'. This will help prevent incorrect diagnosis and unnecessary replacement of fuel senders. If the multimeter range is set at 'Auto' then, during a sweep of the sender from 50 Ohms to 998 Ohms, the multimeter has to change its measurement range. For approximately 1 second, during the range switch over point, the multimeter display indicates an open circuit. This can lead to a mis-diagnosis of a fuel sender fault.

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
• Low/contaminated fuel • Fuel supply/return line(s) • Fuel tank and filler pipe • Fuel leak(s) • Fuel filler cap • Fuel filter • Push connect fittings • Fuel pump	• Fuses • Links • Relays • Fuel pump module • Sensor(s) • Engine control module (ECM) • Central Junction Box (CJB) • Restraints Control Module (RCM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index

Symptom Chart

Symptom	Possible Causes	Action
Engine cranks, but does not start	• Low/contaminated fuel • Air leakage • Fuel pump module fault • Low pressure fuel system fault • Blocked fuel filter • Crankshaft position (CKP) sensor	• Check the fuel level and condition. Draw off approximately 1L (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel • Check the intake air system for leaks • Check the lift pump operation, check the low-pressure fuel system for leaks/damage • Check the fuel filter • Refer to the electrical circuit diagrams and test the CKP sensor circuit for short circuit to ground, short circuit to power, open circuit, high resistance
Difficult to start	• Glow plug system fault (very cold conditions) • Low/contaminated fuel • Fuel pump module fault • Low pressure fuel system fault • Air leakage • Blocked fuel filter • Exhaust Gas Recirculation (EGR) valve fault	• Check the glow plug circuits • Check the fuel level and condition. Draw off approximately 1L (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel • Check the fuel pump module operation, check the low pressure fuel system for leaks/damage • Check the intake air system for leaks • Check the fuel filter • Check the EGR valves

Fuel Gauge, Resistance, Voltage And Fuel Tank Level Comparison Chart

Use the chart to determine fuel tank fuel volume versus fuel gauge reading to determine the fuel level symptom and fault.

NOTES:

The vehicle must be parked on a level surface to obtain an accurate fuel level gauge reading.

The actual values may vary, according to the quantity of fuel in the left and right sides of the fuel tank.

Volume, Resistance and Voltage Values

Gauge Reading	Fill Volume (L)	Fuel Level Sensor "pump/active/A" (0xD908) - Right side		Fuel Level Sensor "eject/passive/B" (0xD907) - Left side	
		Resistance (Ω)	Voltage (V)	Resistance (Ω)	Voltage (V)
	0	51.90	0.37	51.40	0.37
	1	51.90	0.37	51.40	0.37
	2	51.90	0.37	51.40	0.37
	3	76.30	0.53	51.40	0.37
	4	84.90	0.58	51.40	0.37
Engine stop	5	102.70	0.68	51.40	0.37
	6	111.90	0.74	51.40	0.37
	7	121.70	0.79	51.40	0.37
	8	140.60	0.89	51.40	0.37
Empty	9	150.90	0.94	51.40	0.37
	10	161.60	1.00	51.40	0.37
	12	194.40	1.15	51.40	0.37
	14	217.90	1.26	51.40	0.37
	16	242.50	1.36	51.40	0.37
	18	269.00	1.47	51.40	0.37
	20	298.80	1.58	51.40	0.37
	21	312.70	1.63	51.40	0.37
	22	342.60	1.73	51.40	0.37
	23	344.50	1.73	51.40	0.37
	24	374.80	1.83	51.40	0.37
	25	391.60	1.88	51.40	0.37
	26	409.10	1.93	51.40	0.37
¼	28	446.30	2.04	51.40	0.37
	30	485.40	2.14	51.40	0.37
	32	551.40	2.30	51.40	0.37
	34	653.90	2.51	51.40	0.37
	36	803.80	2.77	51.40	0.37
	38	992.90	3.02	51.40	0.37
	40	992.90	3.02	51.40	0.37
	42	992.90	3.02	51.40	0.37
	44	992.90	3.02	59.60	0.42
½	46	992.90	3.02	85.10	0.58
	48	992.90	3.02	120.60	0.78
	50	992.90	3.02	141.20	0.89
	52	992.90	3.02	171.40	1.05
	54	992.90	3.02	193.90	1.15
	56	992.90	3.02	229.40	1.31
	58	992.90	3.02	255.00	1.41
	60	992.90	3.02	295.50	1.57
	62	992.90	3.02	325.80	1.67
	63	992.90	3.02	341.10	1.72
¾	64	992.90	3.02	357.30	1.78
	66	992.90	3.02	391.10	1.88
	68	992.90	3.02	427.40	1.99
	70	992.90	3.02	465.30	2.09
	72	992.90	3.02	527.40	2.24
	74	992.90	3.02	573.70	2.35
Full	76	992.90	3.02	651.20	2.50
	78	992.90	3.02	737.30	2.66
	80	992.90	3.02	836.80	2.82
	82	992.90	3.02	990.90	3.02
	83	992.90	3.02	990.90	3.02

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.

REFER to: Diagnostic Trouble Code (DTC) Index - TDV6 3.0L Diesel , DTC: Engine Control Module (100-00 General Information, Description and Operation).

Published: 11-May-2011

Fuel Tank and Lines - TDV6 3.0L Diesel - Fuel Cooler

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

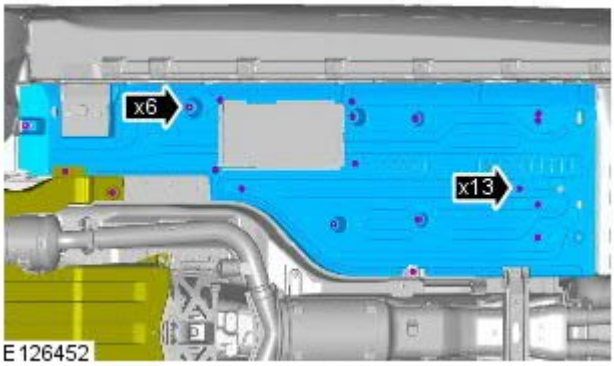
1. Refer to: Diesel Fuel System Health and Safety Precautions (100-00 General Information, Description and Operation).

2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

3. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

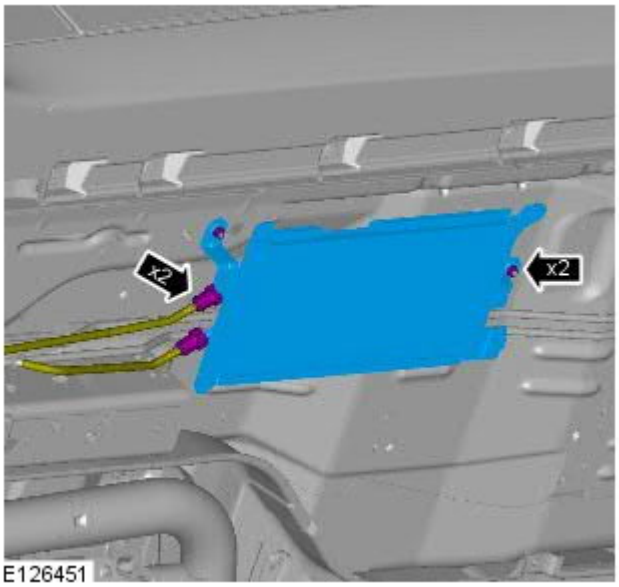
4. *Torque:* 7 Nm



5. WARNING: Fluid loss is unavoidable, use absorbent cloth or a container to collect the fluid.

   CAUTION: Make sure that all openings are sealed. Use new blanking caps.

   Torque: 12 Nm



Installation

1. NOTE: Remove and discard the blanking caps.

   To install, reverse the removal procedure.

2. Refer to: Low-Pressure Fuel System Bleeding - TDV6 3.0L Diesel (310-00 Fuel System - General Information, General Procedures).

Published: 11-May-2011

Fuel Tank and Lines - TDV6 3.0L Diesel - Fuel Filter

Removal and Installation

Removal

CAUTIONS:

Be prepared to collect escaping fluids.

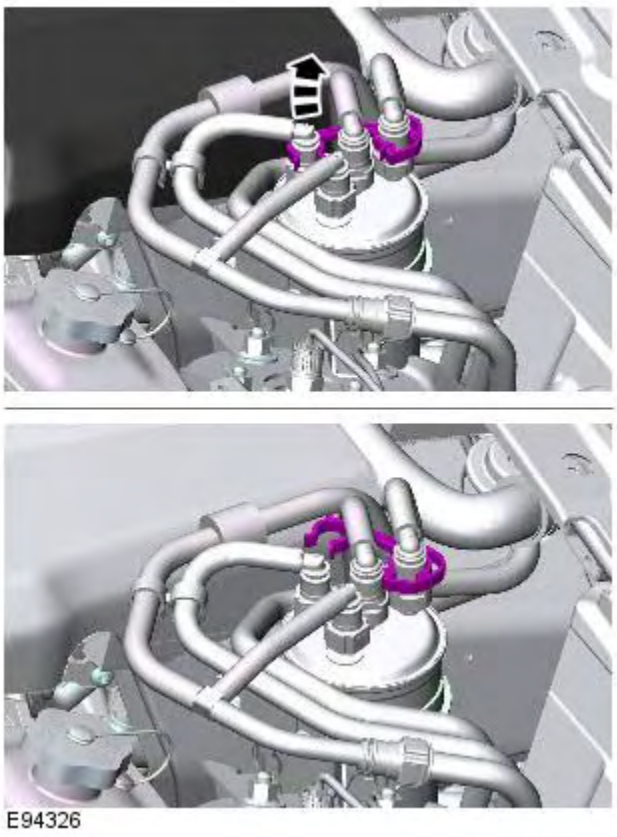
Make sure that all openings are sealed. Use new blanking caps.

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1.



E94326

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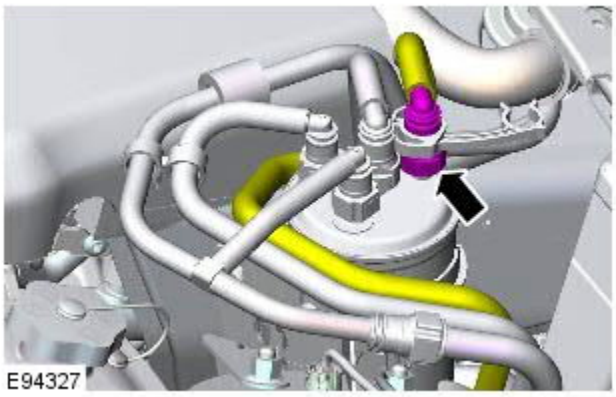

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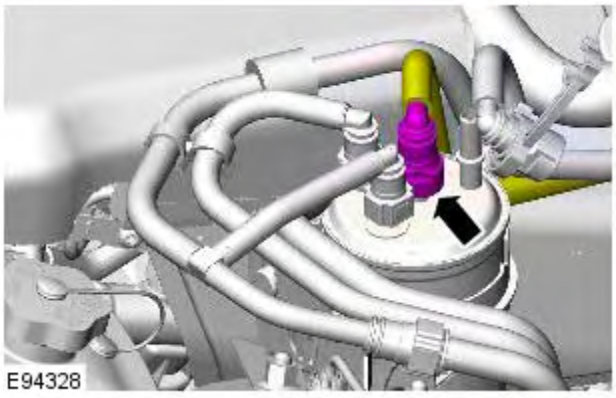

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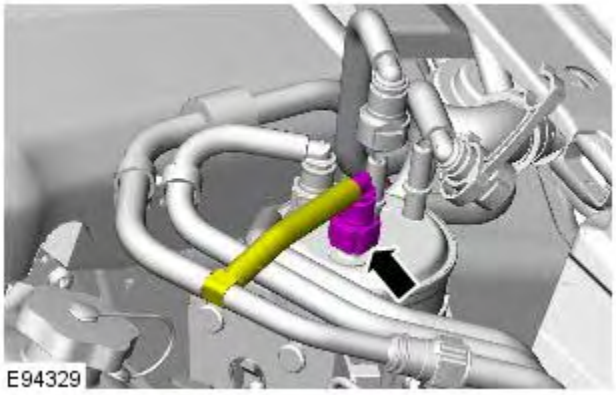

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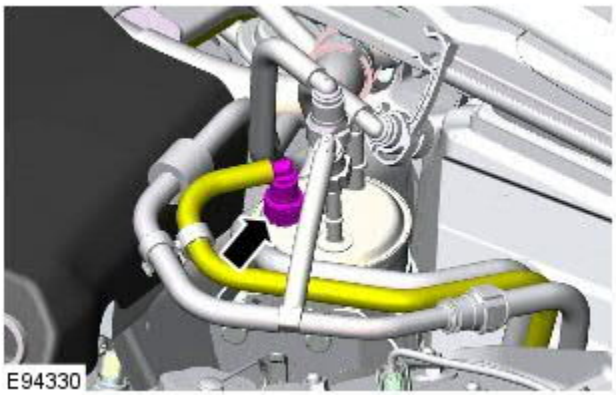

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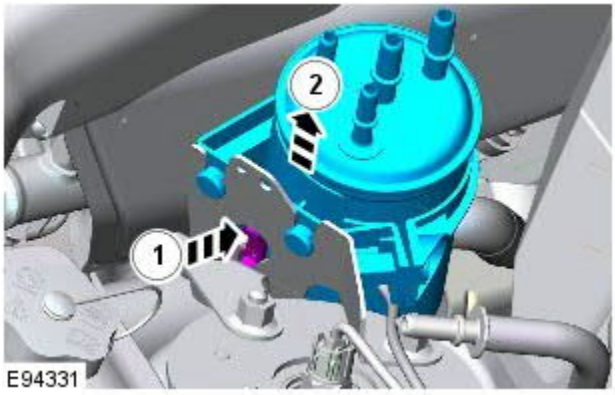

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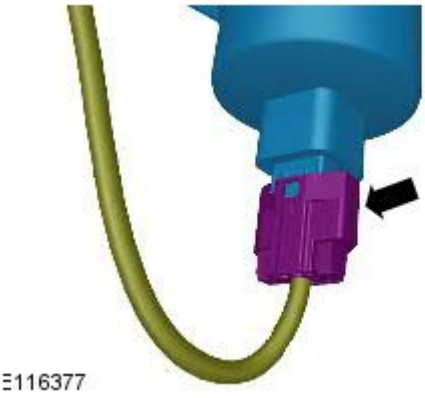
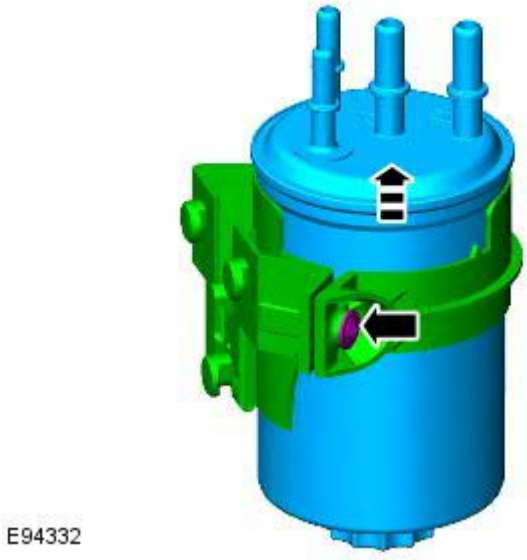
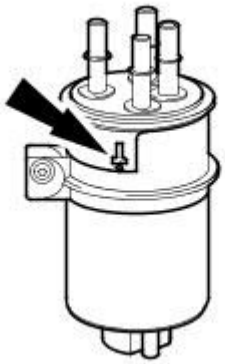


8. *Torque:* 3 Nm



Installation


E52063

1. CAUTION: Make sure that the fuel filter is correctly aligned. Failure to follow this instruction may result in damage to the vehicle.

   NOTE: Remove and discard all blanking caps.

   To install, reverse the removal procedure.

2. Refer to: Low-Pressure Fuel System Bleeding - TDV6 3.0L Diesel (310-00 Fuel System - General Information, General Procedures).

Published: 11-May-2011

Fuel Tank and Lines - TDV6 3.0L Diesel - Fuel Level Sender

Removal and Installation

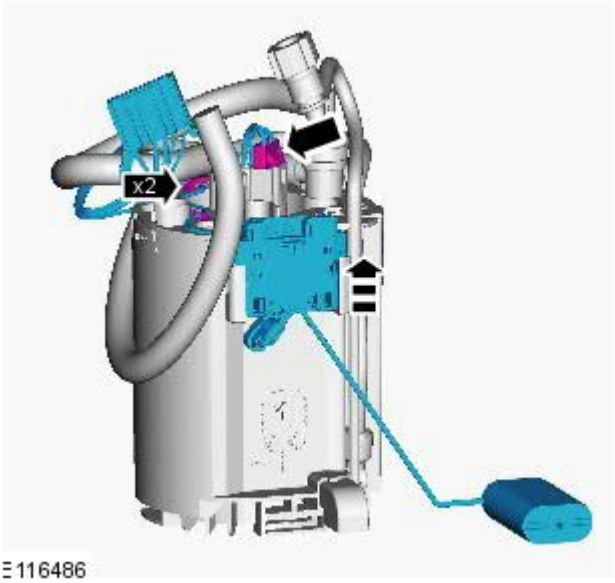
Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. Refer to: Fuel Pump and Sender Unit (310-01A Fuel Tank and Lines - TDV6 3.0L Diesel, Removal and Installation).

3.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Fuel Tank and Lines - TDV6 3.0L Diesel - Fuel Pump and Sender Unit

Removal and Installation

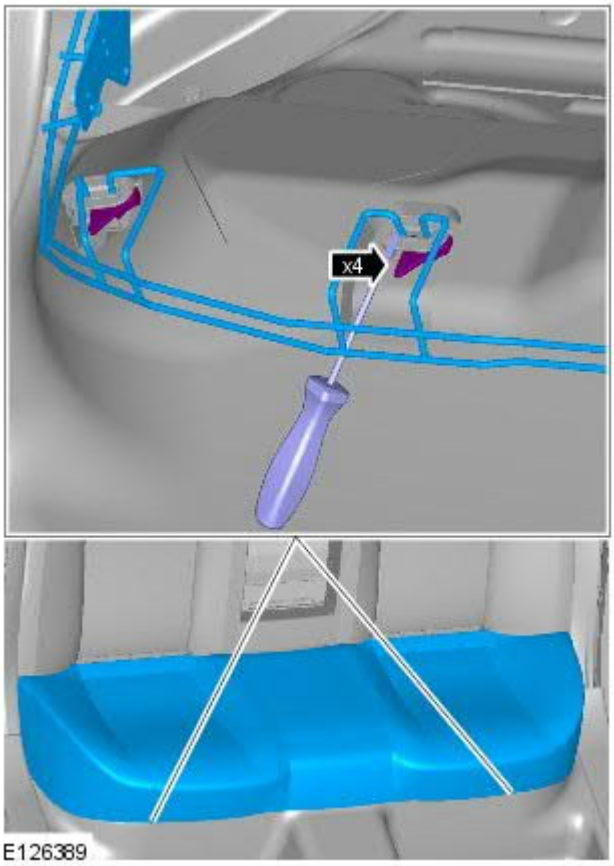
Special Tool(s)

310-123 E80148	310-123 Locking Ring, Fuel Tank

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Diesel Fuel System Health and Safety Precautions (100-00 General Information, Description and Operation).
2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
3.



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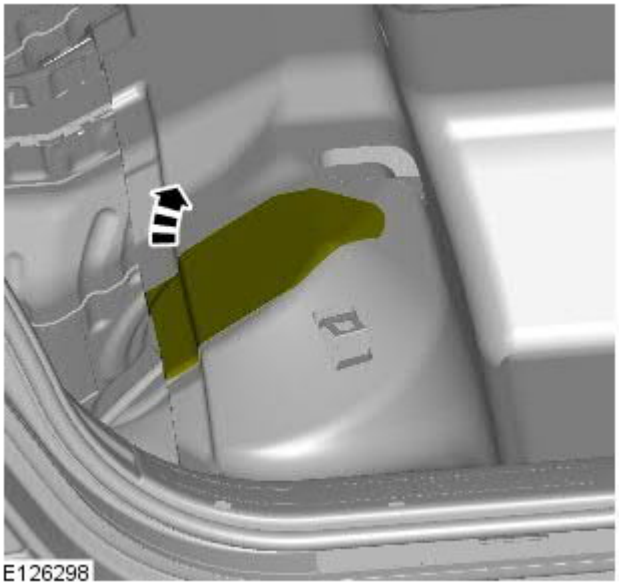

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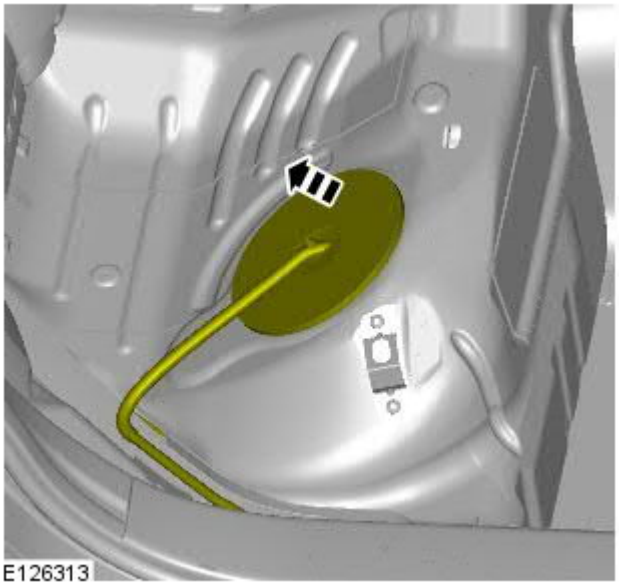
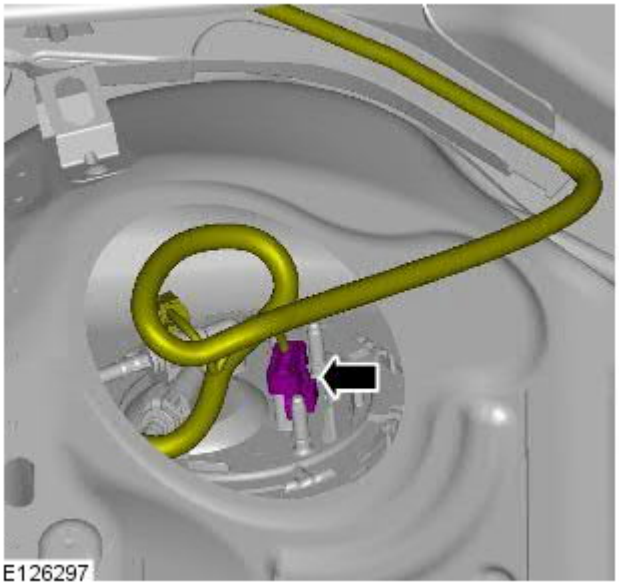
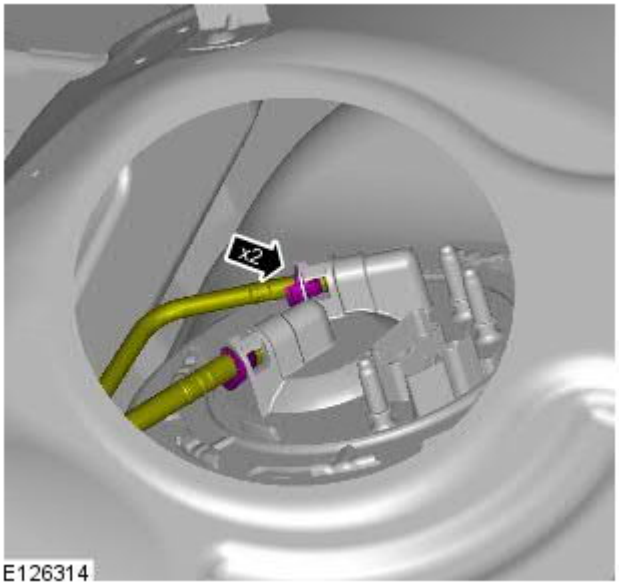




6. CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

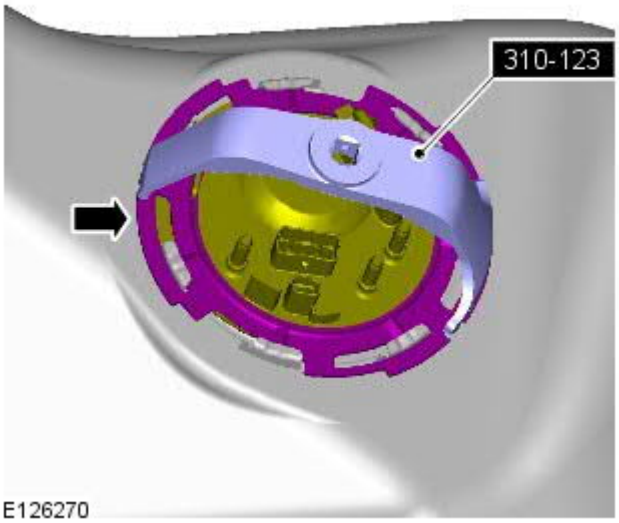


7. CAUTION: Be prepared to collect escaping fuel.

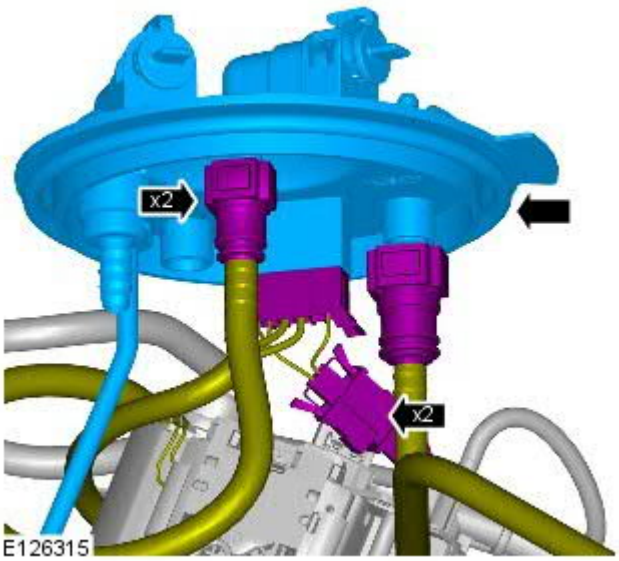
NOTE: Make sure that all openings are sealed. Use new blanking caps.

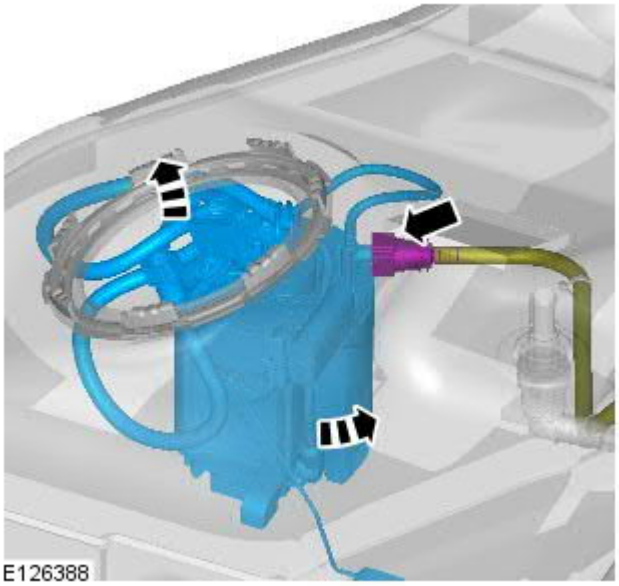
8. NOTE: Note the position of the locating tang.

Special Tool(s): 310-123



9. CAUTION: A new O-ring seal is to be installed.

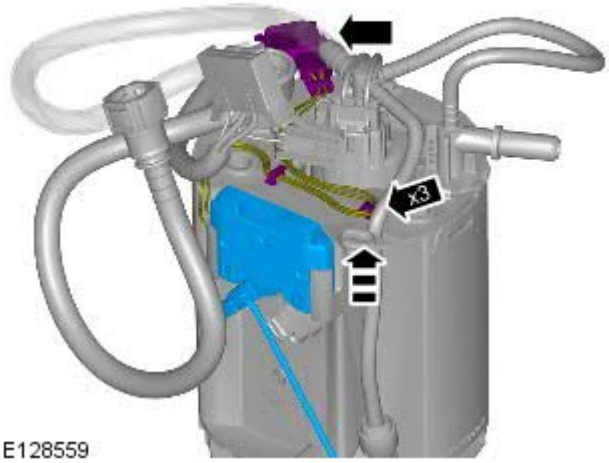




10. WARNING: The spilling of fuel is unavoidable during this operation. Make sure that all necessary precautions are taken to prevent fire and explosion.

    CAUTION: Take extra care not to damage the fuel tank level sensor float and arm.

11. NOTE: Do not disassemble further if the component is removed for access only.



Installation

1. CAUTIONS:

   Take extra care not to damage the fuel tank level sensor float and arm.

   Make sure that the fuel pump and sender unit are correctly installed on to the retaining bayonet bracket in the fuel tank.

   Make sure the fuel tank level sensor arm moves from the full, to the empty position freely and all the pipes are clear of it's path.

   NOTES:

   Make sure the locating tang is installed in the correct position.

Remove and discard all blanking caps.

To install, reverse the removal procedure.

2. Refer to: Low-Pressure Fuel System Bleeding - TDV6 3.0L Diesel (310-00 Fuel System - General Information, General Procedures).

Published: 11-May-2011

Fuel Tank and Lines - TDV6 3.0L Diesel - Fuel Tank

Removal and Installation

Special Tool(s)

	310-123 Locking Ring, Fuel Tank

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Diesel Fuel System Health and Safety Precautions (100-00 General Information, Description and Operation).

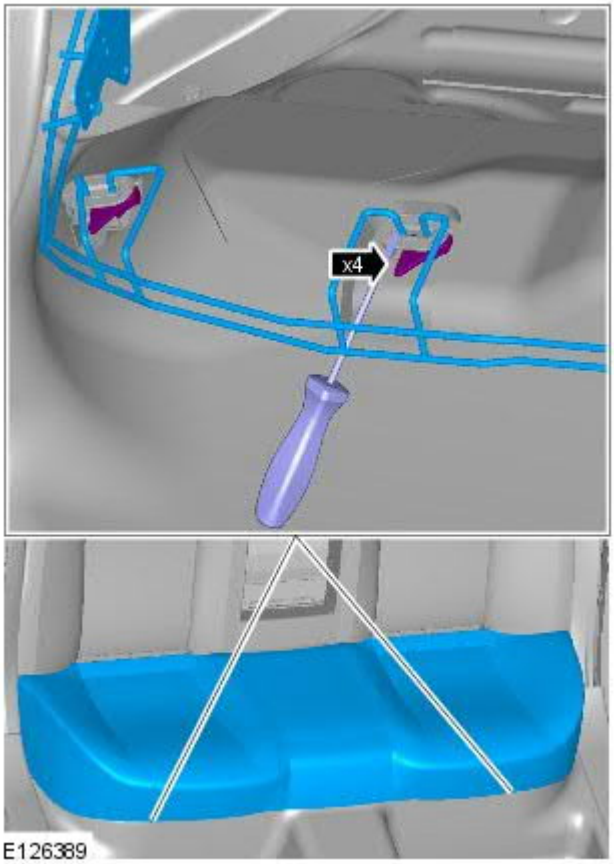
2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

3. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

4. Refer to: Rear Subframe - TDV6 3.0L Diesel (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).

5.



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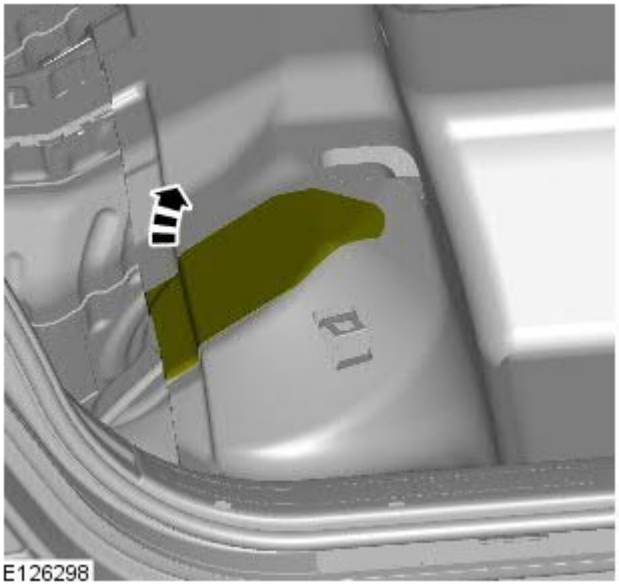

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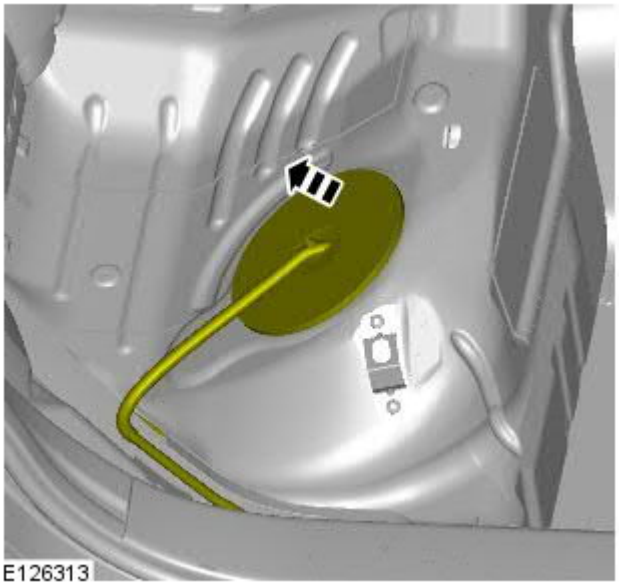
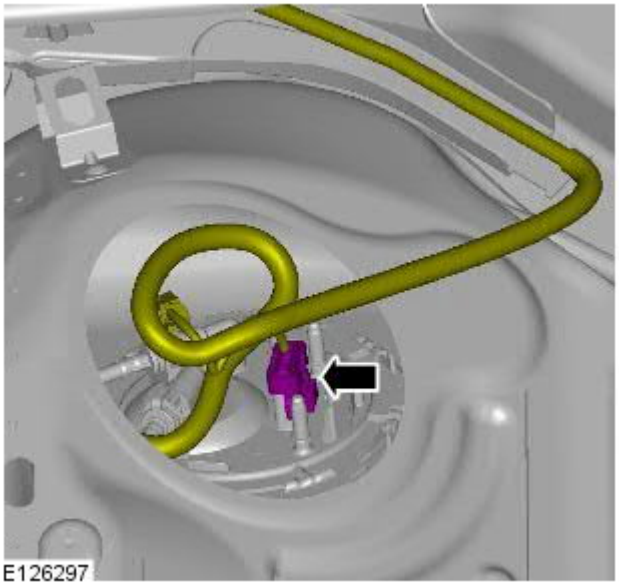
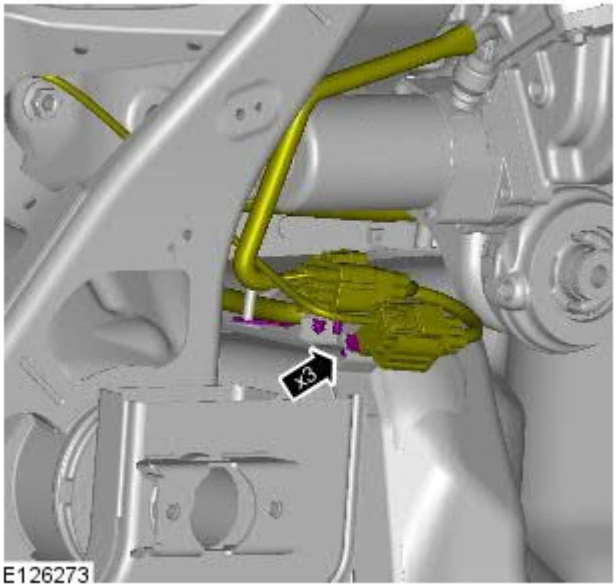
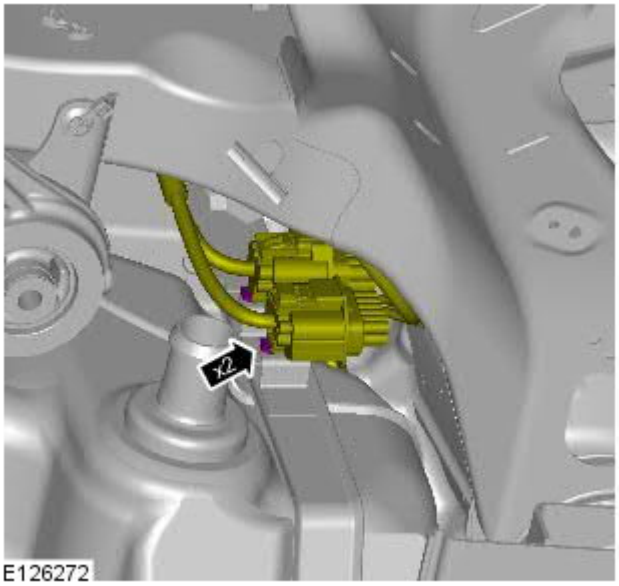

E126313


E126297

8. CAUTION: Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.



9. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



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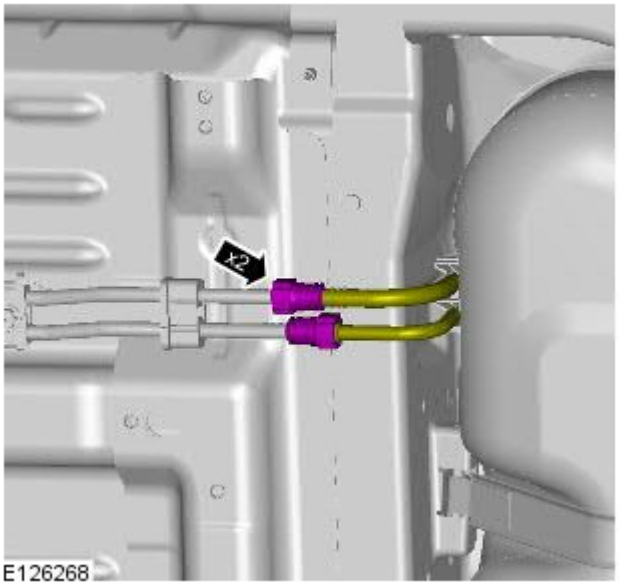
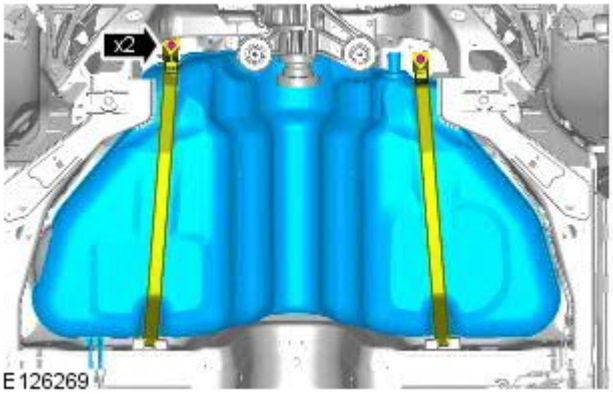


11. WARNING: The spilling of fuel is unavoidable during this operation. Make sure that all necessary precautions are taken to prevent fire and explosion.

    CAUTION: Make sure that all openings are sealed. Use new blanking caps.

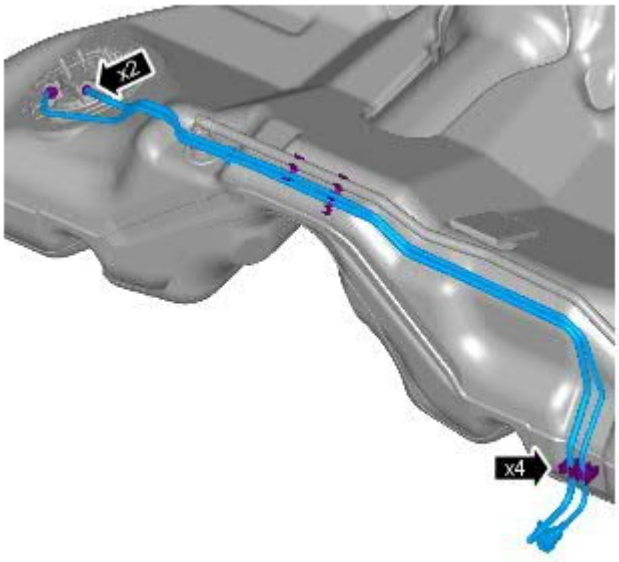


12. NOTES:

    With assistance remove the component.

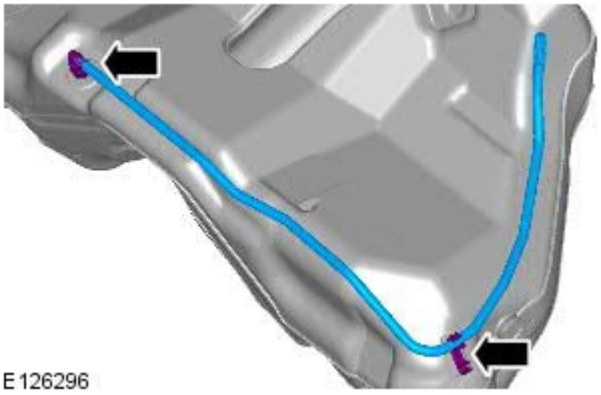
    Some variation in the illustrations may occur, but the essential information is always correct.

    Torque: 35 Nm

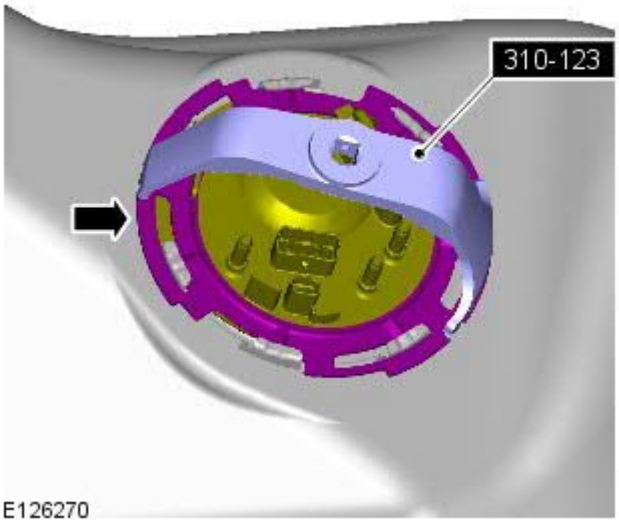


13. NOTE: Do not disassemble further if the component is removed for access only.

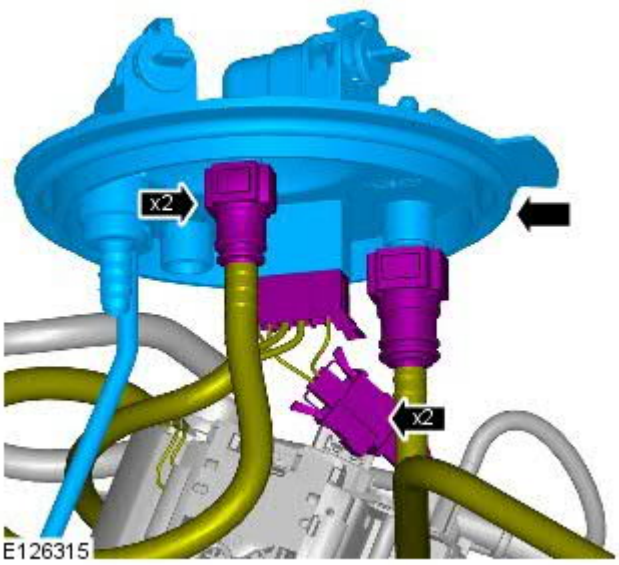
14.

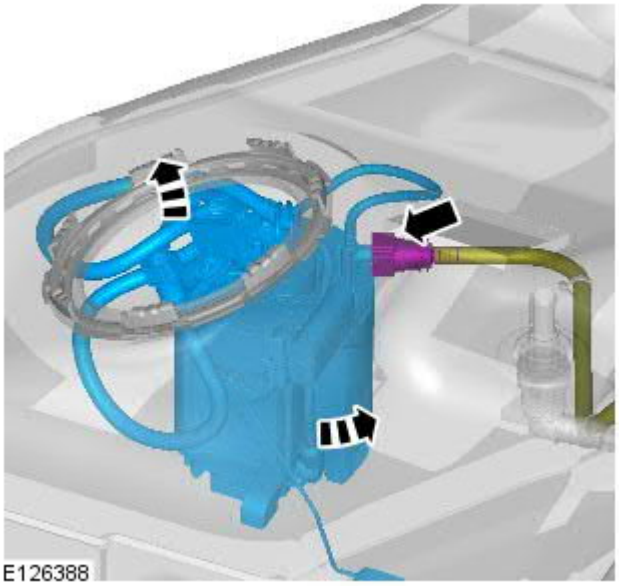


15. *Special Tool(s):* 310-123



16. CAUTION: A new O-ring seal is to be installed.





17. CAUTION: Take extra care not to damage the fuel tank level sensor float and arm.

Installation

1. CAUTIONS:

   Take extra care not to damage the fuel tank level sensor float and arm.

   Make sure that the fuel pump and sender unit are correctly installed on to the retaining bayonet bracket in the fuel tank.

   Make sure the fuel tank level sensor arm moves from the full, to the empty position freely and all the pipes are clear of it's path.

   NOTES:

   Make sure the locating tang is installed in the correct position.

   Remove and discard all blanking caps.

   To install, reverse the removal procedure.

2. Refer to: Low-Pressure Fuel System Bleeding - TDV6 3.0L Diesel (310-00 Fuel System - General Information, General Procedures).

Published: 11-May-2011

Fuel Tank and Lines - TDV6 3.0L Diesel - Fuel Tank Filler Pipe

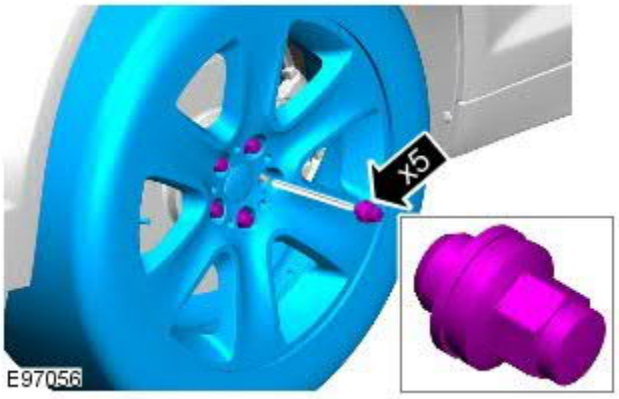
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Diesel Fuel System Health and Safety Precautions (100-00 General Information, Description and Operation).
2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
3. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.
4. Refer to: Fuel Tank Draining - TDV6 3.0L Diesel (310-00 Fuel System - General Information, General Procedures).
5. *Torque:* 128 Nm



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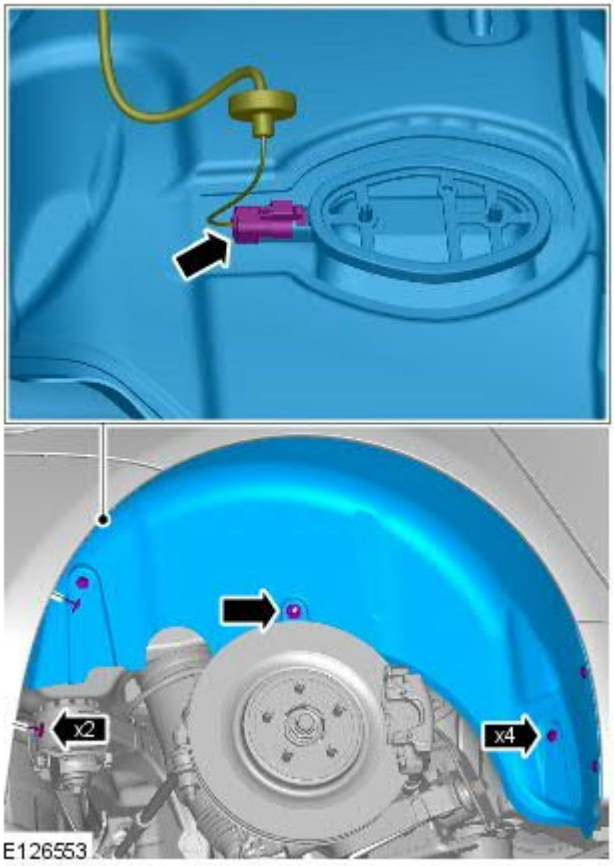
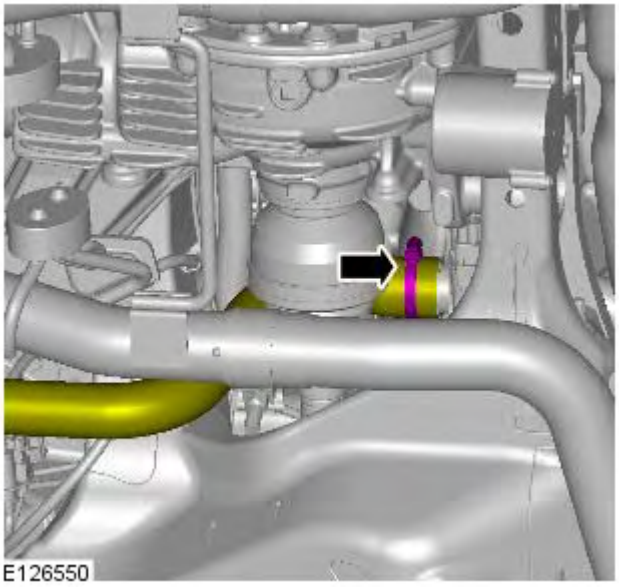
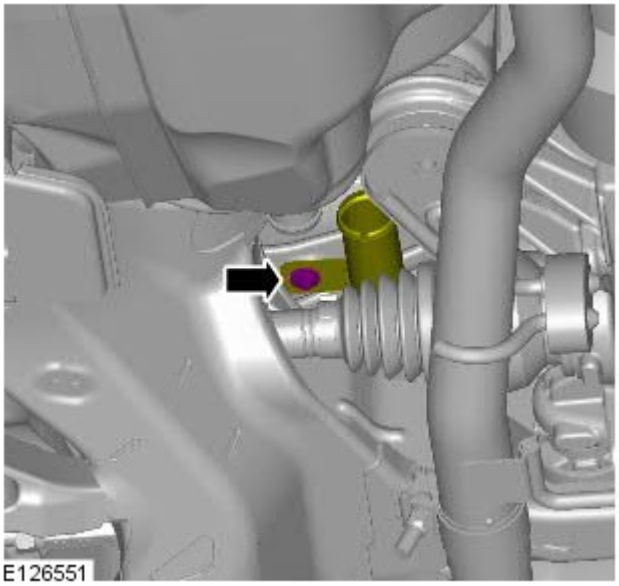
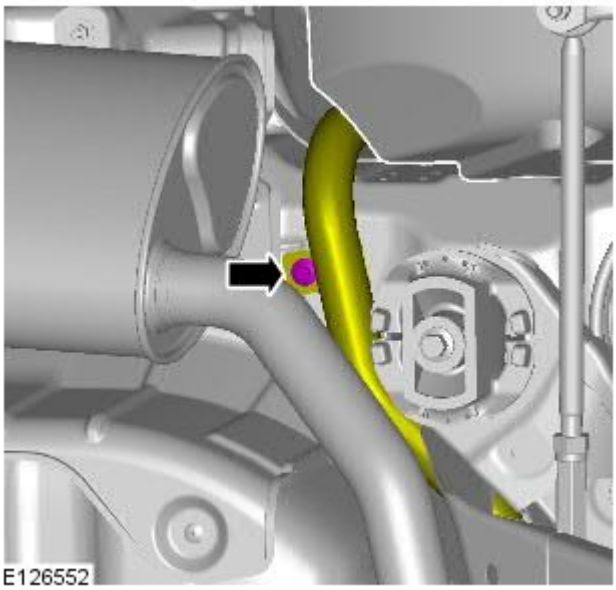


7. *Torque:* 3 Nm

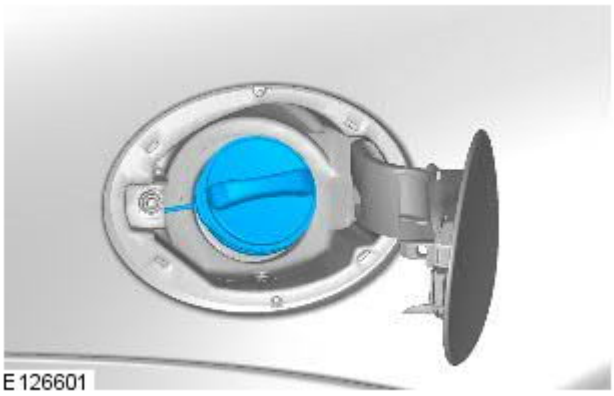




8. *Torque:* 9 Nm



9. *Torque:* 9 Nm



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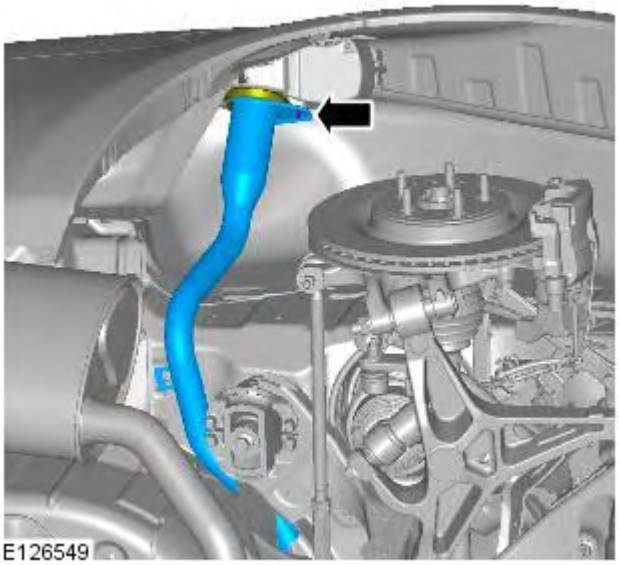


Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Speed Control -

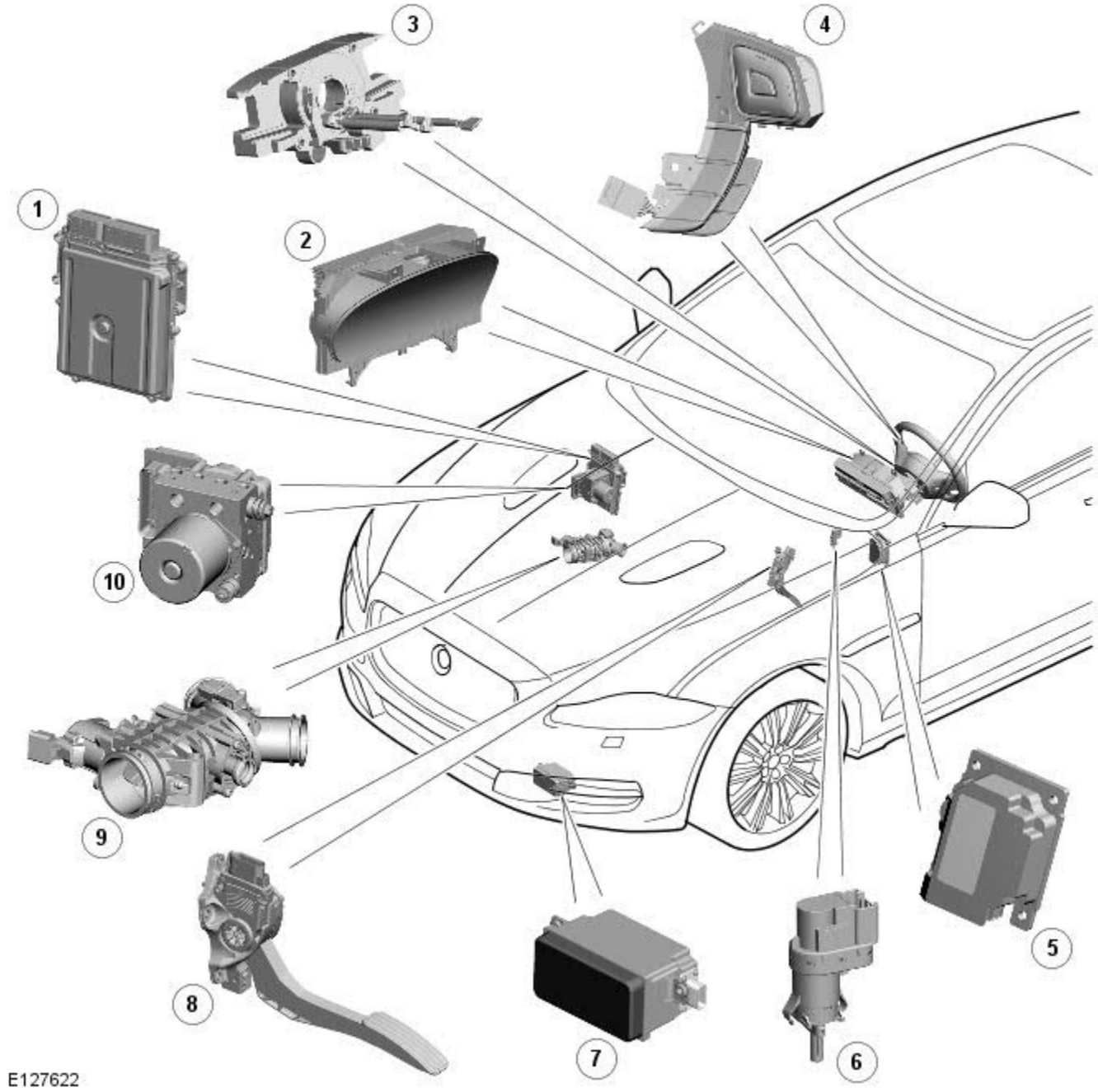
Item	Specification
Speed control sensor vertical alignment	90° ± 0.5°

Description	Nm	lb-ft	lb-in
Speed control module retaining nuts	5	-	44
Speed control sensor alignment bolt lock nut	5	-	44
Speed control sensor bracket reataining bolts	9	-	79
Speed control sensor retaning bolts	5	-	44

Published: 11-May-2011

Speed Control - Speed Control TDV6 3.0L Diesel - Component Location

Description and Operation



Item	Description
1	Engine Control Module (ECM)
2	Instrument cluster
3	Clock spring
4	Speed control switches
5	Adaptive speed control module
6	Brake lamp/brake test switch
7	Adaptive speed control radar sensor
8	Accelerator Pedal Position (APP) sensor
9	Throttle intake manifold - Electric throttle
10	Anti-lock Brake system (ABS) module

Published: 26-May-2011

Speed Control - Speed Control TDV6 3.0L Diesel - Overview

Description and Operation

OVERVIEW

There are two variants of speed control available, a standard system and an adaptive system. The standard system maintains a set speed selected by the driver until operation is suspended or cancelled by a further input from the driver and is controlled by the ECM (engine control module). The adaptive system includes the same functionality as the standard system, but also has the ability to:

- Reduce vehicle speed, to less than the set speed, in order to maintain a selected distance behind a slower moving vehicle
- Accelerate the vehicle back to the set speed, once the way ahead is clear, after reducing the set speed because of a slower moving vehicle
- Alert the driver when the vehicle comes within a given distance of a slower moving vehicle.

Speed Control

The standard speed control system has the following components:

- A SET + switch
- A - switch
- A RESUME switch
- A CANCEL switch

The speed control system also uses:

- The ECM
- The brake switch
- The APP (accelerator pedal position) sensor

Adaptive Speed Control

The adaptive speed control (also known as Adaptive Cruise Control (ACC)) system uses a forward looking radar sensor to scan the road ahead, looking for objects that are moving at a different rate to itself. When a target is identified the adaptive speed control system will monitor the time gap between the host and the target vehicles. When that gap falls below a set driver selected level, the speed control system will intervene, slowing the vehicle by backing off the throttle and/or applying the brakes, until the correct gap is attained. The driver can chose between four gap settings. The chosen setting is displayed in the instrument cluster.

The system will detect but not react to the following:

- Vehicles in the oncoming lane
- Stationary vehicles
- Pedestrians
- Vehicles not in the same lane.

Adaptive speed control is active when the vehicle is moving at a minimum speed of 20 mph (32 km/h) and a maximum speed of 112 mph (180 km/h). Adaptive speed control only functions when a set speed is entered in standard cruise control mode. The adaptive speed control system only intervenes with the set speed when it detects a target vehicle, and then only if the minimum time gap is breached.

It is important to note that the system is intended for use in limited driving situations, does not remove control and responsibility from the driver, and at all times can be quickly overridden. The adaptive speed control system is not a collision warning system and will not react to stationary objects. The system does not operate below a minimum speed of approximately 20 mph (32 km/h) since it is unsuitable for use in cities or congested traffic. The system is best suited to main roads/ highways with gradual bends.

The adaptive speed control system incorporates the following components in addition to those listed for standard speed control:

- An adaptive speed control radar sensor
- Steering wheel gap increase and decrease control switches
- The ABS (anti-lock brake system) control module.

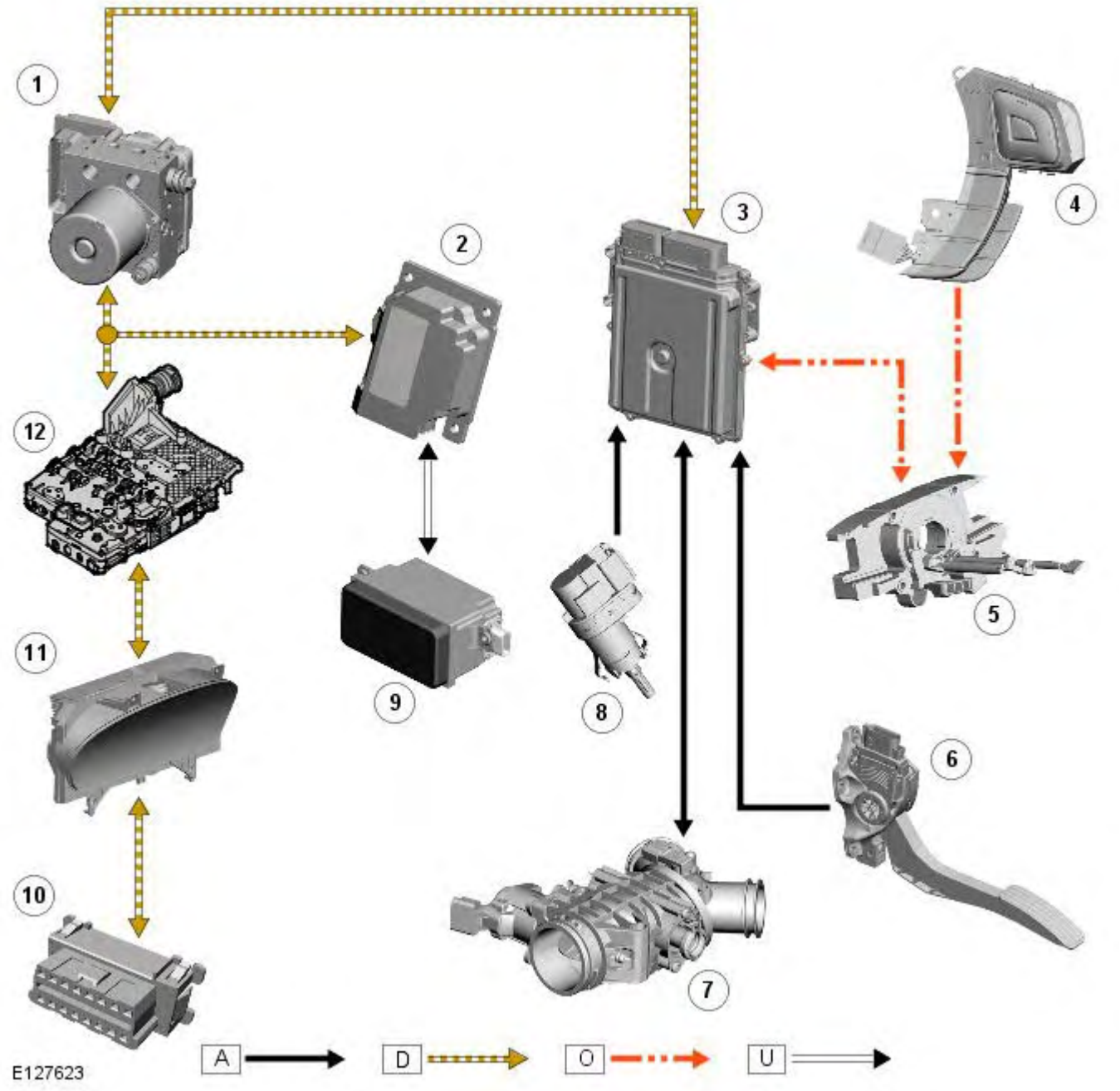
Published: 11-May-2011

Speed Control - Speed Control TDV6 3.0L Diesel - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: **A** = Hardwired; **D** = High speed CAN (controller area network) bus; **O** = LIN (local interconnect network) bus; **U** = Private CAN bus



Item	Description
1	Anti-lock Brake System (ABS) module
2	Adaptive speed control module
3	Engine Control Module (ECM)
4	Speed control switches
5	Clock spring

6	Accelerator Pedal Position (APP) sensor
7	Throttle intake manifold - Electric throttle
8	Brake lamp/brake test switch
9	Adaptive speed control radar sensor
10	Diagnostic socket
11	Instrument cluster
12	Transmission Control Module (TCM)

System Operation

SPEED CONTROL

The speed control system is integrated with the engine management system and uses fueling intervention to automatically maintain a set vehicle speed. Once engaged, the system can also be used to accelerate the vehicle without using the accelerator pedal. The speed control system comprises the following components:

- '+' and '-' (set/accelerate and decelerate) steering wheel switches
- Resume switch
- Cancel switch
- Clock spring
- Speed control warning indicator.

The speed control system also uses inputs from the brake pedal switch, the APP (accelerator pedal position) sensor, the ECM (engine control module) and the ABS (anti-lock brake system) module.

The speed control is operated by the driver using only the steering wheel switches. When speed control is active, the ECM regulates the PWM (pulse width modulation) signals to the fuel injectors to adjust the fuel supply as required to maintain the set speed.

During speed control operation, the ECM controls vehicle speed by adjusting fuel injection duration and timing. When the accelerator pedal is pressed with speed control active, the ECM outputs a calculated throttle angle signal in place of the actual throttle angle signals produced by the APP sensor. The calculated throttle angle is derived from fuel demand based on the torque required to overcome the rolling resistance (vehicle motion drag).

The minimum set speed for speed control is 20 mph (32 (km/h). Speed control is automatically suspended if the following conditions apply:

- Vehicle speed falls below 20 mph (32 km/h).
- The brake pedal is pressed.
- The cancel button is pressed.
- Neutral, park or reverse gear is selected.
- The difference between actual speed and the set speed is too great.
- If the accelerator pedal is used to accelerate beyond the set speed for too long (more than 5 minutes).
- Stability control system intervention
- System error causes shut-off.

There are 4 standard speed control switches:

- Set speed **+** accelerate switch
- Decelerate **-** switch
- Cancel switch
- Resume switch.

The standard speed control switches are located on the RH (right-hand) side of the steering wheel. The switches are resistive ladder type switches which vary the resistance of a voltage signal sent to them. The resistive ladder is wired to a control module within the switch assembly, the control module is a LIN node which transmits the data to the CJB (central junction box) which passes the data onto the high speed CAN bus. In the event of the ECMlogging a cruise switch fault DTC (diagnostic trouble code), fault finding should start at the switch assembly and clockspring. The ECM diagnostic detects that the switch assembly control module hasn't provided an updated live counter.

Engage Speed Control

Speed control is engaged by pressing the set speed accelerate **+** switch. Once engaged the speed can be increased by one of 3 methods:

- Press and hold the set speed accelerate **+** switch which will cause the vehicle to accelerate. When the switch is released the attained speed will be set as the cruise speed.
- Repeatedly pressing the set speed accelerate **+** switch. Each press increases the vehicle speed by 1 mph (2 km/h).
- Use the accelerator pedal to increase the vehicle speed. Once the required speed is reached, a single press of the set speed accelerate **+** switch will set the cruise speed.

When the target speed has been set, a green marker will appear on the outer circumference of the speedometer in the instrument cluster, adjacent to the set speed. If the set speed is changed the marker will move accordingly. If the speed control is cancelled the marker changes to a gray color until the resume switch is pressed to re-engage speed control, when it changes back to a green color.

Reduce Cruising Speed

The set speed can be reduced by pressing and holding the decelerate - switch until the required speed is reached. When the switch is released the speed is reset at that value. The set speed can be reduced incrementally by pressing and releasing the decelerate - switch. Each press will reduce the speed by 1 mph (2 km/h). Adaptive speed control braking can be induced by using the SET – switch to decelerate the vehicle.

Set Speed Adjustment

Speed control adjustment is limited around the current vehicle speed. This means speed adjustment won't occur when resuming or if the vehicle speed is noticeably different to set speed. This is noticeable when resuming speed control and a large difference exists between the set speed and the current speed. The driver can set a new speed, but can't adjust the old speed.

Suspend Speed control

Suspending speed control means speed control has been deactivated without loss of the memory speed. In all suspend events the memory speed is maintained. Speed control can be suspended in a number of ways, as described in the general description.

A single press of the RESUME switch will resume speed control at the previously set speed.

NOTE: In the event that a memory speed has been lost during a driving cycle, confirm with the customer if the "Cruise Not Available" message was observed. Loss of memory speed implies a fault has occurred. The massage 'Cruise Not Available' may only be displayed on demand for some errors, so speed control needs to be requested via the SET + switch to drive the message.

ADAPTIVE SPEED CONTROL

The adaptive speed control system utilises the following components:

- Adaptive speed control sensor
- Adaptive speed control module
- Steering wheel control switches
- ECM
- Throttle intake manifold - Electric throttle
- ABS module and pump
- Adaptive speed control warning indicator (in the instrument cluster)
- Forward alert warning indicator.

The adaptive speed control system uses a forward looking radar sensor to scan the road ahead, looking for objects that are moving at a different rate to itself. When a target is identified the adaptive speed control system will monitor the time gap between it and the target vehicle. When that gap falls below a set driver selected level the adaptive speed control system will intervene slowing the vehicle by backing off the throttle and/or applying the brakes, until the correct gap is attained. The driver can chose between four gap settings, 1, 1.4, 1.8 and 2.2 seconds.

The system will detect but not react to the following:

- Vehicles in the oncoming lane
- Stationary vehicles
- Pedestrians
- Vehicles not in the same lane
- Motorcycles.

Adaptive speed control is active when the vehicle is moving. Adaptive speed control only functions when a set speed is entered via the operation of the SET + switch. The adaptive speed control system only intervenes with the set speed when it detects a target vehicle, and then only if the minimum time gap is breached.

It is important to note that the system is intended for use in limited driving situations, does not remove control and responsibility from the driver, and at all times can be quickly overridden. The adaptive speed control system is not a collision warning system and will not react to stationary objects. The system does not operate below a minimum speed of approximately 20 mph (32 km/h) since it is unsuitable for use in cities or congested traffic. The system is best suited to main roads/ highways with gradual bends.

The ECM, electric throttle and throttle control are unchanged from those used for non adaptive speed control variants.

With the ignition switched ON, the adaptive speed control module is powered up but no radar transmissions are emitted until the vehicle is in motion.

Radar Sensing

The adaptive speed control system is based on the use of a front mounted radar sensor. The sensor transmits a 1.5° wide beam forward of the vehicle and detects the returning signals reflected off other vehicles and objects ahead.

The 1.5° wide radar beam is mechanically scanned at a rate of 10 sweeps/second across a total arc of 15° centered on the longitudinal axis of the vehicle. The radar operates at millimetric wavelengths (76 - 77 GHz) and transmits a frequency modulated continuous wave signal at a relatively low power level (no high power pulses).

With the ignition switched ON, the adaptive speed control module is powered up but no radar transmissions are emitted until the vehicle is in motion.

The radar sensor detects three primary parameters of objects within the scanned arc. These are:

- Range
- Relative velocity
- Angle.

Range

The radar sensor detects the presence and ranges of different vehicles and objects within the scanned arc up to a distance of approximately 130 meters (426.5 feet). The transmitted signal frequency changes continuously in a cyclic pattern (modulation). This means that, in the time taken for the signal wave front, to travel to and from a target vehicle (or other object), the transmission frequency will have changed. The difference between the received signal frequency and the new transmission frequency is proportional to the distance between the transmitting vehicle and the target vehicle.

Relative Velocity

When the signal is reflected off a vehicle moving at a different speed (opening or closing the gap) an effect known as the 'Doppler Shift' causes an extra frequency modulation to be imposed on the signal. This doppler frequency varies with the relative speed of the vehicle being followed, enabling the system to differentiate between vehicles traveling at different speeds and also between moving vehicles and stationary objects.

Angle

Using a narrow angle beam to scan horizontally enables the system to distinguish between vehicles in different lanes and between vehicles and roadside objects.

Follow Mode

In follow mode a set speed is selected in the normal speed control manner and this speed is maintained until a slower vehicle is encountered in the lane ahead. When the vehicle ahead comes within the effective range of the radar sensor, the system identifies it as a target vehicle and an icon is illuminated on the instrument cluster to indicate that the system is in "follow mode". When the distance between the two vehicles closes to a set time gap, the adaptive speed control system closes the throttle and if necessary applies the brakes to maintain the set time gap. Follow mode is effectively a closed loop system. If several vehicles are ahead, the closest vehicle is chosen as the target to follow. If the target vehicle moves out of radar range, or if either vehicle changes lane or drops below the minimum operating speed, the system exits follow mode and the follow mode icon is extinguished. The adaptive speed control system will only raise its speed to the originally set speed, it will not accelerate past this speed to maintain a time gap.

Driver operation of the foot brake or control switches will immediately cancel adaptive speed control. A 'cruise cancelled' message will be displayed to the driver in the message center.

When the vehicle is in follow mode, the follow mode warning indicator is illuminated in the instrument cluster. The gap setting will be displayed at the time of the set event, NOT on the detection of every target, this is to prevent overwriting the tachometer in the instrument cluster everytime a target is detected.

Follow Mode Warning Indicator

E122343

Forward Alert

Limited detection and warning of vehicles ahead is provided during adaptive cruise control operation by the forward alert warning. The enhanced forward alert warning provides additional warnings when the adaptive cruise control is not engaged. If a vehicle is detected close ahead, a warning tone will be emitted and a 'Forward Alert' message will be displayed. Throttle and braking intervention is **NOT** applied

The forward alert system is active when the warning indicator in the instrument cluster is illuminated. Forward alert does not initiate any action, the driver must take the appropriate action when the message is displayed. The system monitors driver intervention and may not issue the warning if the driver has taken the appropriate action (braking, steering or indicating) early enough.

Forward Alert Warning Indicator

E122344

The forward alert system uses the adaptive speed control system components. Forward alert is turned on and off independently of adaptive speed control, via the instrument cluster menu. Forward alert will notify the driver by means of a chime, and warning indicator in the instrument cluster and indication in the message center, when a target vehicle comes into range. The system will NOT use throttle or brake intervention to slow the vehicle.

When forward alert is selected on or off, the instrument cluster sends the forward alert information to the adaptive speed control module on the CAN bus. When a forward alert sensitivity adjustment is made using the time gap increase/decrease switches on the RH side of the steering wheel. The switches are connected via fly leads to the clockspring and pass a signal a LIN bus signal, via the clockspring to the CJB. The CJB routes the selected sensitivity adjustment signals to the ECM on the high speed CAN bus.

NOTE: This system is intended as a driver aid and should be used as such. The system is NOT a collision warning or avoidance device.

The system sensitivity can be adjusted in the same manner as the Adaptive Speed Control, via the steering wheel mounted switches. Each adjustment is accompanied by a message in the message center.

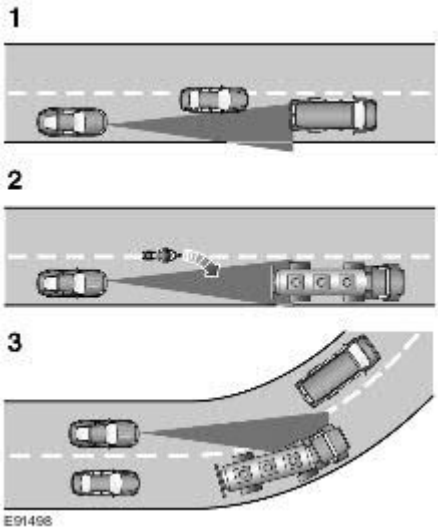
SYSTEM RESTRICTIONS

The adaptive speed control system is only intended to provide enhanced speed control as described above in certain restricted conditions. The following points should be noted:

- Automatic braking is limited to approximately 30% of full pressure (0.3G deceleration) and is intended to provide a smooth, gradual deceleration in follow mode conditions. Harsh braking by the target vehicle or following the target vehicle down to very low speeds or to a halt will require the driver to intervene and override the brakes. A 'driver intervene' message will be displayed in the message center accompanied with an audible chime.
- While the radar sensor detects moving and stationary targets for assessment of the environment ahead, the system does not react to or provide any control in situations other than follow mode conditions. Stationary or slow moving vehicles (below 10 km/h), pedestrians, objects on the road and oncoming vehicles in the same lane are not recognized.

WARNING: It must be emphasized that the adaptive speed control system is not a collision warning or avoidance system and that, other than the limited conditions of follow mode, driver intervention will be necessary to control the vehicle speed.

The following illustration shows circumstances where the adaptive cruise control system may brake late or unexpectedly. The driver is required to intervene in these situations.



Item	Description
1	Driving on a different line to the vehicle in front.
2	Vehicles that merge into the same lane are only detected once they have moved fully into the lane.
3	On bends in the road there can be issues with detection of the vehicle in front when going into and coming out of a bend.

In follow mode, some situations may cause target ambiguities for the detection system. These situations include:

- The nearby presence of a third vehicle when driving on a line slightly offset to the target vehicle.
- Vehicles edging into the lane ahead which are not detected by the system until they have moved into the radar beam.

On the approach to, or exit from a bend, a target vehicle may be lost or a new target acquired as vehicles ahead change their angular position with respect to the radar sensor. On a straight road, if the sensing vehicle is in follow mode below its selected set speed, losing the target vehicle will cause the sensing vehicle to accelerate to this set speed. This acceleration is undesirable either on, or entering a bend when the target is suddenly lost, and in this situation the system inhibits the resumption of the set speed.

The speed control system compares vehicle speed data from the ABS system with the relative speed of an external object as detected by the radar sensor to ascertain whether the object is stationary or not.

NOTE: If tires are fitted which are different in diameter from those specified for the vehicle, the vehicle speed calculated by the ABS will not be the true road speed. This situation may cause stationary objects to be falsely identified as moving vehicles and result in automatic deceleration on a clear road.

BRAKE SYSTEM FUNCTIONS

Electronic Brake Prefill

Electronic brake prefill senses any rapid throttle lift off, activating a small brake hydraulic pressure build-up of approximately 3 to 5 bar (43.5 to 72.5 lbf/in²) in anticipation of the brakes being applied.

This application produces a quicker brake pedal response and consequently slightly shorter stopping distances. The system supports vehicles with adaptive speed control.

When the ABS module detects rapid throttle lift off (signal received from the ECM over the high speed CAN bus), it controls the ABSHCU (hydraulic control unit) to apply a low brake pressure to assist in a quicker brake application.

Emergency Brake Assist

EBA (emergency brake assist) assists the driver in emergency braking situations by automatically increasing the applied braking effort. The ABS module activates EBA when:

- The brake pedal is rapidly pressed
- The brake pedal is pressed hard enough to bring the front brakes into ABS operation.

When the brake pedal is rapidly pressed, the ABS module increases the hydraulic pressure to all of the brakes until the threshold for ABS operation is reached. This action applies the maximum braking effort for the available traction. The ABS module monitors for the sudden application of the brakes, using inputs from the brake pedal switch and from the pressure sensor within the HCU With the brake pedal pressed, if the rate of increase of hydraulic pressure exceeds the predetermined limit, the ABS module activates emergency braking.

When the brake pedal is pressed hard enough to bring the front brakes into ABS operation, the ABS module increases the hydraulic pressure to the rear brakes up to the ABS threshold.

EBA operation continues until the driver releases the brake pedal, sufficiently for the hydraulic pressure in the HCU to drop below a threshold value stored in the ABS module.

Advanced Emergency Brake Assist

Advanced EBA uses adaptive speed control technology to provide pre-emptive control when sudden braking is required. The system is an enhancement of electronic brake prefill and emergency brake assist. The system can sense the possibility of a collision before the driver reacts through the brake pedal and can prepare the braking process even before the driver reacts and moves to the brake pedal, thus when the driver takes action, the braking system can respond to emergency braking more promptly, potentially avoiding a collision entirely, or mitigating the effects if a collision is inevitable. The system activates if the risk of collision increases after the forward alert warning is issued.

After a forward alert warning is displayed, the brakes are automatically applied gently in preparation for rapid braking and the EBA activation threshold is lowered. If the brake pedal is then pressed quickly then braking is fully implemented by the emergency brake assist system, even if the pressure on the brake pedal is light.

The system operates using signals from the adaptive speed control module, based on proximity to and closing speed to the vehicle in front by monitoring forward traffic and obstructions with the radar sensor used by adaptive speed control. Through the positive brake-line pressure available from the HCU, it will apply a pre-charge of brake pressure even before the driver reacts. Thresholds for the entry to EBA are reduced so that the system functions earlier than it would without the data from the radar sensor.

Advanced EBA is available at speeds above 5 mph (7 km/h) and will function even when forward alert and adaptive speed control are switched off.

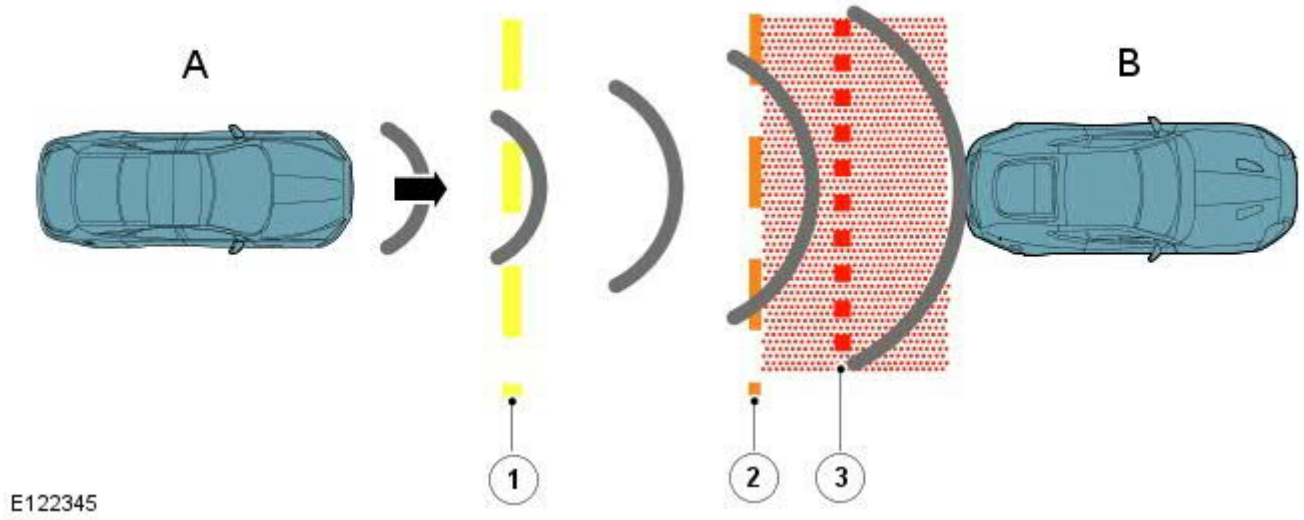
Principle of Operation - Advanced Emergency Brake Assist

The radar sensor detects vehicles ahead that are moving in the same direction as the host vehicle. In the event of a collision risk, and 'Forward Alert' is on, the driver is initially alerted by a visual and audible warning signal. If the risk of collision increases after the warning, advanced EBA maybe activated. The advanced EBA prepares the brake system for rapid braking with the brakes being applied gently. If the brake pedal is depressed quickly then braking is implemented with full brake function, even if the force on the pedal is light.

The forward alert and Advanced EBA system response to an imminent rear-end collision with another moving vehicle reacts in the following order:

- **Forward alert**
  - **Collision warning** - audible and visual (driver can turn this function off)
- **Advanced Emergency Brake Assist**
  - **1st stage precharge** - If a collision is judged to be credible and the driver takes no action then Advanced EBA will prepare the brake system by requesting a fixed precharge brake pressure (approximately 3 bar). Reduction of EBA activation threshold provides a faster entry to the full EBA function.
  - **2nd stage precharge** - If a collision is judged to be imminent and the driver shows an intent to respond to the threat, for example; quick release of the throttle, Advanced EBA will request that the brake system applies a fixed brake pressure (approximately10 bar).

NOTE: If the throttle is already released, precharge 1 and 2 occurs simultaneously (the system moves directly to precharge level 2).

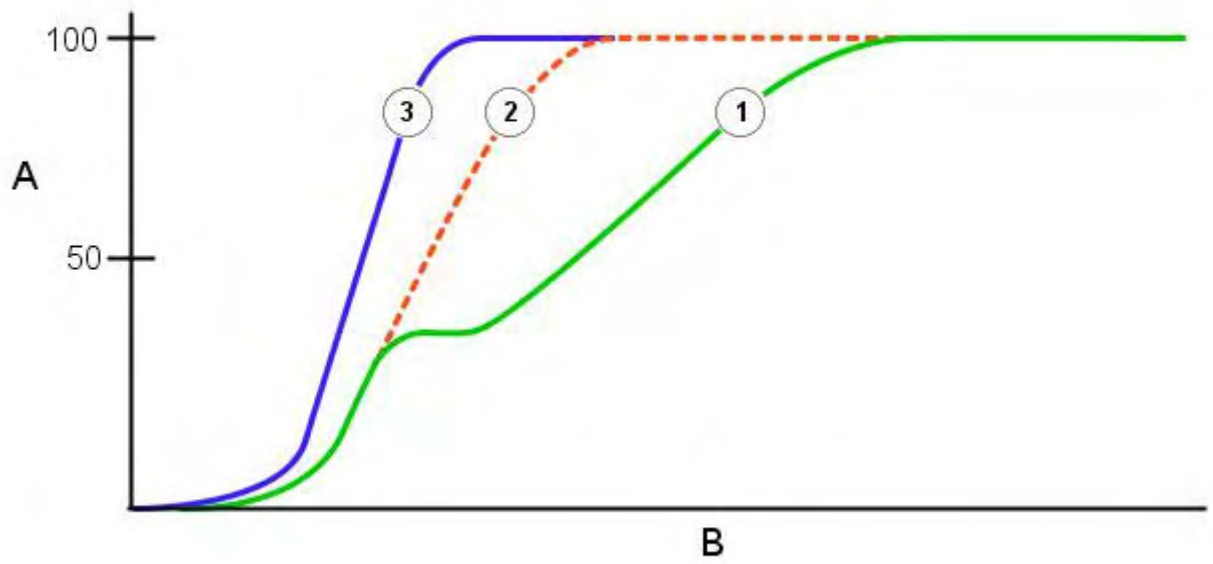


Item	Description
A	Host vehicle
B	Target vehicle
1	Forward alert warning: Visual and audible warning
2	Brake support: 1st stage pre-charge (stop lamps on) Advanced EBA
3	Brake support: 2nd stage pre-charge (throttle release) Advanced EBA

EBA is designed to detect an emergency braking situation giving an automatic increase in vehicle deceleration, up to ABS levels. This quick, increase, in braking deceleration assists the 'average' driver to achieve a reduced stopping distance.

Advanced EBA enhances the performance of EBA. When a critical approach to forward vehicles is detected Advanced EBA requests a pre-charge pressure to the brake system and increases the sensitivity for activation of EBA.

The graph below shows a comparison of 'normal' braking, EBA and Advanced EBA brake pressure profiles.



E122346

Item	Description
A	Percent total brake force
B	Time
1	Conventional brake system without EBA
2	Conventional brake system with EBA (higher activation threshold based on low level of threat, or normal brake assist sensitivity)
3	Advanced EBA (lower activation threshold based on high level of threat and higher brake assist sensitivity)

NOTES:

The system:

- Only operates at speeds above 5 mph (7 km/h)
- Responds only to vehicles moving in the same direction as the host vehicle
- Is designed to help reduce the crash speed and damage in certain rear-end collisions only
- Is not a collision avoidance system and is not a substitute for safe and attentive driving
- Effectiveness depends on many factors, such as speed, driver input, and road conditions
- DOES NOT WARN FOR STATIONARY OR SLOW MOVING VEHICLES
- The driver should always keep a safe following distance.

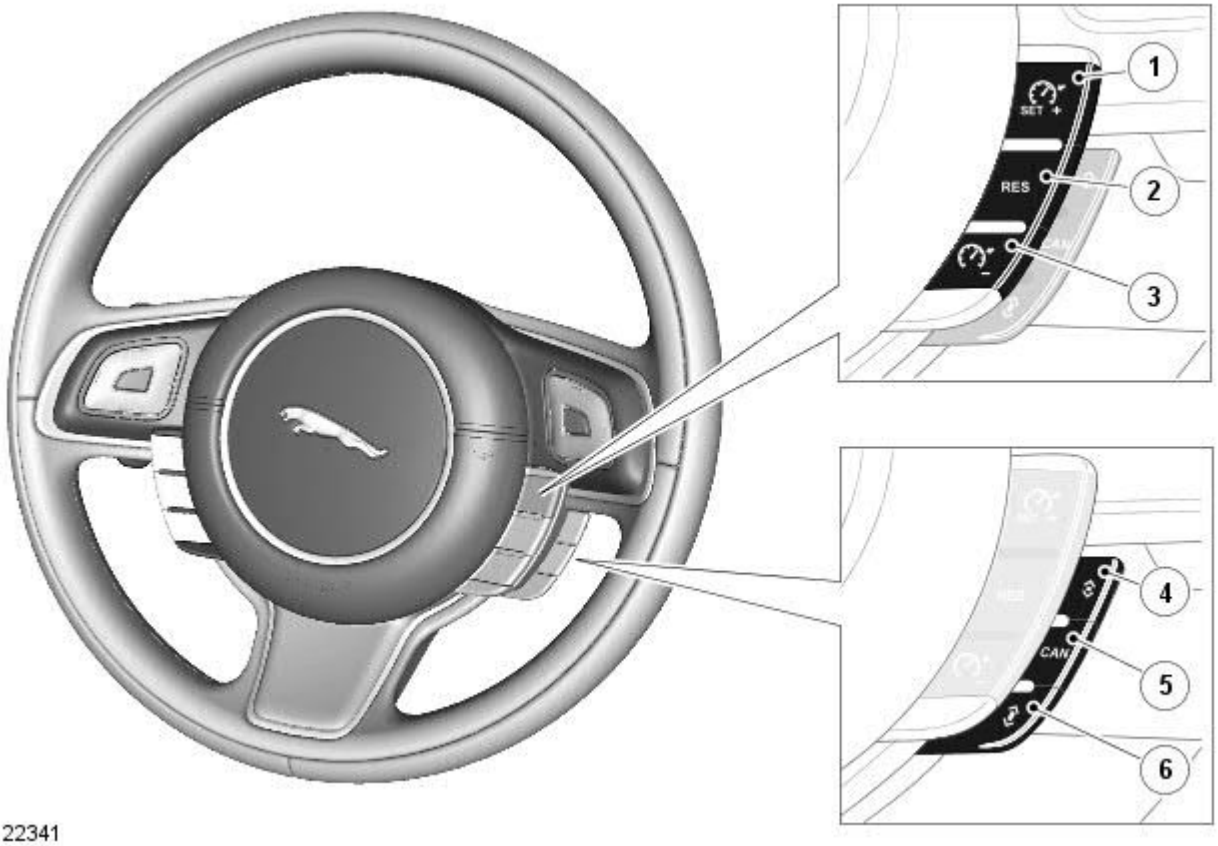
The stop lamps will always be activated on application of the service brakes including all electronic braking interventions (pre-charge, brake assist etc.).

Advanced Emergency Brake Assist - Malfunction Warnings

If the Advanced EBA system is in a fault condition for five consecutive ignition cycles the 'Forward Alert Not Available' fault message will be permanently displayed.

Component Description

SPEED CONTROL SWITCHES



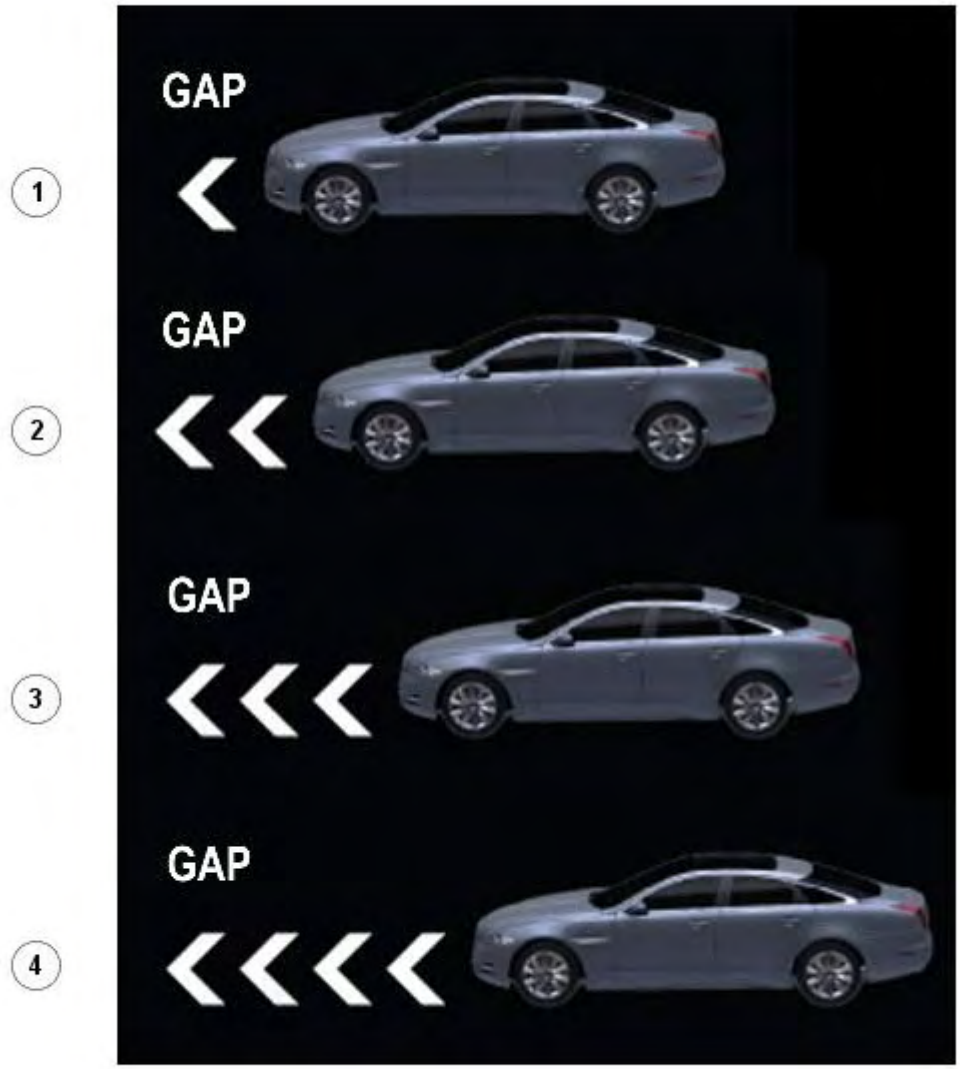
E122341

Item	Description
1	Set speed + switch (Engage speed control/increase speed)
2	Resume (RES) (Resume previous set speed)
3	Set speed - switch (Decrease speed)
4	Time gap decrease switch (Vehicles with adaptive speed control only)
5	Cancel (CAN) (Disengage speed control)
6	Time gap increase switch (Vehicles with adaptive speed control only)

The speed control switches are located on the RH side of the steering wheel. The switches are connected via fly leads to the clock spring. The speed control switches are resistive ladder type switches which vary the resistance of a 5 volt signal sent to them. The signal is returned along a LIN bus, via the clockspring to the CJB. The CJB routes the control signals to the ECM on the high speed CAN bus.

Speed control is engaged by pressing the set speed switch (+). Once engaged the speed can be varied by the set speed adjustment switches (+ or -). Each press of the speed adjustment switch will increase or decrease the set speed in steps of 1 mph (2 kph).

Gap Setting Display Options



E122342

Item	Description
1	Gap setting = 1 second
2	Gap setting = 1.4 seconds
3	Gap setting = 1.8 seconds
4	Gap setting = 2.2 seconds

The gap settings are changed using the time gap increase and decrease switches which are located on the RH side of the steering wheel. The switches are connected via fly leads to the clock spring. The gap switches are resistive ladder type switches which vary the resistance of a 5 volt signal sent to them. The signal is returned along a LIN bus, via the clockspring to the CJB. The CJB routes the selected gap setting signals to the ECM on the high speed CAN bus.

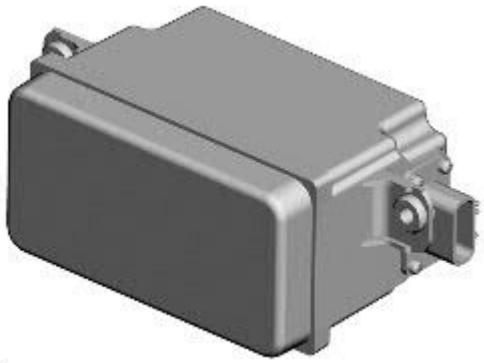
The time gap will return to the default gap (the third setting) each time the ignition is cycled.

ADAPTIVE SPEED CONTROL MODULE

E98450

The adaptive speed control module is located on the drivers side at the bottom of the A pillar. The control module is connected to the other vehicle systems via the high speed CAN bus. Signals from the adaptive speed control forward looking radar sensor are received on a dedicated CAN bus between the two modules.

ADAPTIVE SPEED CONTROL RADAR SENSOR



E98451

The adaptive speed control radar sensor is located in the front bumper, on the RH side above the radiator grill behind the bumper cover. The sensor is connected to the adaptive speed control module via a private CAN bus. If the unit is replaced in service the unit must be re-aligned vertically. Horizontal alignment is achieved by putting the sensor in service mode using an approved Jaguar diagnostic system.

The vehicle is then driven for a short period while the sensor calibrates itself. Calibration is complete when the 'follow' icon in the instrument cluster stops flashing.

Service Alignment Process

The service alignment process measures the path of stationary targets such as streetlights, railings, road signs, parked vehicles etc., and uses this data to correct for radar misalignment. Alignment will complete more quickly if more suitable targets are seen. The following recommendations should be followed:

- Vehicle speed must be above 30mph (48kph)
- Attempt to keep the vehicle speed about the same. The process will take longer to complete if the speed varies too much.
- Choose a road with plenty of stationary objects, like lamp posts, railings, street signs or parked vehicles. Use an inside or outside lane
- Following vehicles too closely will obscure the stationary targets from the radar, a time gap of at least 2 seconds is recommended
- A straighter road will produce a quicker and better result, although the process will still operate on a curved road
- The time the module takes to align will vary, depending on the route, speed, number of targets, and the individual module

SPEED CONTROL WARNING INDICATORS

E122340

Item	Description
1	Adaptive speed control/follow mode active (Amber)
2	Speed control active (Green)
3	Forward Alert warning indicator (Green)

ADAPTIVE SPEED CONTROL - MALFUNCTION WARNINGS

If a malfunction occurs during operation of the system in adaptive speed control or follow modes, the adaptive speed control system will switch off and cannot be used until the fault is cleared. The message 'Driver Intervene' appears briefly and is then replaced by the message 'Cruise Not Available'. If a malfunction of the adaptive speed control, or any related system occurs at any other time, the message 'Cruise Not Available' will be displayed. It will not be possible to activate the adaptive speed control system in any mode.

Accumulations of dirt, snow or ice on the radar sensor or cover may inhibit adaptive speed control operation. Fitting of a vehicle front protector or metallised badges may also affect adaptive speed control operation. The adaptive speed control system relies on its radar to detect objects and constantly scans ahead. If the radar detects no vehicles ahead in adaptive speed control or follow mode, then the adaptive speed control will be deactivated, the audible alarm sounds and the message 'Driver Intervene' displays briefly. The message 'ACC Sensor Blocked' follows the previous message. The same messages may also be displayed while driving on open roads with few objects for the radar to detect. Clearing the obstruction allows the system to return to normal operation. If the obstruction is present when adaptive speed control is inactive (e.g. on initial starting or with the system switched off), the message 'ACC Sensor Blocked' will be displayed.

Published: 19-Jun-2013

Speed Control - Speed Control TDV6 3.0L Diesel

Diagnosis and Testing

Principles of Operation

For a detailed description of the speed control system and operation, refer to the relevant Description and Operation section in the Workshop Manual. REFER to:

Speed Control - TDV6 3.0L Diesel (310-03, Description and Operation),
Speed Control - TDV6 3.0L Diesel (310-03 Speed Control, Description and Operation),
Speed Control - TDV6 3.0L Diesel (310-03, Description and Operation).

Inspection and Verification

1. Verify the customer concern
2. Visually inspect for obvious signs of mechanical or electrical damage

Visual Inspection

Mechanical	Electrical
• Adaptive speed control module • Speed control module (non-adaptive systems) • Ensure the speed control sensor is free from obstructions	• Fuses • Wiring harness • Electrical connector(s) • Steering wheel switches • Brake switch • Speed control sensor • Adaptive speed control module • Speed control module (non-adaptive systems) • Engine control module (ECM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC index

Speed Control Sensor (vehicles with adaptive system installed)

An incorrectly aligned speed control sensor can cause incorrect system operation. Before starting any repair work on the speed control system, on vehicles with the adaptive system installed, check the adjustment of the speed control sensor

The correct function of the system depends on the operation of the speed control sensor, this requires correct alignment and an unobstructed field of view

Customer complaints of poor system performance, late vehicle detection, late system braking, heavier than expected braking when gaining on the vehicle in front or system is detecting vehicles in adjacent lanes, may be due to the sensor pointing up or down (it should be set to level)

Check that there are no obstructions to the sensor

Check for signs of damage to the front bumper/sensor mounting area that could indicate that the sensor has been disturbed

Symptom Chart

Symptom	Possible Cause	Action
Speed control inhibited or disabled	• Default mode enabled • Supply voltage to speed control module • Supply voltage to speed control sensor • Steering wheel speed control switch(s) • Steering wheel speed control switch circuit • Throttle sensors • Brake switch • ABS fault	• Check for network related DTCs that could be caused by power failure to the module or sensor and refer to DTC index • Check for sticking, jammed and broken speed control switches. Refer to the electrical circuit diagrams and check speed control switch circuits for short, open circuit • Check for engine throttle position sensor DTCs and refer to the relevant DTC index • Check for correct installation and adjustment of brake switch. Refer to the electrical circuit diagrams and check brake switch circuits for short, open circuit • Check ABS system for related DTCs and refer to the relevant DTC index

Symptom	Possible Cause	Action
Unable to regulate/adjust vehicle speed	• Steering wheel switch malfunction	• Check for sticking, jammed and broken speed control switches. Carry out steering wheel speed control switch and circuit tests. Refer to the electrical circuit diagrams
Unable to cancel speed control from steering wheel	• Steering wheel switch malfunction	• Check for sticking, jammed and broken speed control switches. Carry out steering wheel speed control switch and circuit tests. Refer to the electrical circuit diagrams
Unable to cancel speed control from brake pedal	• Brake switch malfunction	• Check for correct installation and adjustment of brake switch. Refer to the electrical circuit diagrams and check brake switch circuits for short, open circuit

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Adaptive Speed Control Module (ASCM) (100-00, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - TDV6 3.0L Diesel, DTC: Engine Control Module (ECM) (100-00, Description and Operation).

Published: 11-May-2011

Speed Control - Speed Control Sensor Adjustment

General Procedures

Special Tool(s)

	501-F007 Inclinometer

NOTES:

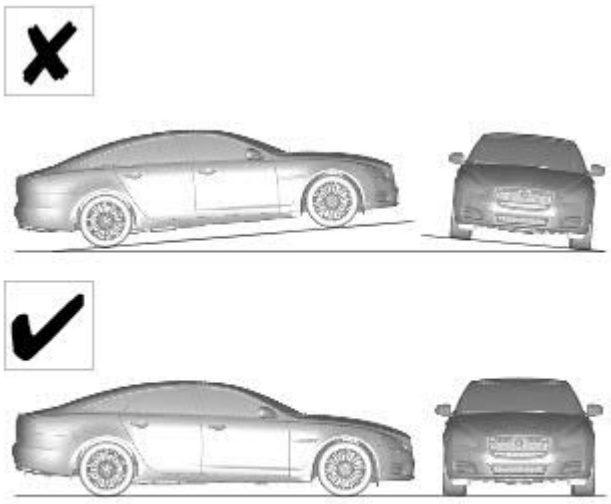
Removal steps in this procedure may contain installation details.

This procedure details how to adjust the speed control sensor vertically. There is no horizontal adjustment required.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

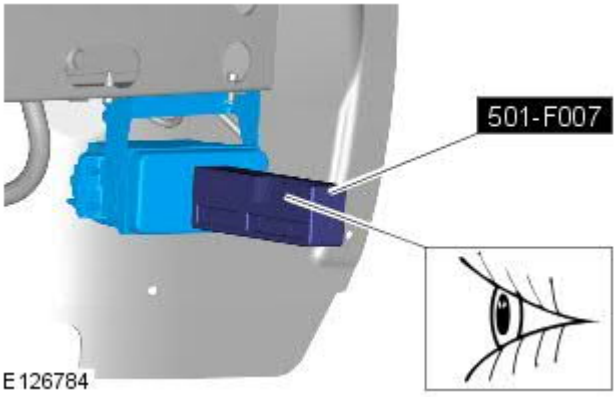
2. Refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).



E126783

3. NOTE: Make sure that the vehicle is standing on a level surface.

   Set the air suspension ride height to the STANDARD setting.

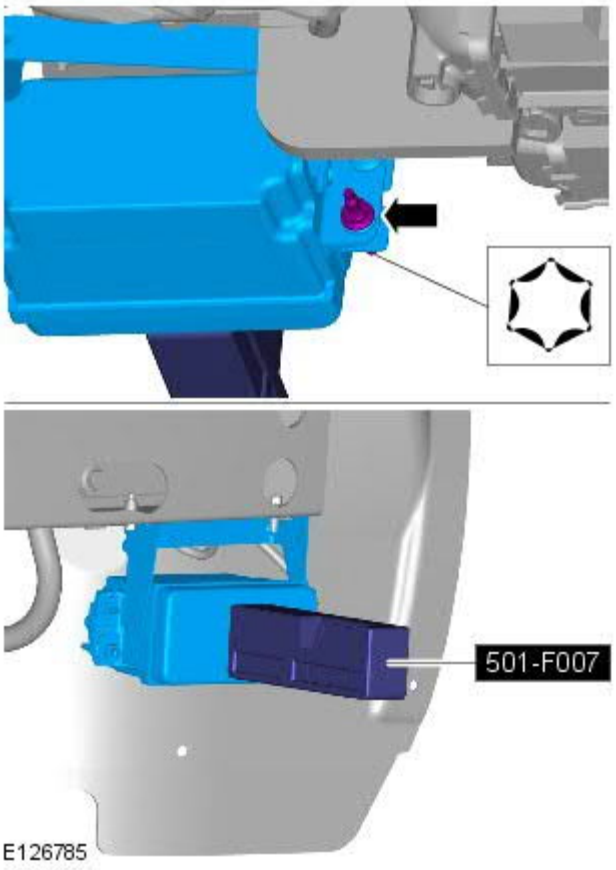


4. NOTES:

   Using the special tool, check the speed sensor is level, (+/- 0.5 degree).

   Make sure that the vehicle is standing on a level surface.

   Special Tool(s): 501-F007



5. NOTES:

   Do not release the securing nut.

   Make sure that the vehicle is standing on a level surface.

   Special Tool(s): 501-F007

6. Refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

7.
   - This procedure is required if:
   - A new ACC radar and, or ACC module are installed.
   - The ACC radar needed to be removed or is misaligned in its position due to another repair operation.

8.
   - From the diagnostic tool menu, select: Service Alignment Mode.
   - The follow indicator will now be flashing, this indicates that the vehicle is in "service alignment" and now requires driving.
   - The vehicle speed must be above 30 mph (48 kph).
   - Choose a road with plenty of stationary objects, like street lights, road signs, or barriers. Use an inside or outside lane.
   - Following vehicles too closely will obscure the stationary targets

from the radar, a time gap of 2 seconds is recommended.
- A straight road will produce a quicker and better result, although the process will still operate on a curved road.
- The time that the ACC module takes to align will vary, depending on the route, speed, number of targets, and individual module.
- When the flashing follow indicator light extinguishes, the ACC system is now functional, and a required vehicle speed can now be set by the driver and the ACC system will operate as normal.

Published: 11-May-2011

Speed Control - Speed Control Deactivator Switch

Removal and Installation

Removal

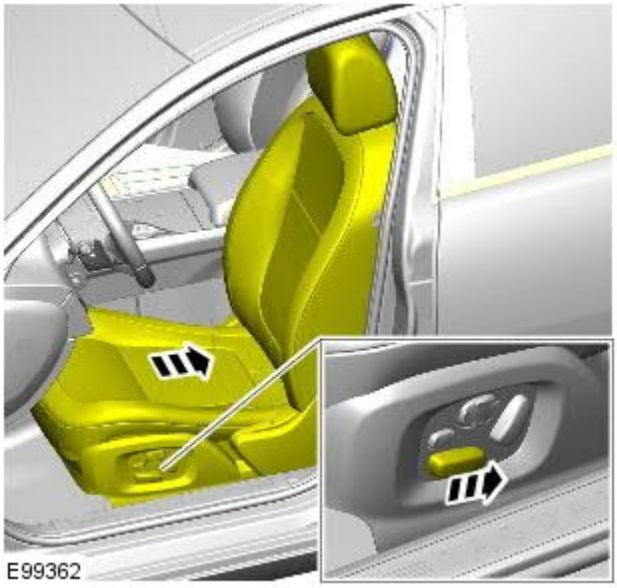
NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2.



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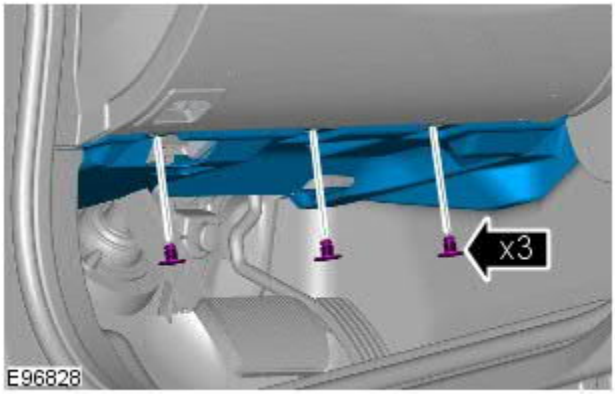
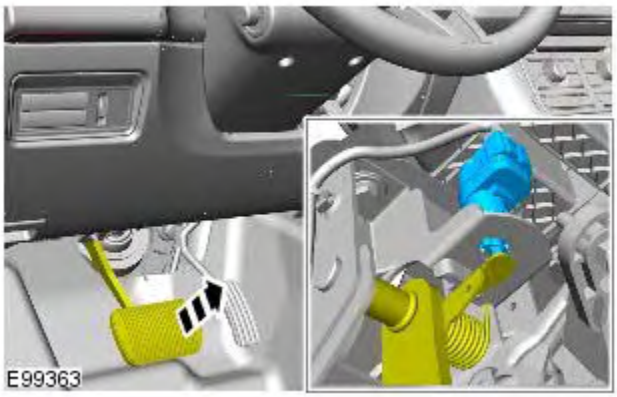
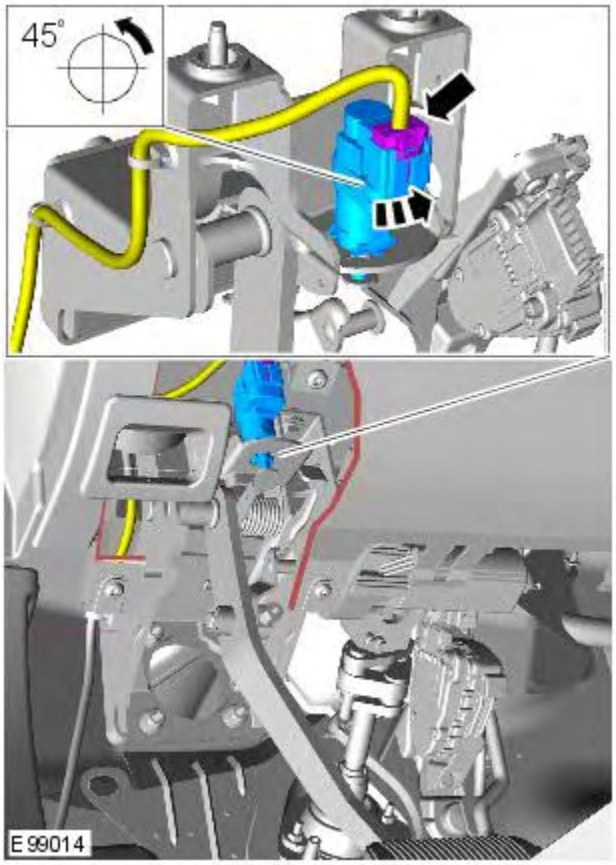
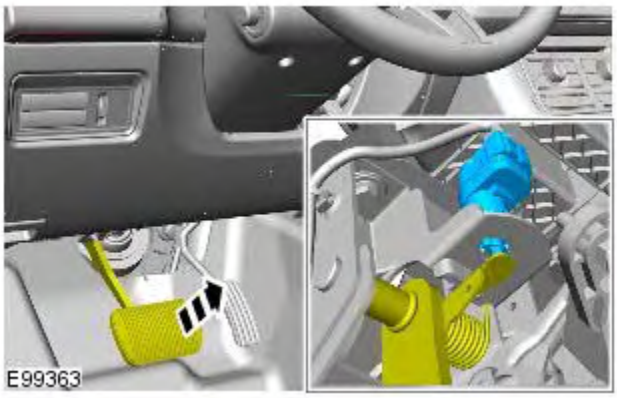




4. CAUTION: Make sure that the brake pedal remains in the rest position during this procedure.



5. CAUTION: Make sure that the brake pedal remains in the rest position during this procedure.



6. CAUTION: Make sure that the brake pedal remains in the rest position during this procedure.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Speed Control - Speed Control Module

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

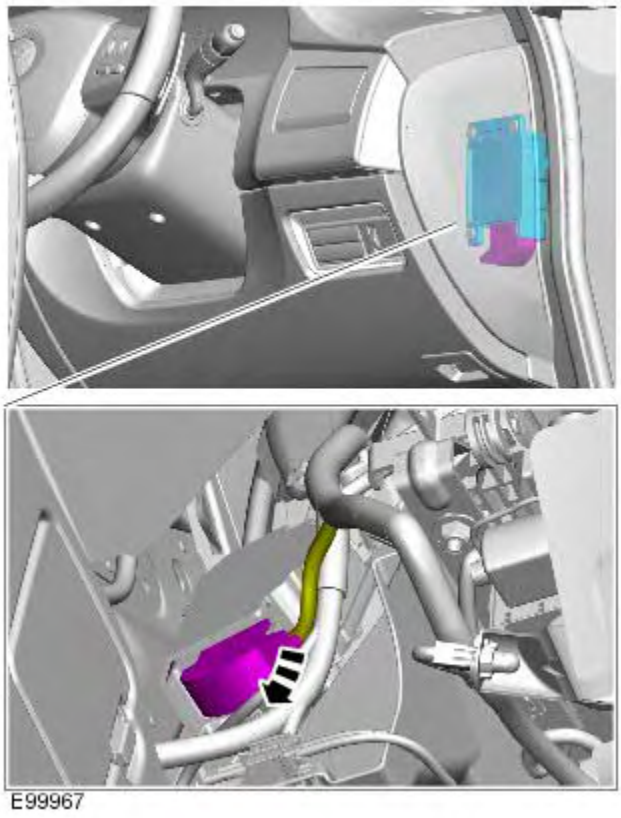
Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

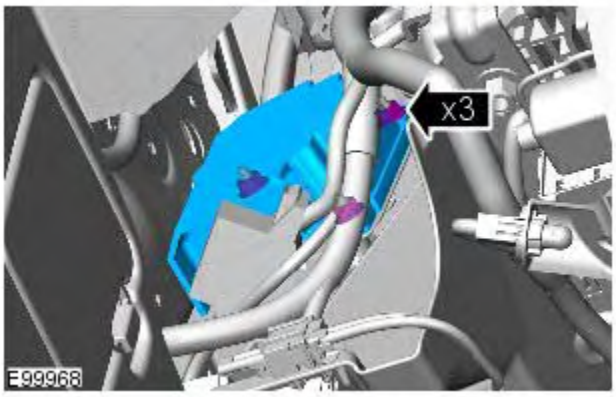
2. Refer to: Speed Control Sensor Adjustment (310-03 Speed Control, General Procedures).

3. Refer to: Instrument Panel Lower Section (501-12 Instrument Panel and Console, Removal and Installation).

4.



E99967



5. CAUTION: Make sure that all diagnostic trouble codes (DTCs) have been removed after the road test.

   Torque: 4 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Speed Control - Speed Control Sensor

Removal and Installation

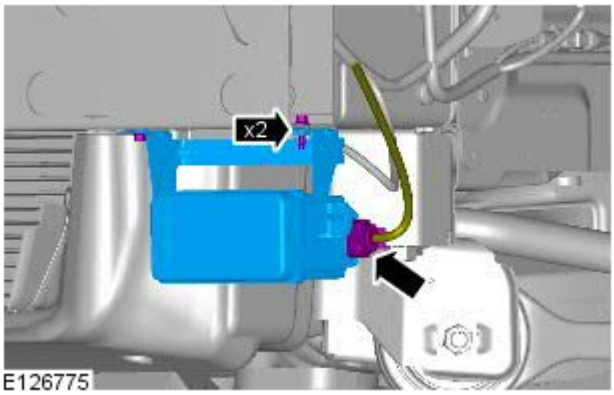
Removal

NOTE: Removal steps in this procedure may contain installation details.

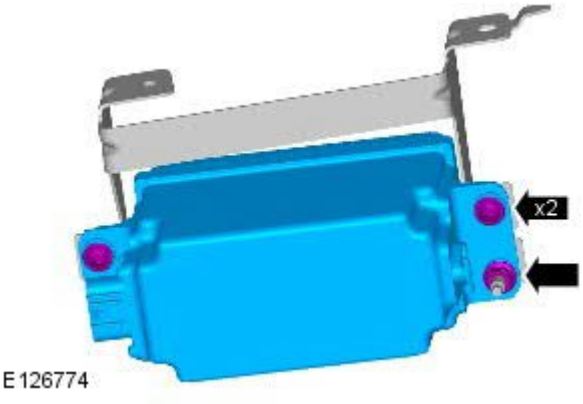
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).



3. *Torque:* 9 Nm



4. NOTE: Do not disassemble further if the component is removed for access only.

   Torque: 5 Nm

Installation

1. To install, reverse the removal procedure.

2. Refer to: Speed Control Sensor Adjustment (310-03 Speed Control, General Procedures).

Published: 11-May-2011

Speed Control - Speed Control Switch

Removal and Installation

Removal

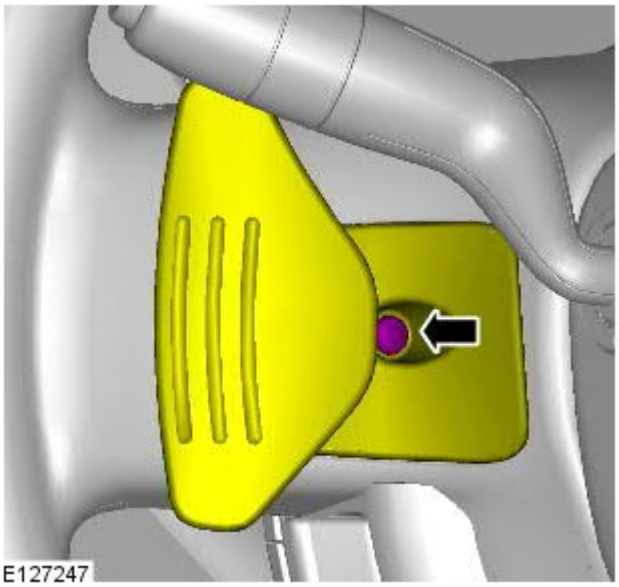
NOTE: Removal steps in this procedure may contain installation details.

1. Make the SRS system safe.

   Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

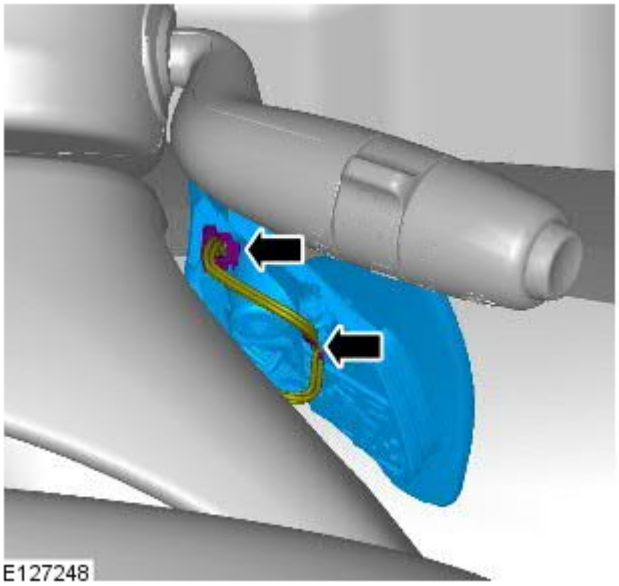
2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

3. Refer to: Driver Air Bag Module (501-20B Supplemental Restraint System, Removal and Installation).

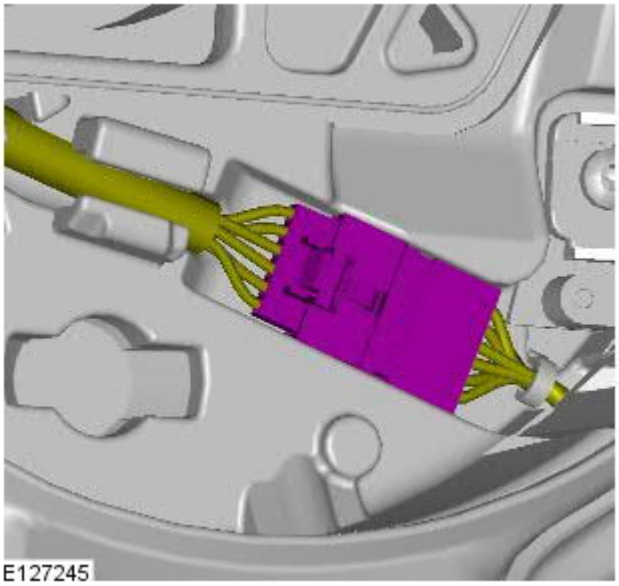


4. NOTE: Right-hand shown, left-hand similar.

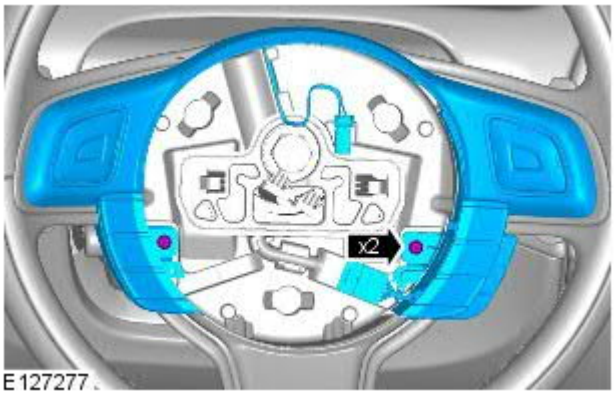
   Torque: 2 Nm



5. NOTE: Right-hand shown, left-hand similar.

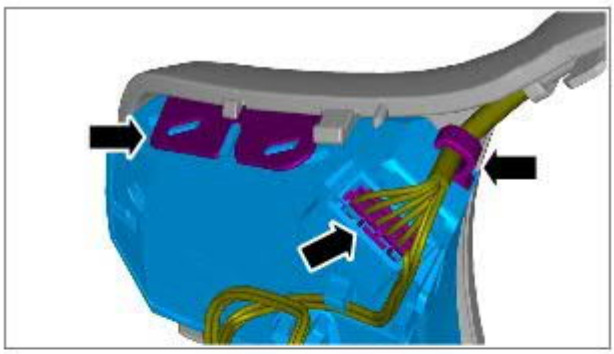


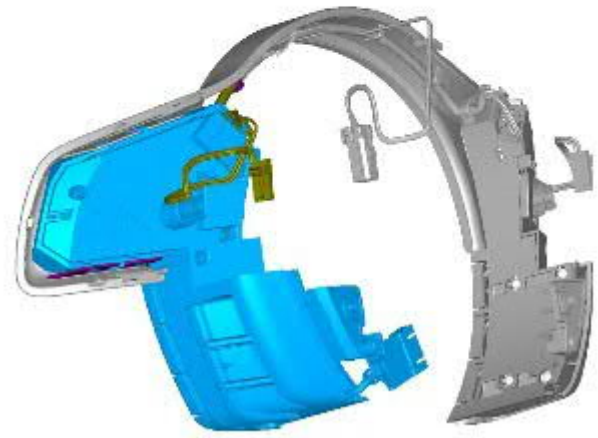
6.



7. Carefully release the clips.

   Torque: 2 Nm





E127246

8. Carefully release the clips.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Climate Control System - General Information -

Lubricants, Fluids, Sealers and Adhesives

Description	Specification
Air conditioning (A/C) refrigerant	HFC 134a
A/C compressor oil	ND-OIL8 or Sanden SP10

Capacities

Description	Grammes
A/C refrigerant - all vehicles	700

Refrigerant Oil Adding Capacities

NOTE: Rotate the A/C compressor shaft at least 6 to 8 turns when draining the refrigerant oil.

Item	Milliliters
A/C condenser core	Add 33
A/C evaporator	Add 46
A/C compressor	1. Drain old A/C compressor. With drain plug removed and ports uncapped, rotate shaft to remove A/C compressor oil and measure the amount of oil captured. 2. Drain new A/C compressor into a clean vessel. With drain plug removed and ports uncapped, rotate shaft to remove oil. Then add back a quantity of the new oil that is identical to the quantity of oil removed from the old A/C compressor. However, if this quantity is less than 30ml, then make it up to 30ml.
A/C lines - if air conditioning has been operational.	Add 10 per A/C line
A/C system after flushing - with compressor included	Add 110
A/C system after flushing - without a new compressor installed - remaining A/C compressor oil is to be drained	Add 110
A/C system after flushing - with a new compressor installed - A/C compressor supplied with 110ml	-

Published: 27-Feb-2014

Climate Control System - General Information - Climate Control System

Diagnosis and Testing

Principle of Operation

For a detailed description of the Climate Control System, refer to the relevant Description and Operation section in the workshop manual. REFER to: (412-01 Climate Control)

Heating and Ventilation (Description and Operation),
Heating and Ventilation (Description and Operation),
Heating and Ventilation (Description and Operation),
Air Conditioning (Description and Operation),
Air Conditioning (Description and Operation),
Air Conditioning (Description and Operation),
Control Components (Description and Operation),
Control Components (Description and Operation),
Control Components (Description and Operation).

Inspection and Verification

WARNING: Servicing must be carried out by personnel familiar with both vehicle system and the charging and testing equipment. All operations must be carried out in a well ventilated area away from open flame and heat sources.

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
• Coolant level • Hose(s) • Coolant pump • Control flap(s) • Duct(s) • Vent(s) • Cabin air filter • Drive belt • Air conditioning compressor • Thermostatic expansion valve • Evaporator • Receiver drier • Air conditioning condenser • Refrigerant pipes • Auxiliary drive belt • Fuel fired booster heater • Fuel fired booster heater fuel pump • Fuel fired booster heater fuel pipes	• Fuse(s) • Wiring harness • Electrical connectors • Blower • Air conditioning compressor • Electric cooling fan • Automatic Temperature Control Module (ATCM) • Refrigerant pressure sensor

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index
5. Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

Symptom Chart

Symptom	Possible Causes	Action
Air conditioning performance poor or inoperative	• Refrigerant undercharged • Refrigerant overcharged • Thermostatic expansion valve faulty	• GO to Pinpoint Test A.

Symptom	Possible Causes	Action
	• Receiver drier restricted • Water in refrigerant	
Air conditioning operates briefly and then switches off	• Electric cooling fan inoperative • Air conditioning condenser airflow obstructed	• Test the operation of the electric cooling fan • Check the air conditioning condenser for external obstructions

Pinpoint Tests

PINPOINT TEST A : PRELIMINARY TESTS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: PRELIMINARY TEST 1	
NOTES: This test is performed with the engine **not** running.	
Normal pressure for a correctly charged and switched off system is approximately 4.5 bar on both gauges (system equalised).	
	1 Close the valves on the air conditioning station
	2 Connect the air conditioning station to the vehicle charging ports
	3 Check the pressure values
	Is a pressure registered on both gauges? **Yes** GO to Pinpoint Test B. **No** GO to Pinpoint Test D.

PINPOINT TEST B : FUNCTIONALITY TESTS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
B1: FUNCTIONALITY TEST 1	
NOTES: Normal pressures for a correctly charged and working system are 1.0 bar to 2.0 bar (low) and 11.0 bar to 15.0 bar (high).	
Normal temperature (measured at the center air vent) for a correctly charged and working system is -7°C to -2°C when ambient temperature is 20°C.	
	1 Close the valves on the air conditioning station
	2 Connect the air conditioning station to the vehicle charging ports
	3 Open all doors and the tailgate
	4 Start the engine
	5 Set the temperature to the lowest setting (all zones)
	6 Set the fan speed to maximum
	7 Set the recirculate switch to off
	8 Insert a temperature probe into the centre air vent
	9 Raise engine speed to 1500rpm and maintain this speed for 5 minutes
	10 Check the temperature value
	11 Check the pressure values
	Are the pressure readings stable and in the green 'normal' region of the gauge? **Yes** Air conditioning system operating normally **No** Air conditioning system fault present. GO to Pinpoint Test C.

PINPOINT TEST C : GAUGE TESTS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
C1: GAUGE TEST 1	

NOTE: This test is performed with the engine running and the air conditioning set to on.

	1 Check the pressure values
	Did the gauges register a change in pressure when the air conditioning was switched on? **Yes** GO to C2. **No** Using the manufacturer approved diagnostic system, check the Automatic Temperature Control Module (ATCM) for related DTCs and refer to the relevant DTC index

C2: GAUGE TEST 2

NOTE: This test is performed with the engine running and the air conditioning set to on.

	1 Check the pressure values
	Are the pressure gauge readings fluctuating? **Yes** Moisture present in the air conditioning system. Recover the refrigerant. Install a new receiver drier. Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B. **No** GO to C3.

C3: GAUGE TEST 3

NOTES:

This test is performed with the engine running and the air conditioning set to on.

Normal pressures for a correctly charged and working system are 1.0 bar to 2.0 bar (low) and 11.0 bar to 15.0 bar (high).

	1 Check the pressure values
	Are the pressure gauge readings too low? **Yes** GO to C4. **No** GO to C6.

C4: GAUGE TEST 4

NOTE: This test is performed with the engine **not** running.

	1 Stop the engine
	2 Using the manufacturer approved refrigerant leak detector, check for a refrigerant leak
	Was a refrigerant leak detected? **Yes** Refer to the relevant section of the workshop manual and recover the refrigerant. Repair as necessary. Evacuate and recharge the air conditioning system. GO to Pinpoint Test B. **No** GO to C5.

C5: GAUGE TEST 5

NOTE: This test is performed with the engine **not** running.

	1 Refer to the relevant section of the workshop manual and recover the refrigerant
	Was the weight of the recovered refrigerant less than specified for the air conditioning system? **Yes** Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B. **No** Install a new receiver drier. Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B.

C6: GAUGE TEST 6

NOTES:

This test is performed with the engine running and the air conditioning set to on.

Normal pressures for a correctly charged and working system are 1.0 bar to 2.0 bar (low) and 11.0 bar to 15.0 bar (high).

	1 Check the pressure values

	Are the pressure gauge readings too high? **Yes** GO to C7. **No** Test inconclusive. GO to Pinpoint Test B.
C7: GAUGE TEST 7	
NOTE: This test is performed with the engine **not** running.	
	1 Stop the engine
	2 Refer to the relevant section of the workshop manual and recover the refrigerant
	Was the weight of the recovered refrigerant more than specified for the air conditioning system? **Yes** Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B. **No** Install a new thermal expansion valve. Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B.

PINPOINT TEST D : NITROGEN LEAK TESTS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
D1: NITROGEN LEAK TEST	
CAUTION: When charging the system with nitrogen, the pressure should be regulated to 7.0 bar.	
NOTE: This test is performed with the engine **not** running.	
	1 Charge the air conditioning system with nitrogen
	2 Isolate the nitrogen supply
	3 Monitor the pressure gauge and check for leaks
	Has the source of the leak been identified? **Yes** Rectify the leak as necessary. Install a new receiver drier. Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B. **No** Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Automatic Temperature Control Module (ATC) (100-00, Description and Operation).

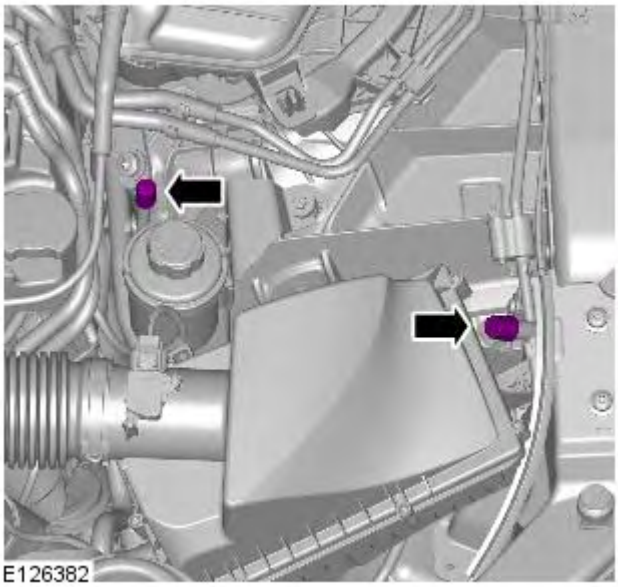
Published: 20-May-2013

Climate Control System - General Information - Air Conditioning (A/C) System Recovery, Evacuation and Charging

General Procedures

1. WARNING: Servicing must be carried out by personnel familiar with both vehicle system and the charging and testing equipment. All operations must be carried out in a well ventilated area away from open flame and heat sources.

   Refrigerant recovery.



2. Remove the dust covers from the high and low pressure connections.

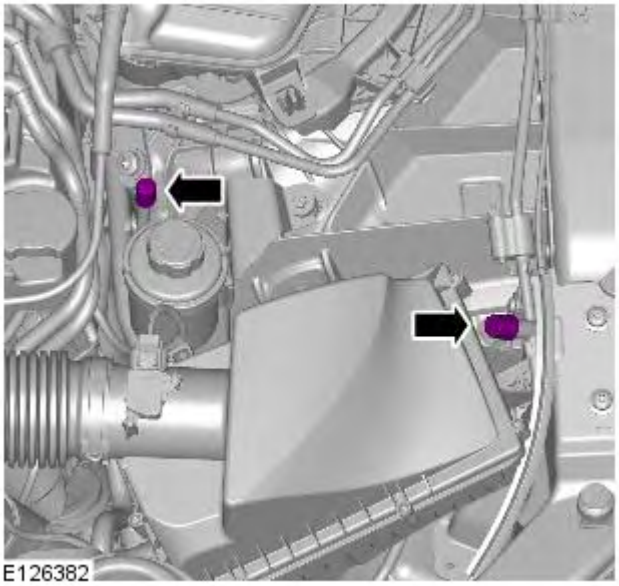
3. Connect the high and low pressure lines to the appropriate connections.

4. WARNING: Refrigerant must always be recycled before re-use to ensure that the purity of the refrigerant is high enough for safe use in the air conditioning system. Recycling should always be carried out with equipment which is design certified by Underwriter Laboratory Inc. for compliance with SAE J1991. Other equipment may not recycle refrigerant to the required level of purity. R143a Refrigerant Recover Recycling Recharging station must not be used with any other type of refrigerant. Refrigerant R134a from domestic and commercial sources must not be used in motor vehicles air conditioning systems.

   Following the manufacturer's instructions, recover the refrigerant from the A/C system.

5. Measure and record the quantity of refrigerant oil recovered from the system.

6. Evacuation.



7. Remove the dust covers from the high and low pressure connections.

8. Connect the high and low pressure lines to the appropriate connections.

9. Following the manufacturer's instructions, evacuate the A/C system.

10. CAUTION: The system must be evacuated immediately before recharging commences. Delay between evacuation and recharging is not permitted.

    Recharging

11. Ensure the correct amount of oil is added to the A/C system before or during recharging.

12. Recharge the A/C system to the correct specification.
    For additional information, refer to: Specifications (412-00 Climate Control System - General Information, Specifications).

Published: 11-May-2011

Climate Control System - General Information - Air Conditioning (A/C) System Flushing

General Procedures

1. WARNINGS:

   Use extreme care and observe all safety precautions related to the use of refrigerants. Due to refrigerant hazards, always wear safety goggles and non-penetrable gloves when working on or flushing air conditioning (A/C) systems. Failure to follow this instruction may result in personal injury.

   When flushing the A/C system, refer to the manufacturers equipment instructions for additional information. Failure to do so may result in system damage or personal injury.

   The A/C refrigerant analyzer must be used before the recovery of any vehicle's A/C refrigerant. Failure to do so puts shop bulk refrigerant at risk of contamination. If the vehicle A/C refrigerant is contaminated, refer the customer to return to the repair facility that performed the last A/C repair. If the customer wishes to pay the additional cost, use the A/C recovery equipment that is designated for recovering contaminated A/C refrigerant. All contaminated A/C refrigerant must be disposed of as hazardous waste. For additional information, refer to the manufacturers equipment instructions. Failure to follow this instruction may result in personal injury.

   Prior to using the A/C flushing equipment for the first time, follow the operating instructions. Failure to follow this instruction may result in personal injury.

   CAUTION: Prior to flushing, remove and discard the desiccant sack. Depending on the equipment used, other A/C components may have to be removed prior to flushing. For additional information, refer to the manufacturers equipment instructions before flushing the A/C system.

   Recover the refrigerant.
   For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

2. Remove the desiccant sack.
   For additional information, refer to: Desiccant Bag (412-01 Climate Control, Removal and Installation).

3. Flush the system. For additional information, refer to the manufacturers equipment instructions.

4. Install new refrigerant lines if blocked with debris.

5. Install a new desiccant sack.
   For additional information, refer to: Desiccant Bag (412-01 Climate Control, Removal and Installation).

6. Add the required amount of oil to the A/C system depending on the repair procedure.
   For additional information, refer to: Specifications (412-00 Climate Control System - General Information, Specifications).

7. Evacuate and charge the A/C system.
   For additional information, refer to: Air Conditioning (A/C) System

Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

8. Carry out fluorescent dye leak detection test.
   For additional information, refer to: Fluorescent Dye Leak Detection (412-00 Climate Control System - General Information, General Procedures).

9. Check the A/C system for correct operation.

Published: 11-May-2011

Climate Control System - General Information - Contaminated Refrigerant Handling

General Procedures

1. If contaminated refrigerant is detected DO NOT recover the refrigerant into your R-134a OR R-12 recovery/recycling equipment. Take the follow actions:
    1. Repeat the test to verify contaminated refrigerant is present.
    2. Advise the customer of the contaminated A/C system and any additional cost to repair the system. The customer may wish to return to the repair facility performing the last A/C repair.
    3. Recover the contaminated refrigerant using suitable recovery only equipment designed for capturing and storing contaminated refrigerant. This equipment must only be used to recover contaminated refrigerant to prevent the spread to other vehicles. As an alternative, contact an A/C repair facility in your area with the proper equipment to perform the repair.
    4. On completion of the recovery of the contaminated refrigerant, it will be necessary to carry out the A/C system flushing procedure. For additional information, refer to Air Conditioning (AC) System Flushing in this section.

Published: 11-May-2011

Climate Control System - General Information - Electronic Leak Detection

General Procedures

1. WARNING: Good ventilation is necessary in the area where A/C leak testing is to be carried out. If the surrounding air is contaminated with refrigerant gas, the leak detector will indicate this gas all the time. Odors from other chemicals such as antifreeze, diesel fuel, disc brake cleaner, or other cleaning solvents can cause the same problem. A fan, even in a well ventilated area, is very helpful in removing small traces of contamination from the air that might affect the leak detector. Failure to follow this instruction may result in personal injury.

   Attach an R-134a manifold gauge set or use a UL-approved recovery/recycling device such as an R-134a A/C refrigerant center (which meets SAE Standard J 1991). For additional information, refer to the manufacturers equipment instructions.
   - Both gauges should indicate 413-551 kPa (60-80 psi) at 24°C (75°F) with the engine off.
   - If little or no pressure is indicated, carry out the air conditioning (A/C) system recovery, evacuation and charging procedure. For additional information, refer to Air Conditioning (AC) System Recovery, Evacuation and Charging in this section.

2. Use an R134-a Automatic calibration halogen leak detector to leak test the refrigerant system. For additional information, refer to the manufacturers equipment instructions.

3. If a leak is found, carry out the air conditioning (A/C) system recovery procedure.
   For additional information, refer to Air Conditioning (AC) System Recovery, Evacuation and Charging in this section.

Published: 11-May-2011

Climate Control System - General Information - Fluorescent Dye Leak Detection

General Procedures

1. WARNING: Eye protection glasses supplied with the ultraviolet (UV) lamp should be used to protect eyesight from harm.

   NOTE: The air conditioning (A/C) system has an R-134a leak trace dye wafer incorporated into the desiccant bag. The exact location of leaks can be pinpointed by the bright yellow/green glow of the tracer dye. Since more than one leak may exist, always inspect each component. If it is necessary to add dye (due to a severe leakage for example) use proprietary tracer dye injection equipment.

   Check for leaks using ultraviolet (UV) lamp.

2. Check all components, fittings and lines of the A/C system.

3. Carry out the repair. For additional information, refer to Section 412-03 Air Conditioning.

4. After the leak is repaired, remove any traces of leak trace dye with a general purpose oil solvent.

5. Check the A/C system for correct operation.

6. Verify the repair by operating the system for a short time and inspecting with the (UV) lamp.

Published: 11-May-2011

Climate Control System - General Information - Inspection and Assembly Requirements

General Procedures

1. Check for leaks using ultraviolet (UV) Lamp.
   For additional information, refer to Flourescent Dye Leak Detection in this section.

2. NOTES:

   Any time a hose or component connection leak is observed, the component and fitting must be separated, cleaned and a new O-ring fitted and lubricated with air conditioning compressor oil.
   For additional information, refer to Specifications in this section.

   When separating A/C joints, cap the open connections immediately. Do not leave open to atmosphere.

   O-ring seal surfaces must be free of dirt, lint, burrs and scratches. The O-ring and connector should be lubricated with air conditioning compressor oil.
   For additional information, refer to Specifications in this section.

Published: 11-May-2011

Climate Control System - General Information - Manifold Gauge Set Connection

General Procedures

1. WARNINGS:

   Use extreme care and observe all safety precautions related to the use of refrigerants. Failure to follow this instruction may result in personal injury.

   For additional information, refer to the manufacturers equipment instructions. Failure to follow this instruction may result in personal injury and system damage.

   Install the manifold gauge set. For additional information, refer to the manufacturers equipment instructions.

2. Carry out the repair.

3. Remove the manifold gauge set. For additional information, refer to the manufacturers equipment instructions.

4. Carry out flourescent dye leak detection test.
   For additional information, refer to Flourescent Dye Leak Detection in this section.

5. Check air conditioning (A/C) system for correct operation.

Published: 28-Dec-2012

Climate Control System - General Information - Refrigerant System Tests

General Procedures

1. WARNINGS:

Use extreme care and observe all safety precautions related to the use of refrigerants. Failure to follow this instruction may result in personal injury.

The A/C refrigerant analyzer must be used before the recovery of any vehicle's A/C refrigerant. Failure to do so puts shop bulk refrigerant at risk of contamination. If the vehicle A/C refrigerant is contaminated, refer the customer to return to the repair facility that carried out the last A/C repair. If the customer wishes to pay the additional cost, use the A/C recovery equipment that is designated for recovering contaminated A/C refrigerant. All contaminated A/C refrigerant must be disposed of as hazardous waste. For all equipment, follow the equipment manufacturers procedures and instructions. Failure to follow this instruction may result in personal injury.

NOTE: Jaguar Land Rover Limited supports the efficient usage, recovery and recycling of the refrigerant used in passenger car air conditioners. Jaguar Land Rover Limited recommends the use of UL-approved recovery/recycling device such as R-134a A/C refrigerant center (which meets SAE Standard J 1991) during any A/C system repair and recharge procedure which requires that the system be evacuated.

Use R-134a A/C Refrigerant Centre to evacuate and recover the A/C system.

- Follow the equipment manufactures procedures and instructions for use of equipment.

Published: 15-Nov-2013

Climate Control System - General Information - Air Conditioning (A/C) Compressor Commissioning

General Procedures

Activation

CAUTION: Failure to follow this instruction may result in damage to the component.

1. Set the ignition to the on position, make sure the air conditioning (A/C) is in the off position.
2. Start the engine and allow to run for a minimum of 5 minutes.
3. Set the heater controls to 22°C, with the fan speed set to 75%.
4. Switch on the A/C system.
5. Open all air vents in the dashboard.
6. Run the A/C system for a minimum of 5 minutes, while the engine is still at idle speed.
7. Once this is achieved the compressor is stabilized, with the oil being distributed evenly throughout the system.

Published: 11-May-2011

Climate Control -

Description	Nm	lb-ft	lb-in
In-vehicle temperature sensor bolts	2.5	-	22
Blower motor control module bolts	1.5	-	13
Climate control assembly to cross car beam bolts	9	-	80
Climate control module bolts	1.5	-	13
Defrost vent/register blend door actuator bolts	1.5	-	13
Footwell vent/duct blend door actuator bolts	1.5	-	13
Evaporator housing bolts	1.5	-	13
Evaporator core pipes mounting bracket bolts	1.5	-	13
Thermostatic expansion valve to evaporator core bolts	3.5	-	31
Evaporator core pipes to thermostatic expansion valve bolt	5	-	44
Desiccant bag plug	12	9	-

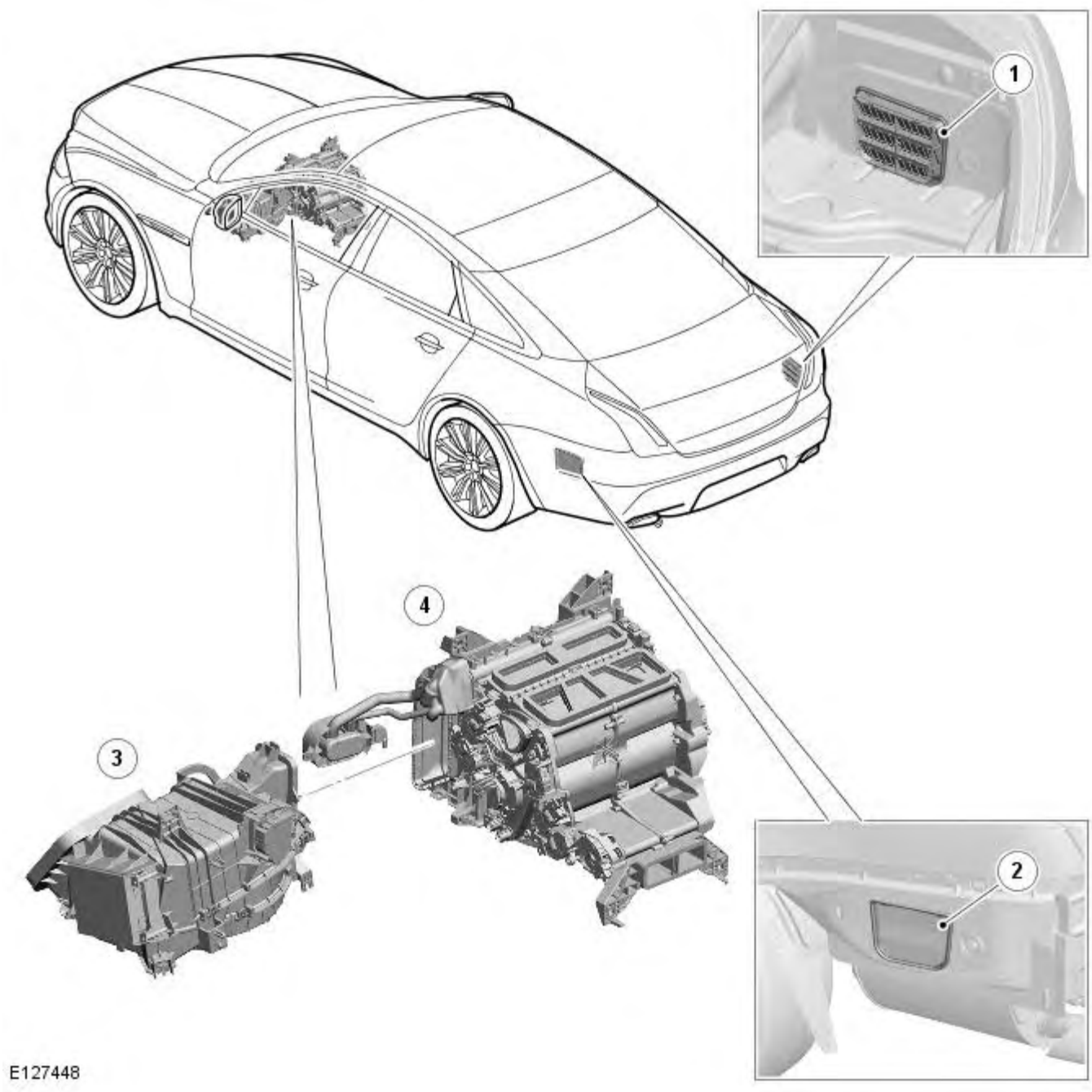
Published: 11-May-2011

Climate Control - Heating and Ventilation - Component Location

Description and Operation

NOTE: RHD (right-hand drive) installation shown, LHD (left-hand drive) installation similar.

COMPONENT LOCATION



Item	Description
1	RH (right-hand) ventilation outlet
2	LH (left-hand) ventilation outlet
3	Air inlet duct
4	Heater assembly

Published: 11-May-2011

Climate Control - Heating and Ventilation - Overview

Description and Operation

OVERVIEW

The heating and ventilation system controls the temperature and flow of air supplied to the passenger compartment. The system is either a dual zone or four zone system, depending on vehicle specification.

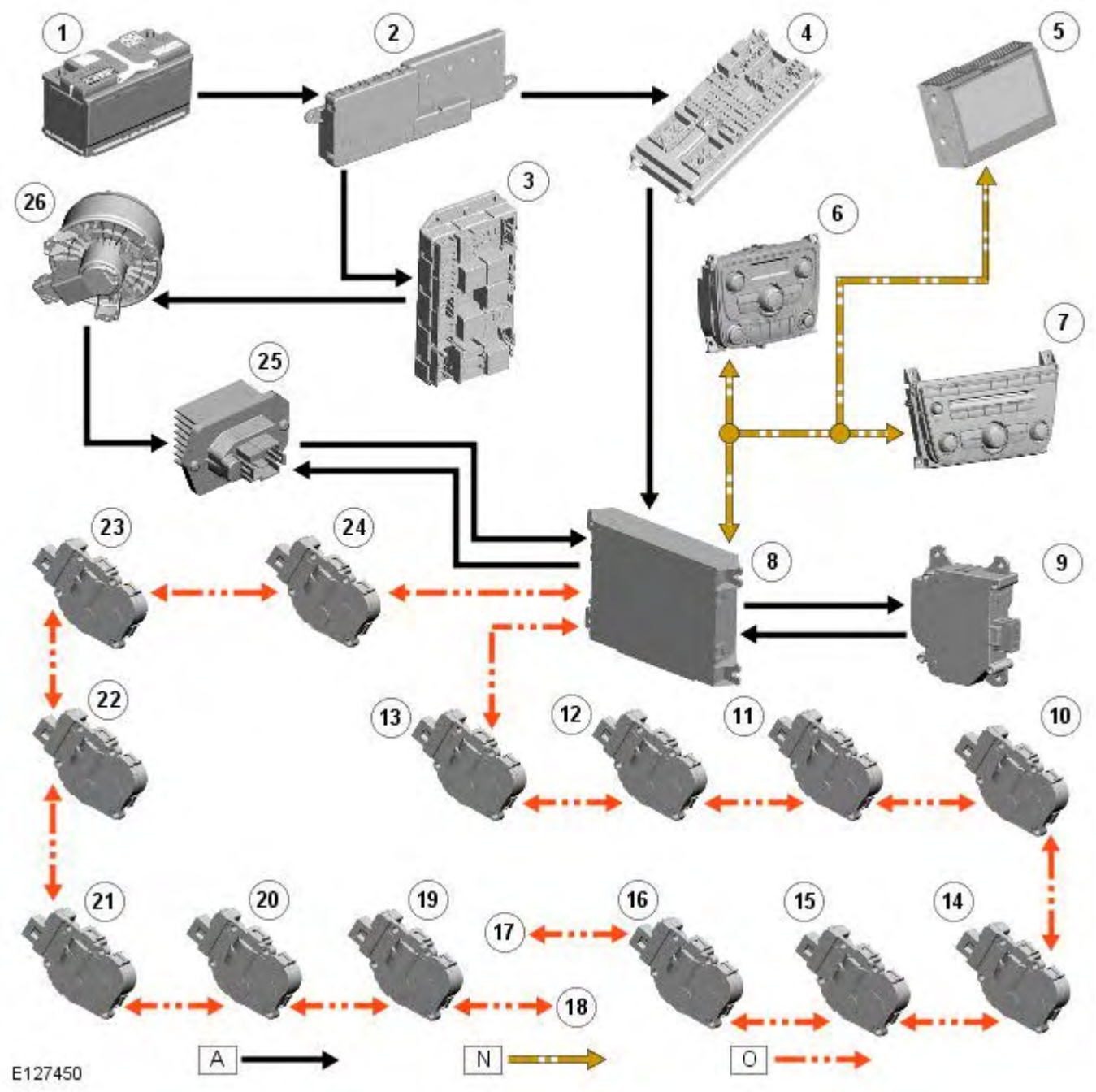
Published: 11-May-2011

Climate Control - Heating and Ventilation - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: A = Hardwired; N = Medium speed CAN (controller area network) bus; O = LIN (local interconnect network) bus.



Item	Description
1	Battery
2	BJB (battery junction box)
3	RJB (rear junction box)
4	CJB (central junction box)
5	TSD (touch screen display)
6	Rear climate control panel

7	Integrated control panel
8	ATC (automatic temperature control) module
9	Fresh air / recirculation servo
10	RH (right-hand) front face stepper motor
11	RH rear temperature blend stepper motor
12	RH front foot stepper motor
13	RH front temperature blend stepper motor
14	RH rear face stepper motor
15	RH rear foot stepper motor
16	Defrost stepper motor
17	To seat heating
18	To electric booster heater (where fitted) and seat heating
19	LH (left-hand) rear foot stepper motor
20	LH rear face stepper motor
21	LH front face stepper motor
22	LH rear temperature blend stepper motor
23	LH front foot stepper motor
24	LH front temperature blend stepper motor
25	Blower control module
26	Blower

System Operation

PRINCIPLES OF OPERATION

Operation of the heating and ventilation system is controlled by the ATC module.
Refer to: Control Components (412-01 Climate Control, Description and Operation).

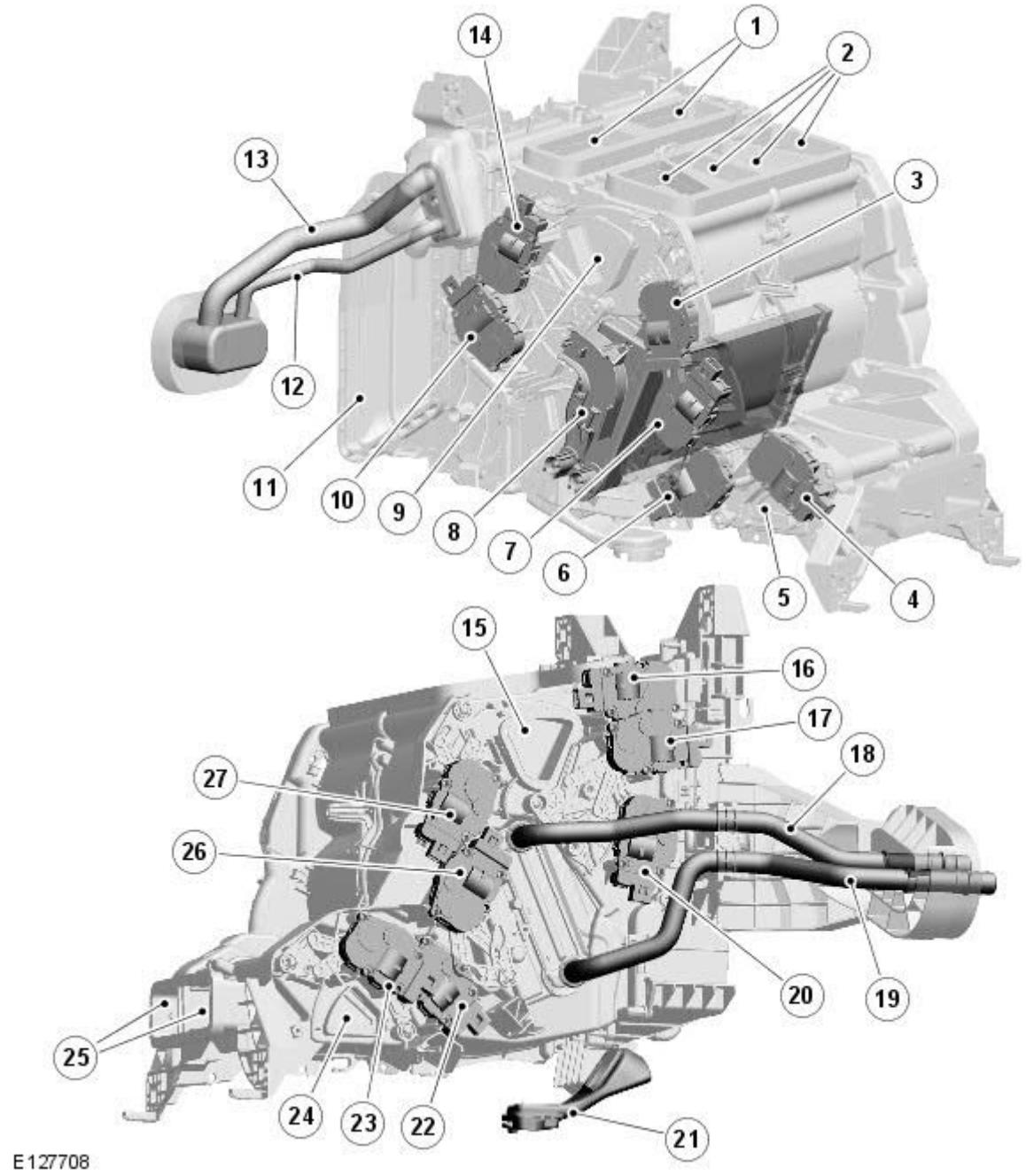
The system can be operated in automatic or manual mode, with temperature settings selected using the switches on the integrated control panel and, on four zone systems, the rear climate control panel.

When the engine is running, coolant is constantly circulated through the heater core by the engine coolant pump.

The blower is supplied with power from the blower relay on the RJB and connected to ground via the blower control module. The blower control module regulates the voltage across the blower motor to control blower speed. The voltage set by the blower control module is controlled by a PWM (pulse width modulation) signal from the ATC module. The ATC module uses a feedback signal from the blower control module to monitor blower speed.

Component Description

HEATER ASSEMBLY



Item	Description
1	Defrost outlets
2	Front face outlets
3	LH front face stepper motor
4	LH rear face stepper motor
5	LH rear foot outlet
6	LH rear foot stepper motor
7	LH rear temperature blend stepper motor
8	Electric booster heater
9	LH front foot outlet
10	LH front temperature blend stepper motor
11	Air inlet
12	Evaporator high pressure line
13	Evaporator low pressure line
14	LH front foot stepper motor

15	RH front foot outlet
16	Defrost stepper motor
17	RH front foot stepper motor
18	Heater core return pipe
19	Heater core feed pipe
20	RH front temperature blend stepper motor
21	Evaporator drain pan
22	RH rear foot stepper motor
23	RH rear face stepper motor
24	LH rear foot outlet
25	Rear face outlets
26	RH rear temperature blend stepper motor
27	RH front face stepper motor

The heater assembly controls the temperature and flow of air supplied to the air distribution ducts. The heater assembly is mounted on the vehicle centerline, between the instrument panel and the engine bulkhead. The heater assemblies on two and four zones systems are the same.

The heater assembly consists of a casing that contains an A/C (air conditioning) evaporator, a heater core, distribution control doors and temperature control doors. On 3.0L diesel vehicles, the heater assembly also contains a PTC (positive temperature coefficient) electric booster heater.

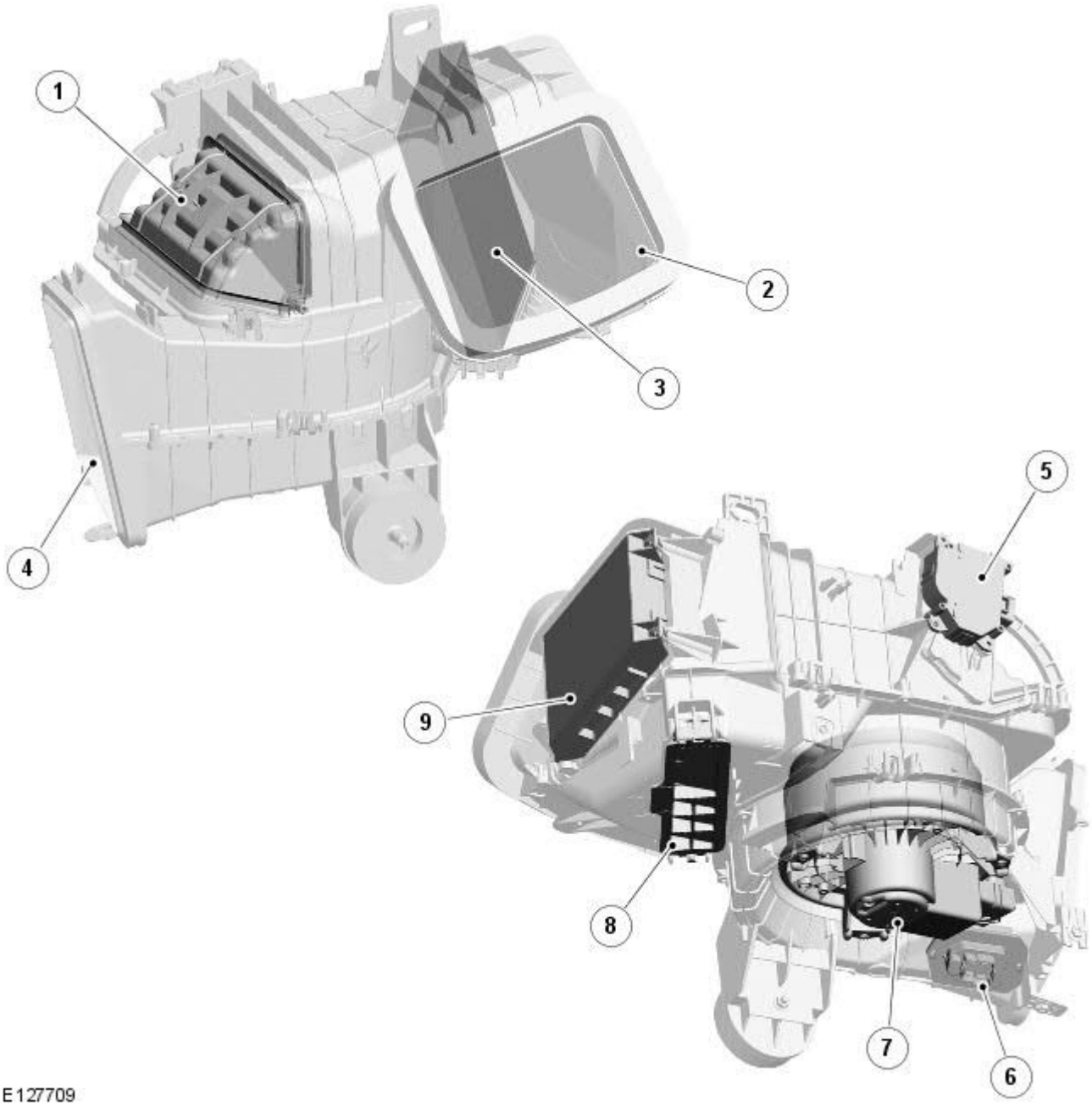
Mounted on the heater casing are 13 stepper motors. Each of the stepper motors is connected to either a distribution control door or a temperature control door.

NOTE: The stepper motors are particularly susceptible to low voltage and a range of stepper motor DTC (diagnostic trouble code)'s are likely due to low voltage at engine crank. Only take note of these if it is a permanent fault that recurs persistently.

The evaporator is part of the A/C system.
Refer to: Air Conditioning (412-01 Climate Control, Description and Operation).

The heater core provides the heat source to warm the air supplied to the passenger compartment. The heater core is an aluminum two pass, fin and tube heat exchanger, and is installed across the width of the heater housing. Two aluminum tubes attached to the heater core extend through the engine bulkhead and connect to the engine cooling system.

AIR INLET DUCT



Item	Description
1	Air inlet door (in fresh air position)
2	Air inlet
3	Pollen filter
4	Air outlet
5	Fresh air/recirculation servo motor
6	Blower control module
7	Blower
8	Pollen filter cover
9	ATC module

The air inlet duct connects the fresh air inlet in the engine bulkhead to the heater assembly. The air inlet duct is installed behind the instrument panel on the passenger side.

The air inlet duct consists of a casing that contains a pollen filter, an air inlet door, a blower and a blower control module. A recirculation air inlet is incorporated into the casing. A servo motor mounted on the casing is connected to the air inlet door, to allow selection between fresh and recirculated air.

The pollen filter is installed in the fresh air inlet of the air inlet duct. A cover on the underside of the air inlet duct allows access for replacement of the pollen filter.

The blower regulates the volume of air flowing through the air inlet duct to the heater assembly. The blower consists of an open hub, centrifugal fan and an electric motor.

The blower control module regulates the power supply to the blower motor. The blower control module is installed in the air inlet duct downstream of the blower, where any heat generated during operation is dissipated by the air flow.

VENTILATION OUTLETS

E127710

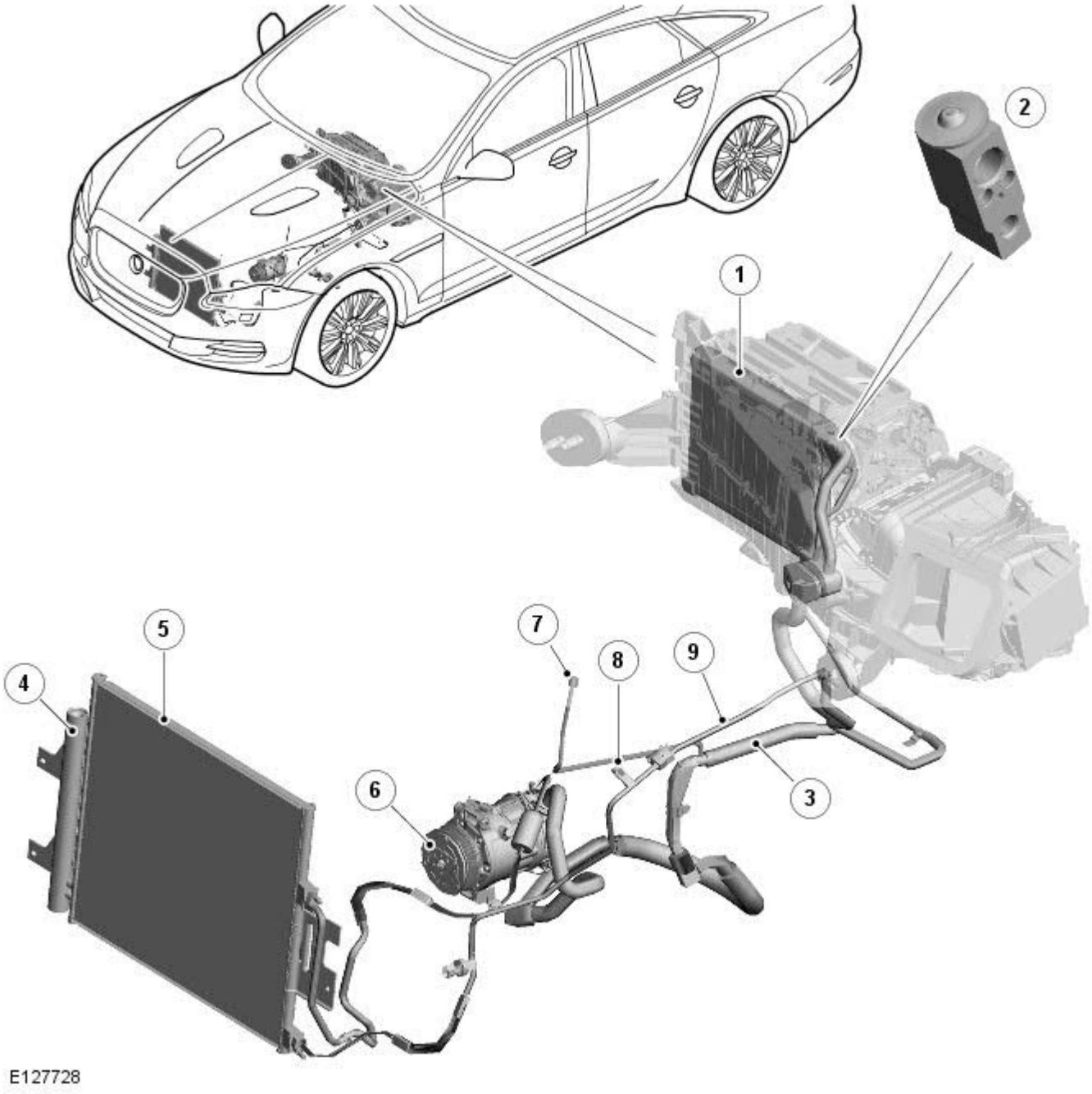
The ventilation outlets allow the free flow of air through the passenger compartment. The outlets are installed in the LH and RH rear quarter panels, behind the rear bumper. Each ventilation outlet consists of a grille covered by a soft rubber flaps, and is effectively a non-return valve. The flaps open and close automatically depending on the pressure differential between the air inside and outside the vehicle.

Published: 25-Jun-2013

Climate Control - Air Conditioning - Component Location

Description and Operation

COMPONENT LOCATION RHD (right-hand drive) 3.0L diesel installation shown, other installations similar.



Item	Description
1	Evaporator
2	Thermostatic expansion valve
3	Low pressure line
4	Receiver drier
5	Condenser
6	A/C (air conditioning) compressor
7	Low pressure servicing connection
8	High pressure servicing connection
9	High pressure line

Published: 25-Jun-2013

Climate Control - Air Conditioning - Overview

Description and Operation

OVERVIEW

A/C (air conditioning) system transfers heat from the passenger compartment to the outside atmosphere to provide the heater assembly with dehumidified cold air. The A/C system is a sealed, closed loop system filled with a charge weight of refrigerant as the heat transfer medium. Depending on market, the refrigerant is either R1234yf or R134a. Oil is added to the refrigerant to lubricate the internal components of the A/C compressor. The system consists of:

- An A/C compressor
- A condenser
- A receiver drier
- A thermostatic expansion valve
- An evaporator
- Low and high pressure refrigerant lines.

Published: 25-Jun-2013

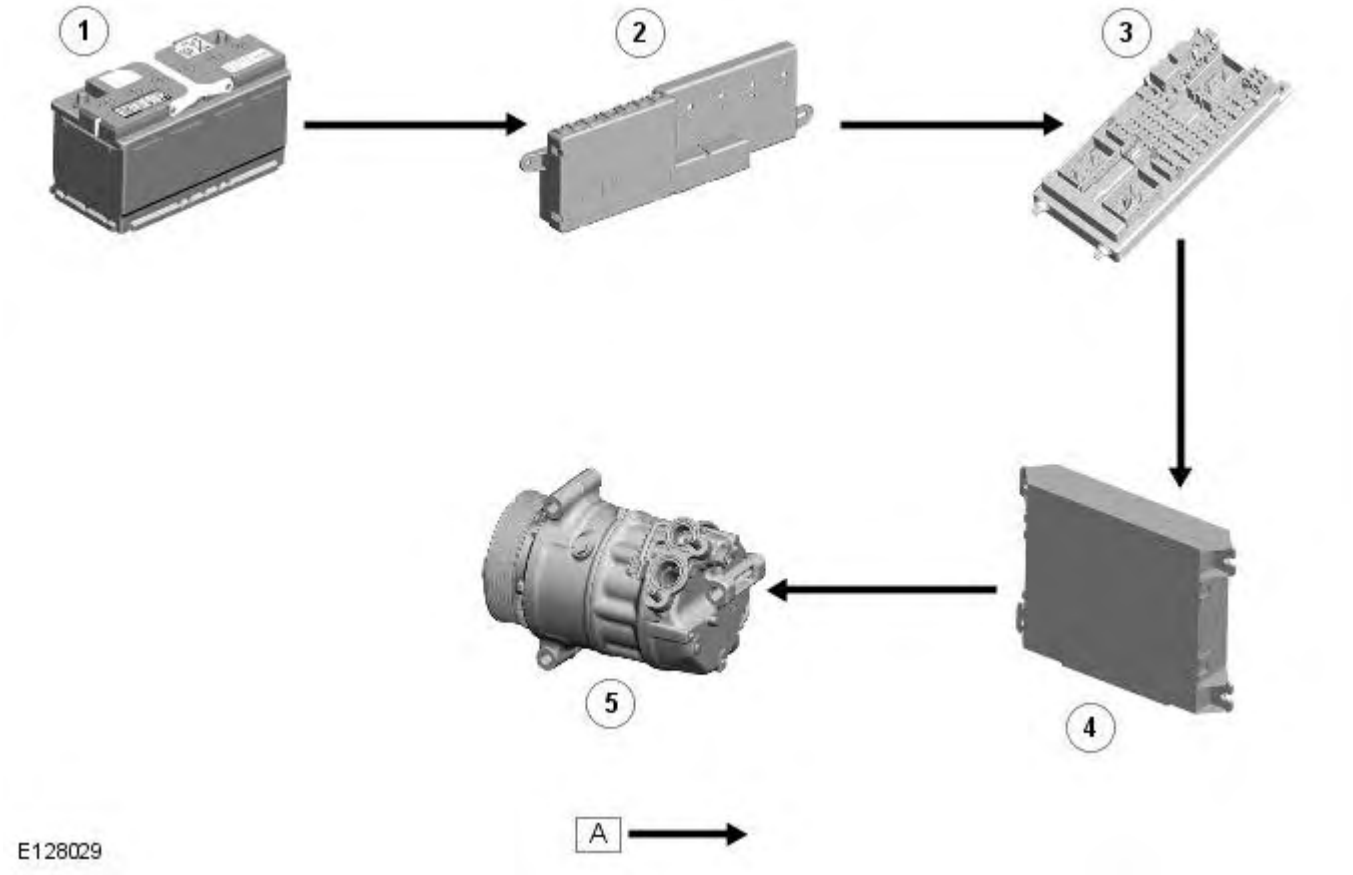
Climate Control - Air Conditioning - System Operation and Component Description

Description and Operation

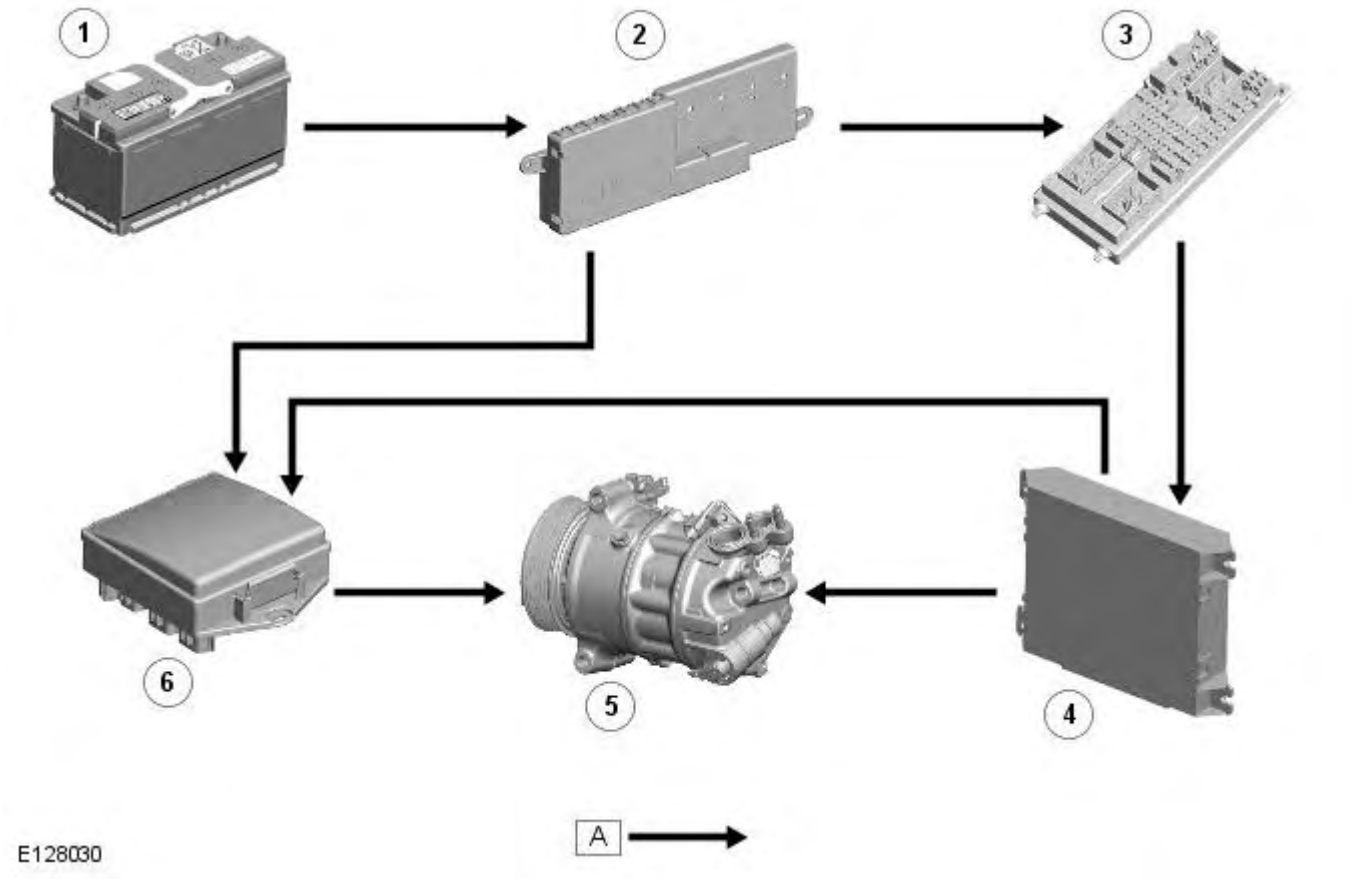
Control Diagram

NOTE: A = Hardwired.

PETROL VEHICLES (up to 2013 MY)



Item	Description
1	Battery
2	BJB (battery junction box) (50 A midifuse)
3	CJB (central junction box)
4	ATC (automatic temperature control) module
5	A/C (air conditioning) compressor



Item	Description
1	Battery
2	BJB (50 A midifuse to CJB; 250 A megafuse to EJB (engine junction box))
3	CJB
4	ATC module
5	A/C compressor
6	EJB (ignition relay)

System Operation

PRINCIPLES OF OPERATION

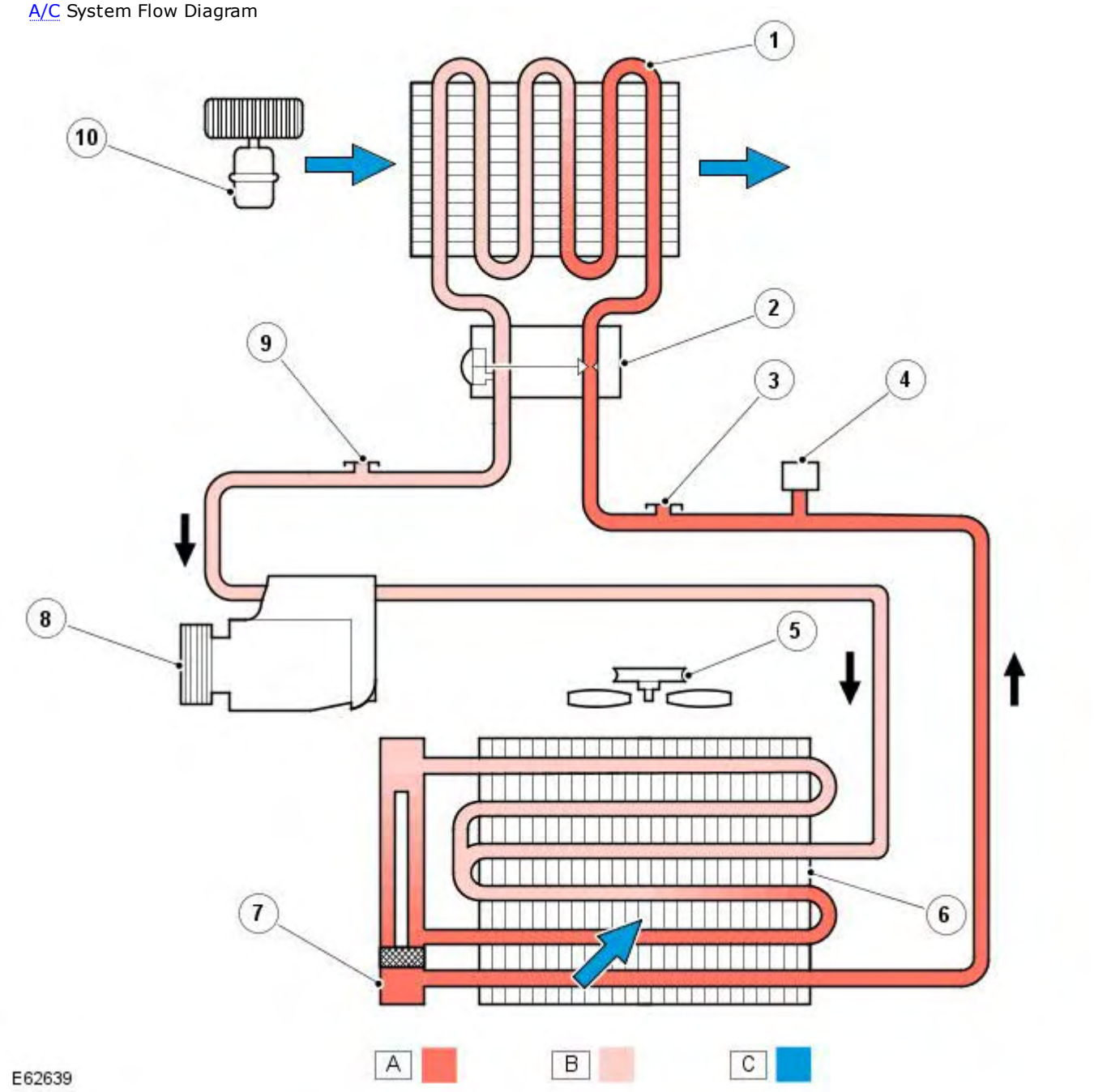
To accomplish the transfer of heat, refrigerant is circulated around a sealed system, where it passes through two pressure/temperature regimes. In each of the regimes the refrigerant changes state, during which process maximum heat absorption or dissipation occurs.

The low pressure/temperature regime is from the thermostatic expansion valve, through the evaporator to the compressor. The refrigerant decreases in pressure and temperature at the thermostatic expansion valve, then changes state from a liquid to a vapor in the evaporator to absorb heat.

The high pressure/temperature regime is from the compressor, through the condenser and receiver drier assembly to the thermostatic expansion valve. The refrigerant increases in pressure and temperature as it passes through the compressor, then releases heat and changes state from a vapor to a liquid in the condenser.

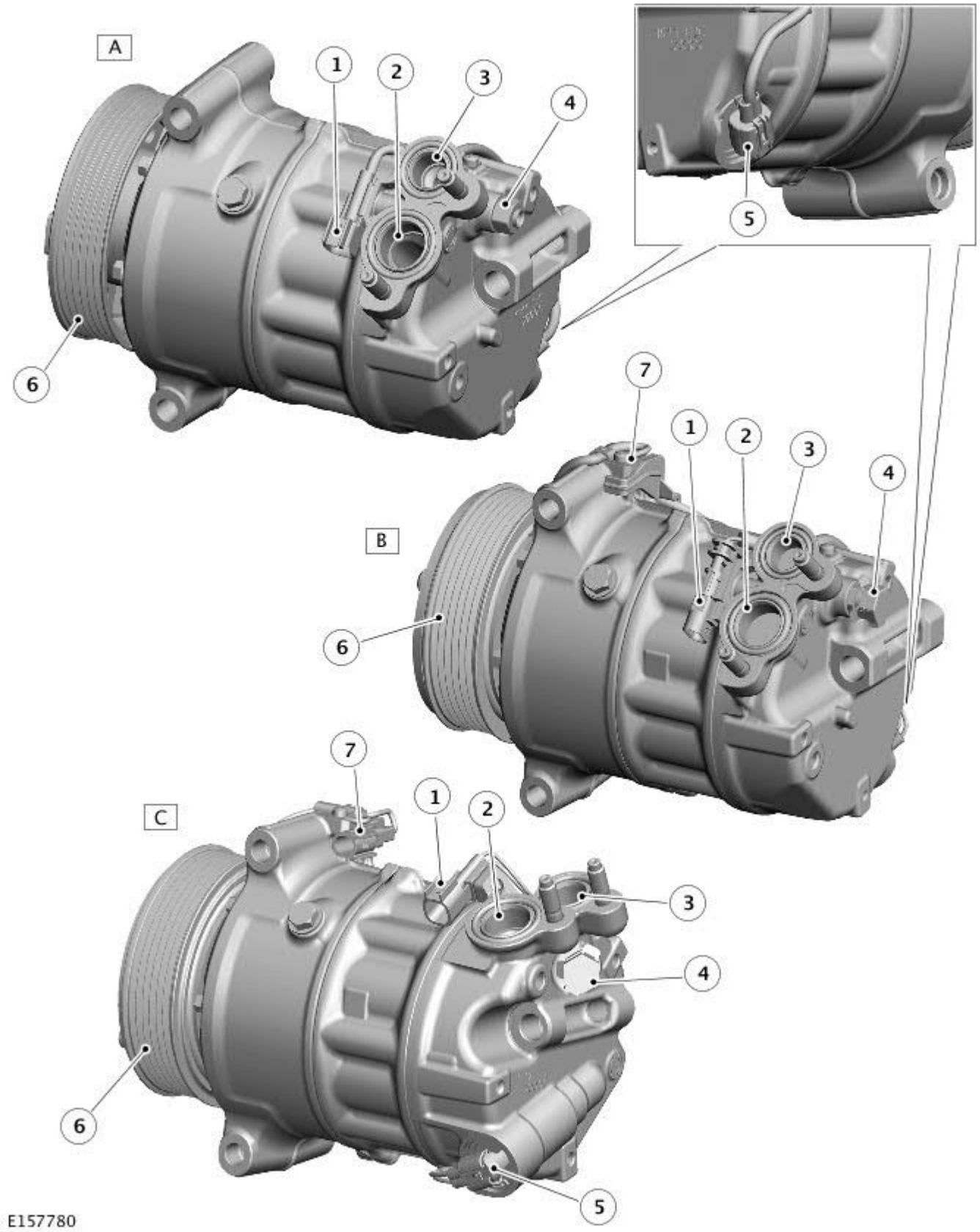
Operation of the A/C system is controlled by the ATC module.
Refer to: Control Components (412-01 Climate Control, Description and Operation).

A/C System Flow Diagram



Item	Description
A	Refrigerant liquid
B	Refrigerant vapor
C	Air flow
1	Evaporator
2	Thermostatic expansion valve
3	High pressure servicing connection
4	Refrigerant pressure sensor
5	Engine cooling fan
6	Condenser
7	Receiver drier
8	A/C compressor
9	Low pressure servicing connection
10	Blower

COMPRESSOR



A

Item	Description
A	Compressor - petrol vehicles (up to 2013 MY)
B	Compressor - petrol vehicles (2103 MY onwards)
C	Compressor - 3.0L diesel vehicles
1	Solenoid valve electrical connector
2	Inlet port
3	Outlet port
4	Pressure relief valve
5	Solenoid valve
6	Pulley
7	Clutch electrical connector

The A/C compressor circulates refrigerant around the system by compressing low pressure, low temperature vapor from the evaporator and discharging the resultant high pressure, high temperature vapor to the condenser.

The A/C compressor is a variable displacement unit driven by the engine accessory drive belt.

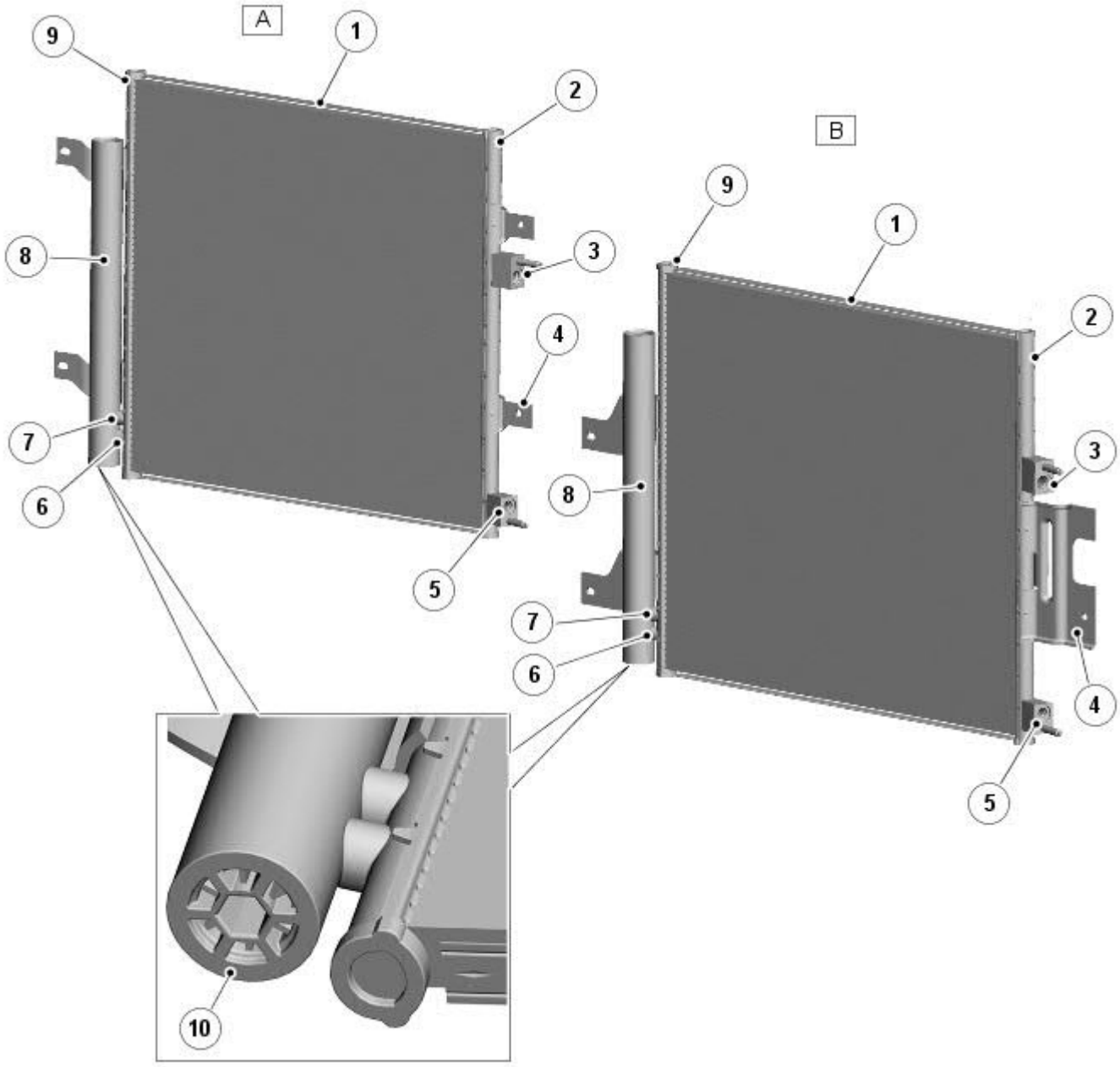
- Up to 2013 MY: petrol vehicles, the A/C compressor is driven directly from the pulley.
- 2013 MY Onwards: petrol vehicles, the A/C compressor is driven via an electro-magnetic clutch.
- On 3.0L diesel vehicles theA/C compressor is driven via an electro-magnetic clutch.

While the ignition is on, the clutch is permanently engaged by a power feed from the ignition relay in the EJB

To protect the system from excessive pressure, a pressure relief valve is installed in the outlet side of the A/C compressor. The pressure relief valve vents excess pressure into the engine compartment.

The solenoid valve enables the flow of refrigerant through the A/C compressor to be adjusted to match the cooling load. Operation of the solenoid valve is controlled by the ATC module using a hardwired drive current of differing values. By controlling the flow of refrigerant through the compressor, the solenoid valve controls the A/C system pressure and the evaporator operating temperature.

CONDENSER



E127738

Item	Description
A	Condenser - petrol vehicles
B	Condenser - 3.0L diesel vehicles
1	Condenser core
2	LH (left-hand) end tank
3	High pressure compressor discharge line connector block
4	Mounting bracket
5	High pressure liquid outlet line connector block
6	Receiver drier outlet pipe
7	Receiver drier inlet pipe
8	Receiver drier
9	RH (right-hand) end tank
10	Desicant access plug

The condenser transfers heat from the refrigerant to the surrounding air to convert the high pressure vapor from the compressor into a liquid. The condenser is installed immediately in front of the radiator. Two brackets on each end tank attach the condenser to the end tanks of the radiator.

The condenser is classified as a sub-cooling condenser and consists of a fin and tube heat exchanger core installed between two end tanks. Divisions in the end tanks separate the heat exchanger into a four pass upper (condenser) section and a two pass lower (sub-cooler) section.

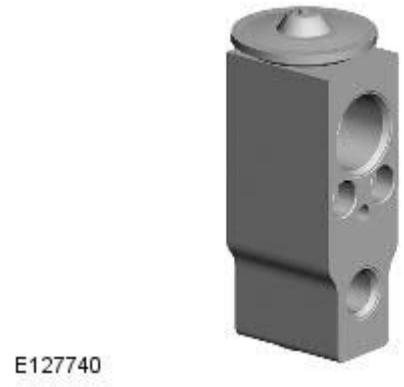
The LH end tank provides the connections to the high pressure line from the A/C compressor and the high pressure liquid line to the evaporator.

The RH end tank provides the connections to the receiver drier.

RECEIVER DRIER

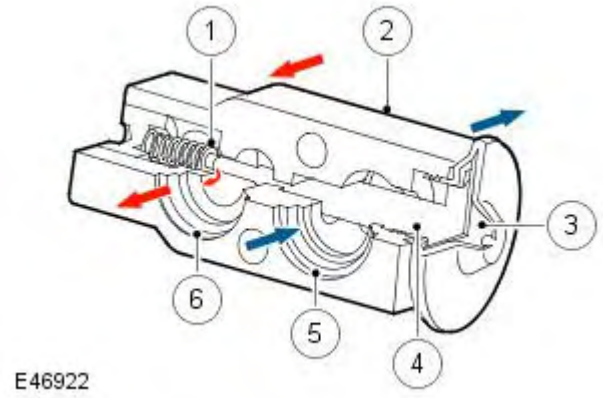
The receiver drier is connected to the RH end tank of the condenser. It removes solid impurities and moisture from the refrigerant, and provides a reservoir for liquid refrigerant to accommodate changes of heat load at the evaporator. The receiver drier is part of the condenser assembly and is not serviceable separately.

THERMOSTATIC EXPANSION VALVE



The thermostatic expansion valve meters the flow of refrigerant into the evaporator, to match the refrigerant flow with the heat load of the air passing through the evaporator.

The thermostatic expansion valve is a block type valve located behind the heater assembly, and attached to the inlet and outlet ports of the evaporator. The thermostatic expansion valve consists of an aluminum housing containing inlet and outlet passages. A ball and spring metering valve is installed in the inlet passage and a temperature sensor is installed in the outlet passage. The temperature sensor consists of a temperature sensitive tube connected to a diaphragm. The bottom end of the temperature sensitive tube acts on the ball of the metering valve. Pressure on top of the diaphragm is controlled by the evaporator outlet temperature conducted through the temperature sensitive tube. The bottom of the diaphragm senses evaporator outlet pressure.



Item	Description
1	Metering valve
2	Housing
3	Diaphragm
4	Temperature sensor
5	Outlet passage from evaporator
6	Inlet passage to evaporator

Liquid refrigerant flows through the metering valve into the evaporator. The restriction across the metering valve reduces the pressure and temperature of the refrigerant. The restriction also changes the liquid stream of refrigerant into a fine spray, to improve the evaporation process. As the refrigerant passes through the evaporator, it absorbs heat from the air flowing through the evaporator. The increase in temperature causes the refrigerant to vaporize and increase in pressure.

The temperature and pressure of the refrigerant leaving the evaporator acts on the diaphragm and temperature sensitive tube, which regulate the metering valve opening and so control the volume of refrigerant flowing through the evaporator. The warmer the air flowing through the evaporator, the more heat available to evaporate refrigerant and thus the greater volume of refrigerant allowed through the metering valve.

EVAPORATOR

The evaporator is installed in the heater assembly, between the blower and the heater matrix, to absorb heat from the exterior or recirculated air.

Most of the moisture in the air passing through the evaporator condenses into water, which drains out of the vehicle by passing through a drain tube to the underside of the vehicle.

REFRIGERANT LINES

The refrigerant lines consist of a combination of rigid pipes and flexible hoses that connect the thermostatic expansion valve on the evaporator to the A/C compressor and the condenser. To maintain similar flow velocities around the A/C system, the diameter of the refrigerant lines varies to suit the two pressure/temperature regimes. Larger diameter pipes are installed in the low pressure/temperature regime and smaller diameter pipes are installed in the high pressure/temperature regime.

Low and high pressure servicing connections are incorporated into the refrigerant lines for system servicing.

Petrol engine vehicles (NAS market from 14 MY)

An internal heat exchanger is installed which increases the efficiency of the evaporator and ensures any residual liquid in the low pressure line is evaporated before it reaches the compressor. Refer to the Component Location graphic titled: Petrol engine vehicles (NAS market from 14 MY).

NOTE: The internal heat exchanger is incorporated primarily because of the introduction of refrigerant R1234yf which replaces refrigerant R134a.

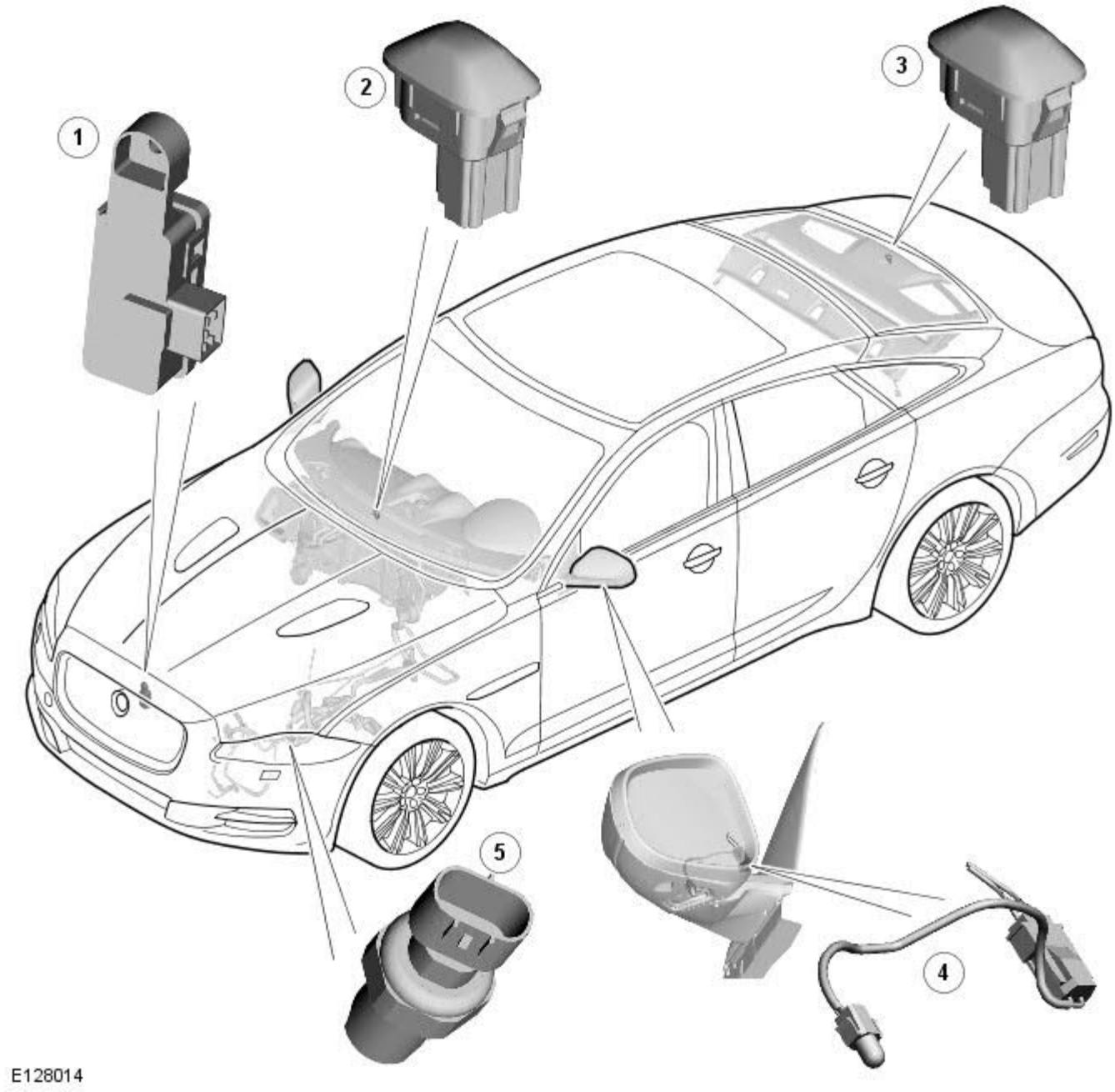
Published: 11-May-2011

Climate Control - Control Components - Component Location

Description and Operation

NOTE: LHD (left-hand drive) installation shown, RHD (right-hand drive) installation similar.

COMPONENT LOCATION - SHEET 1 OF 2



Item	Description
1	Pollution sensor (where fitted)
2	Front sunload sensor
3	Rear sunload sensor (where fitted)
4	Ambient air temperature sensor
5	Refrigerant pressure sensor

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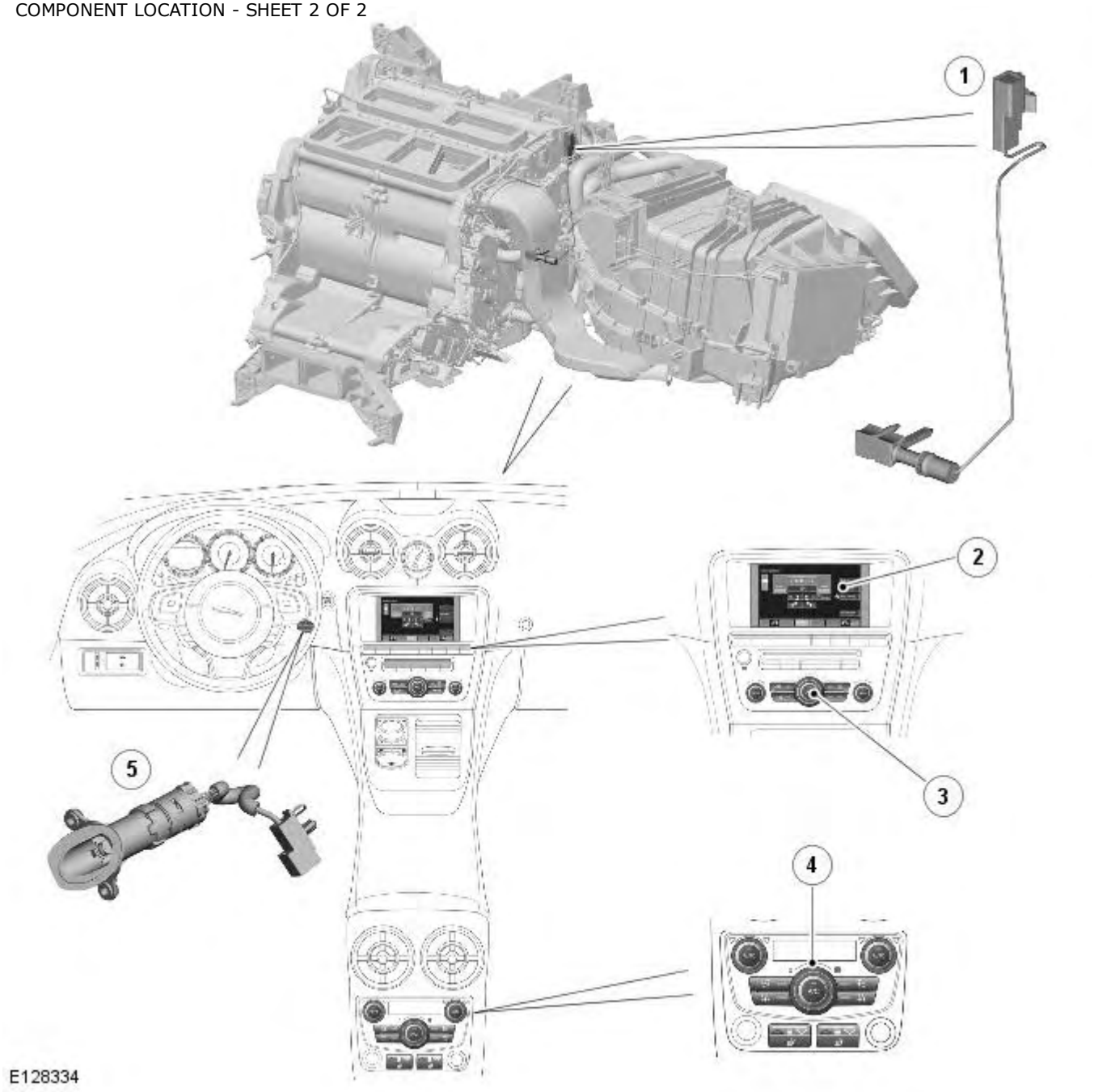
COMPONENT LOCATION - SHEET 2 OF 2



Item	Description
1	Evaporator temperature sensor
2	TSD (touch screen display)
3	ICP (integrated control panel)
4	Rear climate control panel
5	Humidity and temperature sensor

Published: 11-May-2011

Climate Control - Control Components - Overview

Description and Operation

OVERVIEW

The climate control system is controlled by the ATC (automatic temperature control) module. It controls the heating and ventilation system and the A/C (air conditioning) system to regulate the temperature, volume and distribution of air into the passenger compartment. The system is either a dual zone or four zone system, depending on vehicle specification, which is fully automatic and capable of supplying individual temperature levels to each zone of the passenger compartment, up to a maximum differential of approximately 3 ºC (5.4 ºF). Manual overrides for the system include inlet air source, blower speed and air distribution. These selections can be made on the TSD (touch screen display), the ICP (integrated control panel) and, on four zone systems, the rear climate control panel.

The two and four zone climate control systems contain the same hardware. Different software in their respective ATC modules produces the different functionality required by the two systems.

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Climate Control - Control Components - System Operation and Component Description

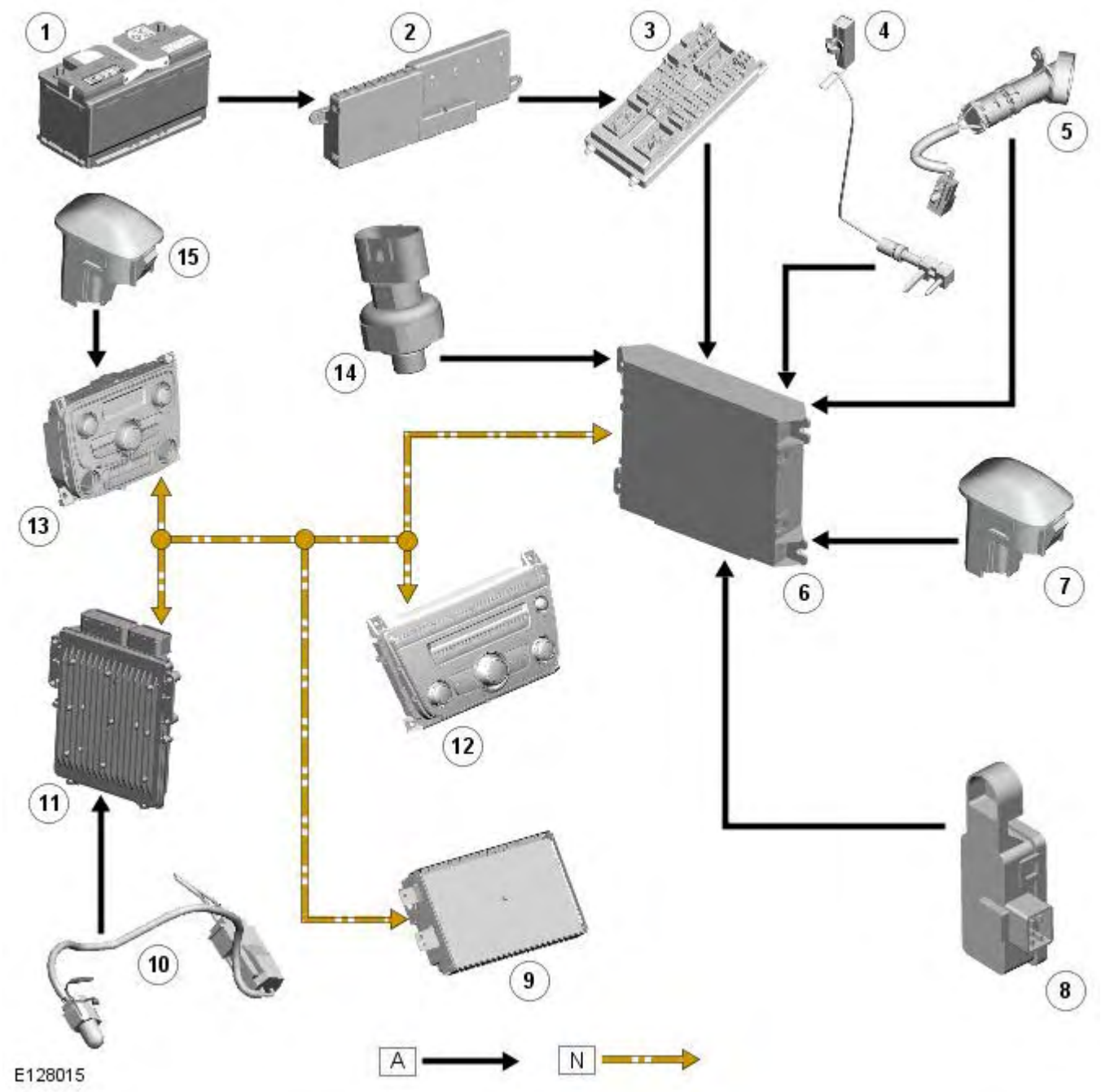
Description and Operation

Control Diagram

NOTES:

A = Hardwired; N = Medium speed CAN (controller area network) bus.

See Heating and Ventilation, and Air Conditioning for control system outputs.



Item	Description
1	Battery
2	BJB (battery junction box) (50 A midi fuse)

3	CJB (central junction box)
4	Evaporator temperature sensor
5	Humidity and temperature sensor
6	ATC (automatic temperature control) module
7	Front sunload sensor
8	Pollution sensor (where fitted)
9	TSD (touch screen display)
10	Ambient air temperature sensor
11	ECM (engine control module)
12	ICP (integrated control panel)
13	Rear climate control panel (where fitted)
14	Refrigerant pressure sensor
15	Rear sunload sensor (where fitted)

System Operation

PRINCIPLES OF OPERATION

AIR INLET CONTROL

The source of inlet air is automatically controlled by the ATC module, unless overridden by pressing the air recirculation switch on the ICP (integrated control panel) to give timed or latched recirculation. A brief press of the switch illuminates the switch indicator and activates timed recirculation. Pressing and holding the switch causes the switch indicator to flash and then illuminate constantly, indicating that the air inlet is in latched recirculation and the switch can be released. A second press of the switch cancels recirculation and the ATC module returns the recirculation door to the fresh air position. Timed recirculation is automatically cancelled after a set time, which varies with ambient air temperature.

During automatic control, the ATC module determines the required position of the recirculation door from its 'comfort' algorithm and, if fitted, the pollution sensor. If it detects pollution, the ATC module sets the air source to recirculation for 10 minutes, then to fresh air for 20 seconds to renew the air in the vehicle. The ATC module repeats this cycle until the pollution is no longer present.

The sensitivity of the pollution sensor can be adjusted on the TSD (touch screen display) using the Settings button on the FRONT CLIMATE menu. The pollution sensing function can also be switched off by adjusting sensitivity to the minimum setting. If there is a fault with the pollution sensor, the ATC module disables automatic operation of the recirculation door.

AIR TEMPERATURE CONTROL

The temperature blend doors adjust the proportion of cool air from the evaporator that passes through the heater core to produce the required output air temperature.

The temperature blend doors for each zone are operated independently to enable individual temperature settings for the different zones. The temperature blend doors are operated by stepper motors, which are controlled by the ATC module using LIN (local interconnect network) bus messages.

The ATC module calculates the temperature blend stepper motor positions required to achieve the selected temperature and compares it against the current position. If there is any difference, the ATC module signals the stepper motors to adopt the new position.

Air temperature is controlled automatically unless maximum heating (HI) or maximum cooling (LO) is selected. When maximum heating or cooling is selected, a 'comfort' algorithm in the ATC module adopts an appropriate strategy for air distribution, blower speed, and air source.

Temperature control in one zone can be compromised by another zone being set to a high level of heating or cooling. True maximum heating or cooling (displayed as HI or LO on the TSD) can only be selected for the driver's zone. If HI or LO is selected for the driver's zone, the temperature for the other zone(s) is automatically set to match the driver's zone.

If A/C (air conditioning) is selected off in the automatic mode, no cooling of the inlet air will take place. The minimum output air temperature from the system will be ambient air temperature plus any heat pick up in the air inlet path.

If the Sync climate button on the TSD is pressed, the ATC module synchronizes the temperature of the other zone(s) with the driver's zone.

BLOWER CONTROL

When the system is in the automatic mode, the ATC module determines the blower speed required from a comfort algorithm. When the system is in the manual mode, the ATC module operates the blower at the speed selected using the rotary control switch on the ICP. The ATC module also adjusts blower speed to compensate for the ram effect on inlet air produced by forward movement of the vehicle. As vehicle speed and ram effect increases, blower motor speed is reduced, and vice versa.

On vehicles fitted with the four zone system, the system cannot be turned on using the rotary blower control on the rear climate control panel. This is to encourage the use of the AUTO mode. Provided the rear climate control panel is unlocked,

pressing a rear AUTO button on the rear climate control panel will reactivate the system if previously off.

AIR DISTRIBUTION CONTROL

Air distribution doors direct the air to the individual vents and registers in the passenger compartment. The doors are operated by stepper motors, which are controlled by the ATC module using LIN bus messages.

When the A/C system is in automatic mode, the ATC module automatically controls air distribution into the passenger compartment in line with its 'comfort' algorithm. Automatic control is overridden if any of the buttons on the TSD, or switches on the ICP or rear climate control panel, are selected. Air distribution remains as selected until one of the AUTO switches is pressed or a different manual selection is made.

A/C COMPRESSOR CONTROL

When A/C is selected the ATC module maintains the evaporator at an operating temperature that varies with the passenger compartment cooling requirements. If the requirement for cooled air decreases, the ATC module raises the evaporator operating temperature by reducing the flow of refrigerant provided by the A/C compressor. The ATC module closely controls the rate of temperature increase to avoid introducing moisture into the passenger compartment.

If the requirement for cooled air increases, the ATC module lowers the evaporator operating temperature by increasing the flow of refrigerant provided by the A/C compressor.

When A/C is off, the compressor current signal supplied by the ATC module holds the A/C compressor solenoid valve in the minimum flow position, effectively switching off the A/C function.

The ATC module incorporates limits for the operating pressure of the refrigerant system. If the system approaches the high pressure limit, the compressor current signal is progressively reduced until the system pressure decreases. If the system falls below the low pressure limit, the compressor current signal is held at its lowest setting so that the A/C compressor is maintained at its minimum stroke. This avoids depletion of the lubricant from the A/C compressor.

A/C COMPRESSOR TORQUE

The ATC module transmits refrigerant pressure and A/C compressor current values to the ECM over the medium speed then high speed CAN bus, using the CJB as a gateway. The ECM uses these values to calculate the torque being used to drive the A/C compressor. The ECM compares the calculated value with its allowable value and, if necessary, forces the ATC module to inhibit the A/C compressor by transmitting the 'ACClutchInhibit' CAN message. This forces the ATC module to reduce the drive current to the A/C compressor solenoid valve, which reduces refrigerant flow. This in turn reduces the torque required to drive the A/C compressor.

By reducing the maximum A/C compressor torque, the ECM is able to reduce the load on the engine when it needs to maintain vehicle performance or cooling system integrity.

COOLING FAN CONTROL

The ATC module determines the amount of condenser cooling required from the refrigerant pressure sensor, since there is a direct relationship between the temperature and pressure of the refrigerant. The cooling requirement is broadcast to the ECM on the medium speed CAN bus. The ECM then controls the temperature of the condenser using the cooling fan.

PROGRAMMED DEFROST

The programmed defrost DEF switch is located on the ICP. When the switch is pressed, the ATC module instigates the programmed defrost function. When selected, the ATC module configures the system as follows:

- Automatic mode off.
- A/C on.
- Selected temperature unchanged.
- Air inlet set to fresh air.
- Air distribution set to windshield.
- Blower speed set to level 6.

The ATC module also sends a medium speed CAN message to the CJB to activate the windshield heater (where fitted) and rear window heater.

On vehicles fitted with the four zone system, the rear climate control panel shows a defrost symbol to indicate that the system is in defrost and no air flow will be available to the rear vents.

The programmed defrost function can be cancelled by one of the following:

- A second press of the DEF switch.
- Selecting any air distribution switch on the TSD.
- Pressing the driver side AUTO switch on the ICP.
- Switching the ignition OFF.

The blower speed can be adjusted without terminating the programmed defrost function. If the blower speed has been adjusted and then the DEF switch is pressed again, the system will go back to the DEFROST default settings. Another press of the DEF switch, or pressing the driver AUTO switch, will exit the DEFROST mode but leave the heated screen(s) on.

Component Description

ATC MODULE

E128058

The ATC module is mounted on the outboard end of the air inlet duct, behind the front passenger side of the instrument panel. The ATC module processes inputs from the system sensors, the TSD, the ICP and, on four zone systems, the rear climate control panel. In response to these inputs, the ATC module outputs control signals to the A/C system and the heating and ventilation system.

Two electrical connectors provide the interface between the ATC module and the vehicle wiring.

REFRIGERANT PRESSURE SENSOR

E128364

The refrigerant pressure sensor provides the ATC module with a pressure input from the high pressure side of the refrigerant system. The refrigerant pressure sensor is located in the refrigerant line between the condenser and the thermostatic expansion valve.

EVAPORATOR TEMPERATURE SENSOR

E97626

The evaporator temperature sensor is a NTC (negative temperature coefficient) thermistor that provides the ATC module with a temperature signal from the downstream side of the evaporator. The evaporator temperature sensor is mounted directly onto the evaporator matrix fins.

The ATC module uses the input from the evaporator temperature sensor to control the load of the A/C compressor and thus the operating temperature of the evaporator.

HUMIDITY AND TEMPERATURE SENSOR

E128059

The humidity and temperature sensor is behind a grill in the instrument panel, on the inboard side of the steering column. The sensor incorporates:

- A NTC thermistor to measure temperature.
- A capacitive sensor element to measure humidity.
- A motor driven fan to draw air through the sensor and over the sensing elements.

Humidity within the passenger compartment is controlled by raising and lowering the evaporator temperature. An increase in evaporator temperature increases the moisture content of the air entering the passenger compartment. Lowering the evaporator temperature reduces the moisture content of the air entering the passenger compartment.

AMBIENT AIR TEMPERATURE SENSOR

E116093

The ambient air temperature sensor is a NTC thermistor that provides theATC module with an input of external air temperature. The sensor is hard wired to the ECM, which transmits the temperature to the CJB on the high speed CAN bus. The CJB acts as a gateway and transmits the ambient air temperature on the medium speed CAN bus for use by other systems. The sensor is installed in the LH (left-hand) door mirror, and is accessed by removing the mirror glass, cap and actuator.

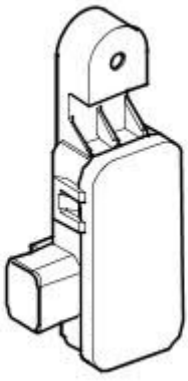
SUNLOAD SENSOR

E128016

All vehicles have a sunload sensor installed in the center of the defrost grill of the instrument panel. Vehicles with a four zone systems have a second, identical, sunload sensor installed in the center of the parcel shelf.

The sunload sensor consists of two photoelectric cells that provide the ATC module with inputs of light intensity; one as sensed coming from the left of the vehicle and one as sensed coming from the right. The inputs are a measure of the solar heating effect on the vehicle, and are used by the ATC module to adjust blower speed, temperature and distribution to improve comfort in the individual zones.

POLLUTION SENSOR (WHERE FITTED)



E43588

The pollution sensor is attached to the center of the upper front crossmember and provides the ATC module with separate signals of hydrocarbon levels and oxidized gas levels.

The pollution sensor allows the ATC module to monitor the ambient air for the level of hydrocarbons and oxidized gases such as nitrous oxides, sulphur oxides and carbon monoxide, which controls the air inlet source to reduce the amount of contaminants entering the passenger compartment.

Published: 11-May-2011

Climate Control - Ambient Air Temperature Sensor

Removal and Installation

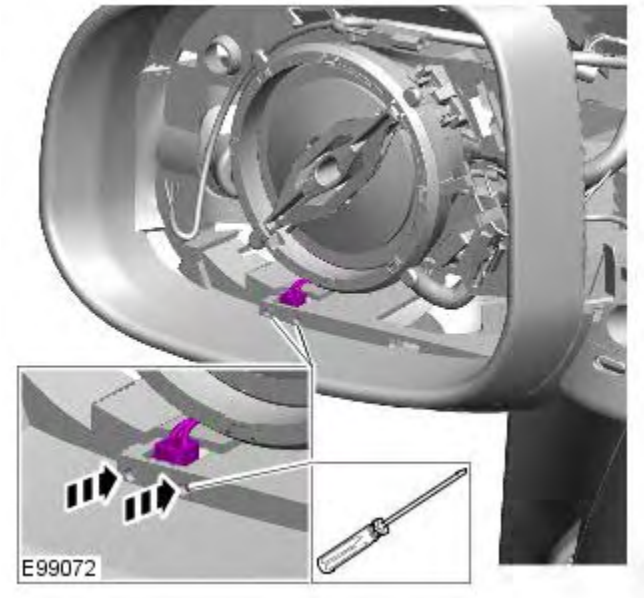
Removal

NOTE: Removal steps in this procedure may contain installation details.

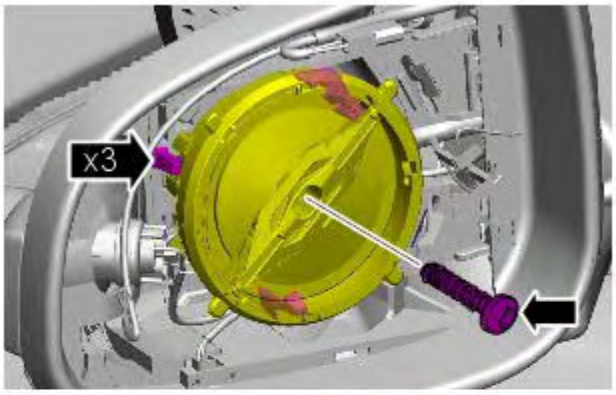
1. Refer to: Exterior Mirror Cover (501-09 Rear View Mirrors, Removal and Installation).

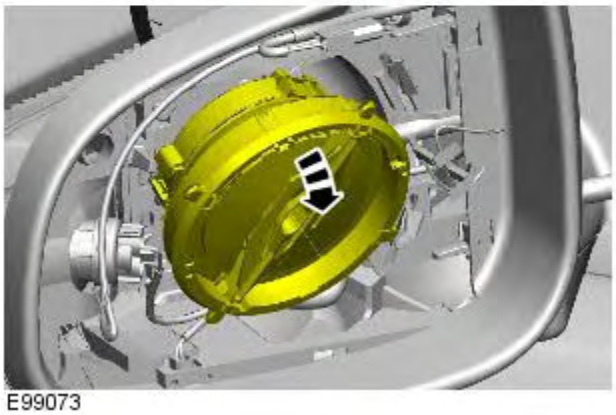
2.

3.



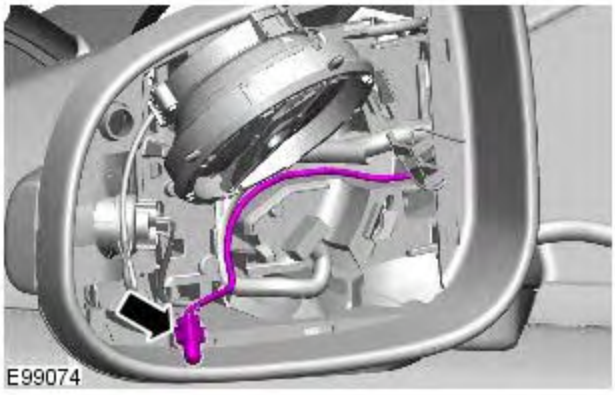
4.





E99073

5.



E99074

Installation

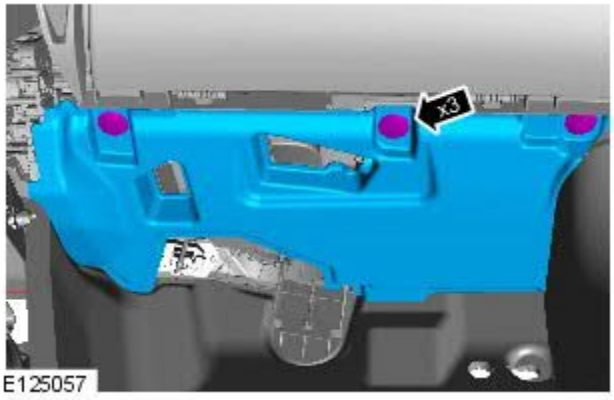
1. To install, reverse the removal procedure.

Published: 11-May-2011

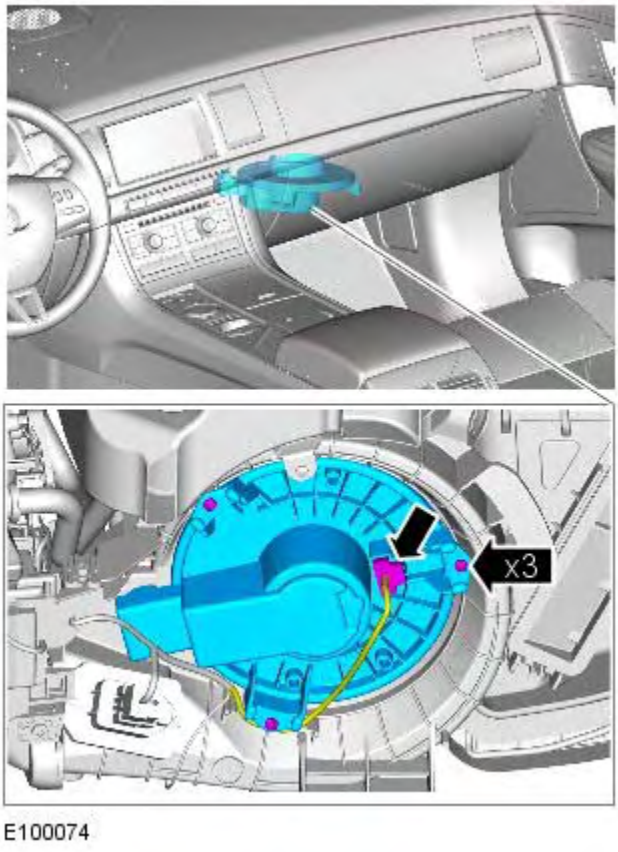
Climate Control - Blower Motor
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.



1. NOTE: Right-hand shown, left-hand similar.



2. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Installation

1. To install, reverse the removal procedure.

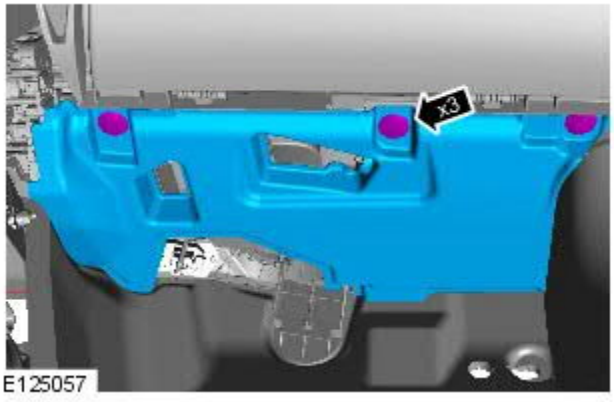
Published: 11-May-2011

Climate Control - Blower Motor Control Module

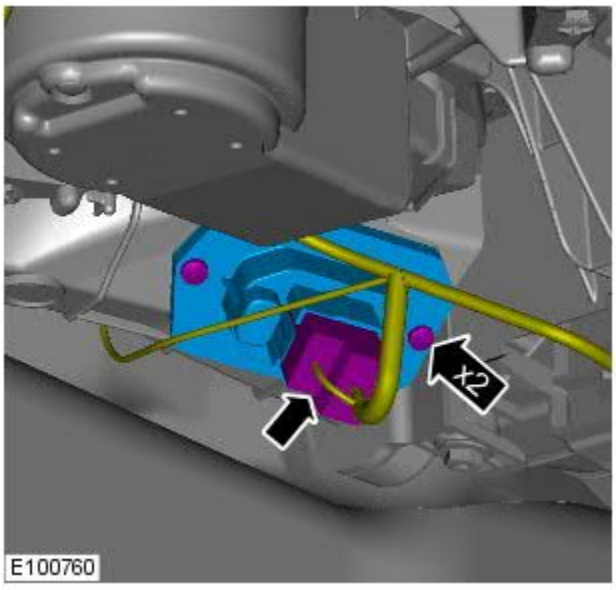
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.



1. NOTE: Right-hand shown, left-hand similar.



2. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

   Torque: 1.3 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Climate Control - Center Registers

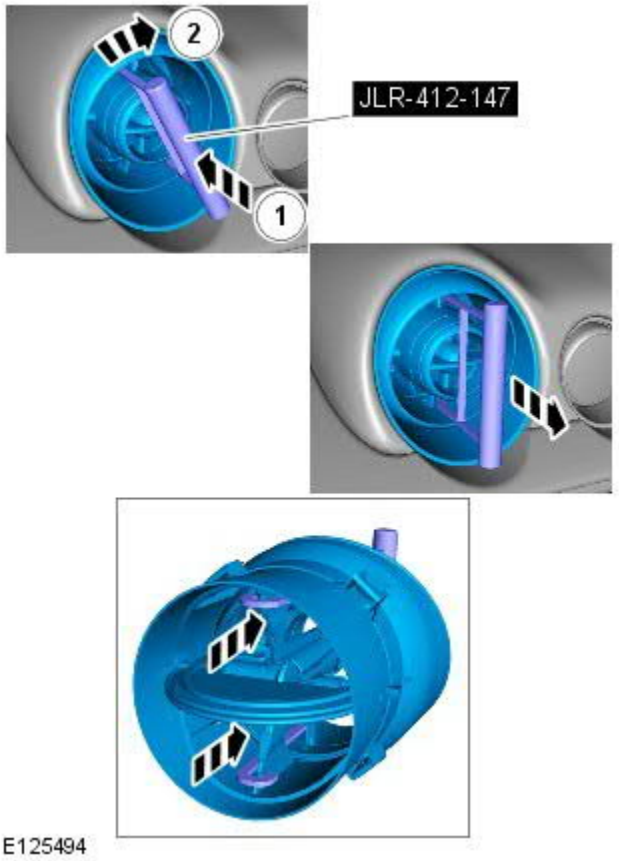
Removal and Installation

Special Tool(s)

	JLR-412-147 Remover, Register

Removal

NOTE: Removal steps in this procedure may contain installation details.



1. CAUTIONS:

   Before inserting the special tool, make sure that the register is fully open.

   Care must be taken to avoid damage to the internal components of the center registers.

   Repeat for the other centre register secured to the instrument panel.

   To install the register, align the securing clips and push the register into the housing until firmly secured in it's seated position.

   During removal, care must be taken not to damage the instrument panel covering with the register clips.

   Special Tool(s): JLR-412-147

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Climate Control - Climate Control Assembly

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

LHD illustration shown, RHD is similar.

Some variation in the illustrations may occur, but the essential information is always correct.

All vehicles

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Cooling System Draining, Filling and Bleeding - V8 S/C 5.0L Petrol (303-03B Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).

3. Refer to: Cooling System Draining, Filling and Bleeding - V8 5.0L Petrol (303-03B Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).

4. Refer to: Cooling System Draining, Filling and Bleeding (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).

5. Refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

6. Refer to: Cowl Side Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

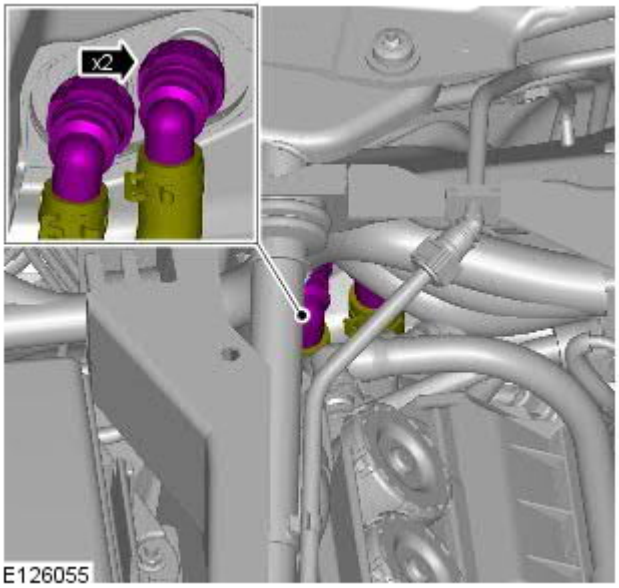
7. Refer to: Steering Column (211-04 Steering Column, Removal and Installation).

8. Refer to: Instrument Panel Center Reinforcement (501-12 Instrument Panel and Console, Removal and Installation).

9. Refer to: Secondary Bulkhead Panel LH (501-02 Front End Body Panels, Removal and Installation).

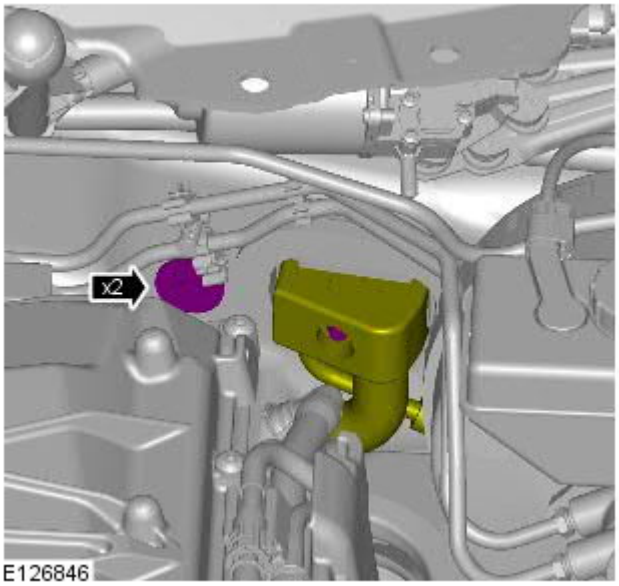
Vehicles with diesel engine

10. Refer to: Secondary Bulkhead Panel RH (501-02 Front End Body Panels, Removal and Installation).



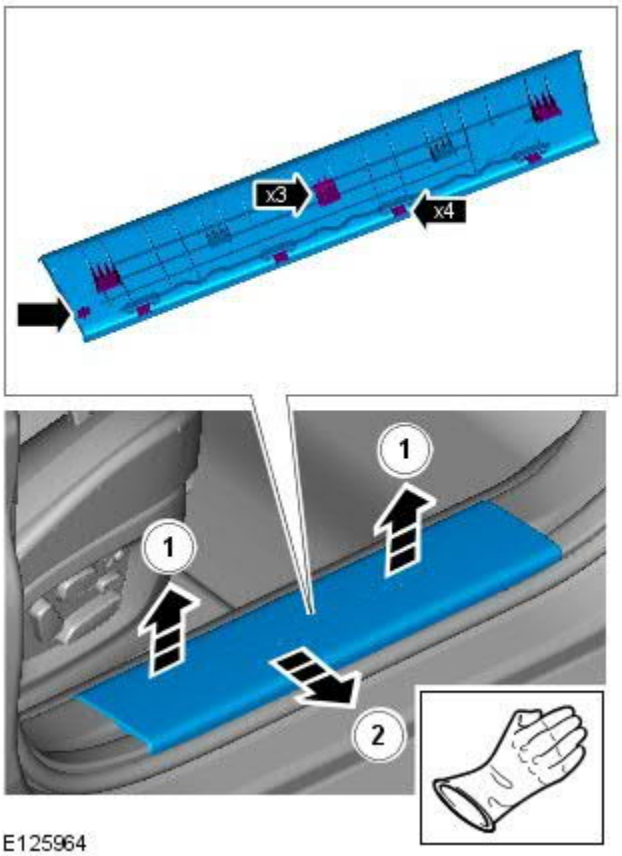
11. CAUTION: Be prepared to collect escaping coolant.

All vehicles



12. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

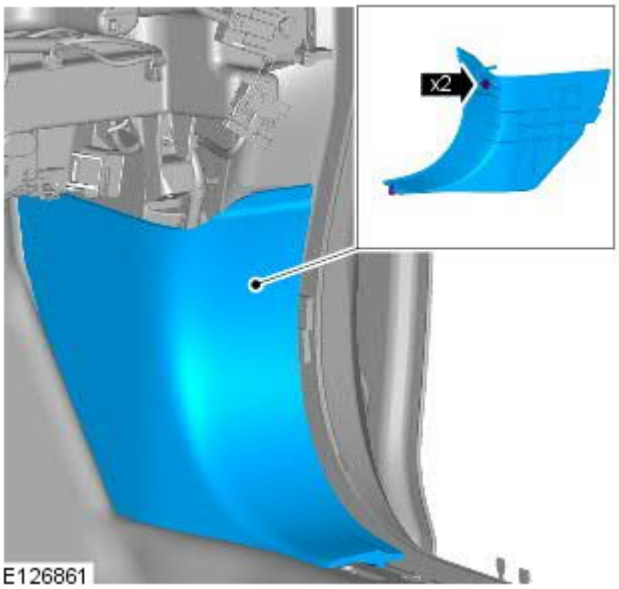
Torque: 9 Nm



E125964

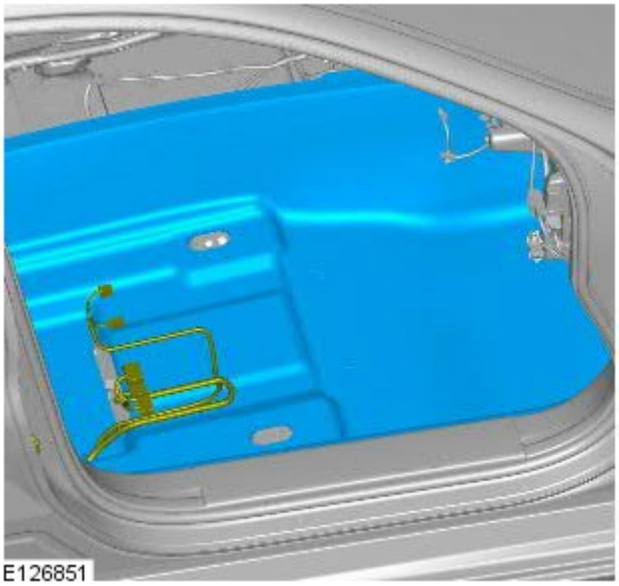
13. CAUTION: Make sure that the component is correctly located on the locating dowels.

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



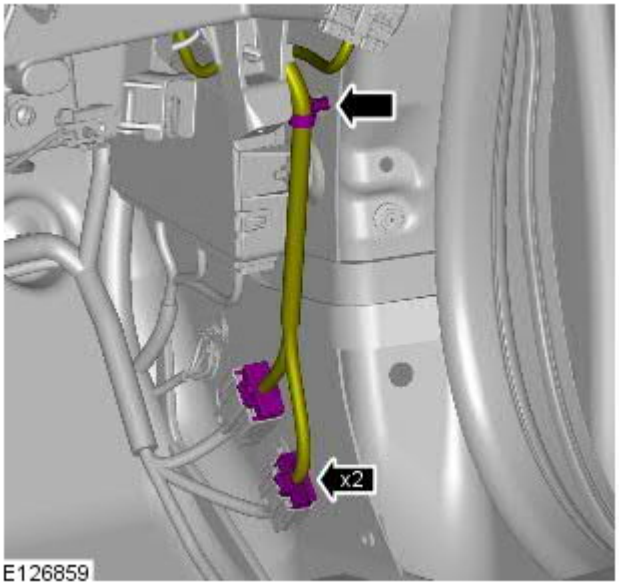
E126861

14.



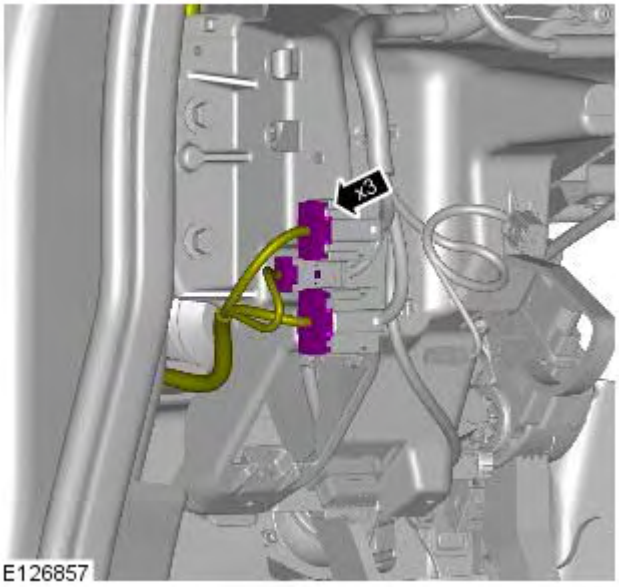
15.

- Repeat for both sides.



16.

17.



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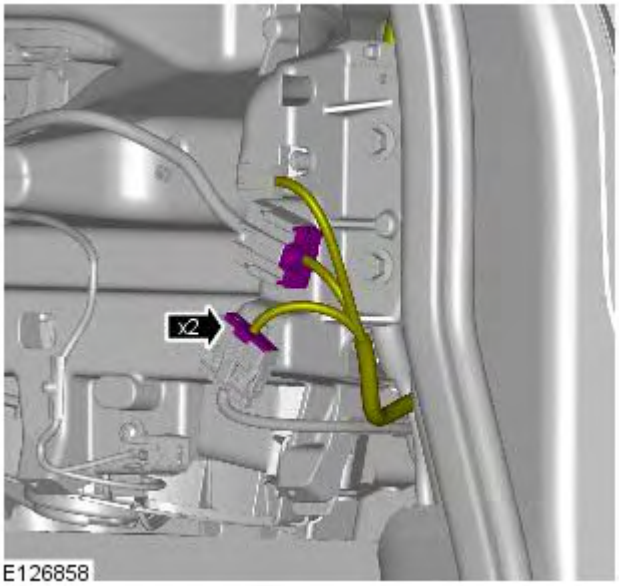
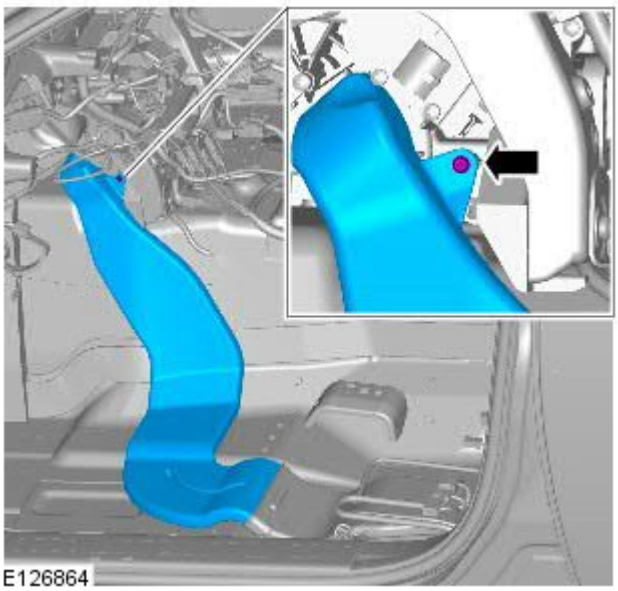
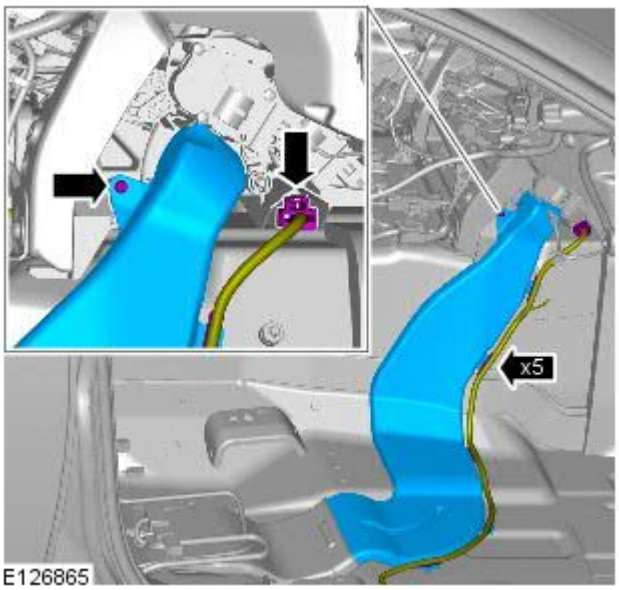


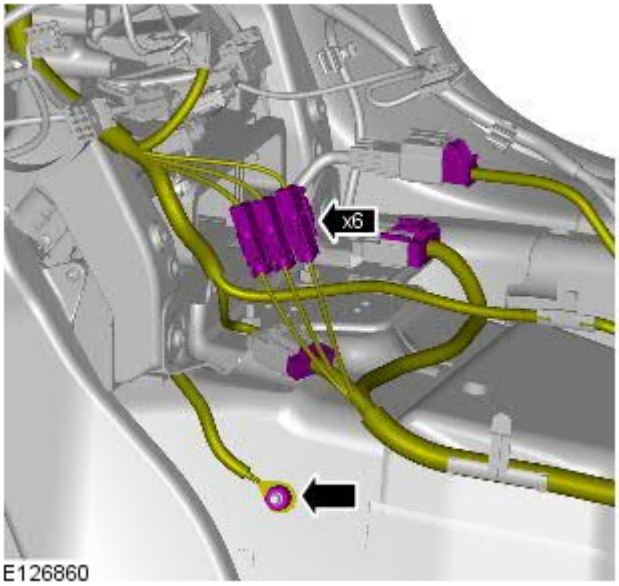


19. *Torque:* 1.5 Nm



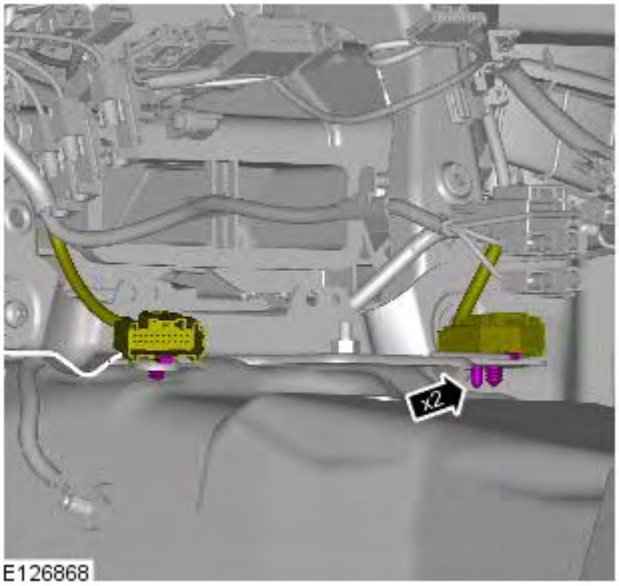
20. *Torque:* 1.5 Nm

21. *Torque:* 9 Nm

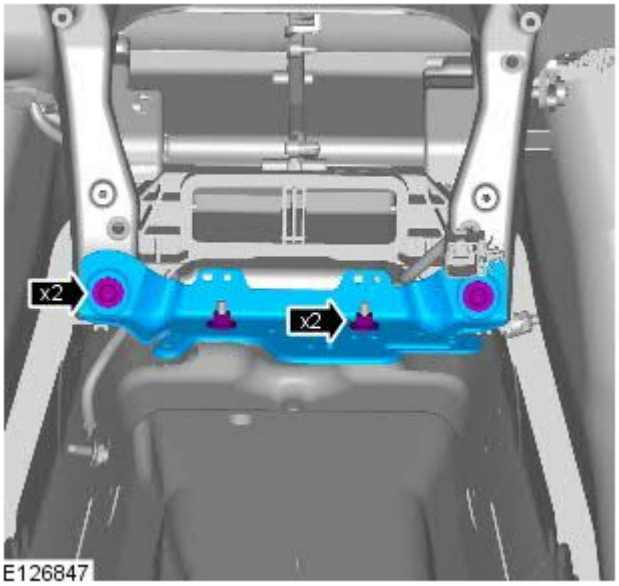


E126860

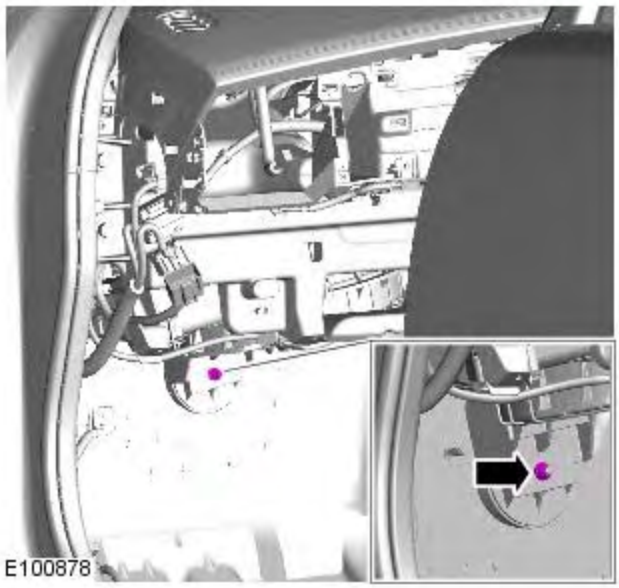
22.



E126868

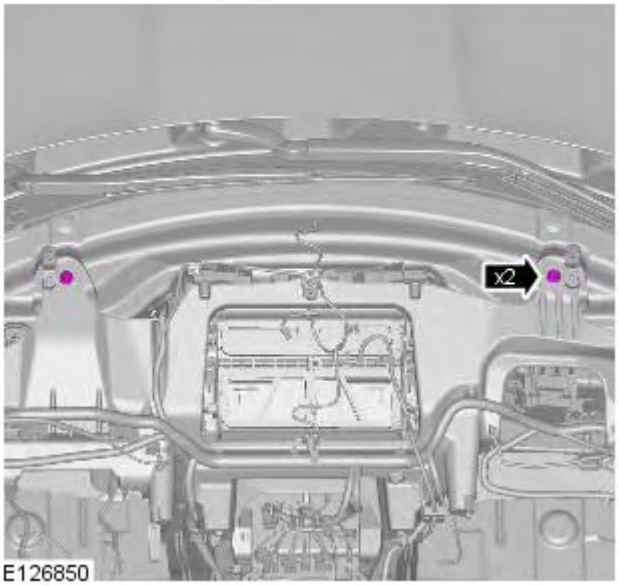


23. *Torque:* 9 Nm

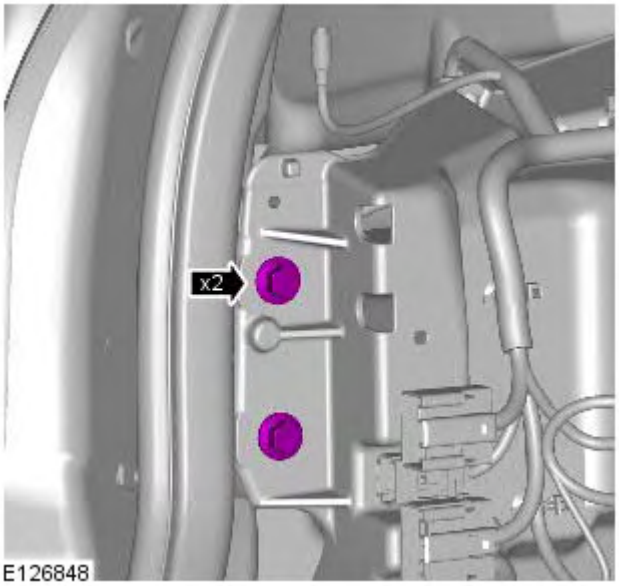


24. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

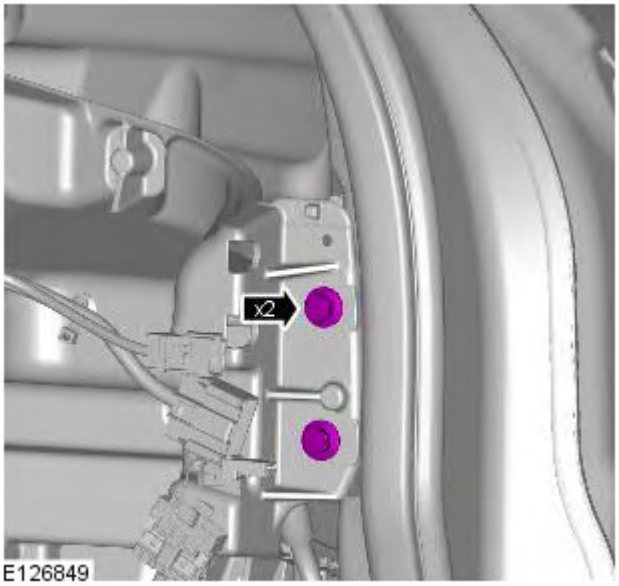
Torque: 3 Nm



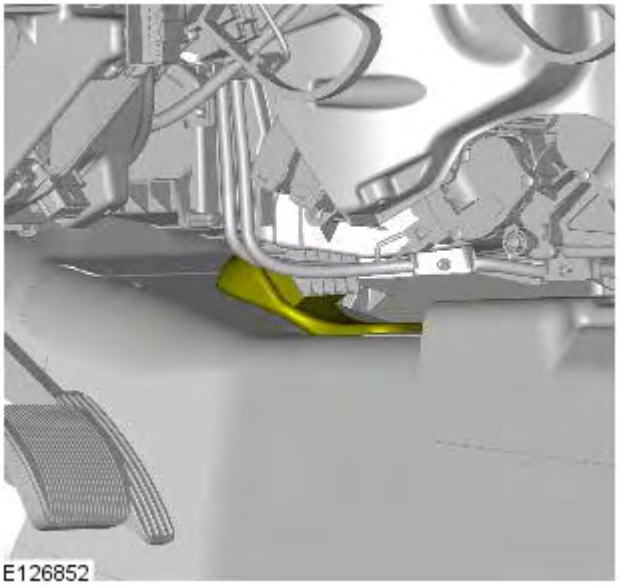
25. *Torque:* 9 Nm



26. *Torque:* 9 Nm



27. *Torque:* 9 Nm



28. CAUTION: Take extra care not to damage the component.

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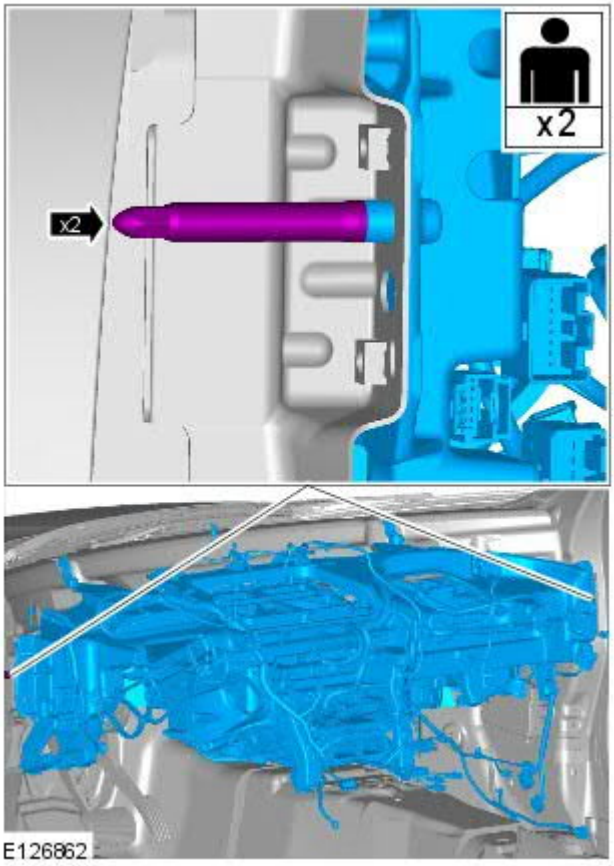
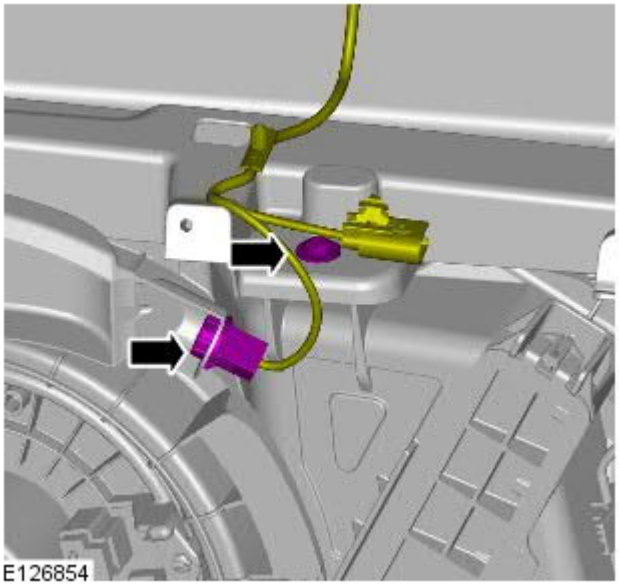
29.

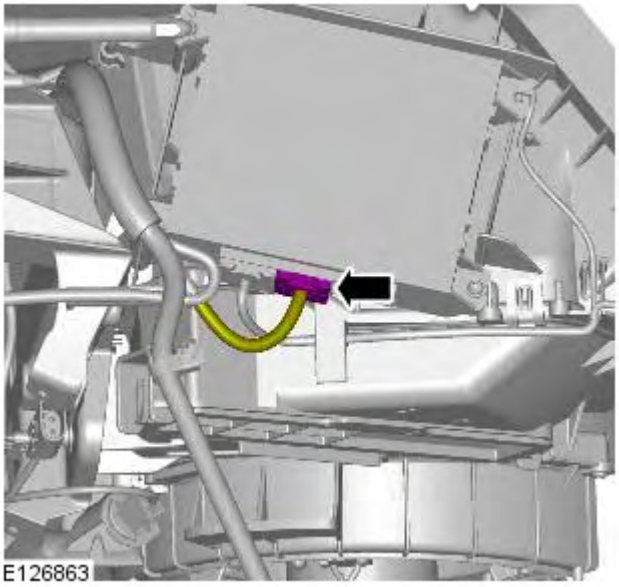


30. NOTE: Do not disassemble further if the component is removed for access only.

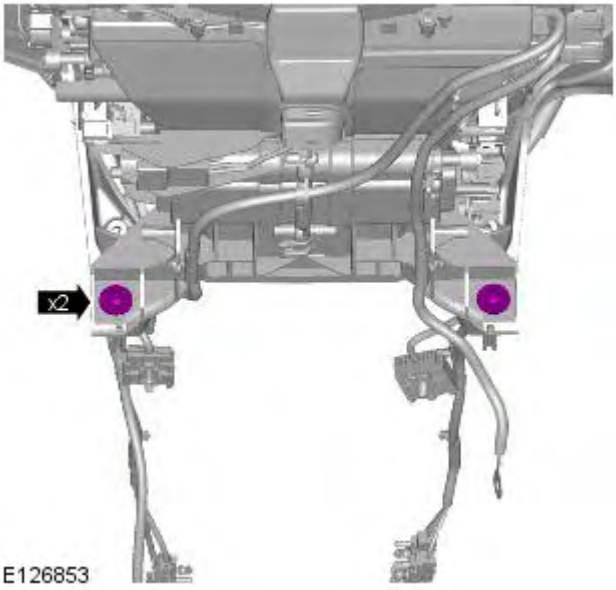
Torque: 9 Nm



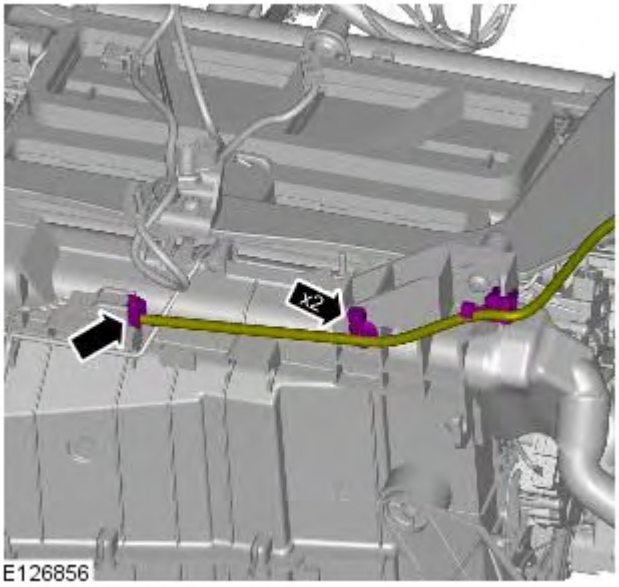
31.



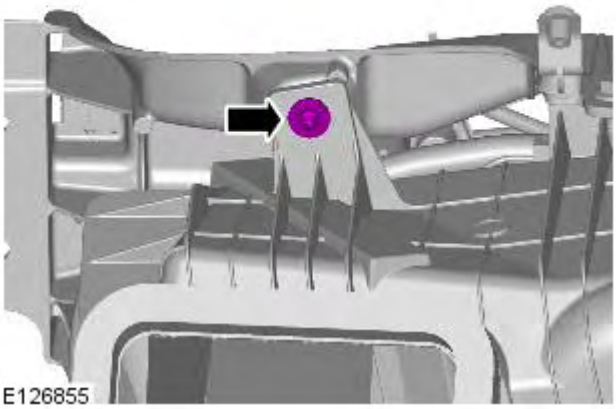
32. *Torque:* 9 Nm



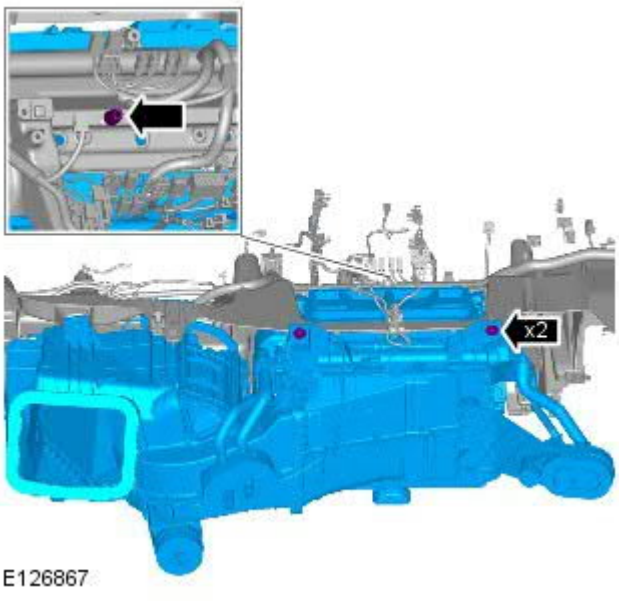
33.



34. *Torque:* 9 Nm



35. *Torque:* 9 Nm



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Climate Control - Climate Control Module

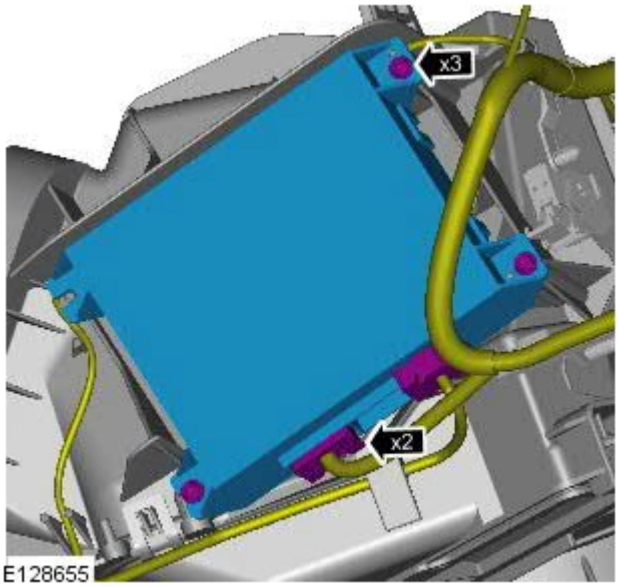
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. Refer to: Climate Control Assembly (412-01 Climate Control, Removal and Installation).



3. CAUTIONS:

   Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

   Make sure that the component is correctly located on the locating dowels.

   NOTE: LHD illustration shown, RHD is similar.

   Torque: 1.3 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Climate Control - Defrost Vent/Register Blend Door Actuator LHD RWD

Removal and Installation

Removal

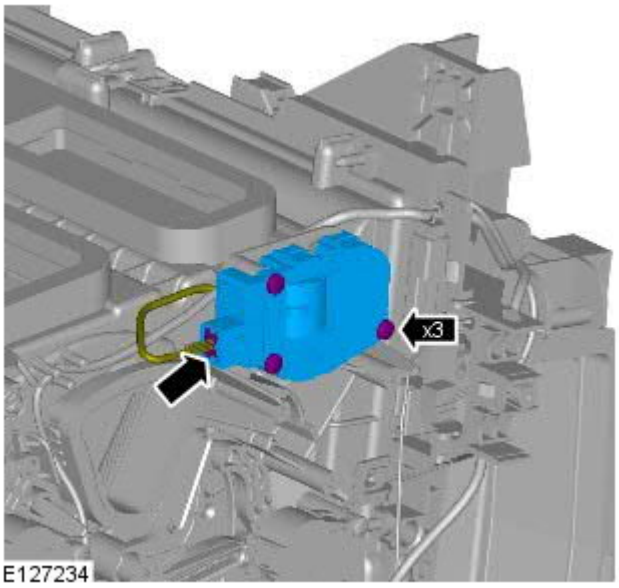
NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

3. Refer to: Footwell Vent/Duct Blend Door Actuator - LHD RWD (412-01 Climate Control, Removal and Installation).



4. CAUTIONS:

   Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

   Make sure that the component is correctly located on the locating dowels.

   Torque: 1.5 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Climate Control - Defrost Vent/Register Blend Door Actuator RHD RWD

Removal and Installation

Removal

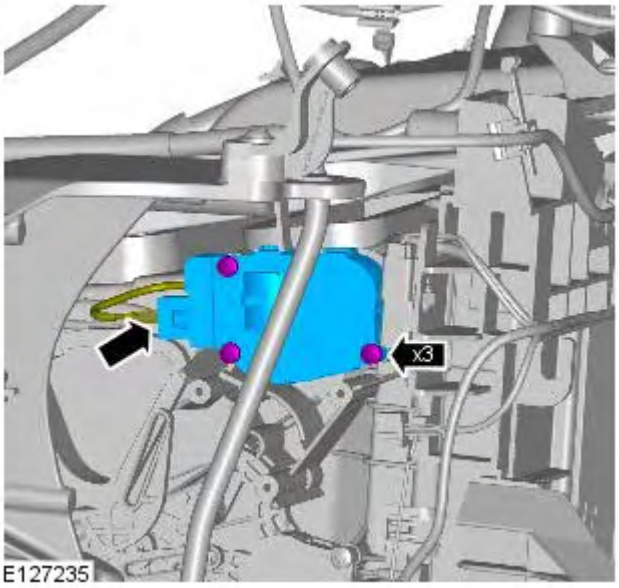
NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

3. Refer to: Footwell Vent/Duct Blend Door Actuator - RHD RWD (412-01 Climate Control, Removal and Installation).



4. CAUTIONS:

   Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

   Make sure that the component is correctly located on the locating dowels.

   Torque: 1.5 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Climate Control - Desiccant Bag

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

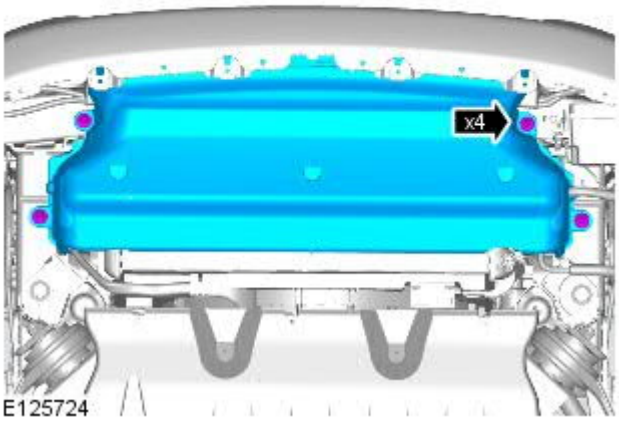
1. WARNING: Make sure to support the vehicle with axle stands.

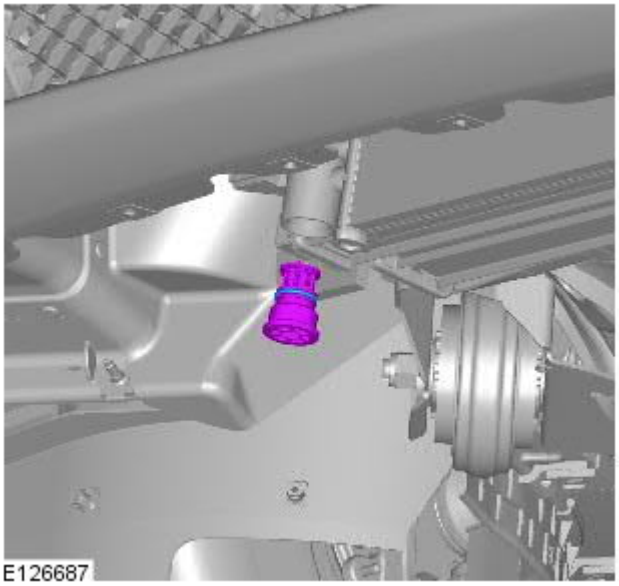
   Raise and support the vehicle.

2. Refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

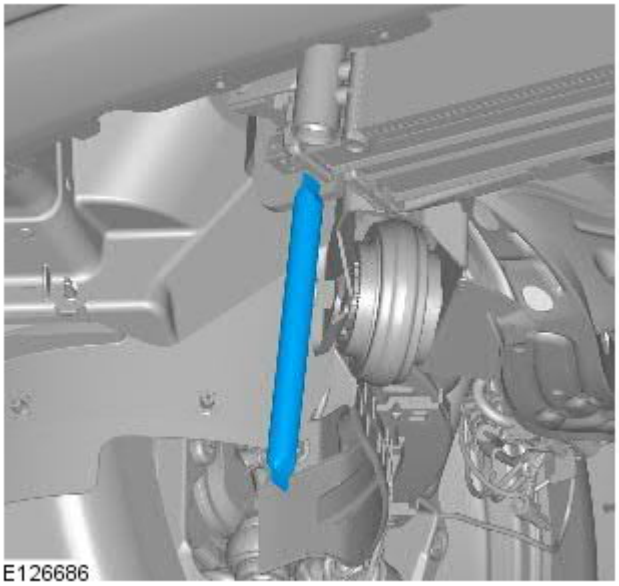
3. Refer to: Radiator Splash Shield (501-02 Front End Body Panels, Removal and Installation).

4.





5. *Torque:* 12 Nm



6.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Climate Control - Driver Side Register

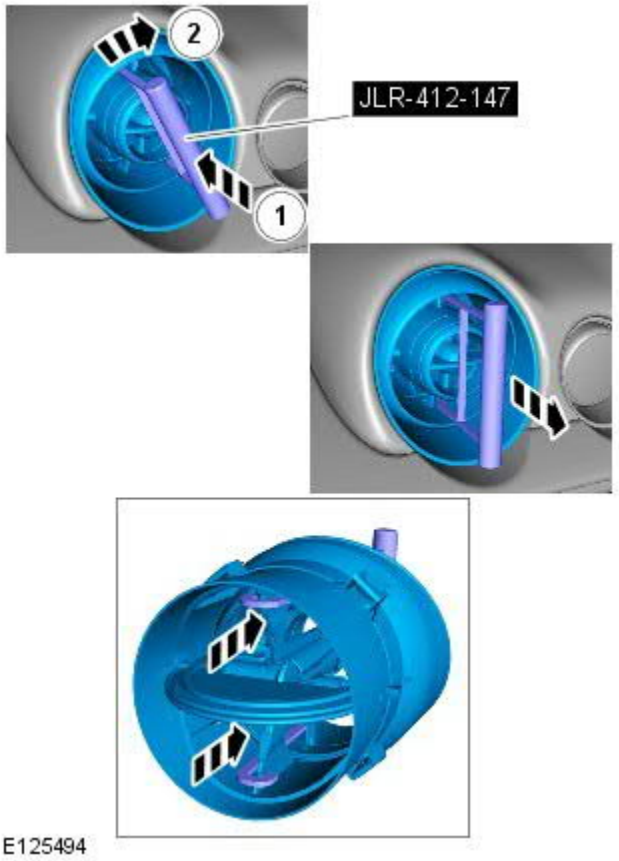
Removal and Installation

Special Tool(s)

	JLR-412-147 Remover, Register

Removal

NOTE: Removal steps in this procedure may contain installation details.



1. CAUTIONS:

   Before inserting the special tool, make sure that the register is fully open.

   Care must be taken to avoid damage to the internal components of the center registers.

   To install the register, align the securing clips and push the register into the housing until firmly secured in it's seated position.

   During removal, care must be taken not to damage the instrument panel covering with the register clips.

   NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

   Special Tool(s): JLR-412-147

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Climate Control - Evaporator

Removal and Installation

Removal

CAUTION: Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

NOTE: Removal steps in this procedure may contain installation details.

All vehicles

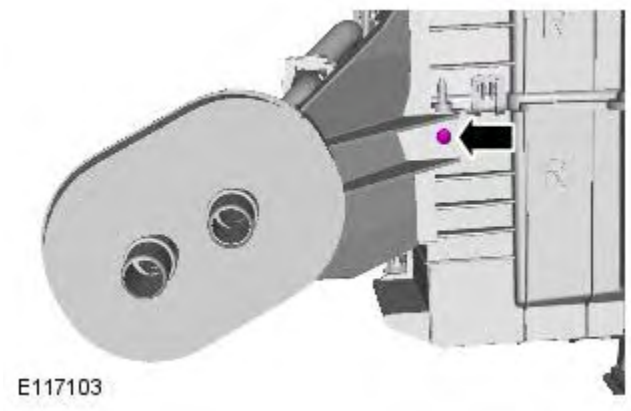
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

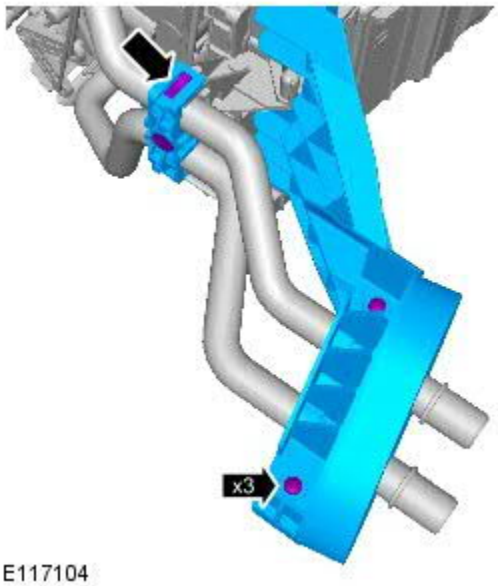
3. Refer to: Thermostatic Expansion Valve (412-01 Climate Control, Removal and Installation).

Right-hand drive vehicles



4. *Torque:* 1.5 Nm

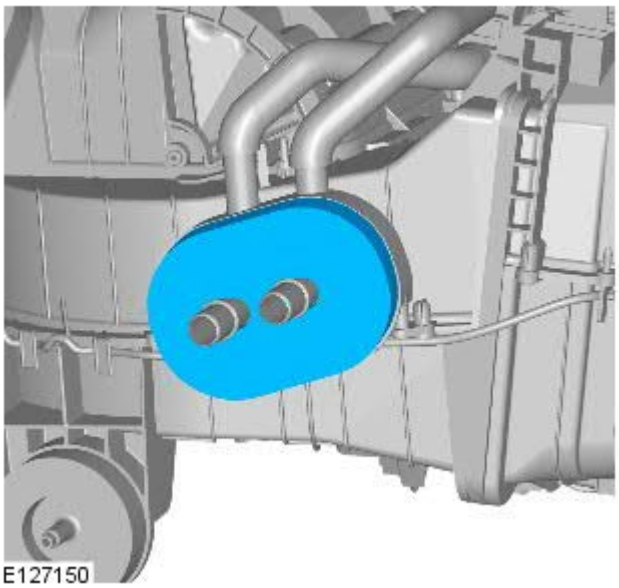
5. *Torque:* 1.5 Nm



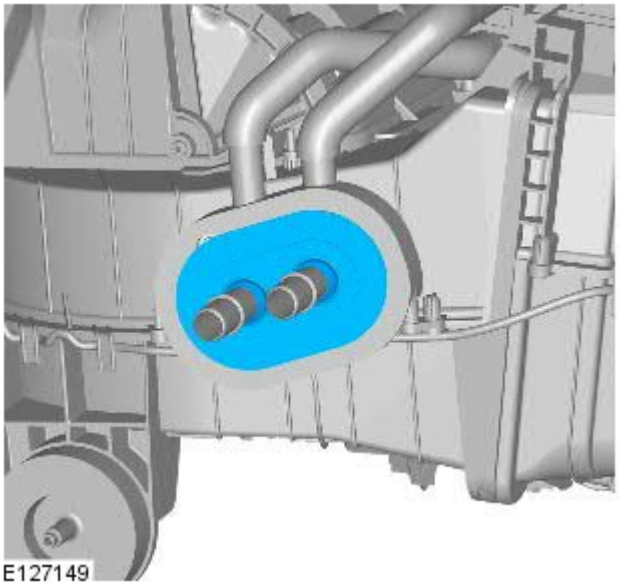
E117104

Left-hand drive vehicles

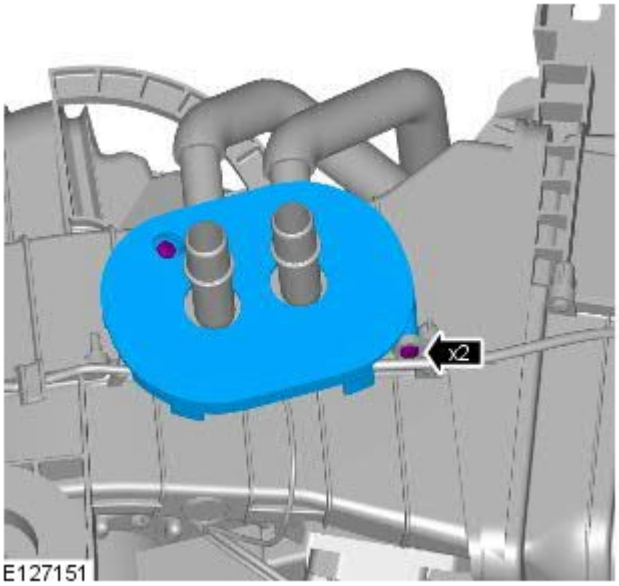
6.

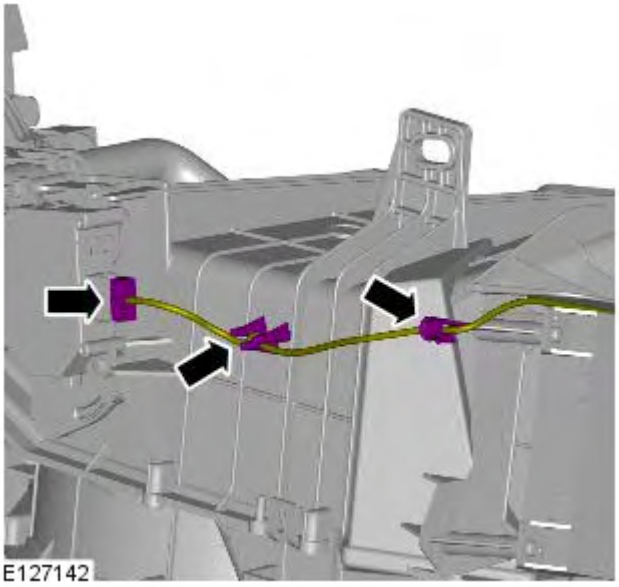

E127150

7.

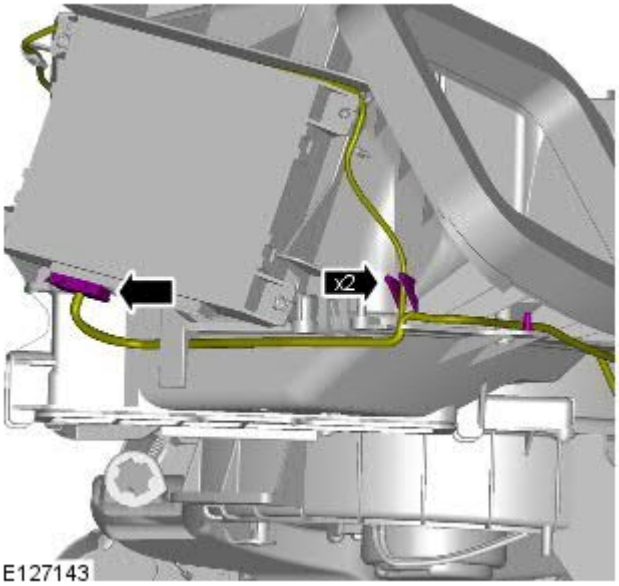


8. *Torque:* 1.5 Nm

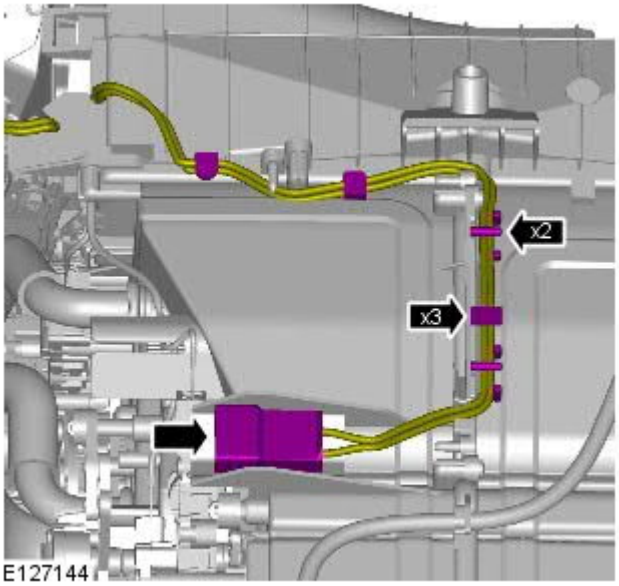




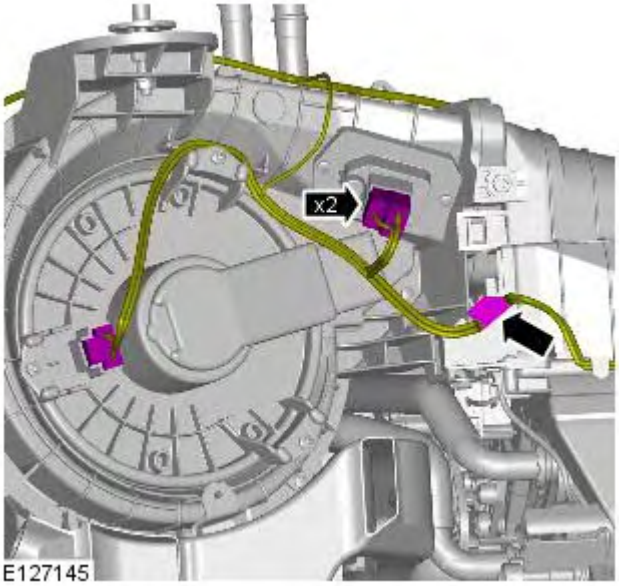
9. NOTE: LHD illustration shown, RHD is similar.



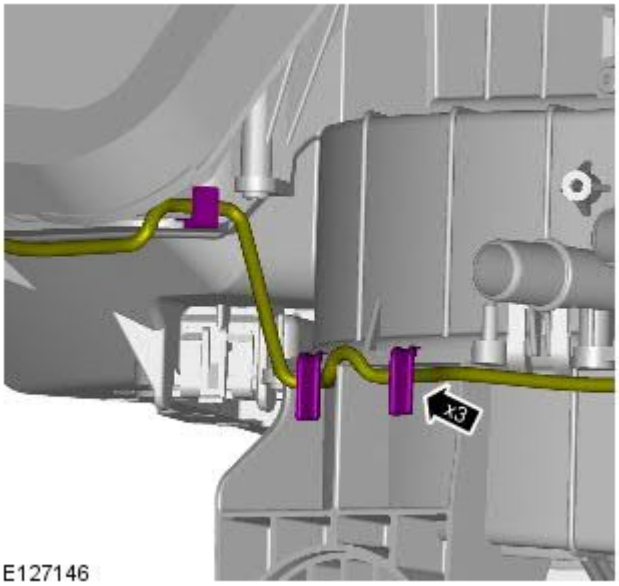
10. NOTE: LHD illustration shown, RHD is similar.



11. NOTE: LHD illustration shown, RHD is similar.

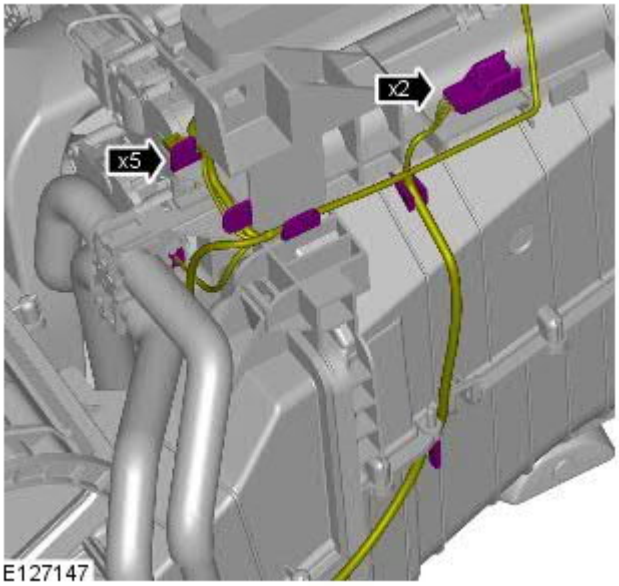


12. NOTE: LHD illustration shown, RHD is similar.



E127146

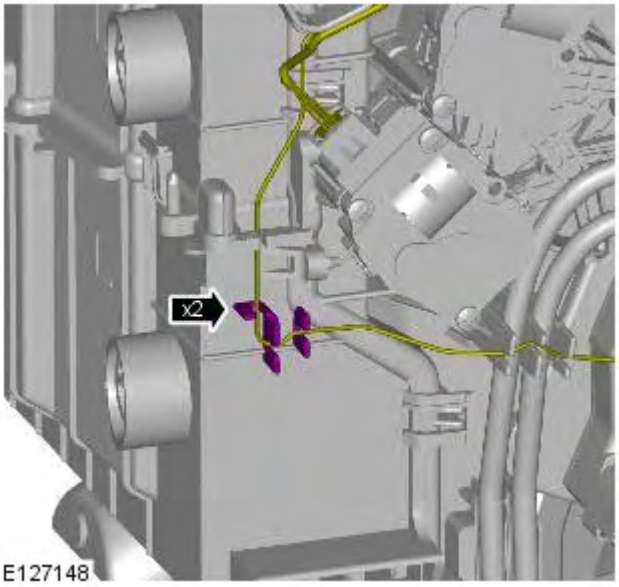
13. NOTE: LHD illustration shown, RHD is similar.



E127147

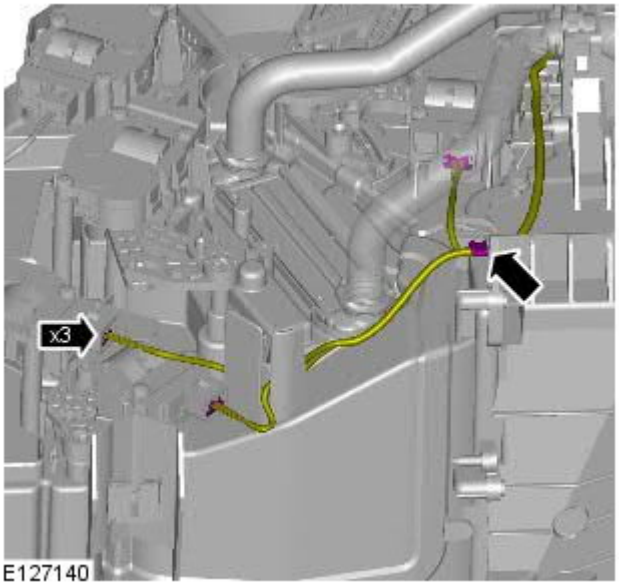
14. NOTE: LHD illustration shown, RHD is similar.

Vehicles with diesel engine



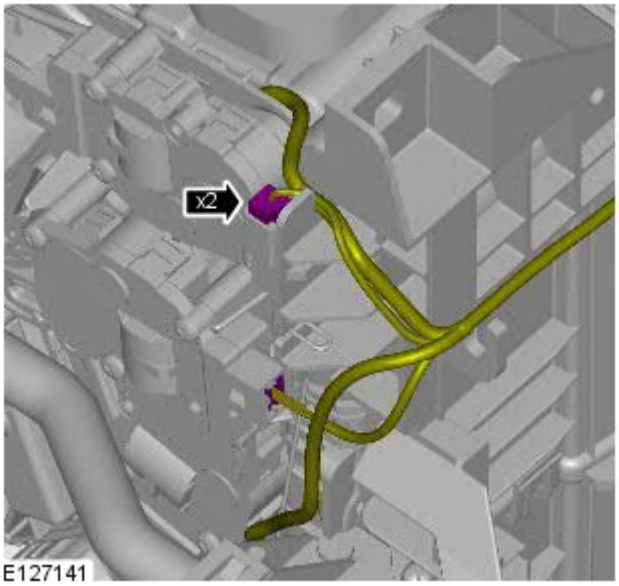
15. NOTE: LHD illustration shown, RHD is similar.

Right-hand drive vehicles

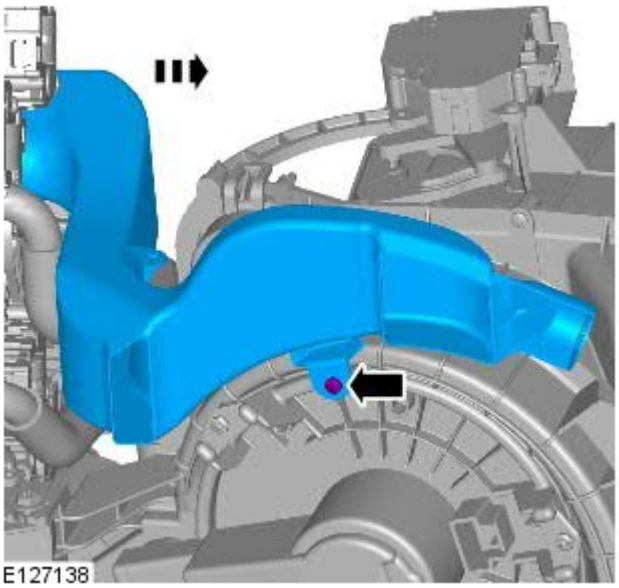


16.

17.

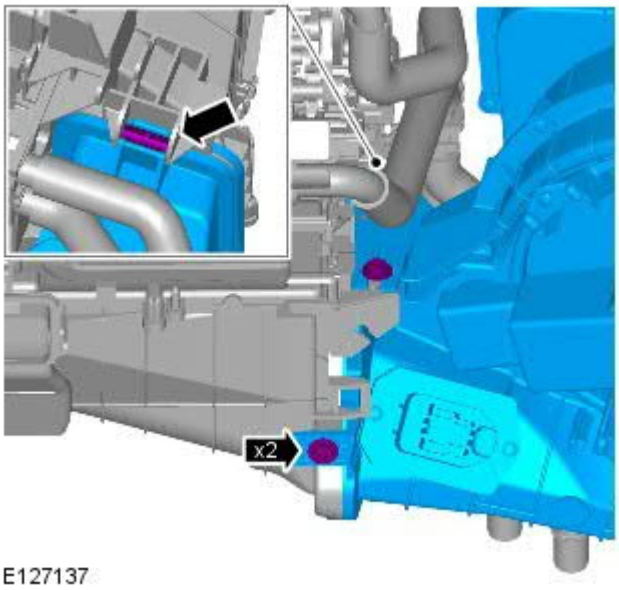


All vehicles



18. NOTE: LHD illustration shown, RHD is similar.

Torque: 1.5 Nm

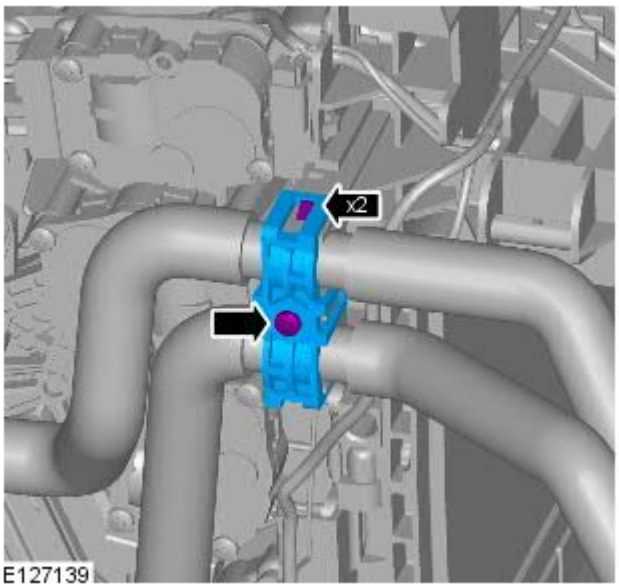


E127137

19. NOTE: LHD illustration shown, RHD is similar.

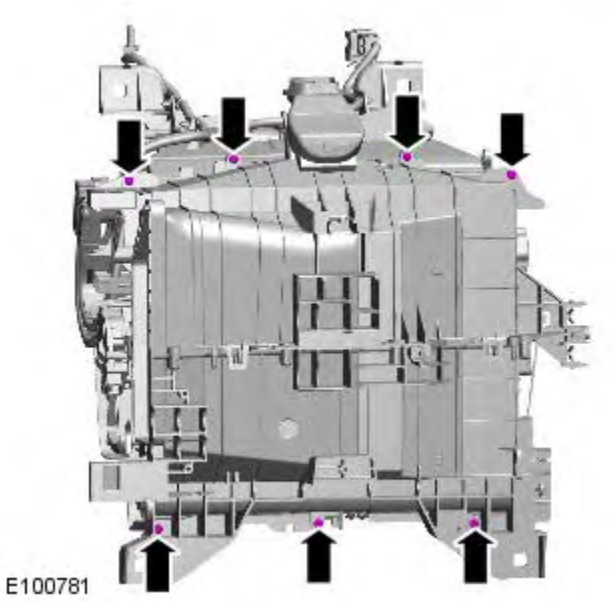
Torque: 9 Nm

Left-hand drive vehicles



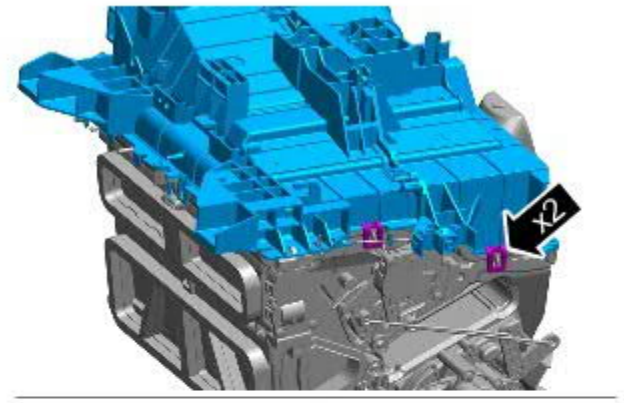
E127139

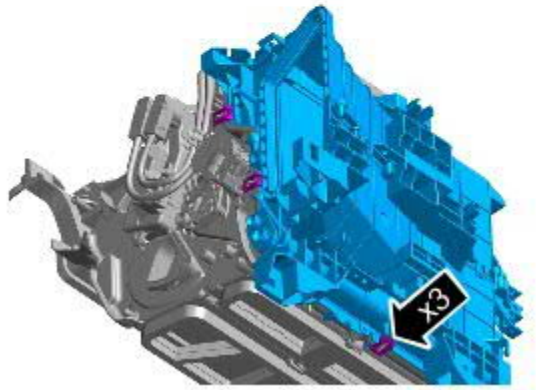
20. *Torque:* 1.5 Nm


E100781

21. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

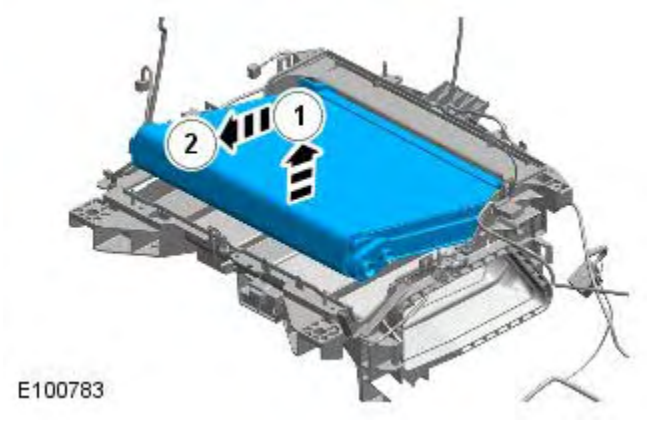
Torque: 1.5 Nm





E100782

22. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



23. WARNING: Only use moderate force when installing the sensor.

    CAUTIONS:

    Make sure the evaporator temperature sensor harness does not become trapped.

    Make sure that the sensor is correctly installed.

    NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

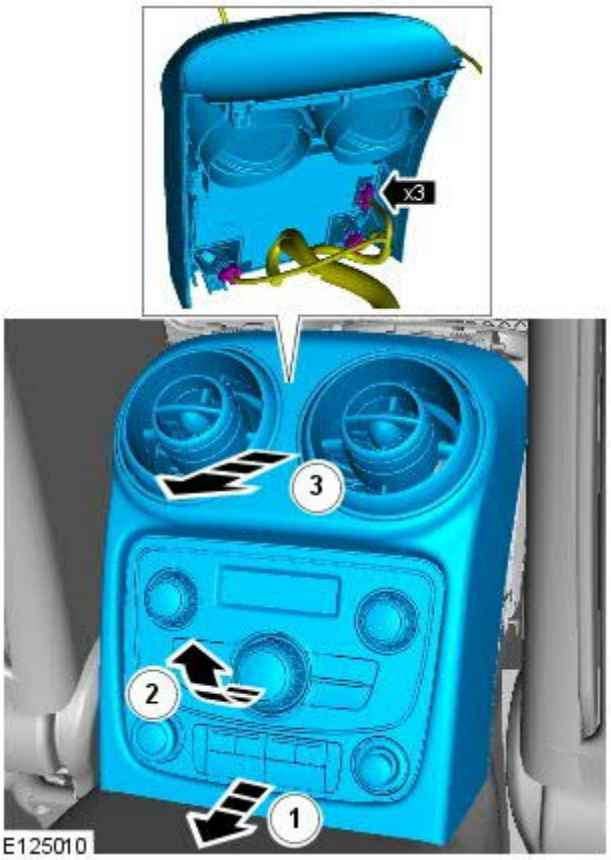
Climate Control - Floor Console Register

Removal and Installation

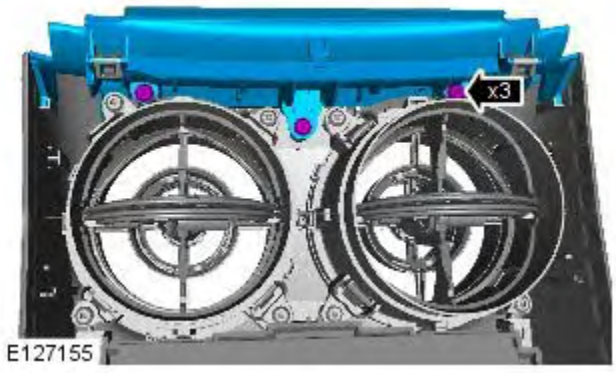
Removal

NOTE: Removal steps in this procedure may contain installation details.

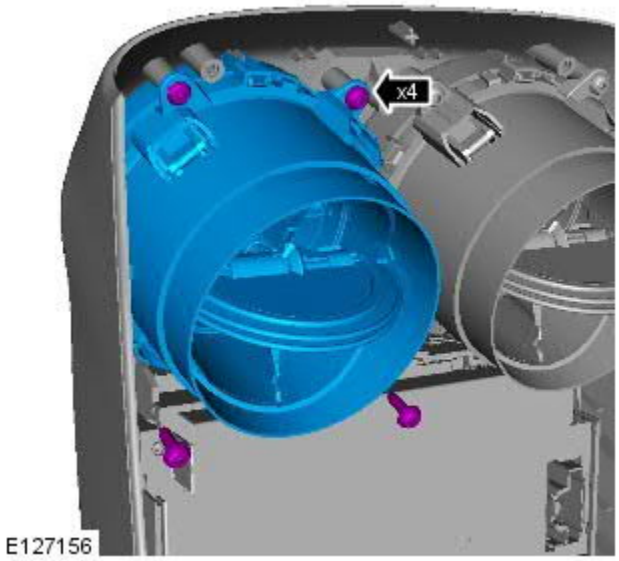
1.



2. *Torque:* 2 Nm



3. *Torque:* 2 Nm



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Climate Control - Footwell Vent/Duct Blend Door Actuator LHD RWD

Removal and Installation

Removal

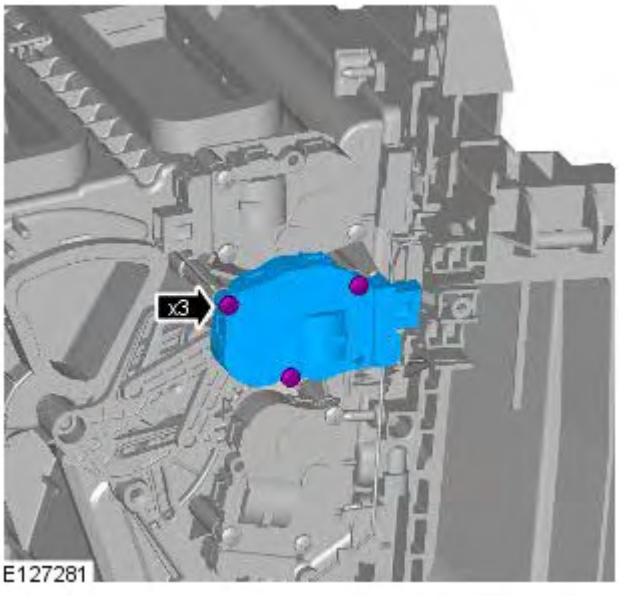
NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

3. Refer to: Heater Core (412-01 Climate Control, Removal and Installation).



4. CAUTIONS:

   Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

   Make sure that the component is correctly located on the locating dowels.

   Torque: 1.5 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Climate Control - Footwell Vent/Duct Blend Door Actuator RHD RWD

Removal and Installation

Removal

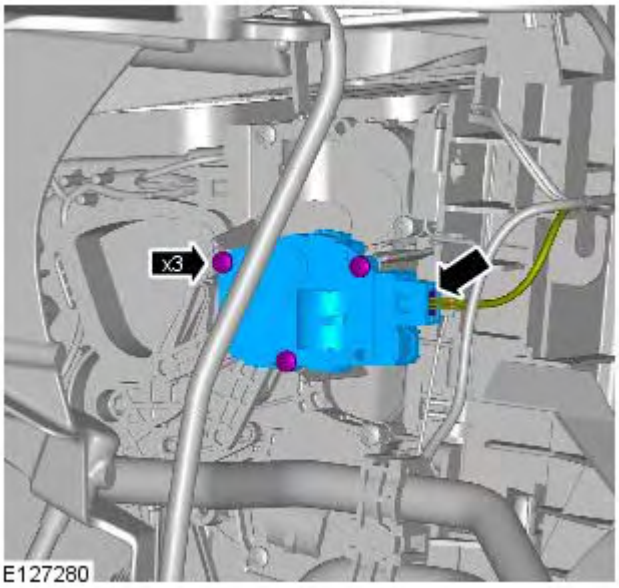
NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

3. Refer to: Climate Control Assembly (412-01 Climate Control, Removal and Installation).



4. CAUTIONS:

   Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

   Make sure that the component is correctly located on the locating dowels.

   Torque: 1.5 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Climate Control - Heater Core

Removal and Installation

Removal

CAUTION: Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

NOTE: Removal steps in this procedure may contain installation details.

All vehicles

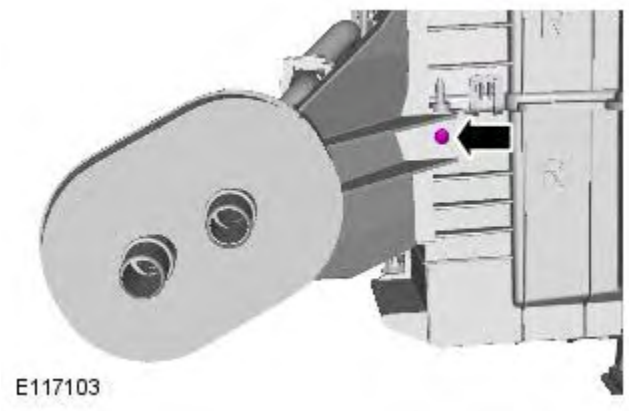
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

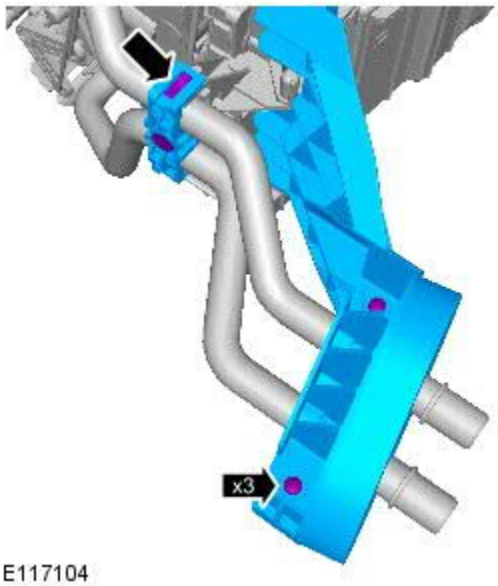
3. Refer to: Climate Control Assembly (412-01 Climate Control, Removal and Installation).

Right-hand drive vehicles



4. *Torque:* 1.5 Nm

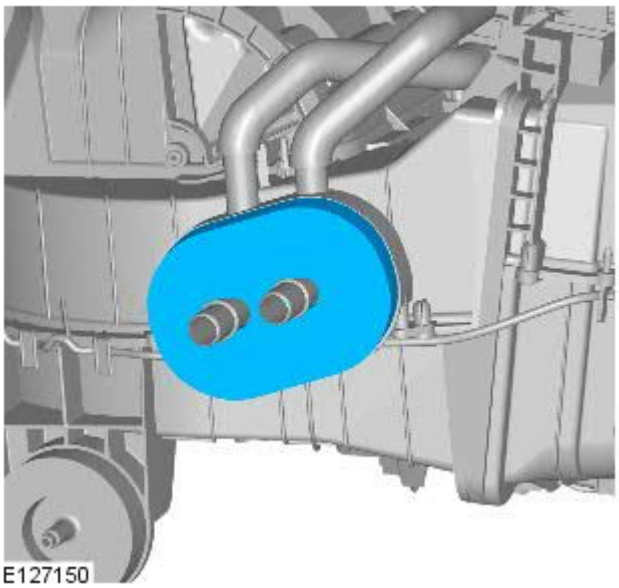
5. *Torque:* 1.5 Nm



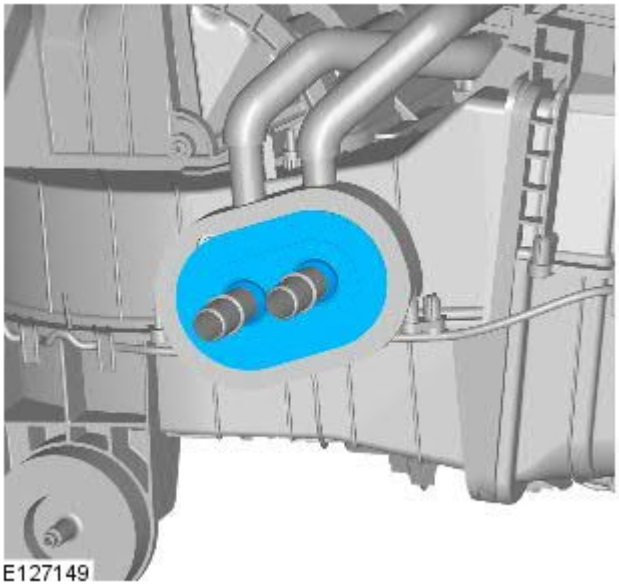
E117104

Left-hand drive vehicles

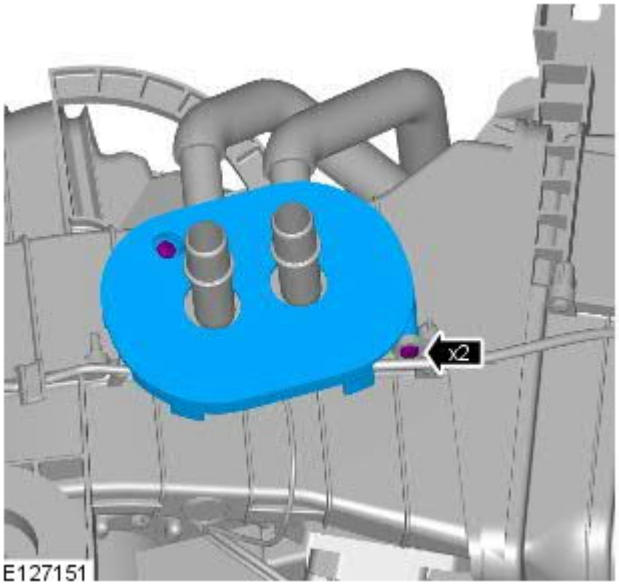
6.


E127150

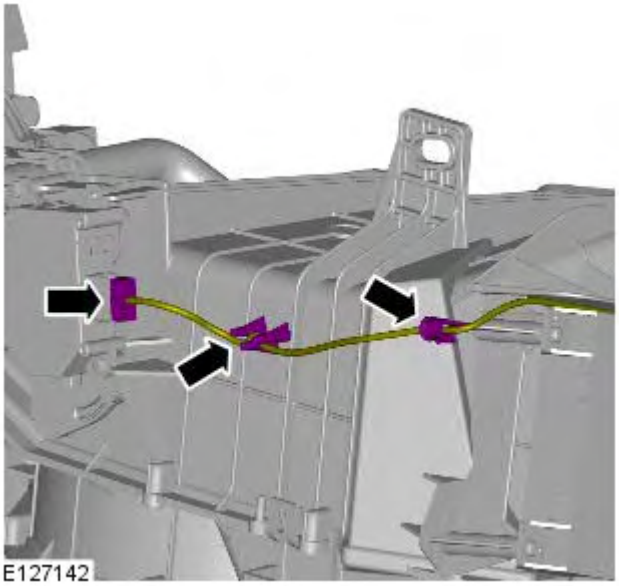
7.



8. *Torque:* 1.5 Nm



9.



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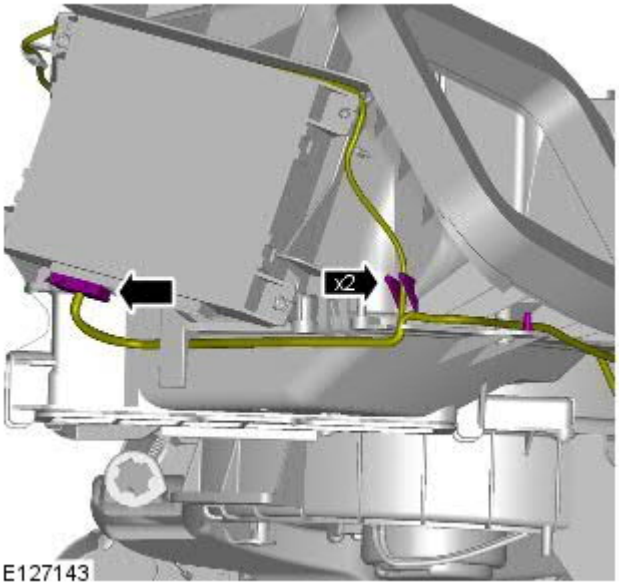
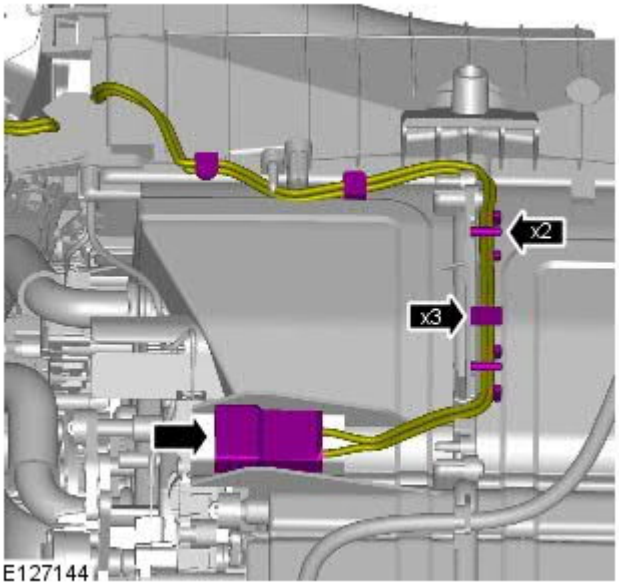


11.



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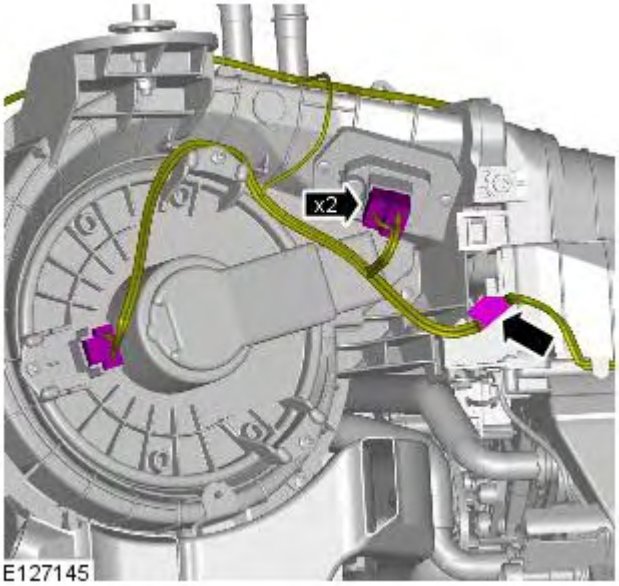
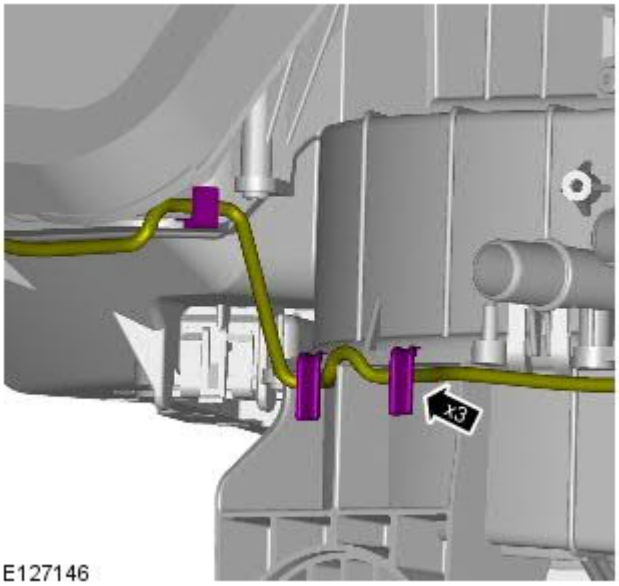
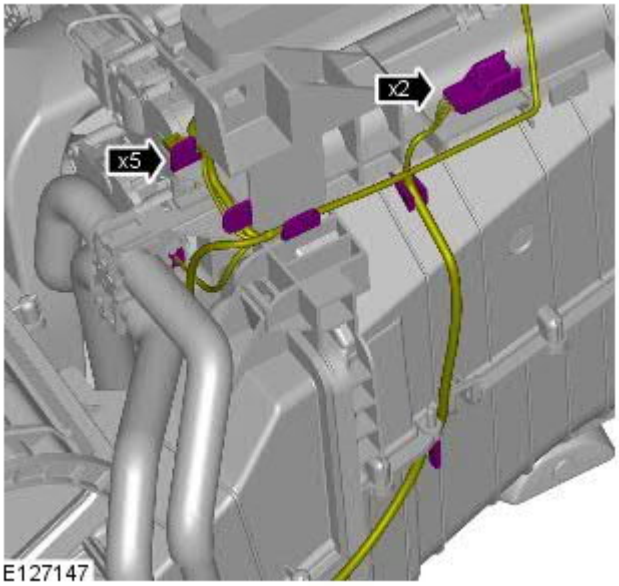


13.

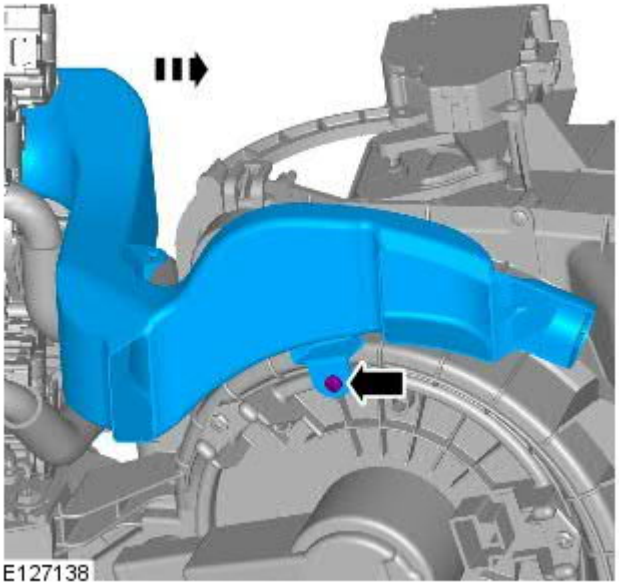


E127146

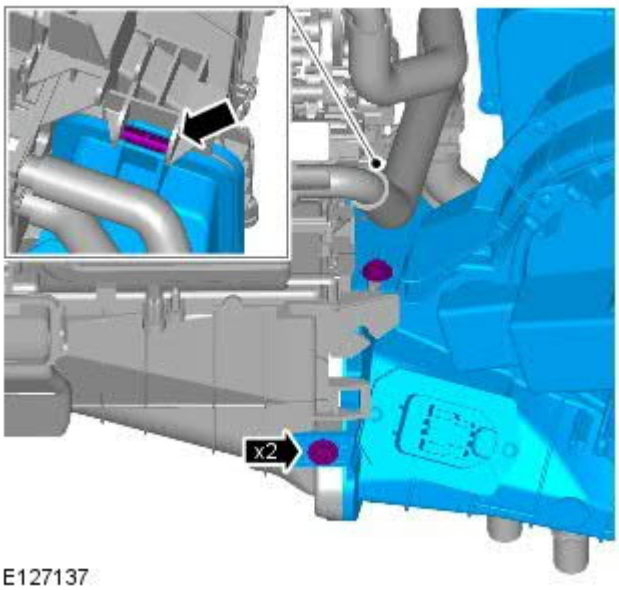
14.



E127147

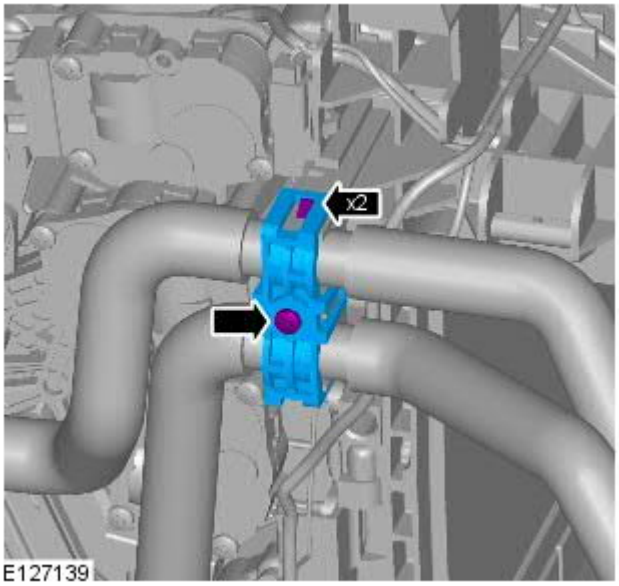

E127138

15. *Torque:* 1.5 Nm

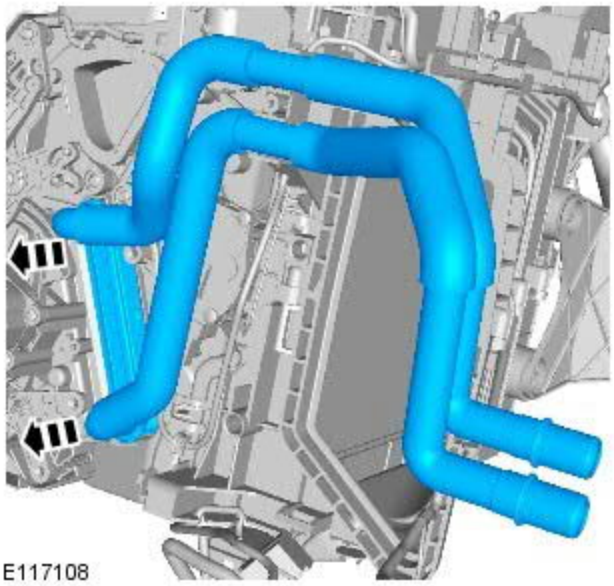


E127137

16. *Torque:* 9 Nm



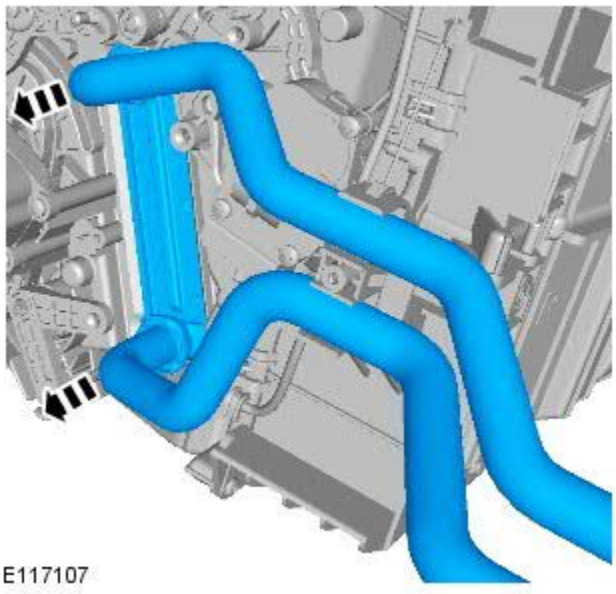
17. *Torque:* 1.5 Nm



18.

Right-hand drive vehicles

19.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Climate Control - In-Vehicle Temperature Sensor

Removal and Installation

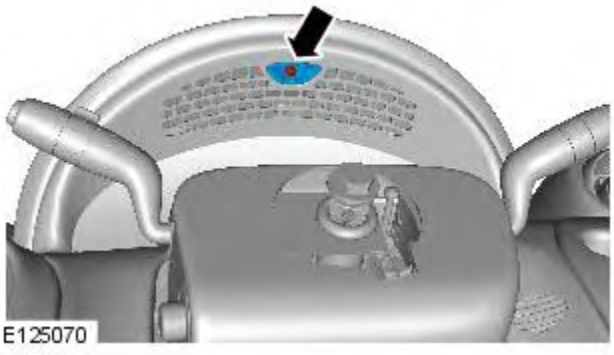
Removal

NOTES:

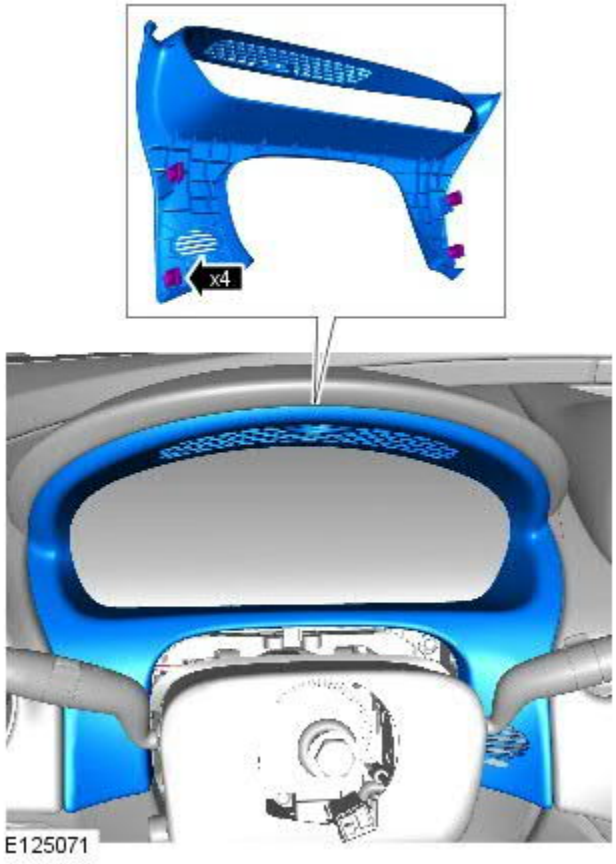
Removal steps in this procedure may contain installation details.

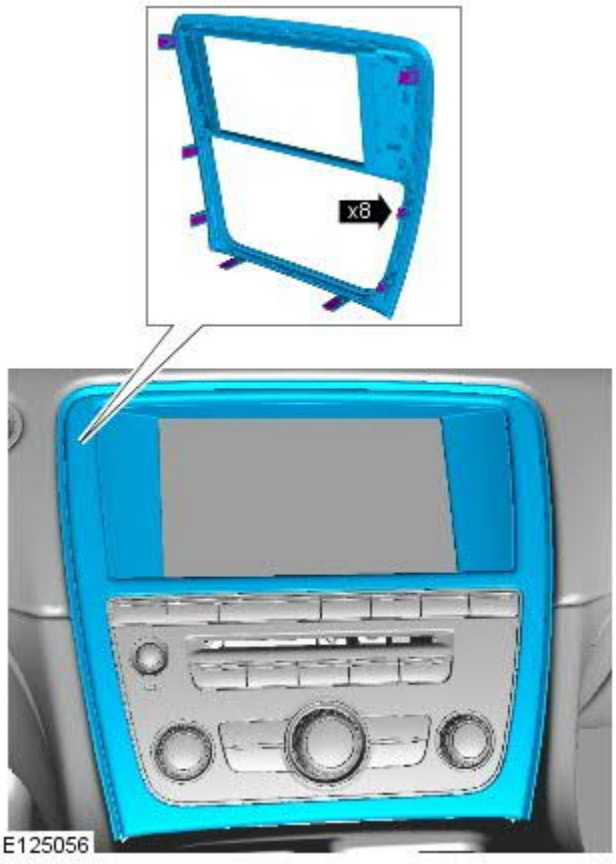
Some variation in the illustrations may occur, but the essential information is always correct.

1. *Torque:* 2 Nm

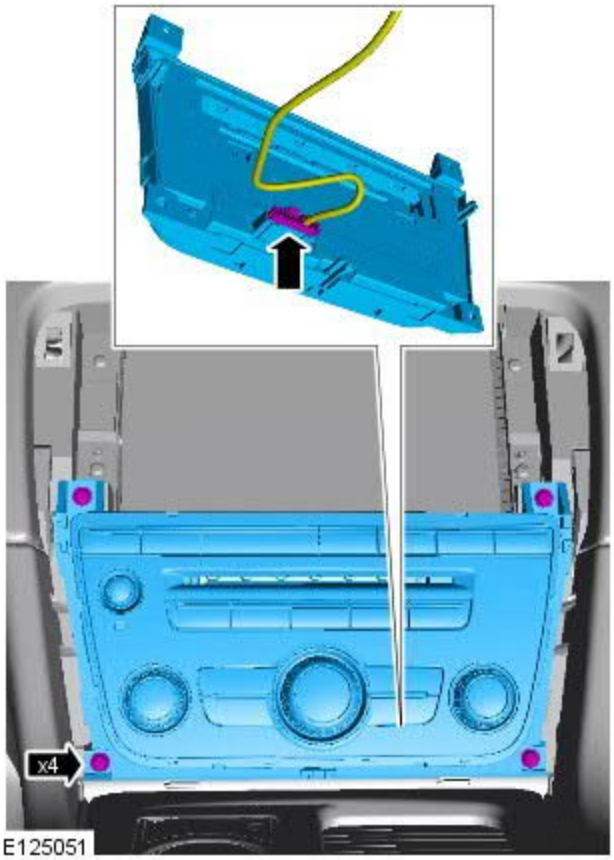


2.

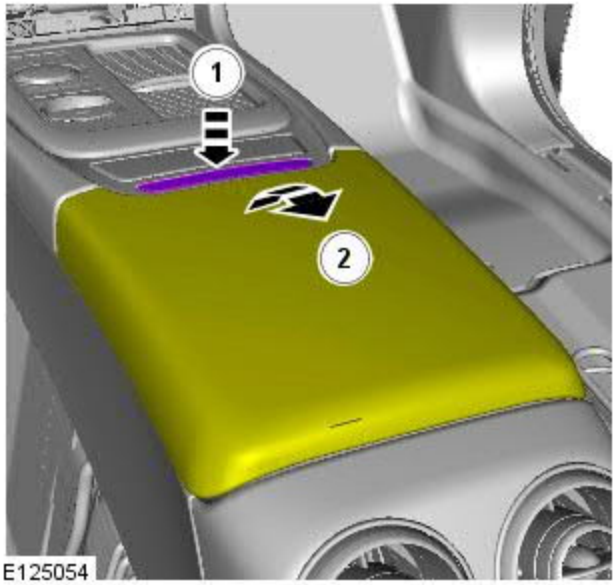




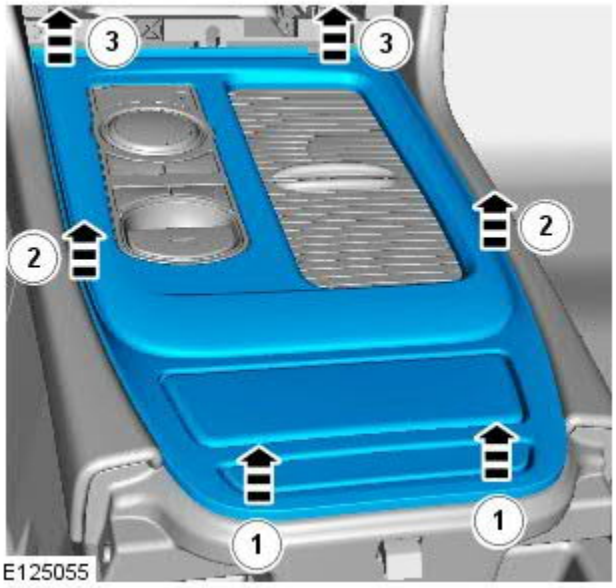
3. CAUTION: Take extra care not to damage the edges of the component.



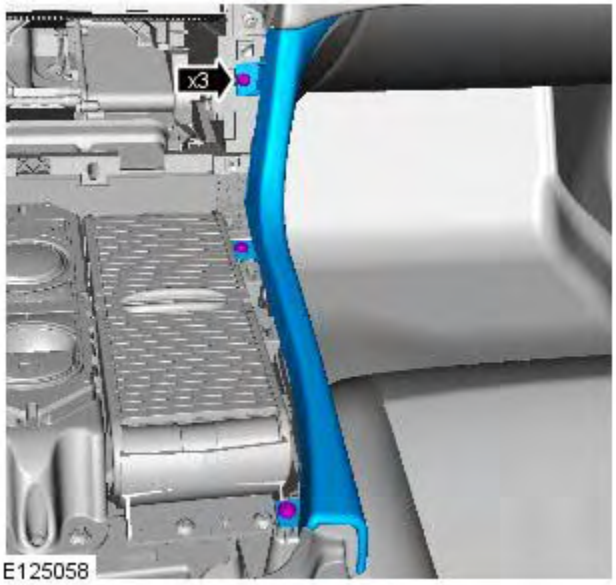
4. *Torque:* 4 Nm



5.

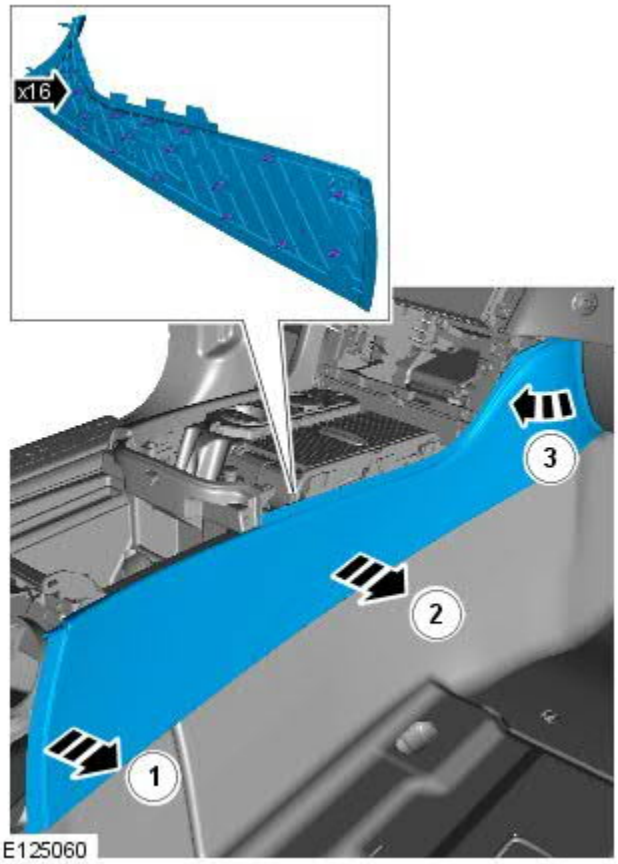


6. CAUTION: Take extra care not to damage the edges of the component.



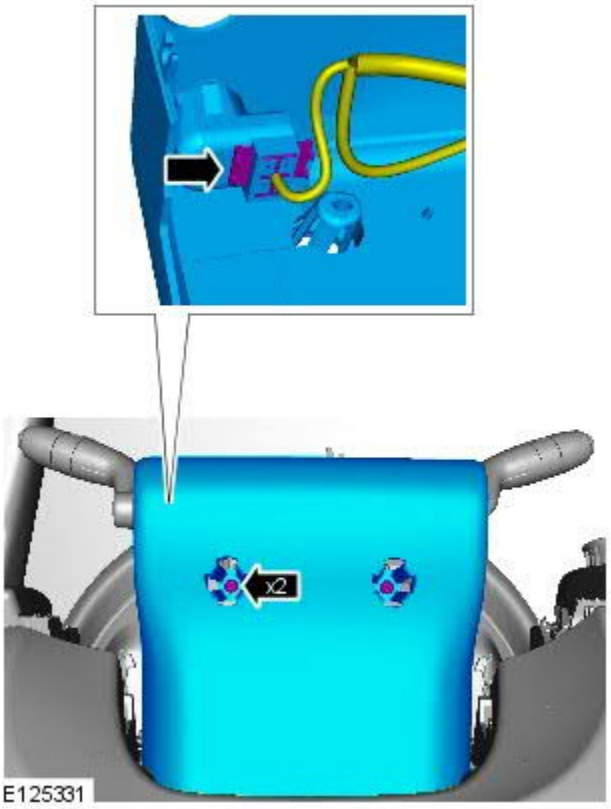
7. NOTE: RH illustration shown, LH is similar.

   Torque: 2.5 Nm

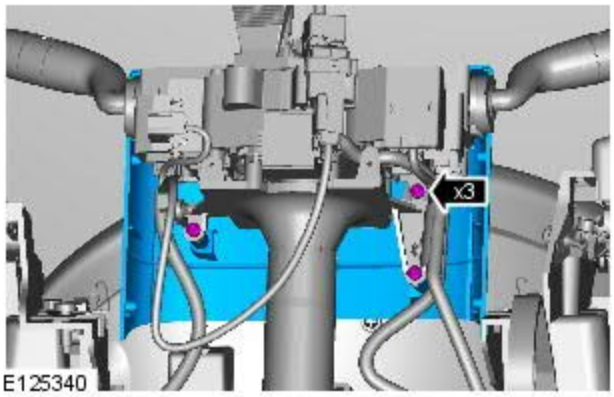


8. NOTE: RH illustration shown, LH is similar.

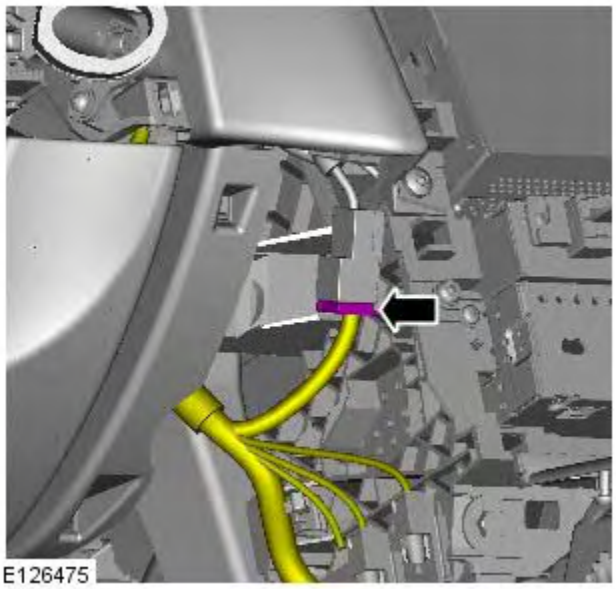
9. *Torque:* 2.5 Nm



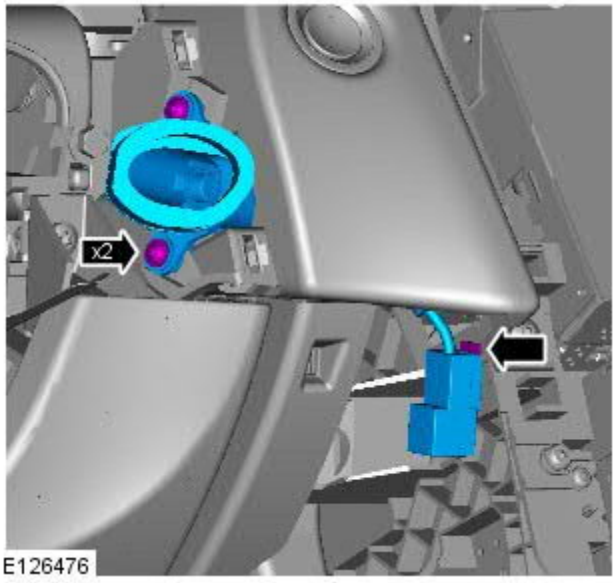
10. *Torque:* 2.5 Nm



11.



12. *Torque:* 2 Nm



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Climate Control - Passenger Side Register

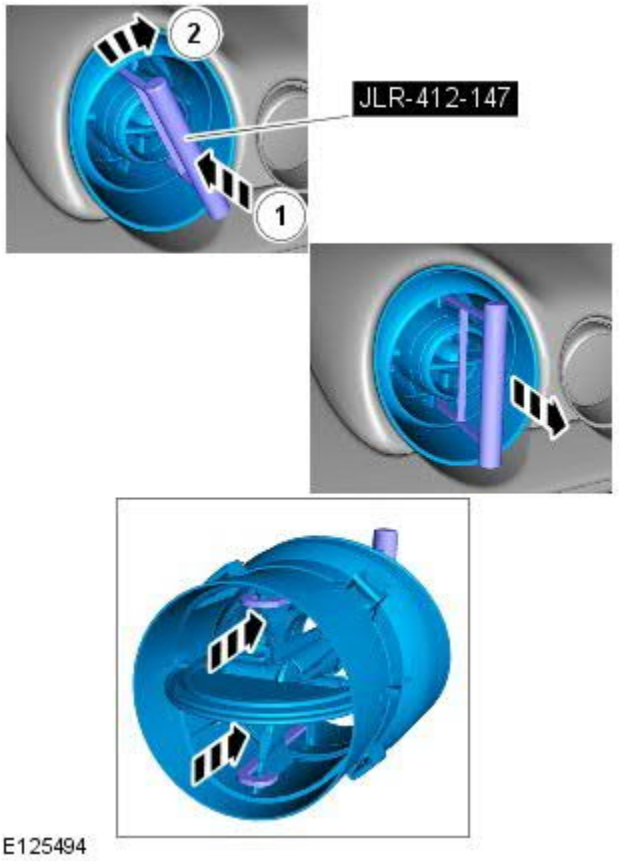
Removal and Installation

Special Tool(s)

	JLR-412-147 Remover, Register

Removal

NOTE: Removal steps in this procedure may contain installation details.



1. CAUTIONS:

   Before inserting the special tool, make sure that the register is fully open.

   Care must be taken to avoid damage to the internal components of the center registers.

   To install the register, align the securing clips and push the register into the housing until firmly secured in it's seated position.

   During removal, care must be taken not to damage the instrument panel covering with the register clips.

   NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

   Special Tool(s): JLR-412-147

Installation

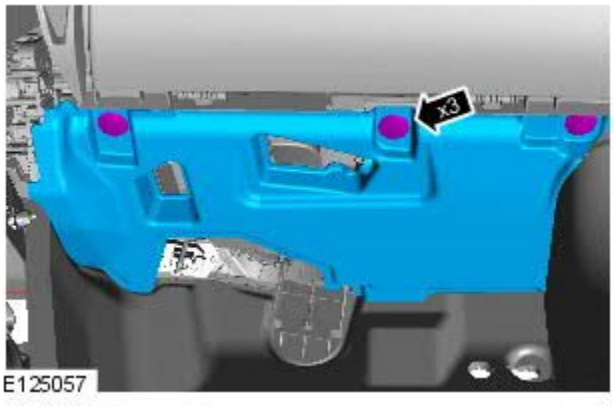
1. To install, reverse the removal procedure.

Published: 11-May-2011

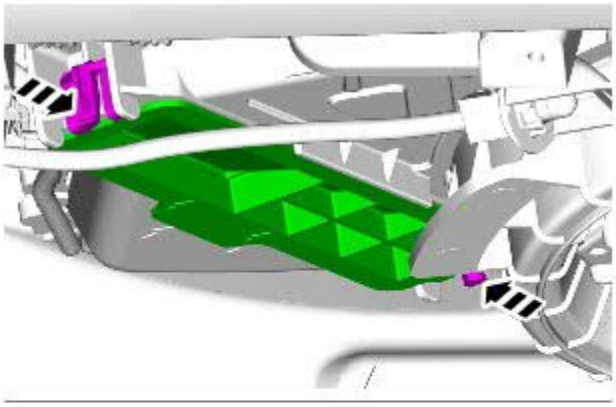
Climate Control - Pollen Filter

Removal and Installation

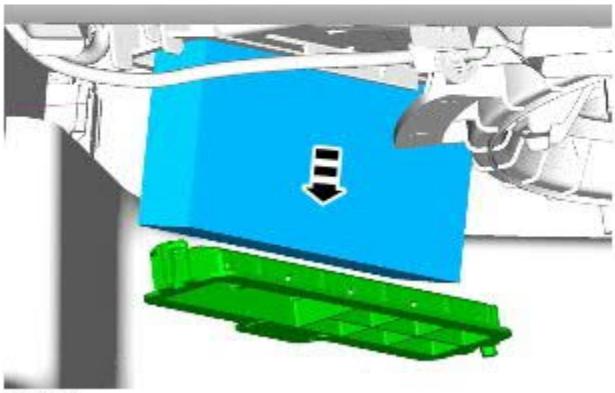
Removal

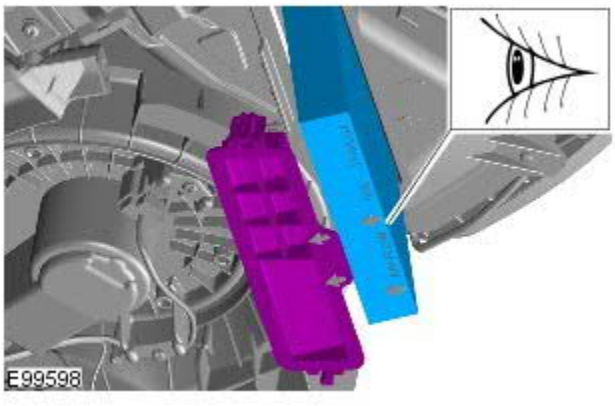


1. NOTE: LHD illustration shown, RHD is similar.



2. NOTE: RHD illustration shown, LHD is similar.





3. NOTE: LHD illustration shown, RHD is similar.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Climate Control - Recirculation Blend Door Actuator

Removal and Installation

Removal

NOTES:

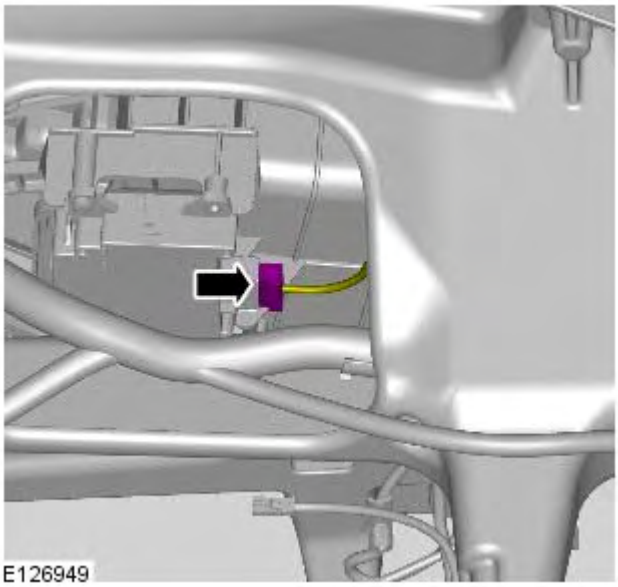
Removal steps in this procedure may contain installation details.

LHD illustration shown, RHD is similar.

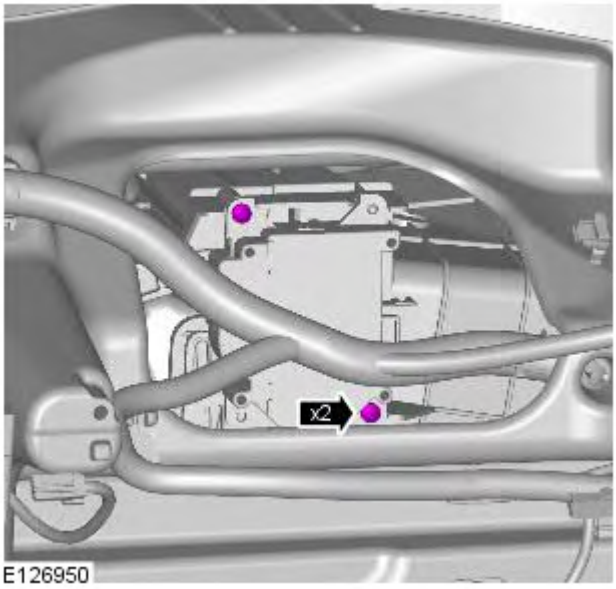
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. Refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).

3.



4. *Torque:* 1.5 Nm



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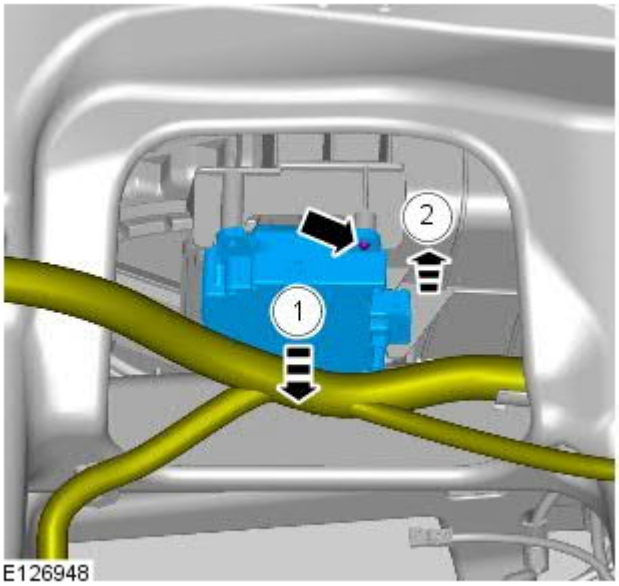


Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

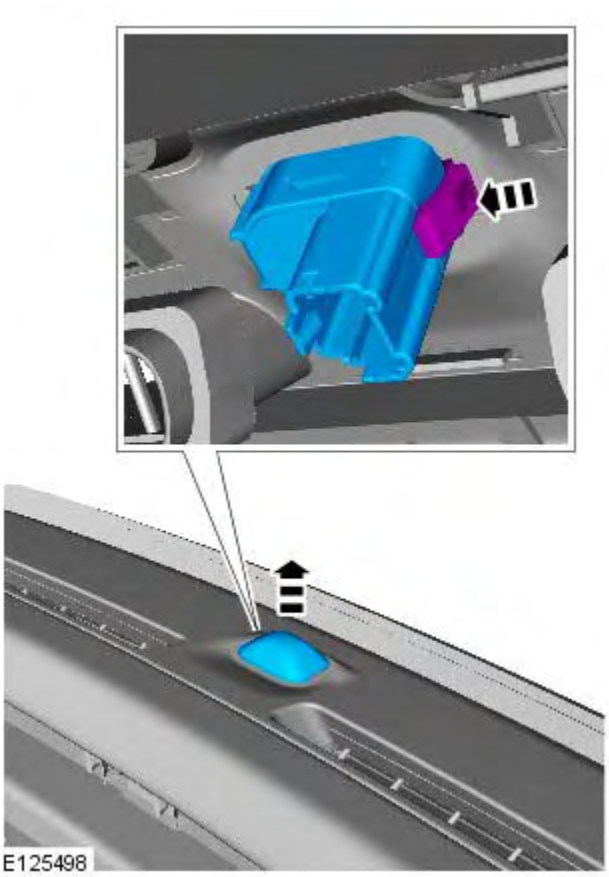
Climate Control - Sunload Sensor

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).
3.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Climate Control - Thermostatic Expansion Valve

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

All vehicles

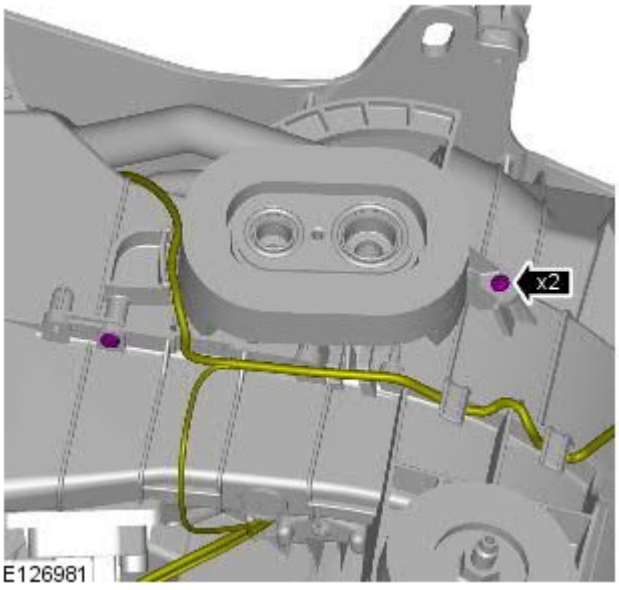
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

3. Refer to: Climate Control Assembly (412-01 Climate Control, Removal and Installation).

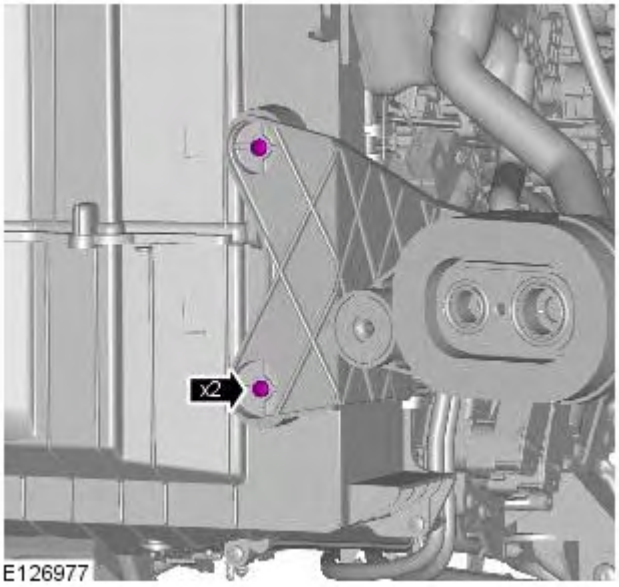
Right-hand drive vehicles



4. CAUTION: Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

   Torque: 1.5 Nm

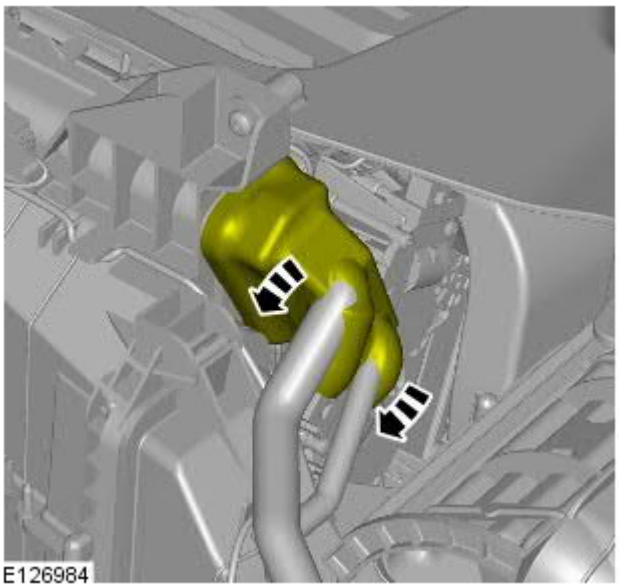
Left-hand drive vehicles



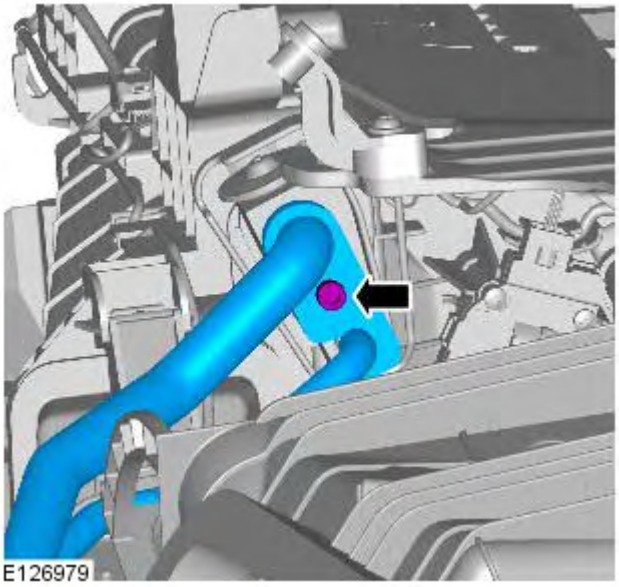
5. CAUTION: Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

   Torque: 1.5 Nm

All vehicles



6.

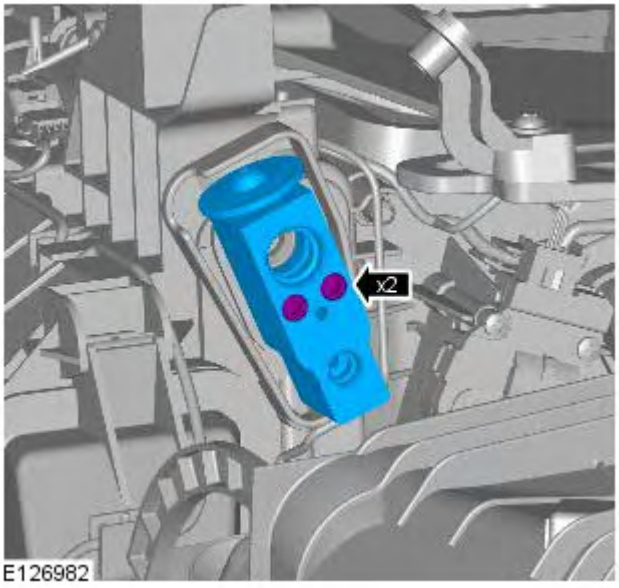


7. CAUTIONS:

   Take care not to damage the O-ring seals during installation.

   A new O-ring seal is to be installed.

   Torque: 5 Nm



8. CAUTIONS:

   Take care not to damage the O-ring seals during installation.

   A new O-ring seal is to be installed.

   Torque: 3.5 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Auxiliary Climate Control -

Description	Nm	lb-ft	lb-in
Electric booster heater retaining screws	1.3	-	11

Published: 11-May-2011

Auxiliary Climate Control - Electric Booster Heater

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

LHD illustration shown, RHD is similar.

Some variation in the illustrations may occur, but the essential information is always correct.

All vehicles

1. WARNING: Make sure to support the vehicle with axle stands.

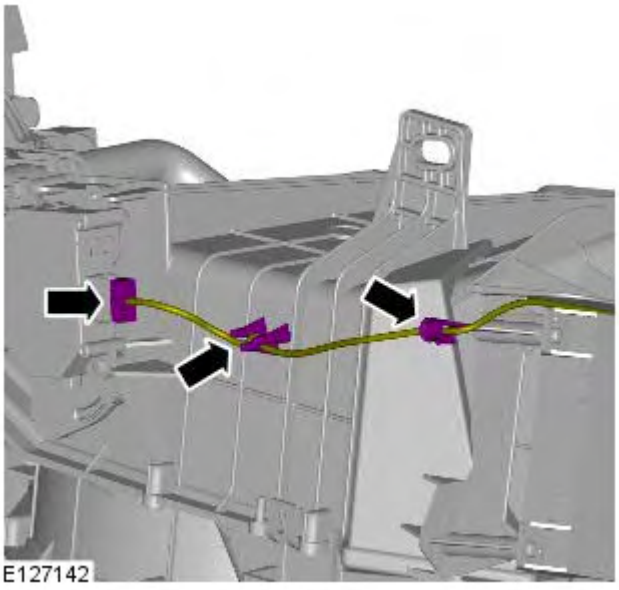
   Raise and support the vehicle.

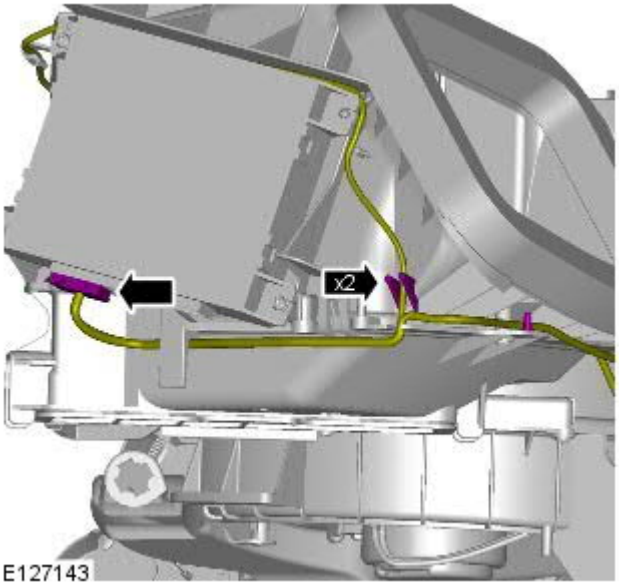
2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

3. Refer to: Thermostatic Expansion Valve (412-01 Climate Control, Removal and Installation).

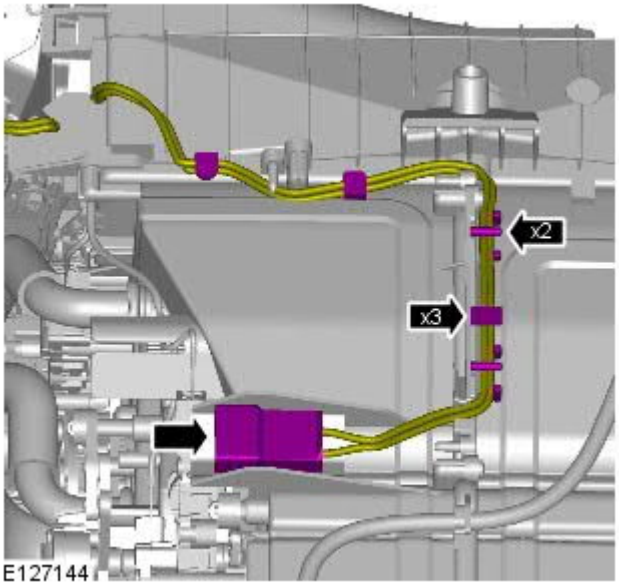
Right-hand drive vehicles

4. NOTE: LHD illustration shown, RHD is similar.

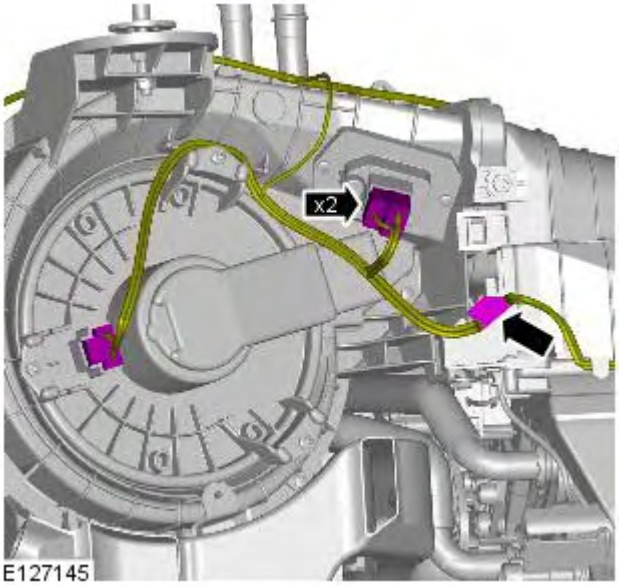




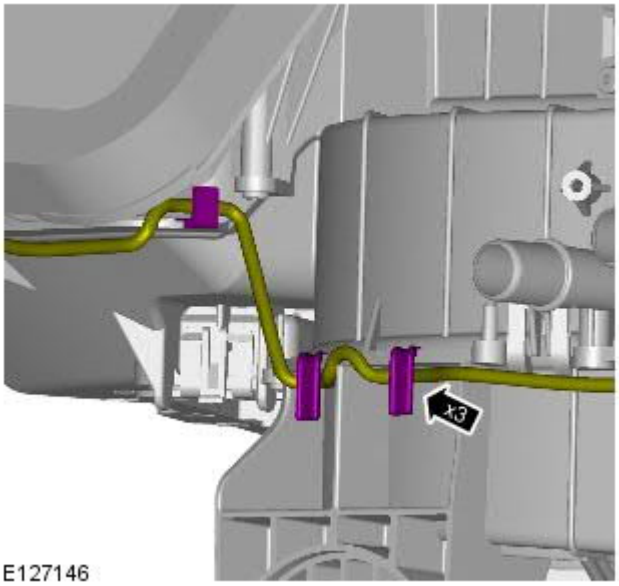
5. NOTE: LHD illustration shown, RHD is similar.



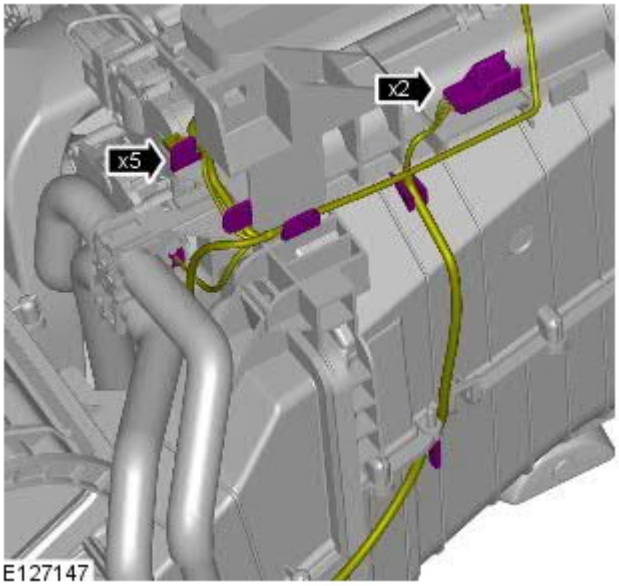
6. NOTE: LHD illustration shown, RHD is similar.



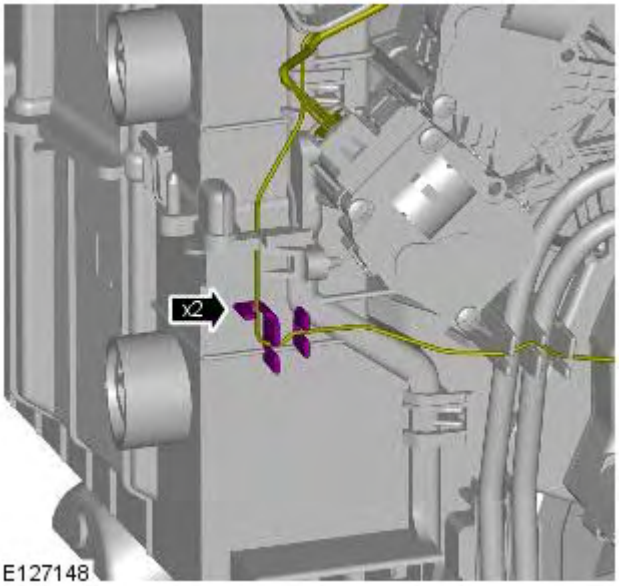
7. NOTE: LHD illustration shown, RHD is similar.



8. NOTE: LHD illustration shown, RHD is similar.

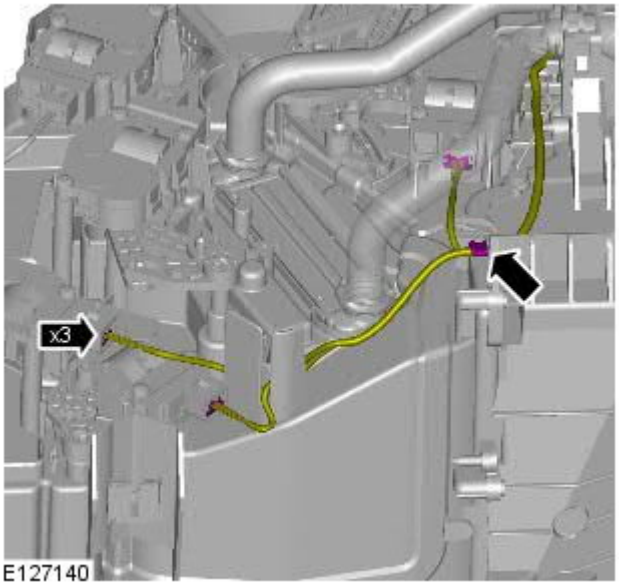


9. NOTE: LHD illustration shown, RHD is similar.



10. NOTE: RHD illustration shown, LHD is similar.

11.



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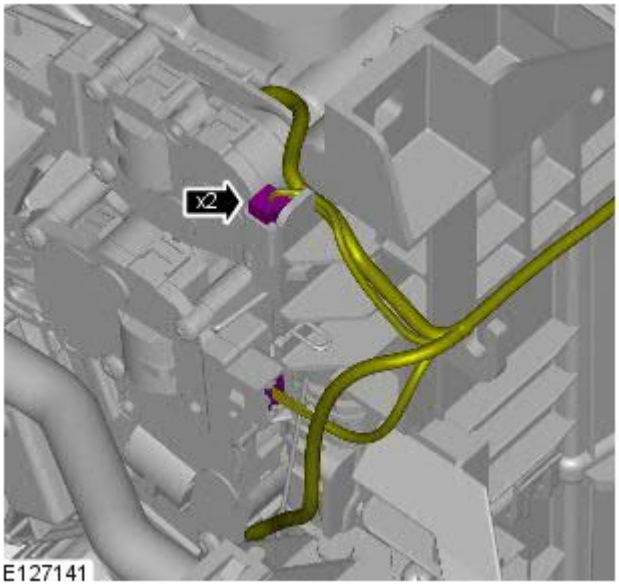
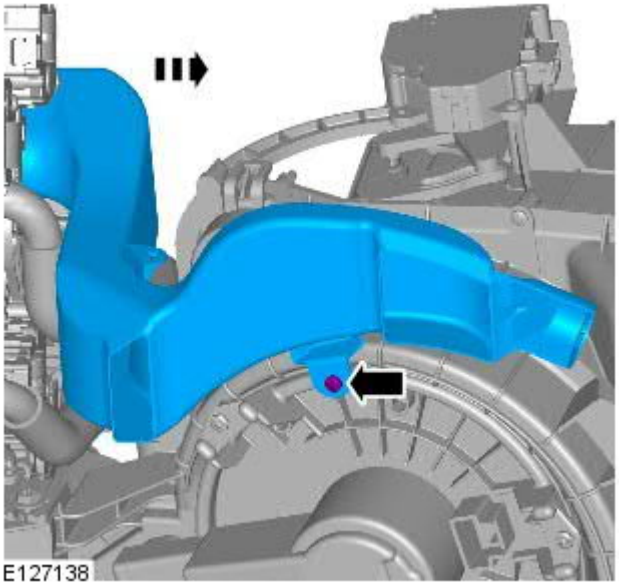
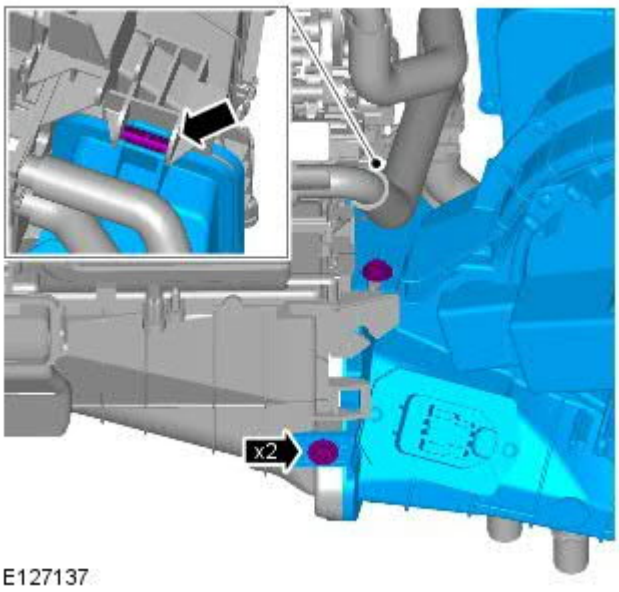




13. NOTE: LHD illustration shown, RHD is similar.

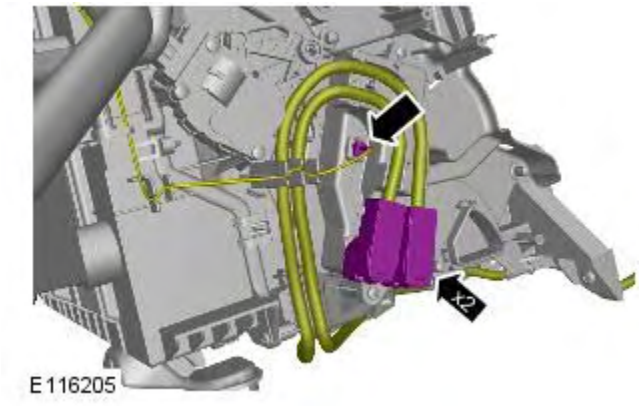
Torque: 1.5 Nm



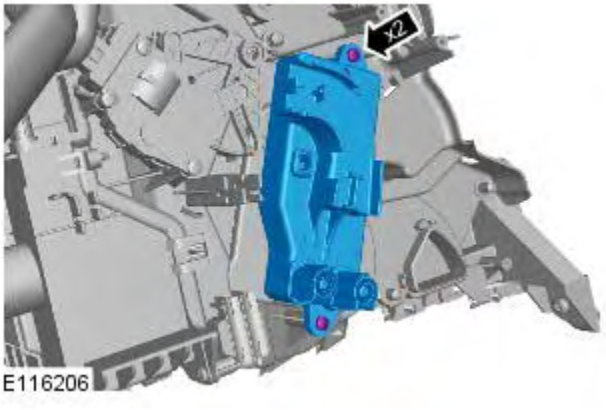
14. NOTE: LHD illustration shown, RHD is similar.

Torque: 9 Nm

All vehicles



15. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



16. CAUTION: Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

    NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

    Torque: 1.3 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Air Conditioning -

Torque Specifications

Description	Nm	lb-ft	lb-in
Air Conditioning (A/C) compressor retaining bolts	25	18	-
A/C compressor drain plug	15	11	-
A/C discharge line to compressor nut	18	13	-
A/C suction line to compressor nut	18	13	-
A/C discharge line to compressor bolt	9	-	80
A/C condenser to radiator bolts	7	-	62
A/C discharge line to condenser nut	8	-	71
A/C liquid line to condenser nut	8	-	71
A/C pressure cutoff switch	8	-	71

Published: 11-May-2011

Air Conditioning - Air Conditioning

Diagnosis and Testing

For additional information.
REFER to: Climate Control System (412-00 Climate Control System - General Information, Diagnosis and Testing).

Published: 14-Nov-2013

Air Conditioning - Air Conditioning (A/C) Compressor TDV6 3.0L Diesel

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

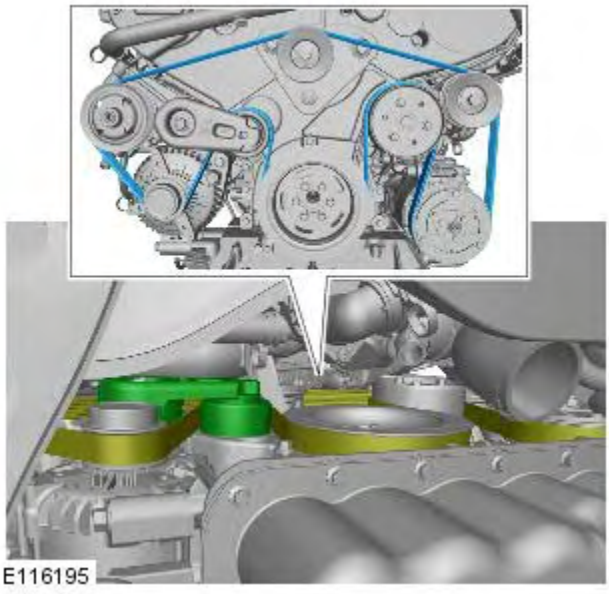
3. Refer to: Cooling System Partial Draining, Filling and Bleeding (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).

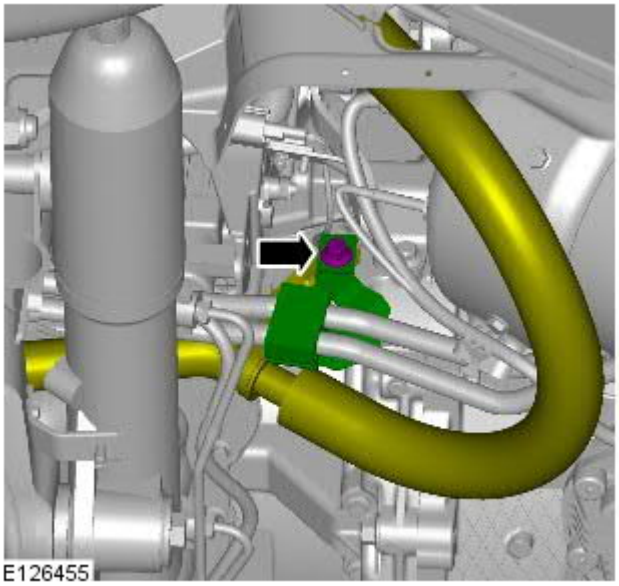
4. Refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

5. Refer to: Specifications (412-00 Climate Control System - General Information, Specifications).

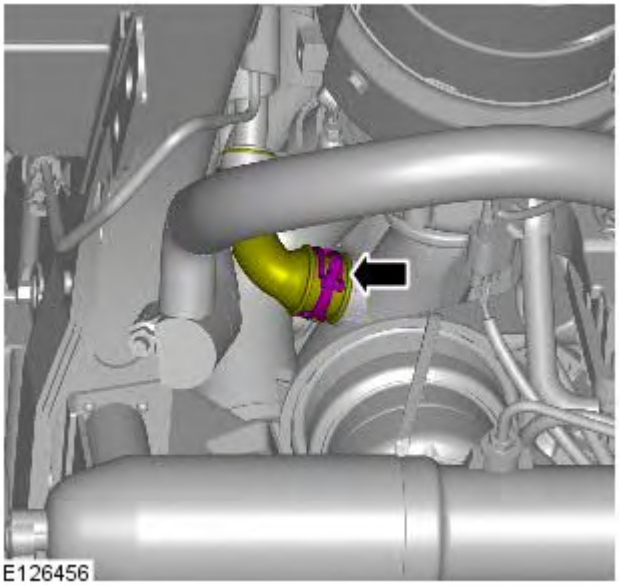
6. Refer to: Turbocharger Bypass Valve (303-04B Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Removal and Installation).

7.



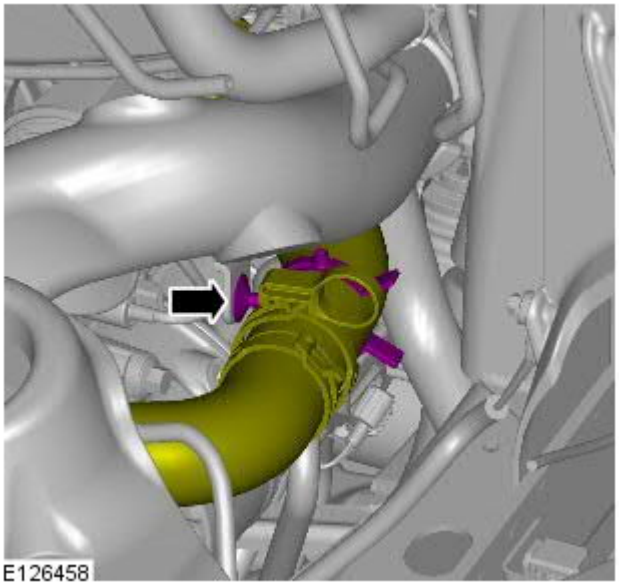

E126455

8. *Torque:* 23 Nm

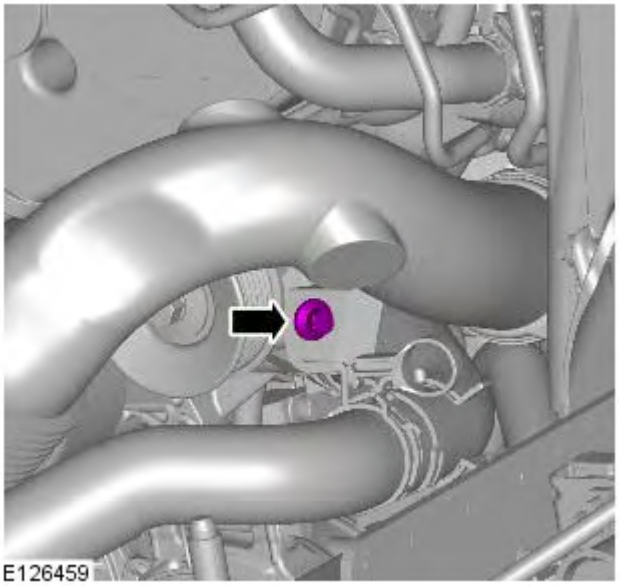

E126456

9.

10.



11. *Torque:* 8 Nm



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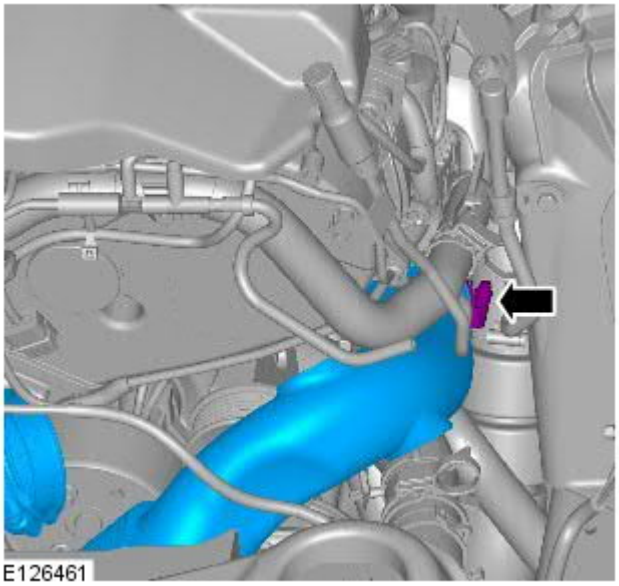
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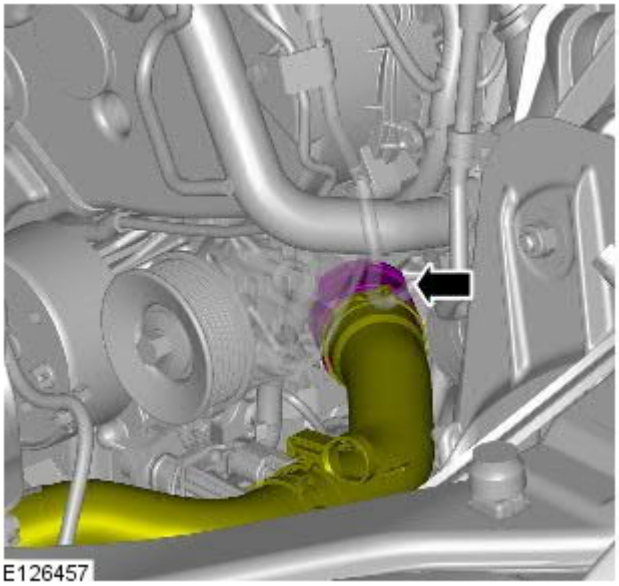
13.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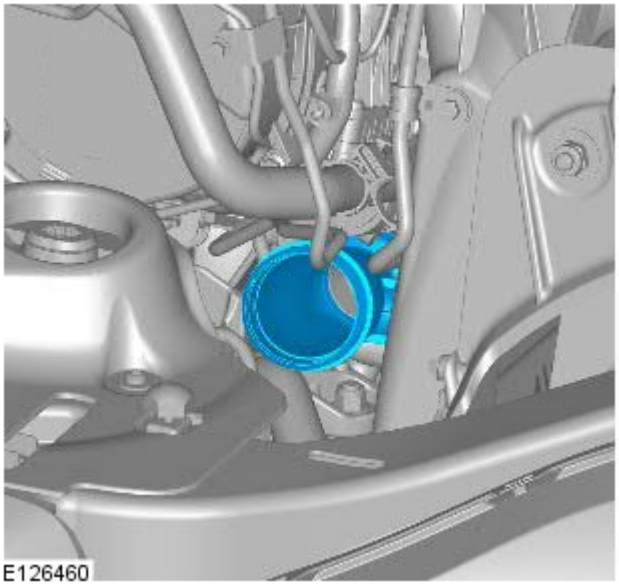
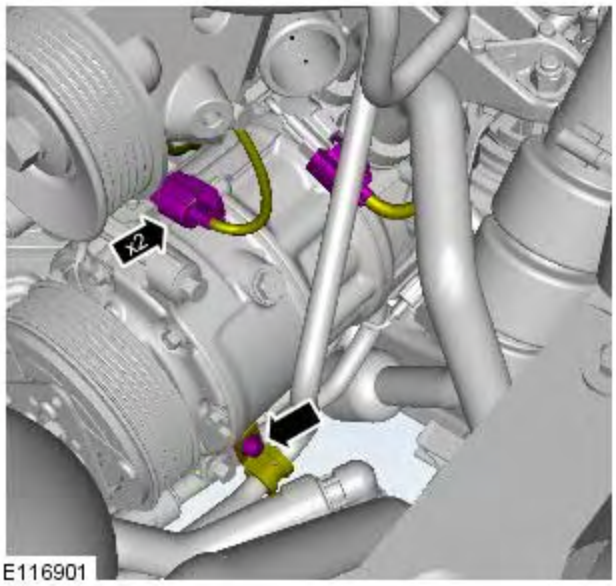
14.



15. *Torque:* 9 Nm



16. CAUTIONS:

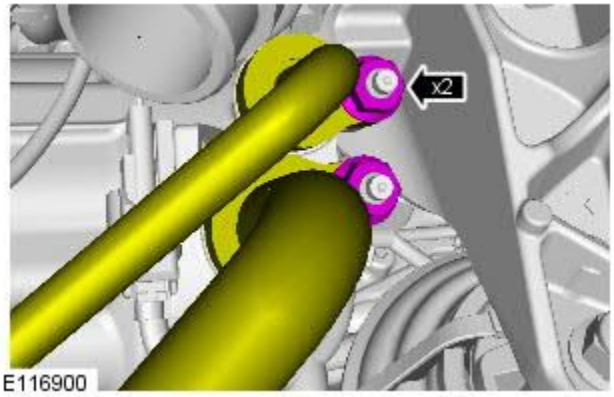
Take care not to damage the O-ring seals during installation.

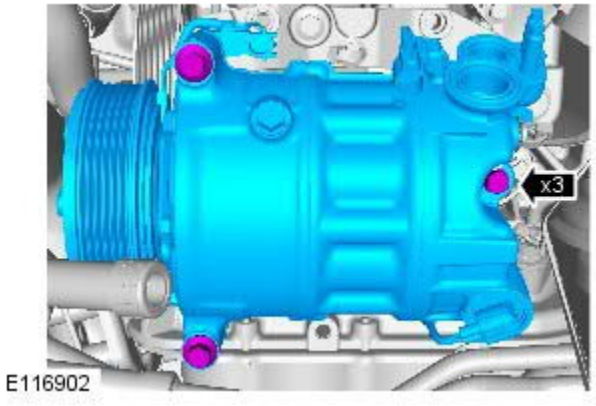
A new O-ring seal is to be installed.

Immediately cap all refrigerant lines to prevent ingress of dirt and moisture.

Make sure that all openings are sealed. Use new blanking caps.

Torque: 18 Nm





17. *Torque:* 25 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Air Conditioning - Condenser Core TDV6 3.0L Diesel

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

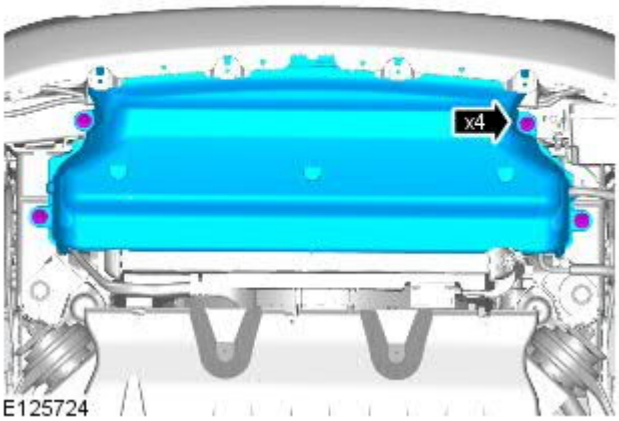
1. WARNING: Make sure to support the vehicle with axle stands.

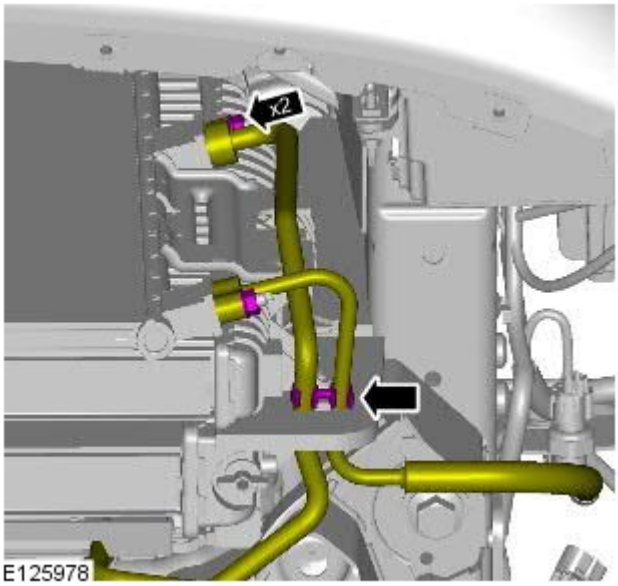
   Raise and support the vehicle.

2. Refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

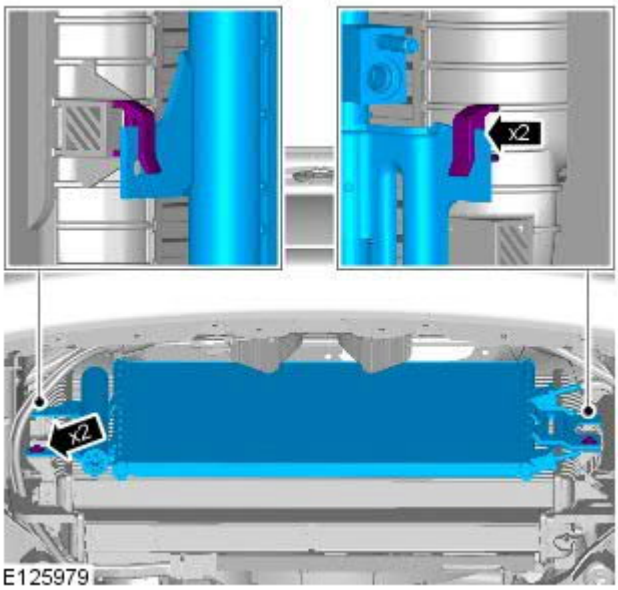
3. Refer to: Radiator Splash Shield (501-02 Front End Body Panels, Removal and Installation).

4.





5. *Torque:* 8 Nm



6. NOTE: Always protect the cooling pack elements to prevent accidental damage.

   Torque: 7 Nm

Installation

1. To install, reverse the removal procedure.

www.JagDocs.com

Published: 11-May-2011

Air Conditioning - Pressure Cutoff Switch

Removal and Installation

Removal

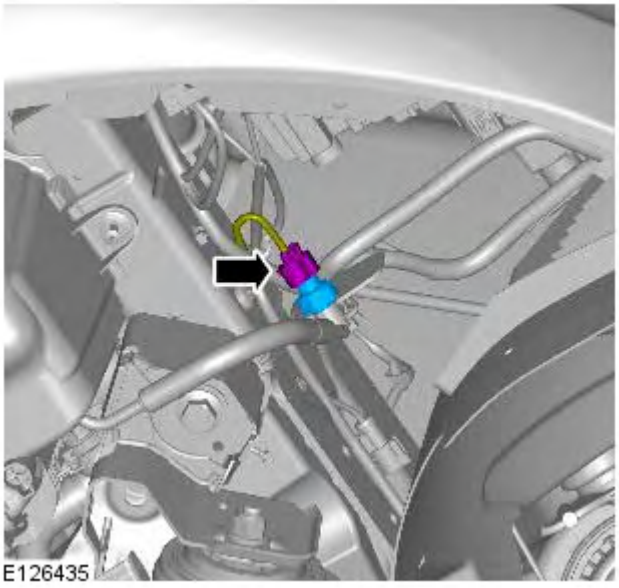
NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. For additional information, refer to: Air Conditioning (A/C) System Recovery, Evacuation and Charging (412-00 Climate Control System - General Information, General Procedures).

3. For additional information, refer to: Radiator Splash Shield (501-02 Front End Body Panels, Removal and Installation).



4. CAUTION: Make sure the air conditioning (A/C) hose does not turn when removing the low pressure switch.

   TORQUE: 8 Nm

Installation

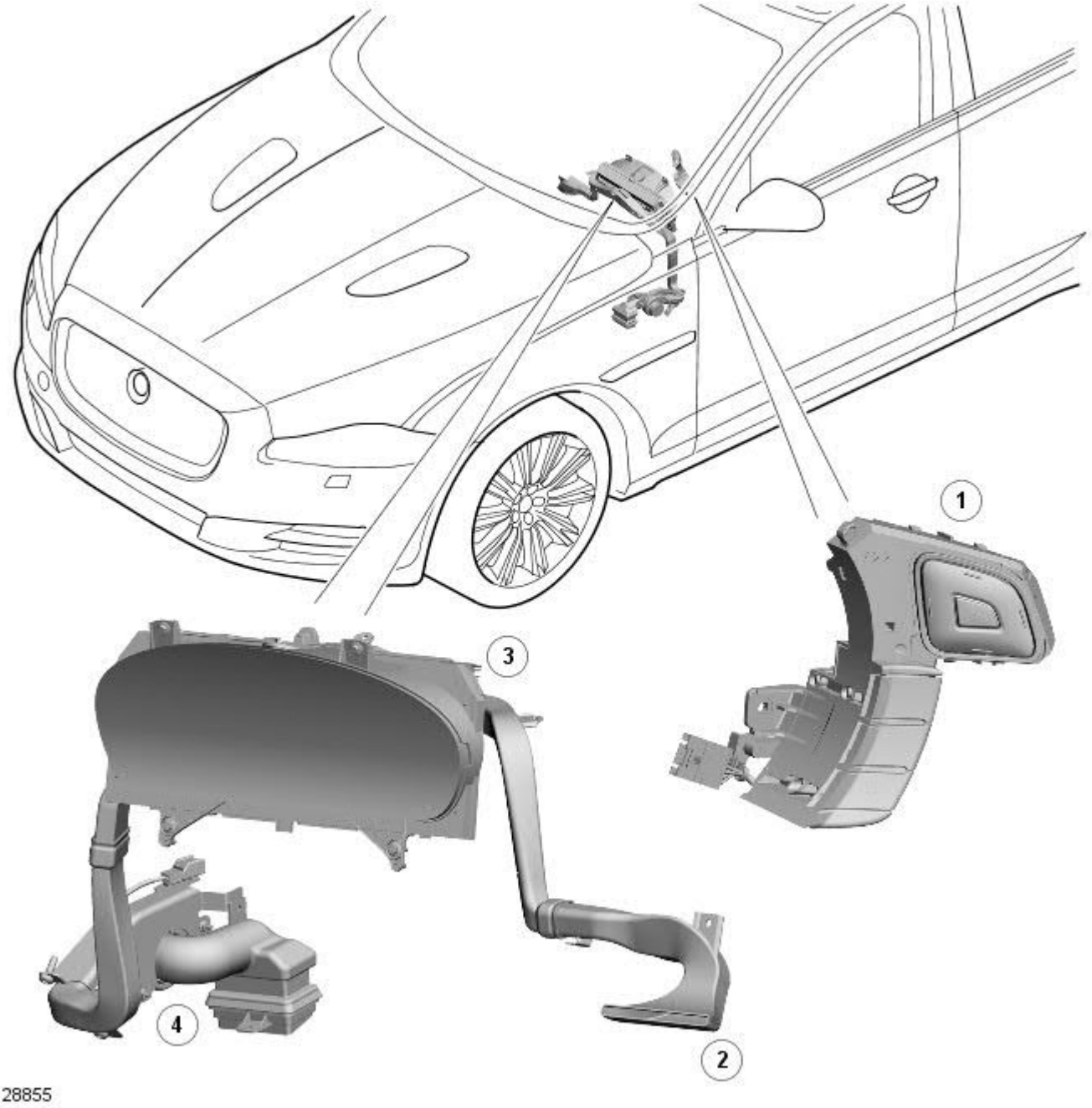
1. To install, reverse the removal procedure.

Published: 11-May-2011

Instrument Cluster - Instrument Cluster - Component Location

Description and Operation

INSTRUMENT CLUSTER - COMPONENT LOCATION



E128855

Item	Description
1	Right Hand (RH) steering wheel mounted switch assembly
2	Ventilation duct to Touch Screen Display (TSD)
3	Instrument cluster
4	Cooling fan

Published: 11-May-2011

Instrument Cluster - Instrument Cluster - Overview

Description and Operation

OVERVIEW

The instrument cluster is a high definition Thin Film Transistor (TFT) display.

The cluster is designed to look similar to a conventional instrument cluster for the main display. The display can be continually reconfigured to prioritise and refine the information presented to the driver. All displays are 'virtual' gauges with the speedometer and the tachometer being the dominant features of the new display. Only 2 hardwired warning indicators remain; the airbag warning indicator and the security warning indicator. Both of these indicators are LED (light emitting diode)'s.

Two ambient light sensors; one on either side of the pack, (to ensure the brightest lighting conditions are detected) are used to adjust cluster illumination in response to prevailing lighting conditions.

The instrument cluster features a number of warning indicators. The warning indicators illuminate in one of four colors which indicate the level of importance of the warning as follows:

- Red = Warning
- Amber = Caution
- Green = System operative
- Blue = Headlamp high beam operative.

A feature and driver preference menu is available to allow the driver to select certain features and functions of the instrument cluster and change them to their personal preference. A menu control 'joy pad' is located on the RH (right-hand) side of the steering wheel and allows selection of the displayed functions and navigation of the menus. When selected, the menu is displayed in the RH side of the TFT screen which allows access to a number of vehicle functions.

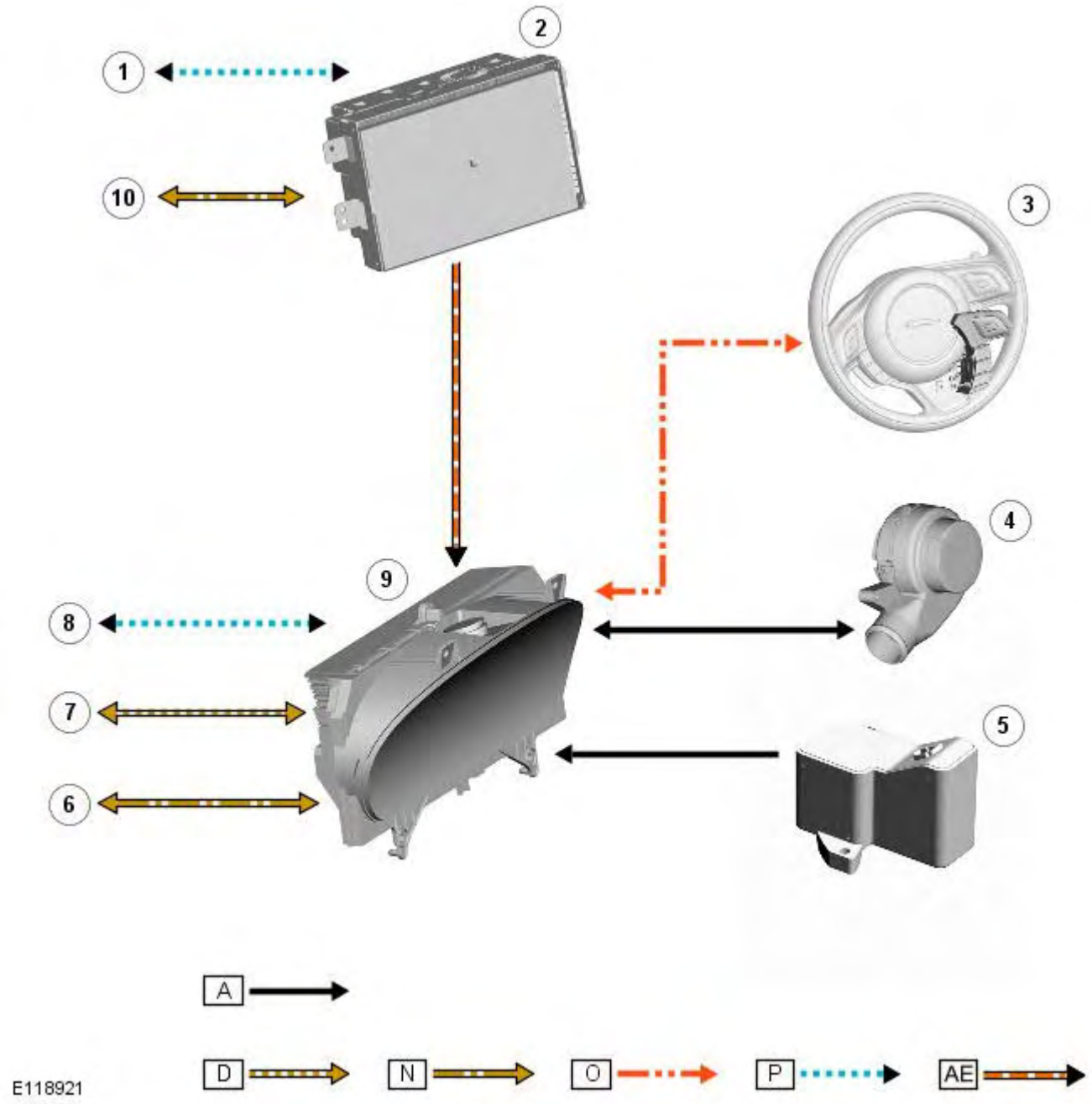
Published: 11-May-2011

Instrument Cluster - Instrument Cluster - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: **A** = Hardwired; **D** = High speed CAN bus; **N** = Medium speed CAN bus; **O** = LIN bus; **P** = MOST; **AE** = LVDS signal



Item	Description
1	Connection to MOST ring
2	Touch Screen Display (TSD)
3	Right Hand (RH) steering wheel mounted switch assembly
4	Instrument cluster cooling fan
5	Electric steering column lock
6	Connection to medium speed CAN bus

7	Connection to high speed CAN bus
8	Connection to MOST ring
9	Instrument cluster
10	Connection to medium speed CAN bus

System Operation

OPERATION

Vehicle Interface

Then instrument cluster receives a permanent power supply from the vehicle battery via a 50A midi-fuse located in the BJB (battery junction box) and then CJB (central junction box). The cluster also has a connection with the CJB for the security LED (light emitting diode) operation.

The instrument cluster communicates with other vehicle systems via the medium speed CAN (controller area network) bus, the high speed CAN bus and the Media Oriented System Transport (MOST) ring. The cluster is not a gateway for these interfaces; this task is performed by the CJB.

The instrument cluster is connected to the Touch Screen Display (TSD) by a Low Voltage Differential Signalling (LVDS) digital video screened cable. This connection is to support the detailed satellite navigation maps displayed in the instrument cluster.

A single wire from the instrument cluster to the electric steering column lock provides a ground for the lock operation. Power supply and control for the steering column lock is provided by the CJB via hardwired connection and a high speed CAN bus connection.

Cooling Fan

The cooling fan operation is controlled by the instrument cluster. The cooling fan receives a power supply via a 10A mini fuse in the CJB. Three additional wires connect the fan to the instrument cluster; one for a fan PWM (pulse width modulation) for fan speed, one for a monitor signal and a ground.

The instrument cluster monitors its internal temperature and also receives temperature information from the TSD. If one or both of these temperatures exceeds a predetermined value, the instrument cluster operates the cooling fan.

The instrument cluster can control the speed of the fan motor and hence the air flow to both the cluster and the TSD, via air ducting, by varying the PWM signal to the motor.

At temperatures of up to 40°C (104°F) the cluster operates the fan motor speed at a duty cycle of 30%. as the temperature increases, the duty cycle is increase linearly up to a 100% duty cycle at temperatures of 60°C (140°F).

The monitor connection between the fan and the instrument cluster is used by the cluster to detect fan faults (for example a blockage). Any faults are recorded as a DTC (diagnostic trouble code) in the instrument cluster.

When the TSD requires cooling a request is sent from the TSD on the medium speed CAN bus to the instrument cluster. The instrument cluster uses the information from the TSD to operate the fan at the required speed using PWM.

If the TSD or the instrument cluster are individually requesting cooling fan operation, the fan request is granted for that components requirements. If both the TSD and the instrument cluster both request fan operation, the fan duty cycle is set to operate to the greater of the two requests.

Right Hand (RH) steering wheel mounted switch assembly

A LIN (local interconnect network) bus connection from the clockspring to the instrument cluster receives signals from the RH (right-hand) steering mounted switch assembly.

The switch assembly contains a control module. The module outputs a reference voltage to the joy pad in the RH steering wheel switch assembly. The switches in the switch assembly are connected through several resistors in series to a ground point. The control module monitors the resistance in the switch circuit to determine the selected switch function.

When a switch is operated (switch contact momentarily closed), the control module senses the change in resistance and determines the requested function by the measured resistance value. The control module converts this information into a LIN bus message which passed via the clockspring to the instrument cluster in the LIN bus.

NOTE: The control module in the RH steering wheel switch assembly also passes information from the speed control switches to the speed control module in the same way, but these are not related to instrument cluster operation and control.

Component Description

DESCRIPTION

Instrument Cluster

The instrument cluster comprises a 12.3 inch Thin Film Transistor (TFT) with a multilayered virtual display. The cluster has a high level of graphic presentation and interactive functionality. These features give the driver advanced levels of control and set-up using interactive graphic menu features.

The instrument cluster combines a virtual representation of virtual analogue instruments, graphic information, digital information and warning signals. The cluster is linked via a LVDS cable, the MOST ring and the medium speed CAN bus to the TSD which provides selected information directly in the driver's view in addition to the instrument panel mounted TSD.

The TFT screen uses a specific type of field-effect transmitter made by depositing thin films of a semi-conductor active layer, as well as the dielectric layer and metallic contacts, over a supporting substrate. The display comprises an active matrix of a large number of individual light emitting picture elements (pixels). Each pixel incorporates its own transistor switch and is controlled by the application of positive and negative voltages across rows and columns. The transistors are made from a thin film of silicon deposited on a glass panel (hence TFT) and each transistor takes up only a small fraction of the area of its pixel. The remaining part of the silicone film is etched away to allow light from the pixel to pass through forming the display.

The instrument cluster screen displays at a resolution of 1280 X 480 pixels, at a cycle time of 30 frames per second and an aspect ratio of 8:3 (image width divided by the height), so it has clear definition and no visible delay in changing information.

The instrument cluster presents the information in 3 zones, but the information displayed in each zone can vary with the chosen mode and the required information to be displayed.

Standard Mode Display

E121537

In standard mode the:

LH (left-hand) Dial includes the following displays:

- Fuel gage
- Digital clock, ambient temperature or frost warning icon
- Information center with sub-displays for entertainment, phone and navigation
- Trip computer with sub-display for vehicle odometer, journey distance, average speed, average fuel consumption, instantaneous fuel consumption and distance to empty
- Engine temperature gage
- Warning indicators.

Center Dial includes the following displays:

- Speedometer
- Warning indicators.

RH Dial includes the following displays:

- Normally the tachometer
- Message center to display warnings and temporary alerts
- system control menus, selected using the joy pad on the RH steering wheel switch.

The 3 zones can display warning indicators at dedicated locations as shown the following illustration.

Warning Indicators

Item	Description
1	Airbag warning (amber)
2	Low fuel warning (amber)
3	Frost warning (amber)
4	LH turn signal indicator (green)
5	Brake System warning (red) - USA only
6	Brake system warning (red) - ROW
7	Emergency brake assist warning (amber) - USA only
8	Emergency brake assist warning (amber) - ROW
9	High beam warning (blue)
10	Automatic Speed Limiter (ASL) active warning (amber)
11	Forward alert active (green)
12	Rear fog lamps active (amber)
13	Side lamps active (green)
14	Anti-lock Brake System (ABS) warning (amber) - USA only
15	Anti-lock Brake System (ABS) warning (amber) - ROW
16	RH turn signal indicator (green)
17	General warning indicator (amber)
18	General warning indicator (red)
19	Glow plugs active warning (amber) (Diesel models only)
20	Oil pressure warning (red) (Diesel models only)
21	Charge indicator warning (red)
22	Speed control active (green)
23	Park brake system warning (red) - USA only
24	Park brake system warning (red) - ROW
25	Adaptive speed control active (amber)
26	Dynamic Stability Control (DSC) active warning (amber)

27	Adaptive Front lighting System (AFS) warning (amber)
28	Automatic high beam active warning (amber)
29	Check engine MIL warning (amber)
30	Coolant temperature warning (red)
31	Seat belt warning (red)
32	Tire pressure monitoring warning (amber)
33	DSC off warning (amber)

The general warning indicators (amber and red) are illuminated to alert the driver to a message in the message center. They are illuminated when a warning is required to be displayed, even if it is not currently being displayed due to being cycled with other messages. All warning messages are associated with a warning indicator colour according to their status. Some messages are associated with a no-color warning which means the message is displayed without one of the general warning lamps being illuminated.

When the ignition is off the instrument cluster TFT screen is blank. When the vehicle is unlocked, the instrument cluster, along with the TSD, begin a start-up routine which is not visible to the driver. The start-up routine includes acquiring data from vehicle systems. The display is configured once the start burton is pressed to either switch on the ignition or start the engine.

The instrument cluster displays the Jaguar 'leaper' badge before the main instrument graphics begin to be displayed and the instrument cluster performs a series of 'pre-drive' checks. The instrument cluster displays the standard 3 dial display of speedometer, tachometer and fuel/temperature gage. The dials, although entirely 'virtual' give a 3-dimensional impression of being physical dials with shadows and highlights added by the TFT screen.

The needles on the dials are also virtual and sweep around the speedometer and tachometer dials in the same manner as a 'conventional' mechanical needle. As the needle approaches a number on the dial, that number and the number preceding and following it become more prominent by brightening the display in that area of the TFT. This feature can be selected on or off using the display settings menu.

The instrument cluster can determine what information to display, when to display it and where on the display it will be shown. This is governed by preset display properties. The system versatility allows the instrument cluster to display information or hide it from view when its is not required.

Dynamic Mode Display

E121541

A dynamic mode is available by pressing the dynamic mode button in the floor console. When selected, this mode modifies the instrument cluster display only the components required for performance driving. A chequered flag icon is displayed in the tachometer to signify that dynamic mode is active and the display is illuminated in a red color.

If winter mode is selected by pressing the appropriate button on the floor console a message is displayed in the tachometer area, with a combined car and snow flake image with the words 'Winter Mode Confirmed' displayed. The change to this mode is confirmed by the instrument cluster being illuminated in a blue highlighting color and a winter mode icon is displayed in the tachometer area.

The instrument cluster can be easily changed by the driver to display either imperial (miles) or metric (km) units for the trip computer, speedometer and ambient temperature. This is configured during vehicle production to meet legislative and market requirements, but the driver can change certain unit displays using the instrument cluster menus.

Instrument Cluster Menu

E121542

The driver can use the 'joy pad' on the RH steering wheel switch assembly to navigate through a series of menu-driven features. The menu's are displayed in the RH side of the instrument cluster and override the tachometer display. If another function of higher priority is required to be displayed, then the menu display will also be overridden. The menu will be displayed until the driver closes the menu display.

When the driver uses the joy pad on the RH steering wheel switch assembly the menu appears as vertical stack of 6 rows of menu selections as follows:

- Main Menu
- Show Warnings (OK)
- Vehicle Set-up
- Trip Computer
- Display Settings
- Service Menu.

Most menu levels are contained on one page, however, for lists with more than 6 sub-items additional up/down arrows are positioned adjacent to the menu to signify there are additional menu items to display. The menu items and sun-menu items will not obscure any active warnings in the instrument cluster.

Dependent on vehicle specification, if a feature is not present on the vehicle, it will not be shown in any of the menus.

To exit the menu navigate the cursor to the 'back' arrow on the LH side of the Main Menu line. The menu will be removed and replaced with the tachometer or the message center, dependant on priority.

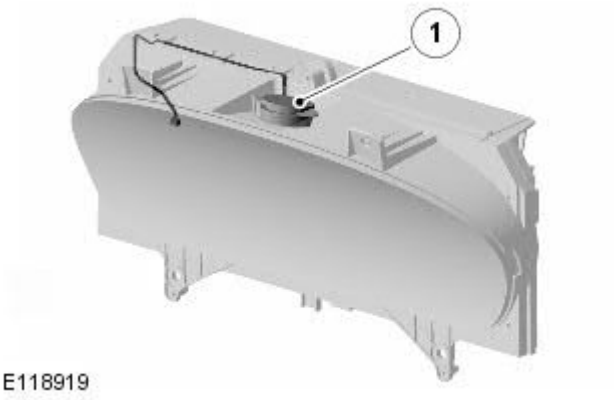
The Service Menu allows access to the following information:

- Vehicle Identification Number (VIN)
- Oil level display (not dynamic)
- Auto High Beam (AHB) sensitivity.

The AHB sensitivity is only available for NAS markets as a test option.

Additional Instrument Cluster Features

A speaker is mounted on the top of the instrument cluster casing. The speaker generates audible warnings and is controlled by a sound generator within the instrument cluster. The speaker cannot be replaced separately.



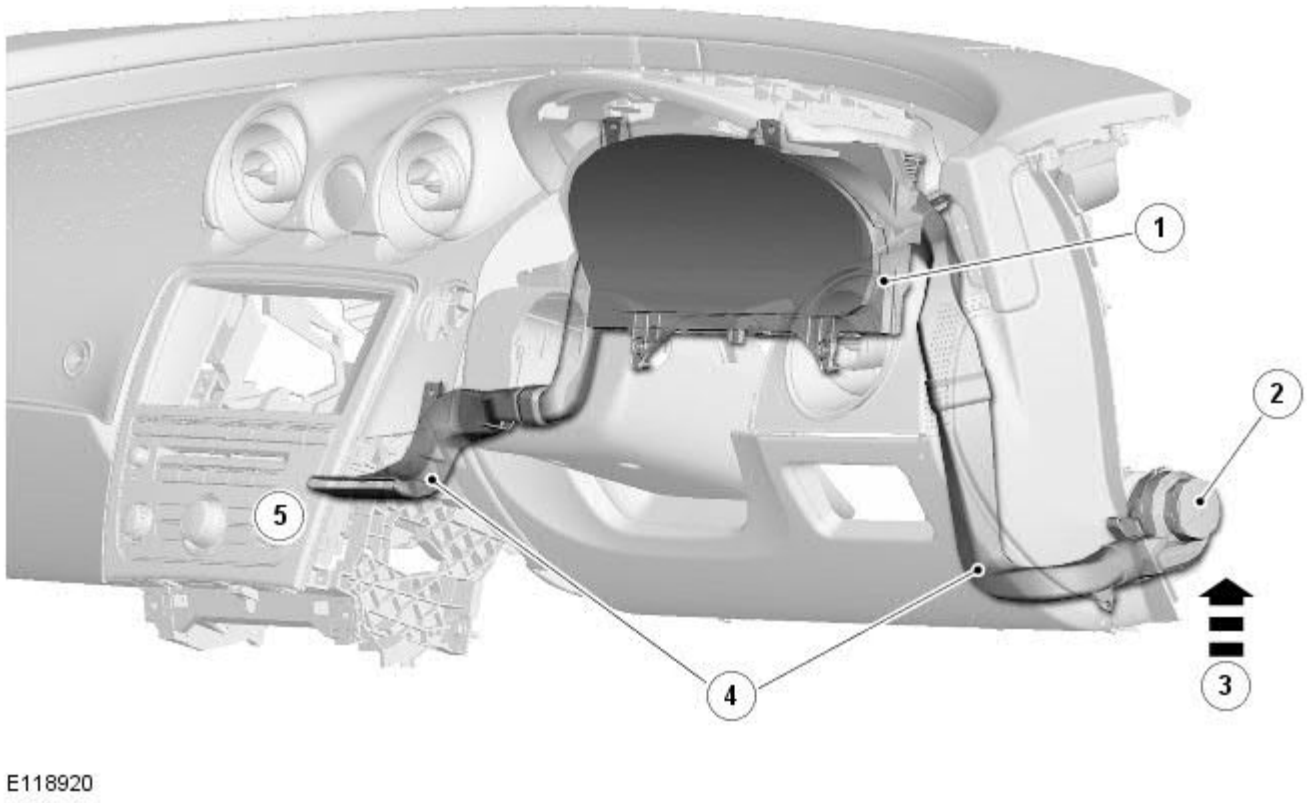
Item	Description
1	Instrument cluster speaker

On each side of the TFT screen are 4 small apertures, 2 each side. The upper apertures on each side are ambient light sensors. The sensors are used to adjust the cluster illumination in response to the prevailing ambient light conditions. The instrument cluster also has high output LED backlighting and a smoked glass screen which helps prevent washout by reducing the amount of sunlight that can reach the screen directly. The TFT screen also incorporates an anti-glare coating.

The lower apertures contain LED status warning indicators. The LHLED is the primary SRS (supplemental restraint system) warning indicator. A secondary SRS warning indicator is located within the TFT screen and is only used in case of failure of the primary warning indicator for legislation requirements.

The instrument cluster is integrated into the vehicle start authorization process as it includes encoded data exchange information as part of the distributed start authorization strategy. The cluster also controls the ground switching of the electric steering column lock.

Cooling Fan



Item	Description
1	Instrument cluster
2	Cooling fan

3	Air inlet
4	Ducting
5	Air outlet to TSD

An electric cooling fan is located outboard of the steering column, behind the instrument panel. The fan is attached to a bracket which in turn is attached to the instrument panel structure.

The fan has a filtered air intake and draws air from below the instrument panel. Plastic ducting is routed from the fan to the rear of the instrument cluster. A rectangular port in the instrument cluster distributes the cooling air around the rear of the TFT screen. The ducting from the instrument cluster is also routed to the rear of the TSD to provide cooling for the TSD in high ambient temperatures.

NOTE: Vehicles fitted with a dual-view TSD have an integral fan within the TSD, in addition to the cooling fan for the cluster. Single view TSD units have no integral fan and rely solely on the cooling from the cluster fan.

Right Hand (RH) steering wheel mounted switch assembly

The instrument cluster menus are navigated and items selected using the joypad control. The joy pad control is a 2-axis switch with a central button (OK).

Pressing any of the joypad controls activates the menu display in the instrument cluster.

The up and down arrows can be used to navigate through the menu list, with the selected menu being highlighted. If the selected menu has a sub-list, the right arrow is used to display and view the sub-list. Pressing the left arrow will close the sub-list and return to the main menu. To select an menu, press the OK button and the selected menu will be displayed in the instrument cluster.

If the menu is activated and no further selections are made using the joy pad within 10 seconds, the menu will time-out and the menu will be removed from the instrument cluster display. Once the joy pad has been used to select a menu, the time-out period is extended to 30 seconds.

To exit the menu's, select the top menu 'Main Menu' and press OK to close the menu display.

Published: 13-Jun-2013

Instrument Cluster - Instrument Cluster

Diagnosis and Testing

Principles of Operation

For a detailed description of the Instrument Cluster system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (413-01 Instrument Cluster)

Instrument Cluster (Description and Operation),
Instrument Cluster (Description and Operation),
Instrument Cluster (Description and Operation).

Car Configuration File (CCF)

CAUTION: If a new instrument cluster is to be installed, the instrument cluster renewal procedure must be carried out using the approved diagnostic system. This will ensure that the CCF data is correctly transferred from the central junction box to the replacement cluster. The CCF will also need to be updated using the approved diagnostic system if the vehicle is modified in service from its original factory specification. This can include the fitting of non-standard wheels and/or tires and optional accessory dealer install components with an electrical interface, such as park assist control

The CCF contains all relevant data about the specification and market condition of the applicable vehicle, immobilization codes and driver personal settings. This information is retained in the central junction box, the engine control module and the instrument cluster enabling each system module to detect which systems and components are installed to the vehicle. The information is continuously transferred between these three system modules to ensure that the data is constantly backed-up between the modules

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle

1. Verify the customer concern
2. Confirm which, if any, warning lights and/or messages were displayed on the instrument cluster. For a list of messages: REFER to: Information and Message Center (413-08 Information and Message Center, Description and Operation) / Information and Message Center (413-08 Information and Message Center, Description and Operation) / Information and Message Center (413-08 Information and Message Center, Description and Operation).
3. Visually inspect for obvious electrical faults

Visual inspection

Electrical
• Battery • Fuses - Central and battery junction boxes - Megafuses • Wiring harness • Damaged, loose or corroded connectors • CAN circuits • Instrument cluster • Central junction box • Engine control module

4. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
5. Use the approved diagnostic system or a scan tool to retrieve any DTCs before moving onto the DTC index
   - Make sure that all DTCs are cleared following rectification

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Instrument Cluster (IPC) (100-00 General Information, Description and Operation).

Published: 28-Jun-2013

Instrument Cluster - Instrument Cluster

Removal and Installation

Removal

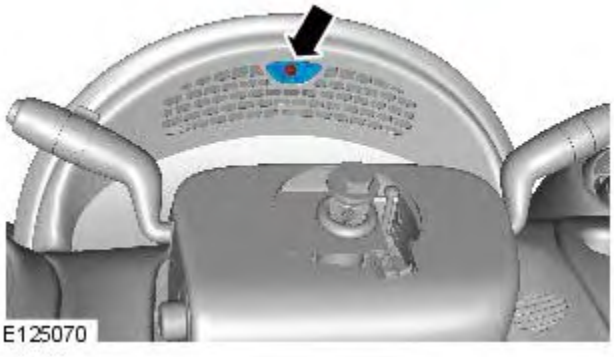
NOTE: Removal steps in this procedure may contain installation details.

1. CAUTION: If a new instrument cluster is to be installed, the Jaguar approved diagnostic equipment must be connected prior to removal, the data must then be downloaded from it. Failure to follow this instruction, could result in permanent damage to the instrument cluster.

   Fully extend and lower the steering column for access.

2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

3. *Torque:* 2 Nm



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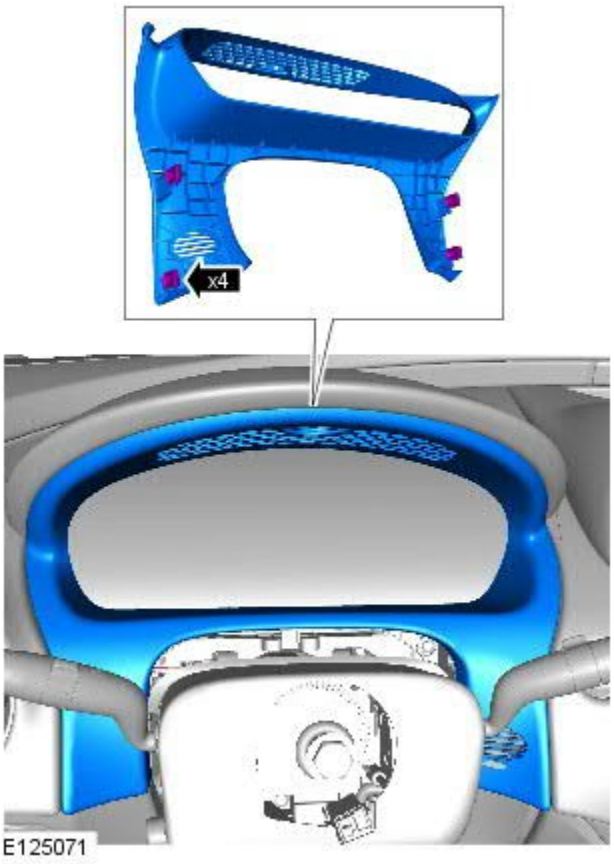
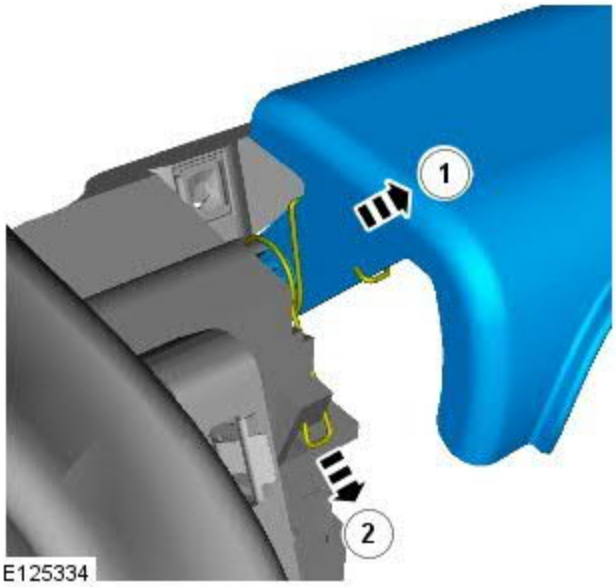
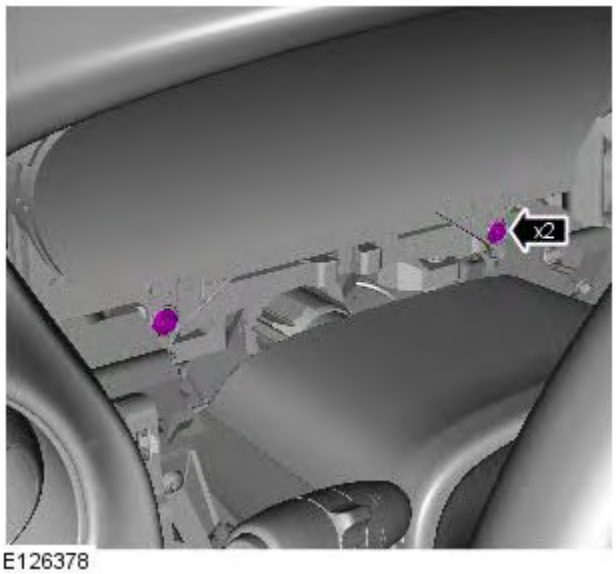


5. NOTE: The procedure must be carried out on both sides.

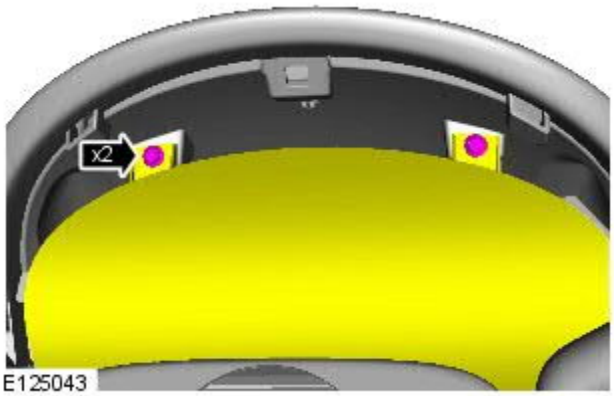


6. *Torque:* 1.5 Nm



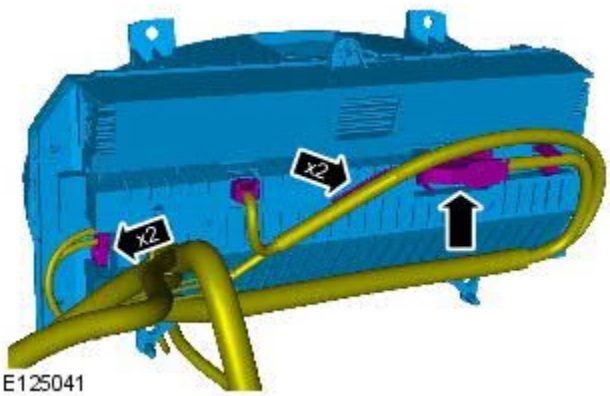
E126378

7. *Torque:* 1.5 Nm



E125043

8.



E125041

Installation

1. To install, reverse the removal procedure.
2. Configure the instrument cluster and ignition keys using the diagnostic tool.

Published: 11-May-2011

Information and Message Center - Information and Message Center - Component Location

Description and Operation

INFORMATION AND MESSAGE CENTER - COMPONENT LOCATION

E128857

Item	Description
1	Time display
2	Ambient temperature/Frost warning symbol
3	Message Center
4	Trip computer information display
5	Audio, telephone displays

Published: 11-May-2011

Information and Message Center - Information and Message Center - Overview

Description and Operation

OVERVIEW

Designed to look similar to a conventional instrument cluster for the main display, the TFT display can be continually reconfigured to prioritise and refine the information presented to the driver. All displays are 'virtual' gauges with the speedometer and the tachometer being the dominant features of the new display.

Telephone and navigation information is shown in the LH (left-hand) side of the display. Time, temperature, navigation and trip computer information is also displayed in this area. Messages are shown in the RH (right-hand) side of the display and override the tachometer when message display is required.

The instrument cluster information areas display the following information to the driver:

- Odometer - Displays the total vehicle distance traveled
- Trip meter - There are 3 trip meters available; A and B which display the total vehicle distance traveled since the last reset and a 'Trip Auto' meter which resets after every ignition cycle.
- Ambient temperature - Displays the external ambient temperature in °C or °F
- Message center - Displays system information to the driver.

Published: 11-May-2011

Information and Message Center - Information and Message Center - System Operation and Component Description

Description and Operation

System Operation

OPERATION

The information and messages which can be displayed in the instrument cluster are mainly generated from other system control modules. When a system control module detects a change or a fault which is tagged to generate a message, an electronic signal is sent via the medium or high speed CAN (controller area network) buses to the instrument cluster, which displays the message. If more than one message is requested the instrument cluster displays them in order of priority.

Component Description

DESCRIPTION

Odometer and Trip Meter

The trip computer memory stores data for a journey or series of journeys until it is reset to zero.

The odometer is located in the LH (left-hand) side of the TFT screen. In addition to displaying the total distance the vehicle has travelled, this area of the display can also show the following information:

- Odometer
- Trip distance
- Trip average speed
- Trip average fuel consumption
- Instantaneous fuel consumption
- Range available on remaining fuel.

The above selections are shown in the order in which they appear. The selections can be made by pressing the trip button on the end of the LH steering column multifunction switch repeatedly until the option required is reached.

There are 3 independent trip recordings available to view; A, B and automatic. The instrument cluster menu is used to select which trip recording is displayed. The A and B memories can be set independently, while the Auto trip will reset after every ignition cycle as the vehicle moves.

The automatic trip is always available and is reset each time the engine is started and the vehicle moves. Previous trips can be added to form a continuous trip recording by pressing and releasing the trip button on the end of the LH steering column multifunction switch when the automatic trip information is displayed. The message center will confirm that the previous journey information has been added and pressing and holding the trip button for 3 seconds will add the data. The previous trip information can also be deleted by pressing and releasing the trip button when the automatic trip information is displayed. The message center will confirm deletion of the previous journey data and pressing and holding the trip button for 3 seconds will delete the previous trip information.

Trip A and B can be reset by the driver at any time. When the required trip information is displayed, pressing and holding the trip button for 3 seconds will erase the previous trip information stored. Resetting trip A or B will not affect the other trip information, for example, if trip A is reset, trip B will retain its information until it is reset.

Ambient Temperature

The ambient temperature is displayed in the LH side of the TFT screen. The temperature can be displayed in degrees F or C and this is selectable by the driver using the instrument cluster menu.

If the external temperature falls to 4°C (39°F) or below, the external temperature display is accompanied by an orange snowflake symbol.

Navigation Information

The navigation system can display information in the LH side of the instrument cluster. When navigation information is displayed, the fuel and engine temperature gages are removed and the Time, ambient temperature, trip, telephone or audio information is removed while the navigation information is displayed.

Message Center

The message center is located in the RH (right-hand) side of the TFT screen. Other information displayed in this area may be temporarily removed to allow for the message to be displayed.

The majority of messages are generated by the cluster which monitors system status via the bus systems and displays system information messages as requested by the controlling module. Other system control modules are also capable of generating messages to display system status. Some messages are accompanied by a chime, which is requested by the control module generating the message and generated by the instrument cluster via the sounder, which is located on the top of the cluster.

The driver can view system status messages which are current in the instrument cluster by using the instrument cluster menu and selecting the 'Show Warnings' menu selection.

The messages are displayed in a language applicable to the vehicle market configuration and can be changed using the instrument cluster menu.

Gear Position Display

The gear position is displayed in the tachometer display on the RH side of the TFT screen. It shows the current selector position P, R, N, D or S. When the transmission is in manual Dynamic Mode, the display will show the currently selected gear ratio 1, 2, 3, 4, 5 or 6 in the LH side of the TFT screen, replacing the audio, telephone or navigation displays.

The gear position display is controlled by the TCM (transmission control module). The gear position is illuminated in response to CAN bus messages from the TCM.

Service Interval Indicator

The Service Interval Indicator is displayed in the message center. The indicator displays information calculated by the ECM (engine control module) to calculate the remaining distance to the next service based on the amount of fuel used since the last service interval reset.

The ECM counts down the distance to engine service and the instrument cluster rounds this down to the nearest 50 miles (KM). The fuel used based count down starts from 3200 miles (km) displaying the required figure in the trip computer message center, for example 'Service Required in 1950 miles (km)'. When the ECM has calculated the distance to service is 0 miles (km), the will request the instrument cluster to display 'Service Required' in the message center.

The ECM also monitors and calculates when the time to the next oil service is required and when an oil service is required, 'Service Required' is displayed in the message center. This message takes priority over the distance to service calculation.

The service information is displayed in the message center for 4 seconds at each ignition cycle. There is no minus figure if the service distance is exceeded, 'Service Required' is displayed, via a CAN bus message from the instrument cluster, until the ECM service counter is reset using an approved Jaguar diagnostic system .

Published: 13-Jun-2013

Information and Message Center - Information and Message Center

Diagnosis and Testing

Principles of Operation

For a detailed description of the information and message centre system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (413-08 Information and Message Center)

Information and Message Center (Description and Operation),
Information and Message Center (Description and Operation),
Information and Message Center (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

1. Verify the customer concern
2. Visually inspect for obvious signs of mechanical or electrical damage

Visual Inspection

Mechanical	Electrical
• Rear seat entertainment remote control • Touch screen	• Fuses • Wiring harness • Electrical connector(s) • Battery condition, state of charge • Rear seat entertainment remote control • Touch screen

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident check the system for any logged Diagnostic Trouble Codes (DTCs) and refer to the DTC index

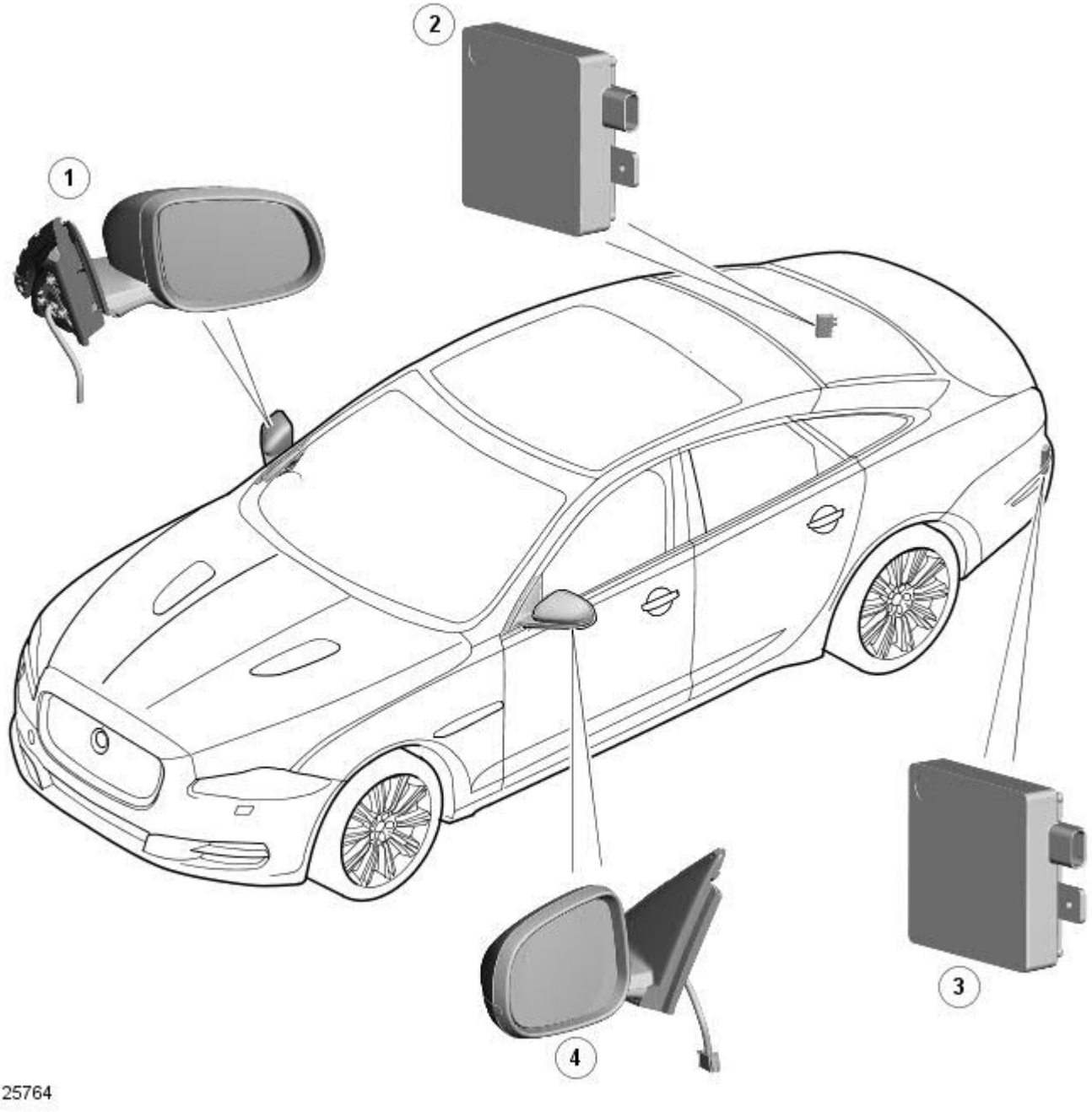
DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Instrument Cluster (IPC) (100-00 General Information, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - DTC: Touch Screen (TS) (100-00 General Information, Description and Operation).

Published: 11-May-2011

Warning Devices - Blindspot Monitoring System - Component Location

Description and Operation



Item	Description
1	RH (right-hand) door mirror
2	RH (right-hand) blind spot monitoring module
3	LH (left-hand) blind spot monitoring module
4	LH (left-hand) door mirror

Published: 11-May-2011

Warning Devices - Blindspot Monitoring System - Overview

Description and Operation

Overview

Eliminating blind spots is a major element in vehicle body design, but because of the structural requirements of B, C and D pillars, blind spots cannot be entirely eliminated. Statistics show that some accidents are directly attributable to drivers moving across into the path of overtaking vehicles that have not been seen in conventional mirrors. New mirror designs have improved the situation, however the introduction of a radar-based blind spot monitoring system helps to further reduce the risk.

The blind spot monitoring system comprises:

- LH (left-hand) Blind spot monitoring sensor
- RH (right-hand) Blind spot monitoring sensor
- LH (left-hand) door mirror
- RH (right-hand) door mirror

The system uses two radar modules operating at a frequency of 24 GHz and each combining the radar and electronic module in a single unit. The modules are located behind the rear bumper surface, symmetrically, one on each side of the car behind the rear wheels. They are side facing and inclined rearwards at an angle of 16 degrees, which is dictated by the shape at the rear of the vehicle. Each module is calibrated to detect a vehicle in the driver's blind spot. Once a valid target is detected the module illuminates an amber warning 'alert icon' LED (light emitting diode) in the relevant exterior door mirror. If there is a fault or blockage with the blind spot monitoring system an amber warning indicator dot LED (light emitting diode) is displayed in the exterior mirror and the message 'blind spot monitoring not available' or 'blind spot sensor blocked' is displayed in the instrument cluster message center.

When the system initiates, it performs a self-check, during which the warning icons in the mirrors illuminate alternately for a short period of time. Each module does a left/right determination check when the ignition is switched on. Each mirror has a different circuit configuration so that the modules can determine which mirror they are connected to. If a module detects the wrong mirror it will go into a fault condition.

The blind spot monitoring modules receive vehicle speed on the medium speed CAN (controller area network) and are inactive until the vehicle reaches 16kph (10mph).

Each Blind Spot Monitor module emits a radar field greater than the blind spot area. The actual blind spot area is calibrated into the module during its manufacture.

CAUTION: The blind spot monitoring system is designed as a driver aid not a safety device. The driver should always exercise due care and attention whilst driving.

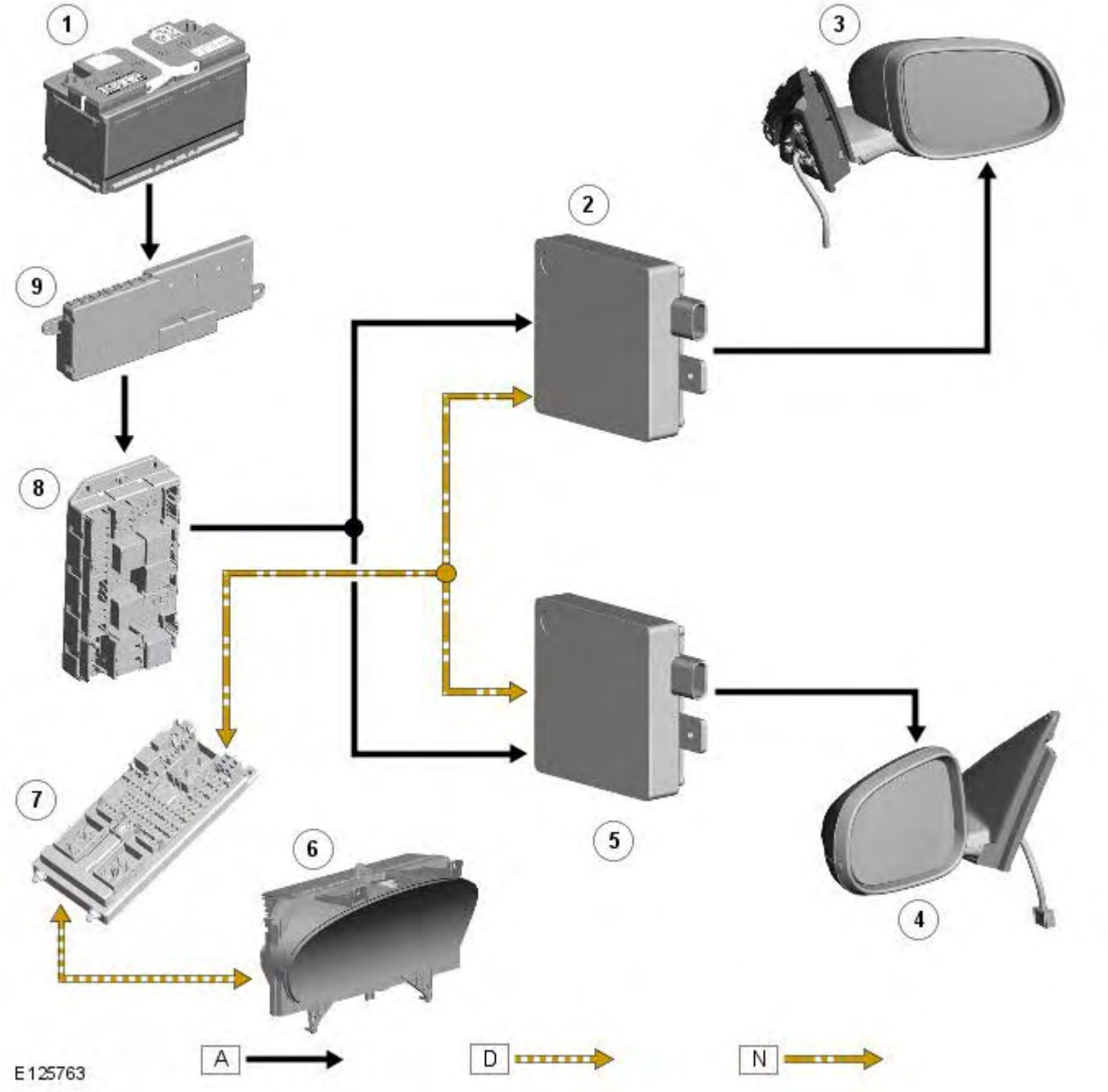
Published: 11-May-2011

Warning Devices - Blindspot Monitoring System - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: A = Hardwired: D = High speed CAN bus: N = Medium speed CAN bus



Item	Description
1	Battery
2	RH (right-hand) blind spot monitoring module
3	RH (right-hand) door mirror
4	LH (left-hand) door mirror
5	LH (left-hand) blind spot monitoring module
6	Instrument cluster

7	CJB (central junction box)
8	RJB (rear junction box)
9	BJB (battery junction box)

System Operation

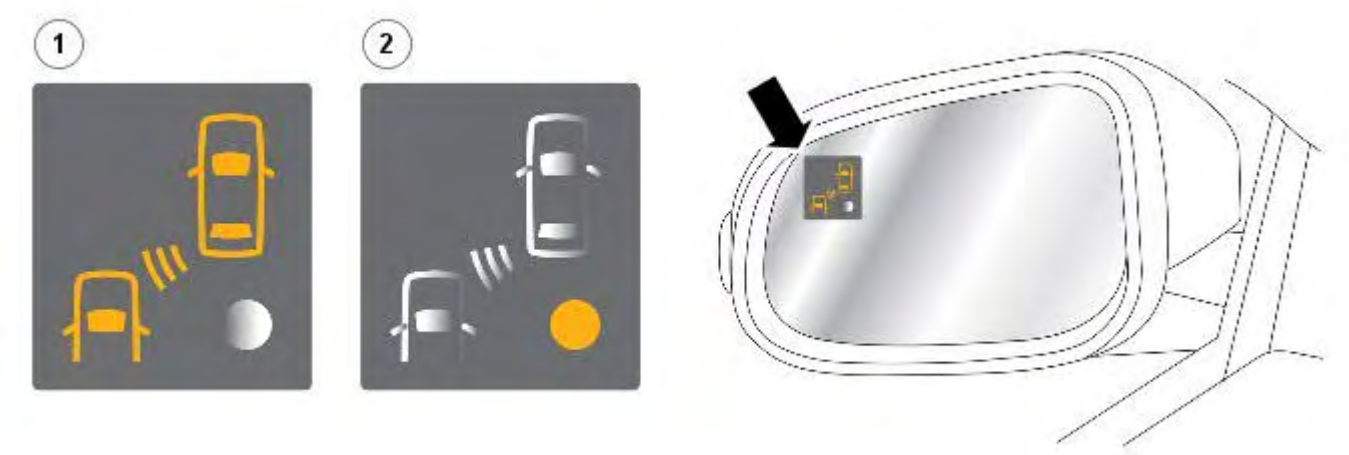
Principles of Operation

Blind spot monitoring system detects overtaking vehicles relative to the radar modules, on either side of the vehicle, at a distance of up to 2.5 meters laterally and in an area from the door mirror up to 6.0 meters behind the module. These criteria identify an overtaking vehicle within the blind-spot area and within a typical carriageway lane width, while eliminating other objects that are not relevant, either because of their position, they are stationary, traveling in the opposite direction. A vehicle is classed as a heavy goods vehicle, car or motorcycle. A motorcycle is defined as a minimum size of 2.0m long, 0.8m wide (widest point) and 1.1m high. The system is not affected by the mass of the overtaking vehicle providing all identification criteria, including relative velocity of (16km/h - 10mph) or above, is met.

The system emits radar pulses and analyses the reflections, identifying objects of interest that move into the blind spot zone. Having detected another vehicle in the defined blind spot zone it alerts the driver by illuminating the amber alert icon located in the appropriate exterior mirror.

NOTE: If an overtaking vehicle is detected on both sides of the vehicle simultaneously, the warning alert icons in both mirrors will illuminate.

The blind spot monitoring system lenses are shaped so as to minimize the visibility to other drivers. The LED (light emitting diode)’s are located towards the outside extremity of the mirror face, within the peripheral view of the driver but not in any area of the mirror where they could obscure or distract from the image.



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Item	Description
1	Warning alert icon
2	System status warning indicator

The LED (light emitting diode) lighting sequence is as follows;

- Amber alert LED (light emitting diode) icon permanently lit - system operational, vehicle detected in blind spot area
- No LED (light emitting diode) ’s lit – system active no vehicle detected in blind spot area
- Amber status LED (light emitting diode) permanently lit - system not active or faulty

The system has operating limitations and is automatically turned off under certain operating conditions. During these operating conditions the amber status LED (light emitting diode) is permanently lit.

The system operating limitations are as follows;

- The area surrounding the radar face of the module must be clear of metallic items
- The system is inactive until vehicle speed is greater than 16km/h - 10mph (amber status LED (light emitting diode) permanently lit)
- The system is inactive if an approved trailer is connected to the vehicle (amber status LED (light emitting diode) permanently lit)
- The system is inactive when reverse gear or park is selected (amber status LED (light emitting diode) permanently lit)

If either of the radar signals are blocked or distorted, for example by water, the radar face of the module is covered in mud,

sleet or snow the system may detect this and be disabled with the amber status LED (light emitting diode) permanently lit together with a ‘blind spot monitoring blocked’ message displayed in the instrument cluster message center. The system is disabled until the blockage is cleared.

If there is a fault in the system the amber status LED (light emitting diode) is permanently lit and a ‘blind spot monitoring not available’ message displayed in the instrument cluster message center. The system is disabled until the fault is rectified.

System fault and blockage warnings are as follows;

- The system is disabled when the radar module signal is blocked (amber status LED (light emitting diode) permanently lit and instrument cluster message)
- The system is disabled by a fault (amber status LED (light emitting diode) permanently lit and instrument cluster message)

If there is a failure in the communication network and the warning LED (light emitting diode) ’s cannot be displayed in the mirror, a failure message will be displayed in the instrument cluster message center.

When any faults are present in the system DTC (diagnostic trouble code) 's are stored in both blind spot monitoring modules appropriate to each module. Replacement of modules requires the right hand module to be configured using the Jaguar approved diagnostic equipment. Due to the fact that all modules are supplied as left hand modules the replacement left hand modules do not require configuring.

Calibration of the modules using the Jaguar approved diagnostic equipment enables updates to be downloaded as new technology becomes available or any fault concerns require software updates.

Published: 11-May-2011

Warning Devices - Warning Devices

Diagnosis and Testing

Principles of Operation

For a detailed description of the Blindspot Monitoring system and operation, refer to the relevant Description and Operation sections in the workshop manual. REFER to: (413-09 Warning Devices)

Blindspot Monitoring System (Description and Operation),
Blindspot Monitoring System (Description and Operation),
Blindspot Monitoring System (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

NOTE: Particular attention should be paid to the following items where DTCs may not be logged:

- Check for contamination (e.g. dirt, grime, frosting, ice) around the blindspot monitoring sensors and clear.

Visual Inspection

Mechanical	Electrical
• Exterior rear view mirror glass • Mud or sleet contamination around rear bumper area • Blindspot Monitoring Modules	• Fuse(s) • Relay(s) • Wiring Harness • Electrical connector(s) • Blindspot Monitoring Modules

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
• The instrument cluster displays 'BSM System Fault' • DTC B11C915 is logged within the left hand Blind Spot Monitoring module • The Left Alert icon is constantly illuminated	• Left driver display alert LED circuit - short to power	Refer to the electrical circuit diagrams and check left driver display alert LED circuit for short to power.
• The instrument cluster displays 'BSM System Fault' • DTC B11C915 is logged within the left hand Blind Spot Monitoring module • No short to power or open circuit fault on the driver display status LED circuit	• Left mirror ground circuit - open circuit	Refer to the electrical circuit diagrams and check the left mirror ground circuit for open circuit.
• The instrument cluster displays 'BSM System Fault' • DTC B11C915 is logged within the right hand Blind Spot Monitoring module • No short to power or open	• Right mirror ground circuit - open circuit	Refer to the electrical circuit diagrams and check the right mirror ground circuit for open circuit.

Symptom	Possible Cause	Action
circuit fault on the driver display status LED circuit		
• The instrument cluster displays 'BSM System Fault' • DTC U023200 is logged within the right hand Blind Spot Monitoring module • The left driver display status LED does not illuminate when the vehicle is stationary, in Park and the ignition is on	• Left driver display status LED circuit - short to ground • Suspect left hand module failure	Refer to the electrical circuit diagrams and check left driver display status LED circuit for short to ground. Clear DTC and re-test. If DTC remains suspect the left hand Blindspot Monitoring module. Check and install a new left hand Blindspot Monitoring module only, refer to the new module/component installation note at the top of the DTC Index.
• The instrument cluster displays 'BSM System Fault' • DTC U023200 is logged within the right hand Blind Spot Monitoring module • When the system is powered up the left driver display alert LED does not illuminate during the bulb self-checks	• Left driver display alert LED - short to ground, open circuit • Suspect left hand module failure	Refer to the electrical circuit diagrams and check left driver display alert LED circuit for short to ground, open circuit. Clear DTC and re-test. If DTC remains suspect the left hand Blindspot Monitoring module. Check and install a new left hand Blindspot Monitoring module only, refer to the new module/component installation note at the top of the DTC Index.
• The instrument cluster displays 'BSM System Fault' • DTC U023300 is logged within the left hand Blind Spot Monitoring module • The right driver display status LED is constantly illuminated	• Right driver display status LED - short to power • Suspect right hand module failure	Refer to the electrical circuit diagrams and check right driver display status LED circuit for short to power. Clear DTC and re-test. If DTC remains suspect the right hand Blindspot Monitoring module. Check and install a new right hand Blindspot Monitoring module only, refer to the new module/component installation note at the top of the DTC Index.
• The instrument cluster displays 'BSM System Fault' • DTC U023300 is logged within the left hand Blind Spot Monitoring module • When the system is powered up the right driver display status LED does not illuminate during the bulb self-checks	• Right driver display status LED - open circuit • Suspect right hand module failure	Refer to the electrical circuit diagrams and check right driver display status LED circuit for open circuit. Clear DTC and re-test. If DTC remains suspect the right hand Blindspot Monitoring module. Check and install a new right hand Blindspot Monitoring module only, refer to the new module/component installation note at the top of the DTC Index.
• The instrument cluster displays 'BSM System Fault' • DTC U023300 is logged within the left hand Blind Spot Monitoring module • When the system is powered up both the right driver display LEDs do not illuminate during the bulb self-checks	• Right mirror ground circuit - open circuit • Suspect right hand module failure	Refer to the electrical circuit diagrams and check the right mirror ground circuit for open circuit. Clear DTC and re-test. If DTC remains suspect the left hand Blindspot Monitoring module. Check and install a new left hand Blindspot Monitoring module only, refer to the new module/component installation note at the top of the DTC Index.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Blind Spot Monitoring System Module (SODL/SODR) (100-00 General Information, Description and Operation).

Published: 11-May-2011

Warning Devices - Low Washer Fluid Warning Indicator Switch

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

The ignition must be switched off.

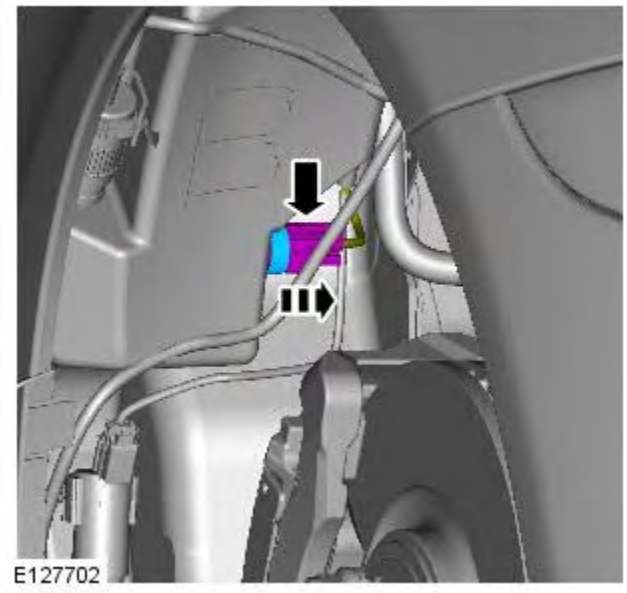
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Remove the RH fender splash shield.

   Refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

3.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Warning Devices - Blindspot Monitoring Sensor LH

Removal and Installation

Removal

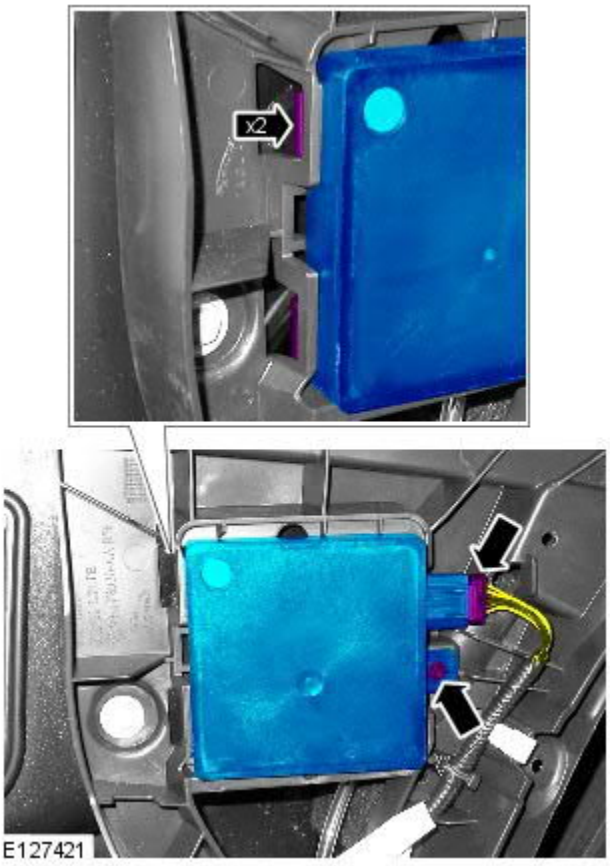
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Refer to: Rear Bumper Cover (501-19 Bumpers, Removal and Installation).



4. CAUTION: Make sure that the component is correctly located on the locating pegs.

   NOTE: RH illustration shown, LH is similar.

   Torque: 1.5 Nm

Installation

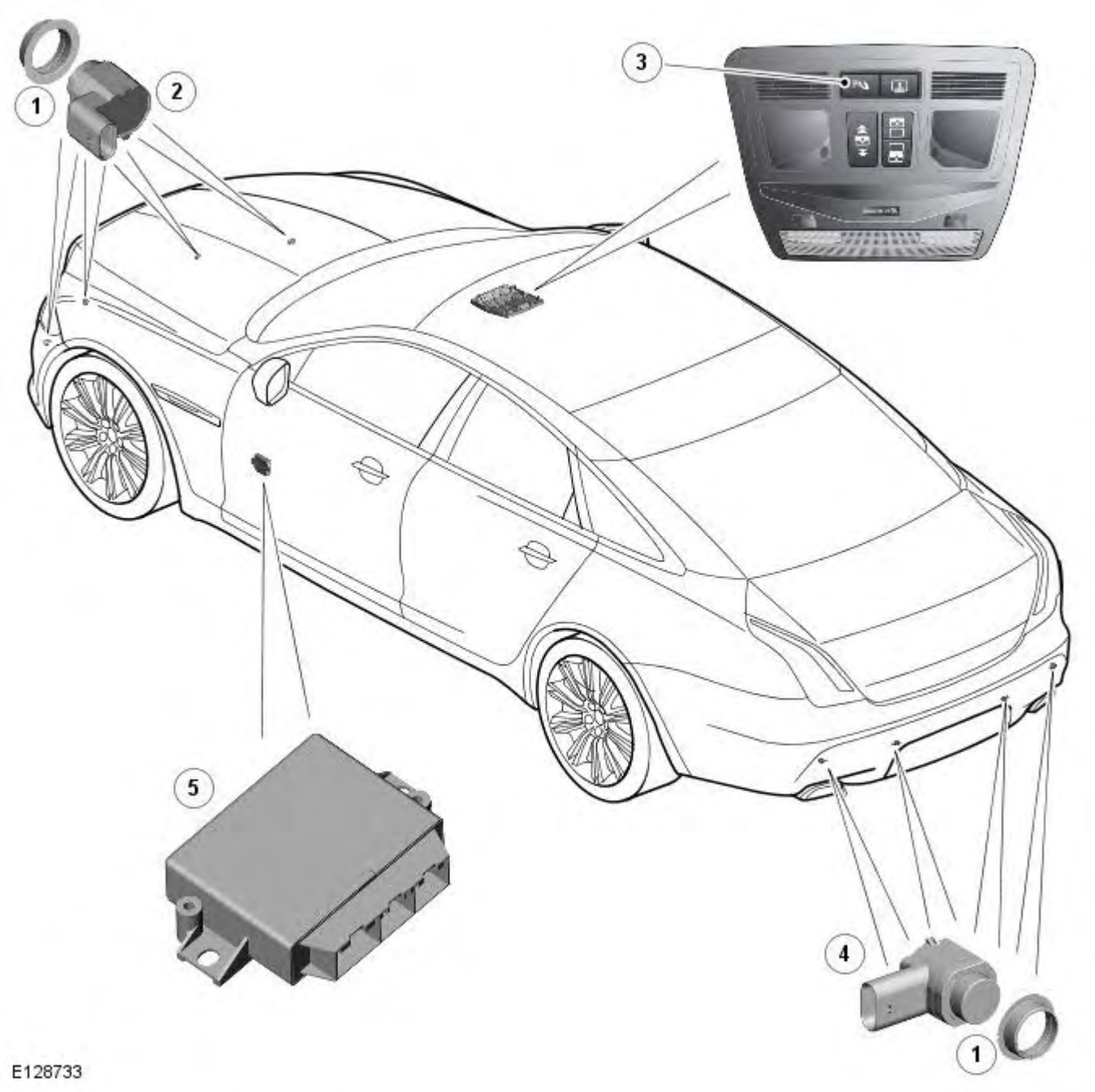
1. NOTE: New units must be configured using the Programmable Module Installation Routine in the diagnostic tool.

   To install, reverse the removal procedure.

Published: 10-May-2012

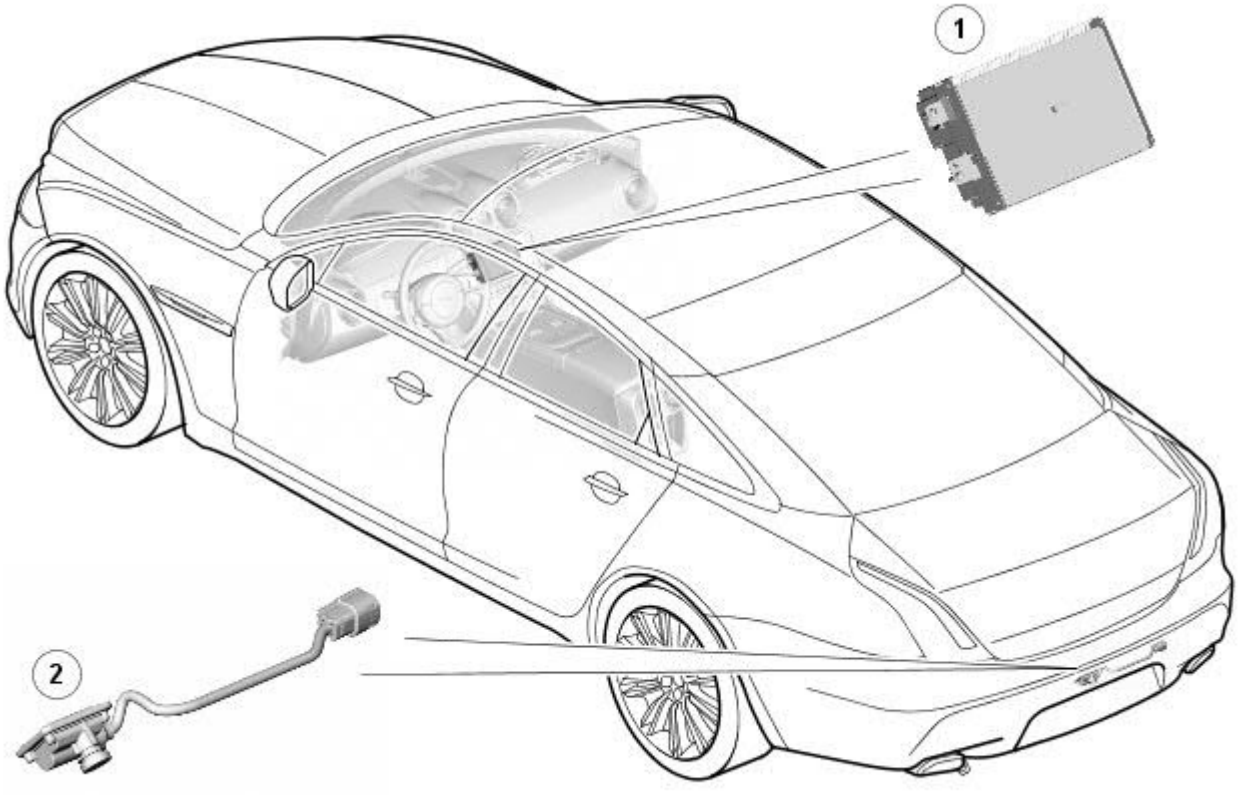
Parking Aid - Parking Aid - Component Location

Description and Operation



Item	Description
1	De-coupling ring
2	Front parking aid sensors
3	Parking aid switch
4	Rear parking aid sensors
	Parking aid module

Component Location - Rear View Camera



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Item	Description
1	TSD (touch screen display)
2	Rear view camera

Published: 11-May-2011

Parking Aid - Parking Aid - Overview

Description and Operation

OVERVIEW

The parking aid system provides an audible warning to the driver when any obstacles are in the path of the vehicle during a forward (if front sensors are fitted) or reversing manoeuver. The purpose of the system is to assist the driver when parking or maneuvering in a restricted space. It is not designed as a crash avoidance system or a replacement for visual interpretation by the driver

All vehicles are fitted with rear parking aid sensors. Higher specification vehicles may also be fitted with front parking aid sensors.

A roof console mounted parking aid switch allows the driver to deactivate the parking aid system if operation is not required.

NOTE: The switch is only fitted to vehicles with front parking aid sensors.

A parking aid camera is a standard fitment on some variants and optional on others. The parking aid camera supplements the information provided by the parking aid system by providing the driver with a visual display of the area directly behind the vehicle.

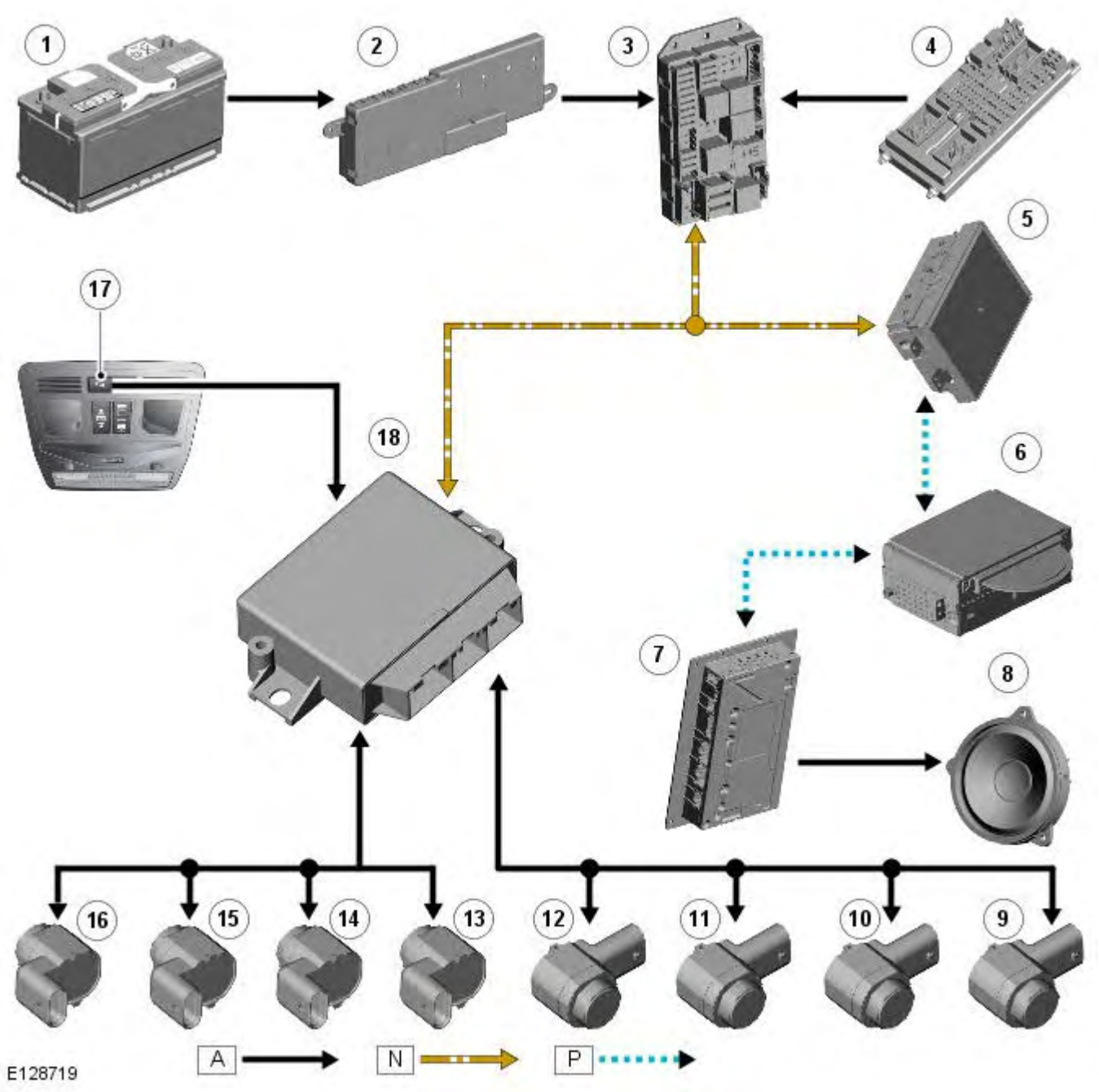
Published: 01-Mar-2013

Parking Aid - Parking Aid - System Operation and Component Description

Description and Operation

Control Diagram

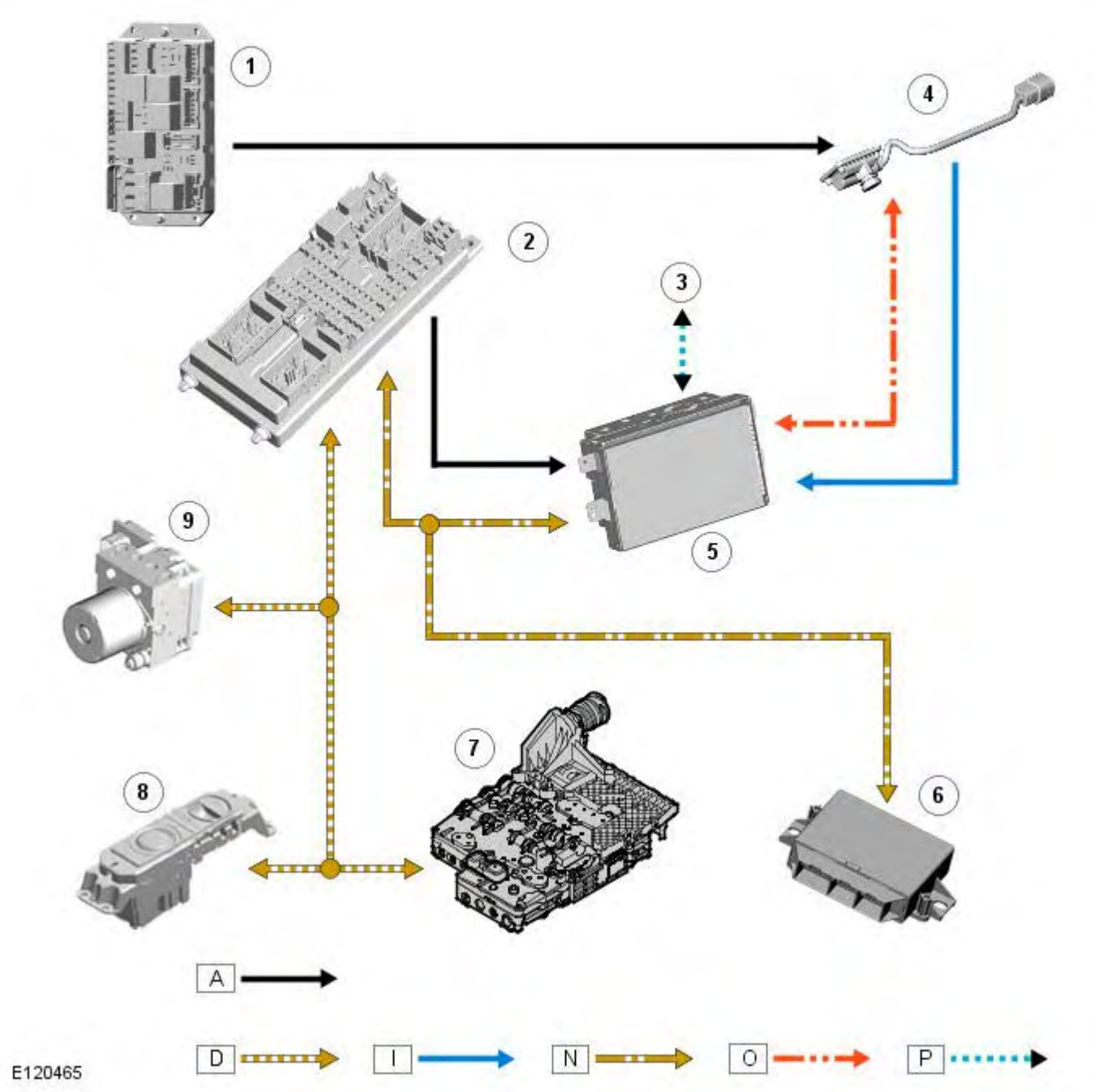
NOTE: A = Hardwired: O = LIN bus: D = High speed CAN bus: N = Medium speed CAN bus: P = MOST (media orientated system transport) ring: I = CVBS signal



Item	Description
1	Battery
2	BJB (battery junction box)
3	RJB (rear junction box)
4	CJB (central junction box)
5	TSD (touch screen display)
6	IAM (integrated audio module)

7	Audi amplifier
8	Speakers
9	RH (right-hand) outer rear sensor
10	RH (right-hand) inner rear sensor
11	LH (left-hand) inner rear sensor
12	LH (left-hand) outer rear sensor
13	RH (right-hand) outer front sensor
14	RH (right-hand) inner front sensor
15	LH (left-hand) inner front sensor
16	LH (left-hand) outer front sensor
17	Parking aid switch
18	Parking aid module

CONTROL DIAGRAM - PARKING AID CAMERA



Item	Description
1	RJB (rear junction box)
2	CJB (central junction box)
3	To MOST ring
4	Rear view camera
5	TSD (touch screen display)
6	Parking aid module
7	TCM (transmission control module)
8	Jaguar Drive control
9	ABS (anti-lock brake system) module

System Operation

PARKING AID

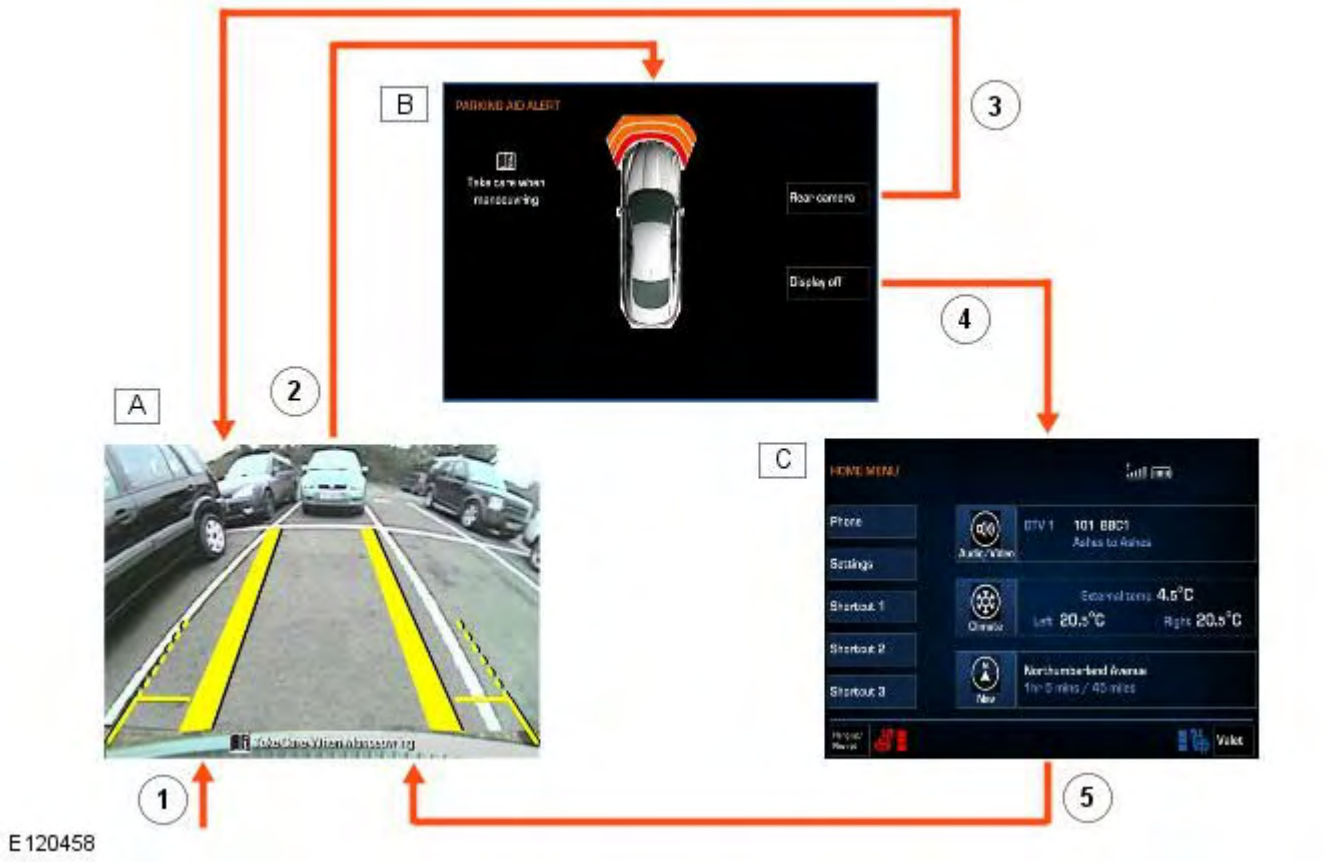
The parking aid module receives and ignition power mode 6 supply from the RJB (rear junction box).

The parking aid module is connected to the entertainment system control module by the medium speed CAN (controller area network) bus and the Media Orientated System Transport (MOST). The entertainment system is used by the parking aid system to provide the driver with an audible warning. If an obstacle is sensed by the rear parking aid sensors, the rear audio system speakers will sound. If an obstacle is sensed by the front parking aid sensors (if fitted), the front audio system speakers will sound.

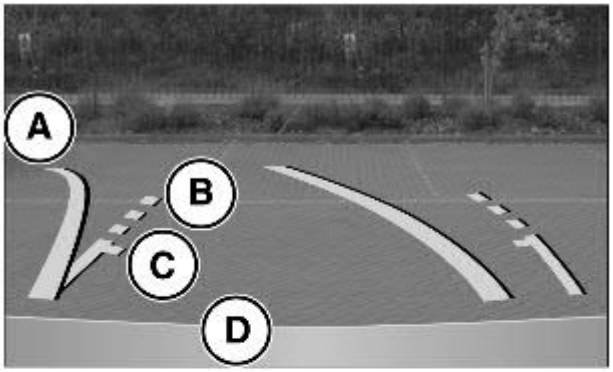
The parking aid system operates using ultrasonic signals which are transmitted by the sensors. The reflected echo from this output is received by the sensors and used by the parking aid module to calculate the distance from an object.

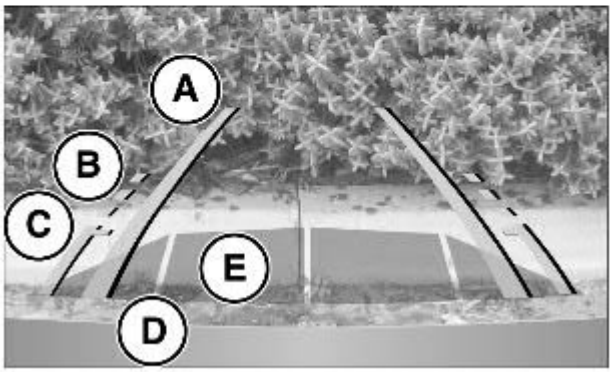
When the parking aid module activates the system, the switch LED (light emitting diode) is illuminated to indicate that the system is operating. The parking aid module then processes signals received from the sensors to determine if there is an object with the detection range of the sensors. A parking aid screen is automatically displayed in the Touch Screen Display. If the vehicle has a parking aid camera fitted, the camera display is automatically displayed in the TSD in preference to the parking aid alert display. To view the parking aid sensor display, a single touch of the TSD screen will remove the camera image display and show the parking aid alert display.

Parking Aid Alert Display



Item	Description
A	Camera image
B	PDC (park distance control) image
C	Original Touch-screen image
1	User selects reverse
2	User touches screen
3	'Rear camera' soft key selected
4	(a)'Display off' soft key selected (b) User selects 'Park' c) Vehicle exceeds 16 km/h (10 mph)
5	User selects reverse





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Item	Description
A	Solid line: The projected wheel trajectory
B	Dotted line: The safe working width of the vehicle (including exterior mirrors)
C	Luggage compartment access guideline: Do not reverse beyond this point if luggage compartment access is required
D	Bumper inclusion
E	Parking sensor activation: A colored area appears, to indicate which rear sensors have been activated

In the combined mode, the sensors emit a series of ultrasonic impulses and then switch to receiver mode to receive the echo reflected by an obstacle within the detection range. The received echo signals are amplified and converted from an analogue signal to a digital signal by the sensor. The digital signal is passed to the parking aid module and compared with pre-programmed data stored in an EEPROM (electrically erasable programmable read only memory) within the module. The module receives this data via the signal line from the sensor and calculates the distance from the object using the elapsed time between the transmitted and received impulse. The duration of the impulse duration is determined by the module, with the sensor controlling the frequency of the impulse output.

In receiver mode, the sensor receives impulses that were emitted by adjacent sensors. The module uses this information to precisely determine the position and distance of the object.

If no objects are detected there are no further warning tones. If an object is detected, repeated audible tones are emitted from either the front or rear audio speakers as appropriate. The time delay between the tones decreases as the distance between the object and the vehicle decreases, until at approximately 300 mm (12 inches), the audible tone becomes continuous.

After the initial detection of an object, if there is no decrease in the distance between an object and the central sensors, the time delay between the audible warnings remains constant. If an object is detected by one of the corner sensors only, the audible warnings stop after approximately 5 seconds if there is no change in the distance between an object and the corner sensor.

When approaching several objects within detection range, the control module recognises the distance from the vehicle to the

nearest object.

The PDC module will prioritise the objects detected, the nearest object detected will take priority and the corresponding audio outputs will be emitted. For example if 2 objects are detected (one front one rear) the nearest detected object will take priority and relevant audible tone will be heard.

If two objects are detected at equal distance (one front one rear) the audible tones will alternate between the front and rear speakers.

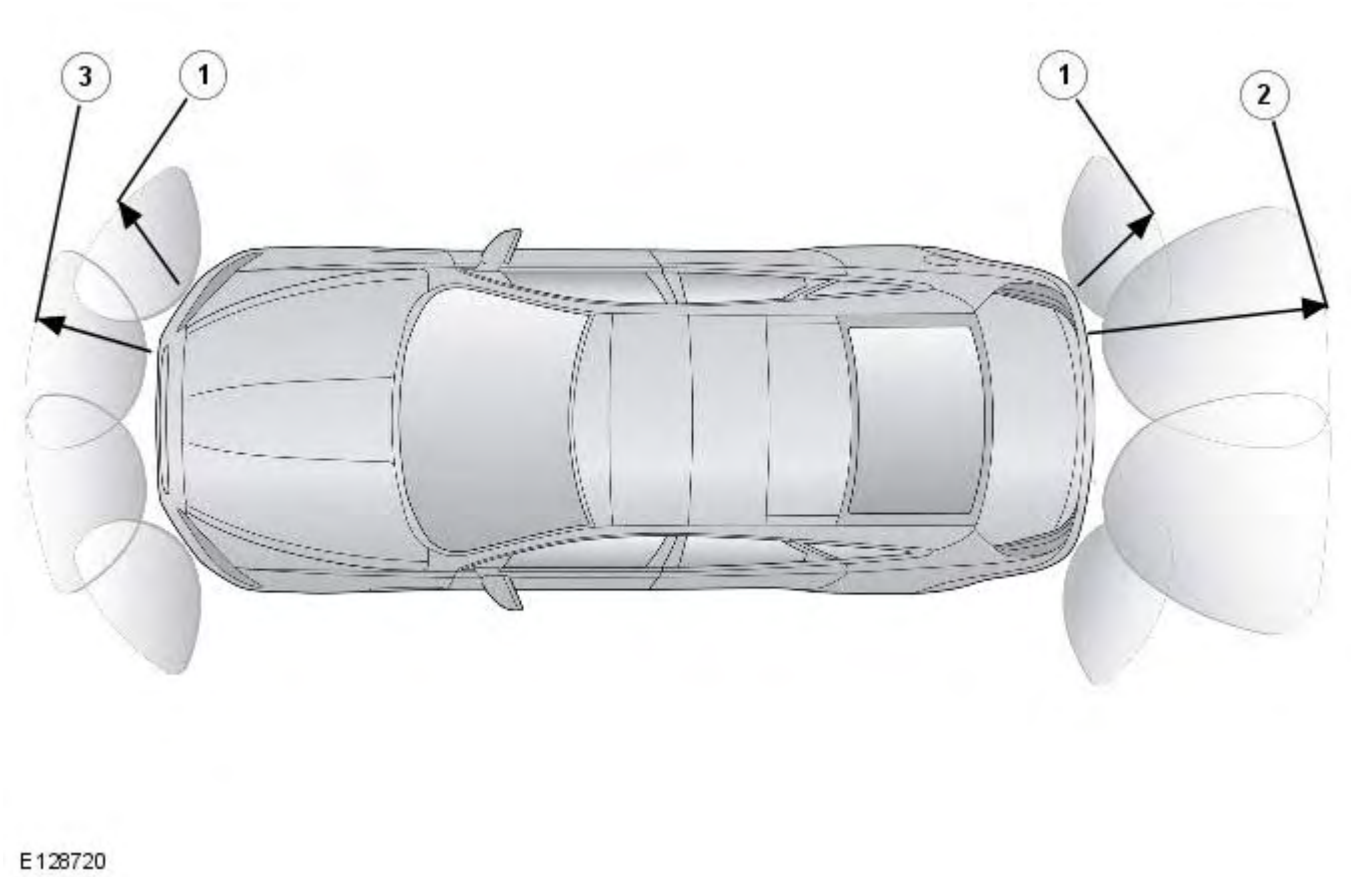
If reverse (R) is the first gear selected after the ignition is switched on, both the front (if fitted) and rear parking aid sensors will become operational. If a forward drive gear is subsequently selected, the front and rear parking aid sensors will remain operational until vehicle speed increases above 16 km/h (10 mph), park (P) is selected or the PDC control switch is pressed.

If drive (D) is the first gear selected after the ignition is switched on the parking aid system will have to be activated by pressing the PDC control switch.

NOTE: The PDC system can not be activated whilst the vehicle is in park (P).

The volume output of the parking aid audible tones can be adjusted by selecting the 'Vehicle Settings' menu and selecting 'Parking' from the menu on the TSD. The volume can be adjusted using the + or - selections on the TSD.

Distance Calculation



E128720

The detection ranges of the sensors are shown in the table below.

Item Number	Sensor Location	Maximum Detection Range Audio Tone	Continuous Audio Tone
1	Rear/Front Outer	Approximately 600 mm (24 inches)	Approximately 300 mm (12 inches)
2	Rear Inner	Approximately 1800 mm (71 inches)	Approximately 300 mm (12 inches)
3	Front Inner	Approximately 800 mm (31 inches)	Approximately 300 mm (12 inches)

PARKING AID CAMERA

The parking aid camera receives an ignition power mode 6 power supply from the RJB. It also has a LIN (local interconnect network) bus connection from the RJB which is not used at the moment but installed for a later enhancement of the parking aid camera.

A shielded co-axial cable connection between the camera and the Touch Screen Display (TSD) is used for the video image transmission.

The camera receives power at all times when the ignition is in power mode 6. When reverse gear is selected, the RJB

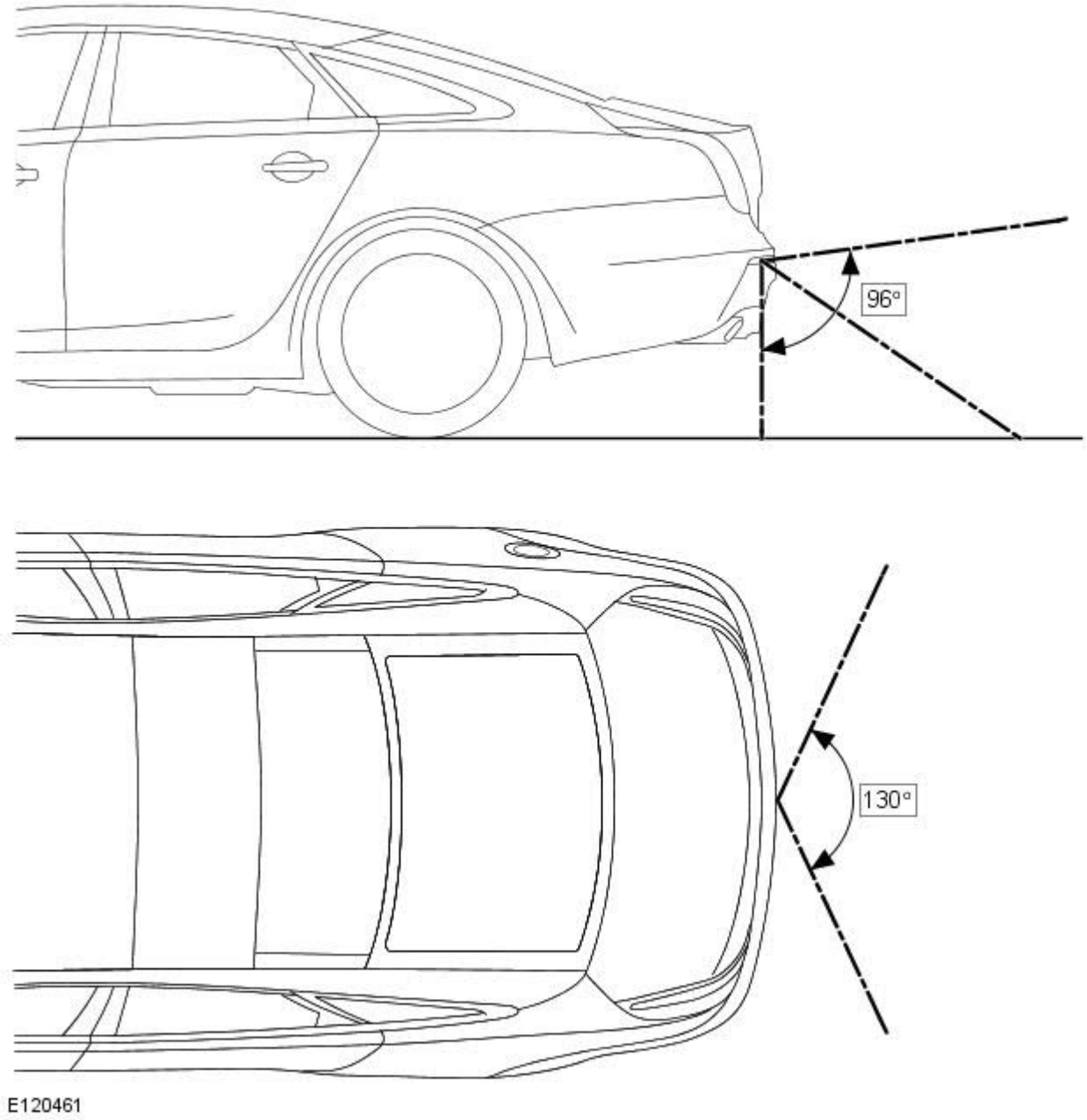
transmits a reverse selected signal on the medium speed CAN bus message to the entertainment system control module. This message is transferred on the MOST to the TSD which displays the parking aid camera video input from the camera in preference to the parking aid alert screen.

If the driver does not require the camera image in the TSD, a single touch on the screen will revert the display to the parking aid alert screen. The camera view can be reselected by pressing the 'Rear Camera' softkey on the TSD.

When reverse gear is deselected, the camera image remains on the TSD for 10 seconds after the transmission has been put into drive 'D'. This is to prevent the TSD switching between screens if the vehicle is being manoeuvred into a parking space. If the vehicle forward speed exceeds 16 km/h (10 mph) within the 10 second period, the camera image is removed from the TSD.

If the TSD display is switched off, the camera image will be automatically displayed when reverse gear is selected. When reverse gear is deselected and the 10 second period has expired, the TSD will revert back to its switched off state.

Camera Viewing Angles



Component Description

PARKING AID

Parking Aid Module
The parking aid module is located on the LH (left-hand) 'A' pillar.

The parking aid module has three connectors which provide for power, ground and CAN bus connections, front parking aid sensors and rear parking aid sensors. The medium speed CAN bus connections provide for the receipt of the following information from other systems:

- ABS (anti-lock brake system) module - Road speed signal
- TCM (transmission control module) - Reverse gear engaged signal

The module also outputs messages on the medium speed CAN bus which are received by the TSD. The TSD processes these messages and converts them into Media Orientated System Transport (MOST) signals which are passed to the audio system power amplifier. These signals are then used by the power amplifier to emit the applicable warning tones from the front or rear audio speakers when an object is detected by the front or rear parking aid sensors. A warning tone can also be emitted to alert the driver to a fault in the parking aid system.

The control module has a diagnostic connection via the medium speed CAN bus to enable faults to be retrieved using the Jaguar approved diagnostic equipment. Additionally an on-board diagnostic routine within the control module constantly monitors the system and alerts the driver to a system fault by emitting a 3 second continuous tone through the rear audio system speakers when the ignition is switched on. If front parking aid sensors are fitted, the control switch LED will also flash 6 times.

Parking Aid Sensors

Four ultrasonic sensors are located in the front (if fitted) and rear bumpers.

Each sensor has a three pin connector which mates with a bumper harness, which in turn is connected to the main body harness. Three pins provide for power supply, ground and signal lines to and from the parking aid module.

The parking aid module controls the operation of each sensor using a digital output on the signal line. The module controls the sensor in one of two modes; combined transmitter and receiver mode or receiver mode only.

Parking Aid Switch

The parking aid switch is located in the instrument panel switch pack, above the touch screen. The switch is the LH switch with an integral LED.

The switch is a non-latching push switch which allows the driver to select the parking aid system on or off. When pressed, the switch momentarily connects a ground to the parking aid module.

The LED indicates when the parking aid system is active. The LED is controlled by the parking aid module.

NOTE: The control switch allows the driver to activate/deactivate the parking aid system if operation is required or not required.

PARKING AID CAMERA

The parking aid camera is located on a bracket which is attached to the luggage compartment lid finisher.

The camera is connected to the vehicle harness by one 3 pin connector for the power, ground and LIN bus and a second connector for the video co-axial cable.

the camera produces color images to an analogue NTSC format, with a resolution of 640 x 480 pixels and an aspect ratio of 4:3.
The image captured by the camera is mirrored to give the driver a true representation of the rear view on the TSD.

Published: 14-Jun-2013

Parking Aid - Parking Aid

Diagnosis and Testing

Principles of Operation

For a detailed description of the parking aid system, characteristics and limitations refer to the relevant Description and Operation section in the workshop manual. REFER to: (413-13 Parking Aid)

Parking Aid (Description and Operation),
Parking Aid (Description and Operation),
Parking Aid (Description and Operation).

Parking Aid System On-Board Self-Test

As part of the strategy of the system if any DTC's are detected, a long high-pitched tone approx 3 seconds will sound and the parking aid switch (where fitted) indicator LED will flash 6 times at ignition on.

- If a fault is present when the parking aid system is activated then the parking aid switch (where fitted) status LED will flash 6 times indicating an issue with front or rear parking aid sensors, wiring switch, parking aid control module or hard wired sounders.
- The rear parking aid sounder/rear audio system will emit an error tone for approx 3 seconds at ignition on if a fault is detected with the front or rear sensors, the switch, or if there is a controller area network (CAN) bus error.
- (Only applicable to vehicles fitted with front parking aid and a hard wired rear parking aid sounder). If there is a fault with the rear parking aid sounder the error tone will come from the front parking aid sounder unit (integral with the instrument cluster).

Audible and Visual Warnings when Parking Aid System is in Error State

Rear Parking Aid System Fitted and No Parking Aid System Switch Fitted	Rear Parking Aid System Fitted and Parking Aid System Switch Fitted	Front and Rear Parking Aid System Fitted with Parking Aid System Switch Fitted
A long high-pitched error tone will sound at Ignition On for approx 3 seconds	• A long high-pitched error tone will sound at ignition on for approx 3 seconds and the parking aid switch indicator LED will flash 6 times at ignition on. Every time the parking aid system is activated within the same ignition cycle, parking aid switch indicator LED will flash 6 times	• A long high-pitched error tone will sound at ignition on for approximately 3 seconds and the parking aid switch indicator LED will flash 6 times at ignition on. Every time the parking aid system is activated within the same ignition cycle the parking aid switch indicator LED will flash 6 times

Inspection and Verification

CAUTIONS:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Diagnosis by substitution from a donor vehicle is not acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

Do not apply any grease based products to any parking aid system connector or pins.

NOTES:

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system)

When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.

If diagnostic trouble codes are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.
3. Ensure that the parking aid sensor face is clear of contamination that could affect the performance of the sensor.

Visual Inspection

Mechanical	Electrical
• Parking aid sensor condition/damaged • Parking aid sensor installation and holder • Parking aid sensor alignment • Parking aid sensor contamination • Bumper cover(s) • Vehicle ride height • Non standard/non manufacturer approved accessories fitted	• Battery • Fuse(s) • Relays • Wiring harness • Electrical connector(s) • Front parking aid sensor(s) • Rear parking aid sensor(s) • Parking aid switch and LED • Parking aid control module • Parking aid sounder • Audio system

4. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
5. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

CAUTION: Do not apply any grease based products to any parking aid system connector or pins.

NOTES:

Please note if this diagnosis is being carried out on a vehicle without a hard wired parking aid speaker, ensure the in car infotainment system is fully functional and configured correctly

Parking aid sensors that are painted incorrectly and not to the manufacturer standards, will not be considered in any warranty claim

Symptom	Possible Causes	Action
NOTE: Permanent/Intermittent fault Parking aid system not functioning correctly. (No DTCs displayed)	• Front or rear parking aid sensors dirty • Front or rear parking aid sensor position incorrect • Front or rear parking aid sensor incorrectly installed • Front or rear parking aid sensor coupling rings not installed/incorrectly installed • Parking aid control module or parking aid sensor connector not fully latched • Parking aid sensors painted without being removed from the bumper assembly or not painted to the manufacturer specification	• Clean front or rear parking aid sensors • Check the front or parking aid rear sensor position • Check the front or rear parking aid sensor are correctly installed • Check front or rear parking aid sensor coupling rings are installed/installed correctly • Ensure all parking aid system connectors are correctly latched • Remove parking aid sensor and ensure correctly painted parking aid sensor is installed - Parking aid sensors that are painted incorrectly and not to the manufacturer standards, will not be considered in any warranty claim
NOTE: Permanent/Intermittent fault Parking aid system not functioning correctly. (No DTCs displayed). System characteristics or environmental effects	• Parking aid sensors incorrectly mounted • Incorrect vehicle ride height • Dirty parking aid sensor face. Ice/snow covered sensor. Debris trapped between parking aid sensor and parking aid sensor body. Heavy rain or water splash from the ground • Non standard, bumper, exhausts/tailpipes, tow bar or external spare wheel	• Ensure the sensors are a tight fit in the holder and locked. Ensure the sensors are central in the holder and bumper and at the correct angle • Ensure vehicle ride height is within the specified limits. Rectify as required • Clean the sensor face as required. Defrost the sensor and dry as required. Clear any debris from the sensor and holder as required. Water flowing over the sensor is a system limitation. (no action required) • Check for non standard, bumper, exhausts/tailpipe, tow bar or external spare wheel mounting that may be being detected by the parking aid system.

Symptom	Possible Causes	Action
	mounting • Area around vehicle is not clear of obstacles such as channels, gutters or other items on the ground • Exhaust gas and warm air clouds creating ghost echoes • Vehicle not on level ground or next to a gradient • Parking aid sensors painted without being removed from the bumper assembly or not painted to the manufacturer specification	Rectify as required • Ensure the area around the vehicle is clear of any obstacles, move the vehicle to a suitable area before continuing diagnosis • Ensure no exhaust gas or warm area clouds are in the area around the parking aid sensor detection range • Ensure the vehicle is on level ground and clear of any ramps, potholes or speed bumps, move the vehicle to a suitable area before continuing diagnosis • Remove parking aid sensor and ensure correctly painted parking aid sensor is installed - Parking aid sensors that are painted incorrectly and not to the manufacturer standards, will not be considered in any warranty claim
Parking aid sensors are being returned with no faults found or signs of water ingress/corrosion	Possible issue with sensor connectors not latched correctly	• When either no/intermittent operation has been reported the following action should be taken • Using Datalogger identify the position of the suspect parking aid sensor within the bumper • 1. Visually locate the position of the suspect parking aid sensor. Inspect and provide details in claim if the sensor has any sign of physical damage • 2. Remove the bumper. Disconnect the wiring at the main harness connector. Inspect the main harness connectors and terminals for signs of damage, backed out pins, corrosion and water ingress, or damage to the seals. Provide details in claim if any of the above symptom's are present • 3. Attempt to remove the harness connector from the suspect parking aid sensor without using the connector latch i.e. lightly pull back on **ALL** wires together, ensuring the harness is held close to the back of the connector, not elsewhere on the wiring harness. **DO NOT** apply excessive force. If the connector can be removed without using the latch, provide details in claim if connector is loose. If the connector is fully latched, disconnect it from the sensor • 4. Inspect and provide details in claim if the suspect sensor harness connector has any sign of water ingress/corrosion • 5. Inspect and provide details in claim if the suspect parking aid sensor harness connector shows any sign that the terminals have backed-out of the connector or for any damage to the terminal seals. Replace/repair the harness as required and proceed • 6. Remove the suspect parking aid sensor from the bumper. Inspect the parking aid sensor connector for signs of water ingress/corrosion. Provide details in claim if corrosion/water ingress is present • 7. Exchange the suspect parking aid sensor with another parking aid sensor within the bumper that is performing correctly. Reconnect all sensors and reconnect the bumper main harness connector. Repeat step 1. Confirm if the original fault now appears at the new position of the suspect parking aid sensor, if so, proceed to step • 8. If not, carry out the appropriate open circuit and short circuit checks between the original suspect parking aid sensor harness connector and the parking aid control module • 9. Refit the parking aid sensors to their original position in the bumper • 10. Reconnect the parking aid sensor to the bumper harness connector. Reconnect main harness connector and refit the bumper • 11. Repeat Step 1. If fault is still present, **replace only the faulty sensor**

PINPOINT TEST A : PARKING AID SYSTEM NOT FUNCTIONING CORRECTLY WITH NO DTCS LOGGED

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: PERMANENT FAULT	
	1 When the parking aid system is activated, there is a vibration on the parking aid sensor membrane. This can be verified by touching the parking aid sensor face with a hard item such as a pencil, ball-pen, small screwdriver, or fingernail. **Ensure no damage is caused to sensor painted surface.**
	Are the parking aid sensor(s) vibrating? **Yes** GO to A2. **No** GO to A5.
A2: SENSORS VIBRATING WITH PARKING AID FAULT	
	1 Clean the parking aid sensor face.
	Parking aid system functioning correctly? **Yes** No further action required. **No** GO to A3.
A3: SENSORS VIBRATING WITH PARKING AID FAULT	
	1 Check parking aid sensors correctly mounted. Parking aid sensor holder correctly mounted. Parking aid sensor decoupler ring fitted or fitted correctly. Parking aid sensor positioning correct. Parking aid sensor painted without being removed from the bumper assembly or not painted to manufacturer specification. Rectify as required.
	Parking aid system functioning correctly? **Yes** No further action required. **No** GO to A4.
A4: SENSORS VIBRATING WITH PARKING AID FAULT	
	1 Carry out speaker test. Only applicable to vehicles with rear hard wired parking aid speakers. Check the parking aid speaker wiring circuit and connector. Rectify as required. Check and install a new parking aid speaker as required. Vehicles with audio parking aid. Confirm audio system is functioning correctly. Refer to the relevant section of the workshop manual.
	Parking aid system functioning correctly. **Yes** No further action required.
A5: SENSORS NOT VIBRATING WITH PARKING AID FAULT	
	1 Isolate the fault to front or rear parking aid sensors
	Are all rear parking aid sensors vibrating? **Yes** GO to A6. **No** GO to A10.
A6: FRONT SENSORS NOT VIBRATING WITH PARKING AID FAULT	
	1 Check the parking aid control module is correctly configured. Check and update the car configuration file as required.
	Parking aid system functioning correctly? **Yes** No further action required. **No** GO to A7.
A7: FRONT SENSORS NOT VIBRATING WITH PARKING AID FAULT	
	1 Check the correct parking aid control module is installed to the vehicle.
	Parking aid system functioning correctly? **Yes** No further action required. **No** GO to A8.
A8: FRONT SENSORS NOT VIBRATING WITH PARKING AID FAULT	
	1 If all 4 front parking aid sensors are not vibrating, carry out harness test on common ground, power supply. Check main parking aid harness connector to bumper harness connector. Rectify as required.
	Parking aid system functioning correctly? **Yes** No further action required. **No** GO to A9.
A9: FRONT SENSORS NOT VIBRATING WITH PARKING AID FAULT	
	1 Check and install a new parking aid control module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.
	Parking aid system functioning correctly. **Yes** No further action required.
A10: REAR SENSORS NOT VIBRATING WITH PARKING AID FAULT	
	1 Check the parking aid control module is correctly configured. Check and update the car configuration file as required.

	Parking aid system functioning correctly? **Yes** No further action required. **No** GO to A11.
A11: REAR SENSORS NOT VIBRATING WITH PARKING AID FAULT	
	1 If all 4 rear parking aid sensors are not vibrating, carry out harness test on common ground, power supply. Check main parking aid harness connector to bumper harness connector. Rectify as required.
	Parking aid system functioning correctly. **Yes** No further action required. **No** GO to A12.
A12: REAR SENSORS NOT VIBRATING WITH PARKING AID FAULT	
	1 Check and install a new parking aid control module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.
	Parking aid system functioning correctly. **Yes** No further action required.

PINPOINT TEST B : PARKING AID SYSTEM NOT FUNCTIONING CORRECTLY WITH NO DTCS LOGGED	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
B1: PARKING AID SYSTEM GIVES WARNING SIGNAL WITHOUT OBSTACLE	
	1 Clean the parking aid sensor face. Check for any damage to the parking aid sensor face. Rectify as required. Snow, water or ice on sensor face. Parking aid sensor face has been repainted to the incorrect thickness. Rectify as required.
	Parking aid system functioning correctly? **Yes** No further action required. **No** GO to B2.
B2: PARKING AID SYSTEM GIVES WARNING SIGNAL WITHOUT OBSTACLE	
	1 Ensure the vehicle ride height is within manufacturer specified limits. Rectify as required.
	Parking aid system functioning correctly? **Yes** No further action required. **No** GO to B3.
B3: PARKING AID SYSTEM GIVES WARNING SIGNAL WITHOUT OBSTACLE	
	1 Check for any non standard accessories are not fitted, such as tow bar, bike rack, body kit, modified exhaust, lighting or licence plate holder.
	Parking aid system functioning correctly? **Yes** No further action required. **No** GO to B4.
B4: PARKING AID SYSTEM GIVES WARNING SIGNAL WITHOUT OBSTACLE	
	1 Limitations or characteristics of the parking aid system such as vehicle on a gradient, exhaust gas vapour, signal reflection.
	Parking aid system functioning correctly? **Yes** No further action required. **No** For a detailed description of the parking aid system, refer to the relevant Description and Operation section in the workshop manual. REFER to: Parking Aid (413-13 Parking Aid, Description and Operation) / Parking Aid (413-13 Parking Aid, Description and Operation) / Parking Aid (413-13 Parking Aid, Description and Operation).

DTC Index

For a list of diagnostic trouble codes that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Parking Aid Module (PAM) (100-00 General Information, Description and Operation).

Published: 30-Apr-2014

Parking Aid - Proximity Camera

Diagnosis and Testing

Principles of Operation

For a detailed description of the rear view camera system, refer to the relevant Description and Operation section of the workshop manual.

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:

If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
• Touch screen • Rear view camera	• Fuses • Wiring harnesses and connectors • Touch screen • Rear view camera

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index
5. Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

Symptom Chart

Symptom	Possible Cause	Action
Rear view camera image slow to react	• System operation within specification	NOTE: After selecting reverse, it may take up to 20 seconds for the image to be displayed. • No further action necessary
Blank screen	• Rear view camera not functioning	• GO to Pinpoint Test A.
Blue screen	• Video in signal absent	• GO to Pinpoint Test B.
No tracking lines	• Missing/invalid reverse gear signal • LIN fault	• Using the manufacturer approved diagnostic system, check the central junction box for related DTCs and refer to the relevant DTC index • GO to Pinpoint Test C.

Symptom	Possible Cause	Action
Frozen tracking lines	• LIN data gateway fault	• GO to Pinpoint Test D.

Pinpoint Tests

PINPOINT TEST A : PERMANENT BLANK SCREEN TESTS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: PERMANENT BLANK SCREEN TEST 1	
NOTE: A blank screen is the default display when the rear view camera is not transmitting an image.	
	1 Refer to the electrical circuit diagrams and check the power and ground connections to the rear view camera
	Are the power and ground circuits within specification? **Yes** GO to A2. **No** Repair power or ground circuit as necessary
A2: PERMANENT BLANK SCREEN TEST 2	
CAUTION: Do not probe the coaxial cable connectors as they are prone to damage.	
NOTE: A DC resistance measurement is not a reliable test method as the system operates at low voltage and high frequency.	
	1 Check the integrity of the rear view camera coaxial cable connectors (at rear view camera, the touch screen and in-line connectors)
	2 Check the coaxial cable for excessive bending, clamping and insulation damage
	Is the rear view camera coaxial cable disconnected or damaged? **Yes** Reconnect or install a new coaxial cable as necessary **No** Install a new rear view camera

PINPOINT TEST B : BLUE SCREEN TESTS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
B1: BLUE SCREEN TEST 1	
NOTE: A blue screen is the default display when the video in signal is absent.	
	1 Select reverse gear and observe the touch screen
	Is the touch screen blue? **Yes** Check the integrity of the rear view camera coaxial cable connectors (at rear view camera, the touch screen and in-line connectors), and retest **No** GO to Pinpoint Test A.

PINPOINT TEST C : ABSENT TRACKING LINES TESTS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
C1: ABSENT TRACKING LINES TEST 1	
	1 Refer to the electrical circuit diagrams and check the rear view camera LIN bus circuit for short circuit to ground, short circuit to power, open circuit, high resistance
	Is a LIN bus circuit fault present? **Yes** Repair the LIN bus circuit as necessary **No** Install a new rear view camera

PINPOINT TEST D : FROZEN TRACKING LINES TESTS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
D1: FROZEN TRACKING LINES TEST 1	

NOTE: The vehicle may take 30 seconds (or 100m) to learn the steering centre position after starting the engine. This is normal.	
	1 Start the engine
	2 Wait at least 30 seconds
	3 Select reverse gear
	4 Turn the steering wheel and observe the touch screen
	Do the tracking lines react to steering input? **Yes** No fault present **No** Potential LIN data gateway fault

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.

Published: 06-Mar-2013

Parking Aid - Front Inner Parking Aid Sensor

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

RH illustration shown, LH is similar.

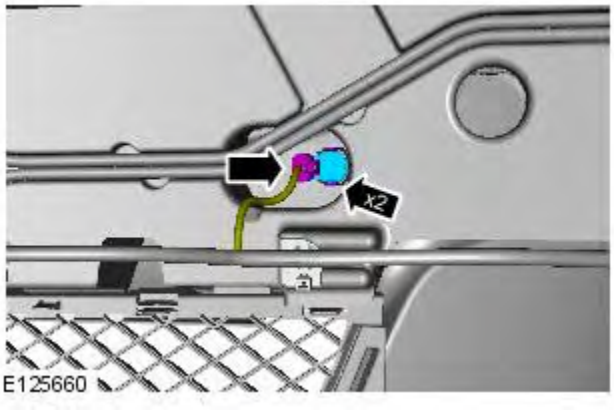
The ignition must be switched off.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

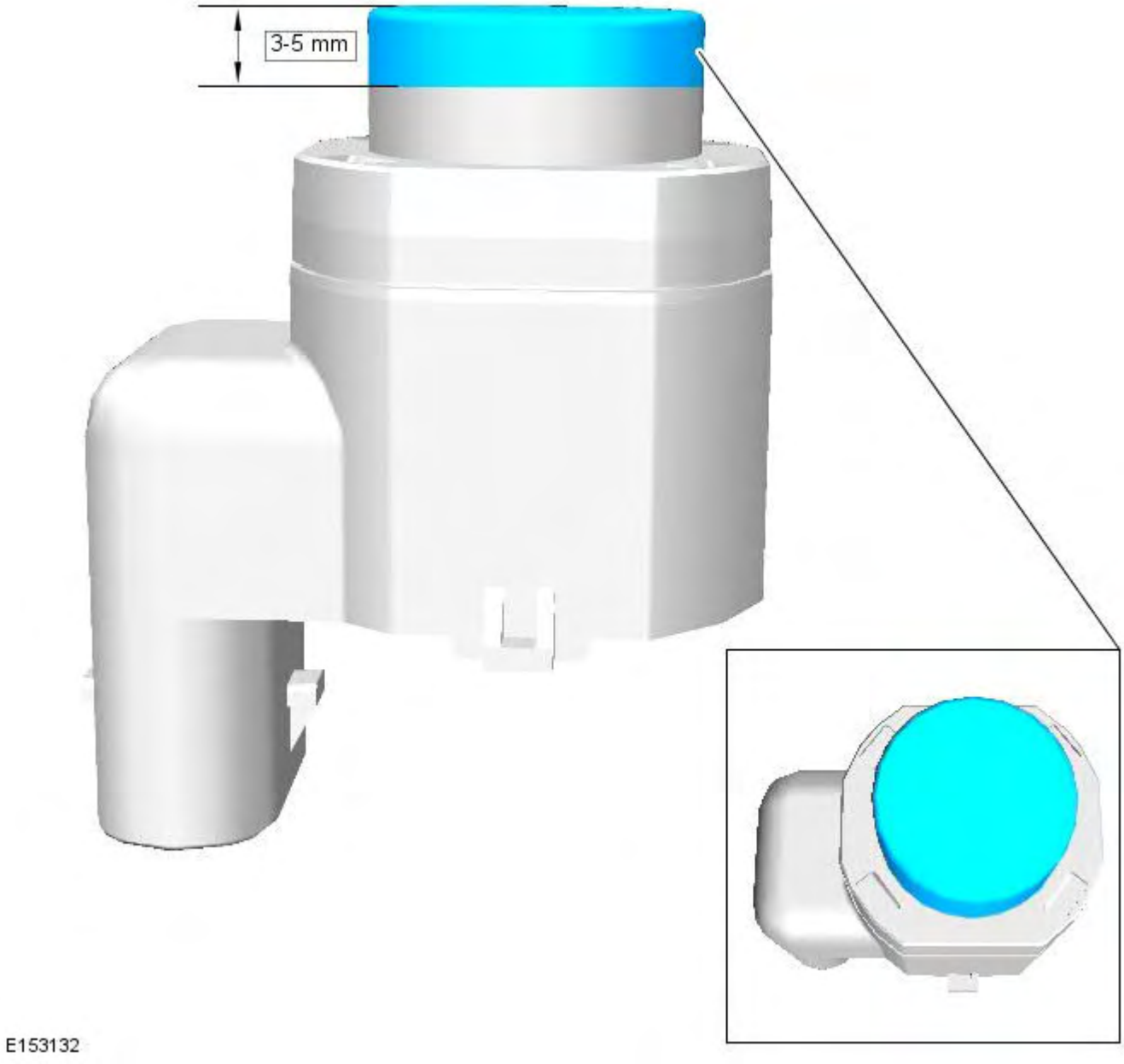
3.



Installation

1. CAUTION: If a new sensor is installed, make sure that the area illustrated is the **only** area painted. Failure to follow this instruction may result in the component malfunctioning.

   NOTE: On vehicles that are equipped with black or unpainted bumpers, the sensor(s) do not require painting.



2. To install, reverse the removal procedure.

Published: 06-Mar-2013

Parking Aid - Front Outer Parking Aid Sensor

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

RH illustration shown, LH is similar.

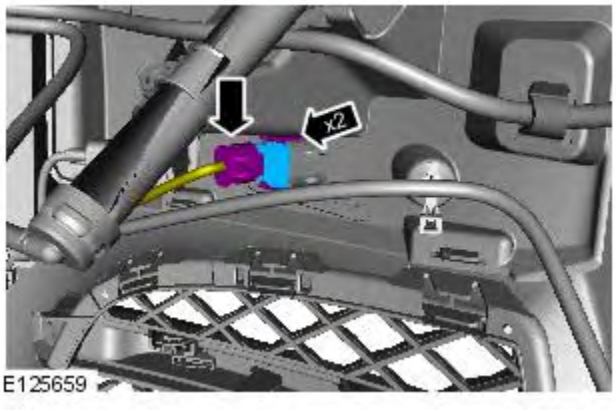
The ignition must be switched off.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

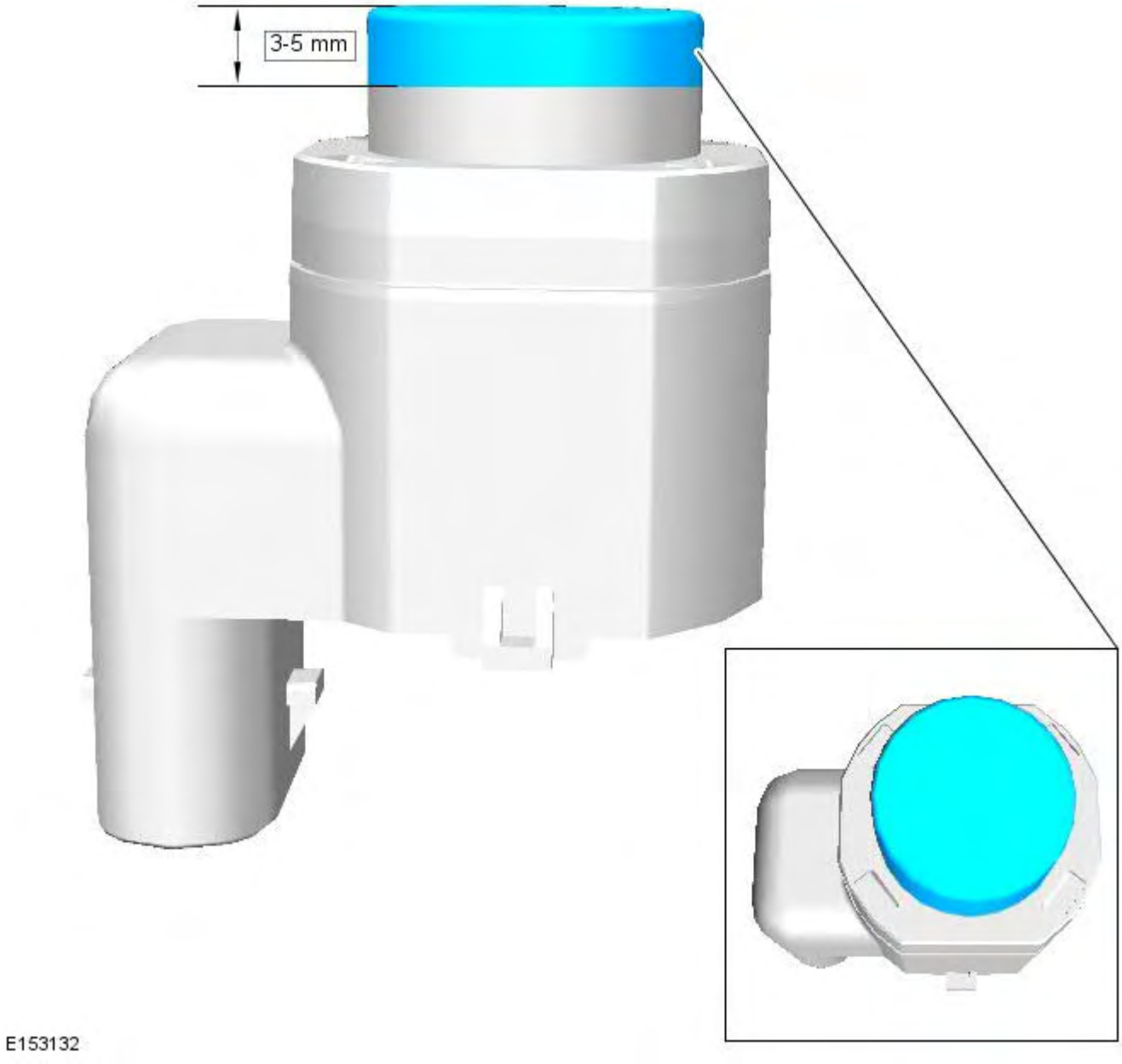
3.



Installation

1. CAUTION: If a new sensor is installed, make sure that the area illustrated is the **only** area painted. Failure to follow this instruction may result in the component malfunctioning.

   NOTE: On vehicles that are equipped with black or unpainted bumpers, the sensor(s) do not require painting.



2. To install, reverse the removal procedure.

Published: 11-May-2011

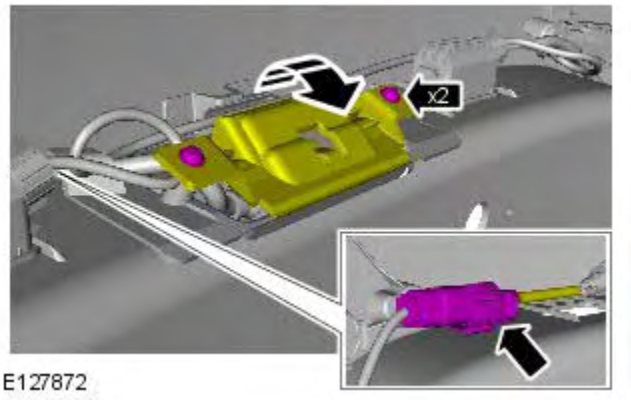
Parking Aid - Parking Aid Camera
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

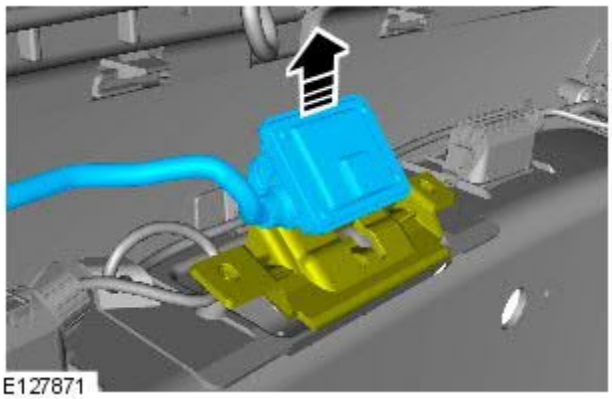
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.
3. Refer to: Rear Bumper Cover (501-19 Bumpers, Removal and Installation).



E127872

4. CAUTION: Take extra care not to damage the component.


E127871

5.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Parking Aid - Parking Aid Module
Removal and Installation

Removal

NOTES:

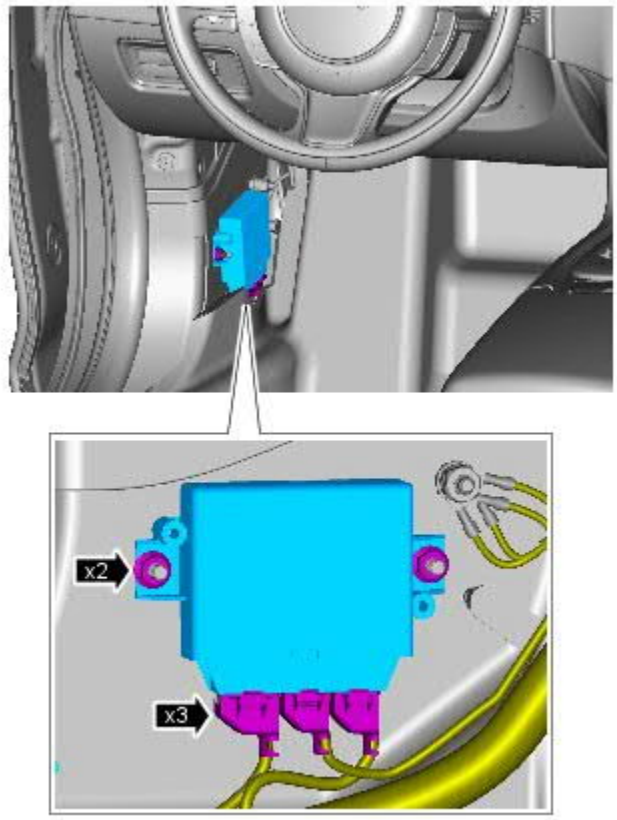
Removal steps in this procedure may contain installation details.

LHD illustration shown, RHD is similar.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. Refer to: Cowl Side Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. *Torque:* 5 Nm



E127415

Installation

1. NOTE: New units must be configured using the Programmable Module Installation Routine in the diagnostic tool.

   To install, reverse the removal procedure.

Published: 06-Mar-2013

Parking Aid - Rear Inner Parking Aid Sensor

Removal and Installation

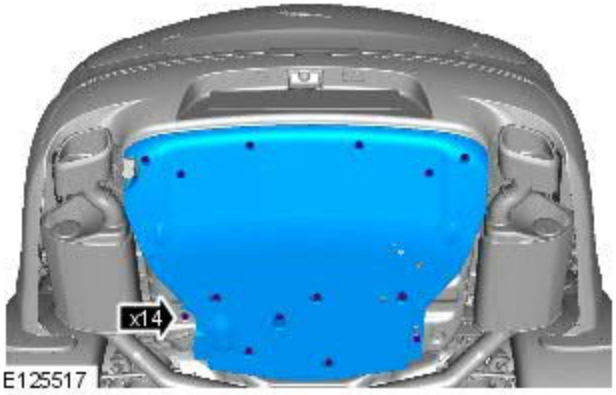
Removal

CAUTION: LH illustration shown, RH is similar.

NOTES:

Removal steps in this procedure may contain installation details.

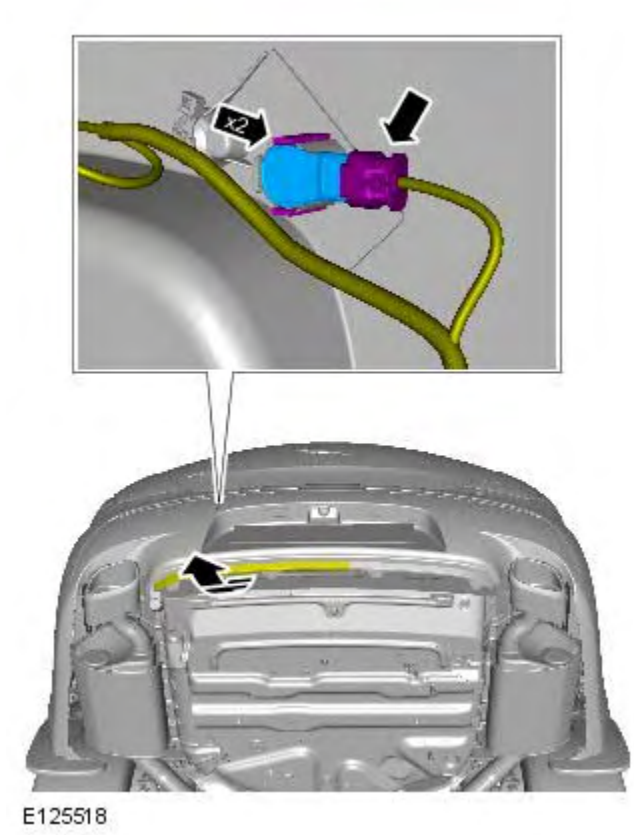
The ignition must be switched off.



1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. *Torque:* 5 Nm



3. CAUTIONS:

   Protect the surrounding trim to avoid damage.

   Protect the surrounding paintwork to avoid damage.

Installation

1. CAUTION: If a new sensor is installed, make sure that the area illustrated is the **only** area painted. Failure to follow this instruction may result in the component malfunctioning.

   NOTE: On vehicles that are equipped with black or unpainted bumpers, the sensor(s) do not require painting.

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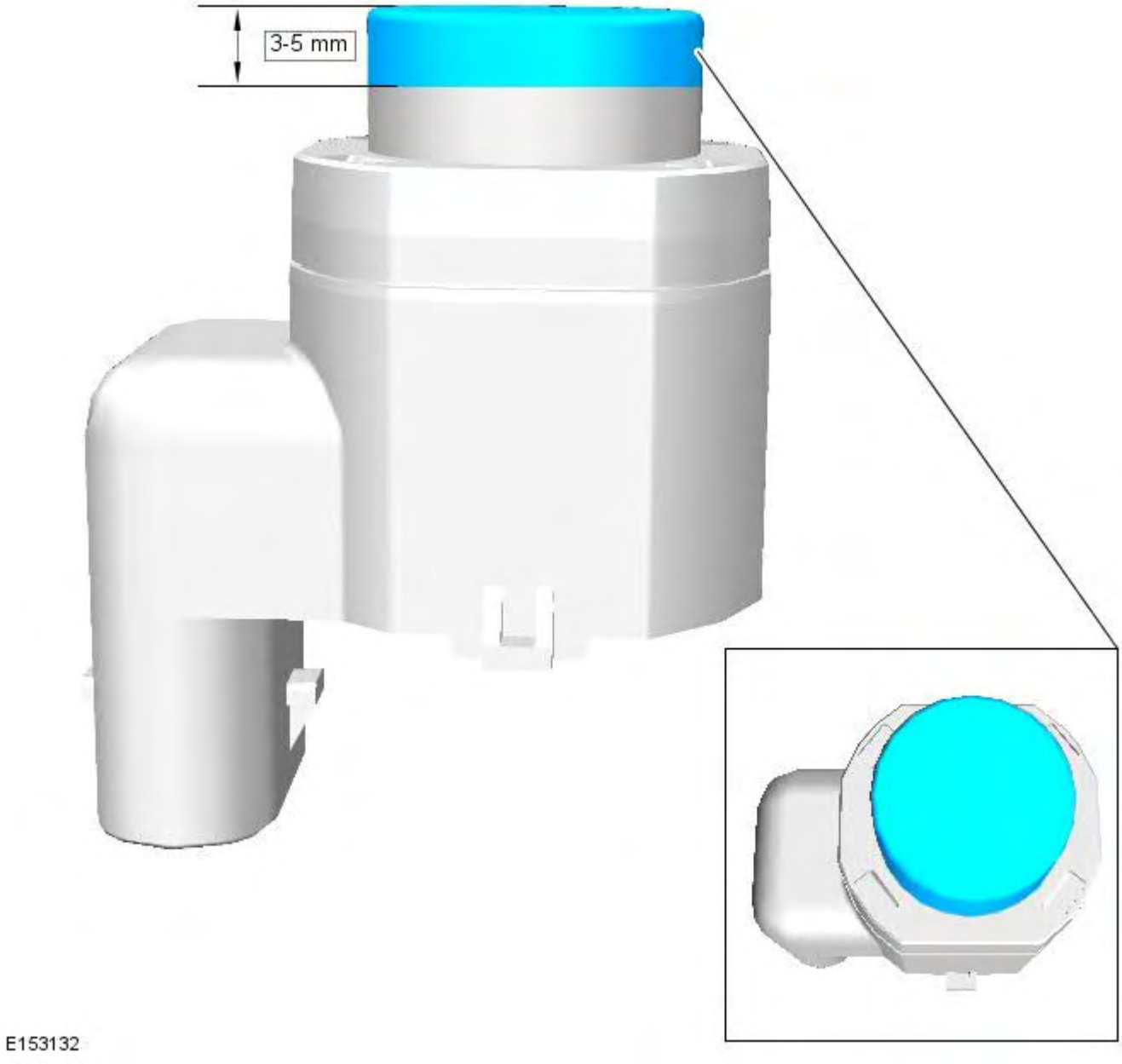


2. To install, reverse the removal procedure.

Published: 06-Mar-2013

Parking Aid - Rear Outer Parking Aid Sensor

Removal and Installation

Removal

CAUTION: LH illustration shown, RH is similar.

NOTES:

Removal steps in this procedure may contain installation details.

The ignition must be switched off.

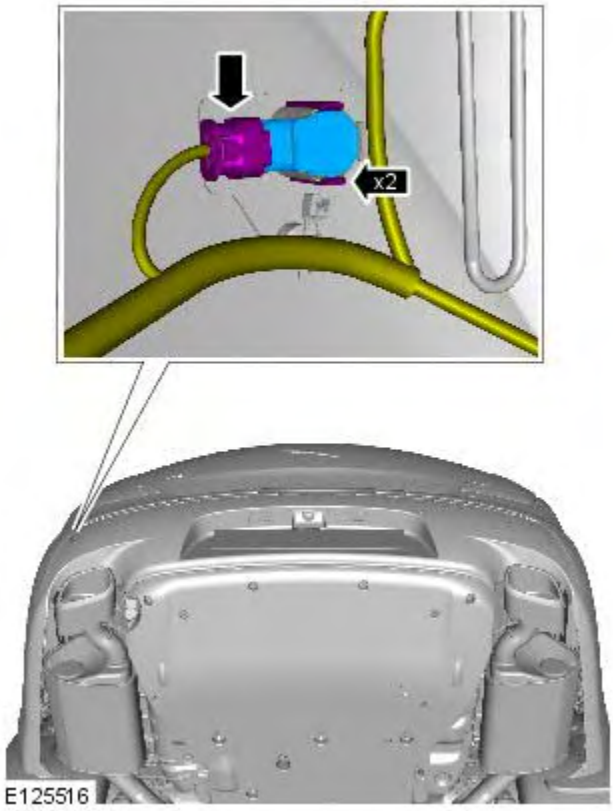
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. CAUTIONS:

   Protect the surrounding trim to avoid damage.

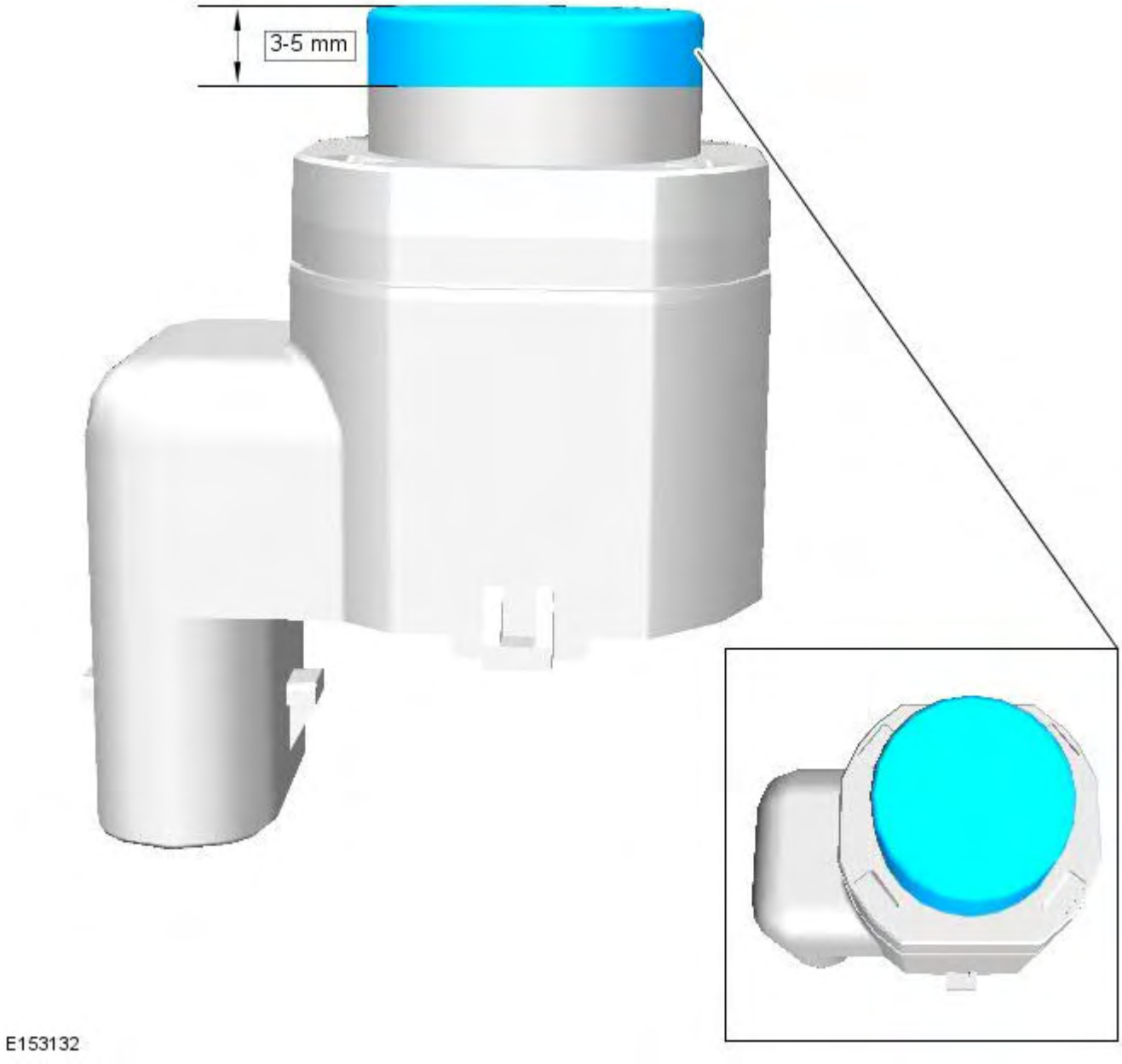
   Protect the surrounding paintwork to avoid damage.



Installation

1. CAUTION: If a new sensor is installed, make sure that the area illustrated is the **only** area painted. Failure to follow this instruction may result in the component malfunctioning.

   NOTE: On vehicles that are equipped with black or unpainted bumpers, the sensor(s) do not require painting.



2. To install, reverse the removal procedure.

Published: 07-Aug-2014

Battery and Charging System - General Information - Battery Care Requirements

Description and Operation

1. INTRODUCTION

This document defines the requirements for care and maintenance of batteries, and the standard of battery care at dealers and retailers for new vehicles.

This applies to all types of 12 Volt Lead Acid Batteries used in Jaguar and Land Rover vehicles whether they are conventional flooded technology or Absorbed Glass Mat (AGM – also known as Valve Regulated Lead Acid (VRLA)) technology and also applies to both Primary, Secondary and Auxiliary Batteries. AGM batteries offer improved resistance to cycling as seen in stop start applications.

In order to prevent damage to the battery and ensure a satisfactory service life, all processes detailed within this document must be rigorously adhered to.

It is equally important therefore to note the following key points:

- All new vehicles leave the factory with either a transit relay installed and/or have a transit mode programmed into the vehicle control modules. The transit relay must be removed and the transit mode disabled (where applicable) using an approved diagnostic system, **NOT MORE THAN 72 HOURS** before the customer takes delivery.
- The battery can be discharged by the following mechanisms:
  - **Self Discharge**: - A lead acid battery will very slowly discharge itself due to its own internal chemical processes whether it is connected to a vehicle or not.
  - **Quiescent Discharge**: - The vehicle electrical systems when connected to the battery will draw charge from the battery.

12 Volt Lead Acid Batteries rely on internal chemical processes to create a voltage and deliver current. These processes and the internal chemical structure of the battery can be damaged if the battery is allowed to discharge over a number of weeks / months, or is left in a discharged state for a lengthy time period.

- **On vehicles with conventional ignition keys**, these must not be left in the ignition lock barrel when the transit relay has been removed, otherwise quiescent current will increase and the battery will discharge more rapidly.
- **For keyless vehicles**, the Smart Key must be stored at least 5m (16 ft) away from the vehicle when the vehicle is parked or stored.
- **AGM Batteries are fully sealed and cannot have the electrolyte level topped up.**

NOTE: Dealers and retailers involved in the storage / handling of vehicles and replacement batteries have a responsibility to ensure that only a fully charged battery may be processed through the distribution selling chain.

2. GENERAL RULES FOR BATTERY CARE

2.1 Dealer Demonstration Vehicles

Vehicles used as dealer demonstrator(s), in a showroom, must be connected to a JLR approved showroom conditioner capable of delivering 50 Amps. This will prevent the battery from being damaged.

2.2 Software Reflash, SDD work or Ignition On related workshop activities

Due to the high electrical current demand and high depth of discharge that can occur during vehicle software re-flash activities, SDD work or ignition on (power mode 6) related work in the workshop, vehicles that are undergoing such activities MUST have a JLR approved power supply capable of delivering 50 Amps or more.

2.3 Extended Vehicle Rework

For any extended vehicle rework that results in consuming vehicle power, either the battery should be disconnected or a JLR approved power supply connected.

2.4 Jump Starting New vehicles before they have been delivered to the customer

- It is the dealer / retailers responsibility to make sure the battery is not allowed to discharge by following the instructions and processes defined in this manual.
- However, if circumstances dictate that a new vehicle must be jump started due to a discharged battery whilst the vehicle is in the dealer / retailers care, **the battery on this vehicle must be replaced with a new one** prior to delivery to the customer at the dealer / retailers liability.
- The vehicle should also undergo investigation as to why the battery became discharged.
- Do not connect the jump starting cable to the negative (-) terminal of the battery. Always connect to the recommended earth point. As defined in the owners handbook or service documentation for that vehicle.

2.5 AGM Batteries

- **AGM batteries must not be charged above 14.8 Volts. Doing so will damage them.**
- AGM Batteries must be tested with a capable battery tester as **detailed in the Equipment section (Section 5) of this**

procedure.

NOTE: Under no circumstances should the battery be disconnected with the engine running because under these conditions the generator can give a very high output voltage. This high transient voltage will damage the electronic components in the vehicle. Loose or incomplete battery connections may also cause high transient voltage.

3. HEALTH AND SAFETY PRECAUTIONS

WARNINGS:

BATTERY CELLS CONTAIN SULPHURIC ACID AND EXPLOSIVE MIXTURES OF HYDROGEN AND OXYGEN GASES. IT IS THEREFORE ESSENTIAL THAT THE FOLLOWING SAFETY PRECAUTIONS ARE OBSERVED.

Batteries emit highly explosive hydrogen at all times, particularly during charging. To prevent any potential form of ignition occurring when working in the vicinity of a battery:

- Do not smoke when working near batteries.
- Avoid sparks, short circuits or other sources of ignition in the battery vicinity.
- Switch off current before making or breaking electrical connections.
- Ensure battery charging area is well ventilated.
- Ensure the charger is switched off when: a) connecting to a battery; b) disconnecting from the battery.
- Always disconnect the ground cable from the battery terminal first and reconnect it last.

Batteries contain poisonous and highly corrosive acid. To prevent personal injury, or damage to clothing or the vehicle, the following working practices should be followed when topping up, checking electrolyte specific gravity, removal, refitting or carrying batteries:

- Always wear suitable protective clothing (an apron or similar), safety glasses, a face mask and suitable gloves.
- If acid is spilled or splashed onto clothing or the body, it must be neutralized immediately and then rinsed with clean water. A solution of baking soda or household ammonia and water may be used as a neutralizer.
- In the event of contact with the skin, drench the affected area with water. In the case of contact with the eyes, bathe the affected area with cool clean water for approximately 15 minutes and seek urgent medical attention.
- If battery acid is spilled or splashed on any surface of a vehicle, it should be neutralized and rinsed with clean water.
- Heat is generated when acid is mixed with water. If it becomes necessary to prepare electrolyte of a desired specific gravity, SLOWLY pour the concentrated acid into water (not water into acid), adding small amounts of acid while stirring. Allow the electrolyte to cool if noticeable heat develops. With the exception of lead or lead-lined containers, always use non-metallic receptacles or funnels. Do not store acid in excessively warm locations or in direct sunlight.

Due to their hazardous contents, the disposal of batteries is strictly controlled. When a battery is scrapped, ensure it is disposed of safely, complying with local environmental regulations. If in doubt, contact your local authority for advice on disposal facilities.

4. BATTERY CARE REQUIREMENTS

4.1 RECEIPT OF A NEW VEHICLE

Within 24 hours of receipt of a new vehicle, a battery condition check must be carried out in accordance with the battery test process utilizing a JLR approved tester as outlined in **the Equipment section (Section 5) of this procedure**.

NOTE: The Midtronics code from the tester must be recorded on the form.

Any actions must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure**. The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.
For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

4.2 NEW VEHICLE STORAGE

If the vehicle is to be stored the transit relays MUST be refitted and / or the vehicle put into transport mode.

Transit relay removal / vehicle placed in normal mode should only be completed a maximum of 72 hours prior to handover to customer

For vehicles without either a transit mode or transit relay the battery negative cable must be DISCONNECTED from the battery.

The battery must be tested and/or re-charged every 30 days and MUST be re-charged after every 90 day period.

NOTE: The Midtronics code from the tester must be recorded on the form.

Any actions must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure**. The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.
For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

4.3 PDI / DELIVERY TO CUSTOMER

Before the vehicle is handed over to the customer and as part of the PDI, the condition of the battery needs to be confirmed. The battery condition must be checked in accordance with the battery test process utilizing a JLR approved tester as outlined in **the Equipment section (Section 5) of this procedure**.

NOTE: The Midtronics code from the tester must be recorded on the form.

Any actions must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure**. The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.
For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

4.4 REPLACEMENT BATTERIES FOR SERVICE

All service replacement batteries must have the battery condition checked within 24 hours of receipt and controlled on a 'First In First Out' basis to ensure batteries are not allowed to age unnecessarily.

For batteries in storage and not yet fitted to a vehicle, they must be stored in a dry environment, not in direct sunlight or under any direct heat source. Any batteries exhibiting any forms of damage or corrosion must not be fitted to any vehicle. Any batteries which are dropped must be scrapped, this applies even if no external damage is apparent.

The battery condition must be checked every 30 days in accordance with the battery test process utilizing a JLR approved tester as outlined in **the Equipment section (Section 5) of this procedure**.

Any actions must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure**.The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.
For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

4.5 BATTERY MAINTENANCE

Any battery whether it is in a vehicle or a replacement part must be tested and/or re-charged every 30 days and MUST be re-charged after every 90 day period.

4.6 BATTERY TEST PROCESS

It is recommended that this test is conducted at least 24 hours after the vehicle engine has been run or the battery charged to avoid the need of surface charge removal. If time constraints make this unacceptable then the surface charge must be removed.

Surface Charge Removal

A vehicle which has had its battery charged or been driven in a 24 hour period before the test, must have its surface charge removed.

- Turn on the ignition (power mode 6) but do not start the vehicle
- Switch on the headlamps on high beam for a minimum 3 minutes
- Switch off the headlamps
- Wait a minimum of 5 minutes before recording test results for any battery measurements

Battery Test

The battery may be tested either on a bench or on the vehicle.

The battery condition must be checked in accordance with the battery test process utilizing a JLR approved tester as outlined in **the Equipment section (Section 5) of this procedure**.

NOTE: The Midtronics code from the tester must be recorded on the form.

Any actions must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure**. The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.
For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

CAUTION: DO NOT connect the tester to any other circuit or chassis point other than the battery negative terminal.

5. EQUIPMENT

All equipment used must be functionally capable of meeting the compliance requirements. Please refer to the approved equipment document (JLR 000015).

In the case of batteries fitted to a new vehicle at the dealership, battery condition should be measured using the appropriate hand-held Midtronics tester as follows:

Battery Type	Battery Tester	Battery Tester
	Jaguar	**Land Rover**
AGM & Flooded	Midtronics EXP1080, GRX 3080	Midtronics EXP1080, GRX 3080

The test results must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.
For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

NOTE: All equipment must be calibrated

6 DETERMINING BATTERY CONDITION

TESTER RESULTS	ACTION
GOOD BATTERY	Return to service.
GOOD RE-CHARGE	Fully charge battery and return to service.
CHARGE AND RE-TEST	Fully charge battery. Remove surface charge. Re-test battery. If same result replace battery.
REPLACE BATTERY OR BAD CELL BATTERY	Verify surface charge removed. Disconnect battery from vehicle and re-test. If result repeats after surface charge removal, replace battery. **DO NOT RECHARGE**.
UNABLE TO DO TEST	Disconnect battery from vehicle and re-test.

7 BATTERY CHARGING

It is essential that a suitably ventilated defined area exists in each dealership / retailer for battery charging.

CAUTION: It is very important that when charging batteries using the traction charger or other stand-alone chargers that the charger is set for the correct type of battery before charging commences. If the wrong switch is selected the result would be a battery that is not charged fully and / or overheating can occur. Follow the manufacturers operating instructions.

Batteries **MUST BE** tested and if necessary charged every 30 days and charged after 90 days irrespective of any test. It is recommended that dealers / retailers always have fully charged batteries ready for use.

CAUTION: Do not charge AGM batteries with voltages over 14.8 Volts as this will damage the battery.

A designated controlled area must be allocated for scrap batteries and clearly controlled as such.

To bring a discharged but serviceable battery back to a fully charged condition proceed as follows:

- Check and if necessary top-up the battery electrolyte level. (Flooded maintainable batteries only)
- Charge the battery using a JLR approved charger as detailed in the approved equipment document following the manufacturers operating instructions.

NOTE: When using the Midtronics Diagnostic Charger, automatic mode must always be used. After charging and analysis, the charger may display 'Top-Off Charging', Hit STOP To End. Do not stop charging until the current falls to 5A or less, otherwise the battery will not be fully charged.

Following charging, a post charge battery condition test must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure**.

NOTE: The Midtronics code from the tester must be recorded on the form.

Any actions must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure**. The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.
For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

8 BATTERY REPLACEMENT

If it is determined that a battery requires replacement, always refer to the appropriate section of the workshop manual for instructions on removing and installing the battery from the vehicle.

On in service vehicles fitted with a Battery Monitoring System (BMS), the BMS control module must be reset following the installation of a new battery. The BMS control module reset procedure must be performed using an approved diagnostic

system.

9 CONFIRMING ELECTROLYTE LEVEL

WARNINGS:

BEFORE CHECKING AND TOPPING-UP THE BATTERY ELECTROLYTE, REFER TO THE HEALTH AND SAFETY PRECAUTIONS SECTION.

AGM TECHNOLOGY BATTERIES ARE FULLY SEALED FOR LIFE AND NO ATTEMPT SHOULD BE MADE TO CHECK OR TOP UP THE ELECTROLYTE LEVEL.

On certain types of battery the electrolyte level may need to be checked.

- Make sure the battery is of a type suitable for topping up. These types of batteries will have cell plugs visible on the top face of the battery or a removable access panel to allow access to the cells.
- On batteries with a clear or opaque case and level marks, check the electrolyte level by visual inspection of the maximum level indicator mark on the battery casing indicating adequate level above the battery separators.
- On batteries with black cases, remove the cell plugs or access panel and ensure the electrolyte level is level with the indicator in the cell hole. A flashlight may be required to see the electrolyte level on this type of battery.
- If the electrolyte level is low, top-up using distilled water.

NOTE: Maintenance free and Valve Regulated (AGM) batteries are sealed and therefore cannot be topped up.

CAUTION: **DO NOT** overfill.

Published: 21-Dec-2012

Battery and Charging System - General Information - Quiescent Drain

Description and Operation

VEHICLE QUIESCENT CURRENT TESTING

On vehicles fitted with a Battery Monitoring System (BMS), the diagnostic routine for quiescent drain testing in the approved Jaguar or Land Rover diagnostic system should be utilized.

If a customer complains of a vehicle battery that discharges continuously or when left for a prolonged period of time, it is recommended that a quiescent drain test is performed as described below.

The battery drain should be measured using the approved Jaguar or Land Rover diagnostic system or a Digital Multi-Meter (DVOM). A procedure for quiescent drain measurement using the diagnostic system is available in the Diagnosis and Testing section of the Workshop Manual. The vehicle should be in the locked/armed state (for example vehicle alarm fully armed), all doors, engine and luggage compartment lids are open and latched (so as to appear closed from an electrical point of view). The test should take place after the vehicle has entered shutdown mode. The time taken for this to occur after the ignition is switched off varies according to model (Refer to the Topix On line resource for details).

When the vehicle is armed, the effect of the security system Light Emitting Diode (LED) flashing is to cause a pulsation in the measured current drain. In this case, either the average current should be taken (using a Digital Multi- Meter (DVOM) with an averaging system) or the current reading taken, ignoring the brief high current peaks.

EQUIPMENT

Approved Jaguar or Land Rover diagnostic system with current probe**OR** Digital Multi-Meter (DVOM) with current probe.

METHOD OF MEASUREMENT

Using an Approved Jaguar or Land Rover Diagnostic System.

1. Switch off all electrical loads and ensure that the ignition is off
2. Connect the current probe to the approved Jaguar or Land Rover diagnostic system
3. Calibrate the probe
4. Install a clamp around the battery lead/junction box lead
5. Go to the Quiescent Current Testing section in this procedure

Using a digital multimeter

Do not use an in-line DVOM to measure the quiescent drain on vehicles fitted with an electronic throttle (for example XK 2006 onwards). The current exceeds the maximum amount the fuse in the DVOM is capable of handling.

1. Switch off all electrical loads and ensure that the ignition is off
2. Connect the current probe to the digital multmeter
3. Calibrate the probe
4. Install a clamp around the battery lead/junction box lead
5. Go to the Quiescent Current Testing section in this procedure

QUIESCENT CURRENT TESTING

1. Switch ignition to ‘on’ or select ignition mode in keyless vehicles and switch to ‘off’ (do not crank)
2. Remove key from ignition switch (if equipped)
3. Open and latch all doors, hood and luggage compartment lid
4. Lock the vehicle using the remote function on the remote handset. (Single lock only to avoid volumetric alarm arming)
5. Remove any other potential electrical drains such as accessories plugged into accessory sockets
6. Record the amperage readings after the shutdown period referenced in the Topix on line resource for details. Note all cars from 10MY onwards and XK from 07MY and XF from 08MY should be less than 30mA after 30 minutes
7. Record the final reading on the battery report form

The preferred method of testing following an excessive current consumption figure is to use a current probe around individual junction box leads to the various suspected circuits to identify a potential cause. This is in preference to the old method of removing fuses for the following reasons:

The drain may be caused by a module remaining active and preventing the quiescent drain from reducing to normal levels
The drain may be caused by a relay winding that is activated. Pulling the fuse can allow this to ‘reset’ and the drain will be lost and go un-diagnosed

QUIESCENT DRAIN - TYPICAL VALUES

NOTE: The quiescent drain after the initial shutdown period should not exceed the value shown in the table.

Jaguar Quiescent Drain Values

MODEL	SHUT DOWN PERIOD (minutes)	TYPICAL VALUES BATTERY DRAIN (mA)
XJS 3.2	60	<30
Sovereign 3.2	60	<37.3
XJ6 4.0	60	<38.6
XJS	60	<43.9
XJ6 (X300) (1995MY)	60	<43
XJ8 (X300)	60	<30
XK8 (X100)	60	<30
S-Type (X200)	60	<30
X-Type (X400)	30	<30
XJ6 (X350)	40	<30
XJ8 (X350)	40	<30
XK (X150) - From 2006MY	<20 (after lock/arm condition) [2]	<30
	33 (unlocked)	<30
XF (X250) - From 2008MY	<20 (after lock/arm condition) [2]	<30
	33 (unlocked)	<30
XF (X250) - From 2013MY	<10 (after lock/arm condition) [2]	<25
XF SportBrake (X250) - From 2013MY	<10 (after lock/arm condition) [2]	<25
	<20 (unlocked)	<25
XJ (X351) - From 2010MY - 2012MY	10 (afterlock/arm condition) [2]	<20
	30 (unlocked)	<20
XJ (X351) - From 2013MY	10 (afterlock/arm condition) [2]	<20
	<20 (unlocked)	<20
F - Type (X152) - From 2013MY	10 (afterlock/arm condition) [2]	<20
	<20 (unlocked)	<20

NOTE:

1. The total current drain will be higher if certain approved accessories are fitted (for example: tracker, trailer module, etc.)

2. Applies to vehicles without Tire Pressure Monitoring System (TPMS). Vehicle shut-down period with TPMS is approximately 15 minutes.

Published: 31-Aug-2012

Battery and Charging System - General Information - Charging System

Diagnosis and Testing

Principle of Operation

For a detailed description of the charging system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (414-00 Battery and Charging System - General Information)

Battery Care Requirements (Description and Operation),
Quiescent Drain (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

1. Verify the customer concern
2. Visually inspect for obvious signs of mechanical or electrical damage

Visual Inspection

Mechanical	Electrical
• Generator • Drive belt • Drive belt tensioner • Generator pulley • Check the security of the generator fittings	• Generator • Battery • Battery connections • Starter motor • Harnesses and connectors • Fuses • Charge warning lamp function • Engine control module

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index

Symptom Chart

Symptom	Possible Cause	Action
Charge warning lamp does not come on	• Bulb/circuit fault • Generator fault • CAN circuit fault • Engine control module fault	Check the warning lamp function with the ignition on and the engine off. Replace bulbs or repair the circuit(s) as necessary. Check for DTCs indicating a generator, CAN or engine control module fault
Charge warning lamp stays on/battery discharges	• Accessory drive belt broken • Generator pulley slipping on shaft • Generator fault • Battery cable fault • CAN circuit fault • Engine control module fault	Check the battery and generator cables. Refer to the electrical guides. Check for DTCs indicating a generator fault. Check the accessory drive belt condition and tension. Check that the pulley does not rotate independently of the generator. Check for DTCs indicating a CAN or engine control module fault
Battery discharged	• Charging/monitoring circuit fault • Battery monitoring system failure • Generator failure • Battery failure • Quiescent current high	Carry out automated diagnostic routine using manufacturer approved diagnostic system
Generator not charging	• Charging/monitoring circuit fault • Generator failure • Pulley loose/failure	Carry out automated diagnostic routine using manufacturer approved diagnostic system

Symptom	Possible Cause	Action
Noise (mechanical)	• Accessory drive belt slipping • Generator fault	Check the accessory drive belt condition and tension. Disconnect the accessory drive belt and check that the generator rotates freely

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00. REFER to: (100-00)

Diagnostic Trouble Code (DTC) Index - DTC: Central Junction Box (CJB) (Description and Operation),
Diagnostic Trouble Code Index: Gateway Module (Description and Operation),
Diagnostic Trouble Code (DTC) Index - TDV6 3.0L Diesel, DTC: Engine Control Module (Description and Operation),
Diagnostic Trouble Code (DTC) Index - DTC: V6 S/C 3.0L Petrol, DTC: Engine Control Module (Description and Operation),
Diagnostic Trouble Code (DTC) Index - V8 5.0L Petrol/V8 S/C 5.0L Petrol, DTC: Module Name: Engine Control Module (Description and Operation).

Published: 11-May-2011

Battery, Mounting and Cables -

Battery Specifications

Engine	Amp hour (Ah)	Cold cranking amps (CCA)
3.0L diesel	90	950
5.0L petrol without block heater	90	800
5.0L petrol with block heater	90	950

Torque Specifications

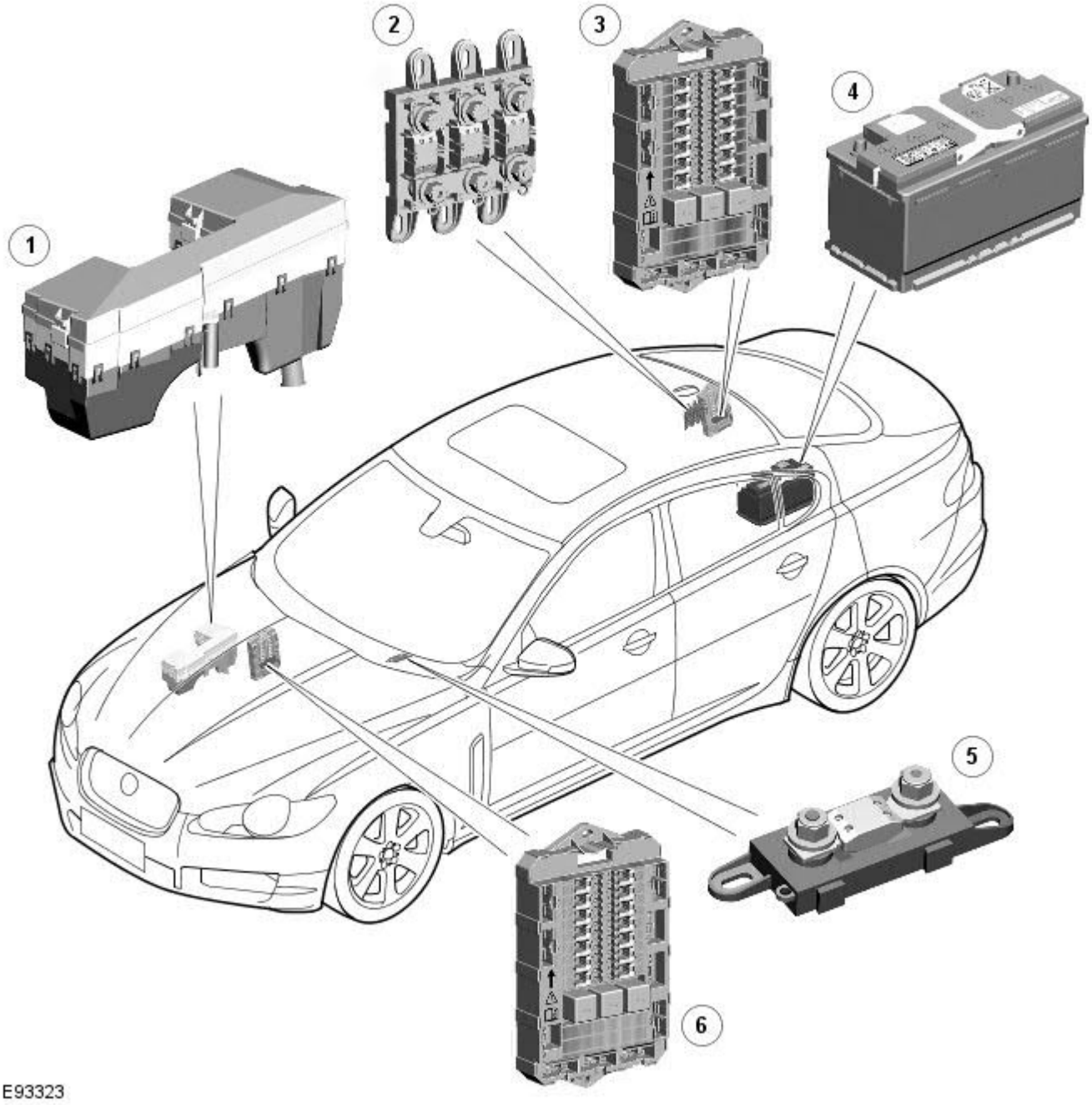
Description	Nm	lb-ft	lb-in
Battery positive cable to rear junction box retaining nut	12	9	-
Battery monitoring system retaining nut to battery positive terminal	6	-	53
Battery ground cable to body retaining bolt	25	18	-
Battery cable terminals	6	-	53
Battery clamp bolts	13	10	-
Battery tray retaining bolt	10	7	-

Published: 11-May-2011

Battery, Mounting and Cables - Battery and Cables - Component Location

Description and Operation

COMPONENT LOCATION



Item	Description
1	EJB (engine junction box)
2	BJB (battery junction box)
3	RJB (rear junction box)
4	Battery
5	Electric booster heater megafuse
6	CJB (central junction box)

Published: 11-May-2011

Battery, Mounting and Cables - Battery and Cables - Overview

Description and Operation

OVERVIEW

Mounted on the battery negative terminal is a battery monitoring system module. The battery monitoring system module is integral with the battery negative cable and is controlled by the ECM (engine control module).

CAUTION: To avoid damaging the battery monitoring system module, always use a suitable body ground point rather than the battery negative terminal when connecting a slave power supply to the vehicle.

If a new battery is fitted to the vehicle, the battery monitoring system module will require re-calibrating using the Jaguar approved diagnostic system.

Fitted on the battery positive terminal is a transit relay. The transit relay must be removed from the vehicle during the Pre-Delivery Inspection (PDI). For additional information, refer to the PDI Manual.

The vehicle battery provides power to the BJB (battery junction box). The BJB contains 3 megafuses, delivering power to the RJB (rear junction box), the CJB (central junction box) and the EJB (engine junction box). In addition to containing fuses and relays, the RJB and RJB contain software to control a number of vehicle systems. These functions are covered in the appropriate sections of this manual.

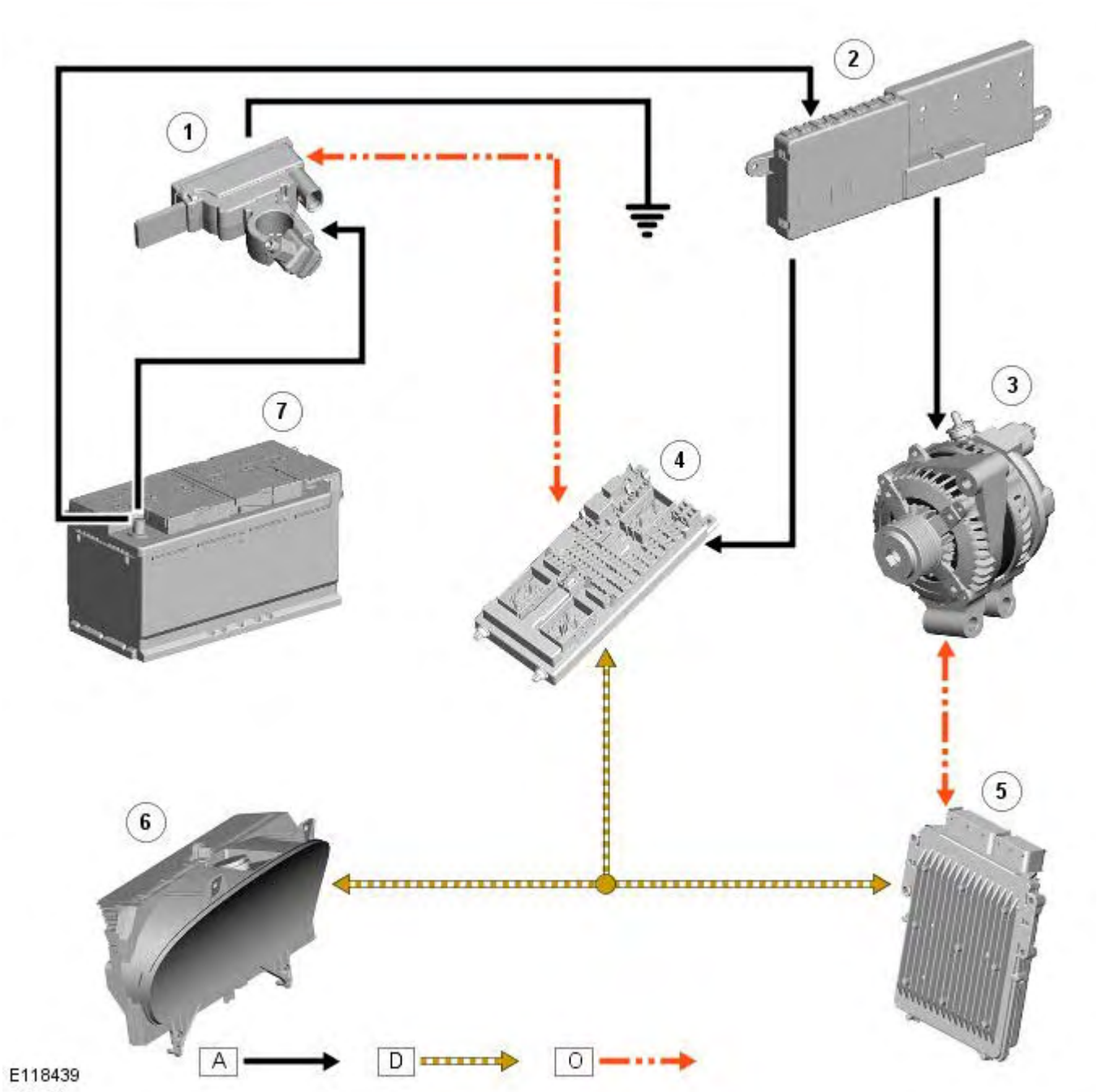
Published: 11-May-2011

Battery, Mounting and Cables - Battery and Cables - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: **A** = Hardwired; **D** = High speed CAN bus; **O** = LIN bus



Item	Description
1	Battery monitoring system module
2	BJB (battery junction box)
3	Generator/regulator
4	CJB (central junction box)
5	ECM (engine control module)
6	Instrument cluster
7	Battery

System Operation

BATTERY MONITORING SYSTEM

Periodically the battery monitoring system module will instigate a self-calibration routine. To self calibrate, the battery monitoring system first charges the battery to its full condition.

NOTE: If the vehicle is only driven for short periods the charging process could take a number of days to complete.

Once the battery is fully charged, the battery monitoring system will discharge the battery to approximately 75% of its full state of charge, but never lower than 12.2 V. The time taken to complete this part of the routine is dependent on the electrical load on the vehicle.

When the second part of the routine has been successfully completed, the battery monitoring system will return the battery to its optimum level of charge. The optimum level of charge will be between 12.6 V and 15 V, depending on battery condition, temperature and loading.

The battery monitoring system module also monitors the battery condition with the engine switched off. If a low voltage condition is detected the module can request the infotainment system is switched off to protect battery voltage. Once the infotainment system has been switched off, the vehicle must be run for at least 5 minutes to charge the battery before the infotainment system can be operated with the engine switched off.

Component Description

BATTERY

The battery is located under the floor in the RH (right-hand) side of the luggage compartment.

On new vehicles the battery positive terminal is fitted with a transit relay. The transit relay must removed using the correct process detailed in the PDI manual.

The battery negative terminal is fitted with a battery monitoring system module. The module is integral with the battery negative cable and communicates with the CJB via a LIN (local interconnect network) bus connection. The battery condition information is passed to the ECM which controls the generator output accordingly.

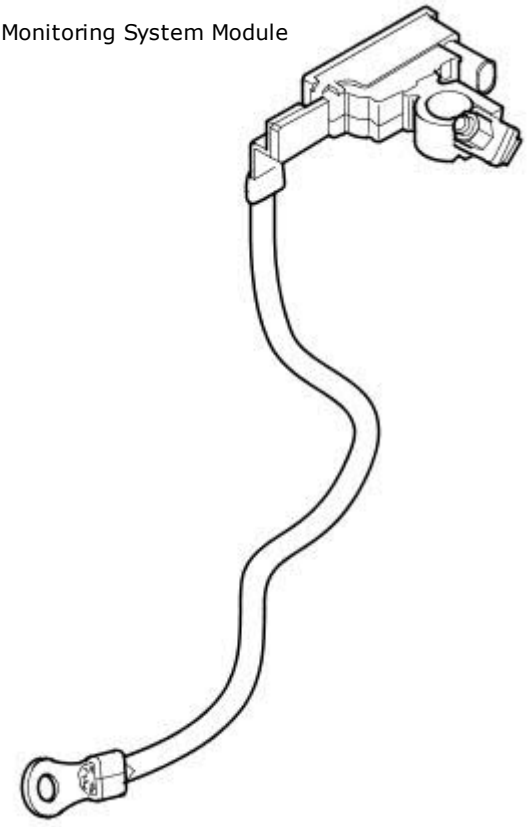
CAUTION: To avoid damage to the battery monitoring system module, always use a suitable body ground point rather than the battery negative terminal when connecting a slave power supply. The recommended ground point is the spare wheel securing bracket in the luggage compartment.

Failure to use the recommended ground point will lead to the setting of a DTC (diagnostic trouble code). Incorrect information of battery condition will be retained by the battery monitoring system module due to the unmonitored current flow into the battery. The system will however, recognize and compensate for the change in battery status after a period of time.

If a new battery is fitted, the battery monitoring system module will require re-calibration using a Jaguar approved diagnostic system. Replacement of the battery monitoring system module requires no action as the module will re-calibrate automatically.

BATTERY MONITORING SYSTEM

Battery Monitoring System Module



E98130

The battery monitoring system module measures battery current and voltage, which it communicates to the CJB over a LIN bus connection. The CJB transmits the battery information to the instrument cluster over the medium speed CAN (controller area network)bus. The instrument cluster acts as a gateway between the medium and high speed CAN bus networks, and transmits the battery condition information to the ECM over the high speed CAN bus. Based on the information received from the battery monitoring system module, the ECM will control the output from the generator and request the switching off of electrical loads if necessary.

CAUTION: Due to the self-calibration routine, it is recommended that all power supply diagnostic testing is carried out using the Jaguar approved diagnostic system rather than a digital multimeter

The battery monitoring system module is able to generate DTC's to help diagnose battery or generator power supply issues. These DTC's can be read using the Jaguar approved diagnostic system. The Jaguar approved diagnostic system can also be used to implement a battery and generator self test routine. For additional information, refer to the Diagnosis and Testing section of the workshop manual.

If a fault is detected, the ECM will override the battery monitoring system module.

The battery monitoring system module DTC's can be used to help diagnose battery or generator power supply faults. The DTC's are stored in both the CJB and the ECM. The Jaguar approved diagnostic system has a process for an automated power supply diagnostic procedure. The procedure provides a menu driven process to locate a fault in a logical sequence. The procedure uses the capability of the battery monitoring system and generator LIN bus controlled functions to provide current flow information and will detect if the battery monitoring system or generator are functioning correctly.

Published: 10-Mar-2014

Battery, Mounting and Cables - Battery

Diagnosis and Testing

Principles of Operation

For a detailed description of the battery system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: Battery and Cables (414-01 Battery, Mounting and Cables, Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer-approved diagnostic system).

When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
• Generator • Drive belt • Drive belt tensioner • Generator pulley • Check the security of the generator fixings	• Generator • Battery • Battery connections • Starter motor • Harnesses and connectors • Fuses • Charge warning lamp function • Engine Control Module (ECM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.
5. Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

Symptom Chart

Symptom	Possible Causes	Action
• Battery power to vehicle interrupted	• High resistance between battery terminals and clamps	• GO to Pinpoint Test A.

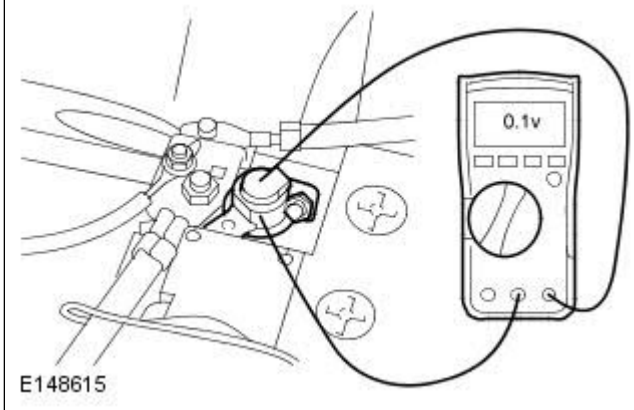
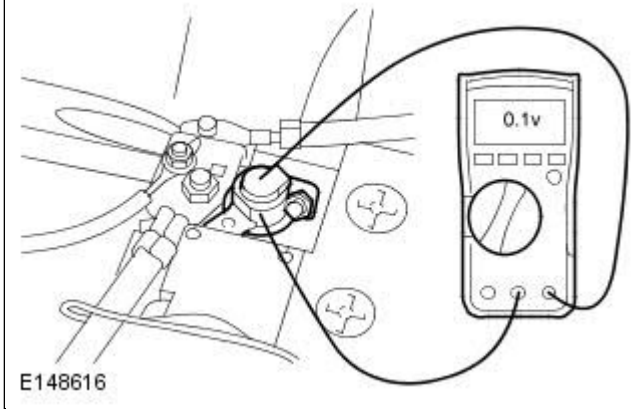
Midtronics EXP-1080 User Guide

Carry out the following: -

Surface Voltage Removal Process

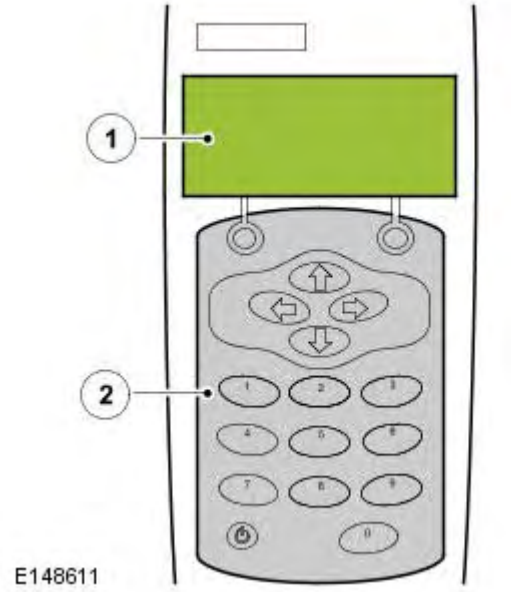
A vehicle which has had its battery charged or been driven in a **24** hour period before the test, must have its surface charge removed

- 1. Turn on the ignition but do not start the vehicle
- 2. Switch on the headlamps on high beam for a minimum 3 minutes
- 3. Switch off the headlamps
- 4. Wait a minimum of 5 minutes before recording test results for any battery measurements

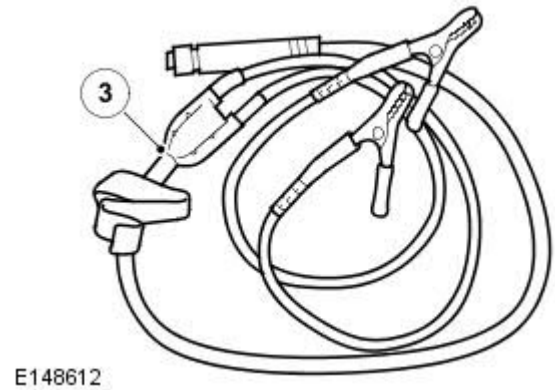
PINPOINT TEST A : VOLTAGE DROP	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: GROUND CIRCUIT	
NOTE: This test checks for high resistance between the battery terminal and the battery clamp	
 E148615	1 Start the engine, turn on the following: • (1) Air conditioning • (2) Blower fan on full speed • (3) Headlights on main beam • (4) Heated screen - rear • (5) Heated screen - front (if installed) • (6) Heated seats (if installed)
	2 Connect the multimeter between the battery negative terminal and the battery clamp as shown in picture below (do not disconnect the battery at this stage)
	3 Set the multimeter to read DC voltage and record the reading
	Is reading equal to or below 0.1 volts? **Yes** GO to A2. **No** Switch all electrical loads and engine off, return the vehicle to an ignition off condition. Disconnect the battery negative clamp, clean clamp and terminal then reconnect and repeat test GO to A1.
A2: POWER CIRCUIT	
NOTE: This test checks for high resistance between the battery terminal and the battery clamp	
 E148616	1 Start the engine, turn on the following: • (1) Air conditioning • (2) Blower fan on full speed • (3) Headlights on main beam • (4) Heated screen - rear • (5) Heated screen - front (if installed) • (6) Heated seats (if installed)
	2 Connect the multimeter between the battery positive terminal and the battery clamp as shown in picture below (do not disconnect the battery at this stage)
	3 Set the multimeter to read DC voltage and record the reading
	Is reading equal to or below 0.1 volts? **Yes** Carry out midtronics battery test procedure **No** Switch all electrical loads and engine off, return the vehicle to an ignition off condition. Disconnect the battery power clamp,

	clean clamp and terminal then reconnect and repeat test GO to A2.

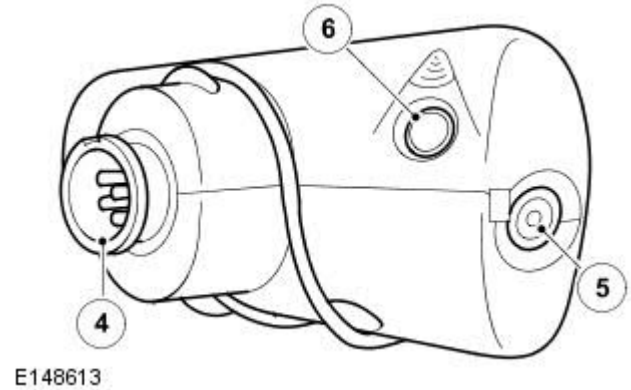
Reference	Description
1	LCD screen with main menu
2	Control panel (key board and power button)
3	Positive and negative fly leads
4	Fly leads connection
5	Temperature sensor
6	Infra-red sensor (data transfer for printer)
7	Amp hour
8	Battery rating (CCA)
9	Rating units
10	Battery type



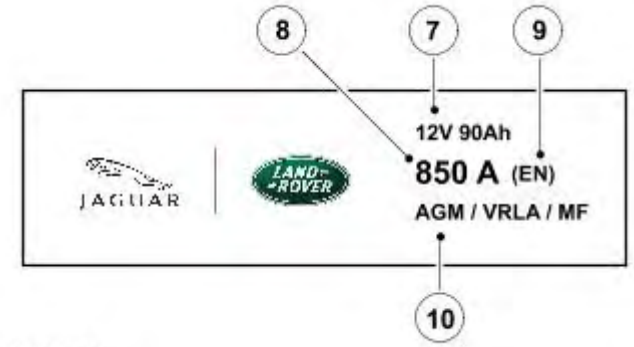
E148611



E148612



E148613



NOTE: Flooded batteries does not have AGM on the label

The following steps must be carried out to ensure correct operation of the EXP-1080 during the battery test procedure

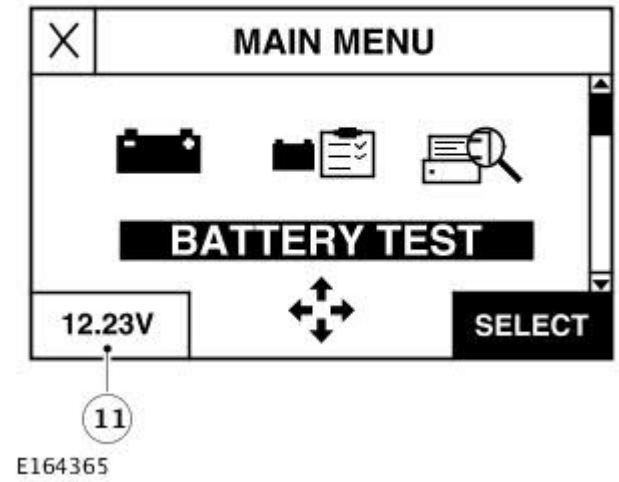
Checks	Action
Battery fluid leakage, check for battery fluid leaks or damage to the battery casing	NOTE: If visible damage to the case is evident do not return battery under warranty Replace the battery if there is any battery fluid leaks evident
Battery vent pipe routing	Check for routing, ensure there are no kinks
EXP-1080 fly lead, condition of clamps	Clean or replace as required
EXP-1080 fly lead connection	Confirm secure connection

NOTE: The Midtronics EXP-1080 is suitable for testing flooded and absorbed glass mat (AGM) type batteries including Primary and Secondary batteries

Midtronics Battery Test Procedure

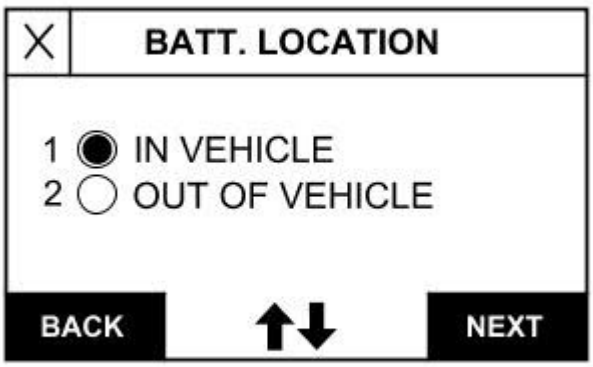
This midtronics battery test procedure will confirm the serviceability of the battery

- 1. Connect the fly-lead to the midtronics EXP-1080
- 2. Connect the fly-leads to the battery terminals
  - **Black lead to negative terminal**
  - **Red lead to positive terminal**
  - Confirm the connections are secure
- 3. The EXP-1080 will power on automatically when connected to a battery, screen below is displayed



NOTE: MAIN MENU SCREEN

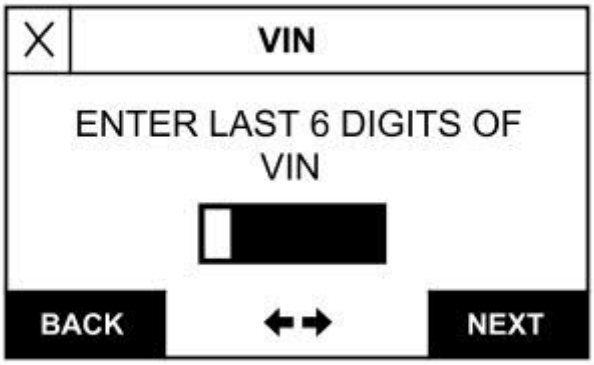
- 4. **Main Menu**. Select **Battery test** and press **SELECT**



E164366

NOTE: BATTERY LOCATION

- 5. **Battery Location**
- Select **Next**
- 6. **VIN**. When **IN VEHICLE** selected, enter the last six of the **VIN** using the key pad



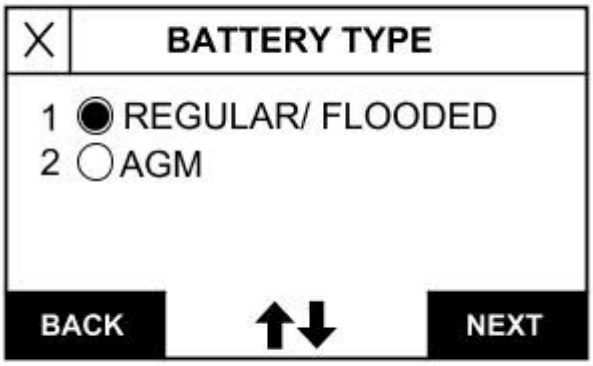
E164367

NOTE: BATTERY RATING

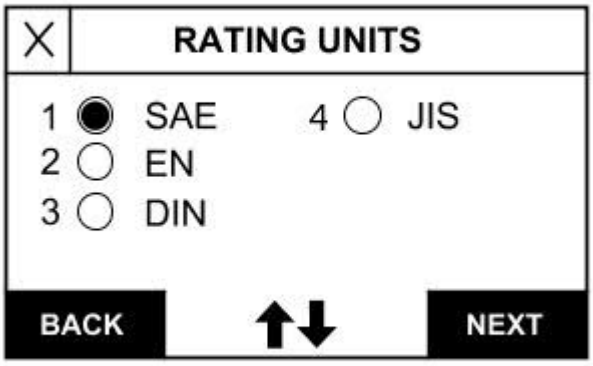
- 7. **Battery Type**. Select the correct battery type (Regular or AGM)

NOTE: ALL AGM batteries are marked (Refer to battery label) Flooded batteries have no reference to being Flooded.

- Select **Next**



E164368

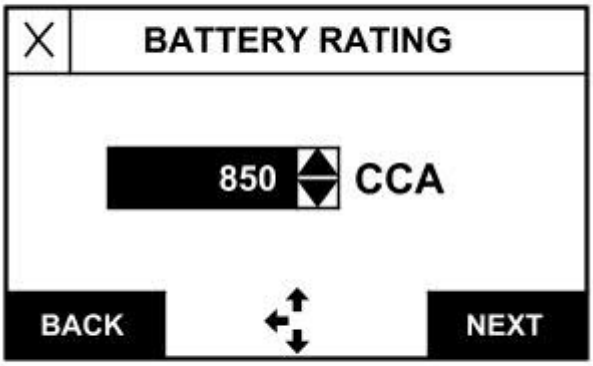


E164369

NOTE: BATTERY TYPE

- 8. **Battery Units**. Select the correct battery rating from the battery label in brackets (number 9). Scroll using the arrow on the Midtronics panel and select **Next**

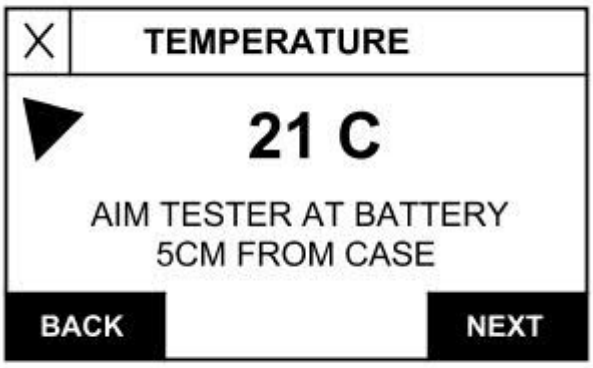
NOTE: UNITS



E164370

NOTE: BATTERY RATING

- 9. **BATTERY RATING**. Scroll using the arrow keys on the midtronics panel, select the correct **CCA** rating (For CCA refer to battery label)
- Select **Next**



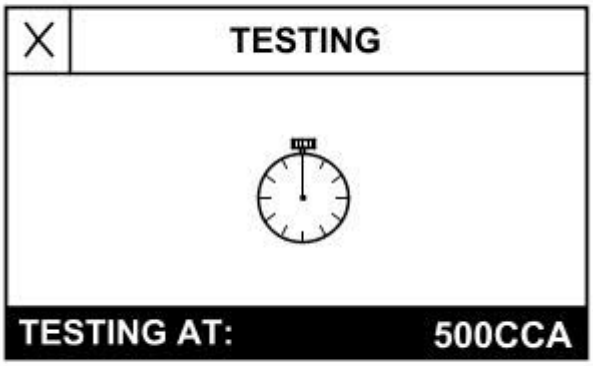
E164371

NOTES:

TEMPERATURE

Ensure that the temperature sensor does not touch any part of the battery or vehicle, this will cause damage not be covered under the midtronics warranty and will require the unit to be returned to a service center

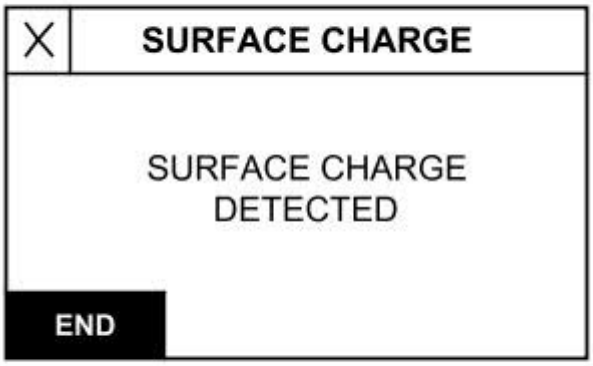
- 10. **Temperature**. Aim the temperature sensor towards the battery casing (Maintain distance of 5cm)
- Select **Next**



E164372

NOTE: TESTING

- 11. **Testing**. The screen displays clock hand's rotating, the EXP-1080 will automatically advance when test has completed



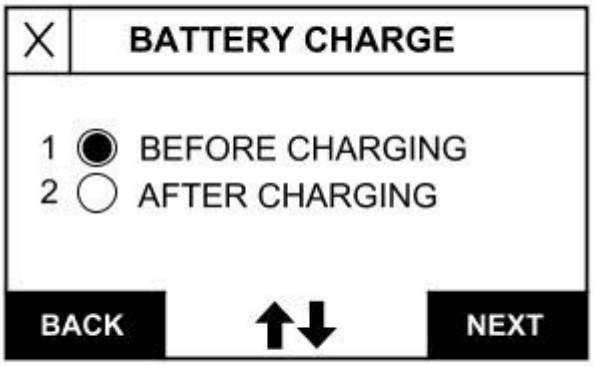
E164373

NOTES:

SURFACE CHARGE

If there is no surface charge this step will not show. **Go to next step**

- 11a. **Surface Charge**. This next step is an additional surface charge test required if the voltage is above 12.4v with a low CCA measured. Ensure the **ignition state is on**. Switch on the headlights (high beam) until EXP-1080 shows **Turn off headlights** then return ignition state to off



E164374

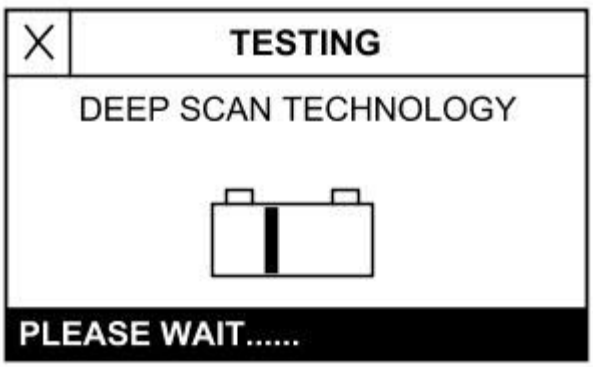
NOTES:

BATTERY CHARGE

If the state of charge is sufficient this step will not show. **Go to next step**

- 11b. **Battery Charge.** Select **Before Charging** if battery has not been on a recommended mains charger for the recommended time shown on the results screen
- Select **After Charging** if battery has been on a recommended mains charger for the recommended time shown on the results screen

NOTE: For a warranty claim you must supply both before and after test codes in the technical comments box when submitting the claim



E164375

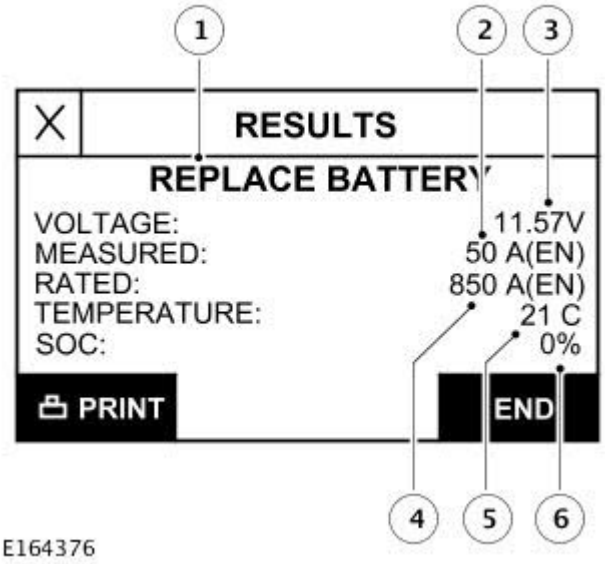
NOTE: DEEP SCAN TECHNOLOGY

- This may not pop up on the screen and is automated program within the unit

NOTE: This test is automated and will show if required. **Go to next step**

- 12. **Testing**. The EXP-1080 will carry out the deep scan test, then automatically advance when test has completed

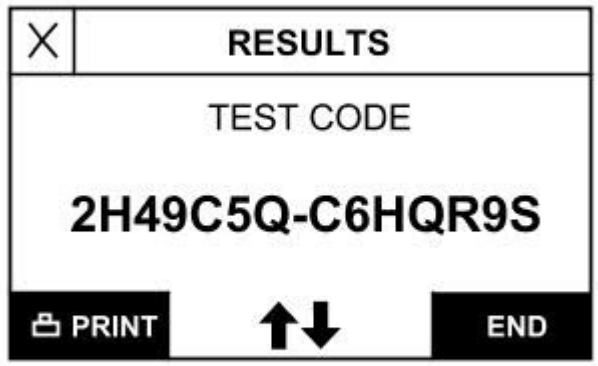
Number	Description
1	Battery test result
2	CCA (Measured capacity rating)
3	Voltage
4	CCA (Manually entered)
5	Temperature
6	State Of Charge (SOC)



E164376

NOTE: RESULTS

Test Result	Action
GOOD BATTERY	Test complete no action required
CHARGE AND RE-TEST	Charge battery using a recommended mains charger (minimum 50 amp) until charging complete. Retest. If the result is the same replace battery
REPLACE BATTERY / BAD CELL BATTERY	Replace battery. **Do Not Recharge**
UNABLE TO COMPLETE TEST	Disconnect battery from vehicle and re-test

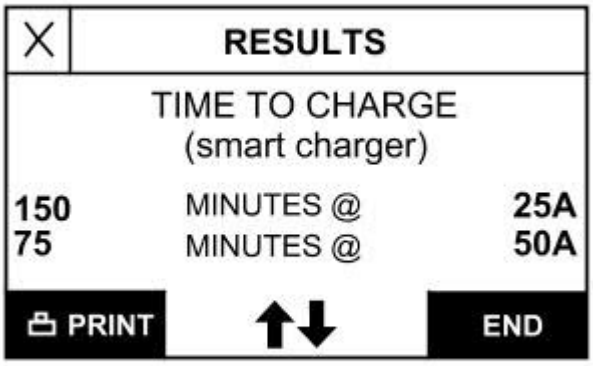


E164377

NOTES:

TEST CODE

Battery test code, must be given if a battery, starter motor or generator is exchanged under warranty



E164378

- 12b. If test result equals "Charge and Re-test" scroll down using the arrow keys to **Time To Charge** screen and follow the **50AMP** charge time for all vehicles apart from **Defender** which can be charged with a 25Amp charger
- **Results**. From the result display use the arrow keys on the control panel to view the test code
- The test code **must** be quoted with every battery claim under warranty

Flooded Battery Care Point

If the vehicle is equipped with a flooded battery, ensure the replacement battery is a flooded battery of the same specification (cold cranking amperage (CCA) / amp hour rating (Ah)) as the original battery

Under no circumstances should you fit a flooded battery to a vehicle that originally had an AGM battery, unless formally instructed by Jaguar/Land Rover

AGM Battery Care Point

If the vehicle is equipped with an absorbed glass mat (AGM) battery, ensure the replacement battery is a AGM battery of the same specification (cold cranking amperage (CCA) / amp hour rating (Ah)) as the original battery, unless formally instructed by Jaguar/Land Rover

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.

Published: 17-Feb-2012

Battery, Mounting and Cables - Battery Disconnect and Connect

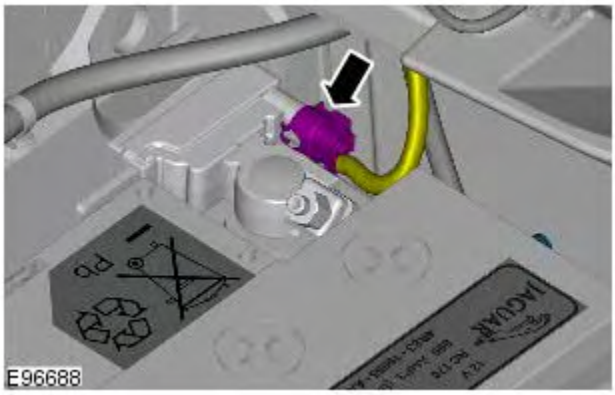
General Procedures

Disconnect

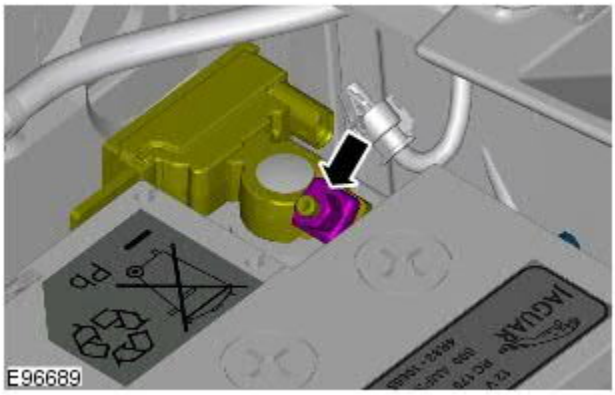
1. Refer to: Battery and Battery Charging Health and Safety Precautions (100-00 General Information, Description and Operation).

2. Obtain and record the audio unit preset radio frequencies.

3. Raise and secure the luggage compartment floor covering.

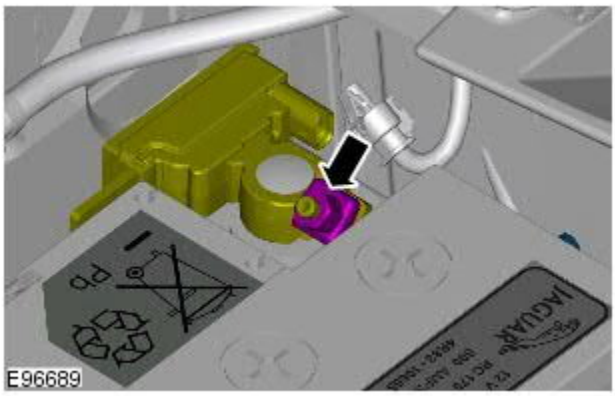


4. CAUTION: Take extra care not to damage the wiring harness.



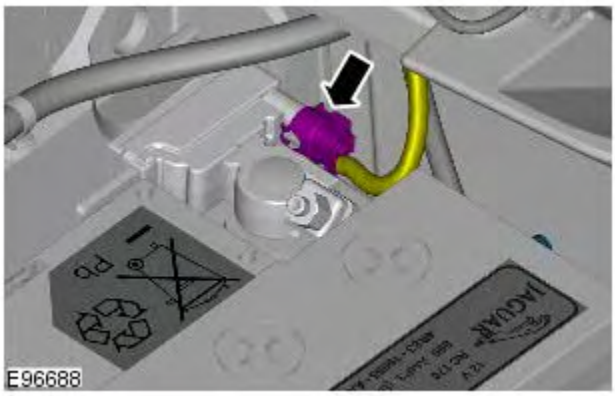
5.

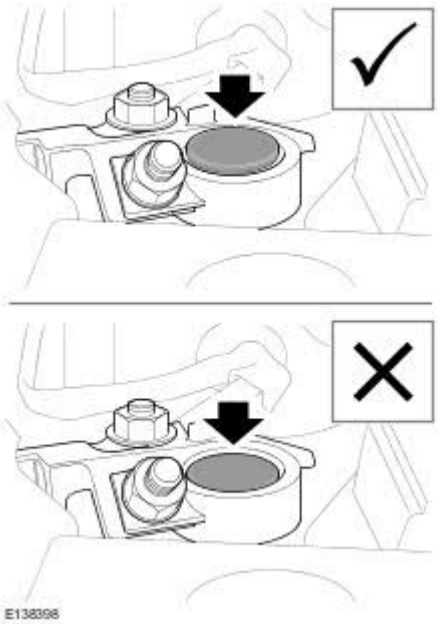
Connect



1. *Torque:* 6 Nm

2.





3. NOTE: Make sure that both the positive and negative battery terminals are correctly located.

4. Lower the luggage compartment floor covering.

5. NOTE: This step is only necessary when installing a new component.

   Using the Jaguar approved diagnostic equipment, reset the battery monitoring system.

6. Refer to: Door Window Motor Initialization (501-11 Glass, Frames and Mechanisms, General Procedures).

7. Enter the audio unit preset radio frequencies.

8. Reset the clock to the correct time.

9. Start the engine and allow to idle until the engine reaches normal operating temperature.

10. Switch the engine off.

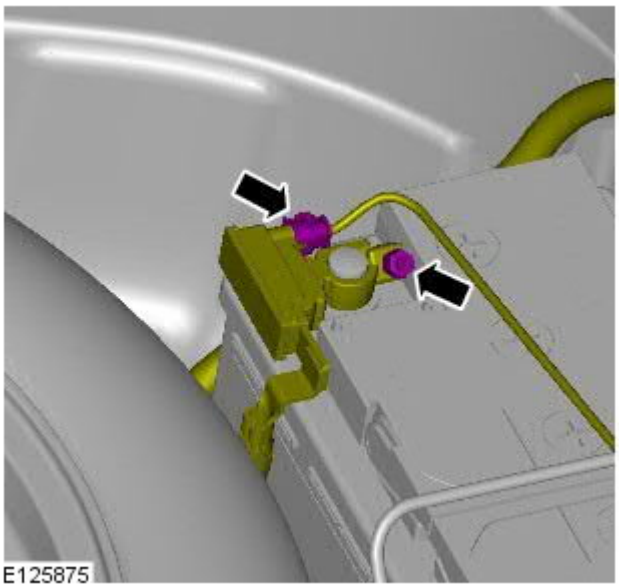
Published: 17-Feb-2012

Battery, Mounting and Cables - Battery

Removal and Installation

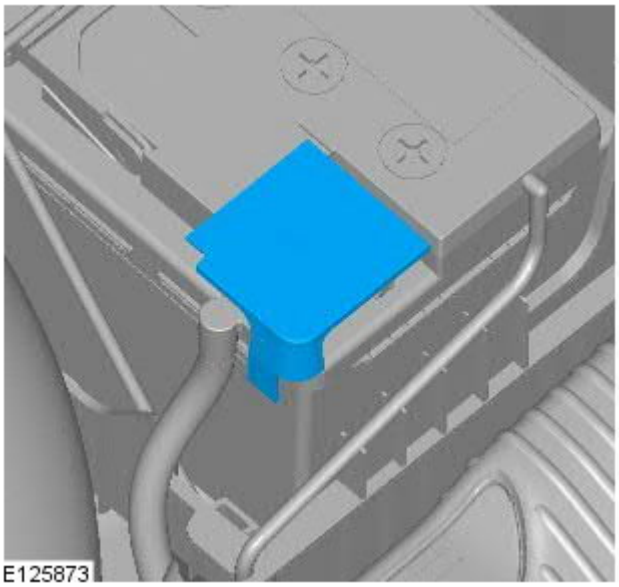
Removal

1. Refer to: Battery and Battery Charging Health and Safety Precautions (100-00 General Information, Description and Operation).
2. Obtain and record the audio unit preset radio frequencies.
3. Raise and secure the luggage compartment floor covering.



4. CAUTION: Take extra care not to damage the wiring harness.

   Torque: 6 Nm



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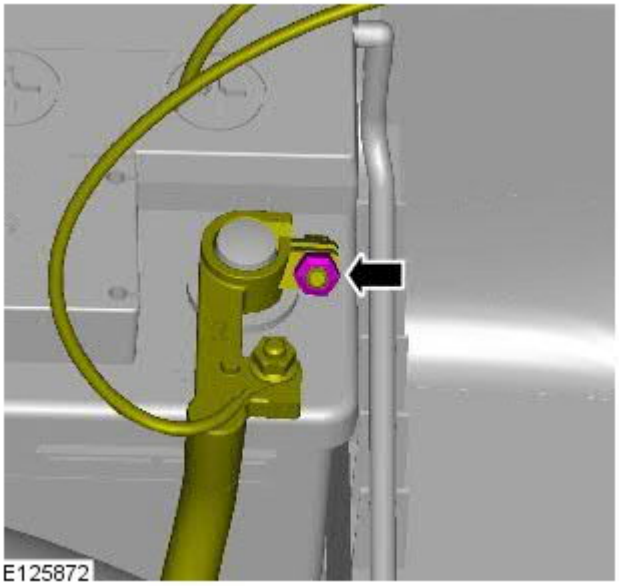
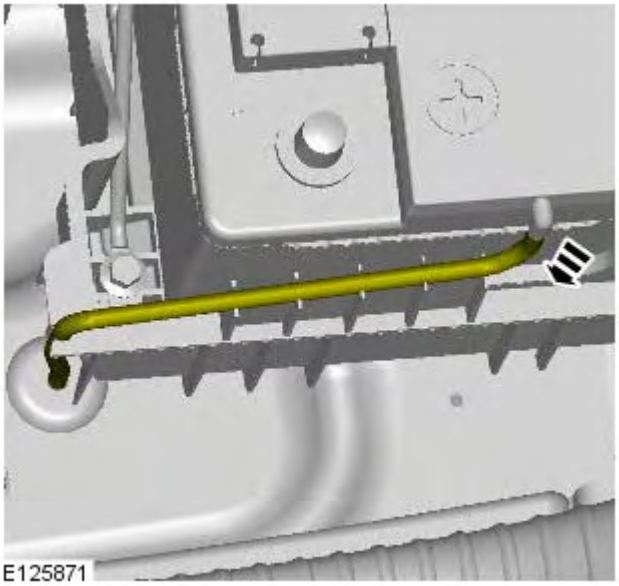
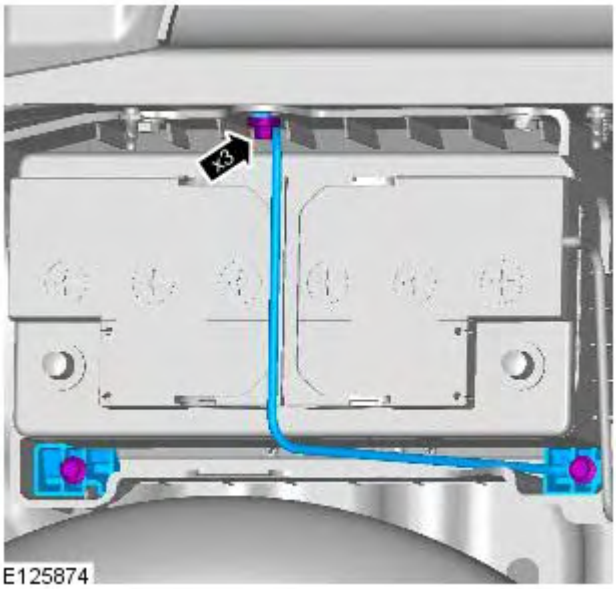


6. CAUTION: Take extra care not to damage the wiring harness.

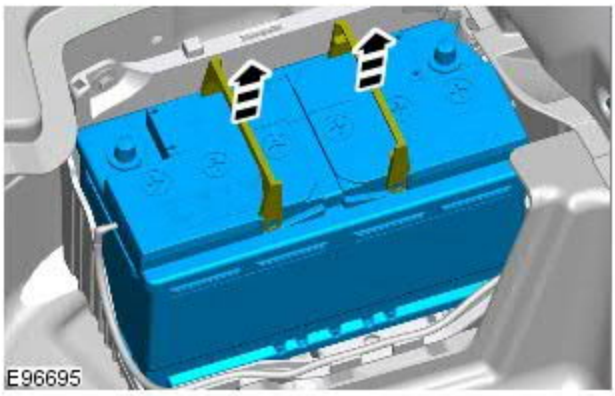
   Torque: 6 Nm



7.

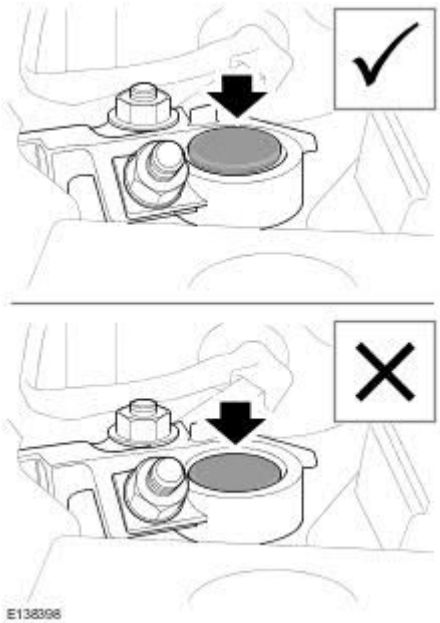


8. *Torque:* 13 Nm



9. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Installation



1. NOTE: Make sure that both the positive and negative battery terminals are correctly located.

   To install, reverse the removal procedure.

2. NOTE: This step is only necessary when installing a new component.

   Using the Jaguar approved diagnostic equipment, reset the battery monitoring system .

3. Refer to: Door Window Motor Initialization (501-11 Glass, Frames and Mechanisms, General Procedures).

4. Enter the audio unit preset radio frequencies.

5. Reset the clock to the correct time.

6. Start the engine and allow to idle until the engine reaches normal operating temperature.

7. Switch the engine off.

Published: 11-May-2011

Generator and Regulator - TDV6 3.0L Diesel -

Description	Nm	lb-ft	lb-in
Generator retaining bolts	47	35	-
Battery positive cable retaining nut	12	9	-
Engine mount lower nut	100	74	-

Published: 11-May-2011

Generator and Regulator - TDV6 3.0L Diesel - Generator

Diagnosis and Testing

For a additional information.
REFER to: Charging System (414-00 Battery and Charging System - General Information, Diagnosis and Testing).

Published: 21-Jan-2014

Generator and Regulator - TDV6 3.0L Diesel - Generator

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Disconnect the battery ground cable.

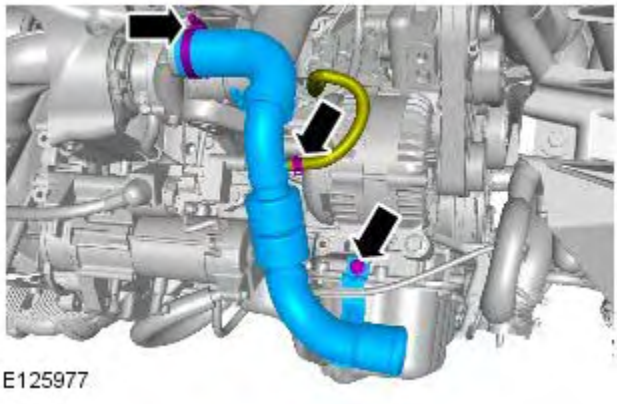
   Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

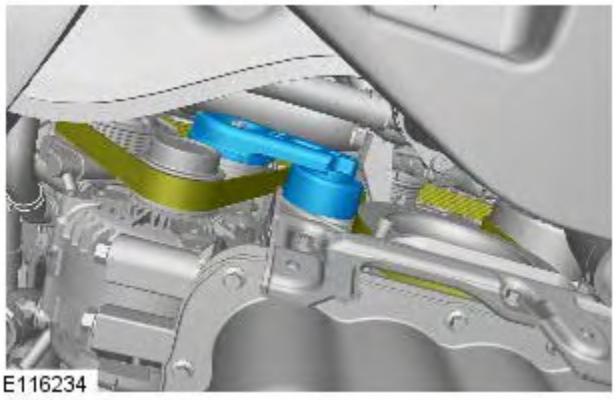
   Raise and support the vehicle.

3. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

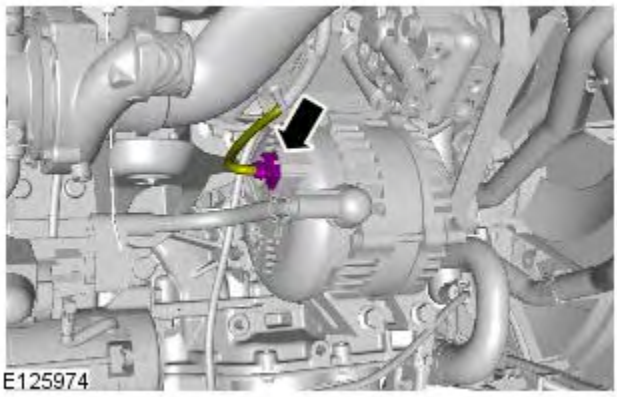
4. Refer to: Turbocharger Bypass Valve (303-04B Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Removal and Installation).


E125977

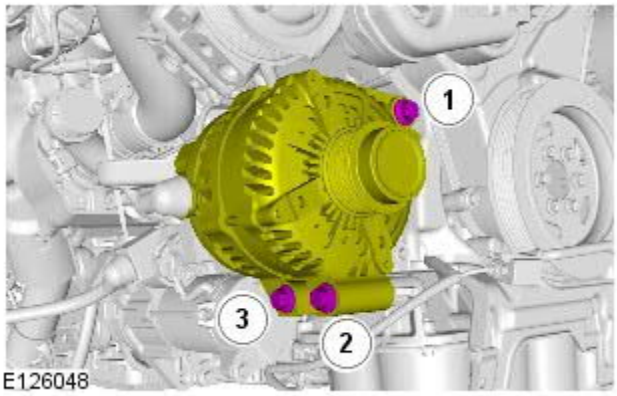
5. NOTE: Engine shown removed for clarity.


E116234

6.



7. NOTE: Engine shown removed for clarity.



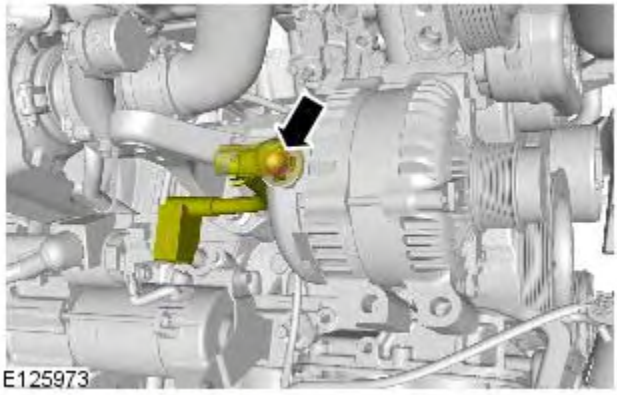
8. CAUTIONS:

   Install all the bolts finger tight before final tightening.

   Tighten the bolts in the sequence shown.

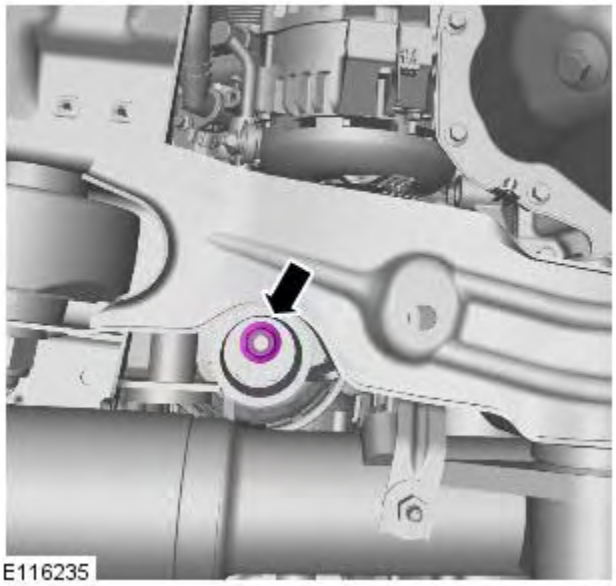
   NOTE: Engine shown removed for clarity.

   Torque: 47 Nm

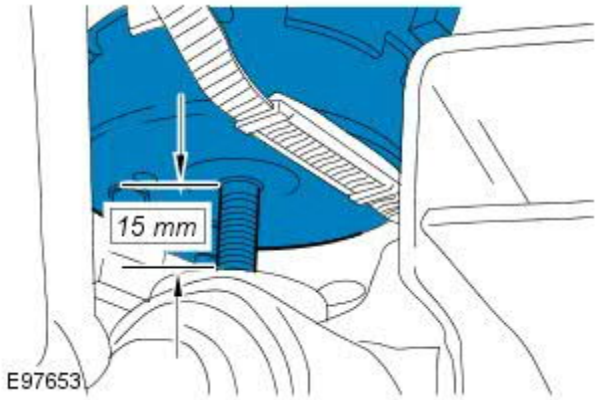


9. NOTE: Engine shown removed for clarity.

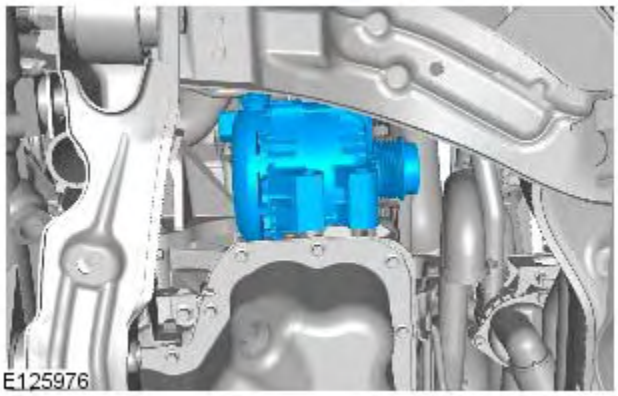
   Torque: 12 Nm



10. *Torque:* 63 Nm



11. Using a suitable hydraulic jack, raise and support the engine.



12.

Installation

1. To install, reverse the removal procedure.

Published: 24-Mar-2014

Information and Entertainment System - General Information - Navigation System Map Updates

Description and Operation

Map Update Applicability - DVD/USB

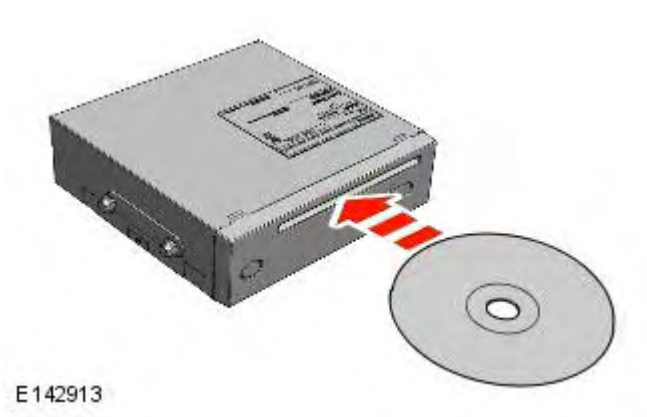
Vehicle	Pre - 10MY	10 MY	11 MY	12MY	13MY	14MY
XK	DVD	DVD	DVD	DVD	DVD	DVD
F-Type	-	-	-	-	-	USB
XF	DVD	DVD	DVD	USB	USB	USB
XJ	-	USB	USB	USB	USB	USB
Freelander	DVD	DVD	DVD	DVD	USB	USB
Discovery 3	DVD	-	-	-	-	
Discovery 4	-	External HD Service Tool	External HD Service Tool	USB	USB	USB
Range Rover Evoque	-	-	-	USB	USB	USB
Range Rover Sport (L320)	DVD	External HD Service Tool	External HD Service Tool	USB	USB	USB
Range Rover Sport (L494)	-	-	-	-	-	USB
Range Rover (L322)	DVD	External HD Service Tool	External HD Service Tool	External HD Service Tool	-	-
Range Rover (L405)	-	-	-	-	USB	USB

NOTE: For vehicles using SD card navigation updates refer to SD Card Navigation Updates (Asia Navigation) below.

Mapping Regions

Region	Mapping Area
1	North America (USA, Canada and Mexico)
2	Western and Eastern Europe
3	Japan
4	Middle East (Bahrain, Jordan, Kuwait, Oman, Qatar, Saudi Arabia and UAE
5	South Africa
6	South America (Brazil and Argentina)
7	Russia
8	Pacific (Australia and New Zealand)
9	South East Asia (Malaysia and Singapore)

DVD Map Updates



Vehicles equipped with the 'remote' navigation module are supplied with a DVD map update which is loaded into and left in the navigation module. Map data is read directly from the DVD. This update can be carried out by the customer.

External HD Service Tool Map Updates

E142915

Discovery 4, Range Rover Sport and Range Rover vehicles, equipped with a HDD (hard disc drive) integrated into the touch screen, are updated at point of service. Dealers are supplied with a set of master pack map update DVD's which are loaded onto the dealer Jaguar/Land Rover approved diagnostic equipment. The map data is then loaded from the diagnostic equipment onto the navigation tool hard drive. The map data is loaded to the touch s screen from the navigation tool hard drive.

The following process should be used to update the map data:

NOTE: The navigation update tool does not need the map data loading every time. This is only necessary when a new map update DVD is released.

- Using the approved Jaguar/Land Rover diagnostic equipment select the navigation update tool.

E142966

- Select **Setup** on th navigation update tool.

E142967

- Connect the navigation update tool to the Jaguar/Land Rover approved diagnostic equipment using the USB cable and press **Continue** proceed.

E142969

- The navigation update tool will then check the connection.

E142970

- Select your preferred language from the drop down menu then press **Save and Continue Setup** to proceed.

- When the navigation update tool confirms the initial setup is complete, press **Continue** to proceed.

- The navigation update tool will the return to the main menu screen, select **Load Map Data** to proceed.

E142968

- Disconnect then reconnect, the USB cable connecting to the navigation update tool to the Jaguar/Land Rover approved diagnostic equipment, press **Continue** proceed.

E142973

- The navigation update tool will then check the connection.

E142974

- Insert map update disk 1 into the DVD drive of the Jaguar/Land Rover approved diagnostic equipment and press **Continue** proceed

E142975

- The navigation update tool will then read the map data

E142976

- Map data will then be copied from disk 1 to the Jaguar/Land Rover approved diagnostic equipment.

E142977

- Insert map update disk 2 into the DVD drive and press **Continue** proceed

- Map data will then be copied from disk 2 to the Jaguar/Land Rover approved diagnostic equipment.

- Map data is now ready to be uploaded onto the navigation update tool, press **Continue** proceed.

E142980

- The map data is now being uploaded onto the navigation update tool.

E142981

- Map data upload is now complete.

E142982

- Disconnect the navigation update tool from Jaguar/Land Rover approved diagnostic equipment.
- Connect the navigation update tool to the vehicle using the firewire cable.
- Select **Navigation** using the touch screen display soft key.

E142956

- Select **Navigation Setup** using the touch screen soft key.

E142957

- Select **Map Change** using the touch screen.

E142958

- Select map region using the touch screen display and press **Map Data Update** to continue.

E142959

- The current map data version and the proposed update map data versions will now be shown, Select the relevant region, using the related touch screen key to proceed.

E142960

- Select **OK** to input the licence key using the touch screen.

E142961

- Input the licence key using the touch screen display and press **OK** to continue.

E142962

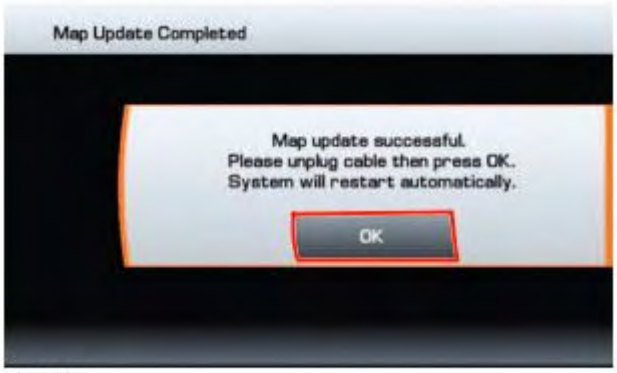
- Select **OK** using the touch screen.

E142963

- The map update will begin.

E142964

- When the map update is complete a message will be shown in the touch screen, select **OK** to continue using the touch screen display soft key. The navigation system will restart with the new map data.



E142965

- Disconnect the navigation update tool from the vehicle.

USB Map Updates

E142914

All Gen 2.1 equipped vehicles are supplied with a USB map updates, these updates can be carried out by the customer.

The following process should be used to update the map data:

- Start the engine.
- Navigate to the touch screen **Home Menu** screen.

E142916

- Insert the USB memory stick containing the map data into the vehicle USB port.

E142914

- Press **Continue** on the touch screen to proceed with the installation of the map update.

E142917

- using the touch screen enter the licence code and press **OK** to proceed.

E142918

- NOTE: Selecting 'Cancel' returns to the 'Home Menu' screen, the map update will continue to run in the background

  The map update will begin and a message will be displayed in the touch screen display advising that navigation is unavailable.

E142919

- Map update progress can be viewed as a percentage of the completed download in the **Home Menu** screen.

E142920

- When the update is complete a message is displayed informing the user.

E142921

- The navigation will restart upon completion of the map update.

NOTE: Remove USB stick immediately

E142922

- Turn off the engine.
- Exit, lock the vehicle and leave for at 15 minutes before using the navigation system.

Japanese Navigation

The Japanese satellite navigation system uses a separate navigation computer module.

The HDD in the ACM/IAM is not used for navigation downloads in this market.

Map updates are supplied in DVD format. The DVD is loaded into the navigation module. Map data is read directly from the DVD.

SD Card Navigation Updates (Asia Navigation)

The Asia market navigation system is an aftermarket unit.

Map updates are supplied in an SD card format. The SD card is loaded into the navigation module. Map data is read directly from the SD card.

NOTE: The following countries use SD card navigation updates.

Country
ANGOLA
ARGENTINA
AZERBAIJAN
BAHAMAS
BARBADOS
BENIN
BOTSWANA
BRAZIL
BRUNEI
BURUNDI
CAYMAN ISLANDS
CHILE
CHINA
COLOMBIA
EGYPT
FIJI
GHANA
HONG KONG
INDIA
INDONESIA
ISRAEL
JAMAICA
KENYA
LEBANON
LESOTHO
MALAWI
MALI
MAURITIUS
MONGOLIA
MOROCCO
MOZAMBIQUE
NAMIBIA
NIGER

Country
NIGERIA
PERU
PHILIPPINES
RWANDA
SENEGAL
SOUTH AFRICA
SRI LANKA
SAINT LUCIA
SWAZILAND
TAIWAN
TANZANIA
THAILAND
TOGO
TUNISIA
UGANDA
URUGUAY
VENEZUELA
VIETNAM
ZAMBIA
ZIMBABWE

Published: 17-Mar-2014

Information and Entertainment System - General Information - Information and Entertainment System

Diagnosis and Testing

Principle of Operation

For a detailed description of the Information and Entertainment System and operation, refer to the relevant Description and Operation section in the workshop manual. REFER to: (415-01A Information and Entertainment System)

Audio System (Description and Operation),
Audio System (Description and Operation),
Audio System (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
• Integrated Audio Module (IAM) • Audio Amplifier Module (AAM) • Touch Screen (TS) • Satellite Radio Control Module (SRCM) • Digital Radio Control Module (DRCM) • TV Control Module (TVCM) • Rear Seat Entertainment Control Module (RSECM) • Speakers • Scratched/dirty compact discs • Water ingress	• Fuses • Wiring harnesses and connectors • Integrated Audio Module (IAM) • Audio Amplifier Module (AAM) • Touch Screen (TS) • Satellite Radio Control Module (SRCM) • Digital Radio Control Module (DRCM) • TV Control Module (TVCM) • Rear Seat Entertainment Control Module (RSECM) • Antennae • Speakers

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index
5. Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

Symptom Chart

Symptom	Possible Causes	Action
Audio/video system inoperative at start up	• Last used audio/video source inoperative • MOST network fault	• GO to Pinpoint Test A.

Symptom	Possible Causes	Action
Audio/video soft key greyed out on touch screen	• Last used audio/video source inoperative • MOST network fault	• GO to Pinpoint Test A.
Soft key response different to soft key touched	• Touch screen calibration incorrect	• Perform touch screen calibration. GO to Pinpoint Test C.
Shortcut soft keys missing from home screen on the touch screen	• Shortcut soft keys set to off after operating the **Clear all** soft key on the 'Home menu shortcuts' screen	• Set the shortcut soft keys to on by navigating to the home screen and operating the following soft keys: **Setup**, **System**, **Home menu shortcuts**, **Default**. The default shortcut soft keys will now be available on the home screen. The shortcut soft keys can be customised as necessary
Poor audio quality (all sources)	• MOST harness connections loose • MOST harness connections contaminated • MOST harness misrouted - Too many bends or bend radius less than 25mm • Audio amplifier system fault	• Check MOST harness connectors for security • Check MOST harness connectors for contamination • Check the routing of the MOST harness • Using the manufacturer approved diagnostic system, check the audio amplifier module for related DTCs and refer to the relevant DTC index
One or more speakers inoperative	• Audio amplifier system fault	• Using the manufacturer approved diagnostic system, check the audio amplifier module for related DTCs and refer to the relevant DTC index
Radio inoperative	• AM/FM antenna fault • Integrated audio module internal failure	• Using the manufacturer approved diagnostic system, check the integrated audio module for related DTCs and refer to the relevant DTC index
Digital radio inoperative	• Digital radio antenna fault • Digital radio control module internal failure	• Using the manufacturer approved diagnostic system, check the digital radio control module for related DTCs and refer to the relevant DTC index
Digital radio no signal reception - New digital radio control module	• Initial tuning not completed	NOTE: Some functions are inhibited when the vehicle is moving. • Operate the **Auto-tune** soft key
Digital radio poor signal reception	• Tuning not refreshed • **Link DAB** set to off • L-band antenna set to off in a L-band antenna region • Band 3 antenna set to off in a band 3 antenna region • L-band antenna or link harness damaged • Band 3 antenna or link harness damaged • Software issue	NOTE: Some functions are inhibited when the vehicle is moving. • Operate the **Auto-tune** soft key • Operate the **Settings** soft key, followed by the **Options** soft key and set **Link DAB** to on • Operate the **Settings** soft key, followed by the **L band and Band 3** soft key • Operate the **Settings** soft key, followed by the **L band and Band 3** soft key • Check the L-band antenna and link harness for damage • Check the band 3 antenna and link harness for damage • Using the manufacturer approved diagnostic system, re-configure the digital radio control module with the latest level software
Digital radio channel list not displayed	• Tuning not refreshed • L-band antenna set to off in a L-band antenna region • Band 3 antenna set to off in a band 3 antenna region	NOTE: Some functions are inhibited when the vehicle is moving. • Operate the **Auto-tune** soft key • Operate the **Settings** soft key, followed by the **L band and Band 3** soft key • Operate the **Settings** soft key, followed by the **L band and Band 3** soft key

Symptom	Possible Causes	Action
Digital radio interrupted by announcements	• **Announcements** set to on	NOTE: Some functions are inhibited when the vehicle is moving. • Operate the **Settings** soft key, followed by the **Announcements** soft key, and set all **Announcements** to off
Unable to store preset channels in digital radio	• **Preset #** soft key not operated for sufficient duration	• Operate the **Preset #** soft key for at least 2 seconds to store the current station
Digital radio will not select preset station when **Preset #** soft key operated	• No station stored to relevant **Preset #** soft key	• Store a station to the relevant **Preset #** soft key and retest
NOTE: Satellite Digital Audio Radio Service (SDARS) applies to NAS market vehicles only. Satellite radio inoperative	• Satellite radio antenna fault • Satellite radio control module internal failure	• Using the manufacturer approved diagnostic system, check the satellite radio control module for related DTCs and refer to the relevant DTC index
NOTE: Satellite Digital Audio Radio Service (SDARS) applies to NAS market vehicles only. No Satellite Digital Audio Radio Service (SDARS) channels available - 'No signal' or 'Acquiring signal' message	• Vehicle not in USA • Poor signal reception • Satellite Digital Audio Radio Service (SDARS) system fault	• No fault to rectify • The vehicle must have clear line of sight to a satellite, which means being outside and having no blockages between the vehicle and the satellite • Using the manufacturer approved diagnostic system, check the Satellite Radio Control Module (SRCM) for related DTCs and refer to the relevant DTC index
NOTE: Satellite Digital Audio Radio Service (SDARS) applies to NAS market vehicles only. Only one Satellite Digital Audio Radio Service (SDARS) channel available (channel 184) - 'Unsubscribed' message	• Channel 184 is available without subscription for a limited period (6 months)	• No fault to rectify. Subscribe to Satellite Digital Audio Radio Service (SDARS) to resume service
NOTE: Satellite Digital Audio Radio Service (SDARS) applies to NAS market vehicles only. No Satellite Digital Audio Radio Service (SDARS) channels available after 6 months without subscribing - 'Unsubscribed' message	• Channel 184 is available without subscription for a limited period (6 months)	• No fault to rectify. Subscribe to Satellite Digital Audio Radio Service (SDARS) to resume service
NOTE: Satellite Digital Audio Radio Service (SDARS) applies to NAS market vehicles only. Some Satellite Digital Audio Radio Service (SDARS) unavailable - 'Unsubscribed' message	• Adult channels blocked by subscription type (family package)	• No fault to rectify. Subscribe to Satellite Digital Audio Radio Service (SDARS) full package to receive adult channels
NOTE: Satellite Digital Audio Radio Service (SDARS) applies to NAS market vehicles only. Satellite Digital Audio Radio Service (SDARS) pay channels unavailable - 'Unsubscribed'	• Payment not made	• No fault to rectify

Symptom	Possible Causes	Action
message		
Compact disc player inoperative	• Incompatible/damaged compact disc • Integrated audio module internal failure	• Insert a known good disc and retest • Using the manufacturer approved diagnostic system, check the integrated audio module for related DTCs and refer to the relevant DTC index
Unable to upload files to the hard drive	• Incompatible/damaged compact disc • Integrated audio module internal failure	• Insert a known good disc and retest • Using the manufacturer approved diagnostic system, check the integrated audio module for related DTCs and refer to the relevant DTC index
Auxiliary audio inoperative	• Incompatible/faulty auxiliary device • Auxiliary device link cable fault • Integrated audio module internal failure	• Connect a known good auxiliary device to the auxiliary socket and retest • Connect a known good auxiliary device to the auxiliary socket using a known good link cable and retest • Using the manufacturer approved diagnostic system, check the integrated audio module for related DTCs and refer to the relevant DTC index
USB audio/video inoperative	• Incompatible/faulty USB device • Integrated audio module internal failure	• Connect a known good USB device to the auxiliary socket and retest • Using the manufacturer approved diagnostic system, check the integrated audio module for related DTCs and refer to the relevant DTC index
USB audio/video inoperative - Apple devices	• Incompatible/faulty Apple device • Bluetooth® and USB connections made in the incorrect order • Integrated audio module internal failure	• Check Apple device compatibility table below. Connect a known good Apple device to the auxiliary socket and retest • Audio streaming is supported via the USB cable but this must be connected after the cellular phone connects via Bluetooth® - Best practice is to start the engine (causing the Bluetooth® connection to be made) before connecting the USB cable • Using the manufacturer approved diagnostic system, check the integrated audio module for related DTCs and refer to the relevant DTC index
Television inoperative	• TV antenna fault • TV control module internal failure	NOTE: Some functions are inhibited when the vehicle is moving. • Using the manufacturer approved diagnostic system, check the TV control module for related DTCs and refer to the relevant DTC index
Television video signal poor/inoperative at the touch screen (television audio normal) - Vehicles without rear seat entertainment	• CVBS signal circuit short circuit to ground, short circuit to power, open circuit, high resistance	NOTES: Some functions are inhibited when the vehicle is moving. The television audio signal is transmitted on the MOST network. • Using the manufacturer approved diagnostic system, check the television control module for related DTCs and refer to the relevant DTC index. Refer to the electrical circuit diagrams and check the CVBS signal circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Using the manufacturer approved diagnostic system, check the television control module for related DTCs and refer to the relevant DTC index
Television video signal poor/inoperative at the touch screen (television audio normal) - Vehicles with rear seat entertainment	• Antenna damaged • Antenna circuit short circuit to ground, short circuit to power, open circuit, high resistance • LVDS signal circuit short	NOTES: Some functions are inhibited when the vehicle is moving.

Symptom	Possible Causes	Action
	circuit to ground, short circuit to power, open circuit, high resistance • CVBS signal circuit short circuit to ground, short circuit to power, open circuit, high resistance • Non-genuine electronic accessories	The television audio signal is transmitted on the MOST network. • Check the antenna for damage • Refer to the electrical circuit diagrams and check the antenna circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Using the manufacturer approved diagnostic system, check the rear seat entertainment control module for related DTCs and refer to the relevant DTC index. Refer to the electrical circuit diagrams and check the LVDS signal circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Using the manufacturer approved diagnostic system, check the rear seat entertainment control module for related DTCs and refer to the relevant DTC index. Refer to the electrical circuit diagrams and check the CVBS signal circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Disconnect/remove non-genuine electronic accessories and retest
Television video signal poor/inoperative at the touch screen AND the rear seat entertainment screens (television audio normal) - Vehicles with rear seat entertainment	• Antenna damaged • Antenna circuit short circuit to ground, short circuit to power, open circuit, high resistance • LVDS signal circuit short circuit to ground, short circuit to power, open circuit, high resistance • TV control module fault • Non-genuine electronic accessories	NOTE: The television audio signal is transmitted on the MOST network. • Check the antenna for damage • Refer to the electrical circuit diagrams and check the antenna circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Using the manufacturer approved diagnostic system, check the rear seat entertainment control module for related DTCs and refer to the relevant DTC index. Refer to the electrical circuit diagrams and check the LVDS signal circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Using the manufacturer approved diagnostic system, check the television control module for related DTCs and refer to the relevant DTC index • Disconnect/remove non-genuine electronic accessories and retest
Television channel list absent	• Incorrect country setting • Software fault	NOTE: Some functions are inhibited when the vehicle is moving. • Check country setting and reset as necessary • Set the country setting to Ukraine and wait 60 seconds. If the channel list is now present, reset to the correct country and using the manufacturer approved diagnostic system, re-configure the television control module with the latest level software
Unable to store television preset channels	• **Preset #** soft key not operated for sufficient duration	• Operate the **Preset #** soft key for at least 2 seconds to store the current channel
Television will not select preset channel when **Preset #** soft key operated	• No television channel stored to relevant **Preset #** soft key	NOTE: Some functions are inhibited when the vehicle is moving. • Store a channel to the relevant **Preset #** soft key and retest
DVD player inoperative	• Incompatible/damaged compact disc • Incorrect region set • Integrated audio module internal failure	NOTE: Some functions are inhibited when the vehicle is moving. • Insert a known good disc and retest • Change region setting • Using the manufacturer approved diagnostic

Symptom	Possible Causes	Action
		system, check the integrated audio module for related DTCs and refer to the relevant DTC index
Unable to pair mobile phone to vehicle via Bluetooth®	• Incompatible mobile phone	NOTE: Installing new components will not improve connectivity with an incompatible mobile phone. • Check mobile phone compatibility by referring to: www.landrover.com/Owners/Bluetooth and following the instructions on the page
Echo when using a mobile phone via Bluetooth®	• Noise cancelling set to On in mobile phone and vehicle	• Set noise cancelling to Off in mobile phone
Navigation system inoperative (integrated navigation system)	• Navigation antenna fault • Integrated audio module internal failure	• Using the manufacturer approved diagnostic system, check the integrated audio module for related DTCs and refer to the relevant DTC index
Navigation system inoperative (with navigation control module)	• Navigation antenna fault • Navigation control module internal failure	• Using the manufacturer approved diagnostic system, check the navigation control module for related DTCs and refer to the relevant DTC index
Traffic message channel inoperative	• FM/TMC antenna fault • VICS antenna fault • Integrated audio module internal failure	NOTE: Vehicle Information and Communication System (VICS) is a type of Traffic Message Channel system used in the Japan market only. • Using the manufacturer approved diagnostic system, check the integrated audio module for related DTCs and refer to the relevant DTC index
Rear seat entertainment system inoperative	• Rear seat entertainment control module internal failure	• Using the manufacturer approved diagnostic system, check the rear seat entertainment control module for related DTCs and refer to the relevant DTC index

USB/CD Data Disk Audio File Compatibility

NOTE: Before attempting a repair to the in-vehicle infotainment system following concerns regarding no playback of audio files stored either on a USB data storage device or on a CD data disc, check below to ensure that the audio files in question are encoded in a compatible format

There are a number of variables that can be set (either automatically or by the user) at the point of creating the audio file that may contribute to an audio file being encoded in an incompatible format. These include:

- The **type of audio file** created (MP3/WMA/AAC)
- The specification of **Variable Bit Rate** (VBR) or **Constant Bit Rate** (CBR) encoding
- If CBR encoding is being used, then a particular **bit rate** value (measured in kilobits per second - kbps) may be selected
- The rate of **sampling frequency**, measured in kilohertz (kHz), may also be selected

Diagnostic Procedures For Audio Files

Identify File Type: if a customer reports issues with audio file playback, first confirm that the data source is operating normally and is not locked or corrupted. This may be achieved by reading the USB storage device or data disk via a PC and confirming that the audio files can be seen/accessed as expected. If the storage device/data disk appears to be operating normally, the next step is to ascertain the file type of those files that will not play through the infotainment system. There are three types of compatible audio file, either **MP3** (which must have a file extension of .mp3); or **WMA** (which must have a file extension of .wma); or **AAC** (which must have a file extension of either .aac or .m4a). If the affected audio files are not of these types, then successful playback via the infotainment system may not be possible.

Further information about the audio file may be accessed via the file properties tab either when viewing the file in Windows Explorer or when playing the file via a digital media player programme. In such a way, it should be possible to ascertain some or all of the required information concerning the file's specified encoding type/bit rate/sampling frequency. Once this information has been obtained, use the tables detailed below to check if the suspect audio file is compatible with the vehicle infotainment system.

Playback Of Audio Files Stored On A USB Storage Device

USB MP3 Files (only if file extension is '.mp3'): Playback of MP3 audio files encoded in Variable Bit Rate (VBR) format is supported at bit rates between 8-320 kbps. For Constant Bit Rate (CBR) files, see table below for compatible sampling rates and bit rates.

File Format/Encoding Format	Sampling Rate	Bit Rates	Notes
MP3 (MPEG 2.5*)	All available are supported	8-160 kbps playback supported	*For MPEG 2.5 format audio files, playback cannot be guaranteed but an attempt will be made to play
MP3 (MPEG 2)	All available are supported	8-160 kbps playback supported	-
MP3 (MPEG 1)	All available are supported	32-128 kbps; 160-320 kbps playback supported	Playback of MPEG 1 audio files with a bit rate of 144 kbps is not supported

USB WMA Files (only if file extension is '.wma'): Playback of WMA audio files encoded in Variable Bit Rate (VBR) format and created using Windows Media Player Version 8.0 and/or Version 9.0 is supported at bit rates between 5-384 kbps. For Constant Bit Rate (CBR) files, see table below for compatible sampling rates and bit rates. Note that WMA CBR files created using Windows Media Player Versions 7.0, 8.0 and 9.0 can be supported, while playback will be attempted but cannot be guaranteed for files created using Windows Media Player Versions 4.0, 4.1, 9 Beta and 9.1.

File Format/Encoding Format	Sampling Rate	Bit Rates	Notes
WMA - Constant Bit Rate (CBR)	At sampling rates of 8 KHz playback supported only at specified bit rates	5-8 kbps (mono); 12 kbps (stereo) playback supported. 31 kbps (mono) playback cannot be guaranteed but an attempt will be made to play	'Lossless', 'Professional' or 'Voice' format files created in Windows Media Player Version 9.0 cannot be supported. DRM (Digital Rights Management) protected files cannot be supported
	At sampling rates of 11.03 KHz playback supported only at specified bit rates	8-10 kbps (mono) playback supported	'Lossless', 'Professional' or 'Voice' format files created in Windows Media Player Version 9.0 cannot be supported. DRM (Digital Rights Management) protected files cannot be supported
	At sampling rates of 16 KHz playback supported only at specified bit rates	10-12 kbps and 16 kbps (mono); 16-20 kbps (stereo) playback supported	'Lossless', 'Professional' or 'Voice' format files created in Windows Media Player Version 9.0 cannot be supported. DRM (Digital Rights Management) protected files cannot be supported
	At sampling rates of 22.05 KHz playback supported only at specified bit rates	16-20 kbps (mono); 20, 22 and 36 kbps (stereo) playback supported	'Lossless', 'Professional' or 'Voice' format files created in Windows Media Player Version 9.0 cannot be supported. DRM (Digital Rights Management) protected files cannot be supported
	At sampling rates of 32 KHz playback supported only at specified bit rates	20 kbps (mono); 32, 40, 48 kbps (stereo) playback supported. 32 kbps (mono); 22, 36, 44, 64, 384 kbps (stereo) playback cannot be guaranteed but an attempt will be made to play	'Lossless', 'Professional' or 'Voice' format files created in Windows Media Player Version 9.0 cannot be supported. DRM (Digital Rights Management) protected files cannot be supported
	At sampling rates of 44.1 KHz playback supported only at specified bit rates	20, 32 and 48 kbps (mono); 32, 48, 64, 80, 96, 128, 160, 192, 256 and 320 kbps (stereo) playback supported. 15 kbps (mono) playback cannot be guaranteed but an attempt will be made to play	'Lossless', 'Professional' or 'Voice' format files created in Windows Media Player Version 9.0 cannot be supported. DRM (Digital Rights Management) protected files cannot be supported
	At sampling rates of 48 KHz playback supported only at specified bit rates	64, 96, 128, 160, 192 and 256* kbps (stereo) playback supported. 32 kbps (mono) & 48, 63, 95, 127, 191 and 320 kbps (stereo) playback cannot be guaranteed but an attempt will be made to play	'Lossless', 'Professional' or 'Voice' format files created in Windows Media Player Version 9.0 cannot be supported. DRM (Digital Rights Management) protected files cannot be supported. *All available versions can be supported at a bit rate of 256 kbps for this sampling rate only

USB AAC Files (only if file extension is '.aac' or '.m4a'): Playback of AAC audio files encoded in Variable Bit Rate (VBR) format is supported at bit rates between 8-320 kbps. For Constant Bit Rate (CBR) files, see table below for compatible sampling rates and bit rates.

File Format/Encoding Format	Sampling Rate	Bit Rates	Notes
AAC - Constant Bit Rate (CBR)	At sampling rates of between 8-32 KHz, playback cannot be not guaranteed but may be possible at some bit rates	8-320 kbps playback cannot be not guaranteed, but may be possible in some cases	-
	At sampling rates of between 44.1 - 48 KHz, playback supported at specified bit rates	48-80 kbps; 96-128 kbps; 160-256 kbps; 320 kbps playback supported	Playback at other bit rates between 44.1-576 kbps may be possible, but cannot be verified
	At sampling rates of between 64-96 KHz, playback cannot be not guaranteed but an attempt will be made to play at some bit rates	96-768 kbps playback cannot be not guaranteed but an attempt will be made to play	Playback at other bit rates between 64-1152 kbps cannot be not guaranteed but an attempt will be made to play

Playback Of Audio Files Stored On A CD Data Disk

CD Data Disk MP3 Files (only if file extension is '.mp3'): Playback of MP3 audio files encoded in Variable Bit Rate (VBR) format is supported at bit rates between 8-320 kbps. For Constant Bit Rate (CBR) files, see table below for compatible sampling rates and bit rates.

File Format/Encoding Format	Sampling Rate	Bit Rates	Notes
MP3 (MPEG 2.5*)	All available are supported	8-160 kbps playback supported	*For MPEG 2.5 format audio files, playback cannot be guaranteed but an attempt will be made to play
MP3 (MPEG 2)	All available are supported	8-160 kbps playback supported	-
MP3 (MPEG 1)	All available are supported	32-128 kbps; 160-320 kbps playback supported	Playback of MPEG 1 audio files with a bit rate of 144 kbps is not supported

CD Data Disk WMA Files (only if file extension is '.wma'): Playback of WMA audio files encoded in Variable Bit Rate (VBR) format and created using Windows Media Player Version 9.0 is supported at bit rates between 32-192 kbps. For Constant Bit Rate (CBR) files, see table below for compatible sampling rates and bit rates. Note that WMA CBR files created using Windows Media Player Version 9.0 can be supported, while playback will be attempted but cannot be guaranteed for files created using Windows Media Player Versions 4.0, 4.1, 7.0, 8.0, 9 Beta and 9.1.

File Format/Encoding Format	Sampling Rate	Bit Rates	Notes
WMA - Constant Bit Rate (CBR)	At sampling rates of 22.05 KHz playback supported only at specified bit rates	32 kbps (stereo) playback supported	'Lossless', 'Professional' or 'Voice' format files created in Windows Media Player Version 9.0 cannot be supported. DRM (Digital Rights Management) protected files cannot be supported
	At sampling rates of 32 KHz playback supported only at specified bit rates	32, 36, 40, 44 and 48 kbps (stereo) playback supported	'Lossless', 'Professional' or 'Voice' format files created in Windows Media Player Version 9.0 cannot be supported. DRM (Digital Rights Management) protected files cannot be supported
	At sampling rates of 44.1 KHz playback supported only at specified bit rates	32 and 48 kbps (mono); 32, 48, 64, 80, 96, 128, 160 & 192 kbps (stereo) playback supported	'Lossless', 'Professional' or 'Voice' format files created in Windows Media Player Version 9.0 cannot be supported. DRM (Digital Rights Management) protected files cannot be supported
	At sampling rates of 48 KHz playback supported only at specified bit rates	64, 96, 128, 160 & 192 kbps (stereo) playback supported	'Lossless', 'Professional' or 'Voice' format files created in Windows Media Player Version 9.0 cannot be supported. DRM (Digital Rights Management) protected files cannot be supported

CD Data Disk AAC Files (only if file extension is '.aac' or '.m4a'): Playback of AAC audio files encoded in Variable Bit Rate (VBR) format is supported at bit rates between 8-320 kbps. For Constant Bit Rate (CBR) files, see table below for compatible sampling rates and bit rates.

File Format/Encoding Format	Sampling Rate	Bit Rates	Notes
AAC - Constant Bit Rate (CBR)	At sampling rates of between 8-24 KHz playback supported at specified bit rates	32-40 kbps; 48-80 kbps; 96-128* kbps playback supported	*112 & 128 kbps bit rate playback not supported for audio files with a sampling rate of 8 KHz
	At sampling rates of between 16-32 KHz playback supported at specified bit rates	160-256* kbps playback supported	*224 & 256 kbps bit rate playback not supported for audio files with a sampling rate of 16 KHz
	At sampling rates of between 32-48 KHz playback supported at specified bit rates	48-80 kbps; 96-128 kbps; 160-256 kbps; 320 kbps playback supported	-

Portable Audio Interface Panel/USB Power Supply

If DTC B1252-19 (USB Port General Electrical Failures - Circuit current above threshold) has been logged, the IAM has detected a current draw from the Portable Audio Interface Panel in excess of 1.7 Amps. In these circumstances, the power supply to the Portable Audio Interface Panel will be cut for an ignition cycle. To reset the system and restore power, the vehicle needs to be locked (with ignition off) and armed for at least 5 minutes.

The USB port on the Portable Audio Interface Panel is able to supply current to a maximum of 500mA. It should be noted that any portable devices connected via the USB port that required more power may not charge or power up correctly and that this may affect the operation of this device with the infotainment system.

Apple Device Compatibility

The following table lists some Apple devices and their compatibility with the information and entertainment system using a USB cable.

Fully Supported	Partially Supported	Not Supported
• iPod® Classic - 6th/7th generation • iPod® Nano - 3rd/4th/5th/6th generation • iPod® Touch - 2nd/3rd/4th generation • iPhone™ 3/3S • iPhone™ 4/4S • iPad™ - 1st generation (with iOS 4.0 or later)	• iPod® Classic - 4th/5th generation • iPod® Nano - 1st/2nd generation • iPod® Touch - 1st generation • iPhone™	• iPod® Classic - 1st/2nd/3rd generation • iPod® Shuffle - 1st/2nd/3rd/4th generation

Pinpoint Tests

PINPOINT TEST A : SOURCE TESTS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: SOURCE TEST 1	
NOTE: Soft key confirmation tones will not be audible if this preference is set to off (Set-up / System / Button feedback)	
	1 Operate the available soft keys
	Was there an audible confirmation tone to indicate that the soft key input was detected? **Yes** Audio amplifier module and MOST network functioning. GO to A2. **No** Audio amplifier module fault or MOST ring break. GO to A2.
A2: SOURCE TEST 2	
NOTES: Operating the steering wheel mode switch briefly will cycle through the audio/video sources as follows: Radio - DAB/SDARS - My Music - My Video Operating the steering wheel mode switch for >2 seconds will cycle through the minor sources as follows: (Radio) FM1 - FM2 - FM3 - AM1 - AM2, and (My Music) DVD/CD - iPod® - BT - Stored CDs - USB - AUX Depending on vehicle specification, various audio/video sources may be installed and are contained in the control modules as follows: • Integrated Audio Module (IAM) - including radio, CD, iPod®, USB, my music, my video, phone and navigation • Digital Radio Control Module (DRCM) • Satellite Radio Control Module (SRCM) • Television Control Module (TVCM) • Rear Seat Entertainment Control Module (RSECM)	
	1 Cycle through the audio/video sources by operating the steering wheel mode switch
	Did the audio/video soft key return to normal and/or the selected source function normally? **Yes** MOST network functioning. GO to A3. **No** Possible MOST ring break. GO to A3.
A3: SOURCE TEST 3	
	1 Operate the **Navigation** soft key (or switch)
	Did the navigation system start up and display a map? **Yes** GO to A4. **No** GO to A4.
A4: SOURCE TEST 4	
	1 Operate the **Phone** soft key (or switch)
	Is the phone menu displayed? **Yes** GO to Pinpoint Test B. **No** GO to Pinpoint Test B.

PINPOINT TEST B : FUSE PULL TESTS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
B1: FUSE PULL TEST 1	
	1 Remove the fuse from the missing audio/video source control module circuit
	2 Inspect the fuse
	Has the fuse blown? **Yes** Refer to the electrical circuit diagrams and test the circuit for short circuit to ground. Repair as necessary. Install a new fuse. GO to B2. **No** Wait at least 30 seconds and re-install the fuse. GO to B2.
B2: FUSE PULL TEST 2	

NOTE: Depending on vehicle specification, various audio/video sources may be installed and are contained in the control modules as follows: • Integrated Audio Module (IAM) - including radio, CD, iPod®, USB, my music, my video, phone and navigation • Digital Radio Control Module (DRCM) • Satellite Radio Control Module (SRCM) • Television Control Module (TVCM) • Rear Seat Entertainment Control Module (RSECM)	
	1 Set the ignition to off
	2 Set the ignition to on
	3 Check the operation of the touch screen and all audio/video sources
	Has full audio/video functionality been restored? **Yes** If the missing source was part of the integrated audio module, using the manufacturer approved diagnostic system, re-configure the integrated audio module with the latest level software. Tests complete **No** GO to B3.
B3: FUSE PULL TEST 3	
	1 Refer to the electrical circuit diagrams and identify the next control module connected to the MOST network
	Is there another control module that has not been reset? **Yes** GO to B4. **No** MOST ring break present. REFER to: Communications Network (418-00 Module Communications Network, Diagnosis and Testing).
B4: FUSE PULL TEST 4	
	1 Remove the fuse from the next control module circuit
	2 Inspect the fuse
	Has the fuse blown? **Yes** Refer to the electrical circuit diagrams and test the circuit for short circuit to ground. Repair as necessary. Install a new fuse. GO to B2. **No** Wait at least 30 seconds and re-install the fuse. GO to B2.

PINPOINT TEST C : TOUCH SCREEN CALIBRATION	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
C1: TOUCH SCREEN CALIBRATION	
NOTE: A suitable stylus (for example the stylus supplied with a Panasonic CF-19) will be required for this procedure.	
	1 Navigate to the touch screen Jaguar Leaper screen
	2 Touch the **Jaguar Leaper** until the engineering mode screen is displayed (approximately 20 seconds)
	3 Scroll down and select **Touch Calibration**
	4 Select **OK**
	5 Tap the touch screen to proceed
	6 Using a suitable stylus, tap the touch screen at the points indicated until a pass/fail result is displayed
	Was the touch screen calibration successful? **Yes** Calibration complete **No** Calibration failed. GO to C1.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Audio Amplifier Module (AAM) (100-00 General Information, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - DTC: Digital Audio Broadcast Module (DABM) (100-00 General Information, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - DTC: Integrated Audio Module (ACM) (100-00 General Information, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - DTC: Integrated Control Panel (FCIMB) (100-00 General Information, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - DTC: Rear Entertainment Module (REM) (100-00 General Information, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - DTC: Touch Screen Display (FCDIM) (100-00 General Information, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - DTC: Satellite Digital Audio Radio System Module (SARM) (100-00 General Information, Description and Operation).

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Information and Entertainment System - General Information - Cellular Phone

Diagnosis and Testing

Principle of Operation

For a detailed description of the cellular phone system, refer to the relevant description and operation sections in the workshop manual.

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
• Microphone • Bluetooth® antenna	• Electrical connectors • Wiring harness for damage or corrosion • Fuses

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for diagnostic trouble codes (DTCs) and refer to the relevant DTC index

Symptom Chart

Symptom	Action
Unable to pair	• GO to Pinpoint Test A.
Not Automatically Connecting	• GO to Pinpoint Test B.
No Audio to 3rd Party	• GO to Pinpoint Test C.
No Audio from 3rd Party	• GO to Pinpoint Test D.
No Audio	• GO to Pinpoint Test E.

Pinpoint Tests

PINPOINT TEST A : UNABLE TO PAIR	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: 'NO PHONE FITTED' DISPLAY	
NOTE: Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the bluetooth function is activated and the telephone handset is placed within the vehicle cabin area.	
	1 Carry out checks to determine if 'No Phone Fitted' is shown on vehicle display.
	Is 'No Phone Fitted' displayed? **Yes** GO to A2. **No** Locate the connected telephone and if not customer telephone, disconnect from the system.
A2: TELEPHONE BLUETOOTH® DEVICE SEARCH	
	1 Carry out Bluetooth® device search using customer handset.

	Is 'Jaguar' identified in Bluetooth® device list? **Yes** Select device from list, then continue with diagnosis.GO to A3. **No** Carry out further Bluetooth® device search, to a maximum of 4 times, waiting approximately 20 seconds between searches. If 'Jaguar' still not identified in Bluetooth® device list, set ignition status to OFF, wait approximately 30 seconds and set ignition status to ON. Carry out further Bluetooth® device search, to a maximum of 4 times, waiting approximately 20 seconds between searches. If 'Jaguar' still not identified in Bluetooth® device list, contact your local in market support for further assistance.
A3: TELEPHONE HANDSET ERROR	
	1 Check for any error shown on the telephone handset when 'Jaguar' is selected from the Bluetooth® device list.
	Was an error immediately shown on the telephone handset? **Yes** Wait approximately 10 seconds then re-attempt selection, to a maximum of 4 times, waiting approximately 10 seconds between each attempt. If error still being displayed, contact your local in market support for assistance. **No** Enter PIN '1313' then continue with diagnosis.GO to A4.
A4: PIN ENTRY STATUS	
	1 Check for successful PIN entry.
	Was PIN entry successful? **Yes** GO to A5. **No** Wait approximately 10 seconds then re-attempt PIN entry, to a maximum of 4 times, waiting approximately 10 seconds between each attempt. If PIN entry is still un-successful, contact your local in market support for assistance.
A5: 'NO PHONE FITTED' DISPLAY	
	1 Carry out checks to determine if 'No Phone Fitted' is still shown on vehicle display.
	Is 'No Phone Fitted' still displayed? **Yes** From the telephone handset, select the connect option for the 'Jaguar' device identified in the Bluetooth® device list. If 'No Phone Fitted' is still displayed, suspect a telephone handset fault. Carry out Pinpoint test again using known good telephone handset. **No** The telephone is paired and connected to the system. No further action is required for this symptom.

PINPOINT TEST B : NOT AUTOMATICALLY CONNECTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: BLUETOOTH® MODULE PAIRED DEVICE LIST	
	NOTE: Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the bluetooth and auto connect functions are activated and the telephone handset is placed within the vehicle cabin area.
	1 Carry out checks to determine if the customer telephone is shown in the Bluetooth® module paired device list.
	Is the Customer telephone in the Bluetooth® module paired device list? **Yes** GO to B2. **No** Pair device as decribed in **Pinpoint Test A**
B2: CUSTOMER HANDSET PAIRED DEVICE LIST	
	1 Carry out checks to determine if the Bluetooth® Module is shown in the Customer telephone paired device list.
	Is the Bluetooth® Module in the Customer telephone paired device list? **Yes** GO to B3. **No** Carry out Unable to Pair Pinpoint Test.Pair device as decribed in **Pinpoint Test A**
B3: CUSTOMER TELEPHONE IN POSITION 1	
	1 Carry out checks to determine if the Customer telephone is in position 1 in the Bluetooth® Module paired device list.
	Is the Customer telephone in position 1? **Yes** GO to B4. **No** Advise Customer that auto connection will only be attempted with the device that is shown in position 1 in Bluetooth® Module paired device list.
B4: CHECK FOR DTC B1A56-13	
	1 Using Manufacturer approved diagnostic system, check for DTC B1A56-13.

	Is DTC B1A56-13 logged? **Yes** Carry out remedial actions as outlined in DTC Index. If symptom remains, contact your local in market support for assistance. **No** GO to B5.
B5: BLUETOOTH® CONNECTION	
	1 Carry out checks to determine if Bluetooth® connection icon is shown on customer Bluetooth® telephone screen but shows 'No Phone Fitted' on vehicle screen.
	Is Bluetooth® connection icon shown on the customer handset but 'No Phone Fitted' displayed on vehicle screen? **Yes** GO to B9. **No** GO to B6.
B6: 'JAGUAR' AUTHORISATION	
NOTE: Some handsets may require operator intervention to manually authorise connection.	
	1 Carry out checks to determine if 'Jaguar' is authorised in the customer Bluetooth® telephone device list menu.
	Is 'Jaguar' authorised in the customer Bluetooth® telephone device list menu? **Yes** GO to B7. **No** Advise customer that 'Jaguar' needs to be authorised in the customer Bluetooth® telephone device list menu, or operator intervention may be required to manually authorise connection.
B7: SEARCH FOR DEVICES SCREEN	
	1 Select the search for devices button on the vehicle display.
	Does pressing the search for devices button bring up the searching screen on the vehicle display? **Yes** Contact your local in market support for assistance. **No** GO to B8.
B8: CYCLE IGNITION AND CHECK SEARCH FOR DEVICES SCREEN	
	1 Lock vehicle (wait 60s) before unlocking and turning Ignition status back to ON.
	Does pressing the search for devices button bring up the searching screen on the vehicle display? **Yes** No further action required for this Symptom. Possible intermitent fault. **No** Contact your local in market support for assistance.
B9: PAIRED DEVICE	
	1 Check Customer telephone paired device list to establish which device the Customer telephone is connected to.
	Is the Customer telephone connected to the vehicle? **Yes** Lock vehicle (wait 60s) before unlocking and turning Ignition status back to ON. If Not Automatically Connecting, contact you local in market support for assistance. **No** Using the Customer telephone controls, disconnect from the currently connected device and delete from paired device list. Lock vehicle (wait for 60s) before unlocking and turning Igition status to ON. If Not Automatically Connecting, contact your local in market support for assistance.

PINPOINT TEST C : NO AUDIO TO THIRD PARTY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: MICROPHONE DIAGNOSTIC TROUBLE CODES (DTCS)	
NOTE: Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the telephone is placed within the vehicle cabin area and is connected to the vehicle via bluetooth.	
	1 Using the Manufacturer approved diagnostic system, check for any logged microphone DTCs in Audio Front Control module.
	Is DTC B1D79-01 logged? **Yes** Carry out diagnosis of electrical failure as advised in Action column of DTC Index. **No** Contact your local in market support for assistance.

PINPOINT TEST D : NO AUDIO FROM THIRD PARTY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: 'IN CALL' DISPLAY	

NOTE: Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the telephone is placed within the vehicle cabin area and is connected to the vehicle via bluetooth.	
	1 Carry out checks to determine if 'In Call' is shown on the vehicle display.
	Is vehicle display showing 'In Call'? **Yes** Contact your local in market support for assistance. **No** Call has ended. No further action is required for this symptom.

PINPOINT TEST E : NO AUDIO	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
E1: AUDIO FROM THIRD PARTY	
NOTE: Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the telephone is placed within the vehicle cabin area and is connected to the vehicle via bluetooth.	
	1 Establish from customer feedback/symptom if there is Audio from the Third Party.
	Is there Audio from the Third Party? **Yes** GO to E2. **No** Refer to the 'No Audio From Third Party' Pinpoint test.
E2: AUDIO TO THIRD PARTY	
	1 Establish from customer feedback/symptom if there is Audio to the Third Party.
	Is there Audio to the Third Party? **Yes** GO to E3. **No** Refer to the 'No Audio To Third Party' Pinpoint test.
E3: CD OR RADIO AUDIO	
	1 Establish from customer feedback/symptom if there is Audio from the CD or Radio.
	Is there Audio from the CD or Radio? **Yes** GO to E4. **No** Suspect MOST ring fault, refer to electrical circuit diagrams and check/rectify MOST ring as necessary.
E4: TELEPHONE HANDSET AUDIO	
	1 Establish from customer feedback/symptom if there is Audio from the telephone handset.
	Is there Audio from the telephone handset? **Yes** Ensure vehicle is parked. Disconnect and reconnect handset. If issue not resolved, contact your local in market support for assistance. **No** Contact you local in market support for assistance.

DTC Index

For a complete list of all diagnostic trouble codes that could be logged on this vehicle, please refer to Section 100-00. REFER to: (100-00 General Information)

Diagnostic Trouble Code (DTC) Index - DTC: Integrated Audio Module (ACM) (Description and Operation),
Diagnostic Trouble Code (DTC) Index - DTC: Touch Screen Display (FCDIM) (Description and Operation).

Published: 13-Jun-2013

Information and Entertainment System - General Information - Navigation System

Diagnosis and Testing

Principle of Operation

For a detailed description of the navigation system, refer to the relevant description and operation sections in the workshop manual. REFER to: (415-01)

Navigation System (Description and Operation),
Navigation System (Description and Operation),
Navigation System (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
• Navigation control module • Audio amplifier module • Integrated audio module • Digital radio control module • Integrated control panel • Touch screen • Satellite radio control module • TV control module • Compact disc player jammed, not loading • Scratched/dirty compact discs • Loudspeakers	• Fuses • Loose or corroded connector(s) • Navigation control module • Audio amplifier module • Integrated audio module • Digital radio control module • Integrated control panel • Touch screen • Satellite radio control module • TV control module • Loudspeakers

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, check for diagnostic trouble codes and refer to the relevant diagnostic trouble codes index

DTC Index

For a list of diagnostic trouble codes that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Navigation Control Module (NCM) (100-00, Description and Operation) / Diagnostic Trouble Code (DTC) Index - DTC: Touch Screen (TS) (100-00, Description and Operation).

Published: 11-May-2011

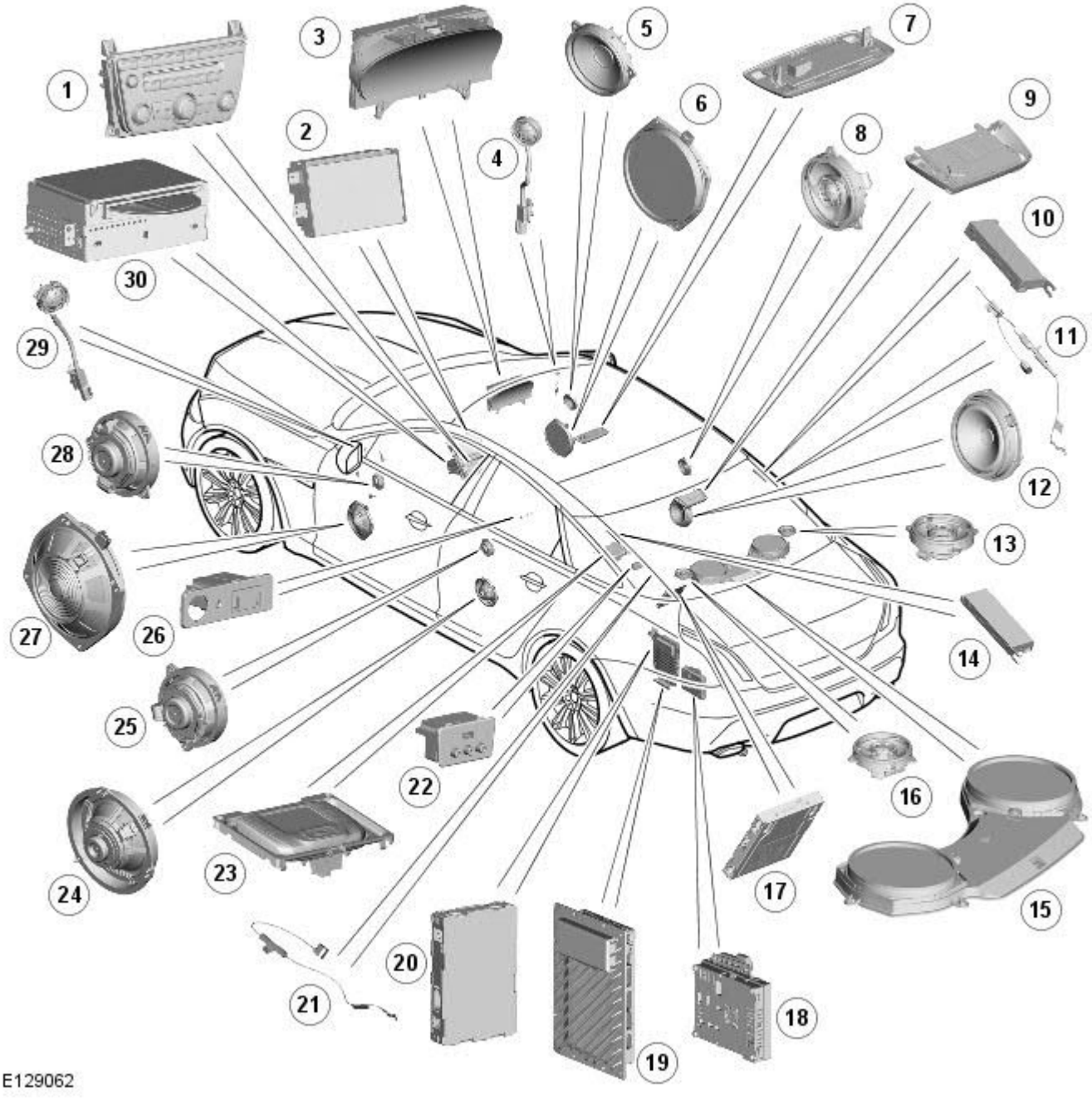
Information and Entertainment System -

Description	Nm	lb-ft	lb-in
Audio unit antenna amplifier to "D" pillar retaining bolts	10	-	89
Audio unit amplifier retaining nuts	10	-	89
Information and entertainment display retaining bolts	4	-	26
Instrument panel speaker retaining screws	2.5	-	18
Steering wheel audio control switch retaining screws	2	-	35
Subwoofer speaker retaining bolts	5	-	44
Audio unit retaining bolts	2.5	-	22
Audio and climate control assembly	1.7	-	15
Digital audio module	10	-	89
Satellite radio tuner	10	-	89
Navigation system antenna	10	-	89

Published: 11-May-2011

Information and Entertainment System - Audio System - Component Location

Description and Operation



Item	Description
1	Integrated Control Panel (ICP)
2	Touch Screen Display (TSD)
3	Instrument Cluster
4	Right Hand (RH) front door bass speaker
5	RH front door tweeter speaker
6	RH front door mid-range speaker
7	WhiteFire® digital wireless headphones transmitter (if fitted)
8	RH rear door co-axial speaker
9	Sigma pod module (GPS+SDARS/ GPS+DAB L-Band/ GPS)
10	AM / FM1 / TV1 / TV2 Amplifier

11	Radio antenna positive wavetrap (isolator)
12	RH rear door bass speaker
13	Parcel shelf co-axial speaker
14	FM2 / DAB_3 / TV3 / TV4 Amplifier
15	Parcel shelf subwoofer assembly
16	Parcel shelf co-axial speaker
17	Rear Seat Entertainment (RSE) control module (if fitted)
18	TV module
19	Audio amplifier
20	DAB (SDARS - NAS only) radio module
21	Radio antenna negative wavetrap (isolator)
22	Rear auxiliary panel
23	Rear seat entertainment remote control (if fitted)
24	Left Hand (LH) rear door bass speaker
25	LH rear door co-axial speaker
26	Front auxiliary panel
27	LH front door bass speaker
28	LH front door mid-range speaker
29	LH front door tweeter speaker
30	Integrated Audio Module (IAM)

Published: 11-May-2011

Information and Entertainment System - Audio System - Overview

Description and Operation

OVERVIEW

The audio system is available in three versions:

- Jaguar 400W Base Audio
- Jaguar 600W High Line Sound System
- Bowers & Wilkins 1200W Premium Sound System

A range of audio systems are available combining radio and CD/DVD functions, Sirius Satellite Radio or DAB Digital Audio Broadcasting receiver, MP3 disc compatibility, RDS, PTY and TA functions. The Integrated Audio Module (IAM) is a combined radio tuner, CD/DVD player and incorporates a 40GB hard drive for use by the audio for storing music and also stores the operating system and files for the navigation system.

Front and rear auxiliary panels (rear panel only fitted if rear entertainment system is present) allow for the connection of a range of portable audio devices to the car's audio system. The front and rear auxiliary panels are controlled through the Integrated Audio Module (IAM) and the rear seat entertainment module respectively, with play back through the car's speaker system. This system allows the user to import their personal portable media player to interface with the car, including iPod and other MP3 players, or USB mass storage devices such as memory sticks. MP3 players can also be controlled through the Touch-screen if they are configured as mass storage devices.

The chosen audio device can be plugged into the car using the auxiliary panels. The interface includes a 3.5mm auxiliary jack-plug socket, a 12-volt power supply, a dedicated iPod connector with charging function, plus a USB2 connector which allows connectivity for a wide variety of USB devices. The USB port also provides a charging function although it does not support a USB hub. The maximum charging current supplied is 500mA. The user can connect an iPod and USB device at the same time, changing the source via the Touch-screen. The non selected source will still charge.

The Jaguar 400W base audio system is the basic audio system which comprises of an IAM with an 8 channel audio amplifier and 12 speakers.

The Jaguar 600W Hi Line Sound System contains a 12-channel Class-D, Digital Signal Processor (DSP) amplifier featuring Audyssey MultiEQ® audio equalisation and Dynamic Volume Control (DVC) and a 14 speaker system, which includes 2 parcel shelf mounted sub-woofers.

The Bowers & Wilkins 1200W Surround Sound System additions include a 15-channel Class-D, DSP amplifier featuring Audyssey MultiEQ® audio equalisation and Dynamic Volume Control with user selectable Dolby® Pro Logic® IIx and DTS™ Neo:6, together with a 20 speaker Surround Sound Speaker System, which also includes 2 parcel shelf mounted sub-woofers.

Digital Audio Broadcasting (DAB) is available for most European markets and gives access to digital radio channels for better sound quality and enhanced functionality depending on local service availability. The DAB module is located in the luggage compartment. The system receives reception signals from the following sources to ensure optimum signal strength:

- DAB L-band antenna located in the Sigma pod antenna module
- DAB band III antenna located in the heated rear window.

For NAS vehicles the digital format adopted is satellite radio which specifically links to the Sirius network. The system operates in the S-band frequency range, and as a result of the use of satellite transmission, has the ability to provide CD (compact disc) quality audio broadcasts over very large areas (typically continents). The satellite radio receiver is located in the luggage compartment. The system receives reception signals from the satellite radio antenna incorporated in the Sigma Pod Module, which is located in the upper centre of the rear screen.

Primary user control of the audio system is via the ICP and the Touch Screen Display (TSD) which are located in the center of the instrument panel.

Published: 11-May-2011

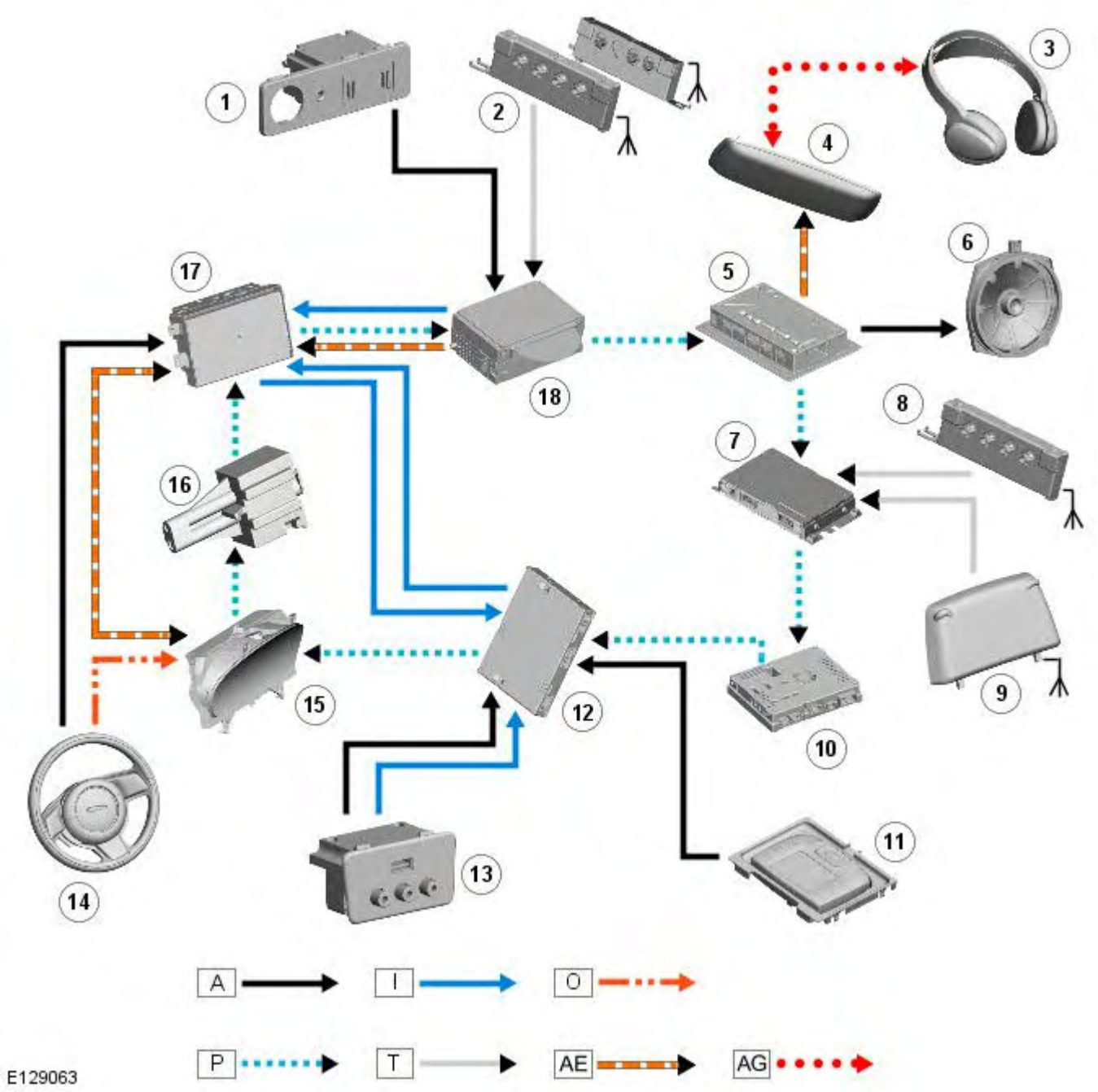
Information and Entertainment System - Audio System - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: **A** = Hardwired; **I** = CVBS; **O** = LIN; **P** = MOST; **T** = Co-axial; **AE** = LVDS; **AG** = Infrared

Control Diagram - Audio System



Item	Description
1	Front auxiliary panel
2	AM /FM /TV / DAB-3 Amplifiers
3	WhiteFire® digital wireless headphones
4	WhiteFire® digital wireless headphones transmitter

5	Audio amplifier
6	Vehicle speakers
7	DAB / SDARS radio module
8	FM2 / TV3 / TV4 / DAB-3 Amplifier
9	Sigma pod module (GPS/DAB L-Band)
10	TV module (reference only)
11	Rear seat entertainment remote control (if fitted)
12	Rear seat entertainment module (if fitted)
13	Rear auxiliary panel (if fitted)
14	Steering wheel audio switches
15	Instrument cluster
16	MOST diagnostic socket
17	Touch Screen Display (TSD)
18	Integrated Audio Module (IAM)

System Operation

AUDIO SYSTEM OPERATION

MEDIA ORIENTATED SYSTEMS TRANSPORT (MOST)

The components of the audio/infotainment system are all connected on the Media Orientated Systems Transport (MOST) ring. The MOST ring is a fibre optic communications bus for multimedia applications. Audio and control information is passed around the MOST ring and can be picked up by any of the systems units. For example, radio station tuning/selection input by the vehicle user into the Touch Screen Display (TSD) is sent along the MOST ring and collected by the Integrated Audio Module (IAM) which then selects the requested radio station.

MOST technology uses a plastic optical fibre which forms a network connecting the audio and multimedia system components. Each component in the ring is connected to the plastic optical fibre through a device known as a Fiber Optical Transceiver (FOT). Each FOT has two optical connections; one connection is sensitive to light and is the input, the second connection forms the light source and is the output. The system operates by connecting the output from one FOT to the input of another FOT.

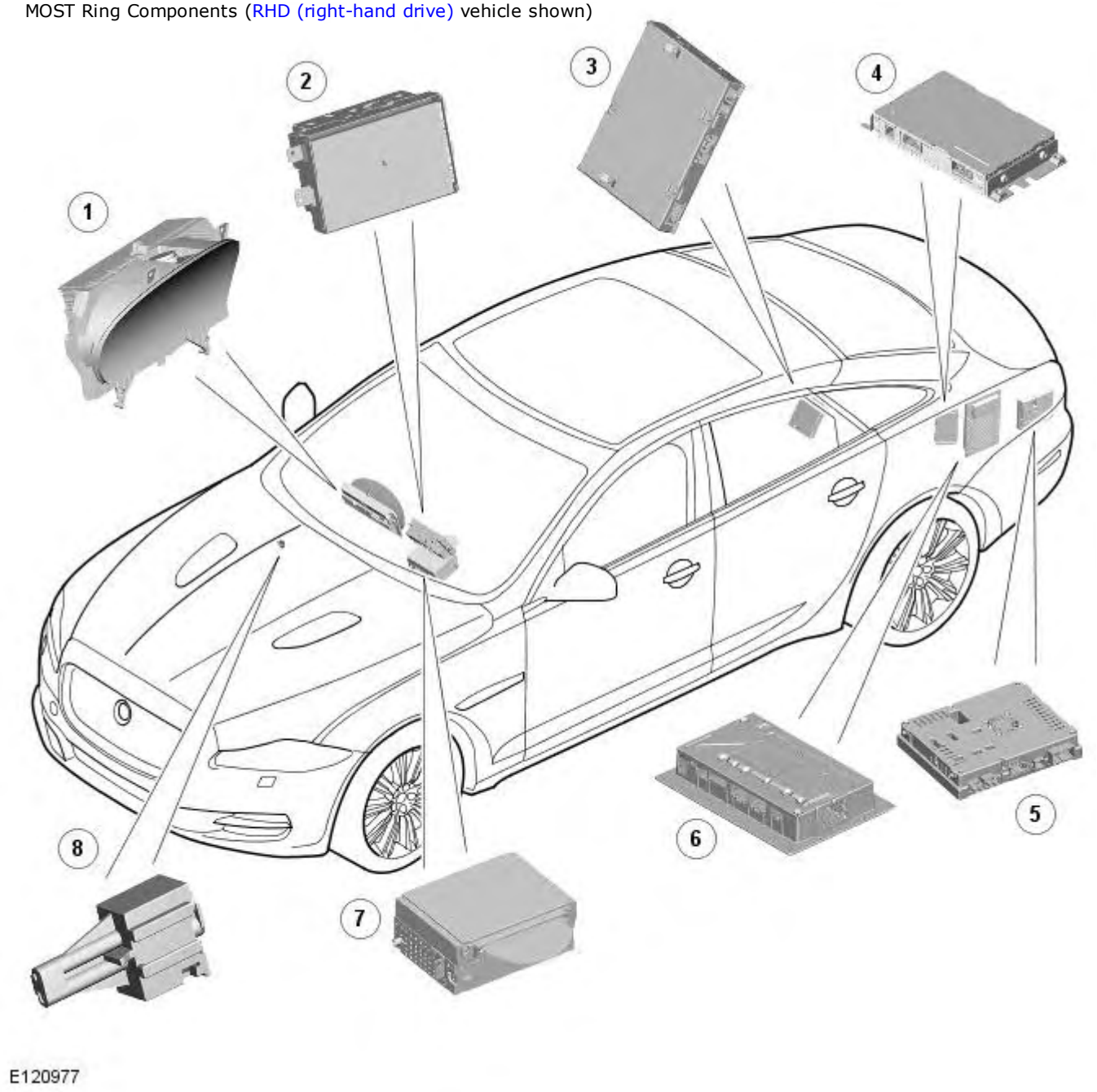
The light signals are sent in one direction only and are formed in the following way:

- Electrical signals are converted into an electrical current
- The current then drives an LED (light emitting diode) in the FOT to produce a high intensity red light
- The LED transmits the light through a fiber optic cable
- A photo diode in the FOT at the opposite end of the fiber optic cable detects the light.

The following components may be connected to the MOST ring dependant on the vehicle equipment level:

- Touch Screen Display (TSD) (MOST timing master)
- Integrated Audio Module (IAM)
- Rear Seat Entertainment (RSE) module (if fitted)
- Digital Audio Broadcast (DAB) radio receiver (if fitted)
- Satellite Digital Audio Radio Service (SDARS) (NAS only - if fitted)
- Power audio amplifier
- Instrument cluster
- Telephone control module (if fitted)
- Navigation computer (if fitted)
- Televison (TV) tuner (if fitted).

MOST Ring Components (RHD (right-hand drive) vehicle shown)



E120977

Item	Description
1	Instrument cluster
2	Touch Screen Display (TSD)
3	Rear Seat Entertainment (RSE) module (if fitted)
4	DAB module / SDARS module (NAS only)
5	Television tuner
6	Power audio amplifier
7	Integrated Audio Module (IAM)
8	MOST diagnostic connector

MOST is a synchronized network. A timing master supplies the clock information and all other devices on the network synchronize their operation to this clock. The timing master for the MOST network on this vehicle is the Touch Screen Display (TSD). This unit also controls and manages the MOST ring and the system components.

An Optical Bus tester is used in conjunction with the approved Jaguar diagnostic system to diagnose the MOST system. The Optical Bus tester emits a visible, high intensity red light which can be connected into the ring at any point to test the ring integrity. Disconnecting a MOST connector will reveal if the high intensity red light is visible.

If a break occurs in the MOST ring, fault codes are stored in the TSD which can be retrieved using an approved Jaguar

diagnostic system.

Component Description

AUDIO SYSTEM DESCRIPTION

Integrated Audio Module (IAM)

E121832

The IAM is located in central position in the instrument panel, behind the Integrated Control Panel (ICP).

The IAM is a multi functional unit which has the following systems and features:

- Radio tuner
- Compact Disc (CD) player (single slot)
- Hybrid Digital (HD)
- Bluetooth® receiver (telephone and audio streaming) Radio (where fitted)
- 40 GB Hard drive (Navigation and audio ripping)
- USB controller (front)
- Audio AUX
- DVD player (audio and video).

The IAM is connected on the MOST ring to the other audio system components. The driver can control audio functions by using soft keys on the Touch Screen Display (TSD), steering wheel mounted audio control switches or by voice commands.

The 40 GB hard drive is used for storing the information for satellite navigation and music files. A 10GB partition is provided for storing music files. Up to 10 CD's can be loaded individually via the CD slot and the music data copied onto the hard drive.

The IAM has an integral tuner for AM/FM reception. Each audio system features auto-store, with a press and hold function to store selected channels as pre-sets. The standard search facility finds the nine strongest channels currently available, while search and manual tuning also allow channels to be stored. The IAM does not have an integral audio power amplifier, so all variants of the audio systems use a separate audio power amplifier located in the luggage compartment.

Hard Disc Drive

The integral hard drive for the navigation system removes the requirement of a separate navigation computer usually found in the rear luggage compartment. The IAM stores the navigation map data locally within the 40GB hard drive (30GB partition reserved for navigation). By storing the information in this way and processing it within the IAM, navigation display, route calculation speeds and accuracy are vastly improved. Map upgrades and software now have to be loaded directly into the IAM.

The map images are transmitted from the IAM to the TSD via a Low Voltage Differential Signal (LVDS). Turn by turn instructions are also available, these are displayed in the instrument cluster via a second LVDS link between the instrument cluster and TSD.

The IAM has the ability to load audio files and 'rip' the music onto the internal hard drive, a 10GB partition is reserved to store music. It is possible to store up to 10 uncompressed albums onto the hard drive. Only CDDA files can be loaded into the virtual changer.

File compatibility for the single slot CD mechanism includes:

- CD audio
- mp3 – (MPEG Layer III)
- WMA – (Microsoft Windows Media Audio)
- WAV – (waveform)
- AAC – (Advanced Audio Coding. Apple iTunes - only through iPod interface)

NOTES:

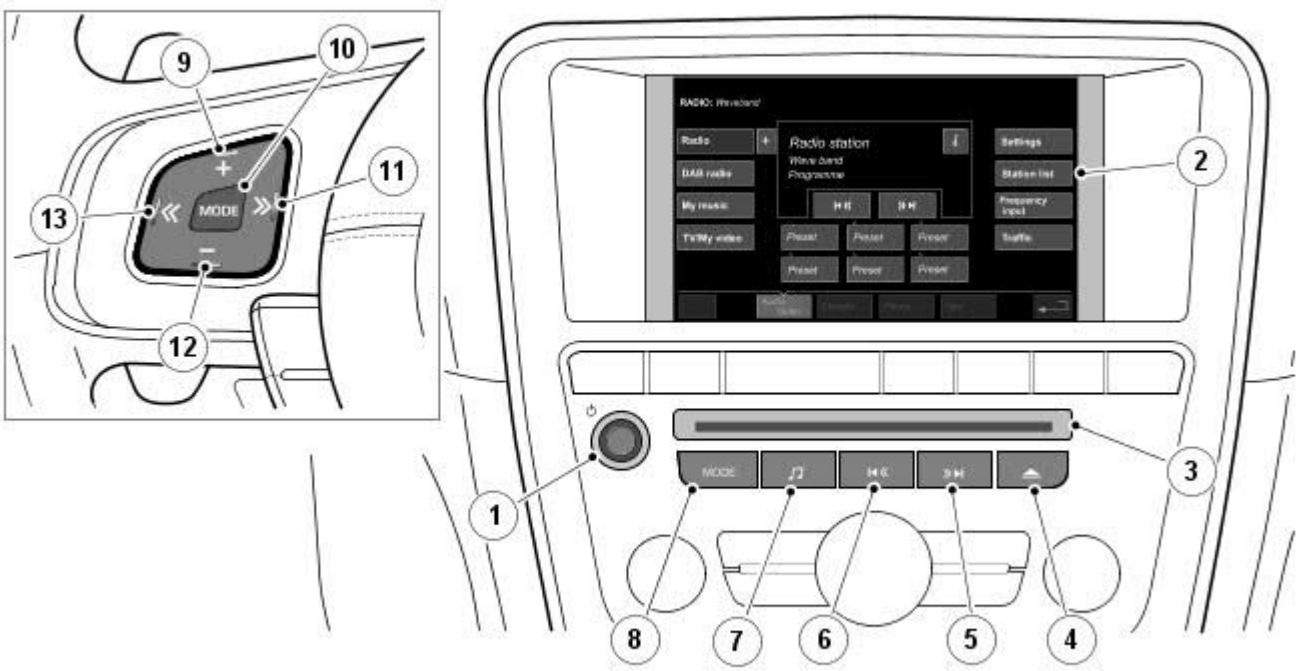
The CD player may take a longer time to load an MP3 disc, if there are more tracks than on a normal CD. To minimise loading time, a rigid folder structure is recommended.

In the event of customer complaints relating to audio quality, file compression should be taken into consideration during diagnosis.

The IAM communicates on the MOST ring with the rest of the audio system. If the IAM is replaced it must be configured as a new module using an approved Jaguar diagnostic system

Calibration of the IAM using an approved Jaguar diagnostic system enables updates to be downloaded as new technology becomes available or any fault concerns require software updates.

Audio Controls



E129064

Item	Description
1	On/Off and volume control
2	Touch Screen Display (TSD)
3	CD load and eject slot
4	CD eject button
5	Seek up: Short press to auto seek up the frequency to the next radio station, next TV channel on the channel list, or next track on selected audio source. Long press to activate manual seek mode - further short presses change the frequency in single increments. A further long press will scan forwards through the current waveband, a track or to select the next preset TV channel until the button is released.
6	Seek down: Short press to select the previous radio preset, previous TV channel on the channel list, or previous track on selected audio source. Long press to scan backwards through a track or to select the previous preset TV channel.
7	Settings button: Press to display audio Settings menu.
8	MODE button: Press repeatedly to scroll through all audio/video sources. Long press will cycle through each source sub-selection (for example FM1, FM2, FM3, AM1, AM2 etc.)
9	+ button: Press to increase button
10	MODE button: Press repeatedly to scroll through all audio/video sources. Long press will cycle through each source sub-selection (for example FM1, FM2, FM3, AM1, AM2 etc.)
11	Seek down: Short press to auto seek down the frequency to the next radio station, next TV channel on the channel list, or next track on selected audio source. Long press to activate manual seek mode - further short presses change the frequency in single increments. A further long press will scan backwards through the current waveband, a track or to select the next preset TV channel until the button is released.
12	- button: Press to decrease volume
13	Seek down: Short press to select the previous radio preset, previous TV channel on the channel list, or previous track on selected audio source. Long press to scan backwards through a track or to select the previous preset TV channel.

There are several ways to control the audio system:

- Steering wheel audio switches
- Integrated Control Panel (ICP)
- Touch Screen Display (TSD)
- Voice control.

The steering wheel audio switches allow selection of audio/video source, volume control, selection of radio or TV preset, scan for radio or TV channel, scan backwards or forwards through a music track.

The ICP switches provide the same functions as the steering wheel audio switches.

The TSD provides the greatest selection of controls for the audio/visual systems. On screen soft keys allow navigation through the audio menus and selections and preferences can be programmed into the system.

Voice control is activated by pressing the steering wheel mounted voice control switch. Once activated, a command list is displayed in the instrument cluster which allows the driver to select from a number of systems for voice control as follows:

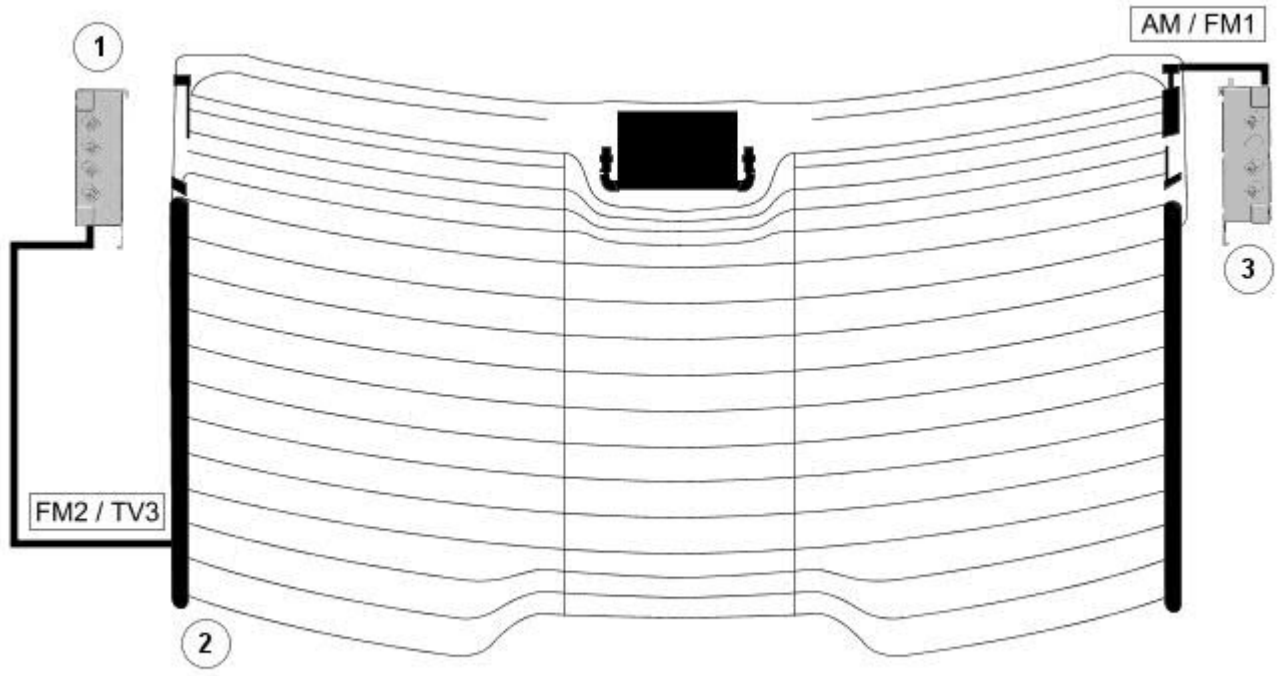
- Telephone
- Navigation system
- USB
- CD
- Radio.

A long press on the voice control switch de-activates the voice control system.

On vehicles fitted with the Rear Seat Entertainment (RSE) system, a remote control touch screen is available for rear seat passengers to select their preferences for the audio/visual systems. The remote touch screen is located in a docking station in the center arm rest and can be operated located in the arm rest or removed for remote operation. On screen menu's, similar to those used in the instrument panel mounted TSD are used to navigate through the selected source functions.

Radio Antennas

Hybrid Digital (HD) and AM/FM



E121823

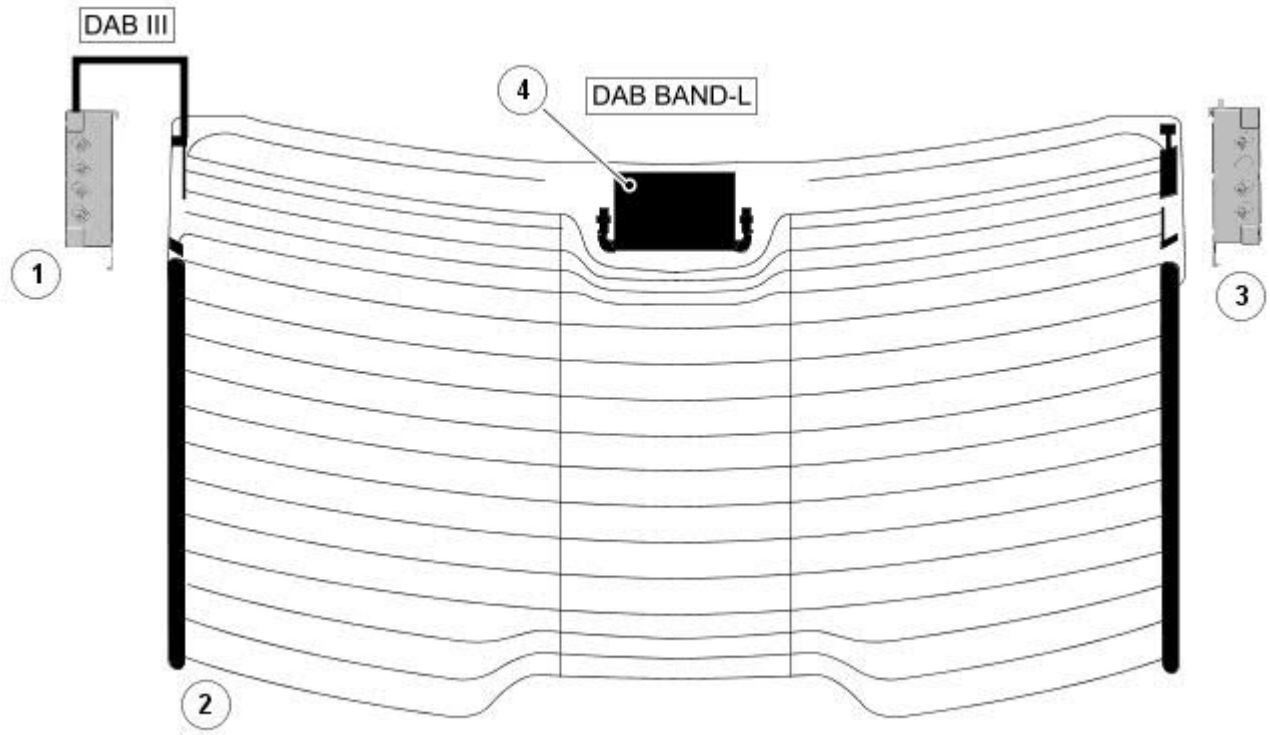
Item	Description
1	FM2 / DAB_3 / TV3 / TV4 Amplifier
2	Rear screen
3	AM / FM1 / TV1 / TV2 Amplifier

HD radio does not require a dedicated antenna. It uses the existing AM/FM antennas located in the rear screen.

NOTE: HD radio transmission depends very much on the broadcaster, not all stations will provide the HD element of the broadcast.

Digital radio transmission does not always necessarily produce a higher resolution sound. This is very much dependant on the compression rate the provider is transmitting the signal.

Digital Audio Broadcasting (DAB) Band III and DAB L-Band

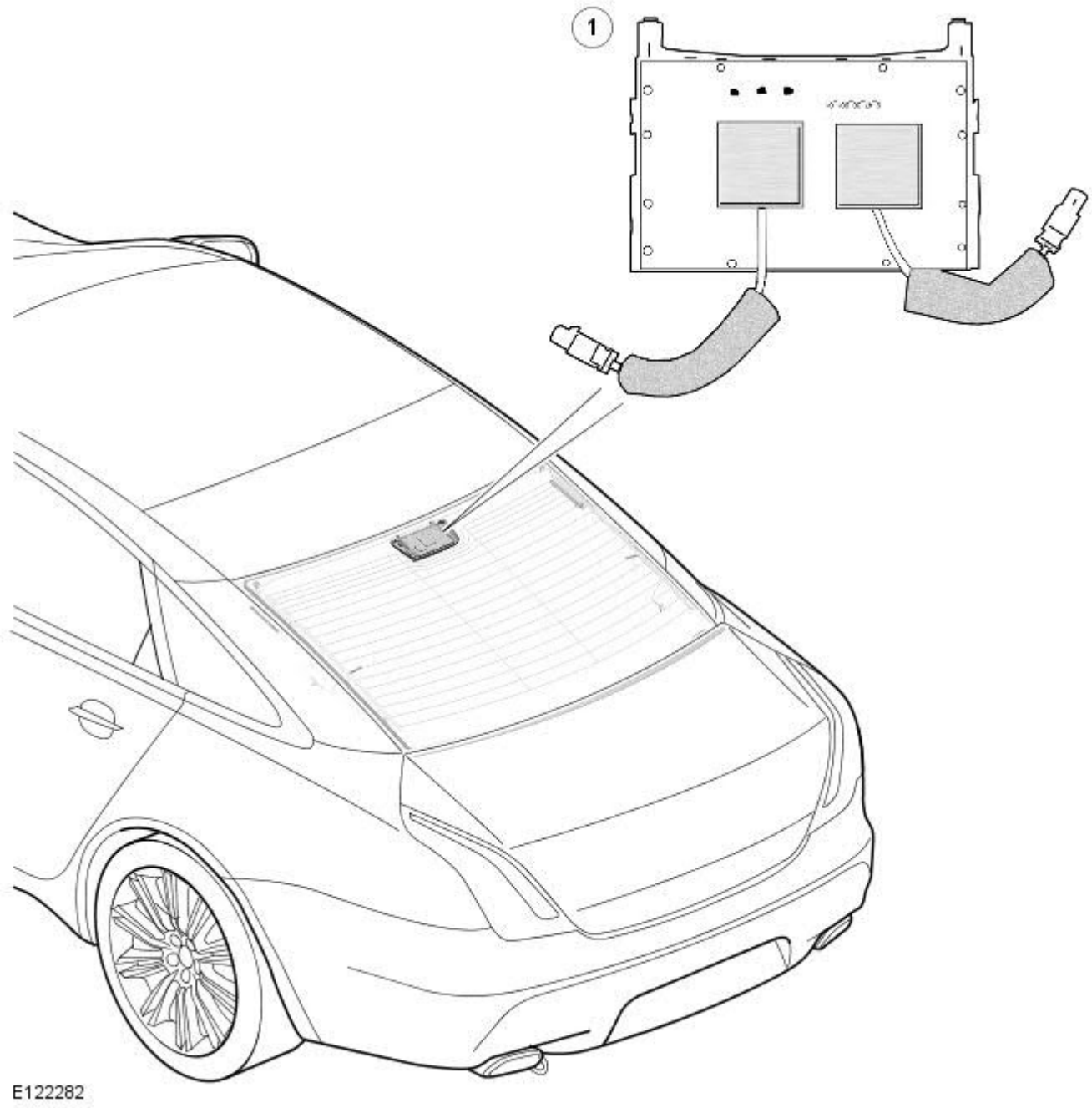


E121825

Item	Description
1	FM2 / DAB_3 / TV3 / TV4 Amplifier
2	Rear screen
3	AM / FM1 / TV1 / TV2 Amplifier
4	Sigma pod

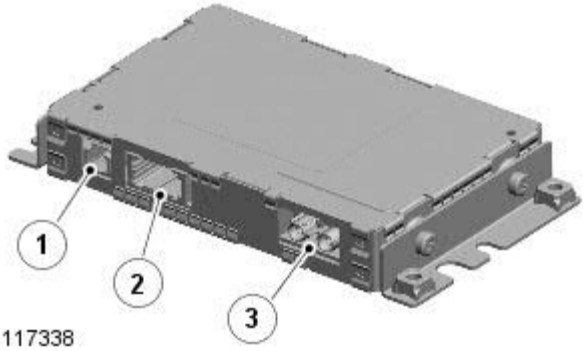
The DAB L-band antenna is located in the sigma pod and is shared with the navigation system Global Positioning Satellite (GPS) antenna where fitted. The sigma pod is located internally in a central position towards the top of the rear window.

The antennas fitted to these modules MUST be 2mm from the glass when they are fixed/slotted into the Sigma pod carrier which is bonded onto the rear screen. Both the air gap and fixed position in the carrier are extremely critical to the functionality, operation and efficiency of all the sigma module antennae.



E122282

Item	Description
Sigma pod (GPS, DAB L-band and SDARS anten	**DAB Control Module**



E117338

Item	Description
1	Power supply and ground connection
2	MOST bus connector
3	L-band and Band III antenna connection

The DAB receiver is located in the LH (left-hand) side of the luggage compartment.

The DAB receiver is a dedicated tuner which is controlled by the IAM on the MOST ring. The receiver processes the signals from the DAB antennas. Digital information is transmitted on the MOST ring and processed by the IAM. The processed information is sent out to the audio amplifier converted to analogue then broadcast through the speaker system.

NOTE: DAB audio resolution is not always better than FM. This is dependant on the compression rate being transmitted by the provider.

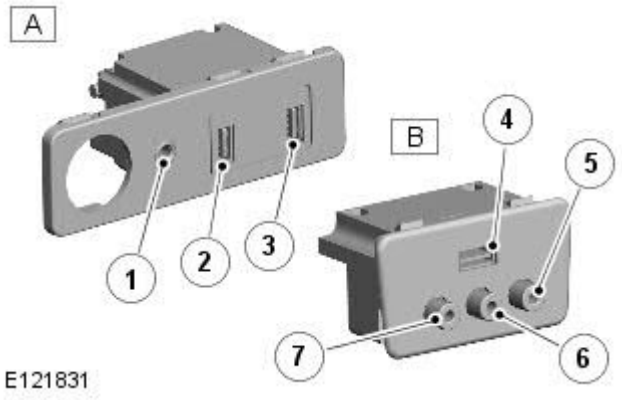
DAB radio is a relatively new and therefore coverage of the digital network is constantly evolving. The United Kingdom for example currently has a DAB coverage of more than 85%, although other countries may have less coverage. DAB reception coverage areas can be checked using the internet.

Before taking any diagnostic action in the event of a customer reception complaint consider that DAB reception depends on local channels/stations and their signal strength and reception is affected by tunnels, hills, tall buildings or densely tree-lined roads.

During periods of signal strength deterioration, the Jaguar DAB system is designed to notify the customer that the signal is weak. As an alternative to muting the sound, possibly replicating a fault symptom to a customer, the over-laying of a 'bubbling' sound is deliberately produced during the transmission. This sound should also not be perceived as a fault, no further diagnosis is required in this instance.

Front and Rear (if fitted) Auxiliary Panels

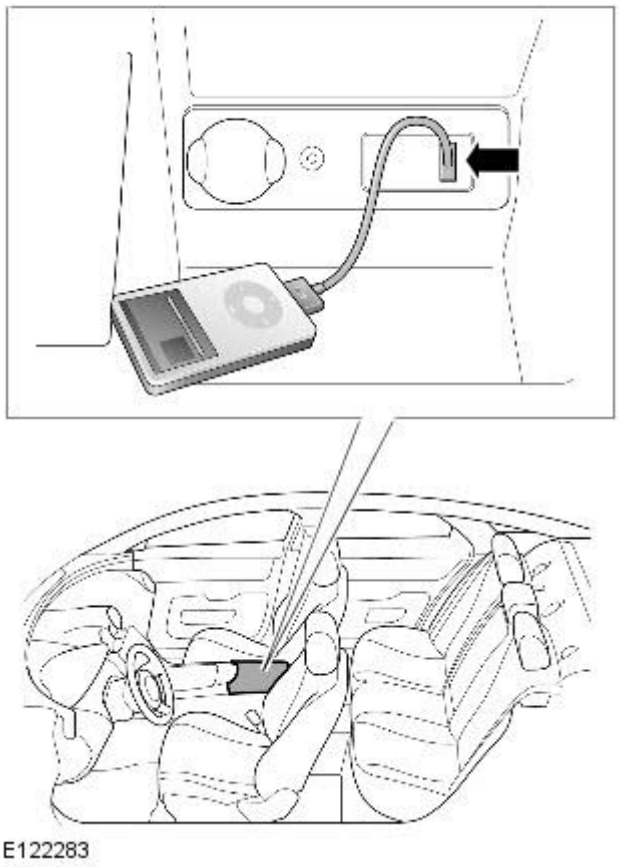
NOTE: **A** = Front AUX panel**B** = Rear AUX panel



Item	Description
1	3.5mm AUX jack socket
2	USB socket
3	USB socket
4	USB socket
5	Video Input
6	Right channel audio input
7	Left channel audio input

All models have an auxiliary 3.5mm mini-jack input socket and 2 USB ports in the centre cubby box. On vehicles fitted with the Rear Entertainment System (RSE) and additional auxiliary panel is fitted which has a USB port, a video input and 2 audio inputs.

Front Auxiliary Panel



E122283

The USB connectivity allows a convenient method of playing music from a range of compatible portable devices through the vehicle audio system. The front auxiliary panel is controlled through the TSD and the steering wheel switches. On vehicles with the RSE system, the rear auxiliary panel can be controlled via the RSE remote touch screen panel, in addition to the TSD and the steering wheel switches. Both systems use the vehicles audio and speaker system.

If front and rear auxiliary panels are fitted, 3 different USB devices can be connected at the same time and each can be controlled independently through the TSD, RSE remote touch screen and the steering wheel controls.

NOTE: Due to a large variety of USB devices available and continual development in this sector it is impossible to guarantee compatibility with all devices.

WhiteFire® Digital Wireless Headphones and Transmitter

E121826

Item	Description
1	WhiteFire® digital wireless headphones
2	WhiteFire® digital infrared transmitter

In addition to the cabin audio speaker output, if the high line audio or premium audio system is fitted, these systems feature 3 additional audio channels which can be accessed through the digital wireless headphones.

The premium headphone system includes Dolby® headphone surround when listening to the DVD source. It is possible to

install the vehicle with up to 3 sets of headphones. Each headset contains 2 AAA batteries.

NOTE: There is no docking station to store the headsets, therefore charging of the batteries is not supported via the vehicles electrical system.

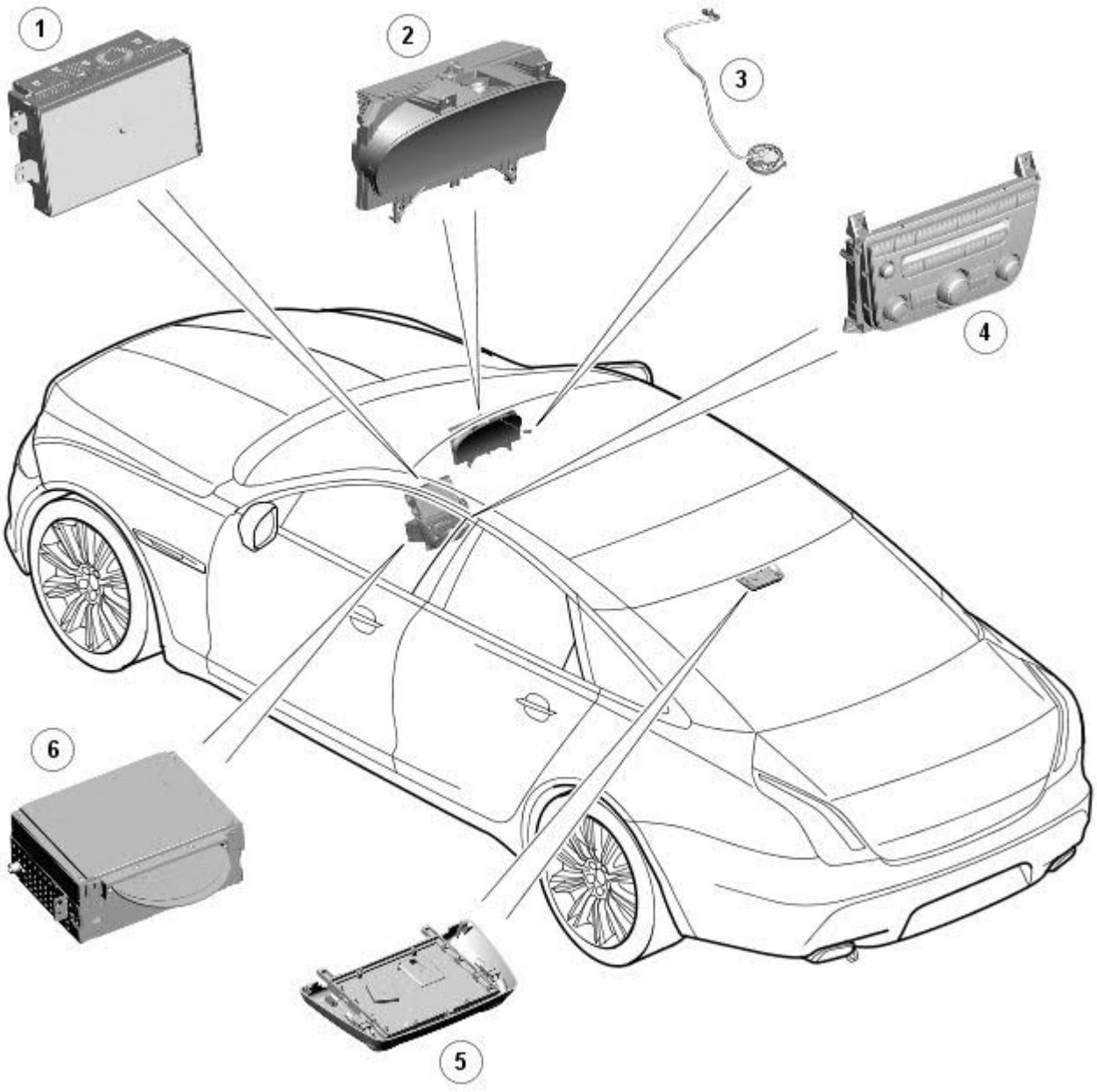
The controls located on the earpiece include the power switch, volume control and channel browse button. To select a different channel press the browse button, conformation via an audible beep can then be heard followed by the audio transmission on that channel.

Published: 11-May-2011

Information and Entertainment System - Navigation System - Component Location

Description and Operation

NAVIGATION SYSTEM - COMPONENT LOCATION



E129656

Item	Description
1	Touch Screen Display (TSD)
2	Instrument cluster
3	Microphone
4	Integrated Control Panel (ICP)
5	Sigma pod (GPS/L Band DAB / SDARS) antenna
6	Integrated Audio Module (IAM)

Published: 11-May-2011

Information and Entertainment System - Navigation System - Overview

Description and Operation

OVERVIEW

The navigation system provides audible and visual route guidance information to enable the driver to reach a desired destination. The system allows the driver to choose the route using minor or major roads or highways with the option of three routes. Directions to hospitals, museums, monuments and hotels are also available.

The navigation system is integrated with the audio/video system and shares a number of components common to all systems. Map information is stored on a hard disk drive located in the Integrated Audio Module (IAM).

The system is new to the 2010MY Jaguar XJ model and uses a hard disk drive to store the navigation data, removing the requirement of a luggage compartment mounted navigation computer used on previous Jaguar models.

The navigation system uses the following components:

- Integrated Audio Module (IAM)
- Integrated Control Panel (ICP)
- Dual-view Touch Screen Display (TSD)
- Sigma pod for GPS antenna
- Instrument cluster.

The dual-view TSD allows the front seat passenger to view television and video images when the car is being driven. The dual-view screen allows the driver to see the navigation or other system screens but not the TV or video when the vehicle is moving. The screen can be switch between single and dual view using a switch on the ICP.

NOTE: Due to legislation, the NAS markets do not receive this dual-view option.

Japanese market vehicles have a modified system from other markets. The Japanese specification vehicles have a navigation computer and a navigation module located in the luggage compartment. This is in addition to the Vehicle Information and Communication System (VICS) beacon antenna located on the top of the instrument panel on Japanese specification vehicles.

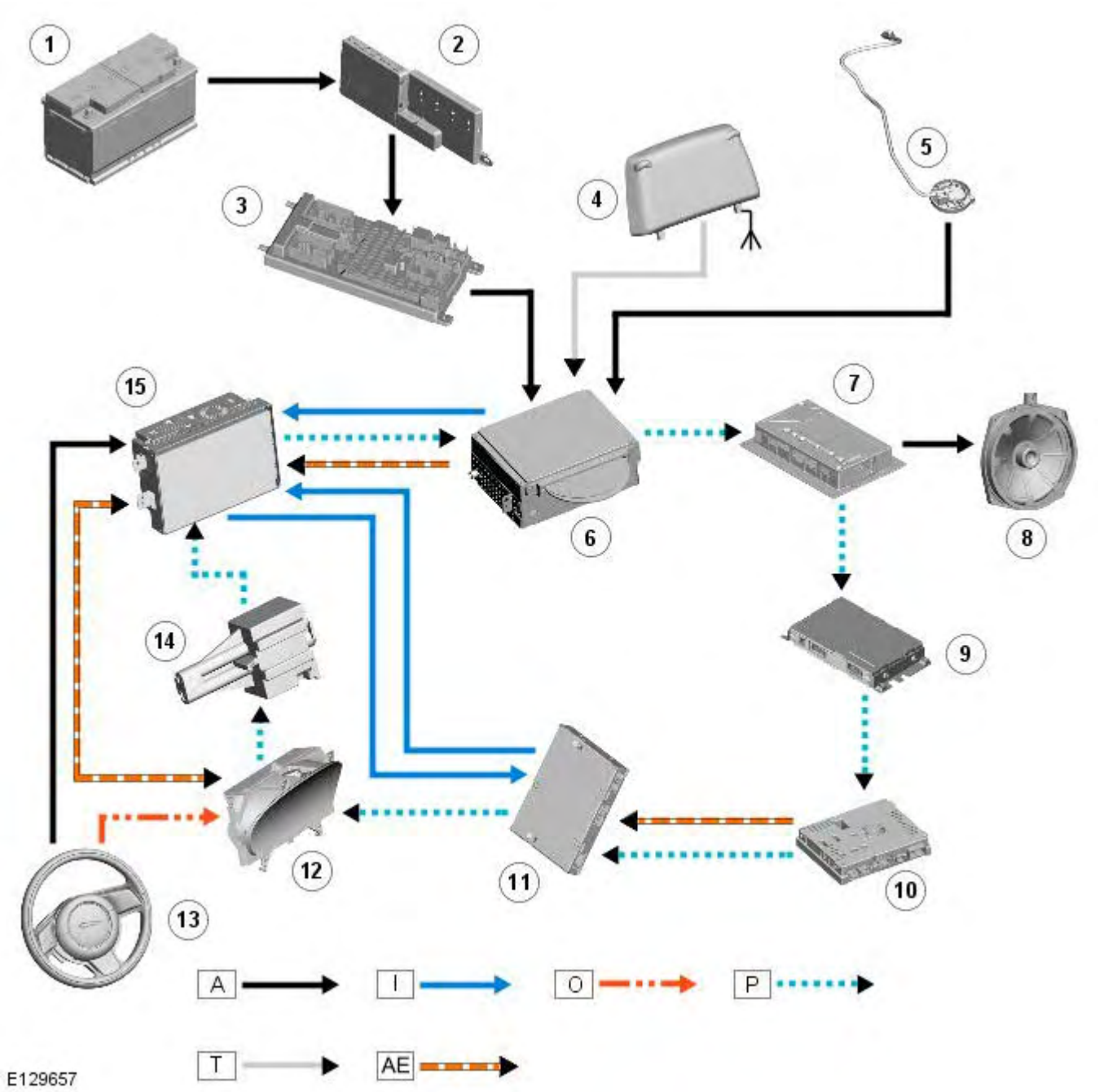
Published: 11-May-2011

Information and Entertainment System - Navigation System - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: **A** = Hardwired **I** = CVBS **N** = MS CAN **O** = LIN **P** = MOST **T** = Coaxial **AB** = Bluetooth® **AE** = LVDS



Item	Description
1	Battery
2	Battery Junction Box (BJB)
3	Central Junction Box (CJB)
4	Sigma pod (GPS antenna)
5	Microphone
6	Integrated Audio Module (IAM)

7	Audio Amplifier
8	Vehicle speakers
9	DAB / SDARS radio module (reference only)
10	TV module (reference only)
11	Rear Seat Entertainment (RSE) module (reference only)
12	Instrument cluster
13	Steering wheel switches
14	MOST diagnostic socket
15	Touch Screen Display (TSD)

System Operation

TRAFFIC MESSAGE CHANNEL (TMC)

The TMC is a specific application of the FM (frequency modulation) Radio Data System (RDS) used for broadcasting real-time traffic and weather information. Data messages are received and decoded by the IAM. The IAM processes the received information and alerts the driver and offers alternative route guidance to avoid the incident.

Each traffic incident is sent as a TMC message. One message consists of an event code and a location code in addition to time details. The message is coded and can be translated by the IAM into the market language. Location code tables assign numbers to locations on the road network. Those location tables are integrated in the maps stored on the IAM hard disk drive. The source of traffic information is typically police, traffic cameras and local network stations.

The TMC system uses the existing FM antenna integral with the rear windshield and audio system antenna amplifiers to pass the signals to the IAM.

VEHICLE INFORMATION AND COMMUNICATION SYSTEM (VICS) - JAPAN ONLY

The VICS is a similar system to the TMC used outside of Japan. VICS is a unique to Japan and give countrywide coverage and broadcasts of real-time traffic and weather information. The VICS has two methods of transmitting the traffic data to the vehicle's navigation system. In certain areas the information is transmitted as an infra-red signal which is received by a VICS beacon antenna located on the instrument panel. The same information is also transmitted on a FM wavelength and is received by the FM antenna integral with the rear windshield and uses the audio system antenna amplifiers to pass the signals to the navigation hard disk drive, via the IAM.

Component Description

INTEGRATED AUDIO MODULE (IAM)

E121832

The IAM is located in central position in the instrument panel, behind the Integrated Control Panel (ICP).

The IAM is a multi functional unit which has the following systems and features:

- Radio tuner
- Compact Disc (CD) player (single slot)
- Hybrid Digital (HD)
- Bluetooth® receiver (telephone and audio streaming) Radio (where fitted)
- 40 GB Hard drive (Navigation and audio)
- USB controller (front)
- Audio AUX
- DVD player (audio and video).

The IAM is connected on the MOST ring to the other audio system components. The driver can control navigation functions by using soft keys on the Touch Screen Display (TSD) or steering wheel mounted control switches.

The 40 GB hard drive is used for storing the information for satellite navigation and music files. A 10GB partition is provided

for storing music files, the remaining 30GB is used for map data storage.

Hard Disc Drive

The integral hard drive for the navigation system removes the requirement of a separate navigation computer usually found in the rear luggage compartment. The IAM stores the navigation map data locally within the 30GB hard drive partition. By storing the information in this way and processing it within the IAM, navigation display, route calculation speeds and accuracy are vastly improved. Map upgrades and software now have to be loaded directly into the IAM from a CD (compact disc).

The map images are transmitted from the IAM to the TSD via a Low Voltage Differential Signal (LVDS) link cable. Turn by turn instructions are also available, these are displayed in the instrument cluster via a second LVDS link between the instrument cluster and TSD.

The IAM communicates on the MOST ring with the rest of the audio system. If the IAM is replaced it must be configured as a new module using an approved Jaguar diagnostic system

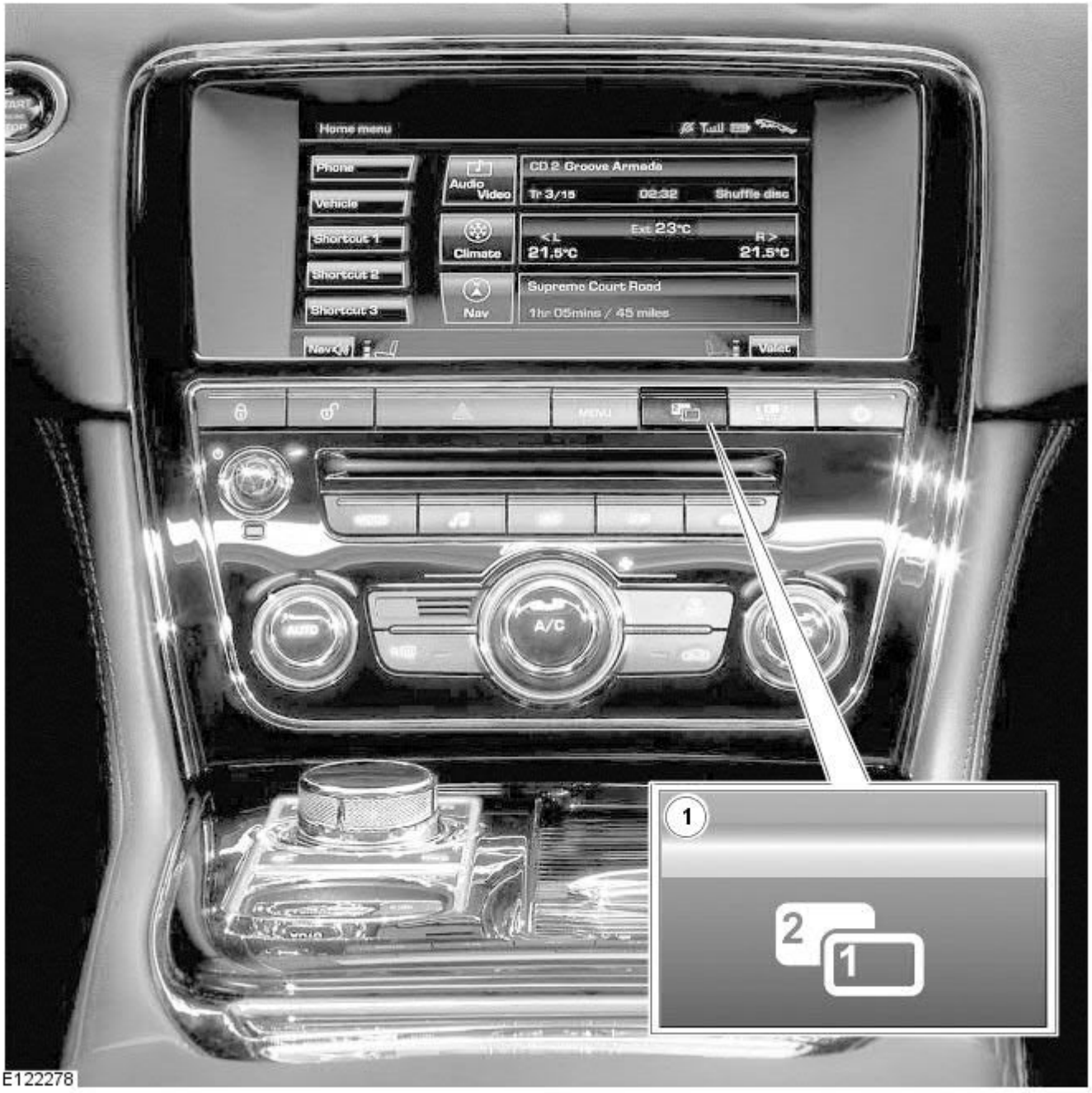
Calibration of the IAM using an approved Jaguar diagnostic system enables updates to be downloaded as new technology becomes available or any fault concerns require software updates.

DUAL-VIEW TOUCH SCREEN DISPLAY (TSD)

The TSD is mounted centrally in the instrument panel. The dual-view TSD enables the passenger and driver to view completely different images from their respective seating positions. This technology has provided a solution for the legal issues attached to viewing moving images whilst the vehicle is in motion. It is not possible for the driver to view moving images with an active speed signal but the passenger can.

NOTE: Due to legislation the NAS markets will not receive this option. A single view display is available in these markets.

The dual-view TSD uses Parallax Barrier Shutter Technology to alternately hide and reveal columns of pixels to the left and right hand views of the screen. The display comes with a specially designed agar coating to help prevent sunlight bleaching.



Item	Description
1	Dual-view button

To access a TV or video image when the vehicle is in motion and single view is selected, the dual view button should be pressed by either the driver or the passenger. This will then switch the TSD to dual-view mode allowing the passenger to view TV or video, but not the driver. A second press of the button will change the TSD back to single view.

Before and after dual view key activation

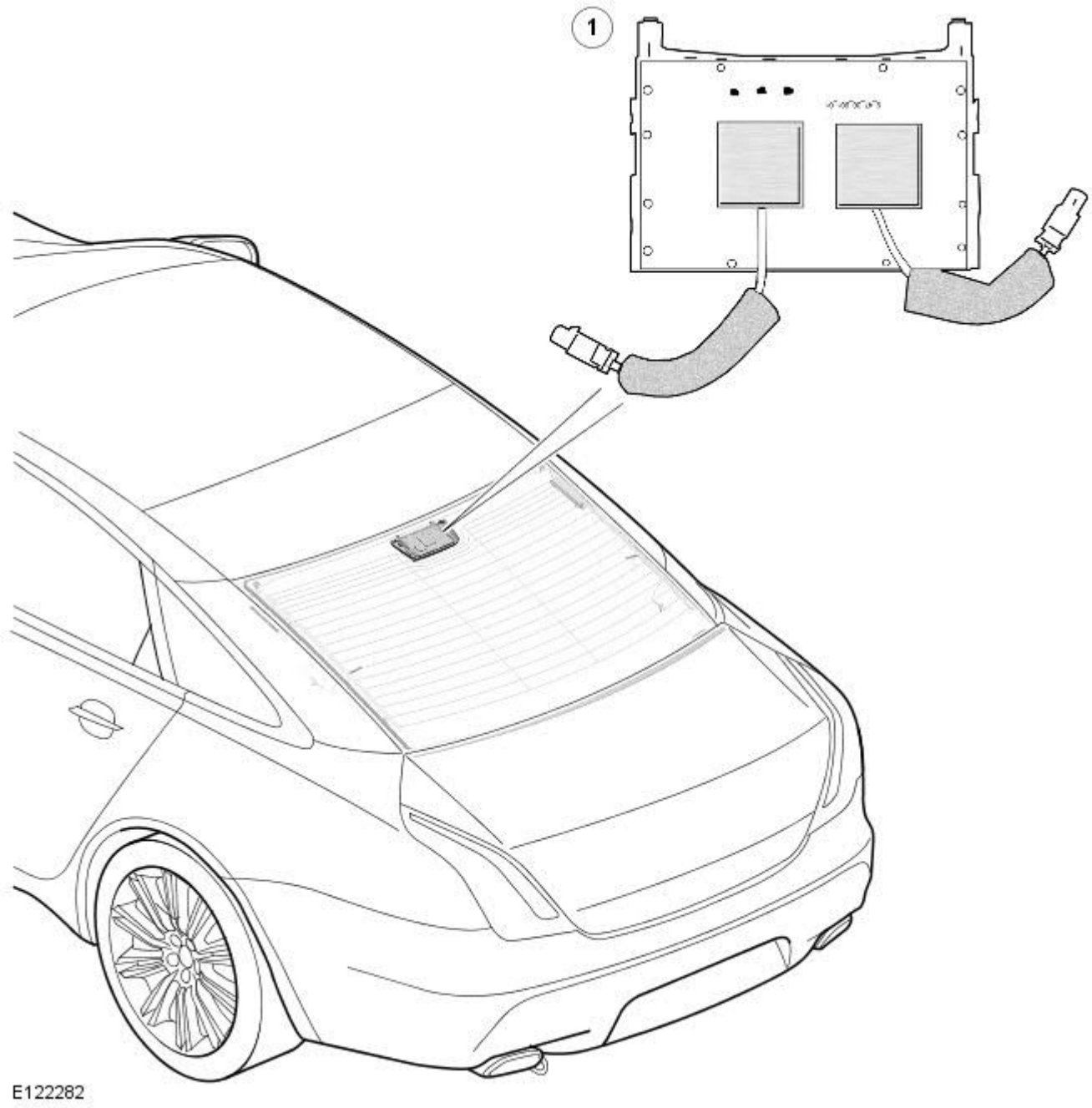
Item	Description
A	Passenger view before dual-view button pressed
B	Driver's view before dual-view button pressed
C	Passenger view after dual-view button pressed
D	Driver's view after dual-view button pressed

Once dual-view has been selected, the driver can change the current screen without affecting the passengers view by pressing any of the keys on the TSD.

The audio system can only broadcast one audio source. Therefore, the TV / video source that is current for the passenger will also be the audio the driver can hear. If headphones have been specified as an option, then the passenger's can choose to listen to the sound source accompanying the TV / video. This allows the driver to listen to a different audio source or navigation commands via the vehicle speaker system.

The driver’s view is also event driven, i.e. if reverse gear were to be selected the rear view camera will be displayed automatically, overriding the displayed navigation or other information. The passenger can choose to see the camera image by pressing the dual-view button to change the TSD display to single view.

SIGMA POD



Item	Description
1	Sigma pod (GPS / L-Band DAB / SDARS antennas)

The navigation system GPS (global positioning system) antenna is located in the sigma pod and is shared with the audio DAB L-band antenna where fitted. The sigma pod is located internally in a central position towards the top of the rear window.

The antennas fitted to the Sigma pod MUST be 2mm from the glass when they are fixed/slotted into the Sigma pod carrier which is bonded onto the rear screen. Both the air gap and fixed position in the carrier are extremely critical to the functionality, operation and efficiency of all the sigma module antennae.

JAPANESE NAVIGATION SYSTEM

The VICS navigation is fitted in Japan at PDI (pre-delivery inspection). The system comprises a separate Alpine 30GB hard disk drive navigation module, vehicle to navigation unit gateway module, an alternative FM radio receiver and the VICS beacon. Refer to installation guide supplied at PDI for details and fault finding information.

The navigation module is connected using an Ai-Net network to the gateway module. The gateway module converts the Ai-Net network signals to a medium speed CAN (controller area network) bus connection to the TSD.

Published: 11-May-2011

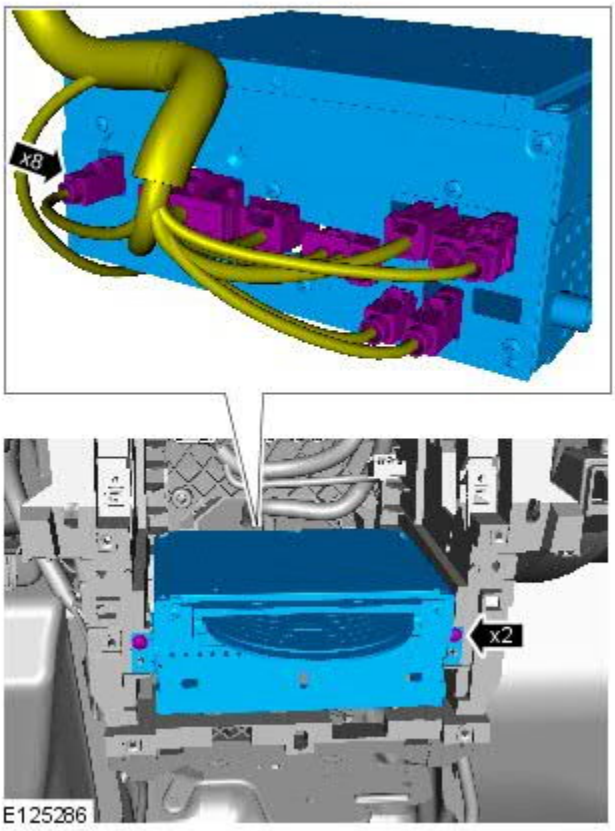
Information and Entertainment System - Audio Unit

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Audio and Climate Control Assembly (415-01A Information and Entertainment System, Removal and Installation).



2. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

   Torque: 2.5 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Information and Entertainment System - Audio Unit Amplifier

Removal and Installation

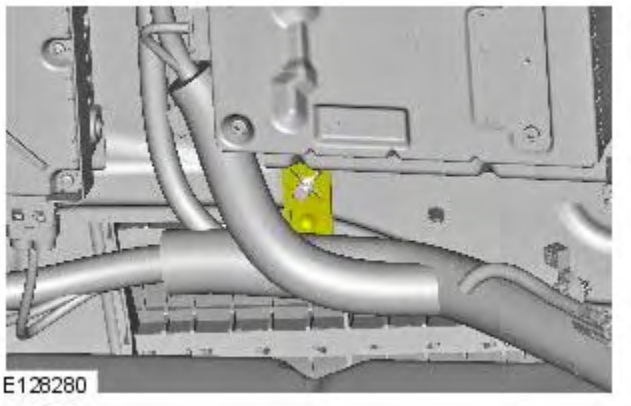
Removal

NOTES:

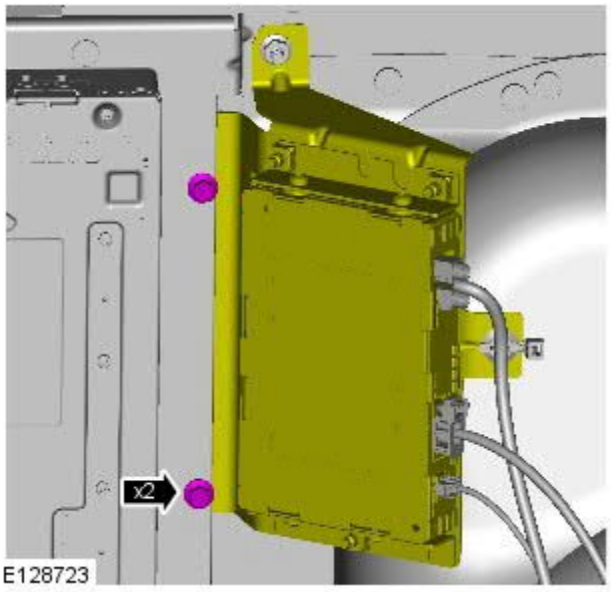
Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

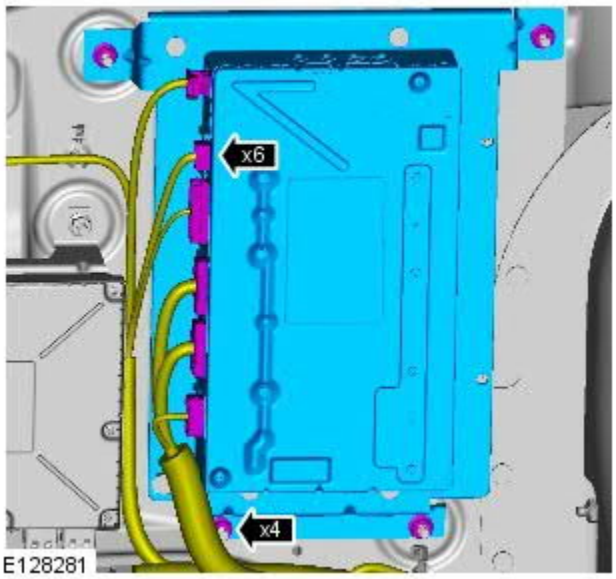
1. Refer to: Loadspace Trim Panel LH (501-05 Interior Trim and Ornamentation, Removal and Installation).



2.

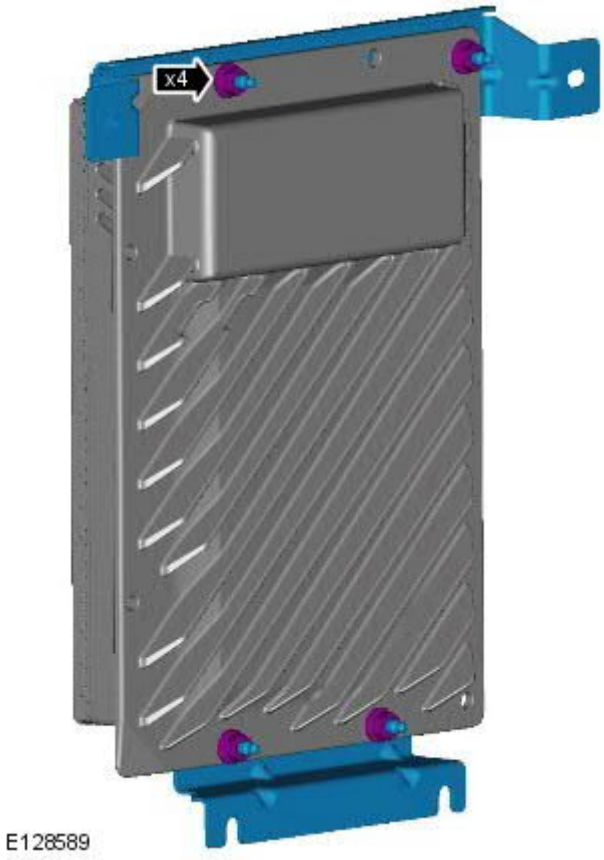


3. *Torque:* 10 Nm



4. NOTE: Do not disassemble further if the component is removed for access only.

   Torque: 10 Nm



5. *Torque:* 10 Nm

Installation

1. To install, reverse the removal procedure.

Published: 15-May-2013

Information and Entertainment System - Audio Unit Antenna Amplifier

Removal and Installation

Removal

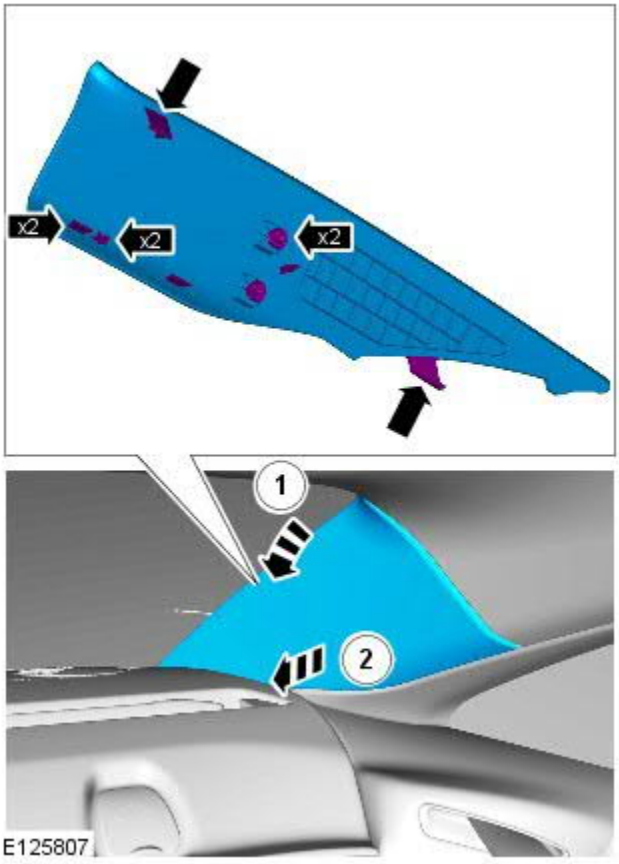
NOTES:

Removal steps in this procedure may contain installation details.

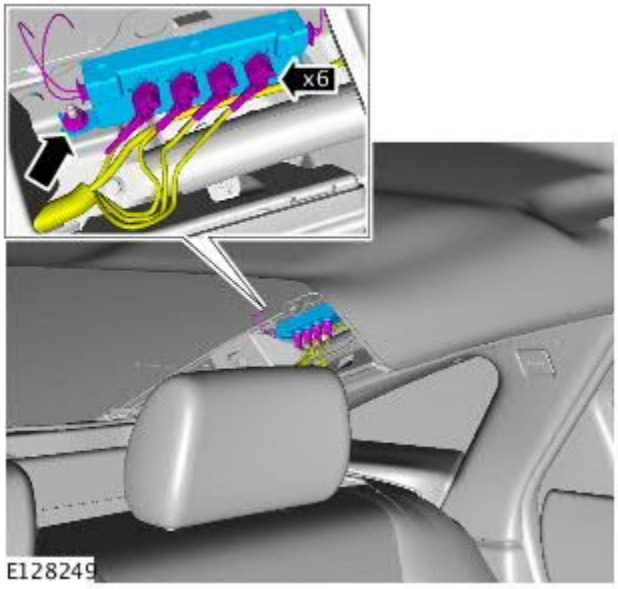
Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2.



3. *Torque:* 10 Nm



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

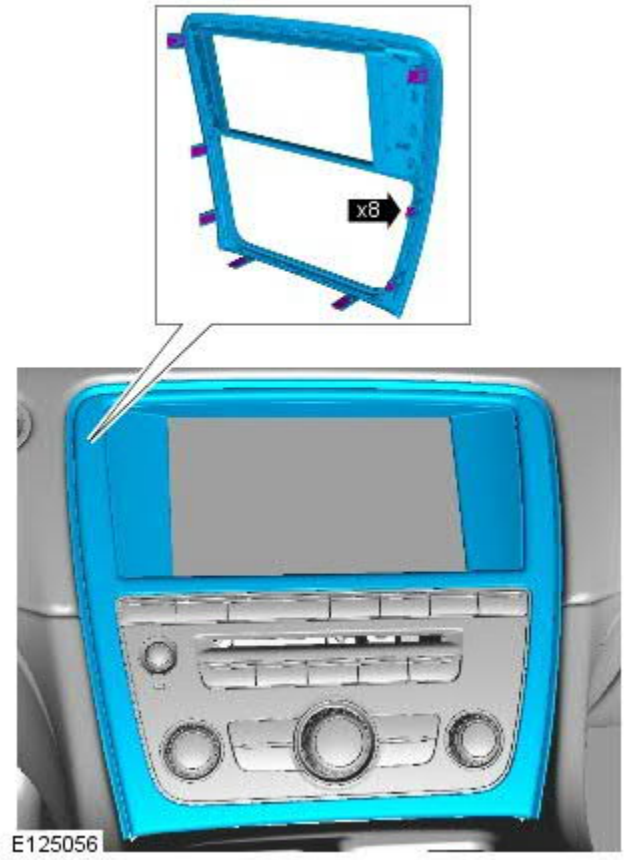
Information and Entertainment System - Audio and Climate Control Assembly

Removal and Installation

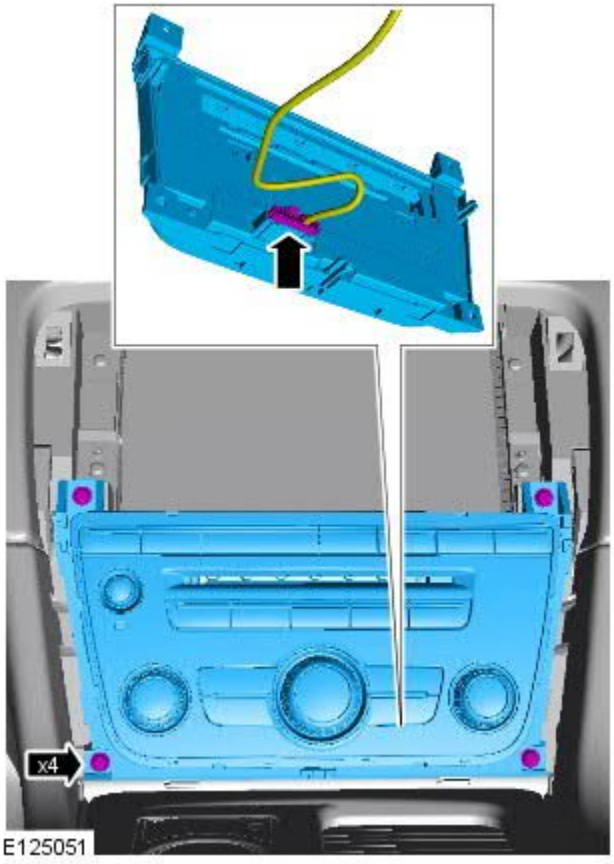
Removal

NOTE: Removal steps in this procedure may contain installation details.

1.



2. *Torque:* 1.7 Nm



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Information and Entertainment System - Digital Audio Module

Removal and Installation

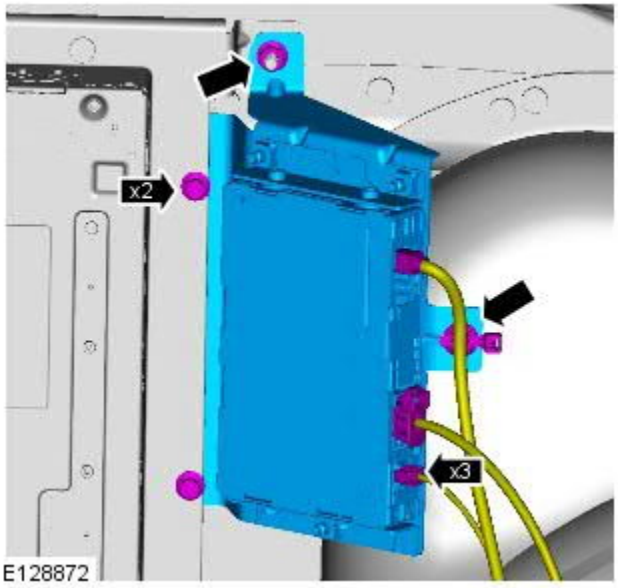
Removal

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Loadspace Trim Panel LH (501-05 Interior Trim and Ornamentation, Removal and Installation).



2. *Torque:* 10 Nm

3. NOTE: Do not disassemble further if the component is removed for access only.

   Torque: 10 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

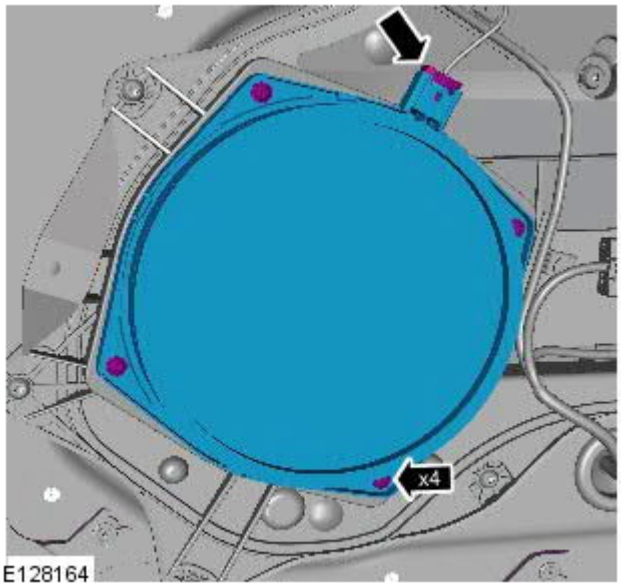
Information and Entertainment System - Front Door Speaker

Removal and Installation

Removal

1. Refer to: Front Door Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

2.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

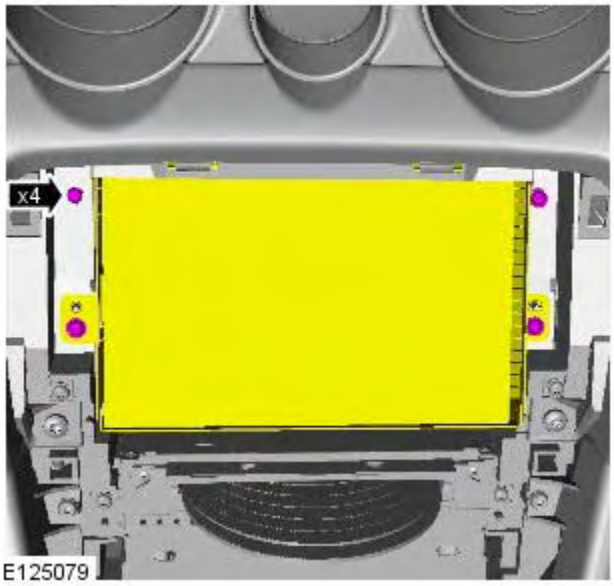
Information and Entertainment System - Information and Entertainment Display

Removal and Installation

Removal

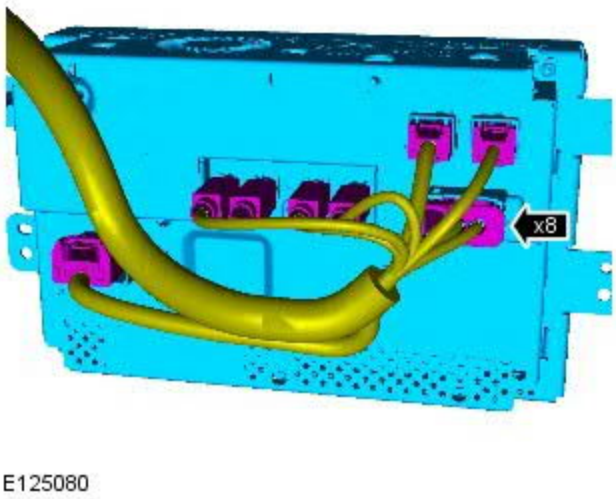
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Audio and Climate Control Assembly (415-01A Information and Entertainment System, Removal and Installation).



2. *Torque:* 4 Nm

3.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Information and Entertainment System - Information and Entertainment System Antenna Base

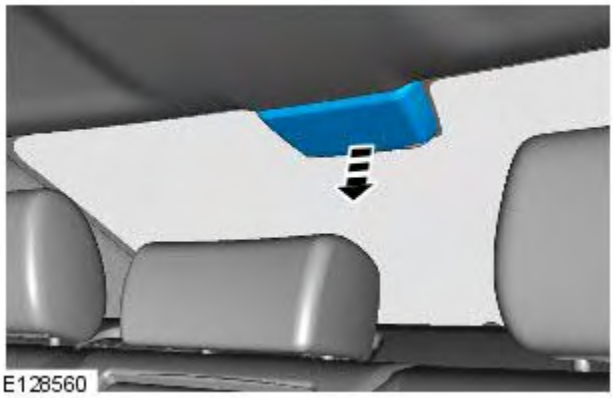
Removal and Installation

Removal

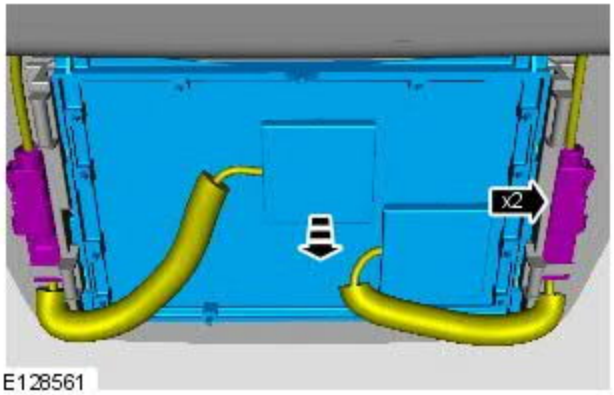
NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2.

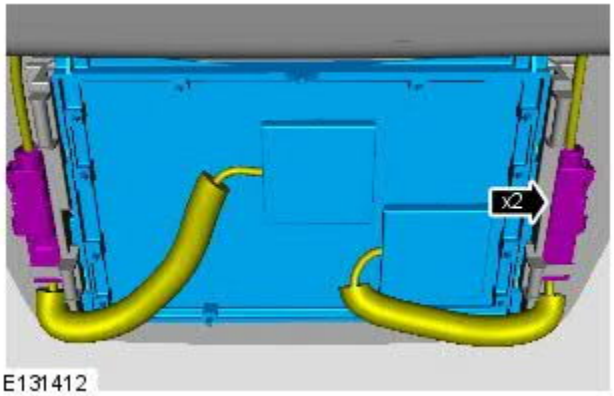


3.

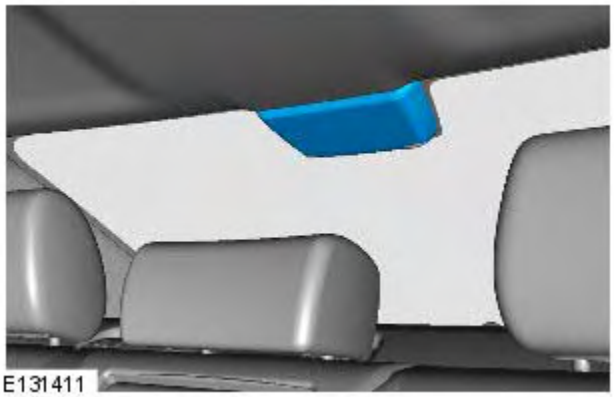


Installation

1.



2. Remove the foam padding (if equipped) from the information and entertainment system antenna base cover.



3. NOTE: Do not engage the clips at this stage.
    1. Align the rear clips first, then the front clips of the information and entertainment system antenna base cover.
    2. Make sure that the information and entertainment system antenna base cover moves forwards and backwards (approximately 2-3mm). This will indicate that the component is correctly located.

4. NOTE: An audible click is heard when the clips are fully latched.

    Engage the information and entertainment system antenna base cover front and rear integral clips at the same time.

5. To make sure that the information and entertainment system antenna base cover is installed correctly and will not cause any noise, make sure it can move forwards and backwards (approximately 2-3mm).

6. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 11-May-2011

Information and Entertainment System - Instrument Panel Speaker

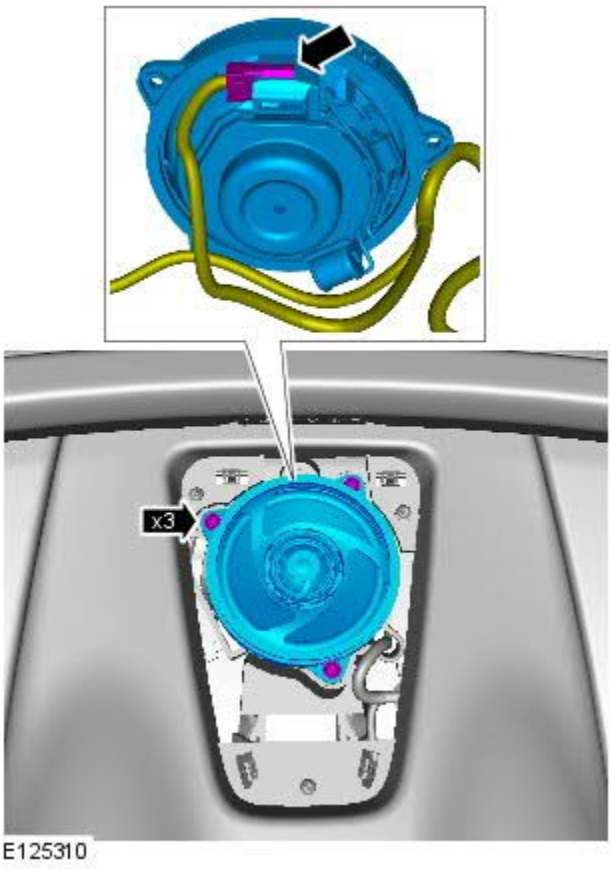
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Instrument Panel Speaker Grille (501-05 Interior Trim and Ornamentation, Removal and Installation).

2. *Torque:* 2.5 Nm



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Information and Entertainment System - Rear Door Speaker

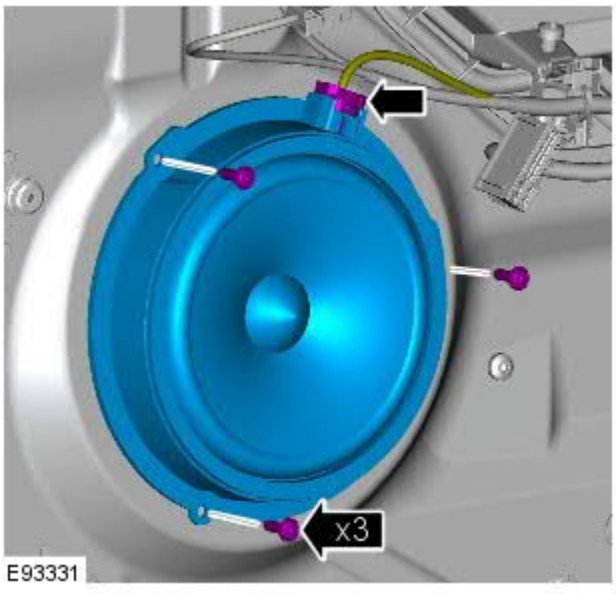
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Rear Door Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

2.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Information and Entertainment System - Steering Wheel Audio Controls

Removal and Installation

Removal

NOTES:

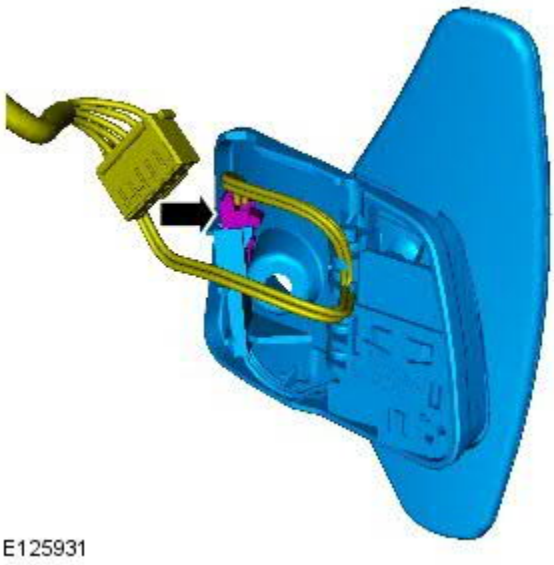
Removal steps in this procedure may contain installation details.

The steering wheel is shown removed for clarity.

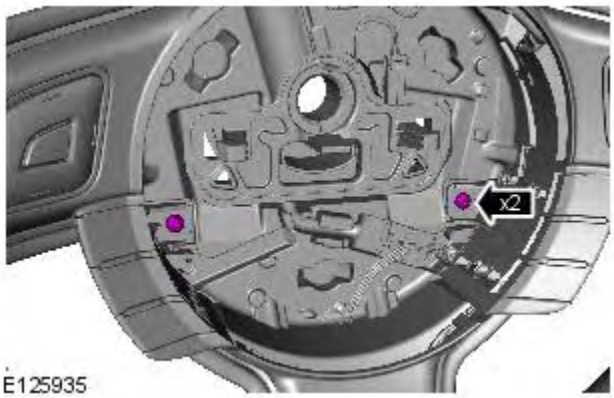
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. Refer to: Driver Air Bag Module (501-20B Supplemental Restraint System, Removal and Installation).

3. *Torque:* 2 Nm

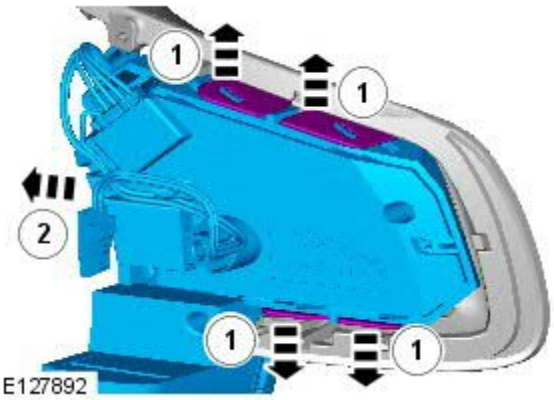


4. NOTE: The procedure must be carried out on both sides.



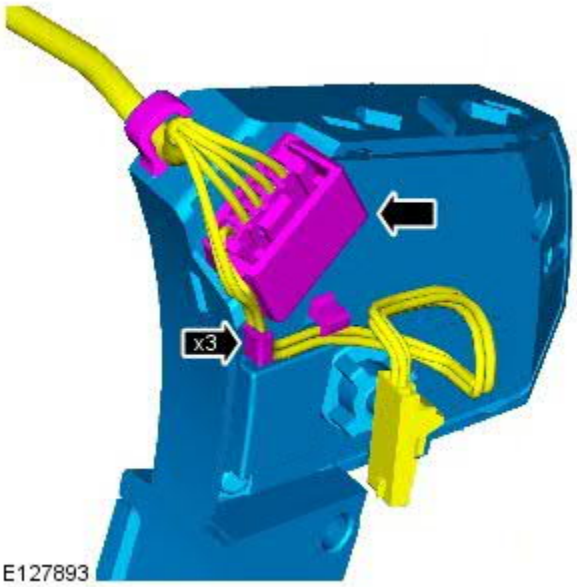
5. *Torque:* 2 Nm

6. CAUTION: Take extra care not to damage the edges of the component.



7.

8.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Information and Entertainment System - Subwoofer Speaker

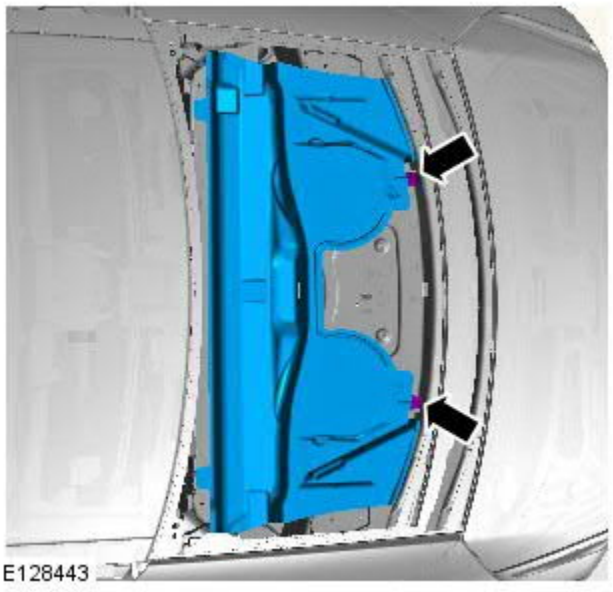
Removal and Installation

Removal

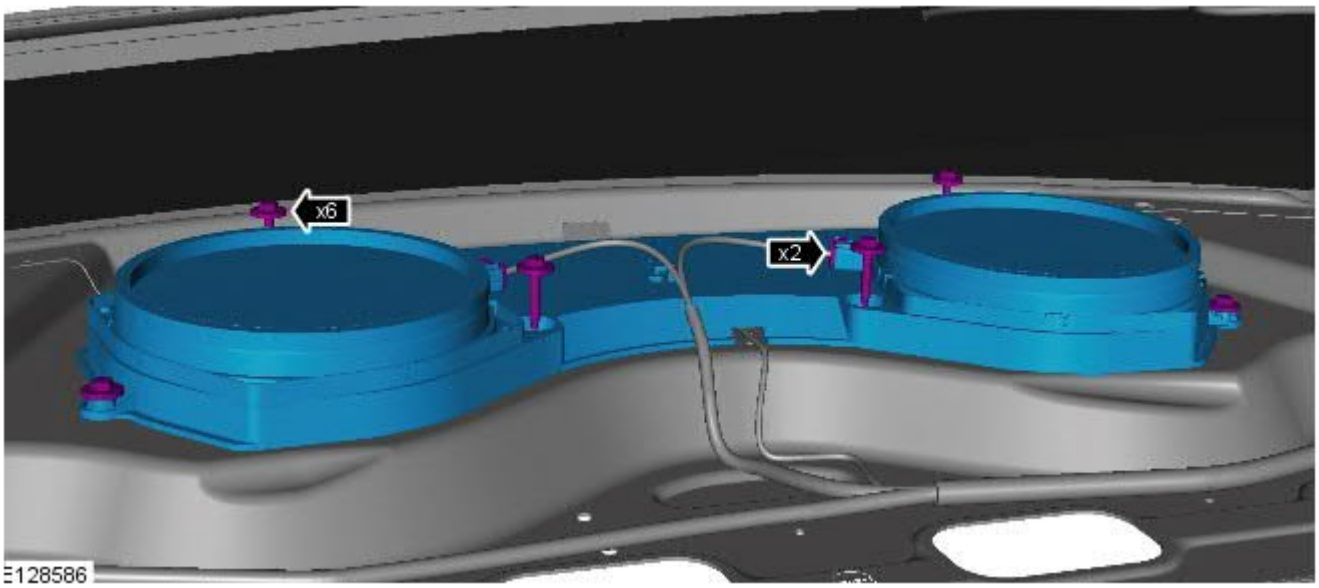
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Parcel Shelf (501-05 Interior Trim and Ornamentation, Removal and Installation).

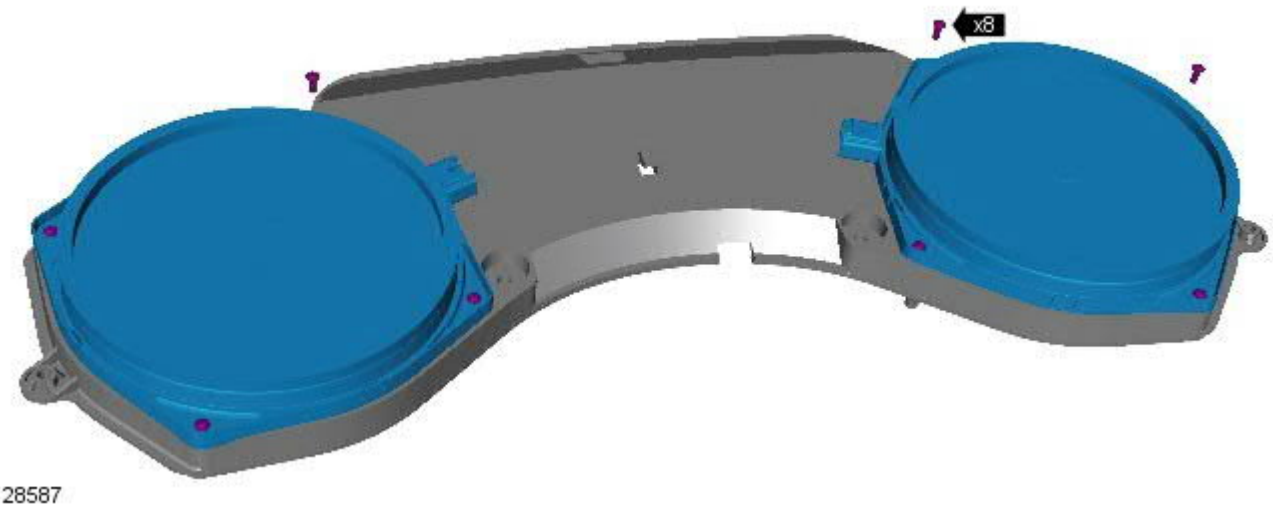
2.



3. *Torque:* 5 Nm



4.



Installation

1. CAUTION: Make sure that the noise vibration harshness (NVH) material is correctly located.

   To install, reverse the removal procedure.

Published: 15-Feb-2012

Information and Entertainment System - Video Display

Removal and Installation

Removal

NOTES:

Some illustrations may show the engine removed for clarity.

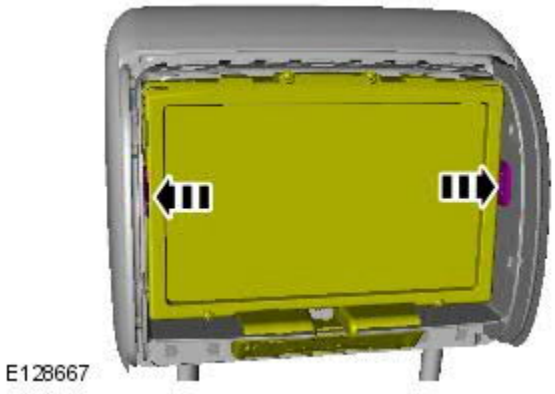
Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

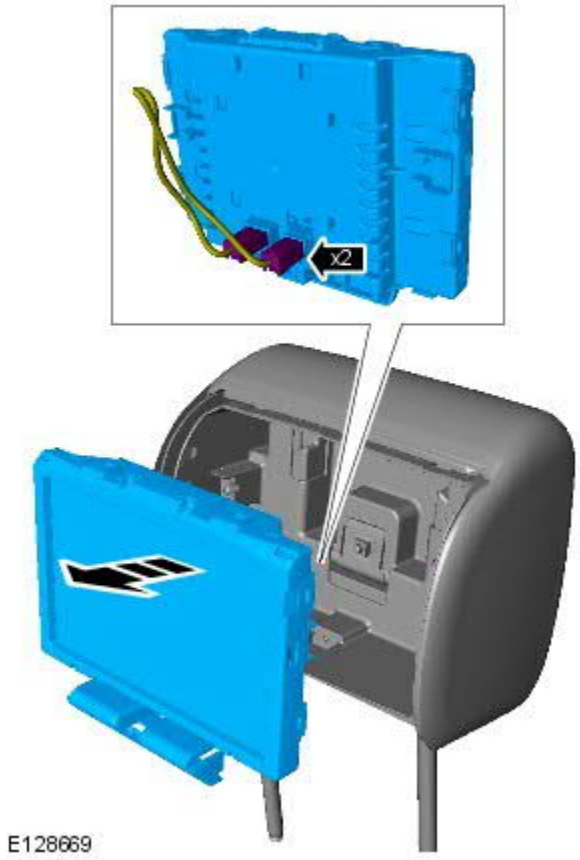
2.

3.

4.



5.



Installation

1. To install, reverse the removal procedure.

Published: 23-Jan-2012

Information and Entertainment System - DTC: Audio Input Control Module - Audio Input Control Module

Diagnosis and Testing

Principle of Operation

This section of the manual concerns diagnostic procedures for the Dension audio input control module. For a detailed description of the information and entertainment system, refer to the relevant description and operation sections in the workshop manual

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
• Audio input control module • Audio amplifier module • Integrated audio module • Integrated control panel • Touch screen display • Loudspeakers	• Fuses • Loose or corroded connector(s) • Audio amplifier module • Integrated audio module • Integrated control panel • Touch screen display • Loudspeakers

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, check for diagnostic trouble codes and refer to the relevant diagnostic trouble codes index

Audio Input Control Module Diagnostics

NOTE: If problems are reported with the audio input control module, prior to further diagnostic checks or replacement of components, first perform a hardware reset by depressing the reset button for a minimum of two seconds. If problems persist, refer to the symptom charts below

Performing A Hardware Reset

Symptom Chart - Intermittent Fault With iPOD® Playback

Symptom	Possible Cause	Action
Intermittent fault with iPOD® playback	• The connected iPOD® unit has crashed or frozen	• See diagnostic procedures as specified in pinpoint test A1 "Check The Operation Of The iPOD®" below GO to Pinpoint Test A.

Symptom	Possible Cause	Action
	• The connected iPOD® unit's battery is not holding charge and requires replacement	• See diagnostic procedures as specified in pinpoint test A2 "Check The iPOD® Battery" below GO to Pinpoint Test A.
	• The iPOD® dock cable is not securely installed • The iPOD® dock cable is faulty	• See diagnostic procedures as specified in pinpoint test A3 "Check The iPOD® Is Charging When Connected To The Audio Input Control Module" below GO to Pinpoint Test A.

Symptom Chart - Intermittent Fault With Playback From USB Device

Symptom	Possible Cause	Action
Intermittent fault with USB playback	• The USB memory stick is damaged or faulty • The USB memory stick is incompatible with the audio input control module	• Check for correct operation by connecting another working USB memory stick loaded with a compatible test file (files may be downloaded from Dension website). If fault clears, then the original USB stick should be replaced. If problem persists, suspect a fault with the USB extension cable
	• The USB extension cable is not securely installed • The USB extension cable is faulty	• See diagnostic procedures as specified in pinpoint test B3 "Check The USB Extension Cable Is Operational And Securely Installed" below GO to Pinpoint Test B.
	• The audio input control module power harness is not securely installed • The audio input control module power harness is faulty	• Ensure all connectors of the audio input control module power harness are correctly secured • If problem persists, check and install a new audio input control module power harness
Not all sound files on the USB are played	• Sound files may be saved in an incompatible file format	• Check that affected sound file is encoded in a compatible file format - Compatible file formats: AAC (up to 320 kbit/s); MP3 (up to 320 kbit/s); MP3 variable bit rate (up to 320 kbit/s); WAV - uncompressed files; OGG (up to 320 kbit/s); WMA - except DRM protected files (up to 320 kbit/s)
	• Sound files may be corrupted	• Check integrity of affected files and remove any damaged files from the memory stick

Symptom Chart - No Response From CDC Button

Symptom	Possible Cause	Action
No response when the CDC button is pressed	• USB input or iPOD® input faulty	• First check operation of iPOD® playback. If iPOD® operates normally but USB playback is faulty, then follow diagnostic procedures as specified in pinpoint test B GO to Pinpoint Test B. • If iPOD® playback is faulty but USB playback operates normally, then follow diagnostic procedures as specified in pinpoint test A GO to Pinpoint Test A.
	• The auxiliary input may be switched to bypass mode	• See diagnostic procedures as specified in pinpoint test A5: "Check If The Bypass Switch On The Auxiliary Input Unit Is Activated" below GO to Pinpoint Test A.
	• The audio input control module power harness is not securely installed • The audio input control module power supply/harness is faulty	• Ensure all connectors of the audio input control module power harness are correctly secured • See diagnostic procedures as specified in pinpoint tests C1: "Check The Integrity Of Power Supply From Vehicle" and C2: "Check The Integrity And Operation Of The Audio Input Control Module Power Harness" below GO to Pinpoint Test C.
	• Optical cables/connectors (if fitted) are not securely installed • Optical cables/connectors (if fitted) are faulty	• Ensure the optical cables are routed appropriately to avoid pinching the cable and with no excessive bends or kinks. Ensure all connectors of the optical cables are correctly secured. Replace any damaged or faulty optical cables and/or connectors as required • If no CD changer is fitted, ensure that the optical cables are configured in a closed loop so that the optical circuit is intact

Symptom Chart - iPOD® Related Faults

Symptom	Possible Cause	Action
iPOD® inoperative	• iPOD® configured or connected incorrectly	• If iPOD® playback is faulty but USB playback operates normally, then follow diagnostic procedures as specified in pinpoint test A GO to Pinpoint Test A.
iPOD® does not operate and in-car display shows "99" on the screen	• The connected iPOD® unit has crashed or frozen	• See diagnostic procedures as specified in pinpoint test A1 "Check The Operation Of The iPOD®" below GO to Pinpoint Test A.
	• The connected iPOD® unit's battery is flat and requires charging • The connected iPOD® unit's battery is not holding charge and requires replacement	• See diagnostic procedures as specified in pinpoint test A2 "Check The iPOD® Battery" below GO to Pinpoint Test A.
	• The iPOD® unit is not compatible with the audio input control module	• See diagnostic procedures as specified in pinpoint test A4 "Check The iPOD® Is Compatible With The Audio Input Control Module" below GO to Pinpoint Test A.
iPOD® playback drops out and system reverts to radio input	• USB input or iPOD® input faulty	• First check operation of iPOD® playback. If iPOD® operates normally but USB playback is faulty, then follow diagnostic procedures as specified in pinpoint test B GO to Pinpoint Test B. • If iPOD® playback is faulty but USB playback operates normally, then follow diagnostic procedures as specified in pinpoint test A GO to Pinpoint Test A.
	• The connected iPOD® unit has crashed or frozen	• See diagnostic procedures as specified in pinpoint test A1 "Check The Operation Of The iPOD®" below GO to Pinpoint Test A.
	• The connected iPOD® unit's battery is flat and requires charging • The connected iPOD® unit's battery is not holding charge and requires replacement	• See diagnostic procedures as specified in pinpoint test A2 "Check The iPOD® Battery" below GO to Pinpoint Test A.
	• The auxiliary input unit is faulty	• See diagnostic procedures as specified in pinpoint test A6 "Check The Operation Of The Auxiliary Input Unit" below GO to Pinpoint Test A.
iPOD® unit will not charge when connected to the audio input control module	• The iPOD® unit is not compatible with the audio input control module	• See diagnostic procedures as specified in pinpoint test A4 "Check The iPOD® Is Compatible With The Audio Input Control Module" below GO to Pinpoint Test A.
	• The iPOD® dock cable is not securely installed • The iPOD® dock cable is faulty	• See diagnostic procedures as specified in pinpoint test A3 "Check The iPOD® Is Charging When Connected To The Audio Input Control Module" below GO to Pinpoint Test A.
iPOD® unit keeps cutting out and rebooting	• The iPOD® unit is not compatible with the audio input control module	• See diagnostic procedures as specified in pinpoint test A4 "Check The iPOD® Is Compatible With The Audio Input Control Module" below GO to Pinpoint Test A.
	• The iPOD® dock cable is not securely installed • The iPOD® dock cable is faulty	• See diagnostic procedures as specified in pinpoint test A3 "Check The iPOD® Is Charging When Connected To The Audio Input Control Module" below GO to Pinpoint Test A.
	• The connected iPOD® unit's battery is flat and requires charging • The connected iPOD®	• See diagnostic procedures as specified in pinpoint test A2 "Check The iPOD® Battery" below GO to Pinpoint Test A.

Symptom	Possible Cause	Action
	unit's battery is not holding charge and requires replacement	
Unable to select specific content on the iPOD® (ie: an individual artist, album or song)	• Content/sound files corrupted or incompatible with the iPOD®	• Check if files/content can be accessed by iPOD® when it is disconnected from the audio input control module. If fault persists, advise customer to renew or replace the affected files
iPOD® not recognised when connected	• The connected iPOD® unit has crashed or frozen	• See diagnostic procedures as specified in pinpoint test A1 "Check The Operation Of The iPOD®" below GO to Pinpoint Test A.
	• USB input or iPOD® input faulty	• First check operation of iPOD® playback. If iPOD® operates normally but USB playback is faulty, then follow diagnostic procedures as specified in pinpoint test B GO to Pinpoint Test B. • If iPOD® playback is faulty but USB playback operates normally, then follow diagnostic procedures as specified in pinpoint test A GO to Pinpoint Test A.
	• The auxiliary input may be switched to bypass mode	• See diagnostic procedures as specified in pinpoint test A5: "Check If The Bypass Switch On The Auxiliary Input Unit Is Activated" below GO to Pinpoint Test A.
	• The auxiliary input unit is faulty	• See diagnostic procedures as specified in pinpoint test A6 "Check The Operation Of The Auxiliary Input Unit" below GO to Pinpoint Test A.
	• The connected iPOD® unit's battery is flat and requires charging • The connected iPOD® unit's battery is not holding charge and requires replacement	• See diagnostic procedures as specified in pinpoint test A2 "Check The iPOD® Battery" below GO to Pinpoint Test A.
	• The iPOD® unit is not compatible with the audio input control module	• See diagnostic procedures as specified in pinpoint test A4 "Check The iPOD® Is Compatible With The Audio Input Control Module" below GO to Pinpoint Test A.
iPOD® connector pins are misaligned	• The iPOD® dock cable is faulty	• Replace dock cable as required. To ensure optimum compatibility, the cable with the white mini-DIN connector - Part No C2S51762 - should be used
iPOD® not working at all. If reset, the system will work for 6 songs then cuts out again. CDC button inoperative and CD sometimes cuts off for 2-3 seconds	• Optical cables/connectors (if fitted) are not securely installed • Optical cables/connectors (if fitted) are faulty	• Ensure the optical cables are routed appropriately to avoid pinching the cable and with no excessive bends or kinks. Ensure all connectors of the optical cables are correctly secured. Replace any damaged or faulty optical cables and/or connectors as required • If no CD changer is fitted, ensure that the optical cables are configured in a closed loop so that the optical circuit is intact
iPOD® inoperative. Display shows no magazine	• The auxiliary input may be switched to bypass mode	• See diagnostic procedures as specified in pinpoint test A5: "Check If The Bypass Switch On The Auxiliary Input Unit Is Activated" below GO to Pinpoint Test A.
iPOD® inoperative. Display shows menu for CD6 and has to load all the tracks	• Audio input control module software requires updating	• Download and install the latest system software. Software releases are available on the Dension website - http://www.dension.com/jaguar/

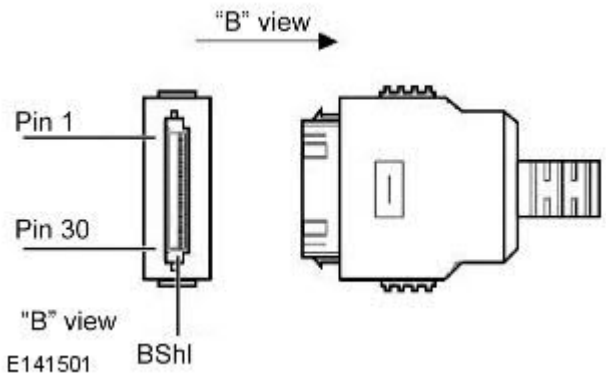
Symptom Chart - USB Memory Stick/Storage Device Related Faults

Symptom	Possible Cause	Action
No playback from memory stick/storage device	• Memory stick/storage device configured or connected incorrectly	• If iPOD® operates normally but USB playback is faulty, then follow diagnostic procedures as specified in pinpoint test B GO to Pinpoint Test B.

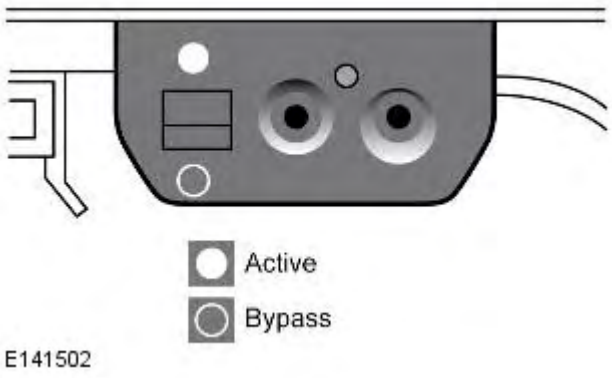
Symptom Chart - System Faults

Symptom	Possible Cause	Action
System defaults to Audio/CD Changer	• The auxiliary input unit may be switched to bypass mode	• See diagnostic procedures as specified in pinpoint test A5: "Check If The Bypass Switch On The Auxiliary Input Unit Is Activated" below GO to Pinpoint Test A.
	• The auxiliary input unit is faulty	• See diagnostic procedures as specified in pinpoint test A6 "Check The Operation Of The Auxiliary Input Unit" below GO to Pinpoint Test A.
	• The memory stick/storage device is not correctly formatted	• See diagnostic procedures as specified in pinpoint test B1 "Check For Correct Formatting" below GO to Pinpoint Test B.
	• The USB extension cable is not securely installed • The USB extension cable is faulty	• See diagnostic procedures as specified in pinpoint test B3 "Check The USB Extension Cable Is Operational And Securely Installed" below GO to Pinpoint Test B.
	• The USB memory stick is damaged or faulty • The USB memory stick is incompatible with the audio input control module	• Check for correct operation by connecting another working USB memory stick loaded with a compatible test file (files may be downloaded from Dension website). If fault clears, then the original USB stick should be replaced. If problem persists, suspect a fault with the USB extension cable
	• The storage capacity of the memory stick/storage device is close to or exceeds 8 Gigabytes	• See diagnostic procedures as specified in pinpoint test B4 "Check The Capacity Of The Memory Stick/Storage Device" below GO to Pinpoint Test B.
	• The connected iPOD® unit's battery is flat and requires charging • The connected iPOD® unit's battery is not holding charge and requires replacement	• See diagnostic procedures as specified in pinpoint test A2 "Check The iPOD® Battery" below GO to Pinpoint Test A.
	• The iPOD® unit is not compatible with the audio input control module	• See diagnostic procedures as specified in pinpoint test A4 "Check The iPOD® Is Compatible With The Audio Input Control Module" below GO to Pinpoint Test A.
	• The connected iPOD® unit has crashed or frozen	• See diagnostic procedures as specified in pinpoint test A1 "Check The Operation Of The iPOD®" below GO to Pinpoint Test A.
• No sound from speakers (either front/rear or left/right) during playback from iPOD®/memory stick • Audio system loses connection to iPOD®/memory stick during playback • iPOD® and radio playback skips after unit has been operating for 4 minutes	• The audio input control module power harness is not securely installed • The audio input control module power supply/harness is faulty	• Ensure all connectors of the audio input control module power harness are correctly secured • See diagnostic procedures as specified in pinpoint tests C1: "Check The Integrity Of Power Supply From Vehicle" and C2: "Check The Integrity And Operation Of The Audio Input Control Module Power Harness" below GO to Pinpoint Test C.
	• Optical cables/connectors (if fitted) are not securely installed • Optical cables/connectors (if fitted) are faulty	• Ensure the optical cables are routed appropriately to avoid pinching the cable and with no excessive bends or kinks. Ensure all connectors of the optical cables are correctly secured. Replace any damaged or faulty optical cables and/or connectors as required • If no CD changer is fitted, ensure that the optical cables are configured in a closed loop so that the optical circuit is intact
	• The iPOD® dock cable is not securely installed • The iPOD® dock cable is faulty	• See diagnostic procedures as specified in pinpoint test A3 "Check The iPOD® Is Charging When Connected To The Audio Input Control Module" below GO to Pinpoint Test A.

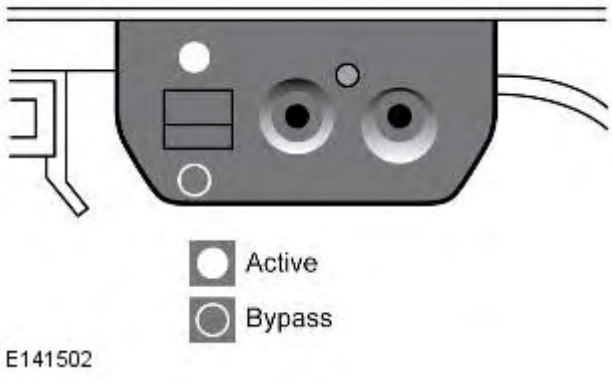
PINPOINT TEST A : IPOD® INOPERATIVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK THE OPERATION OF THE IPOD®	
	1 Check if the iPOD® has crashed or frozen (it is unresponsive to any control commands)
	Has the iPOD® crashed or frozen? **Yes** Reset the iPOD® or refer to Apple service procedures **No** GO to A2.
A2: CHECK THE IPOD® BATTERY	
	1 Check the charge state of the iPOD® battery
	Is the iPOD® battery flat? **Yes** Charge the iPOD® battery for at least 10 minutes either by connecting to the charger supplied with the iPOD® or by connecting to the audio input control module. If iPOD® will not charge when connected to the audio input control module and with the ignition on thenGO to A3. **No** GO to A3.
A3: CHECK THE IPOD® IS CHARGING WHEN CONNECTED TO THE AUDIO INPUT CONTROL MODULE	
	iPOD® Dock Connector - Pin Configuration  1 Check that the iPOD® is charging when connected to the audio input control module
	2 Ignition switch in position II.
	3 Ensure the iPOD® dock cable is securely connected
	Does the iPOD® charge up while connected to the audio input control module? **Yes** GO to A4. **No** Check the integrity of the iPOD® dock cable and its connections. Disconnect the iPOD® and check the voltage readings of the iPOD® dock cable using a multimeter (Pin B8: 5 volts/Pin B15: GND). If a fault is noted, replace dock cable as required. To ensure optimum compatibility, the cable with the white mini-DIN connector - Part No C2S51762 - should be used. If iPOD® will not charge after replacement, then GO to A4.
A4: CHECK THE IPOD® IS COMPATIBLE WITH THE AUDIO INPUT CONTROL MODULE	
NOTES: Some of the earlier (pre-2004) iPOD® models may not be compatible with the audio input control module. In order to optimise functionality the audio input control module may require a firmware update and/or connection via the latest iPOD® dock cable with the white mini-DIN connector - Part No C2S51762. See the manufacturer website for further details - http://www.dension.com/jaguar/	
Some of the earlier (pre-2004) iPOD® models may not be compatible with the audio input control module. In order to optimise functionality the audio input control module may require a firmware update and/or connection via the latest iPOD® dock cable with the white mini-DIN connector - Part No C2S51762. See the manufacturer website for further details - http://www.dension.com	
	1 Determine whether the iPOD® model being used is compatible with the audio input control module installed in the vehicle
	2 Ensure the latest firmware updates are installed and an appropriate iPOD® dock cable is securely connected
	3 For advice, check details on the Dension website - http://www.dension.com/jaguar/

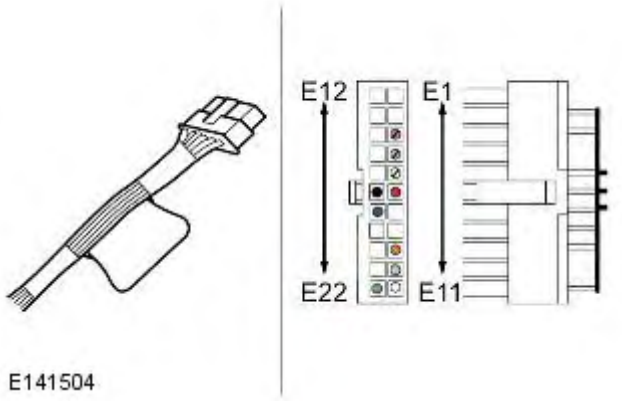
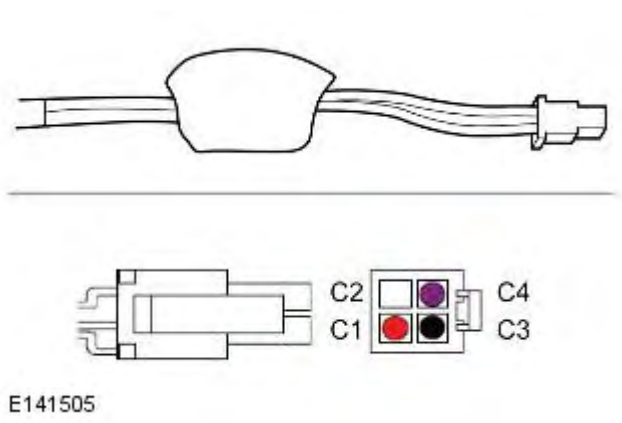
www.JagDocs.com

	Is the iPOD® compatible with the audio input control module? **Yes** GO to A5. **No** Advise customer that an alternative device is required
A5: CHECK IF THE BYPASS SWITCH ON THE AUXILIARY INPUT UNIT IS ACTIVATED	
	Auxiliary Input Unit - Bypass Switch  1 Check the status of the bypass switch on the auxiliary input unit
	Is the switch on the auxiliary input unit to the active mode position? **Yes** GO to A6. **No** Toggle the switch on the auxiliary input unit to the active mode position. Turn off the ignition and wait two minutes until the blue LED on the auxiliary input unit is extinguished. Switch ignition back on the complete the switching process
A6: CHECK THE OPERATION OF THE AUXILIARY INPUT UNIT	
	1 Check the operation of the auxiliary input unit
	2 Disconnect the auxiliary input unit from the audio input control module.
	3 Ignition switch in position 0.
	4 Wait two minutes
	5 Install a new auxiliary input unit
	6 Ignition switch in position II.
	Is the iPOD® now working? **Yes** No further action required **No** Check the integrity of the iPOD® dock cable and its connectionsGO to A3.

PINPOINT TEST B : USB/STORAGE DEVICE DOES NOT POWER UP WHEN CONNECTED	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
B1: CHECK FOR CORRECT FORMATTING	
NOTE: The storage device needs to be configured to FAT16 or FAT32 format	
	1 Check if the memory stick/storage device is correctly formatted
	Is the storage device/memory stick configured to the FAT16 or FAT32 format? **Yes** GO to B2. **No** Reformat the storage device as required
B2: CHECK FOR FAULTY OR INCOMPATIBLE MEMORY STICK/STORAGE DEVICE	
NOTE: Test files may be downloaded from Dension website	
	1 Check the operation of the USB port on the auxiliary input unit by connecting another working USB memory stick/storage device loaded with a compatible test file
	Does the system operate normally when another USB memory stick/storage device is connected? **Yes** Replace the original USB memory stick/storage device **No** GO to B3.
B3: CHECK THE USB EXTENSION CABLE IS OPERATIONAL AND SECURELY INSTALLED	
	1 Check the integrity of the USB extension cable and its connections

	Is the USB extension cable securely pushed into the USB connection port on the audio input control module **Yes** Replace the USB extension cable **No** Secure connections and retest
B4: CHECK THE CAPACITY OF THE MEMORY STICK/STORAGE DEVICE	
NOTE: The higher the capacity of the memory stick is the longer it takes to register with the audio input control module and power up. The maximum permitted capacity is 8 Gigabytes	
	1 Check the storage capacity of the memory stick/storage device does not exceed 8 Gigabytes
	Is the storage capacity of the memory stick/storage device 8 Gigabytes or less? **Yes** High capacity devices may require longer to register and should be allowed up to two minutes to power up following connection to the USB port. If memory stick fails to power up after two minutes, suspect a faulty memory stick GO to B2. or USB extension cable GO to B3. **No** The memory stick/storage device exceeds the maximum permitted capacity. Replace with a device with a capacity of 8 Gigabytes or less
B5: CHECK IF THE BYPASS SWITCH ON THE AUXILIARY INPUT UNIT IS ACTIVATED	
	Auxiliary Input Unit - Bypass Switch  1 Check the status of the bypass switch on the auxiliary input unit
	Is the switch on the auxiliary input unit to the active mode position? **Yes** GO to B6. **No** Toggle the switch on the auxiliary input unit to the active mode position. Turn off the ignition and wait two minutes until the blue LED on the auxiliary input unit is extinguished. Switch ignition back on the complete the switching process
B6: CHECK THE OPERATION OF THE AUXILIARY INPUT UNIT	
	1 Check the operation of the auxiliary input unit
	2 Disconnect the auxiliary input unit from the audio input control module.
	3 Ignition switch in position 0.
	4 Wait two minutes
	5 Replace auxiliary input unit
	6 Ignition switch in position II.
	Is the USB memory stick/storage device now powering up? **Yes** No further action required **No** Check the integrity of the USB extension cable and its connectionsGO to B3.

PINPOINT TEST C : POWER SUPPLY CIRCUIT/POWER HARNESS CHECKS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
C1: CHECK THE INTEGRITY OF PRIMARY POWER SUPPLY	
	1 Remove the retrofitted audio input control module power harness
	2 Reconnect the original power harness
	Are the standard infotainment components on the vehicle operating normally? **Yes** GO to C2. **No** Check power and ground connections to the affected modules. Check for related power or lost communications DTCs and refer to the relevant DTC index. Check fuses and battery charging system. Rectify as necessary

C2: CHECK THE INTEGRITY AND OPERATION OF THE AUDIO INPUT CONTROL MODULE POWER HARNESS	
	1 SELECT APPROPRIATE HARNESS TYPE BASED ON CONFIGURATION OF MICROFIT CONNECTOR
	Audio Input Control Module Power Harness - 2x11 Microfit Connector  E141504 2 Reconnect the retrofit audio input control module power harness
	3 Check the voltages of the 2x11 audio input control module microfit connector using a multimeter • Red wire: permanent 12 volts supply • Black wire: GND • Blue wire: switched 12 volts
	Audio Input Control Module Power Harness - 2x2 Microfit Connector  E141505 4 Reconnect the retrofit audio input control module power harness
	5 Check the voltages of the 2x2 audio input control module microfit connector using a multimeter • Red wire: permanent 12 volts supply • Black wire: GND • Purple wire: switched 12 volts
	Are the voltage readings correct? **Yes** No further action **No** Replace the audio input control module power harness

DTC Index

For a list of diagnostic trouble codes that could be logged on this vehicle, please refer to the relevant DTC index

Published: 11-May-2011

Exterior Lighting -

General Specifications

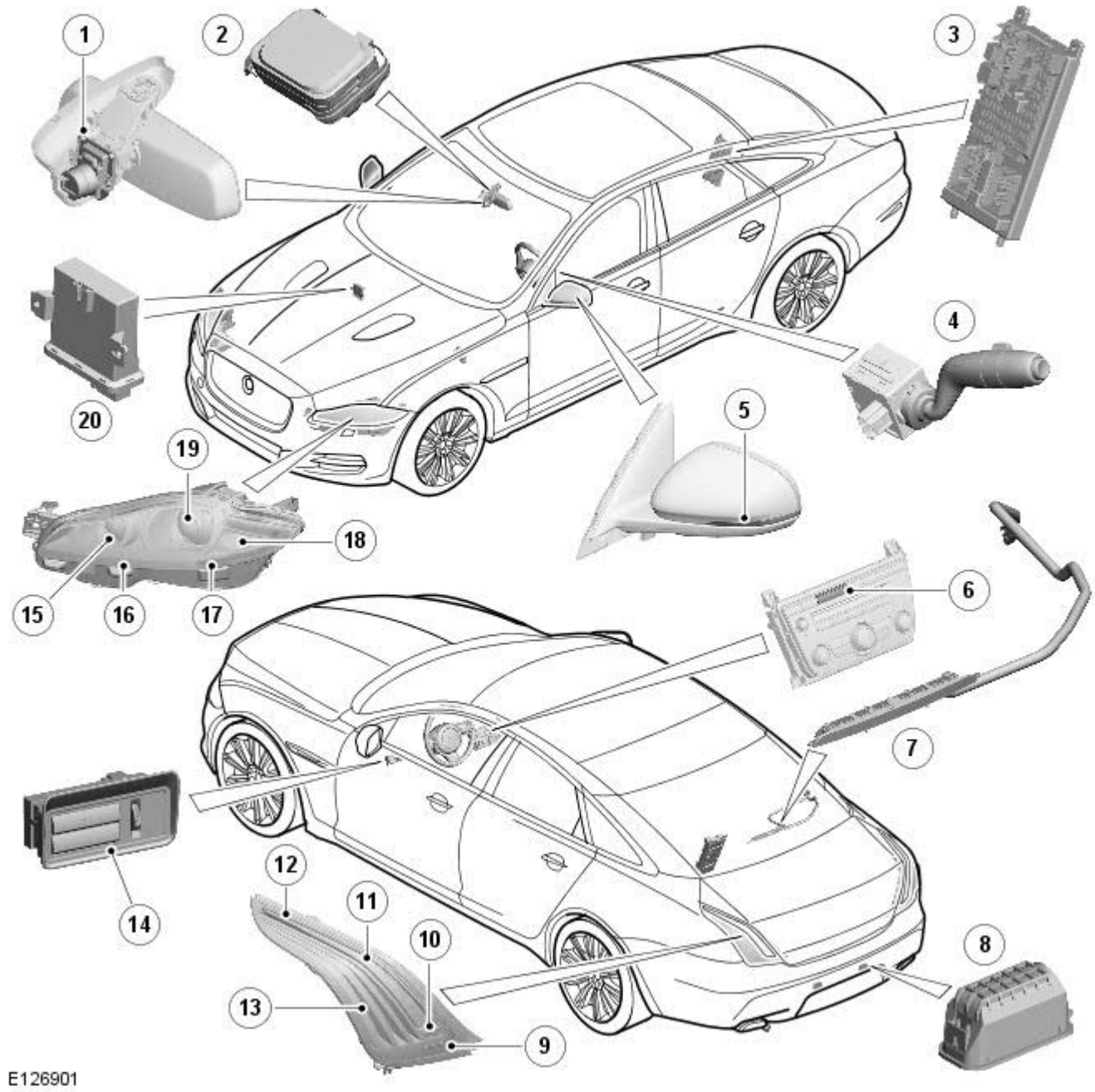
Item	Specification
Headlamp bulb	D35 HID Bi-function

Published: 11-May-2011

Exterior Lighting - Exterior Lighting - Component Location

Description and Operation

COMPONENT LOCATION



Item	Description
1	Auto High Beam control module (inside mirror body)
2	Rain/light sensor
3	Central Junction Box (CJB)
4	Lighting control switch - LH (left-hand) steering column multifunction switch
5	Side repeater lamp (2 off)
6	Hazard warning lamp switch
7	High mounted stop lamp
8	License plate lamp (2 off)
9	Rear fog lamp LED's

10	Reverse lamp LED's
11	Rear turn signal indicator LED's
12	Side marker LED's
13	Stop/side Lamps LED's
14	Rear fog lamp switch
15	Front turn signal indicator lamp LED's
16	Side lamp LED's
17	Side marker lamp LED's (NAS only)
18	Cornering/static bending lamp (where fitted)
19	Xenon headlamp projector module
20	Headlamp control module

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Exterior Lighting - Exterior Lighting - Overview

Description and Operation

OVERVIEW

The exterior lighting systems are controlled by the CJB (central junction box) which contains fuses, relays and microprocessors to control the power supply and functionality of the lighting systems.

The CJB controls the following vehicle functions:

- Control and monitoring of exterior lamps including turn signal indicators and hazard warning functionality
- Illumination dimmer control of instrument cluster and all interior switch illumination
- Monitoring and evaluation of check control inputs from other system control modules and output of applicable messages in the instrument cluster message center.

Driver lighting selections using the LH (left-hand) steering column multifunction switch or the auxiliary lighting switch are passed directly to the CJB.

The lighting system has an 'auto' lights function which is controlled by the CJB on receipt of signals from the rain/light sensor located at the top of the windscreen. The exterior lights are turned on or off in response to ambient light signals from the rain/light sensor on a LIN (local interconnect network) bus connection to the CJB. The auto lights can also be activated when the windshield wipers are activated by signals from the rain sensor, which is located at the top of the windshield or when the driver activates the wipers in the continuous wipe position for more than 10 seconds.

Two levels of headlamp specification are available; xenon or Adaptive Front lighting System (AFS). AFS headlamps feature a cornering lamp or a static bending lamp which illuminates the area at the side of the vehicle when turning into driveways for example. North American Specification (NAS) vehicles have a side marker lamp installed in the headlamp assembly.

The tail lamp comprises the turn signal indicator, side and stop lamps, fog and reverse lamps. A side marker lamp is fitted to the rear fender tail lamp assembly and is fitted in all markets.

An Auto High Beam system can also be fitted which automatically controls the high beam headlamps.

The exterior lighting system comprises the following exterior lamps:

- Front and rear side lamps (LED (light emitting diode)'s)
- License plate lamps
- Side marker lamps (if fitted) (LED's)
- Front and rear turn signal indicator lamps (LED's)
- Turn signal indicator side repeater lamps
- Stop lamps and high mounted stop lamp (LED's)
- Reversing lamps (LED's)
- Rear fog lamps (LED's)
- Static bending/cornering lamps (if fitted - AFS headlamp except NAS) (LED's)
- Bi-xenon headlamps
- Adaptive Front lighting System (AFS) (if fitted).

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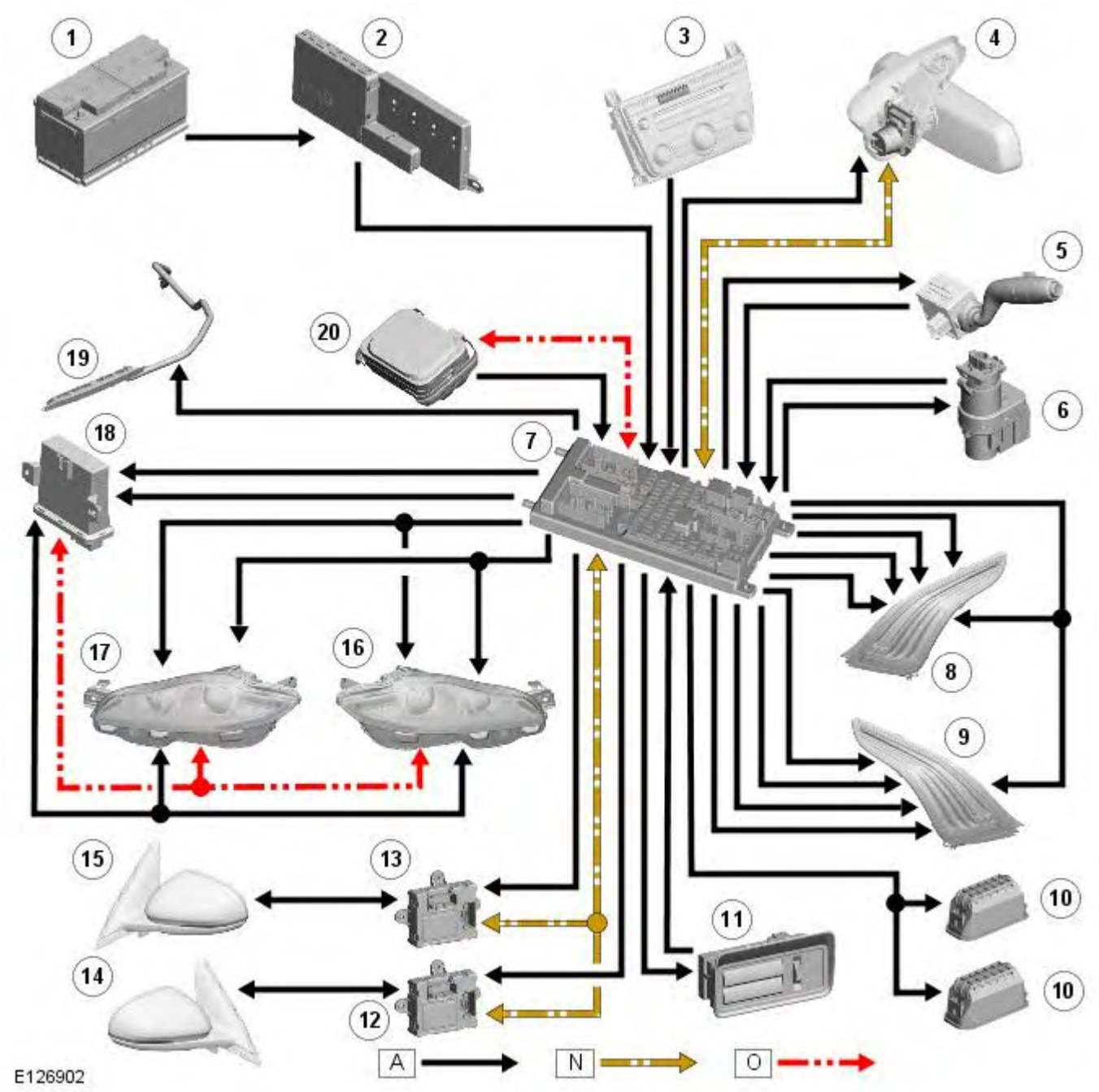
Exterior Lighting - Exterior Lighting - System Operation and Component Description

Description and Operation

Control Diagram

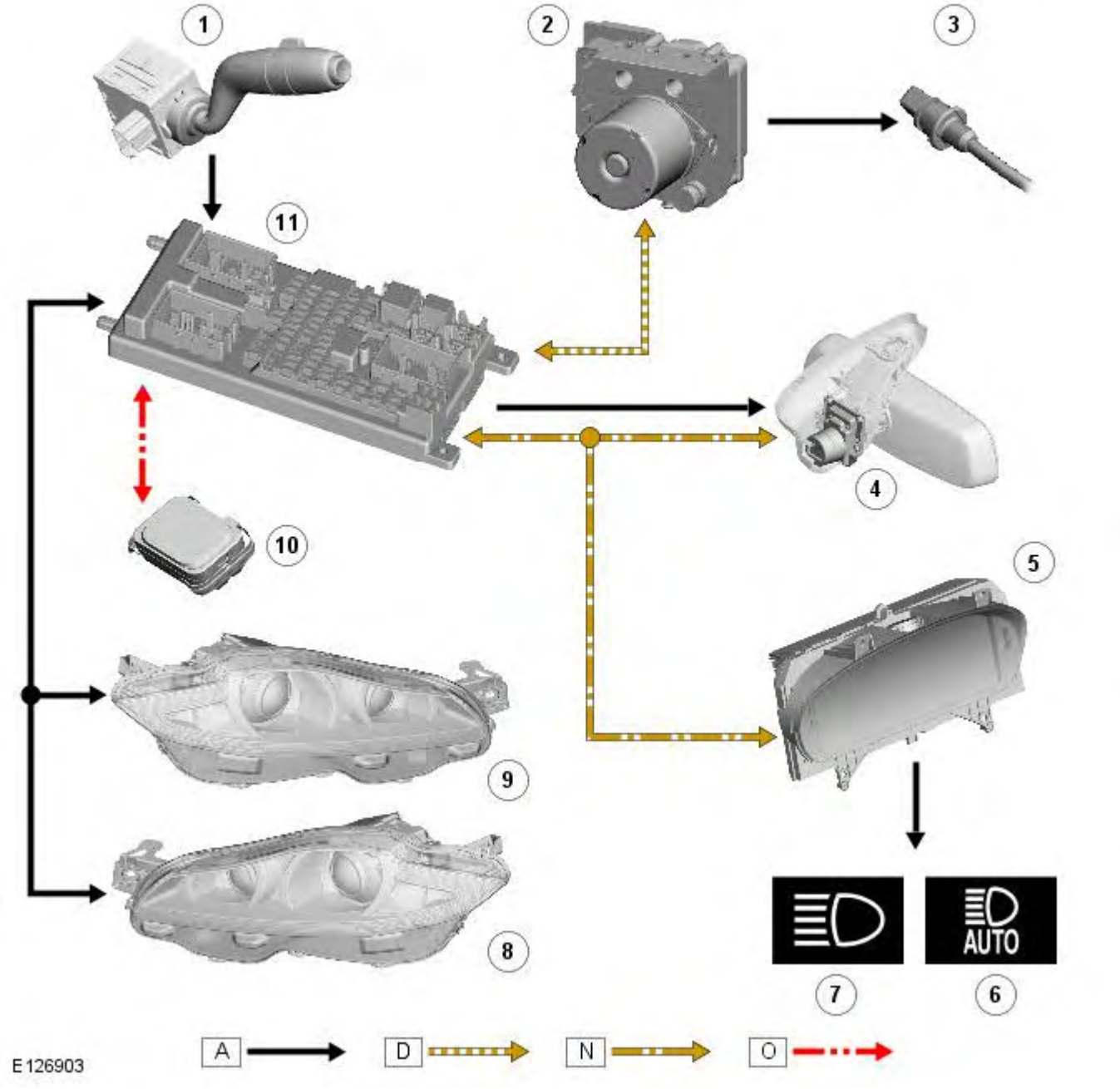
EXTERIOR LIGHTING - CONTROL DIAGRAM



Item	Description
	NOTE: **A** = Hardwired; **N** = Medium speed CAN bus; **O** = LIN bus
1	Battery
2	Battery Junction Box (BJB)
3	Hazard warning lamp switch
4	Auto High Beam (AHB) Module
5	Left Hand (LH) steering column multifunction switch
6	Brake switch

7	Central Junction Box (CJB)
8	LH tail lamp
9	Right Hand (RH) tail lamp
10	License plate lamp (2 off)
11	Rear fog lamp switch
12	Passenger door module
13	Driver's door module
14	RH turn signal indicator side repeater lamp
15	LH turn signal indicator side repeater lamp
16	RH headlamp assembly
17	LH headlamp assembly
18	Headlamp control module (AFS headlamps only)
19	High mounted stop lamp
20	Rain/light sensor

AUTO HIGH BEAM CONTROL DIAGRAM



Item	Description
	NOTE: **A** = Hardwired; **D** = High Speed CAN; **N** = Medium Speed CAN; **O** = LIN Bus
1	LH steering column multifunction switch
2	Anti-lock Brake System (ABS) control module
3	Wheel speed sensor
4	Auto high beam control module and image sensor
5	Instrument cluster
6	Auto high beam warning indicator
7	High beam warning indicator
8	LH headlamp assembly
9	RH headlamp assembly
10	Rain/light sensor
11	Central Junction Box (CJB)

System Operation

CENTRAL JUNCTION BOX (CJB)

The CJB (central junction box) is located behind the rear seat center armrest and is connected to the vehicle wiring harness with 8 multiplugs.

The CJB receives 2 permanent battery power supplies via the BJB (battery junction box).

The lighting circuits are not all protected by conventional fuses as some are protected by Metal Oxide Semiconductor Field Effect Transistors (MOSFETs). The control circuitry within the CJB for each individual circuit can detect and isolate a problem circuit.

Failure of a lamp is not notified to the driver. If a turn signal indicator fails the turn signal warning indicator in the instrument cluster will flash at double speed.

Input Signals for Lamp Control

The CJB receives inputs from the following switches:

- Lighting control switch for side lamps, headlamps and auto headlamps
- Momentary push switch for the rear fog lamps
- Left hand steering column multifunction switch for turn signal indicators and high beam/headlamp flash and Auto High Beam system
- Brake pedal switch
- Momentary push switch for hazard warning.

The switches are supplied with a 10mA supply from the CJB and switch to ground when operated. The CJB detects that a switch has been operated (ON) when its closing resistance is less than 100 Ohm and is detected as OFF when its resistance is more than 10K Ohm.

The lighting control switch uses a resistive ladder, the output voltage of which is detected by the CJB which in turn determines the selected position.

The CJB also receives ignition status via hard wired connections from the stop/start switch.

A reverse gear engaged signal is also received on the high speed CAN (controller area network) bus from the TCM (transmission control module) to enable the CJB to activate the reverse lamps.

The CJB can receive a hazard warning indicator activation message from the RCM (restraints control module), via the high speed CAN bus, in the event of a crash. The CJB can also activate the hazard warning indicators to signify vehicle locking to the driver.

On vehicles with Auto High Beam, the auto high beam control module outputs signals on the medium speed CAN bus to the CJB to control the high beam headlamps.

Circuit Protection

Operation of the lamps is performed using overload proof Metal Oxide Semiconductor Field Effect Transistors (MOSFETs). The MOSFETs can detect overload, load interruption with the lamps switched on and short circuit to positive with the lamps switched off.

The MOSFETs are protected against short circuits, removing the requirement for the lamps circuits to be protected by fuses. The MOSFETs respond to heat generated by increased current flow caused by a short circuit. Normally this would cause the fuse to blow. The MOSFETs react to the heat increase and cut the supply to the affected circuit. Once the fault has been rectified or the MOSFET has cooled, the MOSFET will automatically reset and operate the circuit normally.

If an overload occurs, the current flow is dependant on the temperature of the related MOSFET and can be up to 20 times the rated current of the lamp. The MOSFET heats up and deactivates the load applied to the circuit. When the MOSFET cools the circuit is once again reactivated. This thermal cycling occurs continuously in the event of an overload occurring.

A number of lamps are controlled by relays and these circuits are protected by conventional fuses.

Bulb/LED Monitoring

Bulb/LED (light emitting diode) failure monitoring is performed by the CJB processor. The lamps are cold and warm monitored by the MOSFETs in order to detect bulb failure.

NOTE: Relay controlled lamps have no diagnostic monitoring.

The CJB processor provides outputs to each MOSFET. The output switches the MOSFET to supply the required output to power the applicable lighting circuit. The microprocessor evaluates the circuits by detecting the returned signals from the controlling MOSFET.

When the bulb or LED is functioning normally, the output signal voltage from the controlling MOSFET is 0V. If a bulb or LED in the circuit fails, an open circuit occurs and the MOSFET outputs a signal of 5V to the processor. The signal is interpreted as a bulb or LED failure and generates a DTC (diagnostic trouble code) which can be retrieved using an approved Jaguar diagnostic system.

Warm monitoring is performed continuously when the lights are switched on by evaluating the diagnostic output of the MOSFET switches. Cold monitoring is performed at 32 second intervals when the lights are switched off. The MOSFETs briefly switch on the lights for approximately 1 millisecond (this is insufficient to illuminate the bulb or LED) and checks the bulb or LED as per warm monitoring.

Cold monitoring is not possible for the low/high beam headlamps of vehicles using xenon bulbs. On these vehicles the cold monitoring of the low/high beam headlamps is switched off in the CJB. The CJB detects a failed xenon bulb via a reduction in current flow to the affected headlamp's xenon control module.

When a xenon bulb fails, the control module's current consumption falls to 60mA, which the CJB detects as unsuccessful bulb illumination.

Alarm Indications

The CJB can also display alarm visual indications for alarm arm, disarm and triggered conditions.

If the hazard warning lamps are active when a lock or unlock request is made, the hazard warning cycle is interrupted to allow the visual indication of the requested lock cycle. When visual indication is completed, the hazard warning operation will continue.

If the vehicle is involved in crash of a severity for the RCM to initiate deployment of the airbags, the control module outputs a hazard warning lamps on request on the medium speed CAN bus to the CJB. The hazard warning lamps will be activated and will continue until the RCM outputs a message to deactivate the hazard warning lamps.

Redundant Data Storage

The CJB stores data relating to the Vehicle Identification Number (VIN), total mileage and service interval indicator. This data is received by the CJB from the instrument cluster and used as a back-up in the event of instrument cluster replacement.

If the CJB is to be replaced, an approved Jaguar diagnostic system must be connected to the vehicle and the CJB replacement procedure followed to ensure that the stored data is transferred to the new unit.

Low Voltage Operation

If the battery voltage falls below 11.2V, the CJB operates the minimum lighting to preserve the remaining battery charge.

Crash Signal Activation

In the event of an accident of a severity to activate and deploy the airbags, the RCM requests various electrical operations to assist with the crash situation. The RCM requests via the bus systems to the CJB to activate the hazard warning lamps.

Security Signal Activation

In the event of the security system being triggered, the CJB requests activation of the hazard warning lamps.

Instrument Panel and Switch Illumination Dimming

The CJB controls the instrument cluster backlighting illumination and also illumination of all instrument panel switches.

The CJB supplies a power output to all switch illumination bulbs at a voltage determined by the position of the manual dimmer rheostat. The switch illumination is activated when the lighting control switch is in the side lamp or headlamp position.

LIGHTING CONTROL SWITCH

The CJB outputs 2 reference voltages to the rotary lighting control switch; one feed being supplied to the lighting function of the switch and the second feed being supplied to the auto headlamp exit delay function. The switch position is determined by CJB by the change in returned signal voltage which is routed through up to 4 resistors in series depending on the selection made.

Lighting functions

OFF - When the lighting control switch is in the off position, the reference voltage flows through 1 of the resistors. The returned signal voltage is detected by the CJB which determines that no lighting selection is made. The reference voltage to the auto headlamp exit delay switch is routed through 4 resistors which is detected by the CJB which determines that auto headlamp or exit delay has not been selected.

SIDE LAMPS - When the lighting control switch is in the side lamp position, the reference voltage flows through 2 of the resistors. The returned signal voltage is detected by the CJB which activates the side lamps. The reference voltage to the autolamp exit delay switch is routed through 4 resistors which is detected by the CJB which determines that auto headlamp or exit delay has not been selected.

HEADLAMPS - When the lighting control switch is in the headlamp position, the reference voltage flows through 3 of the resistors. The returned signal voltage is detected by the CJB which activates the headlamps. The reference voltage to the auto headlamp exit delay switch is routed through 4 resistors which is detected by the CJB which determines that auto headlamp or exit delay has not been selected.

AUTOLAMPS - When the lighting control switch is in the auto headlamp position, the reference voltage flows through 4 of the resistors. The returned signal voltage is detected by the CJB which activates the autolamp function. The reference voltage to the autolamp exit delay switch is routed through 4 resistors which is detected by the CJB which determines that auto headlamp has been selected.

High Beam

The CJB outputs a reference voltage to the LH (left-hand) steering column multifunction switch for operation of the high beam/flash function.

When the switch is in the central off position the reference voltage is passed through 3 resistors. The return voltage is detected by the CJB which determines that no selection has been made.

When the switch is moved forwards to the high beam position, the reference voltage is passed through 2 resistors. The return voltage is detected by the CJB which activates the high beam function of the bi-xenon headlamps.

When the switch is moved rearwards to the high beam flash position, the reference voltage is passed through 1 resistor. The return voltage is detected by the CJB which activates the high beam function of the bi-xenon headlamps for as long as the switch is operated.

Headlamp Delay Functions

EXIT DELAY 1 (30 seconds) - When the lighting control switch is moved to the exit 1 position, the reference voltage from the CJB flows through 3 resistors. The returned signal is detected by the CJB which activates the 30 second headlamp delay timer.

EXIT DELAY 2 (60 seconds) - When the lighting control switch is moved to the exit 2 position, the reference voltage from the CJB flows through 2 resistors. The returned signal is detected by the CJB which activates the 60 second headlamp delay timer.

EXIT DELAY 3 (120 seconds) - When the lighting control switch is moved to the exit 1 position, the reference voltage from the CJB flows through 1 resistor. The returned signal is detected by the CJB which activates the 120 second headlamp delay timer.

Turn Signal Indicators

The CJB outputs a reference voltage to the LH steering column multifunction switch for operation of the LH and RH (right-hand) turn signal indicators.

When the switch is in the central off position the reference voltage is passed through 3 resistors. The return voltage is detected by the CJB which determines that no selection has been made.

When the switch is moved to the LH position, the reference voltage is passed through 1 resistor. The return voltage is detected by the CJB which activates the LH turn signal indicators for as long as the switch is activated or for 3 flashes if the switch was operated for the lane change function.

When the switch is moved to the RH position, the reference voltage is passed through 2 resistors. The return voltage is detected by the CJB which activates the RH turn signal indicators for as long as the switch is activated or for 3 flashes if the switch was operated for the lane change function.

AUXILIARY LIGHTING SWITCH

Rear Fog Lamp Switch

The CJB supplies a reference voltage and return to the rear fog lamp switch. The fog lamp switch is a non-latching, momentary switch.

When the fog lamp switch is off the reference voltage is passed through a 1Kohm resistor. The voltage through the resistor is returned to the CJB which determines that no request for fog lamp operation has been made.

When the driver presses the fog lamp switch, the reference voltage is passed momentarily through a 330 ohm resistor. The change in return voltage is sensed by the CJB which determines fog lamp operation has been requested. The CJB provides a power supply to the 3 LED's in each rear fog lamp. A fog lamp warning lamp in the instrument cluster will also be illuminated when the fog lamps are operating.

The CJB will only activate the rear fog lamps if the headlamps are selected ON or are active with auto headlamp activation. When the headlamps are turned off the fog lamps are also turned off. If the driver presses the fog lamp switch for a second time the rear fog lamps are also switched off. When the headlamps are next switched on, the fog lamps will not be activated

until the driver requests fog lamp operation.

NOTE: The rear fog lamps do not operate when DRL (daytime running lamps) are active.

AUTOMATIC HEADLAMPS

Auto Headlamps

When the lighting control switch is in the auto headlamp position, a reference voltage from the CJB flows through 4 resistors in the lighting control switch. The returned signal voltage is detected by the CJB which activates the autolamp function. The reference voltage to the autolamp exit delay switch is also routed through 4 resistors of the same rating which is detected by the CJB which determines that auto headlamp has been selected.

The rain/light sensor receives a battery voltage output from the ignition relay in the CJB. The rain/light sensor continually outputs a LIN (local interconnect network) bus message to the CJB with information regarding the ambient light levels. When the ambient light level reaches a predetermined value, the CJB activates the auto headlamp feature. The CJB can also activate the auto headlamps when it receives information regarding rain fall from the rain/light sensor which subsequently activates the auto wipers function.

Auto High Beam (AHB)

The Auto High Beam (AHB) system is controlled by a AHB control module which is located in the interior rear view mirror body and by the CJB. The module and the CJB are connected via the medium speed CAN bus.

The AHB control module receives a power supply from the CJB when the ignition is in power mode 6 (ignition on). The rear view mirror also includes a low resolution camera (image) sensor which detects headlamps and tail lamps of preceding vehicles. The sensor is connected to the control module which evaluates the image data, checking for light intensity and location.

If conditions are correct, the control module will activate the AHB by sending a high or low beam request message to the CJB via the medium speed CAN bus. The CJB then controls the shutter in the Bi-Xenon projector module.

Component Description

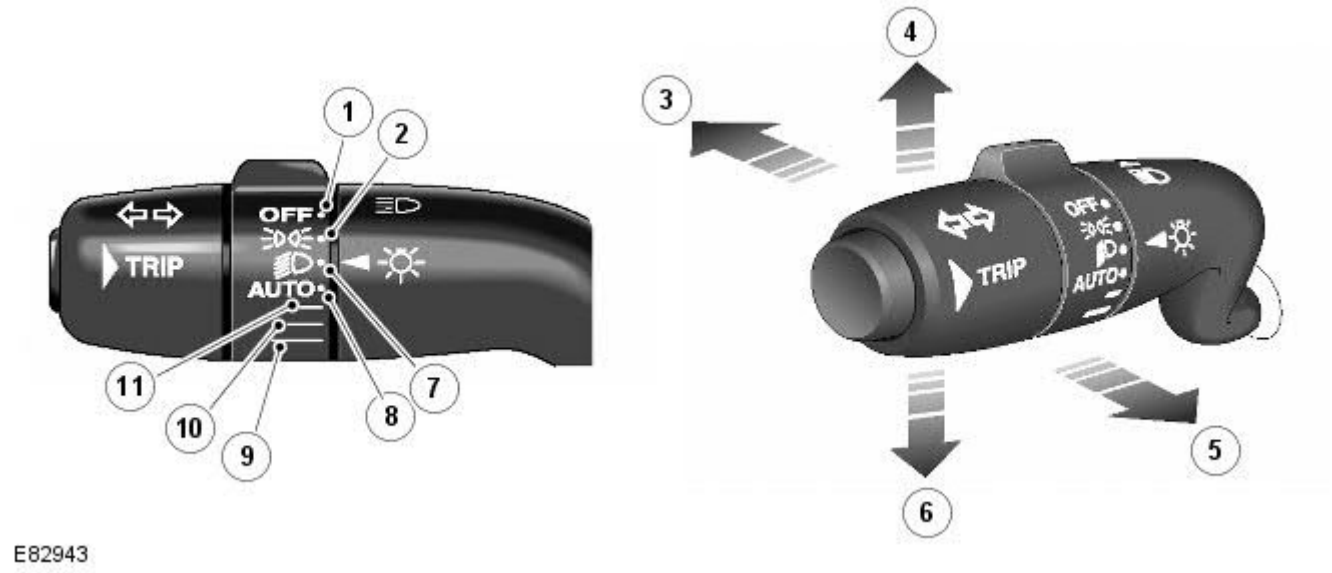
EXTERIOR BULB TYPE/RATING

The following table shows the bulbs used for the exterior lighting system and their type and specification.

NOTE: The tail lamps, side marker lamps, stop lamps, high mounted stop lamp and rear fog lamps are illuminated by LED's and are non-serviceable components.

Bulb	Type	Rating
Xenon headlamp bulb	D3S	35W
Licence plate lamps - All markets	W5W	5W

LIGHTING CONTROL SWITCH



Item	Description
1	Off position
2	Side lamp position
3	High beam position
4	RH turn signal indicator
5	Headlamp flash/high beam off position
6	LH turn signal indicator
7	Headlamp position
8	AUTO headlamp position
9	Headlamp timer 120 second delay position
10	Headlamp timer 60 second delay position
11	Headlamp timer 30 second timer delay position

The lighting control switch is located on the LH steering column multifunction switch. The lighting control switch is a rotary control with positions for the following lighting functions:

- Off
- Side lamps
- Headlamps
- AUTO headlamps
- Headlamp timer (3 time period selections).

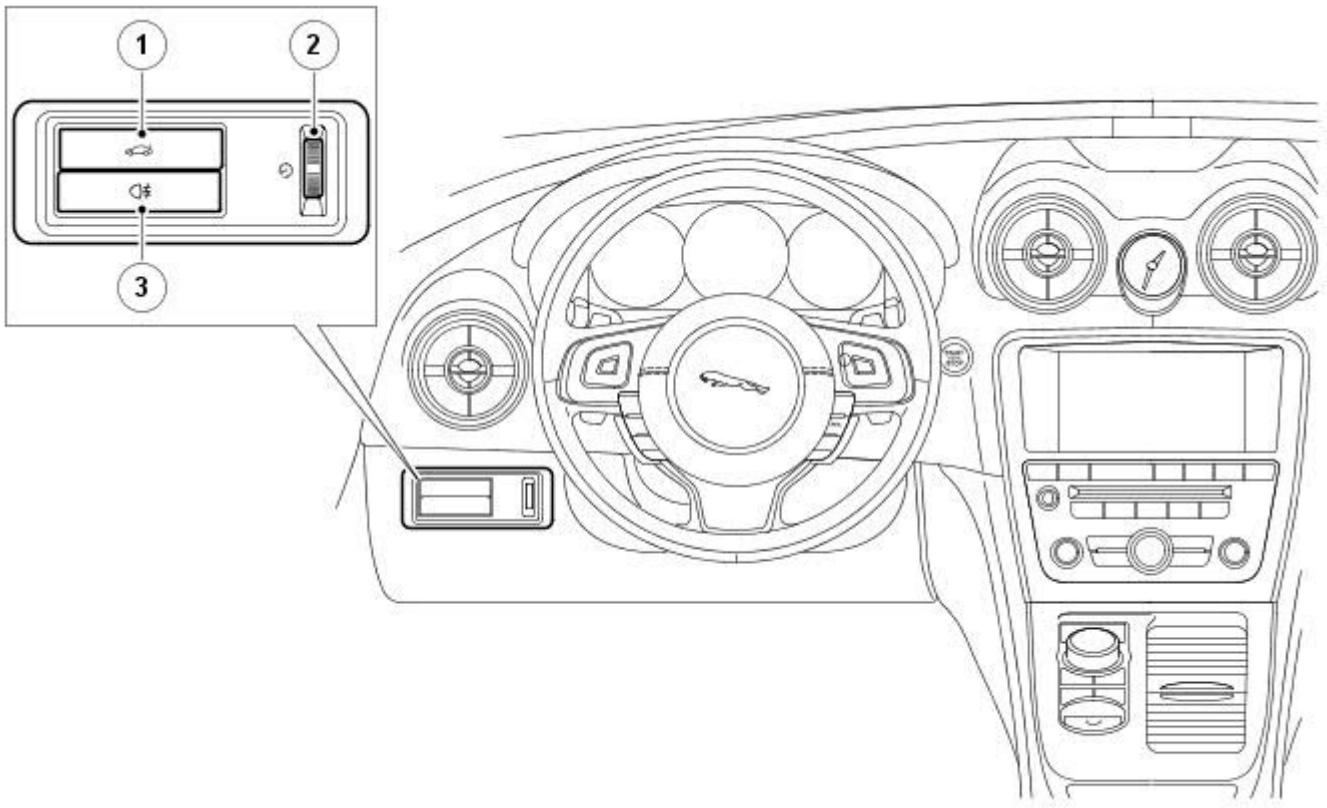
The LH steering column multifunction switch also provides for the following functions:

- Low beam headlamps
- High beam headlamps
- Headlamp flash
- LH and RH turn signal indicators
- Trip computer function button.
  Refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

The switch has a turn signal indicator lane change function which is configurable by the dealer. If the switch is gently pushed to either turn signal indicator position and then released, the applicable turn signal indicators will flash 3 times and then will be automatically cancelled. If a turn signal indicator fails, the green turn signal warning indicator in the instrument cluster will flash at twice the normal rate and the audible ticking from the instrument cluster sounder will also be at twice the normal rate.

AUXILIARY LIGHTING SWITCH

NOTE: LHD (left-hand drive) switch shown



E126904

Item	Description
1	Luggage compartment lid release switch
2	Instrument panel illumination dimmer thumbwheel
3	Rear fog lamp switch

The auxiliary lighting switch is located in the instrument panel, adjacent to the steering column. The switch has a rear fog lamp switch and a rotary thumbwheel dimmer to adjust instrument panel illumination. The auxiliary lighting switch also has a luggage compartment release switch.

The rear fog lamp switch is a non-latching switch which provides a momentary signal to the instrument cluster. The fog lamps can only be activated if the ignition is in power mode 6 and the headlamps or auto headlamps are selected on. If the fog lamp switch is pressed when the fog lamps are operating, they will be switched off. If the lighting control switch is moved to the side lamp or off position or if the auto headlamps turns off the headlamps the rear fog lamps will be extinguished. If the headlamps are subsequently turned on the rear fog lamp operation will not be active and the rear fog lamp switch must be pressed to activate the lamps.

HEADLAMP ASSEMBLY

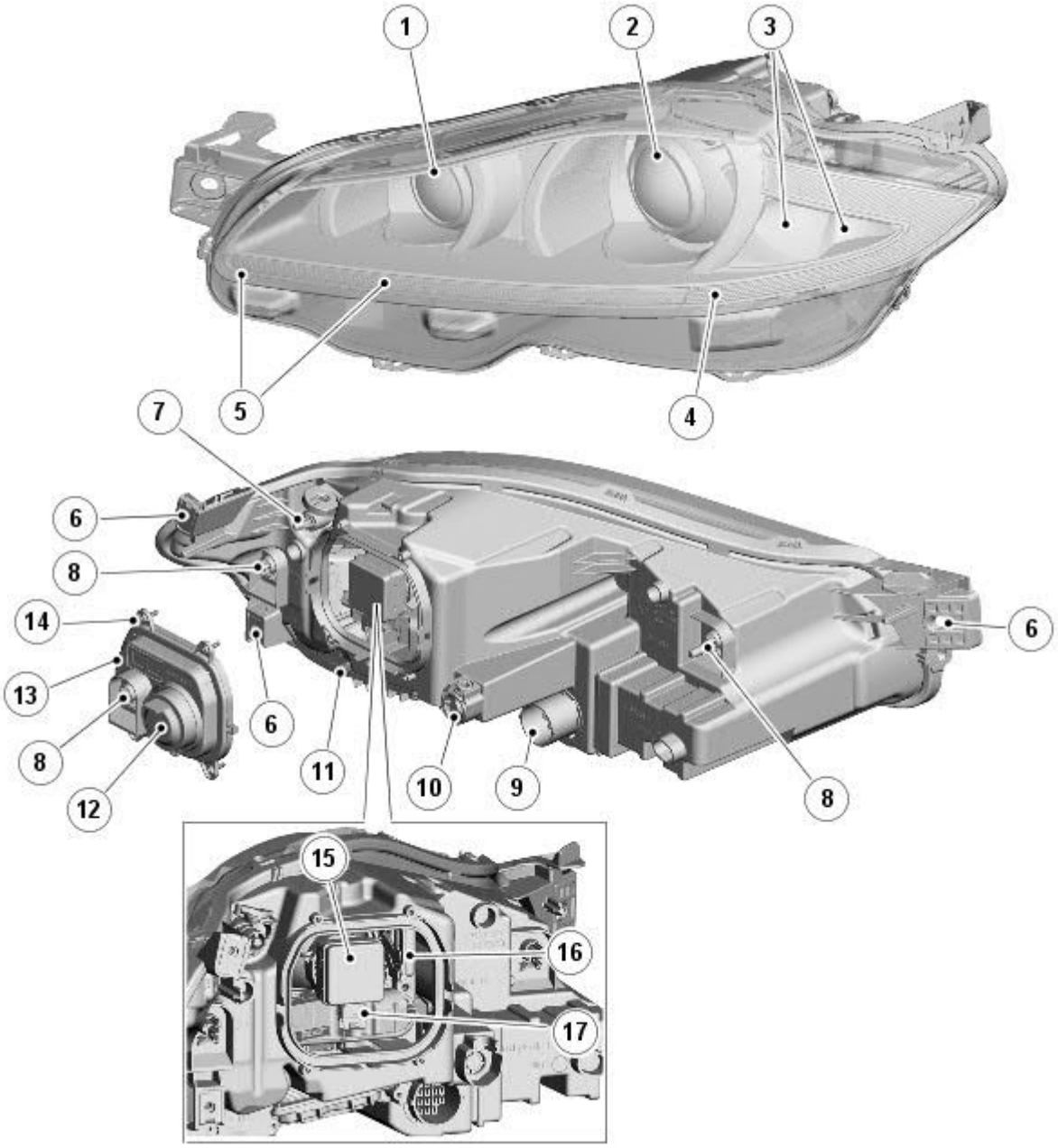
Two types of headlamp are available; xenon without Adaptive Front lighting System (AFS) or xenon with AFS. The headlamp is secured in the front of the vehicle with three bolts; 1 inboard bolt is screwed into the front upper cross member and 2 bolts located at the rear of the headlamp assembly and secure the headlamp to a fender support brackets which in turn is connected to the upper cross-member. Xenon bulb replacement requires the removal of the 3 bolts and the headlamp assembly.

The rear of the headlamp has an access panel which is secured with four screws. The panel allows access to the xenon bulb for replacement. A smaller rubber pull-off cover on the panel can be removed to access the tourist lever. Access to the panel and the pull-off cover is by partial removal of the wheel arch splash shield.

The headlamps have 2 adjustment screws on the rear which allow for the manual setting of the vertical and horizontal alignment.

On NAS vehicles, the headlamp is regarded as 'Visual Optically Left' aiming. The adjustment screws must be turned equal amounts to maintain the correlation in the vertical axis only. There is no horizontal adjustment. Refer to the Service Repair Procedures manual for headlamp alignment data and procedures.

Each headlamp has an integral 16 pin connector which provides inputs and outputs for the various functions of the headlamp assembly.



E126905

Item	Description
1	Turn signal indicator LED's
2	Projector module -Low/High beam headlamp
3	Cornering/static bending lamp LED's (if fitted)
4	Side marker lamp LED (NAS only)
5	Side lamp LED's
6	Headlamp mounting screw locations (3 off)
7	Headlamp beam adjuster
8	Headlamp breather vent (3 off)
9	Electrical connector
10	Headlamp beam adjuster
11	Xenon control module
12	Tourist lever access cover
13	Access panel
14	Access panel attachment screw (4 off)

15	Xenon bulb igniter
16	Tourist lever
17	Xenon ignitor electrical connector

Bi-Xenon Headlamp

The bi-xenon headlamp uses a projector module. The projector module comprises an ellipsoidal lens and a reflector. The projector reflector collects the light produced by the xenon bulb and projects the light into a focal plane containing a shield. The contour of the shield is projected onto the road by the lens.

A tourist lever mechanism is located on the right hand side of the projector module. This mechanism moves a flap to blank off a portion of the beam spread to enable the vehicle to be driven in opposite drive hand markets without applying blanking decals to the headlamp lens. The beam is changed by partial removal of the wheel arch splash shield and removing the access cover at the rear of the lamp assembly and moving a small lever located near the bulb holder, at the side of the projector.

NOTE: The tourist lever is not fitted to NAS vehicles.

WARNING: The Xenon system generates up to 30000 volts and contact with this voltage could lead to fatality. Make sure that the headlamps are switched off before working on the system.

The following safety precautions must be adhered to when working on the xenon low beam headlamp system:

- **DO NOT** attempt any procedures on the xenon headlamps when the lights are switched on.
- Handling of the D3S xenon bulb must be performed using suitable protective equipment; for example gloves and goggles. The glass part of the bulb must not be touched.
- Xenon bulbs must be disposed of as hazardous waste.
- Only operate the bulb in a mounted condition in the projector module installed in the headlamp.

The xenon headlamp is known as 'bi-xenon' because it operates as both a low and high beam headlamp unit. The xenon lamp, or High Intensity Discharge (HID) lamp as they are sometimes referred to, comprises an ellipsoidal lens with a solenoid controlled shutter to change the beam output from low to high beam.

The xenon headlamp system is controlled by the CJB using a control module for each headlamp and an igniter. The control modules and the igniters provide the regulated power supply required to illuminate the bulbs through their start-up phases of operation.

The xenon headlamp is a self contained unit located within the headlamp assembly. The unit comprises a reflector, the lens, a shutter controller and the xenon bulb, which together form an assembly known as the projector module. The reflector is curved and provides the mounting point for the xenon bulb. The bulb locates in a keyway to ensure the correct alignment in the reflector and is secured by a plastic mounting ring. The bulb is an integral component of the igniter and is electrically connected by a connector located in the igniter unit.

The shutter controller is a solenoid which operates the shutter mechanism via a lever. The shutter is used to change the beam projection from low beam to high beam and vice versa.

The xenon bulbs illuminate when an arc of electrical current is established between 2 electrodes within the bulb. The xenon gas sealed in the bulb reacts to the electrical excitation and the heat generated by the current flow to produce the characteristic blue/white light.

To operate at full efficiency, the xenon bulb goes through 3 full stages of operation before full output for continuous operation is achieved. The 3 phases are; start-up phase, warm-up phase and continuous phase.

In the start-up phase, the bulb requires an initial high voltage starting pulse of up to 30000 volts to establish the arc. This is produced by the igniter. The warm-up phase begins once the arc is established. The xenon control module regulates the supply to the bulb to 2.6A which gives a lamp output of 75W. During this phase, the xenon gas begins to illuminate brightly and the environment within the bulb stabilizes, ensuring a continual current flow between the electrodes. When the warm-up phase is complete, the xenon control module changes to continuous phase. The supply voltage to the bulb is reduced and the operating power required for continual operation is reduced to 35W. The process from start-up to continuous phase is completed in a very short time.

The xenon control modules (one per headlamp) receive an operating voltage from the CJB when the headlamps are switched on. The modules regulate the power supply required through the phases of start-up.

The igniters (one per headlamp) generate the initial high voltage required to establish the arc. The igniters have integral coils which generate high voltage pulses required for start-up. Once the xenon bulbs are operating, the igniters provide a closed circuit for the regulated power supply from the control modules.

Static Bending/Cornering Lamps

The static bending/cornering lamps, which are a standard feature on AFS headlamps, are designed to illuminate the direction of travel when cornering at low speeds. The static bending/cornering lamp functionality, which is controlled by the CJB, is unique to vehicles with AFS headlamps and operates using inputs from the steering angle sensor.

The static bending/cornering lamp LED's are incorporated into the outer part of the headlamp assembly. The design of the lens projects a spread of light from the vehicle at approximately 45 degrees to the vehicle axis.

The static bending/cornering lamp uses 2 high power LED's located in the headlamp housing. The LED's are not serviceable components.

Cornering Lamp Functionality

The cornering lamps are designed to illuminate the direction of travel when cornering at low speeds. The design of the lens projects a spread of light from the vehicle at approximately 45 degrees to the vehicle axis.

The cornering lamps are controlled by the LHsteering column multifunction switch with the lighting control switch in the headlamp position and the ignition switch in power mode 6 (ignition on). The cornering lamps are supplied power with power mode 6 (ignition on) to ensure that they do not function with the headlamp delay feature. The cornering lamps are deactivated if the vehicle speed exceeds 25 mph (40 km/h) at which point the static bending lamp functionality is activated.

Only one cornering lamp will illuminate at any one time. If the LH turn signal indicators are selected on, the left hand cornering lamp will be illuminated and visa versa, providing the vehicle speed and lighting control switch positions are correct.

Static Bending Lamp Functionality

NOTE: Static bending lamps only operate when the transmission is in DRIVE or in SPORT.

The static bending lamps operate with a steering angle sensor CAN signal and vehicle speed signal which is received by the AFS control module and the CJB. The AFS control module sends a static bending lamp on request to the CJB which activates the static bending lamp LED's

When the operation parameters of the lamp are reached, the CJB illuminates the static bending lamp LED's on using a full power PWM (pulse width modulation) voltage. When the lamp is switched off, the CJB fades the LED's off by decreasing the PWM voltage in a linear manner.

Turn Signal Indicators

The turn signal indicator lamp is located in-board of the headlamp projector module. The indicator lamp comprises 8 amber LED's arranged in a circular pattern.

When active, the turn signal indicator lamps will flash at a frequency cycle of 400ms on and 400ms off. If a bulb fails, the remaining turn signal lamps bulbs continue to flash at normal speed.

Side Lamps

The side lamp is located in a row along the bottom of the headlamp. The side lamp comprises 8 LED's.

The side lamps are operated by selecting side lamps or headlamps on the lighting control switch. The side lamps are functional at all times and are dependant on a particular ignition mode status. The side lamps will also be illuminated when the lighting control switch is in the AUTO position and a 'lights on' signal is received by the CJB from the rain/light sensor.

Side Marker Lamps (NAS only)

The side marker lamp is located at the outboard end of the side lamps and is illuminated by a single amber LED. An amber reflex reflector continues from the end of the side marker lamp and forms a triangle around the static bending/corning lamp (where fitted).

The side marker lamp is active at all times when the side lamps are active.

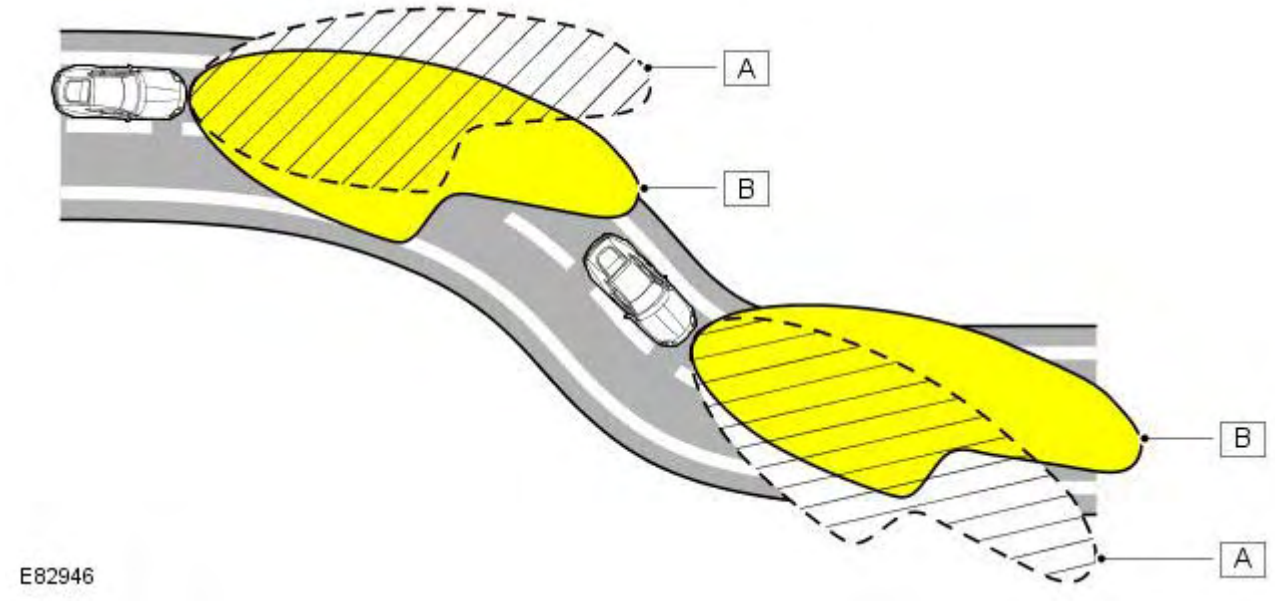
ADAPTIVE FRONT LIGHTING SYSTEM (AFS) HEADLAMPS

The AFS headlamp is similar in its construction to the xenon headlamp. The projector module is constructed and operates as described for the xenon headlamp with the addition of the AFS system which allows the projector module to be moved vertically and horizontally by stepper motors. The following description covers the additional differences to the xenon headlamp with AFS.

The AFS is a system to improve driver visibility under differing driving conditions. AFS provides a larger visible area which is illuminated when cornering by adjusting the position of the beam distribution on the road. Horizontal adjustment is made automatically to the most suitable orientation for the driving conditions using steering angle and information from other vehicle sensors.

AFS includes the dynamic headlamp leveling system described in the 'Headlamp Leveling' section of this document. The bi-xenon™ module within the headlamp is controlled by actuator motors which rotate the projector module on its vertical and horizontal axes to adjust the beam output to suit the cornering conditions and vehicle inclination. Only the adaptive bi-xenon™ lamp projector module swivels, all other lamps remain static.

The AFS is controlled by an AFS control module which is located on the instrument panel frame, behind the glove compartment. The module is connected to and controls an AFS power module located inside the headlamp housing. Signals from the AFS control module are processed by the AFS power module which powers stepper motors to adjust the vertical and horizontal alignment of the projector module. The AFS power module also controls and regulates the operation of the static bending lamp (if fitted) which is requested by the AFS control module but controlled by the CJB.



Item	Description
A	Conventional headlamp beam distribution
B	AFS headlamp beam distribution

The AFS xenon headlamp construction is similar to the non-AFS xenon headlamp assembly. The AFS headlamp has a xenon control module located on the underside of the lamp assembly. An additional AFS power module is located inside the headlamp housing. The AFS power modules supply the correct voltage to the stepper motors which control the positioning and movement of the AFS projector module.

The AFS assembly contains an additional carrier frame which provides the location for the AFS actuators. The remaining lamps are as described previously for the xenon headlamp. The AFS headlamp also incorporates a static bending/cornering lamp (except on NAS market vehicles).

The carrier frame is attached to the AFS vertical actuator. The projector module has a central pivot point which allows the module to move horizontally in response to operation of the AFS horizontal actuator.

The AFS actuators are bi-polar (2 phase) dc stepper motors which are driven by a power output from the AFS power module. Each stepper motor receives its position information from the AFS control module via the applicable AFS power module. When the actuators are powered to their requested positions, a holding current is applied to maintain the actuator position.

The actuators do not supply a positional feedback signal to the AFS control module. Each stepper motor requires referencing each time the AFS system becomes active. When the AFS system is active, each vertical actuator is driven in the low beam position and each horizontal actuator is driven to an inboard position until a mechanical stop in the actuator is reached. Once the stop is reached a step counter in the AFS control module is set to zero and the actuator is then powered to the operating position as determined by the AFS control module software.

The AFS control module receives front and rear suspension height data and vehicle speed signals from the ABS module to adjust the projector module vertically to increase the beam range as the vehicle speed increases.

AFS Control Module

The AFS control module is located on the bulkhead in the passenger compartment, behind the glove compartment.

The AFS control module is a dual functionality unit which also incorporates software to control the dynamic headlamp leveling. The AFS control module is connected to the high speed CAN bus and receives inputs from other vehicle systems on the status of the following parameters:

- • Steering angle
- • Vehicle speed
- • Headlamp status
- • Engine running
- • Reverse gear selected
- • Automatic lighting on.

The AFS will only operate when the AFS control module receives an engine running signal on the CAN bus. When the engine running signal is received the AFS control module performs an initialization routine.

The AFS will also function when the lighting control switch is in the AUTO position and the AFS control module receives a lights on signal from the rain/light sensor and an engine running signal.

The AFS control module then monitors the inputs from the other vehicle systems to control the AFS functionality according to cornering (steering) angles and vehicle speed.

The AFS control module is connected to each AFS power module on a private LIN bus. The power modules read operating

values supplied from the AFS control module and control the output drivers for the stepper motor actuators inside the headlamp assembly.

AFS Operation

The AFS controls the swiveling angle of each projector module using speed and steering angle signals. The angles of each projector module differ to give the correct spread of light, e.g. when turning left, the left hand projector module will have a greater swiveling angle than the right hand projector module.

Initialization Procedure

When the AFS control module receives an ignition on signal, the control module performs the initialization procedure which ensures that the headlamps are correctly aligned on both their vertical and horizontal axes.

The AFS swivel initialization starts less than 1 second after the headlamp leveling initialization is activated to ensure that the headlamps are at or below the 0 degree position in the vertical axis, thus preventing glare to oncoming vehicles. The AFS swivel initialization is completed in less than 2.5 seconds. The LH and RH AFS actuator motors are powered from the 0 degree position to a small movement to the inboard position, then another small movement to the outboard position and then back to the 0 degree position.

Failure Mode

In the event of a failure of the AFS system, a warning indicator in the instrument cluster is illuminated to warn the driver. The AFS warning indicator illuminates when the ignition is in power mode 6 (ignition on) and will flash continuously until the fault is rectified. The AFS warning indicator will also be illuminated if a failure of the steering angle sensor or the vehicle speed signal is detected.

Illumination of the AFS warning indicator does not necessarily mean that there is a fault with the AFS system. The fault may be caused by a failure of another system preventing the AFS system operating correctly.

The AFS control module performs a diagnostic routine every time AFS is requested. If any fault is found, the AFS control module will suspend the operation of the AFS function.

If the AFS leveling system has failed with the xenon projector module in a position other than the correct straight ahead position, the AFS control module will attempt to drive the projector module to a position a small amount lower than the standard position. If the swivel function has failed, the AFS control module will lower the projector module using the leveling actuator motors to a position much lower than standard to prevent excess glare to oncoming vehicles.

The AFS control module software can detect an internal failure of the control module control circuits. The control module will power the projector modules to the zero position and prevent further operation.

Faults can be investigated by interrogating the AFS control module using the Land Rover recommended diagnostic tool to check for fault codes.

HEADLAMP DELAY

The CJB controls a headlamp delay function which illuminates the driveway after leaving the vehicle. The headlamp delay will operate on low beam headlamps only regardless of the position of the LH steering column multifunction switch.

The headlamp delay is activated when the lighting control switch is in one of the 3 exit delay positions and the engine is switched off. The message center displays a 'HEADLIGHT DELAY' message and the low beam headlamps will be activated for a period of approximately 30, 60 or 120 seconds. After the delay period, the CJB automatically switches off the delay function, extinguishing the headlamps.

The headlamp delay feature can also be switched on when approaching the vehicle or switched off by pressing the headlamp button on the smart key.

AUTOMATIC HEADLAMP OPERATION

The automatic headlamp function is a driver assistance system. The driver can override the system operation by selection of side lamp or headlamp on if the ambient light conditions require front and rear lighting to be active. The automatic headlamp system uses a light sensor and the CJB, which are connected via a LIN bus to control the headlamp functionality. The light sensor is incorporated in the rain/light sensor located on the inside of the windshield, below the rear view mirror. The wiper system also uses the rain/light sensor for automatic wiper operation.

The light sensor measures the ambient light around the vehicle in a vertical direction and also the angular light level from the front of the vehicle. The rain/light sensor uses vehicle speed signals, wiper switch position and the park position of the front wipers to control the system. The automatic headlamp operation uses ambient light levels which are monitored by photodiode incorporated in the rain/light sensor. The rain/light sensor sends a lights on/off request to the CJB on the LIN bus, which responds by switching on the low beam headlamps, front side lamps and rear tail lamps. The automatic headlamps are activated under the following conditions:

- Twilight
- Darkness
- Rain
- Snow
- Tunnels
- Underground or multistoried car parks.

Operation of the automatic headlamps requires the ignition to be in ignition mode 6, the lighting control switch to be in the 'AUTO' position and a lights on request signal from the light sensor. If the rain sensor signal activates the fast speed wipers,

the low beam headlamps are activated, providing the lighting control switch is in the 'AUTO' position.

If the automatic headlamp function has been selected and the ambient light falls below a pre-defined level then the rear fog lamps can be manually activated. If the ambient light rises above that level then the fog lamps will be deactivated along with the rest of the lamps. If the ambient light then falls below this level again the lamps will be automatically activated, but the rear fog lamps, which were previously manually selected, will not.

AUTO HIGH BEAM (AHB)

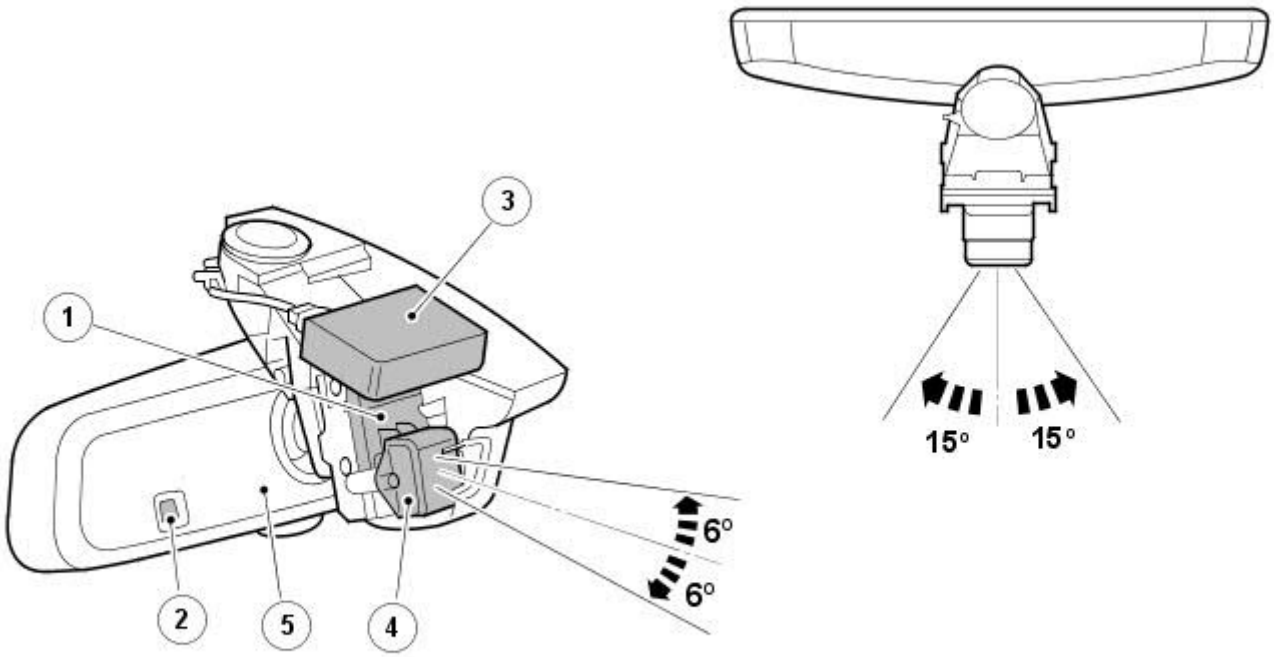
The automatic headlamp system has an additional feature called Auto High Beam (AHB). AHB is an automatic driving aid that relieves the driver of having to switch the high beam lighting on and off.

The AHB functions by employing a light sensor and a camera (image) sensor which together monitor ambient light levels, oncoming vehicle headlamps and preceding vehicle tail lamps. The rain/light sensor (integrated unit) and the camera (image) sensor are located in the interior mirror mounting behind an aperture and looking forwards through the windscreen. If required the system can be overridden.

CAUTION: The high beam assist system is designed as a driving aid only. Should the road conditions require, it is the driver's responsibility to consider other road users and operate the high beam headlamps in a safe manner. In certain circumstances the driver will be required to intervene.

The AHB system is controlled by an AHB control module, which is located in the interior rear view mirror body, and by CJB. The module and the CJB are connected via the medium speed CAN bus.

Auto High Beam Interior Mirror



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Item	Description
1	Rear view mirror calibration bracket
2	Ambient light sensor (HBA)
3	Rain/light sensor (Auto headlamps)
4	Image sensor
5	AHB control module (inside mirror body)

High Beam Assist Warning Indicator

E117699

The warning indicator for the AHB system is green and illuminates if the high beam is activated by the AHB system. The blue high beam warning indicator will also illuminate.

NOTE: The function of the normal 'blue' high beam warning indicator remains unchanged and it always reflects the actual status of the high beam lamps

Auto High Beam Operation

The AHB operates as part of the automatic headlight system. When driving at night with the lighting control switch in the automatic position and the LH steering column multifunction switch in the central position, with sufficient darkness (approximately 1 lux or less) and a suitable road speed, the AHB will automatically operate the high beam lighting when necessary. A warning symbol in the instrument cluster confirms to the driver when the AHB system is selected and enabled.

NOTE: The exterior lighting 'on' threshold for the auto headlamps system is approximately 100 lux which is measured by the rain/light sensor. At light levels below this value the low beam headlamps and exterior lights will be switched on. The AHB will not function until the light level has reached approximately 1 lux. At light levels above 1 lux high beam is not required and therefore is not activated.

Activation (System Ready)

AHB will only activate and illuminate the warning indicator to show system is ready or 'primed' for high beam control, when the following conditions are met:

- AHB has been first 'enabled' via the instrument cluster menu
- Lighting control switch is in the 'Auto' position
- LH steering column multifunction switch in the central position
- The ambient light level is below 100 lux – refer to 'Light Levels' section that follows
- The system has not been overridden or cancelled – refer to 'Override' section that follows
- The camera (image) sensor view is not blocked.

High Beam Control

When activated, AHB will switch the headlamps to high beam when all the following conditions occur:

- No relevant oncoming traffic
- No relevant preceding traffic
- In non-urban environment, i.e. with no street lighting
- Ambient light level is below 1 lux – refer to 'Light Levels' section that follows
- Road speed is suitable – refer to 'Road Speed' section that follows.

Low Beam Control

When activated, AHB will switch the headlamps to low beam when any of the following conditions occur:

- Relevant Oncoming traffic is present
- Relevant Preceding traffic is present
- In urban environment, i.e. with street lighting
- Ambient light level is above 1 lux – refer to 'Light Levels' section that follows
- Road speed is not suitable – refer to 'Road Speed' section that follows
- Unrecognisable reflective inputs from road signs or markings – refer to 'System Limitations' section that follows.

Light Levels

The exterior lighting 'on' threshold for the normal 'auto headlamps' feature is approximately 100 lux and is measured by the windscreen mounted 'rain/light' sensor. When the light level falls to this value the low beam headlamps and exterior lights will be switched on together with the AHB warning indicator.

This warns the driver that the system is activated and ready to automatically switch on the high beam headlamps when the light level falls a little further to approximately 1 lux, as measured by the 'ambient light sensor' located in the mirror body. High beam is generally not required with light levels above 1 lux.

Road Speed

A road speed signal is received by the CJB from the ABS (anti-lock brake system) module via the high speed CAN bus. When the other activation conditions are correct, the CJB will switch the headlamps to high beam when the road speed has increased above 40 km/h (25 mph).

When the road speed falls to below 24 km/h (15mph), the CJB will switch the headlamps to low beam. The 10 mph (15 km/h) difference between the on and off road speed thresholds prevents the system continually switching between high and low beam at low speeds.

Override

The driver can manually override the AHB system at any time. When the AHB system is activated, pulling the LH steering column multifunction switch to the high beam 'flash' position or pushing it forward to the high beam position will de-activate the system and the AHB warning indicator in the instrument cluster will extinguish.

When the multifunction switch is returned to the central position, from a forward high beam position, the system is re-activated and the AHB warning indicator will illuminate again.

Correct Performance

In addition, AHB will only exhibit best performance if all of the following conditions are met:

- No false inputs are received by the camera (image) sensor, such as reflected light from certain static signs – refer to 'System Limitations' section that follows
- Headlamps are correctly aligned
- The AHB system has been set for correct 'hand of traffic' via the driver menu settings – refer to 'Setting Hand of Traffic' section that follows
- Headlamps have been set for correct 'hand of traffic' via the mechanical tourist lever in headlamp casing – refer to 'Setting Hand of Traffic' section that follows
- Camera (image) sensor has been through a self learning 'auto aim' calibration procedure if any components have been replaced – refer to 'Calibration' section that follows
- There are no large reflective items, white papers, etc., sitting on top of the dash board in near view of the camera (image) sensor, or stickers placed directly in front of the camera (image) sensor

Driver Menu Features

The AHB feature must first be enabled using the configuration menu available in the instrument cluster. However if required, the AHB system can be permanently disabled leaving the basic 'Auto Lamps' system still operative.

Within this menu the system can also be configured for driving on the alternate side of the road (Hand of Traffic). This enables the system to be used in different regions and it's setting is important for correct operation.

Setting 'Hand of Traffic' and Auto High Beam 'Enable'

To set the AHB options the following steps must be sequenced:

- With the ignition in power mode 6 (ignition on), and the engine not running, use the joypad controls on the steering wheel to select on the instrument cluster menu:
  - Menu > Vehicle Set-up > Auto High Beam
- Configure the 'Hand of Traffic' setting by selecting the appropriate 'Drive on Left' (of road) or 'Drive on Right' (of road) to the applicable Market condition
- Enable the feature by setting 'Activate Auto high Beam' if not already selected.

NOTES:

Enabling or disabling high beam assist will not affect the ‘Hand of Traffic’ settings once set.

The headlamps still require manual adjustment using the tourist lever for driving abroad in countries where the alternate side of the road is used.

The instrument cluster menu also includes a 'Auto High Beam Sensitivity' selection. This is a requirement option for NAS market vehicles only but it is not recommended for normal use and has been superseded.

NOTE: In other markets the 'Sensitivity' selection is greyed out and cannot be selected.

Refer to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation).

System Limitations

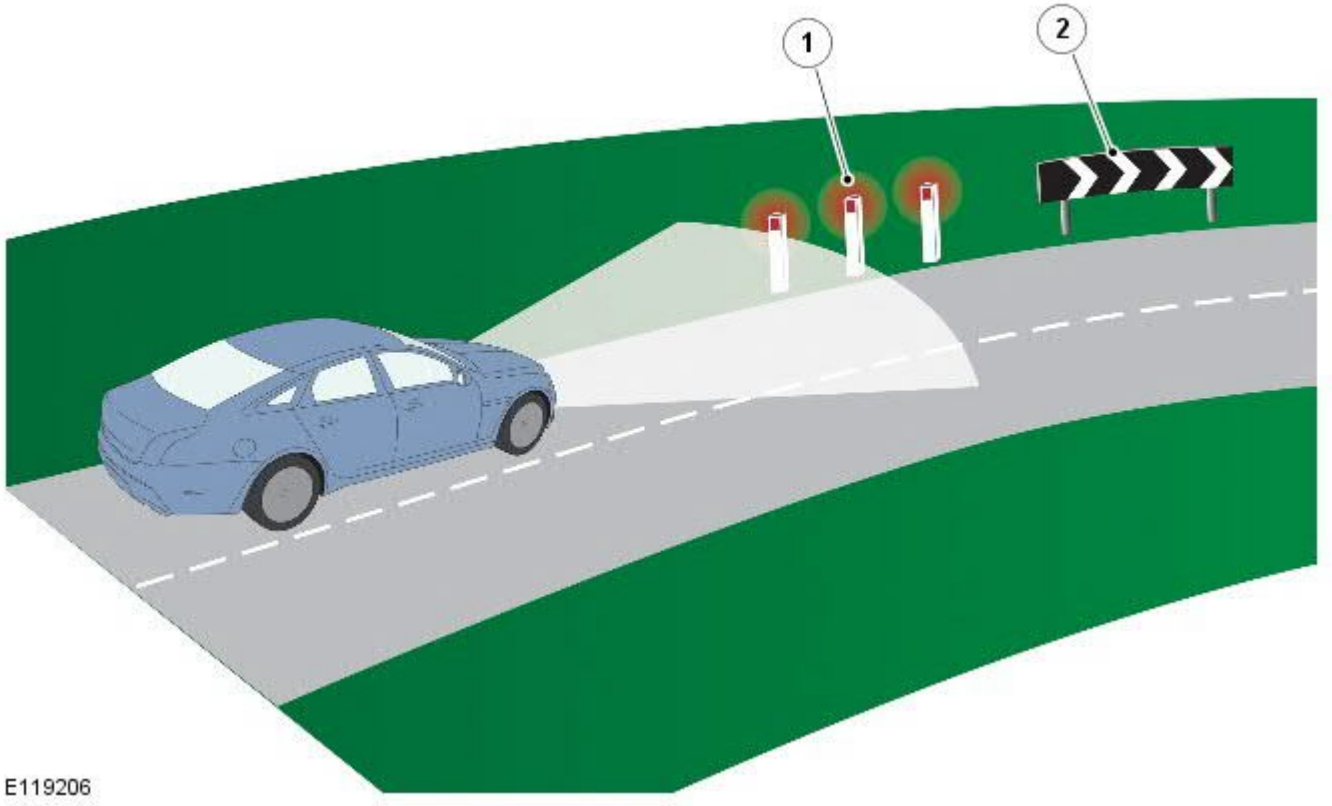
The AHB system can occasionally have difficulty distinguishing between light from other vehicles or reflected light from static highly reflective road signs.

These situations may cause the AHB system to undesirably operate the high beam headlamps or take no action at all. Examples of these situations are as follows:

- Dips, hollows or crests in the road
- Highly reflective static Road signs

- Tight bends
- Poorly illuminated vehicles e.g. cyclists or small mopeds
- Motorway central barriers
- Extreme weather conditions e.g. Fog, heavy snow
- Exterior domestic or industrial lighting

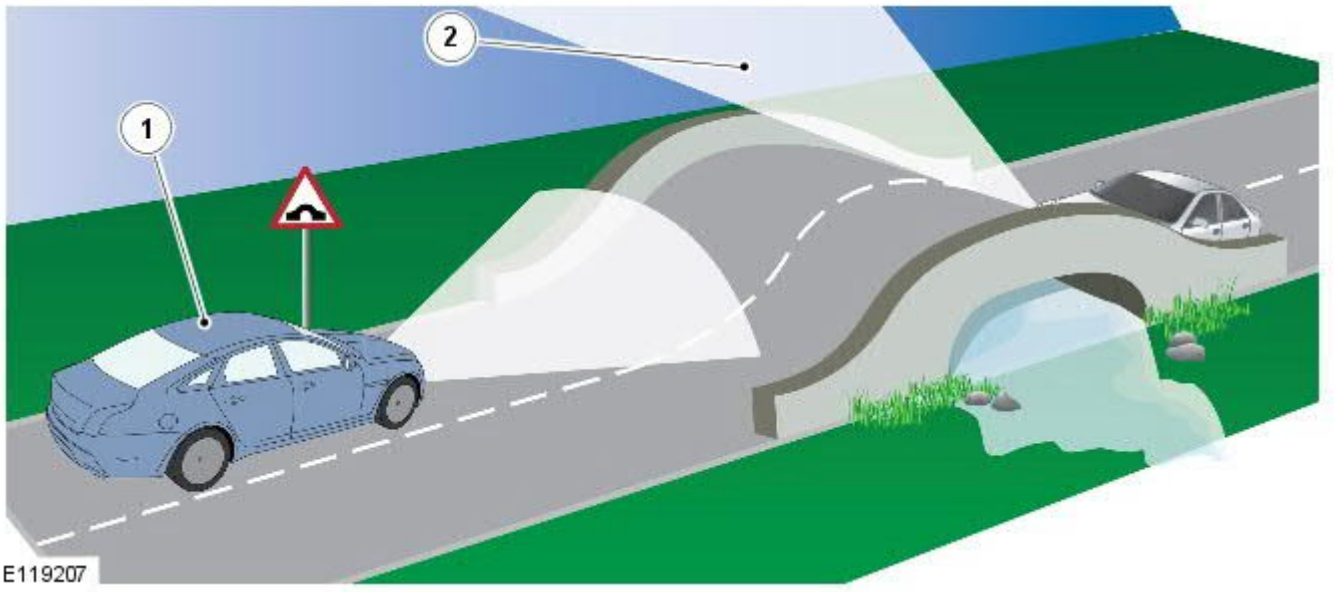
Reflective Static Signs



Item	Description
1	Red reflective signs could be detected as rear tail lamps
2	Large reflective signs could affect the system

There are typical examples when a driver is able to judge if a manual high beam deactivation is necessary before the system operates automatically, for example over the crest of a small bridge. Lights from an oncoming vehicle can be seen on the horizon prior to the camera (image) sensor receiving an input. Although the other road user is approaching the high beam light source, it is not yet affecting the occupants in this situation. Manual override in this instance would be possible although not necessary as the AHB will turn off the high beam lamps upon receiving the input to the camera (image) sensor.

Manual Deactivation



Item	Description
1	Vehicle equipped with auto high beam
2	Oncoming lighting can be seen prior to auto high beam image sensor receiving an input

There are situations when a driver is able to judge if a high beam deactivation is desirable before the AHB system actually operates, for example over a crest of a hill. Headlamps from an oncoming vehicle can sometimes be seen on the horizon prior to the detection sensor receiving an input. It is the driver's preference to determine if early intervention is desired in this and similar situations.

System Diagnosis

NOTE: Windshield stickers, stone chips, dirt and general road film will affect the successful operation of the image sensor if sufficient blocking is present. Avoid placing reflective objects on the instrument panel, for example white paper which can affect the image sensor.

Auto high beam has a self diagnosis capability by comparing data from the ambient light sensor input (located in the rear view mirror) to light levels detected by the image sensor. If a deviation is detected it is assumed that the ambient light available to the image sensor is being restricted by dirt or other blockage and the system will be deactivated. DTC's are stored in the AHB control module's memory and can be accessed using an approved Jaguar diagnostic system. Within the diagnostic system is a procedure to test the basic operation of the camera function.

In the event of a fault, the warning strategy to the driver is as follows:

- Image sensor internal fault - green icon will extinguish with no additional message to driver
- CJB has lost all communication with image sensor - green icon will extinguish with no additional message to driver
- Image sensor blocked - green icon will extinguish with an additional "Camera Blocked" message within the message centre

System Calibration

To achieve effective operation of the AHB system, a calibration routine is performed on vehicle build and system tolerances are set to an accuracy of +/- 0.2 degrees.

This initial calibration is a 'one time only' procedure. Should the AHB components or the windshield require replacement at the dealership, an automatic calibration routine will be performed. This 'auto aim' calibration procedure is a continual process that takes place during a normal drive cycle at night and could take between 10 - 30 minutes dependant on the following driving conditions:

- If sufficient road markings (lane markings) are visible to the image sensor - approximately 10 minutes
- If insufficient road markings are visible, the system uses the tail lights of preceding vehicles - approximately 30 minutes.

NOTES:

Until this calibration is complete the system may not react correctly during operation. This should be made clear to the customer before vehicle handover. During any calibration or rectification work the headlamps should be checked for correct alignment.

Due to mechanical calibration tolerance the correct mirror assembly must be used for the vehicle model types in question

and it is not exchangeable with other vehicle model types.

After any rectification work and before any calibration drives, the headlamps should be checked for correct alignment.

DAYTIME RUNNING LAMPS (DRL)

Refer to DRL section for details.
Refer to: Daytime Running Lamps (DRL) (417-04 Daytime Running Lamps (DRL), Description and Operation).

REAR LAMP ASSEMBLY

The rear lamp assembly is located in the rear quarter panel. The rear lamp assembly is located in a recess in the vehicle body and is secured with 3 studs on the lamp body which are secured to the vehicle body with 3 flanged nuts.

All rear lamps use lamps use LED's with light guides which use internal refraction within the light guide to distribute the light.

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Item	Description
1	Side marker LED
2	Direction indicator LED's

3	Reverse lamp LED's
4	Rear fog lamp LED's
5	Reflector
6	Stop/side lamp LED's
7	Attachment studs (3 off)
8	Electrical connector

Rear Stop and Side Lamp

The side lamps and stop lamps use 36 LED's. The 36 LED's are illuminated at a higher intensity than the side lamp when the stop lamp switch is operated by pressing the brake pedal.

A side marker lamp is fitted to the outer rear lamp assembly and is fitted in all markets. The side marker lamp also uses 4 LED's and are active at all times when the side lamps are selected on.

The stop lamps can also be activated by the adaptive speed control system. A signal from the adaptive speed control module is sent via the high speed CAN bus to the CJB which activates the stop lamps until an off message is received.

Turn Signal Indicator

The turn signal indicator lamp uses 12 amber LED's which illuminate through a clear lens.

Reverse Lamp

The reverse lamp uses 2 LED's which illuminate through a clear lens.

The reverse lamps are activated on receipt of a reverse selected message sent on the medium speed CAN bus to the CJB.

Rear Fog Lamp

The rear fog lamps each use 3 high intensity LED's. The rear fog lamp is activated using a button located on the auxiliary lighting switch in the instrument panel.

LICENCE PLATE LAMPS

Two licence plate lamps are located in the rear bumper. Each lamp can be removed by inserting a wide, flat screwdriver blade or similar tool in a slot between the lamp lens and the finisher and gently levering the lamp from the surround. The 5W bulb is a push fit in a holder which in turn is a press fit in the lamp housing.

HIGH MOUNTED STOP LAMP

The high mounted stop lamp is located at the bottom of the rear windshield. The lamp is secured to a bezel in the parcel shelf with 2 screws.

The high mounted stop lamp uses 12, red colored LED's which illuminate through a clear lens. The high mounted stop lamp functionality is the same as that described for the stop lamps.

TURN SIGNAL INDICATOR SIDE REPEATER LAMPS

The turn signal indicator side repeaters are located in each door mirror. The lamp uses a 5W orange bulb. The lamp unit is secured to the mirror bezel with 2 screws and is connected to the mirror wiring harness with a 2 pin connector.

The side repeaters have the same functionality and operate in conjunction with the front and rear turn signal indicators and the hazard warning flashers.

HAZARD FLASHERS

The hazard flashers are activated by a non-latching switch located in the switch pack located in the center of the instrument panel. The hazard flashers operate at all times when selected and operate independent of the ignition mode.

When the hazard flashers are selected on by the driver, a ground path is momentarily completed to the CJB which activates the front and rear and side repeater turn signal indicators. A second press of the switch is sensed by the CJB and the hazard flasher are deactivated. When the hazard flashers are active, they override any request for turn signal indicator operation.

The hazard flashers can also be activated by a crash signal from the RCM.
Refer to: Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) (501-20B Supplemental Restraint System, Description and Operation).

Published: 11-May-2011

Exterior Lighting - Headlamps

Diagnosis and Testing

Principle of Operation

For a detailed description of the headlamps system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (417-01 Exterior Lighting)

Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation).

Safety Information

WARNING: The xenon headlamp system generates up to 28,000 volts. Make sure that the headlamps are switched off before working on the system. Failure to follow this instruction may result in personal injury.

The following safety precautions must be followed when working on the xenon headlamp system:

1. DO NOT attempt any procedures on the xenon headlamps when the lights are switched on.
2. Handling of the xenon bulb must be performed using suitable protective equipment, e.g. gloves and goggles. The glass part of the bulb must not be touched.
3. Xenon bulbs must be disposed of as hazardous waste.
4. Only operate the lamp in a mounted condition in the reflector.

There are comprehensive instructions on the correct procedures for xenon headlamp system repairs in the manual, refer to section 100-00 - General Information, Standard Workshop Procedures of the workshop manual.

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

1. Verify the customer concern.
   - Note that intermittent fault reports may be due to the cycling operation of the Field Effect Transistors (FETs)
2. Visually inspect for obvious mechanical or electrical faults.

Visual Inspection

Mechanical	Electrical
• Headlamp(s) condition and installation • Bulb(s) and installation • Bulb holder(s) and installation • Lighting control switch and installation • Left-hand steering column multifunction switch and installation	• Fuses • Relays • Wiring harness • Loose or corroded connector(s) • Battery Junction Box (BJB) • Central Junction Box (CJB) • Adaptive Front Lighting System (AFS) module • Headlamp power modules • Instrument Panel Cluster (IPC) • Steering Angle Sensor Module (SASM) • Transmission Control Module (TCM) • Engine Control Module (ECM) • Anti-lock Brake System (ABS) control module • Air Suspension Control module • Local Interconnect Network (LIN) circuits • Controller Area Network (CAN) circuits

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Low beam lamp(s) inoperative	• Bulb failure	Check the bulb and fuse condition. Check the headlamp circuits. Check the lighting control switch function. Check the left-hand steering column

Symptom	Possible Cause	Action
High beam lamp(s) inoperative	• Fuse(s) blown • Circuit fault • Lighting control switch fault • Left-hand steering column multifunction switch fault	multifunction switch operation. Refer to the electrical guides. Check for DTCs indicating a headlamp or related circuit fault.
Low beam lamp(s) dim High beam lamp(s) dim	• Incorrect bulb rating • Tourist lever set in the wrong position • Circuit fault • Lighting control switch fault • Left-hand steering column multifunction switch fault	Check the bulb condition and rating. Check the tourist lever is set correctly. Check the headlamp circuits. Check the lighting control switch function. Check the left-hand steering column multifunction switch function. Refer to the electrical guides.
Low beam lamp(s) stuck on High beam lamp(s) stuck on	• Circuit fault • Lighting control switch fault • Left-hand steering column multifunction switch fault • Headlamp timer function fault	Check the headlamp circuits. Check the lighting control switch function. Check the left-hand steering column multifunction switch operation. Check the headlamp timer function. Refer to the electrical guides. Check for DTCs indicating a headlamp circuit fault.
Headlamp low/high beam switching function inoperative	• Circuit fault • Left-hand steering column multifunction switch fault • Xenon lamp shutter mechanism fault	Check the headlamp circuits. Check the left-hand steering column multifunction switch operation. Check the xenon lamp shutter mechanism operation. Refer to the electrical guides. Check for DTCs indicating a headlamp circuit fault.
Warning lamp(s) inoperative	• Fuse(s) blown • Lighting control switch fault • Left-hand steering column multifunction switch inoperative • Circuit fault • Instrument cluster fault	Check the fuse(s). Check the lighting control switch function. Check the left-hand steering column multifunction switch function. Check the warning lamp circuits. Refer to the electrical guides. Check for DTCs indicating an instrument cluster or CAN system fault.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Headlamp Control Module (HCM) (100-00 General Information, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - DTC: Headlamp Control Module B (HCMB) (100-00 General Information, Description and Operation).

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Exterior Lighting - Autolamps

Diagnosis and Testing

Principles of Operation

For a detailed description of the autolamps system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (417-01 Exterior Lighting)

Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Lighting control switch and installation • Rain/Light sensor condition and installation • Wiper control switch and installation	• Fuses • Relays • Wiring harness • Loose or corroded connector(s) • Battery Junction Box (BJB) • Central Junction Box (CJB) • Rain/Light sensor control module • Local Interconnect Network (LIN) circuits • Controller Area Network (CAN) circuits

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Side and headlamp(s) inoperative when the automatic headlamp switch option is selected	• Fuse(s) blown • Lighting control switch fault • Wiper control switch fault • Circuit fault • Rain/Light sensor fault • LIN circuit fault	Check the fuse(s). Check the lighting and wiper control switch functions. Check the automatic headlamp circuit. Refer to the electrical guides. Check for DTCs indicating a rain/light sensor or LIN system fault.
Automatic headlamp switch illumination inoperative	• Fuse(s) blown • Lighting control switch fault • Circuit fault • Automatic headlamp relay fault	Check the fuse(s). Check the lighting control switch function. Check the automatic headlamp relay circuit. Refer to the electrical guides. Check for DTCs indicating an automatic headlamp fault.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Headlamp Control Module B (HCMB) (100-00 General Information, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - DTC: Headlamp Control Module (HCM) (100-00 General Information, Description and Operation).

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Exterior Lighting - Stoplamps

Diagnosis and Testing

Principle of Operation

For a detailed description of the stoplamps system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (417-01 Exterior Lighting)

Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTE: The stoplamps will be activated automatically under certain conditions when the ride and handling optimization function is used.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Stoplamp condition and installation • Bulbs and installation • Bulb holders and installation • Stoplamp switch condition and installation	• Fuses • Wiring harness • Loose or corroded connector(s) • Hill descent relay • Battery Junction Box (BJB) • Central Junction Box (CJB) • Anti-lock Braking Control module (ABS) • Controller Area Network (CAN) circuits

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Stoplamp(s) inoperative	• Bulb failure • LED lamp failure • Fuse(s) blown • Circuit fault • Stoplamp switch fault	Check the bulb, LED lamp and fuse condition. Check the stoplamp circuits. Check the stoplamp switch function. Refer to the electrical guides. Check for DTCs indicating a stoplamp circuit fault.
Stoplamp(s) dim	• Incorrect bulb rating • Circuit fault	Check the bulb condition and rating. Check the stoplamp circuits. Refer to the electrical guides.
Stoplamp(s) stuck on	• Stoplamp switch fault • Circuit fault • Hill descent relay circuit fault	Check the stoplamp switch function. Check the stoplamp circuits. Refer to the electrical guides. Check for DTCs indicating a stoplamp circuit fault.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Central Junction Box (BCM) (100-00 General Information, Description and Operation).

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Exterior Lighting - Turn Signal and Hazard Lamps

Diagnosis and Testing

Principle of Operation

For a detailed description of the turn signal and hazard lamps system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (417-01 Exterior Lighting)

Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

1. Verify the customer concern.
    - Note that intermittent fault reports may be due to the cycling operation of the field effect transistors (FETs)
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Turn signal lamp(s) condition and installation • Bulbs and installation • Bulb holders and installation • Lighting control switch and installation • Left-hand steering column multifunction switch and installation • Hazard lamp switch condition and installation	• Fuse(s) • Wiring harness • Loose or corroded connector(s) • Battery Junction Box (BJB) • Central Junction Box (CJB) • Steering angle sensor • Anti-lock Braking Control Module (ABS) • Instrument Panel Cluster (IPC) • Restraints Control Module (RCM) • Controller Area Network (CAN) circuits

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Turn signal/hazard lamp(s) inoperative	• Bulb failure • Fuse(s) blown • Circuit fault • Left-hand steering column multifunction switch fault • Hazard lamp switch fault	Check the bulb and fuse condition. Check the turn signal/hazard lamp circuits. Check the left-hand steering column multifunction switch function. Check the hazard lamp switch function. Refer to the electrical guides. Check for DTCs indicating a turn signal/hazard lamp circuit fault.
Turn signal/hazard lamp(s) dim	• Incorrect bulb rating • Circuit fault • Left-hand steering column multifunction switch fault • Hazard lamp switch fault	Check the bulb condition and rating. Check the turn signal/hazard lamp circuits. Check the left-hand steering column multifunction switch function. Check the hazard lamp switch function. Refer to the electrical guides.
Turn signal/hazard lamp(s) stuck on	• Left-hand steering column multifunction switch fault • Hazard lamp switch fault • Circuit fault	Check the turn signal/hazard lamp circuits. Check the left-hand steering column multifunction switch function. Check the hazard lamp switch function. Refer to the electrical guides. Check for DTCs indicating a turn signal/hazard lamp circuit fault.

Symptom	Possible Cause	Action
Warning lamp(s) inoperative	• Fuse(s) blown • Left-hand steering column multifunction switch inoperative • Hazard lamp switch inoperative • Circuit fault • Instrument cluster fault	Check the fuse(s). Check the left-hand steering column multifunction switch function. Check the hazard lamp switch function. Check the warning lamp circuits. Refer to the electrical guides. Check for DTCs indicating an instrument cluster or CAN system fault.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Central Junction Box (BCM) (100-00 General Information, Description and Operation).

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Exterior Lighting - Turn Signal, Cornering and Hazard Lamps

Diagnosis and Testing

Principle of Operation

For a detailed description of the turn signal, cornering and hazard lamps system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (417-01 Exterior Lighting)

Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTE: When diagnosing cornering/static bending lamp faults note that the operating principle differs slightly when the headlamp system is installed with the Adaptive Front Lighting System (AFS).

1. Verify the customer concern.
   - Note that intermittent fault reports may be due to the cycling operation of the field effect transistors (FETs)
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
• Turn signal lamp(s) condition and installation • Cornering lamp(s) condition and installation • Bulbs and installation • Bulb holders and installation • Lighting control switch and installation • Left-hand steering column multifunction switch and installation • hazard lamp switch condition and installation	• Fuses • Wiring harness • Loose or corroded connector(s) • Battery Junction Box (BJB) • Central Junction Box (CJB) • Steering angle sensor • Anti-lock Braking Control Module (ABS) • Instrument Panel Cluster (IPC) • Adaptive Front Lighting System (AFS) module • Restraints control module • Controller Area Network (CAN) circuits

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Turn signal/hazard lamp(s) inoperative	• Bulb failure • Fuse(s) blown • Circuit fault • Left-hand steering column multifunction switch fault • Hazard lamp switch fault	Check the bulb and fuse condition. Check the turn signal/hazard lamp circuits. Check the left-hand steering column multifunction switch function. Check the hazard lamp switch function. Refer to the electrical guides. Check for DTCs indicating a turn signal/hazard lamp circuit fault.
Turn signal/hazard lamp(s) dim	• Incorrect bulb rating • Circuit fault • Left-hand steering column multifunction switch fault • Hazard lamp switch fault	Check the bulb condition and rating. Check the turn signal/hazard lamp circuits. Check the left-hand steering column multifunction switch function. Check the hazard lamp switch function. Refer to the electrical guides.
Turn signal/hazard lamp(s) stuck on	• Left-hand steering column multifunction switch fault	Check the turn signal/hazard lamp circuits. Check the left-hand steering column multifunction switch function. Check the hazard lamp switch function. Refer to the electrical guides. Check for DTCs indicating a turn signal/hazard lamp circuit fault.

Symptom	Possible Cause	Action
	• Hazard lamp switch fault • Circuit fault	
Warning lamp(s) inoperative	• Fuse(s) blown • Left-hand steering column multifunction switch inoperative • Hazard lamp switch inoperative • Circuit fault • Instrument cluster fault	Check the fuse(s) (see visual inspection). Check the left-hand steering column multifunction switch function. Check the hazard lamp switch function. Check the warning lamp circuits. Refer to the electrical guides. Check for DTCs indicating an instrument cluster or CAN system fault.
Cornering lamp(s) inoperative	• Bulb failure • Fuse(s) blown • Circuit fault • Left-hand steering column multifunction switch fault • Lighting control switch fault	Check the bulb and fuse condition. Check cornering lamp circuits. Check the lighting control switch function. Check the left-hand steering column multifunction switch function. Refer to the electrical guides. Check for DTCs indicating a cornering lamp circuit fault.
Cornering lamp(s) dim	• Incorrect bulb rating • Circuit fault • Left-hand steering column multifunction switch fault • Lighting control switch fault	Check the bulb condition and rating. Check the cornering lamp circuits. Check the left-hand steering column multifunction switch function. Check the lighting control switch function. Refer to the electrical guides.
Cornering lamp(s) stuck on	• Left-hand steering column multifunction switch fault • Lighting control switch fault • Circuit fault	Check the cornering lamp circuits. Check the left-hand steering column multifunction switch function. Check the lighting control switch function. Refer to the electrical guides. Check for DTCs indicating a cornering lamp circuit fault.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Central Junction Box (BCM) (100-00 General Information, Description and Operation).

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Exterior Lighting - Parking, Rear and License Plate Lamps

Diagnosis and Testing

Principle of Operation

For a detailed description of the parking, rear and license plate lamps system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (417-01 Exterior Lighting)

Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Rear lamp(s) condition and installation • License lamp(s) condition and installation • Bulbs and installation • Bulb holders and installation • Lighting control switch and installation • Rain/Light sensor condition and installation	• Fuses • Relays • Wiring harness • Loose or corroded connector(s) • Battery Junction Box (BJB) • Central Junction Box (CJB) • Rain/Light sensor control module • Local Interconnect Network (LIN) circuits • Controller Area Network (CAN) circuits

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Rear/License lamp(s) inoperative	• Bulb failure • Fuse(s) blown • Circuit fault • Lighting control switch fault	Check the bulb and fuse condition. Check the rear/license lamp circuits. Check the lighting control switch function. Refer to the electrical guides. Check for DTCs indicating a rear/license lamp circuit fault.
Rear/License lamp(s) dim	• Incorrect bulb rating • Circuit fault • Lighting control switch fault	Check the bulb condition and rating. Check the rear/license lamp circuits. Check the lighting control switch function. Refer to the electrical guides.
Rear/License lamp(s) stuck on	• Circuit fault • Lighting control switch fault	Check the rear/license lamp circuits. Check the lighting control switch function. Refer to the electrical guides. Check for DTCs indicating a rear/license lamp circuit fault.
Rear/License lamp(s) inoperative when the automatic headlamp switch option is selected	• Fuse(s) blown • Lighting control switch fault • Circuit fault • Rain/Light sensor fault • LIN circuit fault	Check the fuse(s). Check the lighting control switch function. Check the automatic headlamp circuit. Refer to the electrical guides. Check for DTCs indicating a rain/light sensor or LIN system fault.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Central Junction Box (BCM) (100-00 General Information, Description and Operation).

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Exterior Lighting - Fog Lamps

Diagnosis and Testing

Principle of Operation

For a detailed description of the fog lamps system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (417-01 Exterior Lighting)

Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Rear fog lamp condition and installation • Bulb holder and installation • Bulb and installation • Fog lamp switch condition and installation	• Fuses • Wiring harness • Loose or corroded connector(s) • Fog lamp relay • Fog lamp warning indicator • Fog lamp switch • Battery Junction Box (BJB) • Central Junction Box (CJB)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Fog lamp inoperative	• Bulb failure • Fuse(s) blown • Circuit fault • Switch inoperative	Check the bulb condition. Check the fuse(s). Check the fog lamp circuits. Check the switch function. Refer to the electrical guides.
Fog lamp dim	• Incorrect bulb rating • Circuit fault • Switch fault	Check the bulb condition and rating. Check the fog lamp circuits. Check the switch function. Refer to the electrical guides.
Warning lamp inoperative	• Fuse(s) blown • Switch inoperative • Circuit fault • Instrument cluster fault	Check the fuse(s). Check the switch function. Check the warning lamp circuits. Refer to the electrical guides. Check for DTCs indicating an instrument cluster fault.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Central Junction Box (BCM) (100-00 General Information, Description and Operation).

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Exterior Lighting - Driving Lamps

Diagnosis and Testing

Principle of Operation

For a detailed description of the driving lamps system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (417-01 Exterior Lighting)

Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Front driving lamp condition and installation • Bulb and installation • Bulb holder and installation • Adjuster screw • Driving lamp switch condition and installation	• Fuses • Wiring harness • Loose or corroded connector(s) • Driving lamp relay • Driving lamp warning indicator • Driving lamp switch • Battery Junction Box (BJB) • Central Junction Box (CJB)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Driving lamp inoperative	• Bulb failure • Fuse(s) blown • Circuit fault • Switch inoperative	Check the bulb condition. Check the fuse(s). Check the driving lamp circuits. Check the switch function. Refer to the electrical guides.
Driving lamp dim	• Incorrect bulb rating • Circuit fault • Switch fault	Check the bulb condition and rating. Check the driving lamp circuits. Check the switch function. Refer to the electrical guides.
Driving lamp lighting coverage poor	• Driving lamp alignment incorrect	Check and adjust driving lamp alignment.
Warning lamp inoperative	• Fuse(s) blown • Switch inoperative • Circuit fault • Instrument panel cluster fault	Check the fuse(s). Check the switch function. Check the warning lamp circuits. Refer to the electrical guides. Check for DTCs indicating an instrument cluster fault.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Central Junction Box (BCM) (100-00 General Information, Description and Operation).

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Exterior Lighting - Reversing Lamps

Diagnosis and Testing

Principle of Operation

For a detailed description of the reversing lamps system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (417-01 Exterior Lighting)

Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Reversing lamp condition and installation • Bulb and installation • Bulb holder and installation	• Fuses • Wiring harness • Loose or corroded connector(s) • Reversing lamp relay • Battery Junction Box (BJB) • Central Junction Box (CJB) • Transmission Control Module (TCM) • Controller Area Network (CAN) circuits

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Reversing lamp(s) inoperative	• Bulb failure • Fuse(s) blown • Circuit fault • Missing reversing switch signal	Check the bulb and fuse condition. Check the reversing lamp circuits. Refer to the electrical guides. Check for DTCs indicating a reversing lamp circuit fault.
Reversing lamp(s) dim	• Incorrect bulb rating • Circuit fault	Check the bulb condition and rating. Check the reversing lamp circuits. Refer to the electrical guides.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Central Junction Box (BCM) (100-00 General Information, Description and Operation).

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Exterior Lighting - Trailer Lamps

Diagnosis and Testing

Principle of Operation

For a detailed description of the trailer lamps system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (417-01 Exterior Lighting)

Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:

Prior to carrying out fault diagnosis of the trailer lamp system, verify the operation of the towing vehicle lighting system with the trailer lighting plug(s) disconnected from the vehicle socket(s).

Intermittent fault reports may be due to the cycling operation of the Field Effect Transistors (FETs).

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Trailer lamp(s) condition and installation • Bulbs and installation • Bulb holders and installation • Trailer socket(s), plug(s) and installation	• Fuses • Relays • Stop lamp switch • Wiring harness • Loose or corroded connector(s) • Trailer socket(s) ground circuit(s) • Battery Junction Box (BJB) • Central Junction Box (CJB) • Trailer fuse box • Trailer relay box • Instrument Panel Cluster (IPC) • Controller Area Network (CAN) circuits

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Trailer brake lamp(s) inoperative	• Bulb failure • Fuse(s) blown • Circuit fault • Brake lamp switch fault	Check the bulb and fuse condition. Check the trailer brake lamp circuit. Check the brake lamp switch function. Refer to the electrical guides.
Trailer brake lamp(s) dim	• Incorrect bulb rating • Circuit fault • Brake lamp switch fault	Check the bulb condition and rating. Check the trailer brake lamp circuit. Check the brake lamp switch function. Refer to the electrical guides.
Trailer brake lamp(s) stuck on	• Circuit fault • Brake lamp switch fault	Check the trailer brake lamp circuits. Check the brake lamp switch function. Refer to the electrical guides.

Symptom	Possible Cause	Action
Trailer fog lamp(s) inoperative	• Bulb failure • Fuse(s) blown • Circuit fault	Check the bulb and fuse condition. Check the trailer fog lamp circuit. Refer to the electrical guides.
Trailer fog lamp(s) dim	• Incorrect bulb rating • Circuit fault	Check the bulb condition and rating. Check the trailer fog lamp circuit. Refer to the electrical guides.
Trailer fog lamp(s) stuck on	• Circuit fault	Check the trailer fog lamp circuit. Refer to the electrical guides.
Trailer tail and number plate lamp(s) inoperative	• Bulb failure • Fuse(s) blown • Circuit fault • Trailer side lamp relay fault	Check the bulb and fuse condition. Check the trailer tail and number plate lamp circuit. Check the trailer tail and number plate lamp relay function. Refer to the electrical guides.
Trailer tail and number plate lamp(s) dim	• Incorrect bulb rating • Circuit fault • Trailer side lamp relay fault	Check the bulb condition and rating. Check the trailer tail and number plate lamp circuit. Check the trailer side lamp relay function. Refer to the electrical guides.
Trailer tail and number plate lamp(s) stuck on	• Circuit fault • Trailer tail and number plate lamp relay fault	Check the trailer tail and number plate lamp circuit. Check the trailer tail and number plate lamp relay function. Refer to the electrical guides.
Trailer turn signal lamp(s) inoperative	• Bulb failure • Fuse(s) blown • Circuit fault	Check the bulb and fuse condition. Check the trailer turn signal lamp circuit. Refer to the electrical guides.
Trailer turn signal lamp(s) dim	• Incorrect bulb rating • Circuit fault	Check the bulb condition and rating. Check the trailer turn signal lamp circuits. Refer to the electrical guides.
Trailer turn signal lamp(s) stuck on	• Circuit fault	Check the bulb and fuse condition. Check the trailer turn signal lamp circuit. Refer to the electrical guides.
Trailer reverse lamp(s) inoperative	• Bulb failure • Fuse(s) blown • Circuit fault • Trailer reverse lamp relay fault	Check the bulb and fuse condition. Check the trailer reverse lamp circuit. Check the trailer reverse lamp relay function. Refer to the electrical guides.
Trailer reverse lamp(s) dim	• Circuit fault • Trailer reverse lamp relay fault	Check the bulb condition and rating. Check the trailer reverse lamp circuit. Check the trailer reverse lamp relay function. Refer to the electrical guides.
Trailer reverse lamp(s) stuck on	• Circuit fault • Trailer reverse lamp relay fault	Check the trailer reverse lamp circuit. Check the trailer reverse lamp relay function. Refer to the electrical guides.
Warning lamp(s) inoperative	• Fuse(s) blown • Circuit fault • Instrument cluster fault	Check the fuse(s). Check the warning lamp circuit. Refer to the electrical guides. Check for DTCs indicating an instrument cluster or CAN system fault.
Trailer socket battery feed missing	• Fuse(s) blown • Circuit fault	Check the fuse condition. Check the trailer battery feed circuit. Refer to the electrical guides.
Trailer socket ignition feed missing	• Fuse(s) blown • Circuit fault • Trailer socket relay faulty	Check the fuse condition. Check the trailer ignition feed circuit. Check the trailer ignition feed relay operation. Refer to the electrical guides.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Central Junction Box (BCM) (100-00 General Information, Description and Operation).

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Exterior Lighting - Headlamp Leveling

Diagnosis and Testing

Principles of Operation

For a detailed description of the headlamp leveling system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (417-01 Exterior Lighting)

Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation),
Exterior Lighting (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Headlamp leveling motor(s) and linkage(s) condition and installation • Lighting control switch and installation • Left-hand steering column multifunction switch and installation	• Fuses • Wiring harness • Loose or corroded connector(s) • Battery Junction Box (BJB) • Central Junction Box (CJB) • Adaptive Front Lighting System (AFS) module • Headlamp power modules • Engine Control Module (ECM) • Anti-lock Brake System (ABS) control module • Air suspension control module • Local Interconnect Network (LIN) circuits • Controller Area Network (CAN) circuits

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Headlamp leveling system inoperative	• Fuse(s) blown • Leveling motor/linkage fault • Headlamp leveling circuit fault • Air suspension system fault	Check the fuse(s) condition. Check the headlamp leveling motor and linkage condition. Check the headlamp leveling circuit. Refer to the electrical guides. Check for DTCs indicating headlamp leveling circuit and air suspension system fault(s).
Headlamp alignment incorrect		

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Headlamp Control Module (HCM) (100-00 General Information, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - DTC: Headlamp Control Module B (HCMB) (100-00 General Information, Description and Operation).

Published: 16-Apr-2014

Exterior Lighting - Headlamp Adjustment

General Procedures

General Equipment

Headlamp beam setter

Check

CAUTION: Some variation in the illustrations may occur, but the essential information is always correct.

1.
- Make sure to check and adjust the tyre pressures to the correct level.
- Park the vehicle on a horizontally level surface.

2.
- Align the headlamp beam setting equipment to one headlamp.

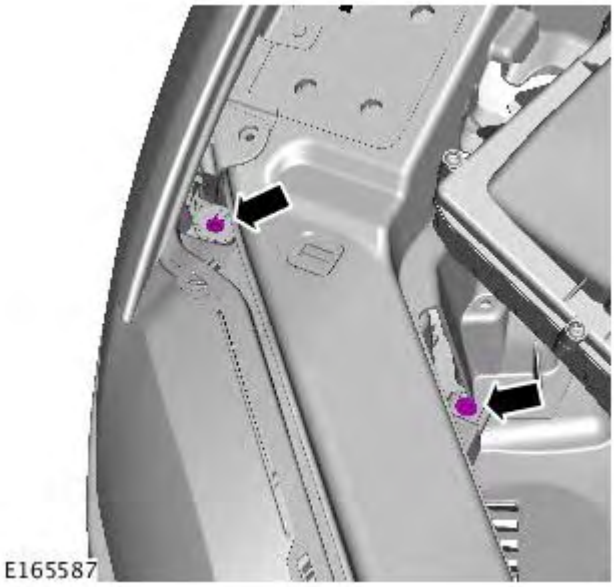
General Equipment: Headlamp beam setter

3. NOTE: The headlamp setting is 1 % below horizontal and parallel.

Check the headlamp beam alignment.

Adjustment

1. Open the hood.



2.
- Adjust the headlamps with an Allen Key.

3.
- To adjust the second headlamp, repeat the above procedure.

Published: 11-May-2011

Exterior Lighting - Headlamp Masking

General Procedures

Adjustment

NOTE: The procedure must be carried out on both sides.

1. NOTE: RH illustration shown, LH is similar.
   - *Torque:*
     Fender Splash Shield 1.5 Nm

Published: 11-May-2011

Exterior Lighting - Approach Lamp

Removal and Installation

Removal

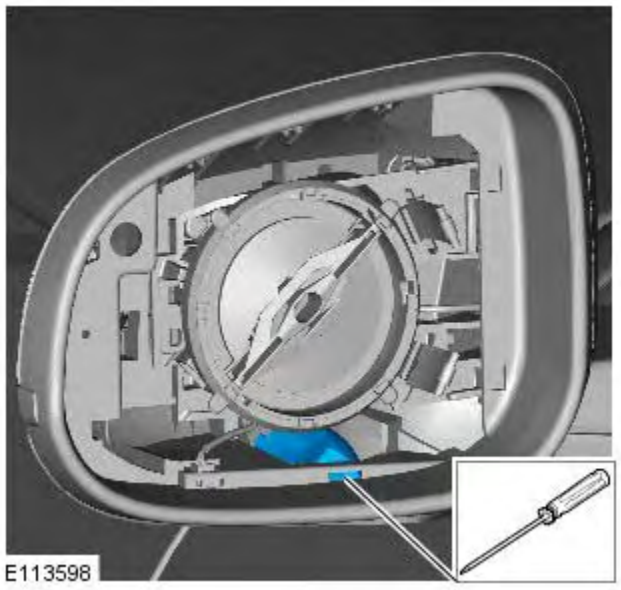
NOTES:

Removal steps in this procedure may contain installation details.

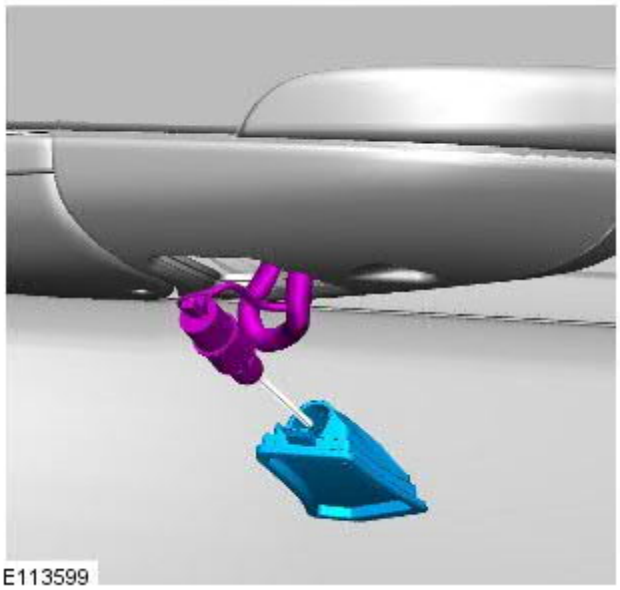
Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Exterior Mirror Glass (501-09 Rear View Mirrors, Removal and Installation).

2.



3.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Exterior Lighting - Headlamp Assembly

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

The ignition must be switched off.

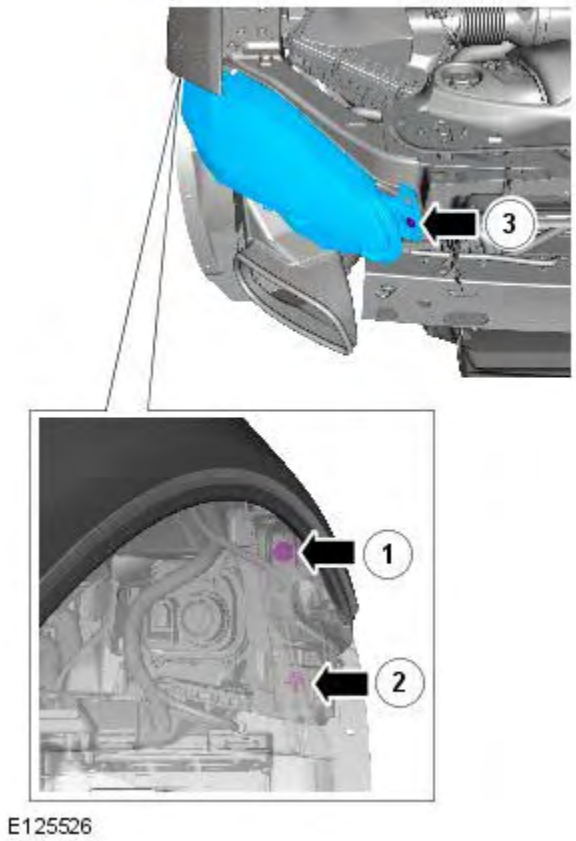
RH illustration shown, LH is similar.

1. WARNING: Make sure to support the vehicle with axle stands.

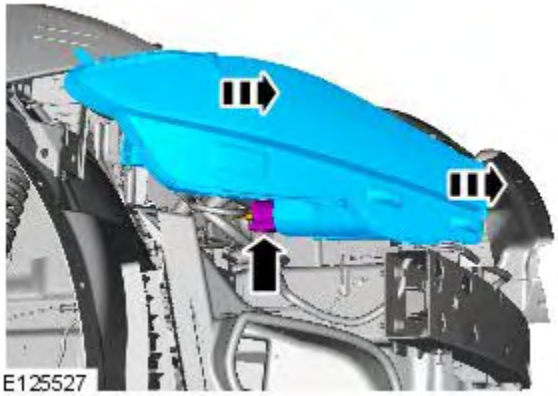
   Raise and support the vehicle.

2. Refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

3.



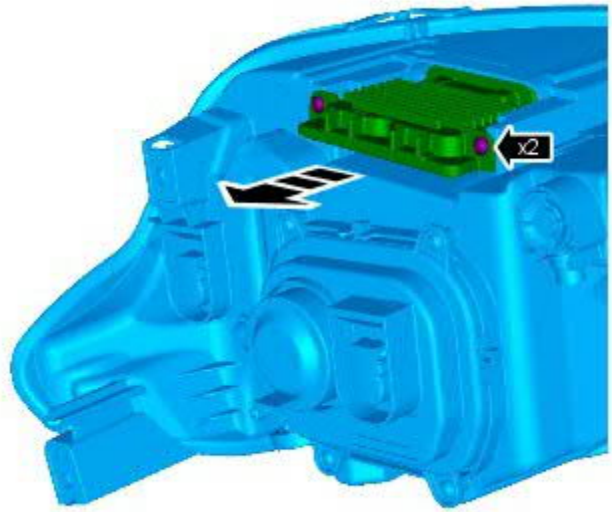
E125526


E125527

4. CAUTIONS:

   Protect the surrounding paintwork to avoid damage.

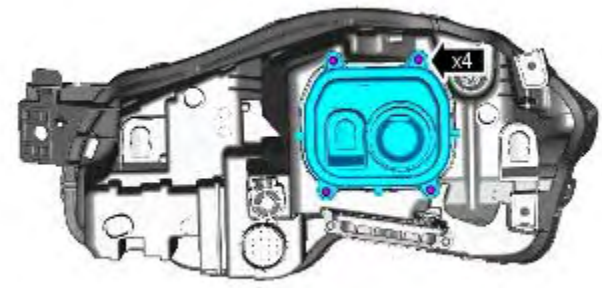
   Protect the surrounding trim to avoid damage.



E125528

5. NOTE: Do not disassemble further if the component is removed for access only.

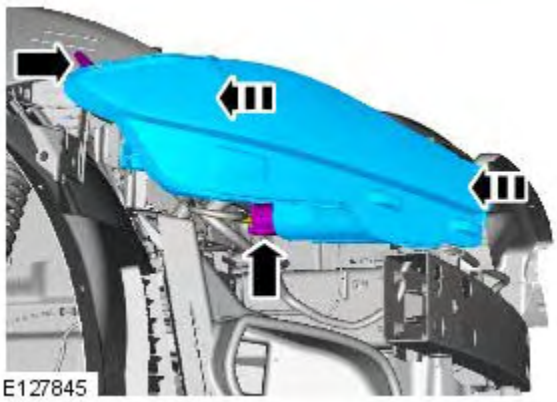
   Torque: 2.5 Nm



E127410

6. *Torque:* 2.5 Nm

Installation

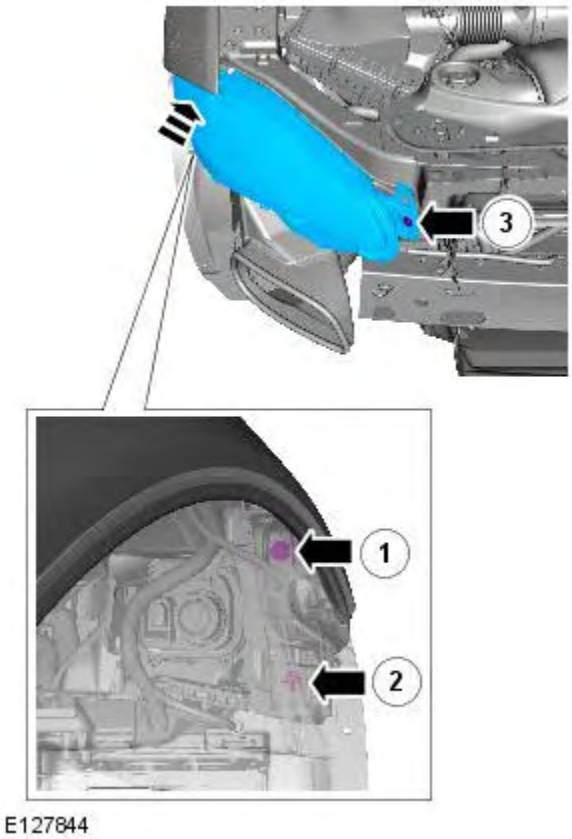

E127845

1. CAUTIONS:

   Protect the surrounding paintwork to avoid damage.

   Protect the surrounding trim to avoid damage.

   Make sure that the component is correctly located on the locating dowels.



E127844

2. NOTES:

   Make sure the headlamp is pressed into and up to the finishing edge of the front fender.

   The gap between the front lamp and the front fender must not exceed 1mm +/- 0.5

   Tighten the bolts in the indicated sequence.

   Torque:
   1 6.2 Nm
   2 6.2 Nm
   3 9 Nm

3. Refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

4. Lower the vehicle.

5. Refer to: Headlamp Adjustment (417-01 Exterior Lighting, General Procedures).

Published: 11-May-2011

Exterior Lighting - Headlamp Bulb

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

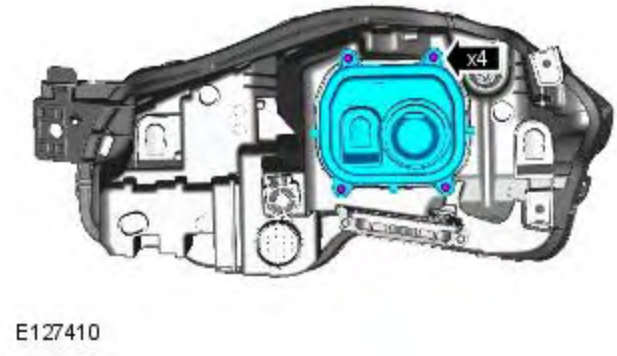
RH illustration shown, LH is similar.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

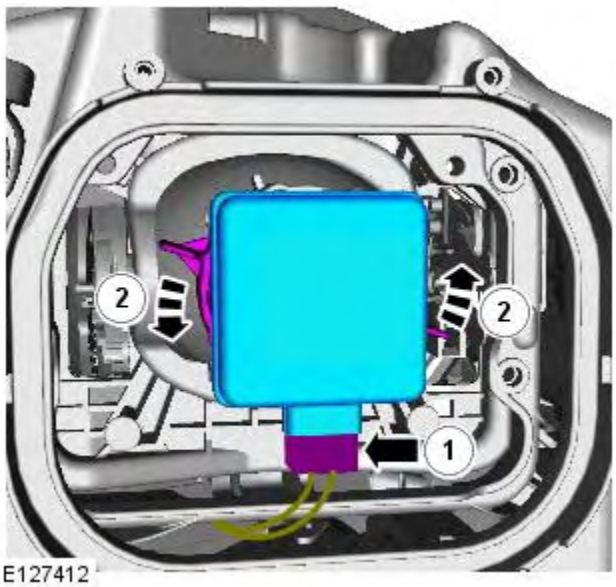
3. Refer to: Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).



E127410

4. NOTE: RH illustration shown, LH is similar.

   Torque: 2.5 Nm



E127412

5. NOTE: RH illustration shown, LH is similar.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Exterior Lighting - Headlamp Leveling Module

Removal and Installation

Removal

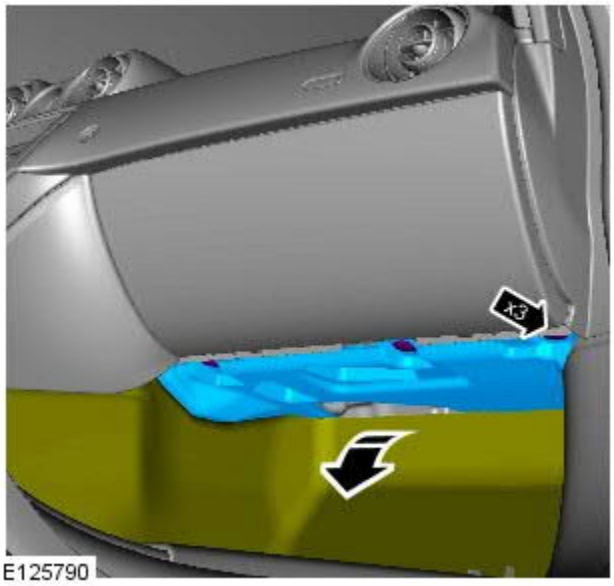
NOTES:

Removal steps in this procedure may contain installation details.

LHD illustration shown, RHD is similar.

Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).



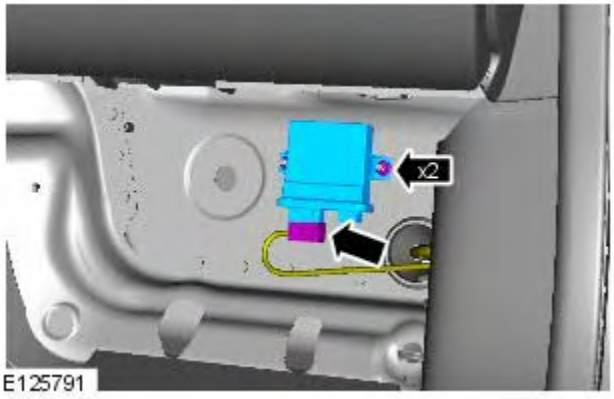
2. CAUTIONS:

   Removal of the clips is a delicate procedure, damage will occur if any force is used.

   Take extra care not to damage the edges of the component.

   Take extra care not to damage the component.

   Take extra care not to damage the clips.



3. *Torque:* 5 Nm

Installation

1. CAUTION: New units must be configured using the Programmable Module Installation Routine in the diagnostic tool.

   To install, reverse the removal procedure.

Published: 11-May-2011

Exterior Lighting - High Mounted Stoplamp

Removal and Installation

Removal

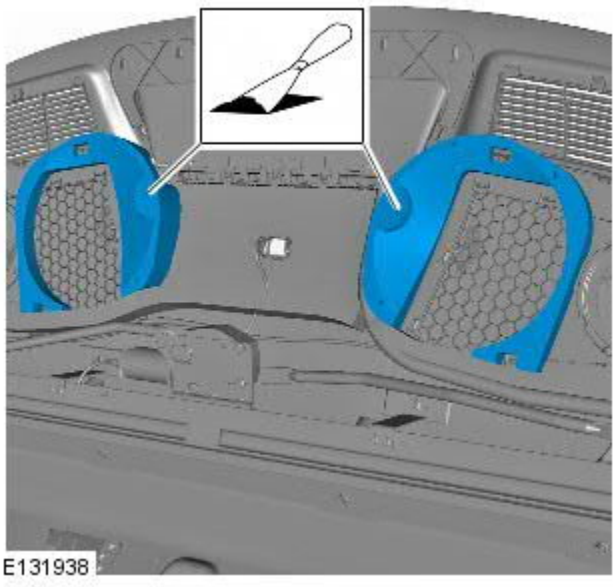
NOTES:

Removal steps in this procedure may contain installation details.

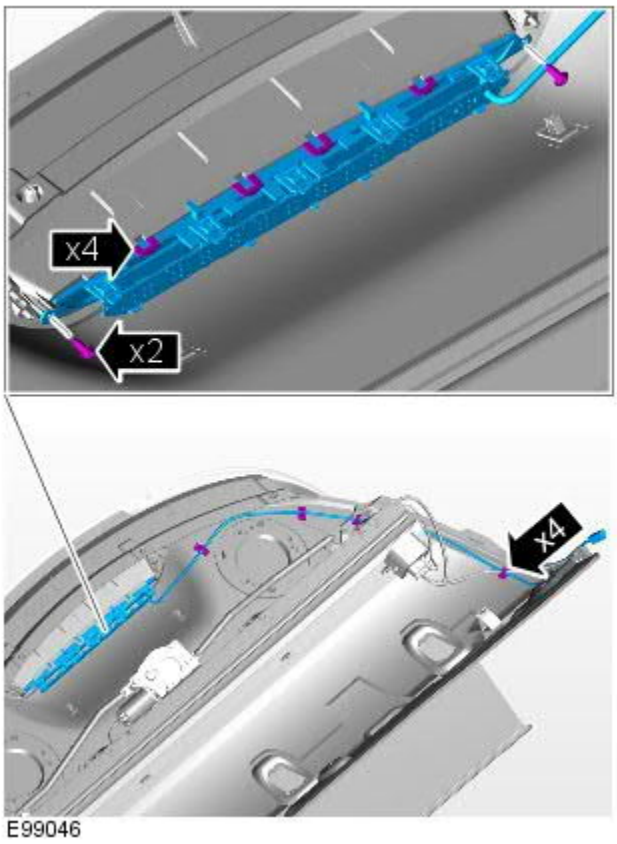
Some variation in the illustrations may occur, but the essential information is always correct.

The ignition must be switched off.

1. Refer to: Parcel Shelf (501-05 Interior Trim and Ornamentation, Removal and Installation).



2. If equipped release the adhesive bond for the subwoofer speaker seals.



E99046

3. CAUTION: Make sure that these components are installed to the noted removal position.

   NOTES:

   Note the fitted position of the component/s prior to removal.

   Make sure that any trim that is accidentally displaced, is installed to it's noted removal position.

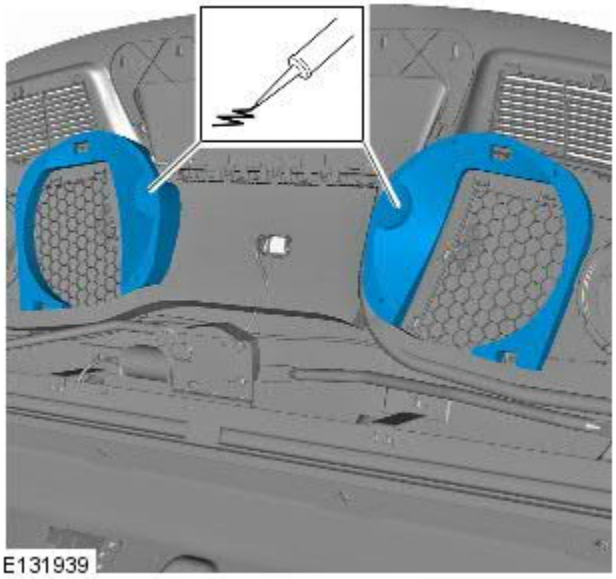
   Torque: 2.5 Nm

E125786

4. CAUTION: Take extra care not to damage the clips.

   NOTE: Do not disassemble further if the component is removed for access only.

Installation


E131939

1.

- To install, reverse the removal procedure.
- Apply a suitable amount of adhesive to one of the mating faces.

Published: 11-May-2011

Exterior Lighting - Rear Lamp Assembly

Removal and Installation

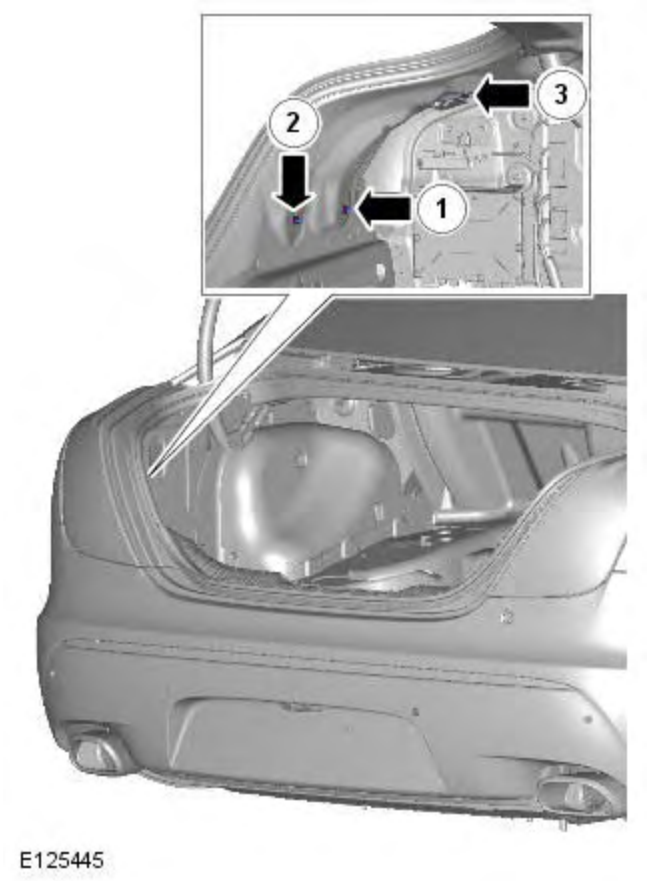
Removal

CAUTION: LH illustration shown, RH is similar.

NOTE: Removal steps in this procedure may contain installation details.

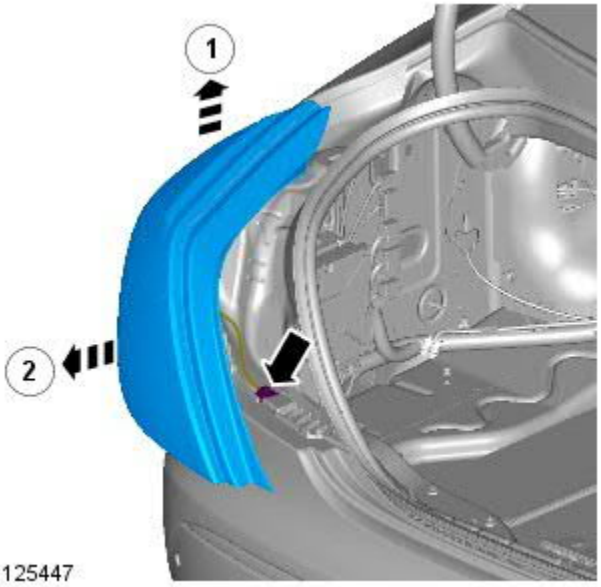
1. Refer to: Loadspace Trim Panel LH (501-05 Interior Trim and Ornamentation, Removal and Installation).

2.



E125445

www.JagDocs.com

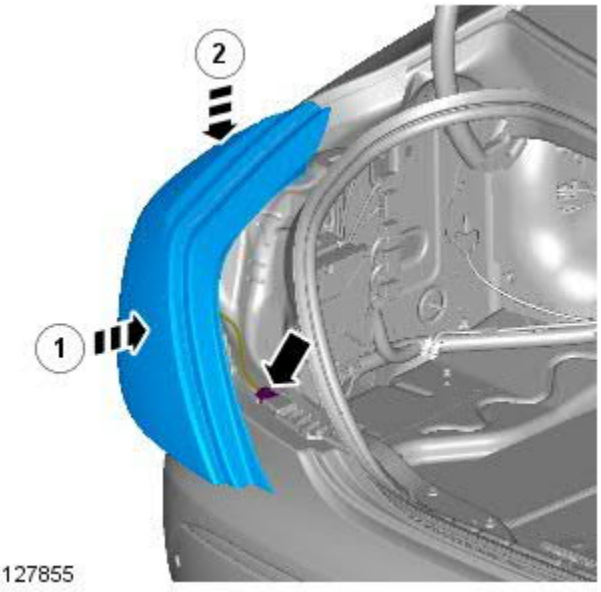


3. CAUTIONS:

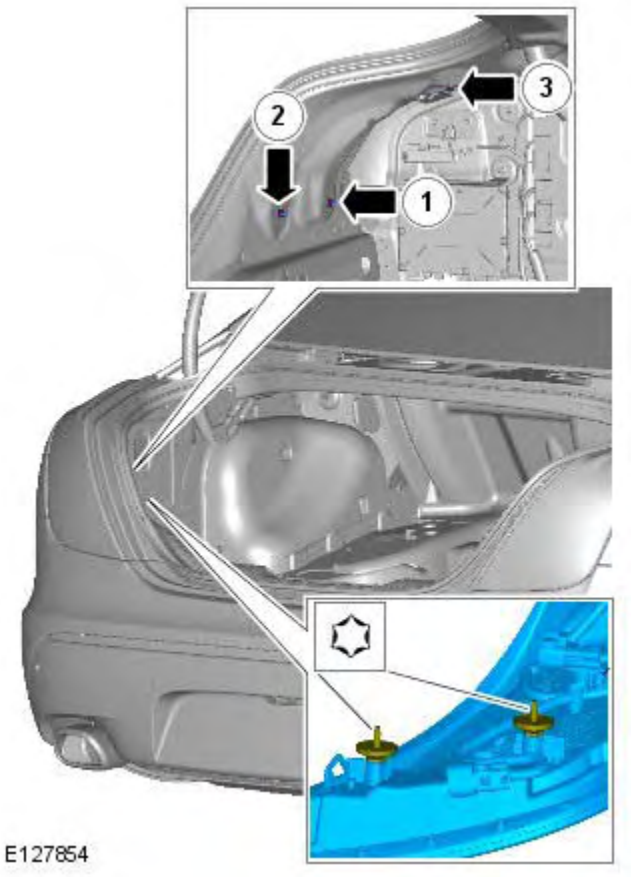
Take extra care not to damage the edges of the component.

Protect the surrounding paintwork to avoid damage.

Installation



1.



2. NOTES:

   Using the 3 adjustment torx studs, make sure that the rear lamp fits flush with all the surrounding bodywork.

   The gap between the rear lamp and the bodywork must not exceed 1 mm.

   Tighten the bolts in the indicated sequence.

   Torque: 3 Nm

3. Refer to: Loadspace Trim Panel LH (501-05 Interior Trim and Ornamentation, Removal and Installation).

Published: 11-May-2011

Exterior Lighting - Side Turn Signal Lamp

Removal and Installation

Removal

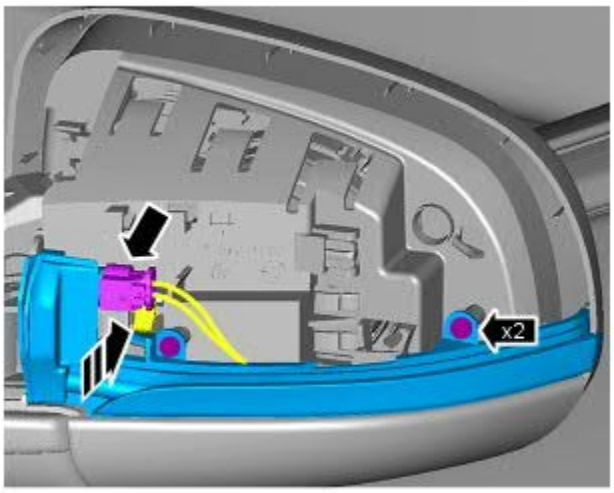
NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

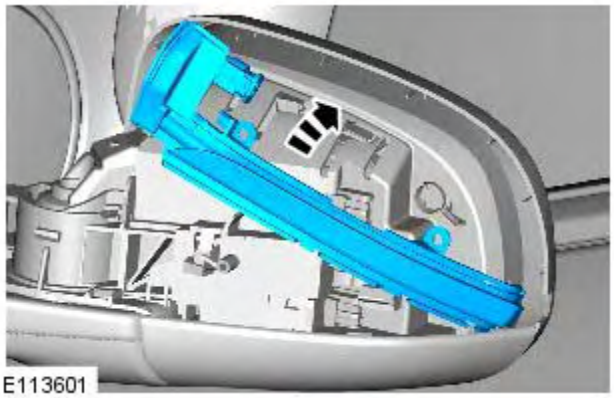
1. Refer to: Exterior Mirror Cover (501-09 Rear View Mirrors, Removal and Installation).

2.



E113600

3.



E113601

Installation

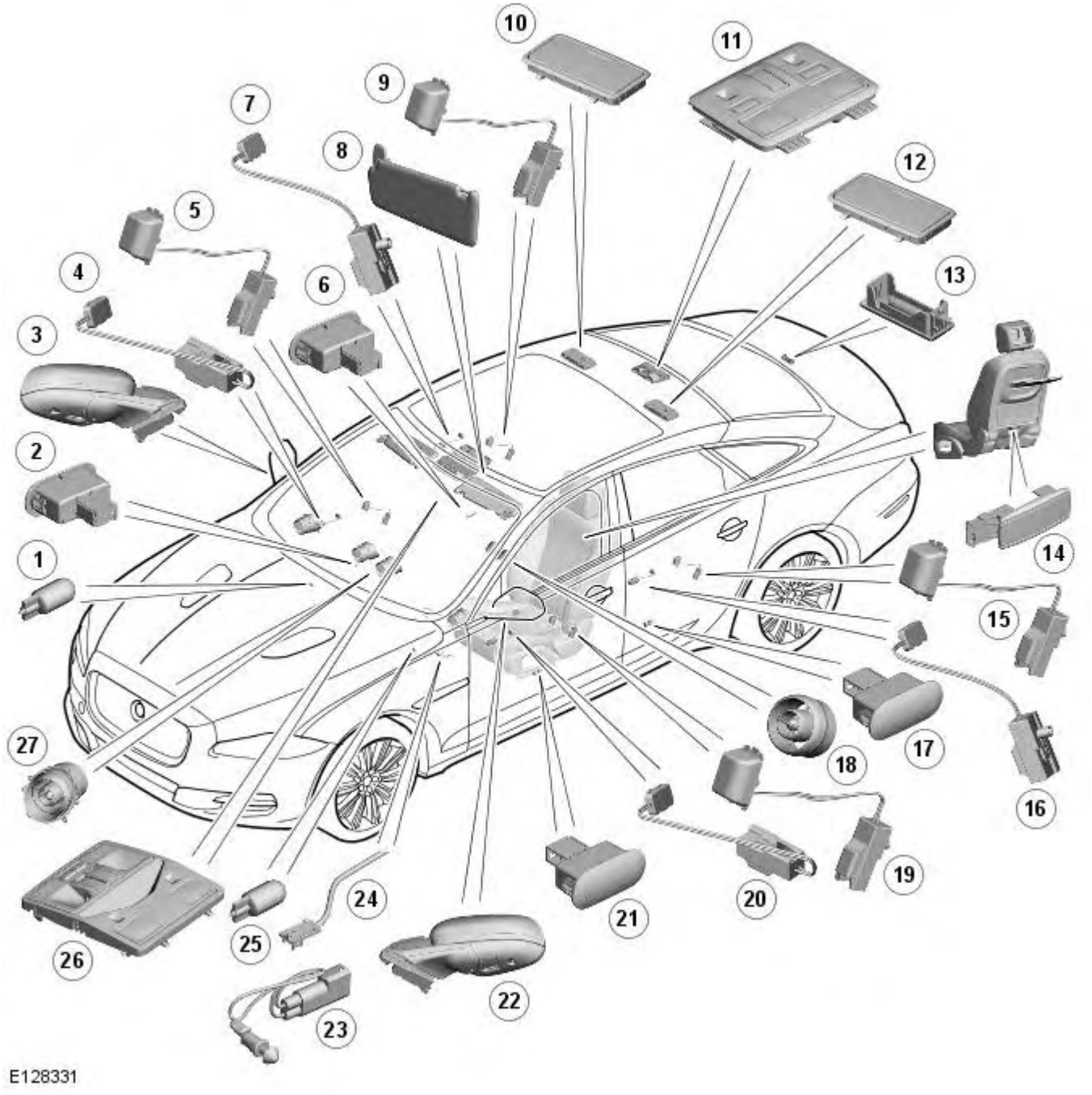
1. To install, reverse the removal procedure.

Published: 11-May-2011

Interior Lighting - Interior Lighting - Component Location

Description and Operation

Component Location



Item	Description
1	Right Hand (RH) front footwell lamp
2	RH front door puddle lamp
3	RH door mirror approach lamp
4	RH front door handle ambient lighting Light Emitting Diode (LED)
5	RH front door pocket ambient lighting LED
6	RH rear door puddle lamp
7	RH rear door handle ambient lighting LED
8	Front vanity mirror (2 off)
9	RH rear door pocket ambient lighting LED

10	RH rear Vanity mirror
11	Rear overhead console
12	Left Hand (LH) rear vanity mirror
13	Luggage compartment lamp
14	Rear footwell lamp (2 off)
15	LH rear door pocket ambient lighting LED
16	LH rear door handle ambient lighting LED
17	LH rear door puddle lamp
18	Rear air vent ambient illumination LED - where fitted (2 off)
19	LH front door pocket ambient lighting LED
20	LH front door handle ambient lighting LED
21	LH front door puddle lamp
22	LH door mirror approach lamp
23	Glovebox lamp switch
24	Glovebox illumination LED
25	LH front footwell lamp
26	Front overhead console
27	Front air vent ambient illumination LED - where fitted (4 off)

Published: 11-May-2011

Interior Lighting - Interior Lighting - Overview

Description and Operation

OVERVIEW

Interior lighting is provided to enable the safe entry and departure from the vehicle for the driver and passengers in low ambient light conditions, without any manual switching of the lights.

NOTE: The term interior lamps also includes the door mirror approach lamps.

The interior lamps are controlled by the CJB (central junction box) and have 2 modes of operation: manual and automatic. The front interior lamps in the front overhead console are operated using the 'JaguarSense' system. The system uses capacitive proximity sensor technology for the switch operation which is integral with the overhead console. The rear overhead console interior lamps have conventional switches.

The interior lighting has 2 modes of operation; automatic and manual.

In automatic mode, the courtesy lamp functionality is controlled by the CJB and reacts to the vehicle being locked or unlocked and opening the vehicle doors.

In the manual mode the interior lamps can be switched on and off with the JaguarSense system and will not illuminate automatically when the vehicle is unlocked or a door is opened.

The driver's and passenger door approach lamps are controlled by the driver's door module and the passenger door module respectively and operate with the automatic mode.

The interior illumination also includes 'ambience' lighting. When the side or headlamps are switched on, phosphor blue LED (light emitting diode)'s illuminate the instrument panel center switch surround, the JaguarDrive rotary control and also illuminate the door handles and door pockets. On high specification vehicles the instrument panel air vents are also illuminated. Two LED's in each of the front and rear overhead consoles provide 'waterfall' lighting to illuminate the interior of the vehicle.

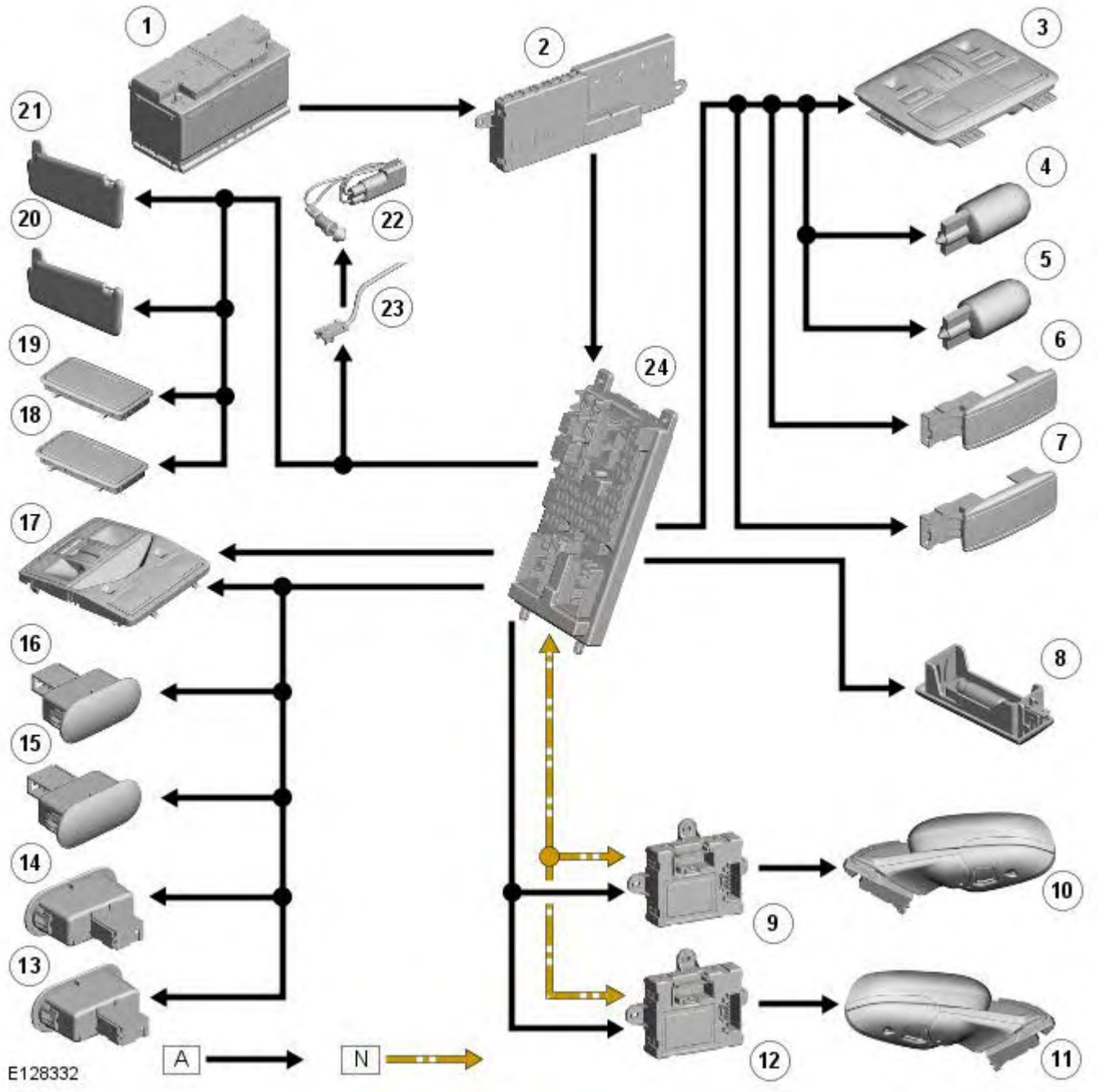
Published: 11-May-2011

Interior Lighting - Interior Lighting - System Operation and Component Description

Description and Operation

Control Diagram

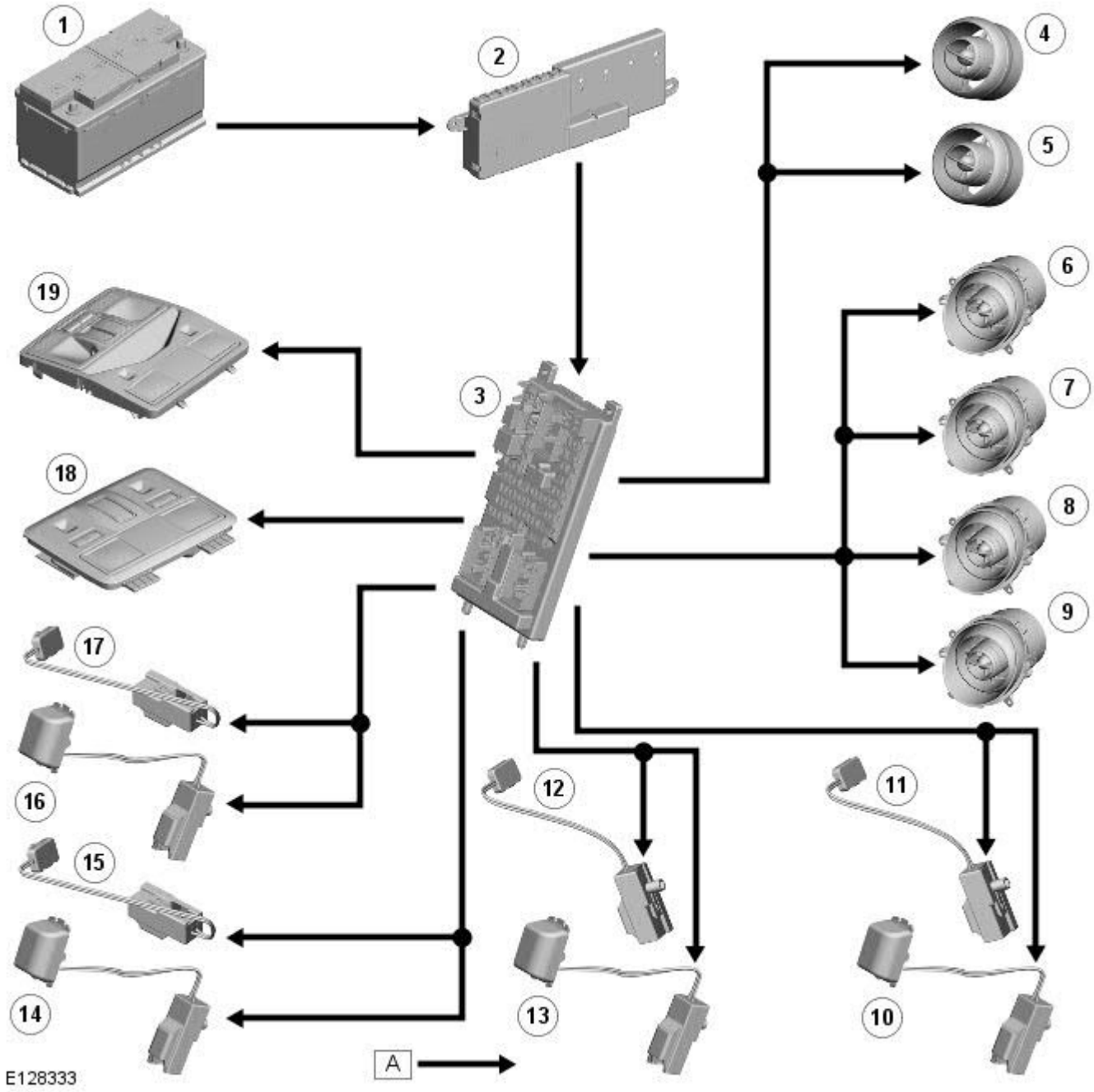
CONTROL DIAGRAM - INTERIOR LIGHTING



Item	Description
A	= Hardwired
N	= Medium Speed CAN Bus
1	Battery
2	Battery Junction Box (BJB)
3	Rear overhead console
4	Left Hand (LH) front footwell lamp
5	Right Hand (RH) front footwell lamp

6	LH rear footwell lamp
7	RH rear footwell lamp
8	Luggage compartment lamp
9	LH Door module
10	LH door mirror approach lamp
11	RH door mirror approach lamp
12	RH door module
13	LH front puddle lamp
14	LH rear puddle lamp
15	RH front puddle lamp
16	RH rear puddle lamp
17	Front overhead console
18	LH rear vanity mirror lamp
19	RH rear vanity mirror lamp
20	LH front vanity mirror lamp
21	RH front vanity mirror lamp
22	Glovebox lamp switch
23	Glovebox lamp
24	Central Junction Box (CJB)

CONTROL DIAGRAM - AMBIENCE LIGHTING



Item	Description
A	= Hardwired
1	Battery
2	Battery Junction Box (BJB)
3	Central Junction Box (CJB)
4	LH rear air vent illumination
5	RH rear air vent illumination
6	LH front outer air vent illumination
7	LH front center air vent illumination
8	RH front center air vent illumination
9	RH front outer air vent illumination
10	LH front door pocket LED (light emitting diode)
11	LH front door handle LED
12	RH front door pocket LED
13	RH front door handle LED

14	LH rear door pocket LED
15	LH rear door handle LED
16	RH rear door pocket LED
17	RH rear door handle LED
18	Rear overhead console waterfall LED's
19	Front overhead console waterfall LED's

System Operation

OPERATION

The CJB (central junction box) provides the power supplies to the interior lamps. The CJB controls the power supply to provide a fade on and off of the lamps. The lamps have 2 modes of operation; automatic and manual.

In the automatic mode the interior lamp functionality is controlled by the CJB. The interior lighting is operated automatically by unlocking the vehicle or opening a door and the illumination period is subject to a timer controlled by the CJB. When all doors are closed the interior lighting can be operated using the JaguarSense system on the front overhead console. Positioning your hand adjacent to the center lamp in the front roof console will switch all interior lamps on or off. The map reading lamps in the front overhead console can also be operated in the same way. The rear interior lamps in the rear overhead console can be operated using the conventional switches in the console.

Manual mode allows the interior lamps to be disabled from automatic operation. Positioning your hand on or near the center interior lamp in the front overhead console for more than 3 seconds will disable the automatic mode and confirmation will be displayed by a 'Manual Lighting' message in the instrument cluster. In manual mode the interior lamps can be still be operated manually but will not operate with unlocking of the vehicle or opening doors. To return to the automatic mode, position your hand on or near the center interior lamp in the front overhead console for more than 3 seconds. Automatic mode will be re-instated and confirmation will be given by a 'Automatic Lighting' message in the instrument cluster.

The driver's and passenger door approach lamps are controlled by the CJB and the driver's door and the passenger door modules respectively on receipt of medium speed CAN (controller area network) bus messages from the CJB.

The CJB monitors the operation of the interior lamps and uses a power management strategy to turn off lamps, if a door is left open for example. If a door is left open or the doors are closed and the interior lamps are switched on, the interior lamps are turned off within 30 minutes by the power saver relay which is located in the CJB. If the interior lamps are left on and the vehicle is locked, the interior lamps will be switched off within 20 seconds of the lock request.

The glovebox lamp operates independently of the interior lamps and is operated by a switch which activates the lamp when the glovebox lid is opened. The glovebox lamp is subject to the power management strategy and will be extinguished after 30 minutes by the battery saver relay if the lid is left open.

Component Description

DESCRIPTION

The CJB receives the following inputs which affect the operation of the interior lamps:

- Ignition status
- Door latch switches
- Luggage compartment lid latch switch
- Glovebox lamp switch
- Unlock signal
- Front roof console interior lamp - 'JaguarSense'
- Front roof console map reading lamps - 'JaguarSense'
- Rear roof console map reading lamps
- Delayed power off relay
- Vanity mirror lamp switches
- Side and headlamp status (ambience lighting only).

The interior lamps fade on when any door is opened and fade off slowly after 20 seconds after the last door is closed.

The interior lamps can be disabled completely by holding your hand near the front center lamp of the 'JaguarSense' system for 3 seconds. The interior lamps are re-enabled by placing your hand near the front center lamp of the 'JaguarSense' for a further 3 seconds.

The interior lamps, in addition to exterior lamps, are switched on in the event of an accident. If an accident is detected by the RCM (restraints control module) , a high speed CAN bus message is sent to the CJB to switch on the interior lamps. In this case, the interior lamps cannot be switched off using the interior lamps switches or 'JaguarSense' feature and require diagnostics to reset the lamp functionality.

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Interior Lighting - Interior Lighting

Diagnosis and Testing

Principle of Operation

For a detailed description of the interior lighting system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (417-02 Interior Lighting)

Interior Lighting (Description and Operation),
Interior Lighting (Description and Operation),
Interior Lighting (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Main interior lamp condition and installation • Map reading lamp(s) condition and installation • Vanity mirror lamp(s) condition and installation • Glove compartment lamp condition and installation • Footwell lamp(s) condition and installation • Ignition switch glow ring condition and installation • Door mirror approach lamp(s) condition and installation • Puddle lamp(s) condition and installation • Luggage compartment lamp condition and installation	• Bulbs • Fuses • Battery Junction Box (BJB) • Central Junction Box (CJB) • Battery saver relay • Wiring harness • Loose or corroded connector(s) • Main interior lamp switch • Map reading lamp switches • Vanity mirror lamp switches • Glove compartment lamp switch • Waterfall lighting LED • Luggage compartment lamp switch

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Main interior lamp inoperative	• Bulb(s) failure • Fuse(s) blown • Circuit fault • Switch fault	Check the bulb(s) condition. Check the fuse(s). Check the lamp circuits. Check the switch function. Refer to the electrical guides.
Waterfall lighting LED inoperative	• LED failure • Fuse(s) blown • Circuit fault	Check the LED condition. Check the LED connector. Check the fuse(s). Check the lamp circuits. Refer to the electrical guides.
Map reading lamp(s) inoperative	• Bulb(s) failure • Fuse(s) blown • Circuit fault • Switch fault	Check the bulb(s) condition. Check the fuse(s). Check the lamp circuits. Check the switch function. Refer to the electrical guides.
Vanity mirror lamp(s) inoperative	• Bulb failure • Fuse(s) blown • Circuit fault • Switch fault	Check the bulb condition. Check the fuse(s). Check the lamp circuits. Check the switch function. Refer to the electrical guides.

Symptom	Possible Cause	Action
Glove compartment lamp inoperative	• Bulb failure • Fuse(s) blown • Circuit fault • Switch fault	Check the bulb condition. Check the fuse(s). Check the lamp circuits. Check the switch function. Refer to the electrical guides.
Footwell lamp inoperative	• Bulb failure • Fuse(s) blown • Circuit fault	Check the bulb condition. Check the fuse(s). Check the lamp circuits. Refer to the electrical guides.
Ignition switch glow ring inoperative	• Bulb/Glow ring failure • Fuse(s) blown • Circuit fault	Check the bulb/glow ring condition. Check the fuse(s). Check the lamp circuits. Refer to the electrical guides.
Door mirror approach lamp(s) inoperative	• Bulb failure • Fuse(s) blown • Circuit fault	Check the bulb condition. Check the fuse(s). Check the lamp circuits. Refer to the electrical guides.
Puddle lamp(s) inoperative	• Bulb failure • Fuse(s) blown • Circuit fault	Check the bulb condition. Check the fuse(s). Check the lamp circuits. Refer to the electrical guides.
Luggage compartment lamp inoperative	• Bulb failure • Fuse(s) blown • Circuit fault • Switch fault	Check the bulb condition. Check the fuse(s). Check the lamp circuits. Check the switch function. Refer to the electrical guides.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Central Junction Box (BCM) (100-00 General Information, Description and Operation).

Published: 11-May-2011

Daytime Running Lamps (DRL) - Daytime Running Lamps (DRL) - System Operation and Component Description

Description and Operation

System Operation

CENTRAL JUNCTION BOX (CJB)

DRL (daytime running lamps) use the full intensity low beam headlamps which are permanently illuminated when the vehicle is being driven. Two DRL systems are available depending on market requirements.

The CJB (central junction box) controls the operation of the DRL. The DRL are activated once the CJB detects an ignition on power mode 6 signal.

The CJB also monitors the lighting control switch and the auto lamps feature and overrides the DRL if required.

Component Description

DAYTIME RUNNING LAMPS - CANADA

The DRL for this market use full intensity low beam headlamps. The side marker lamps, tail lamps and license plate lamps will be on, but instrument cluster illumination will be off. DRL are active when the following parameters are met:

- PARK is not selected on the electronic transmission selector
- EPB (electronic parking brake) is off
- Power mode 6 (ignition on) detected by the CJB
- The CJB receives an engine running signal
- The lighting control switch is in the off or side lamps position.

NOTES:

If the lighting control switch is moved to the headlamp position, DRL are deactivated and normal side lamp and headlamp functionality is operational.

When DRL are active, the headlamp flash function using the left hand steering column multifunction switch will operate normally.

The high beam headlamp function using the left hand steering column stalk switch will be deactivated. When the transmission is in PARK, DRL are turned off. This is to reduce battery discharge during long periods of engine idling in cold climate conditions. When the electronic transmission selector is moved from the PARK position, normal DRL functionality is restored.

DAYTIME RUNNING LAMPS - DENMARK, HOLLAND, NORWAY, SWEDEN, FINLAND AND POLAND

DRL for these markets use full intensity low beam headlamps. Side lamps and license plate lamps will be on, but instrument cluster illumination will be off. DRL are active when the following parameters are met:

- Power mode 6 (ignition on) detected by the CJB
- The CJB receives an engine running signal
- The lighting control switch is in the off position.

NOTE: When DRL are active, the headlamp flash function using the left hand steering column multifunction switch will operate normally. The high beam headlamp function using the left hand steering column stalk switch will be deactivated.

If the lighting control switch is moved to the side lamp or headlamp positions, DRL are deactivated and normal side lamp and headlamp functionality is operational.

AUTOMATIC HEADLAMPS

On vehicles fitted with the automatic headlamps feature, DRL are overridden if the lighting control switch is in the 'Auto' position and the CJB receives a signal from the rain/light sensor to activate the exterior lights.

When the CJB receives a signal to de-activate the automatic headlamps feature the DRL function is restored providing the parameters for DRL activation are met.

Published: 09-Dec-2013

Module Communications Network - Communications Network

Diagnosis and Testing

Principles of Operation

For a detailed description of the Communications Network, refer to the relevant Description and Operation sections in the workshop manual.

Inspection and Verification

CAUTIONS:

Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

Electronic modules are sensitive to static electrical charges. If exposed to these charges, damage may result.

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Electrical
• Fuses (refer to electrical guide) • Wiring harness • Correct engagement of electrical connectors • Loose or corroded connections • Routing of fibre optic harnesses • Correct engagement of optical connectors • Correct placement of optical connectors (ring order) • Correct assembly of optical connectors (backout, etc) • Damage to fibre (chafing, abrasion, kinking, cuts, etc)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index

Symptom Chart

Symptom	Possible Causes	Action
MOST network fault - Touch Screen (TS) soft keys greyed out and inoperative	• MOST ring broken • Control module on MOST network power or ground circuit open circuit, high resistance • Control module on MOST network internal failure	• GO to Pinpoint Test B.
MOST network fault - Touch Screen (TS) blank	• Touch Screen (TS) power or ground circuit open circuit, high resistance • Wake up signal not received by the Touch Screen (TS) • Touch Screen (TS) internal failure	• GO to Pinpoint Test G.

Controller Area Network (CAN)

Control Module Connections to the CAN Harness

Control modules are connected to the CAN harness either in a 'loop' or 'spur' configuration. In the 'loop' type configuration the CAN harness loops into the module (via two connector pins) and then loops out of the module (via another two connector pins). In the 'spur' type configuration, a harness spur is spliced into the main 'backbone' of the CAN harness and the module is connected to the harness spur via two connector pins.

CAN Harness Architecture

For a detailed description of the CAN Networks and architecture, refer to the relevant Description and Operation section in the Workshop Manual.

CAN Network Integrity Tests

If a control module is suspected of non-communication, the Network Integrity test application available on the manufacturer

approved diagnostic system can be used to confirm if communication is possible between the control modules on the vehicle and the manufacturer approved diagnostic system (via the J1962 diagnostic connector). The results from the test can be used to determine if either a single module or multiple modules are failing to communicate.

CAN Terminating Modules

If the Network Integrity test indicates that one or more module on one of the CAN networks (HS or MS) are failing to communicate, there are several checks that can be made. The first step is to identify if both of the CAN terminating modules on each individual CAN Bus are communicating. If both CAN terminating modules for each individual CAN Bus are communicating (identified via the Network Integrity test), then it can be confirmed that the main 'backbone' of the CAN harness is complete. The main 'backbone' of the CAN harness consists of all the modules connected to the CAN harness via a 'loop' configuration and also includes the two terminating modules.

Communication with both CAN terminating modules via the Network Integrity test confirms the physical integrity of the main 'backbone' of the CAN harness (and the harness spur to the J1962 diagnostic connector). This means that there is no requirement to check the resistance of the CAN Network. This is because the standard check for 60 ohms across the CAN High and CAN Low lines will not provide any additional information regarding the physical condition of the CAN harness, beyond what has already been determined from the Network Integrity test.

Non-Communication of a Terminating Module

If a Network Integrity test reveals a terminating module is failing to communicate it can indicate a break in the main 'backbone' of the CAN harness. The first checks should always be to confirm the power and ground supplies to the non-communicating module are correct. Providing these are correct, the resistance between the CAN High and CAN Low lines at the J1962 connector can be checked to determine the integrity of the main 'backbone' of the CAN harness. After disconnecting the battery a reading of 120 ohms would indicate an open circuit in the main 'backbone' of the CAN harness. Alternatively, a reading of 60 ohms would indicate that there is no open circuit fault with the main 'backbone' of the CAN harness.

It is worth noting that even if one of the terminating modules is disconnected from the CAN harness, communications between the modules still connected may still be possible. Therefore communication between the manufacturer approved diagnostic system and the connected modules may also be possible.

Locating CAN Harness Open Circuits

In the case where multiple modules, including a terminating module, are failing to communicate, having first confirmed the power and ground supplies are correct, the approximate location of the open circuit can be identified from analysis of the Network Integrity test results and reference to the relevant CAN network circuit diagrams. For example, if an open circuit existed in a certain position on the CAN harness, any module positioned on the Network between the J1962 connector and the open circuit should return a response during the Network Integrity test. No responses would be returned from any modules past the open circuit fault in the Network.

CAN Harness 'Spur' Type Configuration Circuits

If, after the initial checks (Network Integrity test using the manufacturer approved diagnostic system, and power and ground supplies to the module have been checked and confirmed as correct), a module that is connected to the CAN harness via a 'spur' type configuration is suspected of not communicating, then the physical integrity of the CAN harness 'spur' can be checked.

This is most easily undertaken by individually checking the continuity of the CAN High and CAN Low lines between the non-communicating module connector (with the module disconnected) and the J1962 diagnostic connector.

'Lost Communications' DTCs

As well as the methods described so far in this document, which can be used to determine the location of an open circuit in the CAN harness, 'Lost Communications' DTCs can also be used for this purpose. Lost communication DTCs mean that a module is not receiving CAN information from another module.

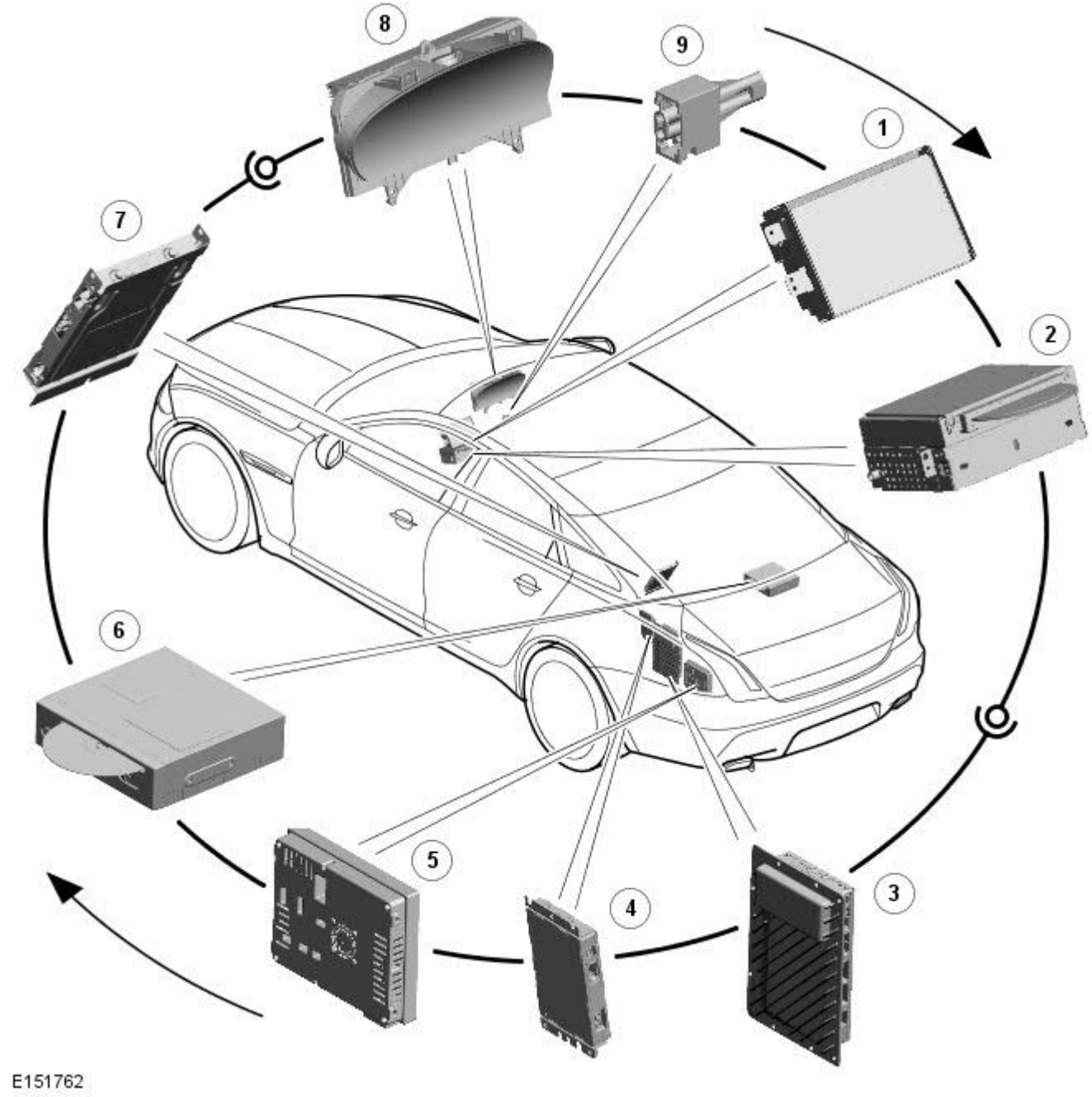
For example, if a global DTC read were to be carried out, only DTCs stored in the modules that the manufacturer approved diagnostic system could communicate with would be displayed. If there was an open circuit fault in a certain position on the CAN harness, the modules that could display DTCs would all be prior to the open circuit on the Network, and these modules should display 'Lost Communications' DTCs with all the modules located on the Network past the open circuit fault.

'Bus off' DTCs

The references to bus and its condition refer to the network concerned and the modules on that network.

If a module logs a 'Bus Off' DTC, it means that the module has detected CAN transmission errors and has disabled it's own CAN transmissions and disconnected itself from the network in an attempt to allow the rest of the network to function. At this point the 'Bus Off' DTC is set. A common cause of 'Bus Off' DTCs can be a short circuit in the CAN network.

Media Oriented Systems Transport (MOST)



NOTE: Items 1, 2, 3, 8 and 9 will always be present. The remaining items are optional and/or market specific.

Item	Description
1	Touch Screen (TS)
2	Integrated Audio Module (IAM)
3	Audio Amplifier Module (AAM)
4	Digital Radio Control Module (DRCM)
5	TV Control Module (TVCM)
6	Navigation Control Module (NCM) - Japan
7	Rear Seat Entertainment Control Module (RSECM)
8	Instrument Cluster (IC)
9	MOST diagnostic connector

Overview

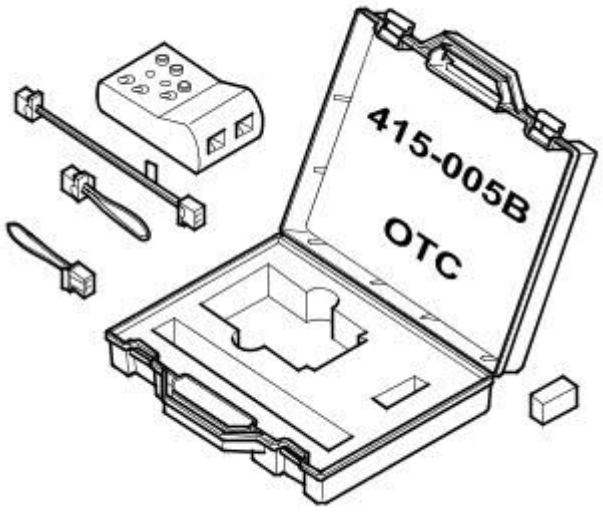
The basic guidelines are covered in the description and operation section, such as not attempting to repair fibre optic cables, but additional precautions include:

- Do not touch the exposed ends of the optical fibres (grease from skin can contaminate the fibre)
- Whenever the fibre optic cable is disconnected, cover the connectors to prevent dust contamination

- Do not expose the fibre optic cable to heat
- Do not bend the fibre optic cable through less than a 25 mm (one inch) radius
- Do not use laser pens to test the fibre optic cable's ability to pass light

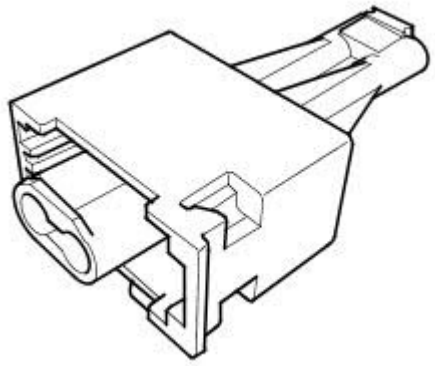
MOST Diagnostic Tools

There are two dedicated tools for testing the MOST system:



E150402

MOST tester. The MOST tester is connected to the MOST network in place of a control module. It will confirm receipt of any existing MOST signal and transmit it to the next control module on the network. Perform the following tests to validate the operation of the MOST tester. GO to Pinpoint Test A.


E150401

MOST prism. The MOST prism is connected in the same way as the MOST tester but will simply reflect any existing signal onward to the next control module. Using the MOST prism before or after a long run of harness may cause a ring break as a good signal may be too weak after travelling the extended distance. Also, the MOST prism will pass light in either direction so will not detect reversed MOST terminals elsewhere in the network. For these reasons, the MOST tester is the preferred tool and should be used unless limited access does not permit it

MOST Ring Break Indication

A ring break in the MOST network is indicated by the Touch Screen (TS) soft keys being greyed out and inoperative. Possible causes of ring breaks are listed in the symptom chart

Pinpoint Tests

PINPOINT TEST A : MOST TESTER TESTS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: MOST TESTER BATTERY TEST	
	1 Set the MOST tester power switch to 'on'

	Is the power LED illuminated? **Yes** Test passed. GO to A2. **No** Test failed. Install a new battery into the MOST tester. GO to A1.

A2: 2+0 INPUT/OUTPUT TEST

NOTES:

'2+0' indicates that the loop harness connector consists of 2 fibre optic terminals and 0 electrical terminals.

The MOST tester may continue to emit a tone or illuminate the LED after the test switch is released. This does not indicate a fault.

	1 Set the MOST tester power switch to 'on'
	2 Set the connector selector switch to '2+0'
	3 Set the indication switch to 'beep' or 'LED'
	4 Remove the covers from the MOST tester 2+0 connector and the 2+0 loop harness connector
	5 Connect the 2+0 loop harness to the MOST tester 2+0 connector
	6 Operate the test switch and check the MOST tester beep/LED
	Did the MOST tester emit a tone or illuminate the LED? **Yes** Test passed. GO to A3. **No** Test failed. MOST tester or 2+0 harness fault

A3: 2+4 INPUT/OUTPUT TEST

NOTES:

'2+4' indicates that the loop harness connector consists of 2 fibre optic terminals and 4 electrical terminals.

The MOST tester may continue to emit a tone or illuminate the LED after the test switch is released. This does not indicate a fault.

	1 Set the MOST tester power switch to 'on'
	2 Set the connector selector switch to '2+4'
	3 Set the indication switch to 'beep' or 'LED'
	4 Remove the covers from the MOST tester 2+4 connector and the 2+4 loop harness connector
	5 Connect the 2+4 loop harness to the MOST tester 2+4 connector
	6 Operate the test switch and check the MOST tester beep/LED
	Did the MOST tester emit a tone or illuminate the LED? **Yes** Test passed. GO to A4. **No** Test failed. MOST tester or 2+4 harness fault

A4: ADAPTER HARNESS AND PRISM TEST

NOTE: The MOST tester may continue to emit a tone or illuminate the LED after the test switch is released. This does not indicate a fault.

	1 Set the MOST tester power switch to 'on'
	2 Set the connector selector switch to '2+0'
	3 Set the indication switch to 'beep' or 'LED'
	4 Remove the covers from the MOST tester 2+0 connector, the prism, and the adapter harness connectors
	5 Connect the adapter harness to the MOST tester 2+0 connector
	6 Connect the prism to the adapter harness
	7 Operate the test switch and check the MOST tester beep/LED
	Did the MOST tester emit a tone or illuminate the LED? **Yes** Test passed **No** Test failed. MOST tester, adapter harness or prism fault

PINPOINT TEST B : MOST NETWORK INITIAL TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS

B1: MOST NETWORK INITIAL TEST 1

NOTE: When connecting the MOST tester, use the 2+0 or 2+4 socket as appropriate and set the connector selector switch to match the socket in use	
	1 Switch on the audio/video system
	2 Remove the cover from the MOST diagnostic connector
	3 Set the MOST tester power switch to 'on'
	4 Connect the MOST tester to the MOST diagnostic connector
	5 Check the Touch Screen (TS) for indication of a MOST network fault
	Has the MOST network been restored? **Yes** The MOST diagnostic connector cover is causing the MOST network fault. GO to B2. **No** The MOST diagnostic connector cover is not causing the MOST network fault. GO to B3.
B2: MOST NETWORK INITIAL TEST 2	
	1 Disconnect the MOST tester
	2 Install the cover to the MOST diagnostic connector
	Has the MOST network been restored? **Yes** No further action required **No** Install a new MOST diagnostic connector cover
B3: MOST NETWORK INITIAL TEST 3	
	1 Check the MOST tester beep/LED
	Did the MOST tester emit a tone or illuminate the LED? **Yes** MOST signal received. The MOST network fault is located downstream of the MOST tester. GO to Pinpoint Test E. **No** MOST signal not received. The MOST network fault is located upstream of the MOST tester. Disconnect the MOST harness connector from the MOST tester and reconnect it to the control module. GO to Pinpoint Test C.

PINPOINT TEST C : MOST NETWORK UPSTREAM TESTS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
C1: MOST NETWORK UPSTREAM TEST 1	
	1 Refer to the electrical circuit diagrams and identify the preceding control module on the MOST network
	Is this control module the Touch Screen (TS)? **Yes** GO to Pinpoint Test F. **No** GO to C2.
C2: MOST NETWORK UPSTREAM TEST 2	
	1 Disconnect the MOST harness connector from the control module
	2 Direct the MOST harness connector at a suitable surface and check for the presence of red light
	Is red light present? **Yes** The MOST network fault is in the control module or the MOST harness to the succeeding control module. GO to C3. **No** The MOST network fault is located upstream of the disconnected control module. Reconnect the MOST harness connector to the control module. GO to C1.
C3: MOST NETWORK UPSTREAM TEST 3	
NOTE: When connecting the MOST tester, use the 2+0 or 2+4 socket as appropriate and set the connector selector switch to match the socket in use	
	1 Connect the MOST harness connector to the MOST tester
	2 Check the Touch Screen (TS) for indication of a MOST network fault
	Has the MOST network been restored? **Yes** The disconnected control module is causing the MOST network fault. GO to Pinpoint Test D. **No** The fault is in the MOST harness between the MOST tester and the succeeding control module. Install a new MOST harness as necessary

PINPOINT TEST D : CONTROL MODULE TESTS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
D1: CONTROL MODULE TEST 1	

NOTES:

When connecting the MOST tester, use the 2+0 or 2+4 socket as appropriate and set the connector selector switch to match the socket in use

The MOST tester may continue to emit a tone or illuminate the LED after the test switch is released. This does not indicate a fault.

	1 Connect the MOST tester to the relevant control module using the adapter harness
	2 Operate the test switch and check the MOST tester beep/LED
	Did the MOST tester emit a tone or illuminate the LED? **Yes** MOST signal received. Tests inconclusive. Reconnect the MOST harness connector to the control module and confirm that the MOST network fault is still present. Repeat the tests from the beginning. GO to Pinpoint Test B. **No** GO to D2.
D2: CONTROL MODULE TEST 2	
	1 Refer to the electrical circuit diagrams and check the relevant control module power and ground circuits for open circuit, high resistance
	Are the power and ground circuits within specification? **Yes** GO to D3. **No** Repair the power and/or ground circuit
D3: CONTROL MODULE TEST 3	
	1 Reconnect the MOST harness to the control module
	2 Check the Touch Screen (TS) for indication of a MOST network fault
	Has the MOST network been restored? **Yes** Tests inconclusive. Repeat the tests from the beginning. GO to Pinpoint Test B. **No** Install a new control module

PINPOINT TEST E : MOST NETWORK FINAL DOWNSTREAM TEST

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: MOST NETWORK FINAL DOWNSTREAM TEST 1	

NOTES:

When connecting the MOST tester, use the 2+0 or 2+4 socket as appropriate and set the connector selector switch to match the socket in use

The MOST tester may continue to emit a tone or illuminate the LED after the test switch is released. This does not indicate a fault.

	1 Disconnect the MOST tester from the MOST diagnostic connector
	2 Install the cover to the MOST diagnostic connector
	3 Disconnect the MOST harness connector from the Touch Screen (TS)
	4 Connect the MOST harness connector to the MOST tester
	5 Operate the test switch and check the MOST tester beep/LED
	Did the MOST tester emit a tone or illuminate the LED? **Yes** GO to E2. **No** The fault is in the harness between the MOST diagnostic connector and the Touch Screen (TS). Install a new MOST harness as necessary
E2: MOST NETWORK FINAL DOWNSTREAM TEST 2	
	1 Disconnect the MOST harness connector from the MOST tester
	2 Reconnect the MOST harness connector to the Touch Screen (TS)
	3 Check the Touch Screen (TS) for indication of a MOST network fault
	Has the MOST network been restored? **Yes** Tests inconclusive. Repeat the tests from the beginning. GO to Pinpoint Test B. **No** GO to Pinpoint Test G.

PINPOINT TEST F : MOST NETWORK FINAL UPSTREAM TESTS

PINPOINT TEST G : TOUCH SCREEN (TS) TESTS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
G1: TOUCH SCREEN (TS) TEST 1	
	1 Using the manufacturer approved diagnostic system, check the Touch Screen (TS) for related DTCs
	Is communication possible between the manufacturer approved diagnostic system and the Touch Screen (TS)? **Yes** Refer to the relevant DTC index **No** GO to G2.
G2: TOUCH SCREEN (TS) TEST 2	
	1 Refer to the electrical circuit diagrams and check the Touch Screen (TS) power and ground circuits for open circuit, high resistance
	Are the power and ground circuits within specification? **Yes** GO to G3. **No** Repair the power and/or ground circuit
G3: TOUCH SCREEN (TS) TEST 3	
	1 Using the manufacturer approved diagnostic system, perform a CAN network integrity test. Refer to the electrical circuit diagrams and check the medium speed CAN bus circuit for short circuit to ground, short circuit to power, open circuit, high resistance
	Is the medium speed CAN bus within specification? **Yes** Install a new Touch Screen (TS) **No** Repair the medium speed CAN bus circuit

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Touch Screen Display (FCDIM) (100-00 General Information, Description and Operation).

Published: 11-May-2011

Module Communications Network - Auxiliary Junction Box (AJB)

Removal and Installation

Removal

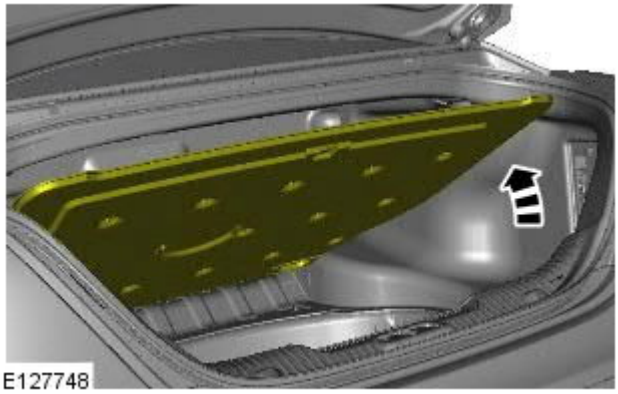
NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2.



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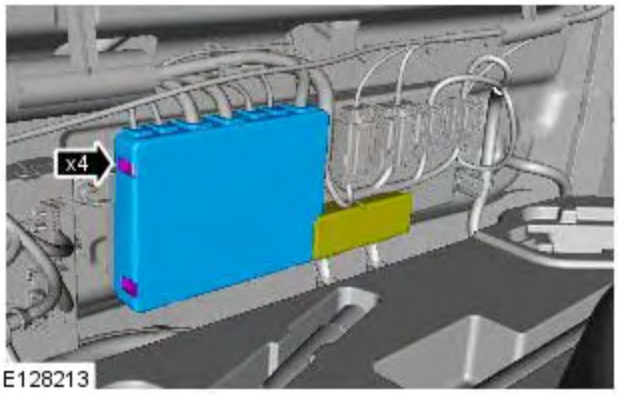

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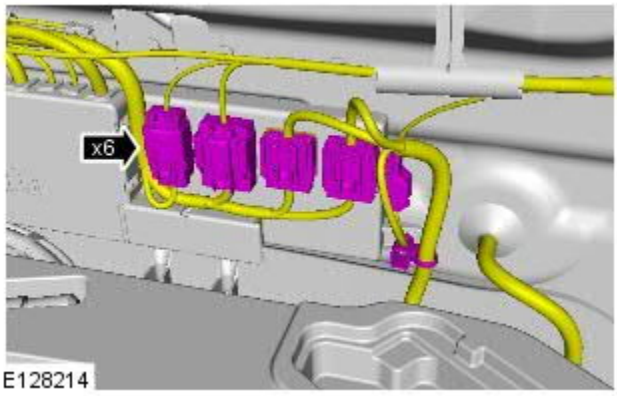
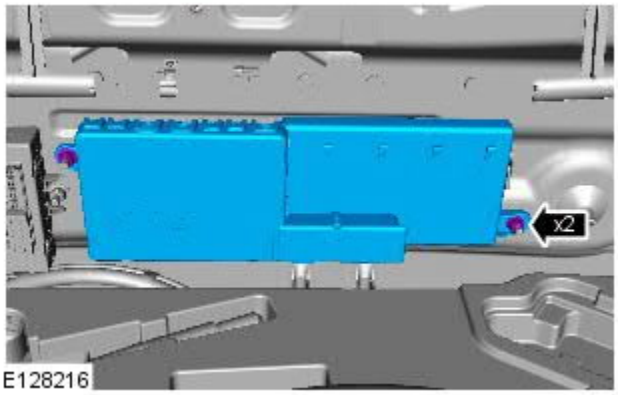


5. *Torque:*
   M8 nut (4) 12 Nm
   M6 (4) 10 Nm



6. *Torque:* 12 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Module Communications Network - Central Junction Box (CJB)

Removal and Installation

Removal

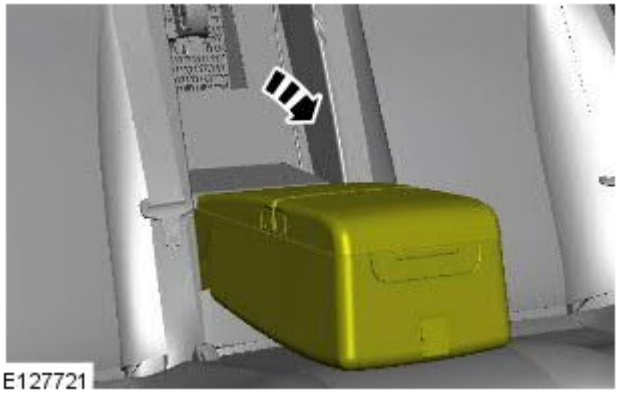
NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2.



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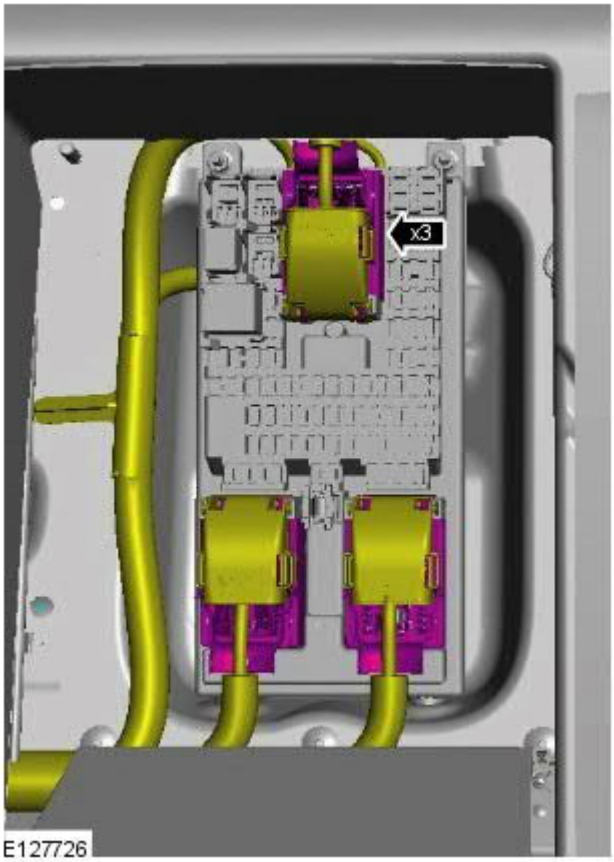
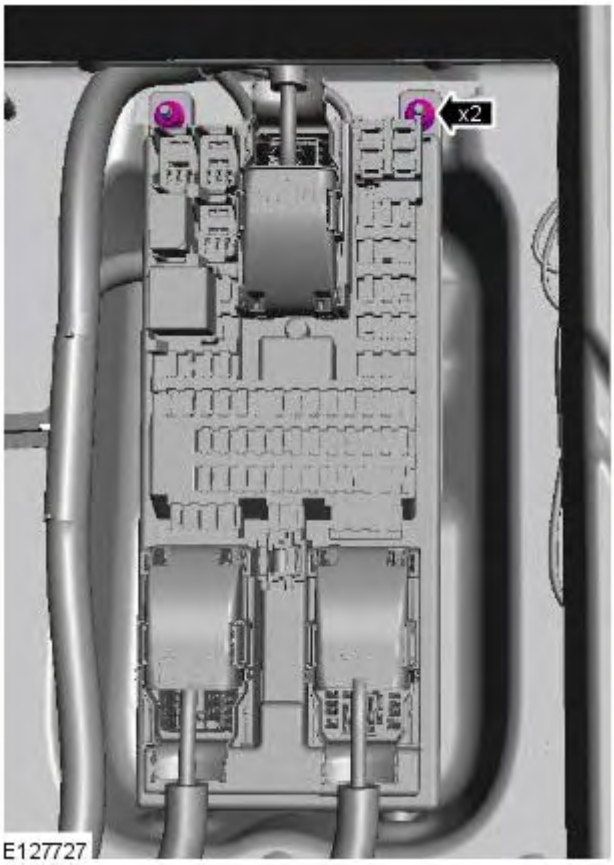
4.



5. *Torque:* 10 Nm



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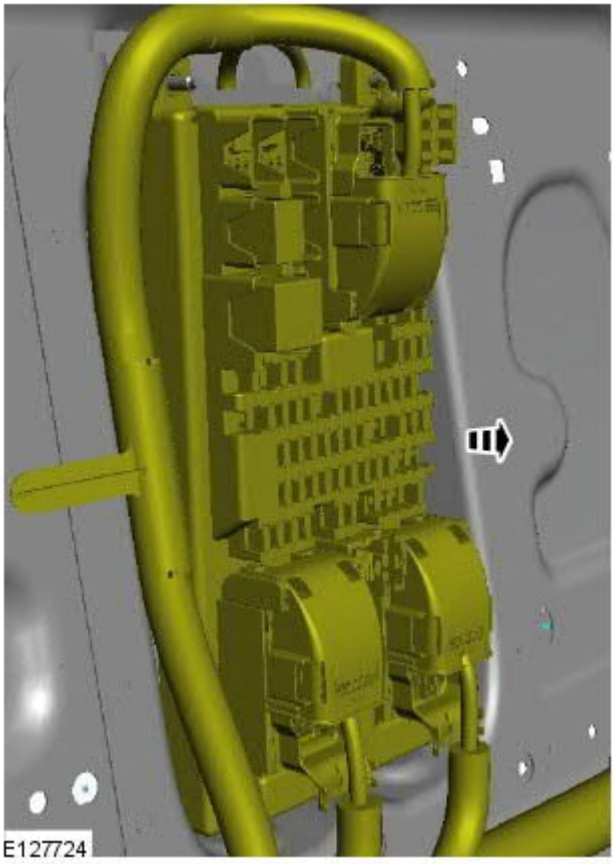
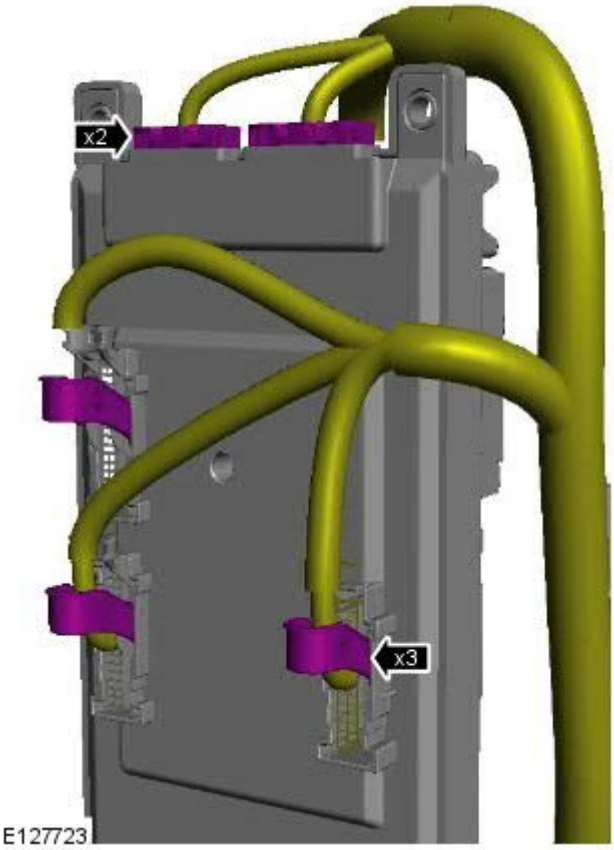


7.



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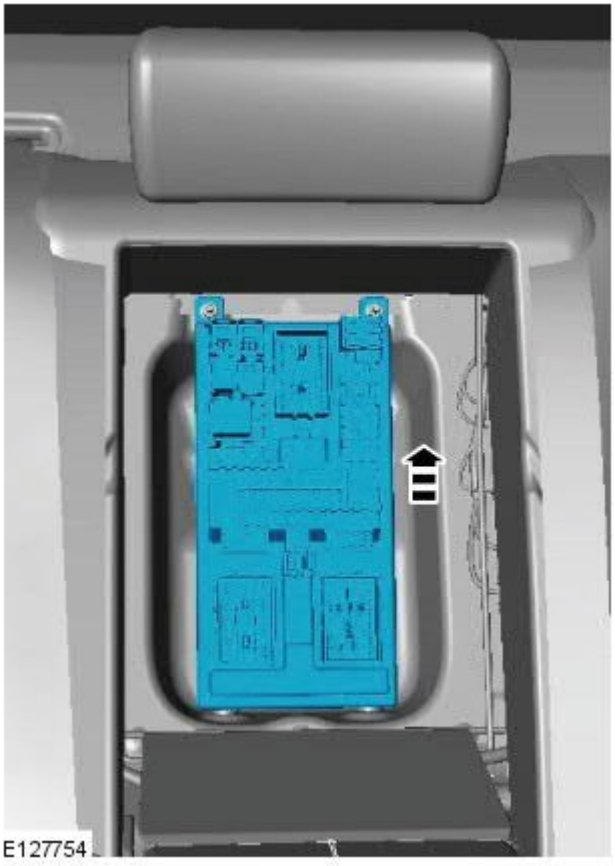

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Module Communications Network - Engine Junction Box (EJB)

Removal and Installation

Removal

NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

Removal steps in this procedure may contain installation details.

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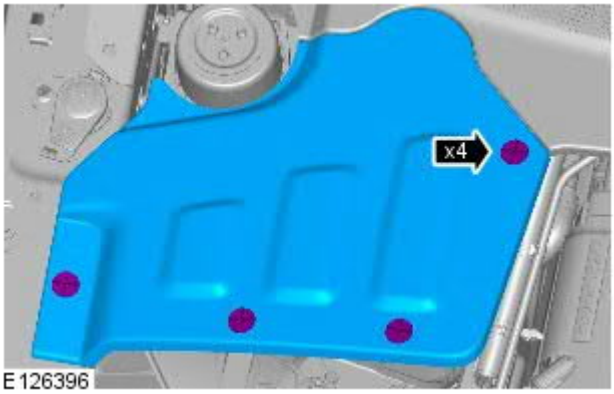
2.



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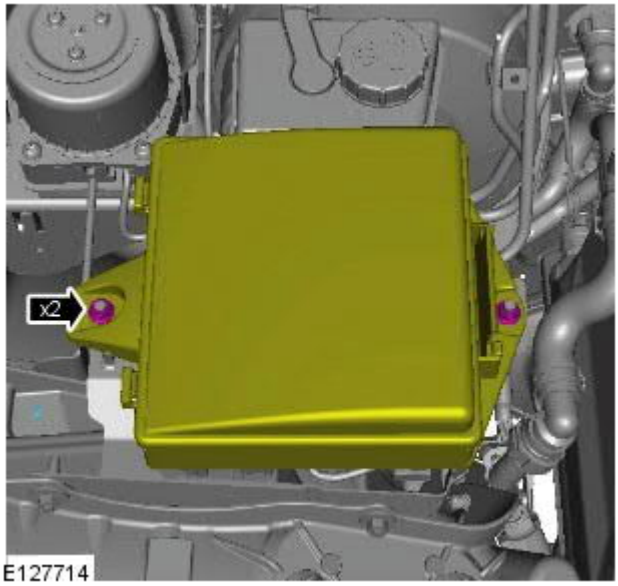

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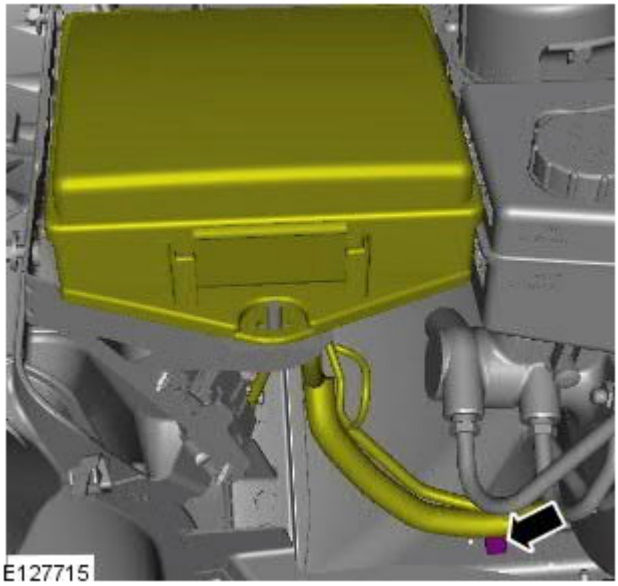

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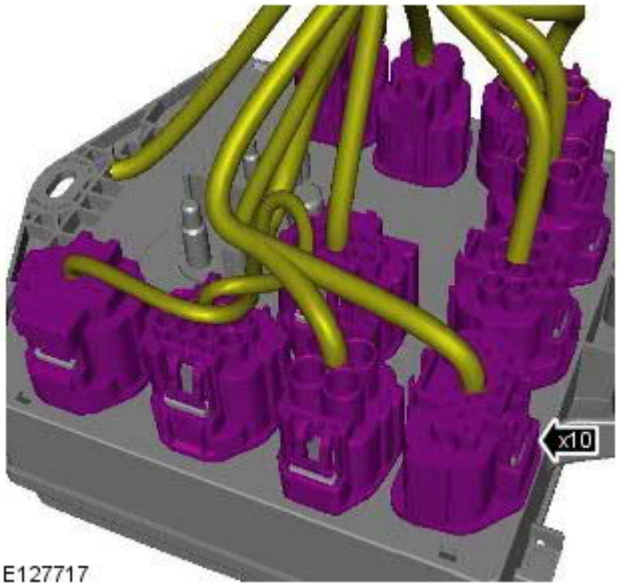

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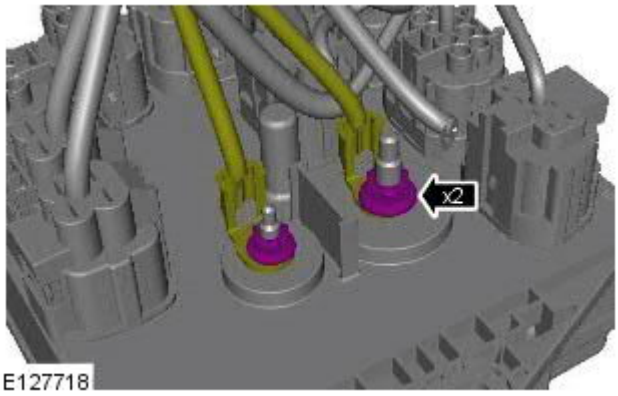

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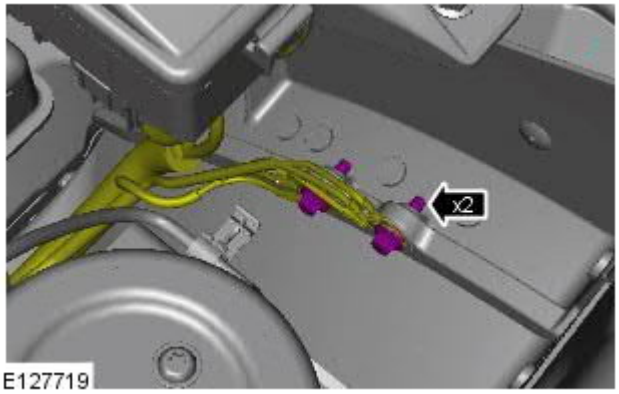
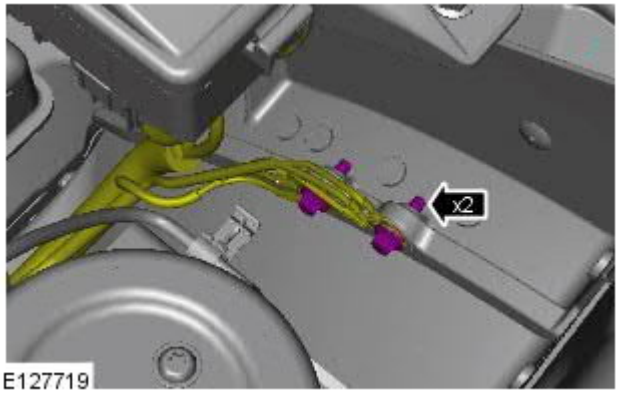


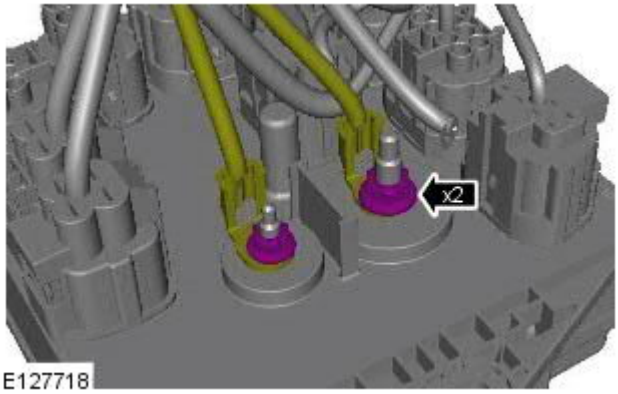
8.

Installation

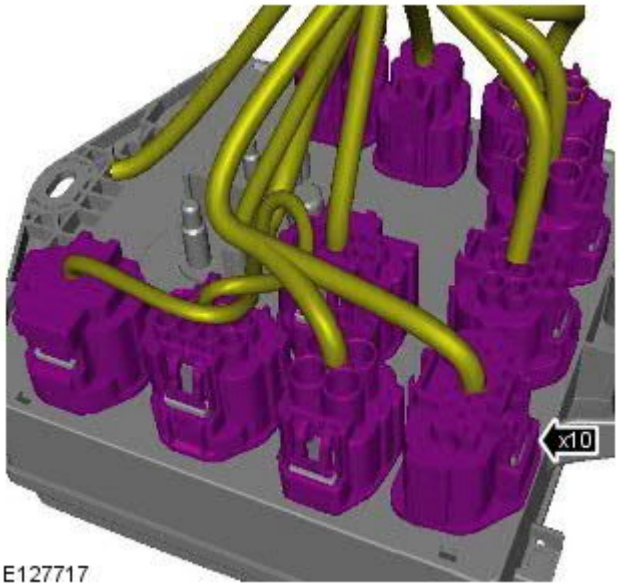
1.



2. *Torque:* 10 Nm



3. *Torque:* 10 Nm



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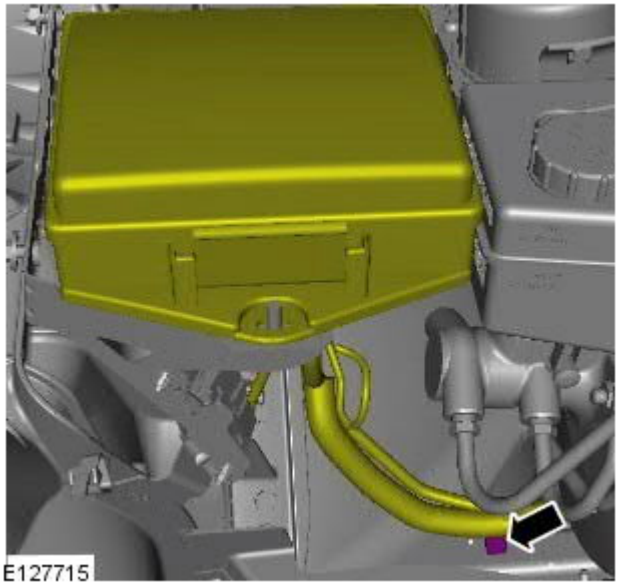

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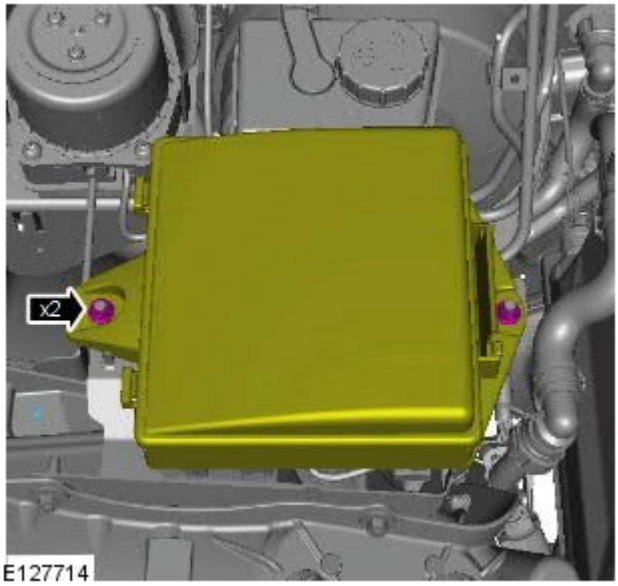
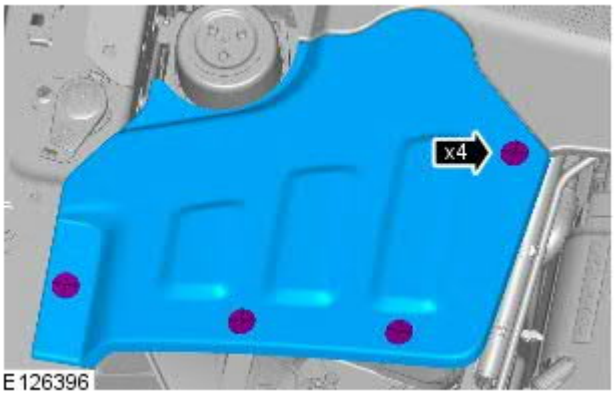


6. *Torque:* 10 Nm



7.

8. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 11-May-2011

Module Communications Network - Rear Junction Box (RJB)

Removal and Installation

Removal

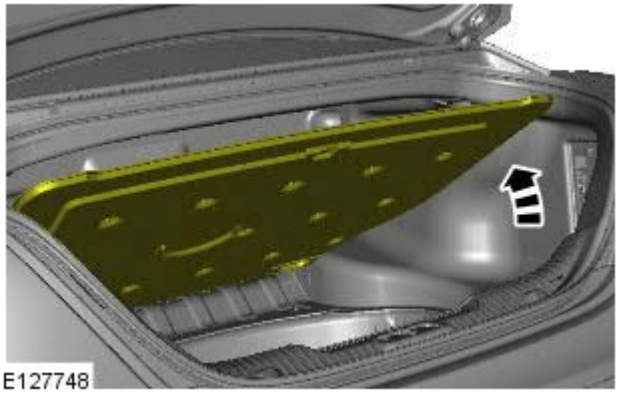
NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2.



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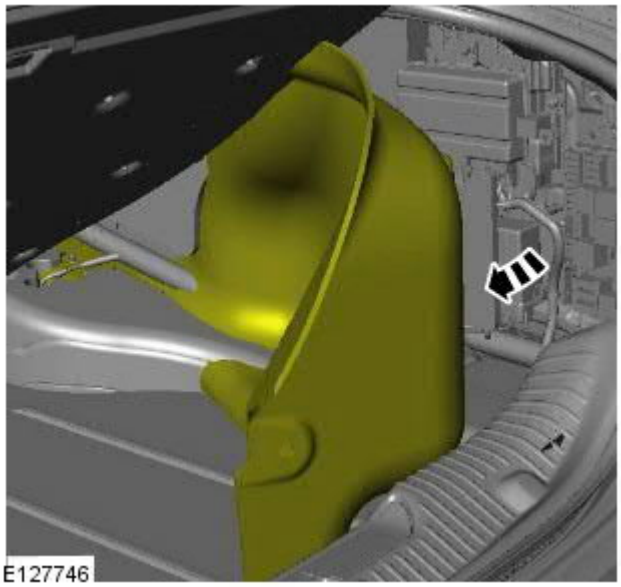
4.



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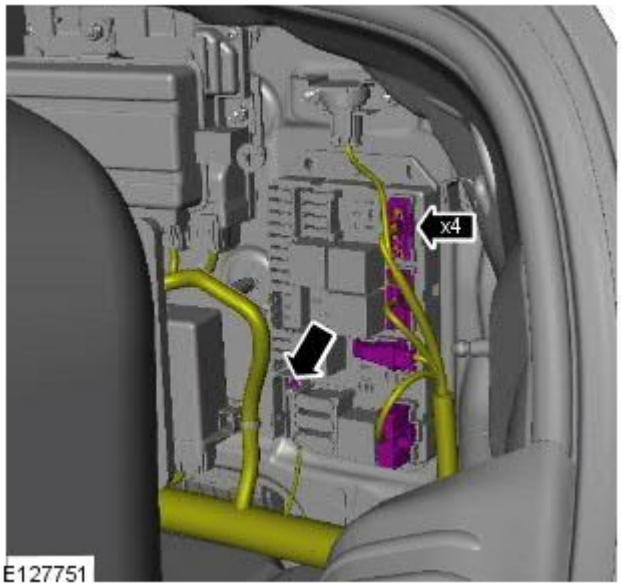
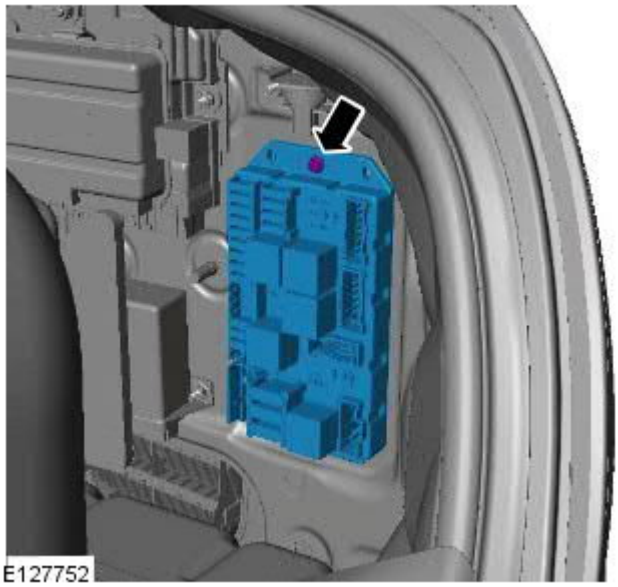
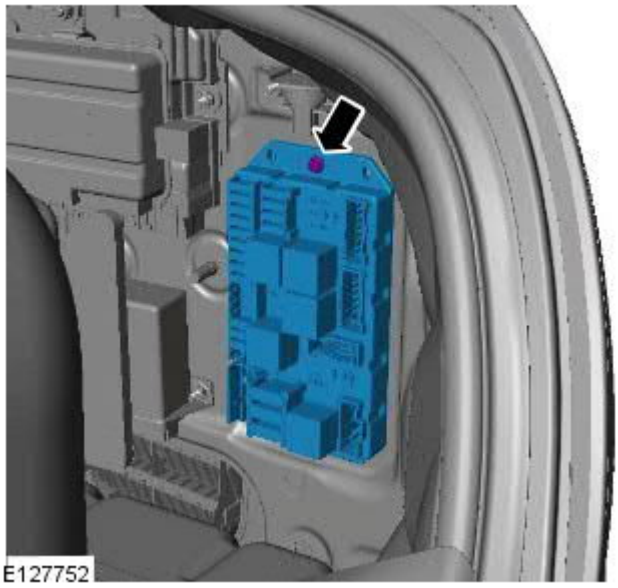




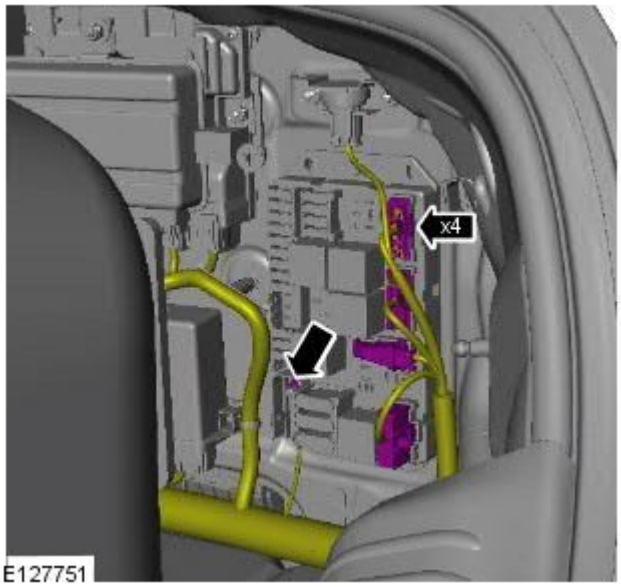
6.

Installation



1. *Torque:* 10 Nm

2.



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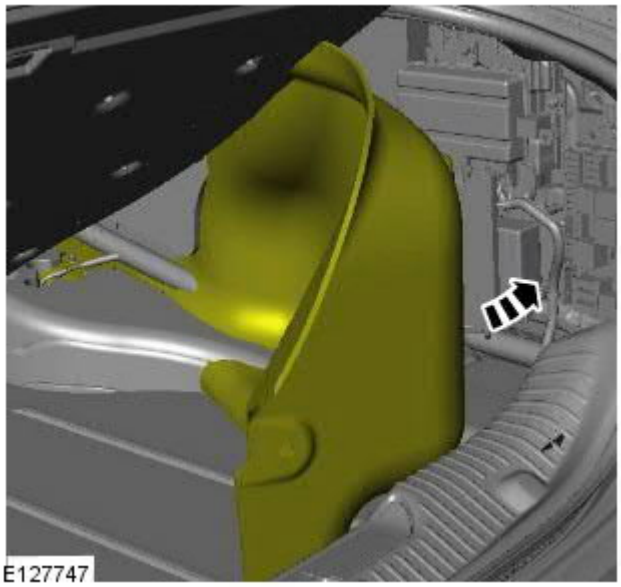
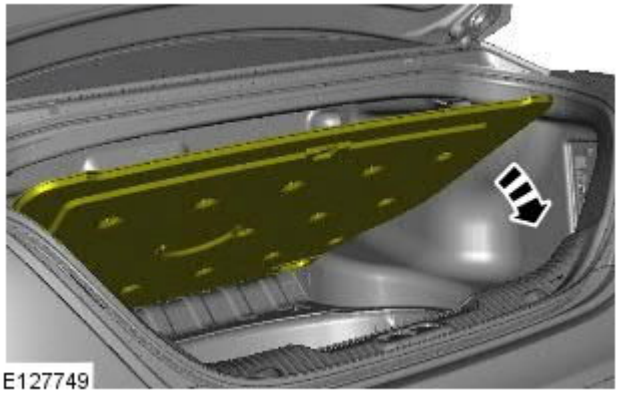


4.

5.



6. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 21-Jan-2014

Wiring Harnesses - Wiring Harness

Description and Operation

Introduction

CAUTION: Do **not** use any other heat shrink sleeve other than the approved glue lined heat shrink sleeve mentioned in the repair procedure.

The purpose of this document is to promote quick and efficient minor repair to harness connectors or cables using approved methods. Repairs may only be made to cables and connectors which have been mechanically, **not electrically** damaged. It also applies where the whole extent of the damage can be clearly identified and rectified.

Care and neatness are essential requirements in making a perfect repair.

Caution:

This harness repair guide, does not approve repairs to any of the following circuits:

1. Any media orientated system transport network harnesses.
2. Supplement restraint system (SRS) firing circuits (Air bags).
3. Link lead assembles, which are unique to safety critical circuits such as anti-lock brake system (ABS) and thermocouple circuits. An example of this is the ABS wheel speed sensors with moulded connectors.
4. 4. Screened cables, leads and wiring harness(s).

If any harness(s) with defective electrical connector terminals or wires from the above circuits are a concern, new components must be installed.

Repair Components

CAUTION: Where the repair procedure indicates that a glue lined heat shrink sleeve should be applied, apply sufficient heat to the glue lined heat shrink to melt the glue in order to provide a water tight seal. Do **not** over heat the glue lined heat shrink sleeve so that the wiring harness insulation becomes damaged.

The wiring harness repair components comprises:

- Pre-terminated wiring harness(s) of different sizes and types
- Three sizes of butt splice connectors
- A selection of colored cable identification sleeves
- Two sizes of glue lined heat shrink sleeves

A suitable heat source, for shrinking heat shrink sleeves will be required.

The pre-insulated diamond grip range of electrical connector terminals and in-line, butt splice connectors are the **only** acceptable product for the repairs of wiring harnesses. The butt connectors not only grip the wire but also the insulation, making a very secure joint.

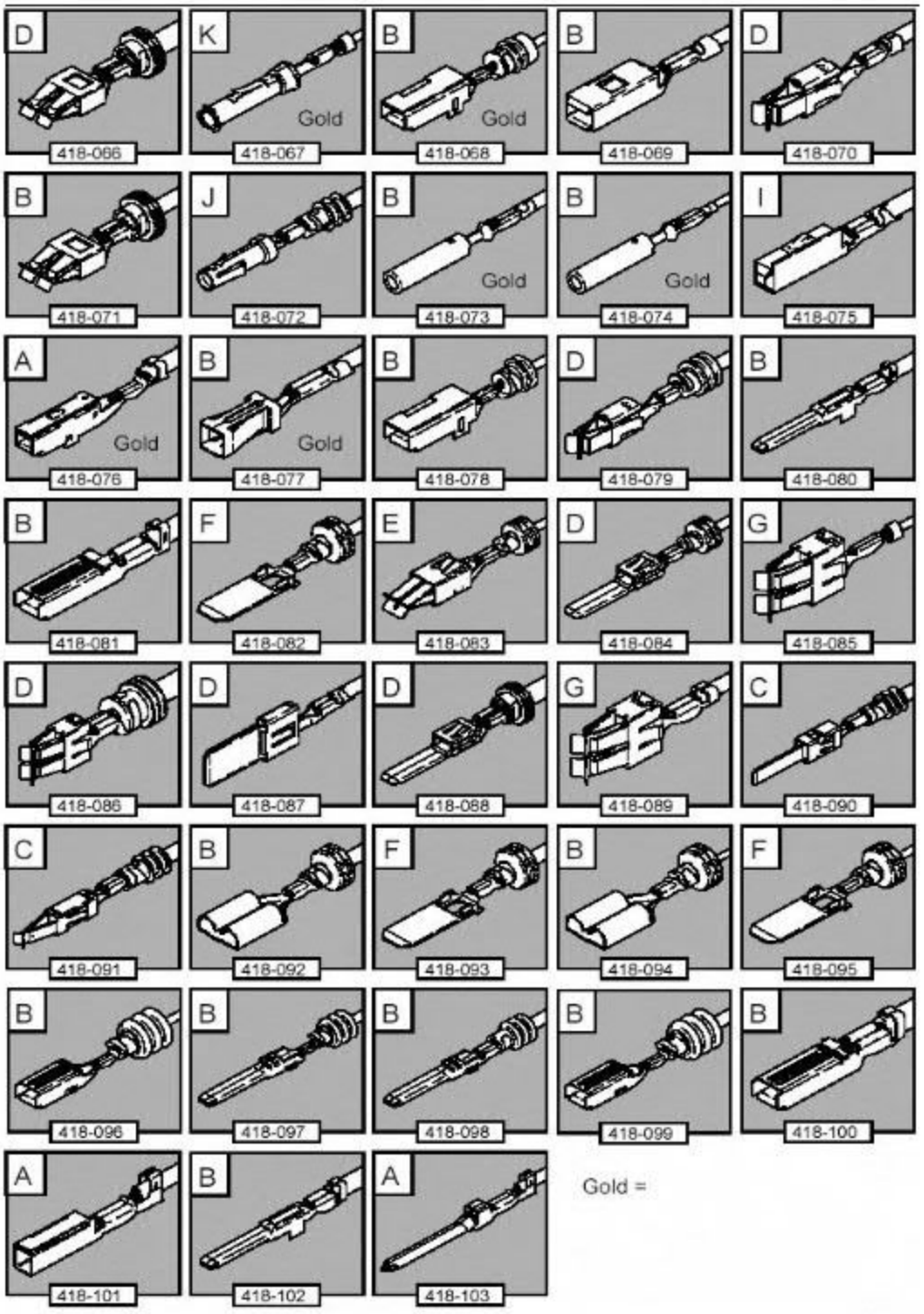
If an electrical connector terminal is not available approval for the repair is **NOT** given and in these circumstances a new wiring harness must be installed.

Pre-Terminated Wiring Harness(s) and Butt Splice Connectors

The pre-terminated wiring harness(s) are supplied with the insulation in one of three colors, red, blue or yellow. The colors do not apply to any particular circuit but to the harness wire size. See the Relationship Table in the Repair Method section.

Butt splice connectors are also supplied with red, blue or yellow coverings, which must be matched to the pre-terminated wiring harness insulation color.

Pre-Terminated Wiring Harness(s)



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The illustration shows:

- The pre-terminated wiring harness(s) which are available via Jaguar/Land Rover authorised parts.
- The part number of the pre-terminated wiring harness
- The letter showing the extractor tip which must be used to remove this type of electrical connector terminal
- Those electrical connector terminals which are gold

Some of the pre-terminated wiring harness(s) have seals installed to the insulation for sealed connector applications. It is

essential for prevention of moisture ingress that a sealed pre-terminated wiring harness must be used where a sealed terminal was removed.

CAUTION: Where the repair procedure indicates that a glue lined heat shrink sleeve should be applied, apply sufficient heat to the glue lined heat shrink to melt the glue in order to provide a water tight seal. Do **not** over heat the glue lined heat shrink sleeve so that the wiring harness insulation becomes damaged.

Two sizes of heat shrink sleeving are available. Each heat shrink sleeve contains a sealant glue. These must be used when connecting wiring harness(s) or electrical connector terminal(s) at all times. The smaller diameter heat shrink sleeve is to be used with the red and blue butt splice connectors and the larger diameter sleeve with the yellow butt splice connectors.

For ease and speed, some of the pre-terminated wiring harness(s) may already have the insulation partly stripped at the splice end. If the repair requires insulation to be stripped from the cable, refer to the Relationship Table for the correct length of insulation to be stripped.

The Pre-Terminated Wiring Harness(s) illustration shows the electrical connector terminal type, the part number of the pre-terminated wiring harness and the letter of the extractor tip which must be used to extract the electrical connector terminal from the connector housing. Additionally, those electrical connector terminal(s) which are gold are identified, all others are therefore, tinned and not gold.

Wiring Harness Cable Identification Sleeves

A selection of colored sleeves are available for maintaining the wiring harness cable identification on the pre-terminated wiring harness. Place the correct colored sleeve(s) over the pre-terminated wiring harness insulation as near to the electrical connector as possible with the main wiring harness cable color nearest to the electrical connector.

For example, if the original wiring harness cable color is pink with a black trace put the pink wiring harness cable identification sleeve on the pre-terminated wiring harness first followed by a black sleeve, and slide both along the wiring harness cable to the electrical connector terminal.

List of Parts

Description	Part Number	Quantity
Pre-Terminated Wiring Harness(s)	418-066 to 418-103 inclusive	10 each
Glue Lined Heat Shrink Pack – small diameter	418-104	25 per pack
Glue Lined Heat Shrink Pack – larger diameter	418-105	10 per pack
Case Assembly Comprising – carry case, lid, inner lid, base, insert, trays foam spacers	418-106	1
Butt Splice Connector – Red	418-107	50 per pack
Butt Splice Connector – Blue	418-108	50 per pack
Butt Splice Connector – Yellow	418-109	20 per pack
Sleeve Identification Pack – for Red insulation	418-112	500
Sleeve Identification Pack – for Blue insulation	418-113	500
Sleeve Identification Pack – for Yellow insulation	418-114	500

Harness repair components can be ordered from Jaguar/Land Rover authorised parts.

Repair Tools

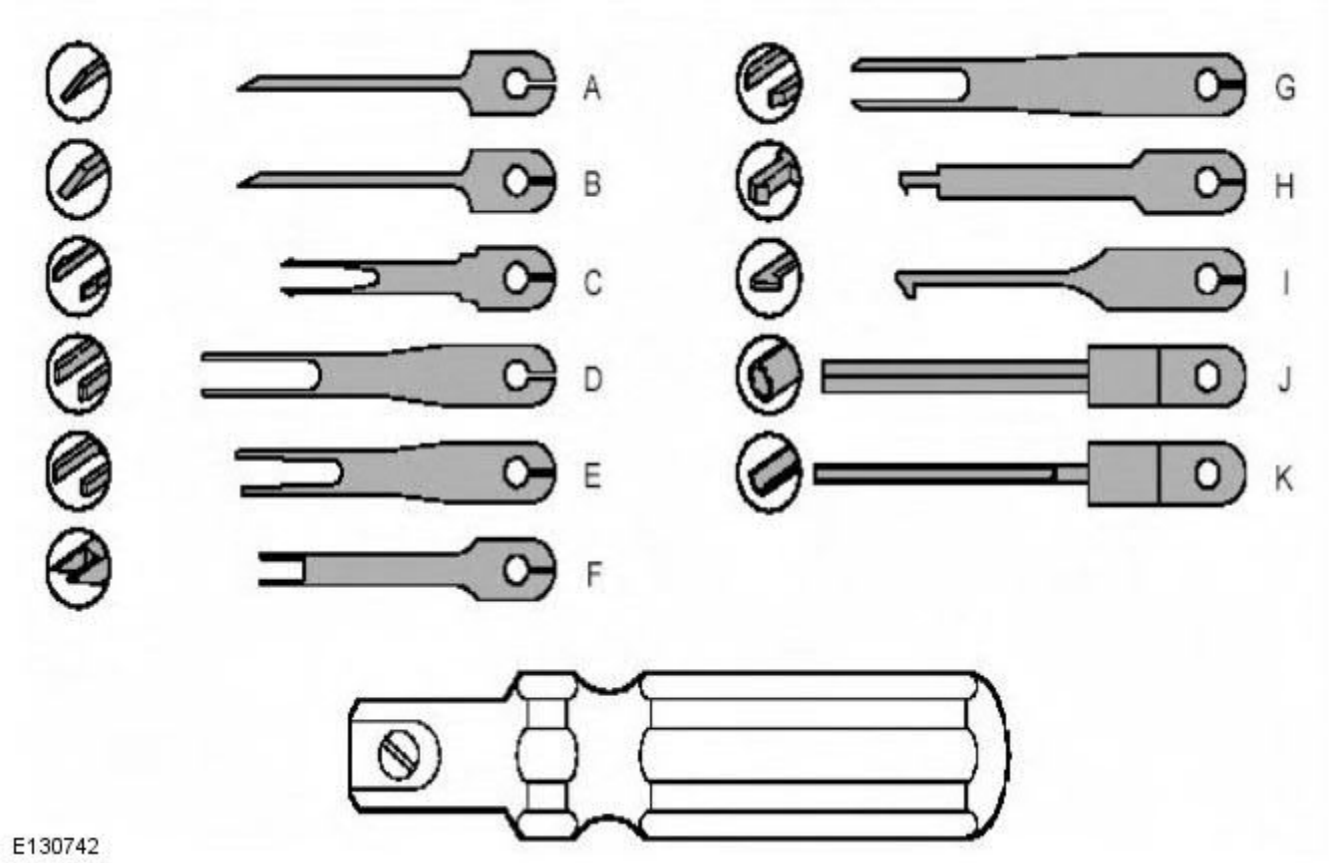
The wiring harness repair tools comprises:

- Crimping pliers
- A wire cutter and insulation stripper
- An electrical connector terminal extraction handle and tips

Extraction Handle and Tips

The extraction handle, in conjunction with the correct tip, is used to remove a terminal from an electrical connector. Each tip is marked with an identification letter, A to K inclusive. Each tip has been specially designed to extract a particular type of electrical connector terminal. The use of any other tool is **not** recommended and is liable to cause damage to the electrical connector. The tip is fastened to the handle by a screw which holds the tip firmly yet allows it to be easily replaced.

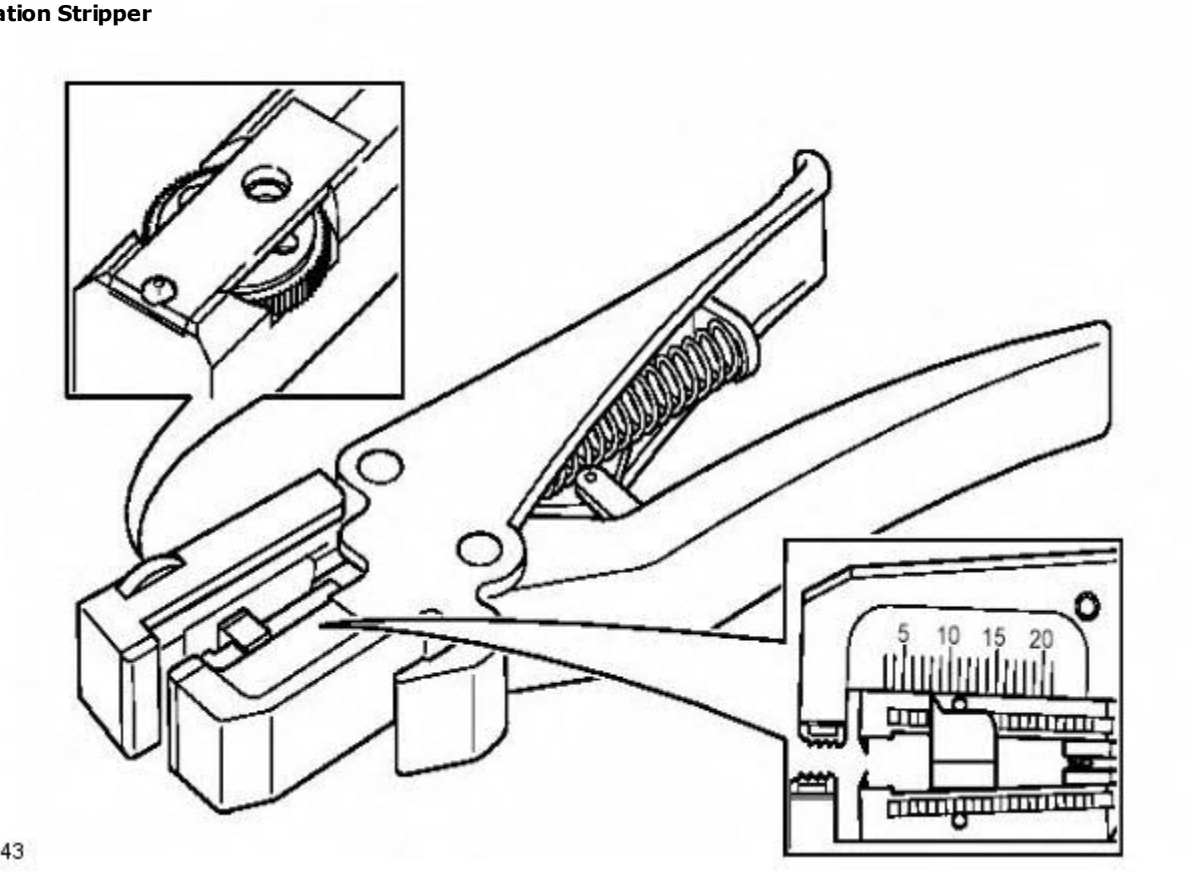
Extraction Handle and Tips



Insulation Stripper

The moving jaw has an adjuster wheel which has a series of holes in it. Turning the wheel and placing the cable in the matching size hole will automatically adjust the jaw to the correct pressure. Note that some wiring harness(s) may have a harder insulation and slight adjustment of the wheel may be needed to make a clean strip but exercise care not to damage the wire.

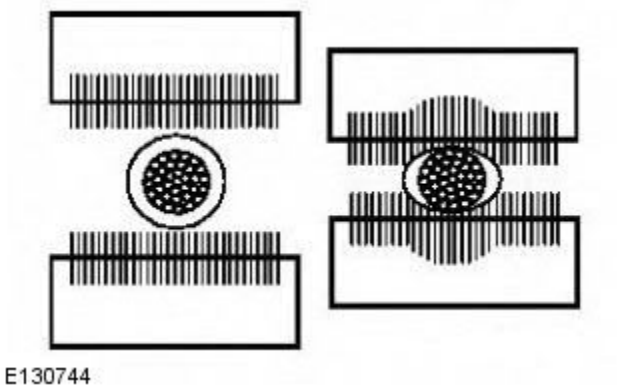
Insulation Stripper



By pressing the outer edges of the wiring harness cable length stop together the adjuster can be slid up or down the jaw. This decreases or increases the length by which the wiring harness cable insulation will be stripped from the pre-terminated wiring harness or wiring harness wire. The adjuster has a position indicator to align with a graduated scale and this sets the correct length in millimetres, of insulation to be stripped. The amount of insulation to be stripped is shown in the Relationship Table.

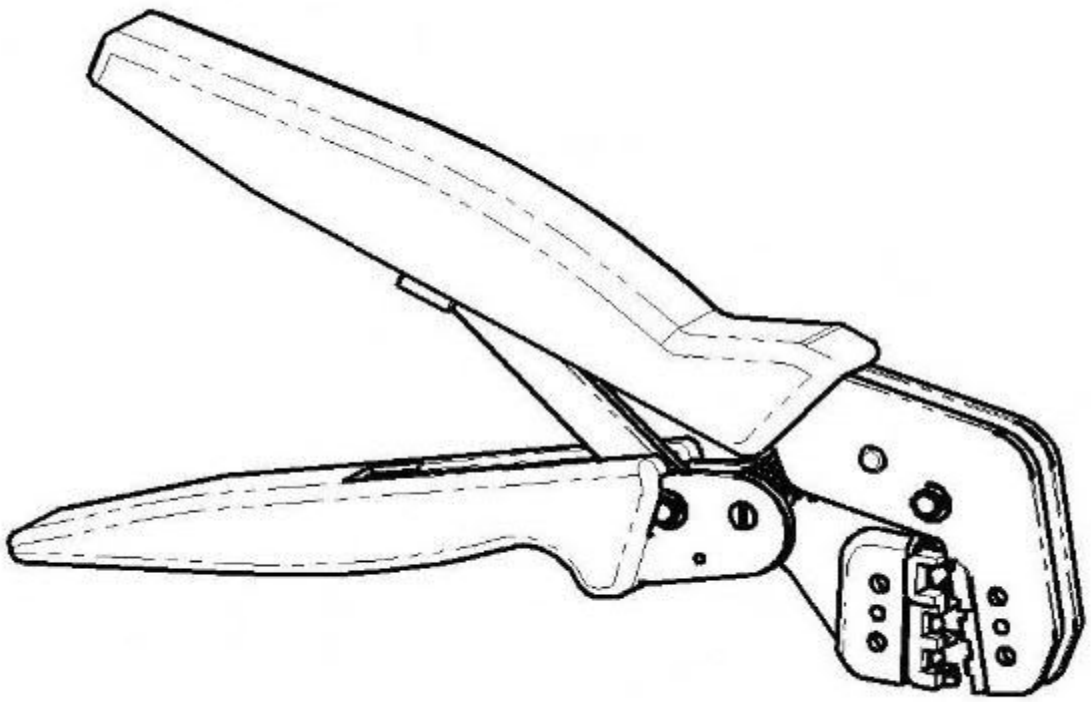
The illustration shows the insulation stripper tool and a wiring harness correctly gripped in the jaws. A wire cutter is provided on the outer side of the fixed jaw.

Cable Correctly Gripped in Stripper Blades



Crimping Pliers

Crimping Pliers



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The crimping pliers have a moving jaw and a stationary jaw, with three different sized crimping enclosures. Each of the enclosures is identified by a red, blue or yellow coloured dot which corresponds to the three colours of the pre-terminated wiring harness(s) and butt splice connector colors.

Description	Part Number	Quantity
Extraction Tool Handle	418-110	1
Extraction Tip Pack consists of 2 spare screws plus	418-S111	1
Tip A	418-118	1
Tip B	418-119	1
Tip C	418-120	1
Tip D	418-121	1
Tip E	418-122	1
Tip F	418-123	1
Tip G	418-124	1
Tip H	418-125	1
Tip I	418-126	1
Tip J	418-127	1
Tip K	418-128	1
Crimping Pliers	YRW500010	1
Wire Stripping Tool	418-117	1

Harness repair tools can be ordered from:

Bosch Automotive Service Solutions

Ironstone Way

Brixworth Industrial Estate

Brixworth

Northants

NN6 9UD

United Kingdom

Telephone: +44 (0) 1327 303400

Fax: +44 (0) 1327 303499

Email: css.uk@bosch-automotive.com

Repair Methods

CAUTION: **Several different types and sizes of terminal may be found in a single electrical connector housing.**

It is necessary to identify:

- The conductor (wire) size of the affected wiring harness
- The electrical connector range from which the damaged wiring harness is to be removed
- The terminal type

Use of the approved diagnostic tool will greatly assist in the quick identification of electrical connectors and faulty pin terminal(s).

Reference can also be made to the vehicle Electrical Guides, held by Dealers, to identify wiring harness(s) and electrical connector(s).

By using the Relationship Table, the wiring harness conductor (wire) size can be related to a suitable pre-terminated wiring harness by the color of the insulation. Also, the correct length of insulation to be stripped from the wiring harness lead is identified.

Relationship Table

CABLE RANGE	SPLICE	STRIP LENGTH
0.35 mm² to 1.50 mm²	RED	6.00 to 7.00 mm
1.00 mm² to 2.50 mm²	BLUE	6.00 to 7.00 mm
4.00 mm² to 6.00 mm²	YELLOW	9.00 to 9.50 mm

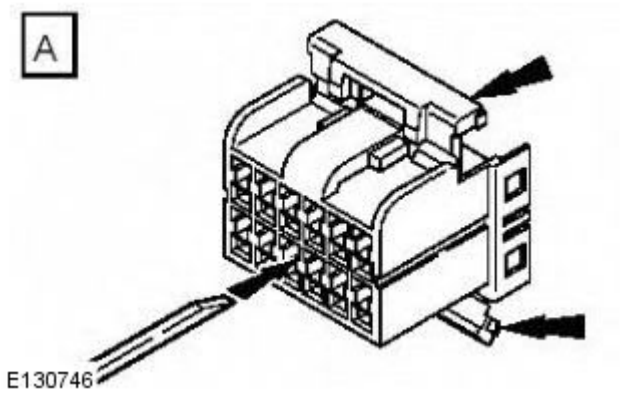
Electrical Connector Terminal Extraction

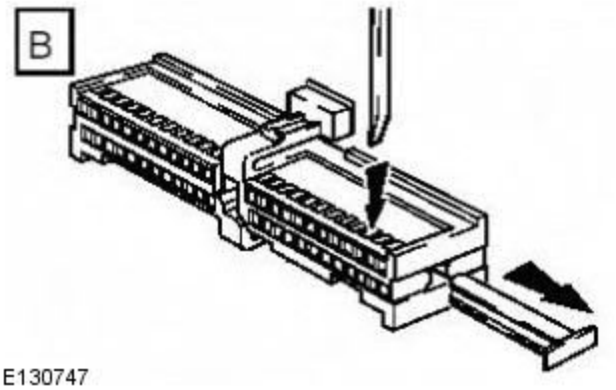
It must be noted that some electrical connector(s) have anti-backout devices which prevent the terminals from being removed from the electrical connector. Some examples of these are shown in following illustrations. The anti-backout device must be released before attempting to remove the terminal from the electrical connector. Some anti-backout devices require a special tip to release the device. Most can be released by carefully using a suitable small screwdriver.

Various types of electrical connector have seals installed internally or externally to prevent moisture ingress. These normally do not have to be removed but make sure that they are installed when the electrical connectors are connected.

The illustrations show examples of each tip used on different types of electrical connector(s). There are a large number of different types of electrical connector used on vehicles therefore only one example using each tip is shown. Technicians experience and judgement will dictate which type of tip should be used for those electrical connector(s) which are not shown. Care should be exercised to avoid further damage when removing the terminals from the electrical connector.

NOTE: **Examples of the extraction tips and anti-backout tips.**





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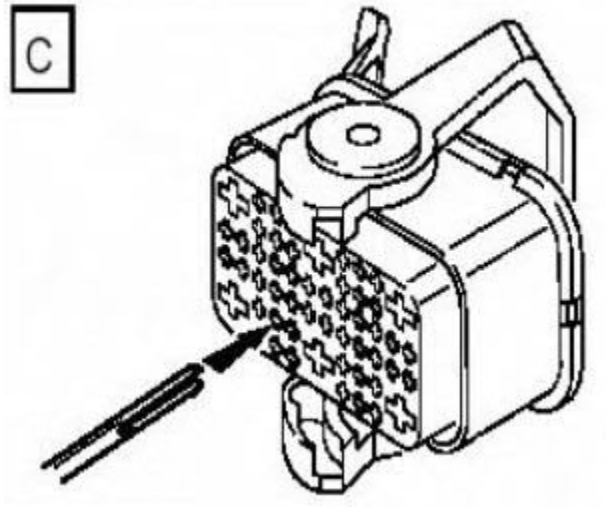

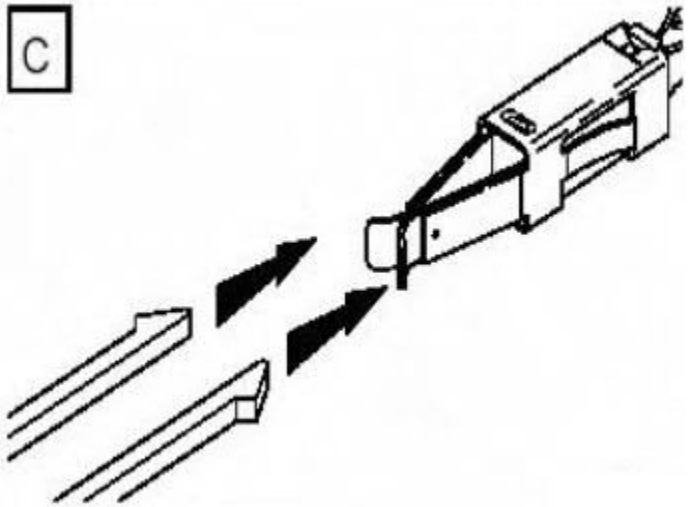

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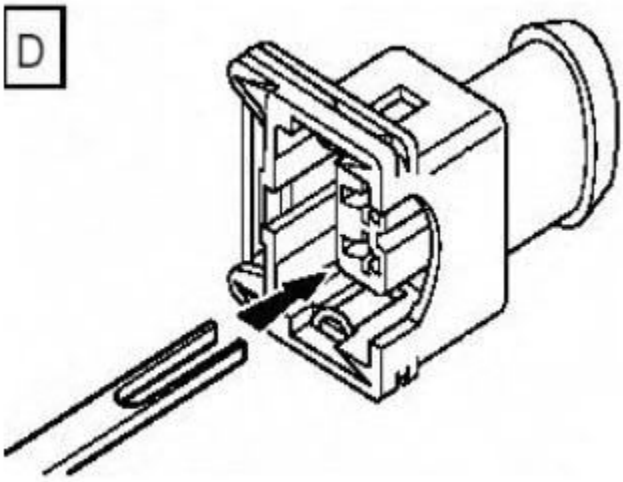

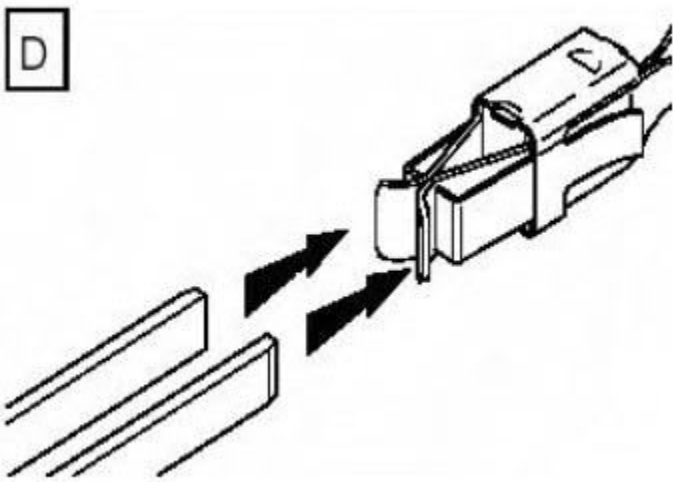

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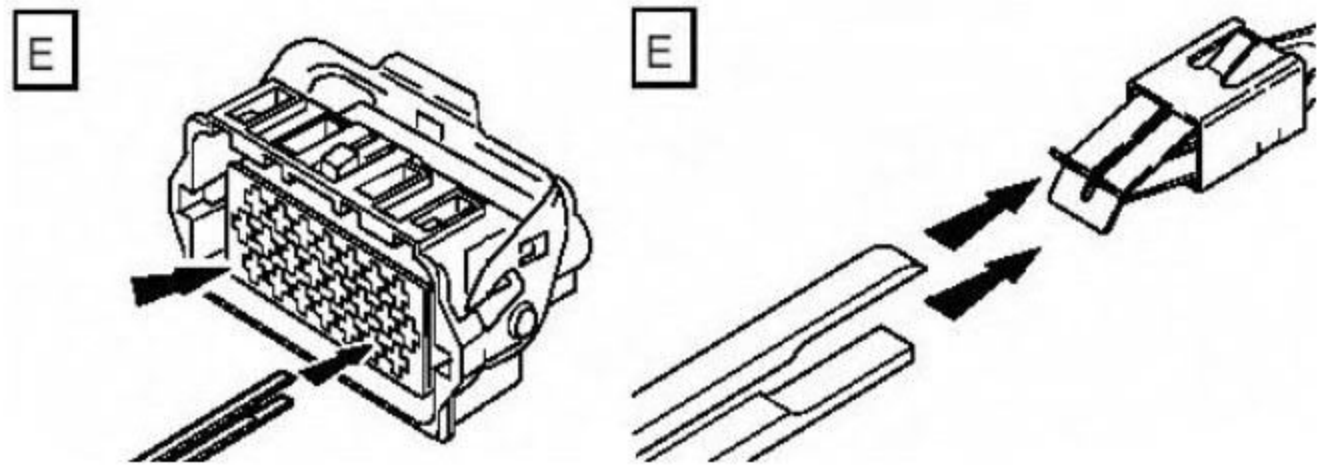

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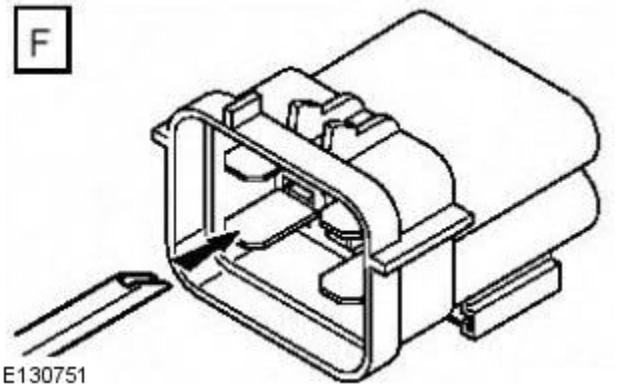

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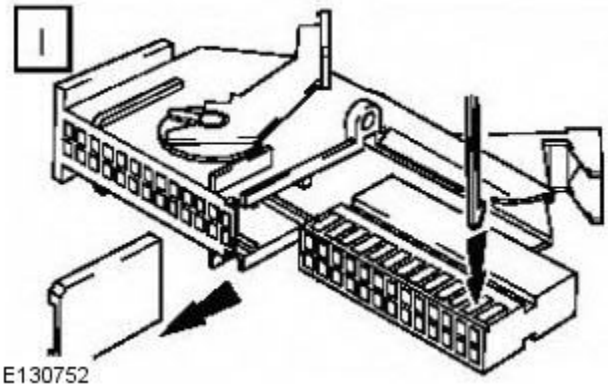

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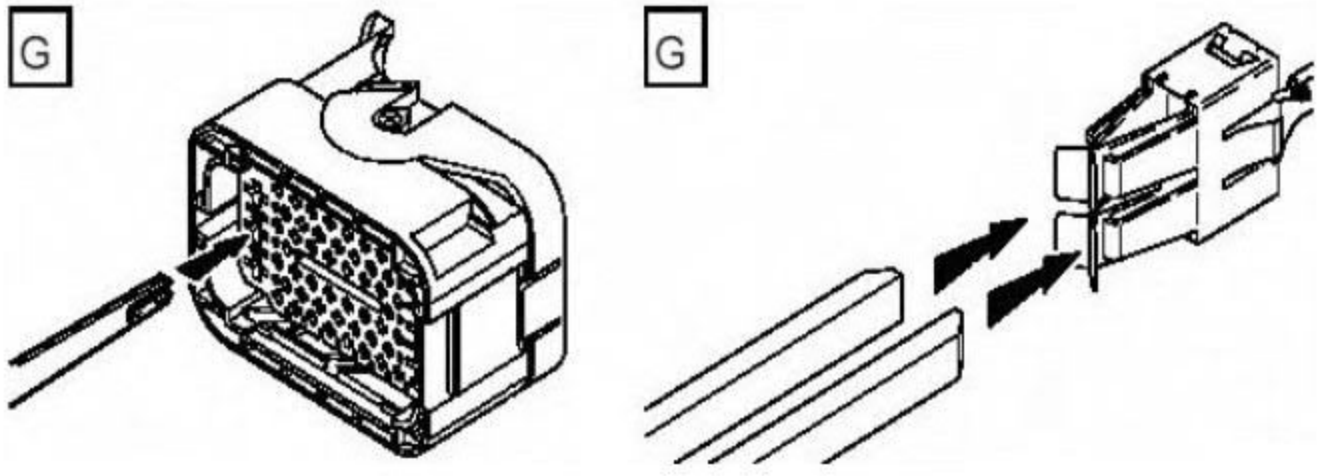

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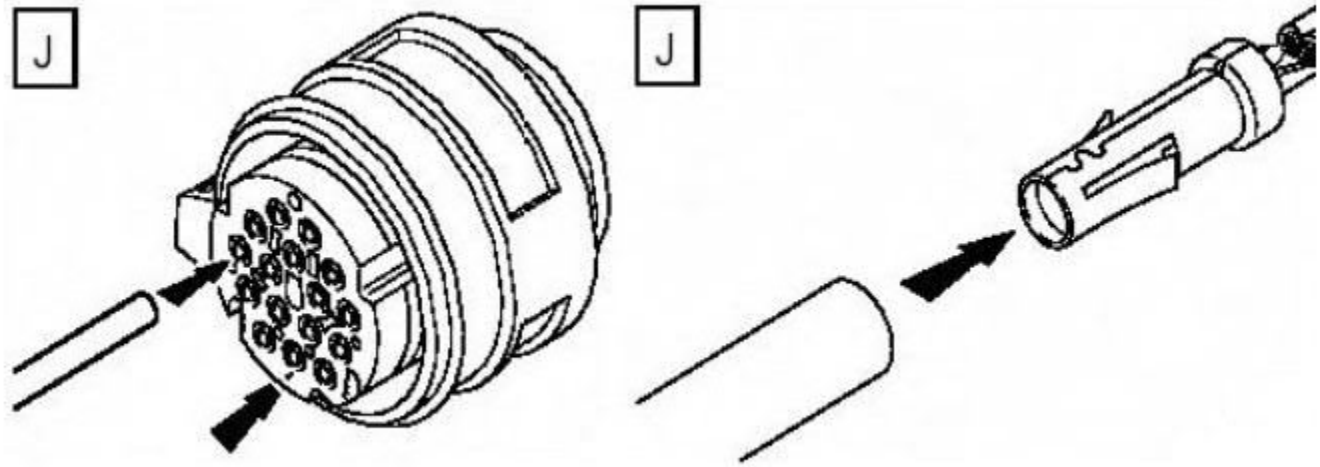

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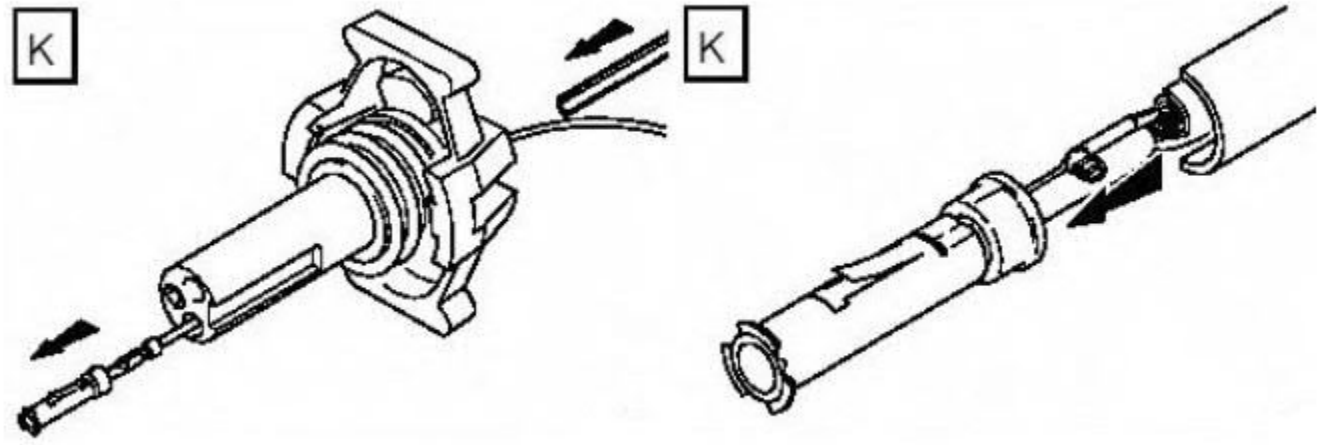


E130755

NOTE: The chart shows the electrical connector types, terminal pins/sockets, extractor tip and anti-backout tip.

Electrical connector terminal type	Pin or socket	Extractor tip	Anti-backout tip
Mulitlock 040 series	D	A	
Mulitlock 040 series	B	A	
Mulitlock 070 series	B	B	
Mulitlock 040 series	D	B	
Econoseal III 070 series	D	B	
Econoseal III 070 series	B	B	
Econoseal III 070 series	B	B	
Econoseal III J2	D	B	
Econoseal III 250 series	B	F	
Econoseal III 250 series	D	B	
Econoseal III 250 series	B	F	
Econoseal III 250 series	D	B	
Micro-timer II 1.5mm	D	C	
Micro-timer II 1.5mm	B	C	
Std power timer 4.8 flat	D	G	
Std power timer 5.8 flat	B	D	
Std power timer 5.8 flat	B	D	
Std power timer 2.8 flat	D	D	
Std power timer 4.8 flat	D	G	
Std power timer 5.8 flat	B	D	
Ford 2.8 flat	D	E	H
Mulitlock 070 series	D	B	
Mulitlock 070 series	B	B	
Junior power timer 2.8 flat	D	D	
Sumitomo TS90 connector	B	B	H
Modu IV gold plated	D	B	
Mulitlock 040 series gold plated	D	A	
Micro qualock	D	I	
EECV	D	B	
EECV	D	B	
Kostal dia 1.50 series	D	J	
AMP 6.3 flat	D	B	
Junior power timer 2.8 flat	D	D	
2.8 series	D	B	I
Sumitomo TS90 connector	D	B	H
Ducon 0.60 gold plated	D	K	
AMP 6.3 flat	D	D	
Econoseal III 250 series	B	F	

Repair Procedure

CAUTIONS:

Do not use crimping pliers, insulation strippers, butt splice connectors, heat shrink sleeves or pre-terminated wiring harness(s) that are not supplied with by authourised Jaguar/Land Rover parts. Each part has been designed to be used only with the other parts available from Jaguar/Land Rover parts.

Where the repair procedure indicates that a glue lined heat shrink sleeve should be applied, apply sufficient heat to the glue lined heat shrink to melt the glue in order to provide a water tight seal. Do **not** over heat the glue lined heat shrink sleeve so that the wiring harness insulation becomes damaged.

It is not correct to make more than five repair joints on the wiring harness to any electrical connector and if more damage is found at the same electrical connector then a new wiring harness must be installed.

1. Remove the faulty terminal from the electrical connector using the extractor tool and correct tip. Make sure that any anti-backout device is released before trying to remove the terminal.
2. CAUTION: A number of electrical connector terminals are gold plated or gold flashed. When defective, they must be installed with a gold pre-terminated wiring harness(s). It is not always easy to identify the female as gold but the male pins are visually easier, therefore always check both male and female terminals to identify those which are gold. Under no circumstances are gold and tin terminals to be mixed as this will lead to early failure of the electrical contact.

   NOTE: Never use a harness lead with a smaller diameter than the original harness lead.

   Select the correct size and type of pre-terminated wiring harness and butt splice connector.
3. Using the wire cutter on the stripping tool, cut the pre-terminated wiring harness and the harness cable to the required

length.

4. NOTE: See illustration: **Stripping Insulation**

   From the Relationship Table, find the correct length of insulation to be stripped from the pre-terminated wiring harness and set the adjustable cable length stop to the correct length. Place the pre-terminated wiring harness in the wire stripper and remove the insulation.
5. Put the cable identification sleeve(s) on to the wiring harness with the main cable colour nearest to the terminal.
6. During this next step do not over tighten. Place the selected butt splice connector in the crimping tool, matching the aperture and the butt connector colours. Make sure that the window indentation in the butt connector is resting over the guide bar on the lower jaw. Partially close the grip until the butt connector is securely held in the aperture. This will give support to the butt connector while the pre-terminated wiring harness is inserted into it.
7. NOTE: See illustration: **Splice Correctly Located**

   Insert the pre-terminated wiring harness into the butt connector and make sure that the wire is against the wire stop. Close the grip firmly, crimping the lead to the butt connector. When the handles have been completely closed the butt connector will be freed from the tool as the handles are released. If the handles have not been completely closed then the jaws will hold the butt connector and it cannot be removed from the tool until the crimp is fully made by closing the handles completely.
8. Make sure that the harness cable has been squarely cut and the correct length of insulation removed. If more than one splice is needed the butt connectors must be not be crimped to the wiring harness at the same distance from the connector. The splices must be staggered to prevent a bulk of splices in the same area of the wiring harness.
9. It is preferable to cover the butt splice joint with heat shrink sleeve. This is desirable not essential, except where the electrical connector is a sealed electrical connector. Use the smaller diameter sleeve for red and blue pre-terminated wiring harness(s) and the large diameter sleeve for the yellow pre-terminated wiring harness(s). It is advisable to place the heat shrink over the completed joint but in some instances the sleeve will not pass over the terminal. Check, and if required, place the correct size sleeve onto the harness cable or pre-terminated wiring harness before crimping the butt splice to the wiring harness.
10. Place the harness cable into the butt splice with the splice window over the guide bar. Make sure that the cable harness wire is against the stop in the butt splice, crimp the butt splice connector to the wiring harness.
11. Gently pull the harness cables each side of the butt splice to make sure that a secure joint has been made.
12. WARNING: Do not use a naked flame in areas where fuel or oil have been spilt. Clean the area of residual oil and fuel and wait until the fuel spill has fully evaporated.

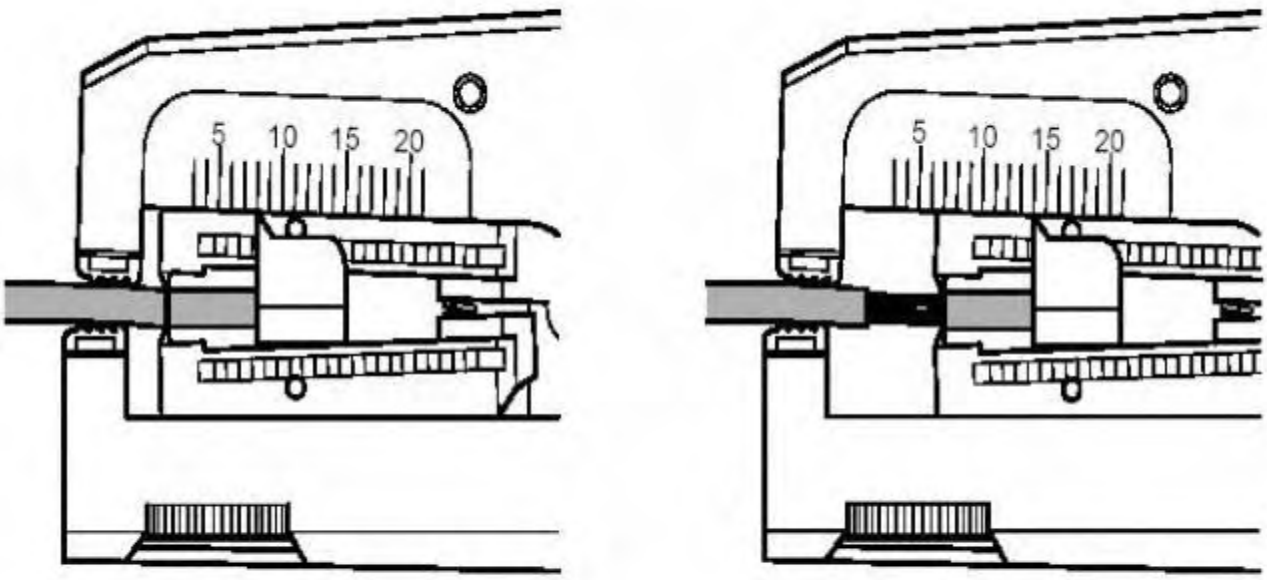
    CAUTIONS:

    When using a heat source make sure that it is localised and causes no damage to surrounding materials.

    Where the repair procedure indicates that a glue lined heat shrink sleeve should be applied, apply sufficient heat to the glue lined heat shrink to melt the glue in order to provide a water tight seal. Do **not** over heat the glue lined heat shrink sleeve so that the wiring harness insulation becomes damaged.

    Using a suitable heat source, shrink the sleeve over the butt splice.
13. If further pre-terminated wiring harness(s) are to be installed to the same electrical connector, make sure that the lead is cut at a different length to the previous joint. This makes sure that the splices will, where possible, be staggered on the wiring harness and prevent a bulk of splices in one area.
14. When all of the splices have been made, fit the terminal(s) to the electrical connector, taking care that the terminals are correctly orientated.
15. Install the wiring harness cover and secure with adhesive electrical tape. Do not cover the wiring harness right to the electrical connector as the terminals must have a little movement and not be firmly bound to the electrical connector or wiring harness. Make sure that the cable identification sleeve(s) are showing at the wiring harness electrical connector.

Stripping Insulation



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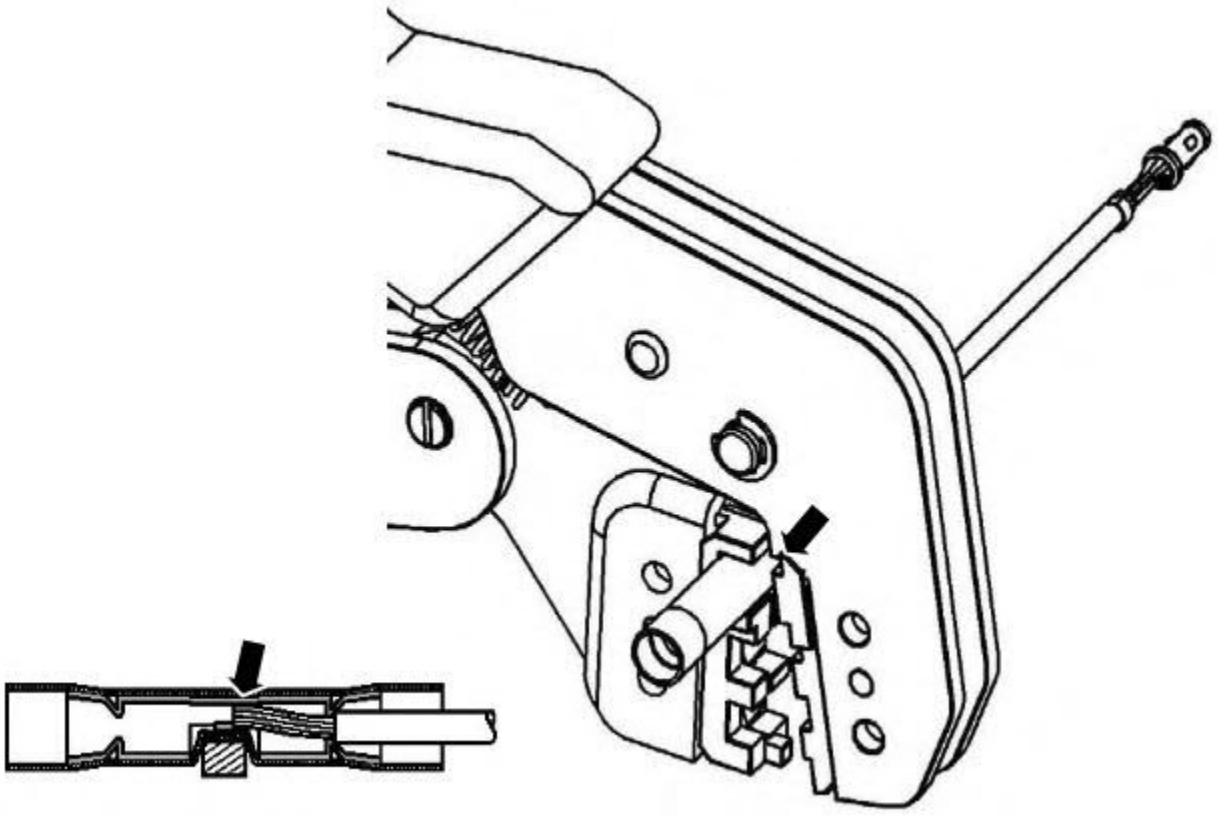
Splice Correctly Located



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Published: 11-May-2011

Wiring Harnesses - Wiring Harness Repair

General Procedures

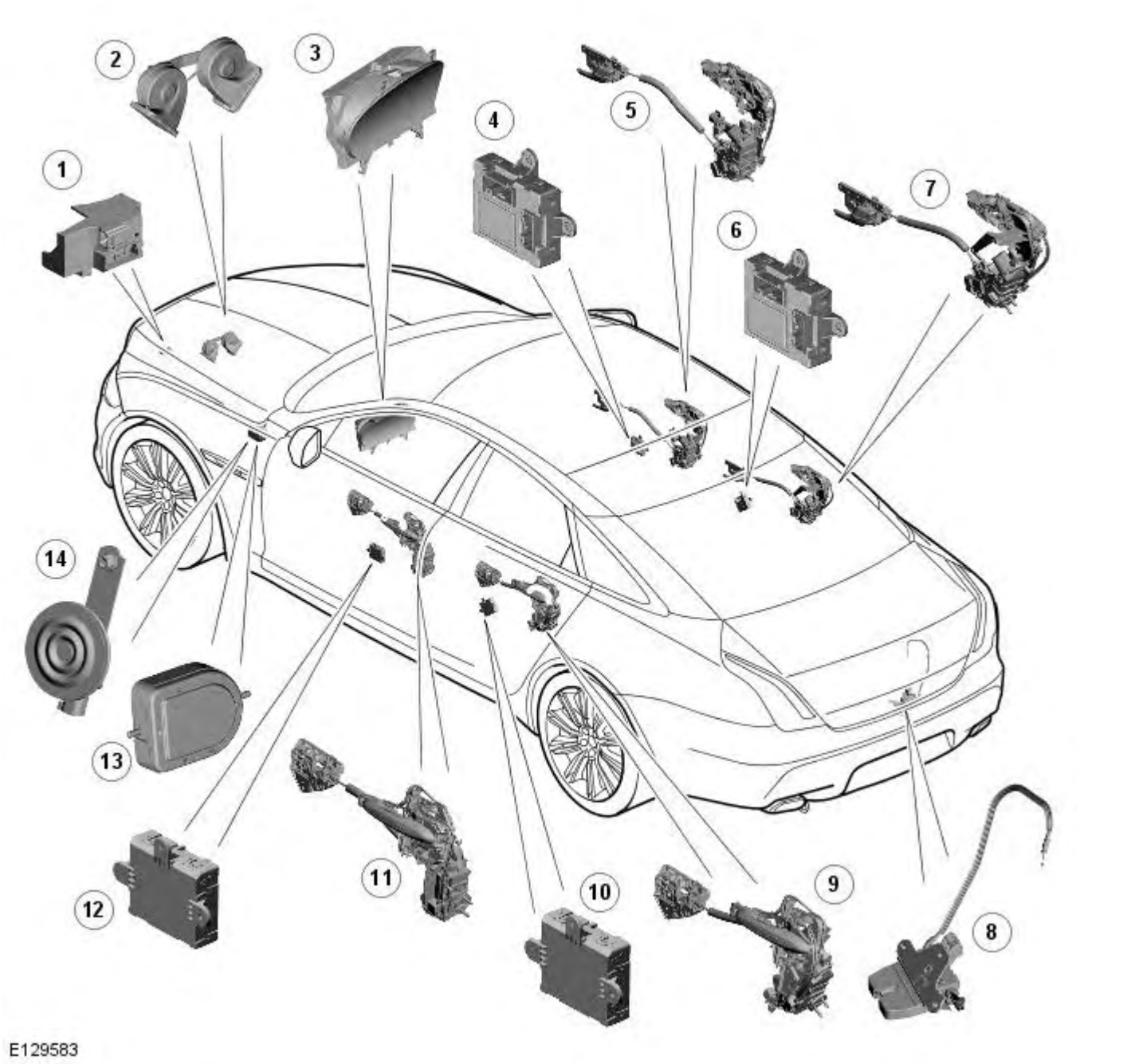
1. For additional information, refer to: Wiring Harness (418-02 Wiring Harnesses, Description and Operation).

Published: 11-May-2011

Anti-Theft - Active - Anti-Theft - Active - Component Location

Description and Operation

Component Location



Item	Description
1	Bonnet switch
2	Horns
3	Instrument cluster
4	RH (right-hand) front door module
5	RH front door latch mechanism
6	RH rear door module
7	RH rear door latch mechanism
8	Luggage compartment latch mechanism
9	LH (left-hand) rear door latch mechanism

10	LH rear door module
11	LH front door latch mechanism
12	LH front door module
13	Battery backed sounder (if fitted)
14	Passive sounder (if fitted)

Published: 11-May-2011

Anti-Theft - Active - Anti-Theft - Active - Overview

Description and Operation

Overview

The active anti-theft system is available with three different levels of vehicle protection depending on market specification:

- Hinged panel sensing
- Hinged panel and intrusion sensing
- Hinged panel, intrusion and inclination sensing.

The CJB (central junction box) automatically arms and disarms the active anti-theft system when it functions the central locking system or if the Smart Key is removed from the vehicle for 60 seconds or more the alarm and immobilizer will arm but the vehicle will remain unlocked.
Refer to: Handles, Locks, Latches and Entry Systems (501-14 Handles, Locks, Latches and Entry Systems, Description and Operation).

Depending on market specification two modes of protection are used: perimeter mode and volumetric mode.

Perimeter mode

Perimeter mode, monitors the security of the hinged panels, which include:

- all doors,
- luggage compartment lid,
- engine compartment lid.

When perimeter mode is active, the CJB monitors the panel ajar switches in the latch mechanisms of the hinged panels.

Volumetric mode

In volumetric mode the CJB monitors the interior of the vehicle for movement using an ultrasonic sound wave sensor.

The battery backed sounder incorporates an inclination sensor which monitors the vehicle for unauthorised tilting; for example towing or jacking.

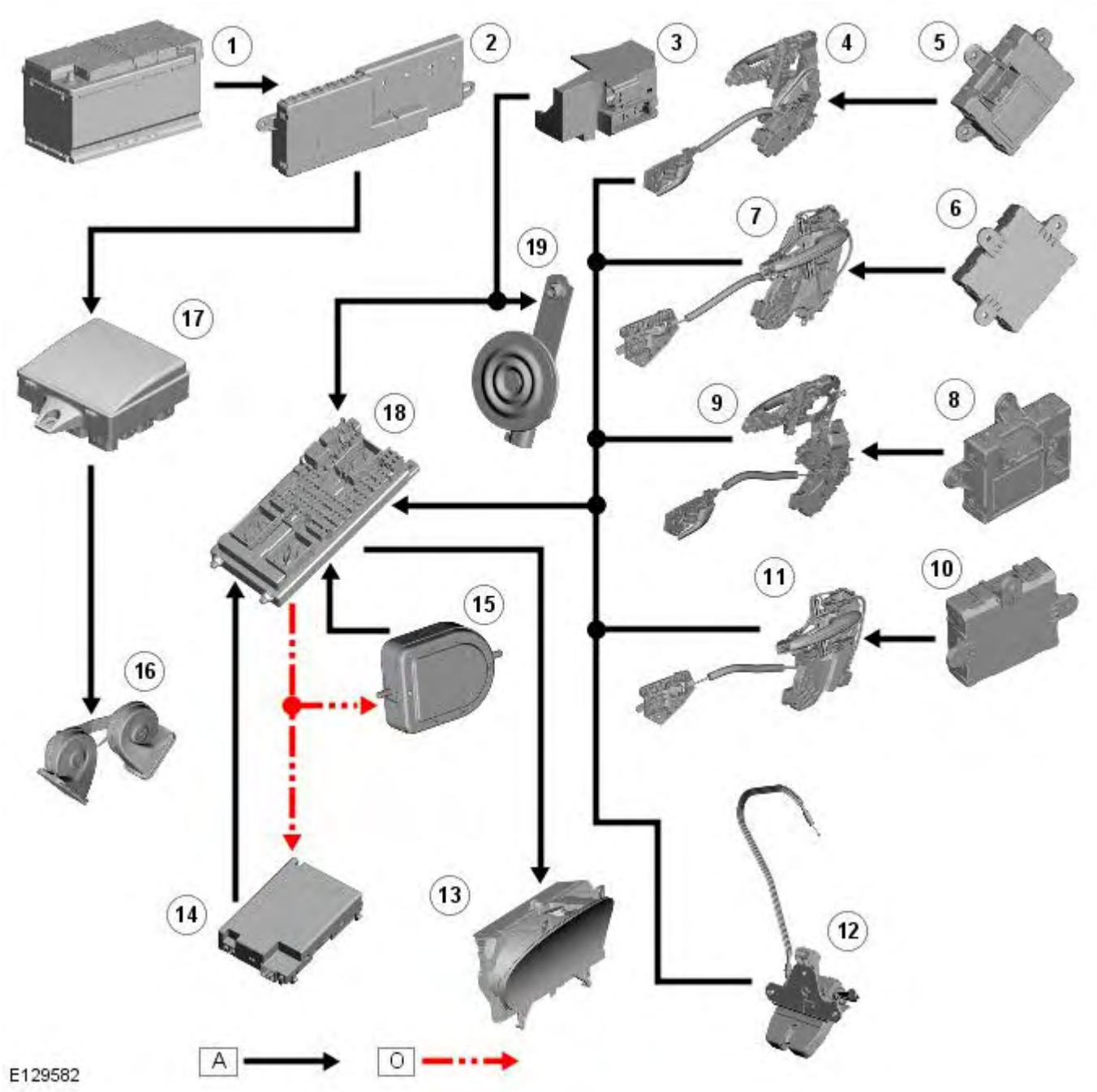
Published: 11-May-2011

Anti-Theft - Active - Anti-Theft - Active - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: **A** = Hardwired; **O** = LIN bus



Item	Description
1	Battery
2	BJB (battery junction box)
3	Bonnet switch
4	Door latch mechanism - LH (left-hand) rear
5	Door module - LH rear
6	Door module - RH (right-hand) rear

7	Door latch mechanism - RH rear
8	Door module - LH front
9	Door latch mechanism - LH front
10	Door module - RH front
11	Door latch mechanism - RH front
12	Luggage compartment lid - latch mechanism
13	Instrument cluster
14	Volumetric sensor
15	Battery backed sounder/tilt sensor (if fitted)
16	Horns
17	EJB (engine junction box)
18	CJB (central junction box)
19	Passive sounder (if fitted)

System Operation

Anti-Theft - Active

The active anti-theft system is available with three different levels of vehicle protection depending on market specification:

- Hinged panel sensing
- Hinged panel and intrusion sensing
- Hinged panel, intrusion and inclination sensing.

The system is controlled by software in the CJB and RJB (rear junction box) and indicates a trigger condition:

- Visually, using the direction indicators,
- Audibly, using the vehicle horn and either a passive or active sounder to indicate a trigger condition.

The passive sounder takes the form of an anti-theft disc horn located at the rear of the engine compartment on the LH side. The active sounder takes the form of a battery backed sounder located in the same position.

The battery backed sounder is fitted with an inclination sensor. The battery backed sounder is a intelligent unit, and communicate to the CJB over a LIN (local interconnect network) bus connection.

Monitoring of the hinged panels is carried out using switches located in each door latch assembly, the engine-compartment-lid latch assembly, and the luggage-compartment-lid latch assembly. The condition of the switches is monitored by the CJB.

Monitoring of front door lock status is carried out using switches located in the door latch mechanisms. The condition of the switches is monitored by the front door modules and transmitted to the CJB over the medium speed CAN (controller area network) bus.

Monitoring of the cabin interior is carried out using an intrusion detection module mounted behind the roof console. The intrusion detection module comprises an ultrasonic sound wave sensor to determine if there is movement within the cabin.

Information from the intrusion detection module is communicated to the CJB over a LIN bus connection.

CAUTIONS:

The intrusion detection module electrical connections, particularly those to the sensors mounted in the roof console, are very delicate and must be handled with care.

The intrusion detection module is an electro-statically sensitive part and should only be handled in an electro-statically controlled environment.

When armed, the active anti-theft system can be triggered in one of the following ways:

- A door ajar switch indicates a door has been opened.
- The engine compartment lid or luggage compartment lid ajar switches indicate that either has been opened.
- Either front door latch mechanism indicates a door has been unlocked.
- The emergency key blade is used to open the LH front door.
- The CJB or RJB are disconnected (this may result in only a partial trigger).
- An attempt is made to start the engine without a valid signal from the Smart Key.
- The battery backed sounder is disconnected (partial trigger only).
- The vehicle battery is disconnected on a vehicle fitted with a battery backed sounder (partial trigger only).
- The inclination sensor detects a change in vehicle attitude.
- The intrusion detection module detects movement within the cabin.
- Panic alarm from the Smart Key.

Component Description

Door Modules

The door modules provide the interface between the door latch-motors, the door latch-switches and the CJB. The door modules provide door switch status information and enable the door latch-motors on request from the CJB or the keyless vehicle module.

Keyless Vehicle Module

The keyless vehicle module interfaces with the Central locking, Radio Frequency (RF) receiver and collects RF signal information which is transmitted from the Smart Key. This information is translated into commands which are passed on the medium speed CAN bus to the:

- CJB,
- RJB,
- door modules, and
- instrument cluster.

The keyless vehicle module also monitors:

- 4 interior antennae,
- 1 luggage compartment antenna,
- a rear bumper antenna, and
- 4 door handle antennae if the passive entry system is fitted.

On vehicles with passive entry, the additional fast latch motors are controlled via the keyless vehicle module and the locking status is passed to the CJB on the medium speed CAN bus.

Alarm Indicator

The alarm indicator is a LED (light emitting diode) located in the instrument cluster. When the ignition is off the indicator gives a visual indication of the active anti-theft system to show if the alarm system is active or not active.

Passive Anti-Theft Horn

The passive anti-theft horn is hardwired to the CJB which activates when the alarm is triggered.

Battery Backed Sounder

Operation of the battery backed sounder is controlled by the CJB on the LIN bus. The sounder is also connected with a permanent battery supply via the CJB. An integral, rechargeable battery powers the sounder if the battery power supply from the CJB is interrupted.

An inclination sensor is incorporated into the battery backed sounder, to monitor vehicle altitude, see Inclination Sensor.

Inclination Sensor

The CJB monitors the inclination sensor and will activate the alarm system if the vehicle is being raised.

Intrusion Detection Module

The intrusion detection module comprises an ultrasonic sound wave sensor which monitors the vehicle's interior.

The intrusion detection module is activated with volumetric mode which in turn is enabled when the vehicle is double locked. The vehicle can be locked and alarmed with the module de-activated if a pet is to be left in the vehicle for example by single-locking the active anti-theft system. The intrusion detection modules can also be de-activated via the 'Alarm Sensors on/off' option in the instrument cluster menu.

NOTE: The Instrument Cluster method of de-activation of the intrusion detection module is only for one arm cycle, it will revert to active when the vehicle is next unlocked.

When the volumetric mode is active and the vehicle battery voltage falls below 9 volts, the CJB will ignore any inputs from the intrusion detection module to prevent false alarm activation.

Published: 14-Jun-2013

Anti-Theft - Active - Anti-Theft - Active

Diagnosis and Testing

Principles of Operation

Electric Steering Column Lock (ESCL)

For a detailed description of the anti-theft - active operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (419-01A Anti-Theft - Active)

Anti-Theft - Active (Description and Operation),
Anti-Theft - Active (Description and Operation),
Anti-Theft - Active (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
• Start/stop button • Electric steering column lock • Vehicle key	• Fuses • Electrical harnesses • Harness connectors • Vehicle key battery • Central junction box (controls +12Volt supply to electric steering column lock and software logic for electric steering column lock control) • Instrument cluster (provides electrical ground circuit to electric steering column lock) • CAN circuits

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident check for Diagnostic Trouble Codes (DTCs) and refer to the DTC index

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Steering Column Lock Module (VIM) (100-00 General Information, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - DTC: Central Junction Box (BCM) (100-00 General Information, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - DTC: Instrument Cluster (IPC) (100-00 General Information, Description and Operation).

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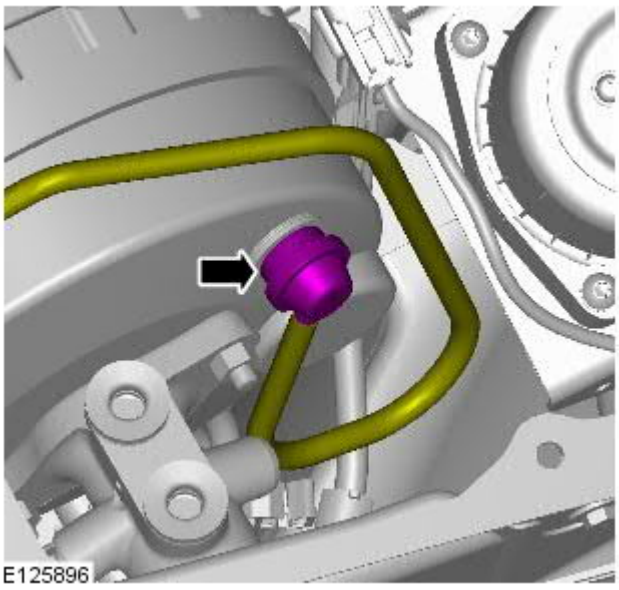
Anti-Theft - Active - Anti-Theft Alarm Horn

Removal and Installation

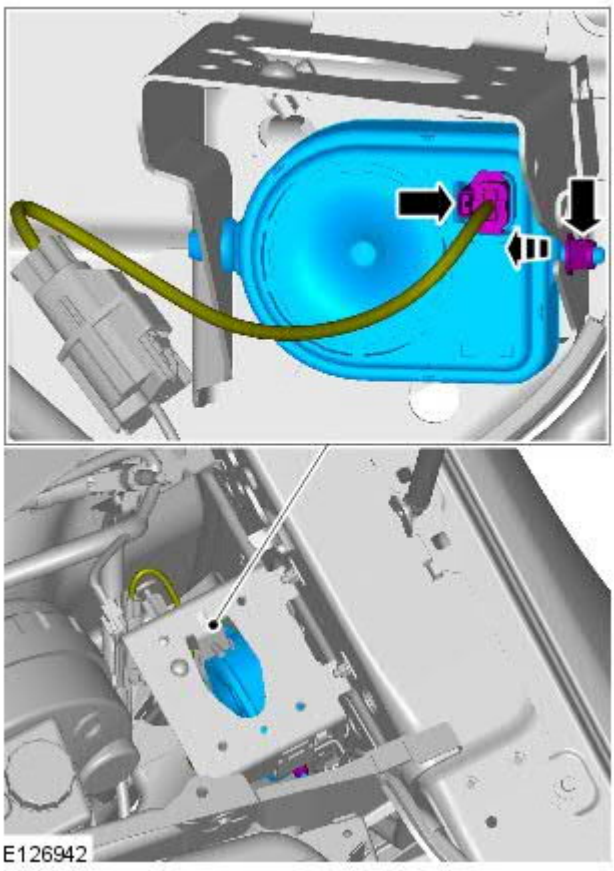
Removal

NOTE: Removal steps in this procedure may contain installation details.

1. For additional information, refer to: Pedestrian Protection Hood Actuator LH (501-20C Pedestrian Protection System, Removal and Installation).



2. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



3. TORQUE: 7 Nm

Installation

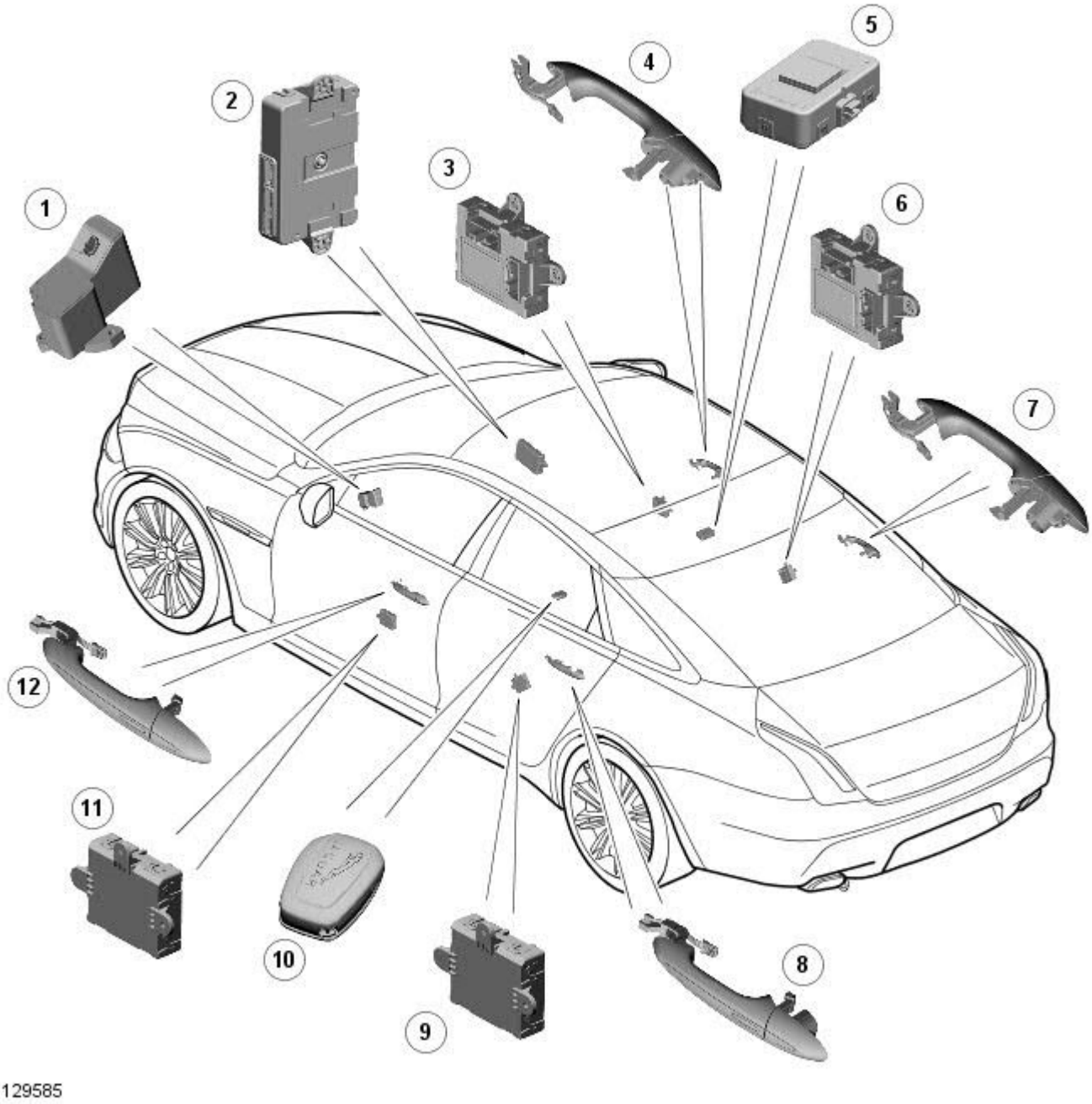
1. To install, reverse the removal procedure.

Published: 11-May-2011

Anti-Theft - Passive - Anti-Theft - Passive - Component Location

Description and Operation

Passive Entry Component Location

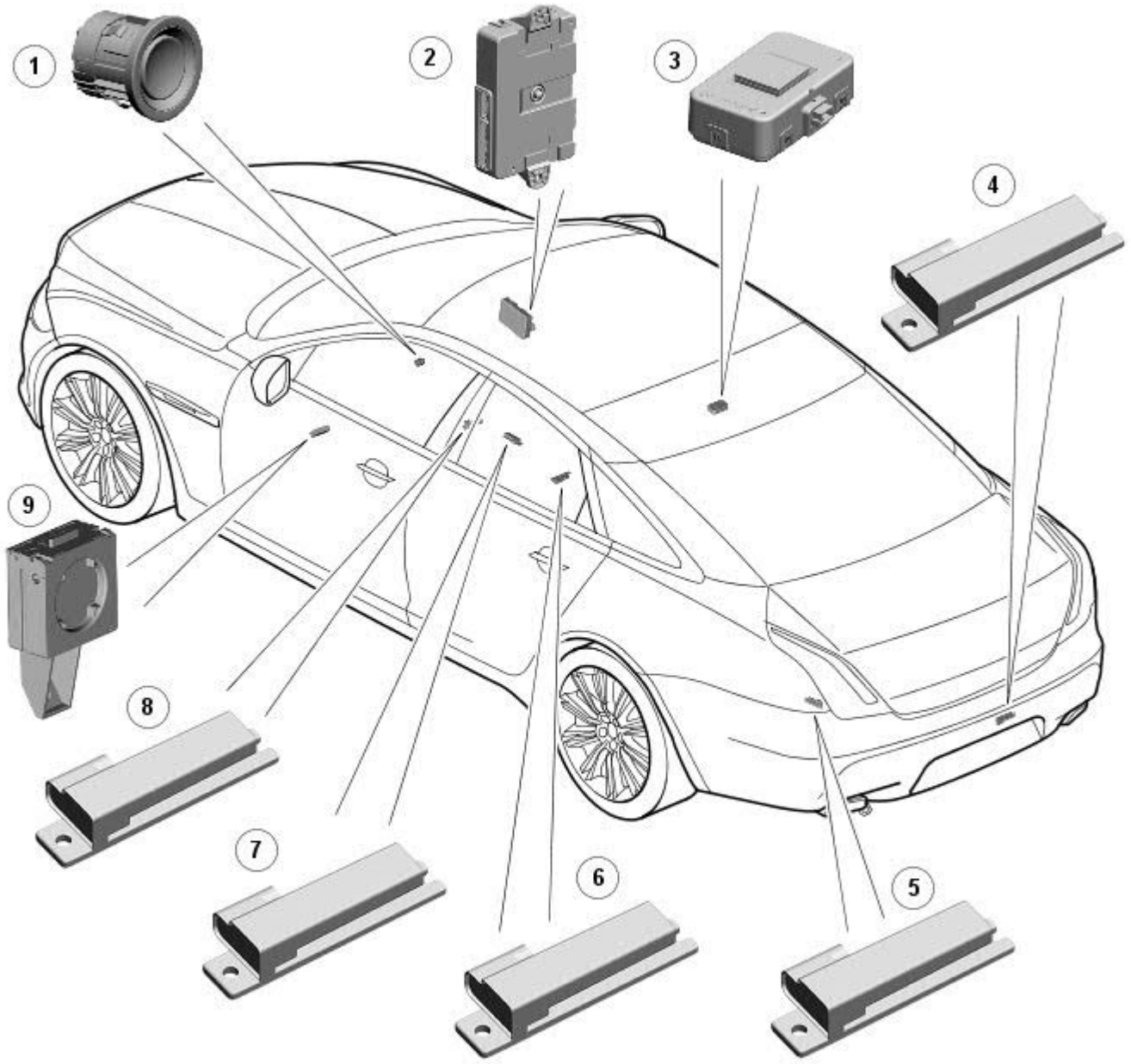


E129585

Item	Description
1	Steering coloum lock
2	Keyless vehicle module (KVM)
3	RH (right-hand) front door module
4	RH front door antenna (integral to the handle)
5	RF receiver
6	RH rear door module
7	RH rear door antenna (integral to the handle)
8	LH (left-hand) rear door antenna (integral to the handle)
9	LH rear door module

10	Smart Key
11	LH front door module
12	LH front door antenna (integral to the handle)

Passive Start Component Location



E129587

Item	Description
1	Stop/Start Button
2	Keyless vehicle module (KVM)
3	RF receiver
4	Interior antenna - luggage compartment
5	Interior antenna LH - luggage compartment
6	Interior antenna - rear compartment
7	Interior antenna - centre compartment
8	Interior antenna - front compartment
9	IAU (immobilizer antenna Unit)

Published: 11-May-2011

Anti-Theft - Passive - Anti-Theft - Passive - Overview

Description and Operation

Overview

The PATS (passive anti-theft system) prevents the vehicle's engine from being started by unauthorized persons.

Engine starting is prevented by inhibiting the fuel, engine (spark, injectors and crank) and ignition systems from operating.

This is achieved by using a uniquely coded Smart Key and an encoded data exchange between multiple control modules.

The system is automatic and requires no input from the driver.

The engine start system is initiated when the encoded data between the Smart Key and vehicle control modules is verified. The engine can then be started when the drive selector is in the 'Park' position, and the start/stop switch and the brake pedal are pressed simultaneously.

Published: 16-Apr-2013

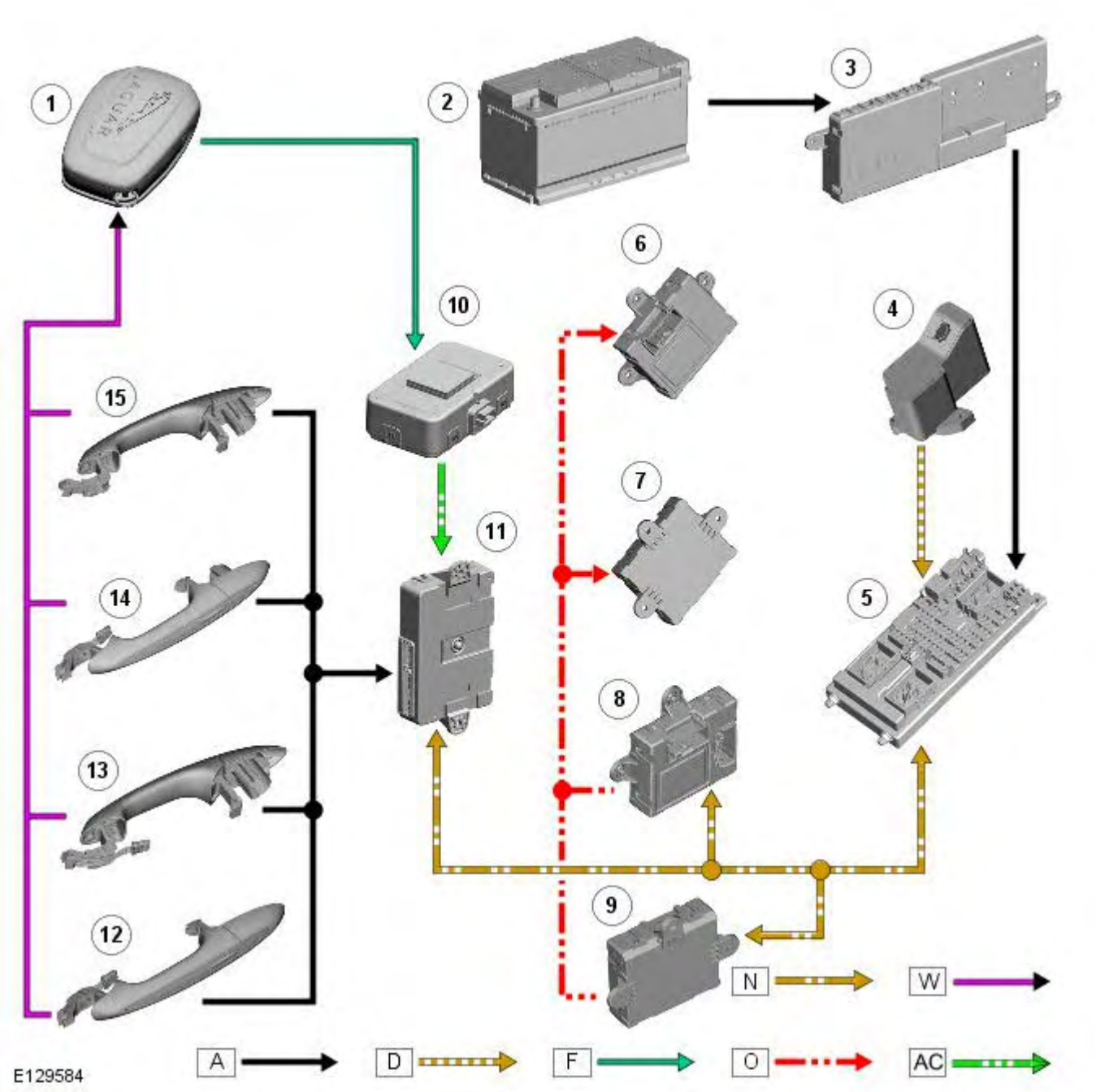
Anti-Theft - Passive - Anti-Theft - Passive - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: **A** = Hardwired; **D** = High speed CAN; **N** = Medium speed CAN; **O** = LIN bus

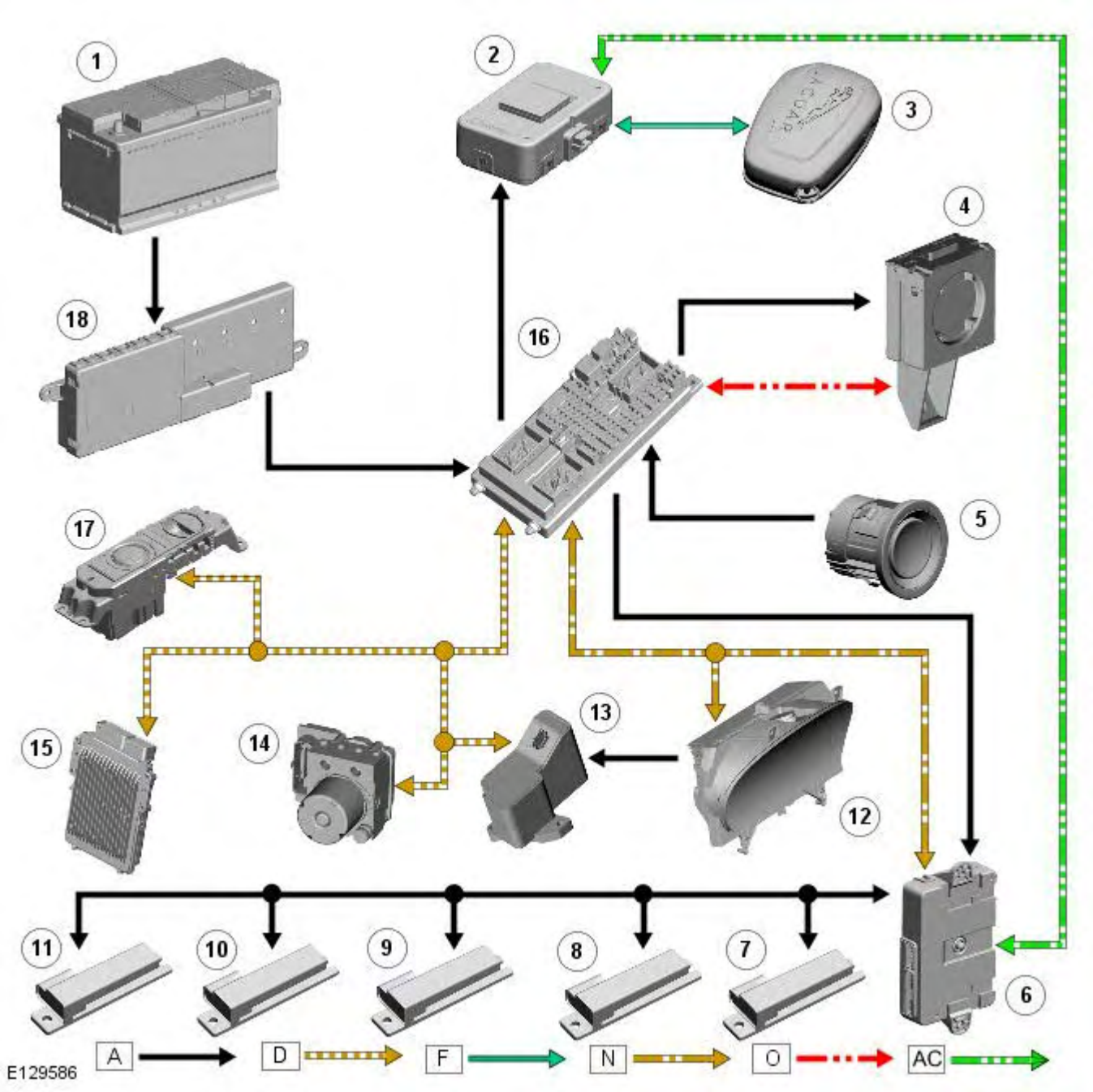
Passive Entry



Item	Description
1	Smart Key
2	Battery
3	BJB (battery junction box)
4	Steering column lock

5	CJB (central junction box)
6	Door module
7	Door module
8	Door module
9	Door module
10	RF receiver
11	KVM (keyless vehicle module)
12	Door handle antenna
13	Door handle antenna
14	Door handle antenna
15	Door handle antenna

Passive Starting



Item	Description
1	Battery
2	RF receiver
3	Smart Key
4	IAU (immobilizer antenna Unit)
5	Stop/Start button
6	KVM (keyless vehicle module)
7	Interior antenna
8	Interior antenna
9	Interior antenna
10	Interior antenna
11	Interior antenna
12	Instrument cluster
13	Steering column lock
14	ABS (anti-lock brake system) module
15	ECM (engine control module) module
16	CJB
17	JaguarDrive selector module
18	BJB (battery junction box)

System Operation

Passive Start System

Upon receiving the 'start button pressed' hardwired signal, the CJB sends a message via the medium speed CAN (controller area network) bus to the KVM initiating the vehicle starting process.

The KVM then energizes the low frequency antennas within the vehicle cabin which transmit a 125KHz signal to the Jaguar Smart Key, upon receipt of the LF signal the Jaguar Smart Key transmits either a 433 MHz or a 315 MHz RF signal containing the authorisation code to the RF receiver.

The RF receiver relays the code, via a serial communication line, to the KVM which then checks and approves the code as valid. The KVM will only respond to a valid Jaguar Smart Key.

The KVM continues the passive start process by communicating a 'Jaguar Smart Key valid' signal to the CJB via the medium speed CAN bus, Once the CJB receives the Jaguar Smart Key authorisation it confirms the response matches with an internal calculation.

Before the CJB sends a mobilisation signal to the ECM, via the high speed CAN bus, it will exchange encrypted data with following components:

- The instrument cluster via the high speed CAN bus,
- The steering column lock via the high speed CAN bus, to authorise unlocking the steering column. The steering column unlocking function is powered by the CJB and grounded via the instrument cluster

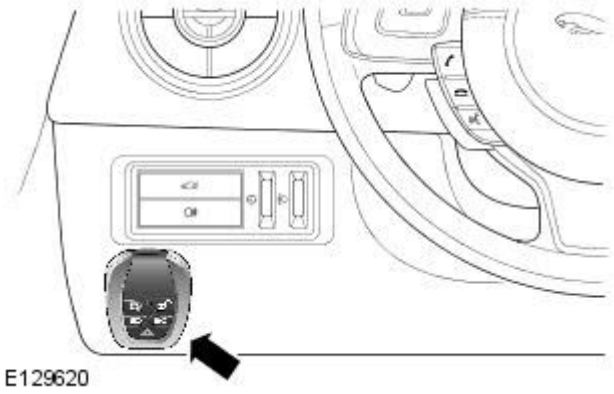
When the CJB receives a hardwired Park/Neutral signal from the JaguarDrive Selector, a high speed CANbus message from the ABS module and a simultaneous start/stop switch signal it interprets this as an engine crank request. Before the engine crank request is processed, the CJB verifies the brake pressure signal received from the ABS module. If the signal is greater than the stored threshold value, a crank request signal is sent to the ECM on the high speed CAN bus.

NOTE: If the KVM fails to locate the Smart Key, a message 'SMART KEY NOT FOUND REFER TO HANDBOOK' will appear in the instrument cluster message center and the keyless start back-up process will have to be used to mobilize and start the vehicle.

To ensure optimum long term reliability of the smart key the battery must be replaced with a brand new, unused battery. If a used battery is installed the "SMART KEY BATTERY LOW" message may not be cleared. To avoid contamination of the contacts the battery should be removed from its packaging and installed into the smart key while wearing gloves. To confirm that the replacement battery is working correctly press the unlock button twice while holding the smart key outside the vehicle, then enter the vehicle with the smart key, press the start button and confirm that the "SMART KEY BATTERY LOW" message is not displayed.

Keyless Start Back-up

If the vehicle has been unlocked using the emergency key blade or the Smart Key is not detected by the vehicle, it will be necessary to use the keyless start back-up system to disarm the alarm and start the engine. The following process must be followed in this event:

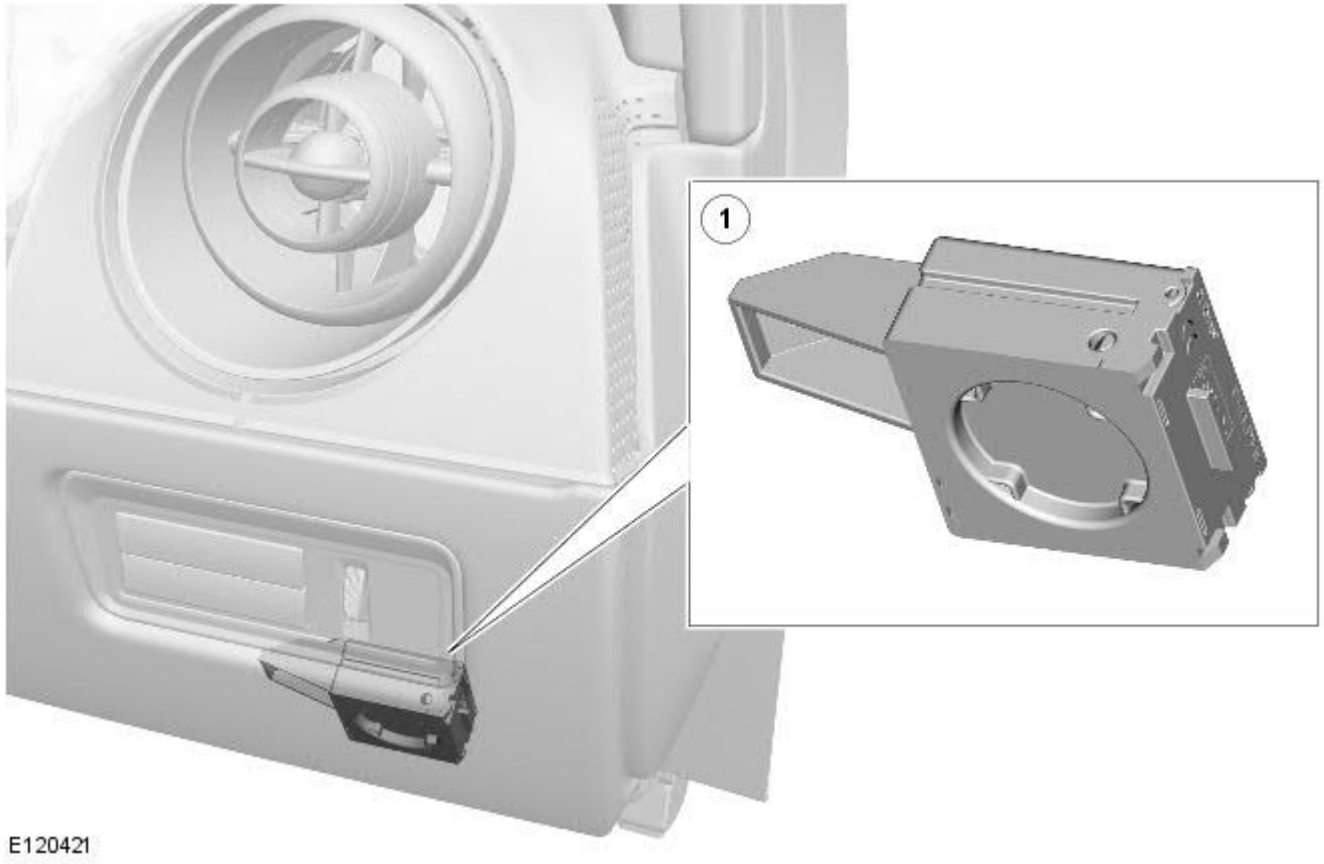


- Position the Smart Key against the underside of the instrument panel, on the outboard side of the steering column, with the buttons facing downwards. This is the location of the IAU.
- Holding the Smart Key in position and with the brake pedal depressed, press the start/stop button to start the engine.

This process bypasses the data exchange between the KVM and the CJB. A transponder within the Smart Key is detected by the IAU. The IAU confirms the code output from the transponder and communicates this code confirmation with the CJB via a LIN (local interconnect network) bus connection. The CJB then initiates the vehicle start process in the normal manner.

Component Description

Immobilizer Antenna Unit (IAU)



Item	Description
1	IAU

The IAU is located on the driver's side behind the instrument panel just below the auxiliary lighting switch. The IAU cannot be seen as it is located behind the trim panel. The IAU is used if the KVM is unable to authorize the Smart Key. The driver will be alerted to this by a chime and a message in the instrument cluster message center 'SMART KEY NOT FOUND REFER TO HANDBOOK'.

If the KVM is unable to identify the Smart Key, for example if the Smart Key battery voltage is low or there is local RF interference, the transponder within the Smart Key can be read by holding the smart key against then instrument panel.

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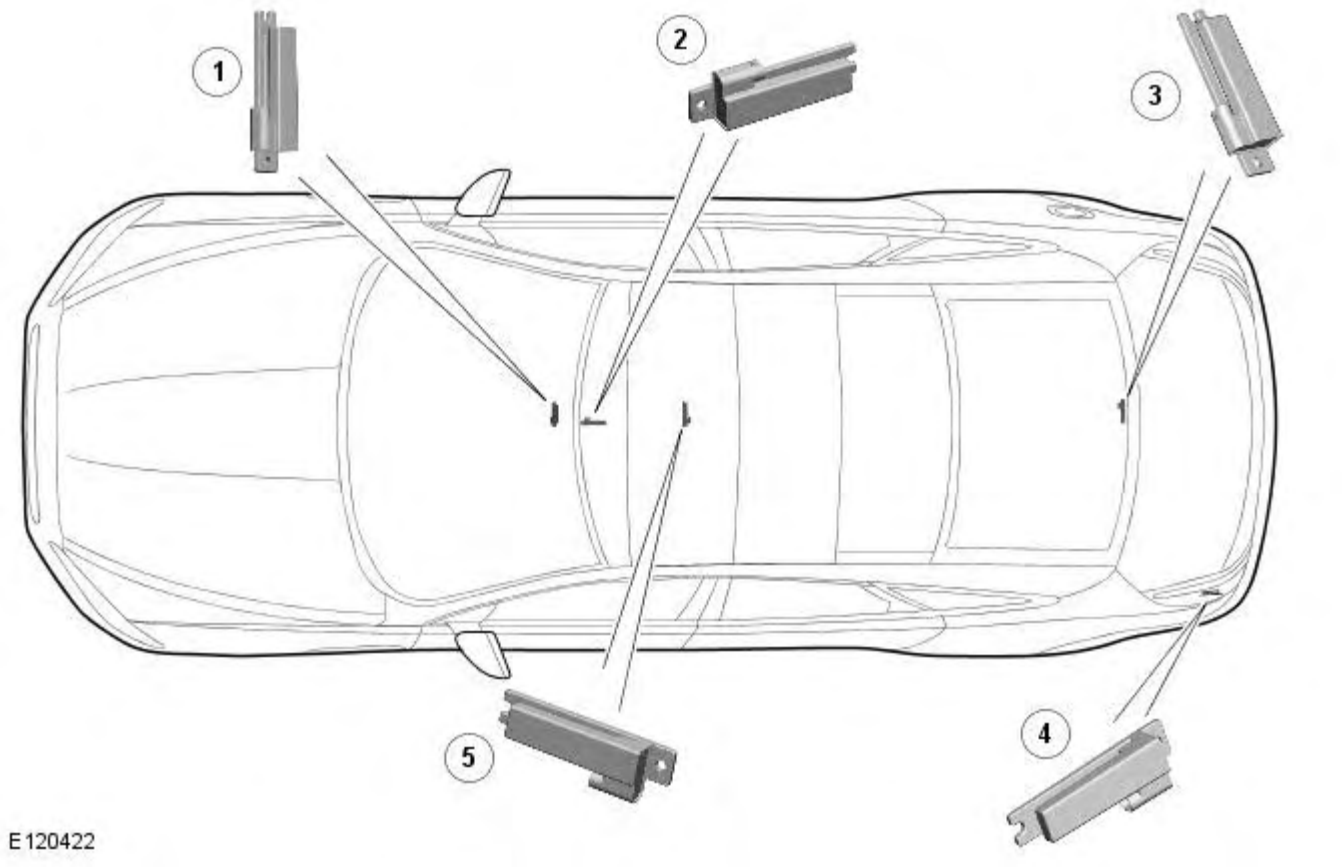
Low Frequency Antenna



Item	Description
1	Interior antenna - front compartment
2	Interior antenna - front compartment
3	Interior antenna - rear compartment
4	Interior antenna LH (left-hand) - luggage compartment
5	Interior antenna - center compartment

Five Low Frequency (LF) antennae for the passive start system are positioned in specific locations within the vehicle.

The KVM transmits an LF signal via the antennas which is received by the Smart Key. The Smart Key then responds by transmitting a RF signal which is received by the RF receiver and passed to the KVM for authorization.

Keyless Vehicle Module

The keyless vehicle module controls signal transmissions to and from the Smart Key and provides authorization to allow the vehicle to be started. The module has a medium speed CAN connection to the CJB for authorizing vehicle starting.

Radio Frequency Receiver

The Radio Frequency (RF) receiver transmission is received from the Smart Key to enable key identification.

Published: 14-Jun-2013

Anti-Theft - Passive - Anti-Theft - Passive

Diagnosis and Testing

Principles of Operation

For a detailed description of the anti-theft - passive system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (419-01B Anti-Theft - Passive)

Anti-Theft - Passive (Description and Operation),
Anti-Theft - Passive (Description and Operation),
Anti-Theft - Passive (Description and Operation).

Inspection and Verification

The best method to confirm the correct operation of the passive anti-theft system (PATS) is to check the LED (located in the centre of the instrument panel). The LED should illuminate solid for 3 seconds, when the ignition status is set to ON, and then extinguish. This validates all PATS functions (i.e. the key transponder matches a stored key code, the challenge/response sequence between the respective modules was successful resulting in the EMS being enabled).

Ignition fails to operate

Check that the smart key is located within the vehicle interior, and that it is the correct one for the vehicle.

Insert the smart key into the start control unit, this is an alternative method to allow Ignition On/Engine Start.

Check that the start button circuit to the central junction box is not open circuit or short circuit to power.

Check that the medium speed CAN network is not malfunctioning, i.e. open circuit or short circuit. This would mean that the remote keyless entry module, central junction box and instrument cluster would be unable to communicate.

Engine fails to crank

If a PATS fault is detected, the LED will flash for 60 seconds at 4Hz with a 50% duty cycle. At the end of this period, the LED will flash a 2 digit code; this code is repeated 10 times. The meaning of these fault codes along with the frequency of flashing is given in the accompanying table. As a general rule a fault code of 16 or less will cause the vehicle not to crank. Additionally, the manufacturer approved diagnostic system should be used to check the instrument cluster, central junction box & engine control module for Diagnostic Trouble Codes (DTCs).

One potential occurrence for failing to crank could be due to the P & N start switch (input to the engine control module).

Check the Crank Request output from the central junction box to engine control module is not short circuit to ground or open circuit.

Check the Starter Relay circuit.

NOTE: On petrol engine variants, due to Smart Start, both sides of relay coil are switched directly from engine control module (If conditions correct). On diesel engine variants the low side only is switched directly from the engine control module

Check that the electric steering column lock correctly operates and the steering wheel can turn freely.

Check that the high speed CAN network is not malfunctioning, i.e. the CAN circuit is open or short circuit. This would mean that the instrument cluster and engine control module would be unable to communicate resulting in no Challenge being performed to enable the engine control module. This would be supported by LED Flash Code 24.

Also check the CAN network between the ABS module and the central junction box. The central junction box uses the CAN_BrakePressureTMC signal to determine if the brake pedal has been pressed in order to allow an engine crank. The central junction box uses a value of 0x05, if the central junction box sees a value less than this, it will not enable the crank request output.

Engine cranks but will not start

If the engine is cranking it means that the engine control module has passed the authorisation required with the instrument cluster. If this authorisation failed, the engine control module would not engage the starter relay. This could be confirmed by verifying the PATS LED prove out (illuminated solid for 3 seconds) or by reading DTCs from the instrument cluster and engine control module.

In this case, the fuel pump circuit should be verified. The fuel pump delivery module (FPDM), which is supplied via the rear junction box (authentication required with the instrument cluster) and controlled by the engine control module, supplies the fuel pump.

In all cases of suspected non-start issues, the most logical failure modes should be eliminated first. i.e.

1. Check all relevant supplies and grounds to the relevant modules listed herein.
2. Note any unusual behaviour from other systems/functionality.
3. Note any functions that are not operating as expected.

If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC index.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Instrument Cluster (IPC) (100-00 General Information, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - DTC: Central Junction Box (BCM) (100-00 General Information, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - GTDi 2.0L Petrol, DTC: Engine Control Module (ECM) (100-00, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - TDV6 3.0L Diesel, DTC: Engine Control Module (ECM) (100-00, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - V6 S/C 3.0L Petrol , DTC: Engine Control Module (ECM) (100-00, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - V8 5.0L Petrol/V8 S/C 5.0L Petrol, DTC: Engine Control Module (ECM) (100-00, Description and Operation).

Published: 11-May-2011

Multifunction Electronic Modules -

Torque Specifications

Description	Nm	lb-ft	lb-in
Rear door module retaining bolts	1.5	1.5	13.3
Front door module retaining bolts	1.5	1.5	13.3
Passenger door module retaining bolts	1.5	1.5	13.3
Driver seat module	3	2.2	26.6

Published: 14-Jun-2013

Multifunction Electronic Modules - Driver Door Module (DDM)

Diagnosis and Testing

Description and Operation

For a detailed description of the multifunction electronic control modules, refer to the relevant description and operation sections in the workshop manual.

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
• Check for stuck/jammed switches and buttons • Visibly damaged or worn components • Loose or missing fasteners	• Fuse(s) • Electrical connector(s) • Wiring harness

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, check for diagnostic trouble codes (DTCs) and refer to the diagnostic trouble codes index

Manual Sunblind Initialization Routine

Where a sunblind module has been replaced, there is an initialization routine available on the diagnostic tool. This requires a new module to be initially installed in the fully down position and running of the "Initialize Specified Function/Feature" diagnostic routine on the manufacturer approved diagnostic tool. Alternatively, the sunblind may be initialized manually by following the procedures described below:

1. Raise the sunblind to top (fully retracted) position
2. Press and hold the window 'down' switch for 15 seconds (the sunblind will go down and will then be in initialization mode)
3. Release window switch and press window 'down' switch again to drive blind fully into lower block
4. Activate window switch 'up' until the sunblind reaches the top (fully retracted) position and release switch
5. The sunblind is now initialized and should have 'one-touch' functionality

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Driver Door Module/Passenger Door Module (DDM/PDM) (100-00 General Information, Description and Operation).

Published: 11-May-2011

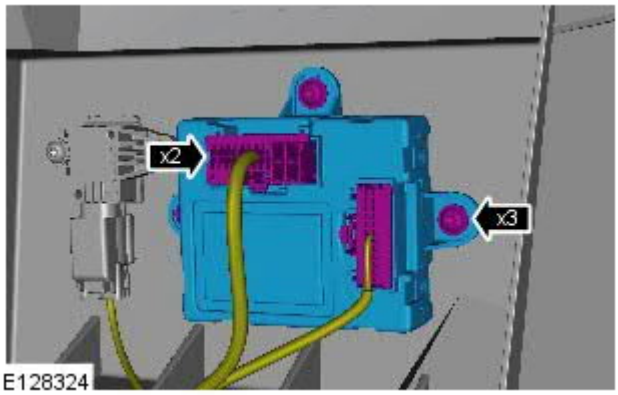
Multifunction Electronic Modules - Driver Door Module (DDM)

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: Front Door Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3.



Installation

1. To install, reverse the removal procedure.
2. If a new component has been installed, configure using Jaguar approved diagnostic tool.

Published: 07-Nov-2011

Multifunction Electronic Modules - Driver Seat Module (DSM)

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least one minute after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

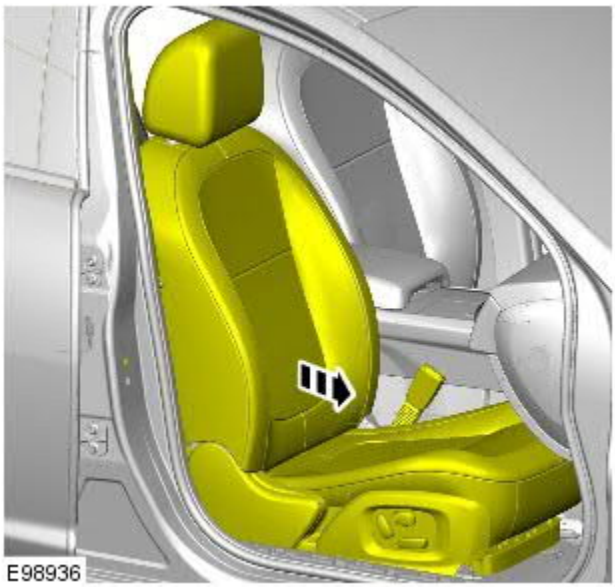
NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

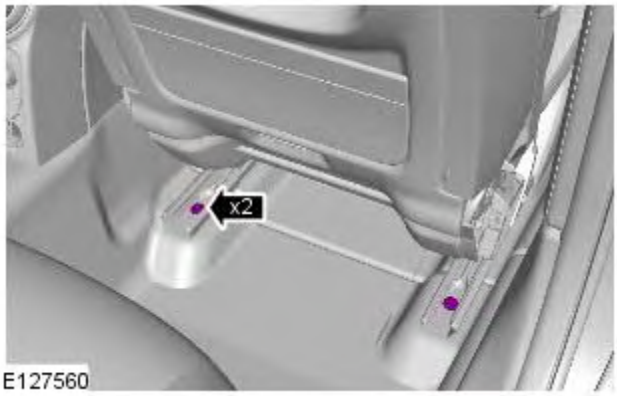
Removal steps in this procedure may contain installation details.

1. Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

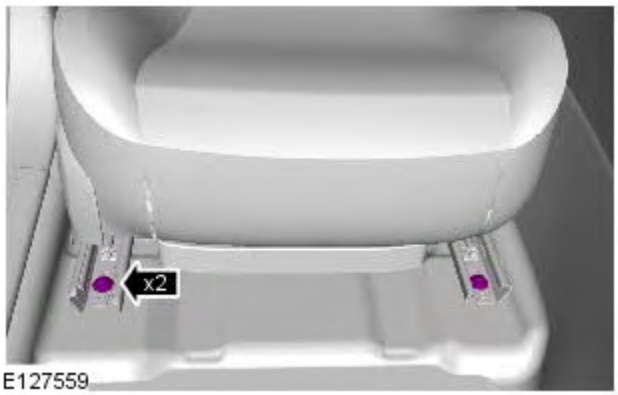
2.



3. *Torque:* 47 Nm



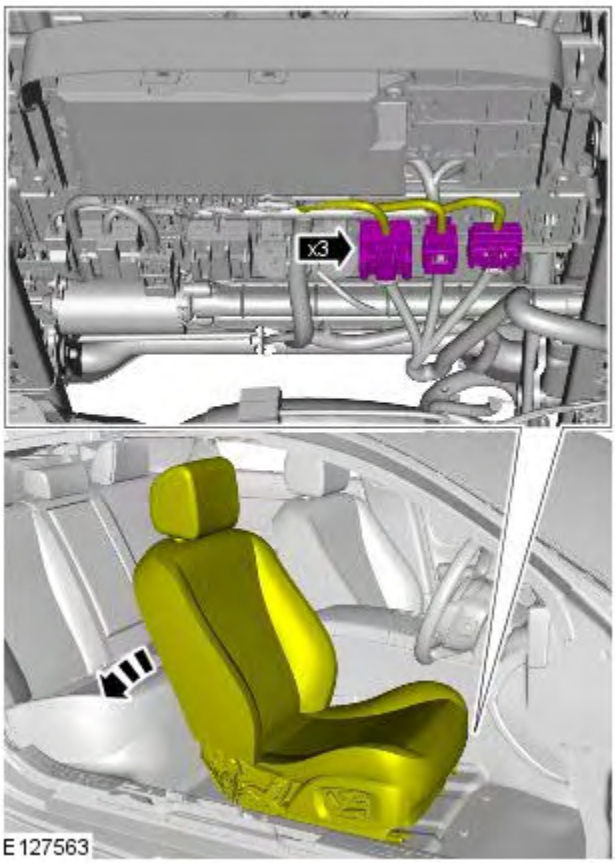
4.

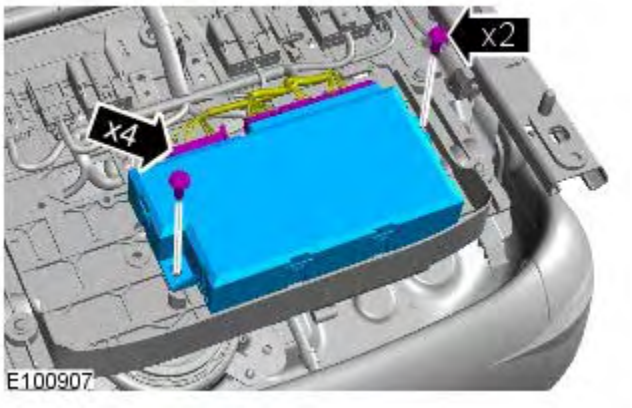


5. *Torque:* 47 Nm

6. Reposition the front seat to the central position.

7.





8. *Torque:* 3 Nm

Installation

1. To install, reverse the removal procedure.

2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Published: 11-May-2011

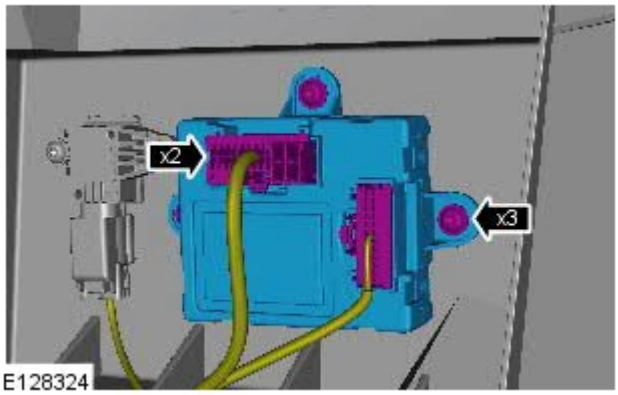
Multifunction Electronic Modules - Passenger Door Module (PDM)

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: Front Door Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3.



Installation

1. To install, reverse the removal procedure.
2. If a new component has been installed, configure using Jaguar approved diagnostic tool.

Published: 11-May-2011

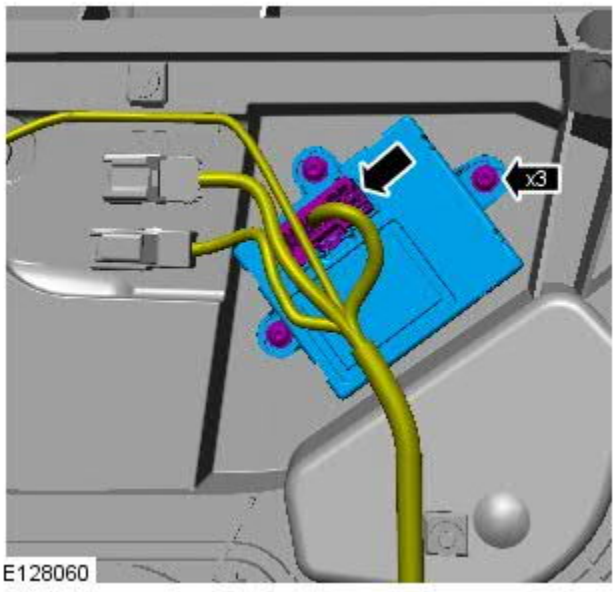
Multifunction Electronic Modules - Rear Door Module (RDM)

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Rear Door Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).



2. *Torque:* 1.5 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Front End Body Panels -

Description	Nm	lb-ft	lb-in
Air deflector retaining nuts	7	-	62
Air deflector retaining bolts	7	-	62
Hood hinge retaining nuts	17	13	-
Hood striker(s) retaining bolts	11	8	-
Hood latch(s) retaining bolts	9	-	80
Radiator splash shield retaining bolts	7	-	62
Fuel Filter lower retaining bolt - vehicles with 3.0L diesel engine	10	7	-
Secondary bulkhead left-hand panel retaining bolts	7	-	62
Coolant pipe bracket to coolant manifold retaining bolt	12	9	-
Engine brace retaining bolts	40	30	-
Pedestrian protection hood actuator retaining bolts	8	-	71
Engine control module (ECM) cover retaining nuts	7	-	62
Electrical connector retaining bolt	8	-	71
Coolant hose bracket to front side member & suspension top mount assembly retaining bolt	7	-	62

Published: 11-May-2011

Front End Body Panels - Air Deflector

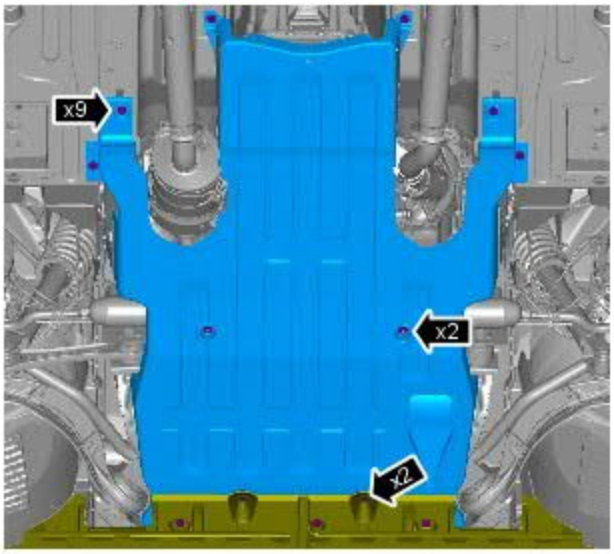
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.



E125437

2. NOTE: Note the fitted position of the washers.

   Torque: 7 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Front End Body Panels - Cowl Vent Screen

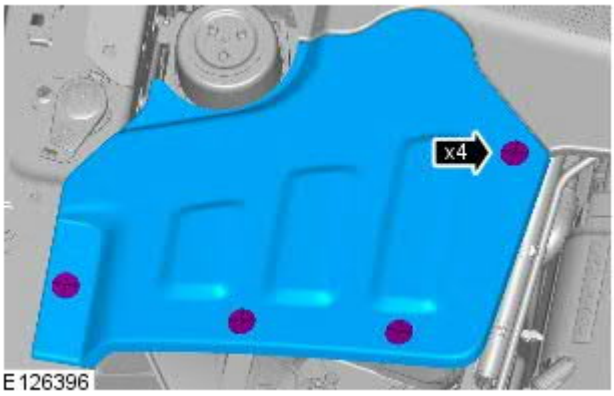
Removal and Installation

Removal

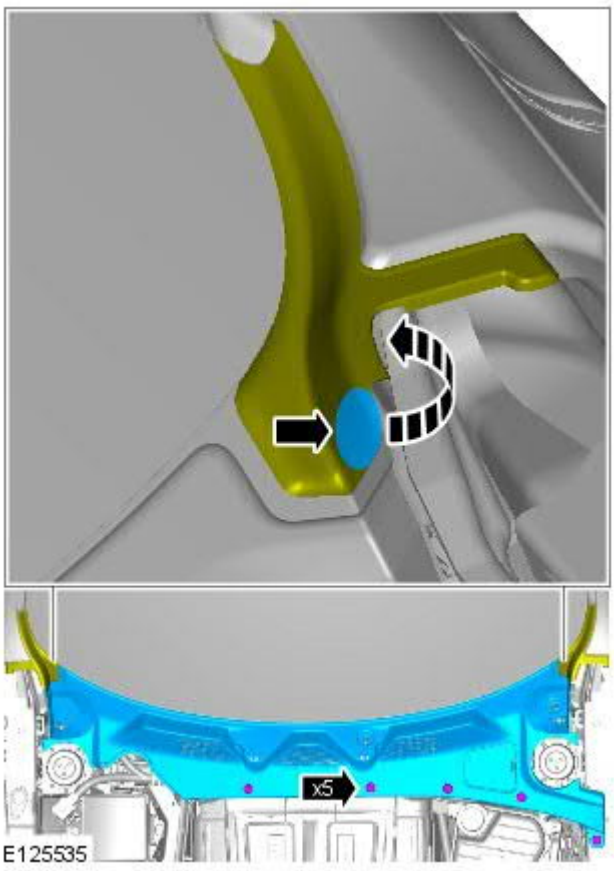
CAUTION: Always protect paintwork and glass when removing exterior components.

NOTE: Removal steps in this procedure may contain installation details.

1. For additional information, refer to: Windshield Wiper Pivot Arm (501-16 Wipers and Washers, Removal and Installation).



2.

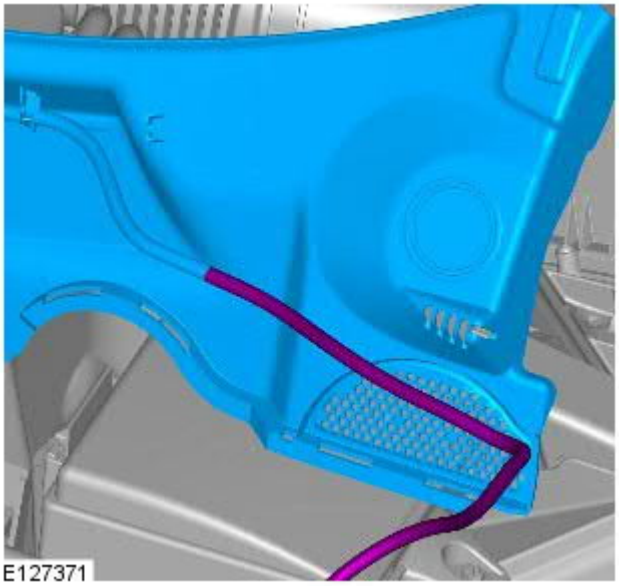


3. CAUTIONS:

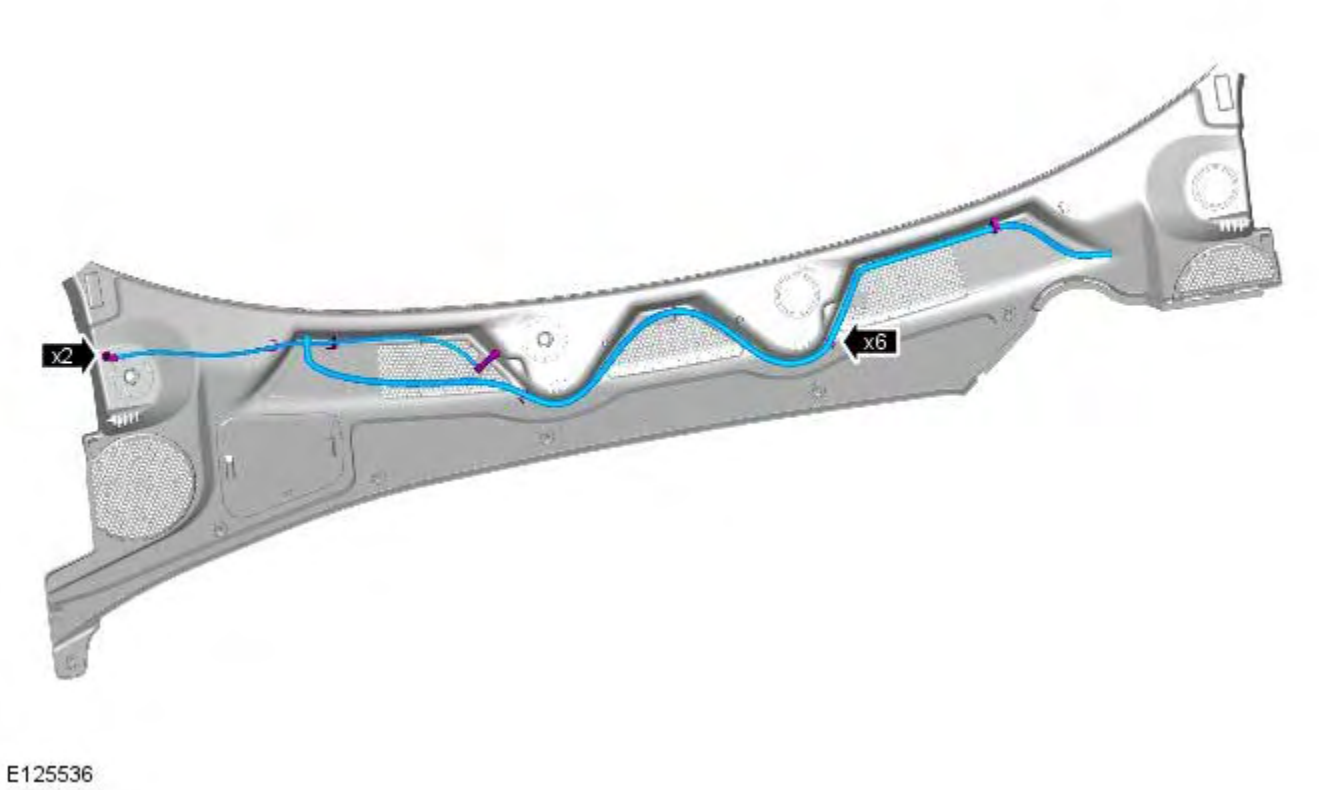
   Detach the rubber end caps from the leafscreen by releasing the velcro.

   Make sure that distortion to the end caps is kept to a minimum.

4.



5. NOTE: Do not disassemble further if the component is removed for access only.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Front End Body Panels - Fender Splash Shield

Removal and Installation

Removal

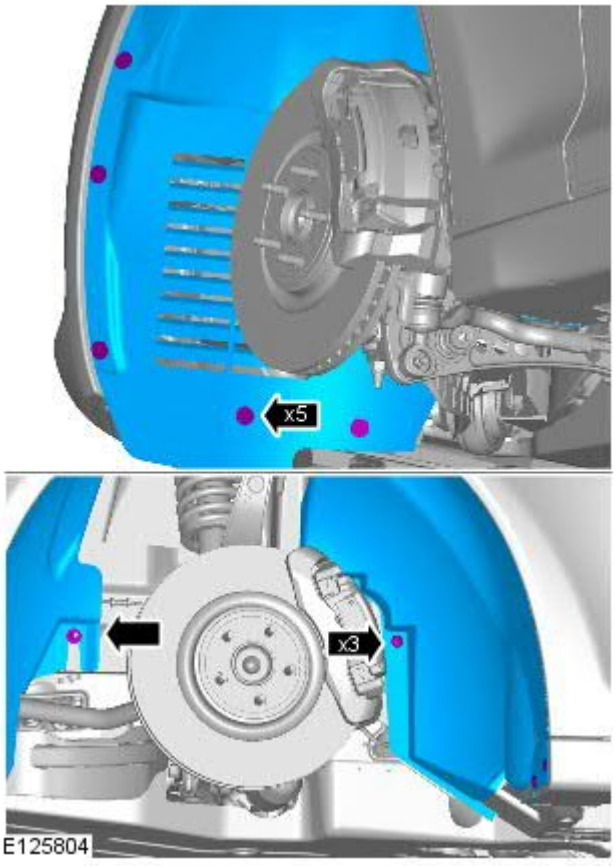
NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

3.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Front End Body Panels - Hood

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

All vehicles

E102844

1. NOTES:

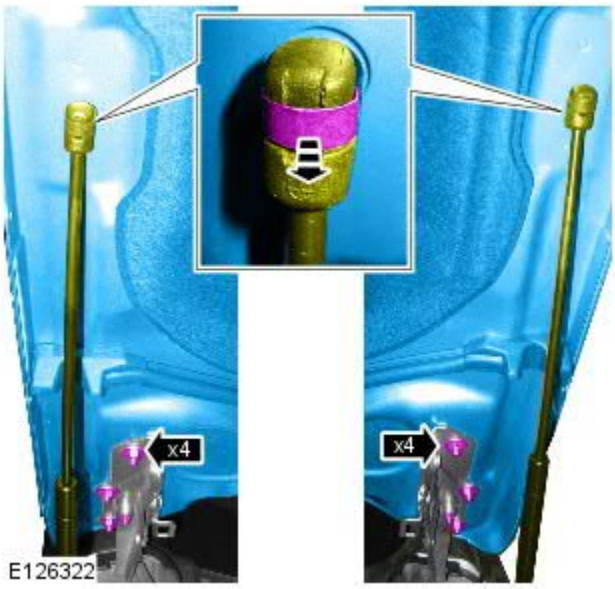
   The hood is manufactured from aluminium.

   The hood is serviced as a separate bolt-on panel.

2. WARNING: The hood and its associated components form part of the pedestrian protection system, it is essential that any repair or replacement operations do not affect the safe working of the system.

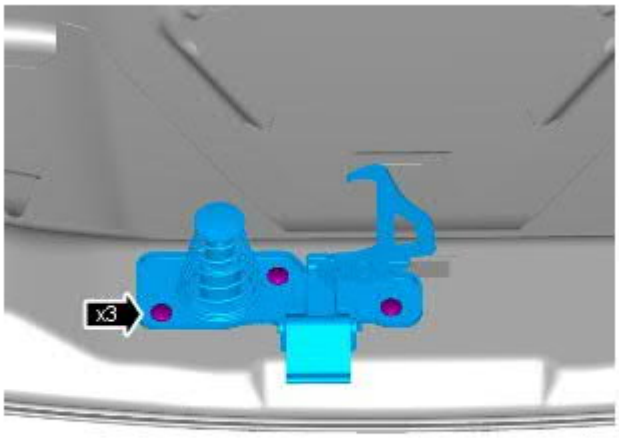
   Refer to: Pedestrian Protection System (501-20C Pedestrian Protection System, Description and Operation).

3. Refer to: Health and Safety Precautions (100-00 General Information, Description and Operation).
   Refer to: Body Repairs (501-25A Body Repairs - General Information, Description and Operation).
   Refer to: Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation).

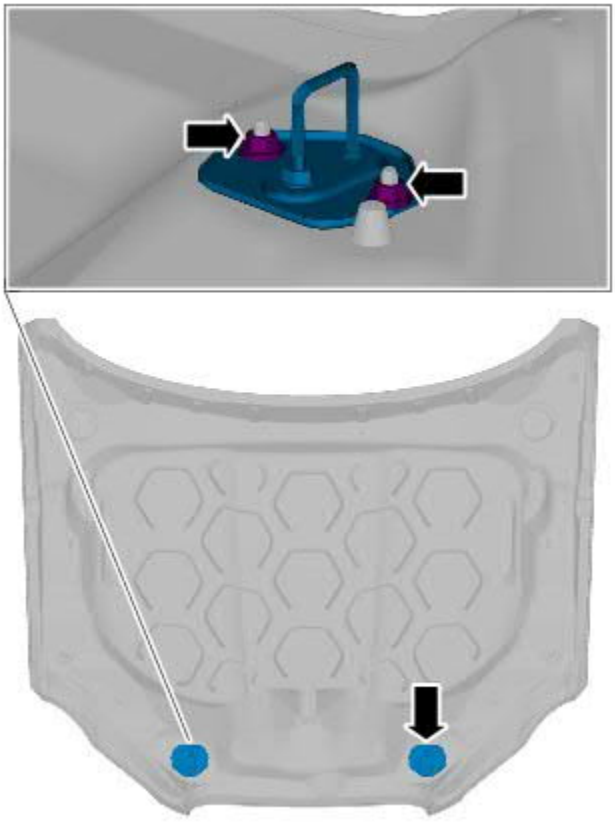


4. CAUTION: Make sure to protect the paintwork.

NOTE: This step requires the aid of another technician.



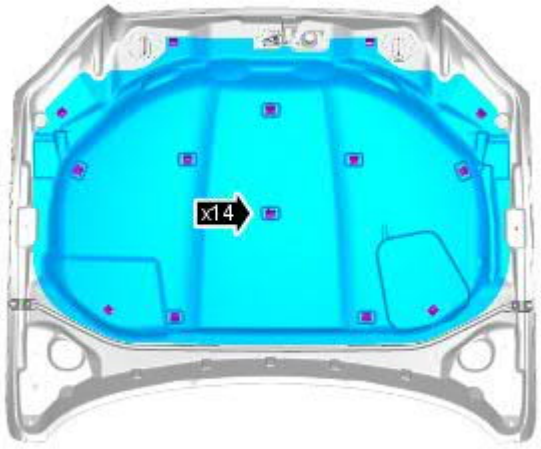
5. NOTE: Do not disassemble further if the component is removed for access only.



E102848

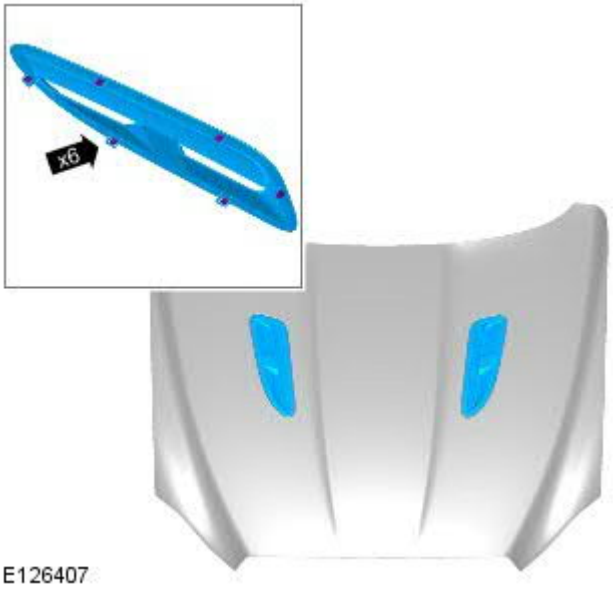
6. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

7.



E126405

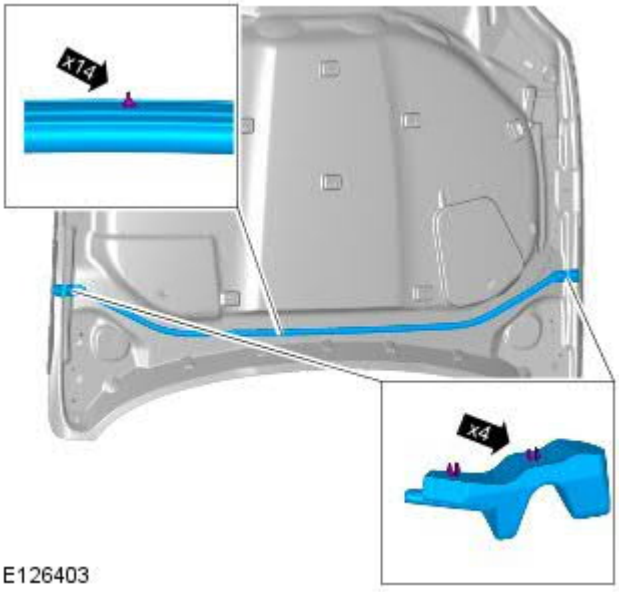
Vehicles with supercharger



E126407

8. CAUTION: Make sure to protect the paintwork.

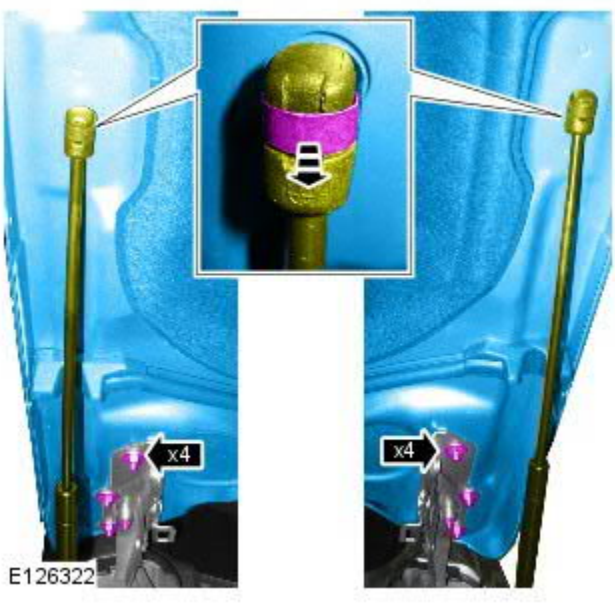
All vehicles



E126403

9.

Installation



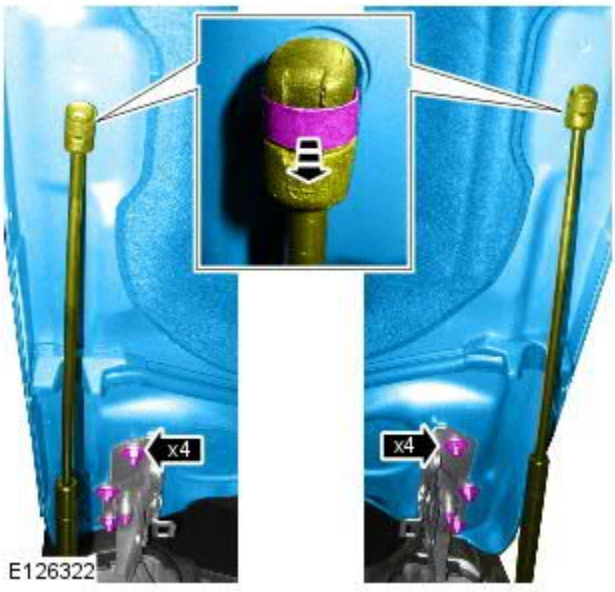
1. NOTES:

   This step requires the aid of another technician.

   If the hood hinges are deformed as a result of the pedestrian protection system deployment, they will need to be replaced.

   Offer up the panel and loosely install the hood hinge retaining nuts.

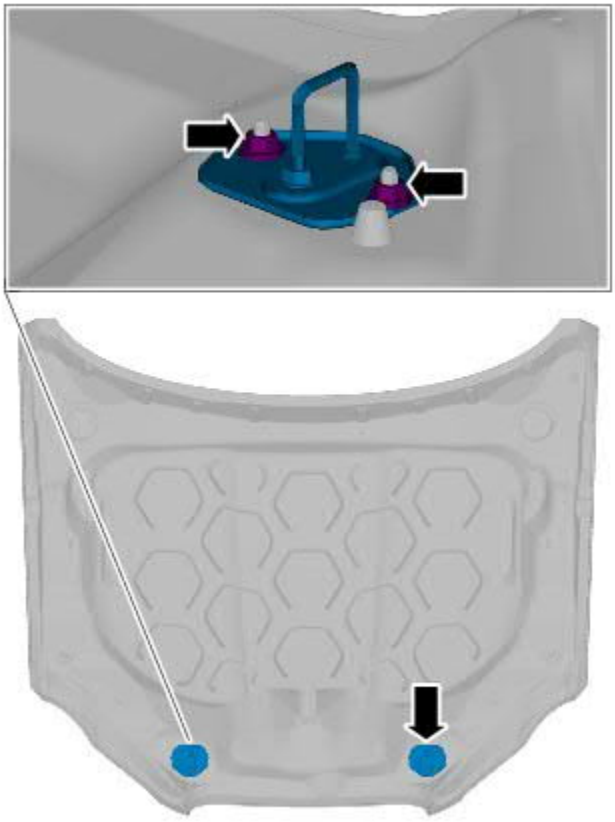
2. Check alignment, if correct, proceed to next step, if not, rectify and recheck before proceeding.



3. CAUTION: Make sure to protect the paintwork.

   NOTE: This step requires the aid of another technician.

   Torque: 17 Nm

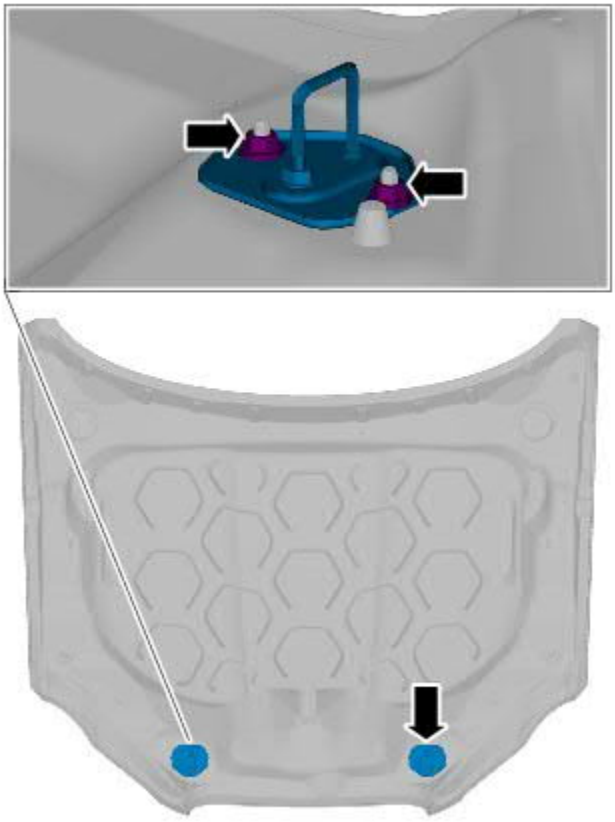


E102848

4. Loosely install both hood strikers.

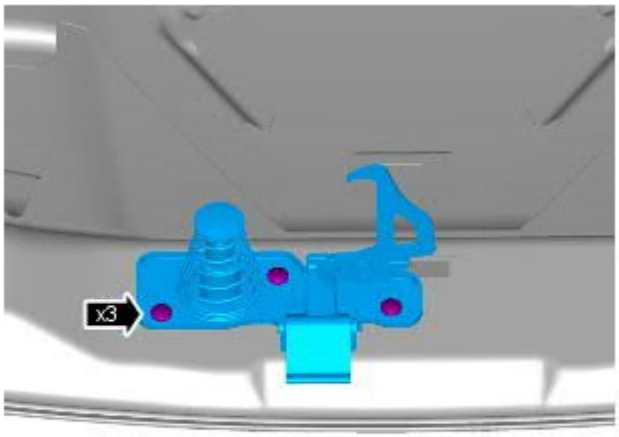
5. Gently close the hood so that the strikers are aligned to the latches.

6. Check alignment, if correct, proceed to next step, if not, rectify and recheck before proceeding.



E102848

7. *Torque:* 11 Nm



E126404

8. *Torque:* 9 Nm

Published: 11-May-2011

Front End Body Panels - Radiator Splash Shield

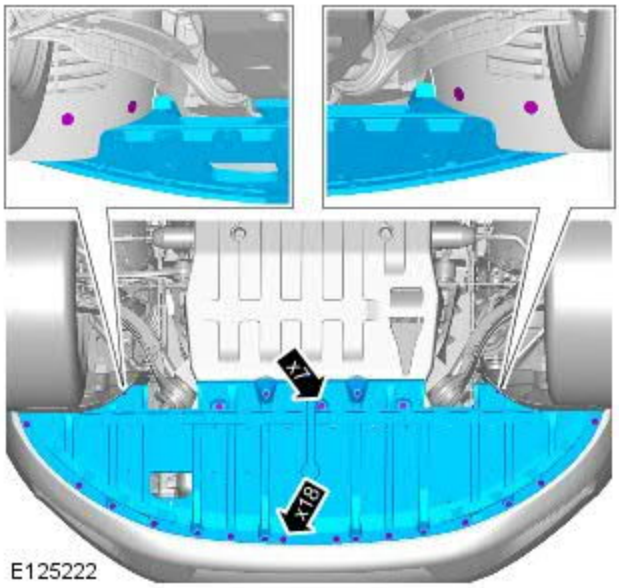
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.



2. *Torque:* 7 Nm

Installation

1. To install, reverse the removal procedure.

Published: 06-Jun-2013

Front End Body Panels - Secondary Bulkhead Panel LH

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least one minute after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

NOTE: Removal steps in this procedure may contain installation details.

All vehicles

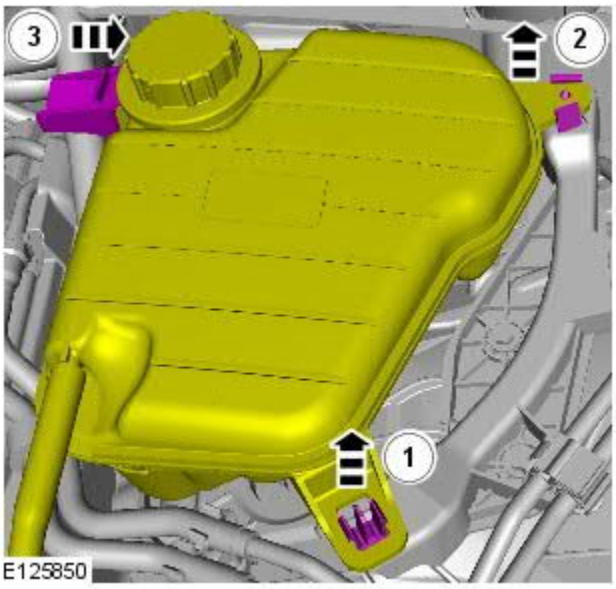
1. Disconnect the battery ground cable.

   Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).
   Refer to: Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).
   Refer to: Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).
   Refer to: Engine Cover - GTDi 2.0L Petrol (501-05, Removal and Installation).

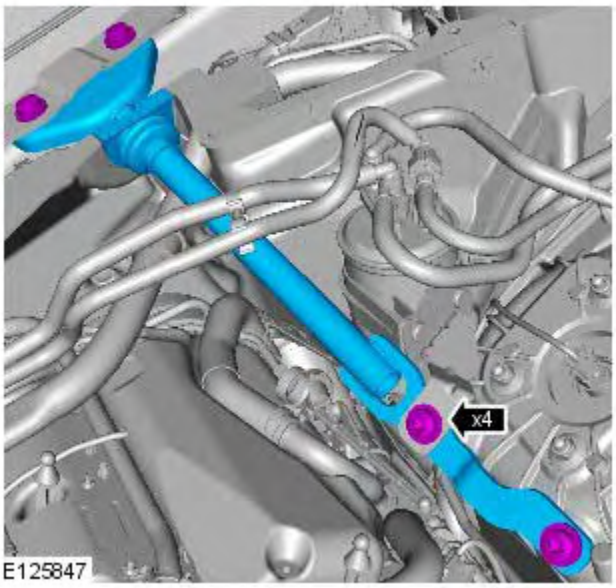
3. Refer to: Cowl Vent Screen (501-02 Front End Body Panels, Removal and Installation).

Vehicles with petrol engine



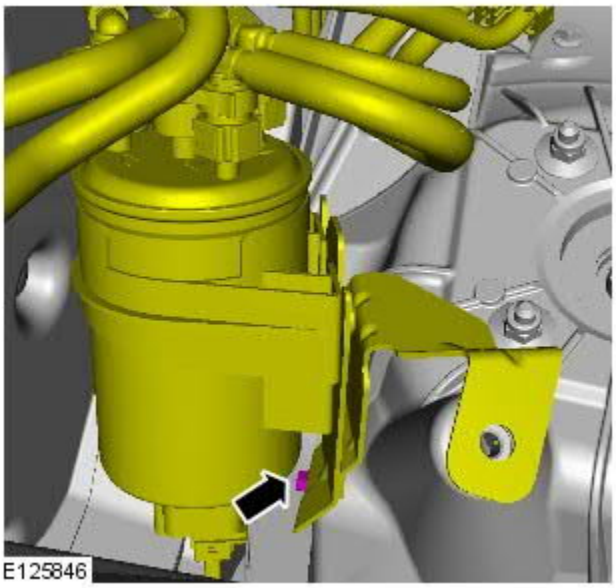
4.

All vehicles



5. *Torque:* 55 Nm

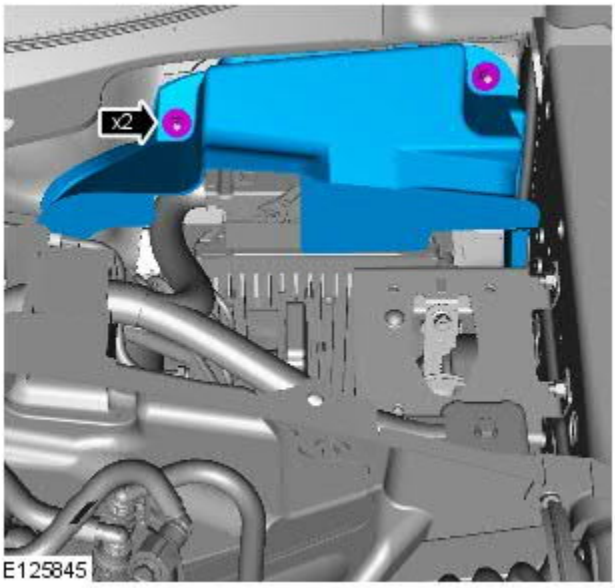
Vehicles with 3.0L diesel engine



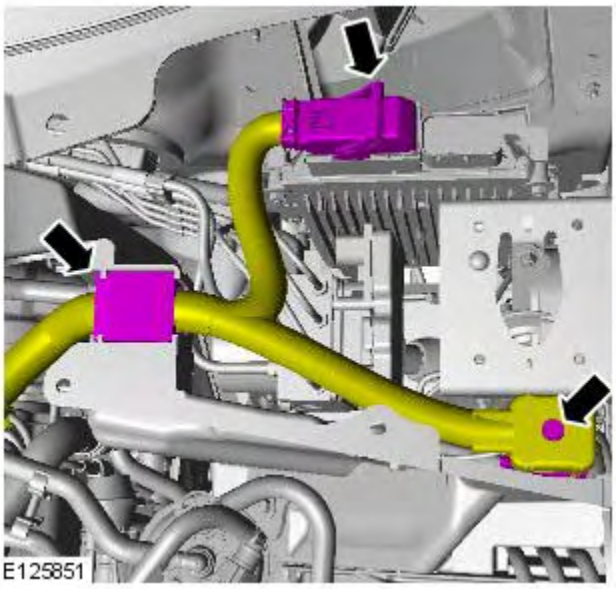
6. *Torque:* 10 Nm

Right-hand drive vehicles

7. Refer to: Pedestrian Protection Hood Actuator LH (501-20C Pedestrian Protection System, Removal and Installation).

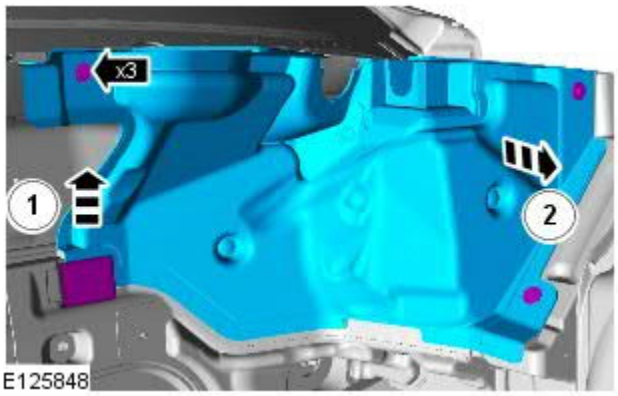


8. *Torque:* 7 Nm

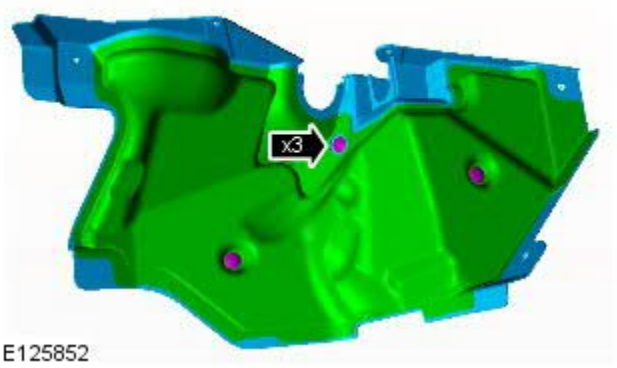


9. *Torque:* 8 Nm

All vehicles

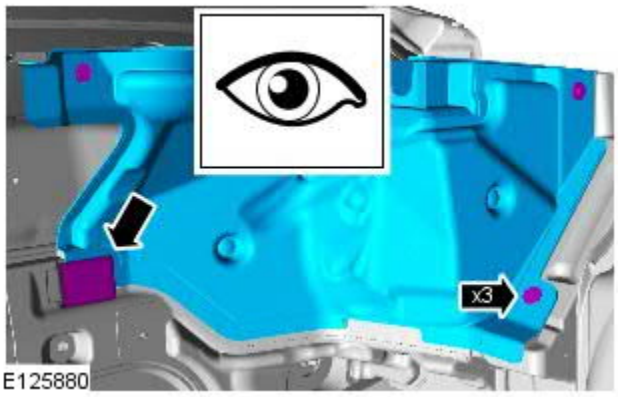


10. *Torque:* 7 Nm



11. NOTE: Do not disassemble further if the component is removed for access only.

Installation



1. CAUTION: Make sure that the clip is correctly located.

   To install, reverse the removal procedure.

Published: 06-Jun-2013

Front End Body Panels - Secondary Bulkhead Panel RH

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least one minute after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

NOTE: Removal steps in this procedure may contain installation details.

All vehicles

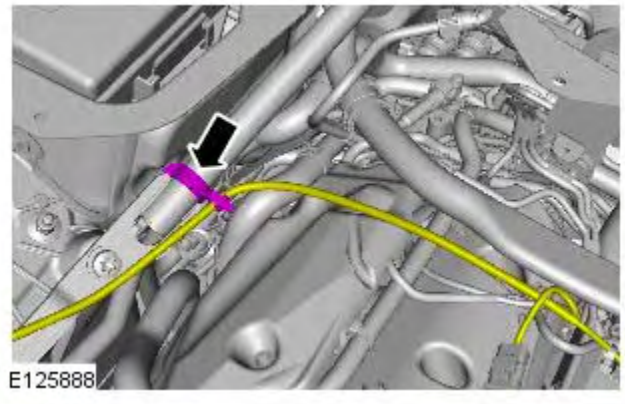
1. Disconnect the battery ground cable.

   Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. Refer to: Secondary Bulkhead Panel LH (501-02 Front End Body Panels, Removal and Installation).

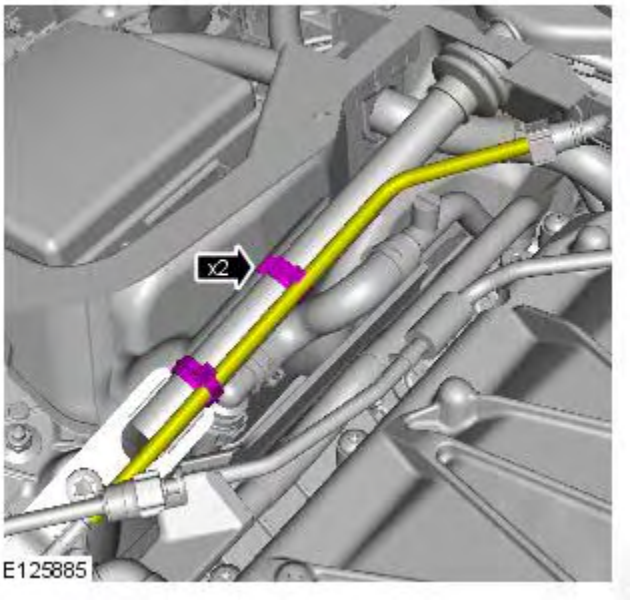
Vehicles with 3.0L diesel engine

3.

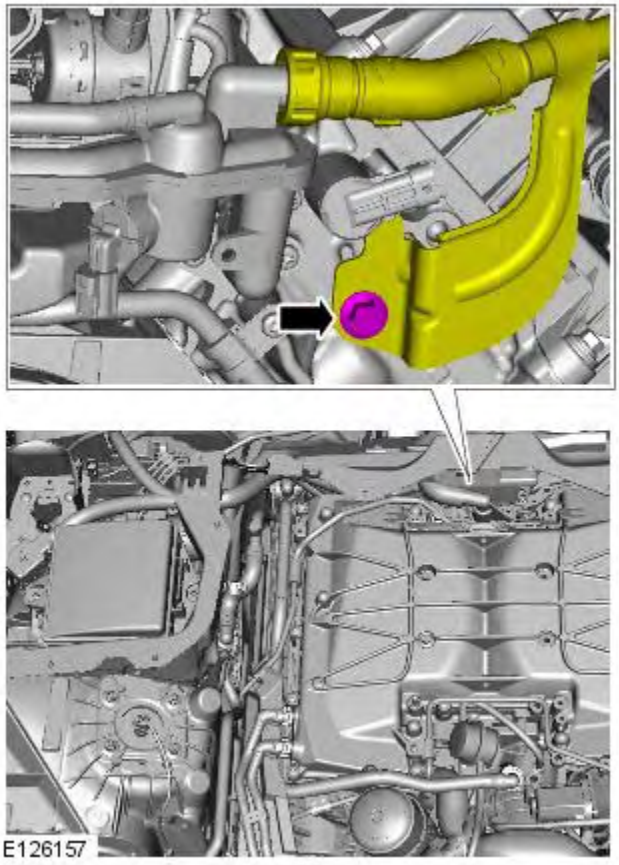


Vehicles with 5.0L engine

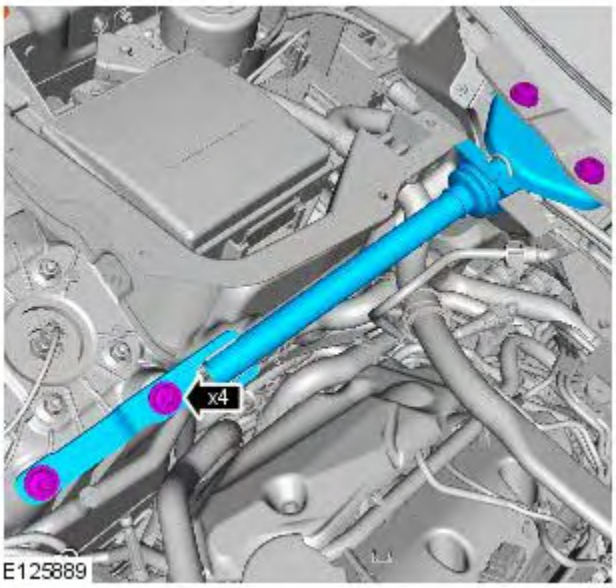
4.



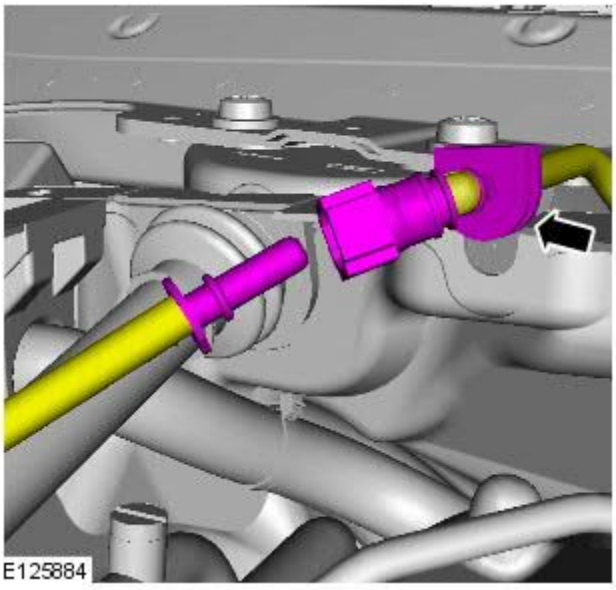
5. *Torque:* 12 Nm



All vehicles

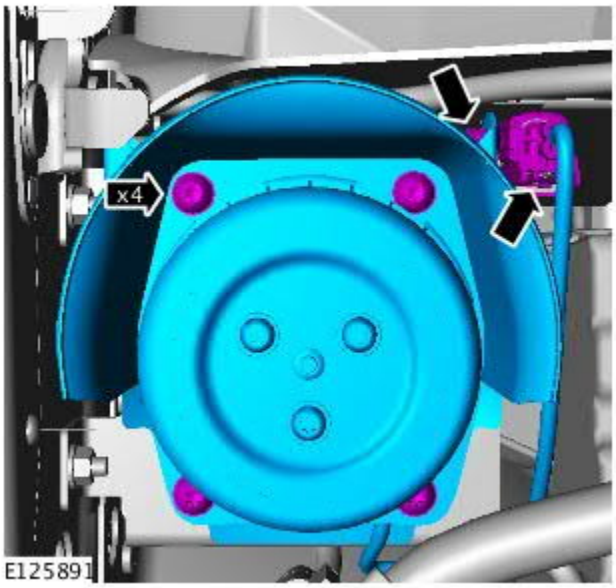


6. *Torque:* 55 Nm

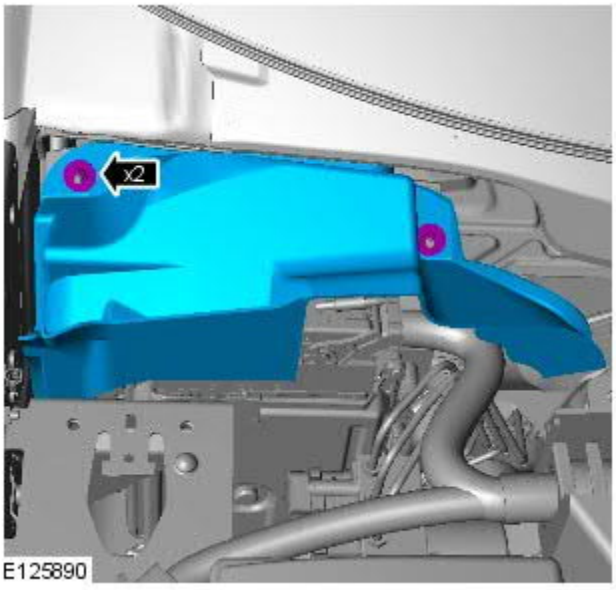


7.

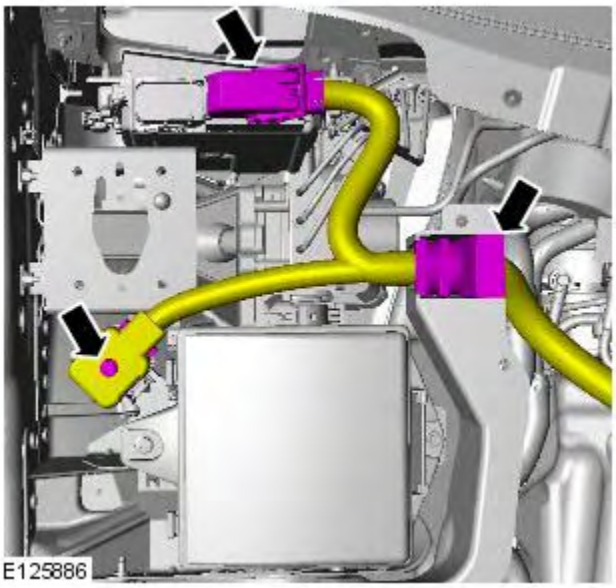
Left-hand drive vehicles



8. *Torque:* 8 Nm

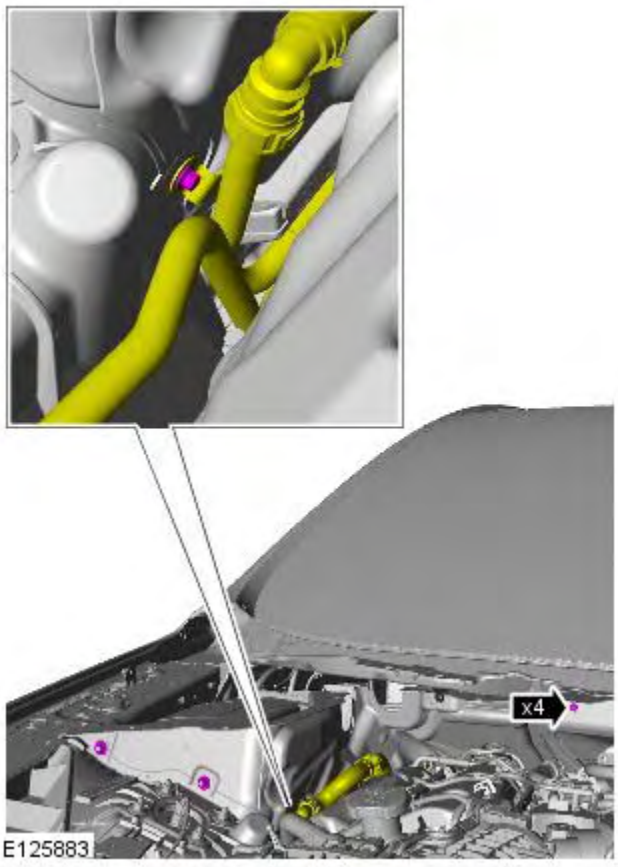


9. *Torque:* 7 Nm

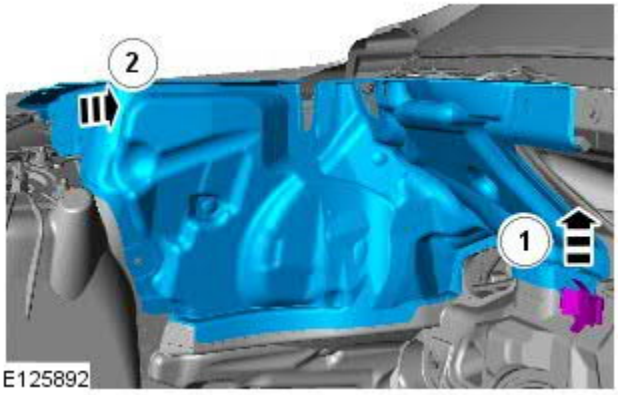


10. *Torque:* 8 Nm

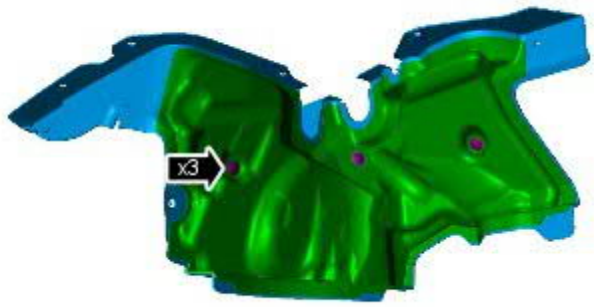
All vehicles



11. *Torque:* 7 Nm

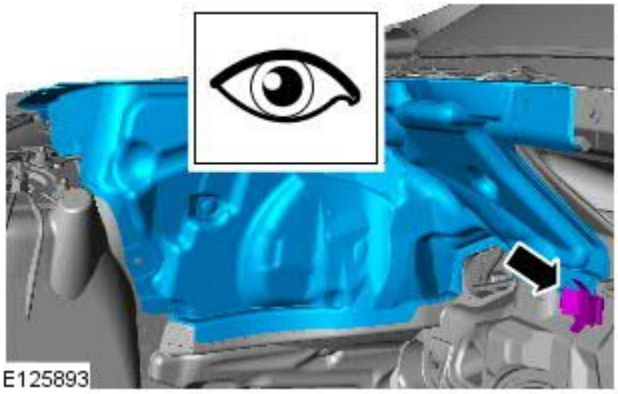


12.



13. NOTE: Do not disassemble further if the component is removed for access only.

Installation



1. CAUTION: Make sure that the clip is correctly located.

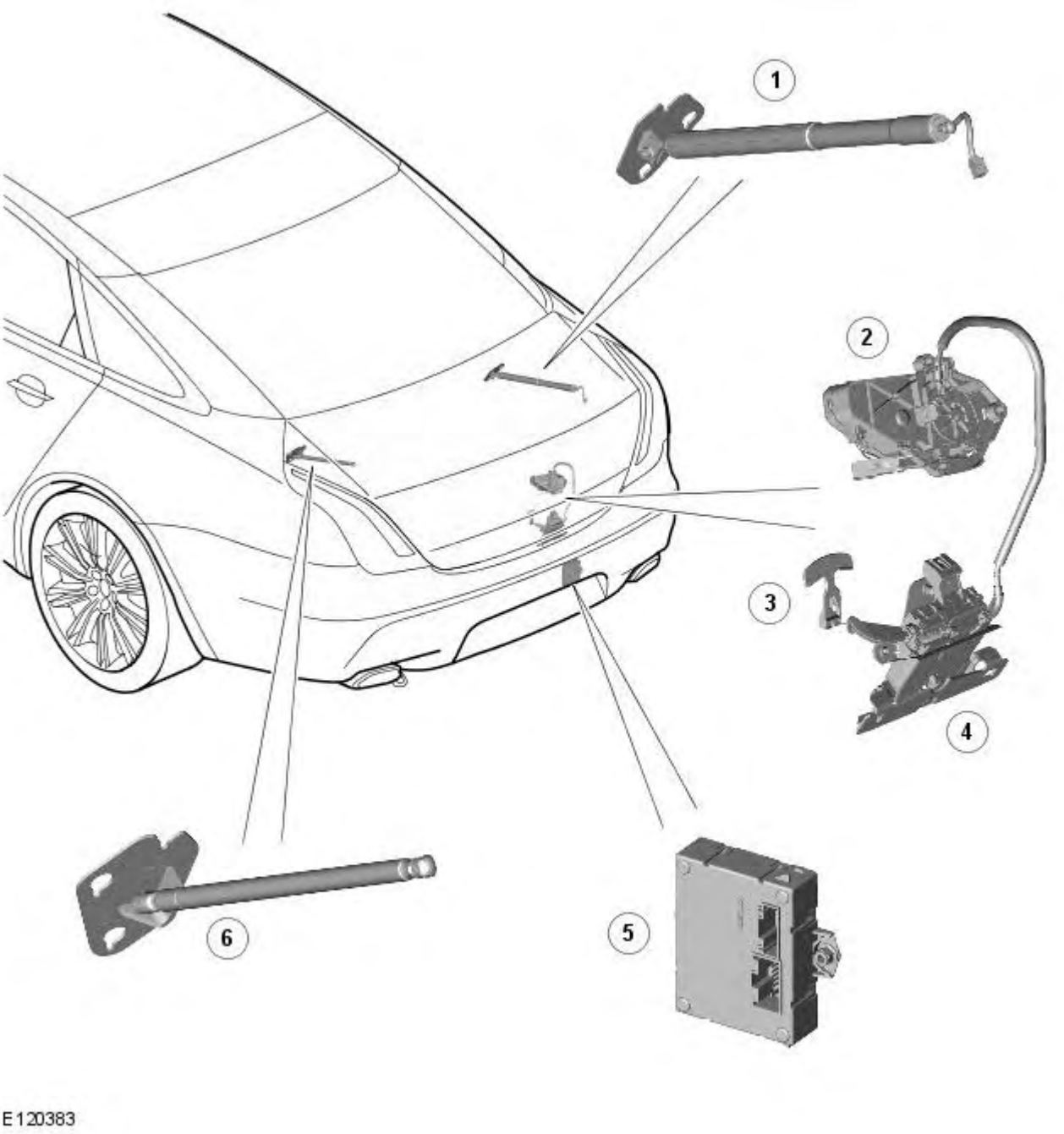
   To install, reverse the removal procedure.

Published: 11-May-2011

Body Closures - Body Closures - Component Location

Description and Operation

Luggage Compartment Lid - Component Location



E120383

Item	Description
1	Powered strut
2	Powered cinch motor
3	Child entrapment lever
4	Striker and latch assembly
5	Luggage compartment lid module
6	Counter balance strut

Published: 11-May-2011

Body Closures - Body Closures - Overview

Description and Operation

Luggage Compartment Lid

Overview

The luggage compartment lid is manufactured from aluminum and comprises a powered open and close mechanism. Swan-neck hinges support the luggage compartment lid and provide the optimum hinge geometry for the powered system.

Powered movement of the luggage compartment lid is provided by an electrically driven spindle housed in the right-hand strut. The counterbalancing strut on the other side of the luggage compartment lid is not powered.

The opening and closing time of the luggage compartment lid is 5 ± 2 seconds with the closing mechanism of the lid being an electronic latch with the addition of a soft-close power cinching unit. The cinching unit pulls the latch closed for the last 6 mm of travel. The latch and power-cinch unit are both located in the luggage compartment lid.

A child entrapment release handle is built into the latch assembly.

Published: 08-Dec-2011

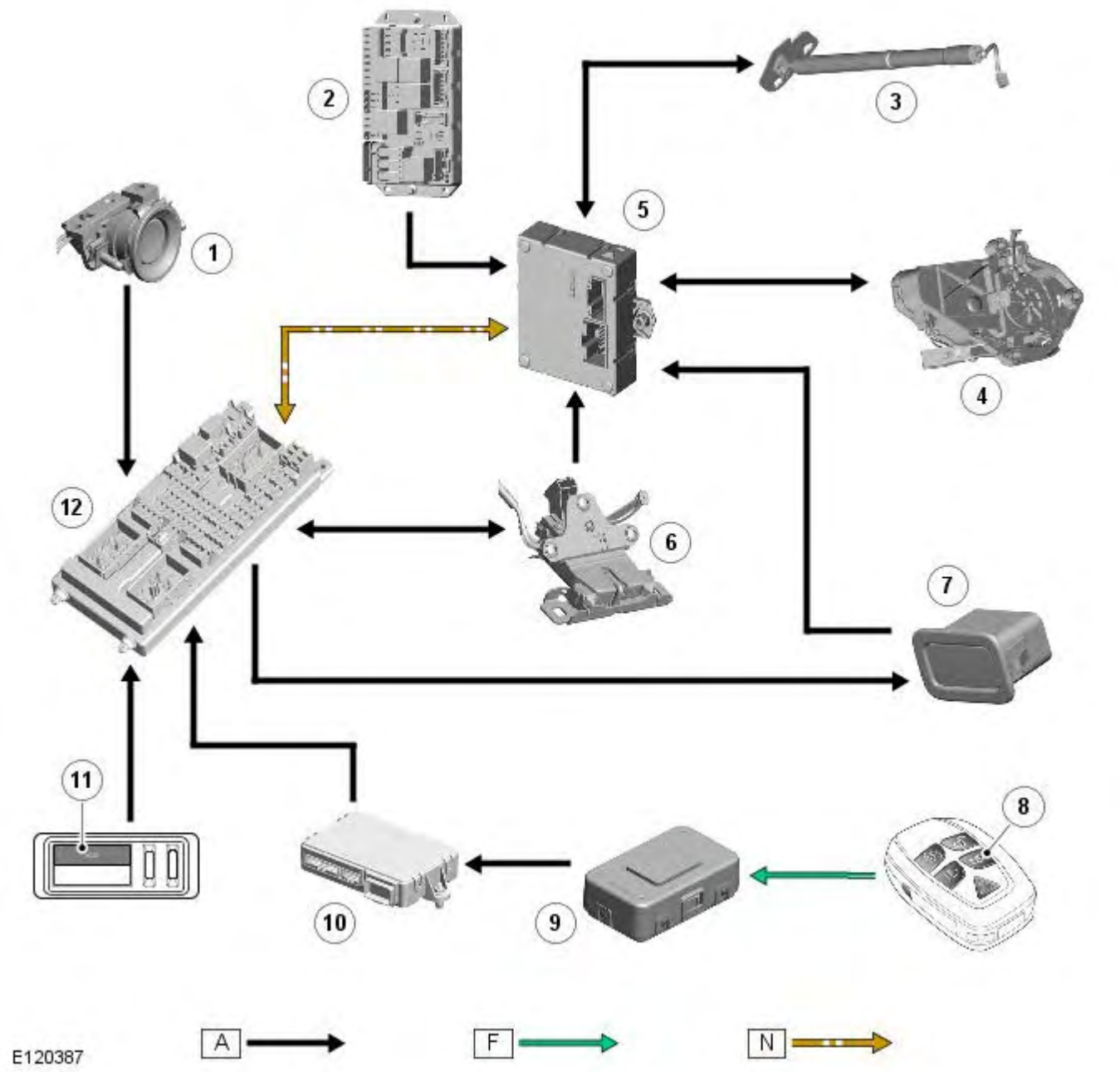
Body Closures - Body Closures - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: **A** = Hardwired; **F** = RF Transmission; **N** = Medium Speed CAN

Luggage Compartment Lid



Item	Description
1	Open button – vehicle exterior
2	RJB (rear junction box)
3	Powered strut
4	Powered cinch motor

5	Luggage compartment lid module
6	Latch assembly
7	Close button – luggage lid closing panel
8	Open button - Smart Key
9	Radio frequency receiver
10	KVM (keyless vehicle module)
11	Open button – vehicle interior
12	CJB (central junction box)

System Operation

Luggage Compartment Lid

The opening and closing functions are controlled by the luggage compartment lid module. The module receives a permanent battery power supply from the RJB. To initiate the luggage compartment lid opening sequence a 'luggage compartment lid release-request' is received by the CJB from one of the following:

- KVM (keyless vehicle module) - signal originates from the Jaguar Smart Key
- Auxiliary lighting panel - interior luggage compartment lid button
- Rear bumper mounted - exterior luggage compartment lid button

The CJB responds with the following simultaneous actions:

- A hardwire power release to the latch actuator mechanism
- An opening signal transmitted to the power luggage compartment lid module via the medium speed CAN bus.

The processing of the opening signal by the CJB is influenced by a number of factors:

- Source of 'opening signal'
- Vehicle status: locked or unlocked
- Vehicle equipped with or without passive entry.

Once the latch is released the luggage compartment lid module actuates the motor located in the powered strut to raise the luggage compartment lid to its fully open or pre-set position. When the luggage compartment lid is in its opening cycle the automatic stop-position of the lid is functioned by a hall sensor located in the motor. The hall sensor signal transmitted to the luggage compartment lid module is synchronized with the pre-set memory indicating the stop position of the luggage compartment lid.

To close the luggage compartment lid a hardwired signal is transmitted directly to the luggage compartment lid module when the button, located on lid’s closing edge is pressed. The module operates the spindle motor in the opposite direction to close the luggage compartment lid to the latch position.

When the latch engages with the striker plate a signal transmitted from the latch actuator mechanism to the luggage compartment lid module confirms the latch is engaged. The module de-activates the spindle drive and activates the power cinch motor to pull the latch closed through the last 6 mm of travel. A mechanical cable connection between the motor and latch assembly is used to complete the closing process.

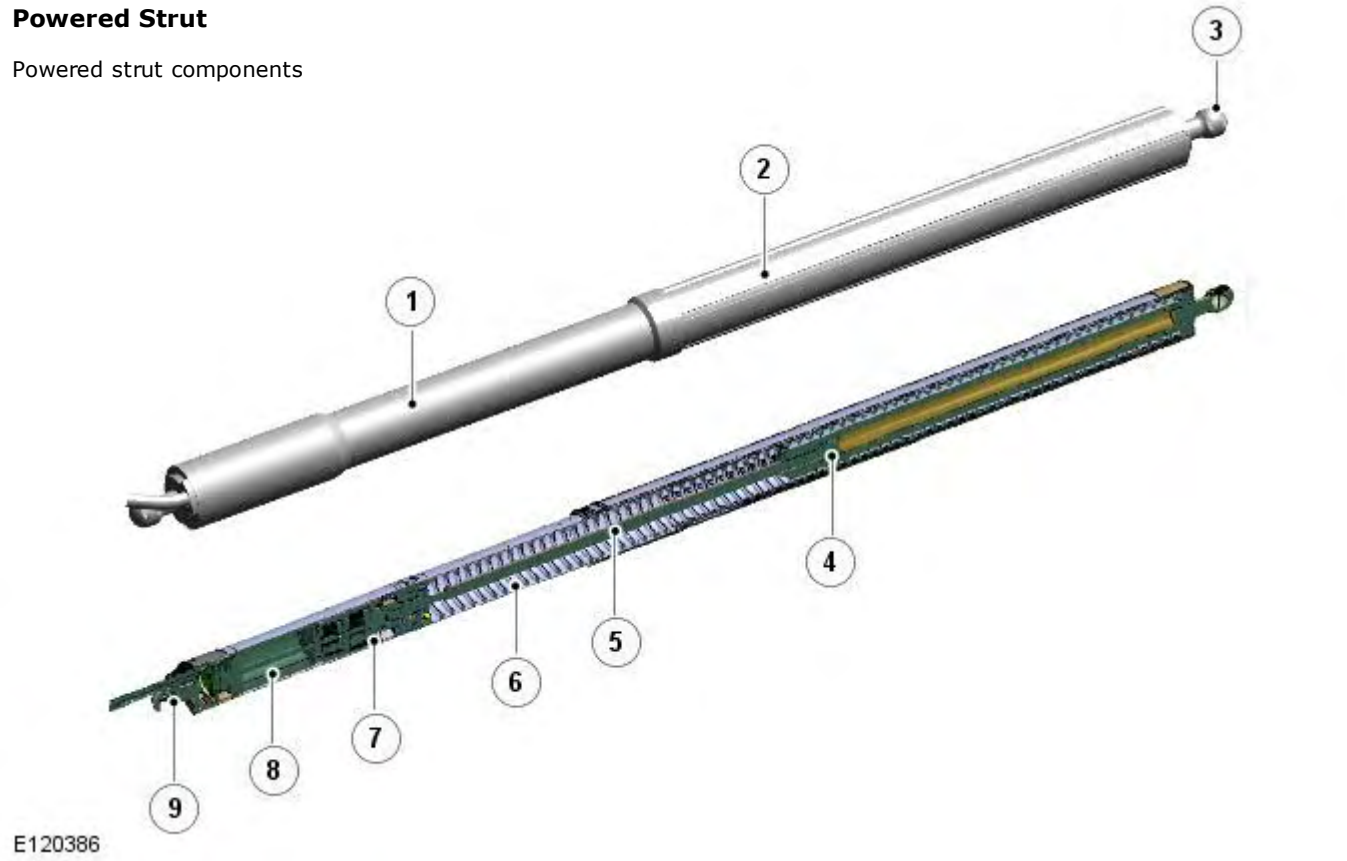
If the battery is disconnected when the luggage compartment lid is closed, the stored and calibrated lid opening heights will remain stored when the battery is reconnected. However if power supply to the luggage compartment lid module is disconnected when the luggage compartment lid is open the system will not recognize the lid’s position and subsequently will not function to any switch commands when power is reinstated. To re-calibrate the system, the luggage compartment lid must be moved manually to the closed position where it will perform a soft close and reset the hall sensor counters to zero.

NOTE: If required the luggage compartment lid can be opened and closed manually.

CAUTION: DO NOT CLOSE THE LUGGAGE COMPARTMENT LID IF THE VEHICLE BATTERY IS DISCONNECTED. It is advisable to close the latch claw when working on a vehicle with the battery disconnected to prevent accidental closure.

Powered Strut

Powered strut components



Item	Description
1	Inner tube
2	Outer tube
3	Ball joint
4	Outer tube spindle nut
5	Spindle
6	Springs
7	Gear
8	Motor
9	Ball joint

The powered strut operates the swan-neck hinge on the right-hand side of the vehicle. Ball-joints positioned at each end of the strut allow it to articulate between a fixed mount on the vehicle and the moveable hinge. The powered strut opens and closes the luggage compartment lid using an electrically driven spindle located in the struts internal electric motor; the lid opening operation is also aided by spring assistance.

The spindle drive comprises an inner and outer tube where the motor and gears in the inner tube drive a threaded spindle which runs on a threaded nut fixed to the inside of the outer tube.

The spindle drive incorporates an object detection function controlled by the luggage compartment lid module. The function is similar to the anti-trap function of a closing electric window but operates in both directions. If the object detection feature is activated while the luggage compartment lid is either opening or closing, the spindle motor is reversed for a preset period.

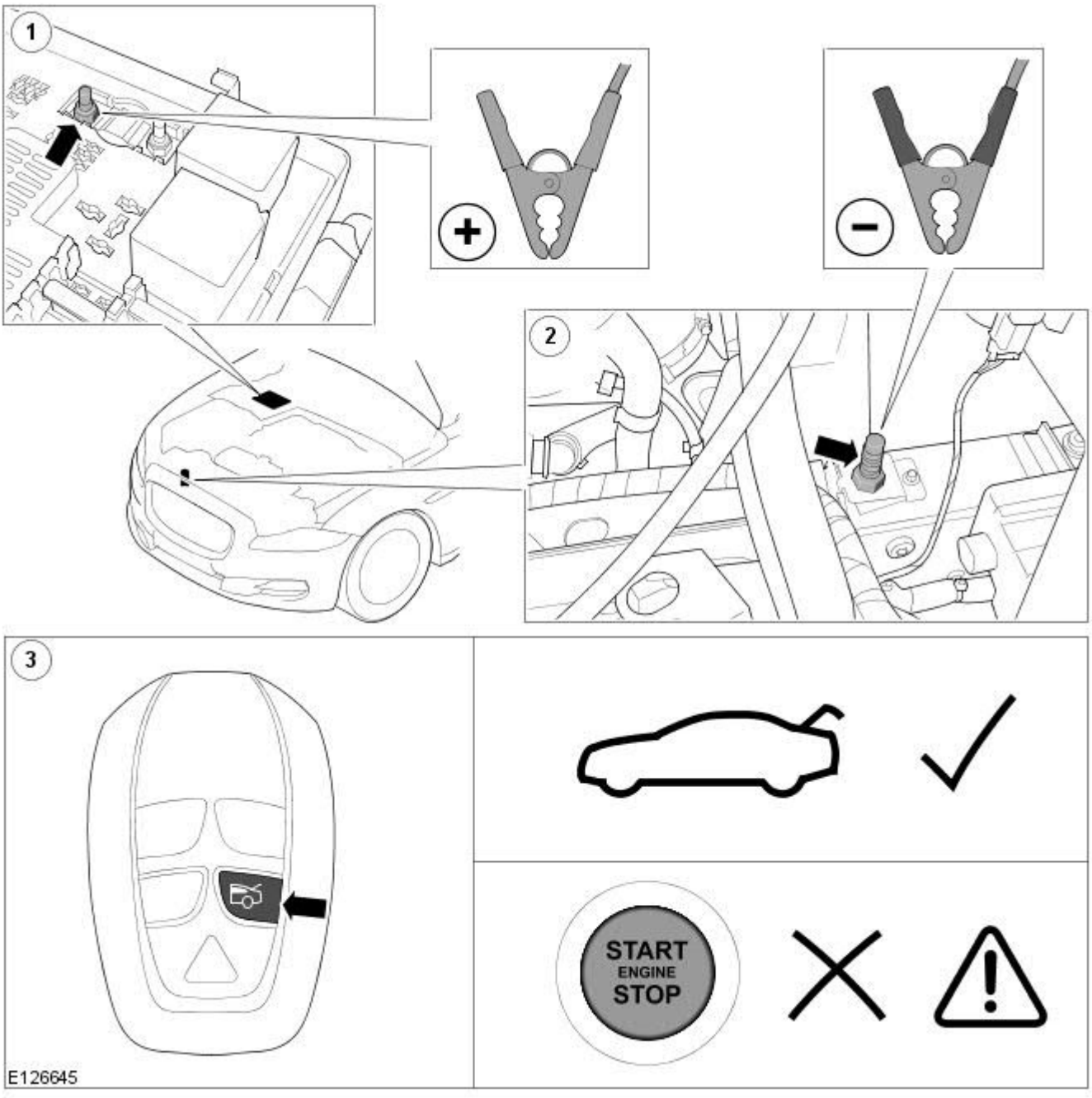
A hall sensor, located in the spindle motor, monitors the speed of the motor. If the speed decreases below a set threshold, indicating an obstruction and increasing the motor current draw, the power feed to the motor is reversed causing the luggage compartment lid to move in the opposite direction of travel.

The amount of travel in the opposite direction, before stopping, is determined by the hall sensor count. An exception to the object detection reverse travel function occurs when the luggage compartment lid is opening through its first few degrees of travel from the latched position. In these circumstances if an obstacle is detected the luggage compartment lid stops in the position of the obstruction and no travel in the opposite direction occurs.

Luggage compartment lid release when the vehicle has a discharged battery

If the battery becomes discharged when the luggage compartment lid is shut, it will be necessary to supply power to the release circuit in order to open it.

Auxiliary power release diagram



Item	Description
1	Attach the positive booster cable clamp to the rearward end of the 100A Midi fuse.
2	Attach the negative booster cable clamp to the earth post at the front of the right-hand chassis leg.
3	Press the luggage compartment release button on the remote control.

CAUTION: Do not attempt to start the vehicle with power supplied in this way.

Luggage compartment lid release when the vehicle has a system fault

In the event of the luggage compartment lid failing to open due to a system fault there is an emergency electrical release connector situated behind the rear seat squab next to the CJB. The connector is linked to the luggage compartment lid latch actuator.

A +12 volt feed applied to the connector will power the luggage compartment lid latch actuator to an un-latched state.

Electrical release connector access location

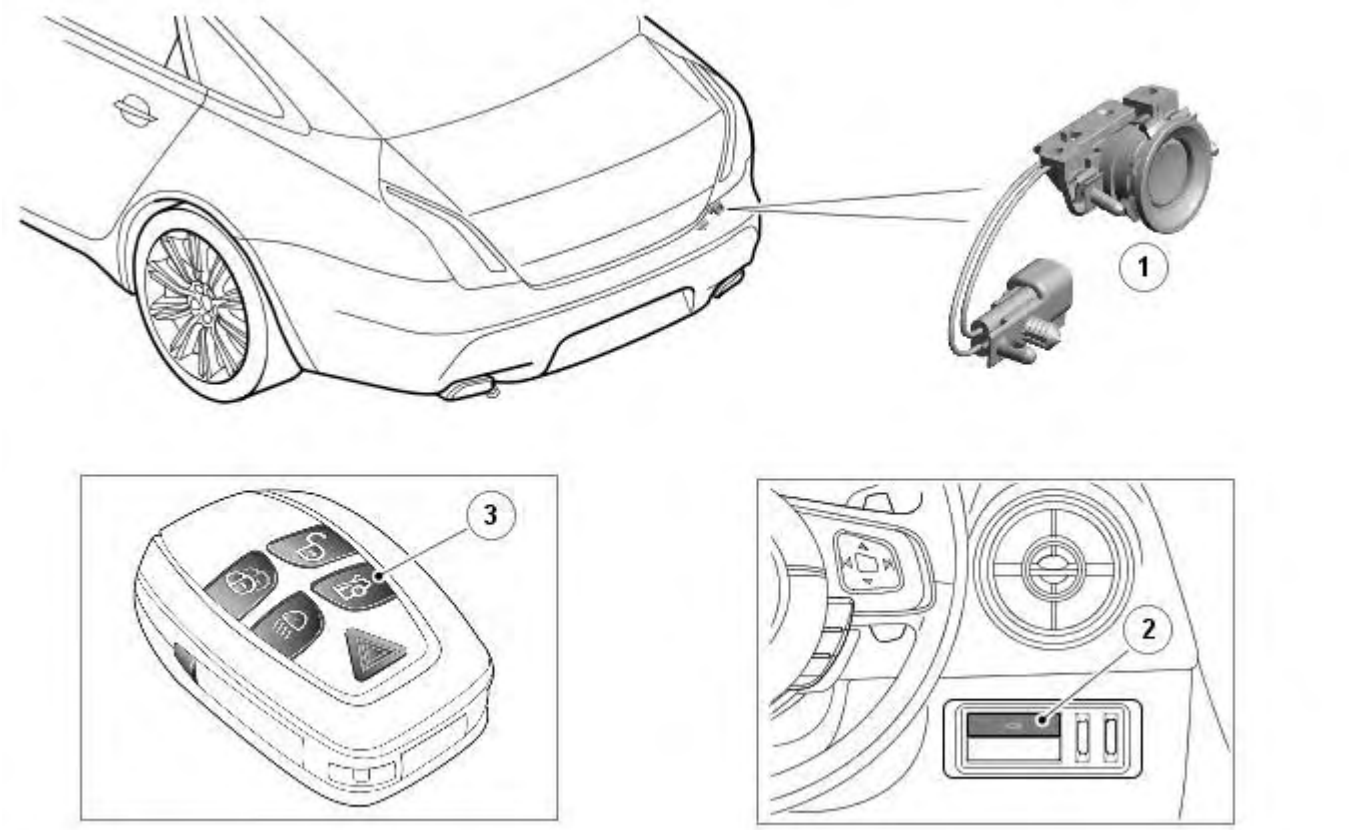
Component Description

Luggage Compartment Lid

The luggage compartment can be opened using the appropriate button on the Smart Key, or via passive entry. It can also be opened using the exterior release at the rear of the vehicle, provided the doors are unlocked and the gear selector is in Park (P).

Provided the vehicle is not locked or alarmed, the luggage compartment can also be opened using the interior release button.

Luggage compartment lid – open buttons

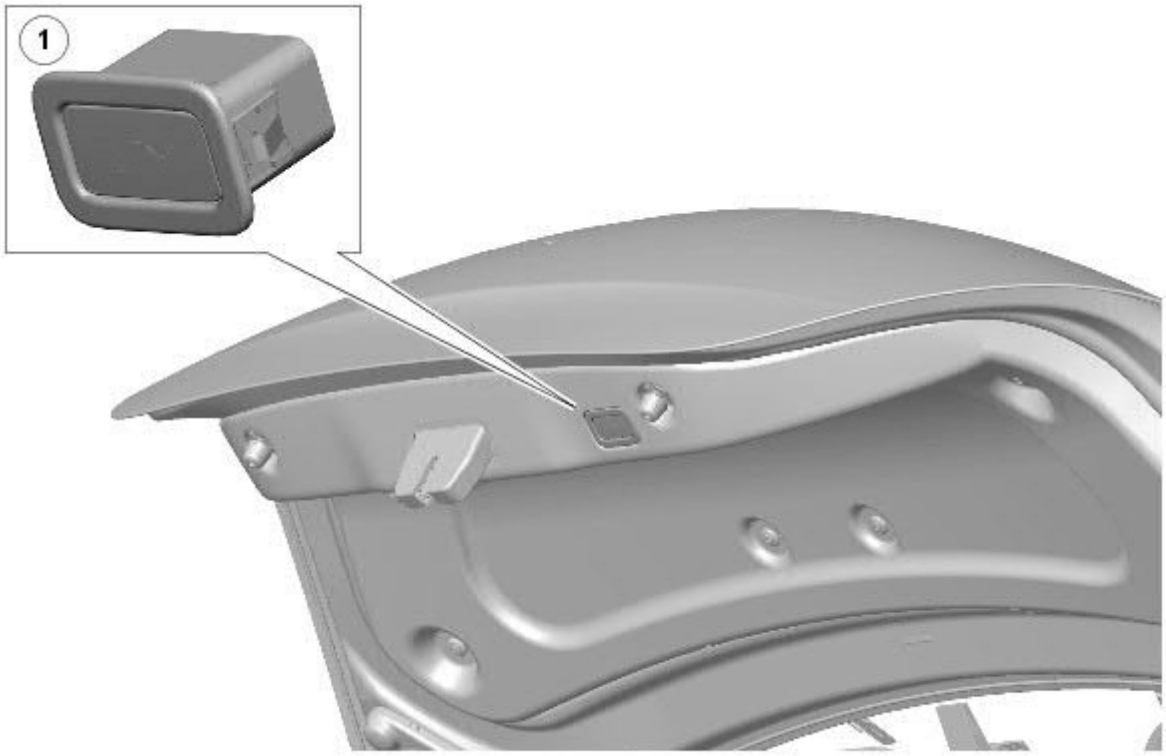


E120384

Item	Description
1	Vehicle exterior - open button
2	Vehicle interior - open button
3	Smart Key - open button

To close the luggage compartment, press the button on the closing edge of the luggage compartment lid.

Luggage compartment lid – close button



E120385

Item	Description
1	Close button

The luggage compartment lid can be stopped at any time during the open or close cycle by a single press on any of the control buttons. Pressing a control button once again will authorize the luggage compartment lid to continue its original cycle, or if required opposite cycle; see chart below.

The luggage compartment lid has a 'Garage Position' setting, where it is possible to set the maximum height to which the luggage compartment lid will open.

To set the required height:

- Open the luggage compartment lid to the position of the required height.
- Press and hold, for 10 seconds, the luggage compartment lid close button.
- Close the luggage compartment lid, then open again to check that it opens to the programmed height.

The maximum opening height is now set. To reset the maximum opening height to full, repeat the process, but fully open the luggage compartment lid before pressing and holding the close button.

The opening and closing control strategies are listed in the following chart:

Strategy	Opening	Closing	Stop	Start from stopped position after opening	Start from stopped position after closing	Garage position - set/reset
Jaguar Smart Key	One push	No function	One push	One push for opening	One push for opening	X
Interior boot lid release	One push	No function	One push	One push for opening	One push for opening	X
Exterior boot lid release	One push	No function	One push	One push for opening	One push for opening	X
Closing-edge button	X	One push	One push	One push for closing	One push for closing	One push for 10 seconds

If any object is detected, that would interfere with the closing of the luggage compartment lid; lid movement will stop and reverse a short distance. Any obstructions must be removed before pressing the close button again.

If the Jaguar Smart Key is inadvertently left inside the luggage compartment and the vehicle is locked and the alarm set, an audible warning will sound and the luggage compartment will re-open after three seconds.

NOTE: If the Jaguar Smart Key is inside a metal box, it will not be detected by the vehicle security system.

Published: 11-May-2011

Body Closures - Front Door

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

RH illustration shown, LH is similar.

1. NOTE: The front door is manufactured from aluminium, it contains a side impact reinforcement manufactured from boron steel.

   The front door is serviced as a separate bolt-on panel.

2. For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

3. WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplemental restraint system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait one minute. Failure to follow this instruction may result in personal injury.

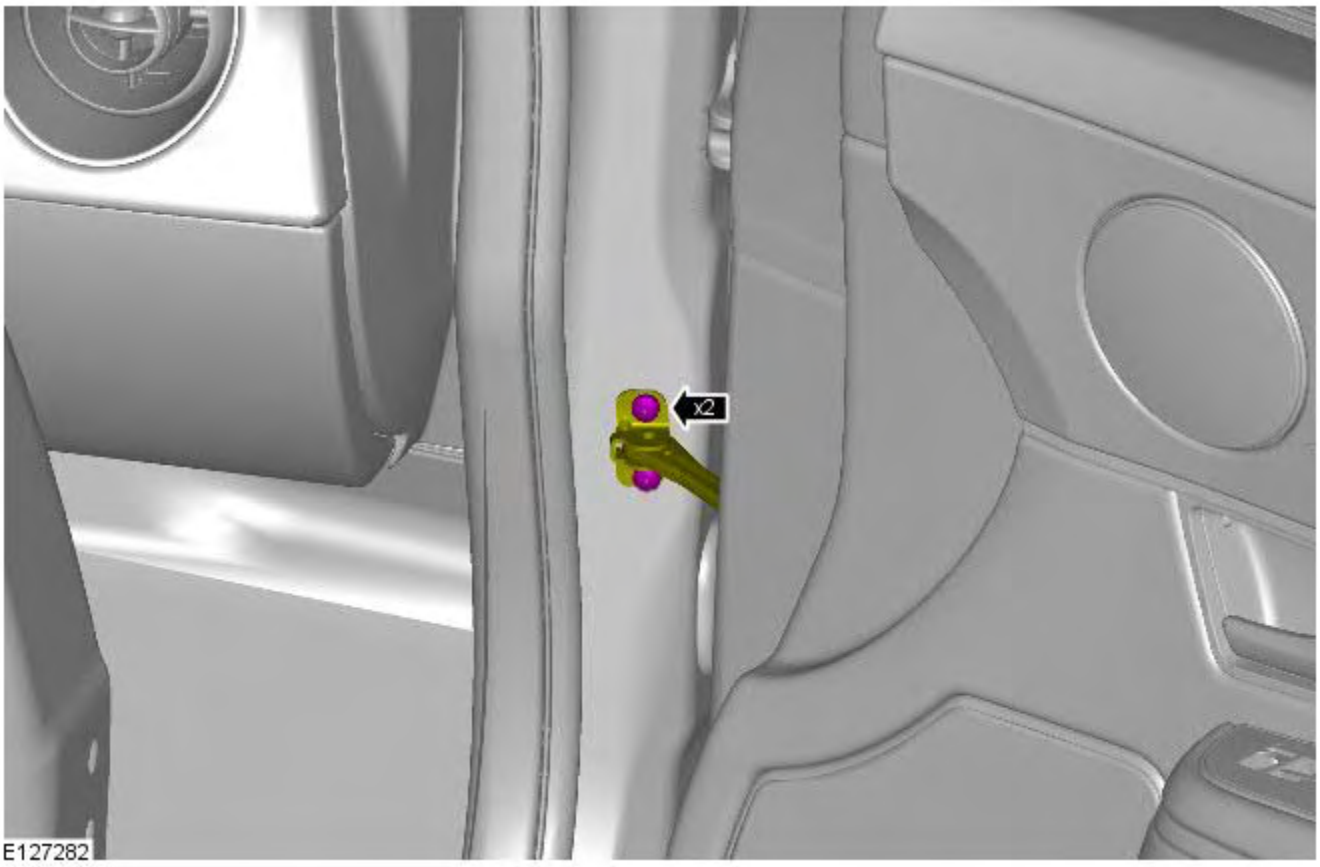
   For additional information, refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

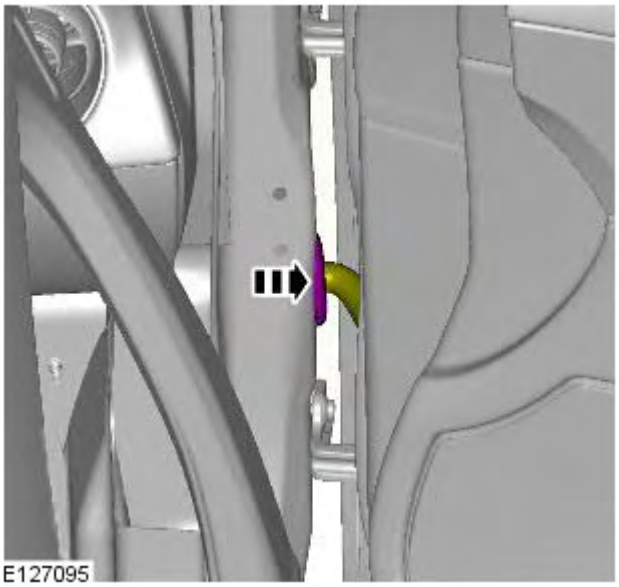
4. For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation).

5. For additional information, refer to: Body Repairs (501-25A Body Repairs - General Information, Description and Operation).

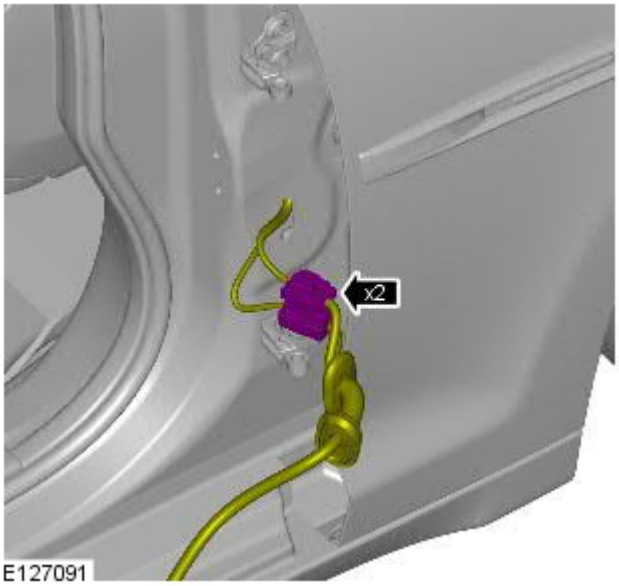
6. For additional information, refer to: Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation).

7. TORQUE: 10 Nm



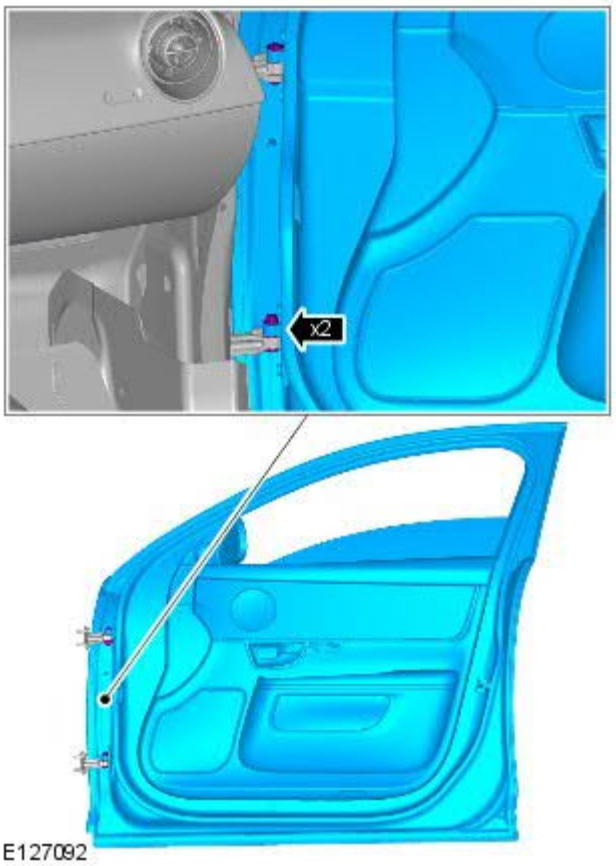


8. CAUTION: Take extra care not to damage the wiring harnesses.



9. CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean.

   NOTE: Front door shown removed for clarity.



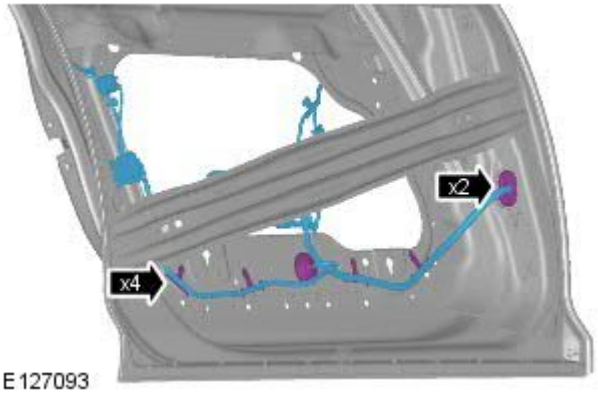
10. NOTE: Do not disassemble further if the component is removed for access only.

    TORQUE: 30 Nm

11. For additional information, refer to: Front Door Latch (501-14 Handles, Locks, Latches and Entry Systems, Removal and Installation).

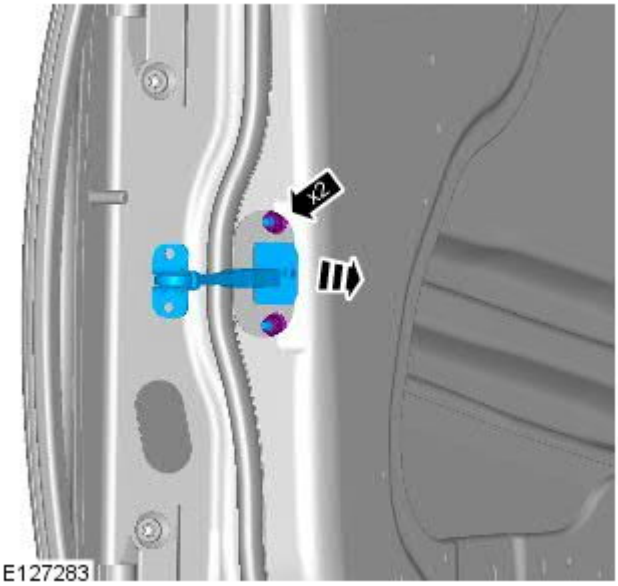
12. For additional information, refer to: Front Door Window Regulator and Motor (501-11 Glass, Frames and Mechanisms, Removal and Installation).

13. For additional information, refer to: Exterior Mirror (501-09 Rear View Mirrors, Removal and Installation).



E127093

14. CAUTION: Take extra care not to damage the wiring harnesses.



E127283

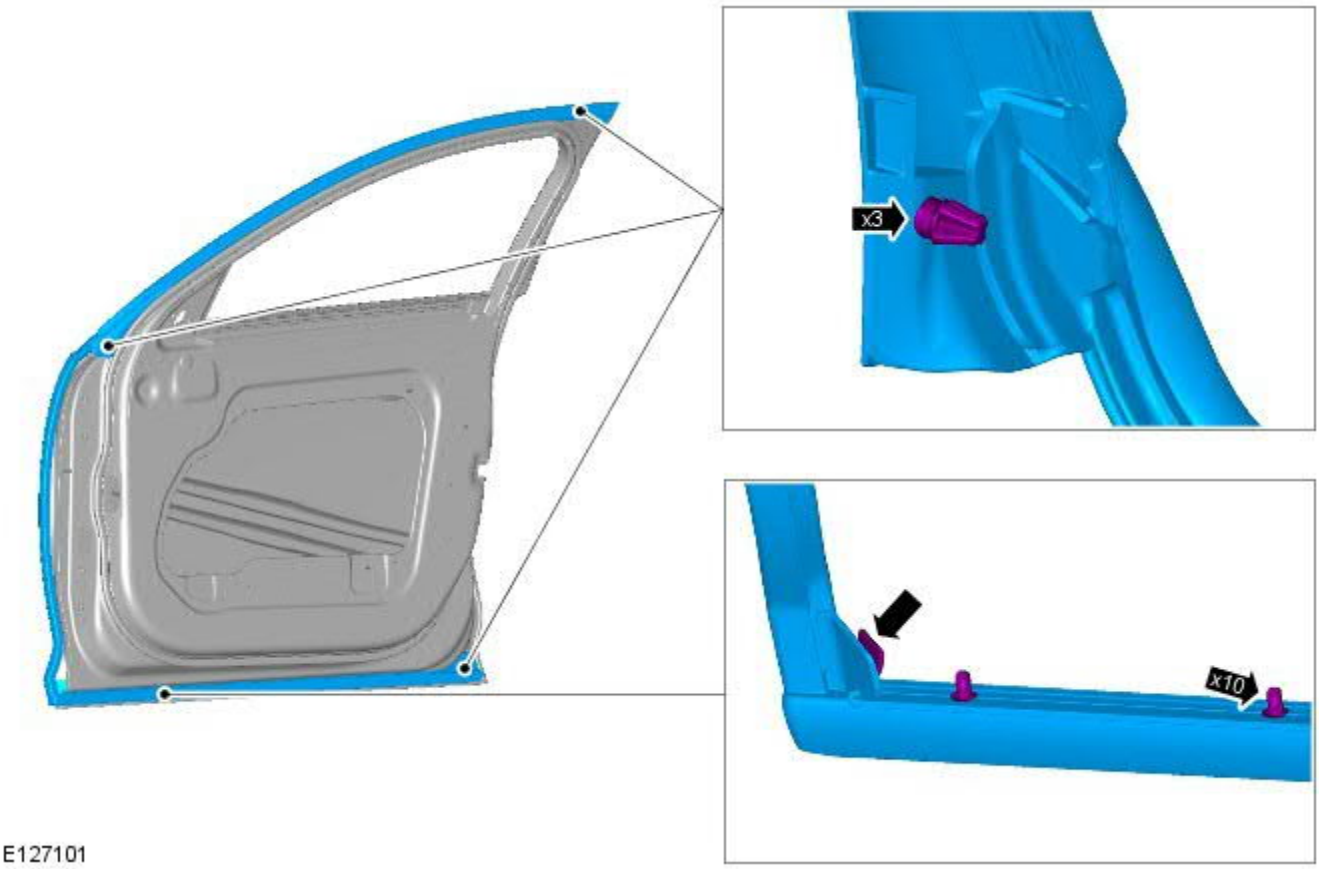
15. CAUTION: Failure to follow this instruction may result in damage to the component.

    TORQUE: 10 Nm

E127090

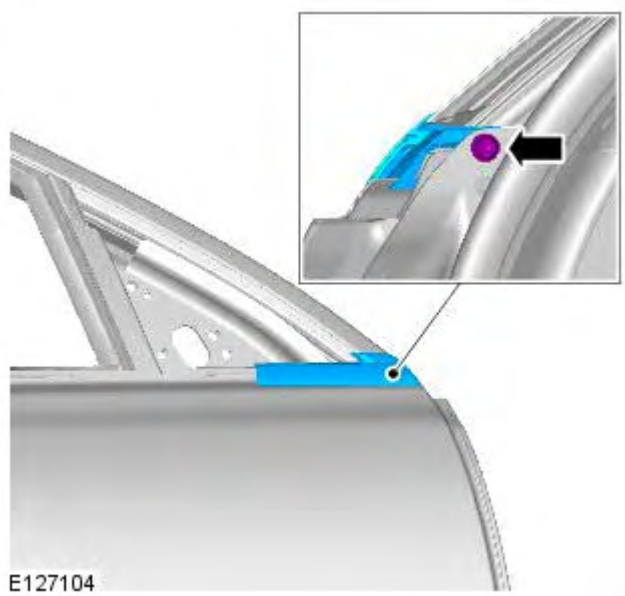
16. TORQUE: 30 Nm

17.



E127101

18.



E127104

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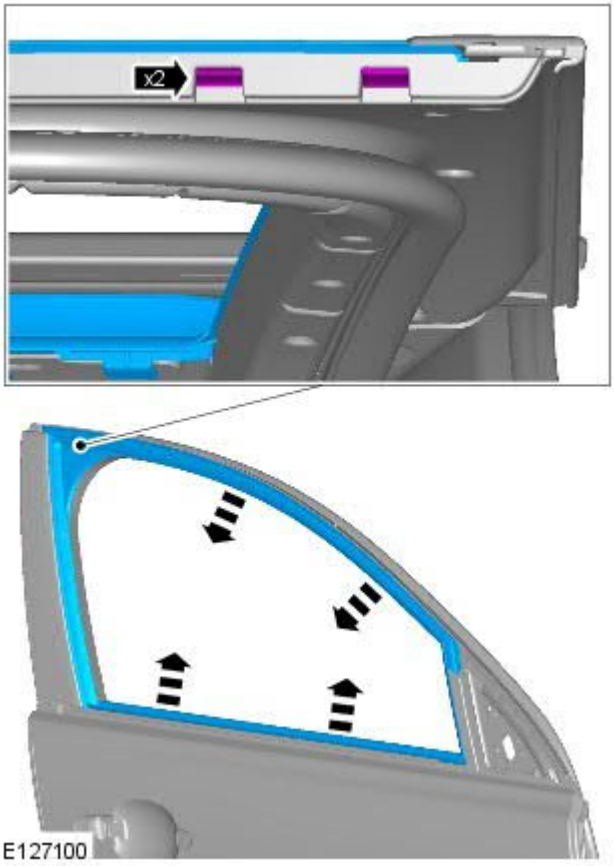
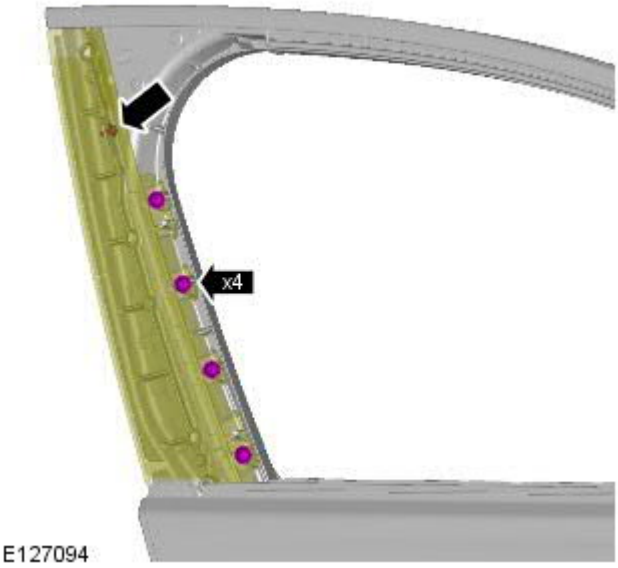


20. TORQUE: 5 Nm



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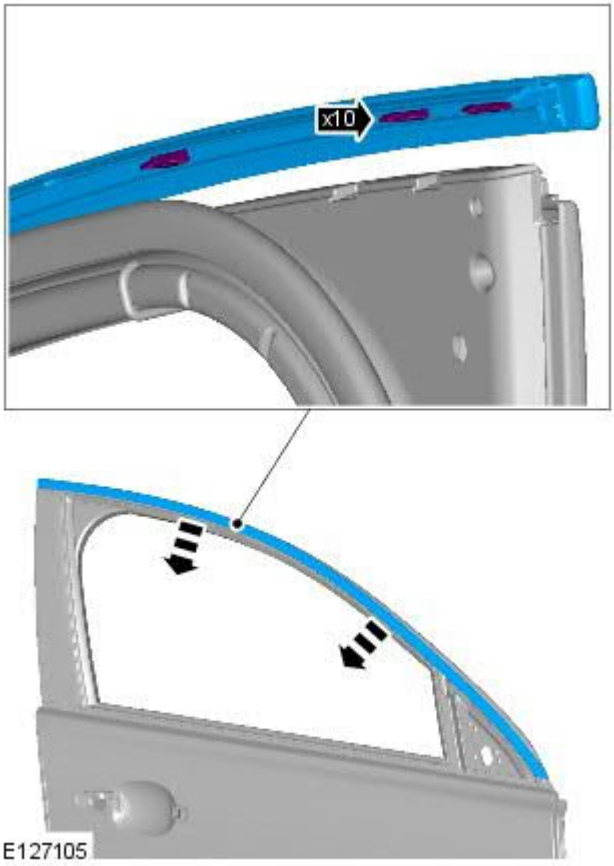


22.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

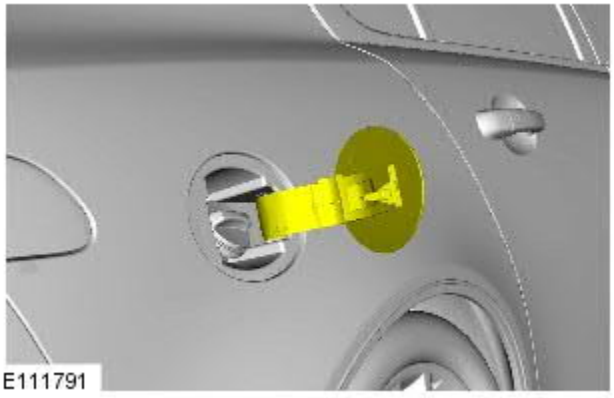
Body Closures - Fuel Filler Door

Removal and Installation

Removal

CAUTION: Do not align the bowl using the hinge arm.

NOTE: Removal steps in this procedure may contain installation details.



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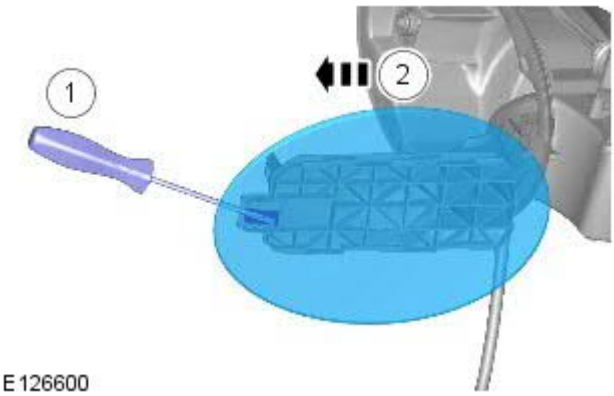


2. CAUTION: Protect the surrounding paintwork to avoid damage.

Installation

1. CAUTION: Make sure that the component is correctly located on the retaining clip.

   To install, reverse the removal procedure.

Published: 11-May-2011

Body Closures - Fuel Filler Door Assembly

Removal and Installation

Removal

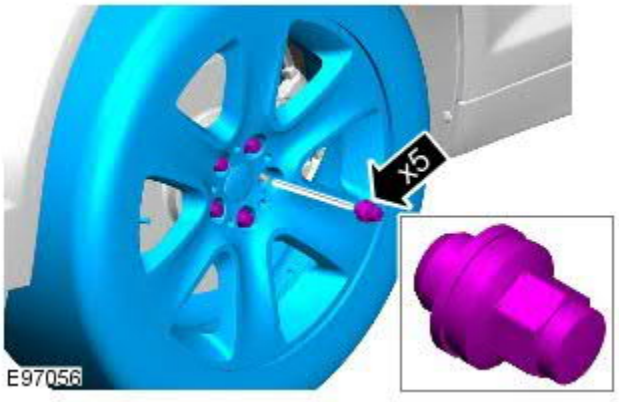
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Diesel Fuel System Health and Safety Precautions (100-00 General Information, Description and Operation).

2. Refer to: Petrol and Petrol-Ethanol Fuel Systems Health and Safety Precautions (100-00 General Information, Description and Operation).

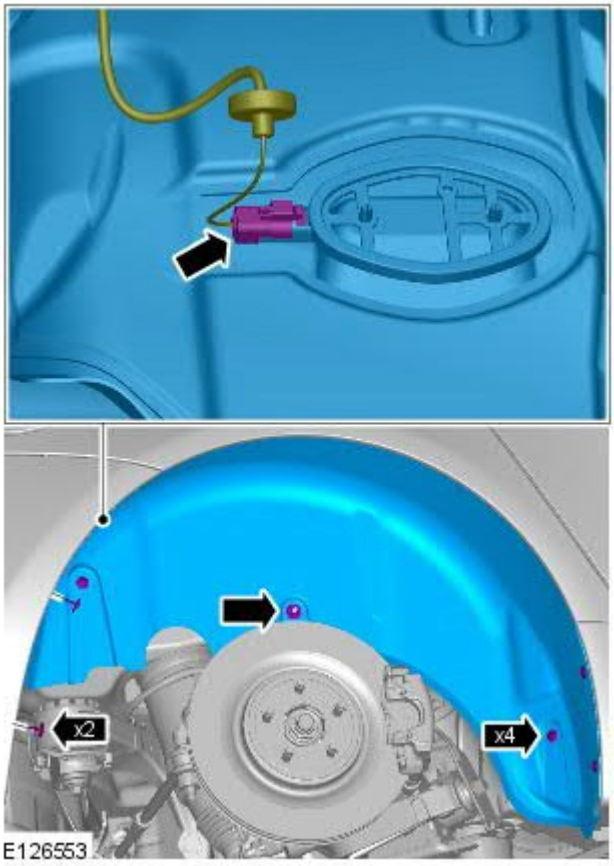
3. WARNING: Make sure to support the vehicle with axle stands.

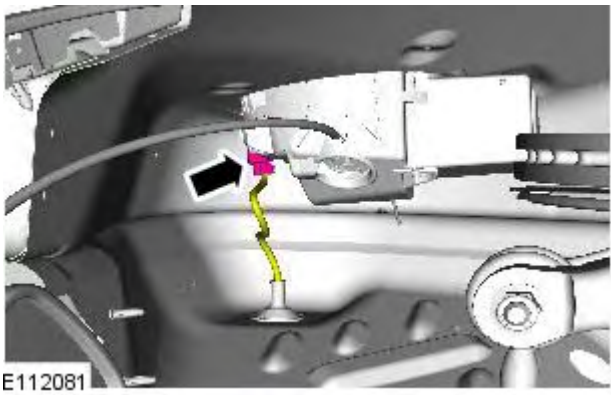
   Raise and support the vehicle.



4. *Torque:* 128 Nm

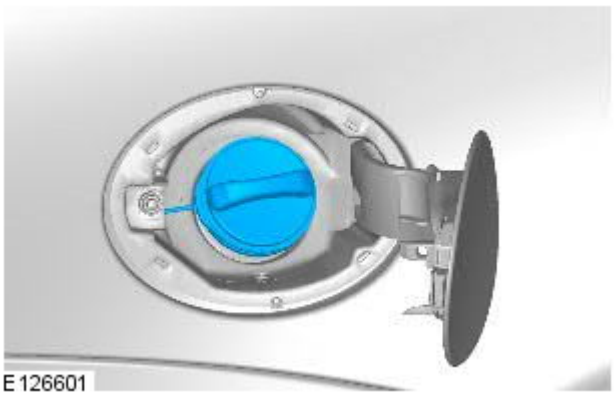
5.





6. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

7.



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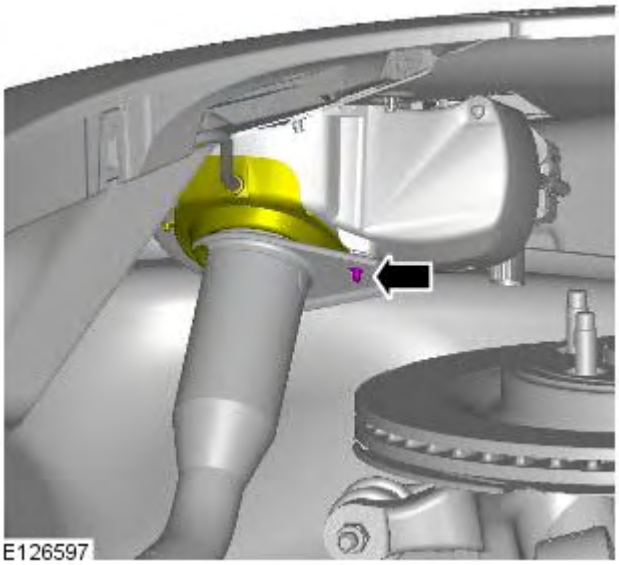

E126597

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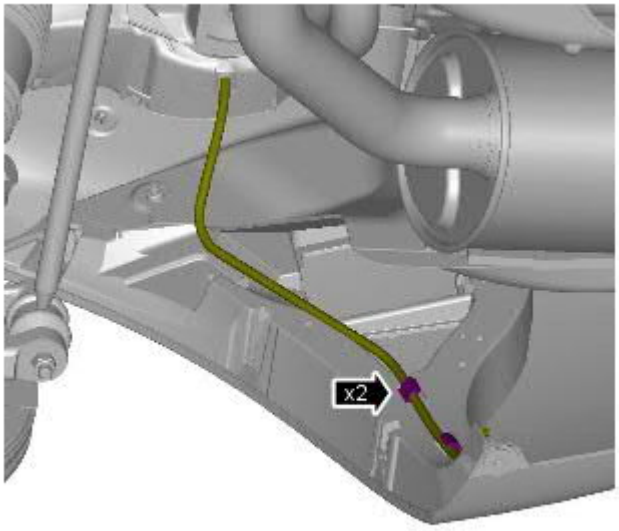

E126598

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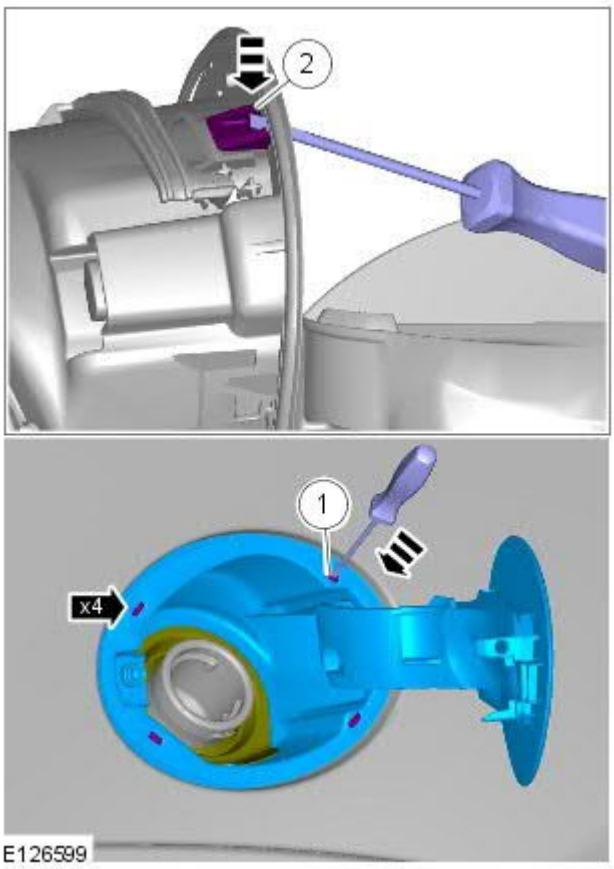
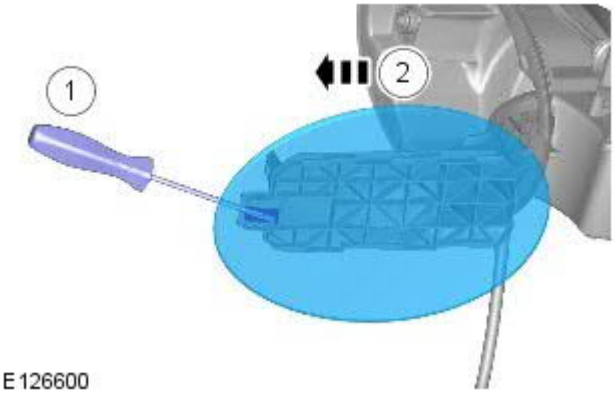


10. CAUTION: Protect the surrounding paintwork to avoid damage.



11. CAUTION: Protect the surrounding paintwork to avoid damage.

NOTE: Do not disassemble further if the component is removed for access only.

Installation

1. To install, reverse the removal procedure.

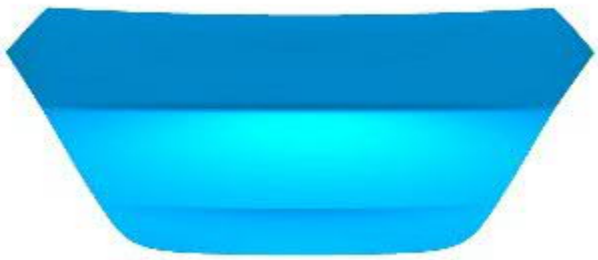
Published: 11-May-2011

Body Closures - Luggage Compartment Lid

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.



E127601

1. CAUTION: Make sure to protect the paintwork.

   NOTES:

   The luggage compartment lid is manufactured from aluminium.

   The luggage compartment lid is serviced as a separate bolt-on panel, less its hinges.

2. For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation).

3. For additional information, refer to: Body Repairs (501-25A Body Repairs - General Information, Description and Operation).

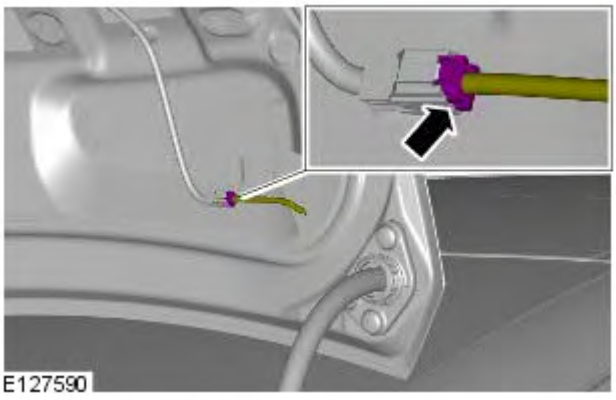
4. For additional information, refer to: Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation).

5. For additional information, refer to: Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

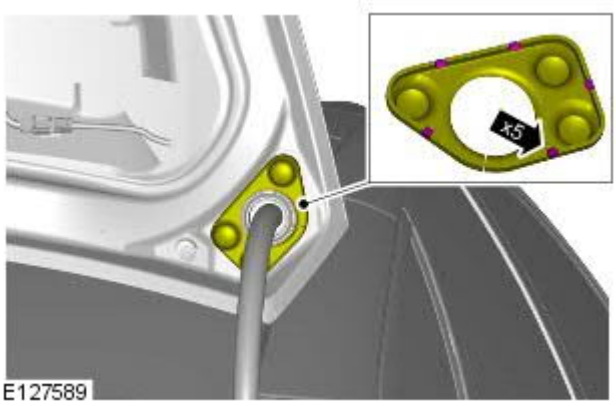
6. For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

7. For additional information, refer to: Luggage Compartment Lid Latch Actuator (501-14 Handles, Locks, Latches and Entry Systems, Removal and Installation).

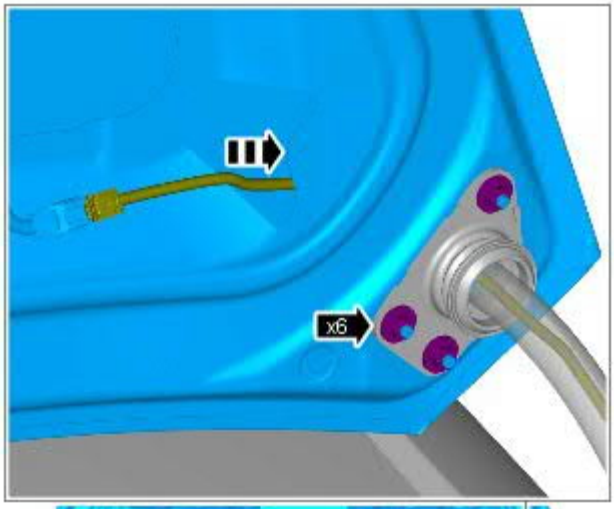
8.

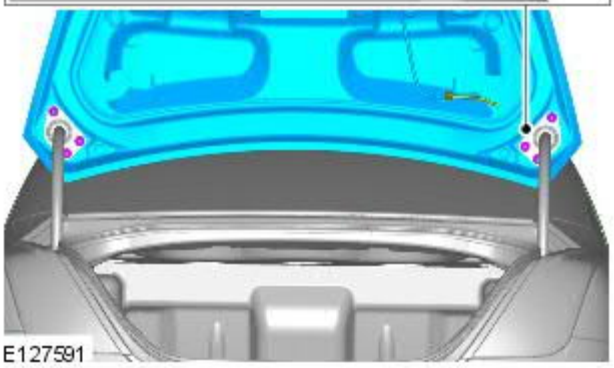


E127590



9. NOTE: The step must be carried out on both sides.

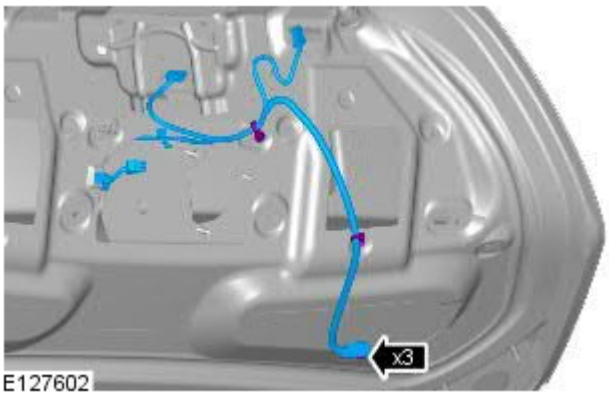




10. WARNING: This step requires the aid of another technician.

CAUTION: Take extra care not to damage the wiring harnesses.

TORQUE: 23 Nm



11. CAUTION: Protect the surrounding paintwork to avoid damage.

NOTE: Do not disassemble further if the component is removed for access only.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Body Closures - Luggage Compartment Lid Hinge

Removal and Installation

Removal

1. The luggage compartment lid hinge is a category B repair.

2. NOTE: The luggage compartment lid hinge is manufactured from steel.

   The luggage compartment lid hinge is serviced as a separate bolt-on panel.

3. The luggage compartment lid hinge is replaced in conjunction with:
   - Luggage compartment lid

4. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

5. Disconnect the battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

6. Remove the luggage compartment lid.
   For additional information, refer to: Luggage Compartment Lid (501-03 Body Closures, Removal and Installation).

7. Remove the parcel shelf.
   For additional information, refer to: Parcel Shelf (501-05 Interior Trim and Ornamentation, Removal and Installation).

8. Remove the back panel inner trim.

9. Remove the loadspace trim panel.
   For additional information, refer to: Loadspace Trim Panel LH (501-05 Interior Trim and Ornamentation, Removal and Installation) /
   Loadspace Trim Panel RH (501-05 Interior Trim and Ornamentation, Removal and Installation).

10. Remove the retaining nuts to the luggage compartment lid hinge mounting.

Installation

1. NOTE: Make sure the gasket is installed between the luggage compartment lid and the luggage compartment lid hinge.

   Offer up the luggage compartment lid hinge. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

2. Tighten the luggage compartment lid hinge retaining nuts.

   NOTE: Bolts are pre-coated to inhibit galvanic corrosion and can be reused only if the coating is not damaged.

   - Tighten to 17 Nm.

3. The installation of associated panels and components is the reversal of removal procedure.

Published: 10-Feb-2012

Body Closures - Luggage Compartment Lid Strut

Removal and Installation

Removal

CAUTION: Make sure the luggage compartment lid is in fully open position.

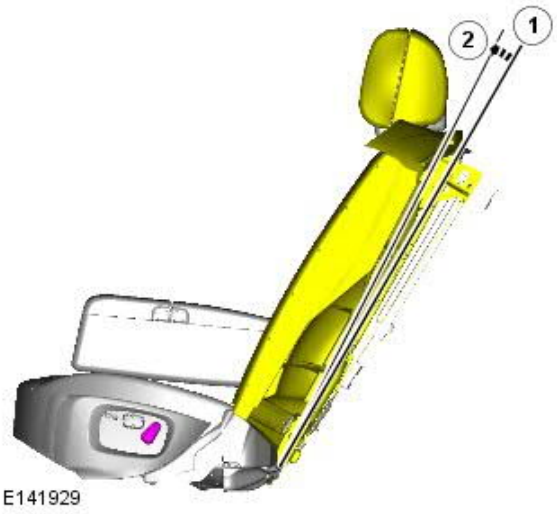
NOTE: Removal steps in this procedure may contain installation details.

All vehicles

1. Refer to: Loadspace Trim Panel RH (501-05 Interior Trim and Ornamentation, Removal and Installation).

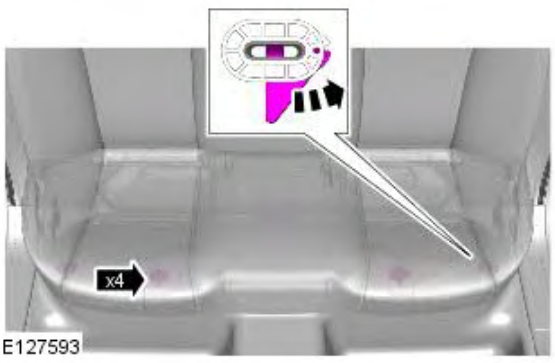
Vehicles with split rear seat backrest

NOTE: If equipped.



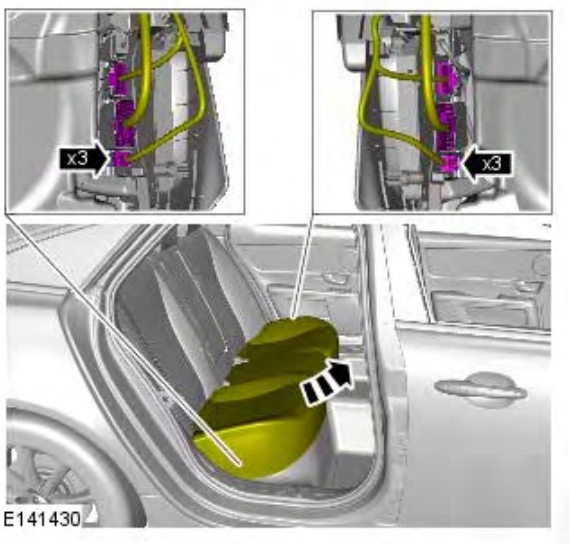
2. Fully recline the rear seat backrest, then adjust it slightly back up to aid access.

All vehicles



3.

4.



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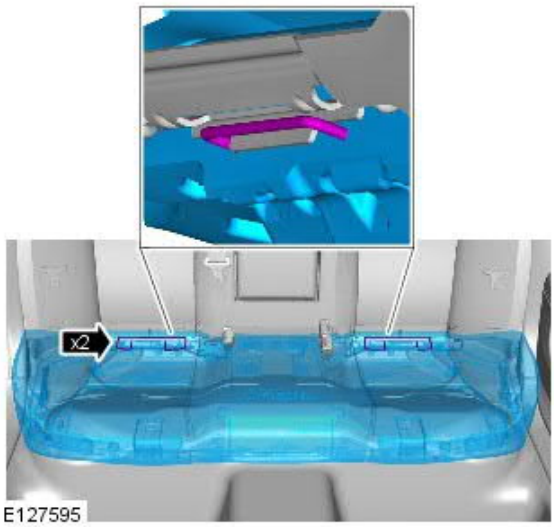
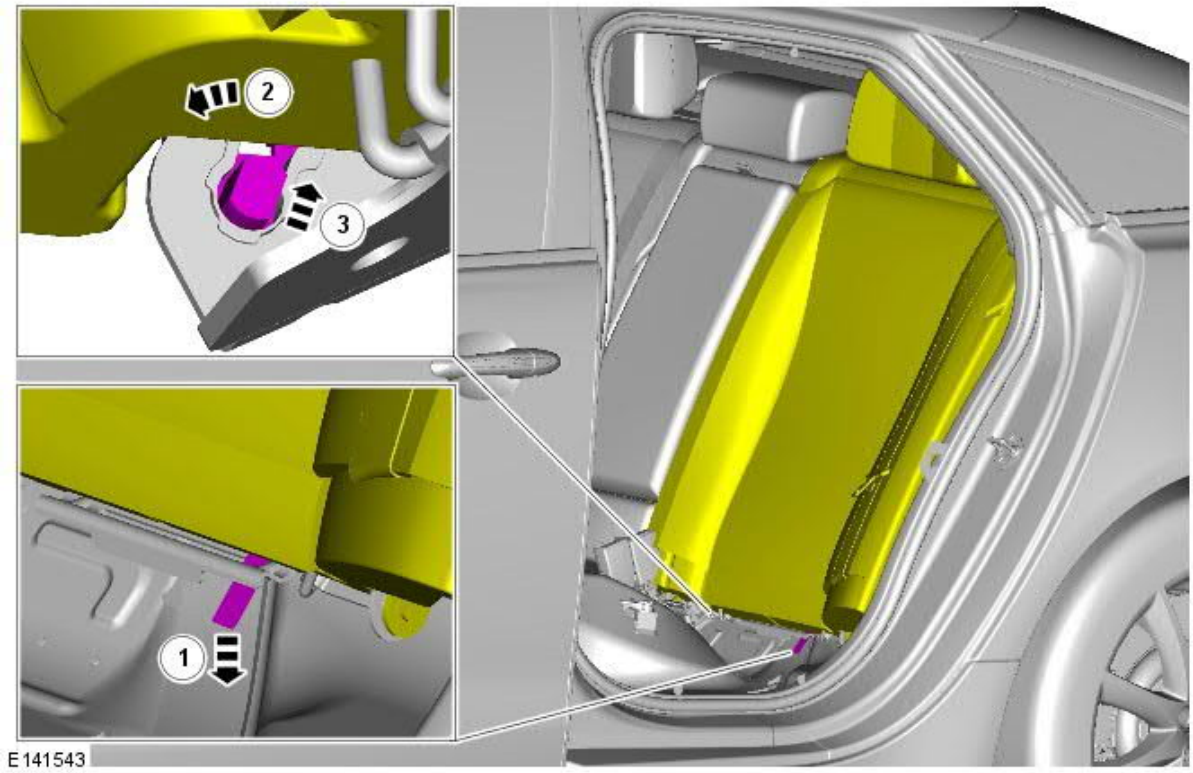


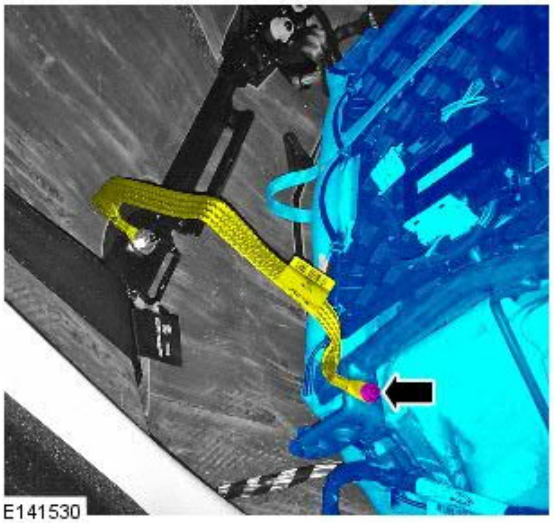
Vehicles with split rear seat backrest

NOTE: If equipped.

6.

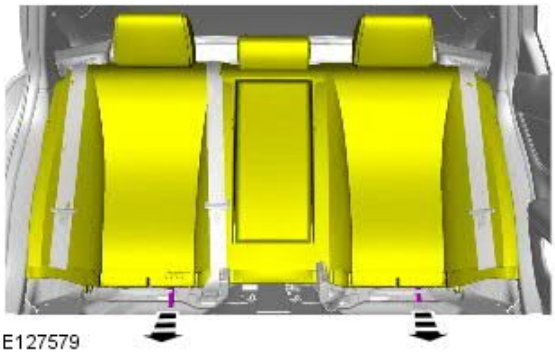


7. *Torque:* 10 Nm



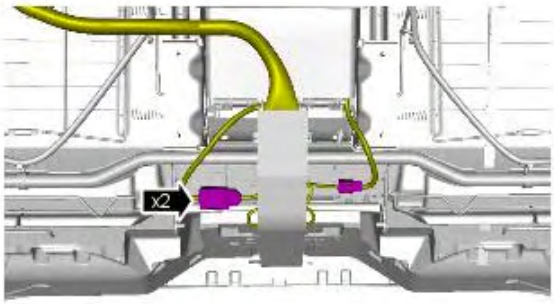
All vehicles

8.



Vehicles with rear passenger entertainment system

9.



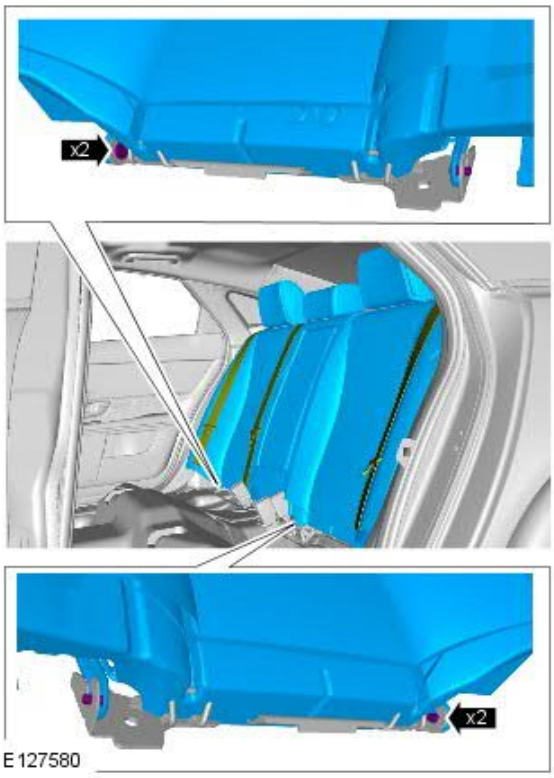
E127581

All vehicles

E128812

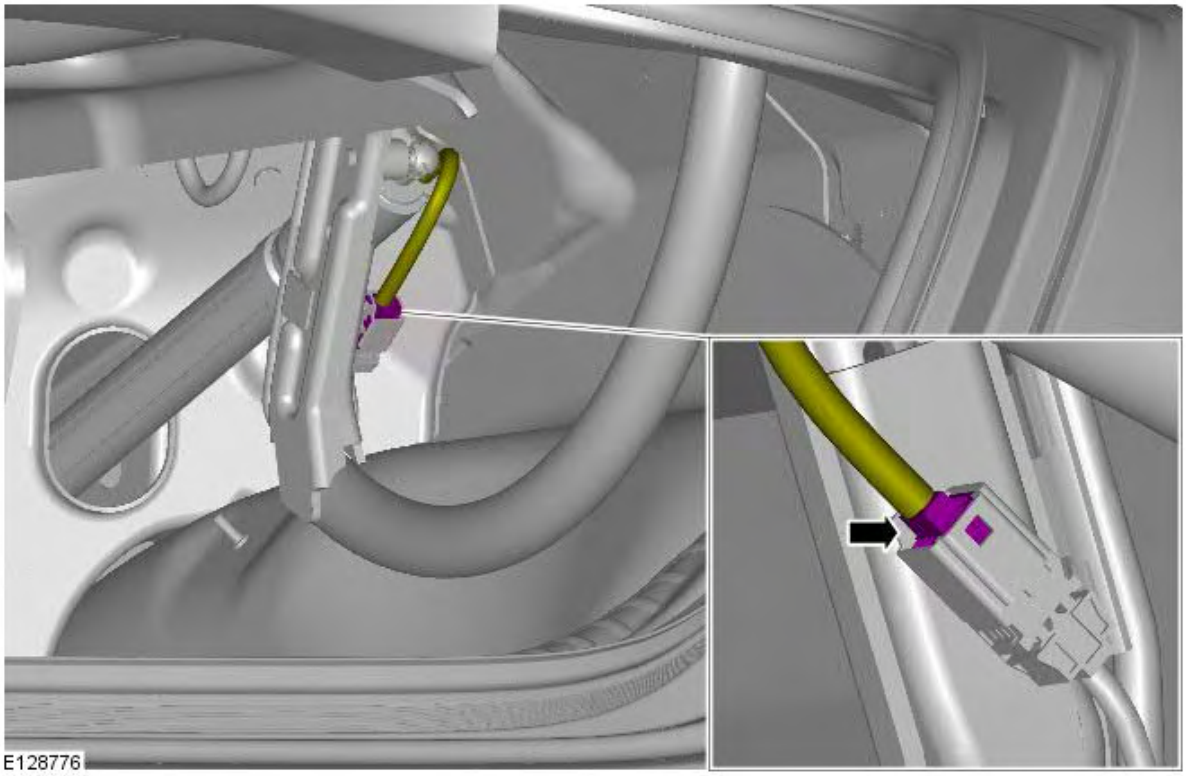
10. NOTE: Note the position of the wiring harnesses to aid installation.

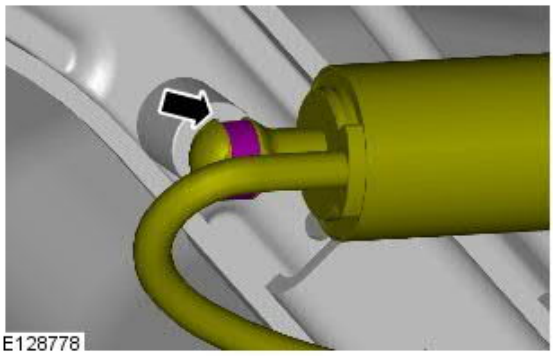
11.



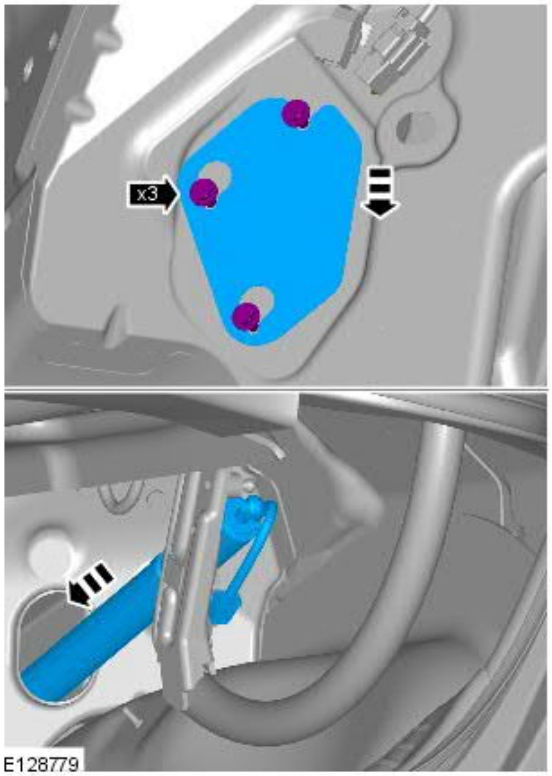
E127580

12.

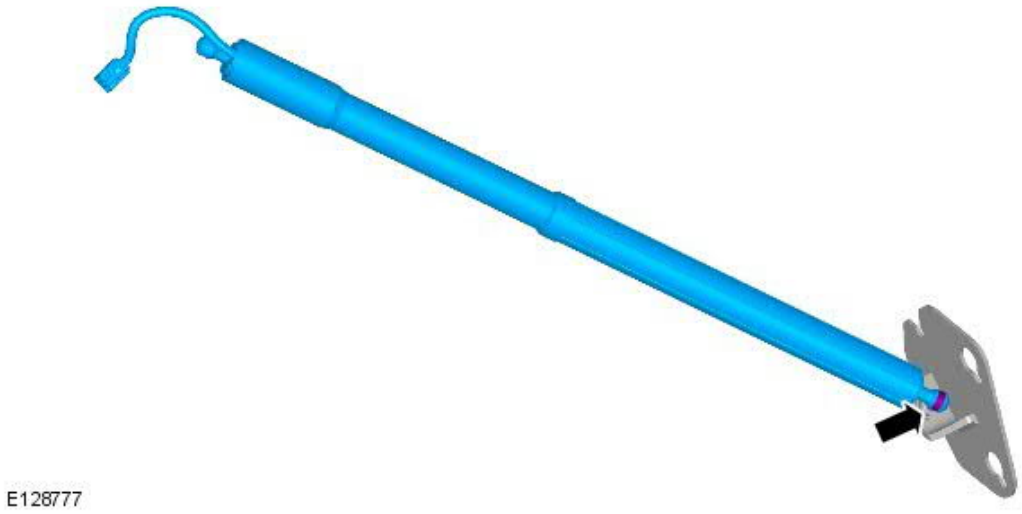




13. CAUTION: Using a suitable tool, release and detach the strut joints.



14. *Torque:* 9 Nm



15. CAUTION: Using a suitable tool, release and detach the strut joints.

NOTE: Do not disassemble further if the component is removed for access only.

Installation

1. To install, reverse the removal procedure.

2. NOTE: Make sure that all the clips are correctly installed.

Published: 11-May-2011

Body Closures - Rear Door

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

RH illustration shown, LH is similar.

1. NOTE: The rear door is manufactured from aluminium, it contains a side impact reinforcement manufactured from aluminium.

   The rear door is serviced as a separate bolt-on panel.

2. For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

3. WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplemental restraint system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait one minute. Failure to follow this instruction may result in personal injury.

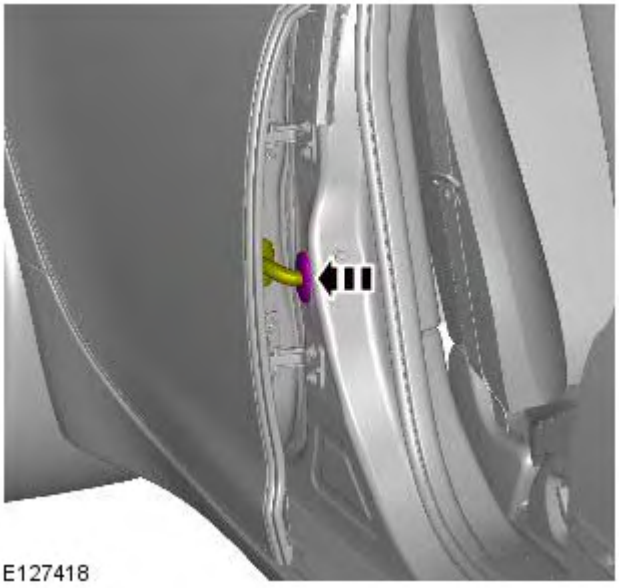
   For additional information, refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

4. For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation).

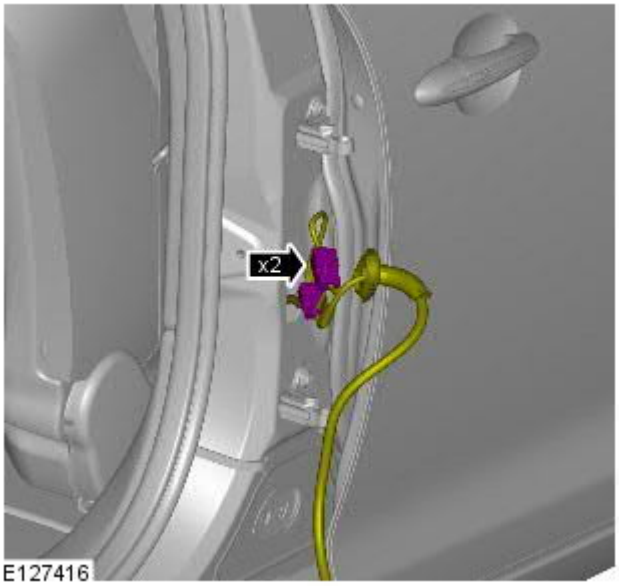
5. For additional information, refer to: Body Repairs (501-25A Body Repairs - General Information, Description and Operation).

6. For additional information, refer to: Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation).

7. TORQUE: 25 Nm

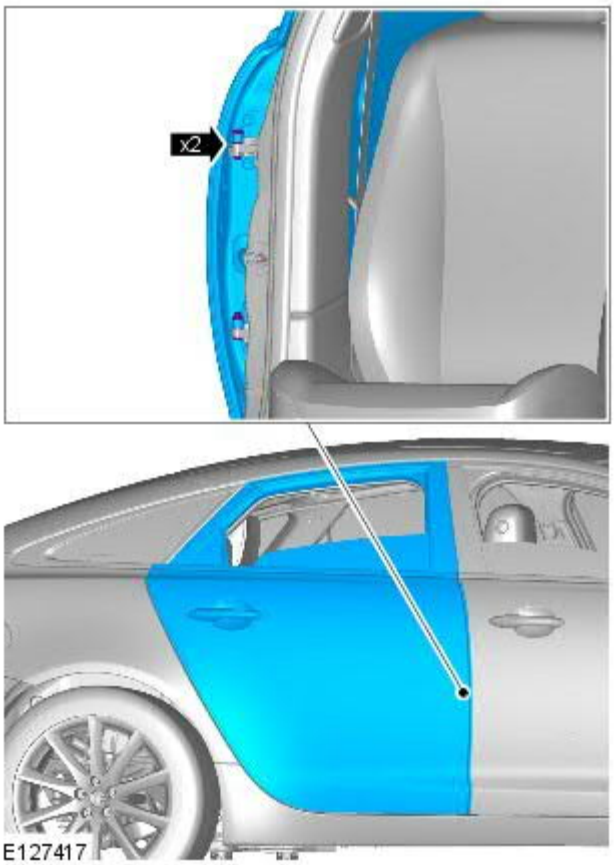


8. CAUTION: Take extra care not to damage the wiring harnesses.



9. CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean.

   NOTE: Rear door shown removed for clarity.

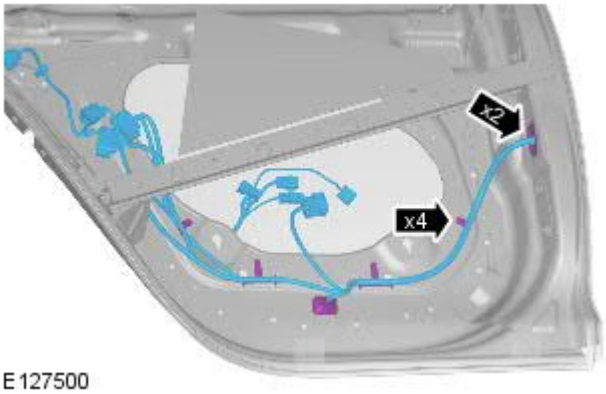


10. NOTE: Do not disassemble further if the component is removed for access only.

    TORQUE: 30 Nm

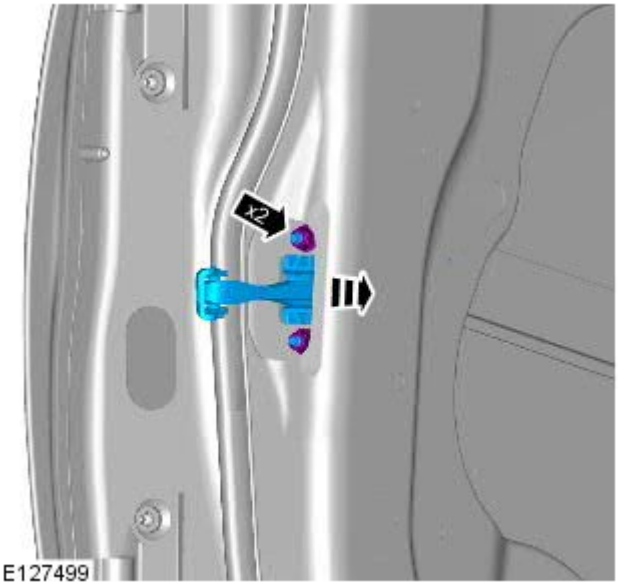
11. For additional information, refer to: Rear Door Latch (501-14 Handles, Locks, Latches and Entry Systems, Removal and Installation).

12. For additional information, refer to: Rear Door Window Regulator and Motor (501-11 Glass, Frames and Mechanisms, Removal and Installation).



E127500

13. CAUTION: Take extra care not to damage the wiring harnesses.



E127499

14. CAUTION: Failure to follow this instruction may result in damage to the component.

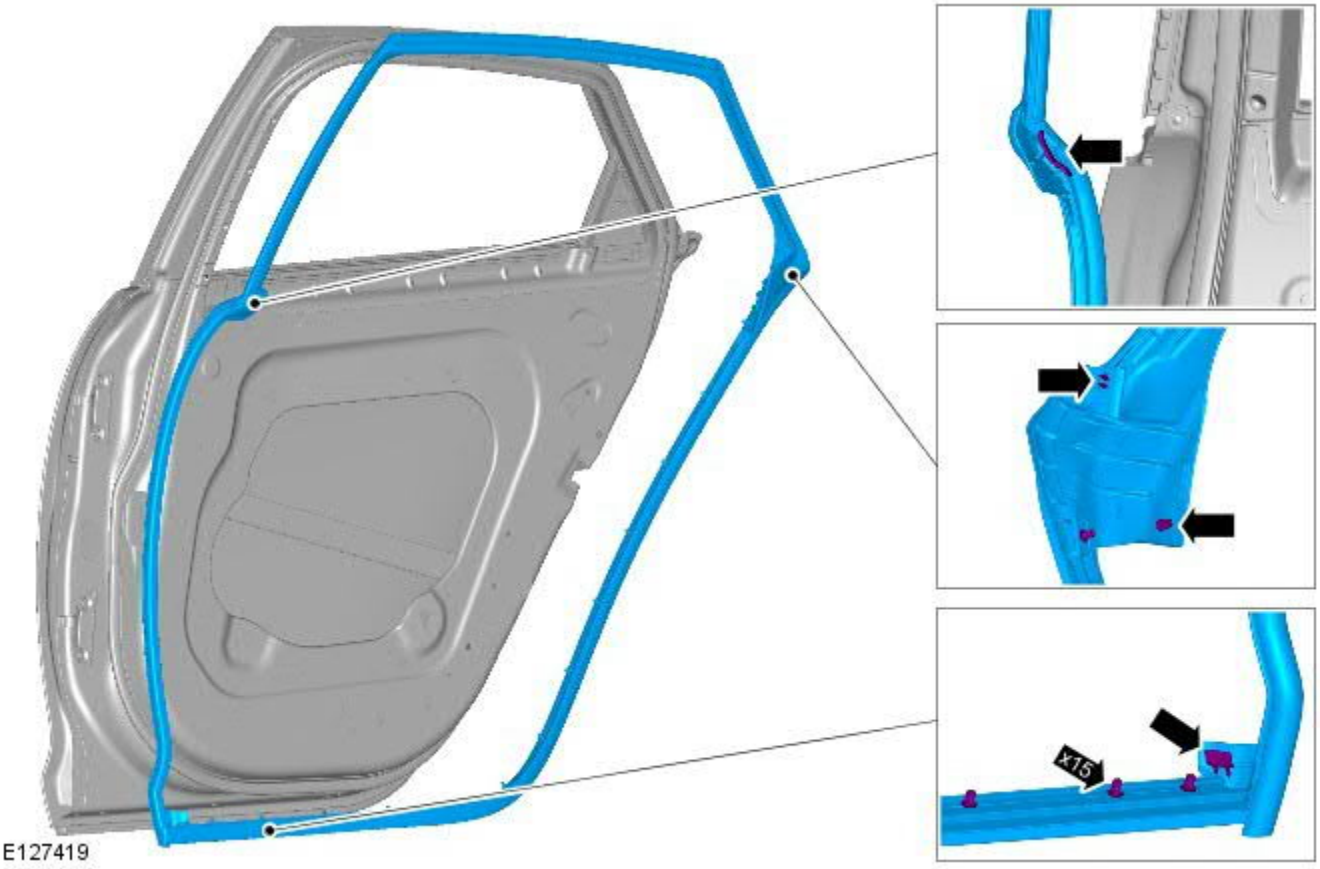
TORQUE: 10 Nm

E127090

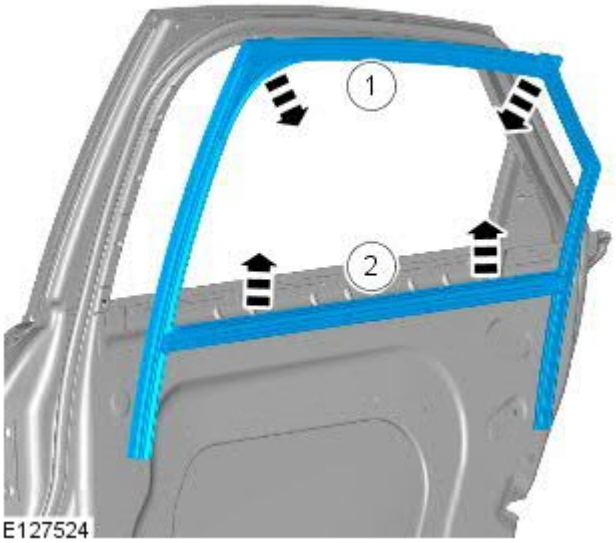
15. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

TORQUE: 30 Nm

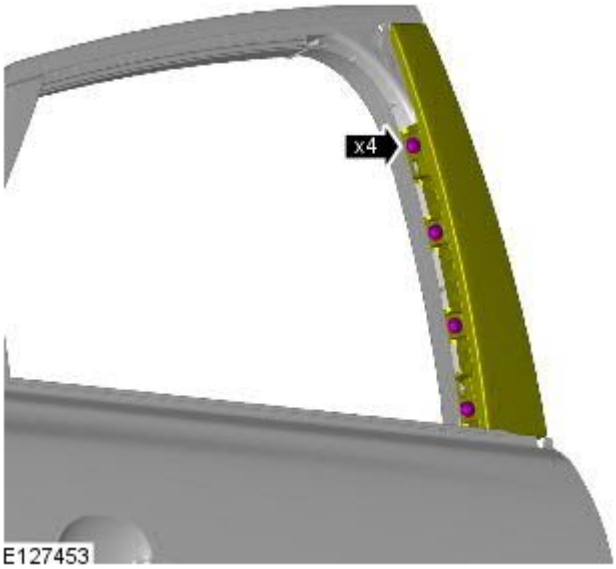
16.



17.



18. TORQUE: 5 Nm



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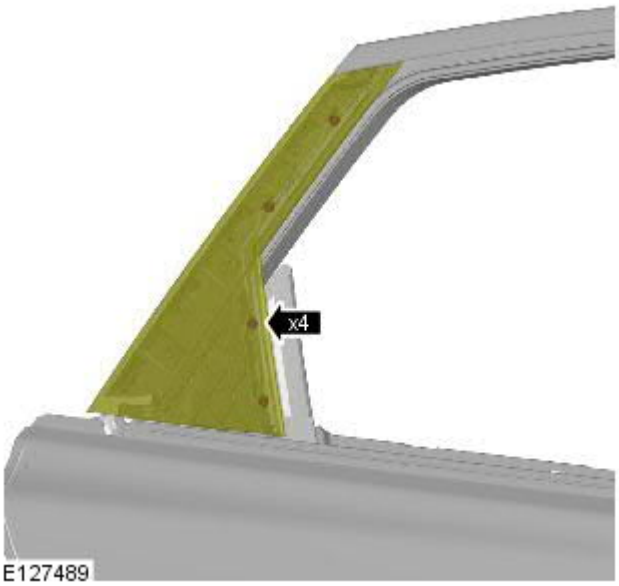

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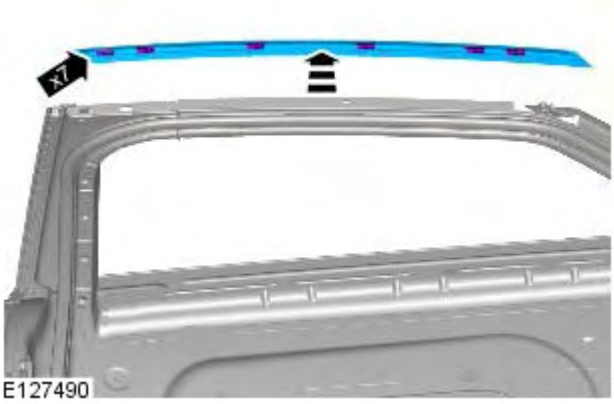
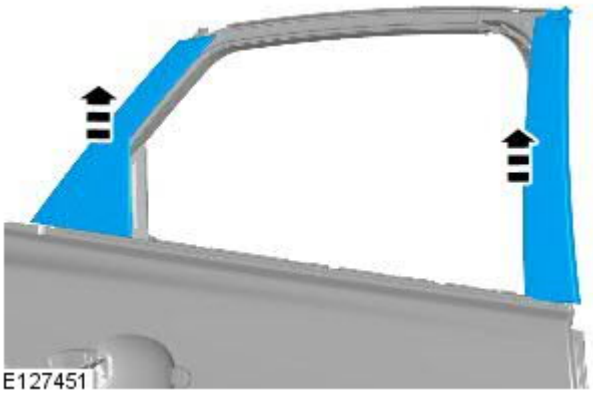
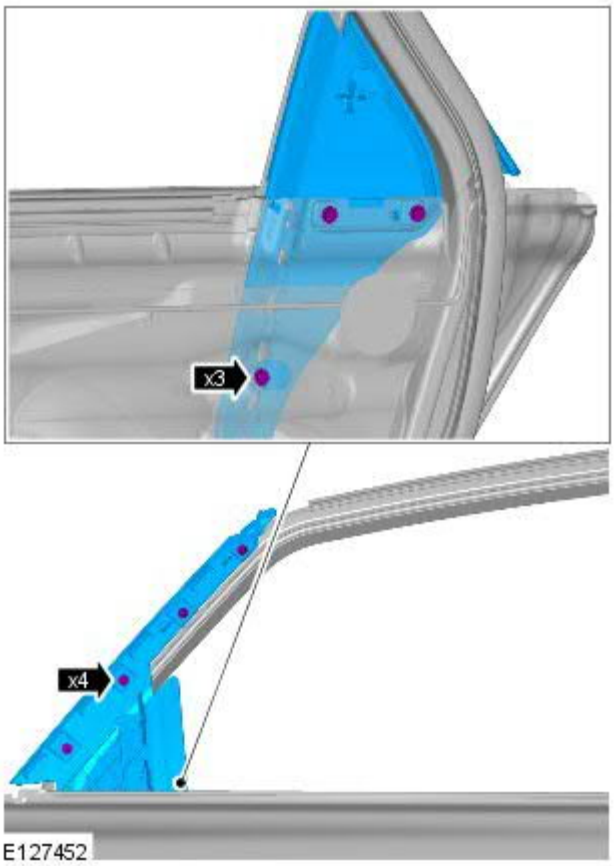


21.



22. TORQUE: 4



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Interior Trim and Ornamentation -

Description	Nm	lb-ft	lb-in
Safety belt lower retaining bolt	40	30	-
A-pillar trim panel screw	6	4	
B-pillar upper trim panel screw	6	4	
C-pillar lower trim panel screw	6	4	
Front door trim panel lower screws	6	4	
Front door trim panel upper screw	3	2	
Front interior door handle screw	3	2	
Rear door trim panel lower screws	6	4	
Rear door trim panel upper screw	3	2	
Rear interior door handle screw	3	2	
Headlining screws	2	1	
Rear parcel shelf bolts	6	4	
Sun visor screws	6	4	

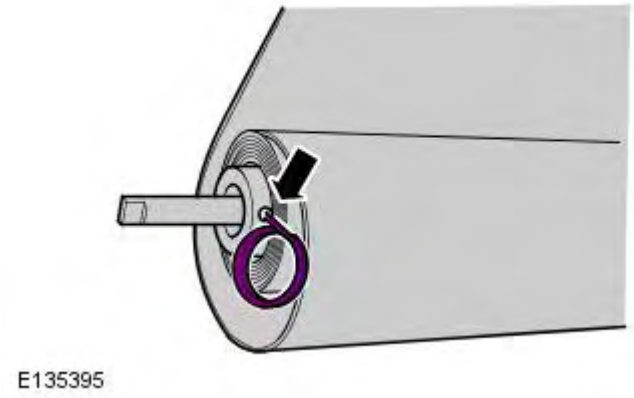
Published: 29-Mar-2011

Interior Trim and Ornamentation - Glass Roof Panel Blind Rewind Procedure

General Procedures

Check

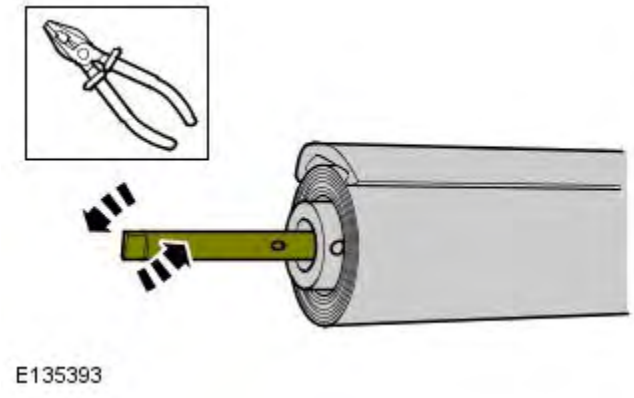
1. Refer to: Glass Roof Panel Blind (501-05 Interior Trim and Ornamentation, Removal and Installation).



E135395

2. Remove the retaining clip.

Adjustment



E135393

1. CAUTIONS:

   Rotating the shaft clockwise will result in permanent damage to the tension spring.

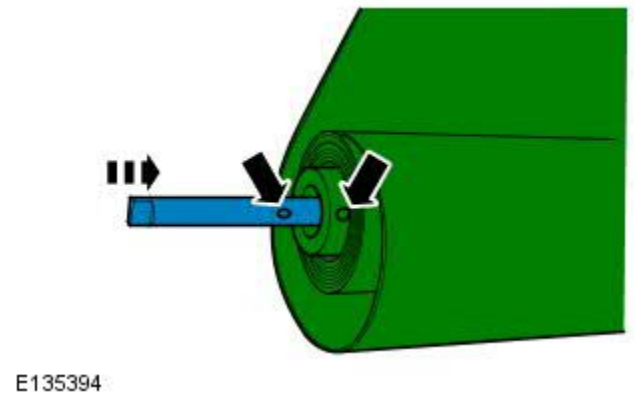
   Make sure that the tension is retained on the shaft until the clip is installed.

   NOTES:

   On vehicles with long wheel base, rotate the roof opening panel blind 12 full rotations.

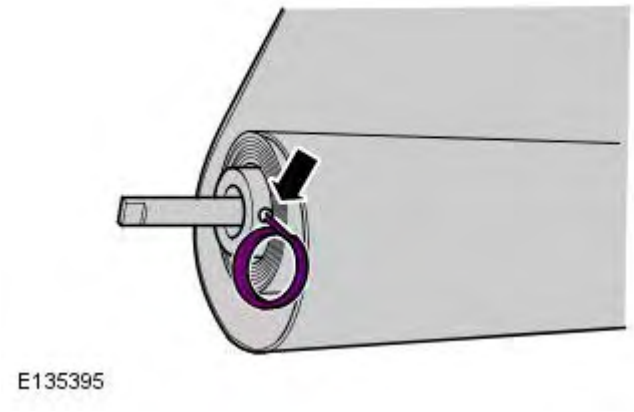
   On vehicles with short wheel base, rotate the roof opening panel blind 11 full rotations.

   Using a suitable tool, rotate the shaft counter clockwise.



E135394

2. Align the holes between the shaft and the blind.


E135395

3. Install the retaining clip.

4. Refer to: Glass Roof Panel Blind (501-05 Interior Trim and Ornamentation, Removal and Installation).

Published: 11-May-2011

Interior Trim and Ornamentation - A-Pillar Trim Panel

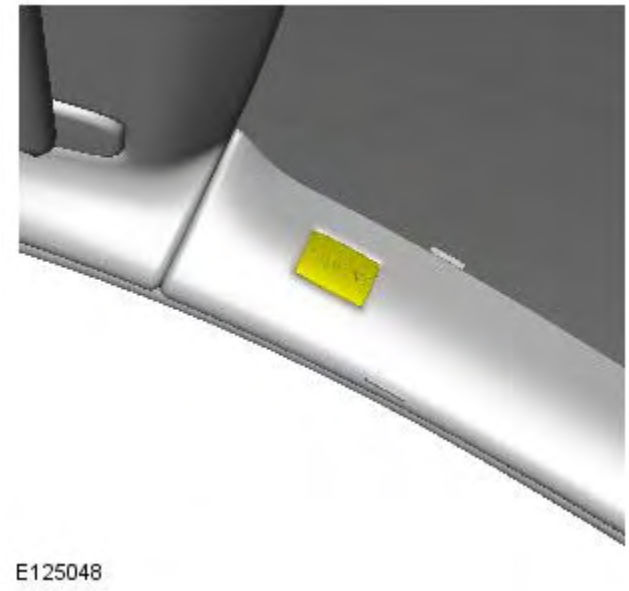
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

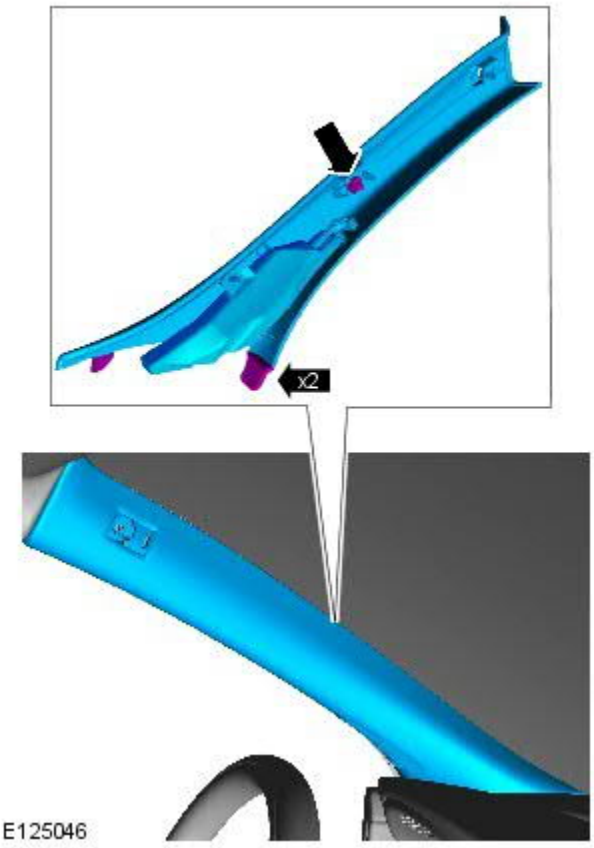
1.

2.



3. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

   Torque: 6 Nm



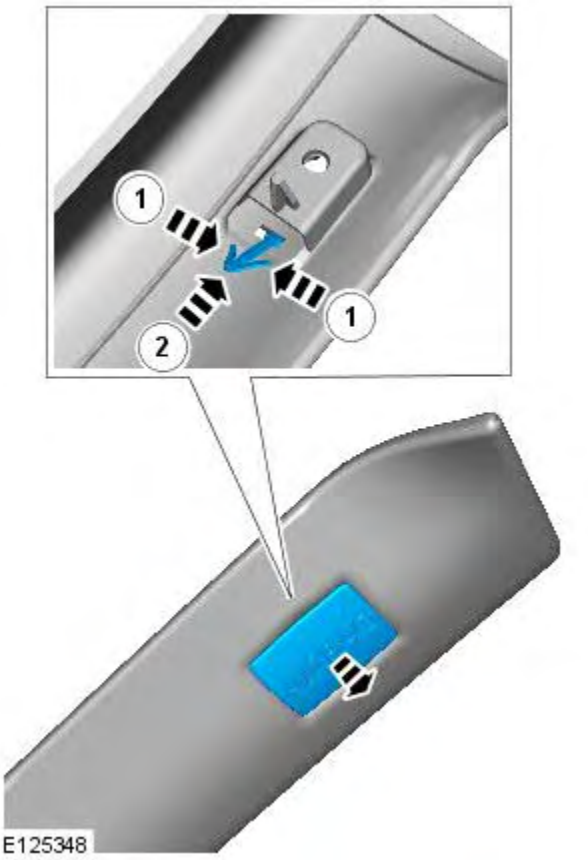
4. NOTES:

   Do not disassemble further if the component is removed for access only.

   Some variation in the illustrations may occur, but the essential information is always correct.

   Note the fitted position of the component/s prior to removal.

5.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

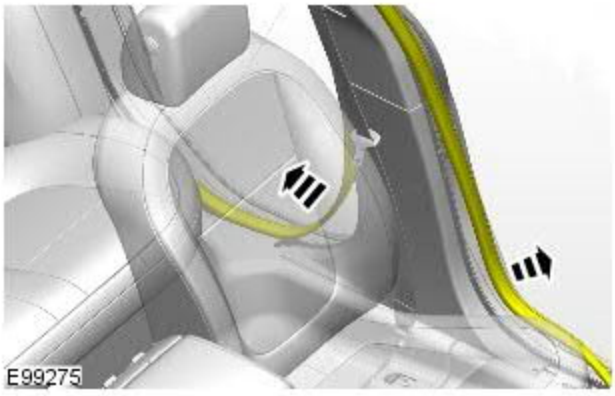
Interior Trim and Ornamentation - B-Pillar Lower Trim Panel

Removal and Installation

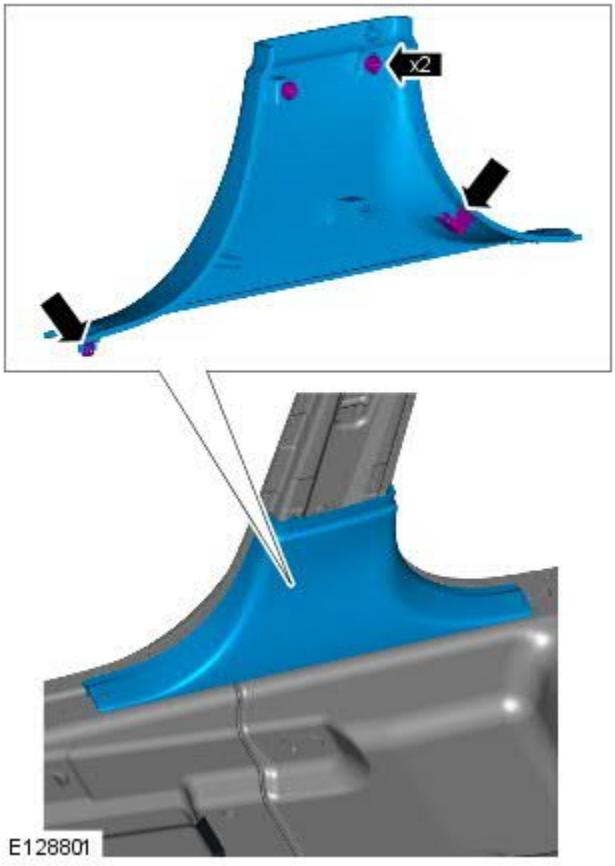
Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Front Scuff Plate Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
2. Refer to: Rear Scuff Plate Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Refer to: B-Pillar Upper Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).



4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



5. CAUTION: Make sure that the clips are correctly located.

   NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Installation

1. To install, reverse the removal procedure.

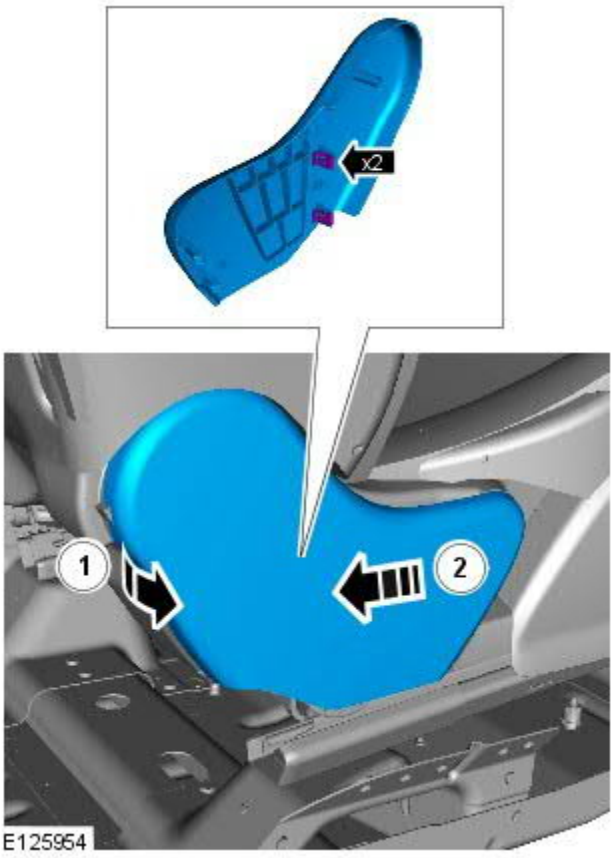
Published: 11-May-2011

Interior Trim and Ornamentation - B-Pillar Upper Trim Panel

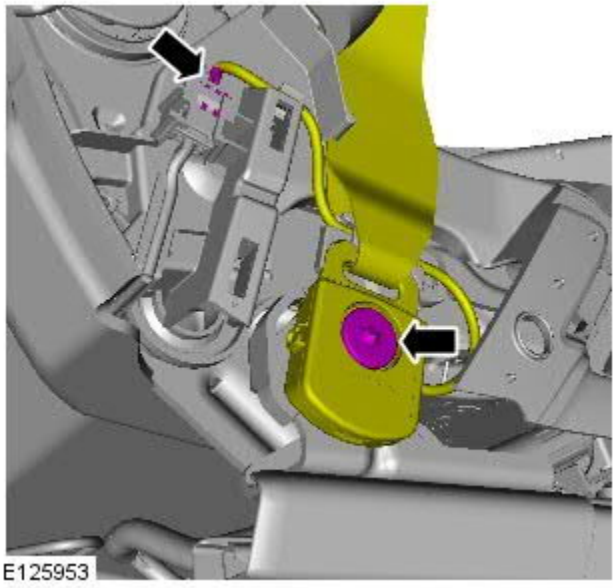
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

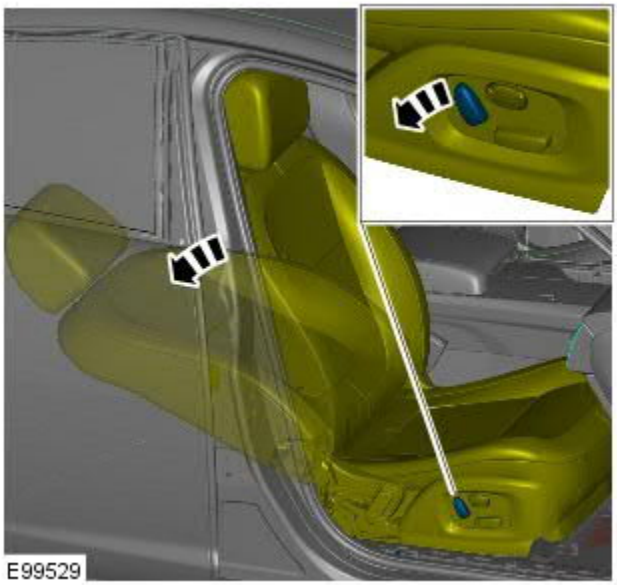


1. CAUTION: Make sure that the component is correctly located on the locating pegs.

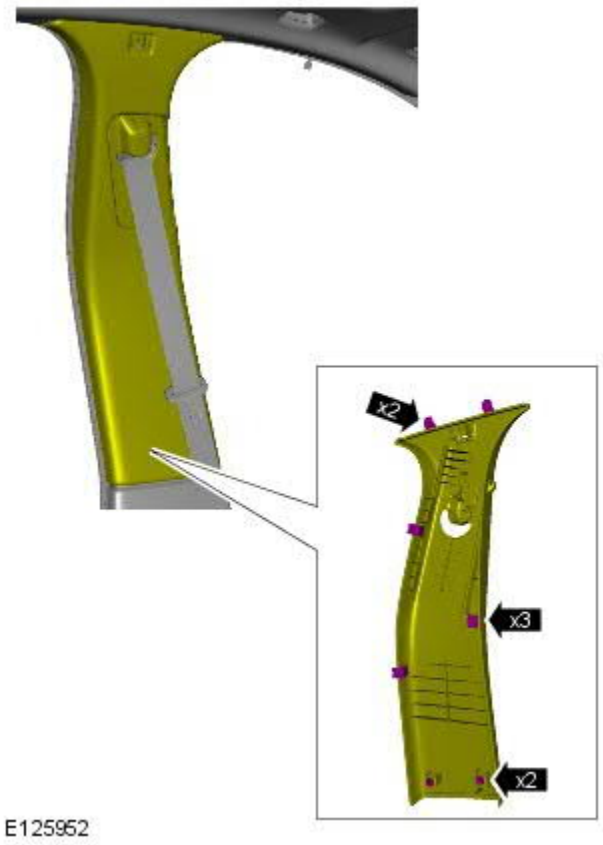


2. *Torque:* 40 Nm

3.

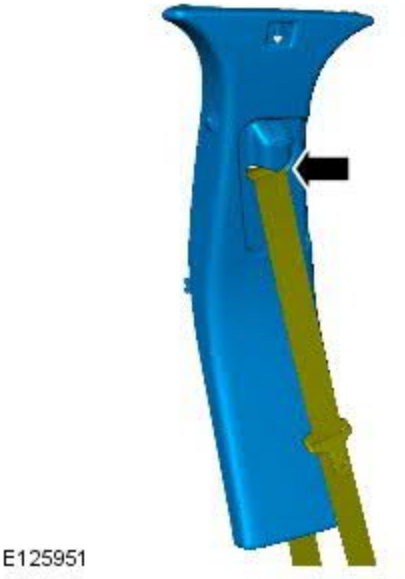


4. *Torque:* 6 Nm



E125952

5. NOTE: Make sure that the component is installed to the noted removal position.


E125951

6. NOTE: Do not disassemble further if the component is removed for access only.

Installation

1. To install, reverse the removal procedure.

Published: 10-Feb-2012

Interior Trim and Ornamentation - C-Pillar Lower Trim Panel

Removal and Installation

Removal

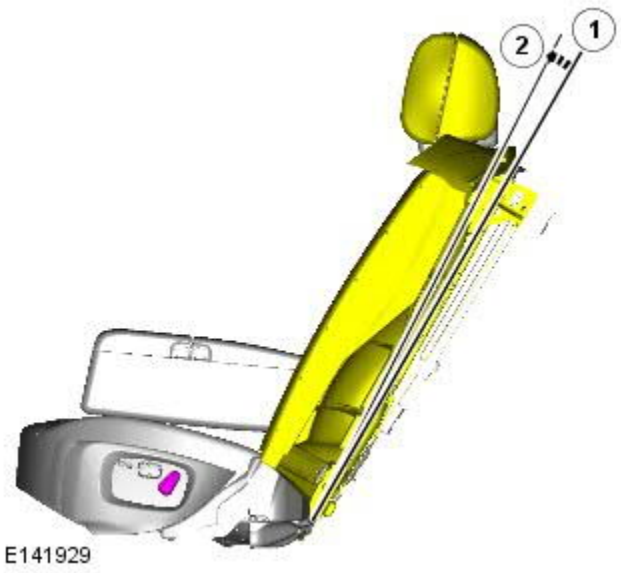
NOTE: Removal steps in this procedure may contain installation details.

All vehicles

1. Refer to: C-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

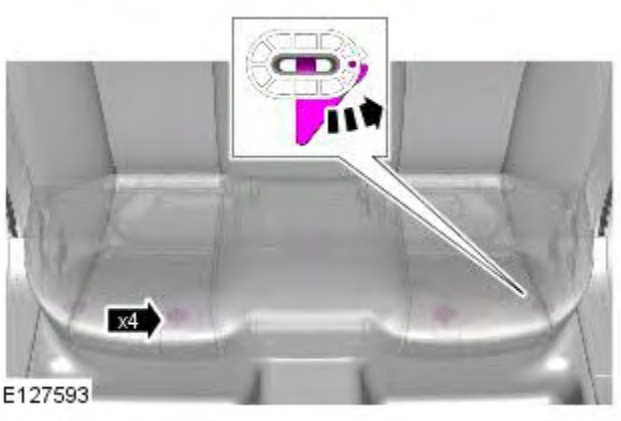
Vehicles with split rear seat backrest

NOTE: If equipped.



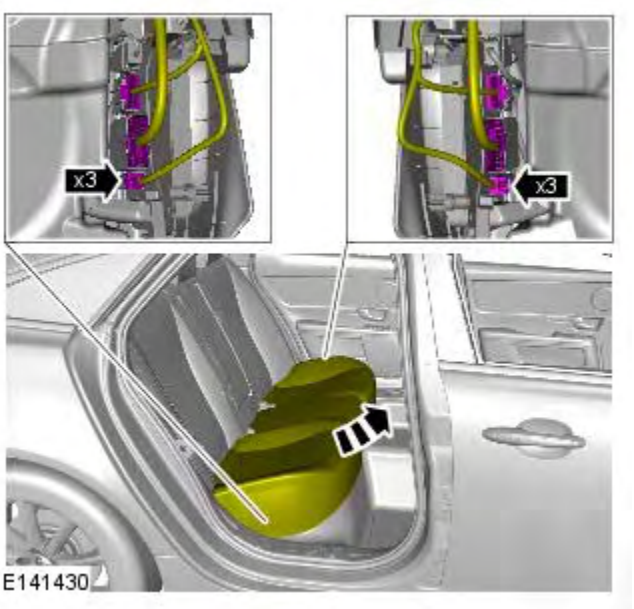
2. Fully recline the rear seat backrest, then adjust it slightly back up to aid access.

All vehicles

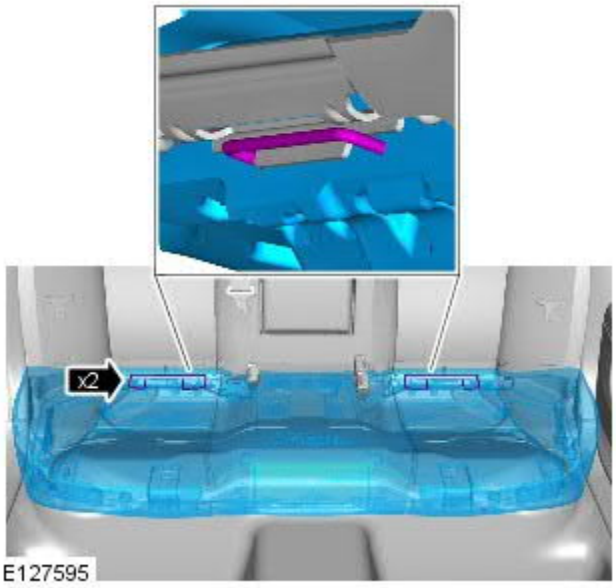


3.

4.



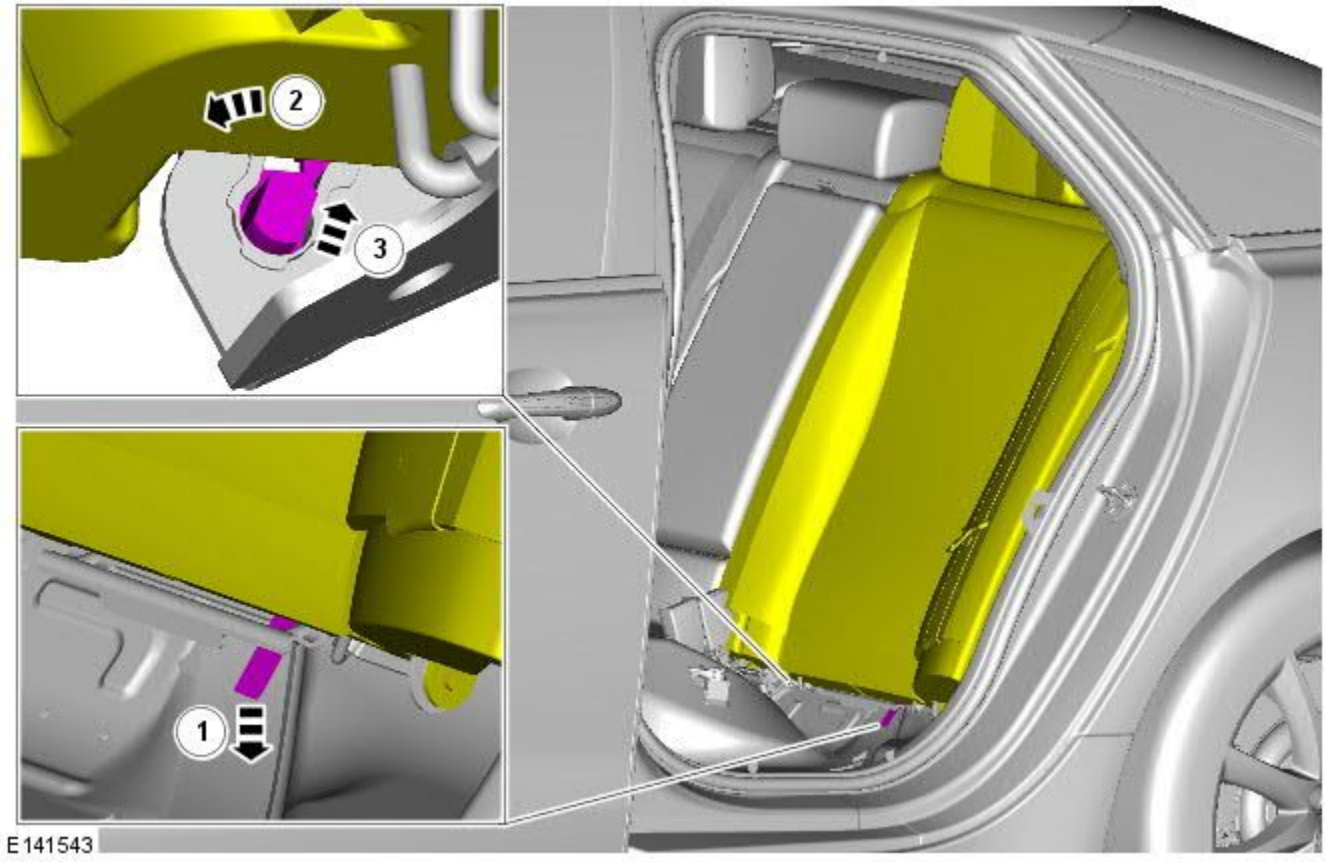
5.



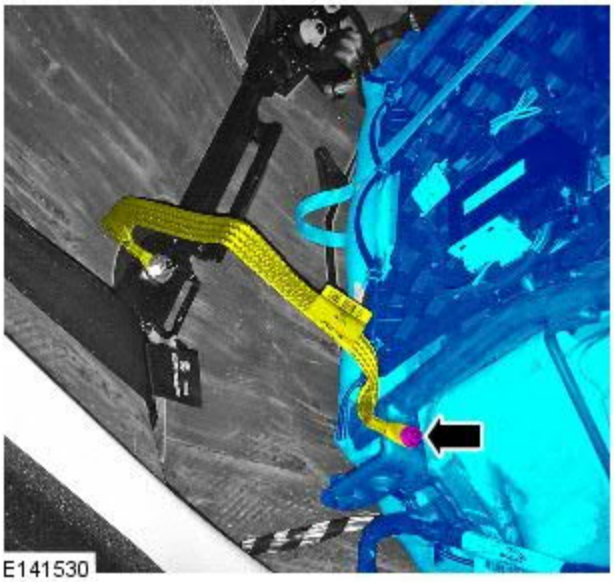
Vehicles with split rear seat backrest

NOTE: If equipped.

6.

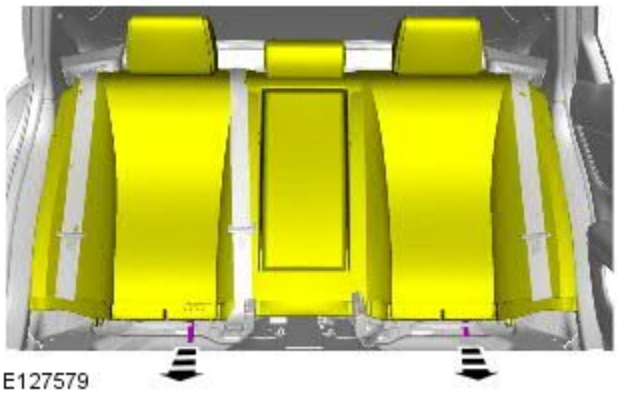


7. *Torque:* 10 Nm



All vehicles

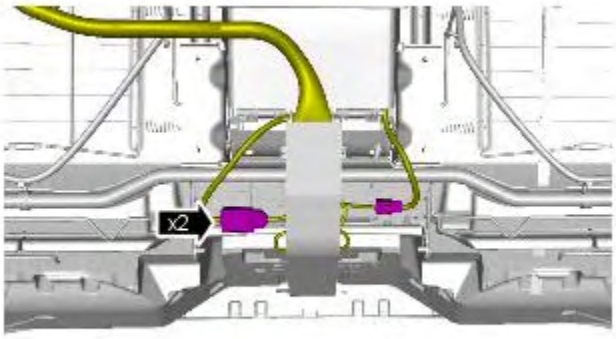
8.



E127579

Vehicles with rear passenger entertainment system

9.



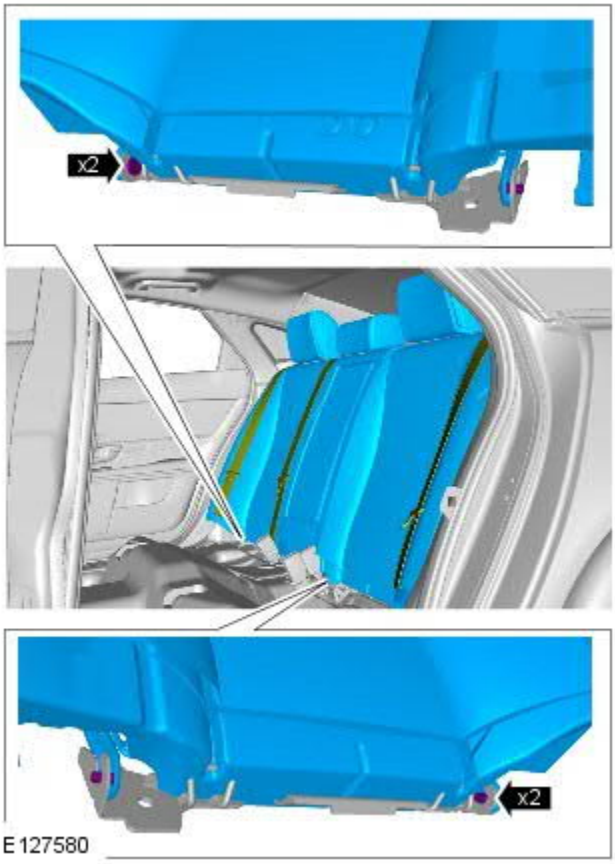
E127581

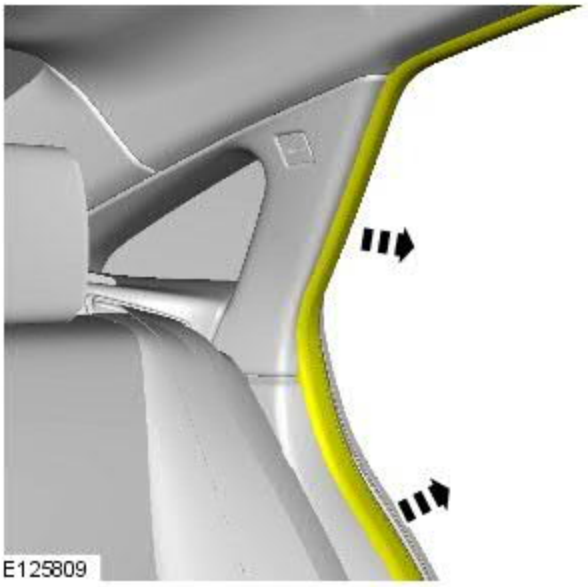
All vehicles

E128812

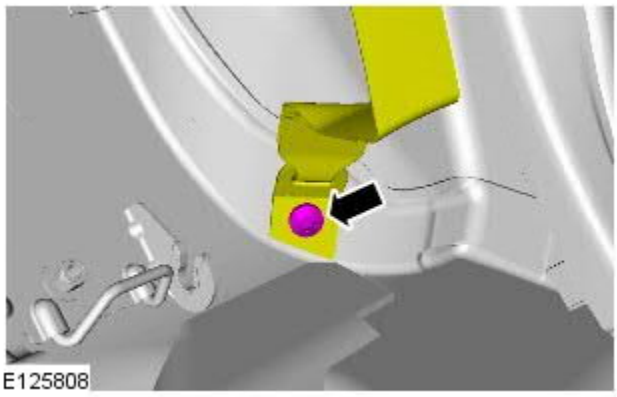
10. NOTE: Note the position of the wiring harnesses to aid installation.

11.



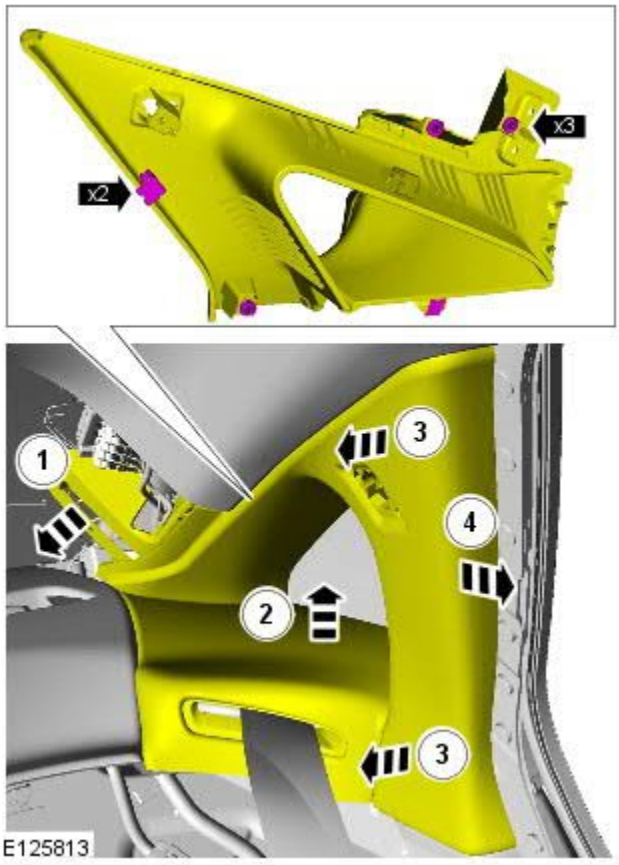


12. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



13. *Torque:* 40 Nm

14. *Torque:* 6 Nm



15.

16.

Installation

1. To install, reverse the removal procedure.

2. NOTE: Make sure that all the clips are correctly installed.

Published: 11-May-2011

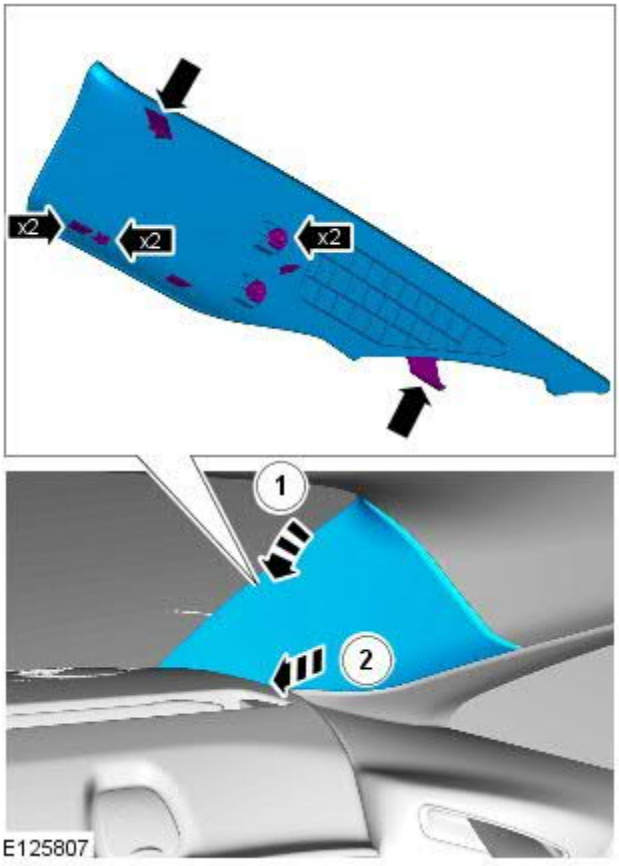
Interior Trim and Ornamentation - C-Pillar Trim Panel

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1.



Installation

1. To install, reverse the removal procedure.

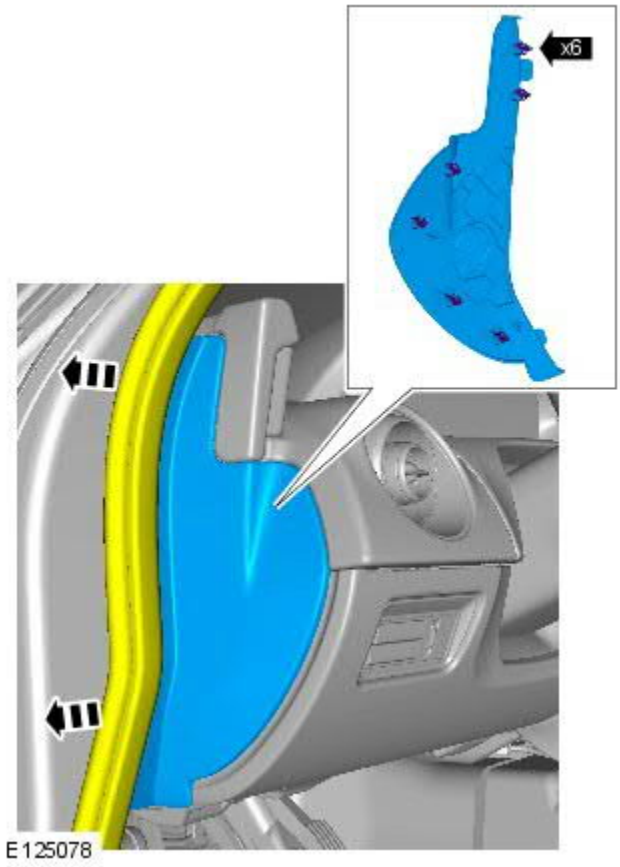
Published: 11-May-2011

Interior Trim and Ornamentation - Cowl Side Trim Panel

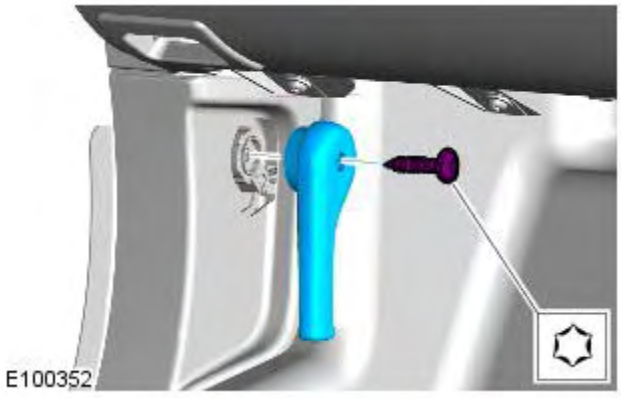
Removal and Installation

Removal

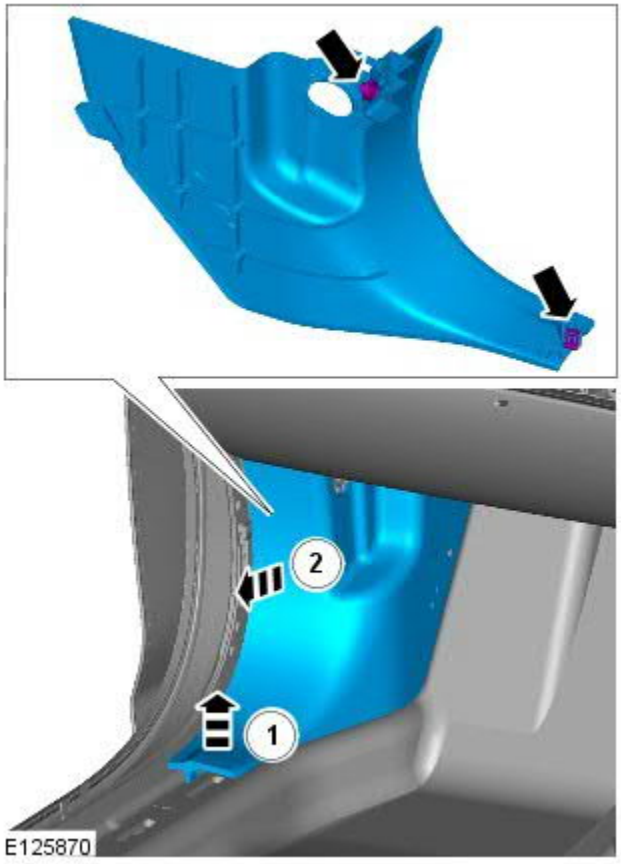
1. Refer to: Front Scuff Plate Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).



2. NOTE: Left-hand shown, right-hand similar.



3. *Torque:* 3 Nm



4. CAUTION: Make sure that the component is correctly located on the locating pegs.

   NOTE: Left-hand shown, right-hand similar.

Installation

1. To install, reverse the removal procedure.

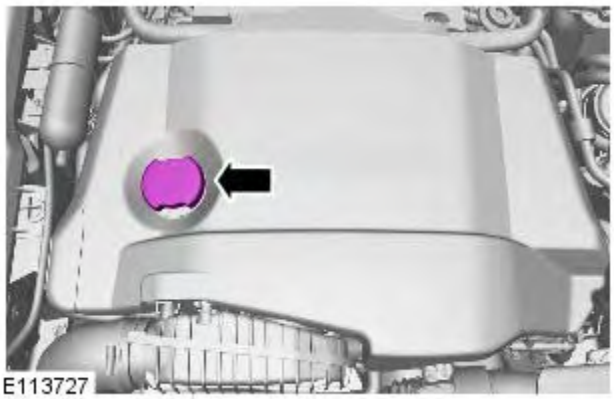
Published: 11-May-2011

Interior Trim and Ornamentation - Engine Cover TDV6 3.0L Diesel

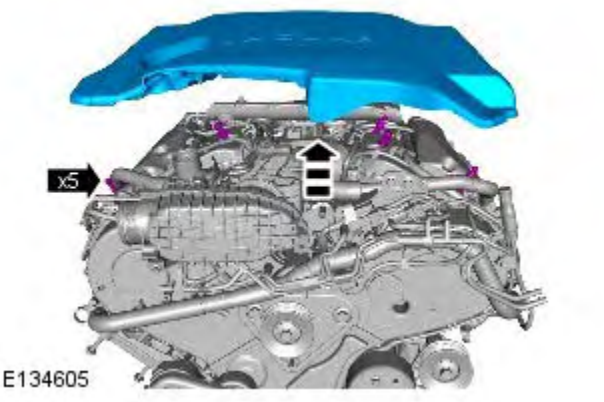
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.



1. CAUTION: Correct installation of the oil filler cap can be obtained by tightening the cap until an audible click is heard.



2.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

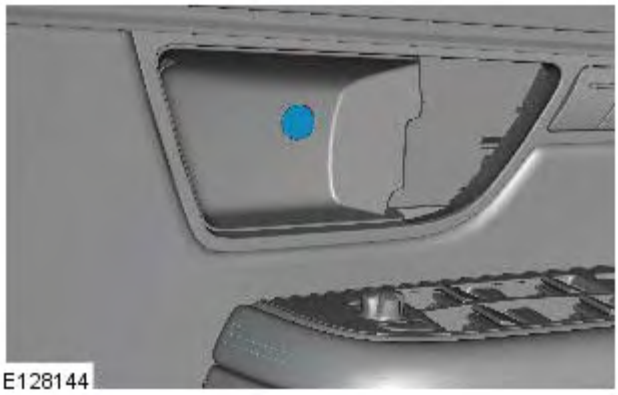
Interior Trim and Ornamentation - Front Door Trim Panel

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1.



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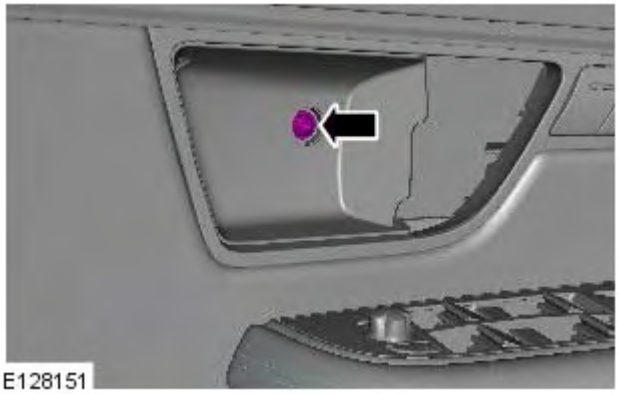

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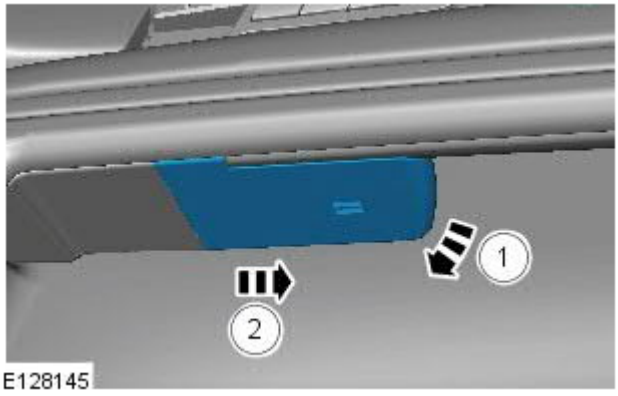

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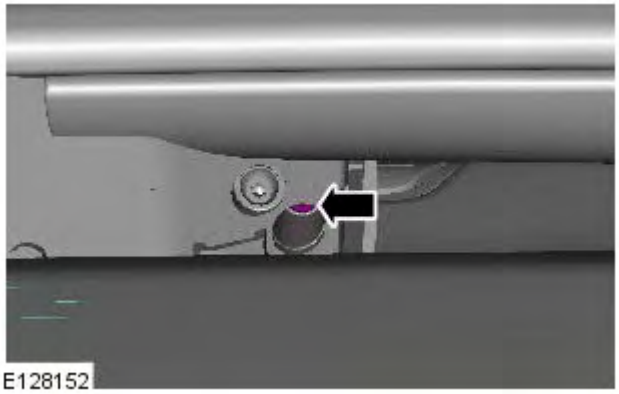

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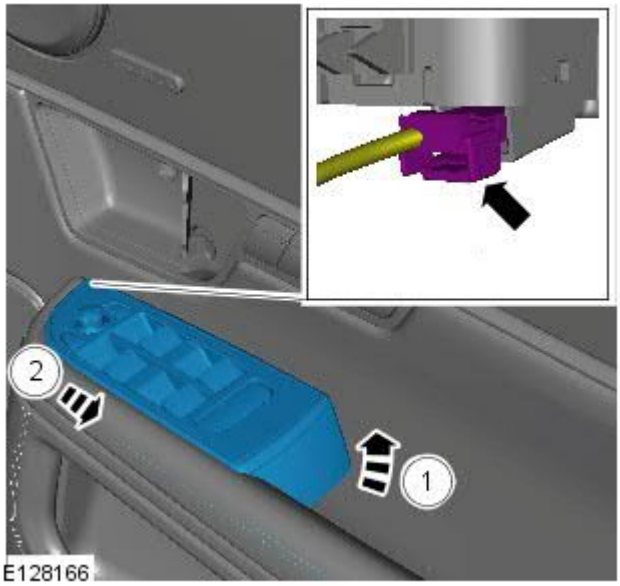
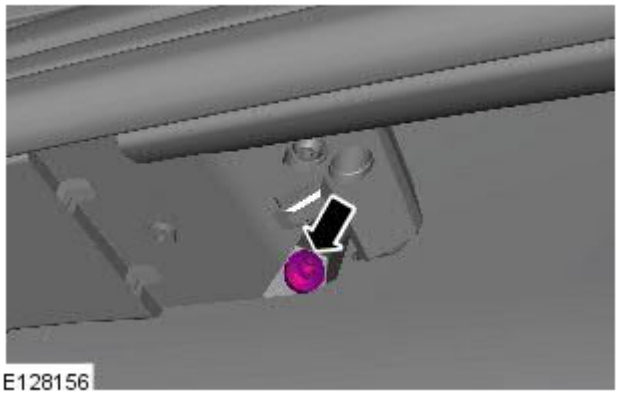
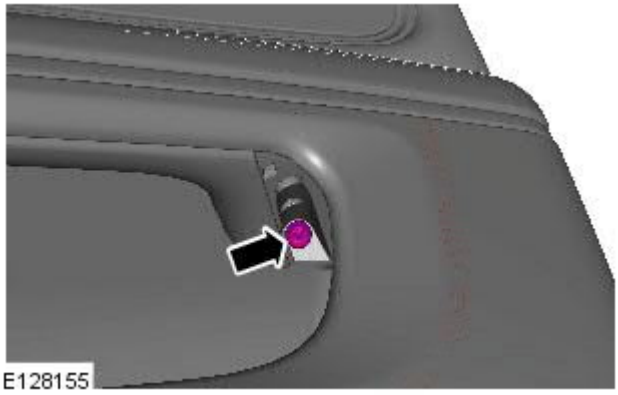


6.



7.



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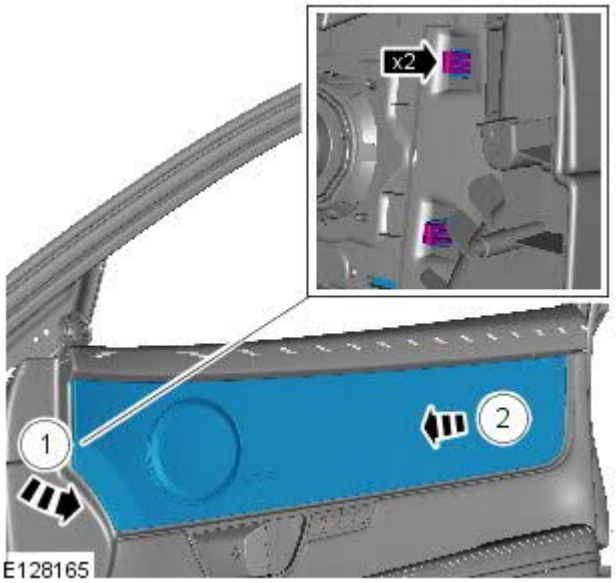

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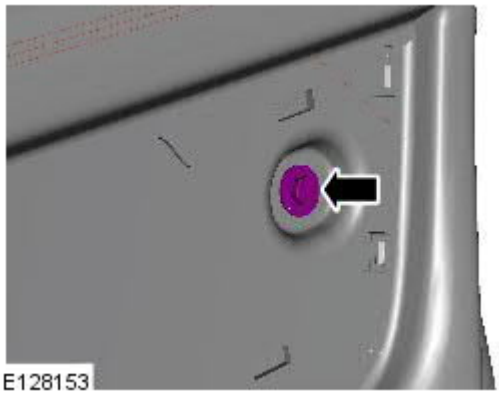

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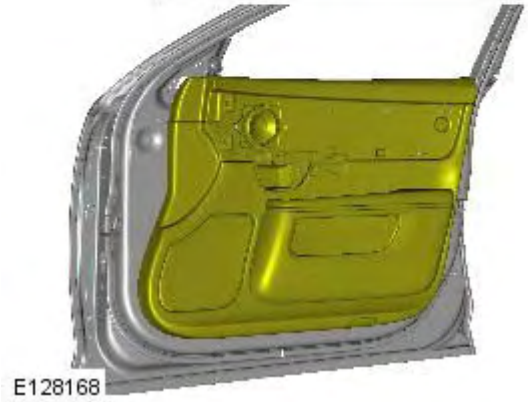
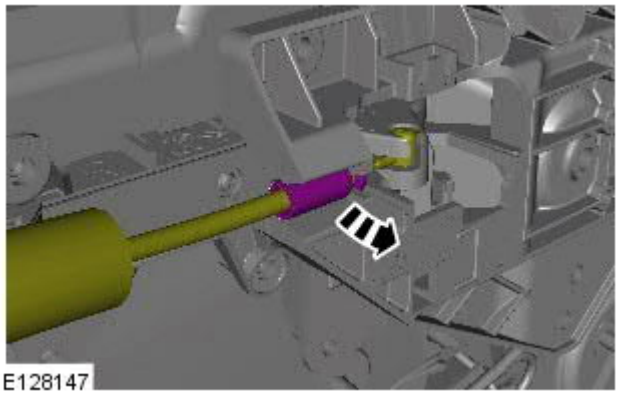
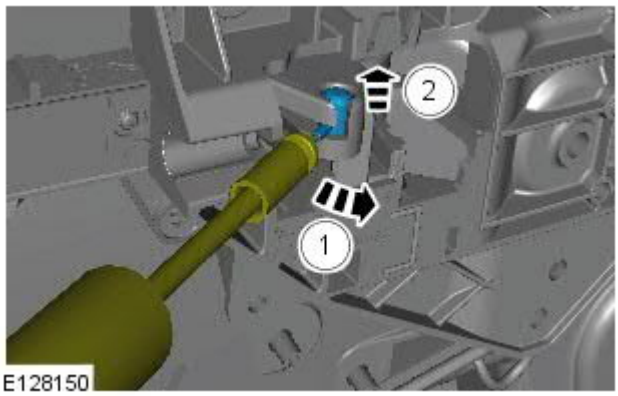
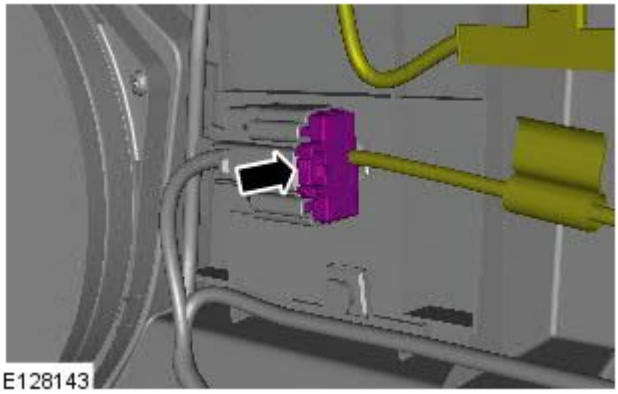


11.



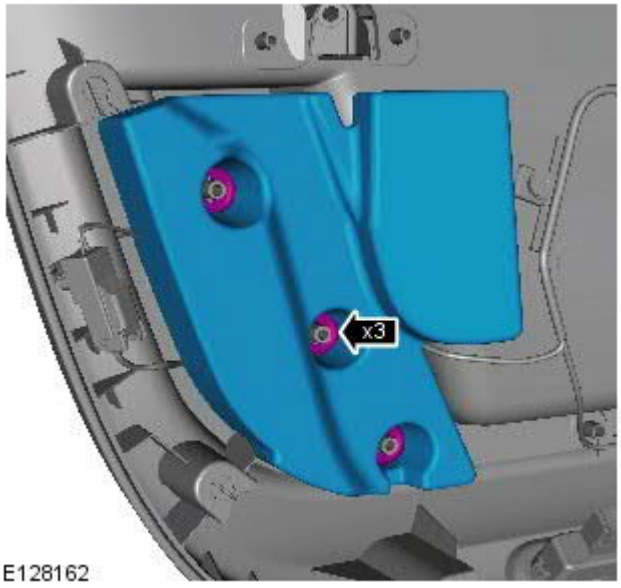
12.



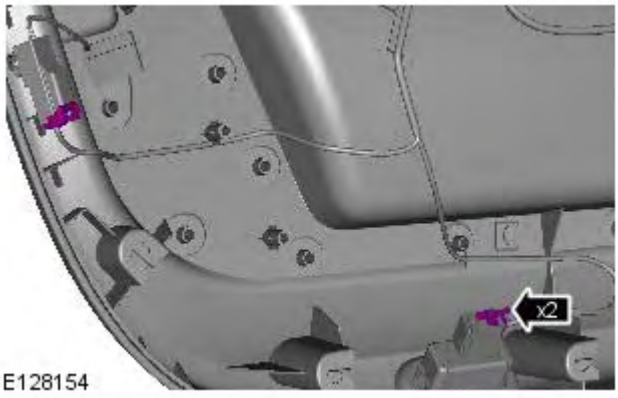


13.

14. Remove the front door trim panel.

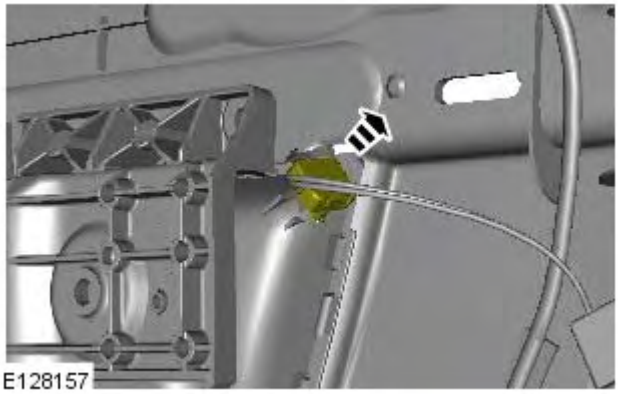


15. NOTE: Do not disassemble further if the component is removed for access only.

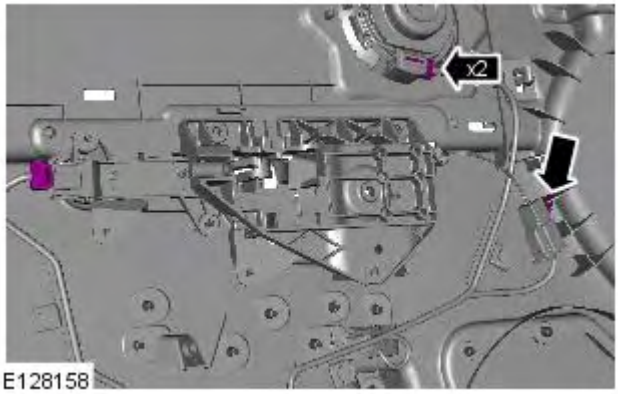


16.

17.

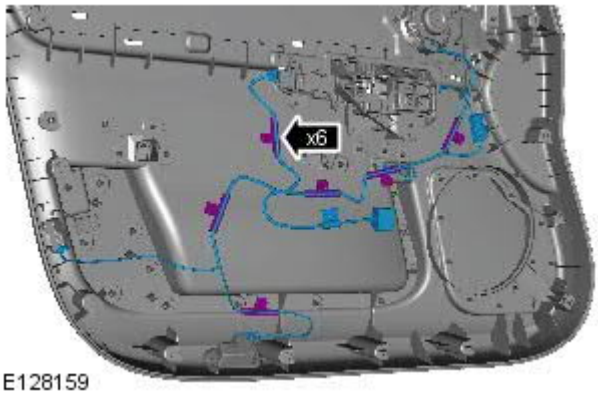

E128157

18.



E128158

19.



E128159

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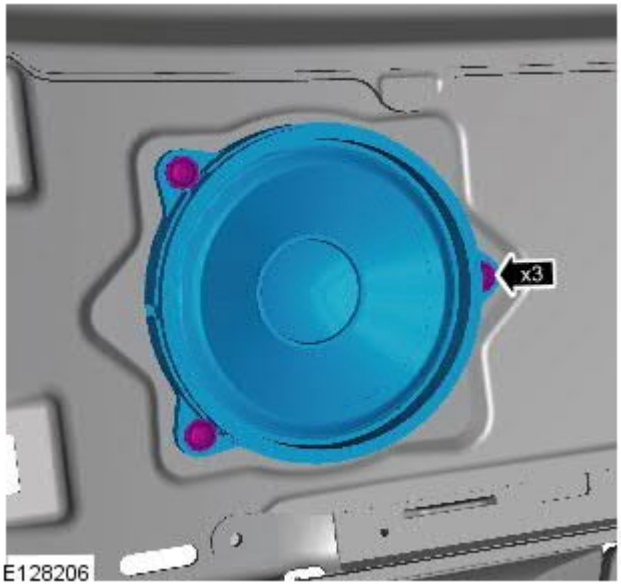

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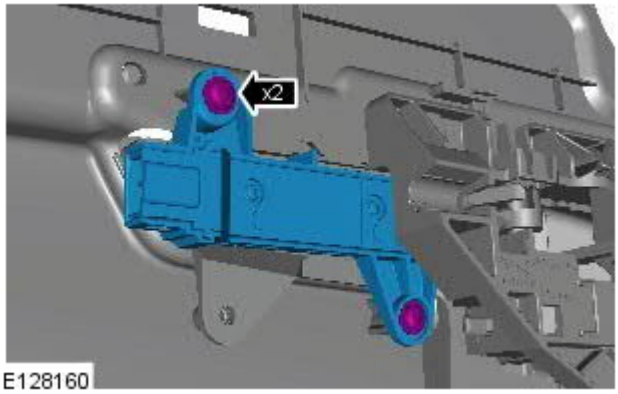
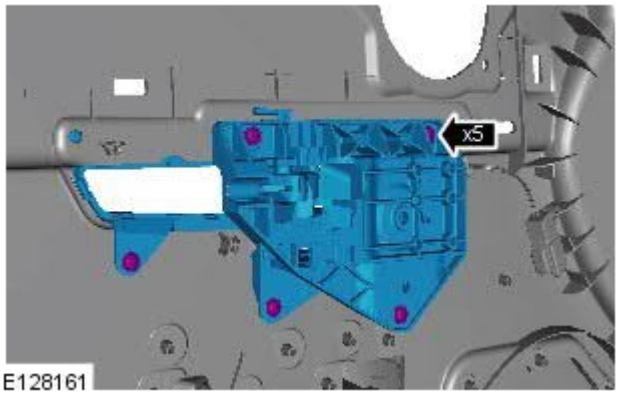
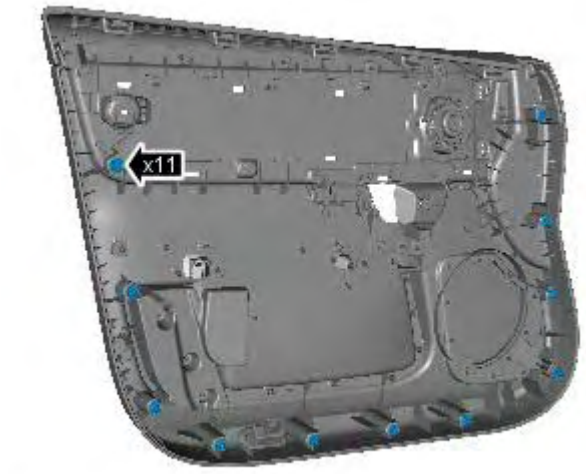


22.



23.



E128163

Installation

1. To install, reverse the removal procedure.

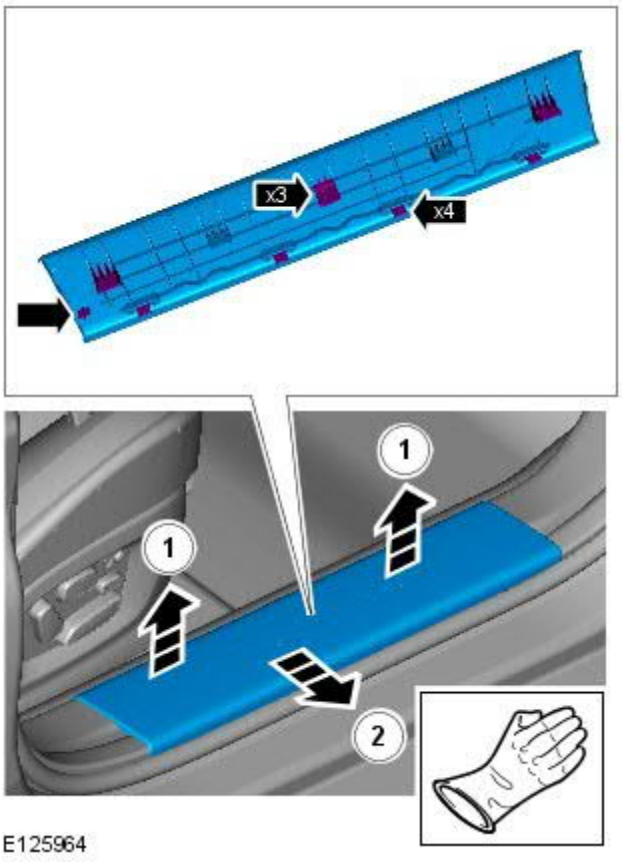
Published: 11-May-2011

Interior Trim and Ornamentation - Front Scuff Plate Trim Panel

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.



1. CAUTION: Make sure that the component is correctly located on the locating dowels.

   NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Installation

1. To install, reverse the removal procedure.

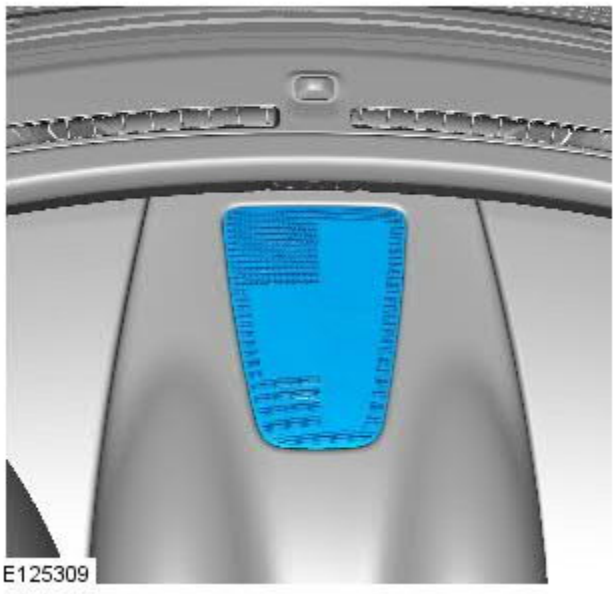
Published: 11-May-2011

Interior Trim and Ornamentation - Instrument Panel Speaker Grille

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.



1. CAUTION: Take extra care not to damage the edges of the component.

Installation

1. To install, reverse the removal procedure.

Published: 10-Feb-2012

Interior Trim and Ornamentation - Glass Roof Panel Blind

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. Refer to: Interior Rear View Mirror (501-09 Rear View Mirrors, Removal and Installation).

3. Refer to: Overhead Console (501-12 Instrument Panel and Console, Removal and Installation).

4. NOTE: The procedure must be carried out on both sides.

   Refer to: Sun Visor (501-05 Interior Trim and Ornamentation, Removal and Installation).

5. NOTE: The procedure must be carried out on both sides.

   Refer to: A-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

6. NOTE: The procedure must be carried out on both sides.

   Refer to: B-Pillar Upper Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

7. NOTE: The procedure must be carried out on both sides.

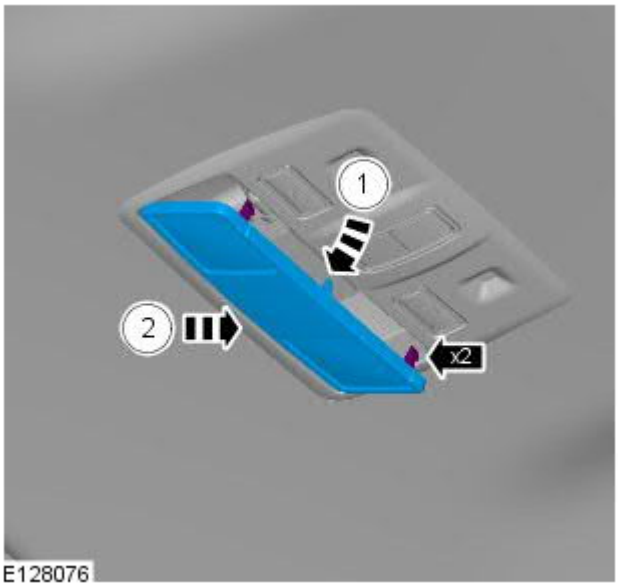
   Refer to: C-Pillar Lower Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

8. NOTE: The procedure must be carried out on both sides.

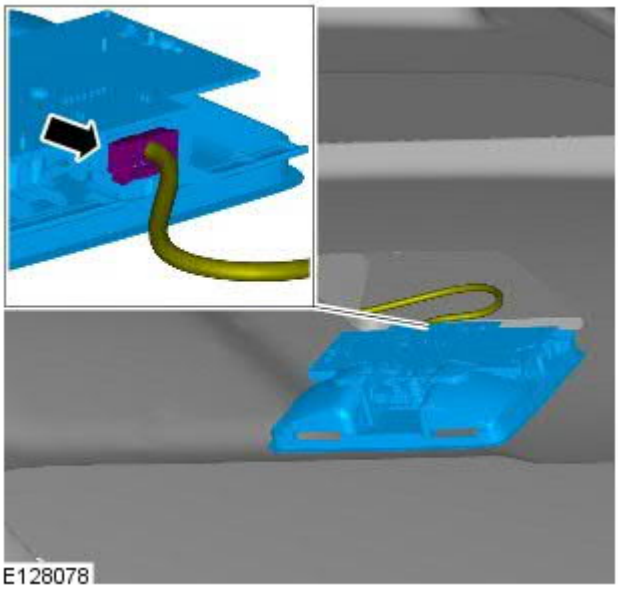
   Refer to: Front Seat (501-10 Seating, Removal and Installation).

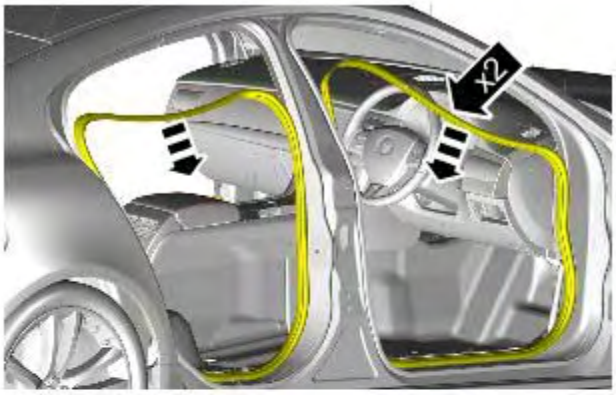
9. *Torque:* 2 Nm

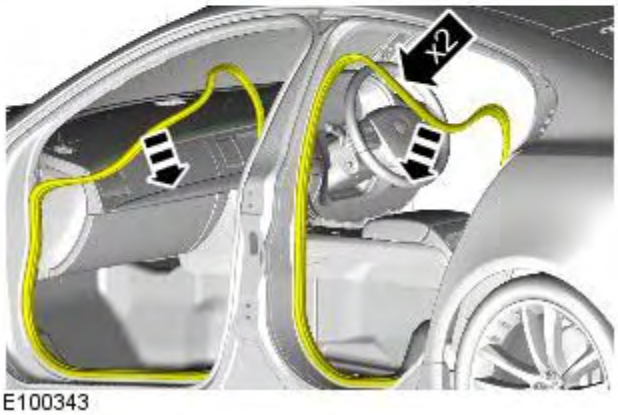
10.



11.

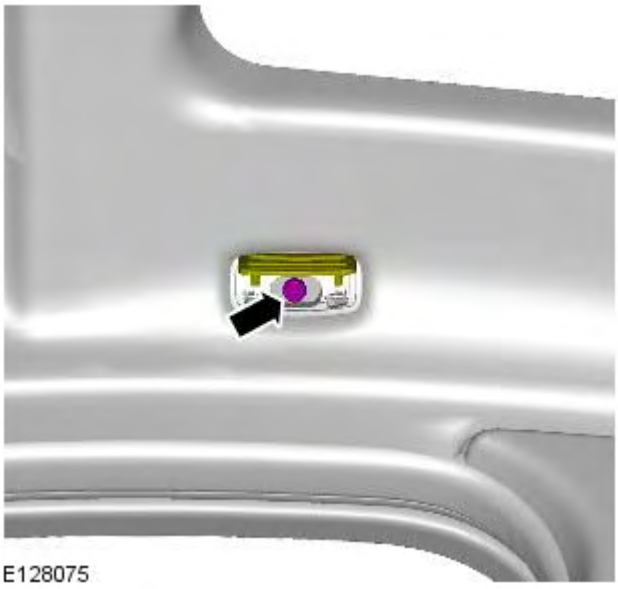






E100343

12. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E128075

13. NOTES:

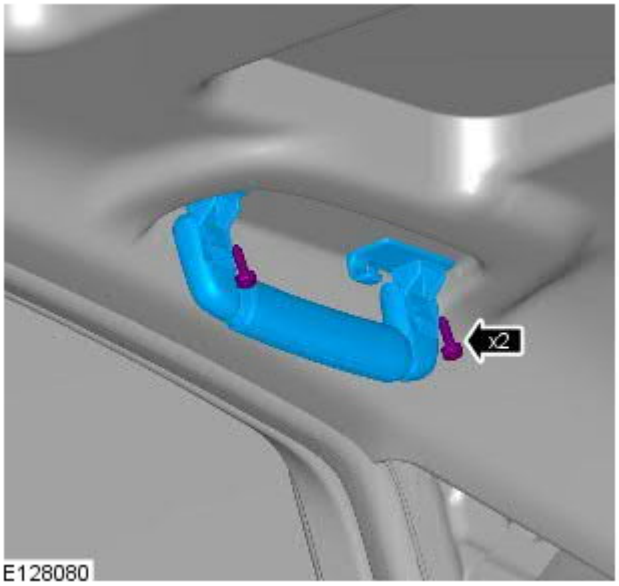
Make sure that the component is installed to the position noted on removal.

Right-hand shown, left-hand similar.

The procedure must be carried out on both sides.

Torque: 2 Nm

www.JagDocs.com



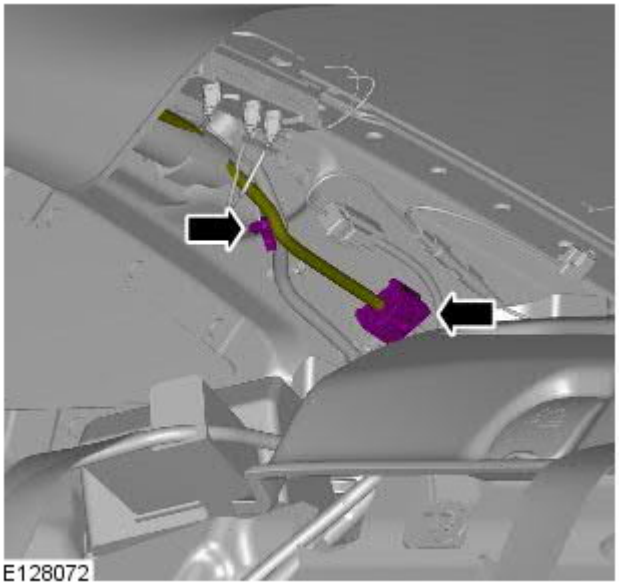
14. NOTES:

Make sure that the component is installed to the position noted on removal.

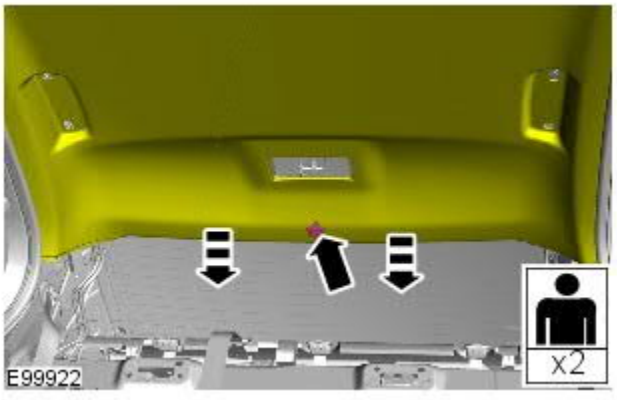
Right-hand shown, left-hand similar.

The procedure must be carried out on both sides.

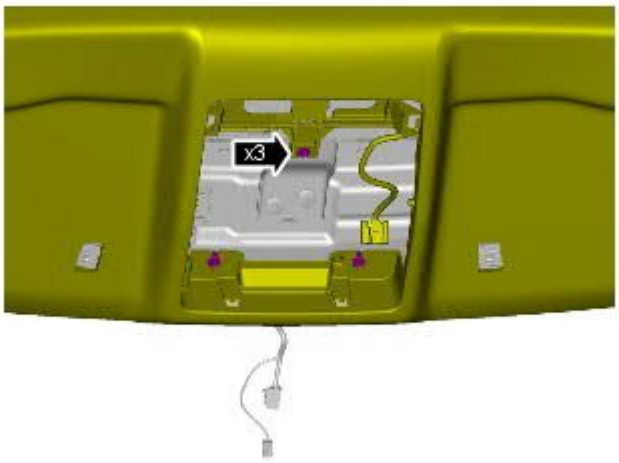
Torque: 2 Nm



15.



16. WARNING: This step requires the aid of another technician.



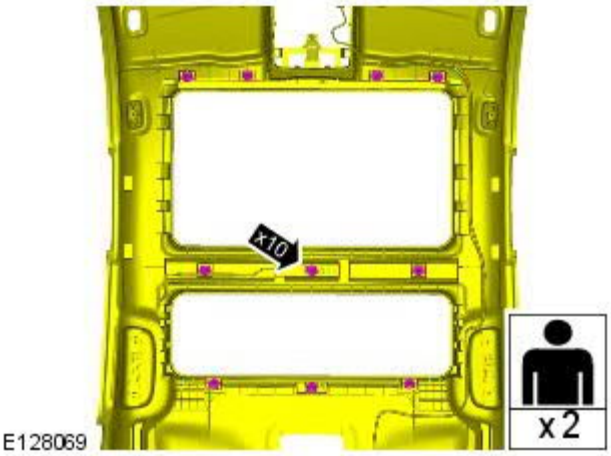
E128070

17. WARNING: This step requires the aid of another technician.

CAUTIONS:

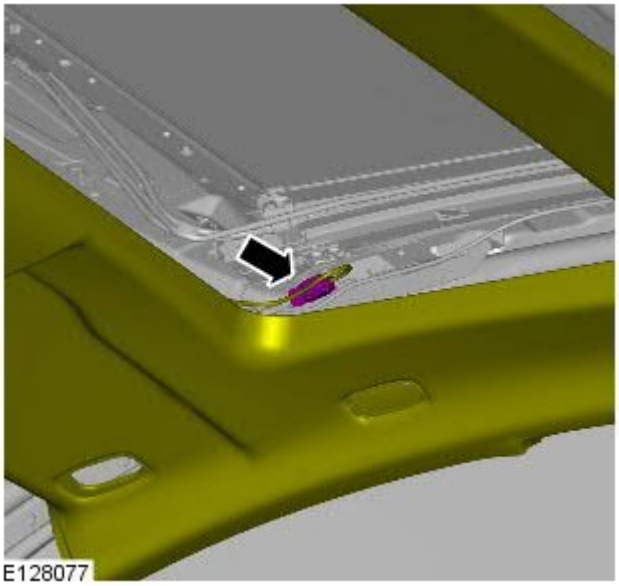
Note the fitted position of the component prior to removal.

Make sure that these components are installed to the noted removal position.

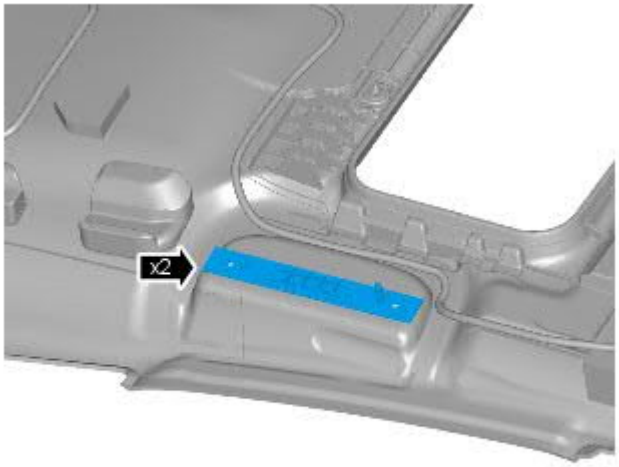


E128069

18. NOTE: This step requires the aid of another technician.


E128077

19. NOTE: This step requires the aid of another technician.



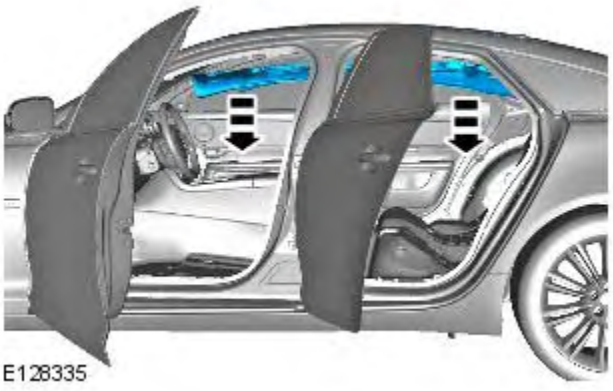
E128068

20. CAUTION: Note the fitted position of the component prior to removal.

NOTES:

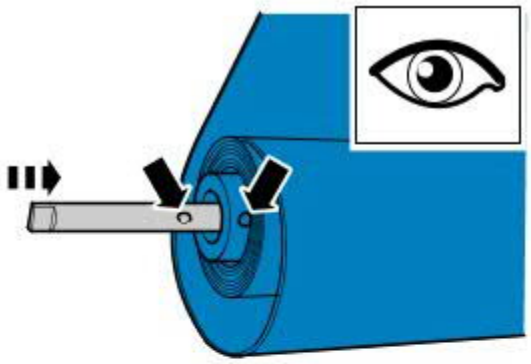
Make sure that the component is installed to the position noted on removal.

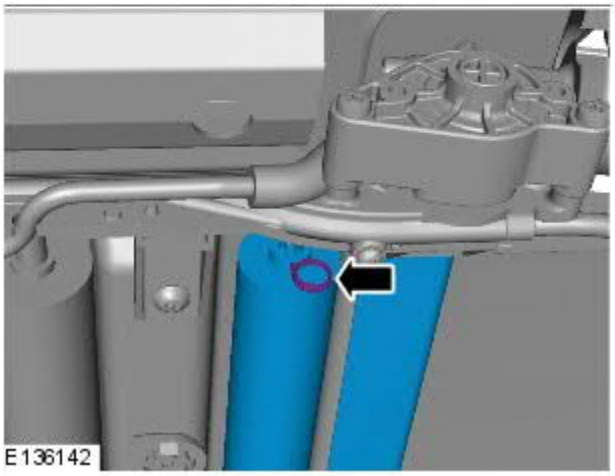
Right-hand shown, left-hand similar.


E128335

21. CAUTION: Protect the surrounding trim to avoid damage.

NOTE: Lower and reposition the headliner to aid access.



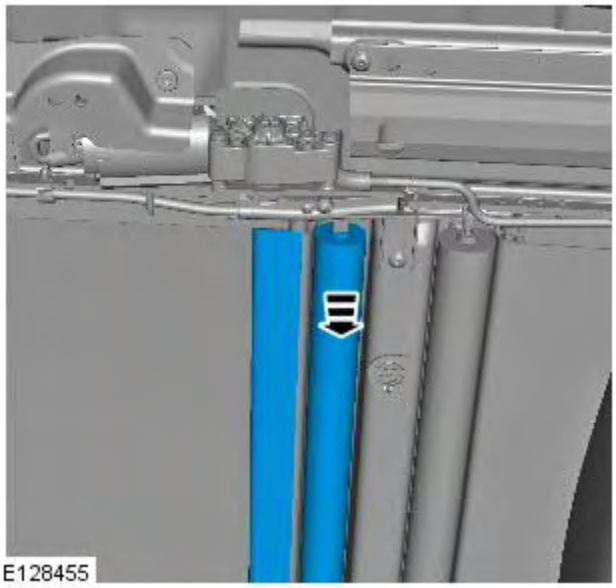


22. CAUTION: Make sure that the clip is correctly located.

    Install the retaining clip.

23. CAUTION: Make sure that the clips are correctly located.

    NOTE: Follow the animation to make sure the roof opening panel blind is removed and installed correctly from and to the guides.



24. NOTE: Support as necessary.

25. If the glass roof panel blind tension has been released, the glass roof panel blind rewind procedure must be followed.

Installation

1. Make sure that the glass roof panel blind tension is correct prior to installation. If the tension has been released refer to the glass roof panel blind rewind procedure.

2. To install, reverse the removal procedure.

Published: 11-Feb-2012

Interior Trim and Ornamentation - Glass Roof Panel Blind Motor

Removal and Installation

Removal

CAUTIONS:

LH illustration shown, RH is similar.

The roof opening panel blind motors are handed and will only install in their respective side.

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. Refer to: Motor Synchronization (501-17 Roof Opening Panel, General Procedures).

3. Refer to: Interior Rear View Mirror (501-09 Rear View Mirrors, Removal and Installation).

4. Refer to: Overhead Console (501-12 Instrument Panel and Console, Removal and Installation).

5. NOTE: The procedure must be carried out on both sides.

   Refer to: Sun Visor (501-05 Interior Trim and Ornamentation, Removal and Installation).

6. NOTE: The procedure must be carried out on both sides.

   Refer to: A-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

7. NOTE: The procedure must be carried out on both sides.

   Refer to: B-Pillar Upper Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

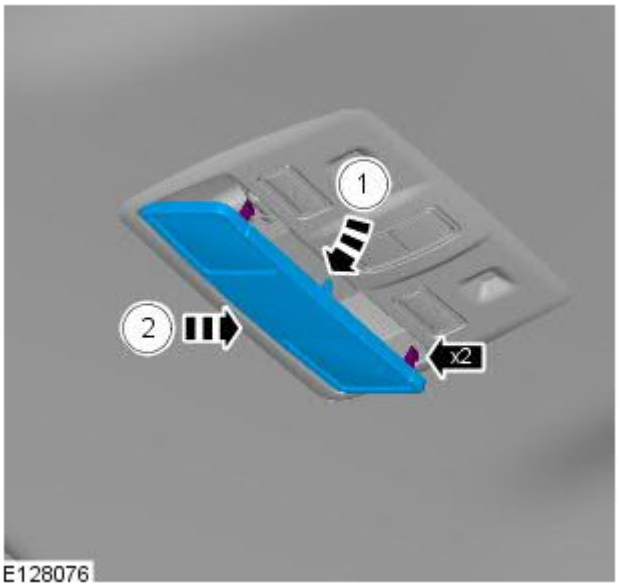
8. NOTE: The procedure must be carried out on both sides.

   Refer to: C-Pillar Lower Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

9. NOTE: The procedure must be carried out on both sides.

   Refer to: Front Seat (501-10 Seating, Removal and Installation).

10. *Torque:* 2 Nm



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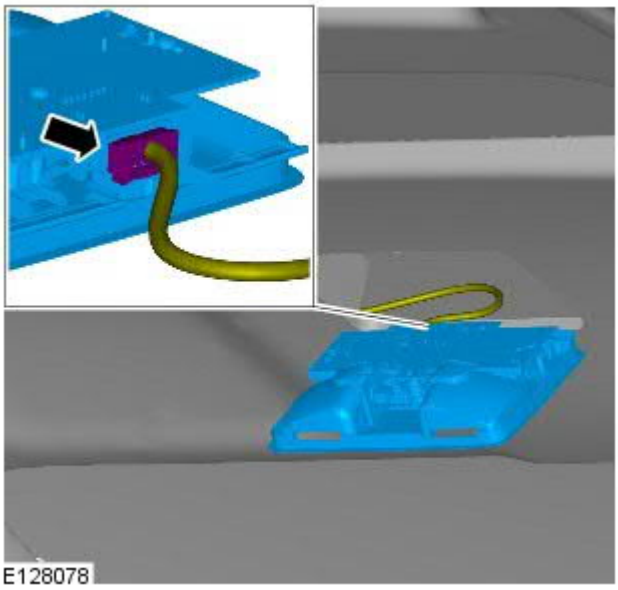

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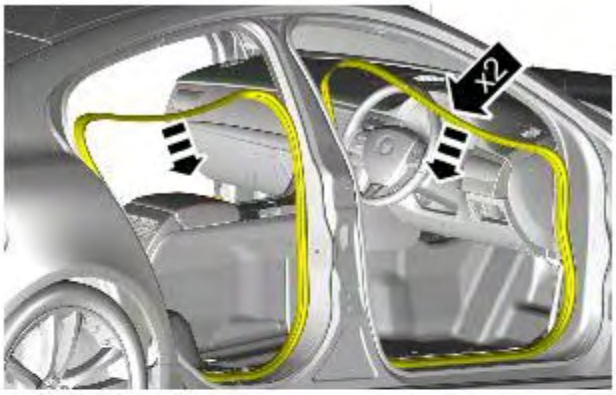
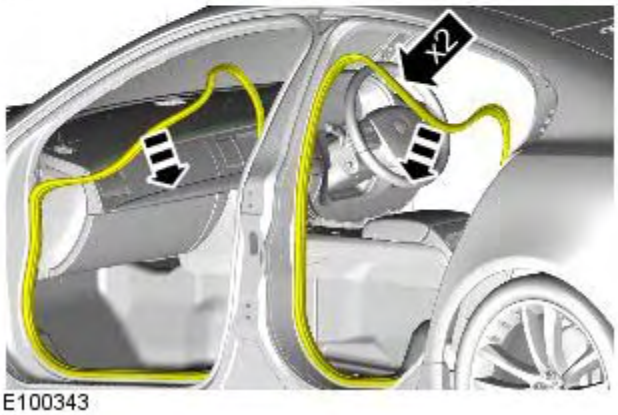
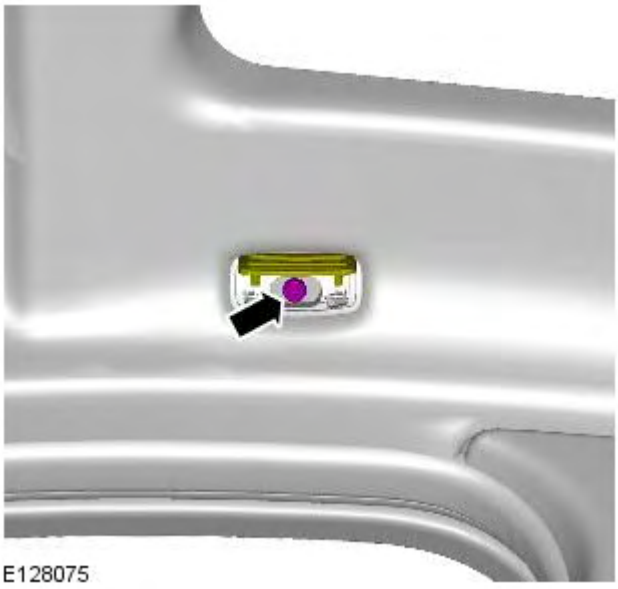




E100343

13. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E128075

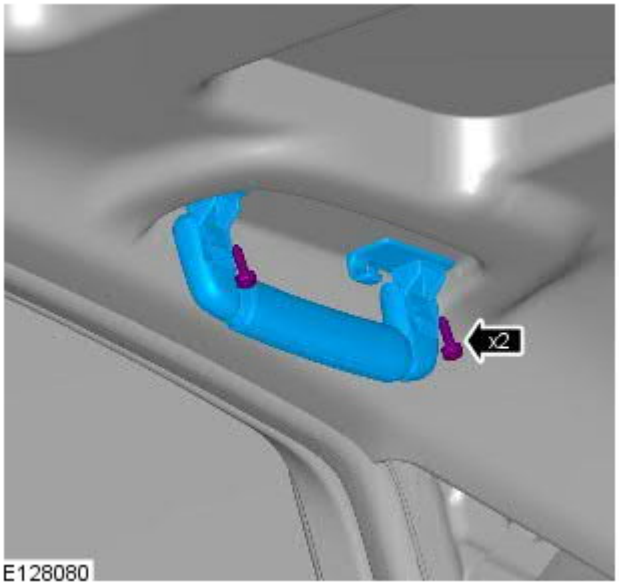
14. NOTES:

Make sure that the component is installed to the position noted on removal.

Right-hand shown, left-hand similar.

The procedure must be carried out on both sides.

Torque: 2 Nm



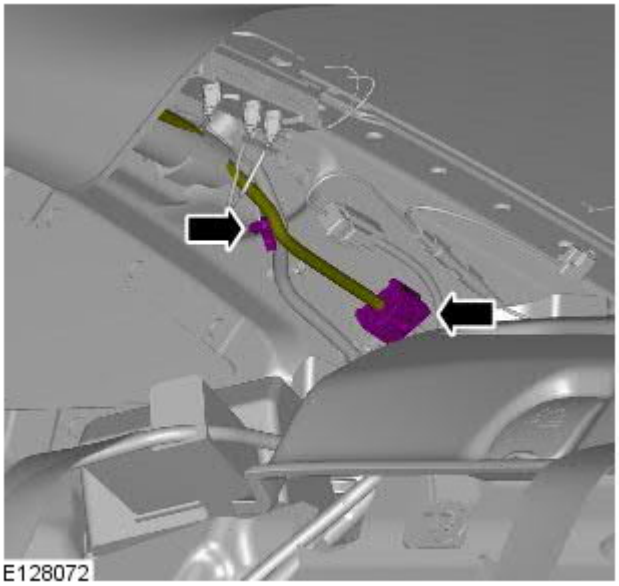
15. NOTES:

Make sure that the component is installed to the position noted on removal.

Right-hand shown, left-hand similar.

The procedure must be carried out on both sides.

Torque: 2 Nm



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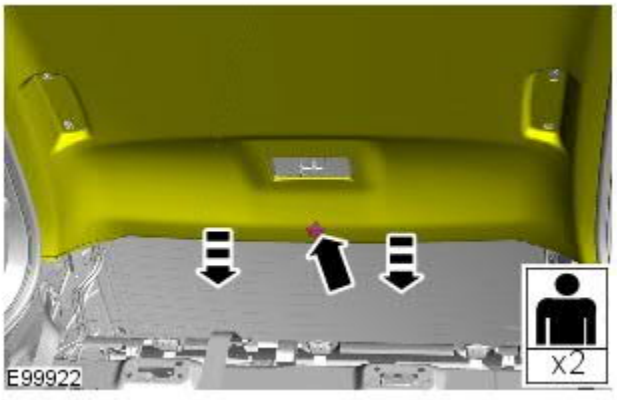
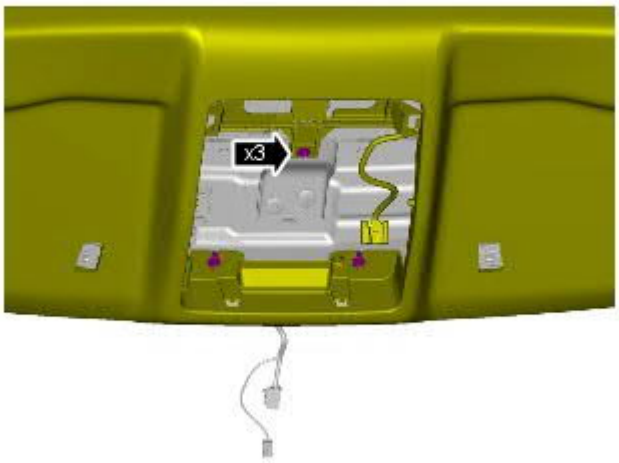


17. WARNING: This step requires the aid of another technician.



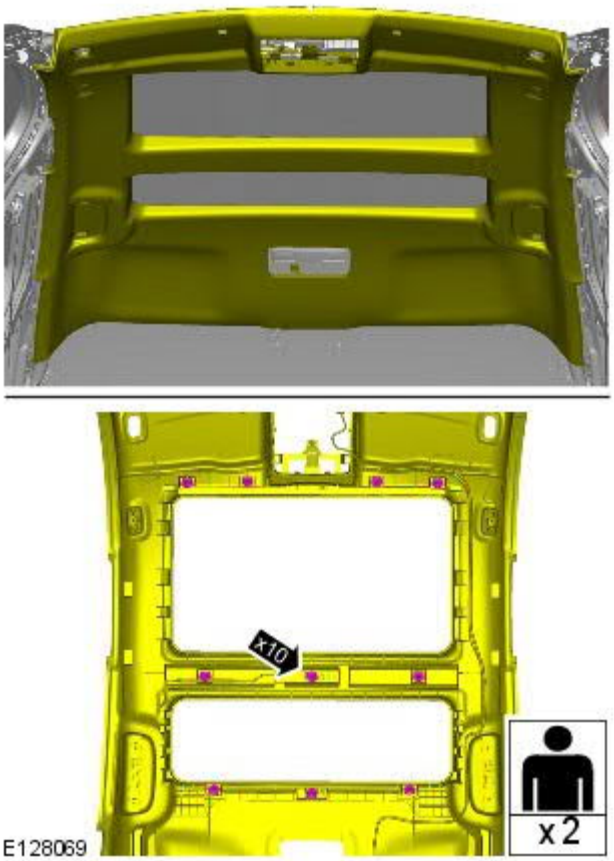
E128070

18. WARNING: This step requires the aid of another technician.

CAUTIONS:

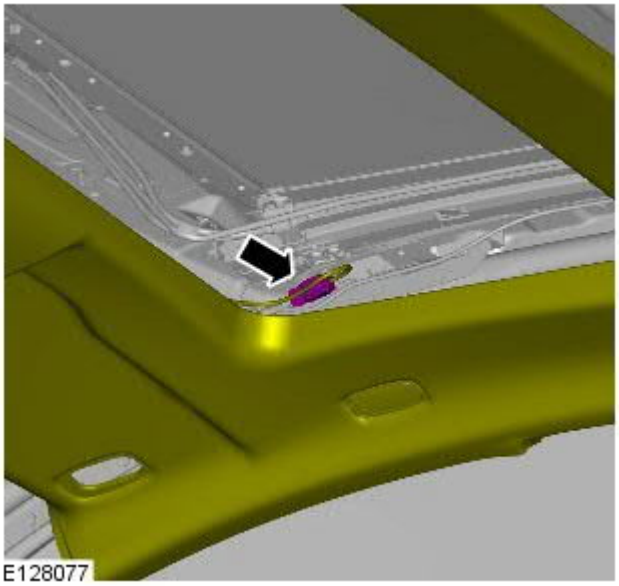
Note the fitted position of the component prior to removal.

Make sure that these components are installed to the noted removal position.

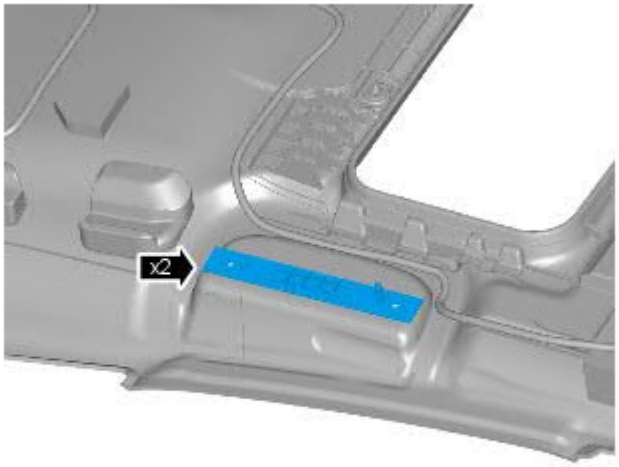


E128069

19. NOTE: This step requires the aid of another technician.


E128077

20. NOTE: This step requires the aid of another technician.



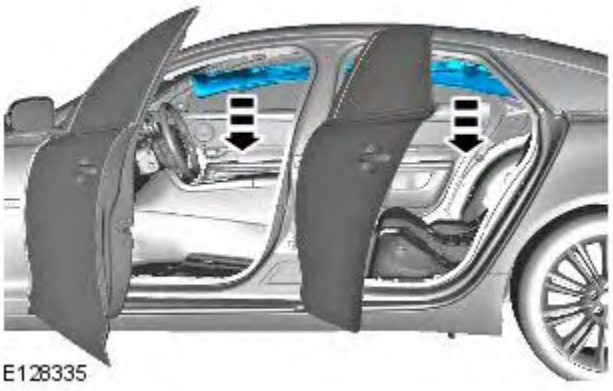
E128068

21. CAUTION: Note the fitted position of the component prior to removal.

NOTES:

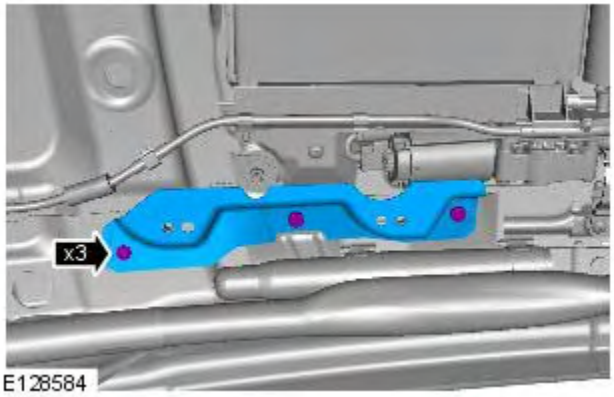
Make sure that the component is installed to the position noted on removal.

Right-hand shown, left-hand similar.


E128335

22. CAUTION: Protect the surrounding trim to avoid damage.

NOTE: Lower and reposition the headliner to aid access.



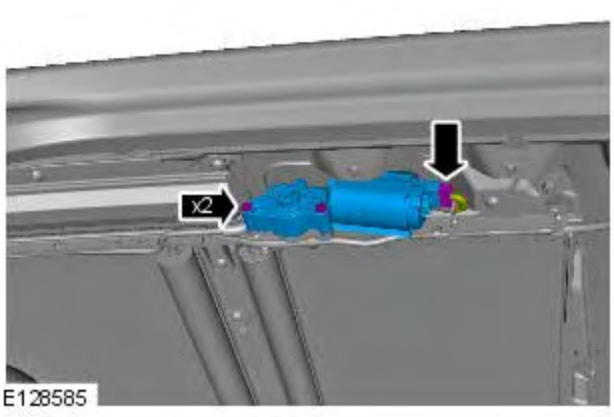
23. CAUTION: Make sure that the component is correctly located on the locating dowels.

    NOTES:

    When installing the side air curtain module, make sure that the component is tucked under the bracket.

    If the side air curtain module has deployed, new retaining brackets must be installed.

    Torque: 9 Nm



24. *Torque:* 5 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Interior Trim and Ornamentation - Headliner

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

All vehicles

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. Refer to: Interior Rear View Mirror (501-09 Rear View Mirrors, Removal and Installation).

3. Refer to: Overhead Console (501-12 Instrument Panel and Console, Removal and Installation).

4. NOTE: The procedure must be carried out on both sides.

   Refer to: Sun Visor (501-05 Interior Trim and Ornamentation, Removal and Installation).

5. NOTE: The procedure must be carried out on both sides.

   Refer to: A-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

6. NOTE: The procedure must be carried out on both sides.

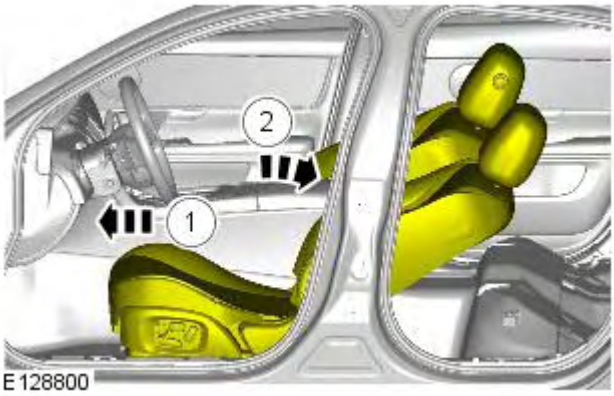
   Refer to: B-Pillar Upper Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

7. NOTE: The procedure must be carried out on both sides.

   Refer to: C-Pillar Lower Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

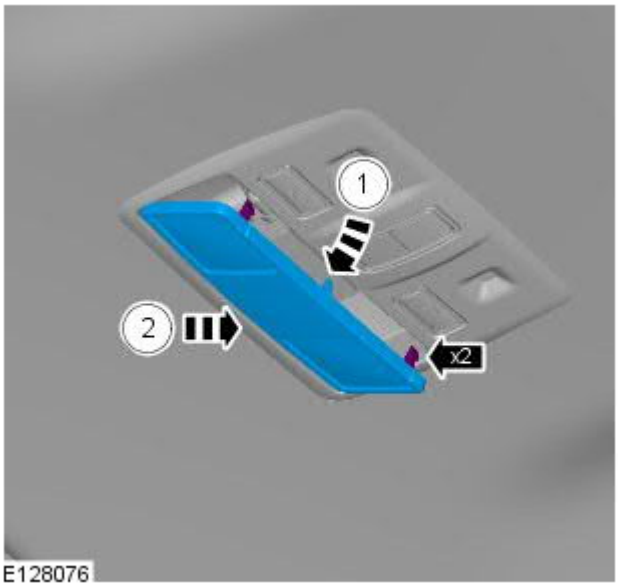
8. Refer to: Windshield Glass (501-11 Glass, Frames and Mechanisms, Removal and Installation).

9.

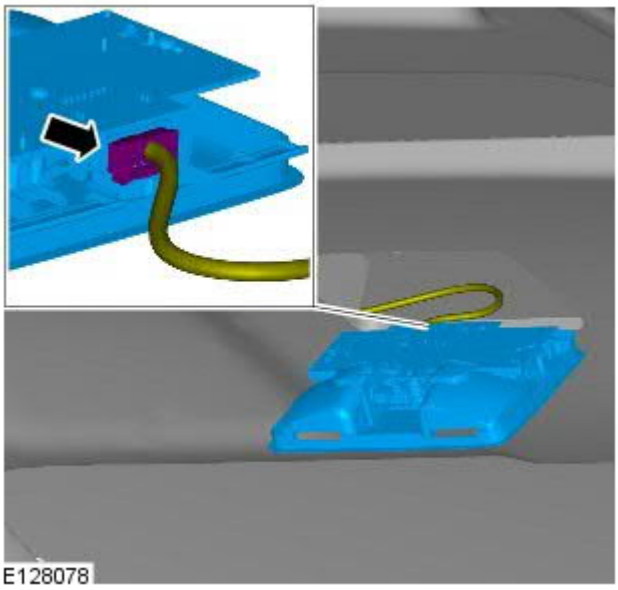


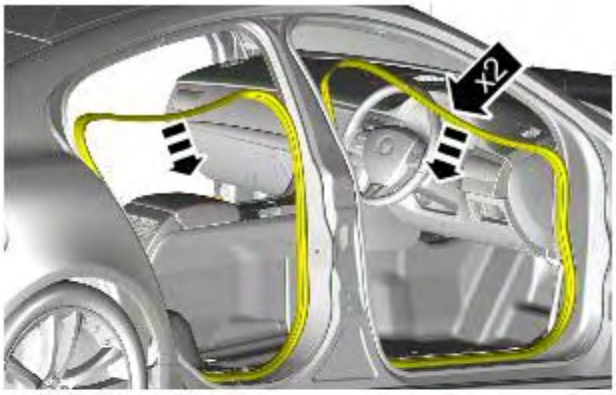
10. *Torque:* 2 Nm

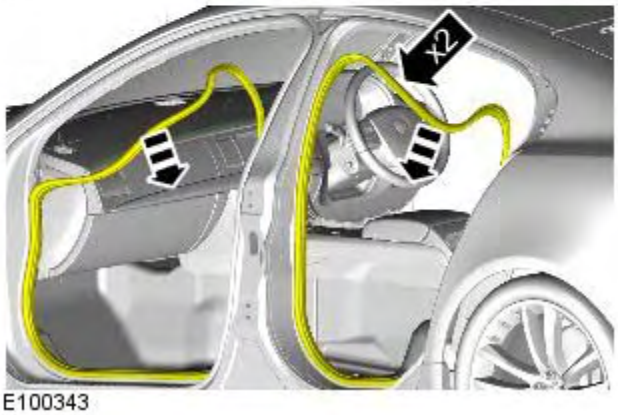
11.



12.

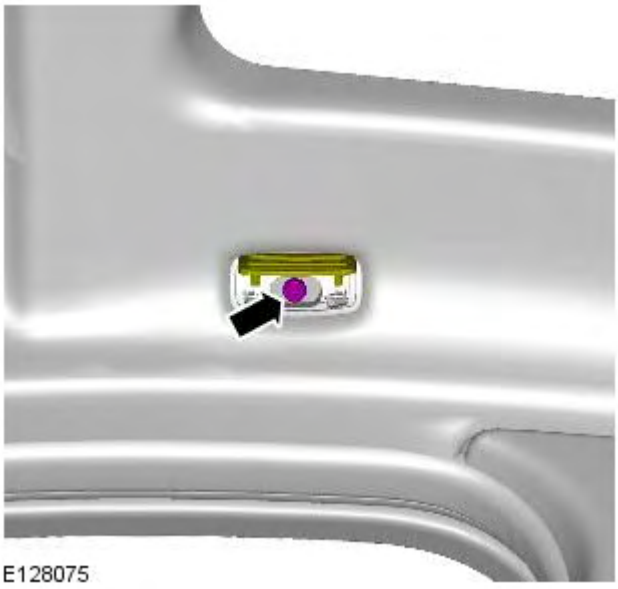






E100343

13. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E128075

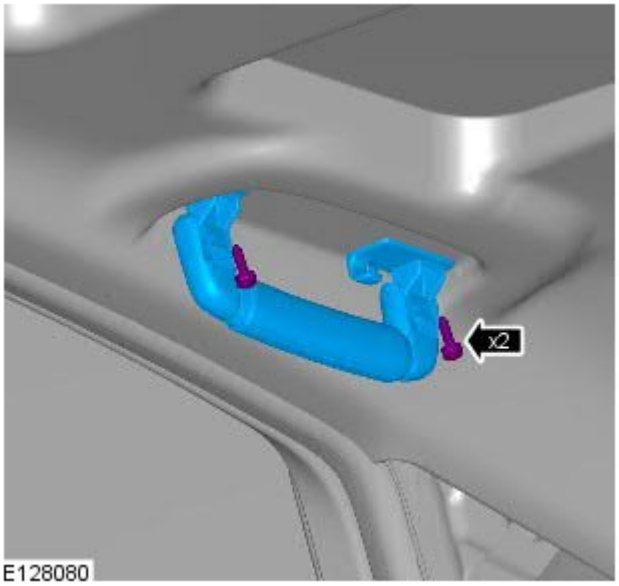
14. NOTES:

Make sure that the component is installed to the position noted on removal.

Right-hand shown, left-hand similar.

The procedure must be carried out on both sides.

Torque: 2 Nm



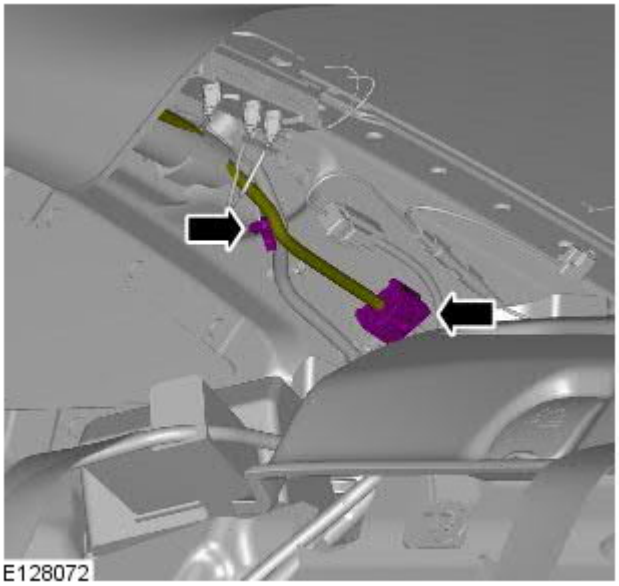
15. NOTES:

Make sure that the component is installed to the position noted on removal.

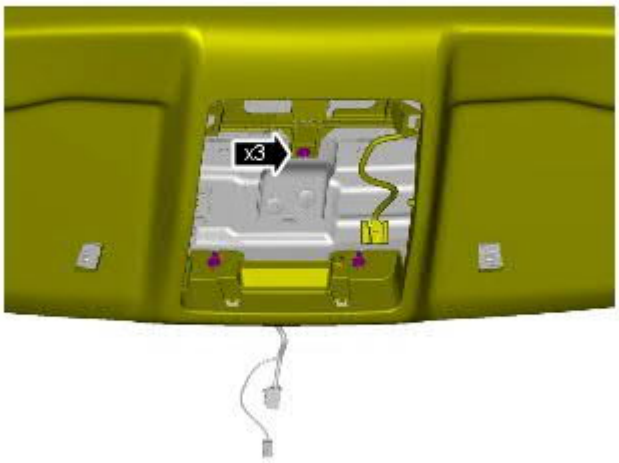
Right-hand shown, left-hand similar.

The procedure must be carried out on both sides.

Torque: 2 Nm



16.



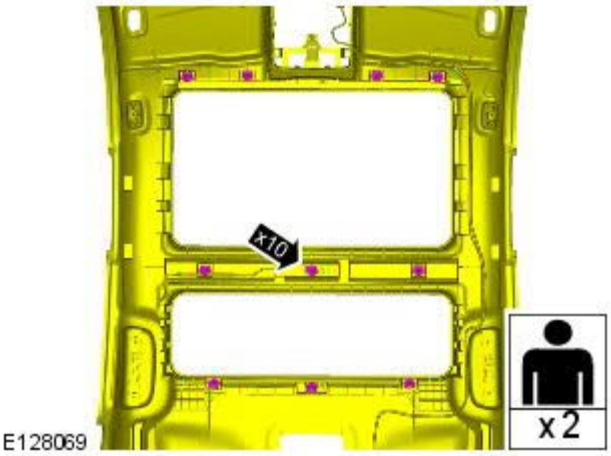
E128070

17. WARNING: This step requires the aid of another technician.

CAUTIONS:

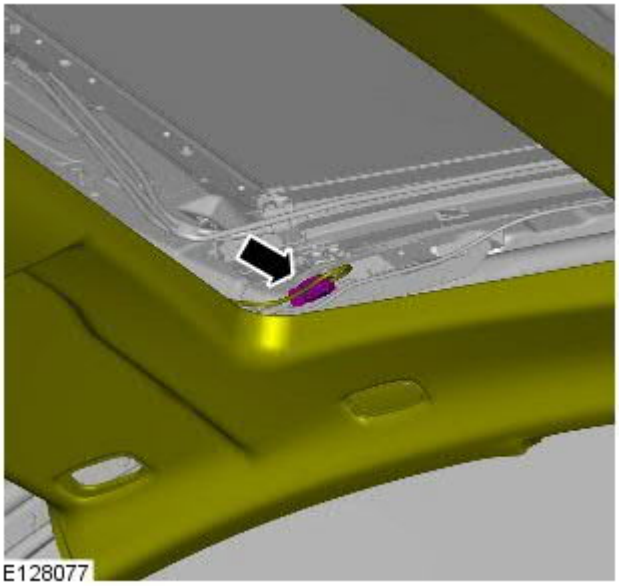
Note the fitted position of the component prior to removal.

Make sure that these components are installed to the noted removal position.

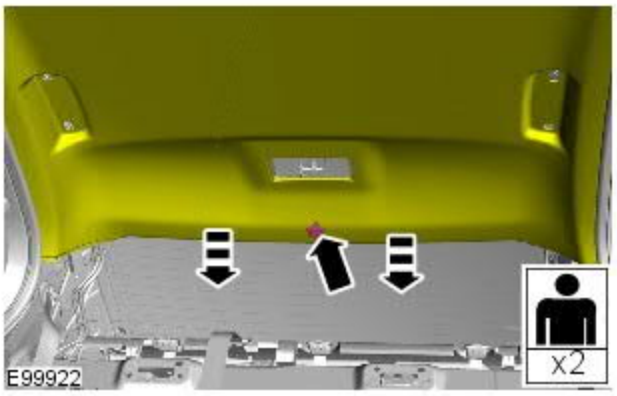


E128069

18. NOTE: This step requires the aid of another technician.



19. NOTE: This step requires the aid of another technician.

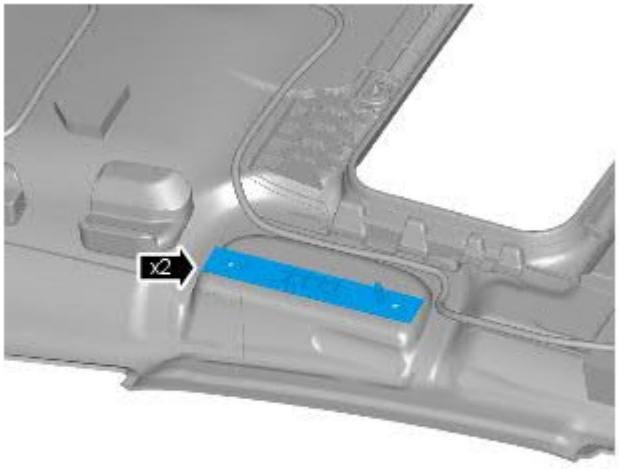


20. WARNING: This step requires the aid of another technician.

21. NOTES:

This step requires the aid of another technician.

Make sure the front and rear passenger assist handles and headliner retaining clips are installed to the headliner prior to installation.



E128068

22. CAUTION: Note the fitted position of the component prior to removal.

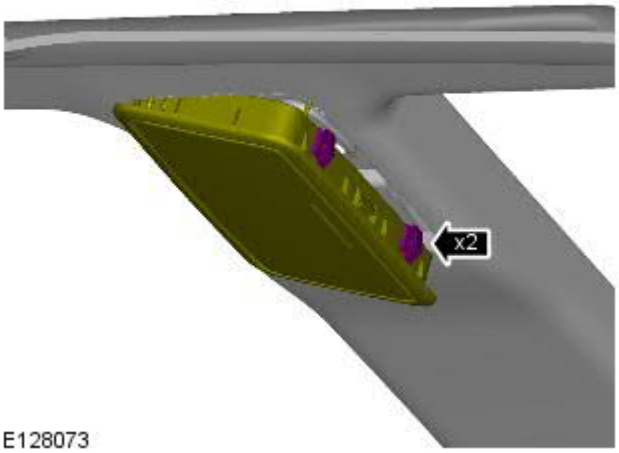
    NOTES:

    Make sure that the component is installed to the position noted on removal.

    Right-hand shown, left-hand similar.

    The procedure must be carried out on both sides.

Long wheelbase

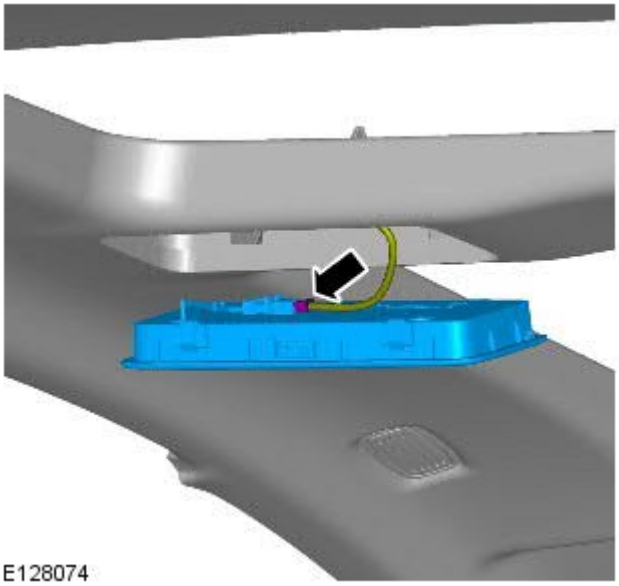


E128073

23. NOTES:

    Do not disassemble further if the component is removed for access only.

    Left-hand shown, right-hand similar.



24. NOTE: Left-hand shown, right-hand similar.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Interior Trim and Ornamentation - Loadspace Scuff Plate Trim Panel

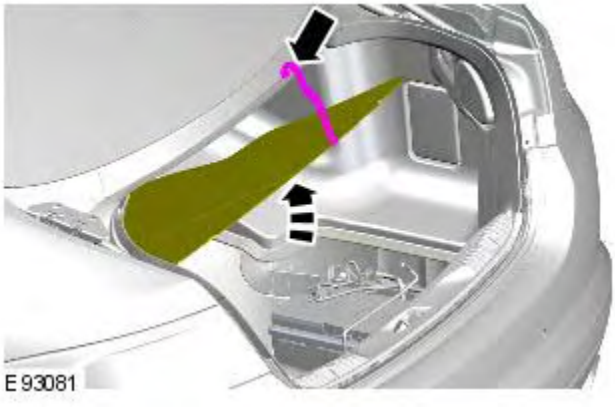
Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.



1.

2. *Torque:* 8 Nm

Installation

1. To install, reverse the removal procedure.

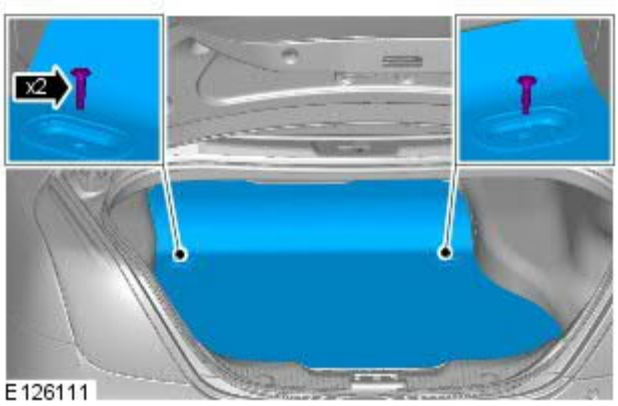
Published: 11-May-2011

Interior Trim and Ornamentation - Loadspace Trim Panel

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.



1.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

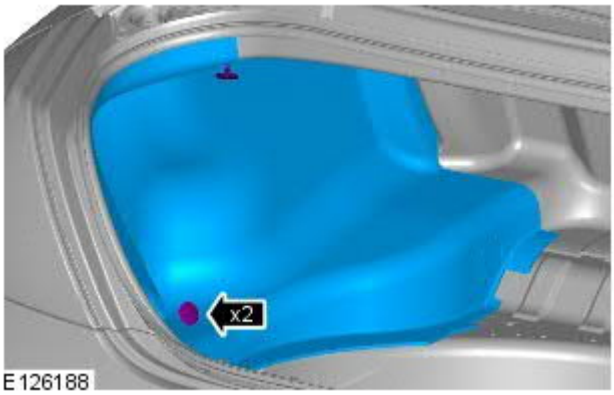
Interior Trim and Ornamentation - Loadspace Trim Panel LH

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Loadspace Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
2. Refer to: Loadspace Scuff Plate Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

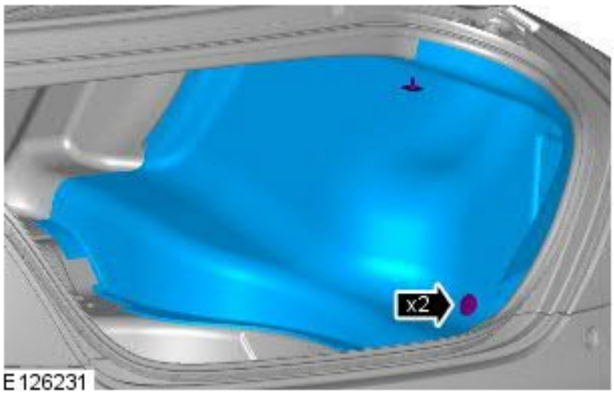
Interior Trim and Ornamentation - Loadspace Trim Panel RH

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Loadspace Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
2. Refer to: Loadspace Scuff Plate Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
3.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

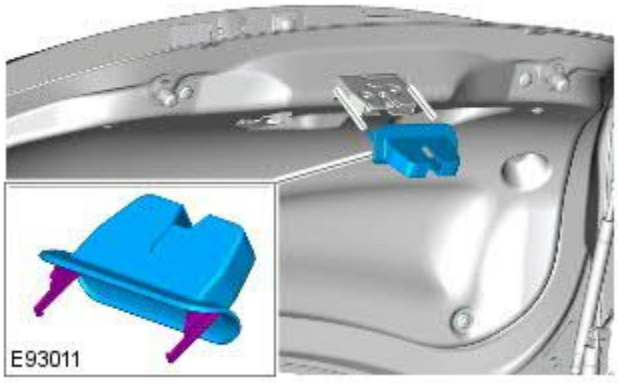
Interior Trim and Ornamentation - Luggage Compartment Lid Trim Panel

Removal and Installation

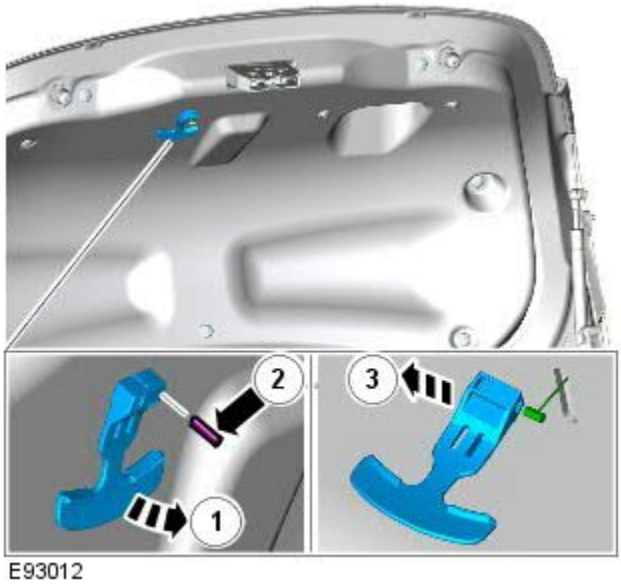
Removal

NOTE: Removal steps in this procedure may contain installation details.

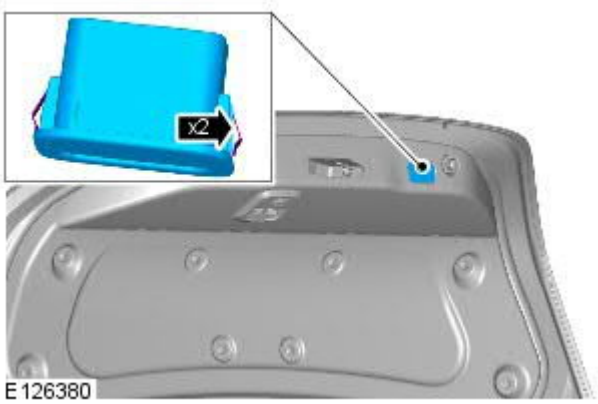
1.

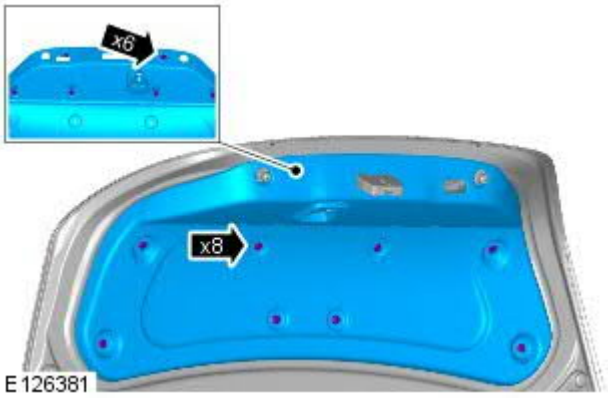


2.



3. Disconnect the electrical connector from the tailgate release switch.





4.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Interior Trim and Ornamentation - Parcel Shelf

Removal and Installation

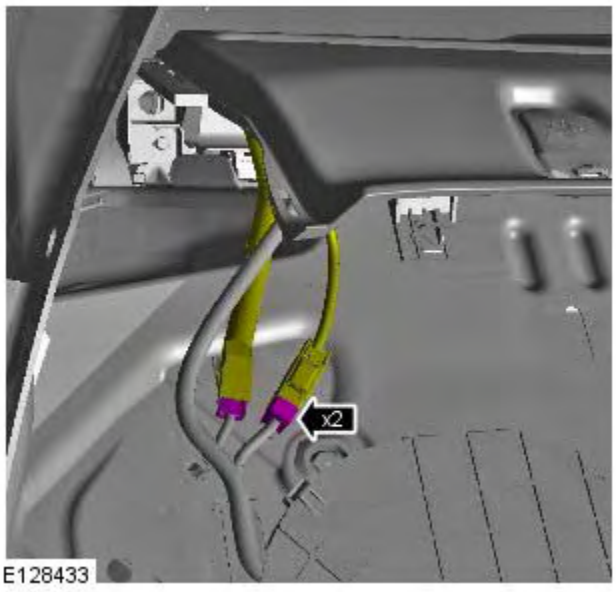
Removal

All vehicles

1. Refer to: C-Pillar Lower Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

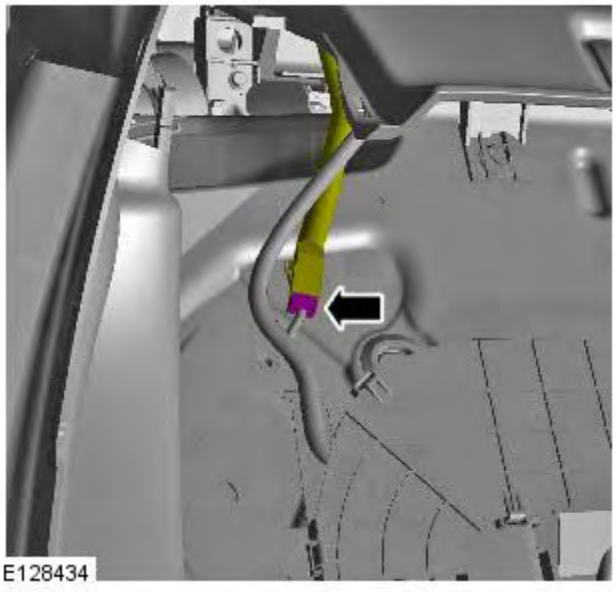
Vehicles with electric rear blind

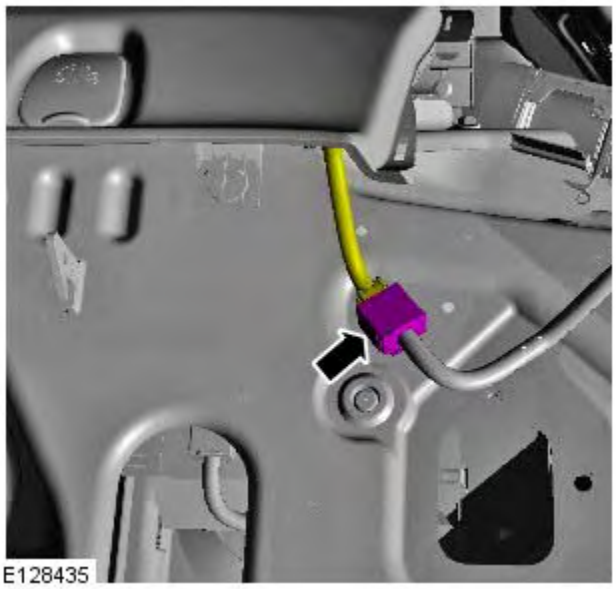
2.



Vehicles without electric rear blind

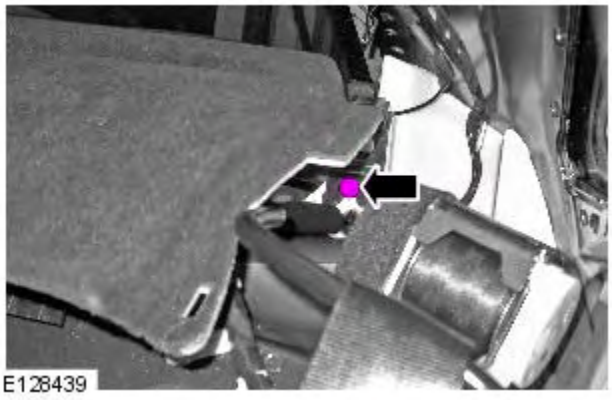
3.





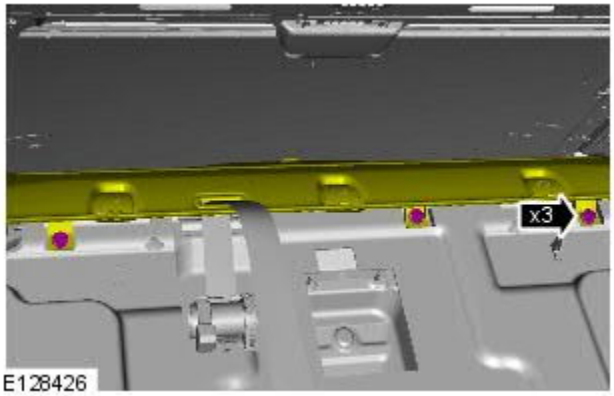
4.

5. NOTE: Loosen the bolt, but do not fully remove.

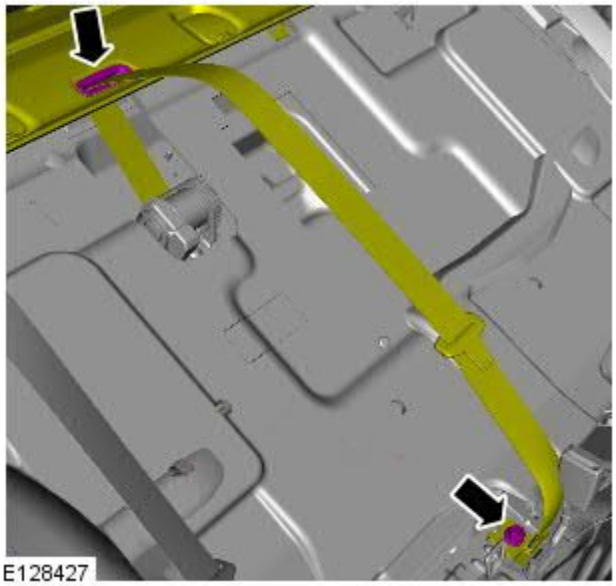


6. NOTE: Loosen the bolt, but do not fully remove.

7.



8.



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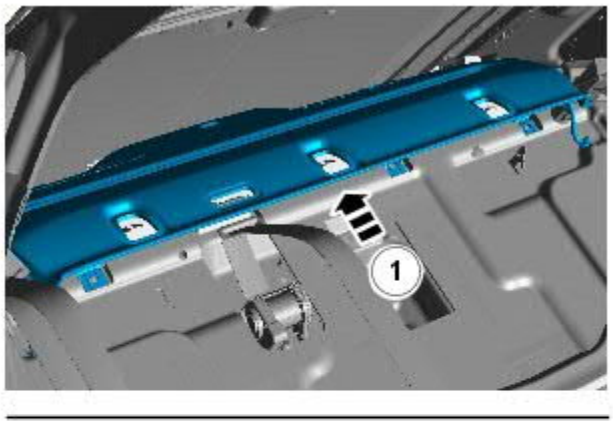
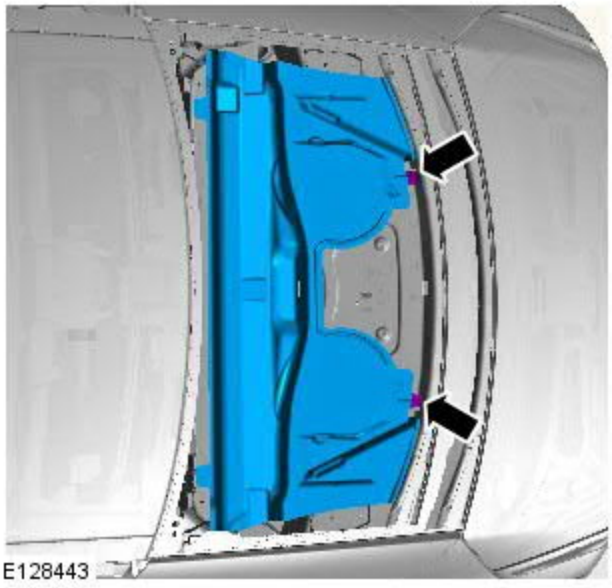
10.



E128428

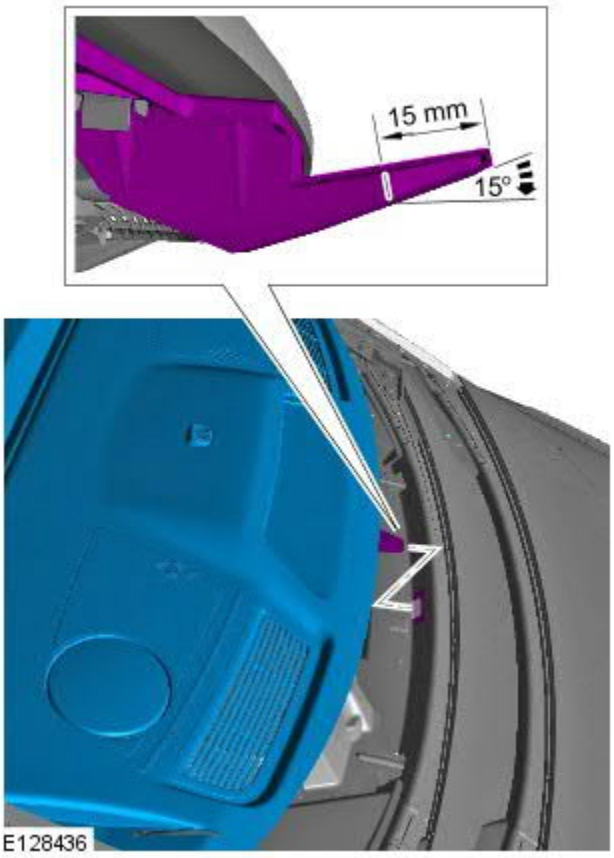
Installation

All vehicles

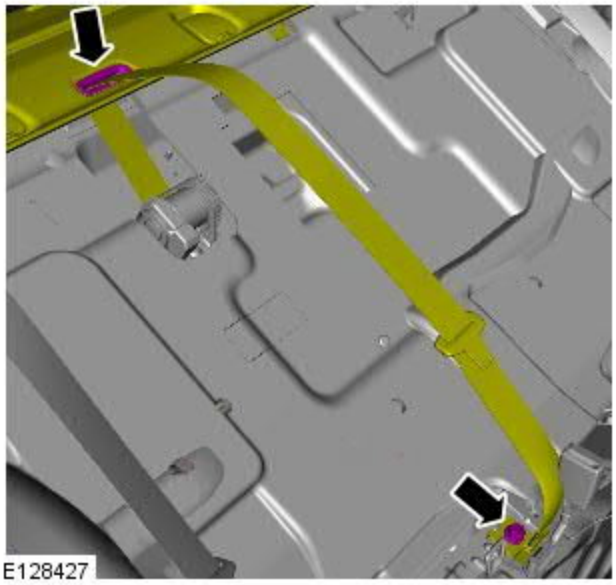


E128443

1. CAUTION: Make sure that the noise vibration harshness (NVH) material is correctly located.

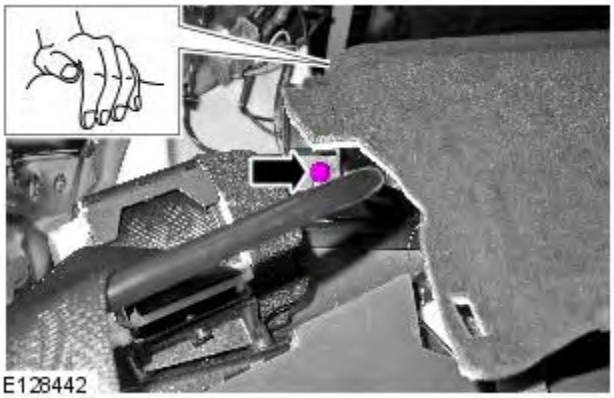


2. CAUTION: Make sure that the wiring harness does not catch when installing the parcel shelf.



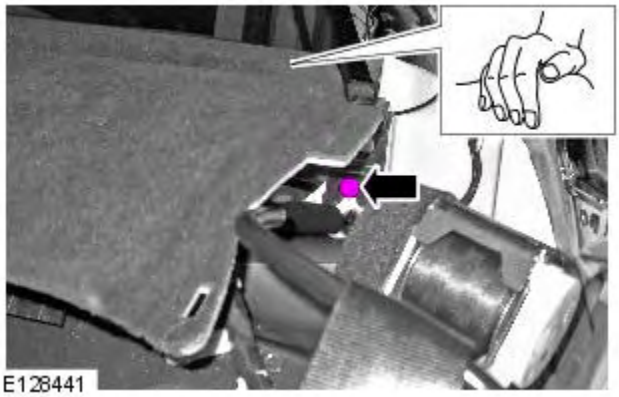
3. *Torque:* 40 Nm

4.



5.

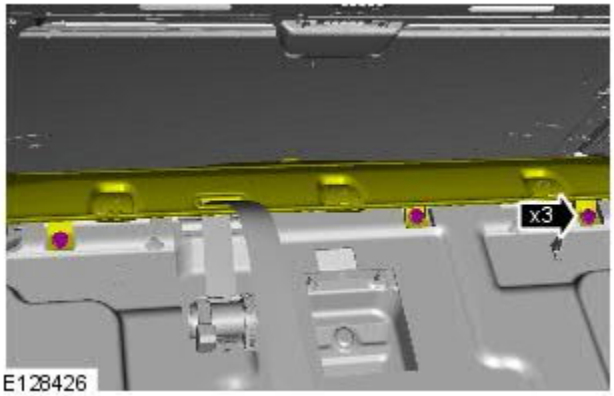
- *Torque:* 6 Nm
- Apply gentle pressure.



6.

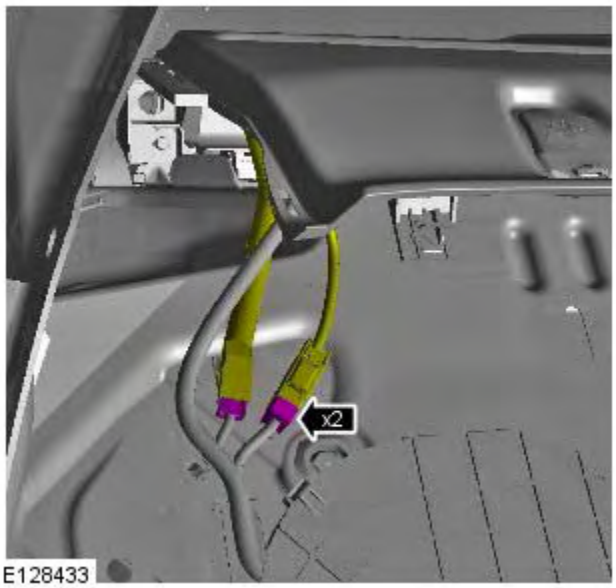
- *Torque:* 6 Nm
- Apply gentle pressure.

7.



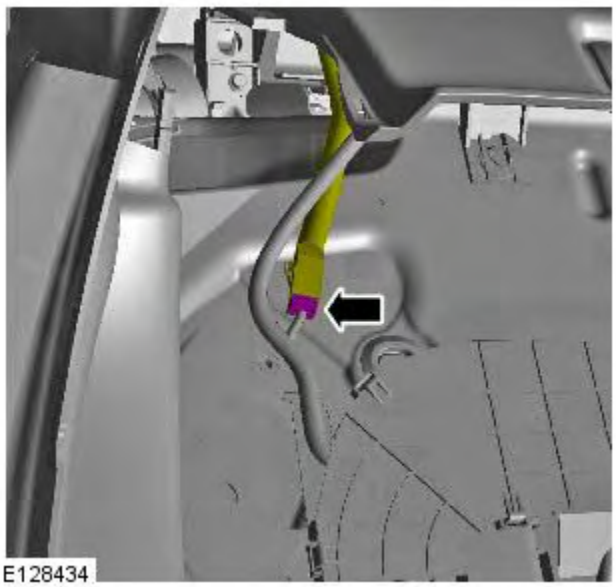
Vehicles with electric rear blind

8.



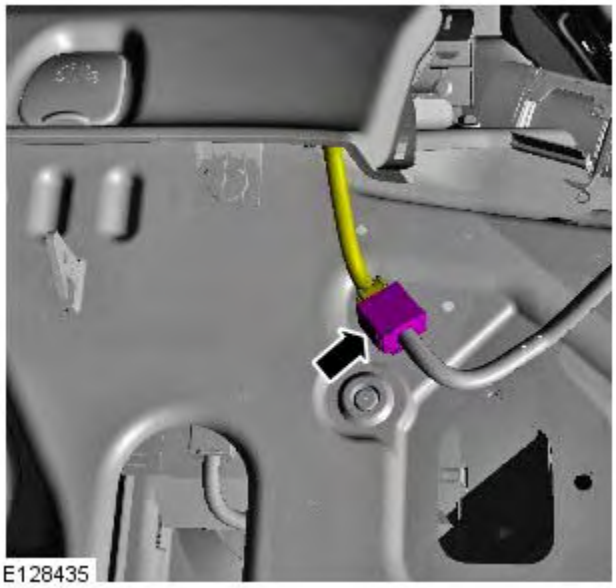
Vehicles without electric rear blind

9.



All vehicles

10.



11. Refer to: C-Pillar Lower Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

Published: 14-May-2013

Interior Trim and Ornamentation - Rear Door Trim Panel

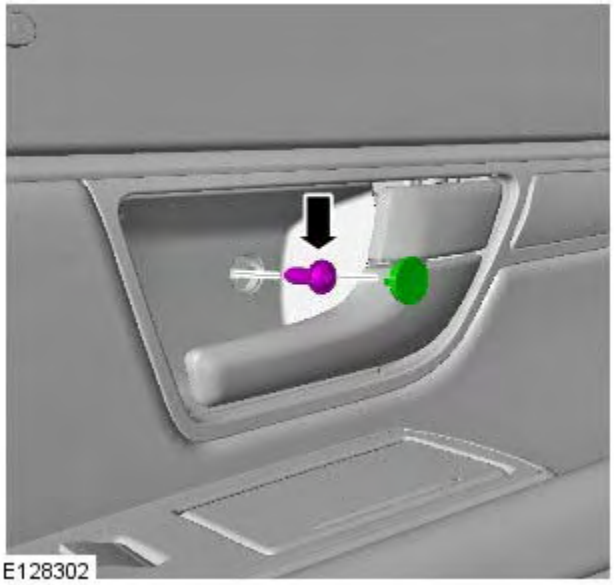
Removal and Installation

Removal

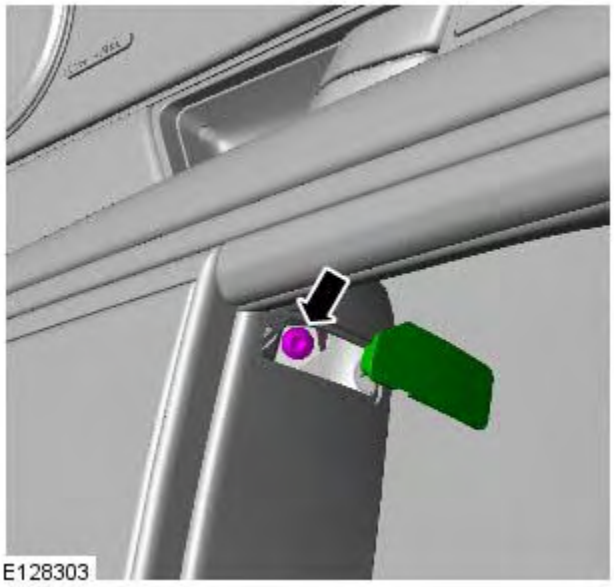
NOTES:

Removal steps in this procedure may contain installation details.

RH illustration shown, LH is similar.

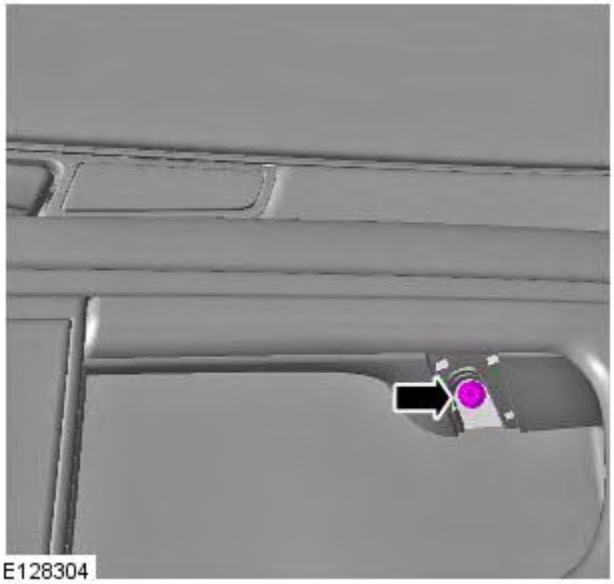


1. *Torque:* 3 Nm



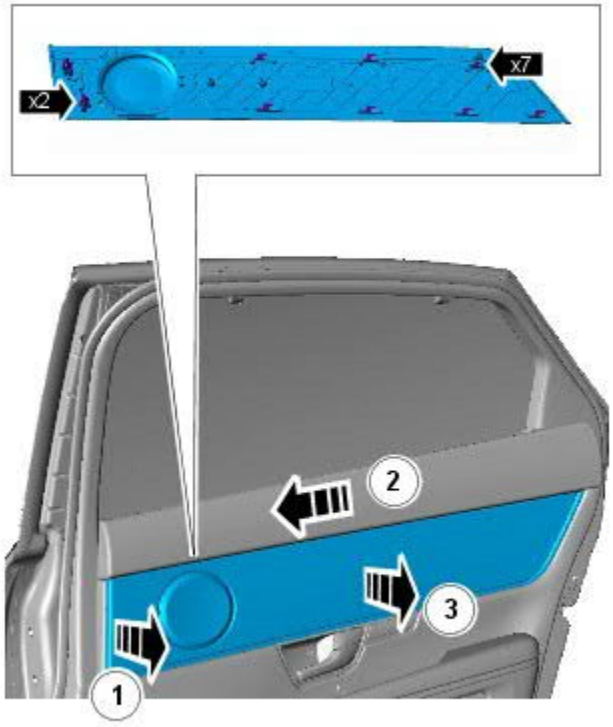
2. *Torque:* 6 Nm

3. *Torque:* 6 Nm



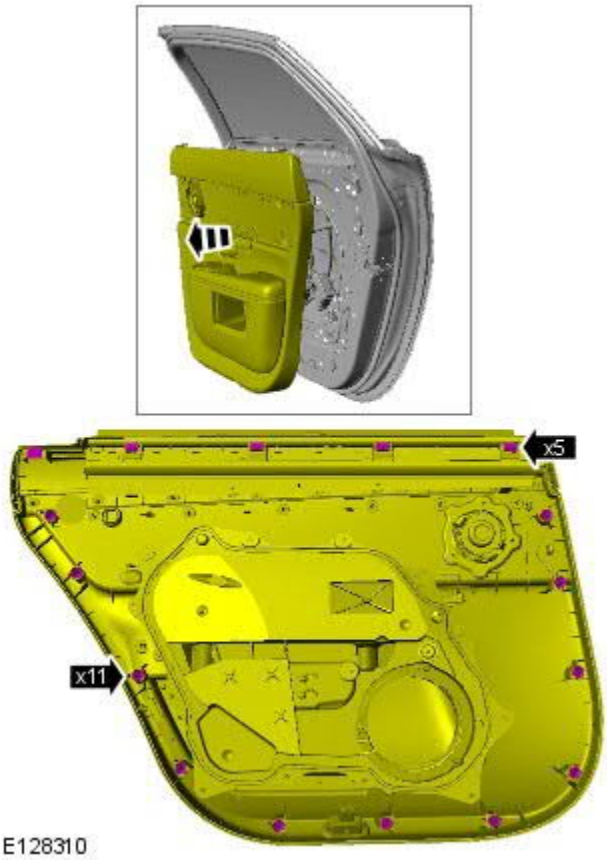
E128304

4.

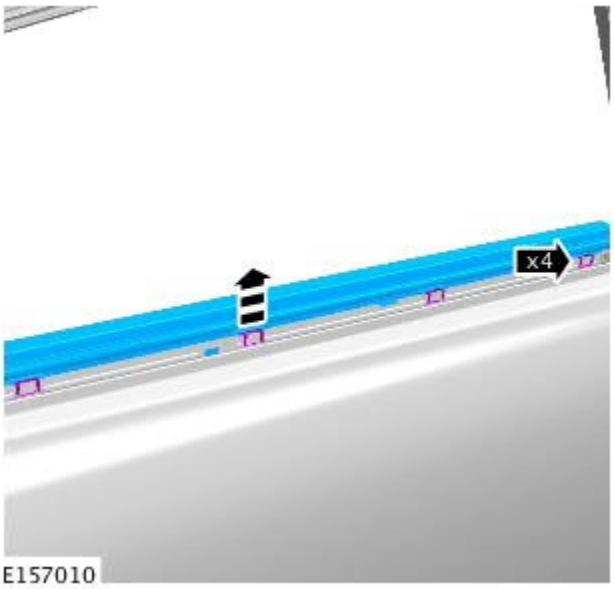


E128305

5. *Torque:* 3 Nm

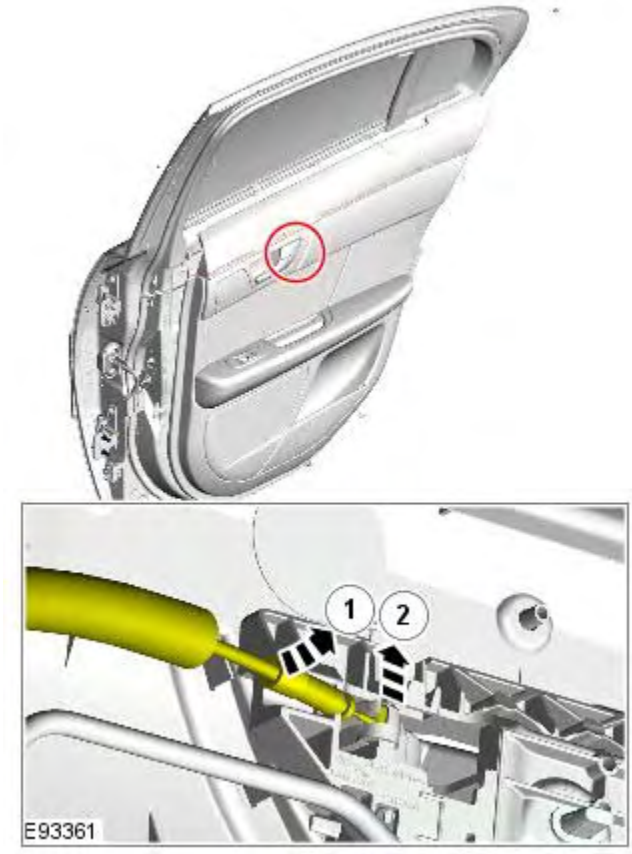


6.



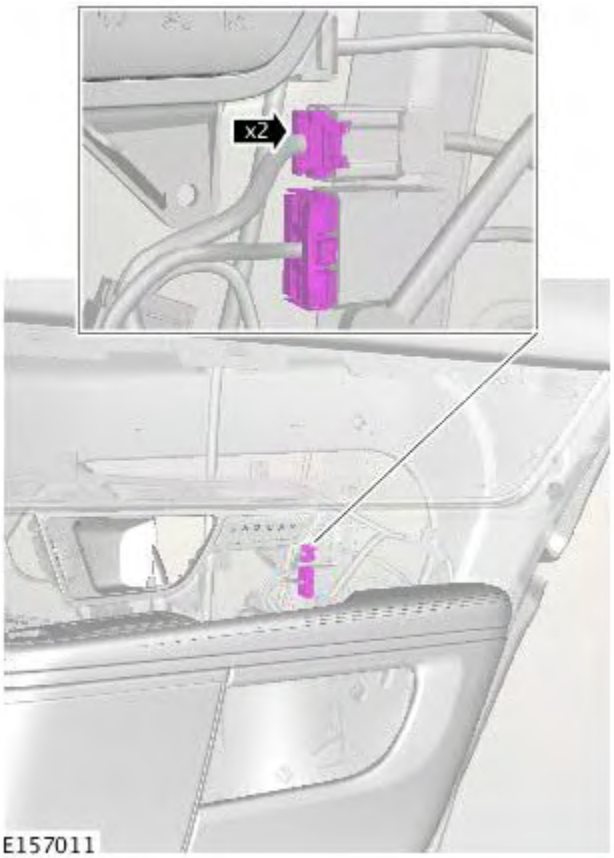
7. CAUTION: Take extra care not to damage the component.

NOTE: For vehicles with electric rear door blind.



8.

9.



10.

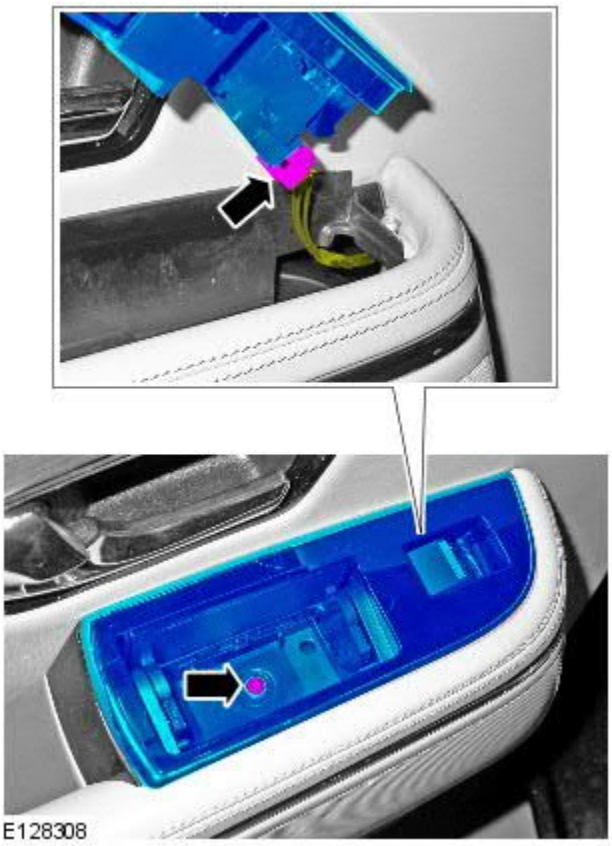
E128306

11. NOTE: Do not disassemble further if the component is removed for access only.

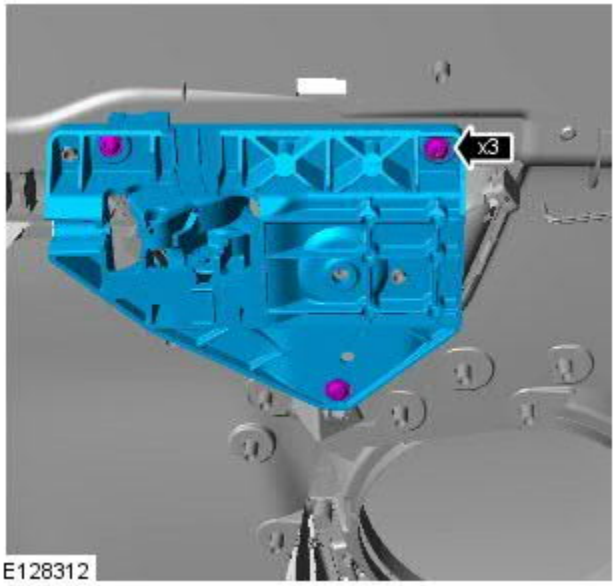
E128307

12. *Torque:* 3 Nm

13.

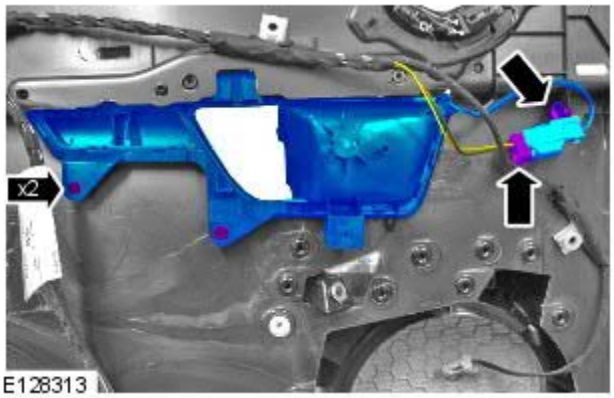

E128308

14. *Torque:* 3 Nm



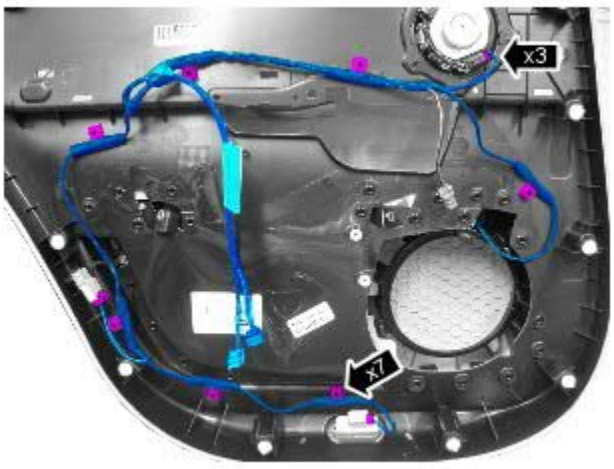
E128312

15. *Torque:* 3 Nm



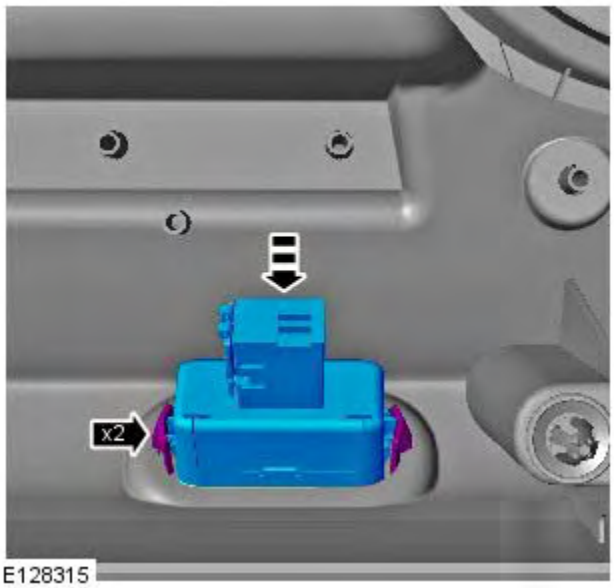
E128313

16.



E128314

17.



18. *Torque:* 5 Nm

19.

E128317

20.

E128318

Installation

1. To install, reverse the removal procedure.

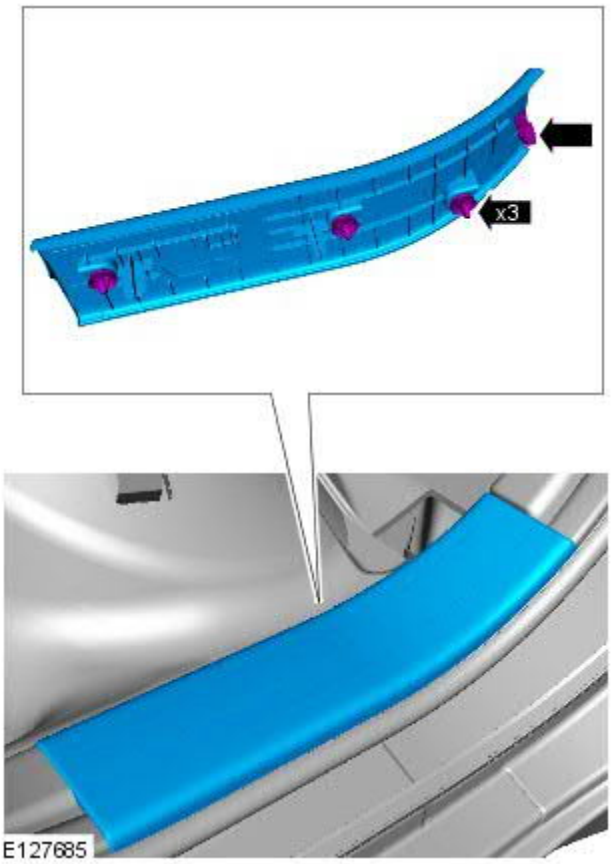
Published: 11-May-2011

Interior Trim and Ornamentation - Rear Scuff Plate Trim Panel

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.



1. CAUTION: Make sure that the clips are correctly located.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Interior Trim and Ornamentation - Sun Visor

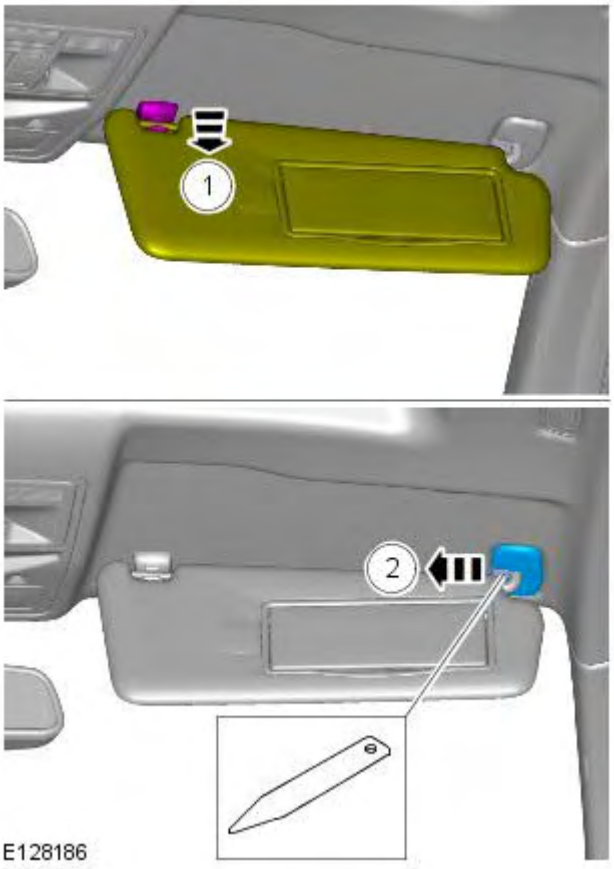
Removal and Installation

Removal

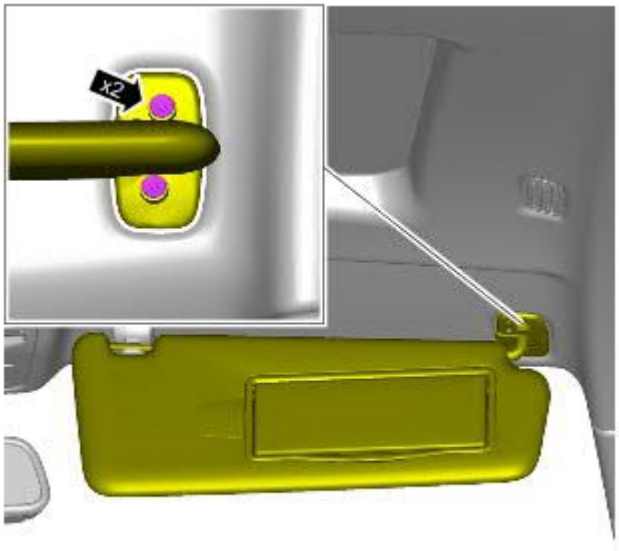
NOTES:

Removal steps in this procedure may contain installation details.

Right-hand shown, left-hand similar.

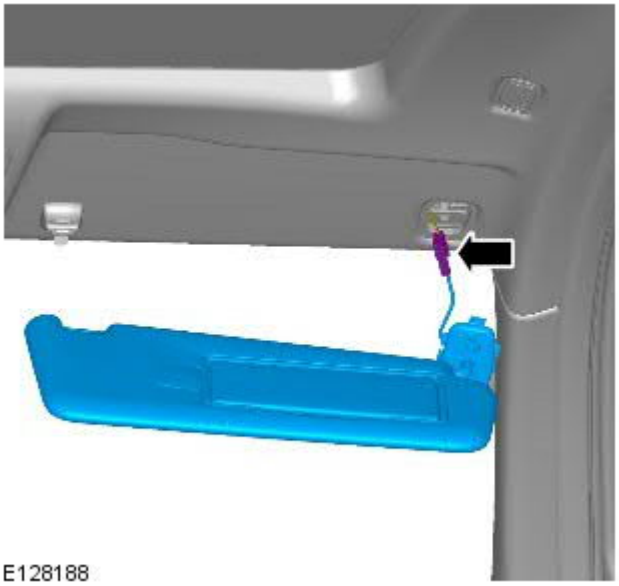


1. CAUTION: Take extra care not to damage the edges of the component.



E128187

2. TORQUE: 6 Nm



E128188

3.

Installation

1. To install, reverse the removal procedure.

Published: 28-Jan-2013

Interior Trim and Ornamentation - Sun Visor Vanity Mirror

Removal and Installation

General Equipment

Interior trim remover

Removal

E150926

1. Using a suitable tool, release the retaining clips and remove the sun visor vanity mirror from the sun visor.

   General Equipment: Interior trim remover

Installation

E150927

1. CAUTION: Do not use excessive force to install the component.

   Press firmly against the areas indicated until an audible click is heard.

Published: 11-May-2011

Exterior Trim and Ornamentation -

Description	Nm	lb-ft	lb-in
Front Grille retaining screws	1.5	1.1	13.3

Published: 11-May-2011

Exterior Trim and Ornamentation - Radiator Grille

Removal and Installation

Removal

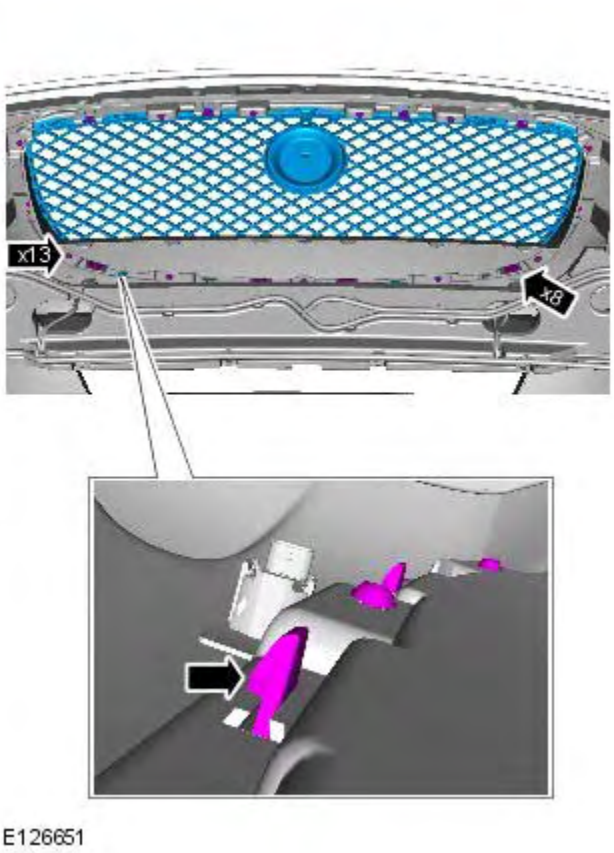
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).



E126651

4. CAUTIONS:

   Protect the surrounding paintwork to avoid damage.

   Take extra care not to damage the clips.

   Torque: 2.5 Nm

5.

E126650

E125726

6. CAUTIONS:

Allow adhesive to cure for 2 hours before proceeding to fit bumper.

Make sure that the component is correctly located on the locating dowels.

NOTE: Do not disassemble further if the component is removed for access only.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Rear View Mirrors -

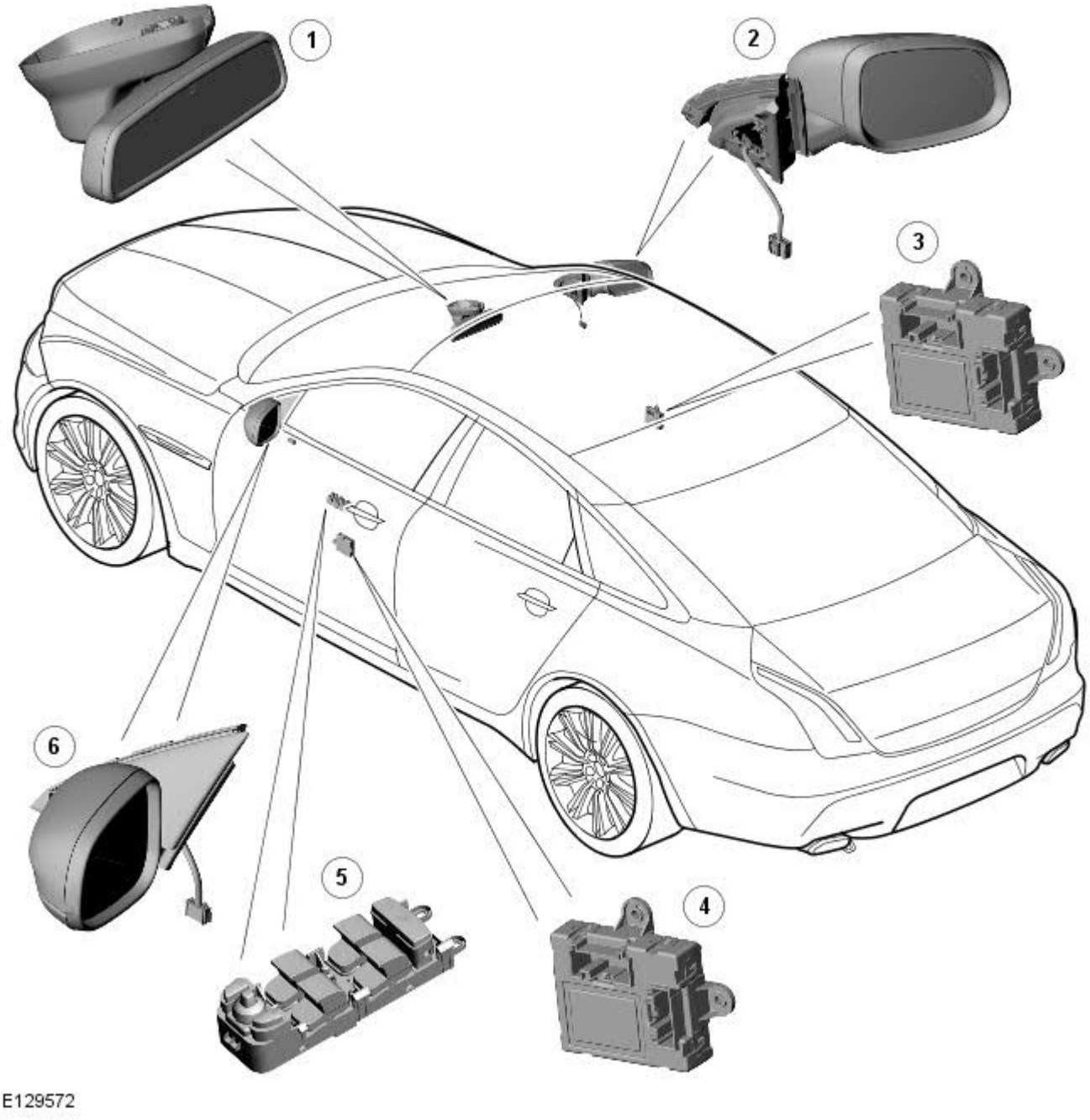
Torque Specifications

Description	Nm	lb-ft	lb-in
Exterior mirror retaining nuts	8	5.90	70.81

Published: 11-May-2011

Rear View Mirrors - Rear View Mirrors - Component Location

Description and Operation



Item	Description
1	Interior mirror
2	RH (right-hand) door mirror Passenger door control module
3	RH door control module
4	LH (left-hand) door control module
5	Mirror control switch
6	LH door mirror

www.JagDocs.com

Published: 11-May-2011

Rear View Mirrors - Rear View Mirrors - Overview

Description and Operation

Overview

The exterior mirrors incorporate the following:

- Blind spot monitoring indicator
- Auto dimming function
- Turn signal indicators
- Approach lamps
- Exterior temperature sensor
- Heated mirror function
- Reverse dipping function

Movement of the door mirrors is controlled from a switch pack located on the drivers door. The switch pack contains 2 non-latching mirror select buttons labeled 'L' and 'R' and a 4-way mirror movement switch. Door mirror movement commands are transmitted to the driver's door module over the LIN (local interconnect network) bus. The drivers door module transmits any mirror movement commands to the passenger door module over the medium speed CAN (controller area network) bus.

Movement of the door mirrors is carried out by the respective door module. The door modules provide supply and ground paths to the mirror motors and monitor mirror position via potentiometers located in the mirror housings.

Both exterior door mirrors and the interior mirror feature an auto dimming function. The interior rear view mirror contains one forward and one reward facing light sensor. The light sensors control the auto dimming feature of the interior mirror to reduce glare from the headlights of following vehicles.

When auto-dimming of the interior mirror is required, a supply is provided by the interior mirror to both door mirrors to initiate the door mirror auto-dimming sequence.

Blind spot monitoring function alerts the driver to a vehicle located in the vehicle blind spot. A warning indicator is located in each exterior mirror towards the outer edge.

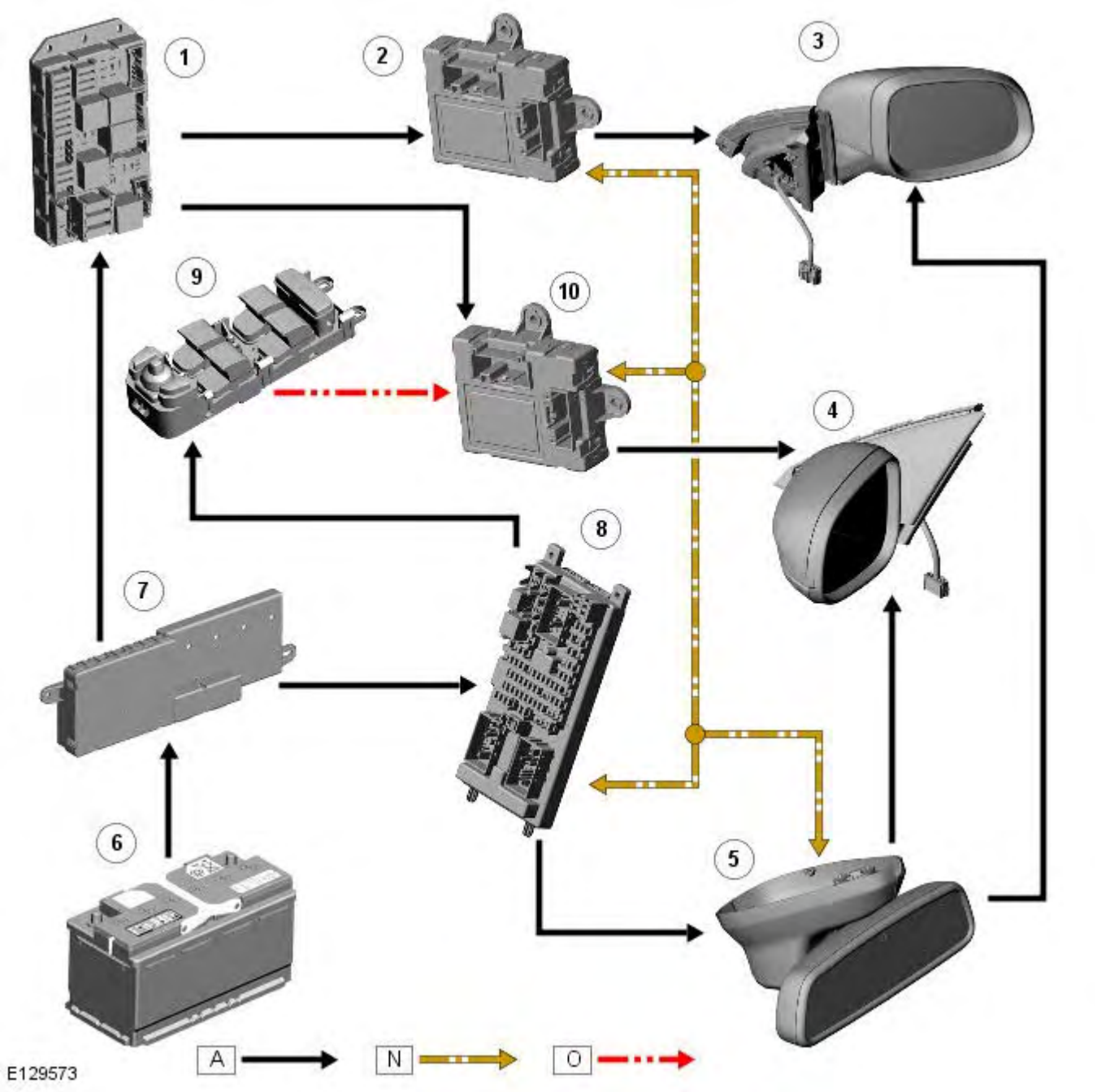
Published: 01-Oct-2012

Rear View Mirrors - Rear View Mirrors - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: A = Hardwired, N = Medium speed CAN (controller area network) bus, O = LIN (local interconnect network) bus



Item	Description
1	RJB (rear junction box)
2	RH (right-hand) door module
3	RH door mirror
4	LH (left-hand)side door mirror
5	Interior mirror
6	Battery

7	BJB (battery junction box)
8	CJB (central junction box)
9	Exterior mirror control switches
	LH door module

System Operation

The rear view mirrors comprise an interior mirror mounted to the windshield, and an exterior mirror mounted on each front door cheater. The types of mirrors and associated operating functions installed depend on the specification and trim level of the vehicle.

Interior Mirrors

The interior rear view mirror is provided as a electrically operated automatic dimming type.

The automatic dimming mirror comprises an electro-chromatic glass housed within a surrounding case that is attached with a ball joint connector to the mirror stem. The mirror stem incorporates an 8-pin electrical connector that is connected to the roof panel wiring harness.

Light sensors are mounted on the front and rear of the mirror surround case. The sensors control the automatic dimming feature to reduce glare from the headlights of following vehicles.

The automatic dimming function is permanently active when the ignition is in power mode 4 (Accessory) and power mode 6 (Ignition). The forward facing light sensor monitors the ambient light level at the front of the vehicle; the rearward facing light sensor monitors the light level coming from the rear of the vehicle. When light from the rear of the vehicle exceeds the ambient light level from the front of the vehicle, the automatic dimming circuit darkens the interior mirror surface.

Automatic dimming is inhibited when reverse gear is selected to provide the driver with maximum vision. On vehicles with automatic transmission, the reverse gear signal is provided by the TCM (transmission control module) via the high speed CAN bus to the CJB. The CJB then provides a power feed to the mirror.

Exterior Mirrors

Electrically operated and heated exterior mirrors are installed as standard. Depending on the specification and trim level of the vehicle, the following options are available:

- Power fold (switch pack operated feature) and auto fold (remote handset operated feature)
- Memory recall
- Reverse gear mirror dip

The power fold/auto fold feature is available only when power fold mirrors are installed to the vehicle.

The auto fold and reverse gear mirror dip functions are not customer configurable, but may be enabled or disabled by the dealer using the Jaguar approved diagnostic system.

The LH door mirror incorporates an ambient air temperature sensor that is hardwired to the ECM (engine control module). The ECM is connected to the CJB and other control modules via the high speed CAN bus. The sensor provides information to the ECM that is then transmitted on the medium speed CAN bus for use by other control modules.

The exterior mirror lamps are controlled by the interior lighting function.

The door mirrors are controlled using a switch pack located on the driver's door. The switch pack contains 2 non-latching mirror select switches labeled 'L' and 'R' and a 4-way directional joystick. The switch pack is connected to the driver door control module via the LIN bus. The driver and front passenger door control modules are connected via the medium speed CAN bus. A hardwired connection between each door control module and the corresponding door mirror, provides the supply and ground paths for the mirror motors.

Each exterior door mirror incorporates 2 motors to control horizontal (left/right) and vertical (up/down) adjustments.

On vehicles installed with a driver's power operated memory seat and memory exterior mirrors, a potentiometer is incorporated within each mirror motor and is used to provide information regarding the actual motor positions. The current position and memory positions of each door mirror motor are maintained and stored within the corresponding door control module.

The memory exterior mirror positions are also monitored and stored within door control module memory when the reverse gear mirror dip function is used.

When reverse gear is selected, the door control module stores the current mirror position and will then dip passenger mirror glass to a default dip position. While reverse gear is selected it is possible to store a preferred dipped mirror position by adjusting the passenger mirror glass to the desired position via the mirror switch pack. When the desired position is achieved using the switch, the new dip position will be automatically stored by the door control module when reverse gear is de-selected. Therefore when reverse gear is re-selected, the dip position recalled by the door control module will be the new reverse gear mirror dip stored position. When reverse gear is deselected the mirror glass will automatically move to the previous stored position prior to reverse gear selection.

Reverse gear mirror dip is only available when memory mirrors are installed, and reverse gear mirror dip is enabled within the instrument cluster.

If the driver selects a memory recall function using the memory seat switch pack, the driver's memory seat and exterior memory mirrors are moved to a stored memory position.

Exterior mirrors with the power fold/auto fold feature incorporate a motor located in the hinge of each exterior mirror arm. Operation of the power fold feature is achieved using the exterior mirror switch pack. Operation of the auto fold feature is achieved using the remote handset.

The power fold function is active when the ignition is in power mode 6 (Ignition).

Both exterior mirrors will power fold when the mirror switch pack 'L' and 'R' switches are pressed together. Pressing the switches again will unfold the mirrors.

When the instrument cluster is configured for the auto fold feature, the mirrors will fold in when the remote handset lock button is pressed. The mirrors will unfold when the vehicle is unlocked using the remote handset unlock button.

NOTE: If the mirrors are folded in using the mirror switch pack (power fold) and the vehicle is then locked, subsequent unlocking of the vehicle will not unfold the mirrors.

When the remote handset unlock button is operated, the CJB recognizes the remote handset for that vehicle and acknowledges the request.

When the vehicle is locked the door control modules reverse the polarity of the mirror fold motor, power and ground connections to operate the mirrors in the opposite direction.

Exterior mirror heating is provided with heater elements bonded to the back of the mirror glass. Power supply for the mirror heating elements is provided by the corresponding driver or passenger door control module.

Operation of the exterior mirror heaters is fully automatic and not controllable by the driver. Exterior mirror heater operation is determined by ambient air temperature and windshield wiper status.

The mirror heating is controlled in two phases, the initial heating phase and a second PWM (pulse width modulation) controlled phase. In the first phase the heater elements in the mirrors are permanently powered for a pre-determined length of time. This length of time varies with the ambient temperature. During the second PWM phase, the heater elements are turned on and off every 30 seconds. The amount of time the exterior mirror heaters are operational increases if the windshield wipers are switched on. This ensures the mirrors remain mist free in damp and wet conditions, where there is an increased risk of misting.

Published: 11-May-2011

Rear View Mirrors - Rear View Mirrors

Diagnosis and Testing

Principle of Operation

For a detailed description of the rear view mirrors system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (501-09 Rear View Mirrors)

Rear View Mirrors (Description and Operation),
Rear View Mirrors (Description and Operation),
Rear View Mirrors (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Door mirror switch condition and installation • Door mirror condition and installation	• Battery condition and state of charge • Fuses • Harnesses and connectors • Washer jet and mirror heater relay • Memory control module(s) • Door mirror switch(s) • Door mirror motor(s) • Ignition switch • Battery Junction Box (BJB) • Central Junction Box (CJB) • Automatic Temperature Control (ATCM) module • Local Interconnect Network (LIN) circuit

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Mirrors do not defrost/washer jets freeze	• Fuse fault • Washer jet and mirror heater relay fault • Circuit fault: high resistance • Circuit fault: short circuit to ground • Automatic temperature control module fault	Check the fuses. Check the operation of the washer jet and mirror heater relay. Check the washer jet and mirror heater circuits. Refer to the electrical guides. Refer to the warranty policy and procedures manual if a module is suspect.
Mirrors inoperative in one or more directions	• Mechanical fault • Switch fault • Motor fault • Circuit fault: high resistance • Circuit fault: short circuit to ground	Operate the mirror switch and listen for the motor(s). If the motor(s) can be heard, check the mechanical condition of the mirror and linkages. Rectify as necessary. Check for DTCs indicating a switch, motor or circuit fault.
Memorized mirror position is not resumed	• Battery voltage below 10.5 volts • Position not stored • Switch operated during "one-touch" memory recall • EEPROM fault	Before condemning a memory component, check the function from the switch and refer to the symptoms above. Make sure the battery voltage is adequate. Make sure that the desired position is correctly stored. Make sure that the memory store/recall procedure is being followed. Refer to the relevant section of the workshop manual.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Driver Door Module/Passenger Door Module (DDM/PDM) (100-00 General Information, Description and Operation).

Published: 11-May-2011

Rear View Mirrors - Exterior Mirror

Removal and Installation

Removal

CAUTION: LH illustration shown, RH is similar.

NOTES:

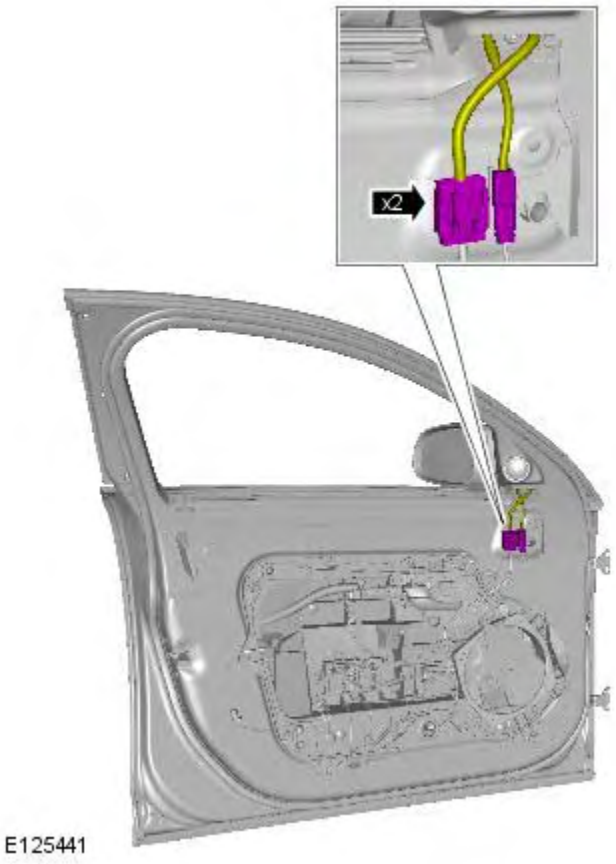
Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1.

E94765

2. Refer to: Front Door Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

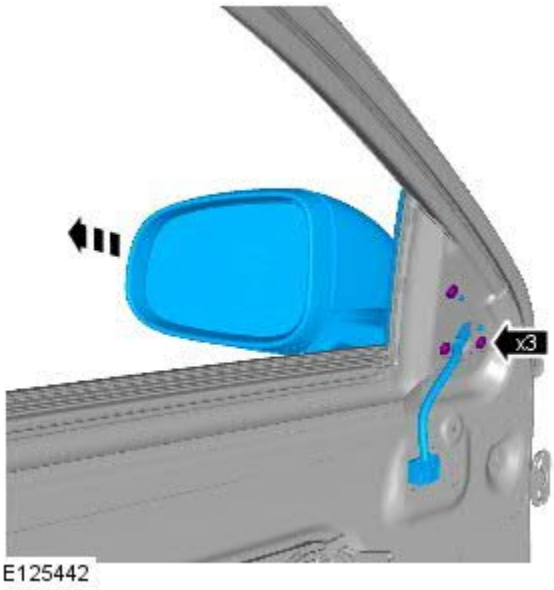


3. CAUTION: Take extra care not to damage the wiring harnesses.

4. CAUTIONS:

Make sure the locating tangs are aligned. Failure to follow this instruction may result in damage to the vehicle.

Take extra care not to damage the seal.



5. CAUTION: Make sure that the component is correctly located on the locating dowels.

   NOTE: Make sure that the harness is routed to the position noted on removal.

   Torque: 8 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Rear View Mirrors - Exterior Mirror Cover

Removal and Installation

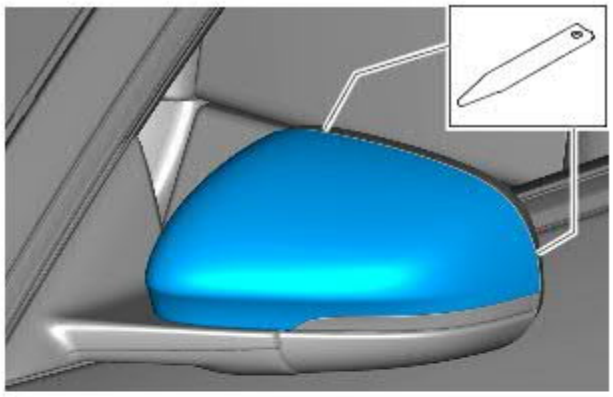
Removal

NOTES:

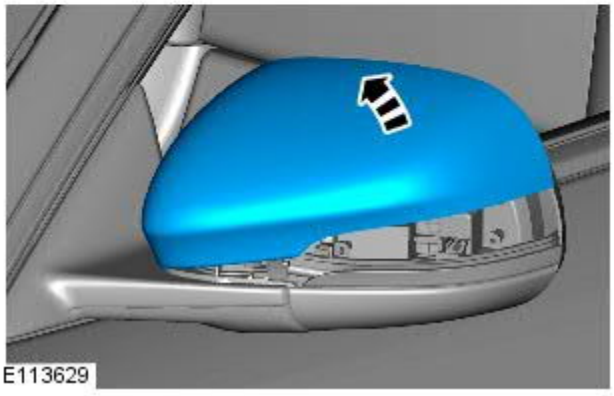
Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Exterior Mirror Glass (501-09 Rear View Mirrors, Removal and Installation).



2. NOTE: Note the fitted position of the locating pegs.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Rear View Mirrors - Exterior Mirror Glass

Removal and Installation

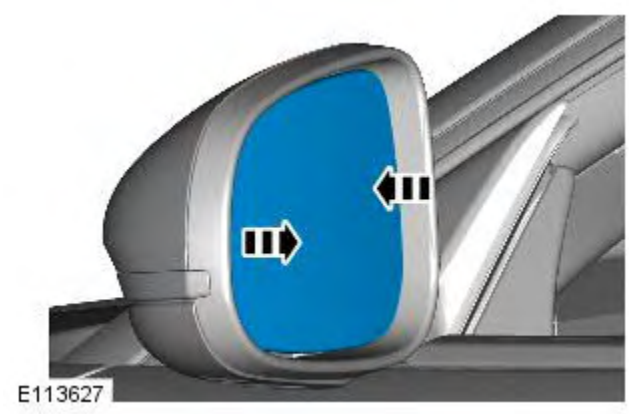
Removal

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1.



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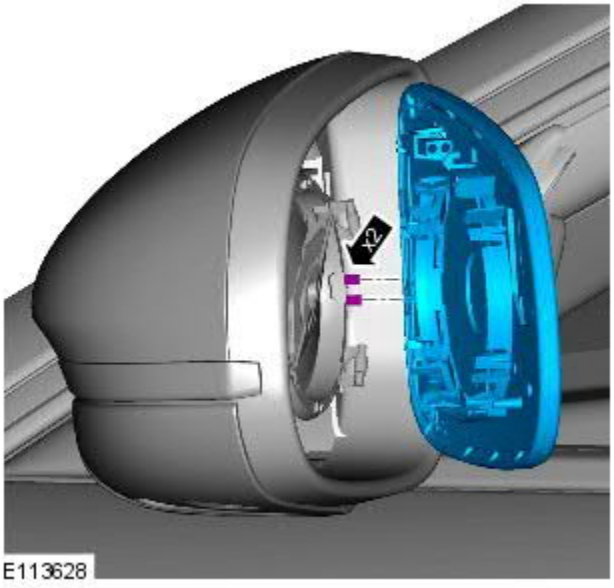


Installation

1. NOTE: Note the fitted position of the locating pegs.

   To install, reverse the removal procedure.

Published: 11-May-2011

Rear View Mirrors - Exterior Mirror Motor

Removal and Installation

Removal

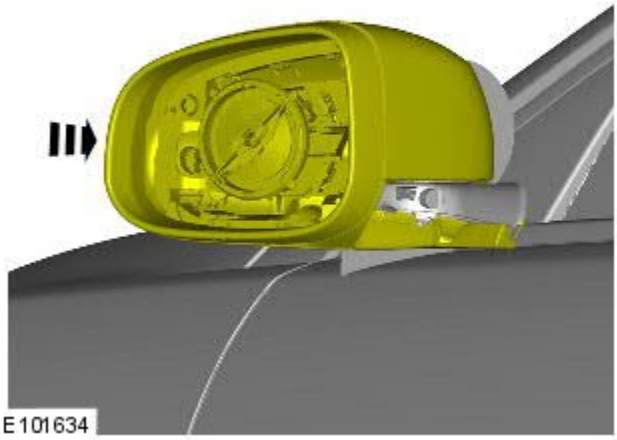
NOTES:

Removal steps in this procedure may contain installation details.

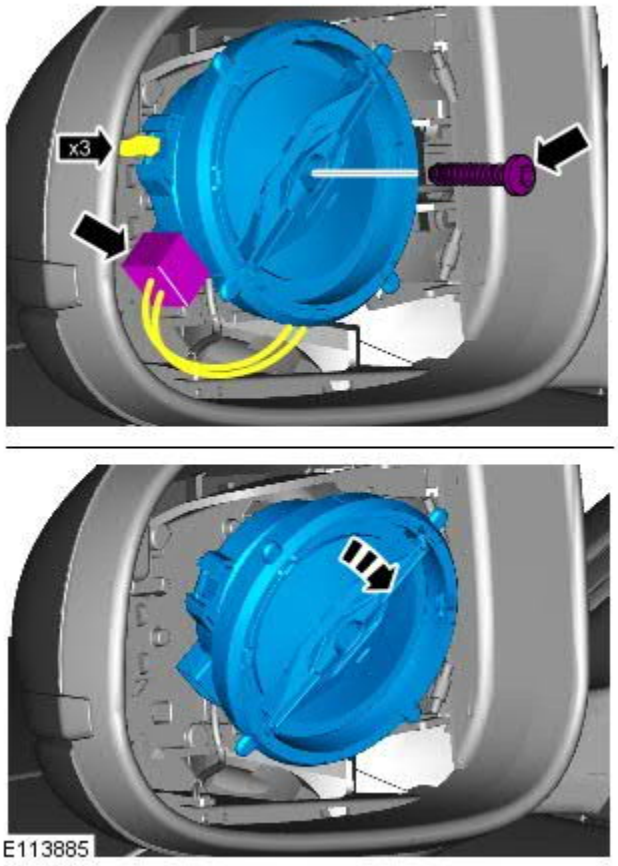
Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Exterior Mirror Glass (501-09 Rear View Mirrors, Removal and Installation).

2.



3.



Installation

1. To install, reverse the removal procedure.

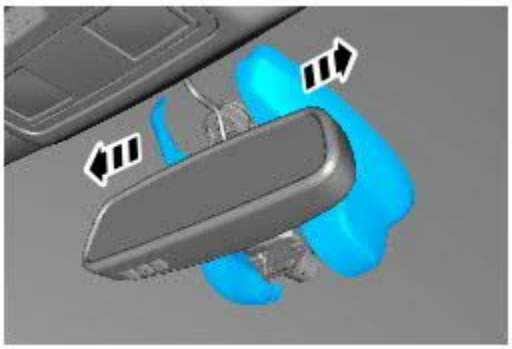
Published: 11-May-2011

Rear View Mirrors - Interior Rear View Mirror

Removal and Installation

Removal

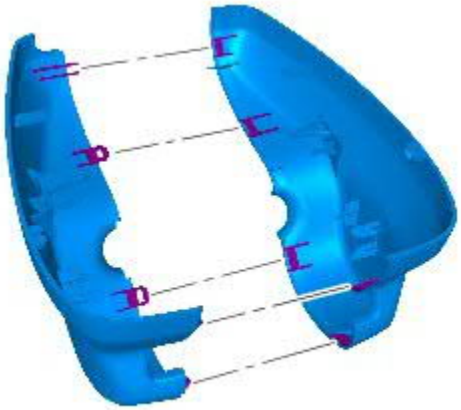
NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



1. CAUTIONS:

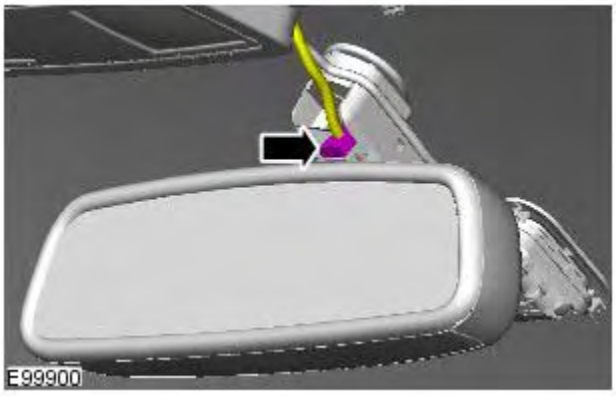
   Take extra care not to damage the clips.

   Protect the surrounding trim to avoid damage.



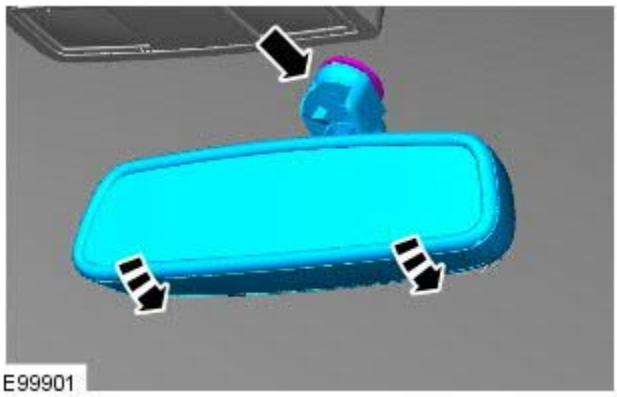
E125685

2.



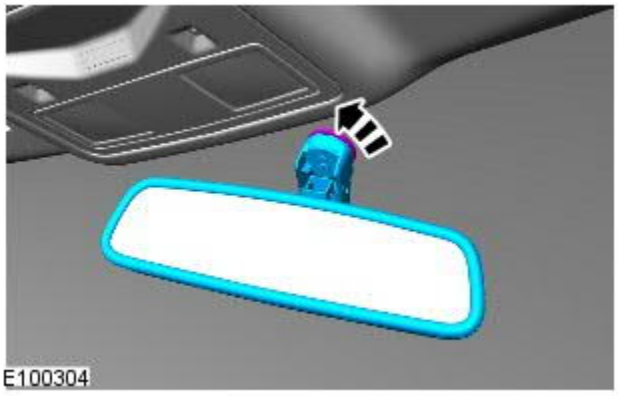
E99900

3.

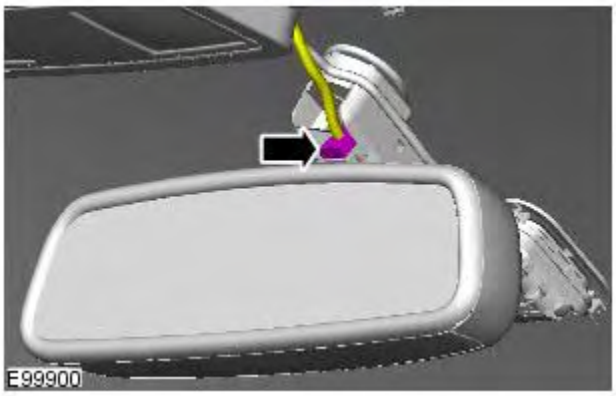


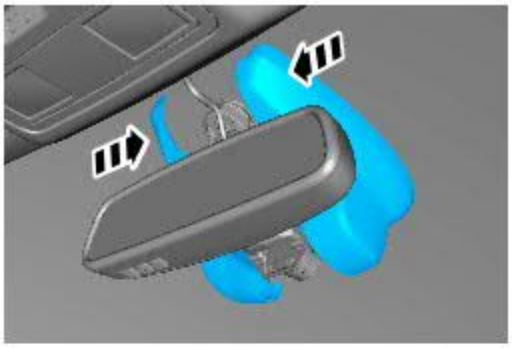
Installation

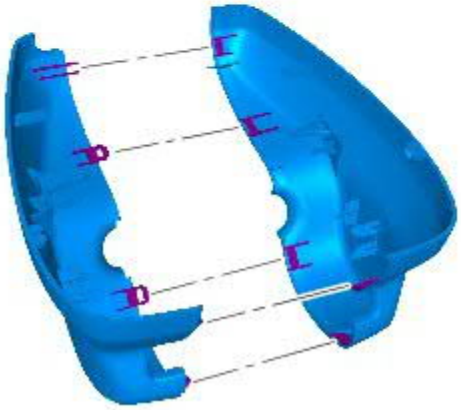
1.



2.







E125792

3. CAUTION: Take extra care not to damage the clips.

NOTE: For vehicles with Auto high beam assist (AHBA) the Interior mirror cover caps are designed for one fit only, therefore should be replaced.

Published: 20-Feb-2012

Seating -

Torque Specifications

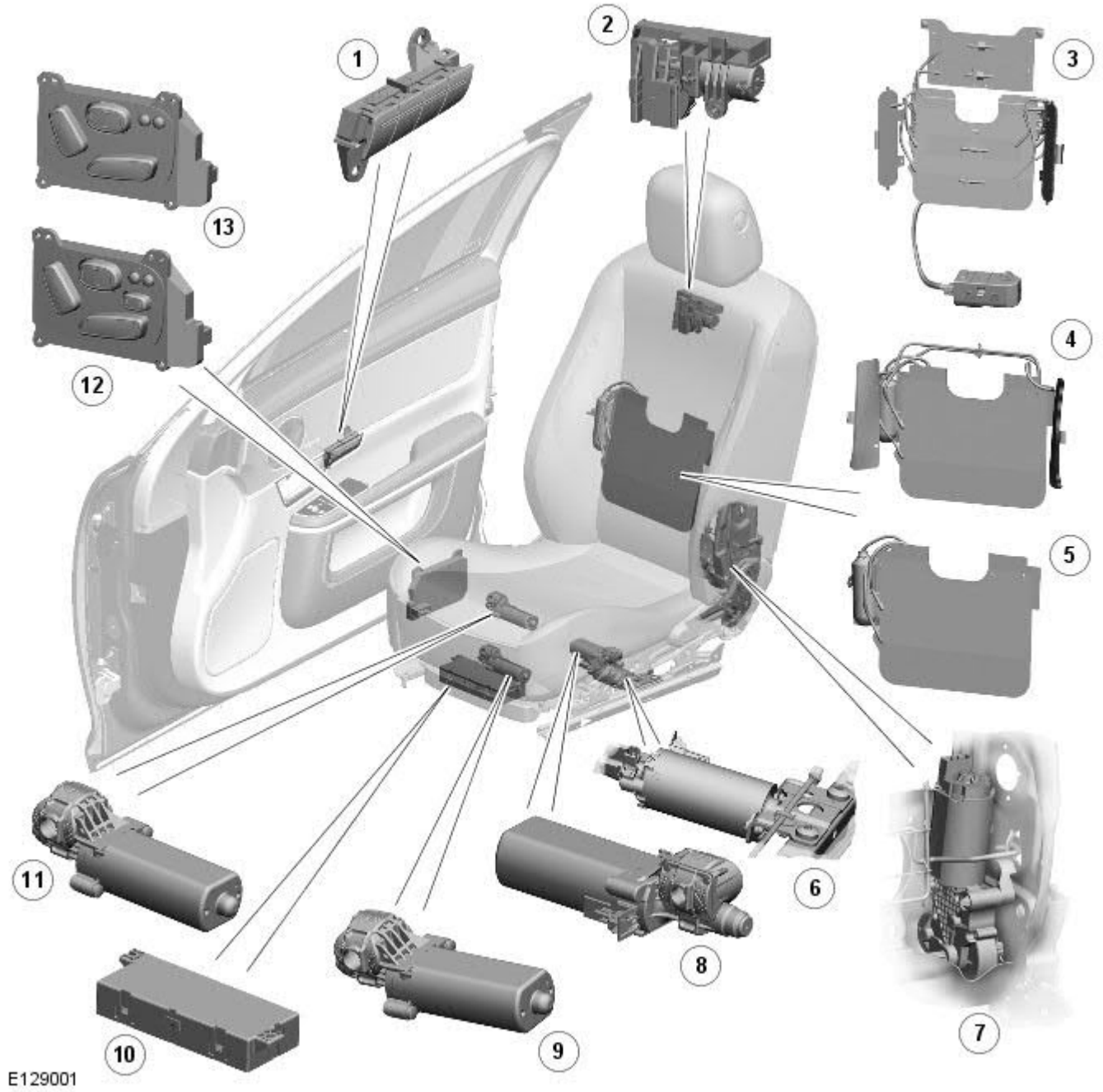
Description	Nm	lb-ft	lb-in
Front seat safety belt anchor retaining bolts	40	30	-
Front seat retaining bolts	47	35	-
Front seat backrest frame to seat base bolts	35	26	-
Front safety belt buckle retaining bolt	40	30	-
Front seat track to cushion frame bolts	20	15	-
Front seat track to cushion frame mechanism bolts	28	21	-
Front seat height adjustment motor retaining bolts	10	7	-
Front seat height adjustment motor arm bolt	28	21	-
Front seat track motor bolts	10	7	-
Front seat tilt motor bolt, M8	22	16	-
Front seat tilt motor bolts, M6	10	7	-
Front seat cushion extension motor bolt, M8	22	16	-
Front seat cushion extension motor bolt, M6	10	7	-
Passenger seat away switch bracket nuts	7	-	62
Front seat backrest frame support panel bolts	9	-	80
Front seat wiring shield bolts	10	7	-
Front seat folding tray cover bolts	3	-	27
Rear seat armrest nuts - Vehicles with split rear seat backrest	25	18	-
Rear seat armrest nuts - Vehicles without split rear seat backrest	8	-	71
Rear seat backrest ground cable - Vehicles with split rear seat backrest	10	7	-
Side air bag module retaining nuts	7	-	62

Published: 11-May-2011

Seating - Seats - Component Location

Description and Operation

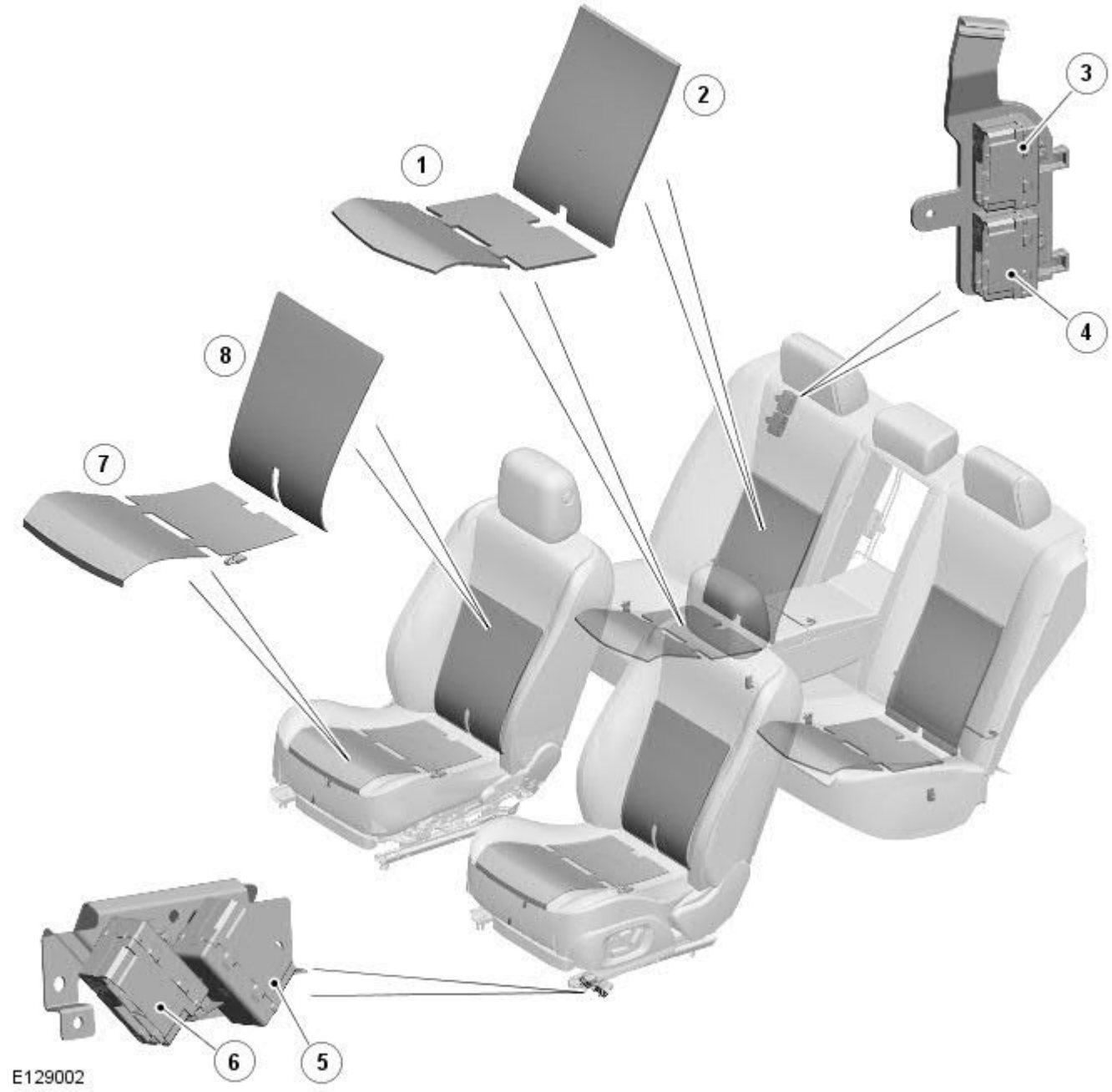
COMPONENT LOCATION - ADJUSTMENT



Item	Description
1	Memory switch pack
2	Head restraint motor
3	Pump, lumbar support, squab bolster supports and back massage cells
4	Pump, lumbar support and squab bolster supports
5	Pump and lumbar support (4-way support shown, 2-way similar)
6	Seat slide motor
7	Squab recline motor
8	Cushion tilt motor
9	Cushion extension motor

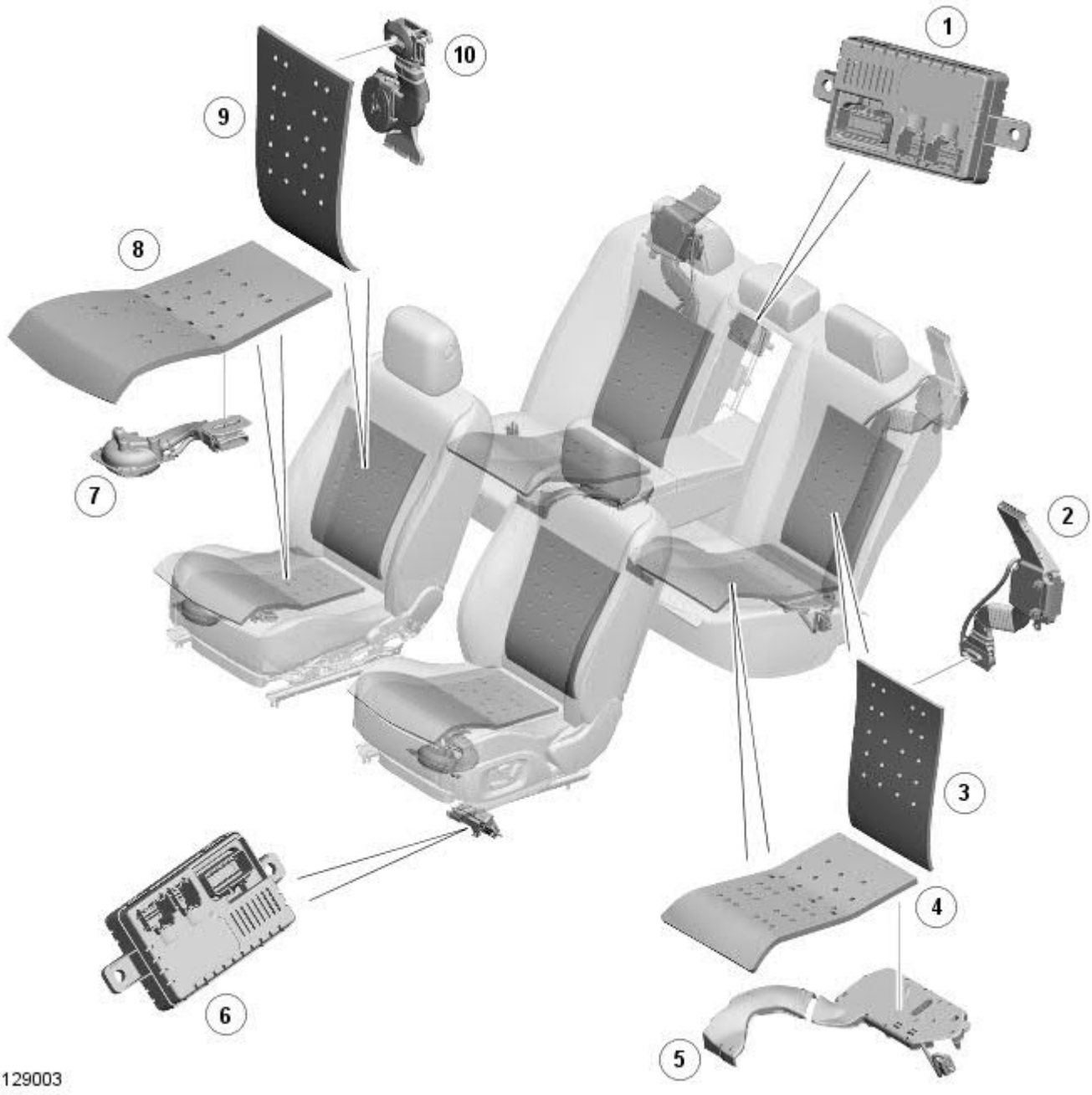
10	Seat control module
11	Seat height motor
12	Seat switch pack (16 and 18 way)
13	Seat switch pack (8,10 and 12 way)

COMPONENT LOCATION - HEATED SEATS



Item	Description
1	Rear seat cushion heater element
2	Rear seat squab heater element
3	Rear RH (right-hand) seat heater module
4	Rear LH (left-hand) seat heater module
5	Front passenger seat heater module
6	Driver seat heater module
7	Front seat cushion heater element
8	Front seat squab heater element

COMPONENT LOCATION - CLIMATE SEATS



Item	Description
1	Rear seats climate control module
2	Rear seat squab climate module
3	Rear seat squab pad assembly
4	Rear seat cushion pad assembly
5	Rear seat cushion climate module
6	Front seats climate control module
7	Front seat cushion climate module
8	Front seat cushion pad assembly
9	Front seat squab pad assembly
10	Front seat squab climate module

Published: 20-Nov-2013

Seating - Seats - Overview

Description and Operation

OVERVIEW

Leather Seat Covers

Leather is a natural product, therefore it bears natural characteristics, such as grain variations, growth & bush marks. These non-weakening marks show the true nature of the hide and are the hallmarks of Leather. In order to maintain the beauty of the vehicles natural Leather upholstery it requires regular cleaning, which if neglected, may cause deterioration. Where dust and dirt are allowed to accumulate and become ingrained in the surface of the Leather, the upholstery may become permanently damaged.

Light coloured upholstery can be particularly susceptible to soiling and staining and care should be taken to ensure that where there is evidence of any soiling or staining on the upholstery then this should be cleaned immediately using the Jaguar/Land Rover approved products, failure to do this could lead to the stain becoming permanent, this applies to all leather upholstery and is not colour specific.

Leather trimmed seats will naturally exhibit areas of creasing and wrinkling over a period of time and is a normal characteristic as the Leather ages.

Particular care should be taken where there is evidence of soiling or staining on the leather, this should be cleaned immediately. Failure to do this could lead to the stain becoming permanent.

Particular care should be taken to prevent damage from studs, zips and buckles.

NOTES:

Please refer to Leather care label attached to seats for more information.

Creasing and wrinkling does not represent a manufacturing defect.

Damage from studs, zips and buckles do not represent manufacturing defects.

Use only Jaguar/Land Rover approved products in accordance with the instructions for use.

Front Seats

Various options are available for the front seats with regard to temperature control and electrical adjustment. Seats are non-heated, heated or heated and cooled (climate), with the following adjustment options:

- 10-way adjustment on the driver seat and 8-way adjustment on the passenger seat.
- 16-way adjustment on the driver seat and 12-way adjustment on the passenger seat.
- 18-way adjustment on the driver and passenger seats.

8-way adjustments consist of seat slide, seat height, squab recline and 2-way lumbar adjustment. 10-way adjustment adds cushion tilt. 12-way adjustment adds head restraint. 16-way adjustment adds cushion extension and replaces 2-way lumbar adjustment with 4-way. 18-way adjustment adds squab bolster adjustment. The controls for seat adjustment are installed in the outboard side shield of the related seat cushion.

The driver seat on all options has a 3-channel memory for easy recall of stored position settings for the seat, steering column and door mirrors. Passenger seats with 18-way adjustment also have a 3-channel memory. The controls for memory operation are in the related front door casing. Lumbar and squab bolster settings are not included in the memory function.

Some climate seats with 18-way adjustment also incorporat a massage function. The massage function is produced using additional lumbar cells. Operation of the massage function is controlled from the Climate / Front Climate / Front Seats menu of the TSD (touch screen display).

Operation of the temperature settings for heated and climate seats is controlled from the Climate / Front Climate / Front Seats menu of the TSD.

Both front seats incorporate an AWS (anti-whiplash system) consisting of active, energy absorbent backrest mechanisms. Together with correctly positioned headrests, the AWS helps reduce the likelihood of neck and spinal injury in the event of a rear impact. In a low speed rear impact, AWS automatically moves and reclines the backrest by a small amount, to change the posture of the seat occupant and reduce the relative front to rear motion between body and head.

A map pocket is installed on the rear of each front seat squab. Depending on trim level, some vehicles also have a folding tray attached to the rear of the squabs.

Rear Seats

The following options are available for the two outer rear seats with regard to temperature control:

- Non-heated seats.
- Heated seats.
- Climate seats.

Operation of the temperature settings for heated and climate seats is controlled from the rear climate control panel and the Climate / Rear Climate / Rear Seats menu of the TSD.

Published: 11-May-2011

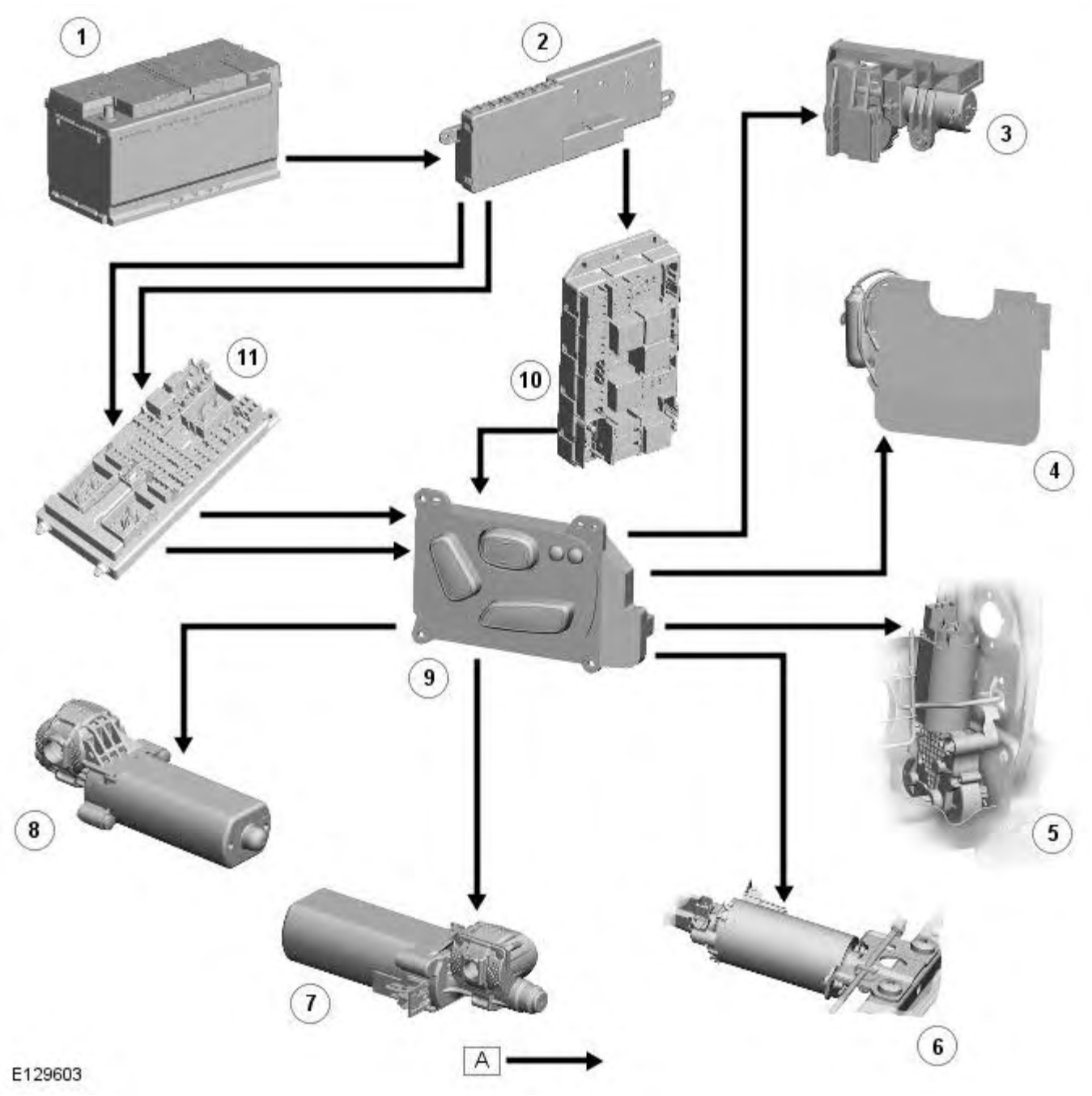
Seating - Seats - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: A = Hardwired; N = medium speed CAN (controller area network) bus; O = LIN (local interconnect network) bus.

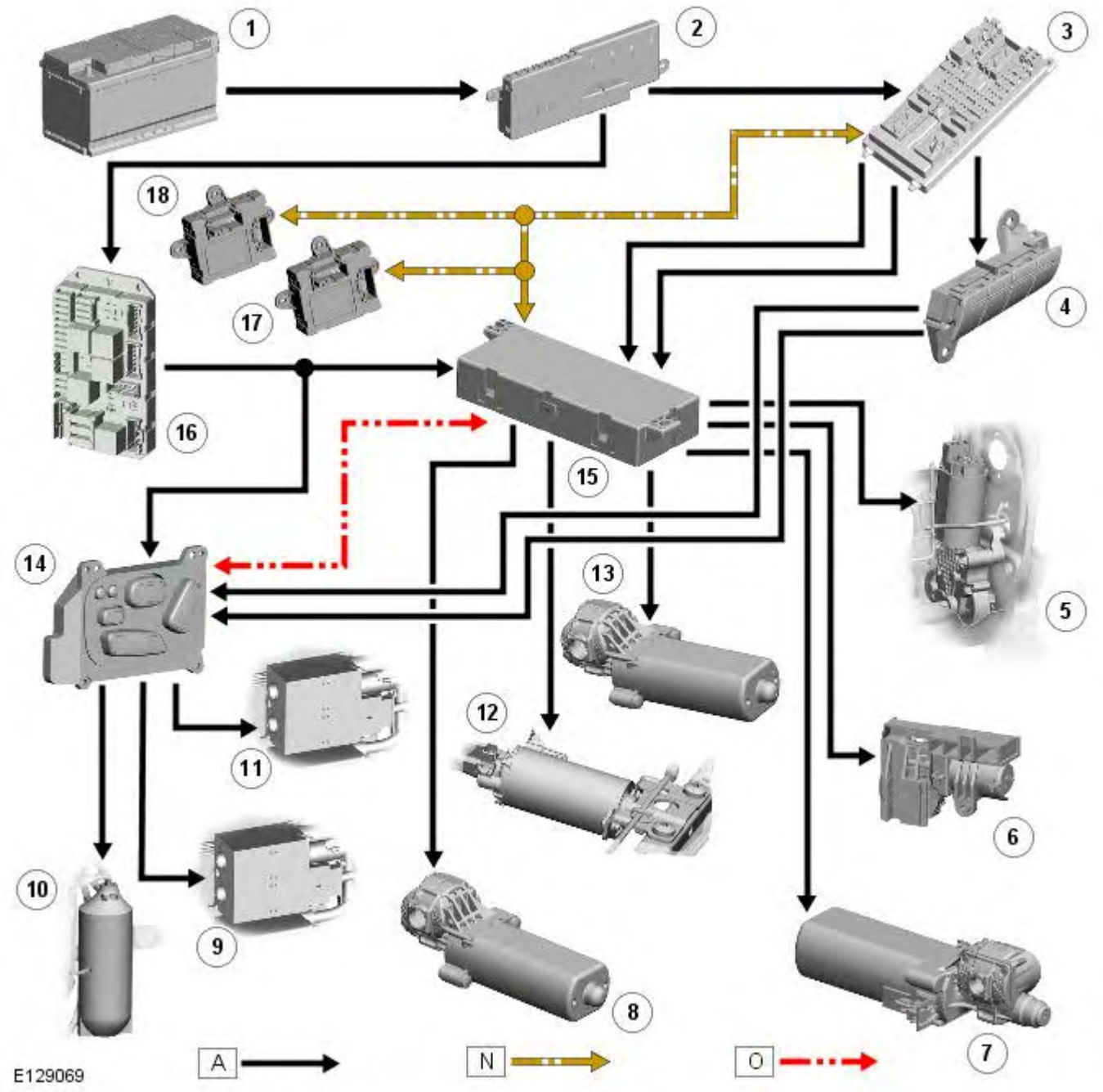
ADJUSTMENT - NON-MEMORY FRONT SEAT



Item	Description
1	Battery
2	BJB (battery junction box)
3	Head restraint motor
4	2-way lumbar adjustment
5	Squab recline motor

6	Seat slide motor
7	Cushion tilt motor
8	Seat height motor
9	Seat switch pack
10	RJB (rear junction box)
11	CJB (central junction box)

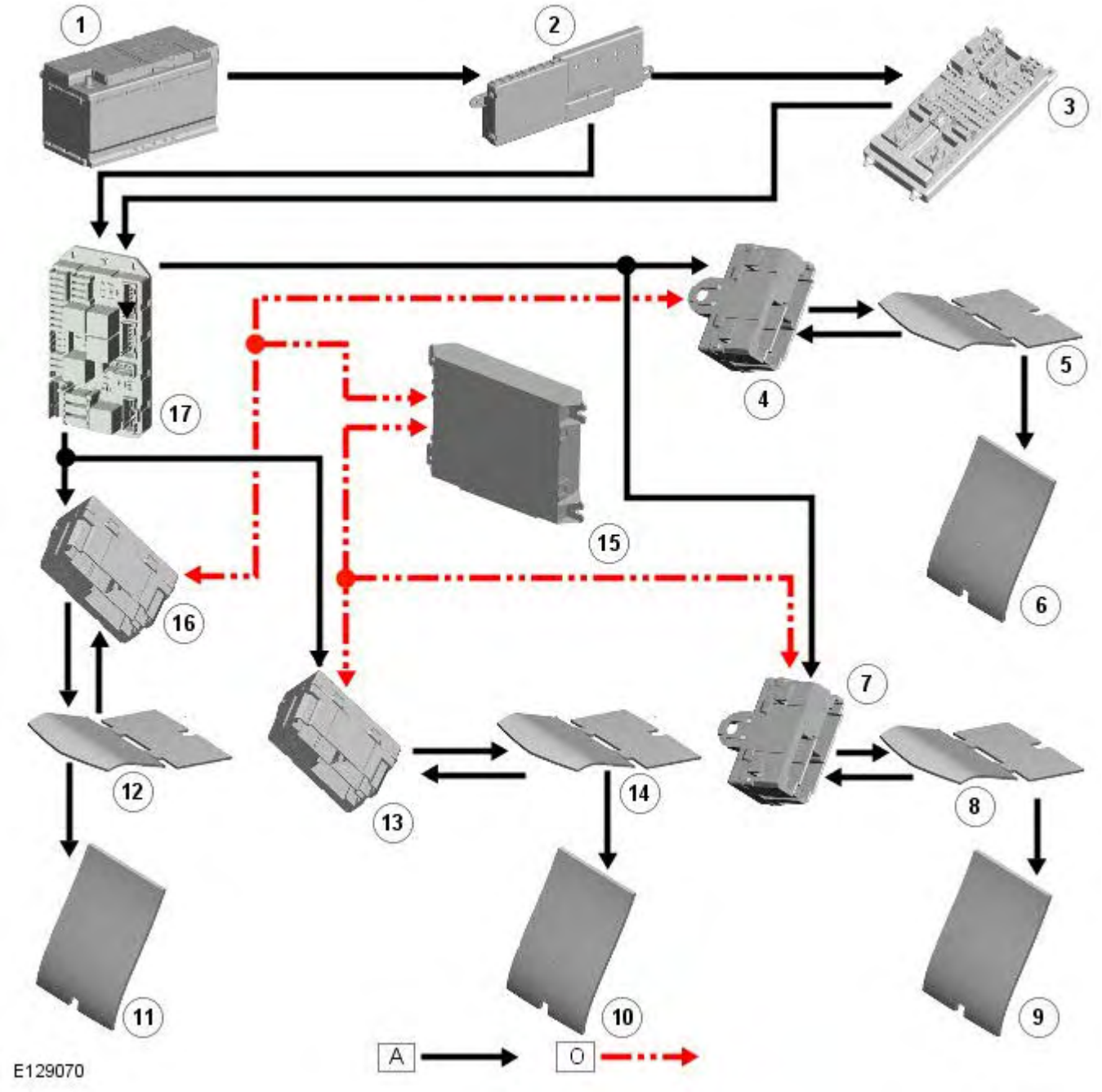
ADJUSTMENT - MEMORY FRONT SEAT



Item	Description
1	Battery
2	BJB
3	CJB
4	Seat memory switches
5	Squab recline motor
6	Head restraint motor

7	Cushion tilt motor
8	Seat height motor
9	Lumbar adjustment solenoids
10	Air pump
11	Squab bolster adjustment solenoids
12	Seat slide motor
13	Cushion extension motor
14	Seat switch pack
15	Driver seat module
16	RJB
17	LH (left-hand) door module
18	RH (right-hand) door module

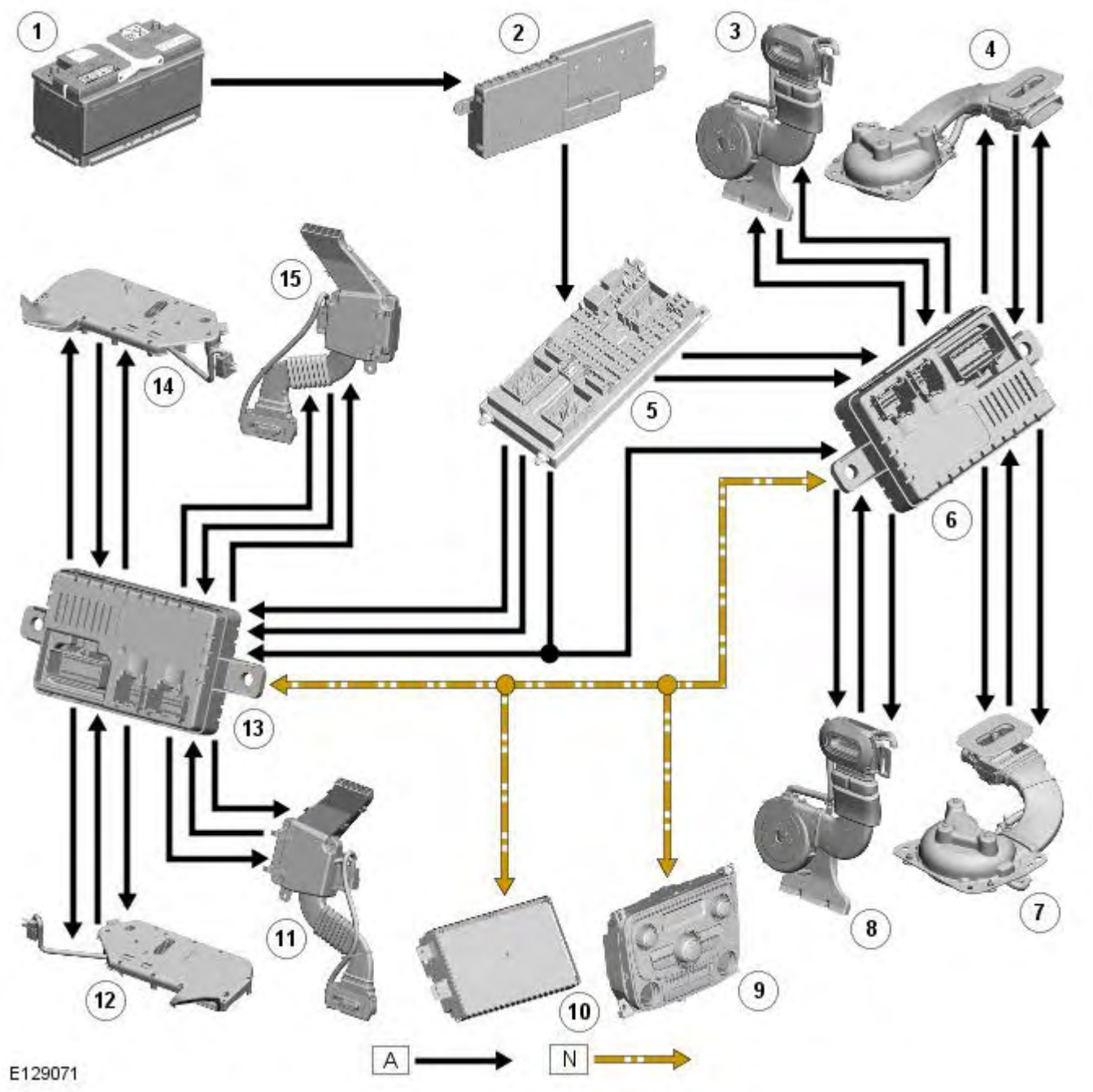
HEATED SEATS



Item	Description
1	Battery
2	BJB
3	CJB
4	Rear RH seat heater module
5	Rear RH cushion heater
6	Rear RH squab heater
7	Rear LH seat heater module
8	Rear LH cushion heater
9	Rear LH squab heater
10	Front LH squab heater
11	Front RH squab heater
12	Front RH cushion heater
13	Front LH seat heater module
14	Front LH cushion heater
15	ATC (automatic temperature control) module
16	Front RH seat heater module
17	RJB

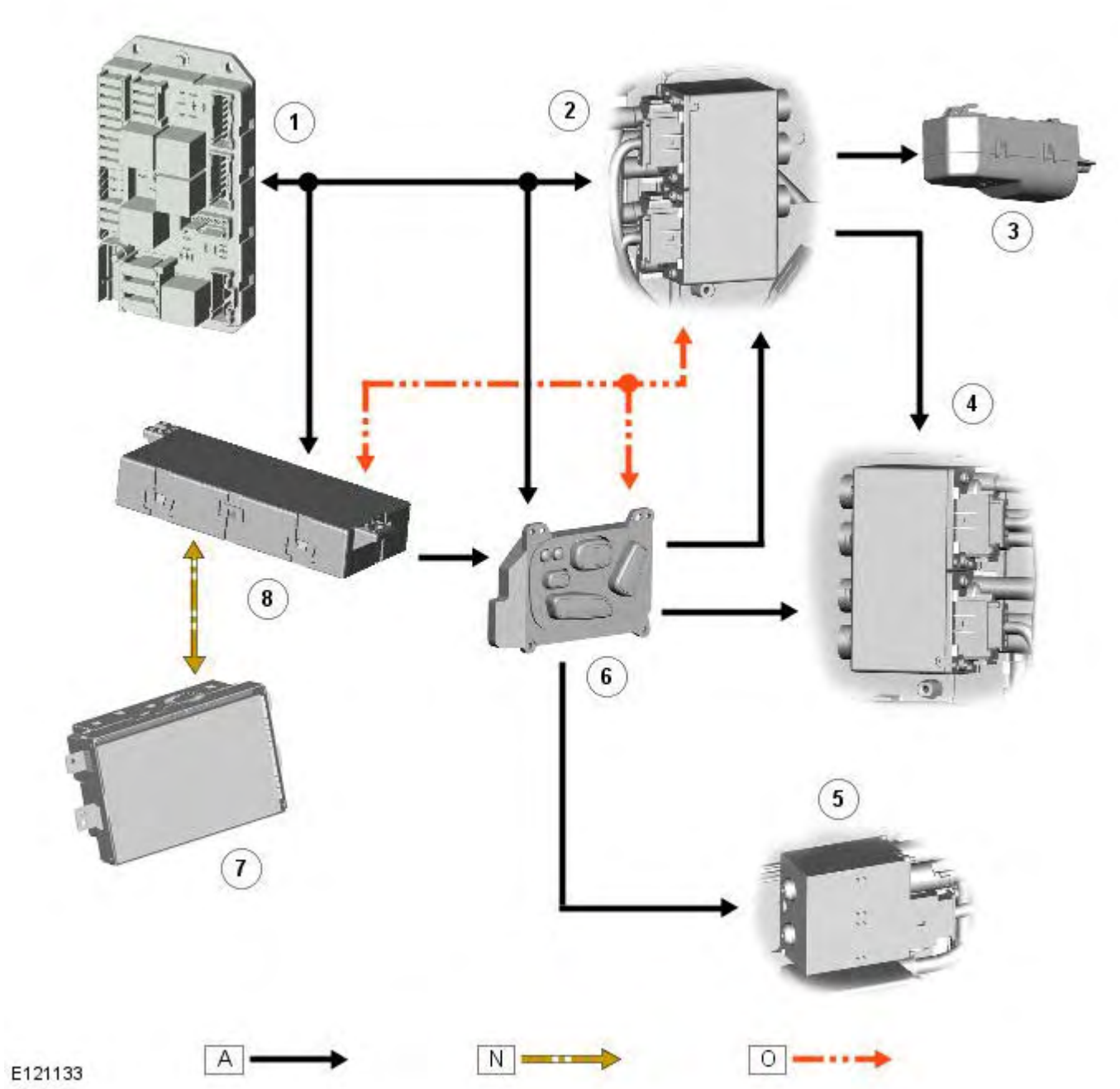
www.JagDocs.com

CLIMATE SEATS



Item	Description
1	Battery
2	BJB
3	Front RH seat squab climate module
4	Front RH seat cushion climate module
5	CJB
6	Front seat climate control module
7	Front LH seat cushion climate module
8	Front LH seat squab climate module
9	Rear climate control panel
10	TSD (touch screen display)
11	Rear RH seat squab climate module
12	Rear RH seat cushion climate module
13	Rear seat climate control module
14	Rear LH seat cushion climate module
15	Rear LH seat squab climate module

SEAT MASSAGE



Item	Description
1	RJB
2	Master massage solenoid
3	Air pump
4	Slave massage and adjustable bolster solenoid
5	Lumbar solenoid
6	Seat switch pack
7	Touch-screen
8	Seat module

PRINCIPLES OF OPERATION

FRONT SEATS

Adjustment - Non-memory Seats

On non-memory front seats, each seat switch pack receives three permanent power supplies; two from the CJB and one from the RJB. The power supplies from the CJB are used to operate the adjustment motors. The power supply from the RJB is used to operate the air pump and associated solenoid valves.

For the adjustment motors, when a switch is operated power is connected to the applicable side of the related motor and a ground is connected to the opposite side of the motor, which then runs in the required direction. To move the motor in the opposite direction the polarity is reversed.

When the lumbar inflate switch is pressed, power is connected to the air pump to inflate the support. When the deflate switch is pressed, power is connected to the deflate solenoid valve, which opens to deflate the support.

Adjustment - Memory Seats

On memory front seats, the seat module receives three permanent power supplies; two from the CJB and one from the RJB. The power supplies from the CJB are used to operate the adjustment motors. The power supply from the RJB is used to operate the seat module.

Permanent power supplies are also connected from the CJB to the memory switch pack and from the RJB to the seat switch pack.

The seat switch pack is connected to the seat module by a LIN bus for the seat adjustment switches. Any selection for seat adjustment generates a message which is passed via the LIN bus to the seat module. The seat module processes the request and operates the applicable seat motor as required using the power supplies from the CJB.

The seat module on the driver seat is also connected to the medium speed CAN bus. This allows the driver seat module to monitor the position of the door mirrors and the steering column, using signals from the door modules and CJB respectively, when storing and recalling memory settings.

The memory switch pack has two hardwired connections with the related seat switch pack. One is for the three channel switches and one is for the memory switch. Operation of the any of the memory switches is relayed from the seat switch pack to the seat module on the LIN bus.

Memory settings are stored in the seat module by pressing the memory switch and then, within 5 seconds, one of the channel switches. When the memory switch is pressed the LED (light emitting diode) in the switch comes on. After the channel switch is pressed, the LED goes off and a chime sounds to confirm that the settings have been memorized. If the ignition is on, the message center will display a confirmation message. Any previously stored settings on the selected channel will be over-written.

Memory settings are recalled by pressing the applicable channel switch. If the ignition is on, the message center will display a confirmation message.

On seats with 2-way lumbar adjustment, when the inflate switch is pressed power is connected to the air pump to inflate the support. When the deflate switch is pressed, power is connected to the deflate solenoid valve, which opens to deflate the support.

On seats with 4-way lumbar adjustment and bolster adjustment, when an inflate switch is pressed, power is simultaneously connected to the air pump and the related inflate solenoid valve. When a deflate switch is pressed, power is connected to the related deflate solenoid valve, which opens to deflate the support. On vehicles with massage seats, power is connected to the inflate and deflate solenoid valves in the same way, but when an inflate selection is made the air pump is activated by a LIN bus message to the master solenoid valve, which then operates the air pump.

Stall Detection

A seat adjustment motor is deemed to have stalled if there is no change in the input from the feedback sensor of the motor for 200 ms. If a stall condition is detected then the drive to that motor is cancelled for the remainder of the memory recall operation or until the switch is re-selected (manual movement). The motor may be activated again, to move past the stall position, by pressing the appropriate switch for more than 2 seconds. If sensor feedback is detected, then the motor will continue to be driven until the switch is released. If sensor feedback is not detected, then the motor is only driven for 0.5 second and then stops until the switch is released and pressed again, when a further 0.5 second of activation is permitted. This is known as inch mode, which allows seat adjustment to be maintained if sensor feedback is lost.

Initialization

When a replacement seat module is fitted, it should be calibrated using Jaguar approved diagnostic equipment so that the module can learn the positions of the adjustment motors.

Battery Monitor

If the battery voltage drops below 10.5 V, then the driver seat module ignores all requests for a memory recall until the battery voltage has reached 11.5 V. This will conserve as much power in the vehicle battery as possible to enable engine cranking.

Massage Seats

Seat massage requests from the START / STOP buttons on the TSD are sent via the medium speed CAN bus to the appropriate seat module. The seat module processes the requests and transmits them to the master massage solenoid on the LIN bus

connection.

When a START button is pressed, the master massage solenoid operates the relevant master and slave solenoid valves and activates the pump. The massage function operates in 10 minute cycles. After a 10 minute cycle is complete the user must re-select the function if a further 10 minute cycle is required.

When a STOP button is pressed, the 10 minute cycle is completed, or the ignition is switched off, the solenoid valves are opened to deflate the massage cells and the air pump turned off.

During operation the bottom cell pair inflate and then deflate. As the first cell pair are deflating the second cell pair start to inflate. This sequence is repeated for all five cell pairs, from cell pair one at the bottom to cell pair five at the top. Cell inflation time, which varies between cell pairs, is as follows:

- Cell pair one - 3 seconds.
- Cell pair two - 2.6 seconds.
- Cell pair three - 2.8 seconds.
- Cell pair four - 2.2 seconds.
- Cell pair five - 1.6 seconds.

Anti-whiplash System

Depending on the weight of the occupant and the severity of the collision, the mechanisms begin to operate at a relative impact speed of between approximately 8.7 and 11.2 mph (13.9 and 17.9 km/h). At the point of a rear impact, the forward energy of the impact and the inertia of the occupant combine to push the backrest against the occupant's back. That causes the AWS mechanism to begin a controlled sequence of movements. First, while remaining in an upright position, the backrest moves rearwards by approximately 50 mm. Next, the backrest reclines through an angle dependant upon the direction and relative speed of the collision, up to a maximum of approximately 15 degrees.

The combined effect of these movements is to absorb some of the energy of the impact and reduce the relative acceleration of head and body, thereby helping to reduce the possibility of whiplash injury.

HEATED SEATS

The heater elements only operate when the engine is running. Power for the heater elements is supplied to the seat heater modules from the heated seat relay in the RJB, which is controlled by a hardwired ignition signal from the CJB.

Seat heating selections made on the TSD and the rear climate control panel are transmitted to the ATC module.
Refer to: Heating and Ventilation (412-01 Climate Control, Description and Operation).

When the ATC module receives a seat heating request, it sends a LIN bus message to the appropriate seat heater module to energize the heater elements in the cushion and the squab. The seat heater module relays the temperature signal, from the thermal sensor in the cushion heater element, back to the ATC module. The ATC module uses the temperature signal to regulate the heater elements at the selected heat setting.

CLIMATE SEATS

The heating/cooling of the climate seats only operates when the engine is running. Power for the climate modules is supplied to the climate seat control modules by two permanent power supplies from the CJB. The climate seat control modules also receive a power supply from the ignition relay in the CJB.

Heating/Cooling selections on the TSD and the rear climate control panel are transmitted to the appropriate climate seat control module on the medium speed CAN bus. The climate seat control module then energizes the Peltier cell and the blower of the climate module(s) in the appropriate seat. The climate seat control module uses the signals from the temperature sensors in the squab and the cushion climate modules to regulate the seat at the selected temperature. If full seat heating/cooling is selected, both the squab and the cushion climate modules are activated. If partial seat heating/cooling is selected, only the squab climate module is activated.

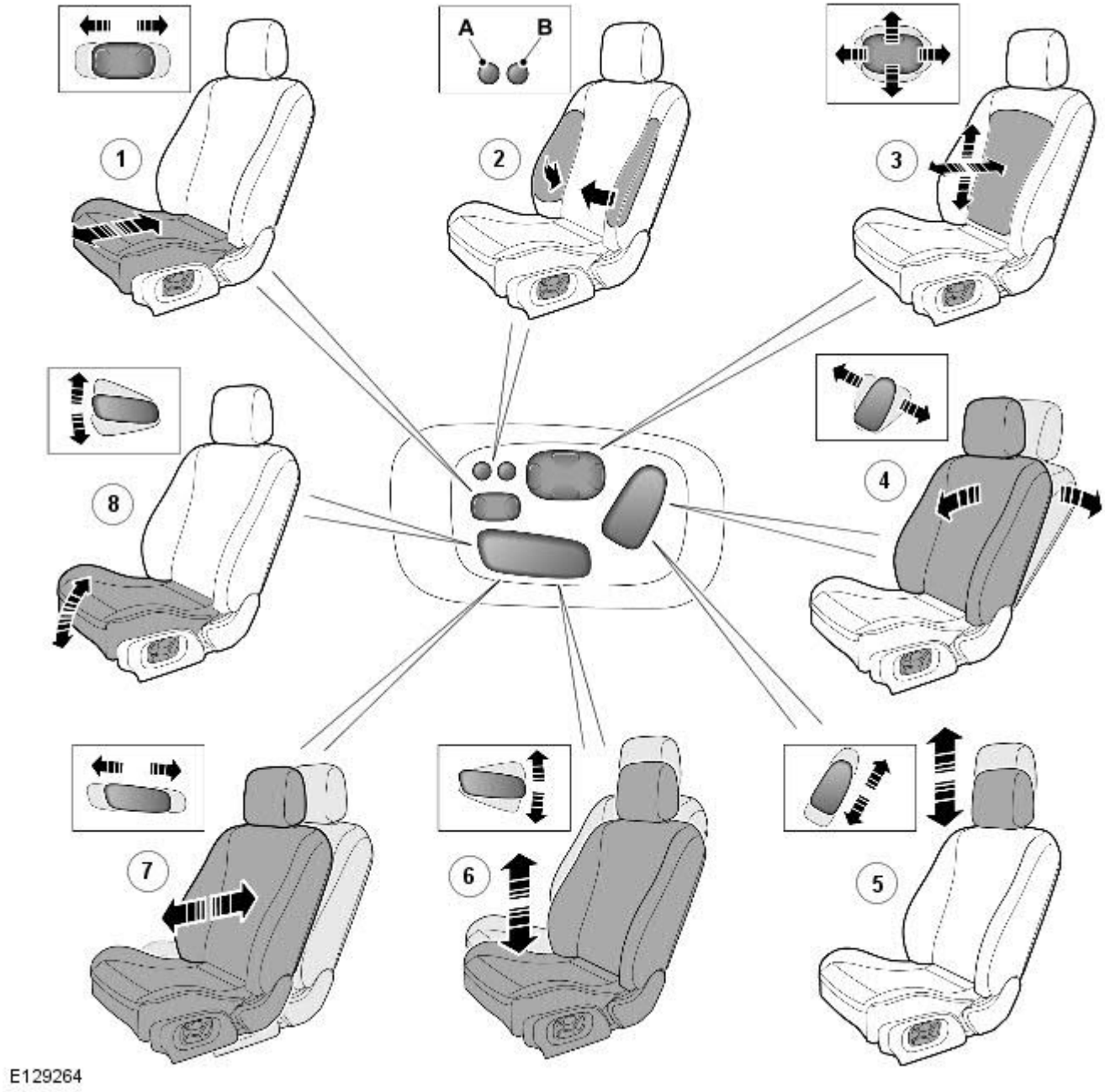
Component Description

FRONT SEATS ADJUSTMENT

Electric motors are used to provide adjustment of seat slide, seat height, squab recline and, where fitted, cushion tilt, head restraint and cushion extension. An air pump and inflatable cushions are used to provide adjustment of the lumbar support and the squab bolster supports (where fitted).

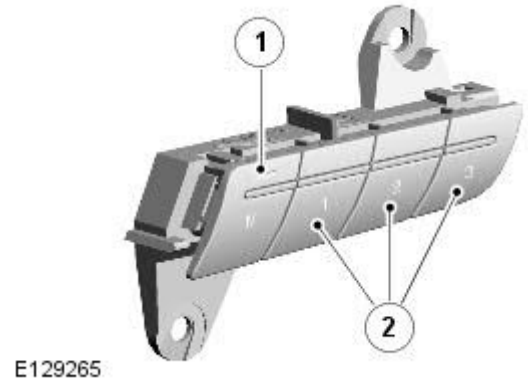
All of the seat adjustments are controlled from the seat switch pack on the outside of the seat cushion. On non memory seats, the control switches are connected directly to the adjustment motors. On memory seats, the switches are connected to the adjustment motors via a seat control module. Memory seats also have a memory switch pack in the related door panel.

Adjustment Switches



Item	Description
1	Cushion extension
2A	Bolster inflate
2B	Bolster deflate
3	Lumbar support (4-way shown; 2-way uses only fore/aft positions for inflate/deflate)
4	Squab recline
5	Head restraint
6	Seat height
7	Seat slide
8	Cushion tilt

Memory Switch Pack



Item	Description
1	Channel switches
2	Memory switch

Seat Motors

Each adjustment motor contains a Hall position sensor. The sensors provide position feedback signals which, on seats with a memory function, are used for memory store and recall operation.

The seat slide motor is an integral component of the cushion frame. The motor drives a gear on a worm drive lead screw, which is integral with the floor rail. The lead screw has a stop at each end to limit the fore and aft seat movement.

The seat height motor is located below the seat. The motor drives a gear on a lead screw. The lead screw moves a lever mechanism, which raises or lowers the seat cushion.

The squab recline motor is located in the squab frame. The recline motor rotates a shaft connected to the squab frame, which changes the angle of the squab.

The tilt motor is located below the seat. The tilt motor drives a gear on a lead screw to raise the front of the seat cushion.

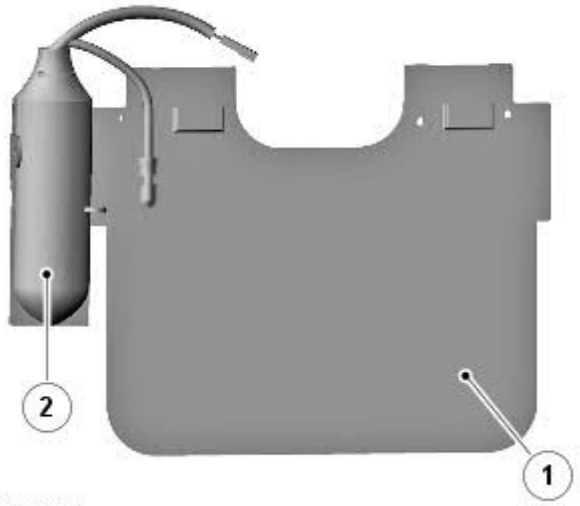
The head restraint motor is located in the upper section of the squab frame and is accessible by removal of the seat back. The motor moves a cradle by a rack and pinion arrangement. The cradle has two head restraint stems, which raise and lower the head restraint as the motor moves the cradle.

The cushion extend motor is located below the seat. The motor drives a gear on a lead screw, which extends or retracts the front of the seat cushion.

Lumbar Adjustment

Lumbar adjustment is provided by a lumbar support and air pump installed in the squab. The lumbar support consists of an inflatable cushion with either a single air cell (2-way lumbar support) or dual air cells (4-way lumbar support), depending on vehicle specification. On vehicles with massage seats, the dual cell lumbar support is operated by the air pump of the massage system.

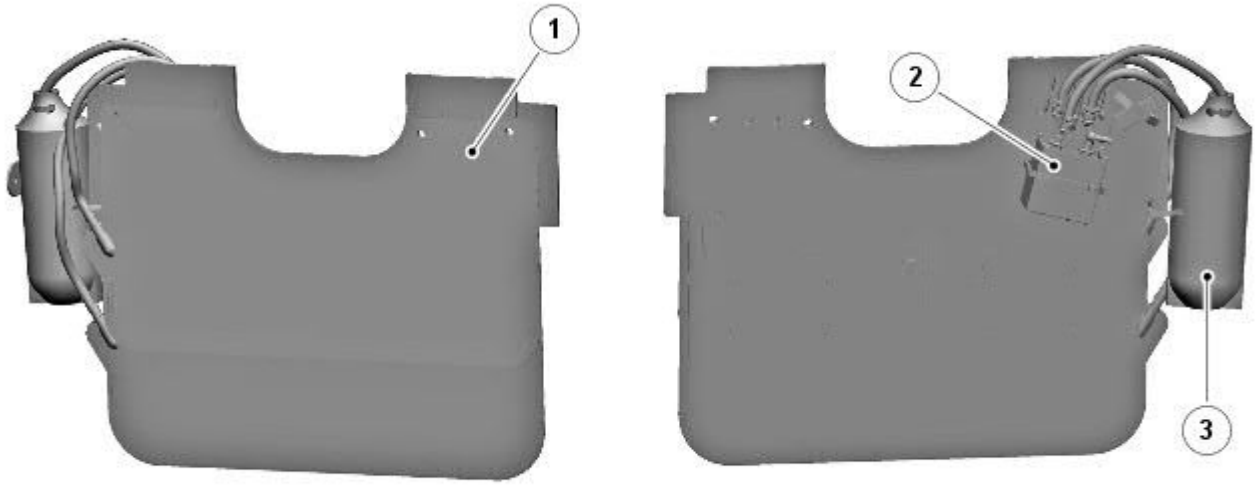
2-way Lumbar Support



E129267

Item	Description
1	Lumbar support
2	Air pump

4-way Lumbar Support

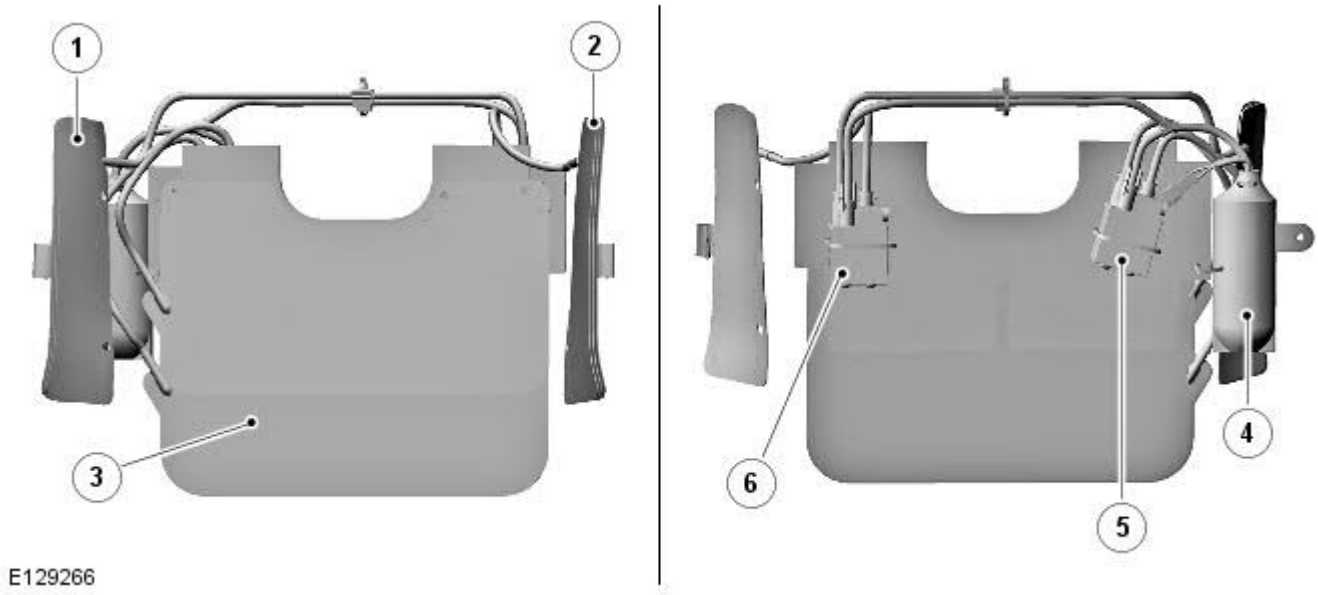


E129268

Item	Description
1	Lumbar support
2	Solenoid valves
3	Air pump

Squab Bolster Adjustment

Squab bolster adjustment is provided by inflatable cushions on the inside faces of the squab bolsters. The inflatable cushions are operated simultaneously by a solenoid valve block and the air pump of the lumbar support or the massage seat system. On vehicles with massage seats, the squab bolster solenoid valves are incorporated into the valve block containing the slave massage solenoid valves.



E129266

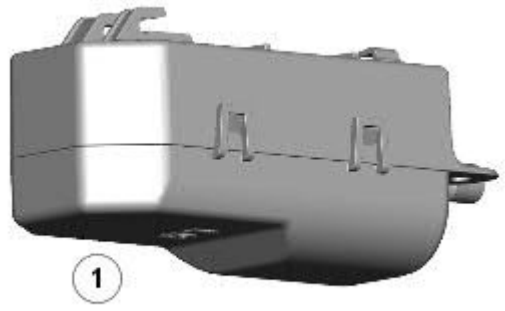
Item	Description
1	RH squab bolster support
2	LH squab bolster support
3	4-way lumbar support
4	Air pump
5	Lumbar support solenoid valves
6	Squab support solenoid valves

MASSAGE SEATS

Where fitted, the massage system in each seat consists of an air pump, air cell pads, master and slave solenoid valve blocks. The air pump is also used for adjustment of the lumbar and squab bolster supports. The slave solenoid block also incorporates the solenoid valves used to control the squab bolster supports.

Operation of the massage system is controlled with START and STOP buttons on the climate menu of the TSD and is independent of the lumbar and squab bolster adjustments.

Air Pump



E121128

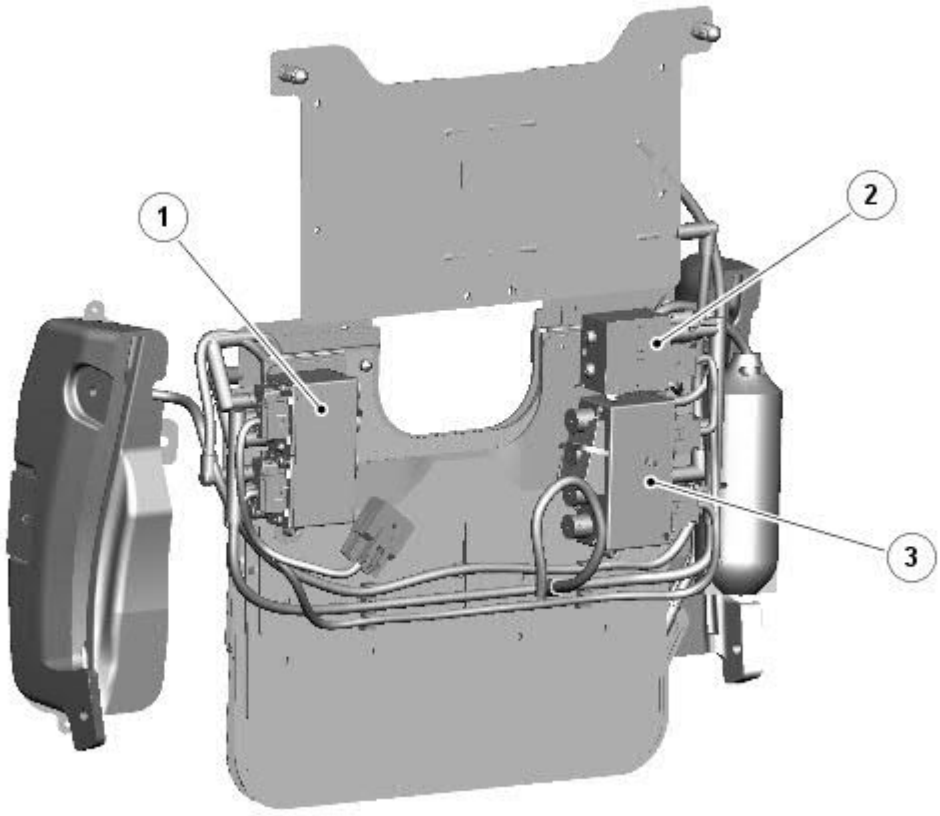
Item	Description
1	Air pump

The air pump is located underneath the seat at the rear of the squab. The pump is housed inside a NVH (noise, vibration and harshness) casing to cut down the pump operation sound level. Operation of the air pump is controlled by the master solenoid valve block.

The maximum pump pressure is controlled by a pressure relief valve in the lumbar solenoid valve block. The maximum pressure range is 310.5 to 379.5 mbar (4.5 to 5.5 lbf/in^2.).

A thermal protection device in the air pump stops pump operation if the temperature increases to 72±4 °C (162±7 °F). The pump will not re-start until 10 minutes after the temperature decreases below the cut-off temperature.

Solenoid Valves

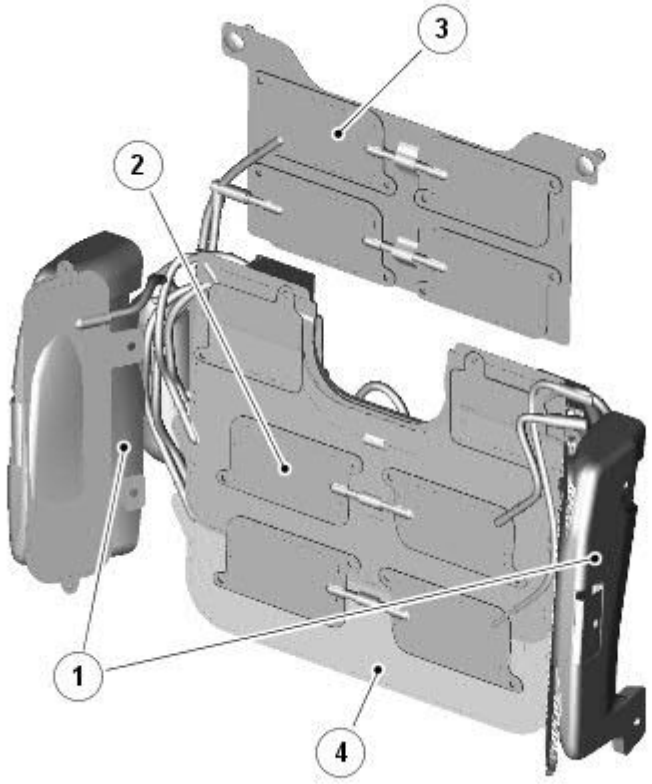


E121129

Item	Description
1	Master massage solenoid valves
2	Lumbar solenoid valves
3	Slave massage and adjustable bolster solenoid valves

The master and slave solenoid valve blocks control the air supply to the massage air cells. During air cell deflation excess air is exhausted to atmosphere through the relevant solenoid valve block exhaust port.

Air Cell Pads



E121130

Item	Description
1	Squab bolster cells (2 off)
2	Lower massage cells (3 pairs)
3	Upper massage cells (2 pairs)
4	Lumber cells (2 off)

The massage air cells are located in two pads in the front of the seat squab. The lower pad contains three separate pairs of cells, the upper pad contains two separate pairs of cells.

During operation the pressure of the air cells is approximately 207 to 379 mbar (3 to 5.5 lbf/in^2.). This variation is due to the inflate time given to each air cell, the flow rate of the pump and the maximum pressure of the system.

HEATED SEATS

Heated seats incorporate heater elements in the cushion and the squab of the seat. Power to the heater elements of the front seats is controlled by two seat heater modules attached to a bracket on the cabin floor, under the carpet at the front left corner of the LH front seat. Power to the heater elements of the two outside rear seats is controlled by two seat heater modules attached to a bracket on the back of the rear seat squab.

Each cushion heater element has a thermal sensor, which supplies a feedback temperature signal to the related seat heater module. The squab heater elements do not have a thermal sensor, and are regulated at the same temperature as the cushion heater elements.

Seat heating for the front and rear seats can be selected on the climate menu of the TSD. Seat heating for the rear seats can also be selected on the rear climate control panel. Three levels of heating are available. Heating can also be selected for either the cushion and the squab or just the squab.

CLIMATE SEATS

Climate seats incorporate climate modules in the cushion and the squab of the seat. Operation of the climate modules of the front seats is controlled by a climate seat control module attached to a bracket on the cabin floor, under the carpet at the front left corner of the LH front seat. Operation of the climate modules of the two outside rear seats is controlled by a climate seat control module attached to the body, behind the of the rear seat squab.

The climate modules contain Peltier cells, which heat up or cool down depending on the voltage provided by the climate seat control module. Each climate module also contains a blower, which blows air over the Peltier cell to distribute the heated or cooled air through liners in the related cushion or squab. The blower is also controlled by the climate seat control module.

Seat heating and cooling for the front and rear seats can be selected on the climate menu of the TSD. Seat heating and

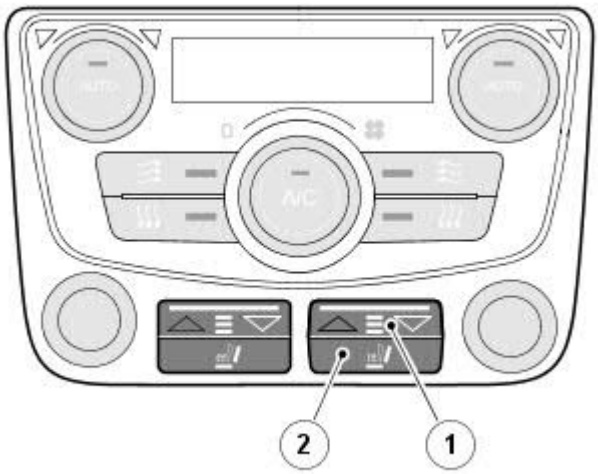
cooling for the rear seats can also be selected on the rear climate control panel. Three levels of heating and three levels of cooling are available. Heating and cooling can also be selected for either the cushion and the squab, or just the squab.

Touch Screen Display

E129269

Item	Description
1	Temperature control buttons
2	Zone control button
3	Massage control buttons

Rear Climate Control Panel



E129270

Item	Description
1	Temperature control switch
2	Zone control switch

Published: 15-Mar-2013

Seating - Seats

Diagnosis and Testing

Principle of Operation

For a detailed description of the seats and seat operation, refer to the relevant Description and Operation section in the workshop manual. REFER to: (501-10 Seating)

Seats (Description and Operation),
Seats (Description and Operation),
Seats (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTE: Prior to carrying out any diagnosis, ensure the vehicle battery is in a good serviceable condition, refer to the battery care manual.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Security, condition and correct installation of seat components and fixings	• Fuses • Harnesses for damage/corrosion • Electrical connectors • Damaged/corroded pins

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the concern and refer to the Symptom Chart, alternatively, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
No seat movement from switch pack (including no memory recall)	• Seat module has gone into sleep mode • Seat switch pack LIN, power or ground circuit - open circuit • Seat switch pack LIN circuit - short to power, ground	Set ignition ON. Re-check seat function from switch pack. Check for DTC B1A9887 and refer to DTC Index. Check for DTC B1A9888 and refer to DTC Index
No seat movement or lumbar movement from switch pack (including no memory recall)	NOTE: Seat module does not control the seat lumbar function • Seat switch pack power or ground supply circuits - open circuit	Refer to the electrical circuit diagrams and check seat switch pack power and ground supply circuits for open circuit
Seat movement and lumbar movement from switch pack is ok, however, no recall from memory switch pack	• Seat switch pack to memory switch pack circuits - short, open circuit	NOTE: Memory switch pack is separate switch hardwired to seat adjust switch Refer to the electrical circuit diagrams and check seat switch pack to memory switch pack circuits for short, open circuit

Symptom	Possible Cause	Action
Seat movement and memory recall works correctly however seat lumbar is not working correctly	NOTE: Seat module does not control the seat lumbar function • Seat movement switch to lumbar circuits - short, open circuit	Refer to the electrical circuit diagrams and check seat movement switch to lumbar circuits for short, open circuit
Seat movement from switch pack occurs in delayed inch mode (seat axis moves short distance when switch pressed for longer than 2 seconds and then stops). This behaviour could occur on any seat axis (slide, height, squab, tilt, headrest or cushion) when requested	• Motor Hall sensor on affected axis is not connected or not receiving expected signals	Check for DTCs, B1B8731, B1B9131, B1B8931, B1B9331, B106331, B106431. If present then check Hall sensor feedback circuits between seat motor and seat module and also check Hall sensor ground circuits for affected axis. These DTCs are only logged if the axis is attempted to be moved in both directions. When hall sensor connection issue fixed press switch on affected axis for longer than 2 seconds. By keeping the switch pressed the axis movement should now operate for the duration of switch-press. Re-calibrate affected seat
Seat movement from switch pack occurs in inch mode. When seat axis movement is requested from the seat switch pack the requested seat axis moves a short distance then stops (does not include lumbar). This behaviour will occur on ALL seat axis (slide, height, squab, tilt headrest and cushion) when requested. MS CAN communication not possible	• MS CAN fault	Carry out CAN network integrity test using manufacturer approved diagnostic system
Seat movement from switch pack occurs in inch mode. When seat axis movement is requested from the seat switch pack the requested seat axis moves a short distance then stops (does not include lumbar). This behaviour will occur on ALL seat axis (slide, height, squab, tilt headrest and cushion) when requested. MS CAN communication not possible	• Seat module is disconnected from the CAN Bus	Check for Instrument Cluster DTC U020800 'Lost Communication With Seat Module'. If this DTC is present, refer to the electrical circuit diagrams and check seat module power and ground supplies for short, open circuit. Carry out CAN network integrity tests using the manufacturer approved diagnostic system
Seat movement from switch pack occurs in inch mode. When seat axis movement is requested from the seat switch pack the requested seat axis moves a short distance then stops (does not include lumbar). This behaviour will occur on ALL seat axis (slide, height, squab, tilt headrest and cushion) when requested. MS CAN communication not possible	• Instrument cluster is disconnected from the CAN Bus	Check for seat module DTC U015500 'Lost Communication With Instrument Cluster'. If this DTC is present, refer to the electrical circuit diagrams and check instrument cluster power and ground supplies for short, open circuit. Carry out CAN network integrity tests using the manufacturer approved diagnostic system
Seat movement from switch pack occurs in inch mode. When seat axis movement is requested from the seat switch pack the requested seat axis moves a short distance then stops (does not include lumbar). This behaviour will occur on ALL seat axis (slide, height, squab, tilt headrest and cushion) when requested. MS CAN communication not possible	• Driver Door Module is disconnected from the CAN Bus	Check for seat module DTC U019900 'Lost Communication With Driver Door Module'. If this DTC is present, refer to the electrical circuit diagrams and check driver door module power and ground supplies for short, open circuit. Carry out CAN network integrity tests using the manufacturer approved diagnostic system
Seat movement from switch pack occurs in inch mode. When seat axis movement is requested from the seat switch pack the requested seat axis moves a short distance then stops (does not include lumbar). This behaviour will occur on ALL seat axis (slide, height, squab, tilt headrest and cushion) when requested. MS CAN communication not possible	• Rear Junction Box (RJB) is disconnected from the CAN Bus	Check for seat module DTC U014200 'Lost Communication With RJB'. If this DTC is present, refer to the electrical circuit diagrams and check RJB power and ground supplies for short, open circuit. Carry out CAN network integrity tests using the manufacturer approved diagnostic system
Seat movement from switch pack occurs in inch mode. When seat axis movement is requested from the seat switch pack the requested seat axis moves a short distance then stops (does not include lumbar). This behaviour will occur on ALL seat axis (slide, height, squab, tilt headrest and cushion) when requested. MS CAN communication not possible	• Central Junction Box (CJB) is disconnected from the CAN Bus	Refer to the electrical circuit diagrams and check CJB power and ground supplies for short, open circuit. Carry out CAN network integrity tests using the manufacturer approved diagnostic system

Symptom	Possible Cause	Action
NOTE: Electric passenger seat can always be activated – there is no passenger seat module installed to this vehicle Seat module does not go to sleep. Seat movement is always active from driver seat switch pack	• Seat module is in manufacturing mode	NOTE: A new module is NOT required to be installed, only the module replacement routine needs to be performed. This will set the PID required to disable manufacturing mode Seat module needs to be configured for customer mode. Check for DTC U1A4C68 'Build/End of Line mode Active'. If this DTC is present then configure for customer mode by running 'New Seat Module Replacement' application for the affected seat using the manufacturer approved diagnostic system
Front seat fore/aft movement not functioning	• Carry out the pinpoint test associated to this Symptom	GO to Pinpoint Test A.
Front seat excessive fore/aft free play	• Carry out the pinpoint test associated to this Symptom	GO to Pinpoint Test B.
Front seat fore/aft movement noisy	• Carry out the pinpoint test associated to this Symptom	GO to Pinpoint Test C.
Front seat height, tilt and/or seat extension motor movement not functioning	• Carry out the pinpoint test associated to this Symptom	GO to Pinpoint Test D.
Front seat height, tilt and/or extension movement noisy	• Carry out the pinpoint test associated to this Symptom	GO to Pinpoint Test E.

DTC Index

For a complete list of all diagnostic trouble codes that could be logged on this vehicle, please refer to Section 100-00. REFER to: (100-00 General Information)

Diagnostic Trouble Code (DTC) Index - DTC: Driver/Passenger Seat Module (DSM/PSM) (Description and Operation), Diagnostic Trouble Code (DTC) Index - DTC: Climate Controlled Seat Module - Front/Rear (SCME/SCMF) (Description and Operation).

Pinpoint Tests

PINPOINT TEST A : FRONT SEAT FORE/AFT MOVEMENT NOT FUNCTIONING	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: CHECK FOR FRONT SEAT FORWARD-REARWARD SEAT MOTOR OPERATION	
	WARNING: Before work is carried out, make the air bag supplemental restraint system safe. For additional information, refer to Standard Workshop Practices section of workshop manual. 1 Set ignition status to ' ON'.
	2 From the switch pack, operate the front seat forward-rearward seat motor switch and listen for evidence of the motor operating.
	Does the motor operate? **Yes** GO to A2. **No** GO to A3.
A2: CHECK FRONT SEAT FORWARD-REARWARD SEAT MOTOR DRIVE BAR	
	1 Check front seat drive bar for correct installation and condition

	Is the front seat drive bar correctly installed and in a serviceable condition? **Yes** Re-check for correct front seat forward-rearward movement. Remove seat to allow for further investigation if required. **No** Correctly install front seat forward-rearward seat motor drive bar, or replace if required.

A3: CHECK FRONT SEAT FORWARD-REARWARD SEAT MOTOR

WARNING: When carrying out the following steps, stand clear of all moving parts and ensure link harness is routed accordingly.

	1 Set ignition status to 'OFF'.
	2 Disconnect front seat forward-rearward seat motor connector.
	NOTE: It may be that the seat has been driven to the limit of travel along the relevant axis, and when the link harness is connected, the seat will remain in the same position. If this is the case, a jolt may be felt from the motor. To confirm the motor operation, swap the link harness to alternate motor pin connections and the seat should travel in the opposite direction. 3 Using a locally made fused link harness and power supply, connect power and ground to forward-rearward seat motor. **Battery positive terminal** / **Battery negative terminal** forward-rearward seat motor pin 1 / forward-rearward seat motor pin 2
	Does the motor operate? **Yes** Using manufacturer approved diagnostic system, check for related Diagnostic Trouble Codes (DTCs) and carry out the repair operations specified. Alternatively, refer to the electrical circuit diagrams and check front seat forward-rearward seat motor circuits. **No** Replace front seat forward-rearward seat motor. Refer to relevant section of workshop manual.

PINPOINT TEST B : FRONT SEAT EXCESSIVE FORWARD-REARWARD FREE PLAY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: CHECK FRONT SEAT FOR EXCESSIVE FORWARD-REARWARD FREE PLAY	
	WARNING: Before work is carried out, make the air bag supplemental restraint system safe. For additional information, refer to Standard Workshop Practices section of workshop manual. 1 Check all accessible front seat frame fixings are installed and to the correct torque.
	Are all accessible front seat frame fixings installed and to the correct torque? **Yes** GO to B2. **No** Install and tighten all accessible front seat frame fixings to correct torque and re-check for excessive free play.
B2: COMPARE THE FRONT SEAT FORWARD-REARWARD FREE PLAY AGAINST A SIMILAR SEAT	
	1 Compare the front seat forward-rearward free play against a similar seat.
	Is the front seat forward-rearward free play excessive when compared to a similar seat? **Yes** GO to B3. **No** The front seat frame is operating correctly. Submit Electronic Product Quality Report (EPQR) with any further query.
B3: CHECK REMAINING FRONT SEAT FRAME FIXINGS	
	1 Remove front seat and/or any seat covers/trim to allow access to check remaining front seat frame fixings are all installed and to the correct torque.
	Are all remaining front seat frame fixings installed and to the correct torque? **Yes** Replace front seat frame. Refer to the relevant section of the workshop manual. **No** Install and tighten all remaining front seat frame fixings to correct torque and re-check for excessive free play.

PINPOINT TEST C : FRONT SEAT FORWARD-REARWARD MOVEMENT NOISY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: COMPARE FRONT SEAT FORWARD-REARWARD MOVEMENT NOISE TO OTHER FRONT SEAT	

	WARNING: Before work is carried out, make the air bag supplemental restraint system safe. For additional information, refer to Standard Workshop Practices section of workshop manual. 1 Compare the front seat forward-rearward movement noise to other front seat.
	Is the front seat forward-rearward movement noise excessive when compared to other front seat? **Yes** GO to C2. **No** GO to C3.
C2: COMPARE FRONT SEAT FORWARD-REARWARD MOVEMENT NOISE TO FRONT SEAT IN OTHER VEHICLE	
	1 Compare the front seat forward-rearward movement noise to front seat in other vehicle.
	Is the front seat forward-rearward movement noise excessive when compared to front seat in other vehicle? **Yes** GO to C3. **No** The front seat frame is operating correctly. Submit Electronic Product Quality Report (EPQR) with any further query.
C3: CHECK FOR DEBRIS OBSTRUCTING SEAT MOVEMENT	
	1 Check for debris obstructing seat movement.
	Is the front seat forward-rearward movement obstructed by debris? **Yes** Remove obstruction and re-check for noisy forward-rearward seat movement. **No** GO to C4.
C4: RE-ALIGN FRONT SEAT FRAME	
	1 Loosen front seat frame fixings.
	2 Set ignition status to 'ON'.
	3 Using the front seat switch pack drive the front seat fully forward then fully rearward.
	4 Tighten front seat frame fixings to the correct torque.
	5 Re-check for noisy seat movement.
	Is the front seat forward-rearward movement still noisy? **Yes** GO to C5. **No** The front seat frame is now operating correctly.
C5: CHECK FRONT SEAT FORWARD-REARWARD SEAT MOTOR DRIVE BAR	
	1 Check front seat drive bar for correct installation and condition.
	Is the front seat drive bar correctly installed and in a serviceable condition? **Yes** Replace front seat forward-rearward seat motor. Refer to relevant section of workshop manual. **No** Correctly install front seat forward-rearward seat motor drive bar, or replace if required.

PINPOINT TEST D : FRONT SEAT HEIGHT, TILT AND/OR SEAT EXTENSION MOTOR MOVEMENT NOT FUNCTIONING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: CHECK FRONT SEAT HEIGHT, TILT OR EXTENSION MOTOR	
WARNINGS: Before work is carried out, make the air bag supplemental restraint system safe. For additional information, refer to Standard Workshop Practices section of workshop manual.	
When carrying out the following steps, stand clear of all moving parts and ensure link harness is routed accordingly.	
	1 Set ignition status to ' OFF'.
	2 Disconnect front seat height, tilt or extension motor connector.
	NOTE: It may be that the seat has been driven to the limit of travel along the relevant axis, and when the link harness is connected, the seat will remain in the same position. If this is the case, a jolt may be felt from the motor. To confirm the motor operation, swap the link harness to alternate motor pin connections and the seat should travel in the opposite direction. 3 Using a locally made fused link harness and power supply, connect power and ground to relevant motor.

Battery positive terminal	Battery negative terminal
motor pin 1	motor pin 2

	Does the motor operate? **Yes** Using manufacturer approved diagnostic system, check for related Diagnostic Trouble Codes (DTCs) and carry out the repair operations specified. Alternatively, refer to the electrical circuit diagrams and check relevant motor circuits. **No** Replace the relevant motor. Refer to relevant section of workshop manual.

PINPOINT TEST E : FRONT SEAT HEIGHT, TILT AND/OR EXTENSION MOVEMENT NOISY	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
E1: COMPARE THE HEIGHT, TILT OR EXTENSION MOVEMENT NOISE WITH THE OTHER FRONT SEAT	
	WARNING: Before work is carried out, make the air bag supplemental restraint system safe. For additional information, refer to Standard Workshop Practices section of workshop manual. 1 Compare the front seat movement noise to other front seat.
	Is the front seat height, tilt or extension movement noise excessive when compared to other front seat? **Yes** GO to E2. **No** GO to E3.
E2: COMPARE FRONT SEAT HEIGHT, TILT OR EXTENSION MOVEMENT NOISE TO FRONT SEAT IN OTHER VEHICLE	
	1 Compare the front seat height, tilt or extension movement noise to front seat in other vehicle.
	Is the front seat height, tilt or extension movement noise excessive when compared to front seat in other vehicle? **Yes** GO to E3. **No** The front seat frame is operating correctly. Submit Electronic Product Quality Report (EPQR) with any further query.
E3: CHECK FOR DEBRIS OBSTRUCTING SEAT MOVEMENT	
	1 Check for debris obstructing seat movement.
	Is the front seat height, tilt or extension movement obstructed by debris? **Yes** Remove obstruction and re-check for noisy height, tilt or extension seat movement. **No** GO to E4.
E4: CHECK FOR HEIGHT, TILT OR EXTENSION MOVEMENT MECHANISM LUBRICATION	
	1 Check and apply manufacturer approved lubrication to seat height, tilt or extension movement mechanism and re-test for noise.
	Is the front seat height, tilt or extension noise still apparent? **Yes** Replace the relevant motor. Refer to relevant section of workshop manual. **No** The front seat height, tilt or extension motor is operating correctly.

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Seating - Heater Mats

Diagnosis and Testing

Principles of Operation

Heated seats incorporate heater elements in the cushion and the backrest of the seat. Each cushion heater element has a thermal sensor, which supplies a feedback temperature signal to the related seat heater module. The backrest heater elements do not have a thermal sensor, and are regulated at the same temperature as the cushion heater elements.

For a detailed description of the seat heater mat, refer to the relevant Description and Operation section in the workshop manual. REFER to: (501-10)

Seats (Description and Operation),
Seats (Description and Operation),
Seats (Description and Operation).

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual inspection

Mechanical	Electrical
• Seat heater switches condition and installation	• Fuses • Harnesses and connectors • Seat heater module • Seat heater switches • Seat heater mat

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTC's) and refer to the DTC Index.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer approved diagnostic system).

When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.

If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00.

DTC Index

For a complete list of all diagnostic trouble codes that could be logged on this vehicle, please refer to section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Seat Module (Driver/Passenger/Rear Left/Rear Right) (100-00, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - DTC: Seat Climate Control Module (SCCM) (100-00, Description and Operation).

Seat Heater Mat Application Chart

NOTE: To ensure an accurate resistance reading, calibrated test equipment **must be** used

Vehicle / Year	Cushion / Backrest	Heater Mat / NTC Resistor	Left Hand Drive		Right Hand Drive		Minimum Resistance	Maximum Resistance
			Passenger Side Connector / Pin	Driver Side Connector / Pin	Passenger Side Connector / Pin	Driver Side Connector / Pin	Ohms At 20°C ±10°C	Ohms At 20°C ±10°C
XK 2010	Cushion	Heater mat	PS002/1 and PS002/4	DS002/1 and DS002/4	PS002/1 and PS002/4	DS002/1 and DS002/4	1,2	1,6
		NTC resistor	PS002/2 and PS002/3	DS002/2 and DS002/3	PS002/2 and PS002/3	DS002/2 and DS002/3	4 000	10 000
	Backrest	Heater mat	PS003/1 and PS003/2	DS003/1 and DS003/2	PS003/1 and PS003/2	DS003/1 and DS003/2	0,35	0,47
XF	Cushion	Heater mat	C3HS07A/1 and C3HS07A/4	C3HS02A/1 and C3HS02A/4	C3HS07A/1 and C3HS07A/4	C3HS02A/1 and C3HS02A/4	1,23	1,64
		NTC resistor	C3HS07A/2 and C3HS07A/3	C3HS02A/2 and C3HS02A/3	C3HS07A/2 and C3HS07A/3	C3HS02A/2 and C3HS02A/3	4 000	10 000
	Backrest	Heater mat	C3HS06A/1 and C3HS06A/2	C3HS01A/1 and C3HS01A/2	C3HS06A/1 and C3HS06A/2	C3HS01A/1 and C3HS01A/2	0,82	1,09
XJ 2008	Cushion	Heater mat	SP14-1 and SP14-4	SD14-1 and SD14-4	SP14-1 and SP14-4	SD14-1 and SD14-4	1,28	1,71
		NTC resistor	SP14-2 and SP14-3	SD14-2 and SD14-3	SP14-2 and SP14-3	SD14-2 and SD14-3	4 000	10 000
	Backrest	Heater mat	SP15-1 and SP15-2	SD15-1 and SD15-2	SP15-1 and SP15-2	SD15-1 and SD15-2	0,88	1,17
XJ 2010 onwards - Front	Cushion	Heater mat	C3HS07/1 and C3HS07/4	C3HS02/1 and C3HS02/4	C3HS07/1 and C3HS07/4	C3HS02/1 and C3HS02/4	0,99	1,32
		NTC resistor	C3HS07/2 and C3HS07/3	C3HS02/2 and C3HS02/3	C3HS07/2 and C3HS07/3	C3HS02/2 and C3HS02/3	4 000	10 000
	Backrest	Heater mat	C3HS06/1 and C3HS06/2	C3HS01/1 and C3HS01/2	C3HS06/1 and C3HS06/2	C3HS01/1 and C3HS01/2	0,67	0,90
XJ 2010 onwards - Rear	Cushion	Heater mat	C3HS78/1 and C3HS78/4	C3HS76/1 and C3HS76/4	C3HS76/1 and C3HS76/4	C3HS78/1 and C3HS78/4	0,99	1,32
		NTC resistor	C3HS78/2 and C3HS78/3	C3HS76/2 and C3HS76/3	C3HS76/2 and C3HS76/3	C3HS78/2 and C3HS78/3	4 000	10 000
	Backrest	Heater mat	C3HS79/1 and C3HS79/4	C3HS77/1 and C3HS77/4	C3HS77/1 and C3HS77/4	C3HS79/1 and C3HS79/4	1,0	1,3

PINPOINT TEST A : SEAT HEATER MAT

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK FOR DTC'S	
	1 Where possible use the manufacturer approved diagnostic system to review any logged seat heater mat DTC's
	Were any seat heater mat DTC's logged? **Yes** Carry out the help text action for any logged DTC's. Clear the DTC and retest. If DTC's return follow the tests listed below GO to A2. **No** GO to A2.
A2: MANUAL CHECK	
NOTES: The manual check should be carried out by someone familiar with correct seat heat operation On full power the seat should be hot to touch	
	1 If required operate the vehicle air conditioning on full for 10 minutes to reduce the in vehicle ambient temperature
	2 Operate the seat heater on full power
	Does the seat heater operate correctly? **Yes** Clear any stored DTC's and retest. If seat heater operation is correct no further action required **No** GO to A3.
A3: SHORT CIRCUIT TO GROUND	

	1 Refer to the electrical circuit diagrams and the seat heater mat application chart (see above) to identify the connector
	2 Disconnect the connector
	3 Refer to the electrical circuit diagrams and check the seat heater mat **heater circuit** and the **NTC resistor circuit** for short circuit to ground
	Are either of the circuits short circuit to ground? **Yes** Repair the circuit or replace the seat heater mat as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component. Clear any stored DTC's and retest **No** GO to A4.
A4: CIRCUIT CONTINUITY TEST	
	1 Refer to the electrical circuit diagrams and check the seat heater mat (heater circuit) for circuit continuity
	Does the seat heater mat **heater circuit** pass the continuity test? **Yes** GO to A5. **No** Repair the circuit or replace the seat heater mat as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component. Clear any stored DTC's and retest
A5: POWER CONSUMPTION	
NOTE: The seat heater power supply cycles on and off dependant on the seat and cabin temperature and may only switch on for 5 seconds in 30 seconds	
	1 Reconnect the connector
	2 Operate the vehicle air conditioning on full for 10 minutes to reduce the in vehicle ambient temperature
	3 Refer to the electrical circuit diagrams and check the seat heater mat (heater circuit) using a **current clamp**
	4 Operate the seat heater on full power
	5 Use the chart above to calculate typical value (V/R=I) (**Volts** divided by **Resistance** equals **Current in Amps**)
	6 Examples (12 volts / 0.5 ohms =24 amps) (12 volts / 1 ohms = 12 amps) (12 volts / 2 ohms = 6 amps)
	Does the seat heater mat consume the correct level of current? **Yes** Clear any stored DTC's and retest. If operation correct, no further action required **No** GO to A6.
A6: RESISTANCE CHECK	
NOTES: Ensure the multimeter used is calibrated and a resistance reading of **0** ohms is shown when the test leads are connected together, alternately subtract any resistance shown from the result	
The seat heater mat circuits should be checked at the seat heater module connector	
Refer to the electrical circuit diagrams and to confirm the total resistance of the circuit the cushion and backrest are connected in series	
	1 Refer to the electrical circuit diagrams and the seat heater mat application chart (see above) to identify the terminals
	2 Disconnect the connector
	3 Using a multimeter, carry out a resistance check of the seat heater mat **heater circuit** and the **NTC resistor circuit**. Record the results
	4 Compare the results to the chart (see above)
	Are the results within specification at the given ambient temperature? (tolerance +/- **0.5** Ohms) **Yes** Reconnect the connector. Clear any stored DTC's and retest. If customer concern or DTC's return refer to electrical circuit diagrams and investigate the power and ground supply circuits **No** Replace the seat heater mat as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component. Clear any stored DTC's and retest

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Seating - Seats Vehicles With: Climate Controlled Seats

Diagnosis and Testing

Principle of Operation

For a detailed description of the seating systems and operation, refer to the relevant description and operation section of the workshop manual. REFER to: (501-10 Seating)

Seats (Description and Operation),
Seats (Description and Operation),
Seats (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests

If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals

The DTC index containing an actions list is for guidance only any reference to “check and install new blower unit” should only be carried out following failure confirmation using the pin out diagnostics and/or the over temperature and fluid/air leak diagnostics contained below. The recording of a DTC does NOT signify a permanently failed unit

The climate system functions in a manner that means any detected error state either intermittent or permanent will shut down the complete seat climate system until the next ignition cycle, this does not mean that both climate units within the one seat have failed. This shut down is design intent to protect the system to ensure that the fault detected does not damage the units, it is possible that both units are functioning correctly and that the fault lies elsewhere within the system. The following process can be carried out without removing either the seats or the climate units from the vehicle and should correctly identify any failed units, this should ensure that only failed units are changed under warranty. Any units exhibiting the correct reading as per process below, should NOT be changed under warranty. If all units have a correct reading then re-confirm customer symptom, if customer symptom is still present then carry out further system checks

1. Verify the customer concern
2. Visually inspect for obvious signs of mechanical or electrical damage

Visual Inspection

Mechanical	Electrical
• Seat heater switch condition and installation	• Battery condition and state of charge • Fuses • Harnesses and connectors • Seat heater switch(es) • Seat heater elements • Seat module(s) • Ignition switch • Battery junction box • Central junction box • LIN circuit

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, carry out normal dealer warranty process, perform on-demand self test, check for DTCs and refer to the relevant DTC index
5. Allow 30 mins since the last seat/cooled operation prior to carrying out pin testing detailed below in the section "Connector and Pin Information"

6. Locate climate seat module, (refer to Electrical Information - Electrical Reference Library, contained in TOPIx) for guidance on how to gain access to the connector(s)
7. Locate and disconnect relevant connector prior to pin test
8. Using ohm-meter to probe each heat/cooled unit pins (at rear of connector), reading should achieve no greater than 10 ohms after 1 minute (initial fluctuations in readings may occur using ohm-meter, post 1 minute readings will have stabilized)

Connector and Pin Information

X351 (All Model Years)								
Terminal ID	**A**	**B**	**C**	**D**	**G**	**H**	**J**	**K**
Climate Seat Unit Location	Right Cushion	Right Cushion	Right Backrest	Right Backrest	Left Cushion	Left Cushion	Left Backrest	Left Backrest
Wiring Colour - Left Hand Drive Vehicles	GY-BU - Grey/Blue	BU - Blue	BU-BN - Blue/Brown	WH - White	YE-BU - Yellow/Blue	BU-OG - Blue/Orange	GY-VT - Grey/Violet	WH-VT - White/Violet
Wiring Colour - Right Hand Drive Vehicles	YE-BU - Yellow/Blue	BU-OG - Blue/Orange	GY-VT - Grey/Violet	WH-VT - White/Violet	GY-BU - Grey/Blue	BU - Blue	BU-BN - Blue/Brown	WH - White

1. If any unit reads greater than 10 ohms, replace only that defective unit
2. If all units read less than 10 ohms but faults are still suspected, do not replace any units. Refer to step 4 below
3. As a final check, when a faulty unit has been identified strip the seat to access unit connector, REFER to: Seats (501-10, Removal & Installation) and re-check ohm reading to confirm greater than 10 ohms prior to removing unit
4. In cases where the above diagnostic routine does NOT identify a failed unit, please refer to "Over Temperature and Fluid/Air Leak Diagnostics" below. Also check for any live technical service bulletins referring to the seat climate system

Seat Climate Control Module/Seat Climate Assembly - Further Diagnostics

In the event of suspected climate seat faults use the pinpoint tests detailed below

Connector Checks

First, check the integrity of the three seat climate control module harness connectors:

1. Disconnect each connector
2. Inspect each connector for cracks and breaks, replace as required
3. Check the integrity of connector terminals for bent terminals, backed-out or badly crimped wires. Rectify as required
4. Reconnect all connectors and retest. If seat climate functions are still faulty, note any DTCs that have been logged by the seat climate control module(s) and refer to the table and pinpoint tests below:

DTC Logged	Pinpoint Test Required
NOTE: Where DTCs are marked in bold, this means that there are two possible diagnostic processes that may be applied to resolve these faults. Check the listings below to reference an alternative set of pinpoint tests for these DTCs • B10B9-13 Blower Control - Circuit open • B10B9-4B Blower Control - Over temperature • B1157-13 Blower Control B - Circuit open • B1157-4B Blower Control B - Over temperature • **B120E-4B** Right Thermal Electric Device Control - Over temperature • **B1224-4B** Left Thermal Electric Device Control - Over temperature • B122A-11 Right Seat Cushion Blower Speed Sensor - Circuit short to ground • B122A-12 Right Seat Cushion Blower Speed Sensor - Circuit short to battery • B122B-11 Right Seat Back Blower Speed Sensor - Circuit short to ground • B122B-12 Right Seat Back Blower Speed Sensor - Circuit short to battery • B122C-11 Left Seat Cushion Blower Speed Sensor - Circuit short to ground • B122C-12 Left Seat Cushion Blower Speed Sensor - Circuit short to battery • B122D-11 Left Seat Back Blower Speed Sensor - Circuit short to ground • B122D-12 Left Seat Back Blower Speed Sensor - Circuit short to battery	GO to Pinpoint Test A.
NOTE: Where DTCs are marked in bold, this means that there are two possible diagnostic processes that may be applied to resolve these faults. Check the listings below to reference an alternative set of pinpoint tests for these DTCs • **B120E-13** Right Thermal Electric Device Control - Circuit open	GO to Pinpoint Test B.

DTC Logged	Pinpoint Test Required
• **B120E-19** Right Thermal Electric Device Control - Circuit current above threshold • **B1223-13** Right Seat Cushion Temperature Sensor - Circuit open • **B1224-13** Left Thermal Electric Device Control - Circuit open • **B1224-19** Left Thermal Electric Device Control - Circuit current above threshold • **B1225-13** Right Seat Back Temperature Sensor - Circuit open • **B1229-13** Left Seat Back Temperature Sensor - Circuit open • **B1235-13** Left Seat Cushion Temperature Sensor - Circuit open	
• B120F-98 Left Seat Cushion - Component or system over temperature • B122E-98 Right Seat Cushion - Component or system over temperature • B122F-98 Right Seat Back - Component or system over temperature • B1230-98 Left Seat Back - Component or system over temperature • B1231-7A Right Seat - Fluid leak or seal failure • B1232-7A Left Seat - Fluid leak or seal failure	GO to Pinpoint Test C.
NOTE: Where DTCs are marked in bold, this means that there are two possible diagnostic processes that may be applied to resolve these faults. Check the listings above to reference an alternative set of pinpoint tests for these DTCs • **B120E-4B** Right Thermal Electric Device Control - Over temperature • **B120E-13** Right Thermal Electric Device Control - Circuit open • **B120E-19** Right Thermal Electric Device Control - Circuit current above threshold • **B1223-13** Right Seat Cushion Temperature Sensor - Circuit open • **B1224-4B** Left Thermal Electric Device Control - Over temperature • **B1224-13** Left Thermal Electric Device Control - Circuit open • **B1224-19** Left Thermal Electric Device Control - Circuit current above threshold • **B1225-13** Right Seat Back Temperature Sensor - Circuit open • **B1229-13** Left Seat Back Temperature Sensor - Circuit open • **B1235-13** Left Seat Cushion Temperature Sensor - Circuit open	GO to Pinpoint Test D.

PINPOINT TEST A : CLIMATE SEATS ASSEMBLY - BLOWER DIAGNOSTICS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: CLIMATE SEATS ASSEMBLY - BLOWER SPEED CONTROL CIRCUIT RESISTANCE CHECKS AT SEAT TO VEHICLE CONNECTOR	
	1 Uncouple seat harness connector from the seat climate control module (Front seats connector C3HS03C/Rear seats connector C3HS41C (static seats)or rear seats connector C3HS41F (moveable seats)
	2 Check the resistance of the climate seats blower speed control circuits at the connector • For right-side seat cushion blower, check resistance at pins 3 and 7 • For right-side seat backrest blower, check resistance at pins 4 and 7 • For left-side seat cushion blower, check resistance at pins 11 and 15 • For left-side seat backrest blower, check resistance at pins 12 and 15
	Is the resistance between 290 and 420 kilo-ohms? **Yes** No circuit faults present. No further action **No** GO to A2.
A2: CLIMATE SEATS ASSEMBLY - BLOWER POWER CIRCUIT RESISTANCE CHECKS AT SEAT CLIMATE ASSEMBLY CONNECTOR	
	1 Locate the appropriate seat backrest/seat cushion climate assembly connector
	2 Disconnect connector
	3 Check the integrity of connector terminals for bent terminals, backed-out or badly crimped wires. Rectify as required
	4 Check the resistance of the climate seats blower power circuits at the climate assembly connector, pins 2 and 4
	Is the resistance between 290 and 420 kilo-ohms? **Yes** GO to A3. **No** Replace the seat climate assembly
A3: CLIMATE SEATS ASSEMBLY - BLOWER SPEED CONTROL CIRCUIT RESISTANCE CHECKS AT SEAT CLIMATE ASSEMBLY CONNECTOR	
	1 Check the resistance of the climate seats blower control circuits at the climate assembly connector, pins 4 and 7

	Is the resistance between 290 and 420 kilo-ohms? **Yes** No internal circuit faults present. Check for circuit faults in wiring harness between seat climate control module and climate seat assembly and replace as required **No** Replace the seat climate assembly

PINPOINT TEST B : CLIMATE SEATS ASSEMBLY - THERMAL ELECTRIC DEVICE (TED) DIAGNOSTICS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
B1: CLIMATE SEATS ASSEMBLY - TED SENSOR CIRCUIT RESISTANCE CHECKS AT SEAT TO VEHICLE CONNECTOR	
	1 Uncouple seat harness connector from the seat climate control module (Front seats connector C3HS03B/Rear seats connector C3HS41B (static seats)or rear seats connector C3HS41E (moveable seats)
	2 Check the resistance of the climate seats TED sensor circuits at the connector • For right-side seat cushion TED sensor circuits, check resistance at pins 2 and 3 • For right-side seat backrest TED sensor circuits, check resistance at pins 4 and 5 • For left-side seat cushion TED sensor circuits, check resistance at pins 7 and 8 • For left-side seat backrest TED sensor circuits, check resistance at pins 9 and 10
	Is the resistance between 0.9 and 1.1 kilo-ohms? (Note: these values are based on an ambient temperature of 22°C/72°F) **Yes** No circuit faults present. No further action **No** GO to B2.
B2: CLIMATE SEATS ASSEMBLY - TED SENSOR CIRCUIT RESISTANCE CHECKS AT SEAT CLIMATE ASSEMBLY CONNECTOR	
	1 Locate the appropriate seat backrest/seat cushion climate assembly connector
	2 Disconnect connector
	3 Check the integrity of connector terminals for bent terminals, backed-out or badly crimped wires. Rectify as required
	4 Check the resistance of the climate seats TED sensor circuits at the climate assembly connector, pins 5 and 8 (Green and Green wires)
	Is the resistance between 0.9 and 1.1 kilo-ohms? (Note: these values are based on an ambient temperature of 22°C/72°F) **Yes** GO to B3. **No** Replace the seat climate assembly
B3: CLIMATE SEATS ASSEMBLY - TED SUPPLY CIRCUIT OPEN CIRCUIT CHECKS AT SEAT CLIMATE ASSEMBLY CONNECTOR	
	1 Check the TED supply circuits at the climate assembly connector, pins 1 and 3 (Blue and Yellow wires) for open circuit faults
	Is an open-circuit fault present? **Yes** Replace the seat climate assembly **No** No internal circuit faults present. Check for circuit faults in wiring harness between seat climate control module and climate seat assembly and replace as required

PINPOINT TEST C : CLIMATE SEATS ASSEMBLY - BLOWER AND DUCTING DIAGNOSTICS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
C1: CLIMATE SEATS ASSEMBLY - BLOWER SPEED CONTROL CIRCUIT RESISTANCE CHECKS AT SEAT TO VEHICLE CONNECTOR	
	1 Uncouple seat harness connector from the seat climate control module (Front seats connector C3HS03C/Rear seats connector C3HS41C (static seats)or rear seats connector C3HS41F (moveable seats)
	2 Check the resistance of the climate seats blower speed control circuits at the connector • For right-side seat cushion blower, check resistance at pins 3 and 7 • For right-side seat backrest blower, check resistance at pins 4 and 7 • For left-side seat cushion blower, check resistance at pins 11 and 15 • For left-side seat backrest blower, check resistance at pins 12 and 15
	Is the resistance between 290 and 420 kilo-ohms? **Yes** No circuit faults present. No further action **No**

	GO to C2.
C2: CLIMATE SEATS ASSEMBLY - BLOWER CIRCUIT RESISTANCE CHECKS AT SEAT CLIMATE ASSEMBLY CONNECTOR	
	1 Locate the appropriate seat backrest/seat cushion climate assembly connector
	2 Disconnect connector
	3 Check the integrity of connector terminals for bent terminals, backed-out or badly crimped wires. Rectify as required
	4 Check the resistance of the climate seats blower circuits at the climate assembly connector, pins 2 and 4 (Violet and Black wires)
	Is the resistance between 290 and 420 kilo-ohms? **Yes** GO to C3. **No** Replace the seat climate assembly
C3: CLIMATE SEATS ASSEMBLY - BLOWER CONTROL CIRCUIT RESISTANCE CHECKS AT SEAT CLIMATE ASSEMBLY CONNECTOR	
	1 Check the resistance of the climate seats blower control circuits at the climate assembly connector, pins 4 and 7 (Black and Purple wires)
	Is the resistance between 290 and 420 kilo-ohms? **Yes** No internal circuit faults present. Check for circuit faults in wiring harness between seat climate control module and climate seat assembly and replace as required. If no harness faults are found, GO to C4. **No** Replace the seat climate assembly
C4: CLIMATE SEATS ASSEMBLY - BLOWER DUCTING INSPECTION	
	1 Check that the ducting is securely attached to the blower and thermal electric device
	2 Check the ducting for holes, cuts or tears
	Is the ducting undamaged and securely attached to the blower and thermal electric device? **Yes** GO to C5. **No** Replace the seat climate assembly
C5: CLIMATE SEATS ASSEMBLY - EXHAUST AIRFLOW CHECKS	
	1 Check for blockages or restrictions at the thermal electric device exhaust vent
	Are blockages or restrictions present? **Yes** Rectify as required **No** GO to C6.
C6: CLIMATE SEATS ASSEMBLY - BLOWER AIRFLOW CHECKS	
	1 Check for blockages or restrictions at the blower air intake
	2 Check that the blower fan movement is not restricted
	Are there any air intake blockages or restrictions to the blower fan movement? **Yes** Rectify as required **No** No further action

PINPOINT TEST D : CLIMATE SEATS ASSEMBLY - THERMAL ELECTRIC DEVICE (TED) AND DUCTING DIAGNOSTICS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: CLIMATE SEATS ASSEMBLY - TED SENSOR CIRCUIT RESISTANCE CHECKS AT SEAT TO VEHICLE CONNECTOR	
	1 Uncouple seat harness connector from the seat climate control module (Front seats connector C3HS03B/Rear seats connector C3HS41B (static seats)or rear seats connector C3HS41E (moveable seats)
	2 Check the resistance of the climate seats TED sensor circuits at the connector • For right-side seat cushion TED sensor circuits, check resistance at pins 2 and 3 • For right-side seat backrest TED sensor circuits, check resistance at pins 4 and 5 • For left-side seat cushion TED sensor circuits, check resistance at pins 7 and 8 • For left-side seat backrest TED sensor circuits, check resistance at pins 9 and 10
	Is the resistance between 0.9 and 1.1 kilo-ohms? (Note: these values are based on an ambient temperature of 22°C/72°F) **Yes** No circuit faults present. No further action **No** GO to D2.
D2: CLIMATE SEATS ASSEMBLY - TED SENSOR CIRCUIT RESISTANCE CHECKS AT SEAT CLIMATE ASSEMBLY CONNECTOR	
	1 Locate the appropriate seat backrest/seat cushion climate assembly connector
	2 Disconnect connector

	3 Check the integrity of connector terminals for bent terminals, backed-out or badly crimped wires. Rectify as required
	4 Check the resistance of the climate seats TED sensor circuits at the climate assembly connector, pins 5 and 8 (Green and Green wires)
	Is the resistance between 0.9 and 1.1 kilo-ohms? (Note: these values are based on an ambient temperature of 22°C/72°F) **Yes** GO to D3. **No** Replace the seat climate assembly
D3: CLIMATE SEATS ASSEMBLY - TED SUPPLY CIRCUIT OPEN CIRCUIT CHECKS AT SEAT CLIMATE ASSEMBLY CONNECTOR	
	1 Check the TED supply circuits at the climate assembly connector, pins 1 and 3 (Blue and Yellow wires) for open circuit faults
	Is an open-circuit fault present? **Yes** Replace the seat climate assembly **No** No internal circuit faults present. Check for circuit faults in wiring harness between seat climate control module and climate seat assembly and replace as required. If no harness faults are found, GO to D4.
D4: CLIMATE SEATS ASSEMBLY - TED DUCTING INSPECTION	
	1 Check that the ducting is securely attached to the blower and thermal electric device
	2 Check the ducting for holes, cuts or tears
	Is the ducting undamaged and securely attached to the blower and thermal electric device? **Yes** GO to D5. **No** Replace the seat climate assembly
D5: CLIMATE SEATS ASSEMBLY - EXHAUST AIRFLOW CHECKS	
	1 Check for blockages or restrictions at the thermal electric device exhaust vent
	Are blockages or restrictions present? **Yes** Rectify as required **No** GO to D6.
D6: CLIMATE SEATS ASSEMBLY - BLOWER AIRFLOW CHECKS	
	1 Check for blockages or restrictions at the blower air intake
	2 Check that the blower fan movement is not restricted
	Are there any air intake blockages or restrictions to the blower fan movement? **Yes** Rectify as required **No** No further action

Over Temperature and Fluid/Air Leak Diagnostics

Check For Air Flow Specific DTCs	Diagnostic Guidance Notes
• B120F-98 • B122E-98 • B122F-98 • B1230-98 • B1231-7A • B1232-7A	• Once the diagnostic process detailed above has been carried out and it has been identified that there has not been a failure of any of the climate units, then refer back to the relevant climate system DTC codes that have been recorded • DTC codes listed that end in 7A or 98 indicate a possible air leak or air flow restriction within the system • In these circumstances, starting with the seat base check all ducting connections for correct engagement and inspect ducting for signs of damage which could result in an air leak (for connection issues re-connect and test system). Only in the event of finding damage to the ducting of one of the units should the unit be replaced. Note that only the specific unit should be replaced • Due to the design function of the system, both climate units in any one seat operate integrally. Therefore, if an issue is detected in one of the units then **both** units are shut down to protect the system until next ignition cycle. Under these circumstances, only replace the damaged unit and DO NOT replace both units

DTC Index

For a complete list of all diagnostic trouble codes that could be logged on this vehicle, please refer to Section 100-00. REFER to: (100-00 General Information)

Diagnostic Trouble Code (DTC) Index - DTC: Driver/Passenger Seat Module (DSM/PSM) (Description and Operation),
Diagnostic Trouble Code (DTC) Index - DTC: Climate Controlled Seat Module - Front/Rear (SCME/SCMF) (Description and Operation).

Published: 01-May-2014

Seating - Seat Smoothing

General Procedures

Check

WARNINGS:

Make sure that the steamer is in the OFF position before connecting or disconnecting from the electrical outlet.

Do not use another high wattage device on the same electrical circuit.

If the use of an extension cord is absolutely necessary, the cord must be rated at a minimum of 10 amps.

To avoid the risk of electrical shock, check the condition of the power cord and the steamer before use.

Make sure that the steamer is disconnected from the electrical outlet before filling or emptying the water reservoir.

The steamer must only be used and placed on its stand on a stable surface.

To prevent injury such as burns, take care whilst using the steamer. Avoid coming into contact with the hot surface of the steamer and do not direct steam toward any persons.

The steamer must ALWAYS be switched off when not in use or left unattended.

Do not allow the power cord to come into contact with the hot surface of the steamer.

CAUTIONS:

Protect the surrounding paintwork to avoid damage.

Protect the paintwork during this operation.

Do not use any additives in the steamer. Damage to the steamer or the seat cover can result if used.

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. CAUTIONS:

   Steam the leather cushions evenly and progressively. Do not use excessive force.

   Take care not to damage the leather whilst steaming into the corners.

   Do not hold the steamer in one place for longer than 10 seconds, as this will burn the leather and damage the covers.

E166054

Published: 03-Jan-2012

Seating - Driver Seat Cushion

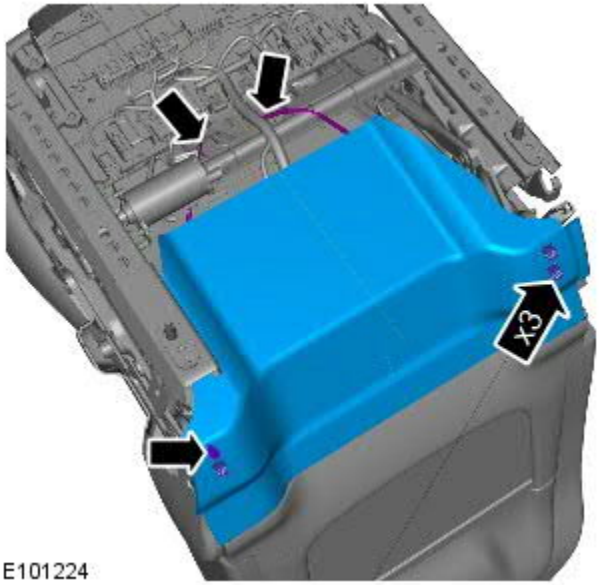
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

All vehicles

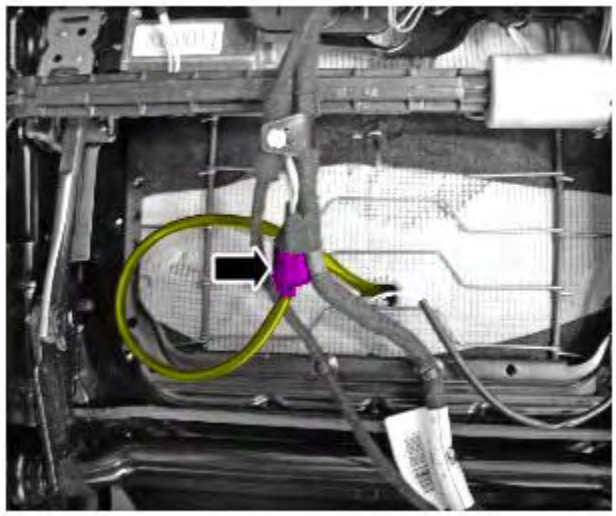
1. Refer to: Front Seat (501-10 Seating, Removal and Installation).
2. Refer to: Front Seat Control Switch (501-10 Seating, Removal and Installation).



E101224

3. NOTE: Make sure that the clips are installed in the correct orientation.

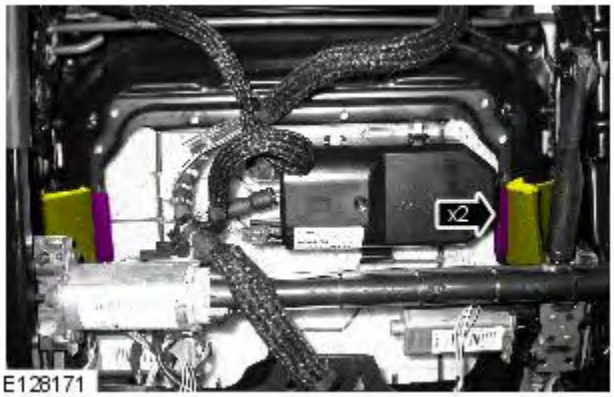
Vehicles with heated front seats



E137449

4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

5.



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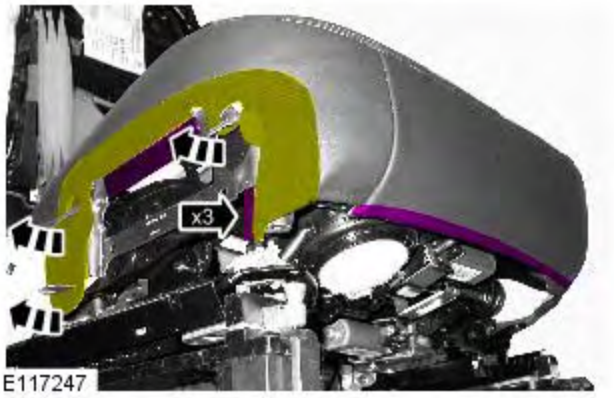

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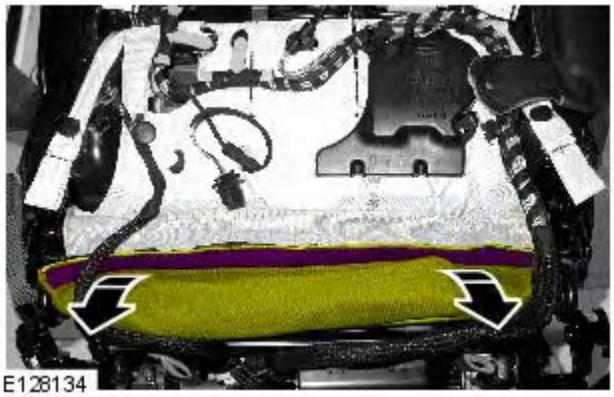
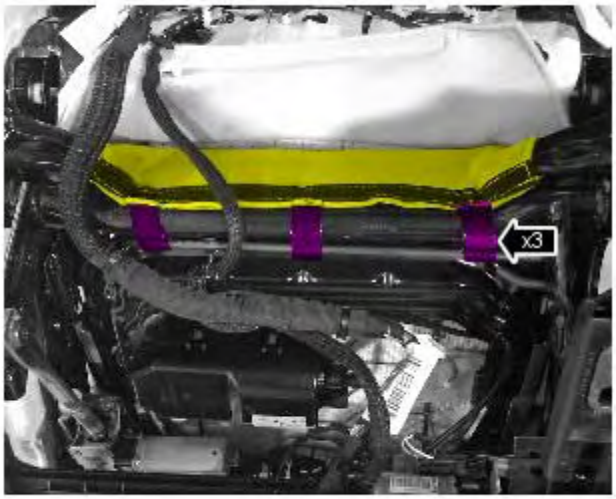

E128134

9.



E140841

10.

E117249

11.

E140684

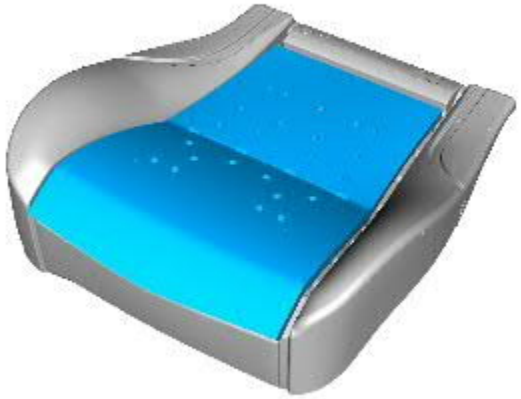
12. NOTES:

Make sure that new hog rings are installed.

Do not disassemble further if the component is removed for access only.

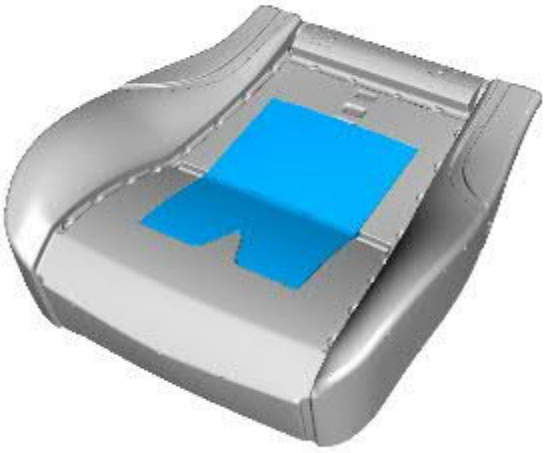
E101234

13.



E140687

14.



E140688

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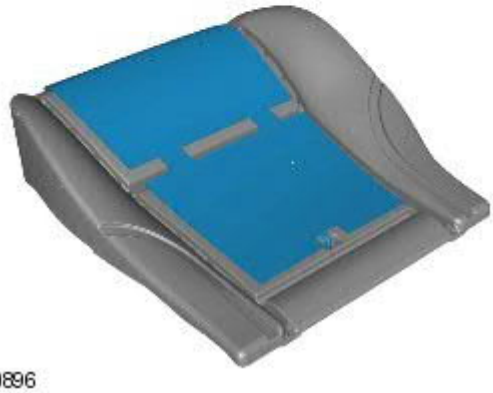
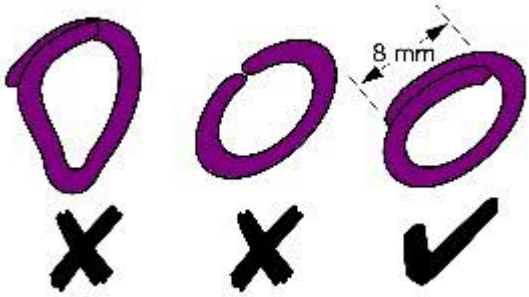


E140896

Installation



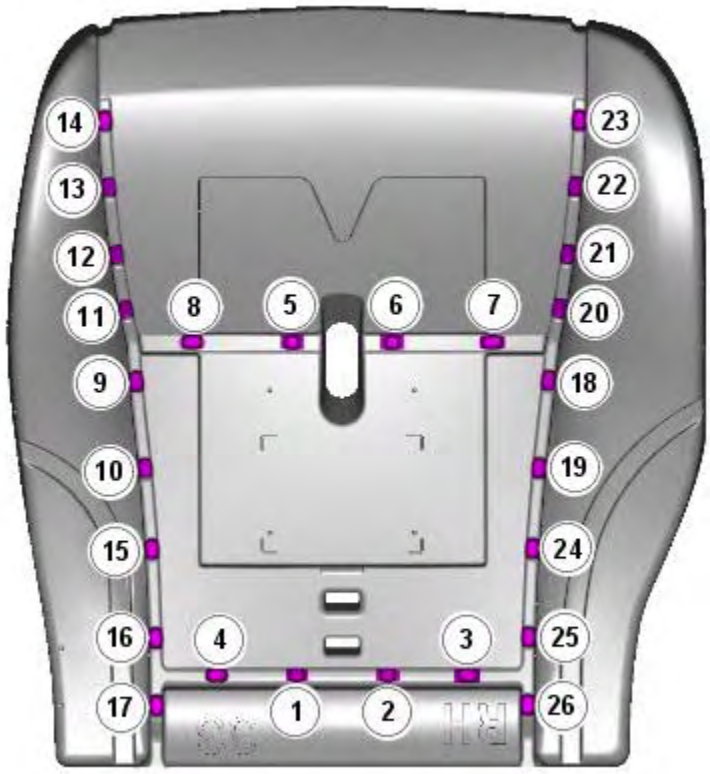
V4001063

1. NOTES:

   Make sure that new hog rings are installed.

   Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.

2. NOTE: Make sure that the hogrings are installed in the sequence shown.



E140733

3. To install, reverse the removal procedure.

Published: 03-Jan-2012

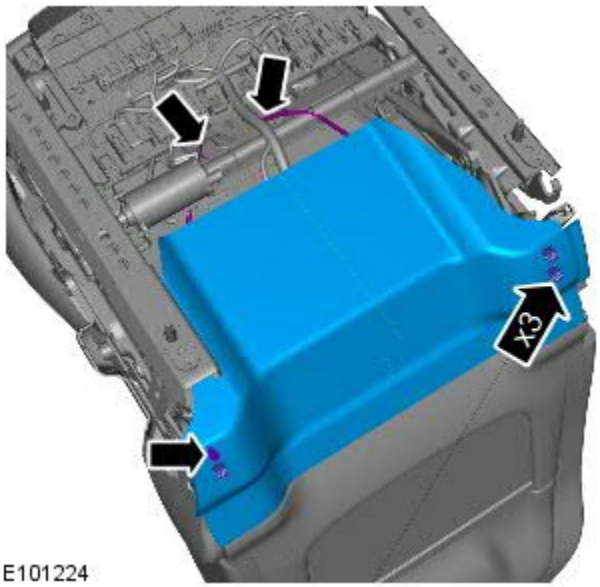
Seating - Driver Seat Cushion Heater Mat

Removal and Installation

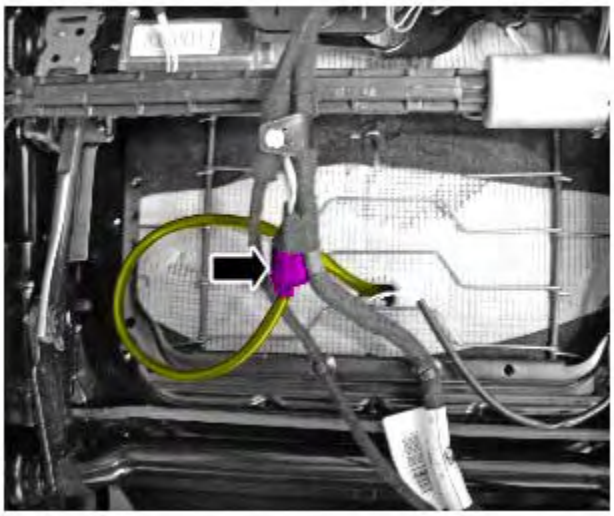
Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Front Seat (501-10 Seating, Removal and Installation).
2. Refer to: Front Seat Control Switch (501-10 Seating, Removal and Installation).
3.



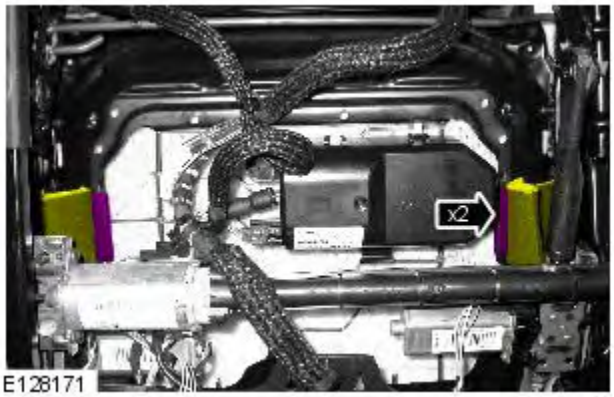
E101224



E137449

4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

5.



E128171

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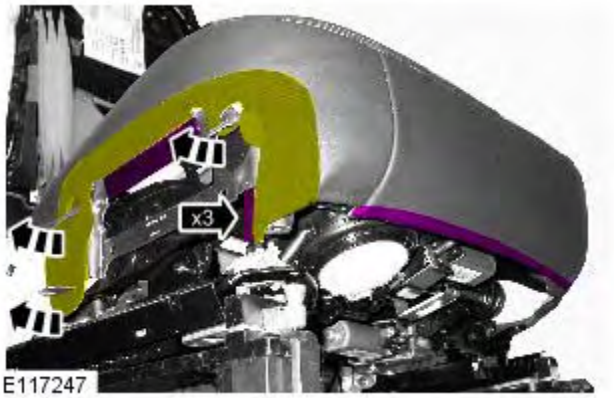
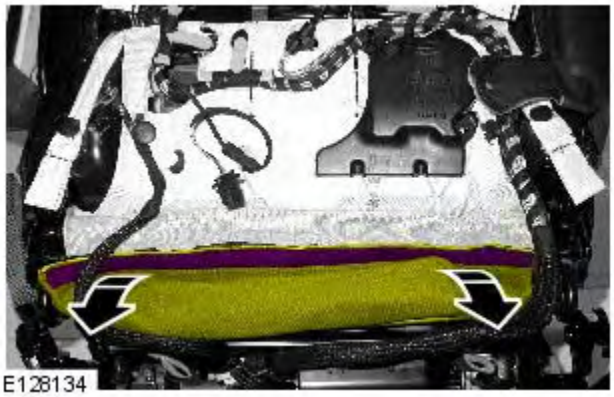


E117247

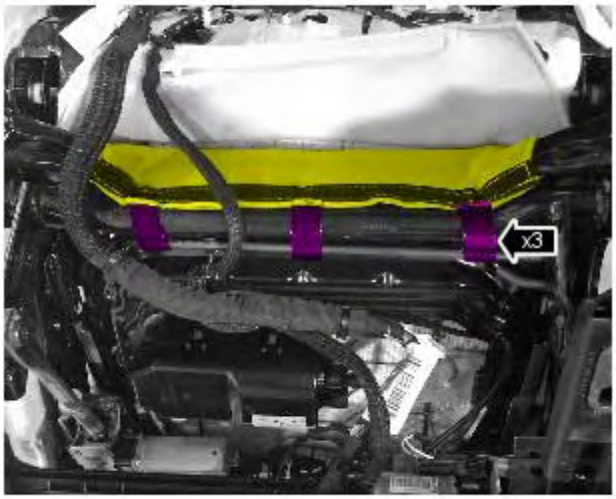
7.

E117248

8.


E128134

9.



E140841

10.

E117249

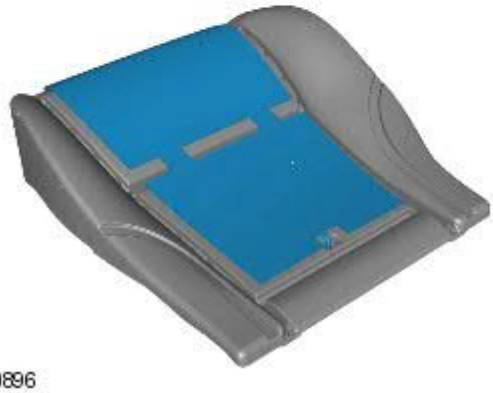
11.

E140684

12. NOTE: Make sure that new hog rings are installed.

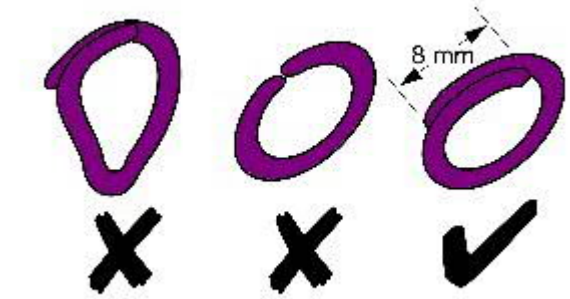
E101234

13.



E140896

Installation



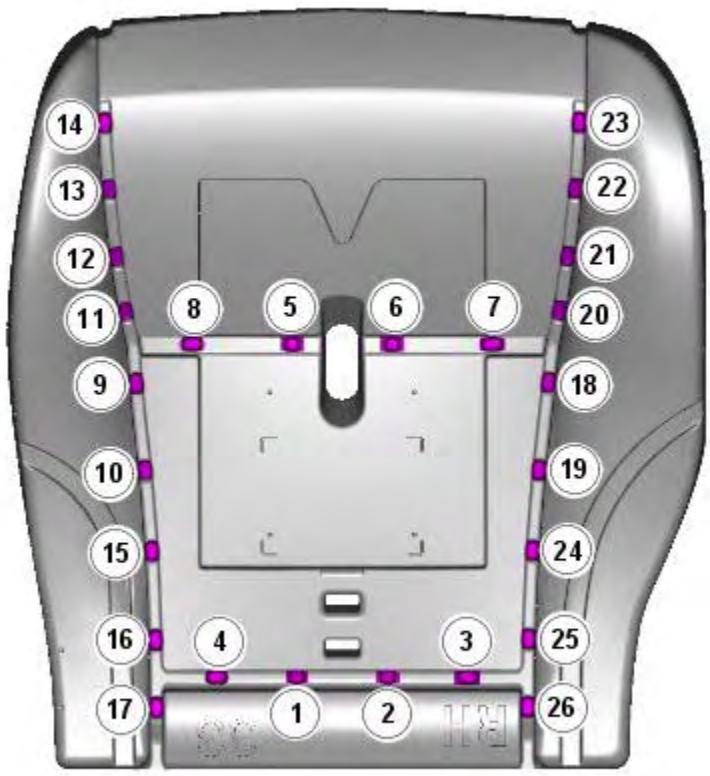
V4001063

1. NOTES:

   Make sure that new hog rings are installed.

   Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.

2. NOTE: Make sure that the hogrings are installed in the sequence shown.



E140733

3. To install, reverse the removal procedure.

Published: 03-Nov-2011

Seating - Front Seat

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplemental restraint system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait one minute. Failure to follow this instruction may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

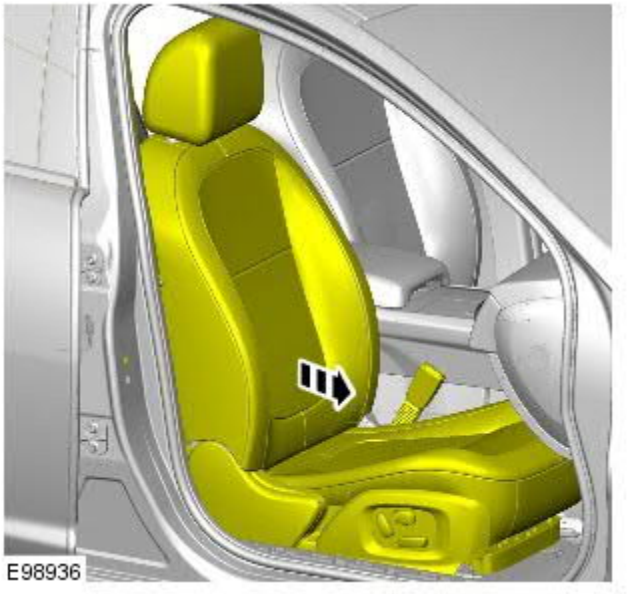
To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

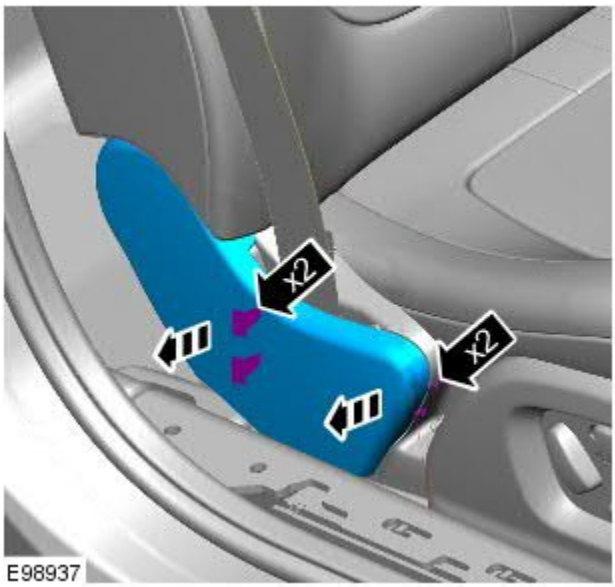
Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

1. Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

2.

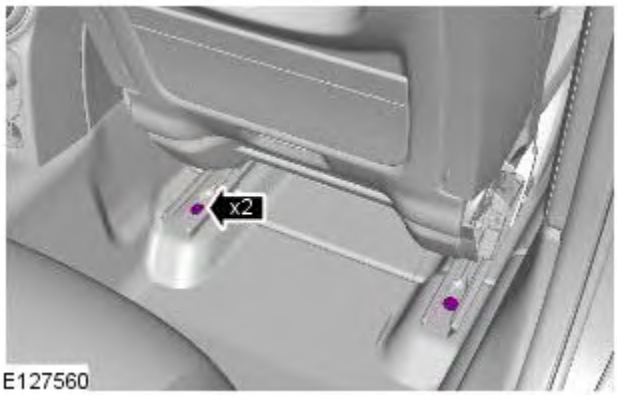


3.

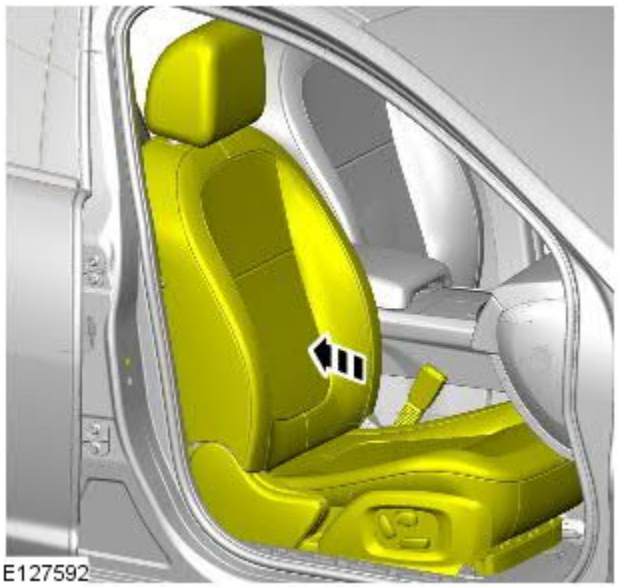


4. *Torque:* 40 Nm

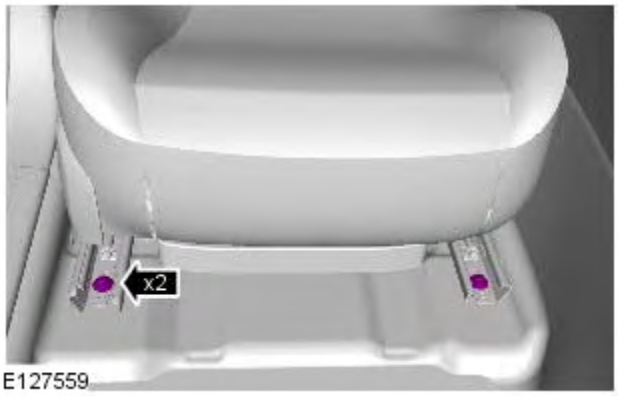
5. *Torque:* 47 Nm



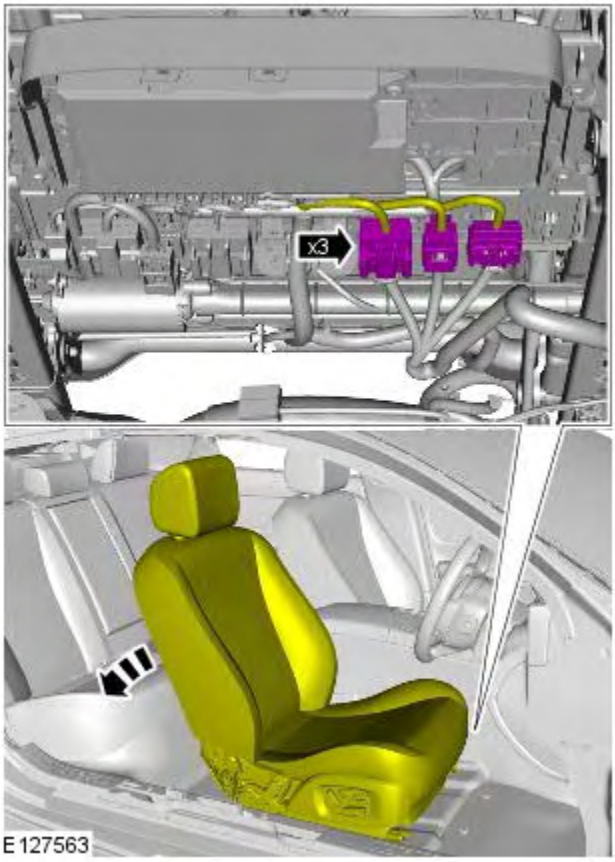
6.



7. *Torque:* 47 Nm



8. Reposition the front seat to the central position.



9.

10. CAUTIONS:

Protect the surrounding paintwork to avoid damage.

Protect the surrounding trim to avoid damage.

NOTE: This step requires the aid of another technician.

Installation

1. To install, reverse the removal procedure.

Published: 19-Apr-2012

Seating - Front Seat Backrest Cover

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least one minute after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

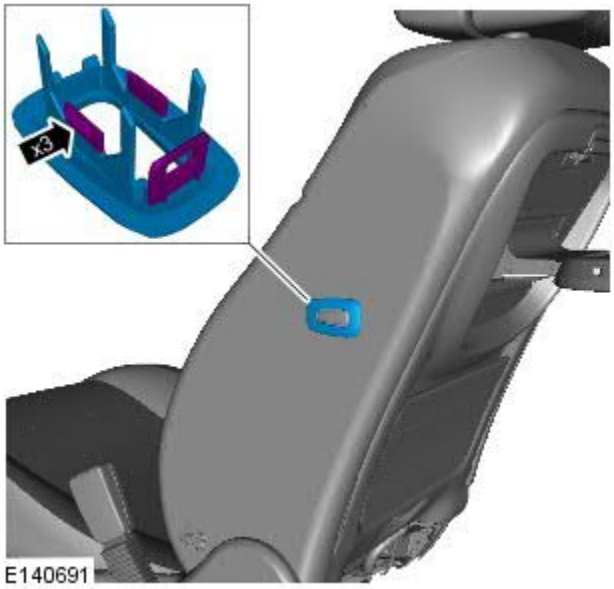
All vehicles

1. Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

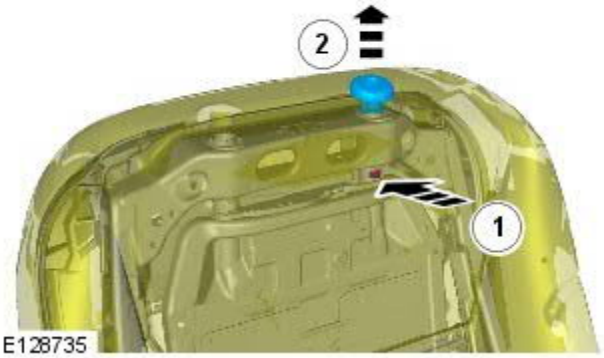
2. Refer to: Front Seat Head Restraint (501-10 Seating, Removal and Installation).

3.

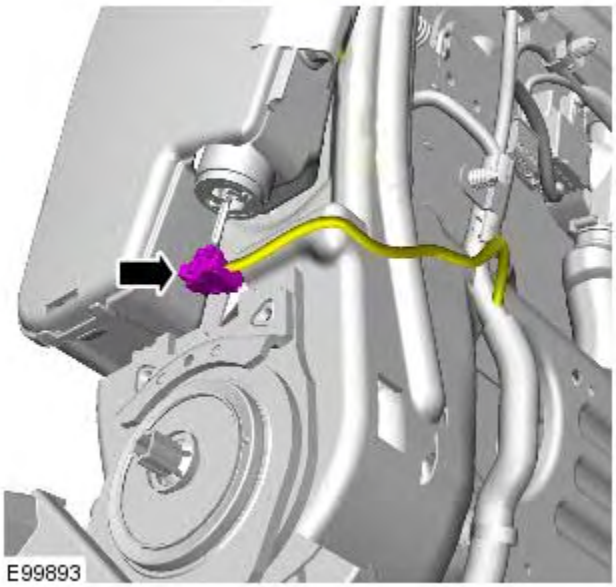
- If equipped.



4.

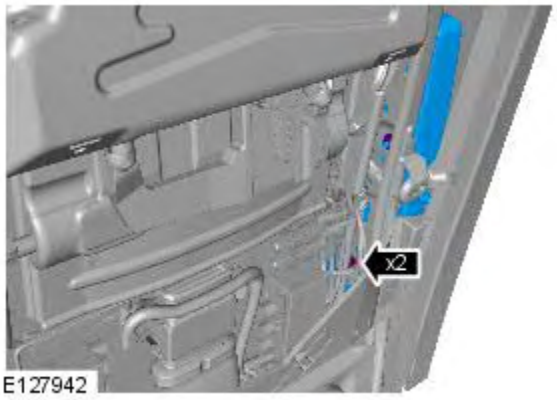


5.



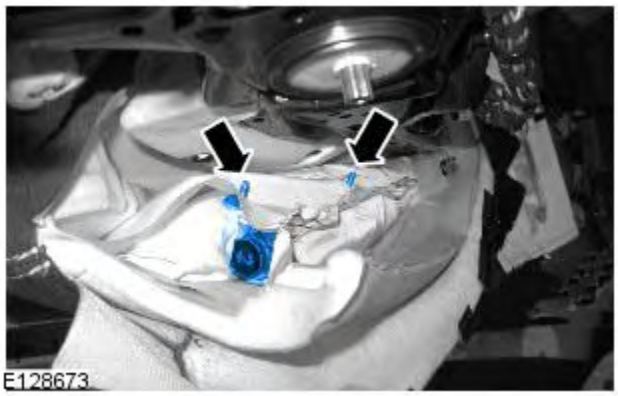
6. WARNING: The SRS electrical connectors are unique. DO NOT force, or attempt to connect electrical connectors to the wrong sockets.

   CAUTION: LH illustration shown, RH is similar.



7. CAUTION: Note the fitted position of the component prior to removal.

   Torque: 7 Nm



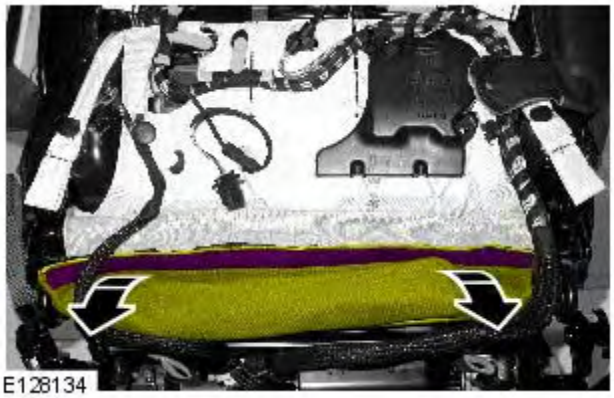
8. WARNING: Make sure that the air bag is correctly installed in to the fabric chute. Failure to follow this instruction may result in incorrect operation of the air bag.

   CAUTION: Note the fitted position of the component prior to removal.

9. NOTE: Note the position of the wiring harnesses to aid installation.

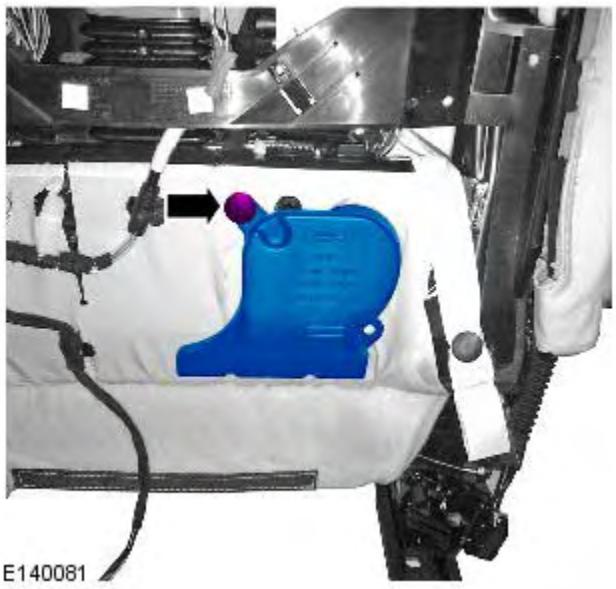
E128087

10.



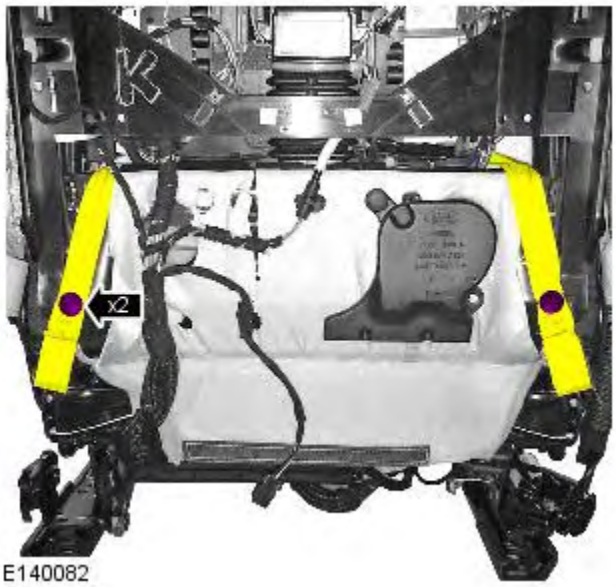
E128134

11.



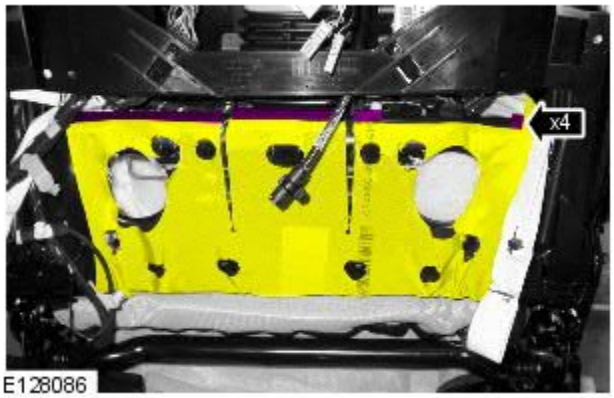
E140081

12.



E140082

13.

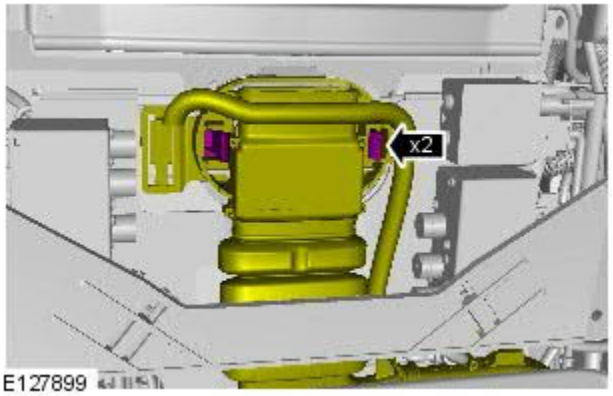


E128086

14.

E140698

15.



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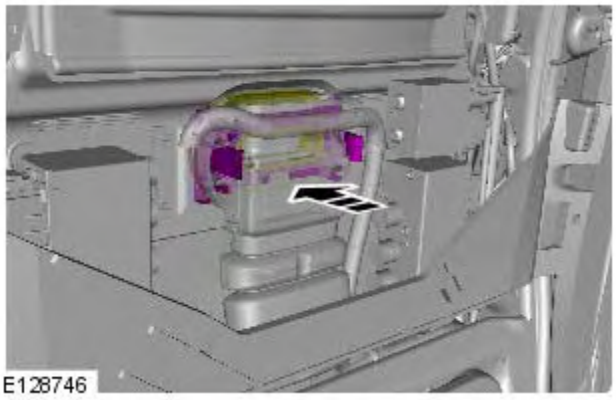
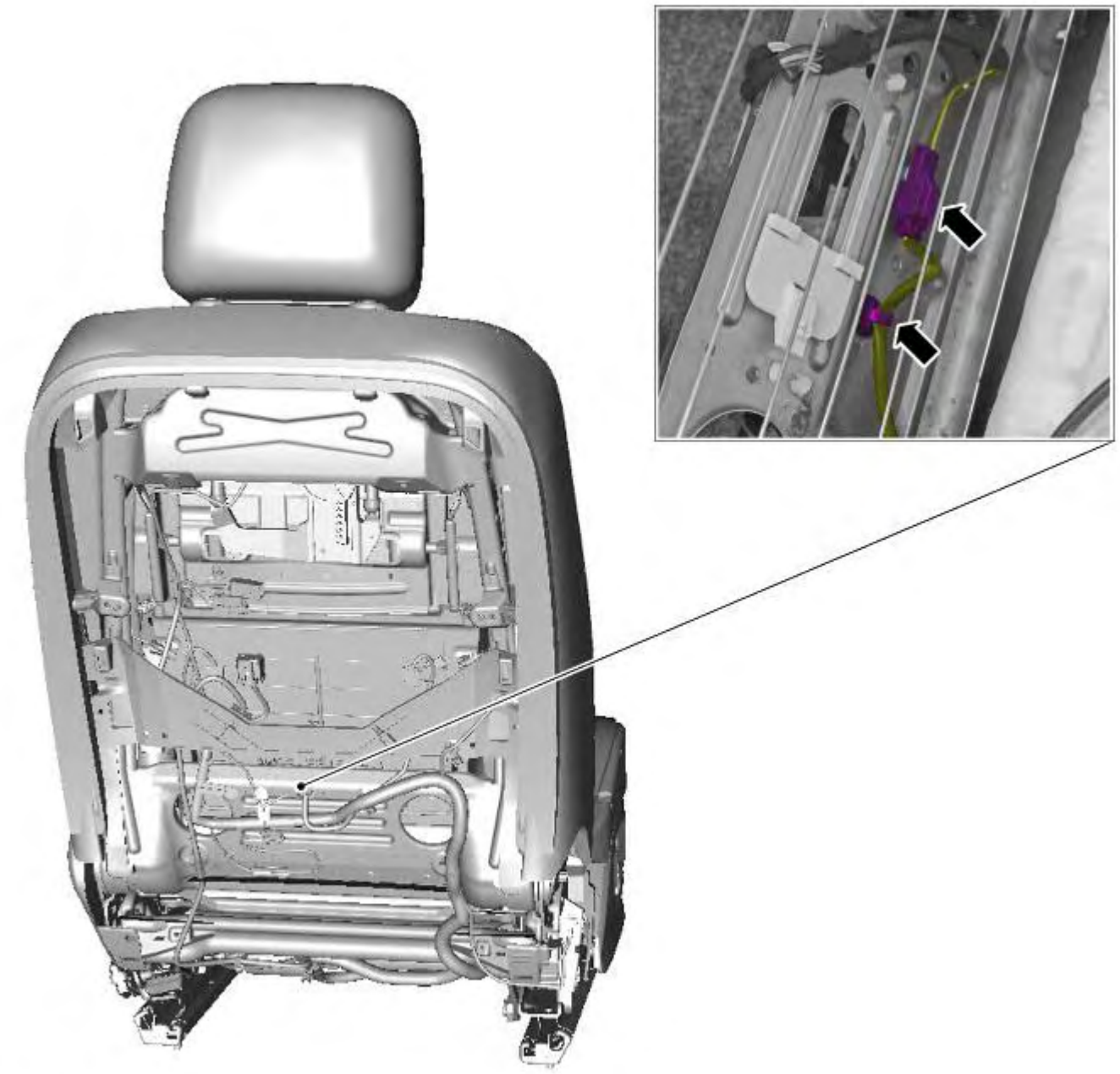


Vehicles with heated front seats

17.



E141493

18.

E128140

19.

E128128

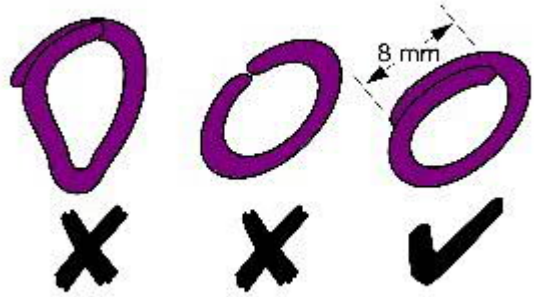
20. NOTE: RH illustration shown, LH is similar.

E128127

21.

E128126

Installation



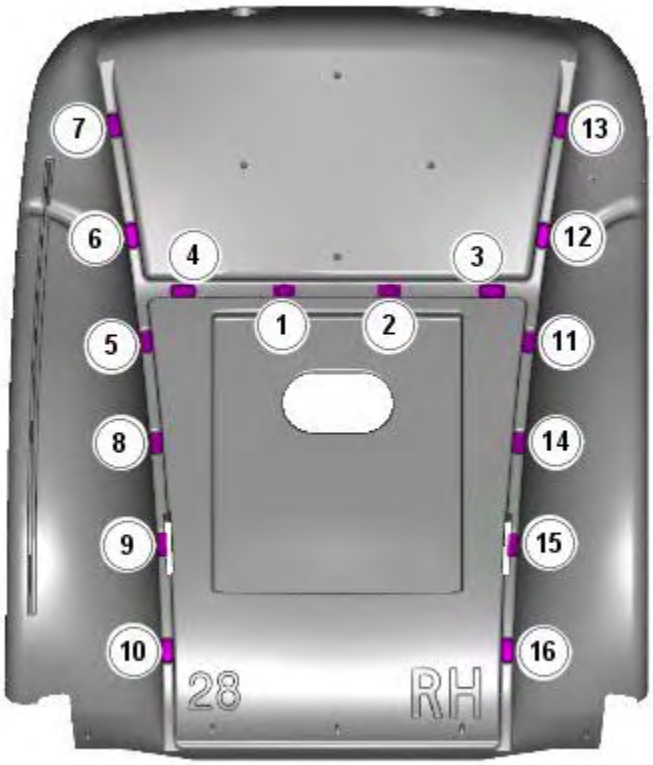
V4001063

1. NOTES:

   Make sure that new hog rings are installed.

   Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.

2. NOTE: Make sure that the hogrings are installed in the sequence shown.



E140737

3. To install, reverse the removal procedure.

Published: 22-Apr-2012

Seating - Front Seat Backrest Cushion

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least one minute after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

Removal steps in this procedure may contain installation details.

All vehicles

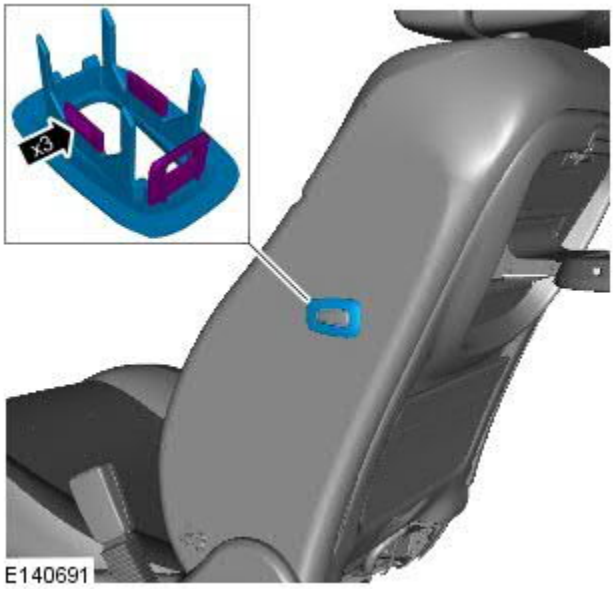
1. Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

2. Refer to: Front Seat Head Restraint (501-10 Seating, Removal and Installation).

www.JagDocs.com

3.

- If equipped.



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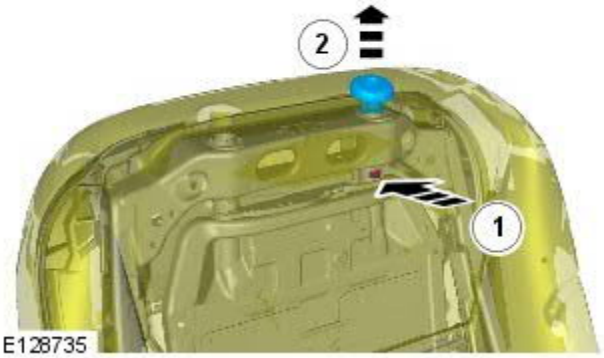

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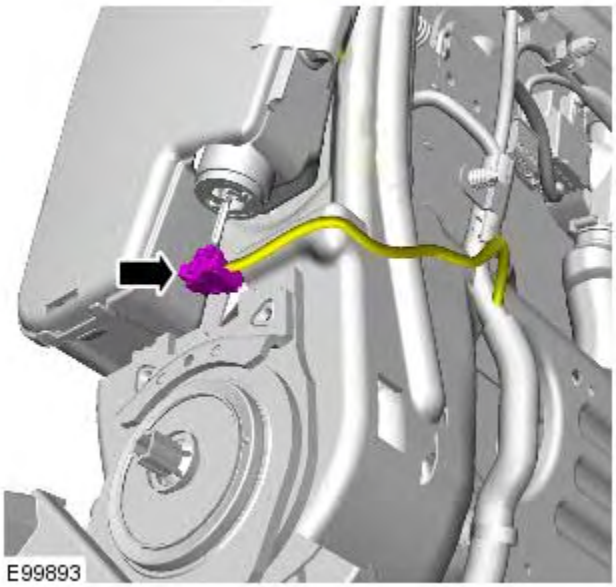
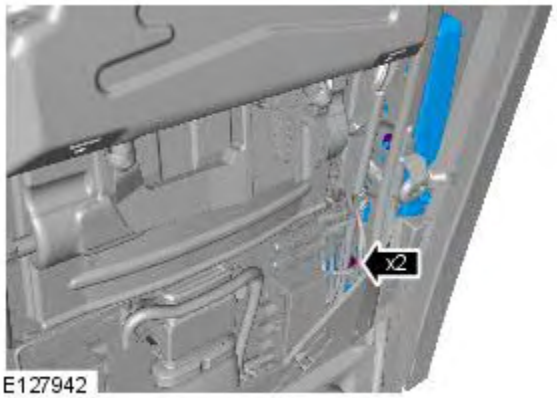
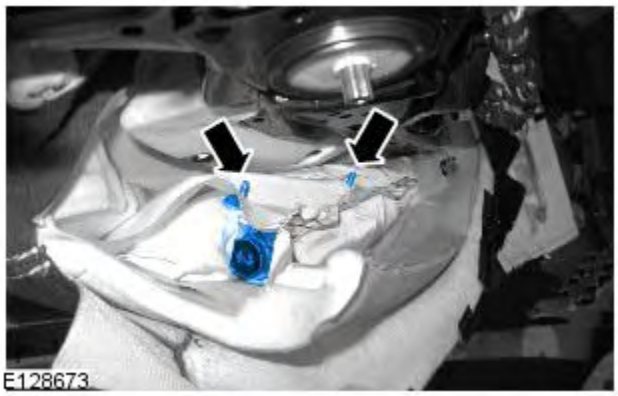


6. WARNING: The SRS electrical connectors are unique. DO NOT force, or attempt to connect electrical connectors to the wrong sockets.

CAUTION: LH illustration shown, RH is similar.



7. *Torque:* 7 Nm



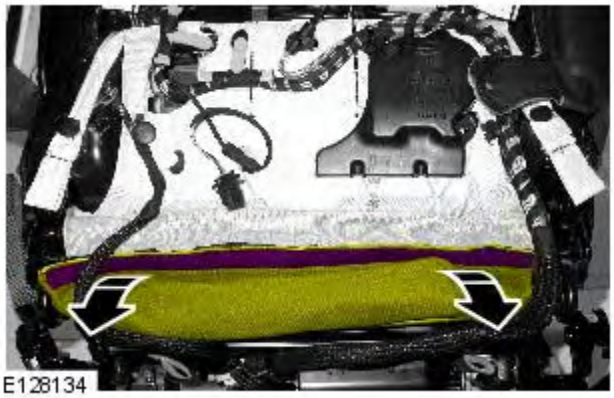
8. WARNING: Make sure that the air bag is correctly installed in to the fabric chute. Failure to follow this instruction may result in incorrect operation of the air bag.

CAUTION: Note the fitted position of the component prior to removal.

9. NOTE: Note the position of the wiring harnesses to aid installation.

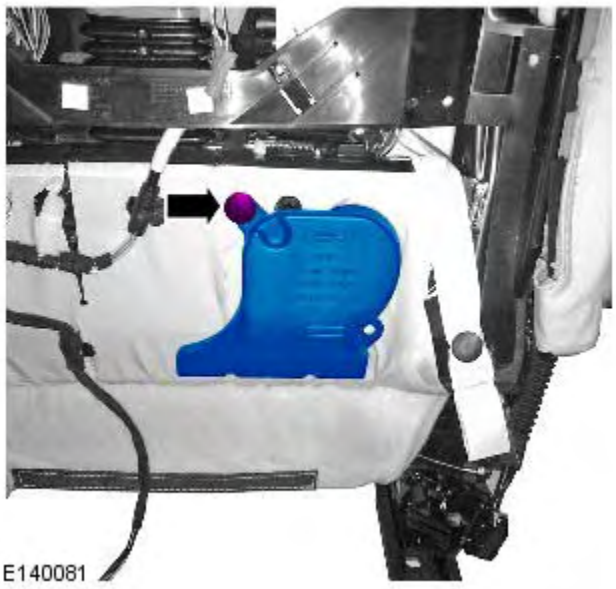
E128087

10.



E128134

11.



E140081

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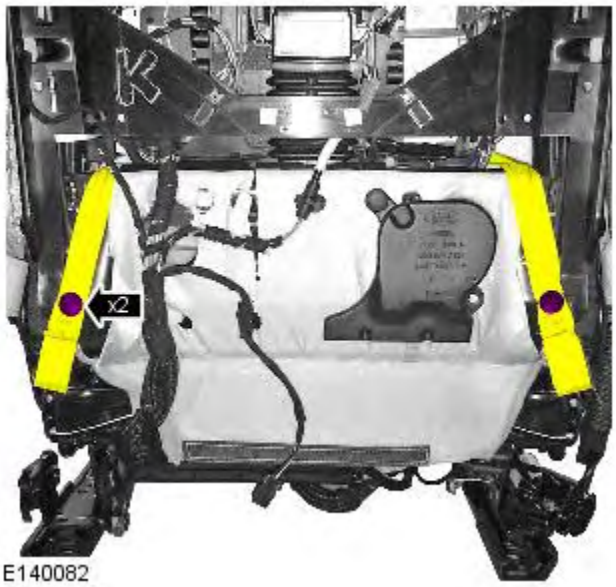
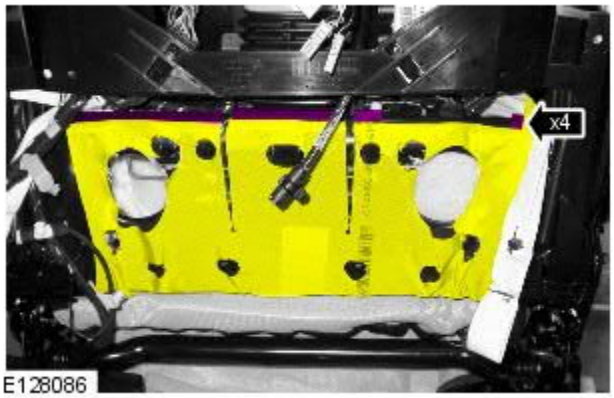


E140082

13.

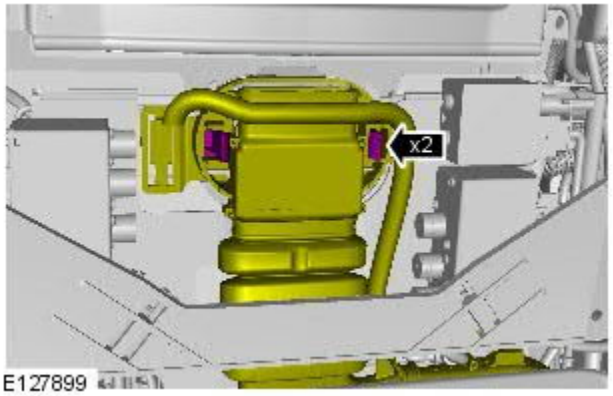


E128086

14.

E140698

15.



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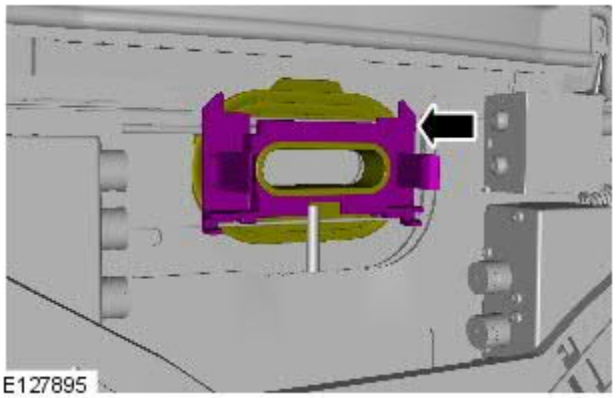
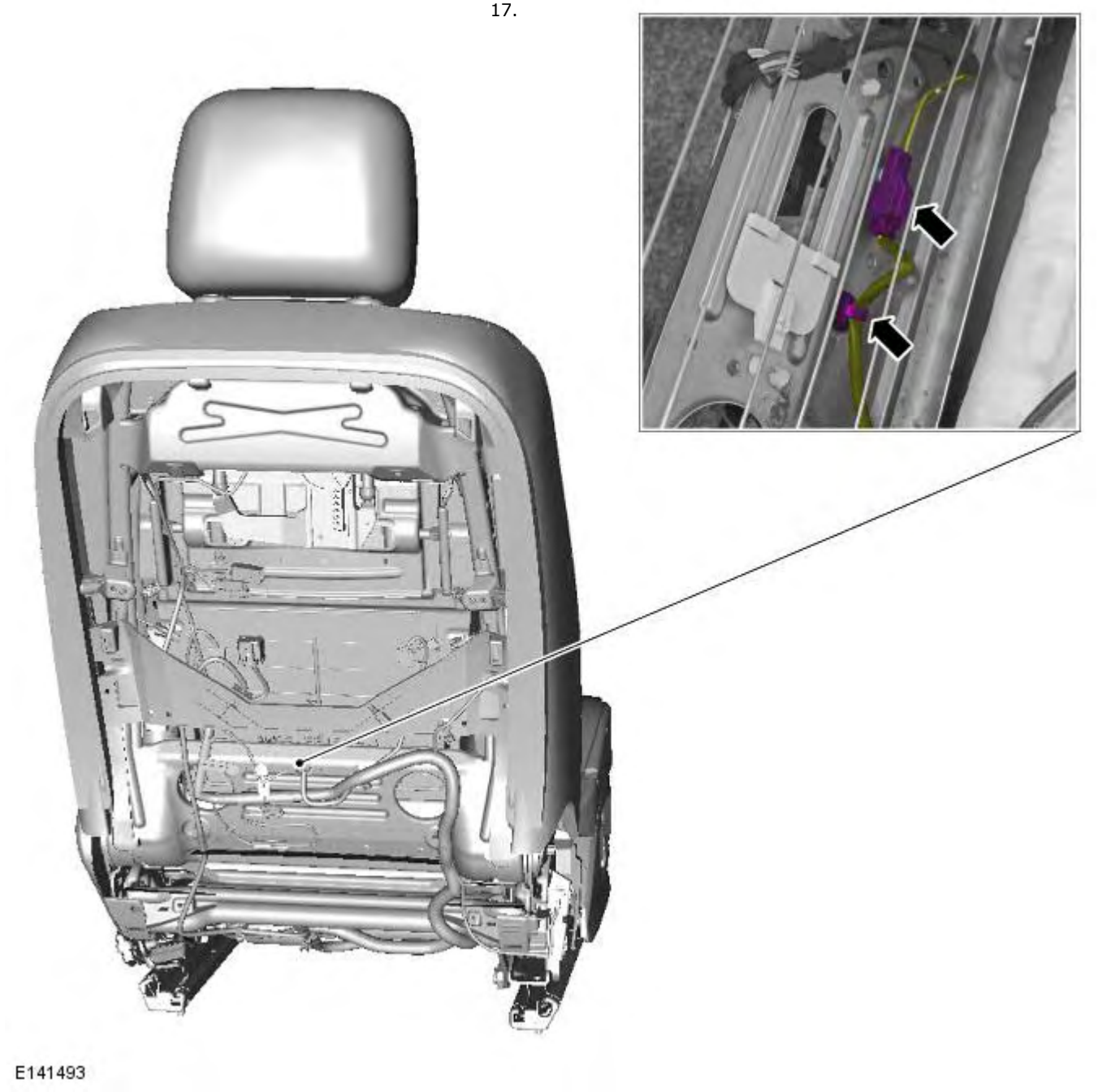


Vehicles with heated front seats

17.



E141493

18.

E128740

E128128

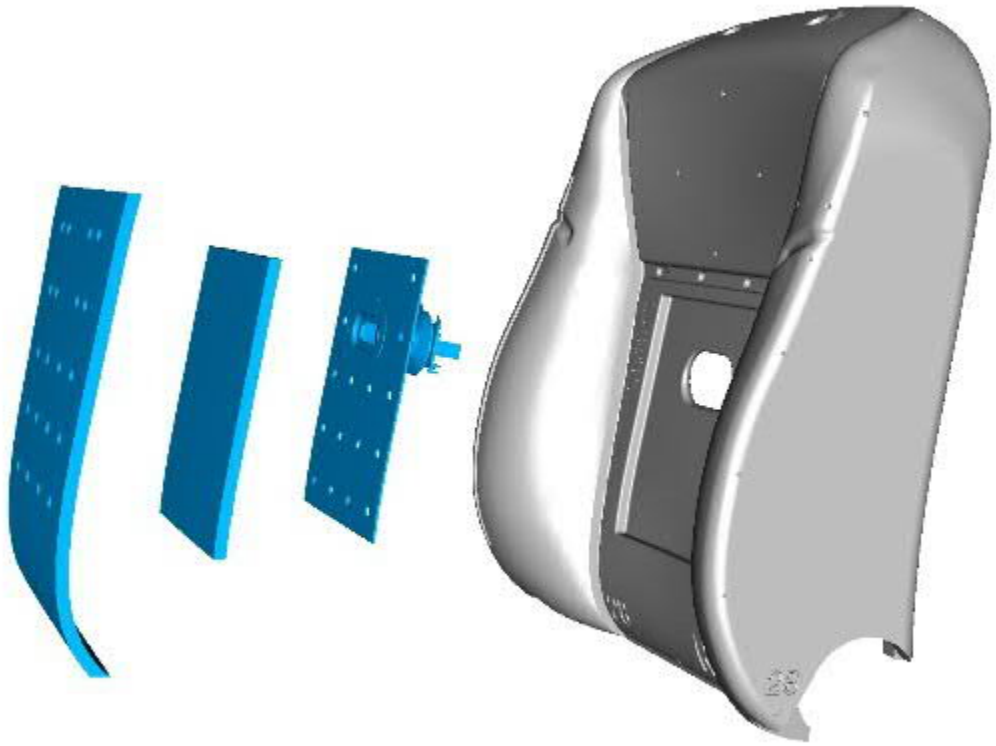
19. NOTE: Do not disassemble further if the component is removed for access only.

E128127

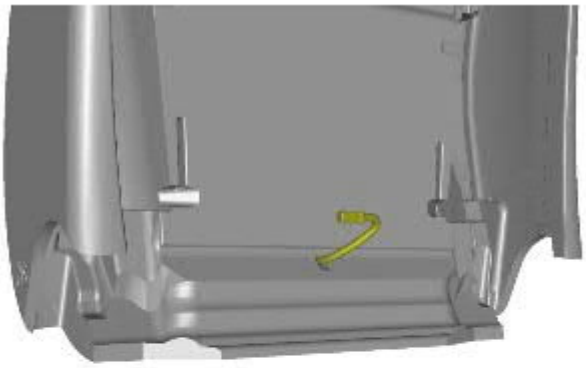
20. NOTE: RH illustration shown, LH is similar.

21.

E128126



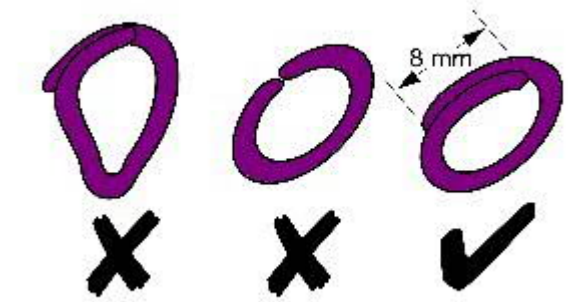
E140741



23.

E140897

Installation



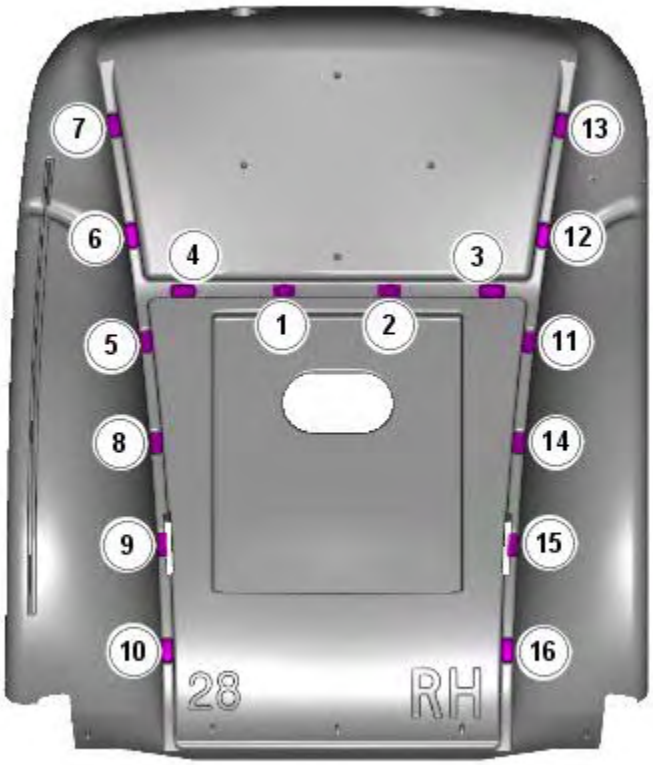
V4001063

1. NOTES:

   Make sure that new hog rings are installed.

   Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.

2. NOTE: Make sure that the hogrings are installed in the sequence shown.



E140737

3. To install, reverse the removal procedure.

Published: 22-Apr-2012

Seating - Front Seat Backrest Heater Mat

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least one minute after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

Removal steps in this procedure may contain installation details.

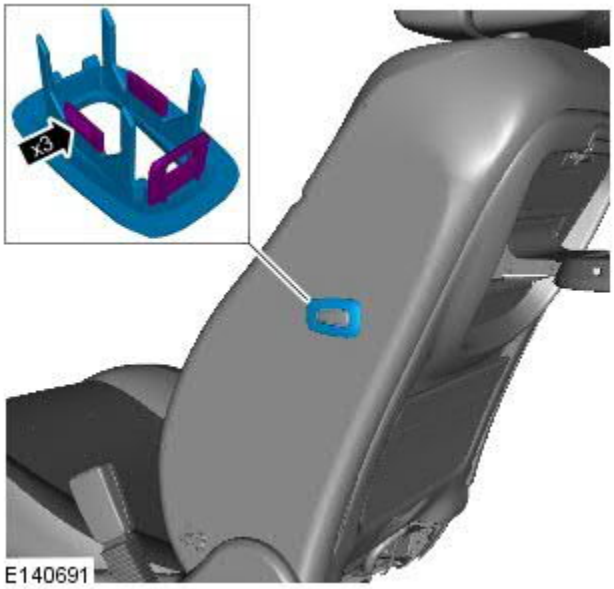
1. Make the air bag supplemental restraint system (SRS) safe.

   Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

2. Refer to: Front Seat Head Restraint (501-10 Seating, Removal and Installation).

3.

- If equipped.



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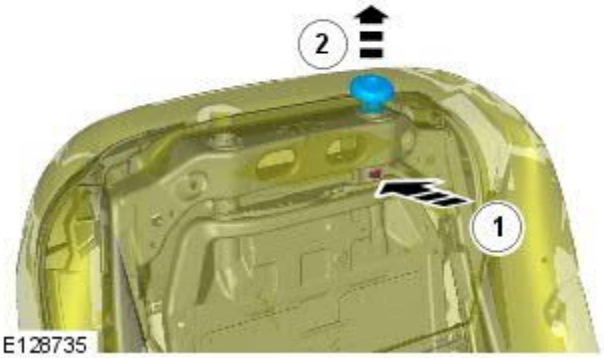

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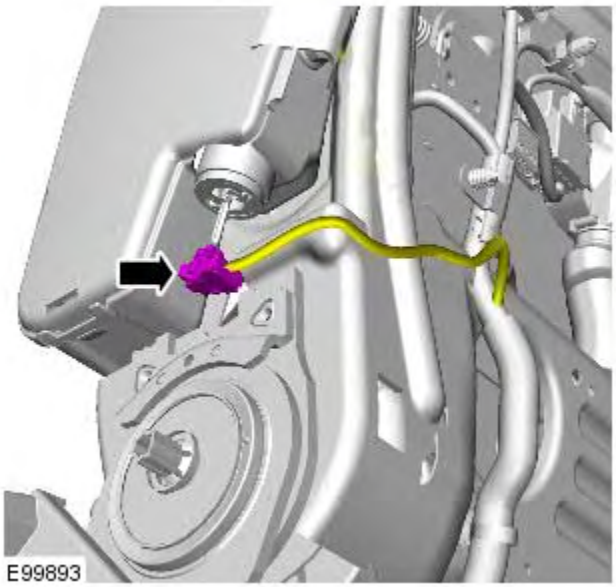
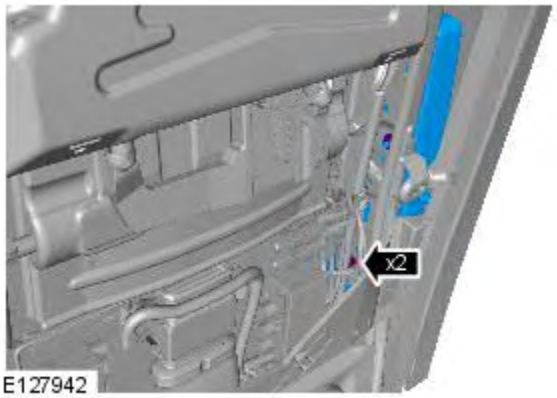
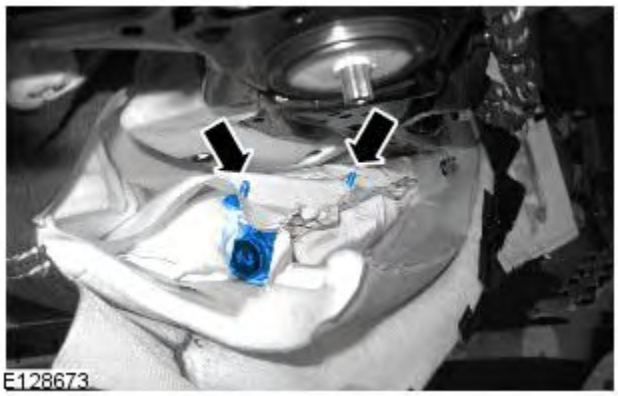


6. WARNING: The SRS electrical connectors are unique. DO NOT force, or attempt to connect electrical connectors to the wrong sockets.

CAUTION: LH illustration shown, RH is similar.



7. *Torque:* 7 Nm



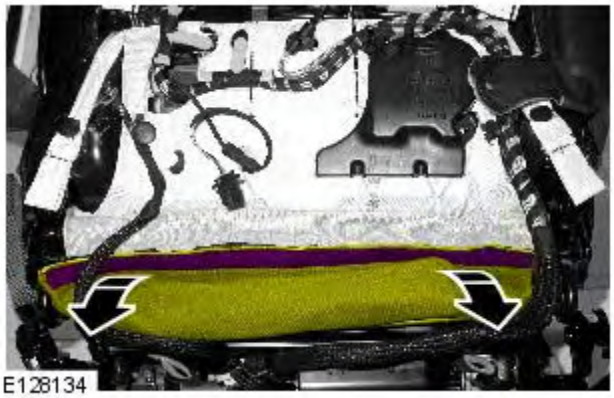
8. WARNING: Make sure that the air bag is correctly installed in to the fabric chute. Failure to follow this instruction may result in incorrect operation of the air bag.

CAUTION: Note the fitted position of the component prior to removal.

9. NOTE: Note the position of the wiring harnesses to aid installation.

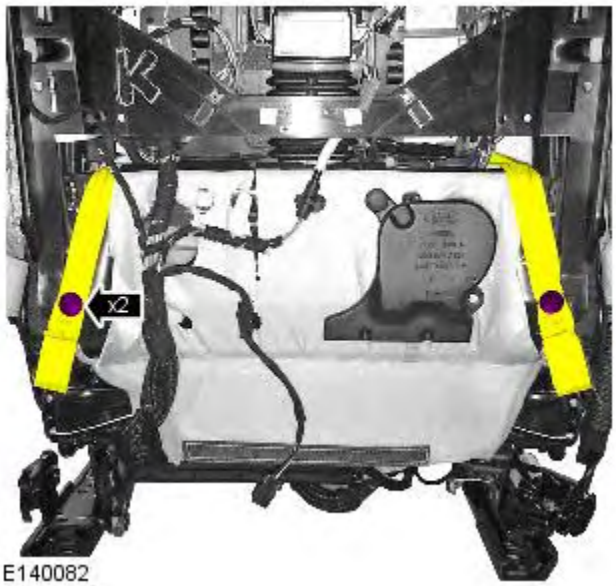
E128087

10.



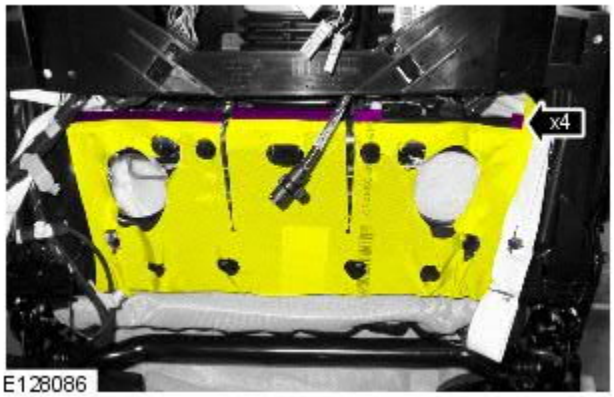
E128134

11.



E140082

12.



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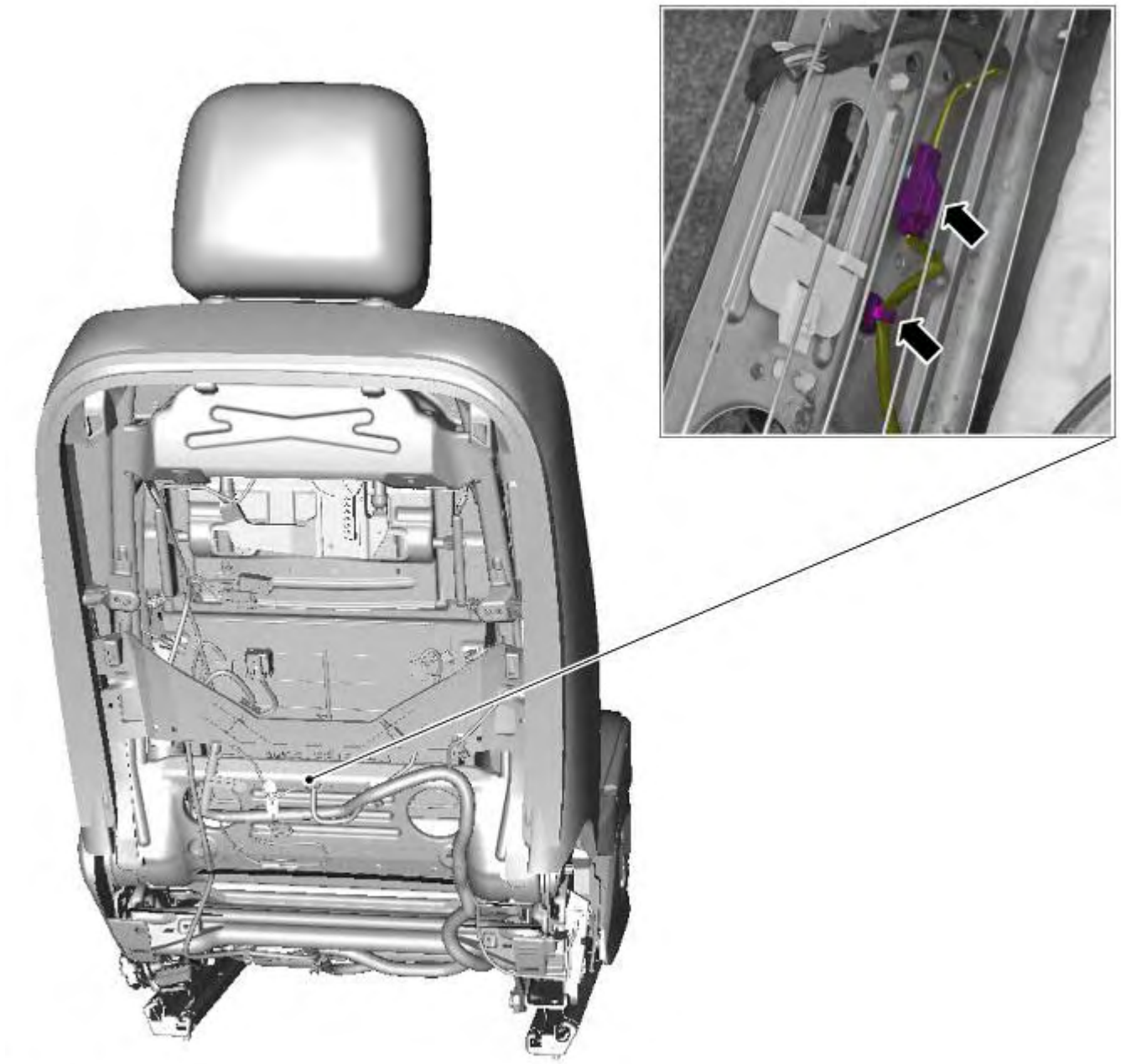


E141493

14.

E128740

15.

E128128

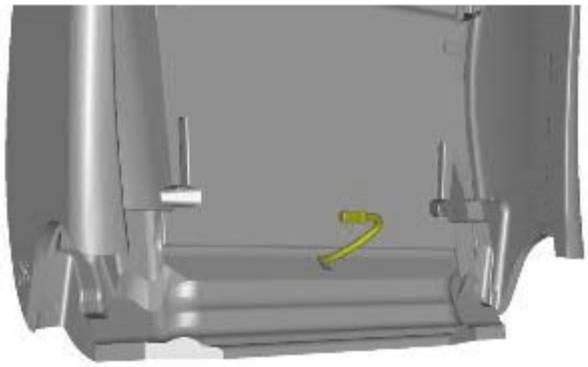
16. NOTE: RH illustration shown, LH is similar.

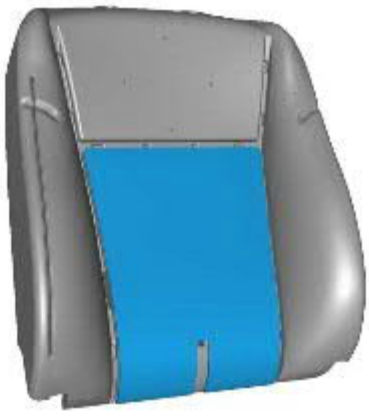
E128127

17.

E128126

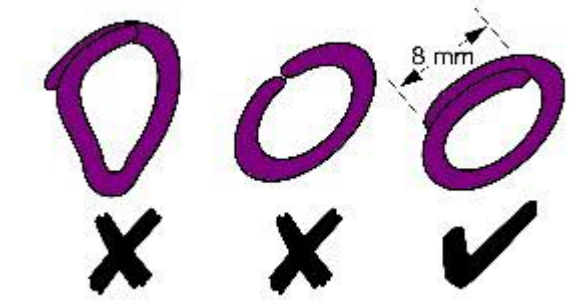
18.





E140897

Installation



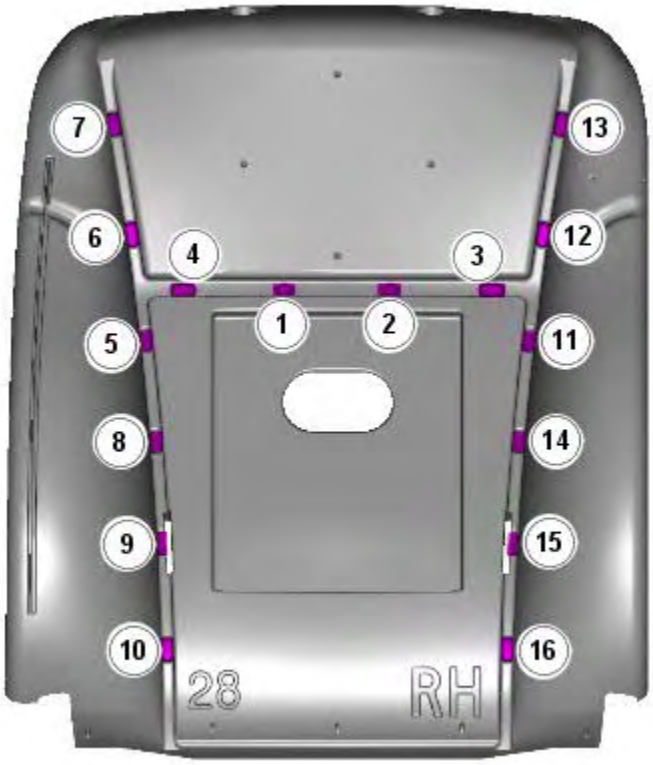
V4001063

1. NOTES:

   Make sure that new hog rings are installed.

   Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.

2. NOTE: Make sure that the hogrings are installed in the sequence shown.



E140737

3. To install, reverse the removal procedure.

Published: 03-Jan-2012

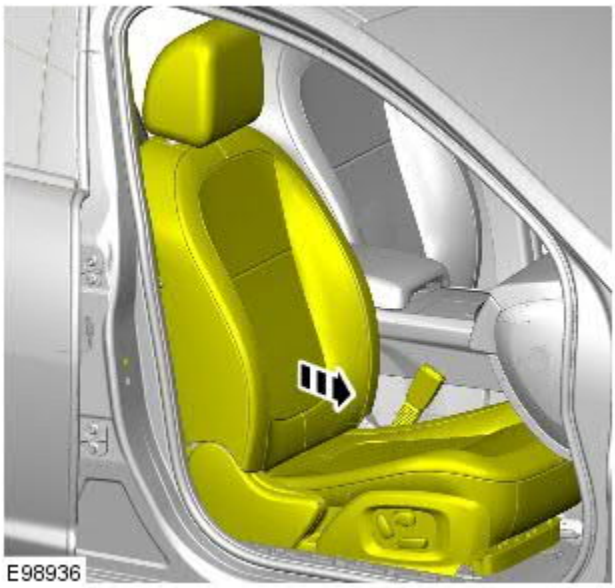
Seating - Front Seat Bolster Pump

Removal and Installation

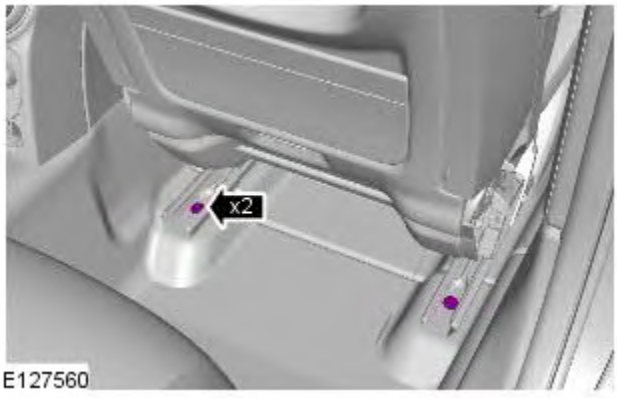
Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

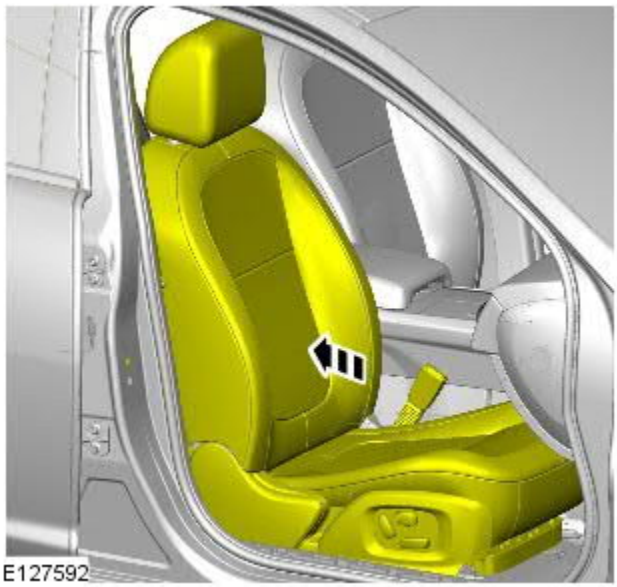


2.

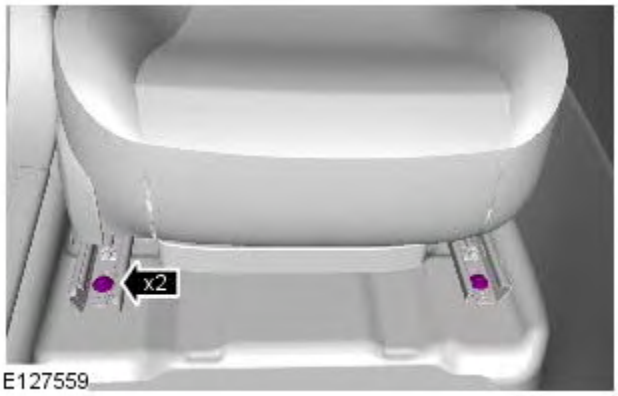


3. *Torque:* 47 Nm

4.


E127592

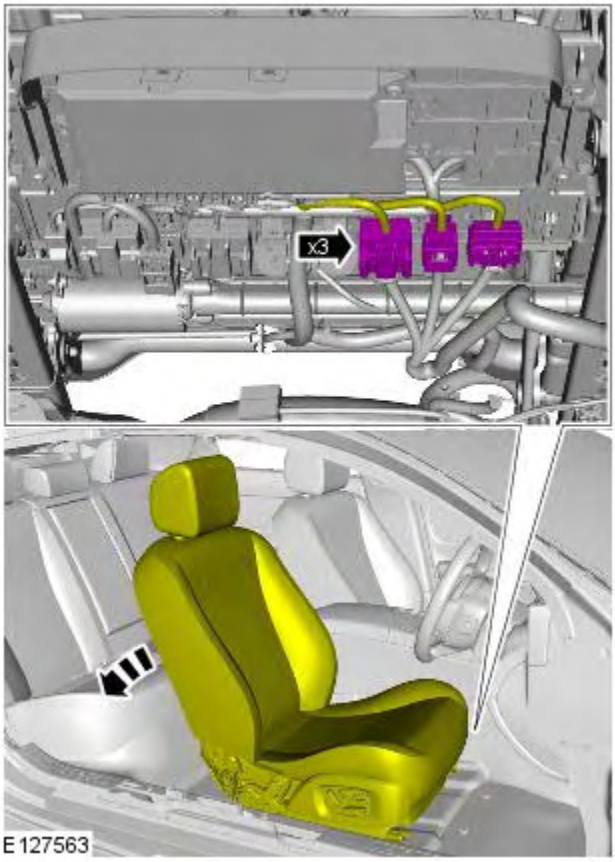
5. *Torque:* 47 Nm



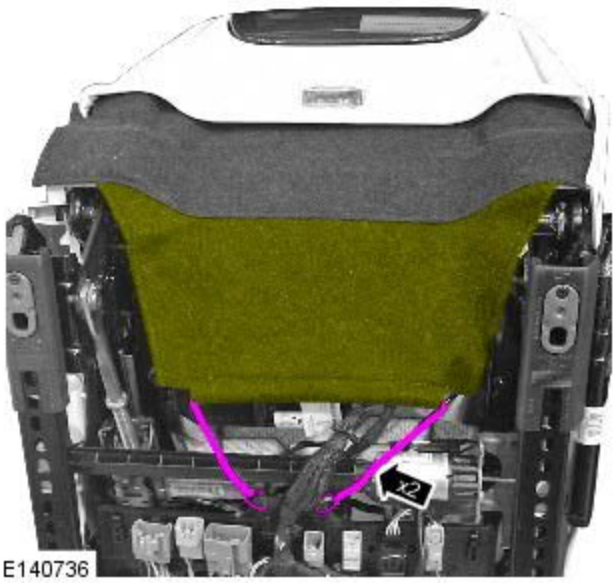
E127559

6. Reposition the front seat to the central position.

7.



8.



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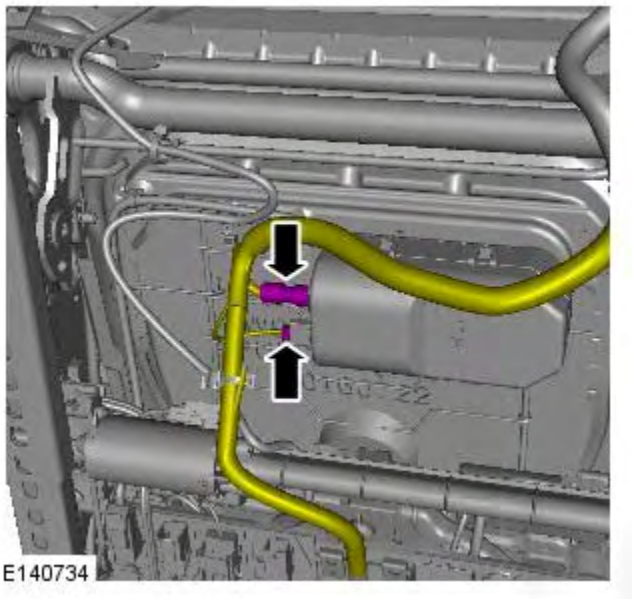

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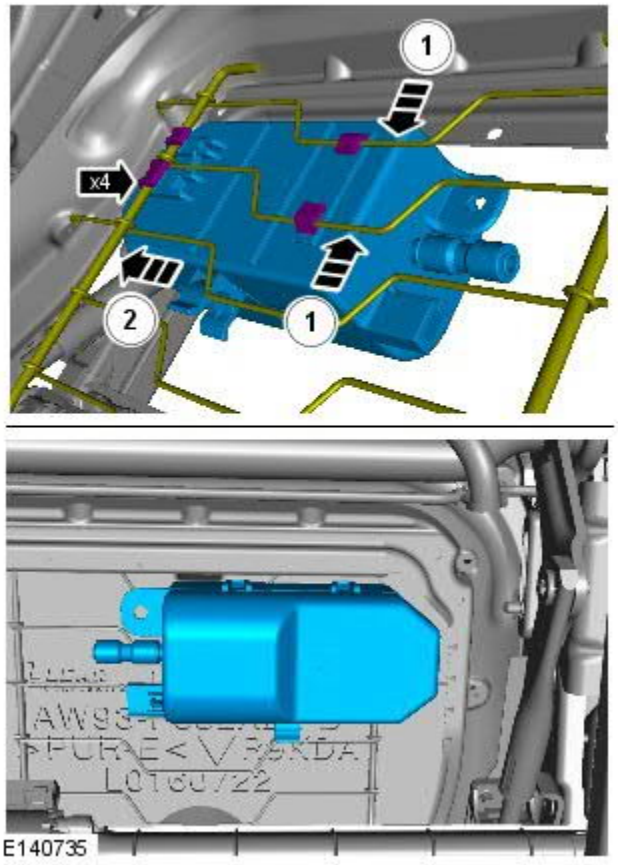


Installation

1. To install, reverse the removal procedure.

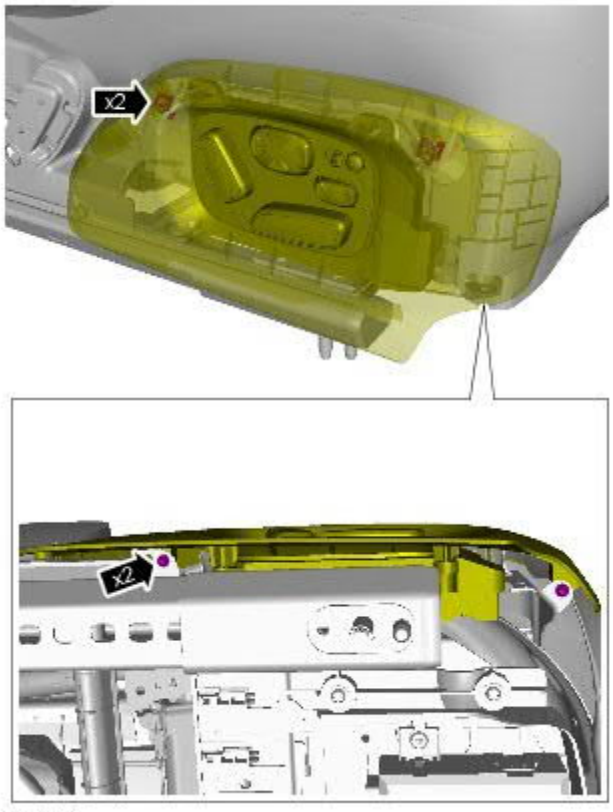
Published: 03-Dec-2011

Seating - Front Seat Control Switch

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.



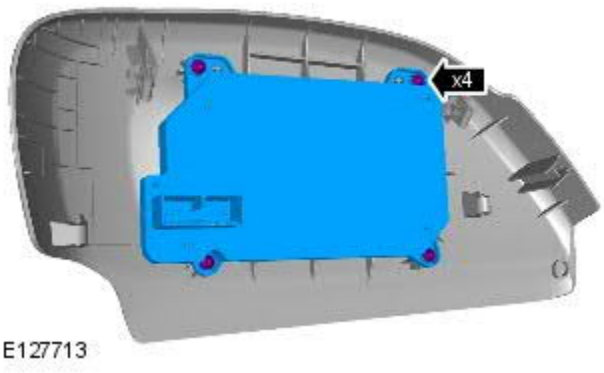
E127711

1. NOTE: Make sure that the clips are installed in the correct orientation.

   Torque: 9 Nm

E127712

2.



3. NOTE: Do not disassemble further if the component is removed for access only.

   Torque: 9 Nm

Installation

1. To install, reverse the removal procedure.

Published: 03-Jan-2012

Seating - Front Seat Cushion Cover

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least one minute after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

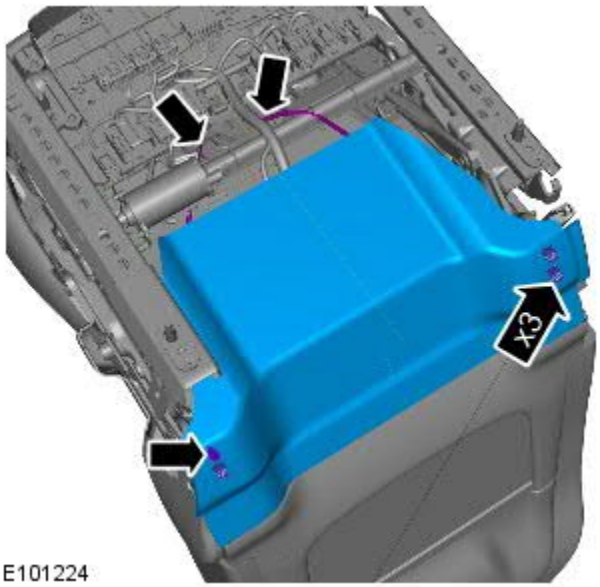
Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

All vehicles

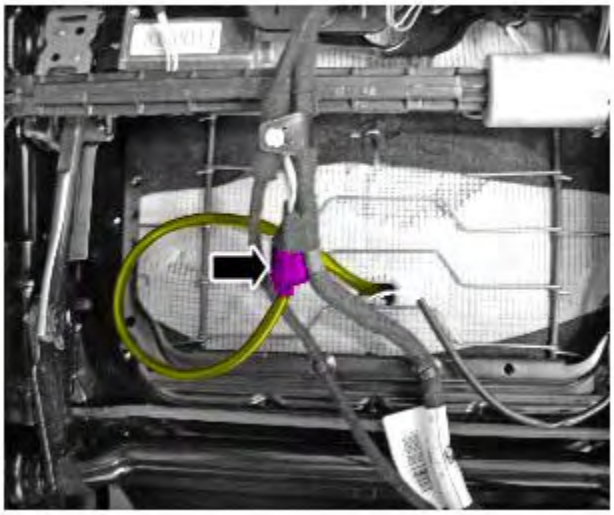
1. Refer to: Front Seat (501-10 Seating, Removal and Installation).
2. Refer to: Front Seat Control Switch (501-10 Seating, Removal and Installation).

3.



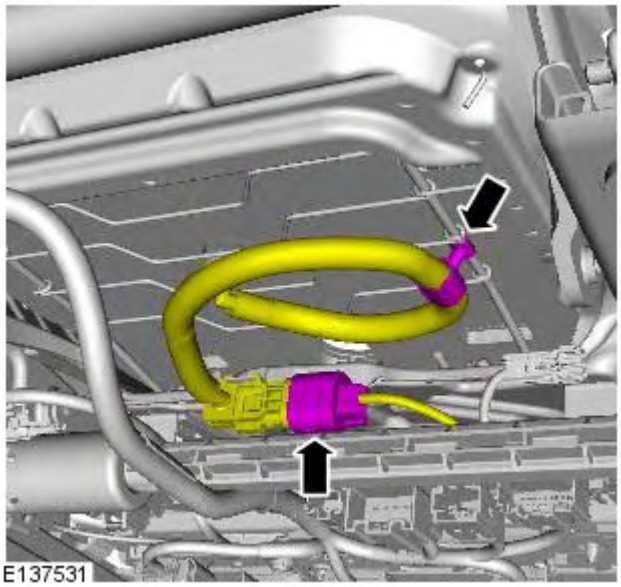
E101224

Vehicles with heated front seats


E137449

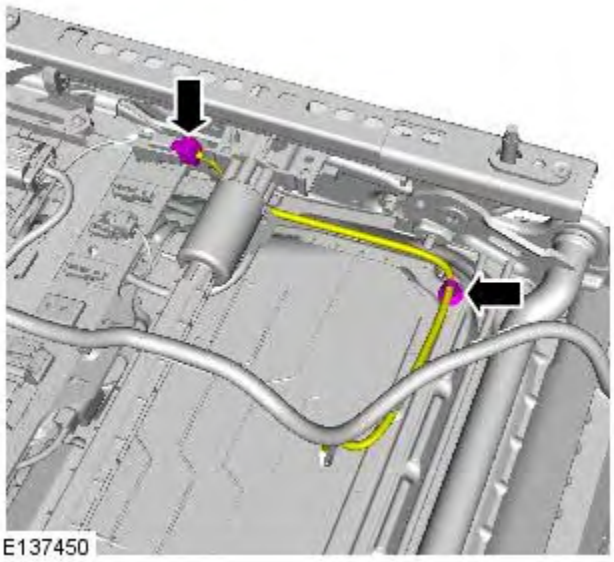
4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

NAS vehicles

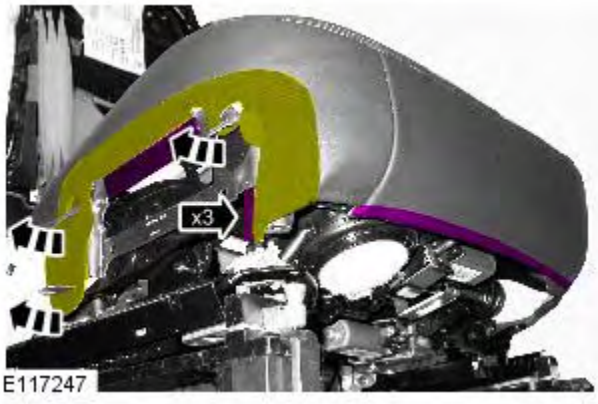


5. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

All vehicles



6. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

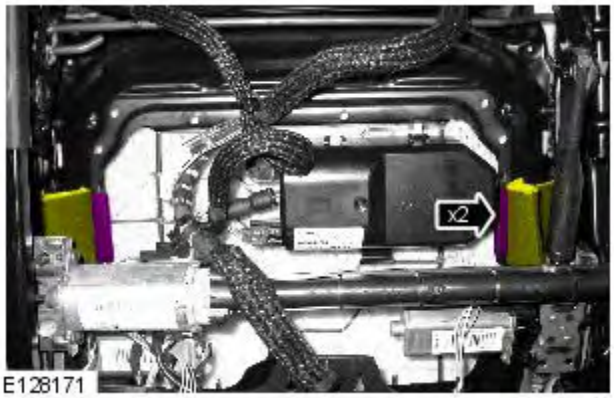


7.

8.

E117248

9.



E128171

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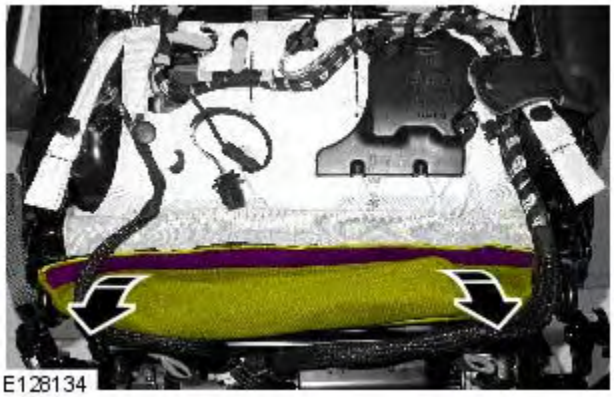
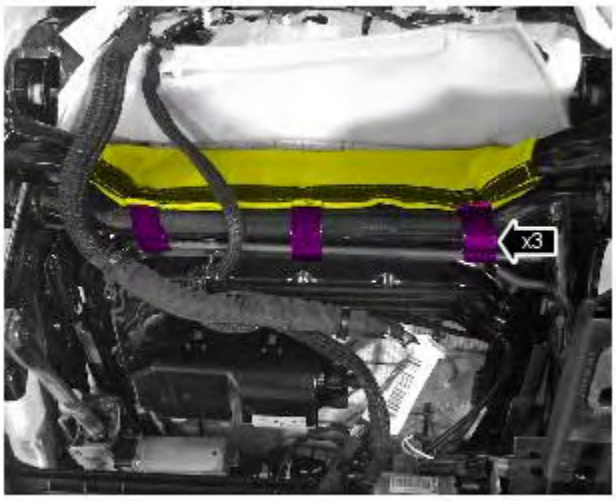

E128134

11.



E140841

12.

E117249

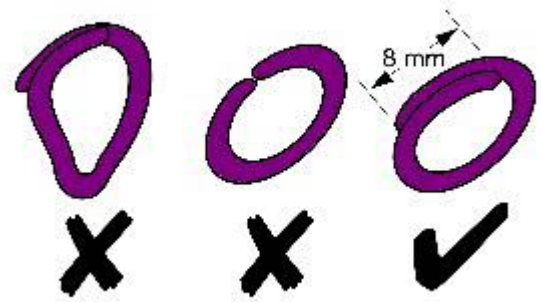
13.

E140684

E101234

14. NOTE: Make sure that new hog rings are installed.

Installation



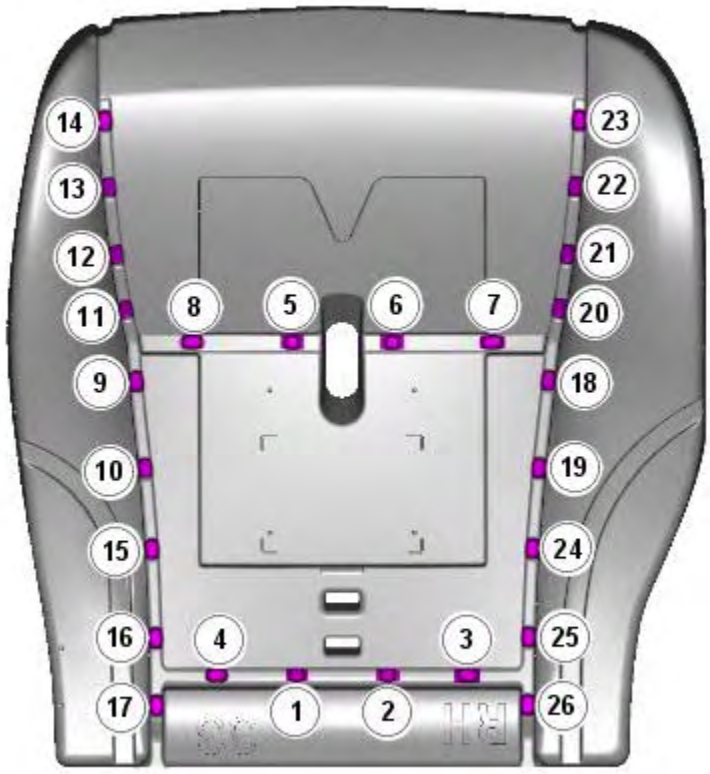
V4001063

1. NOTES:

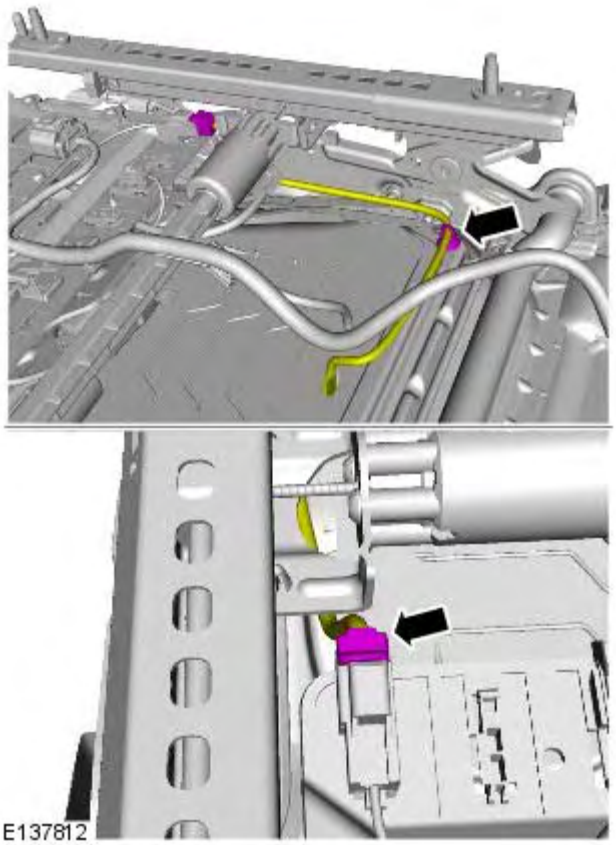
   Make sure that new hog rings are installed.

   Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.

2. NOTE: Make sure that the hogrings are installed in the sequence shown.



E140733



E137812

3. CAUTION: Make sure the component is aligned as shown.

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

4. To install, reverse the removal procedure.

Published: 22-Apr-2012

Seating - Front Seat Height Adjustment Motor

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least one minute after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

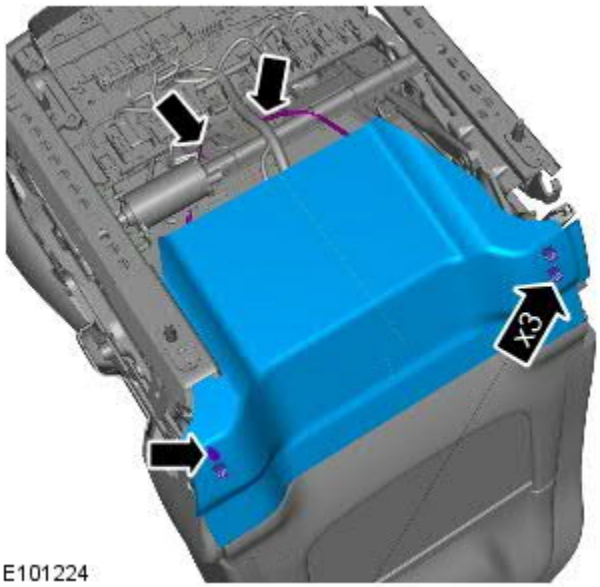
NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

Removal steps in this procedure may contain installation details.

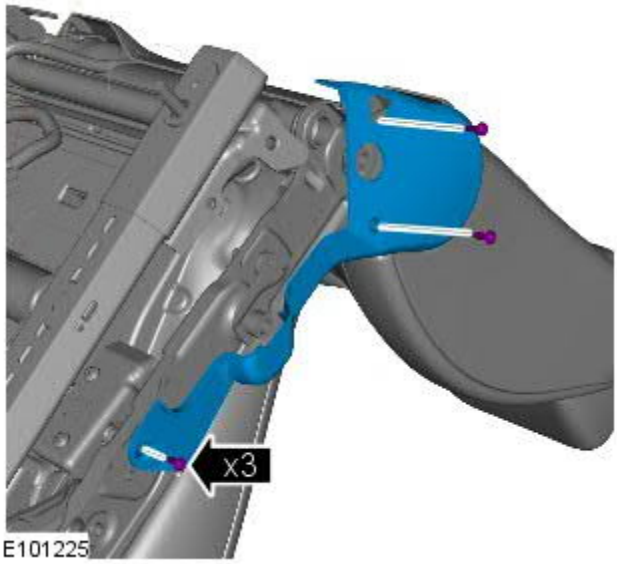
All vehicles

1. Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).
2. Refer to: Front Seat (501-10 Seating, Removal and Installation).
3. Refer to: Front Seat Control Switch (501-10 Seating, Removal and Installation).



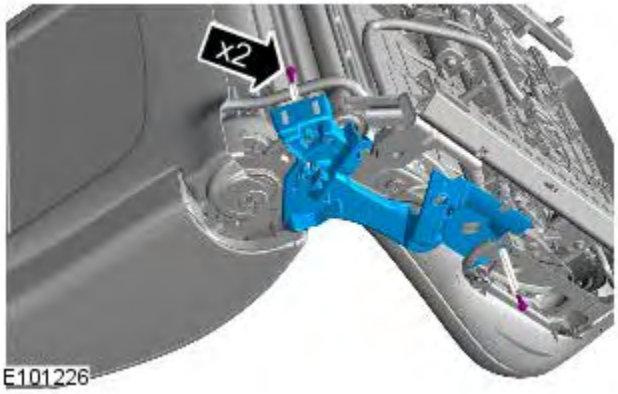
E101224

4. NOTE: Make sure that the clips are installed in the correct orientation.



E101225

5.

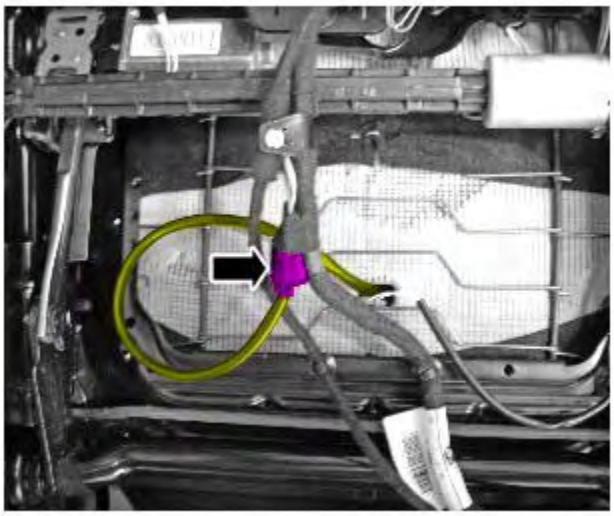


E101226

6.

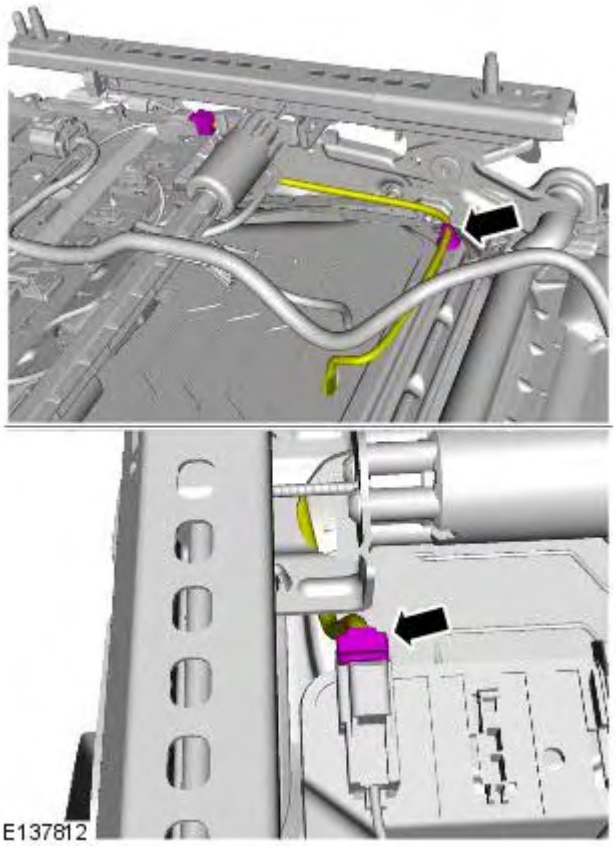
Vehicles with heated front seats

7.



E137449

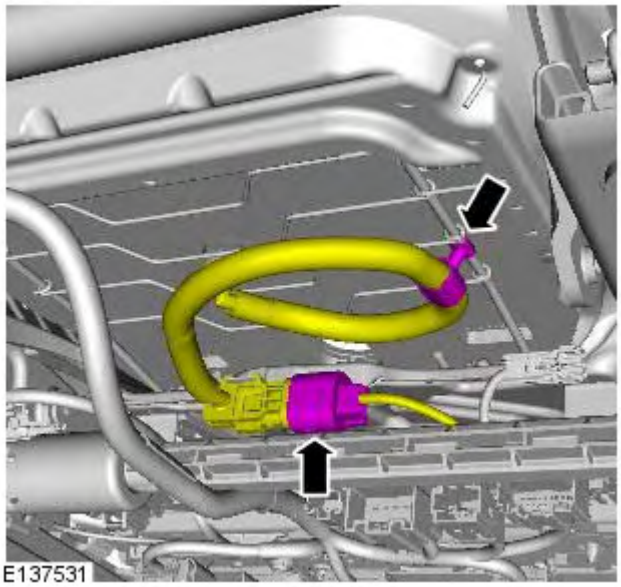
Non NAS vehicles



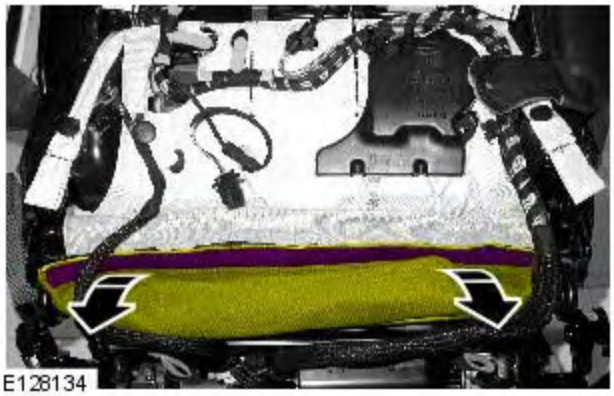
E137812

8. CAUTION: Make sure that the component is aligned and attached as shown.

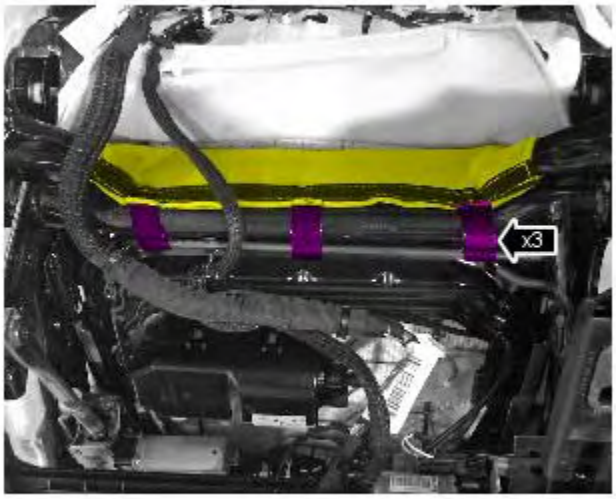
9.


E137531

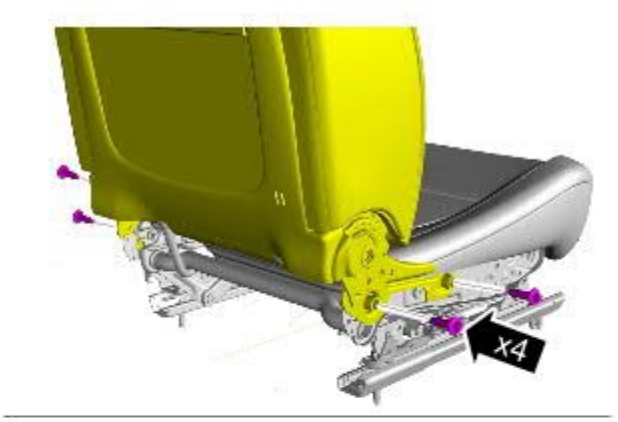
10.


E128134

11.



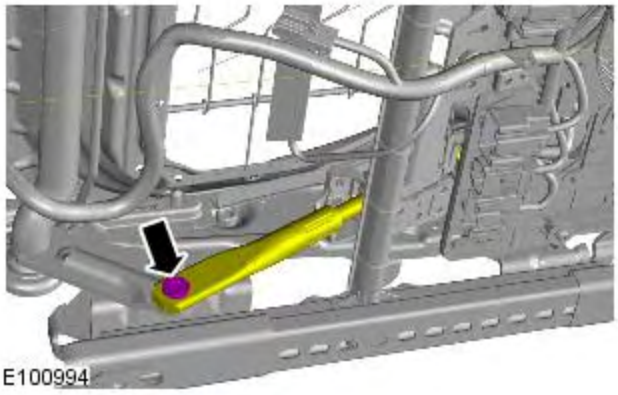
E140841



E101228

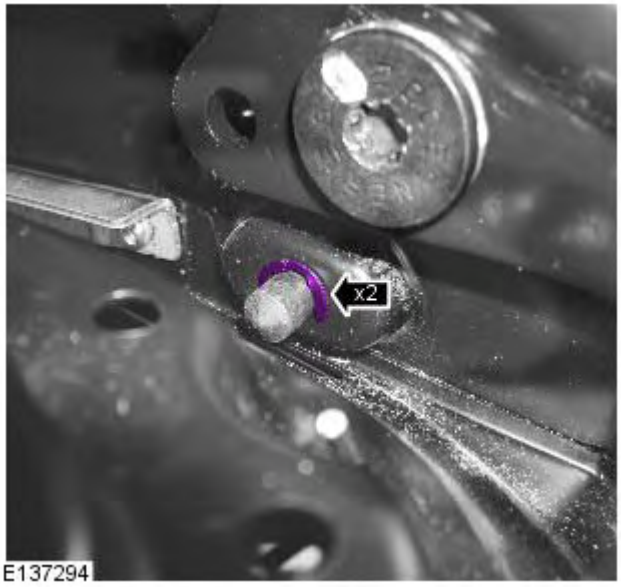
12. CAUTION: Take extra care not to damage the component.

Torque: 35 Nm



E100994

13. *Torque:* 28 Nm



E137294

14. NOTES:

Use a suitable tool to remove the circlips from the seat cushion frame bolts.

Note the orientation of the components.

Right-hand shown, left-hand similar.

Repeat the procedure for the other side.

E137293

15. NOTES:

Right-hand shown, left-hand similar.

Repeat the procedure for the other side.

Torque: 20 Nm

16.

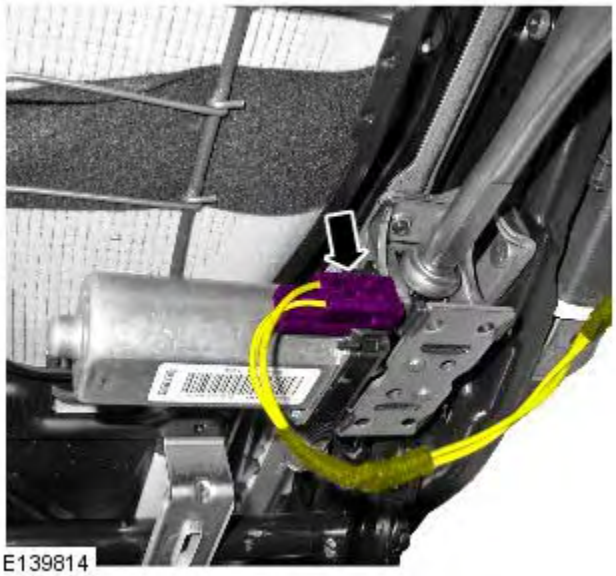
17. NOTES:

Note the orientation of the components.

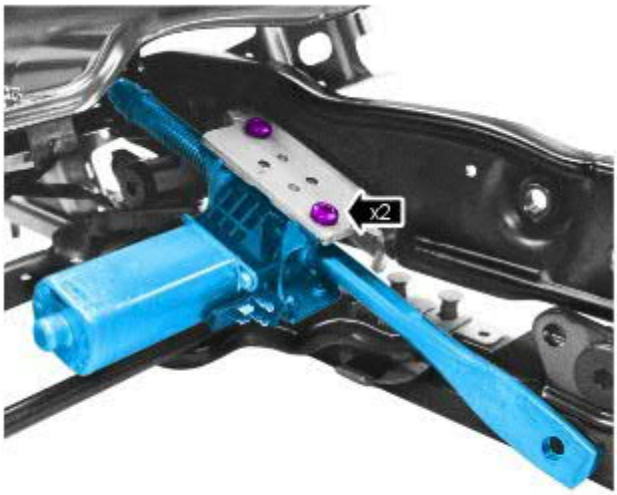
Right-hand shown, left-hand similar.

E137317

18.



19. *Torque:* 10 Nm



Installation

1. To install, reverse the removal procedure.
2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Published: 03-Jan-2012

Seating - Front Seat Recliner Motor

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least one minute after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

NOTES:

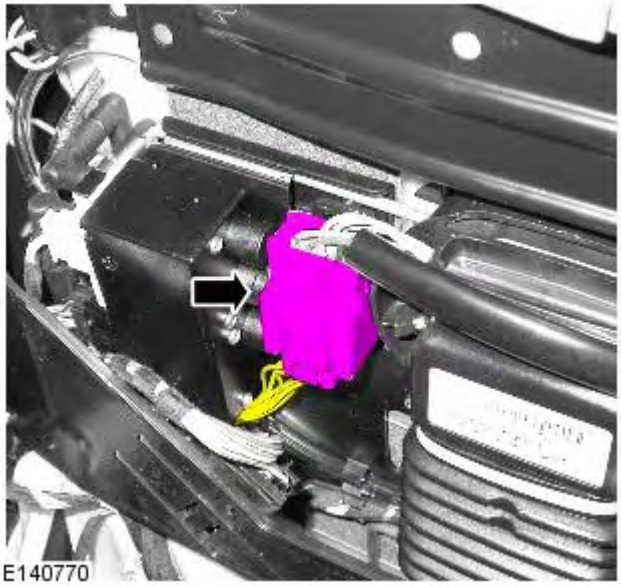
Some variation in the illustrations may occur, but the essential information is always correct.

Removal steps in this procedure may contain installation details.

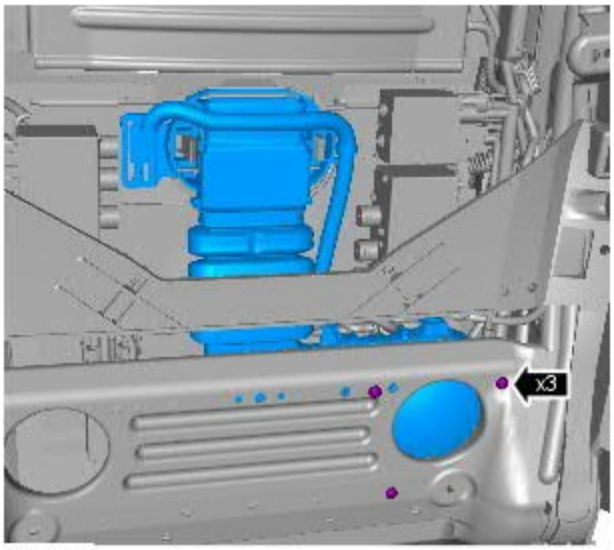
1. Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

2. Refer to: Massaging Lumbar Assembly (501-10 Seating, Removal and Installation).
   Refer to: Lumbar Assembly (501-10 Seating, Removal and Installation).

3.

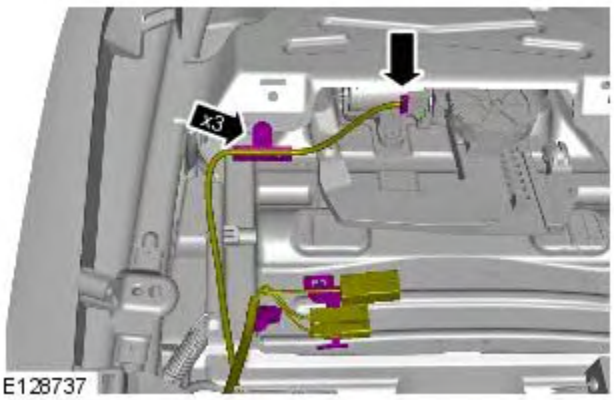

E140770

4.



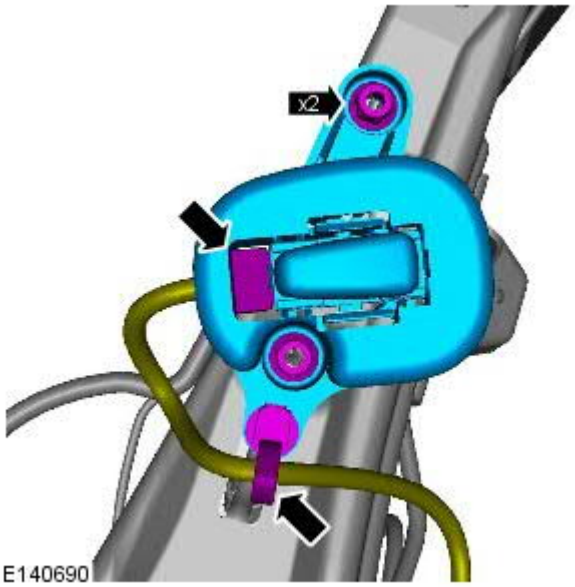
E127898

5.

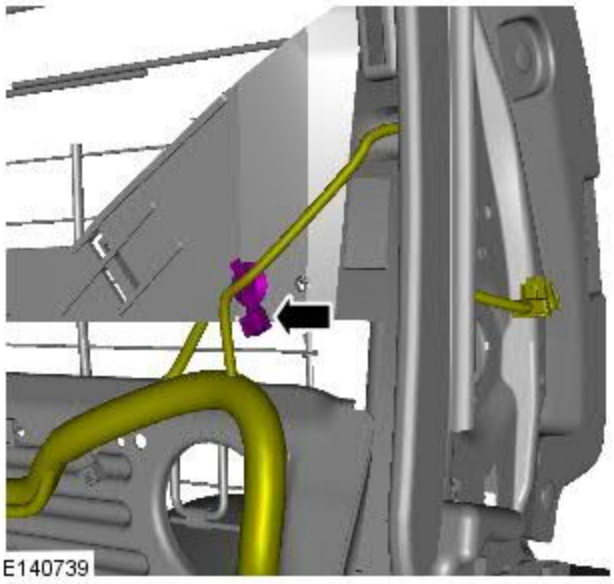


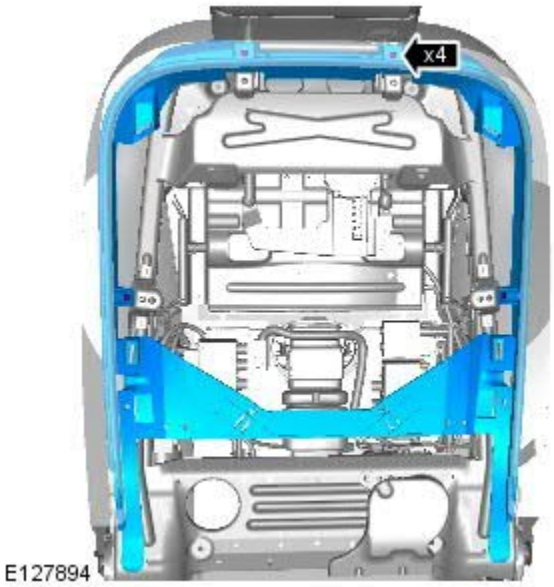
E128737

6. *Torque:* 7 Nm

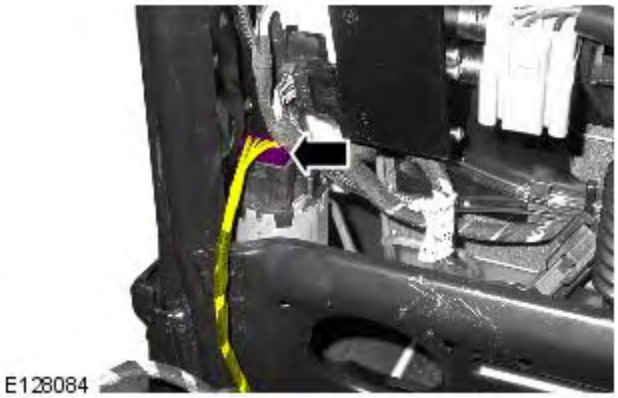


7.

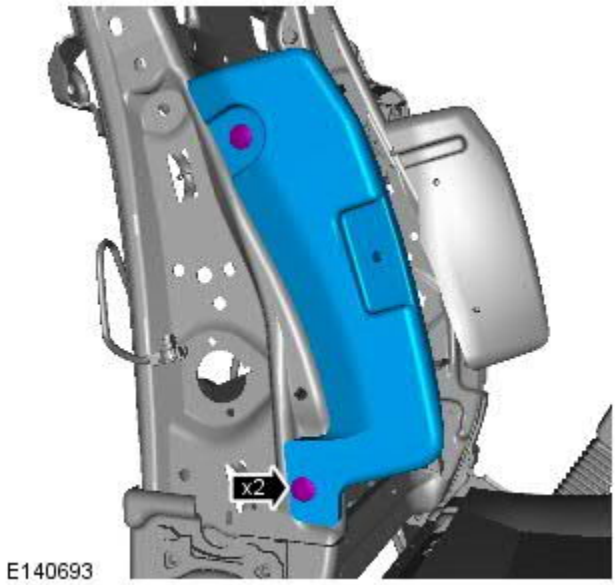




8. *Torque:* 9 Nm



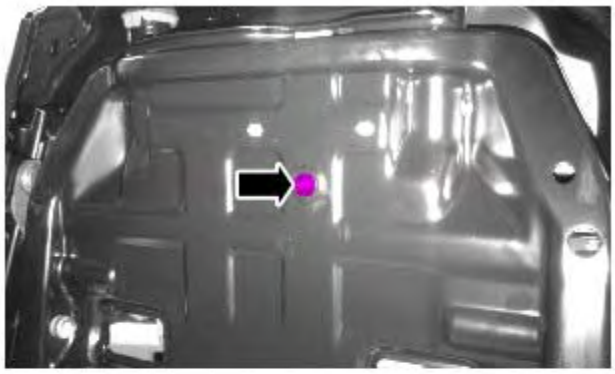
9.



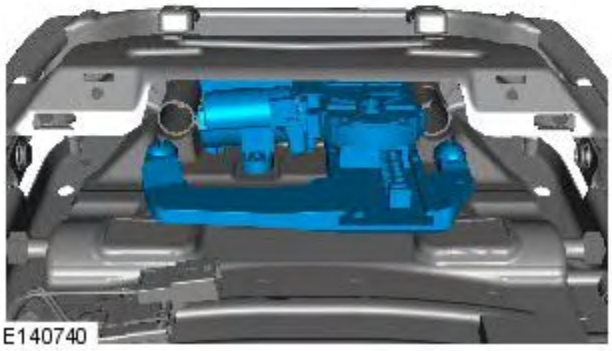
10. NOTES:

Repeat the procedure for the other side.

LH illustration shown, RH is similar.



11.



12. *Torque:* 35 Nm

Installation

1. To install, reverse the removal procedure.
2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Published: 22-Apr-2012

Seating - Front Seat Track Motor

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least two minutes after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

NOTES:

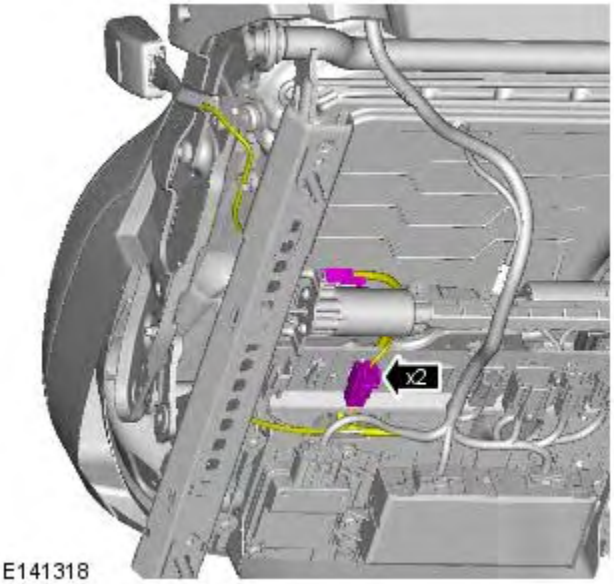
Some variation in the illustrations may occur, but the essential information is always correct.

Removal steps in this procedure may contain installation details.

1. Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

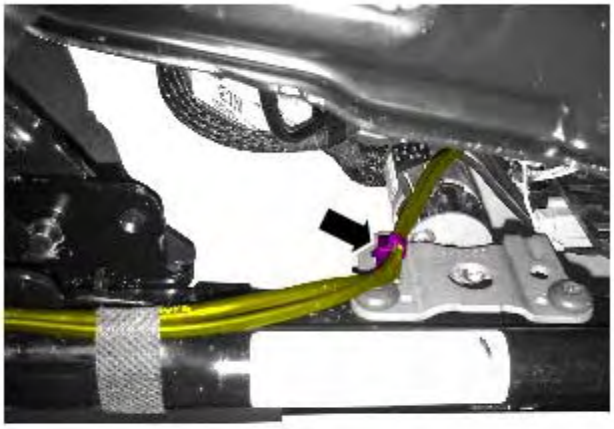
2. Refer to: Front Seat (501-10 Seating, Removal and Installation).

3.



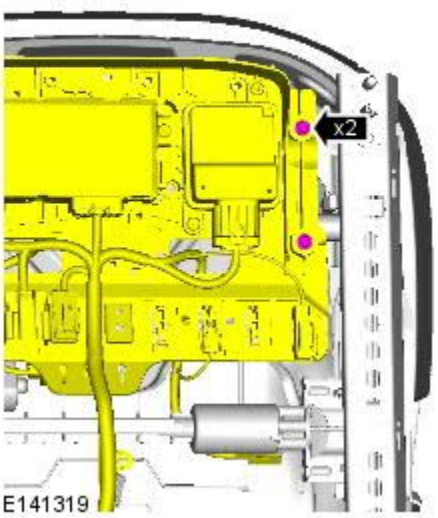
E141318

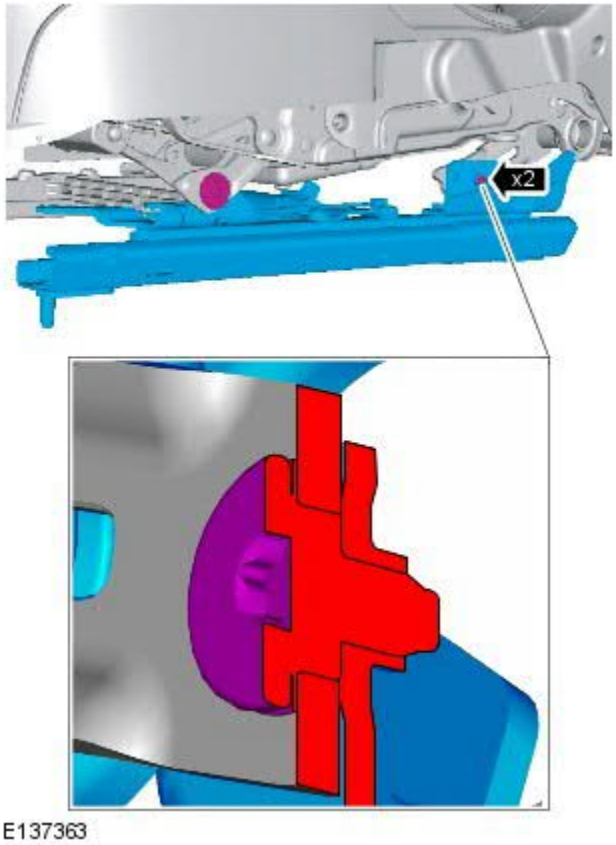
4.



E141317

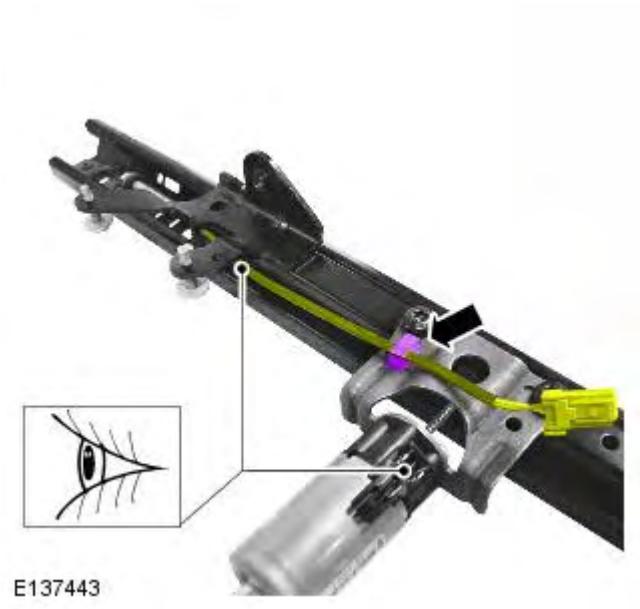
5. *Torque:* 10 Nm



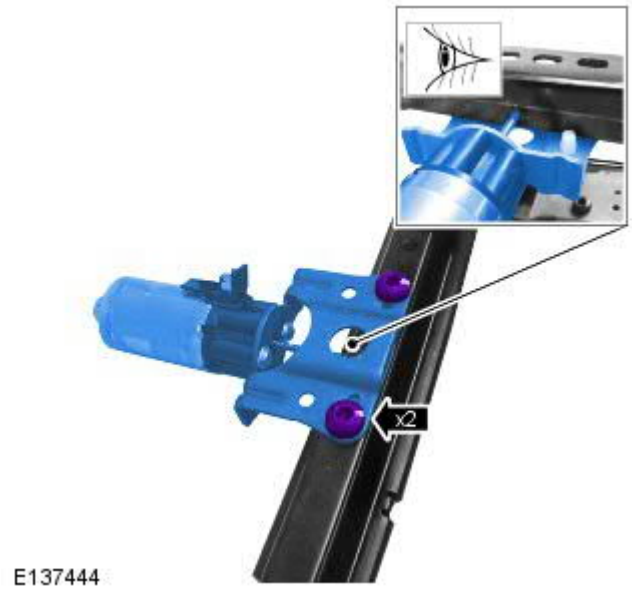


6. NOTE: Install the rear reatining bolt first.

Torque: 28 Nm

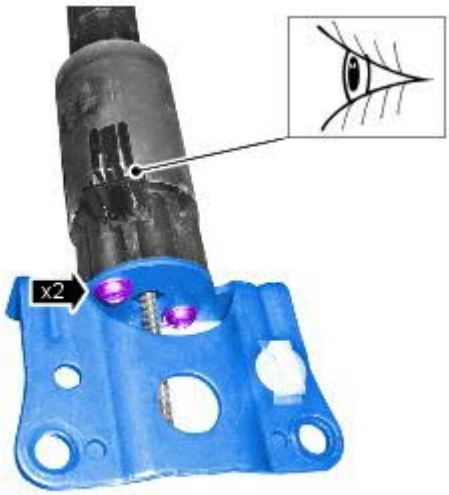


7. NOTE: Note the orientation of the electrical connetor and wiring harness.



8. NOTE: Make a note of the orientation of the front seat track motor drive pin bar.

Torque: 10 Nm

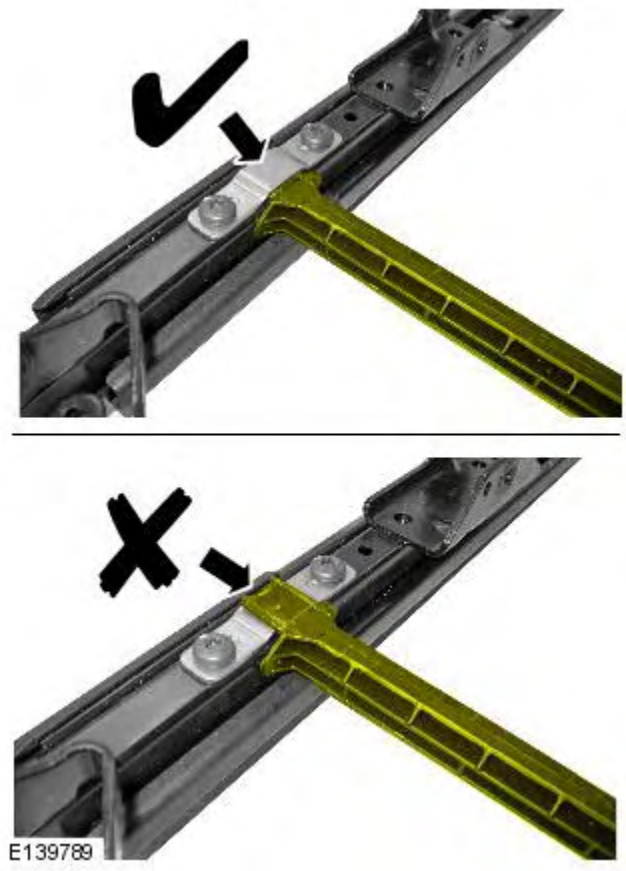


E137445

9. NOTE: Make a note of the orientation of the electrical connector.

   Torque: 1.7 Nm

Installation



1. CAUTIONS:

   Make sure that the front seat track motor is correctly installed to the front seat track.

   Make sure that these components are installed to the noted removal position.

2. To install, reverse the removal procedure.

Published: 15-Feb-2012

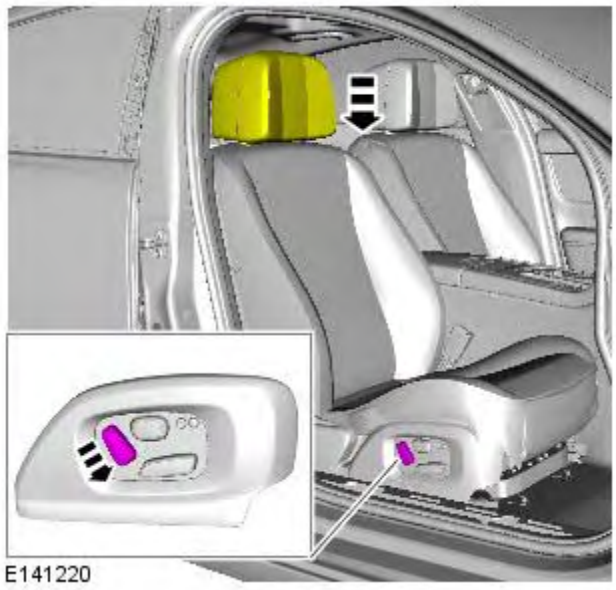
Seating - Front Seat Head Restraint

Removal and Installation

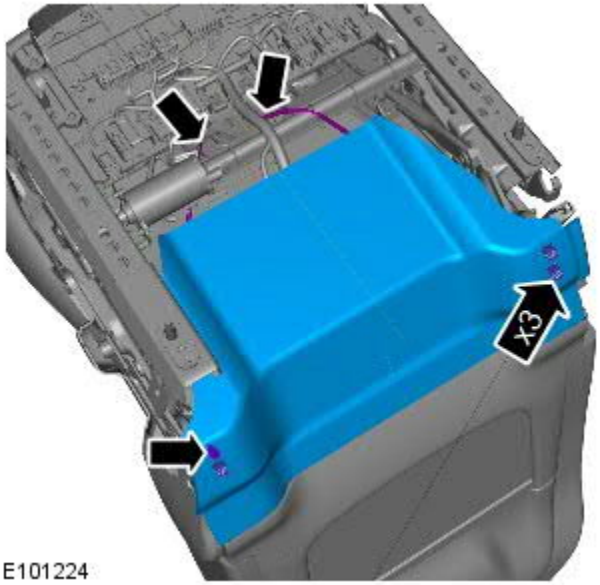
Removal

NOTE: Removal steps in this procedure may contain installation details.

1.

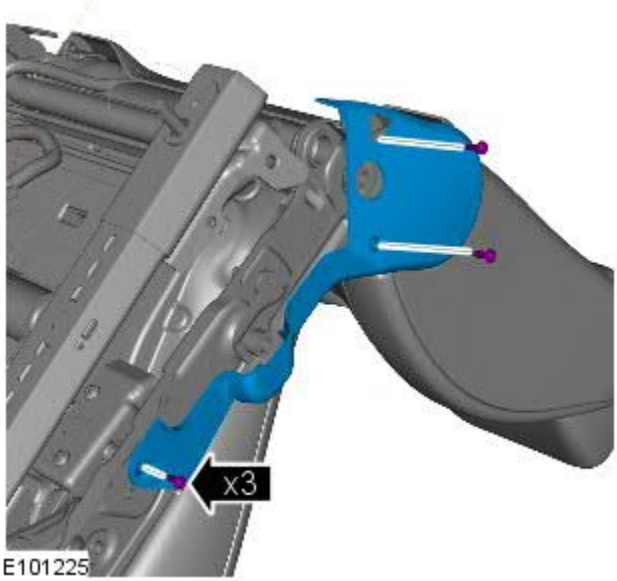


2. Refer to: Front Seat (501-10 Seating, Removal and Installation).



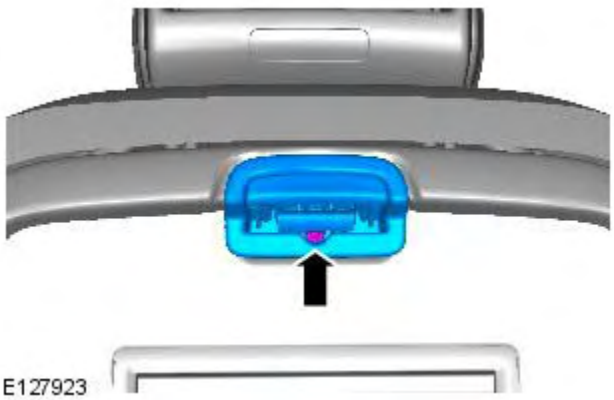
3. NOTE: Make sure that the clips are installed in the correct orientation.

4.



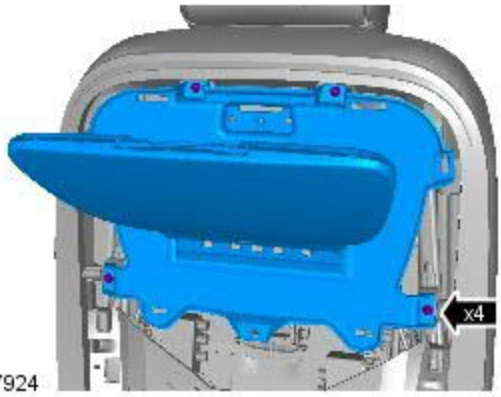
5.

6.



E127922

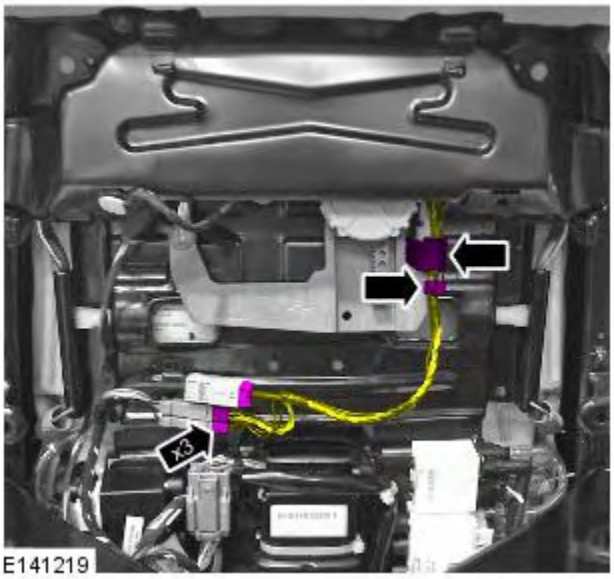
7. NOTE: Make sure that the clips are installed in the correct orientation.

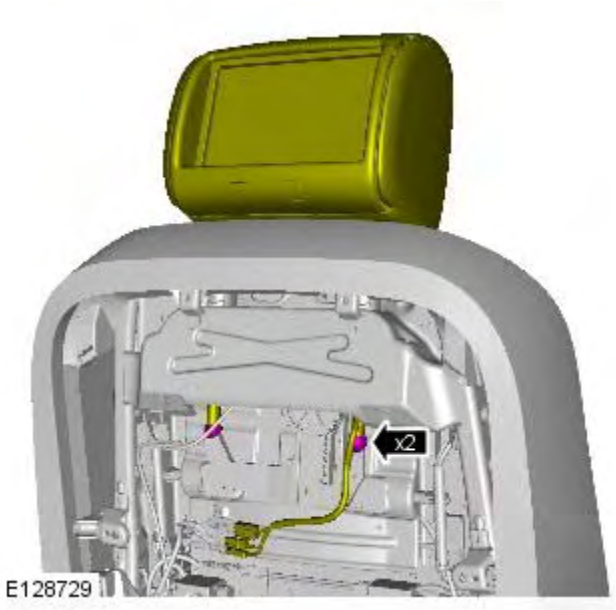


E127924

8.

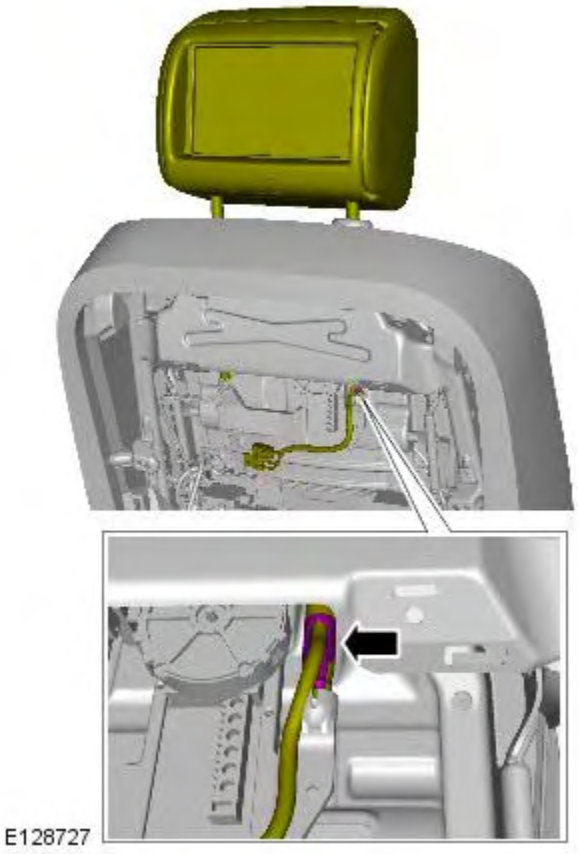
9.



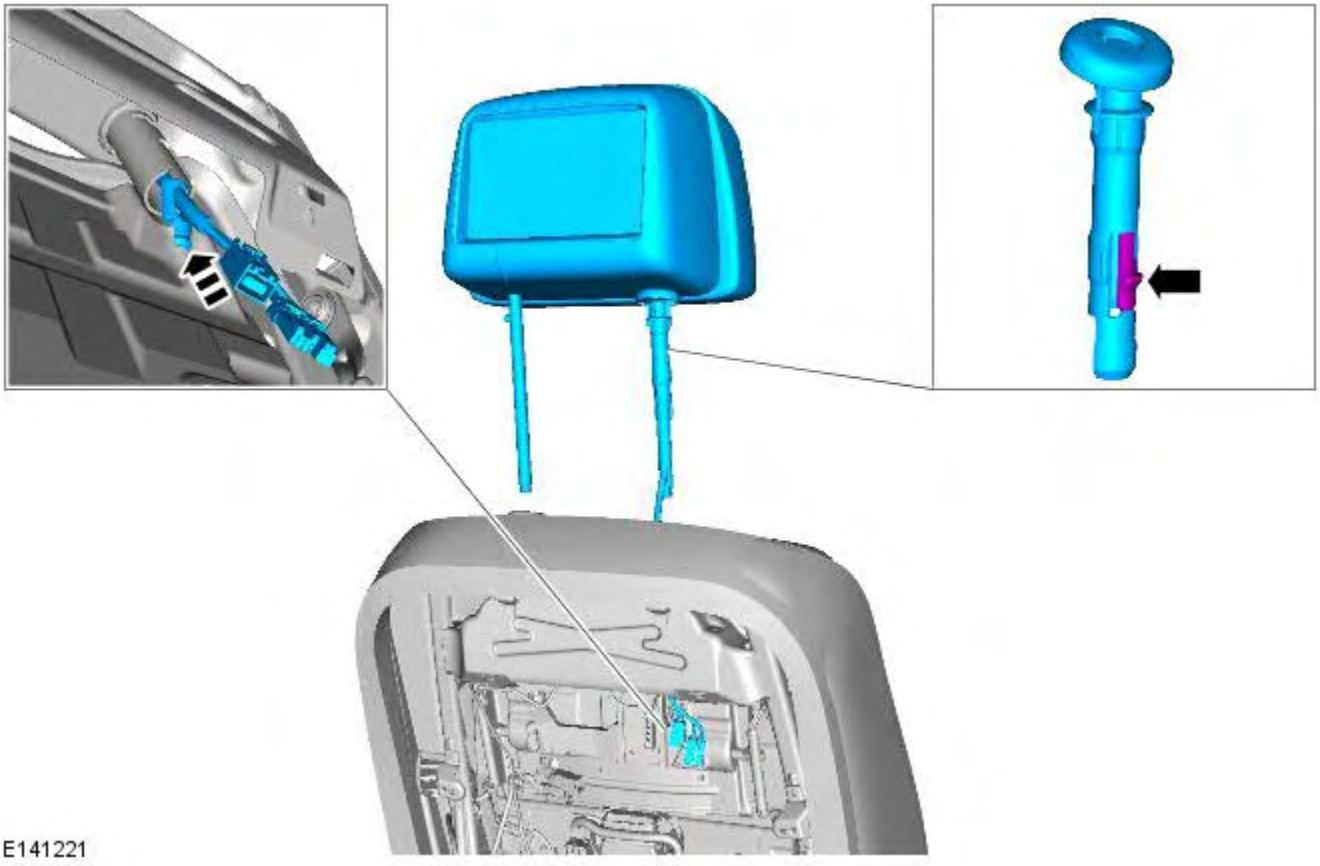


10. CAUTION: Support the head restraint motor assembly while pushing down on the head restraint, you should hear two audible clicks to secure the head restraint to the motor assembly. Failure to do follow this instruction may result in failure of the component.

11.



12. CAUTION: Take extra care not to damage the wiring harnesses.

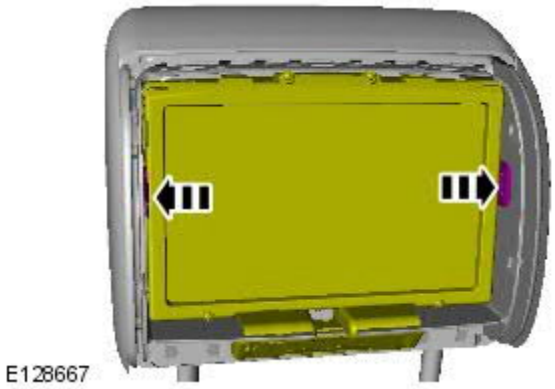


13. NOTE: Do not disassemble further if the component is removed for access only.

14.

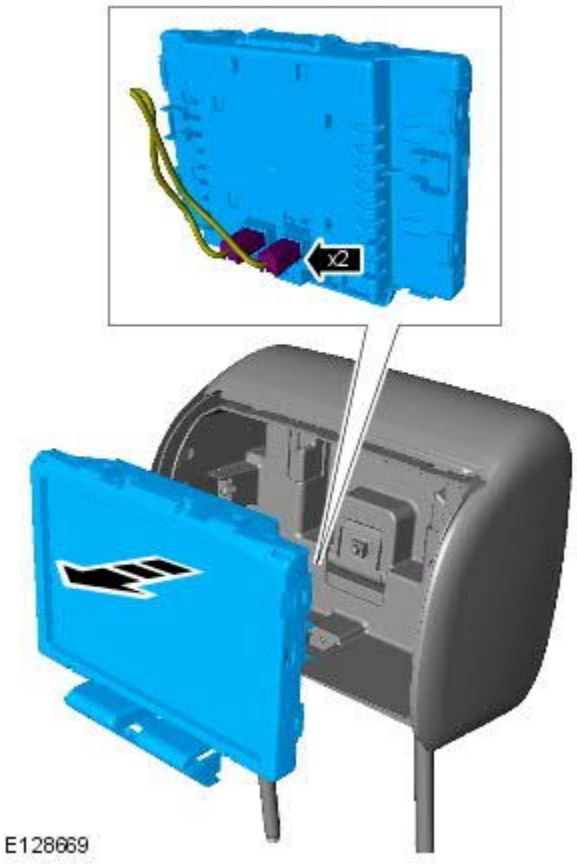
E128668

15.



E128667

16.



Installation

1. To install, reverse the removal procedure.

Published: 21-Nov-2011

Seating - Front Seat Head Restraint Motor

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least one minute after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

Removal steps in this procedure may contain installation details.

1. Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

2. Refer to: Side Air Bag Module (501-20B Supplemental Restraint System, Removal and Installation).

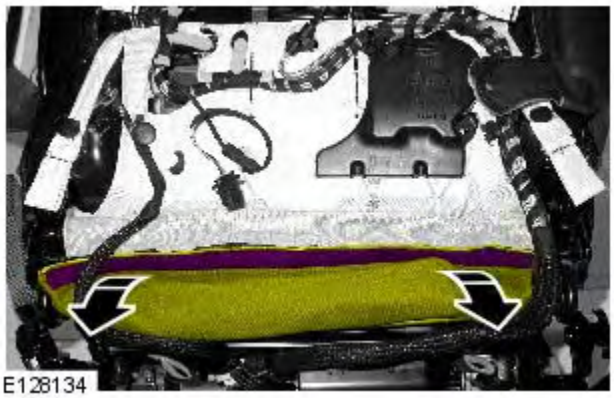
3.

E128088

4. NOTE: Note the position of the wiring harnesses to aid installation.

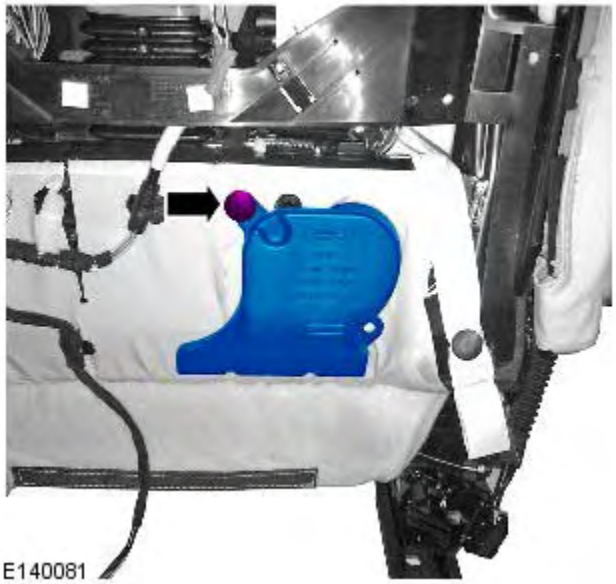
E128087

5.



E128134

6.


E140081

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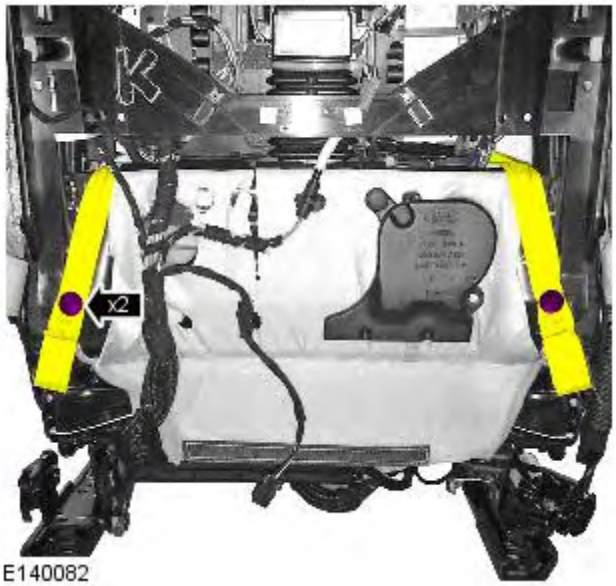
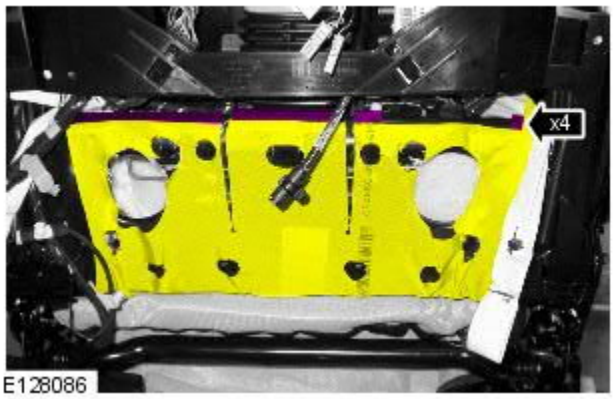


E140082

8.

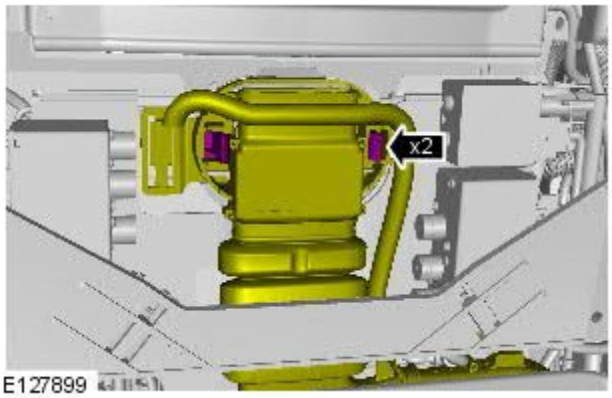


E128086

9.

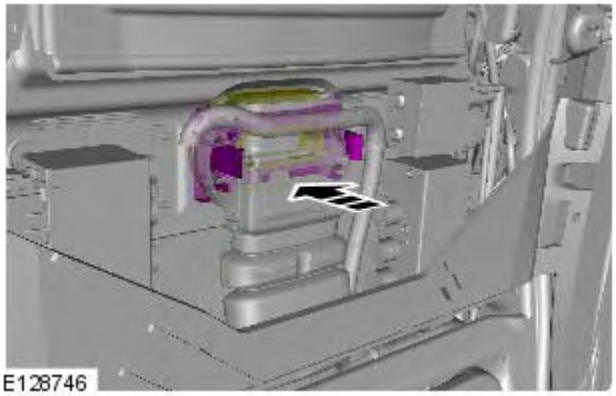
E140698

10.

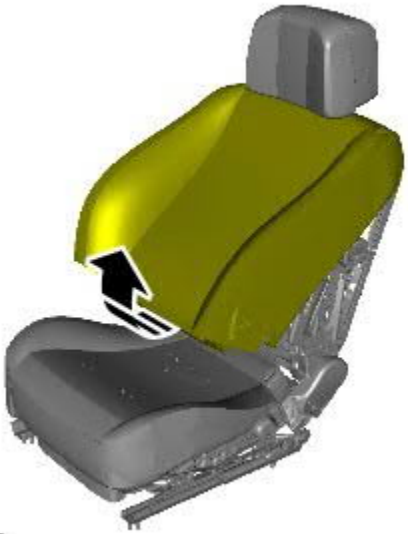


E127899

11.

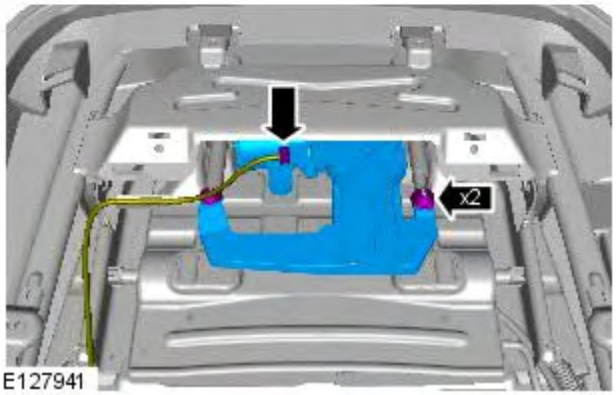

E128746

12.



E140729

13.



E127941

Installation

1. To install, reverse the removal procedure.
2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Published: 22-Apr-2012

Seating - Front Seat Tilt Motor

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least two minutes after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

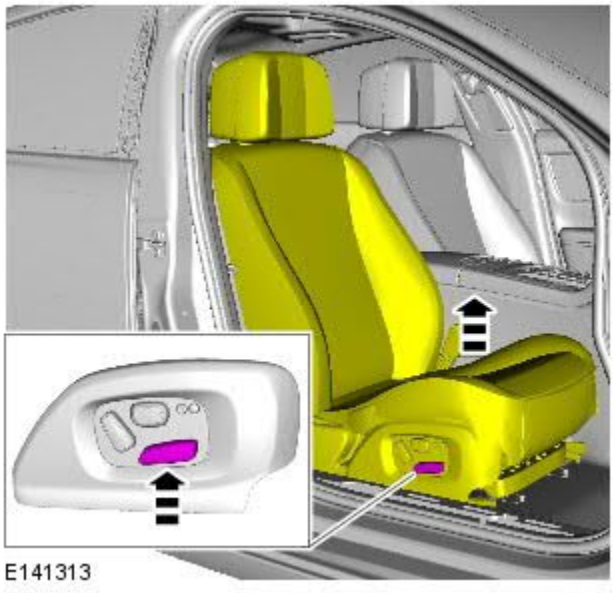
Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

Removal steps in this procedure may contain installation details.

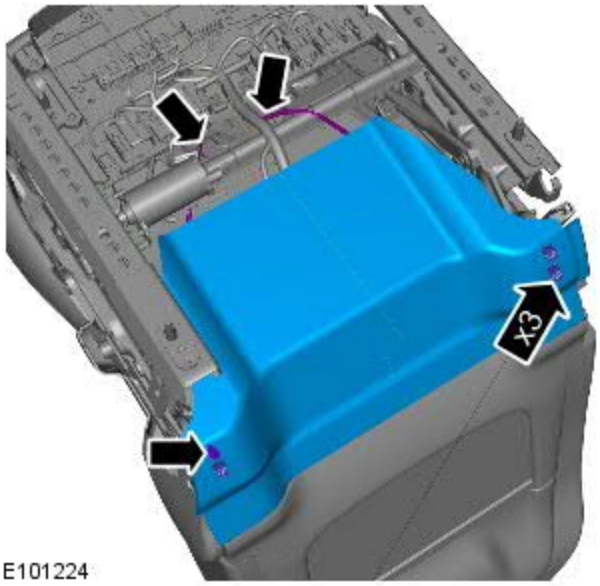


1.

2. WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplemental restraint system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait one minute. Failure to follow this instruction may result in personal injury.

   Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

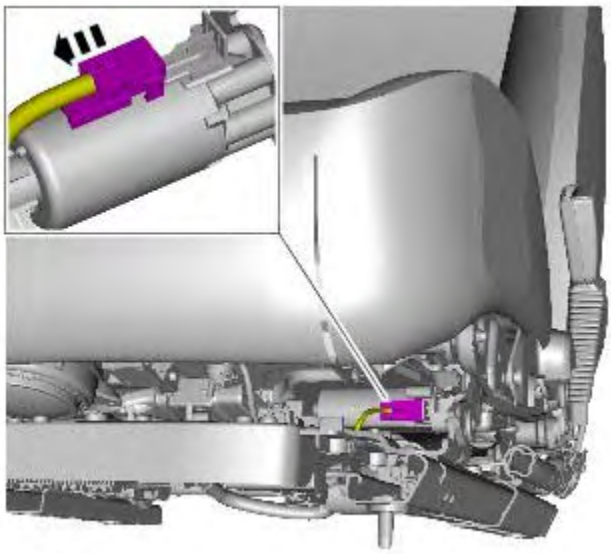
3. Refer to: Front Seat (501-10 Seating, Removal and Installation).

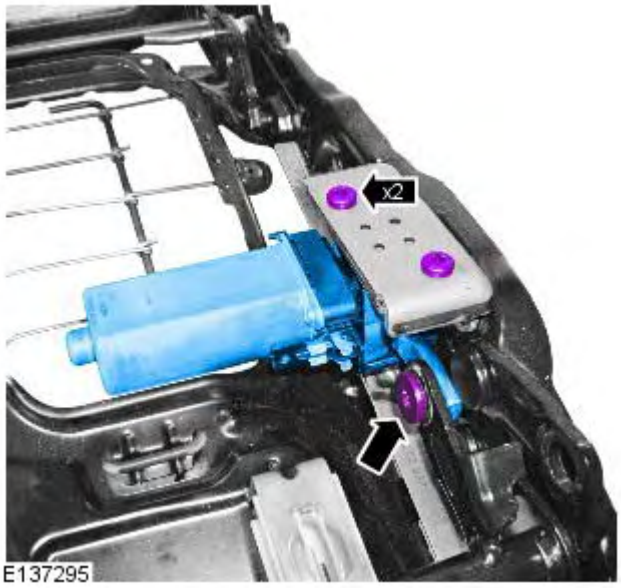


E101224

4. NOTE: Make sure that the clips are installed in the correct orientation.

5.


E141312



6. NOTE: Front seat track shown removed for clarity.

   Torque:
   Bolt 22 Nm
   Screws 10 Nm

Installation

1. To install, reverse the removal procedure.

Published: 03-Jan-2012

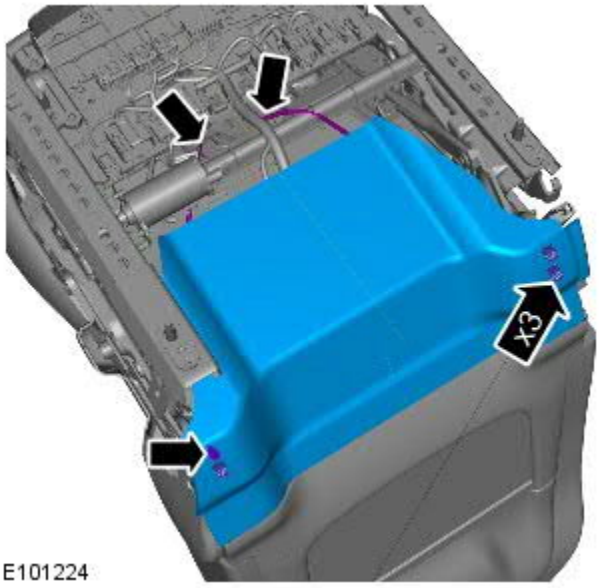
Seating - Front Seat Backrest Blower Motor

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

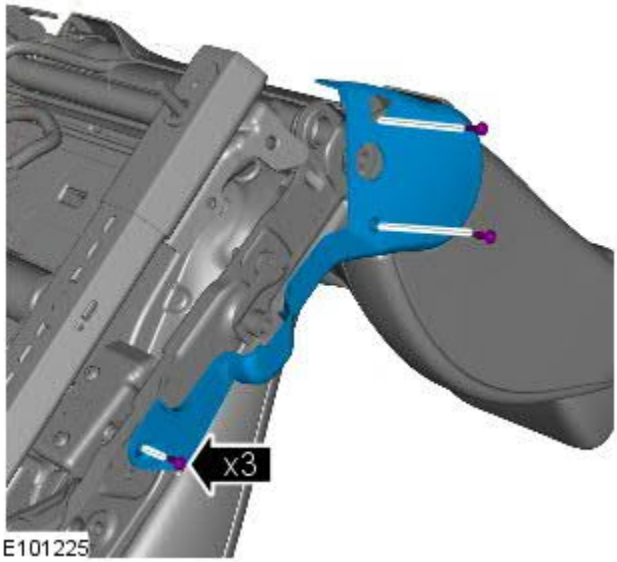
1. Refer to: Front Seat (501-10 Seating, Removal and Installation).



E101224

2. NOTE: Make sure that the clips are installed in the correct orientation.

3.

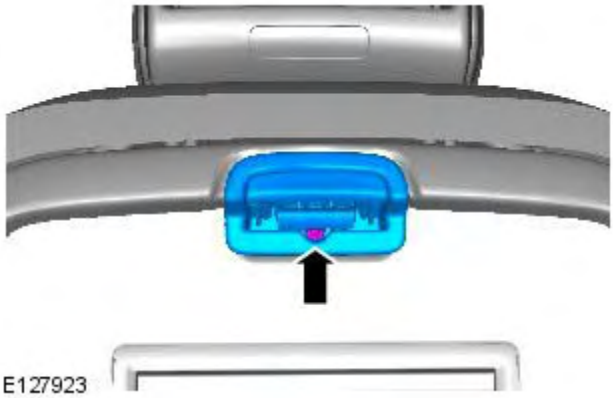


E101225

4.

E127925

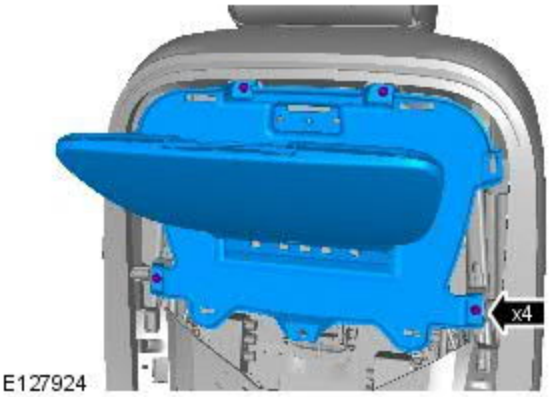
5.



E127923

E127922

6. NOTE: Make sure that the clips are installed in the correct orientation.

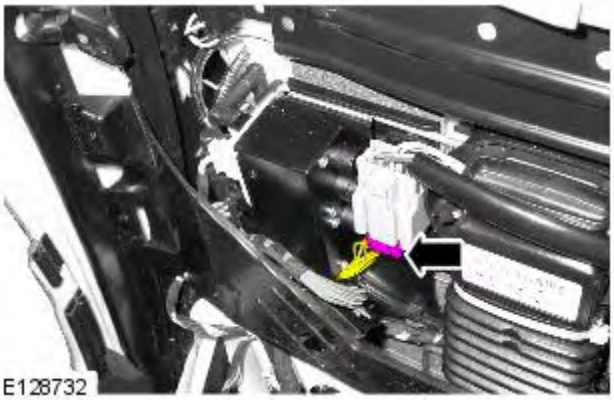


E127924

7.

8.

9.



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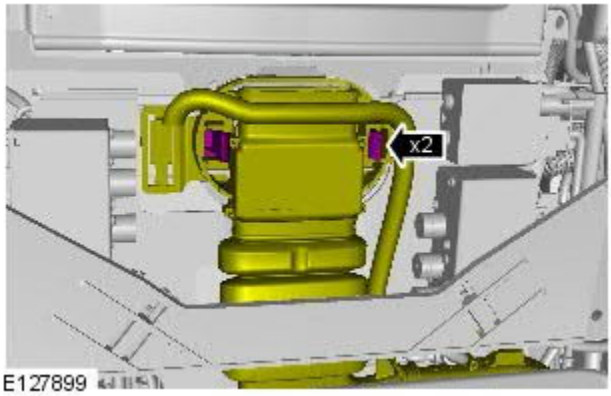
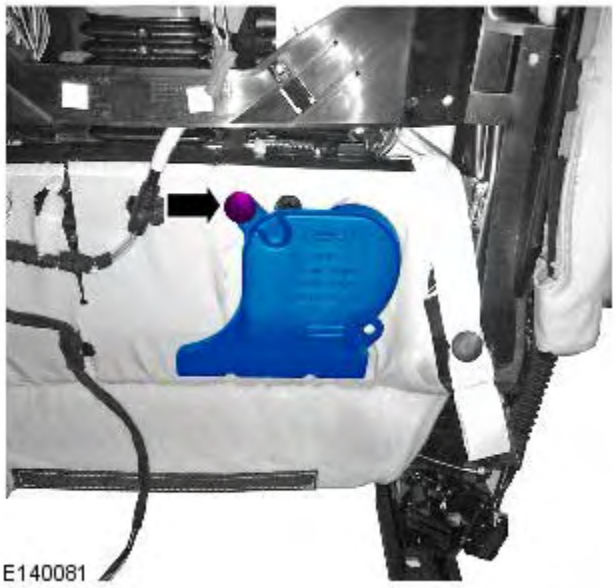


11. NOTE: Note the position of the wiring harnesses to aid installation.

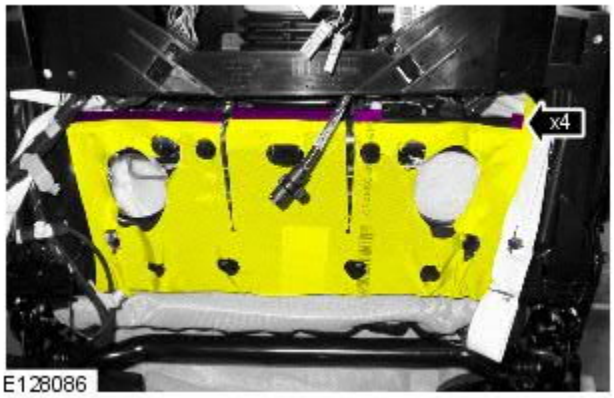
E128087

12.



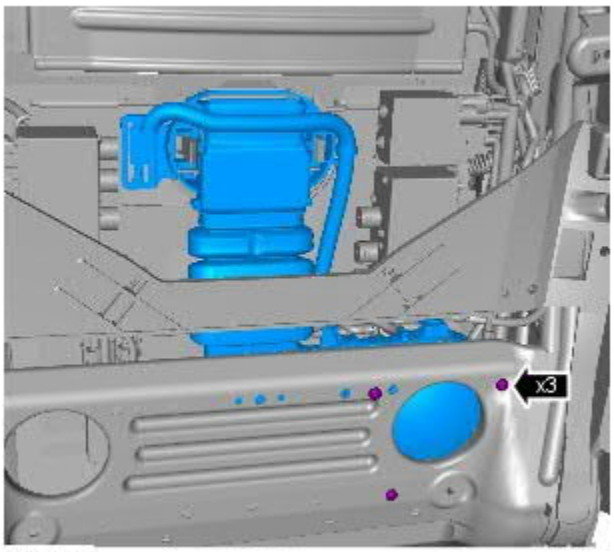
E140081

13.



E128086

14.



E127898

Installation

1. To install, reverse the removal procedure.

Published: 03-Jan-2012

Seating - Front Seat Cushion Blower Motor

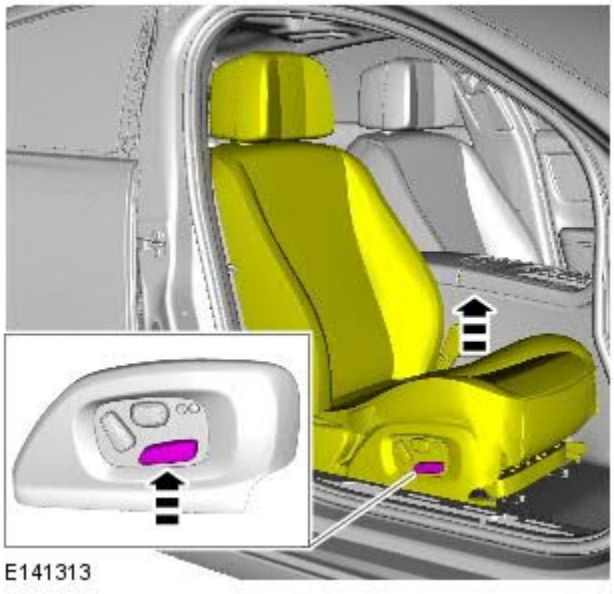
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

All vehicles

1.

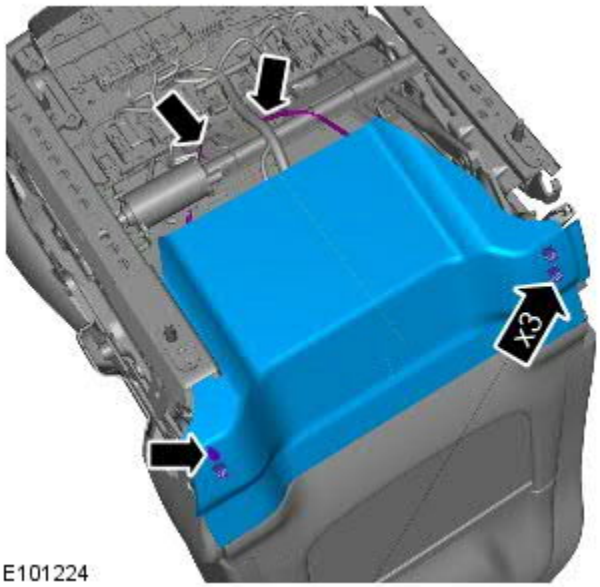


2. WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplemental restraint system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait one minute. Failure to follow this instruction may result in personal injury.

   Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

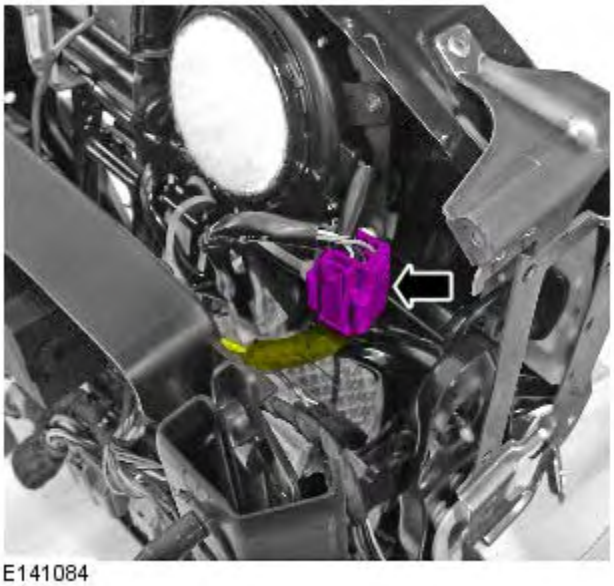
3. Refer to: Front Seat (501-10 Seating, Removal and Installation).

4. Refer to: Front Seat Control Switch (501-10 Seating, Removal and Installation).

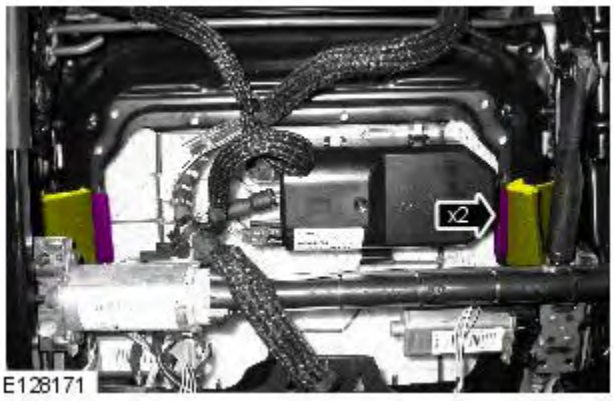


E101224

5. NOTE: Make sure that the clips are installed in the correct orientation.


E141084

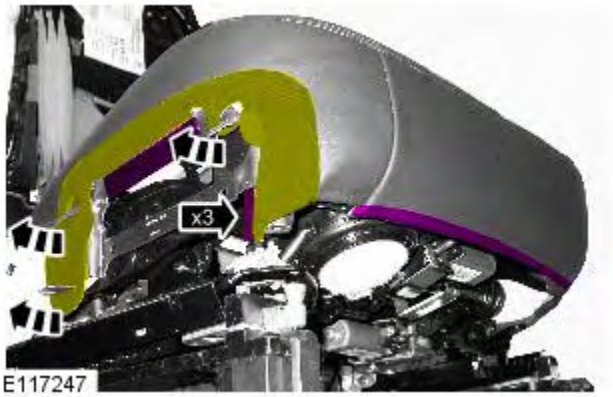
6.



E128171

7.

8.

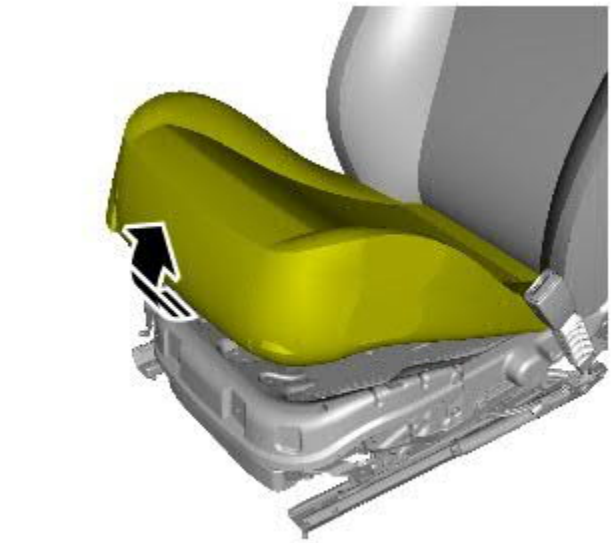


E117247

9.

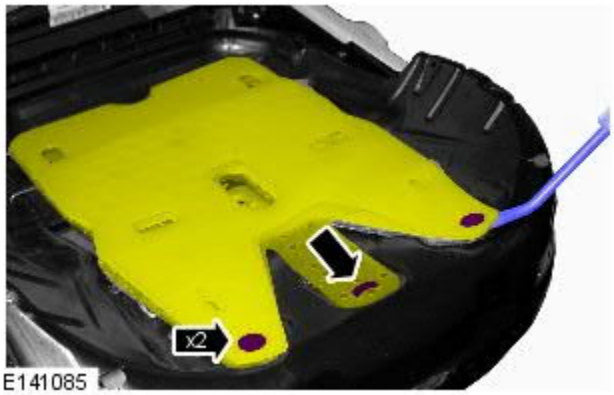
E117248

10.


E141091

NAS vehicles

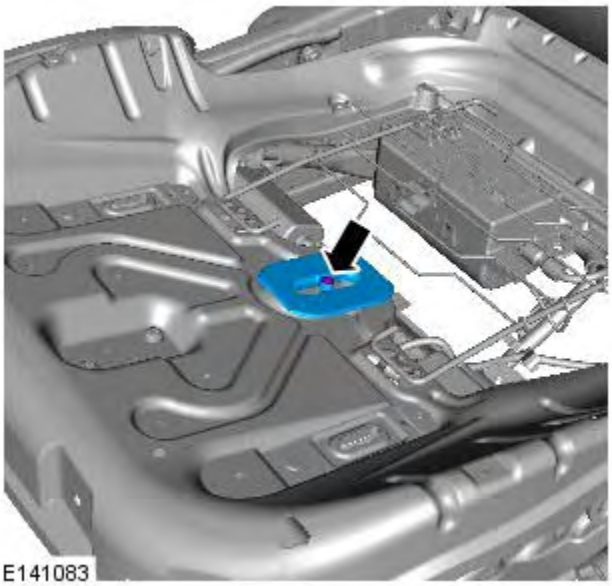
11.



E141085

All vehicles

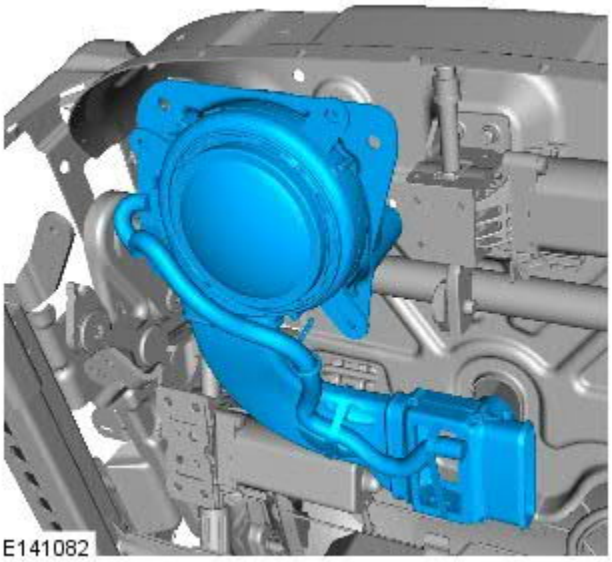
12.


E141083

13.

E141088

14.



Installation

1. To install, reverse the removal procedure.

Published: 22-Apr-2012

Seating - Front Seat Cushion Extension Motor

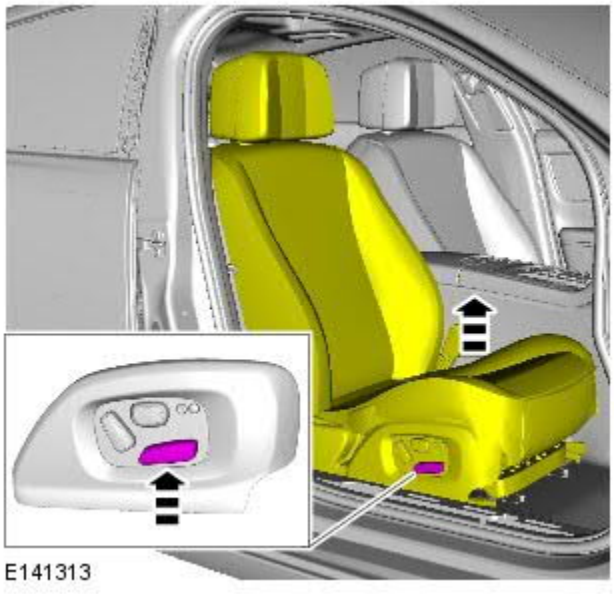
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

All vehicles

1.

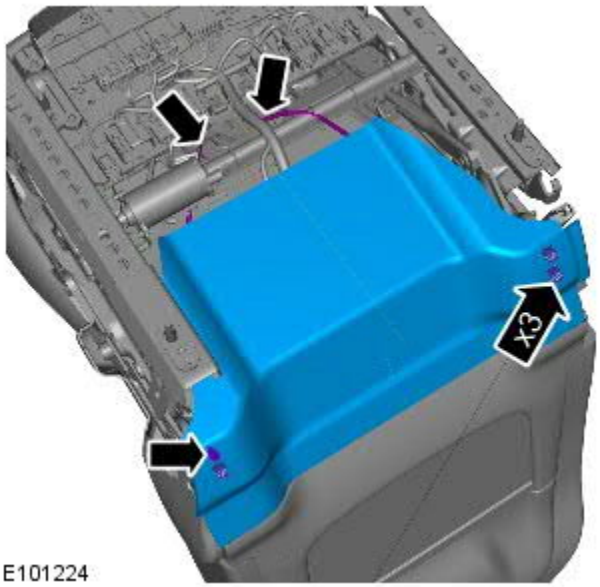


2. WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplemental restraint system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait one minute. Failure to follow this instruction may result in personal injury.

   Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

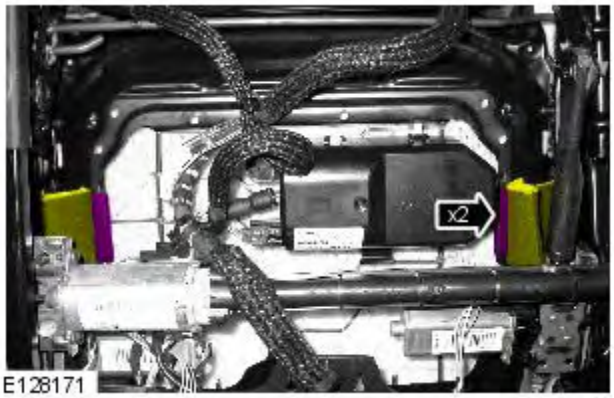
3. Refer to: Front Seat (501-10 Seating, Removal and Installation).

4. Refer to: Front Seat Control Switch (501-10 Seating, Removal and Installation).



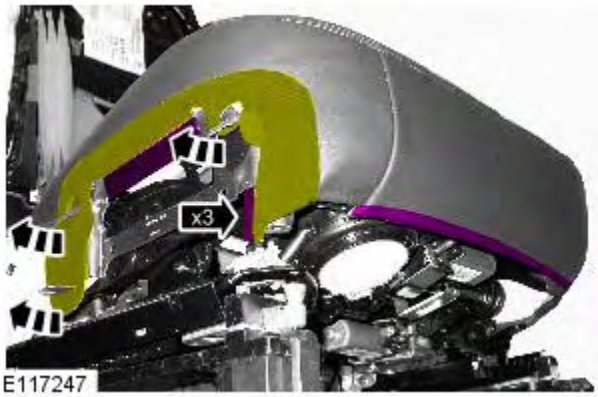
E101224

5. NOTE: Make sure that the clips are installed in the correct orientation.



E128171

6.



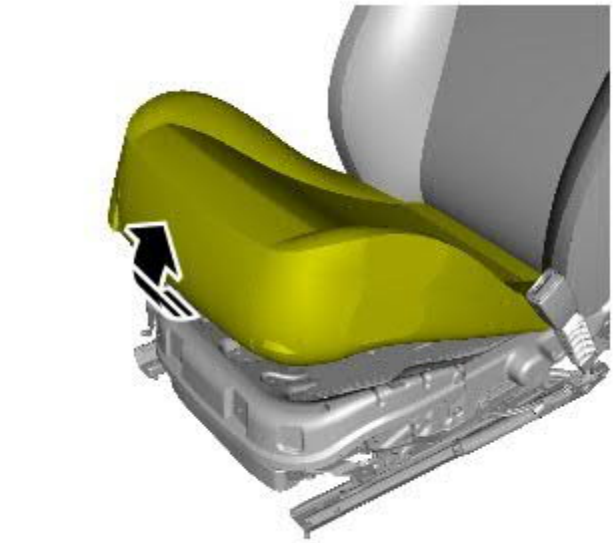
E117247

7.

8.

E117248

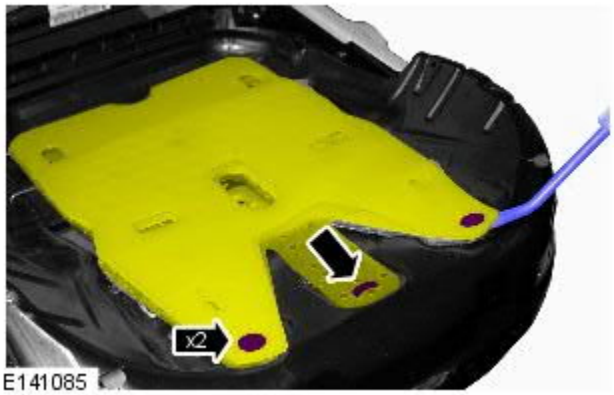
9.



E141091

NAS vehicles

10.

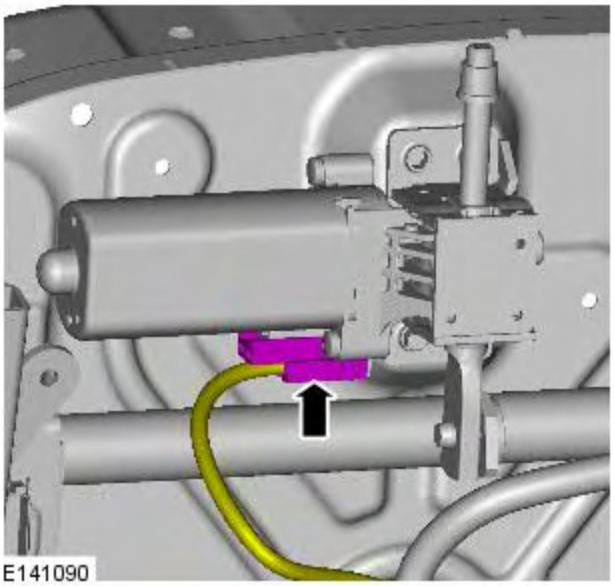


E141085

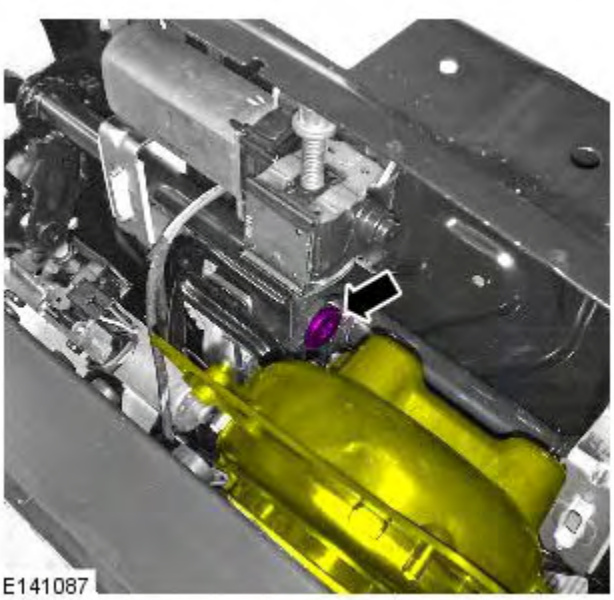
11.

E141088

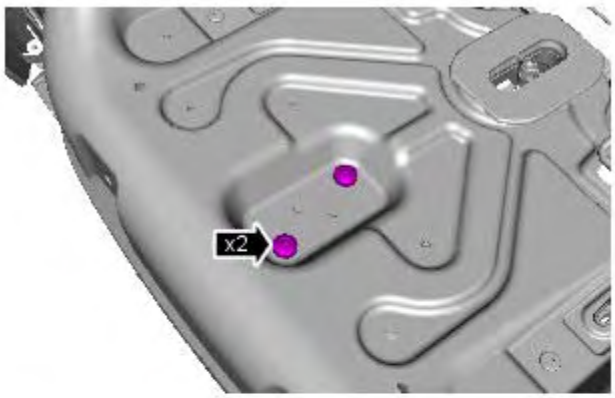
12.



E141090



13. *Torque:* 22 Nm



14. *Torque:* 10 Nm

Installation

1. To install, reverse the removal procedure.

Published: 03-Jan-2012

Seating - Front Seat Folding Tray

Removal and Installation

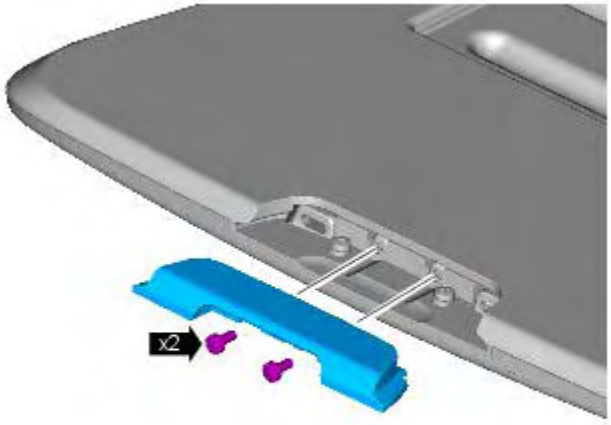
Removal

NOTE: Removal steps in this procedure may contain installation details.

1.

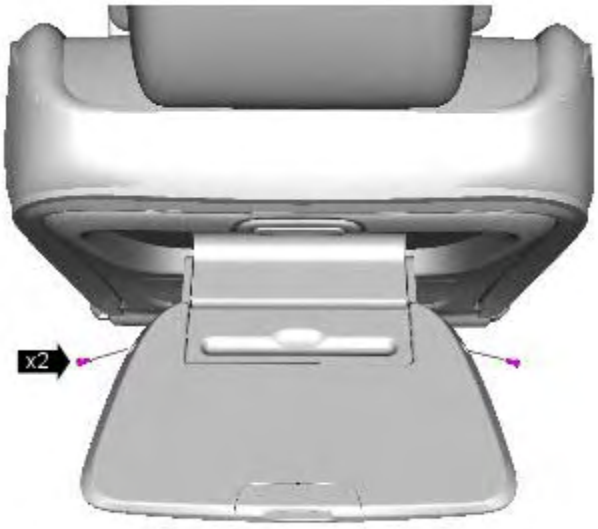
2.

3.



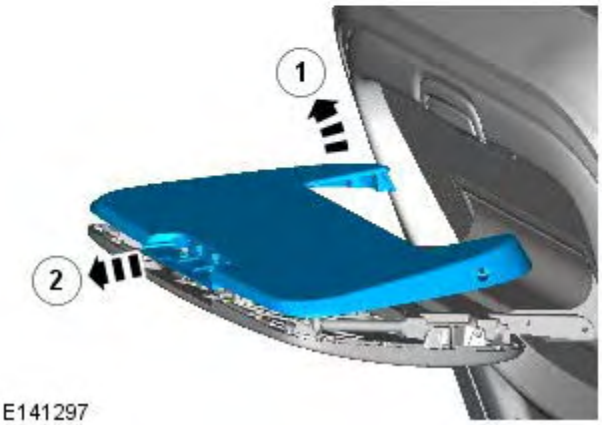
E141298

4. *Torque:* 3 Nm



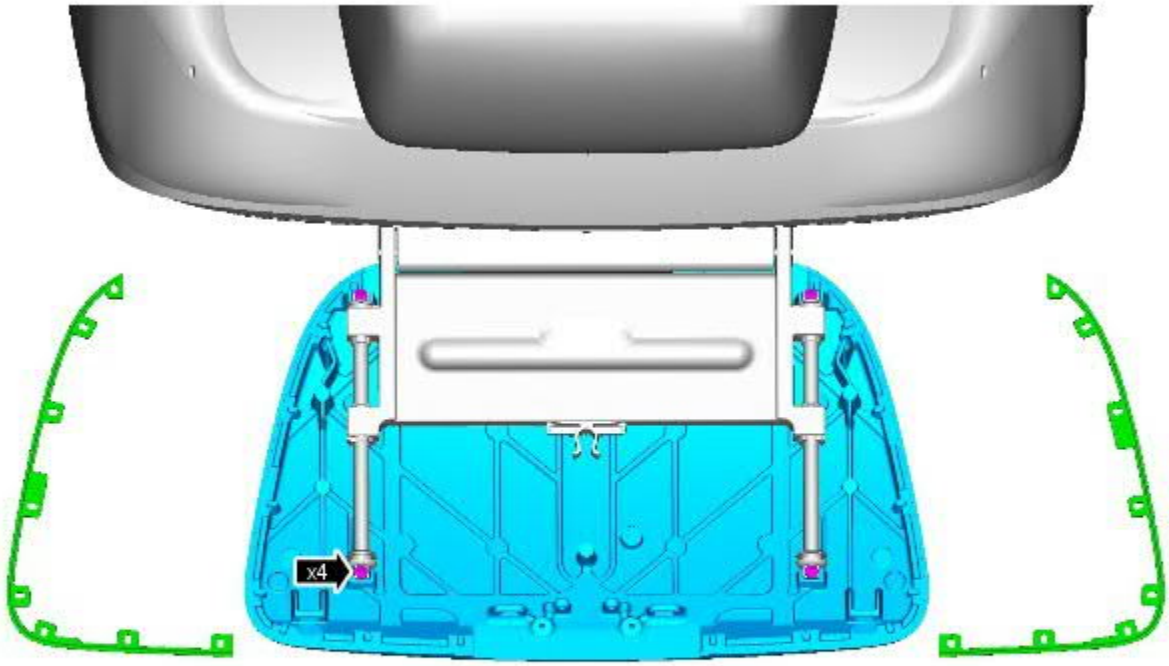
E141299

5.



E141297

6.



E141300

Installation

1. To install, reverse the removal procedure.

Published: 03-Jan-2012

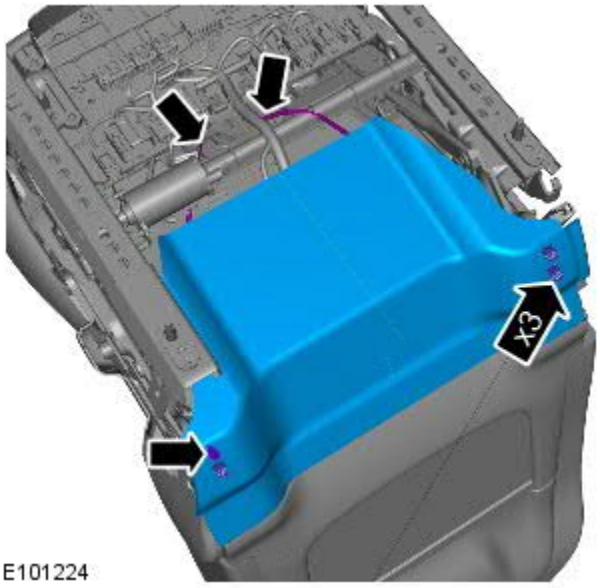
Seating - Front Seat Folding Tray Hinge

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

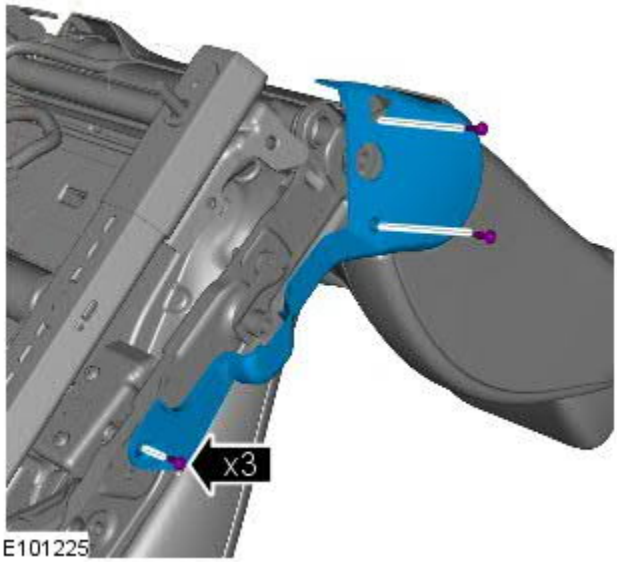
1. Refer to: Front Seat (501-10 Seating, Removal and Installation).



E101224

2. NOTE: Make sure that the clips are installed in the correct orientation.

3.

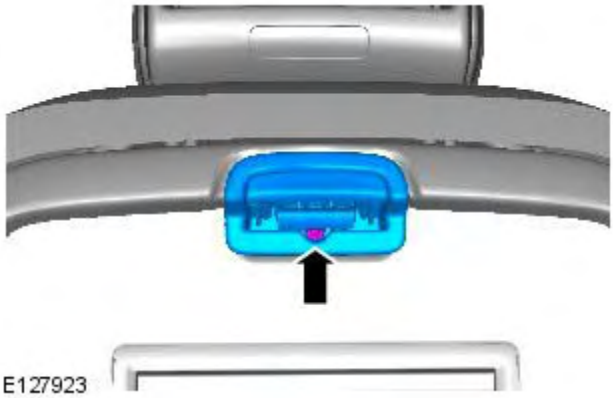


E101225

4.

E127925

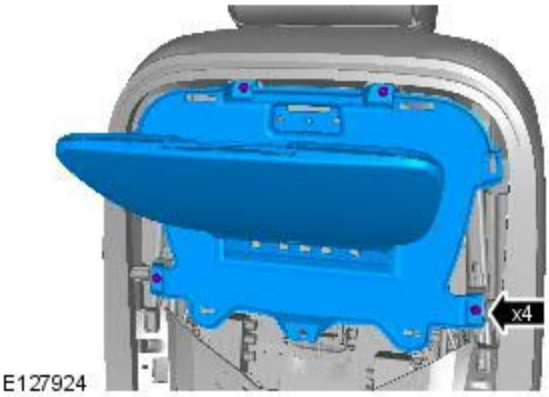
5.



E127923

E127922

6. NOTE: Make sure that the clips are installed in the correct orientation.



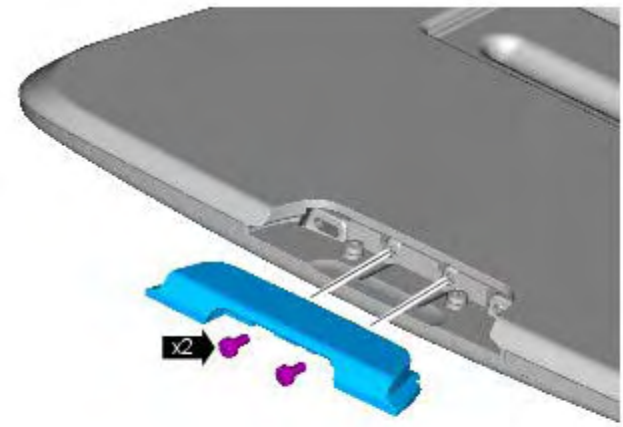
E127924

7.

8.

E141291

9.



E141298

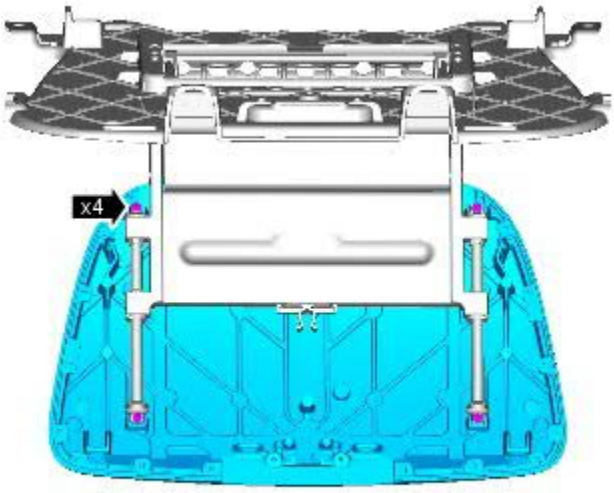
10. *Torque:* 3 Nm

E141294

11.

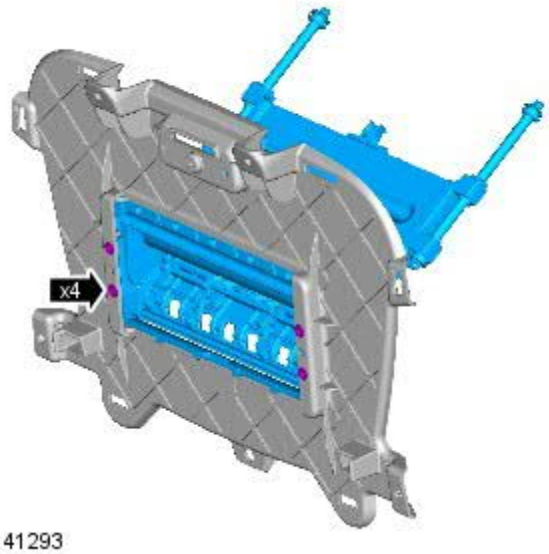
E141292

12.



E141295

13.



E141293

Installation

1. To install, reverse the removal procedure.

Published: 21-Nov-2011

Seating - Lumbar Assembly

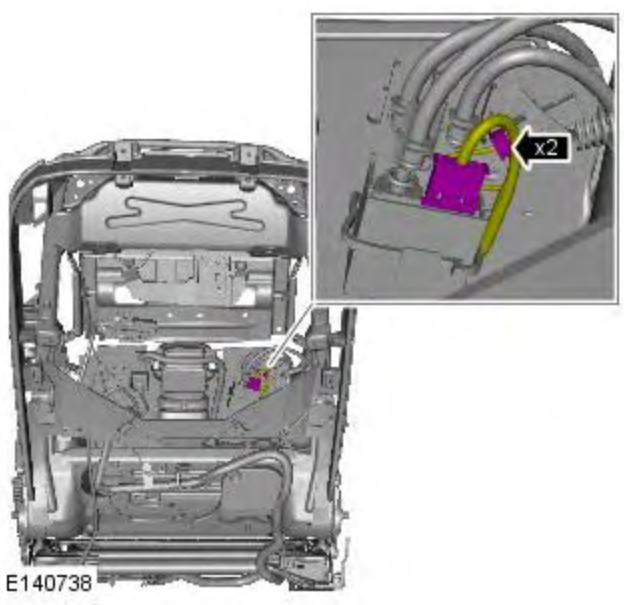
Removal and Installation

Removal

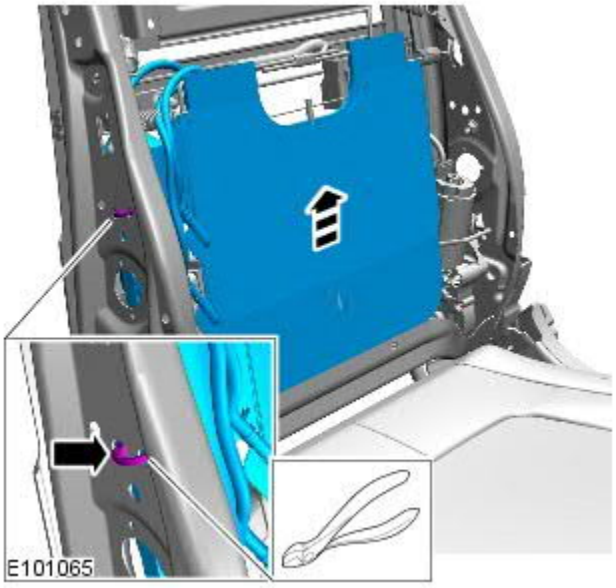
1. Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

2. Refer to: Front Seat Backrest Cushion (501-10, Removal and Installation).

3.



4.



Installation

1. To install, reverse the removal procedure.

2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Published: 21-Nov-2011

Seating - Massaging Lumbar Assembly

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least one minute after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

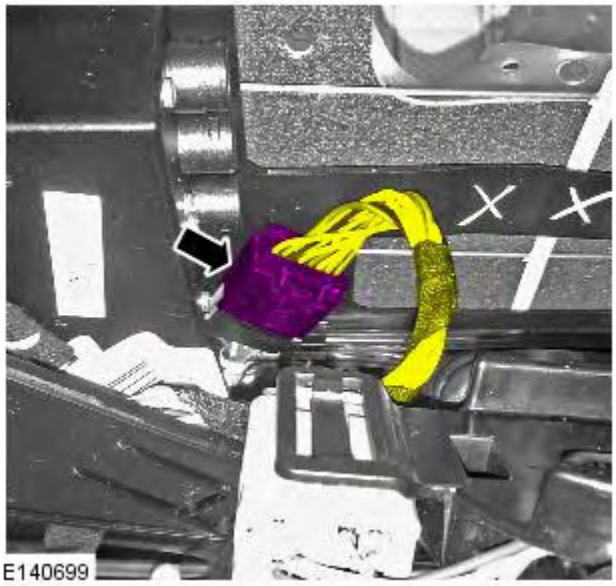
NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

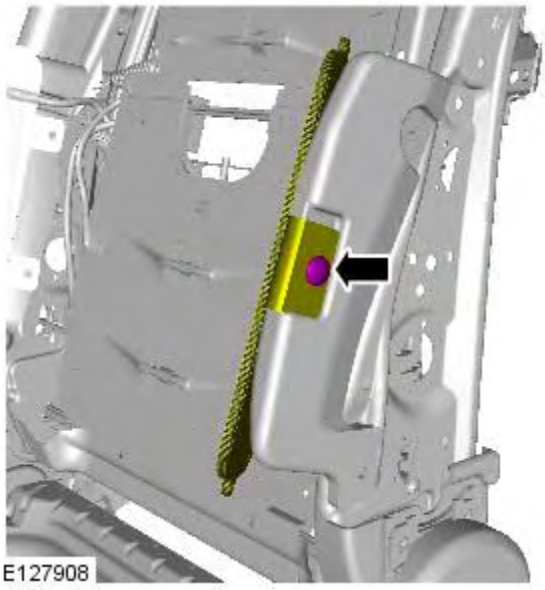
Removal steps in this procedure may contain installation details.

1. Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

2. Refer to: Front Seat Backrest Cushion (501-10, Removal and Installation).



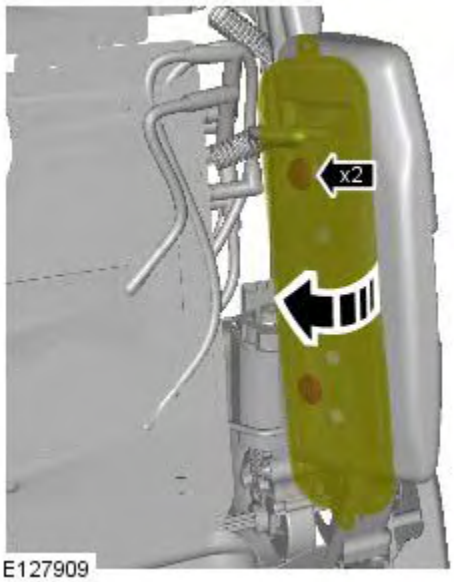
3.



4. NOTES:

Left-hand shown, right-hand similar.

Repeat the procedure for the other side.



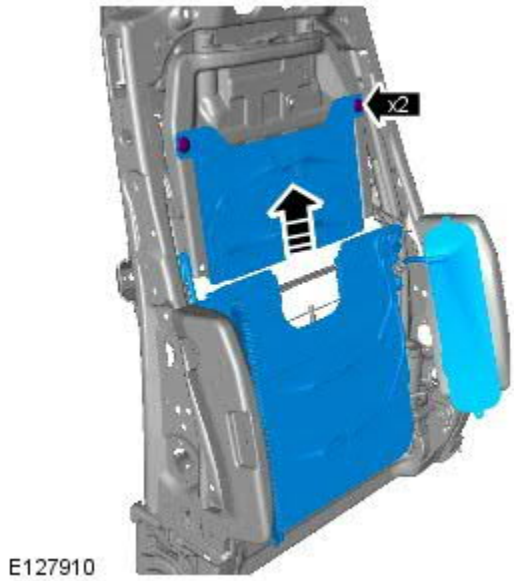
5. NOTES:

   LH illustration shown, RH is similar.

   Repeat the procedure for the other side.

6.

7.



Installation

1. To install, reverse the removal procedure.

2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Published: 07-Nov-2011

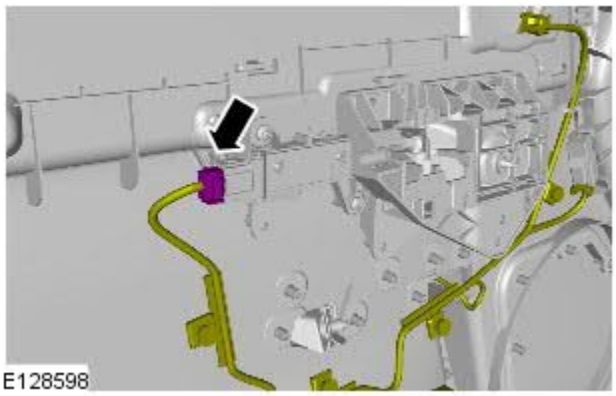
Seating - Memory Seat Position Switch

Removal and Installation

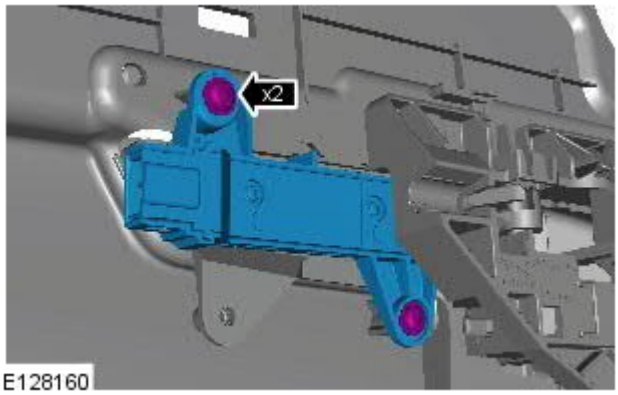
Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Front Door Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).



2.



3. NOTES:

   Install the screws finger tight.

   Tighten the upper retaining screw first and then the lower retaining screw to align the component correctly.

4. NOTE: Make sure that the gap around the component is even.

Installation

1. To install, reverse the removal procedure.

Published: 03-Jan-2012

Seating - Passenger Seat Cushion

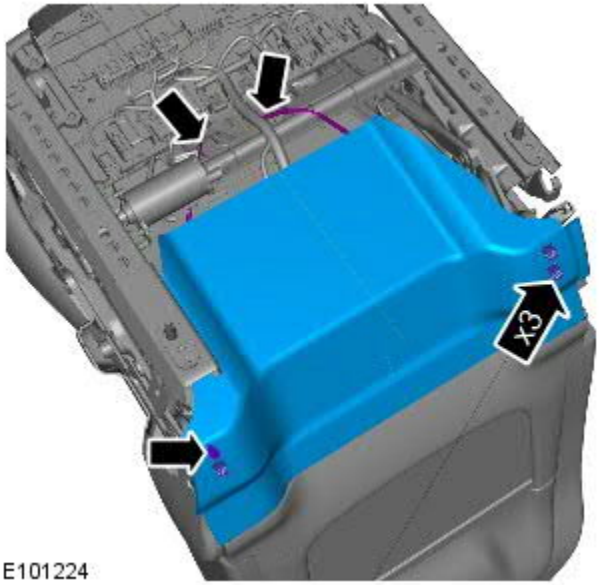
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

All vehicles

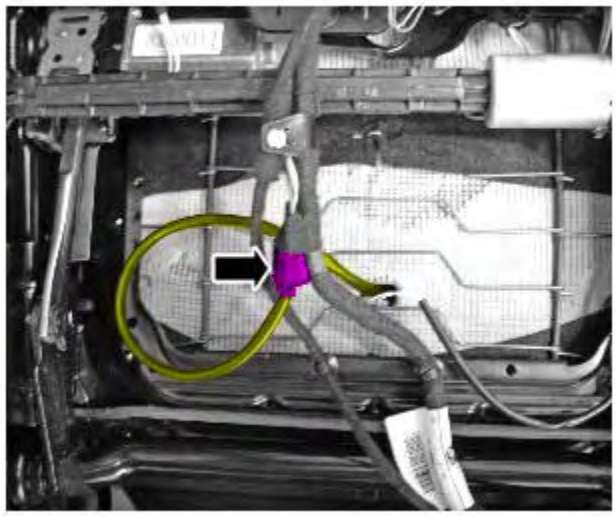
1. Refer to: Front Seat (501-10 Seating, Removal and Installation).
2. Refer to: Front Seat Control Switch (501-10 Seating, Removal and Installation).



E101224

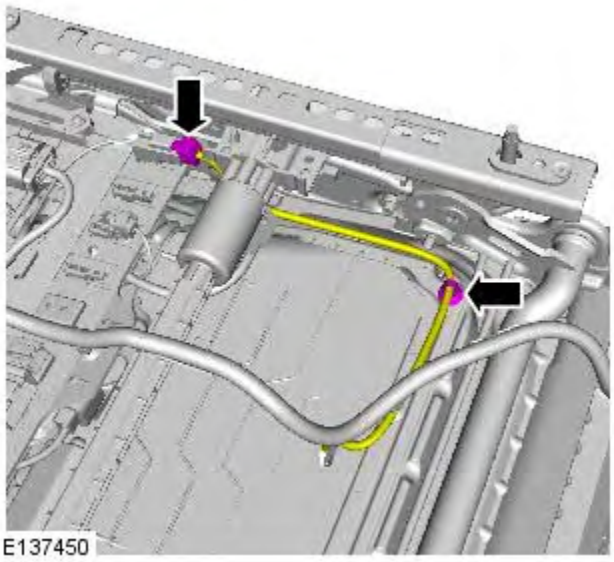
3. NOTE: Make sure that the clips are installed in the correct orientation.

Vehicles with heated front seats

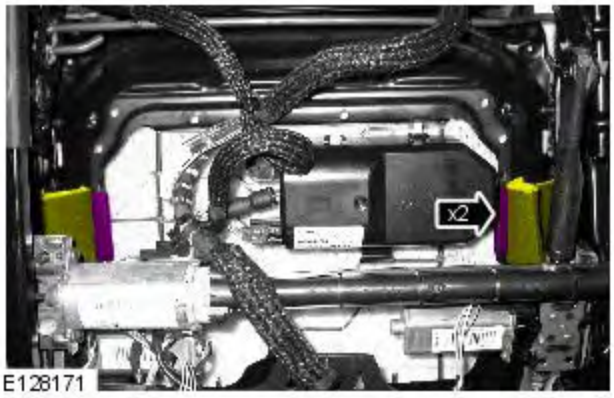


E137449

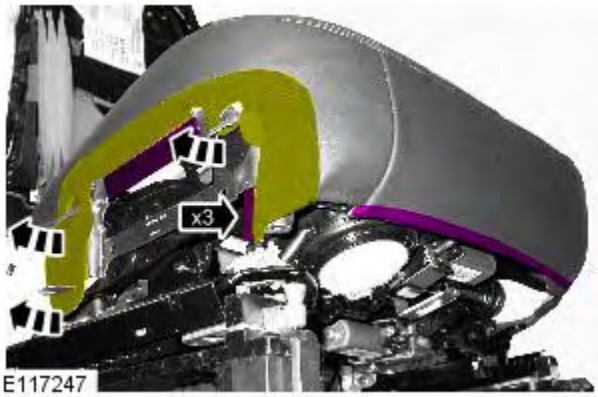
4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



5. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



6.

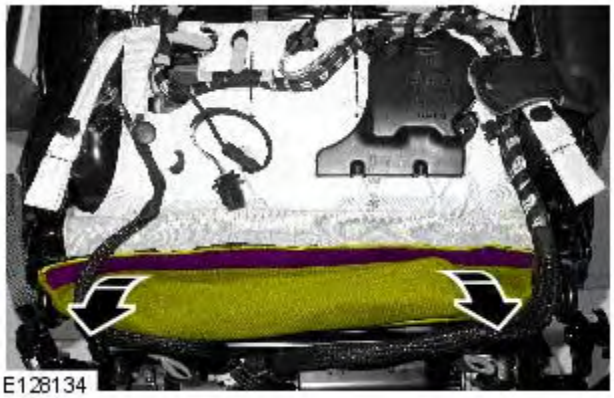


7.

8.

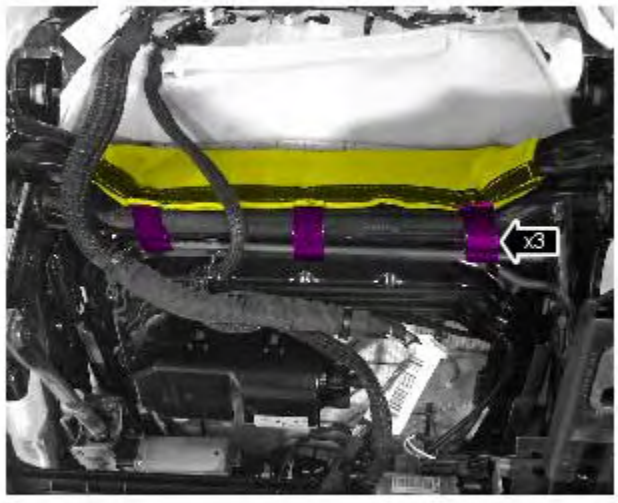
E117248

9.



E128134

10.



E140841

E117249

11.

E140684

12.

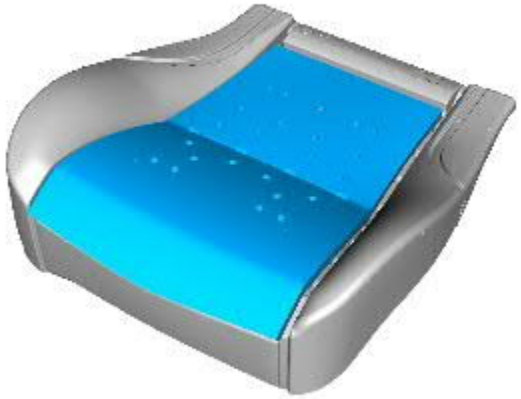
E101234

13. NOTES:

Make sure that new hog rings are installed.

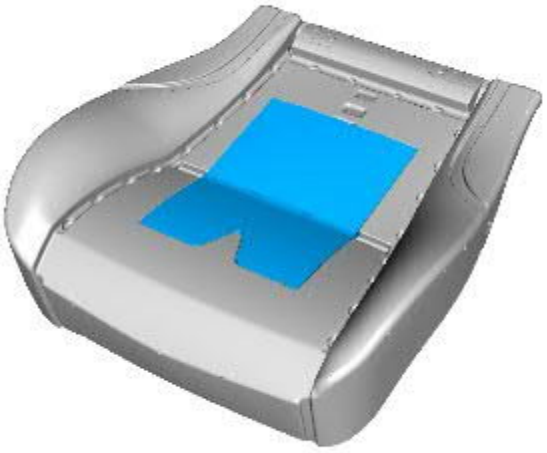
Do not disassemble further if the component is removed for access only.

14.



E140687

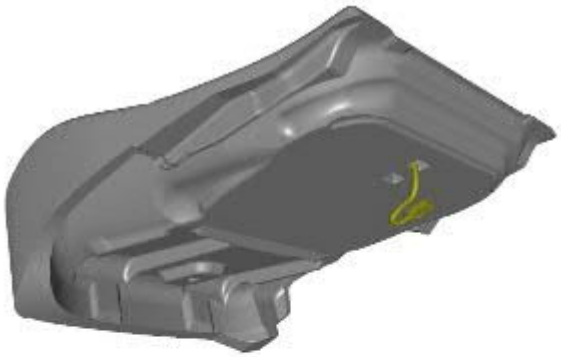
15.

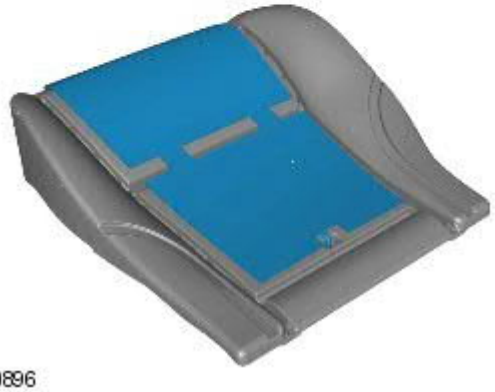


E140688

Vehicles with heated front seats

16.





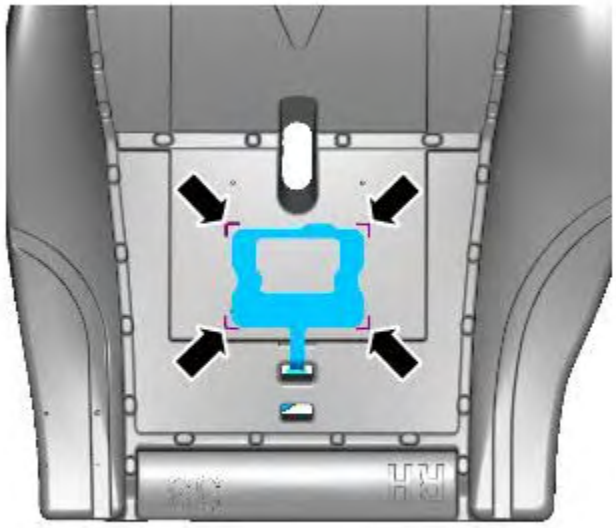
E140896

All vehicles

17.

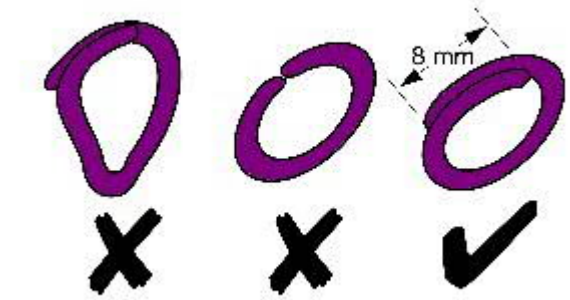
E140686

Installation



E140685

1. CAUTION: Make sure the component is aligned as shown.



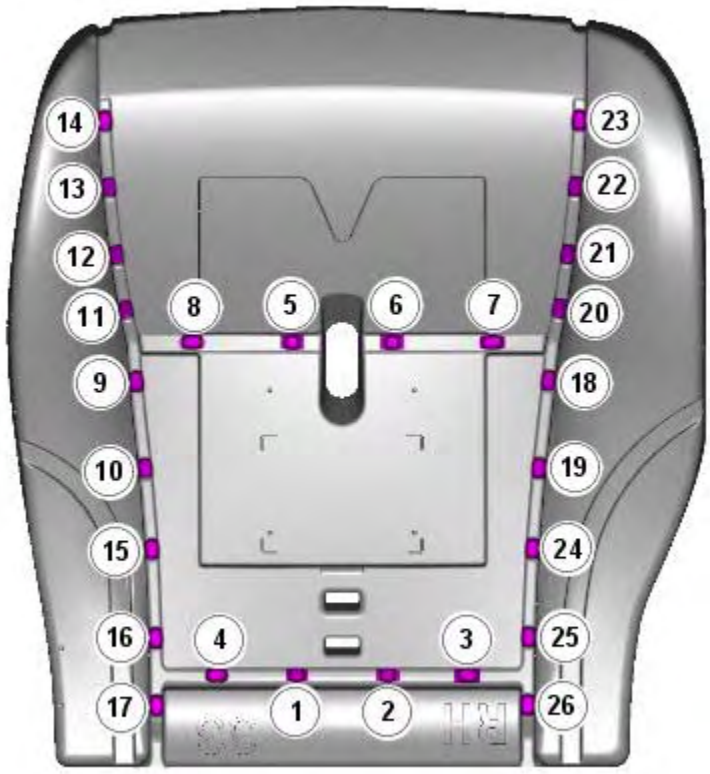
V4001063

2. NOTES:

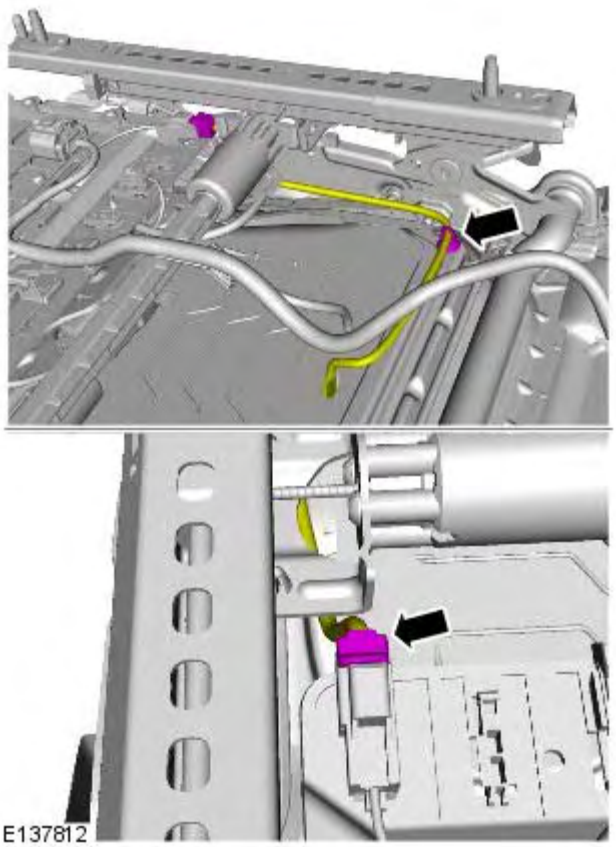
   Make sure that new hog rings are installed.

   Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.

3. NOTE: Make sure that the hogrings are installed in the sequence shown.



E140733



E137812

4. CAUTION: Make sure the component is aligned as shown.

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

5. To install, reverse the removal procedure.

Published: 03-Jan-2012

Seating - Passenger Seat Cushion Heater Mat

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least two minutes after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

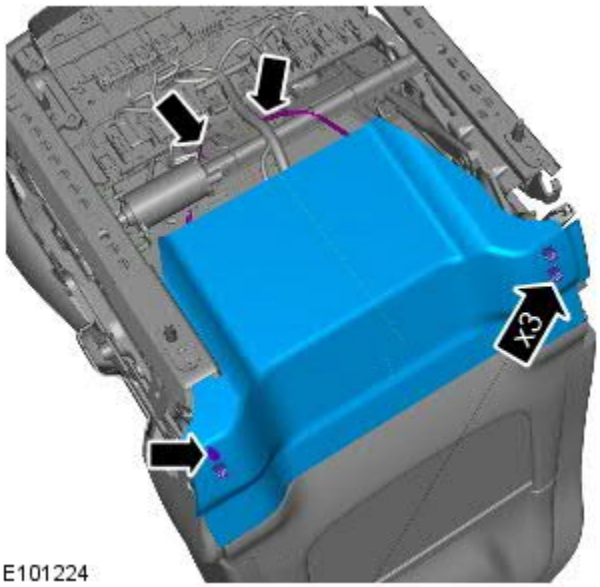
NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

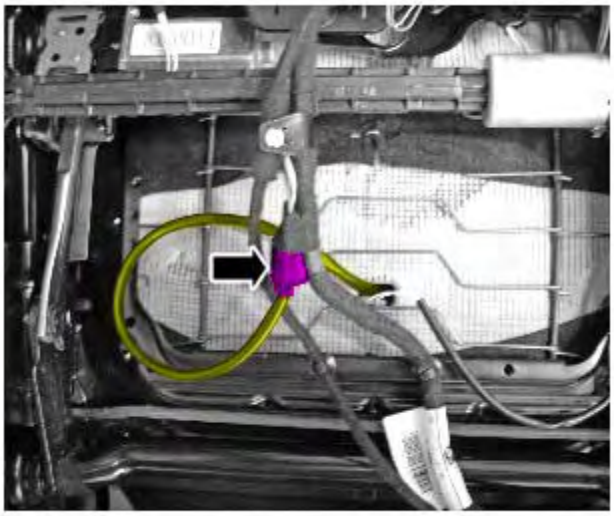
Removal steps in this procedure may contain installation details.

1. Refer to: Front Seat (501-10 Seating, Removal and Installation).
2. Refer to: Front Seat Control Switch (501-10 Seating, Removal and Installation).

3.



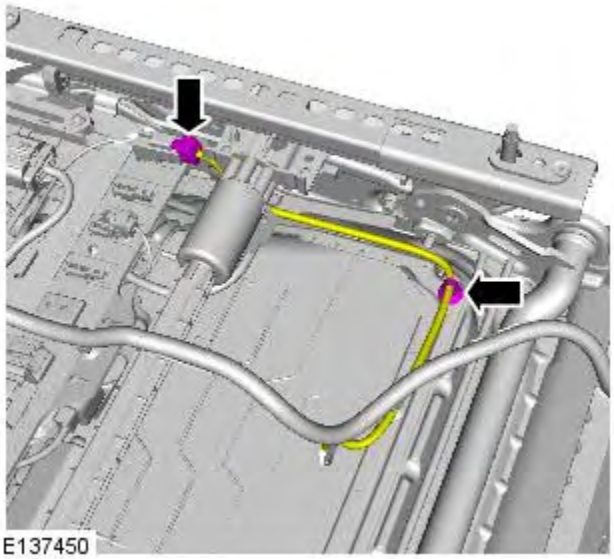
E101224



E137449

4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

5.



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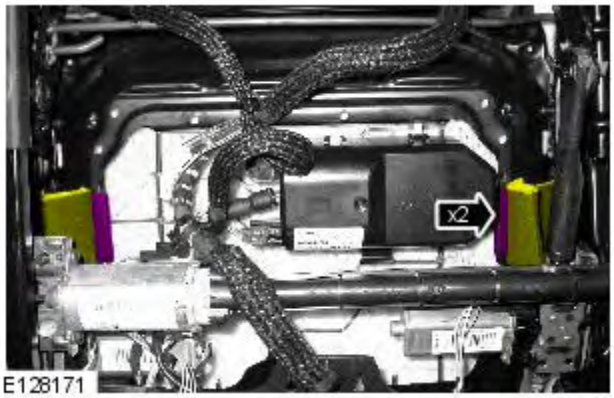

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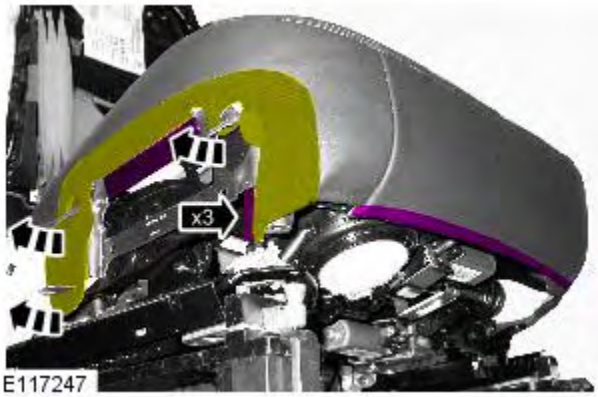
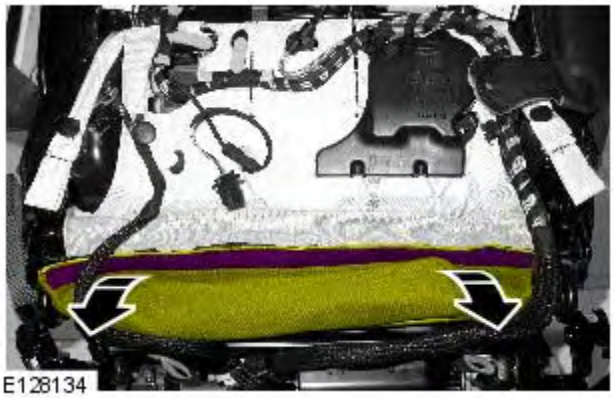


8.

E117248

9.



E128134

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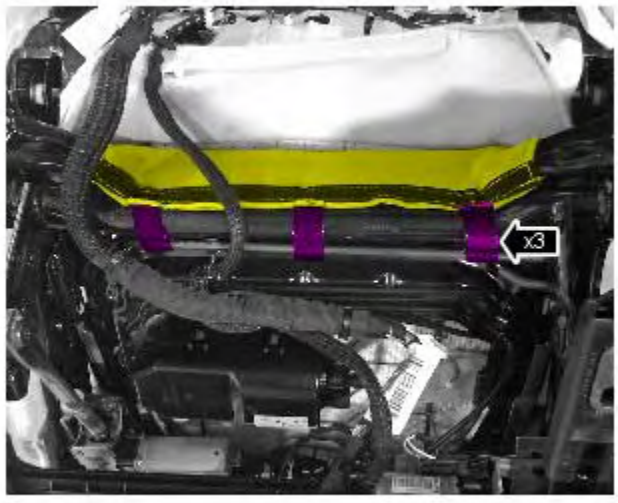


E140841

11.

E117249

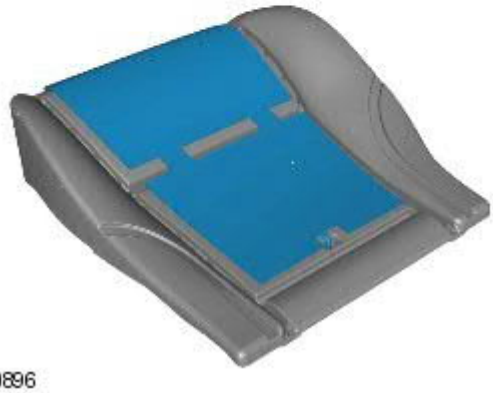
12.

E140684

13. NOTE: Make sure that new hog rings are installed.

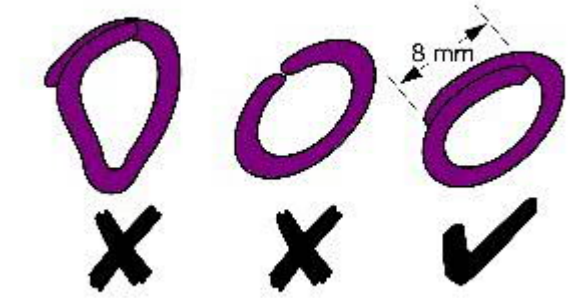
E101234

14.



E140896

Installation



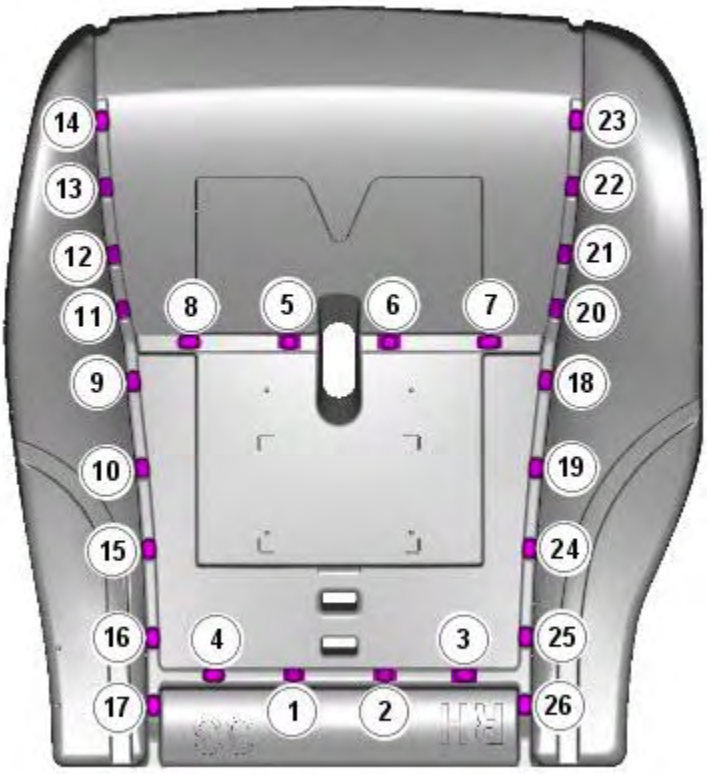
V4001063

1. NOTES:

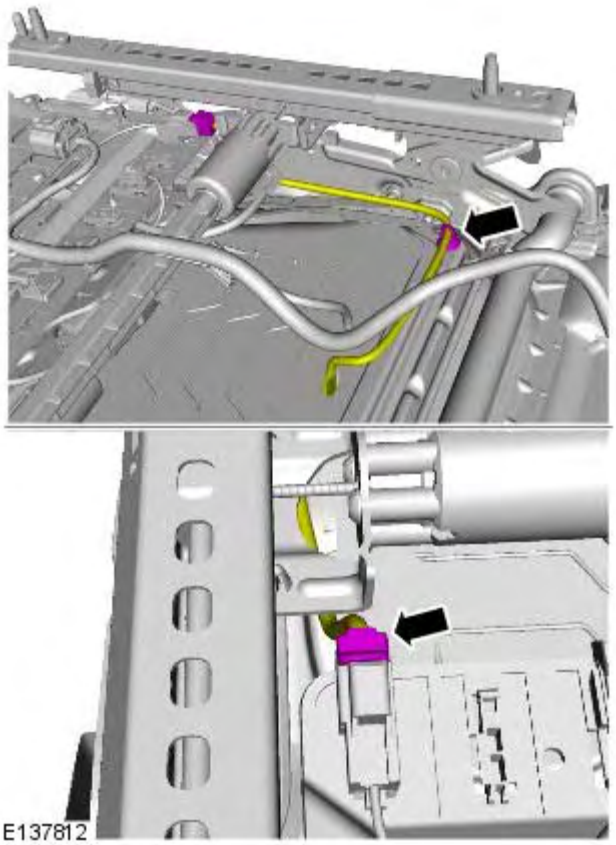
   Make sure that new hog rings are installed.

   Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.

2. NOTE: Make sure that the hogrings are installed in the sequence shown.



E140733



E137812

3. CAUTION: Make sure the component is aligned as shown.

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

4. To install, reverse the removal procedure.

Published: 29-Feb-2012

Seating - Passenger Seat Cushion

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least two minutes after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

CAUTIONS:

The front passenger seat occupant classification sensor is available only as a service kit. No attempt should be made to replace individual components. Failure to follow this instruction may result in personal injury.

Check for correct operation of the front seat after completion of the procedure to make sure that the wiring harness has not become trapped or stretched.

NOTES:

Removal steps in this procedure may contain installation details.

Note the routing of the seat harness.

Some variation in the illustrations may occur, but the essential information is always correct.

All vehicles

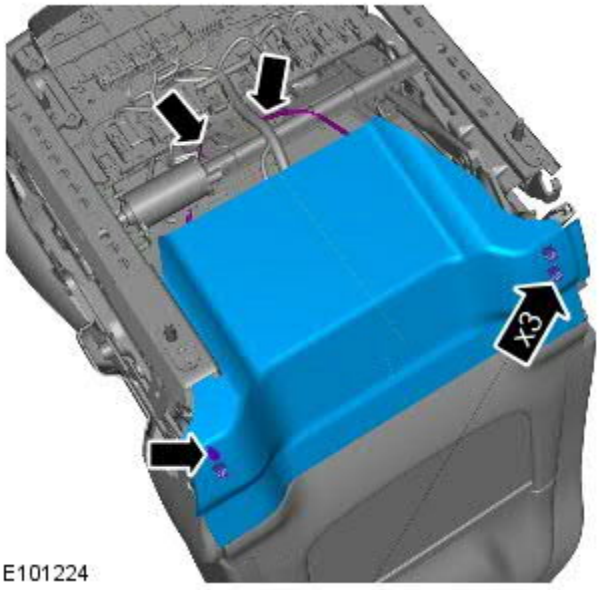
1. Make the air bag supplemental restraint system (SRS) safe.

   Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

3. Refer to: Front Seat (501-10 Seating, Removal and Installation).

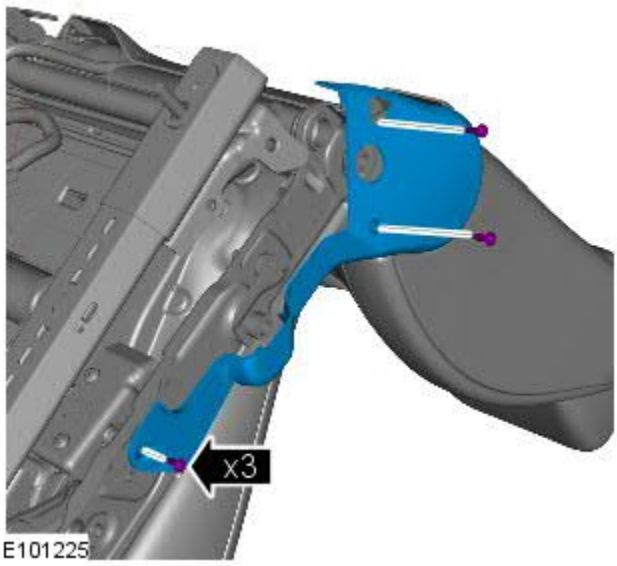
4. Refer to: Front Seat Control Switch (501-10 Seating, Removal and Installation).



E101224

5. NOTE: Make sure that the clips are installed in the correct orientation.

6.

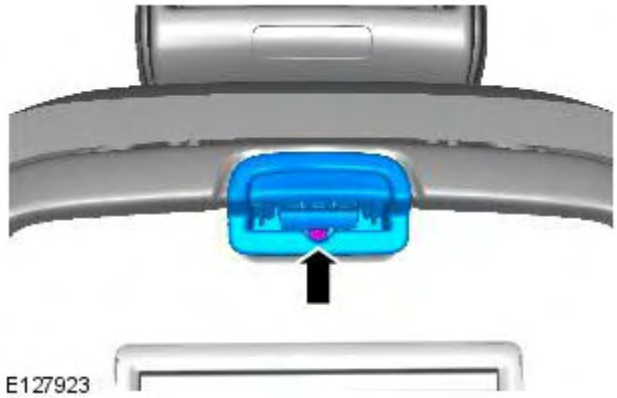


E101225

7.

E127925

8.

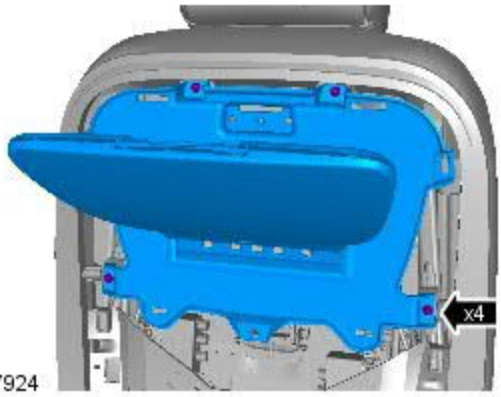


E127923

9.

E127922

10.



E127924

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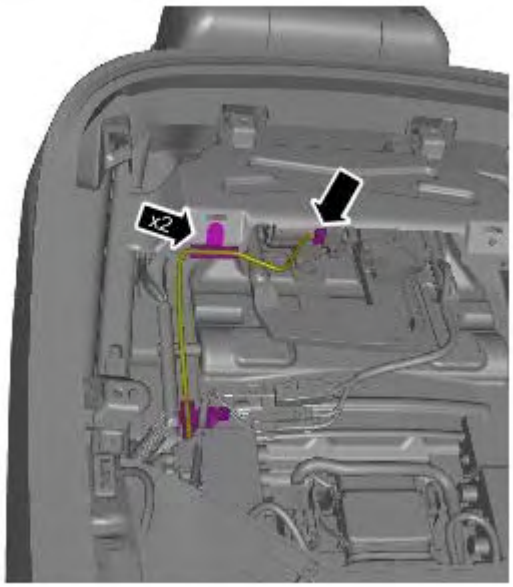

E140973

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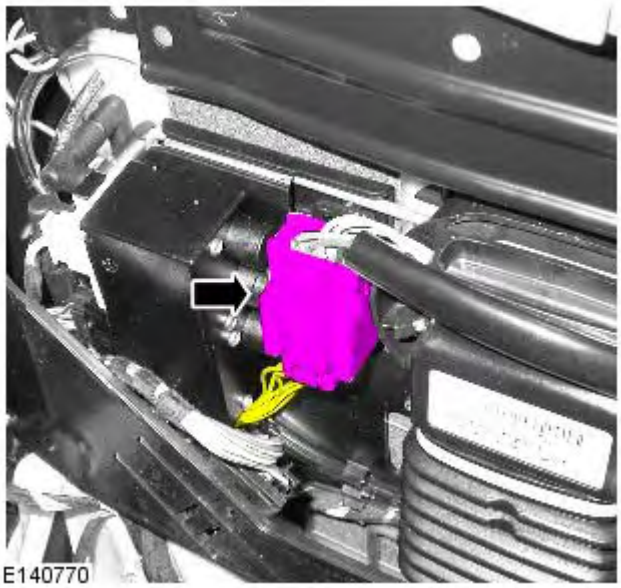
E140770

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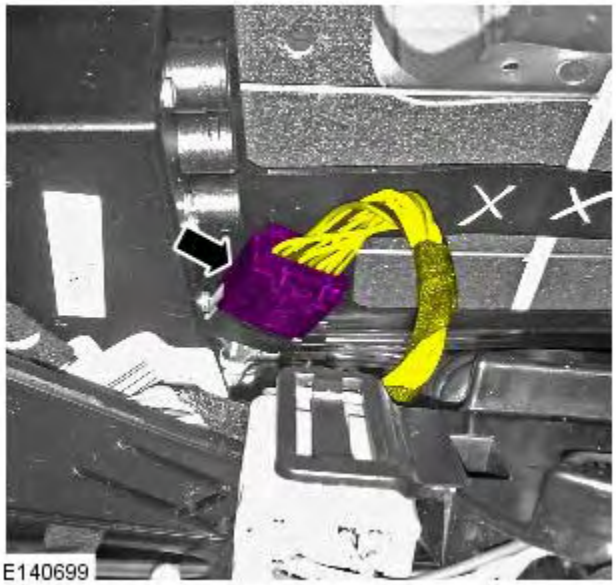
E140699

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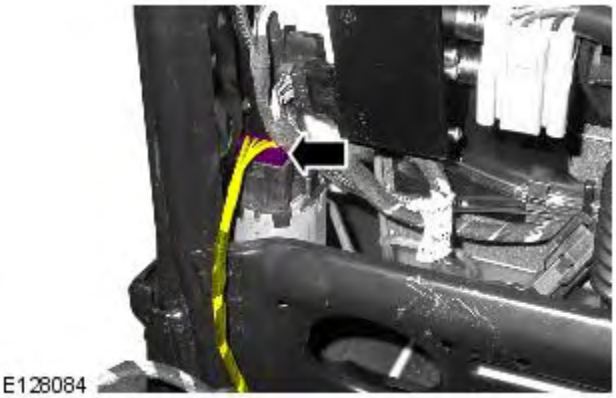
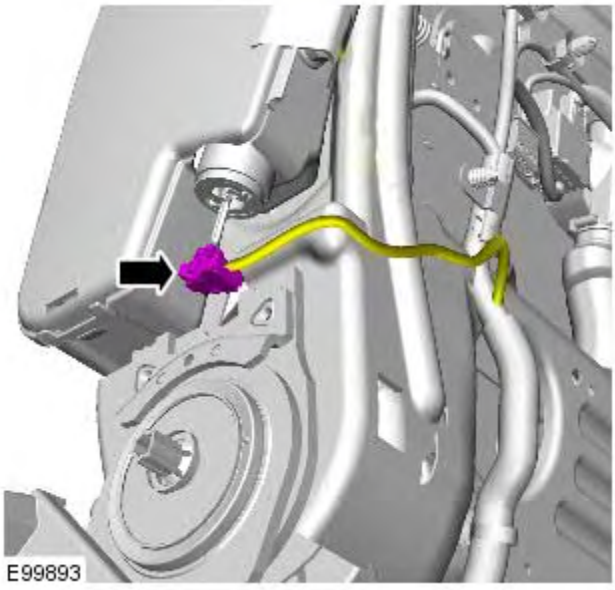

E128084

15. NOTE: Note the position of the wiring harnesses to aid installation.

E128087

16.

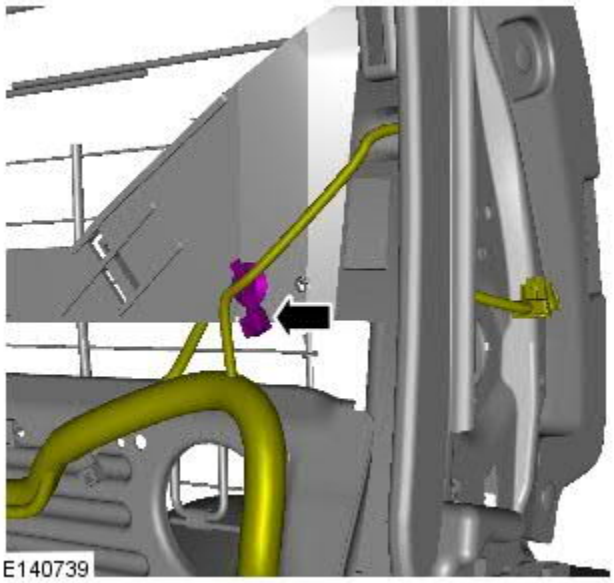
E128088


E99893

17. WARNING: The SRS electrical connectors are unique. DO NOT force, or attempt to connect electrical connectors to the wrong sockets.

CAUTION: LH illustration shown, RH is similar.

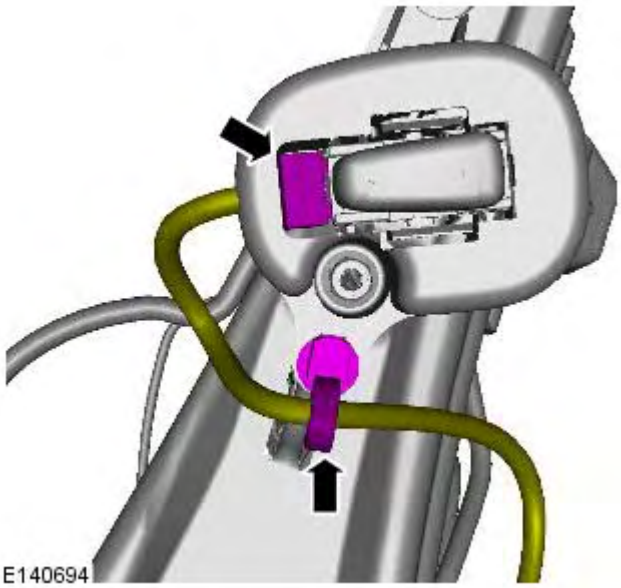
18.



All vehicles

19.

- If equipped.



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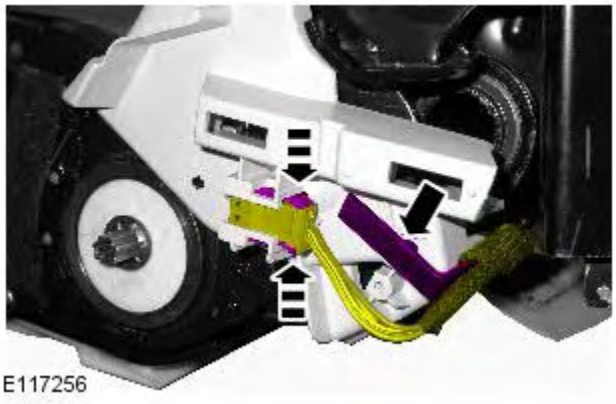
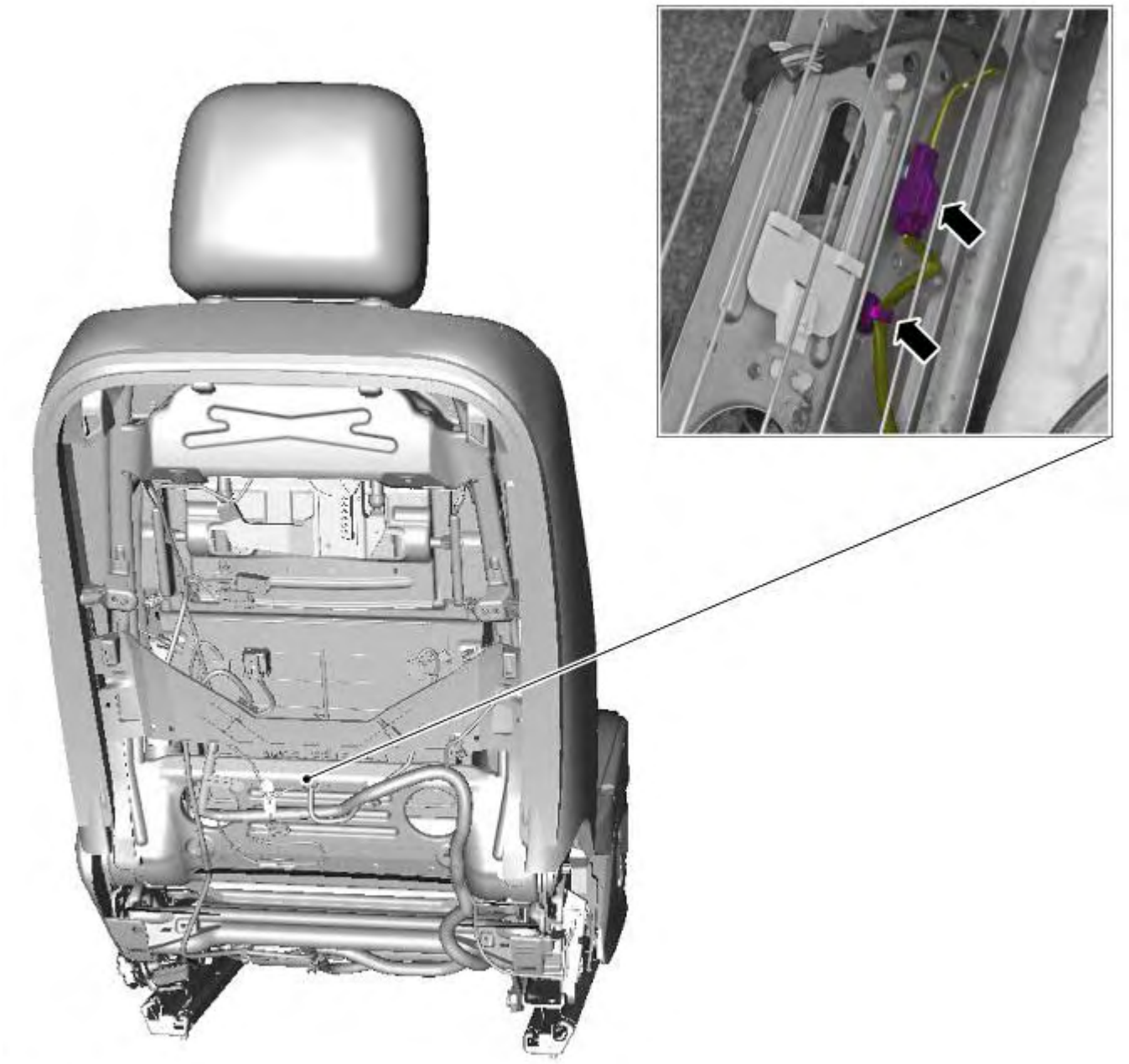
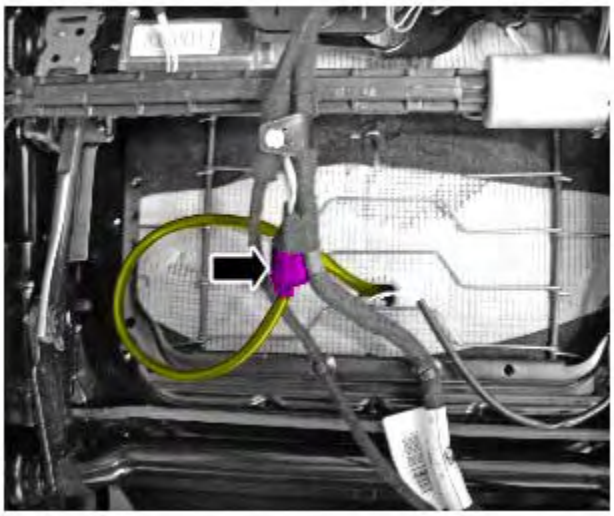


Vehicles with heated front seats

21.



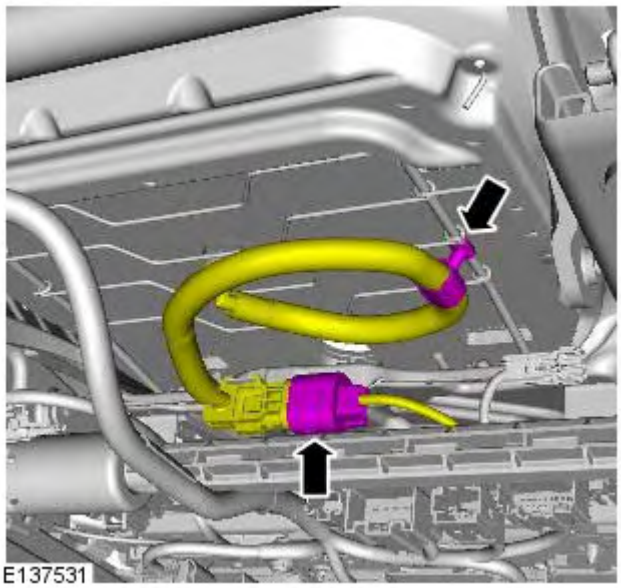
E141493



E137449

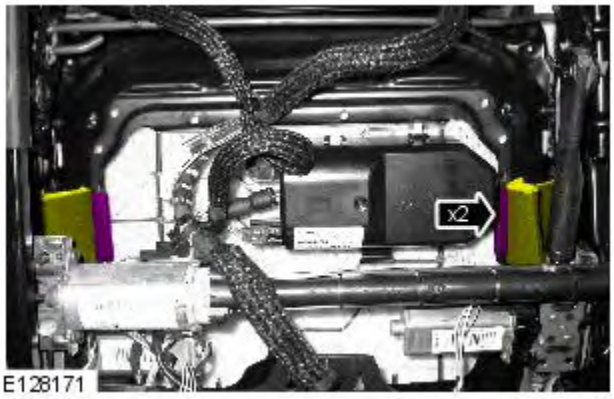
22. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

All vehicles



E137531

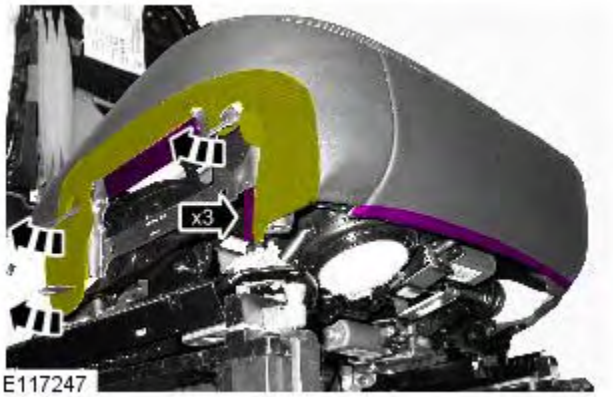
23. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E128171

24.

25.

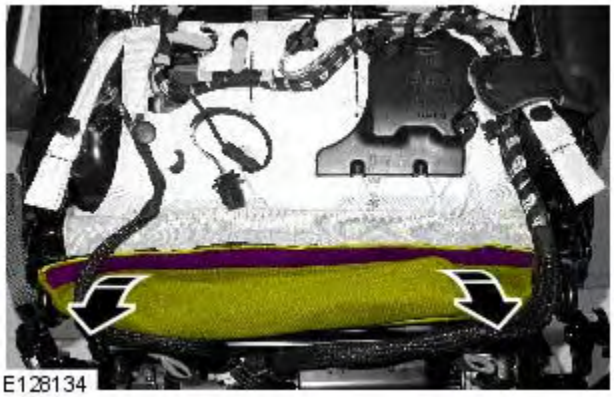


E117247

26.

E117248

27.


E128134

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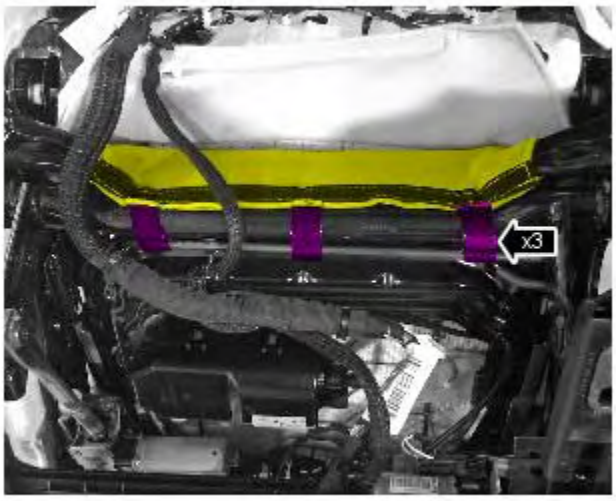


E140841

29.

E117249

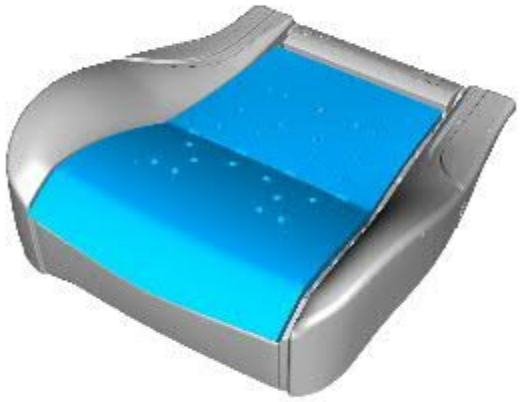
30.

E140684

31. NOTE: Make sure that new hog rings are installed.

E101234

32.



E140687

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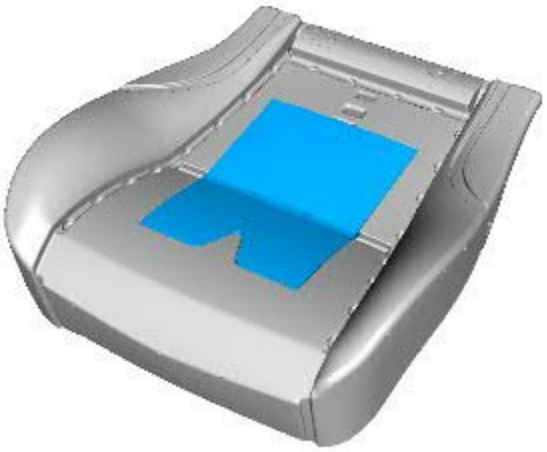

E140688

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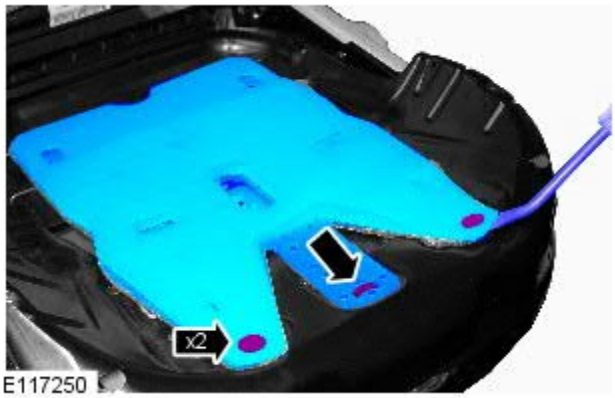

E117250

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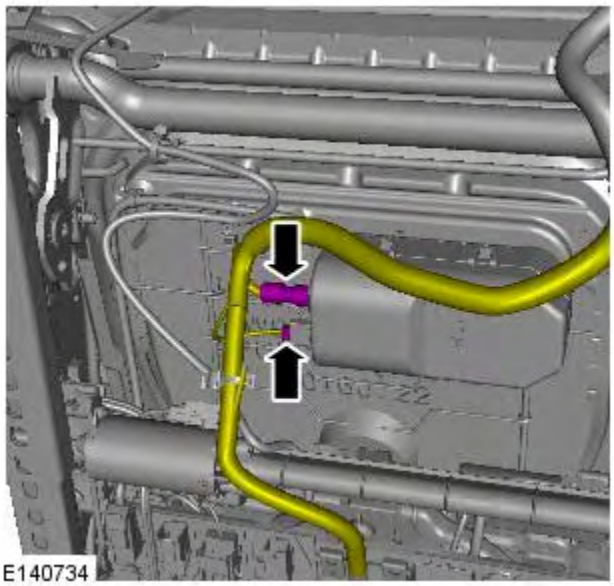

E140734

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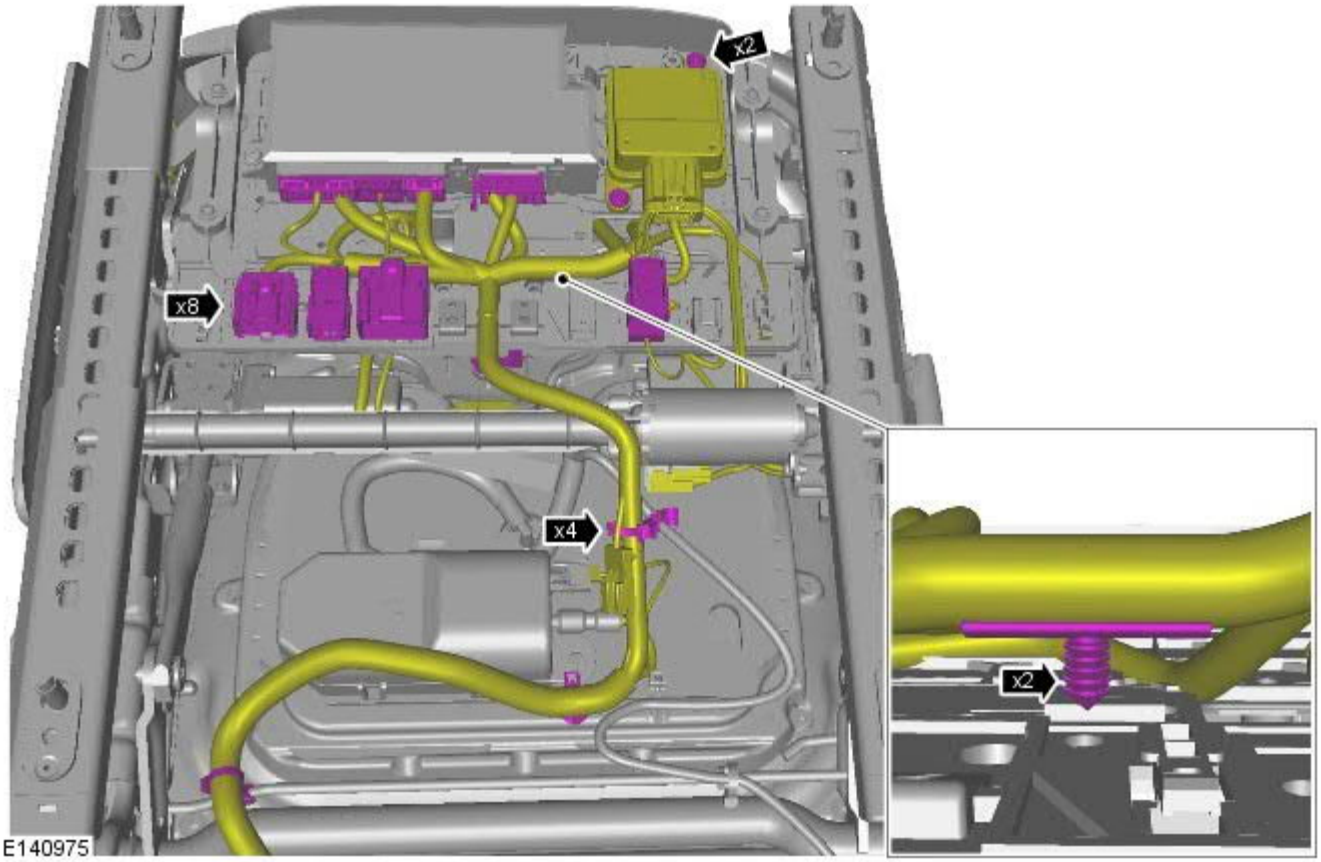

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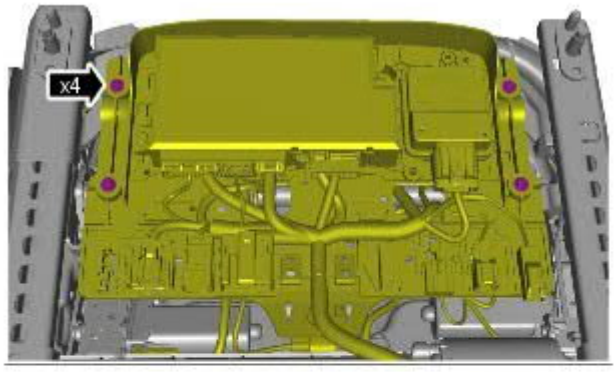
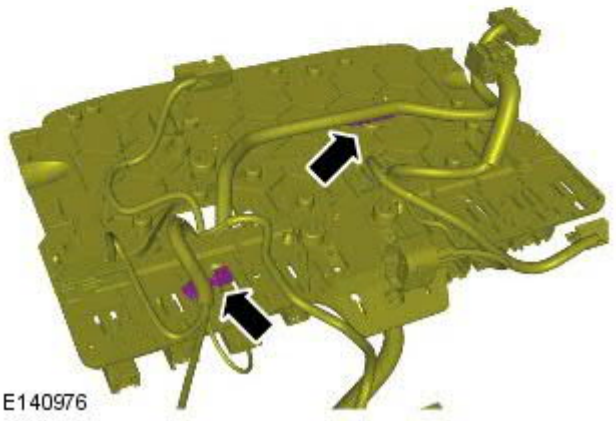
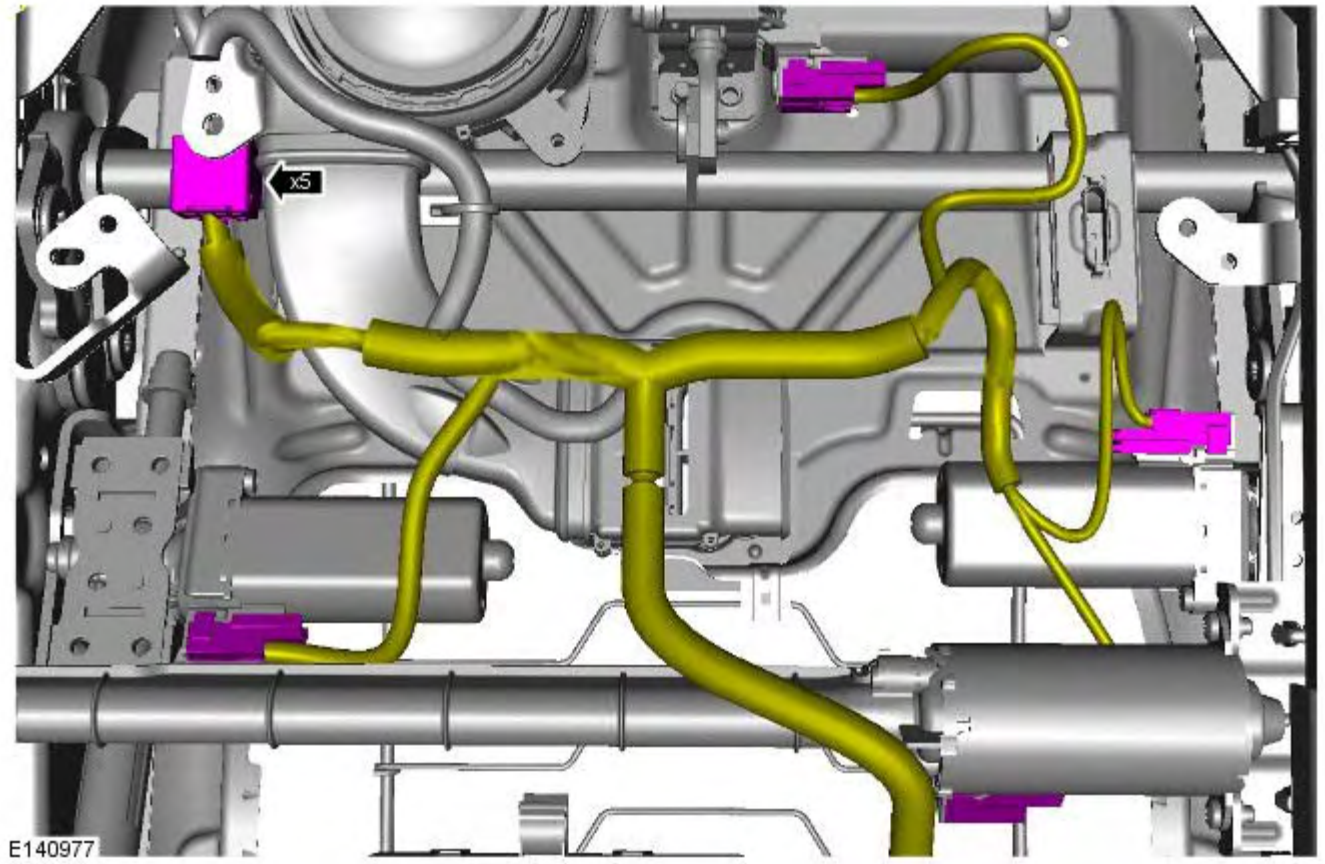




38. NOTE: Note the position of the wiring harnesses to aid installation.



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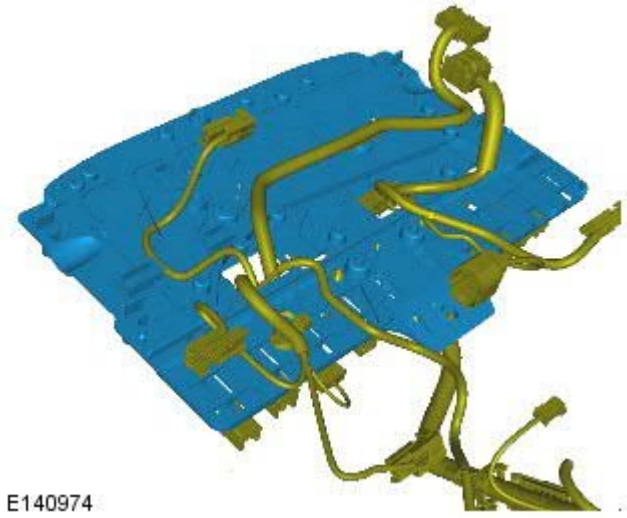

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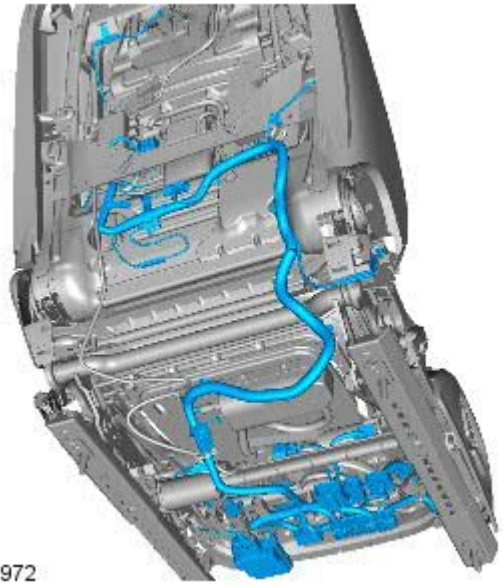


E140972

Installation

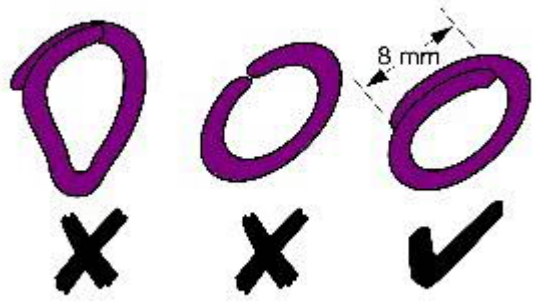
1. CAUTION: The front passenger seat occupant classification sensor is available only as a service kit. No attempt should be made to replace individual components. Failure to follow this instruction may result in personal injury.

E117244

2. NOTES:

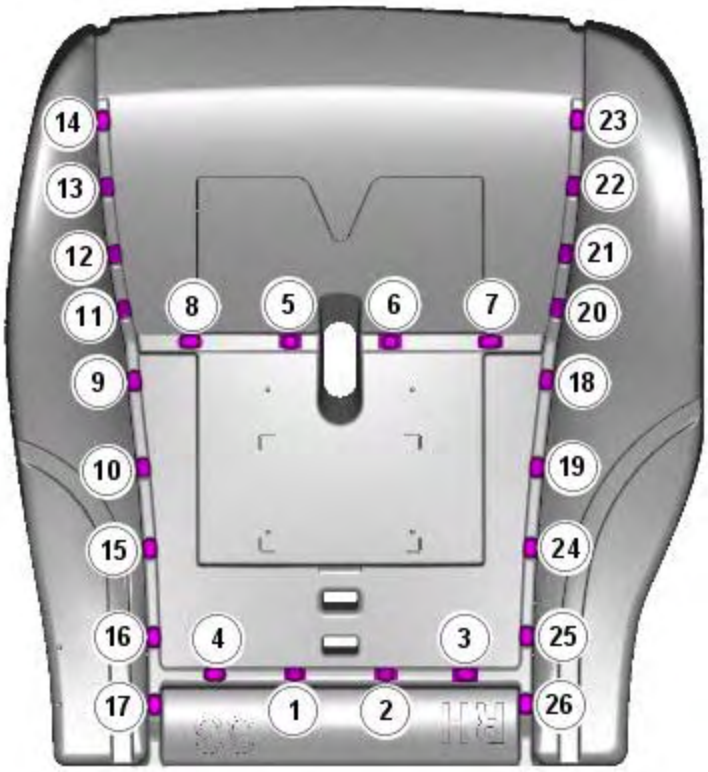
   Make sure that new hog rings are installed.

   Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.



V4001063

3. NOTE: Make sure that the hogrings are installed in the sequence shown.



E140733

4. To install, reverse the removal procedure.

5. NOTE: Make sure that the front seats are empty during this process.

   - If a new service kit is installed configure the occupant classification sensor using the approved Jaguar diagnostic tool and clear any DTCs.
   - If a repair has been carried out reset the occupant classification sensor using the approved Jaguar diagnostic tool and clear any DTCs.

Published: 29-Feb-2012

Seating - Passenger Seat Cushion Heater Mat

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least two minutes after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

CAUTIONS:

The front passenger seat occupant classification sensor is available only as a service kit. No attempt should be made to replace individual components. Failure to follow this instruction may result in personal injury.

Check for correct operation of the front seat after completion of the procedure to make sure that the wiring harness has not become trapped or stretched.

NOTES:

Note the routing of the seat harness.

Some variation in the illustrations may occur, but the essential information is always correct.

1. Make the air bag supplemental restraint system (SRS) safe.

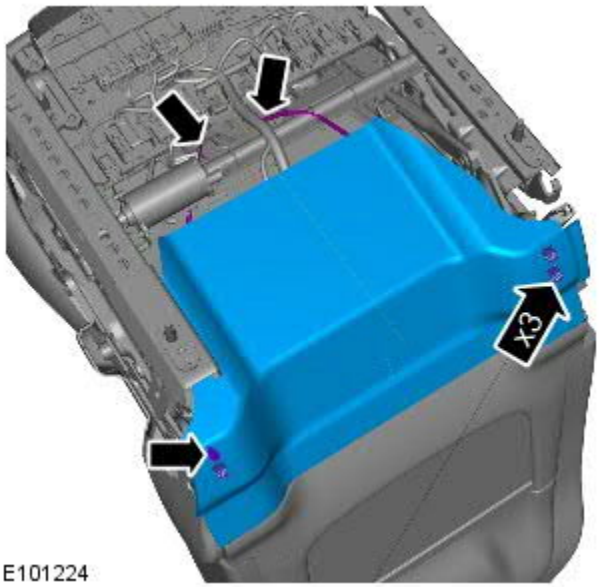
   Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

3. Refer to: Front Seat (501-10 Seating, Removal and Installation).

4. Refer to: Front Seat Control Switch (501-10 Seating, Removal and Installation).

5.



E101224

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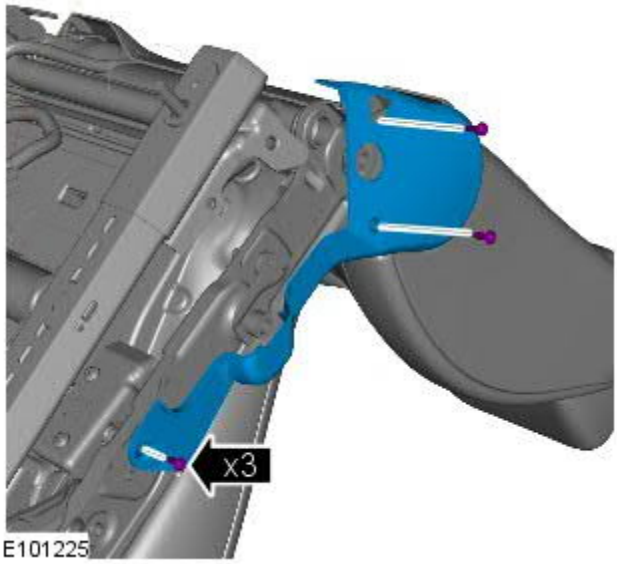

E101225

7.

E127925

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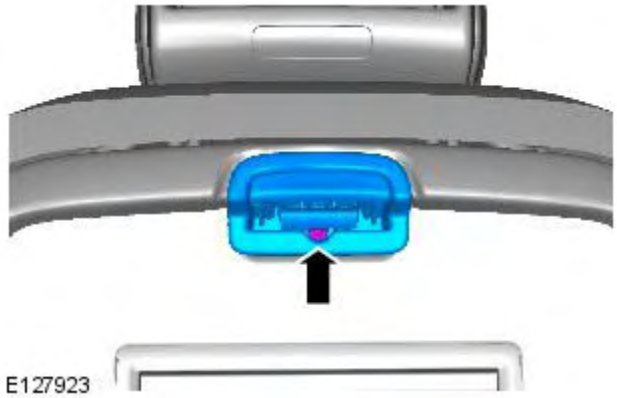

E127923

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E127922

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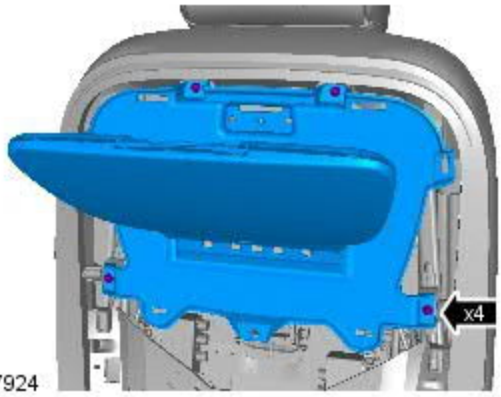

E127924

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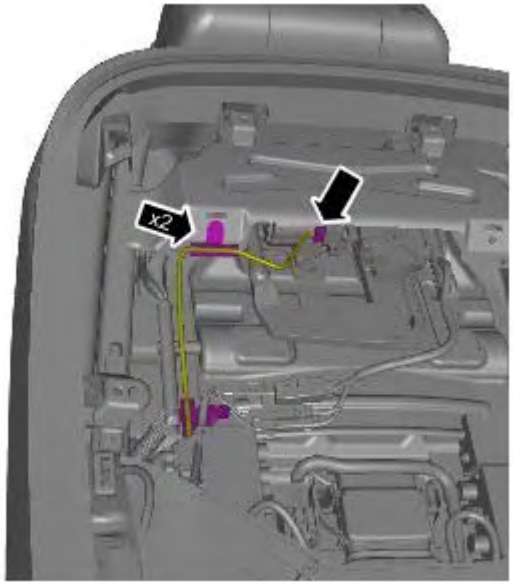

E140973

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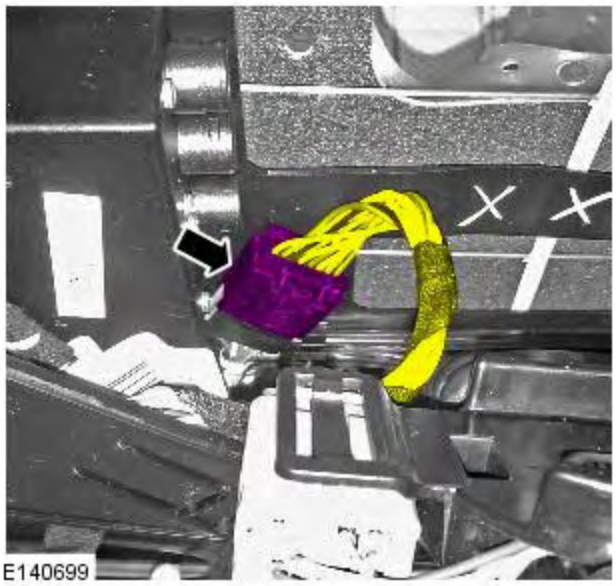

E140699

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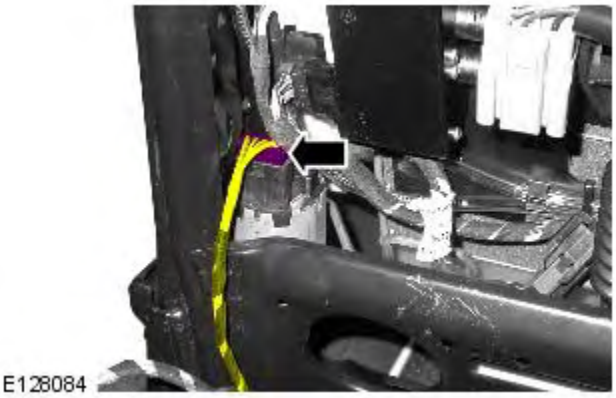


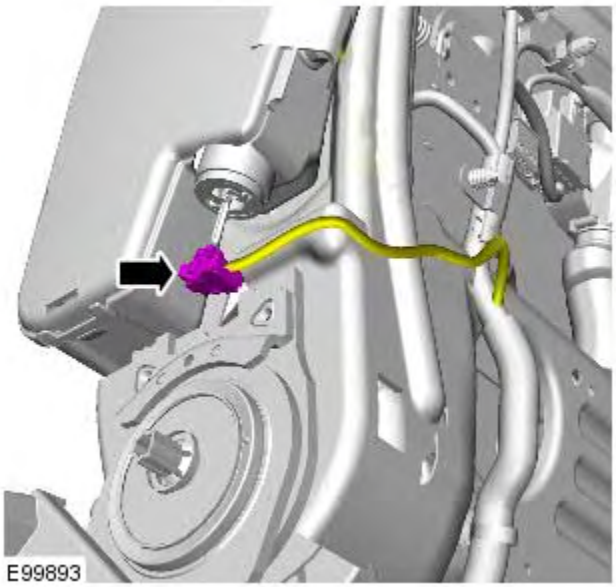
E128084

14. NOTE: Note the position of the wiring harnesses to aid installation.

E128087

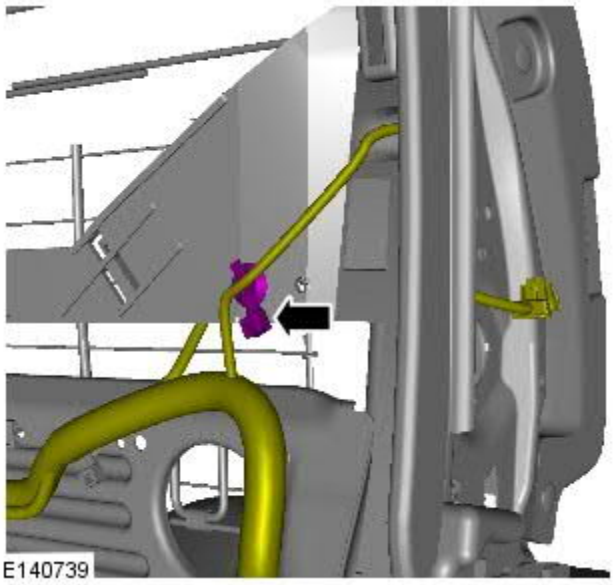
15.

E128088



16. WARNING: The SRS electrical connectors are unique. DO NOT force, or attempt to connect electrical connectors to the wrong sockets.

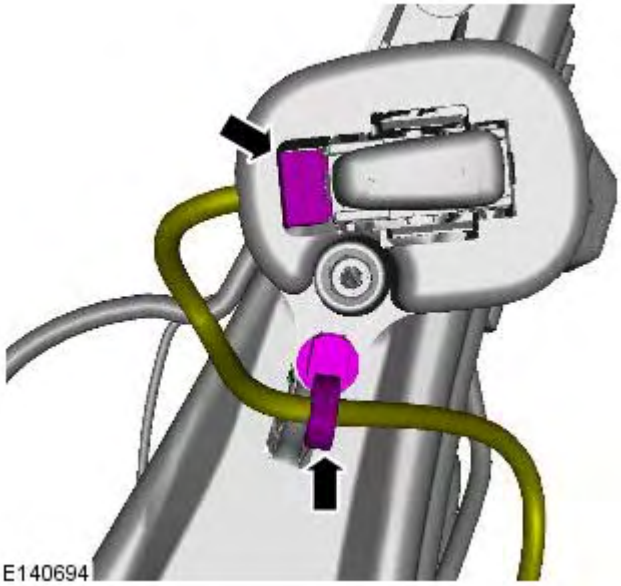
CAUTION: LH illustration shown, RH is similar.



17.

18.

- If equipped.



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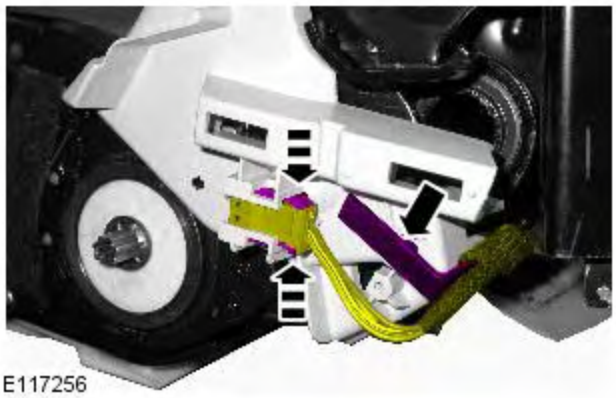

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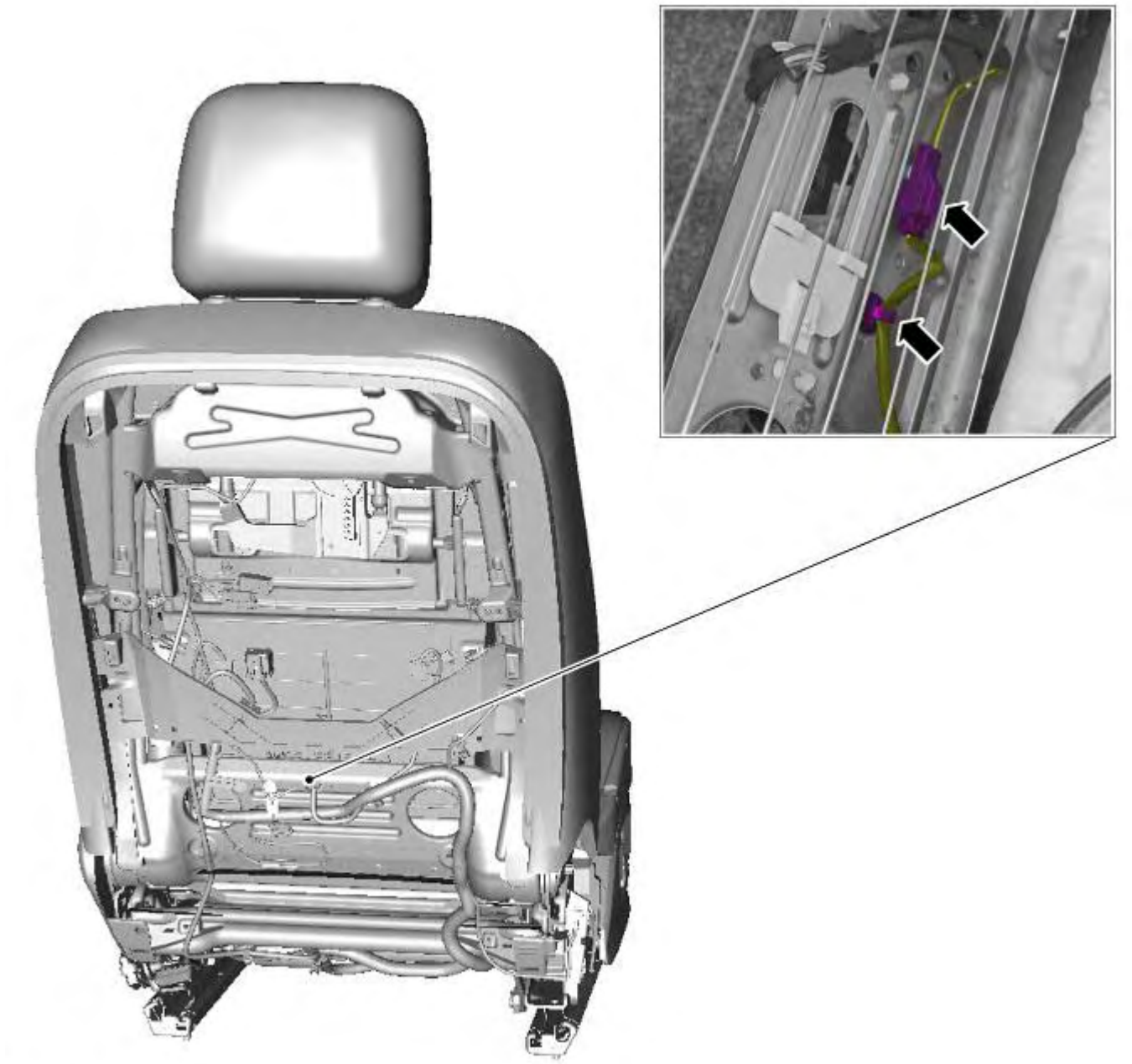

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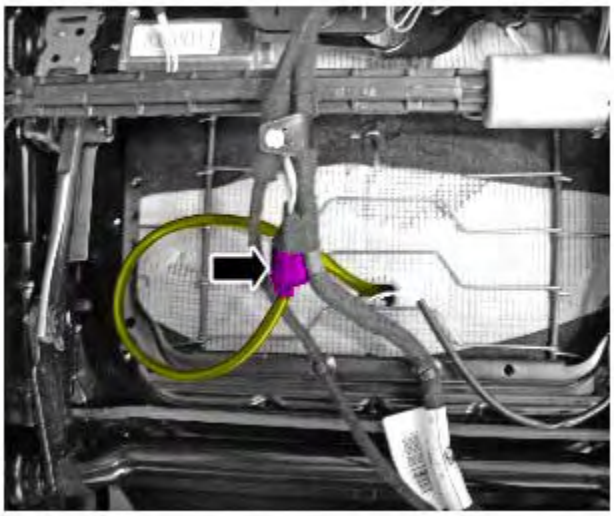
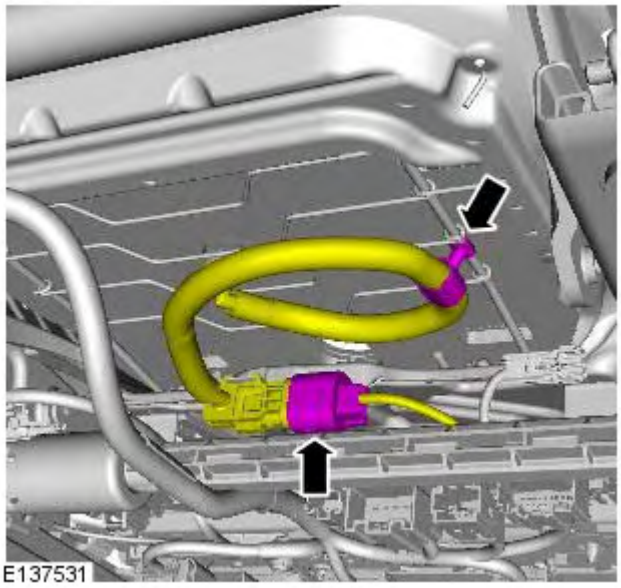


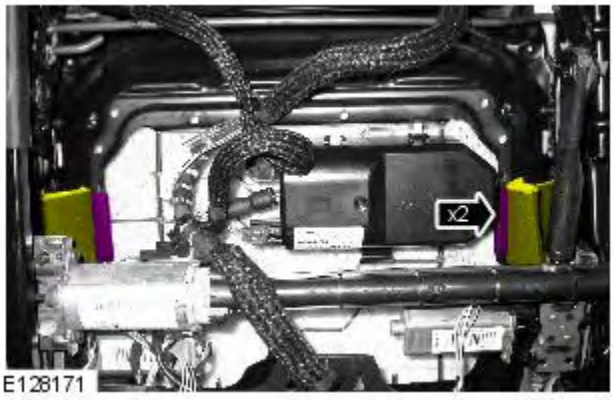
E137449

21. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E137531

22. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E128171

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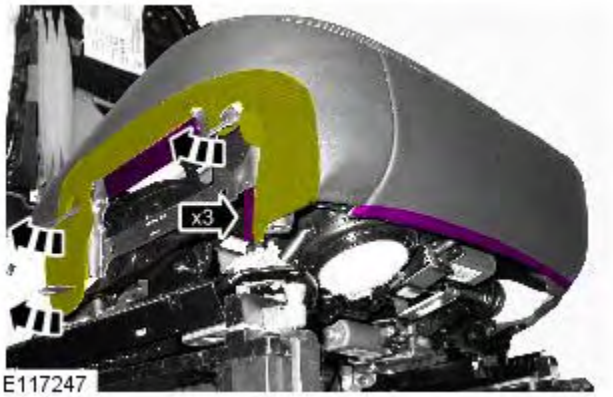
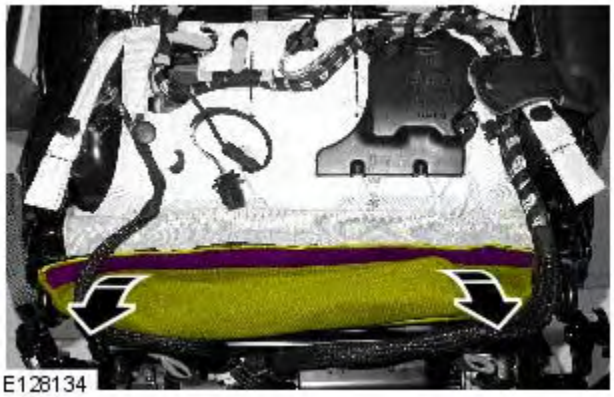


E117247

25.

E117248

26.


E128134

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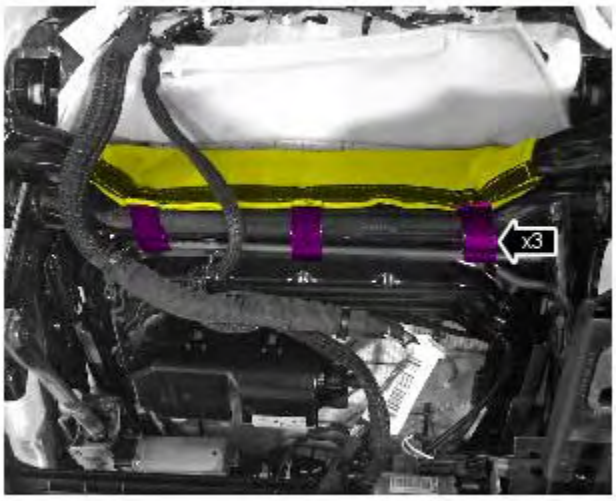


E140841

28.

E117249

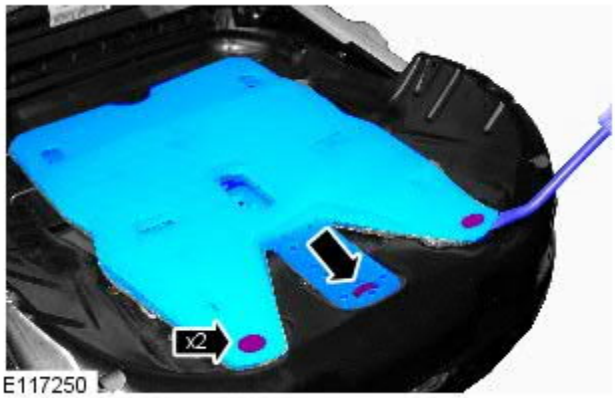
29.

E140684

30. NOTE: Make sure that new hog rings are installed.

E101234

31.



E117250

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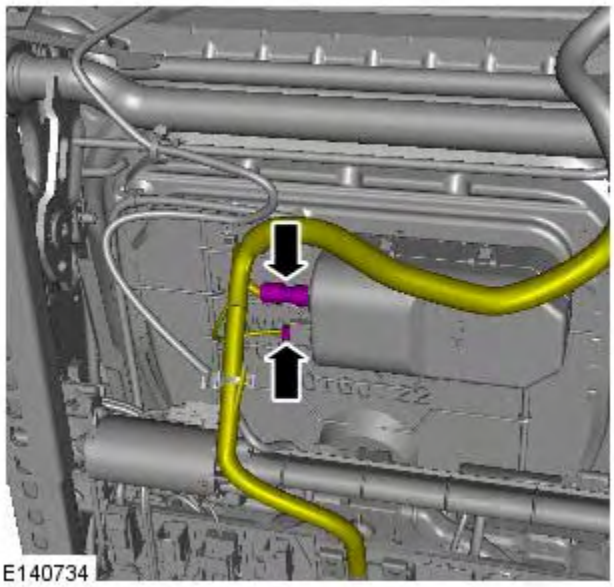
E140734

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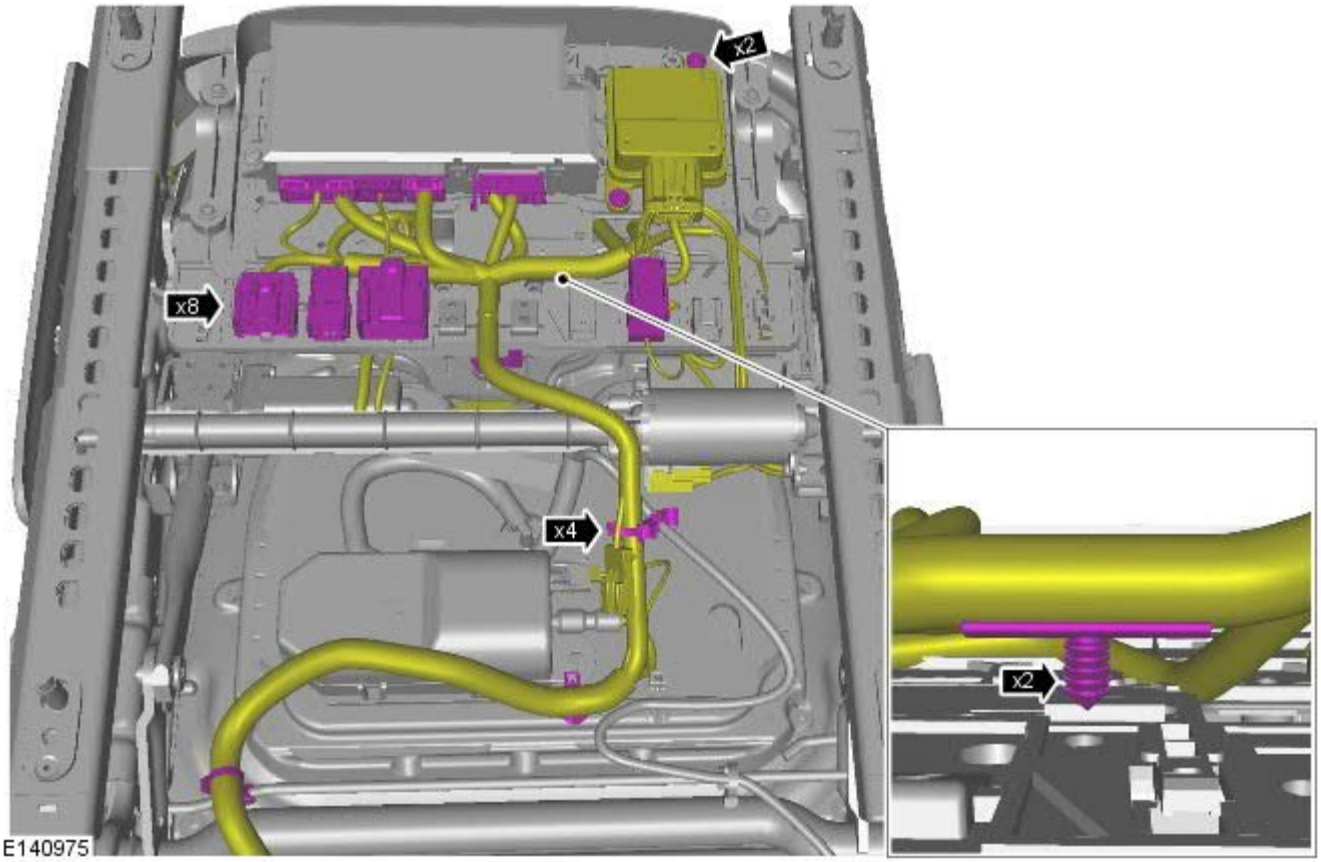

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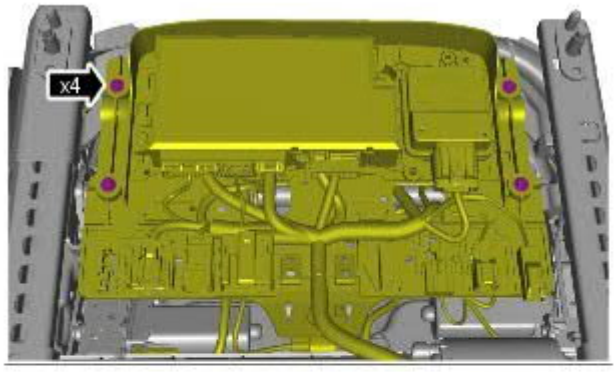
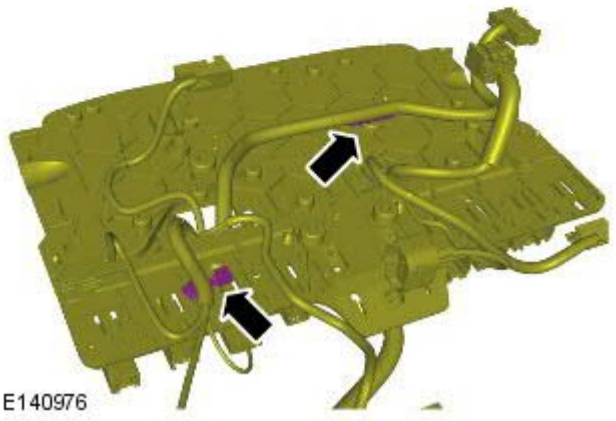
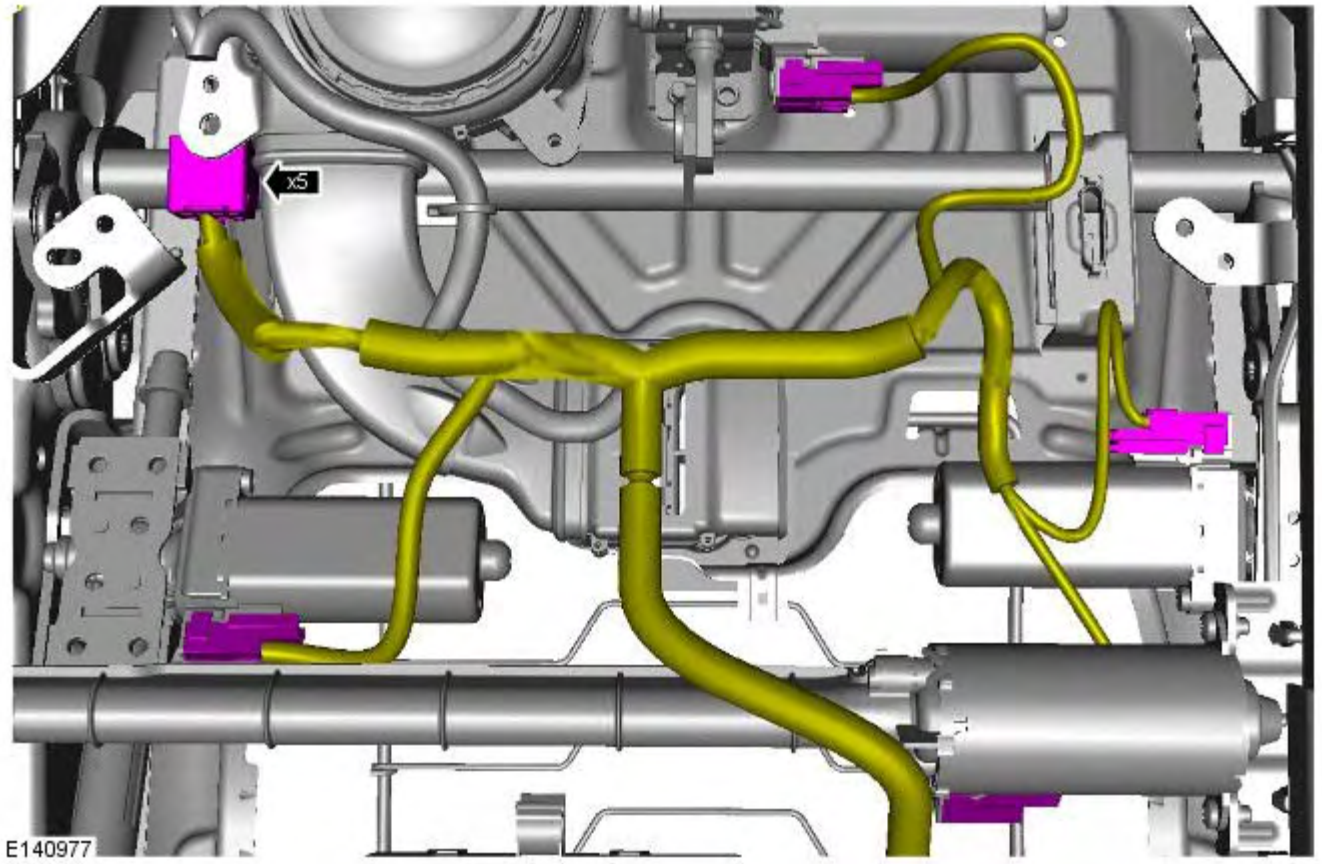




35. NOTE: Note the position of the wiring harnesses to aid installation.



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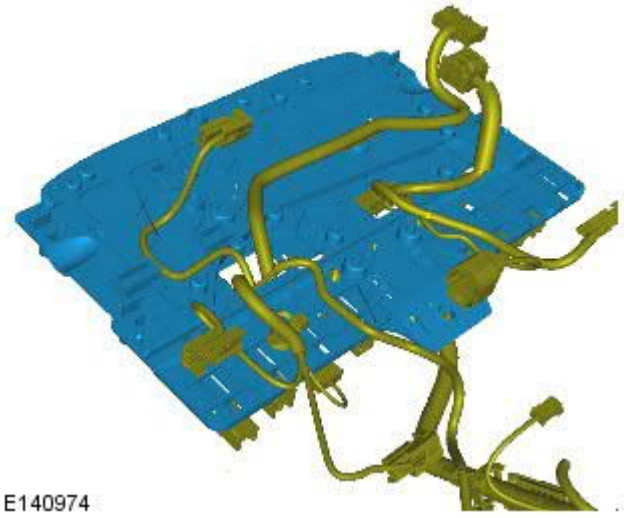

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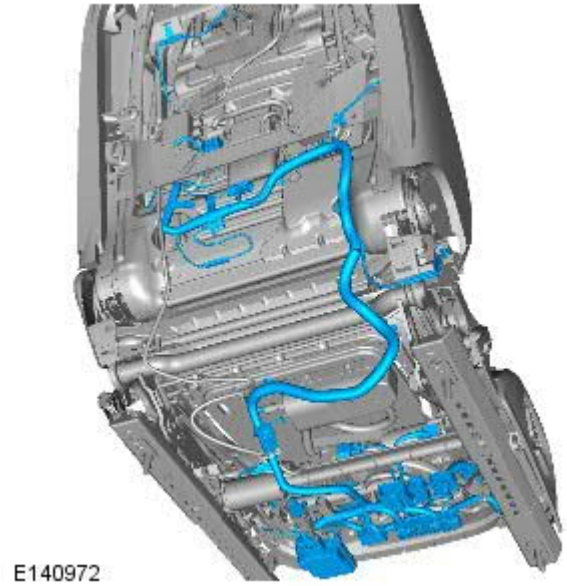


E140972

Installation

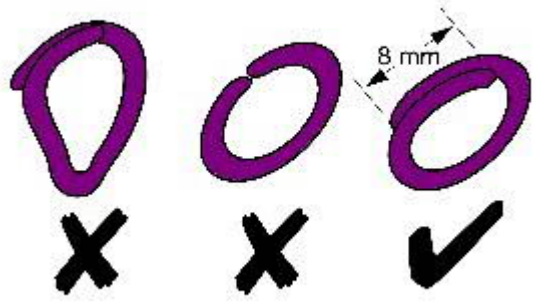
1. CAUTION: The front passenger seat occupant classification sensor is available only as a service kit. No attempt should be made to replace individual components. Failure to follow this instruction may result in personal injury.

E117244

2. NOTES:

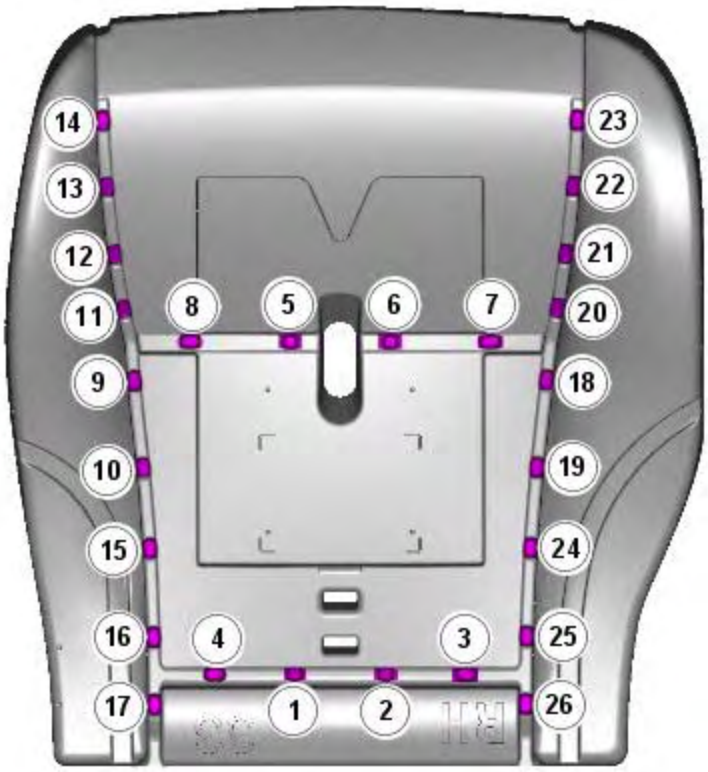
   Make sure that new hog rings are installed.

   Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.



V4001063

3. NOTE: Make sure that the hogrings are installed in the sequence shown.



E140733

4. To install, reverse the removal procedure.

5. NOTE: Make sure that the front seats are empty during this process.

   - If a new service kit is installed configure the occupant classification sensor using the approved Jaguar diagnostic tool and clear any DTCs.
   - If a repair has been carried out reset the occupant classification sensor using the approved Jaguar diagnostic tool and clear any DTCs.

Published: 22-Apr-2012

Seating - Rear Seat Armrest

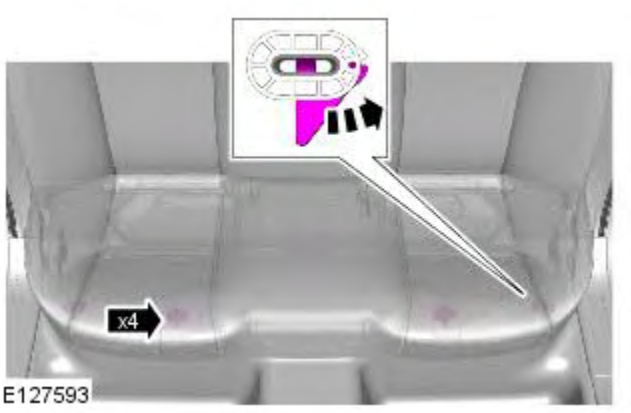
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

All vehicles

1.



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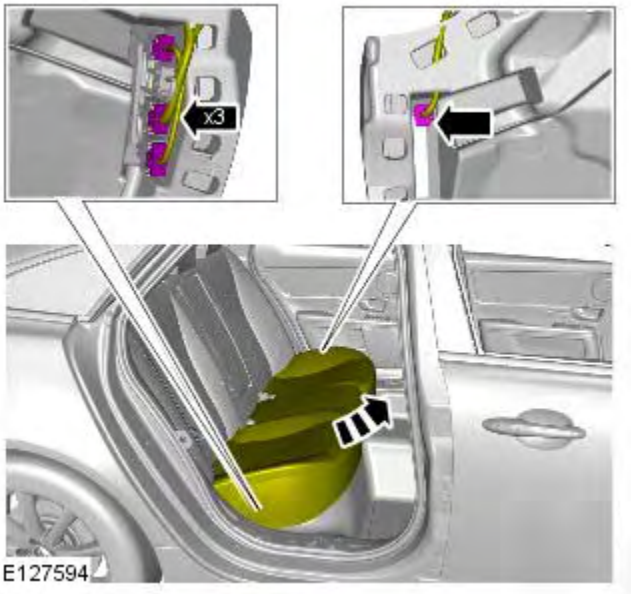

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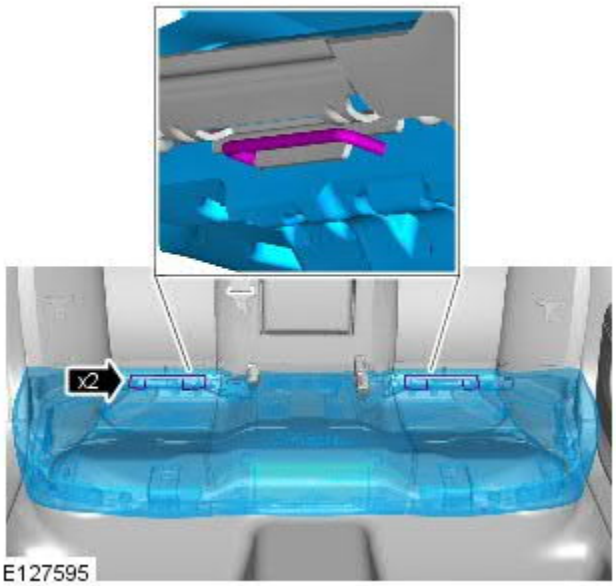

E127595

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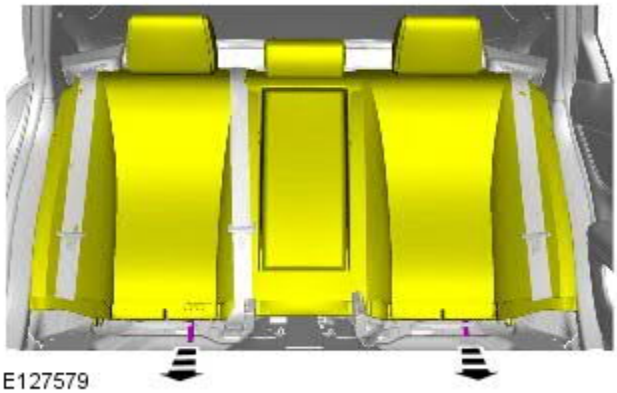
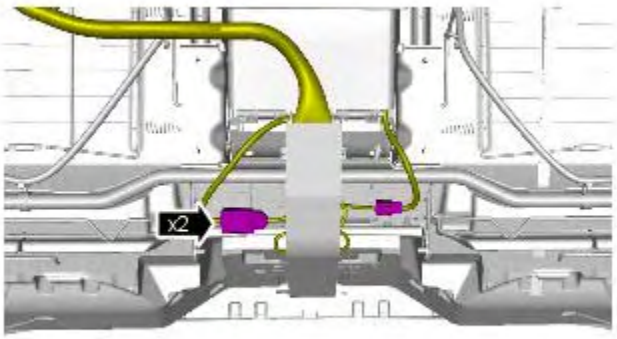


E127579

Vehicles with rear passenger entertainment system

5.



E127581

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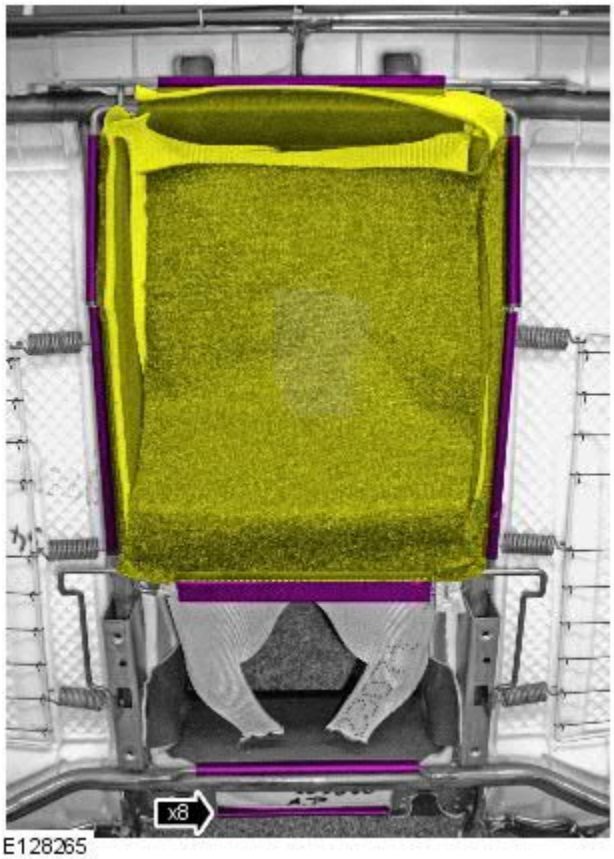
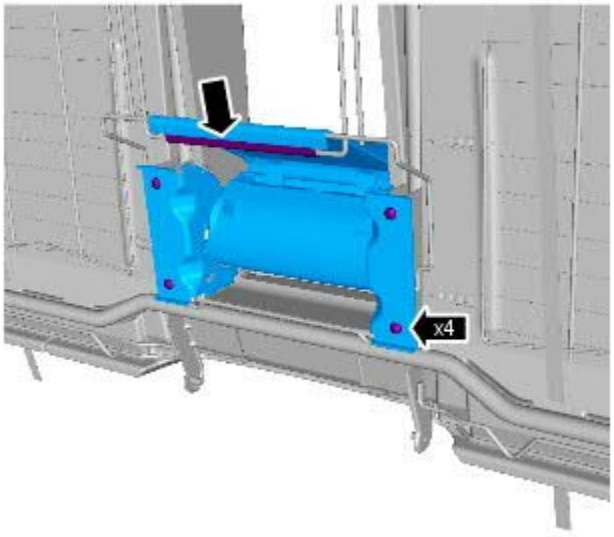


E128265

7.

E128256

8. *Torque:* 8 Nm



E128257

Installation

1. To install, reverse the removal procedure.

Published: 22-Apr-2012

Seating - Rear Seat Backrest

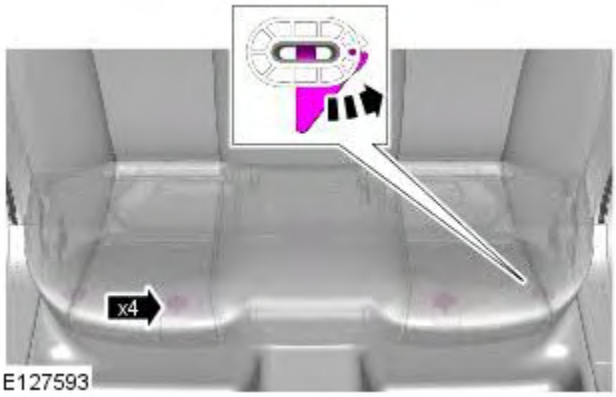
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

All vehicles

1.



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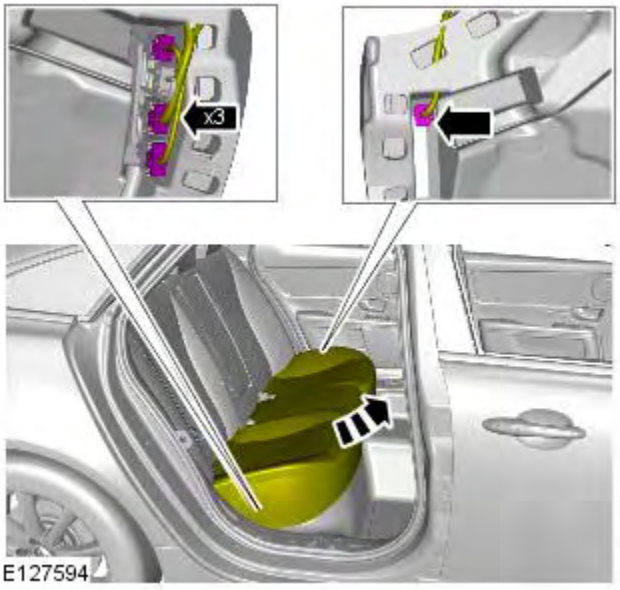

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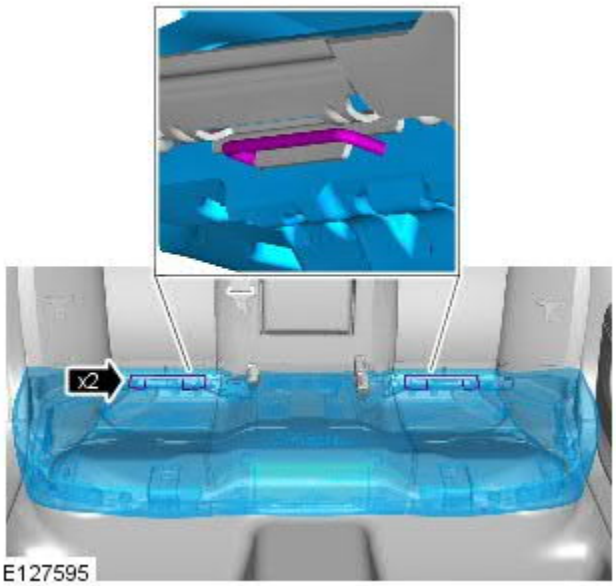

E127595

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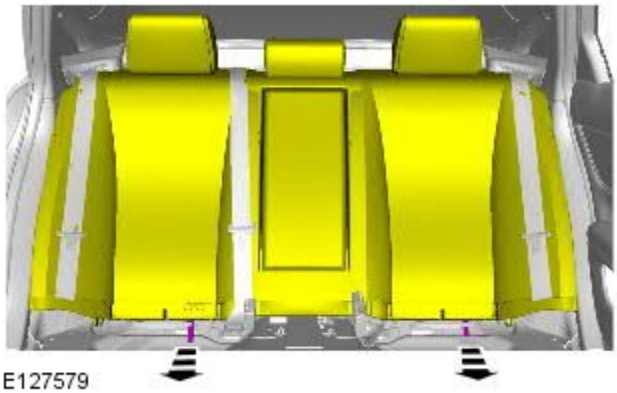
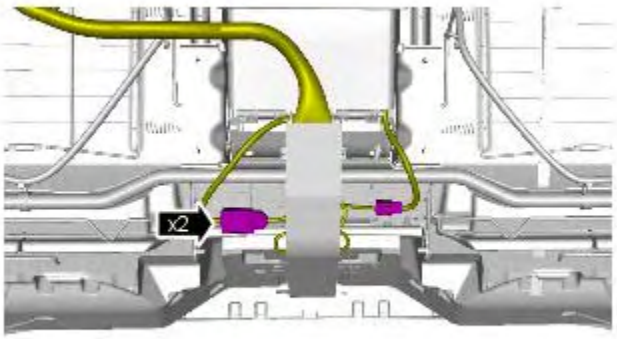


E127579

Vehicles with rear passenger entertainment system

5.

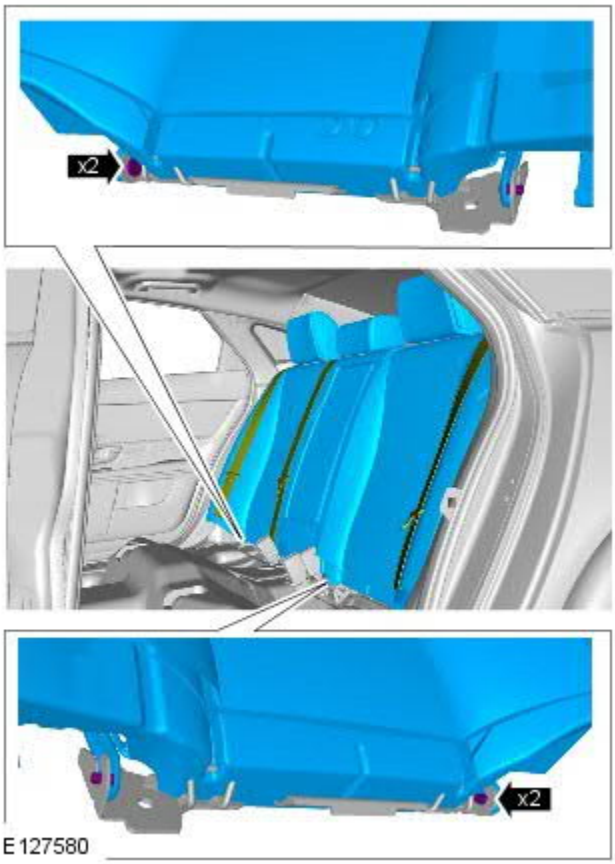


E127581

E128812

6. NOTE: Note the position of the wiring harnesses to aid installation.

7.



E127580

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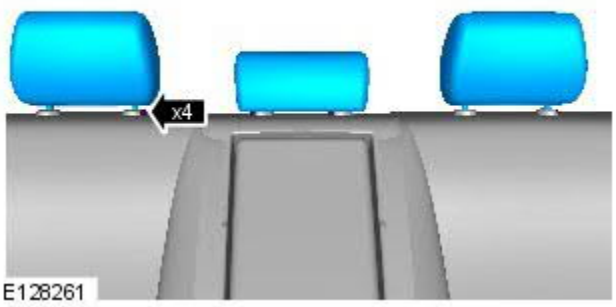

E128261

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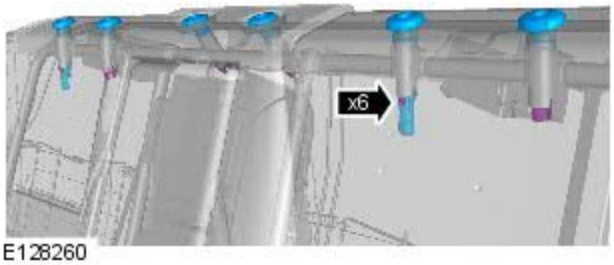
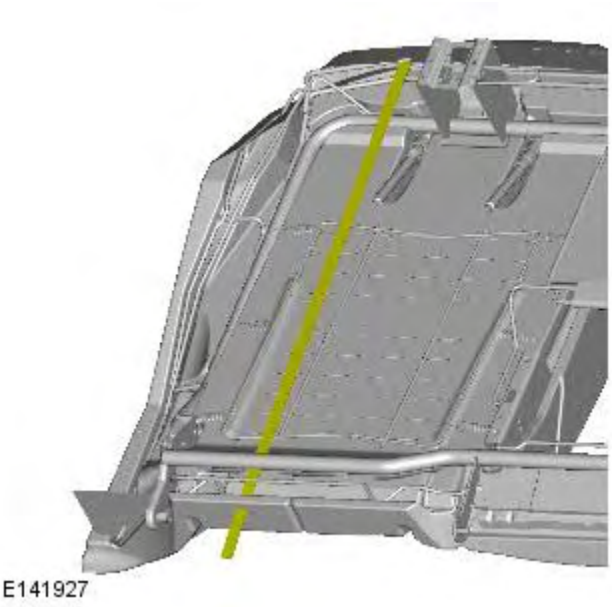
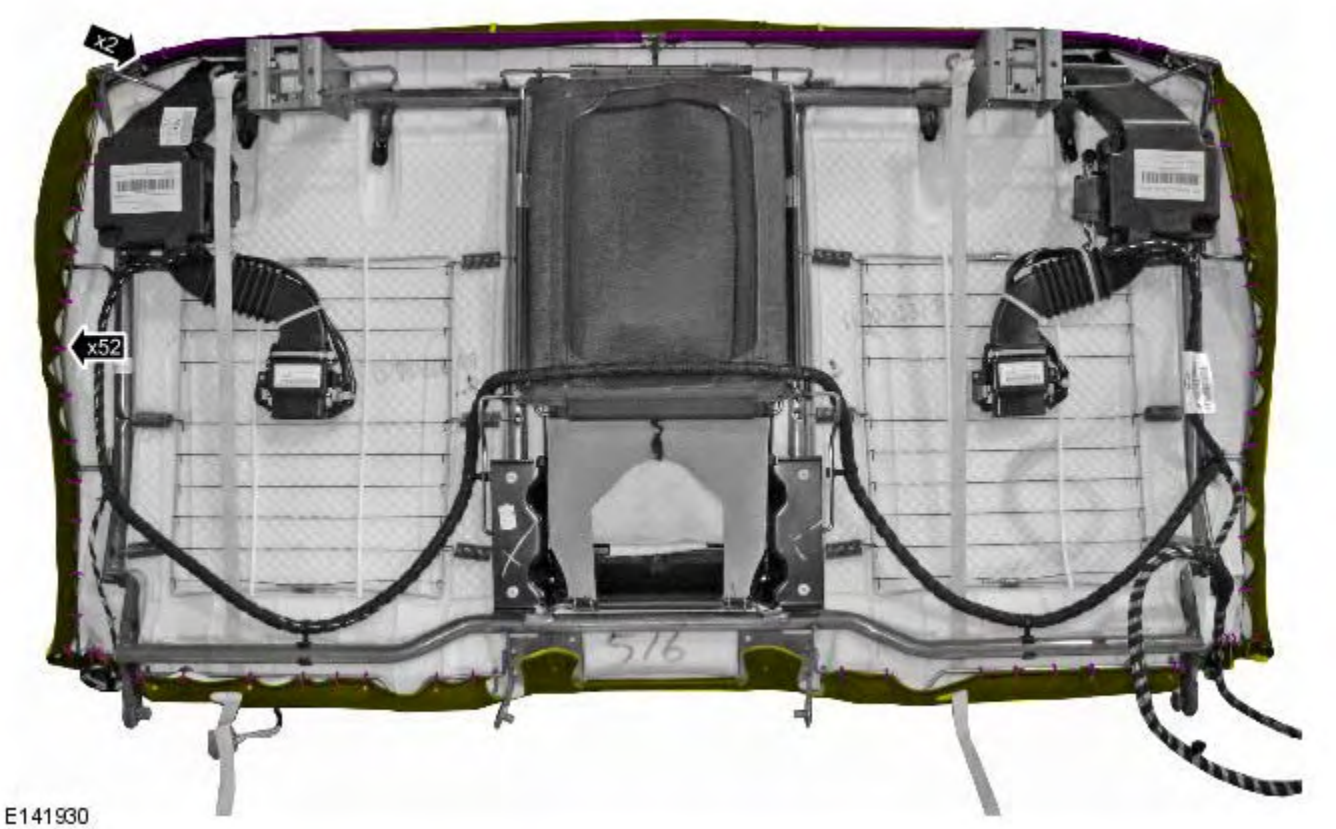


E128260


E141927

10. NOTE: Repeat the procedure for the other side.

11.



E141930

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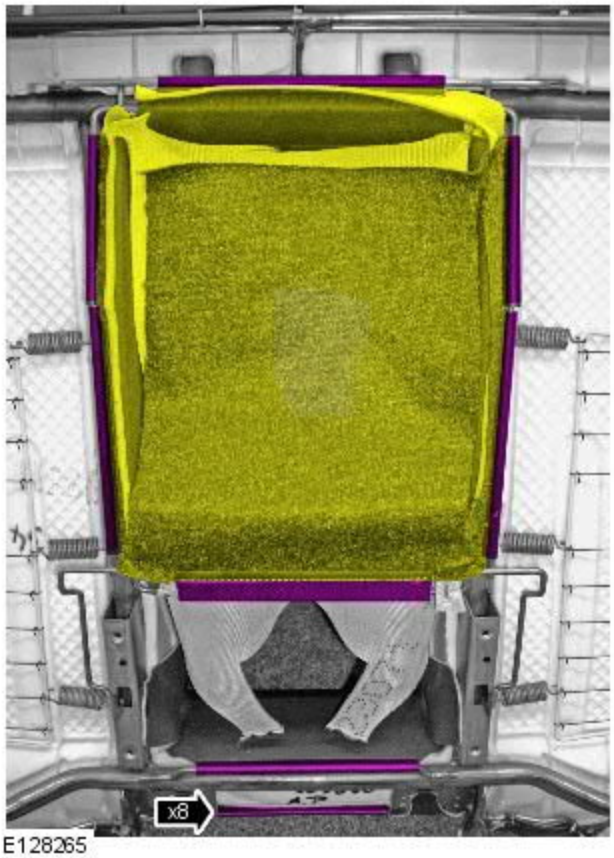
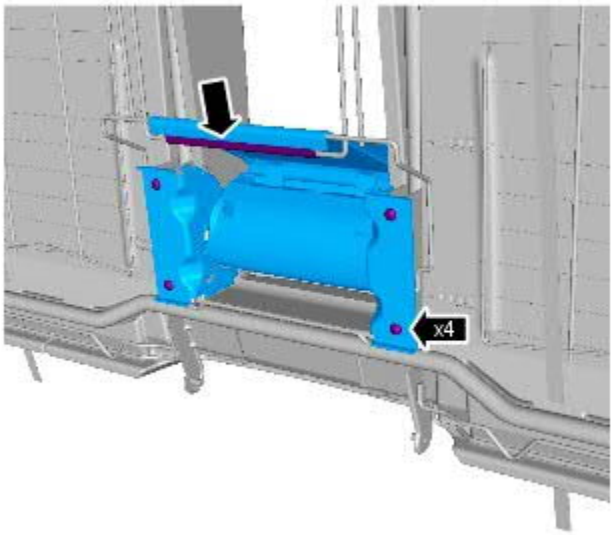


E128265

13.

E128256

14. *Torque:* 8 Nm



E128257

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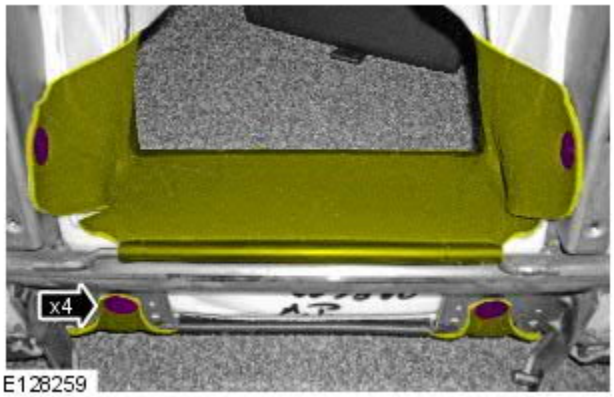

E128259

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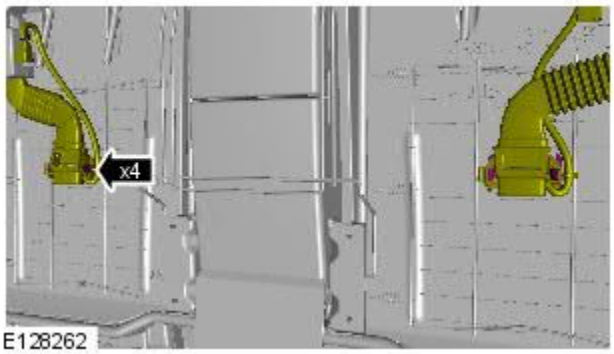
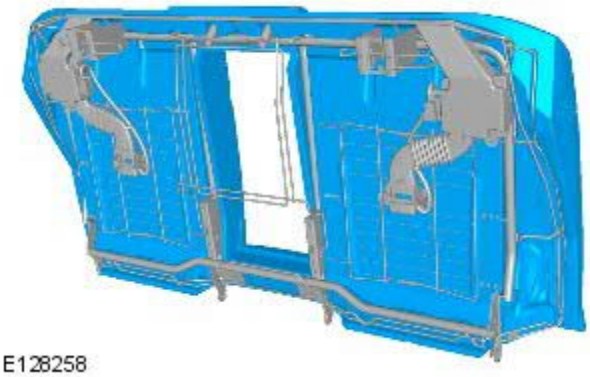
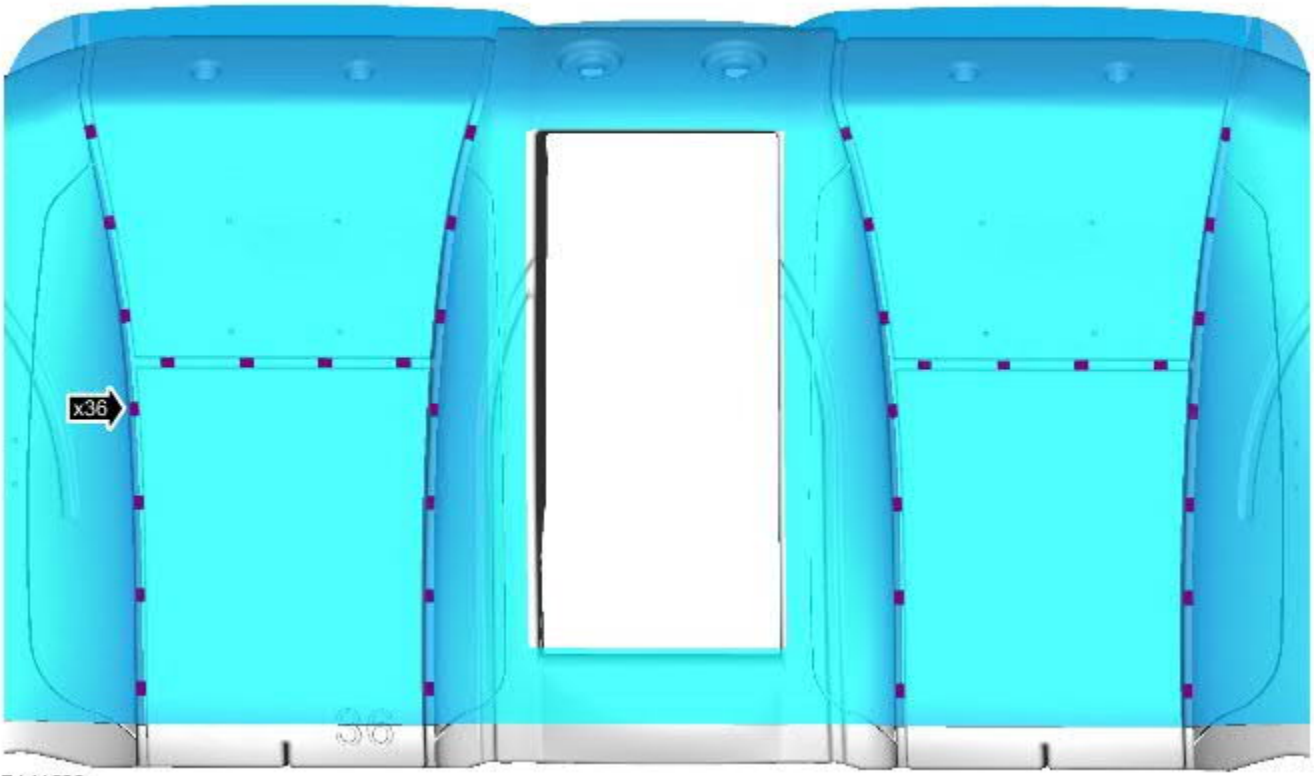


E128262

17.

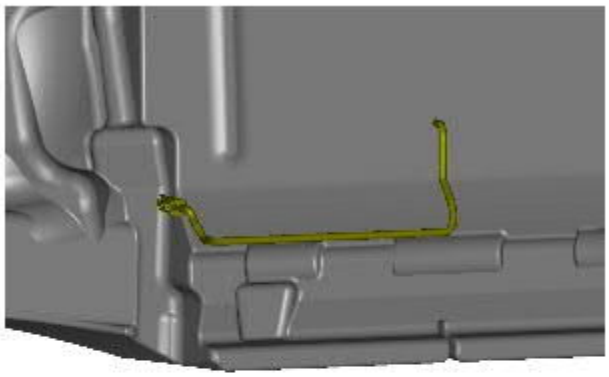

E128258

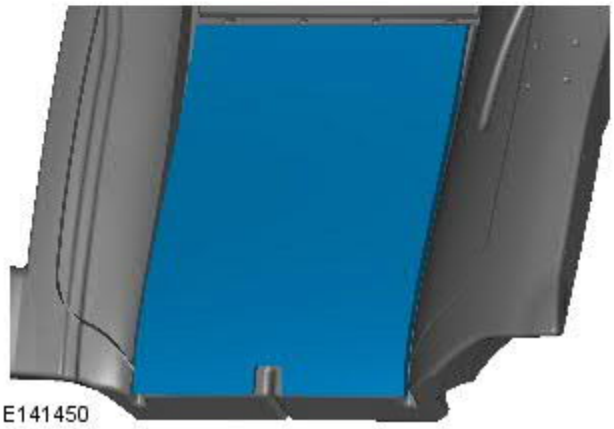


E141822

Vehicles with heated rear seat

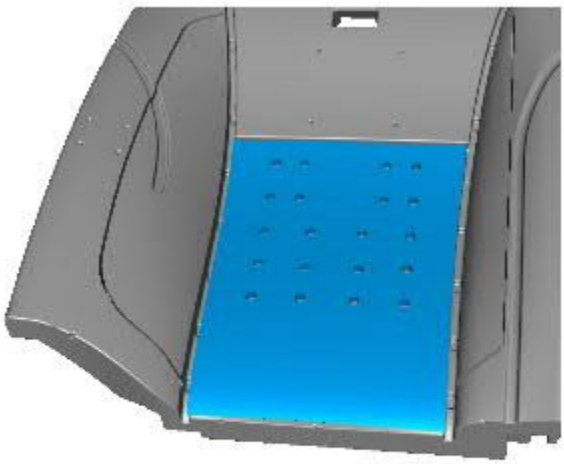
19.





E141450

All vehicles

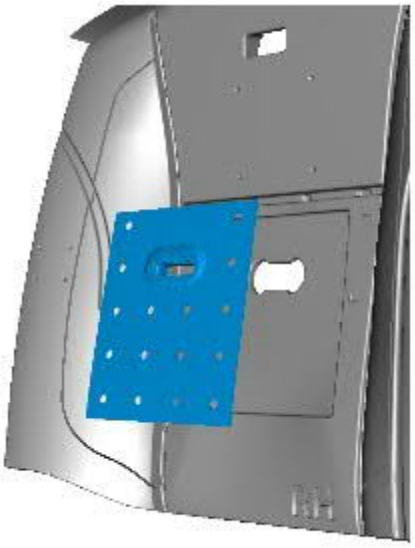


E141422

20. NOTE: Repeat the procedure for the other side.

E141421

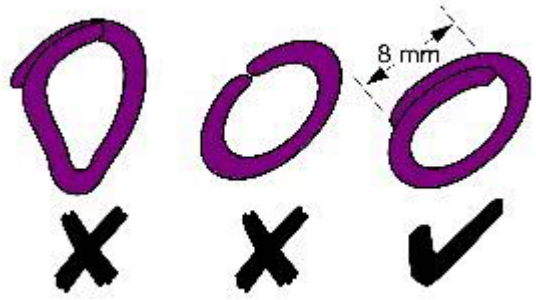
21. NOTE: Repeat the procedure for the other side.



E141451

22. NOTE: Repeat the procedure for the other side.

Installation



V4001063

1. NOTES:

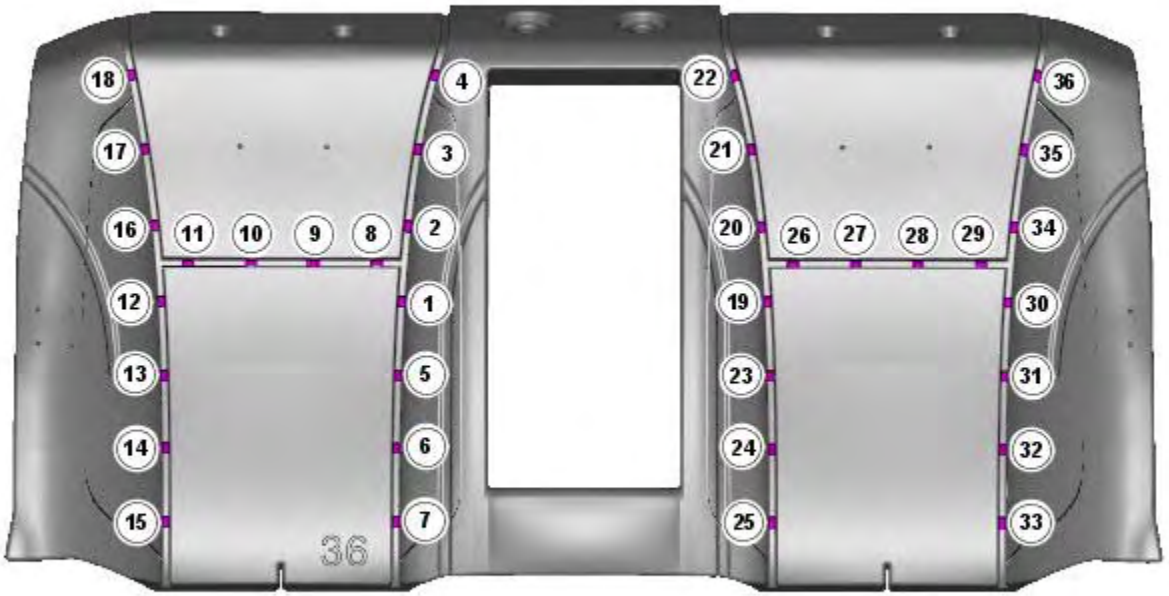
   Make sure that new hog rings are installed.

   Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.

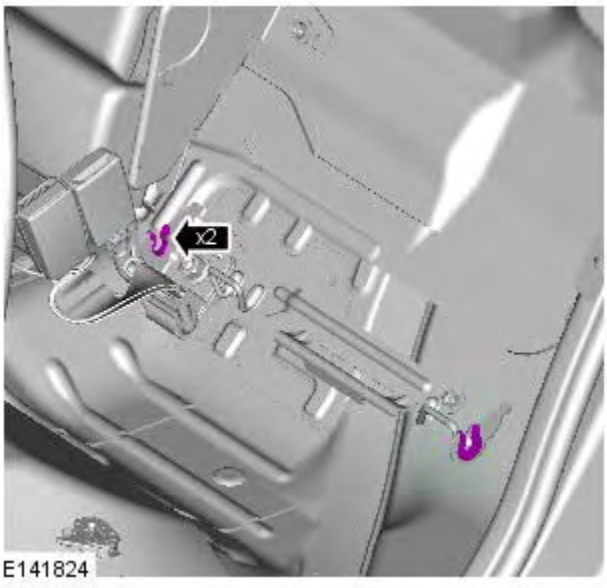
2. NOTES:

   Make sure that the hogrings are installed in the sequence shown.

   Some variation in the illustrations may occur, but the essential information is always correct.



E141455



E141824

3. NOTE: Make sure that all the clips are correctly installed.

4. To install, reverse the removal procedure.

Published: 22-Apr-2012

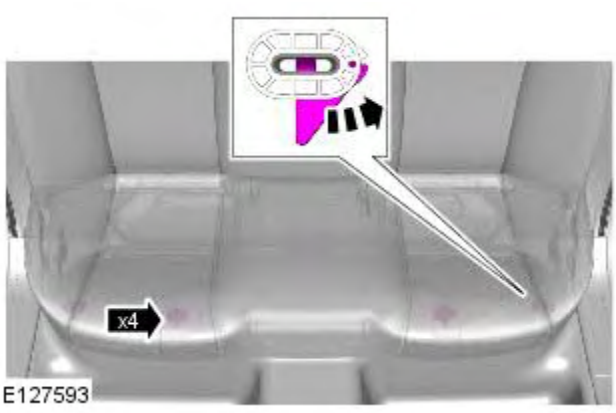
Seating - Rear Seat Backrest Blower Motor

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1.



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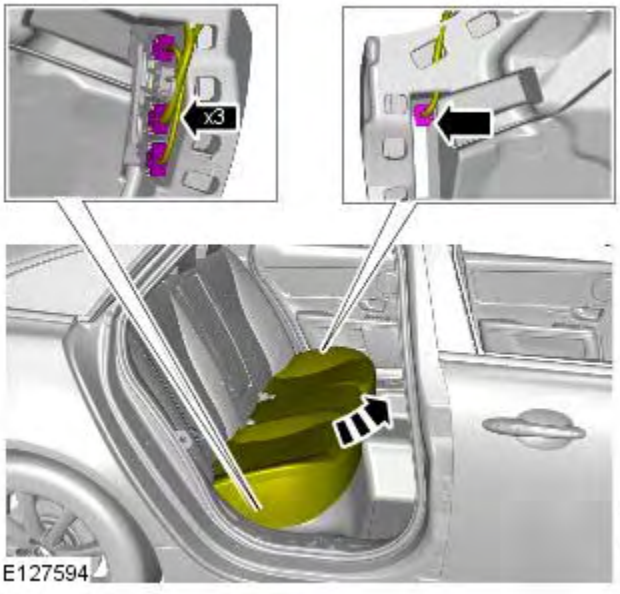
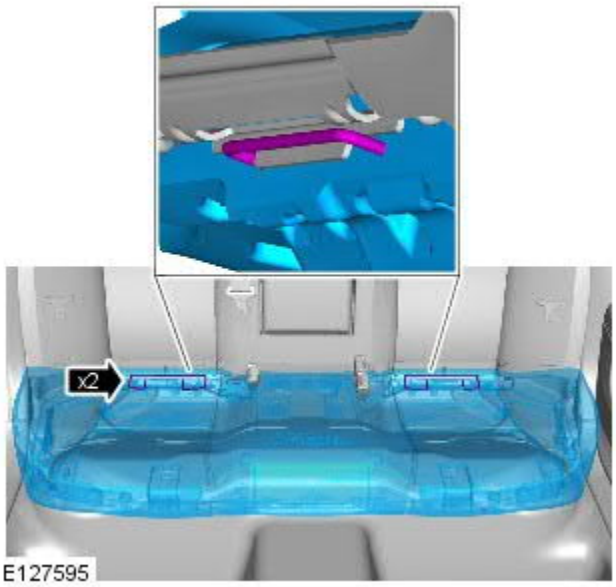
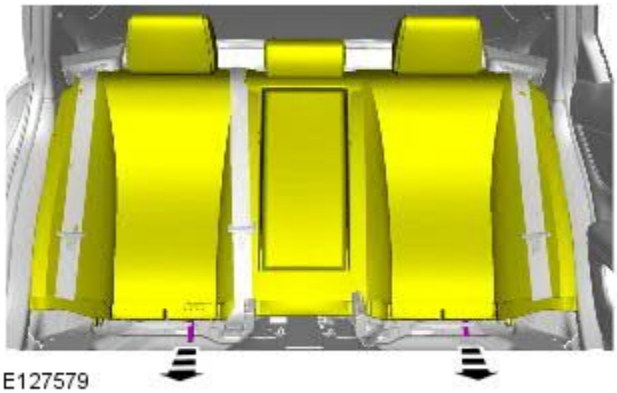


3.



E127595

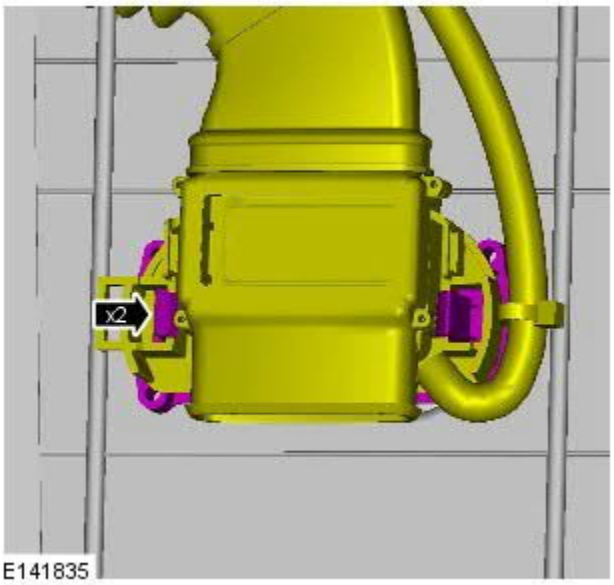
4.


E127579

5.

E141834

6.



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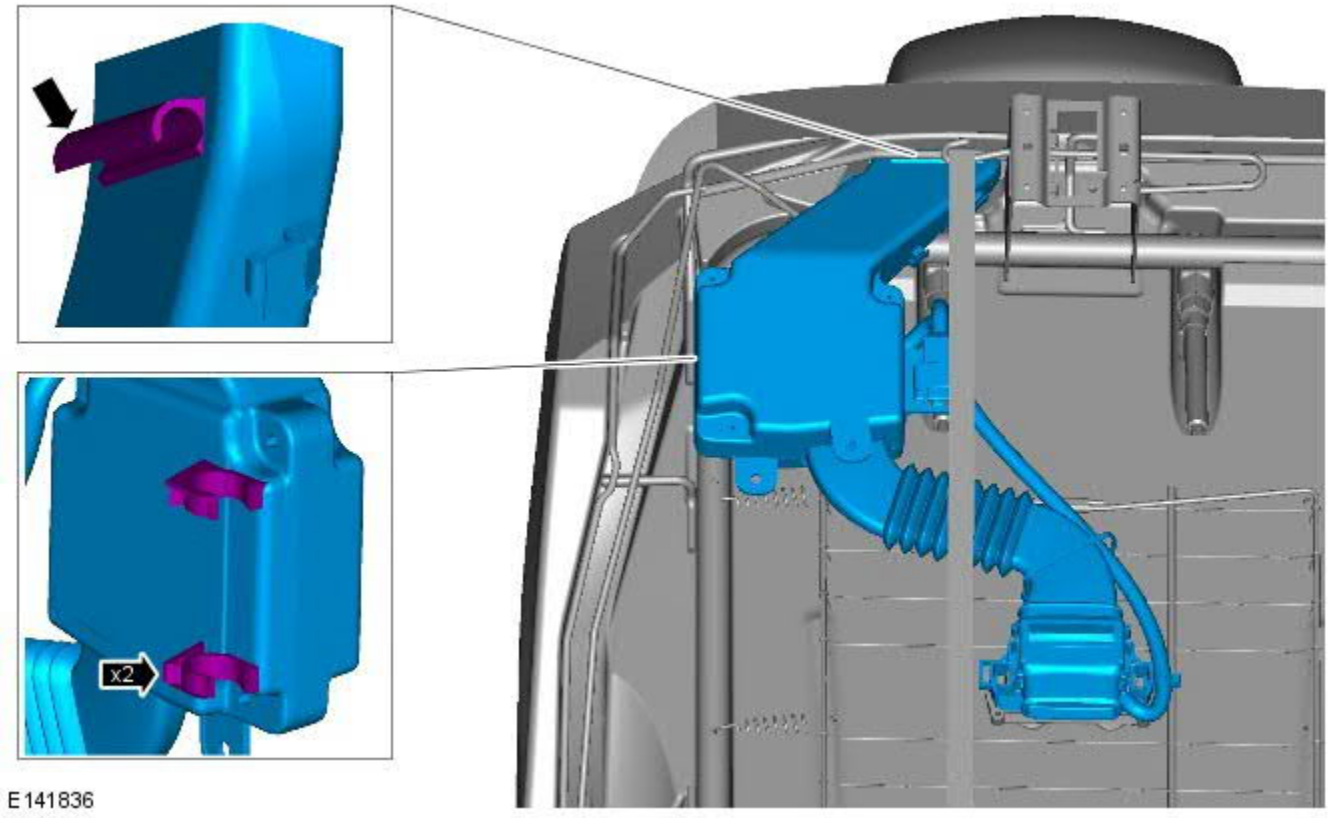


Installation

1. To install, reverse the removal procedure.

Published: 22-Apr-2012

Seating - Rear Seat Backrest Cover

Removal and Installation

Removal

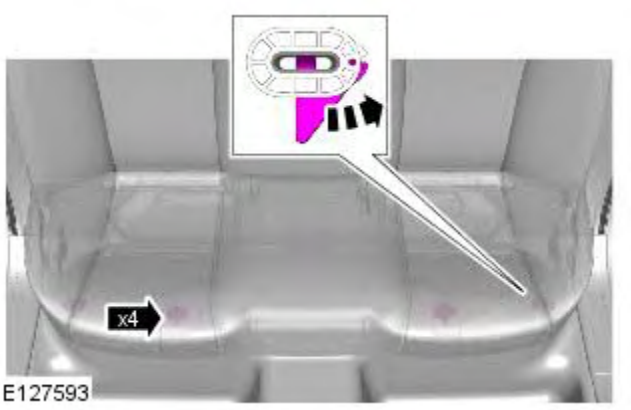
NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

Removal steps in this procedure may contain installation details.

All vehicles

1.



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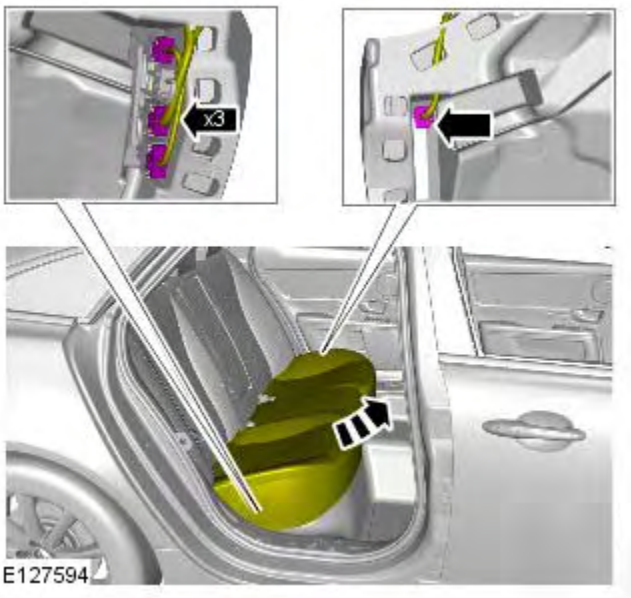

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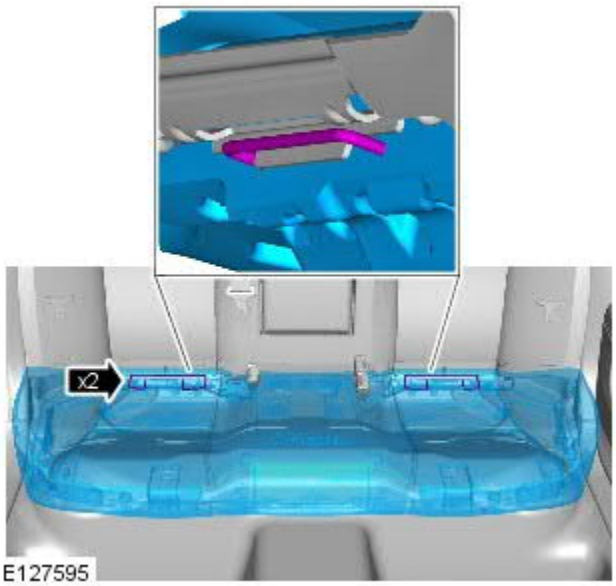
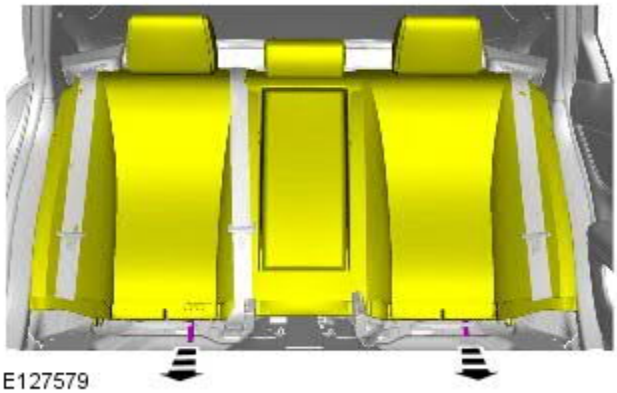


E127595

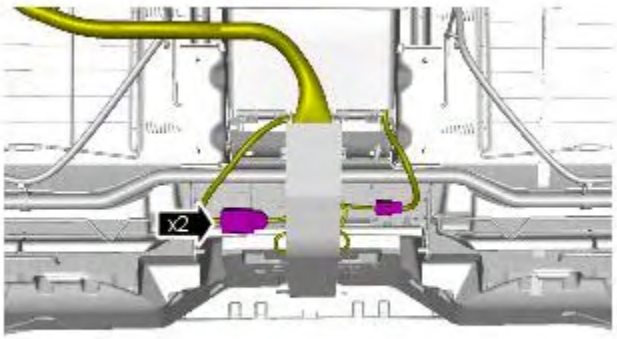
4.



E127579

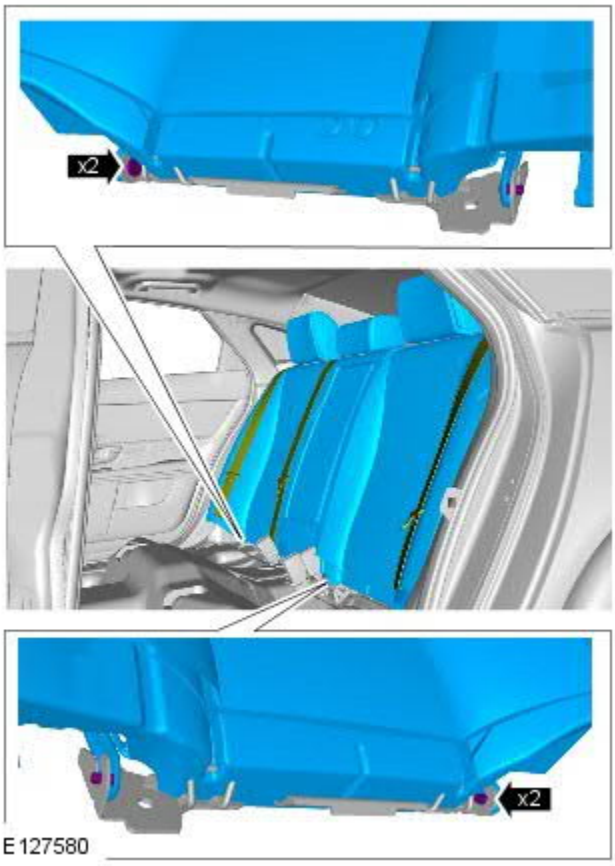
Vehicles with rear passenger entertainment system

5.



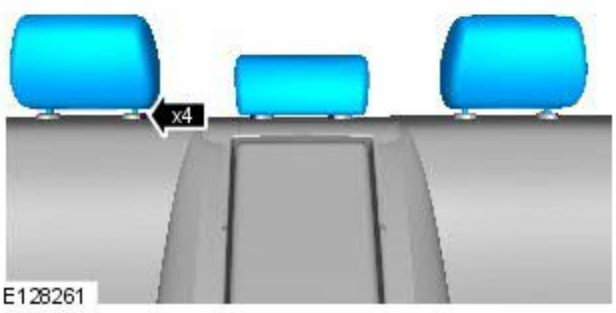
E127581

6. NOTE: Note the position of the wiring harnesses to aid installation.



7.

8.



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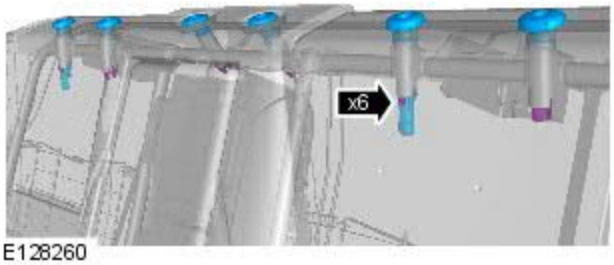
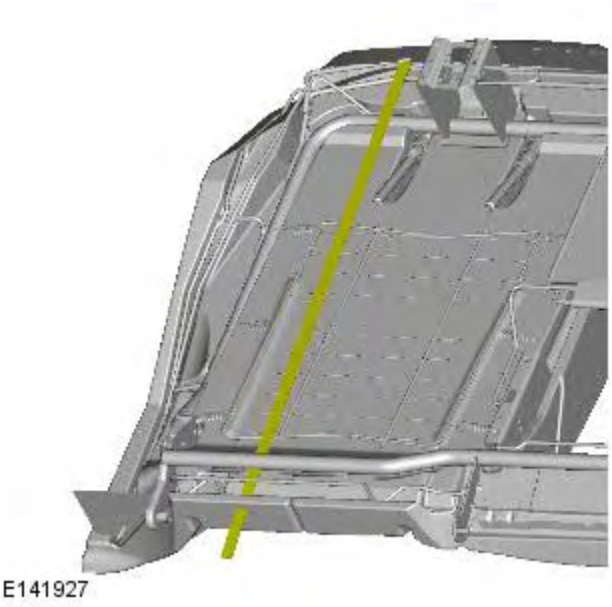
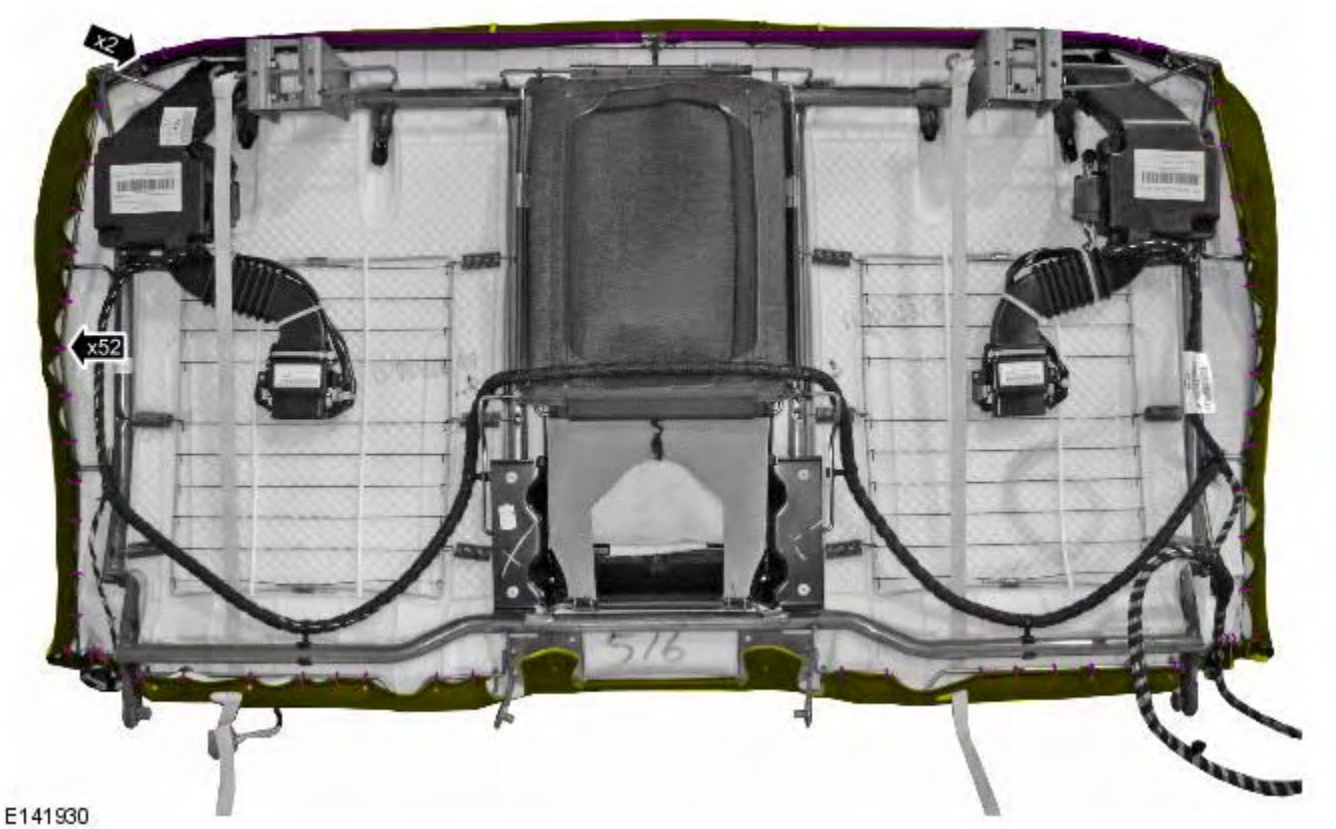


E128260


E141927

10. NOTE: Repeat the procedure for the other side.

11.



E141930

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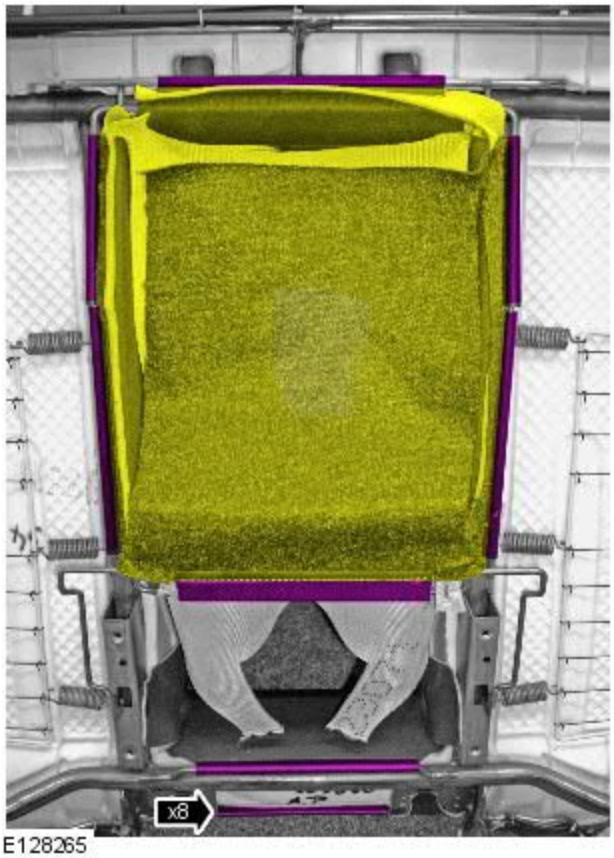
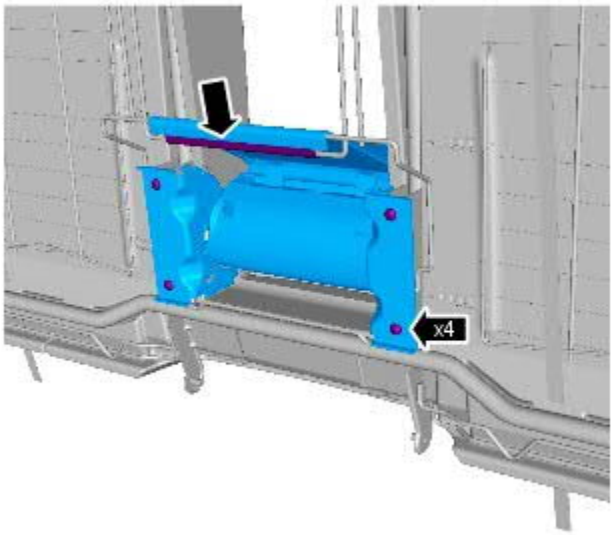


E128265

13.

E128256

14. *Torque:* 8 Nm



E128257

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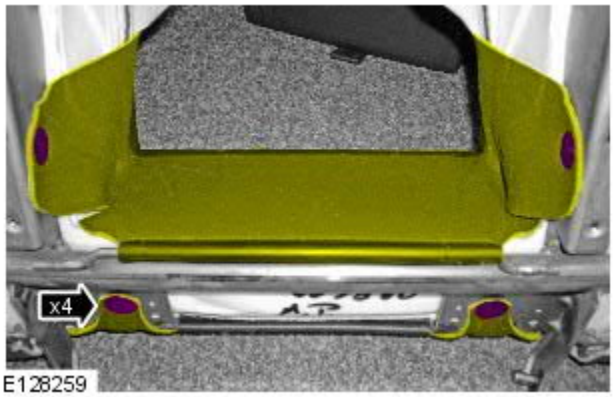

E128259

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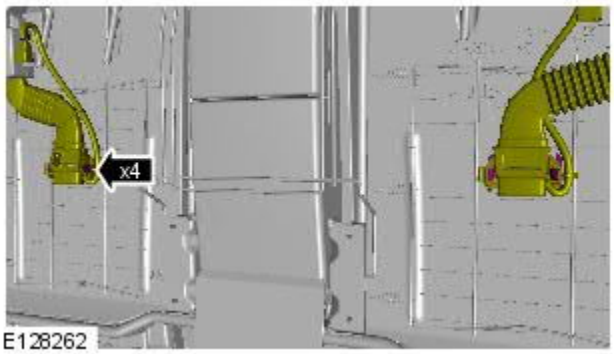

E128262

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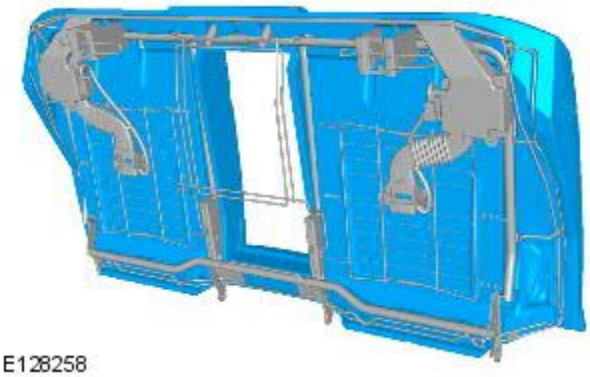
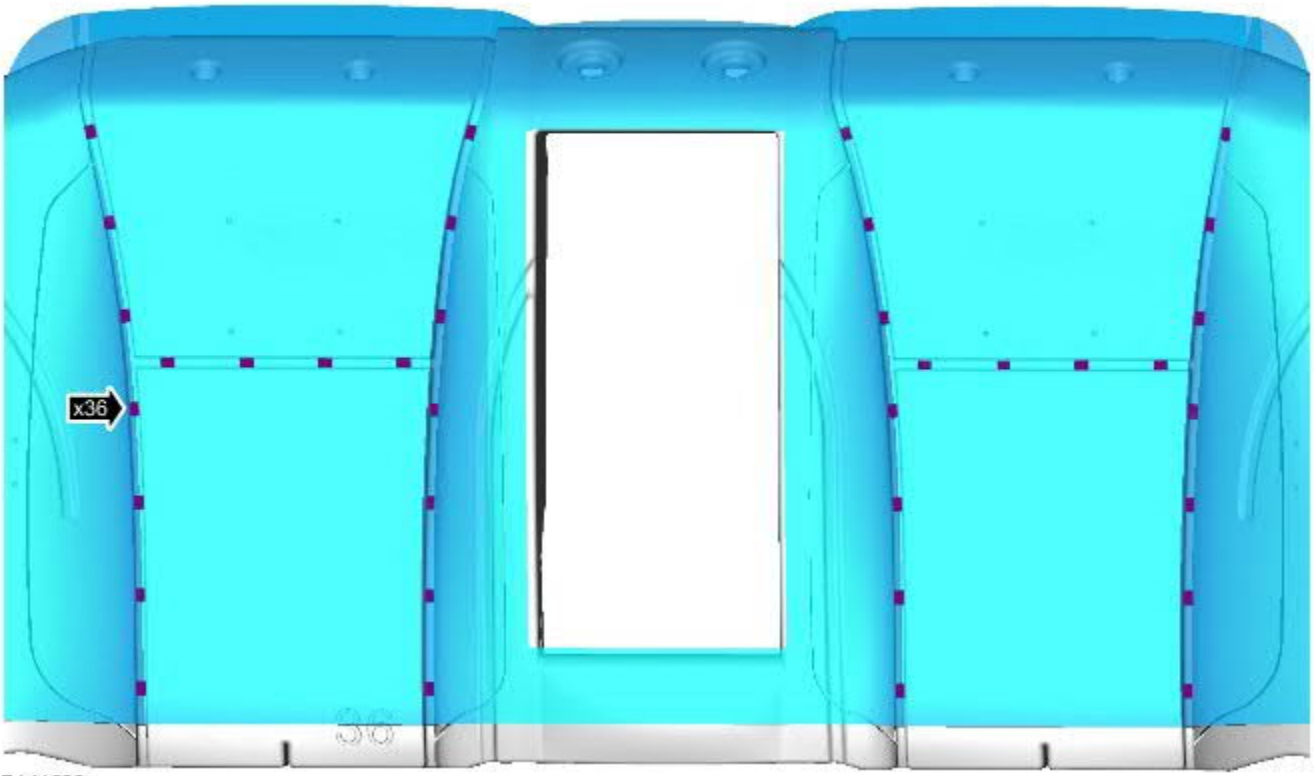
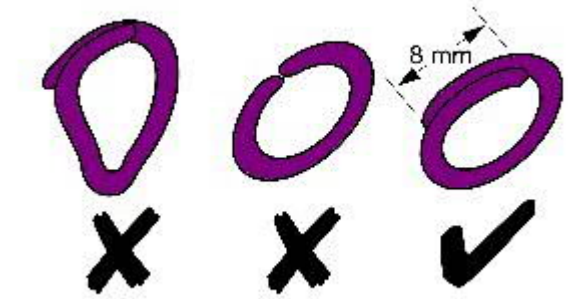

E128258



E141822

Installation



V4001063

1. NOTES:

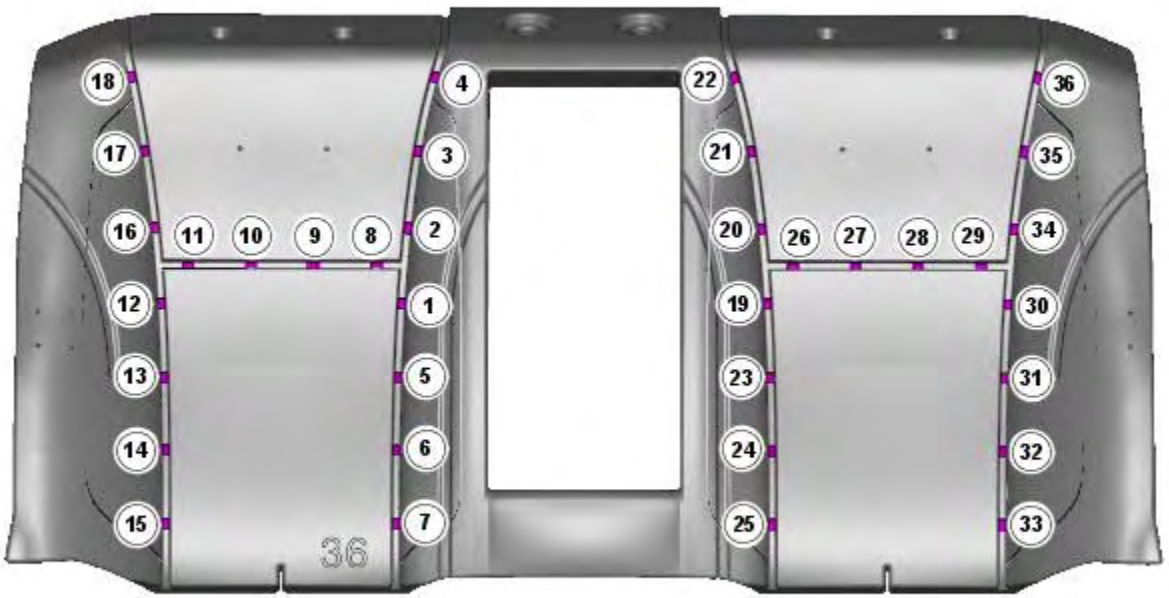
   Make sure that new hog rings are installed.

   Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.

2. NOTES:

   Make sure that the hogrings are installed in the sequence shown.

   Some variation in the illustrations may occur, but the essential information is always correct.



E141455

E141824

3. NOTE: Make sure that all the clips are correctly installed.

4. To install, reverse the removal procedure.

Published: 08-May-2012

Seating - Rear Seat Backrest Heater Mat

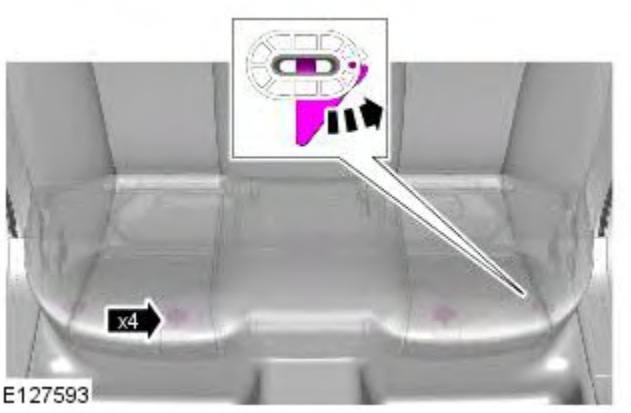
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

All vehicles

1.



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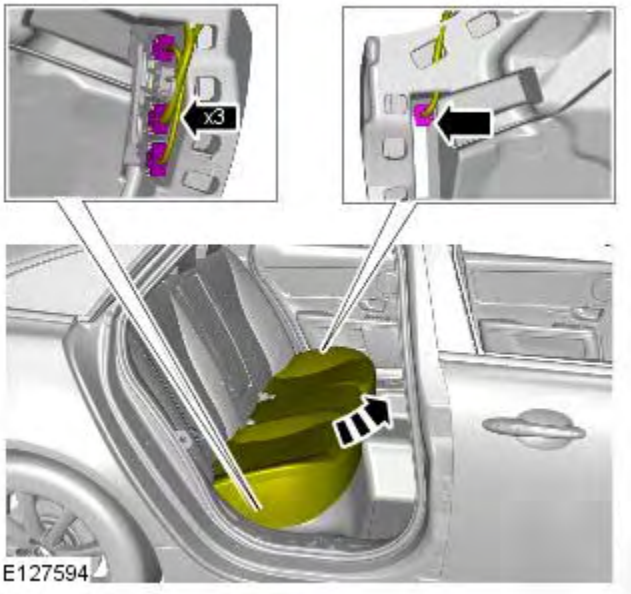

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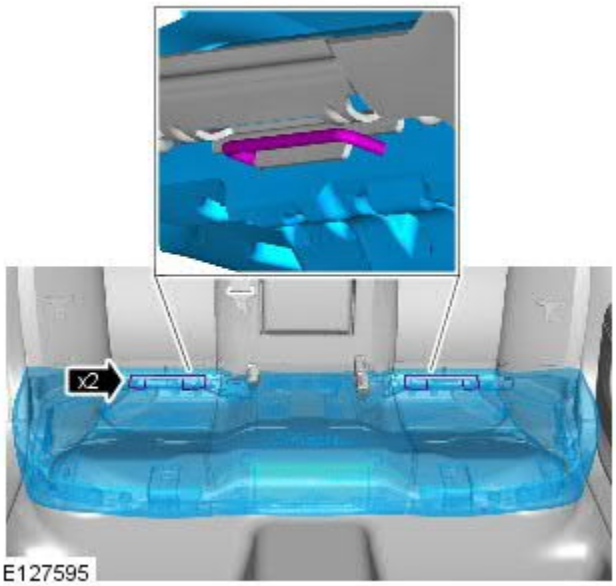
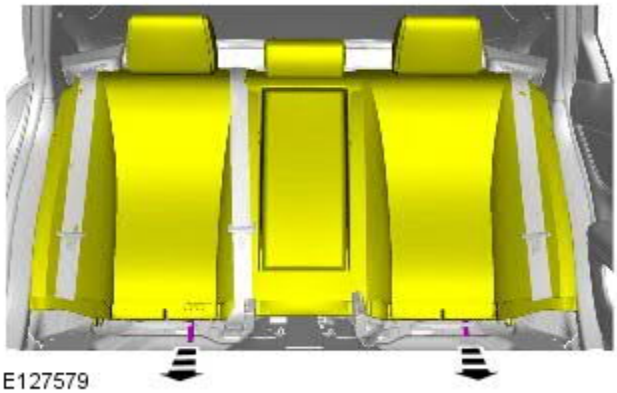


E127595

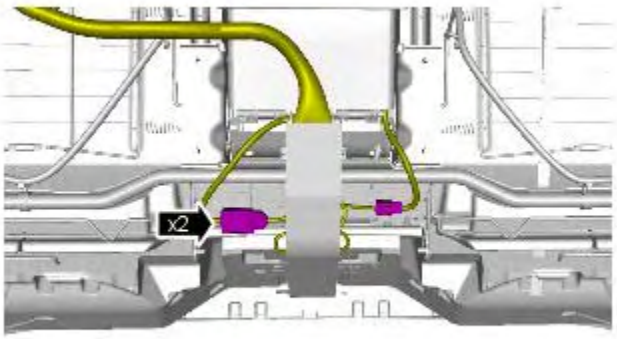
4.



E127579

Vehicles with rear passenger entertainment system

5.

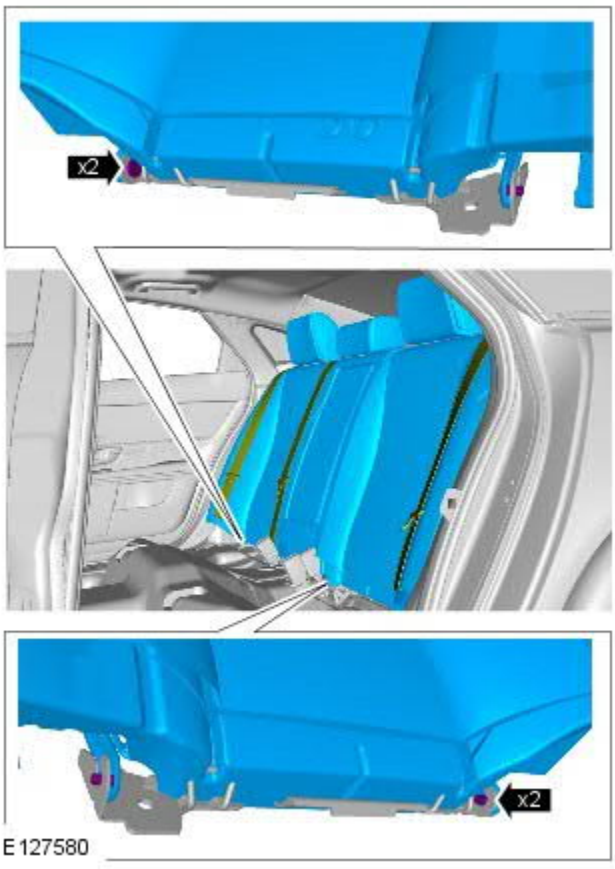


E127581

All vehicles

E128812

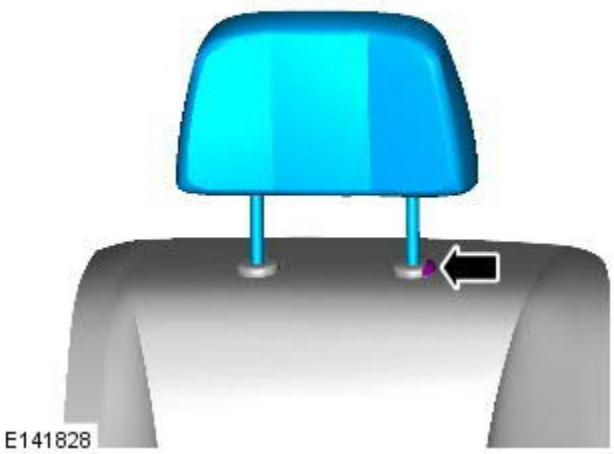
6. NOTE: Note the position of the wiring harnesses to aid installation.



E127580

7.

8.



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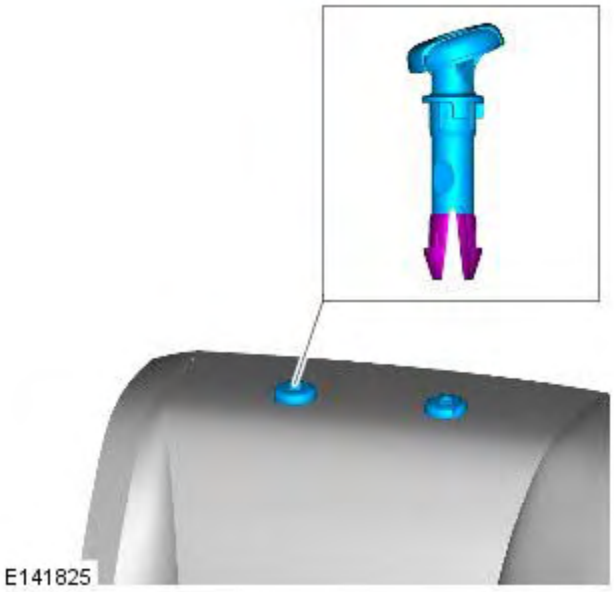

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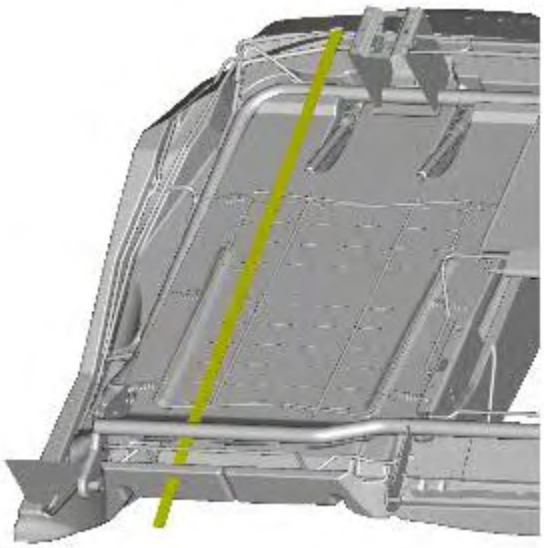
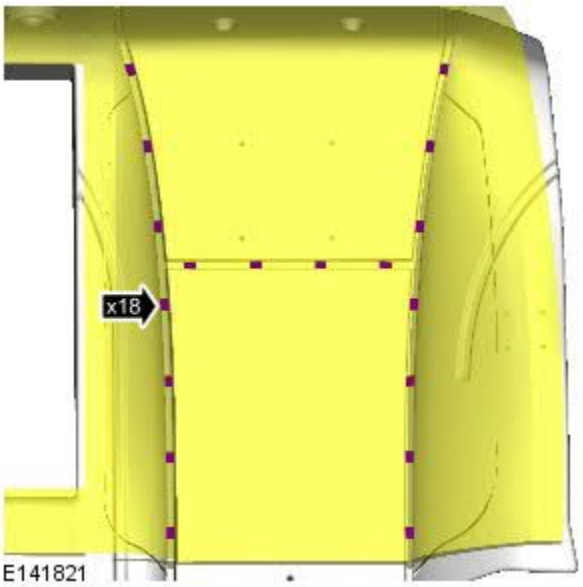


E141927

11.

E141928

12.



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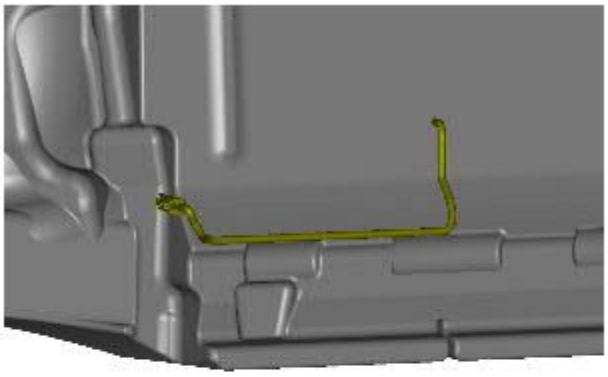
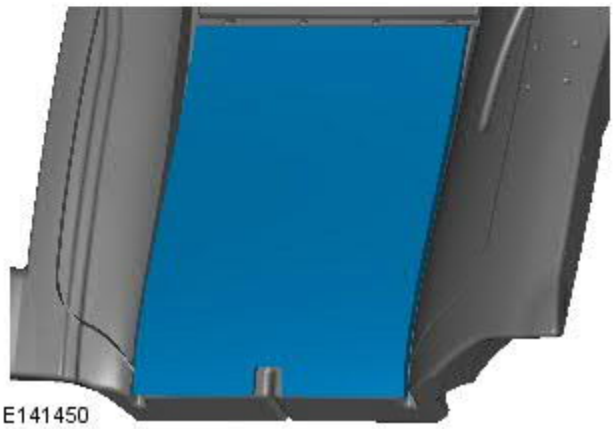


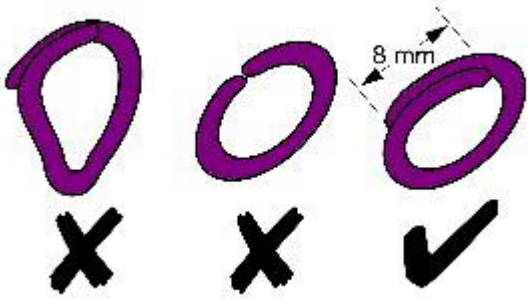


Installation

1. NOTES:

   Make sure that new hog rings are installed.

   Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.

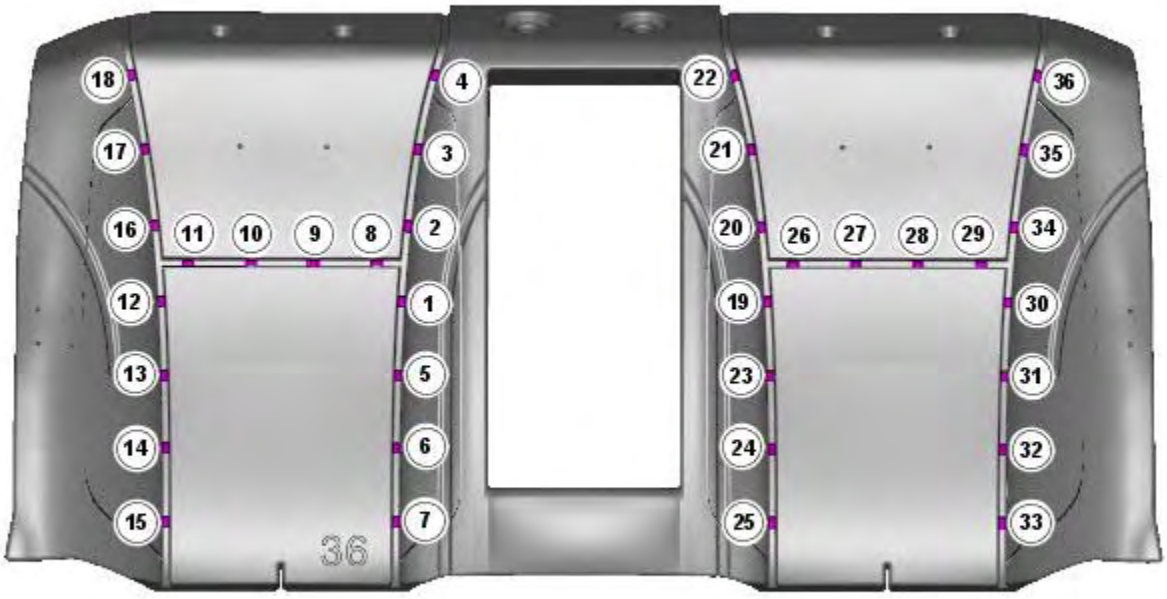


V4001063

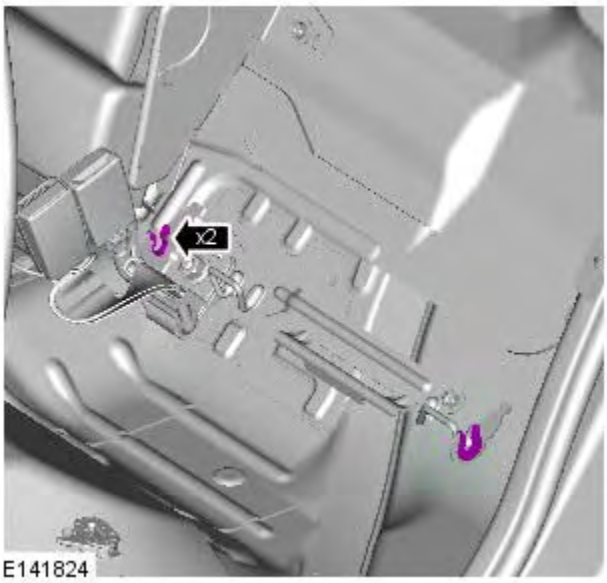
2. NOTES:

   Make sure that the hogrings are installed in the sequence shown.

   Some variation in the illustrations may occur, but the essential information is always correct.



E141455



3. NOTE: Make sure that all the clips are correctly installed.

4. To install, reverse the removal procedure.

Published: 22-Apr-2012

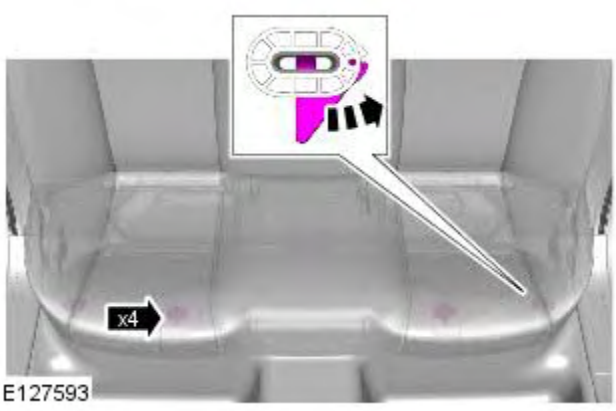
Seating - Rear Seat Control Switch

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1.



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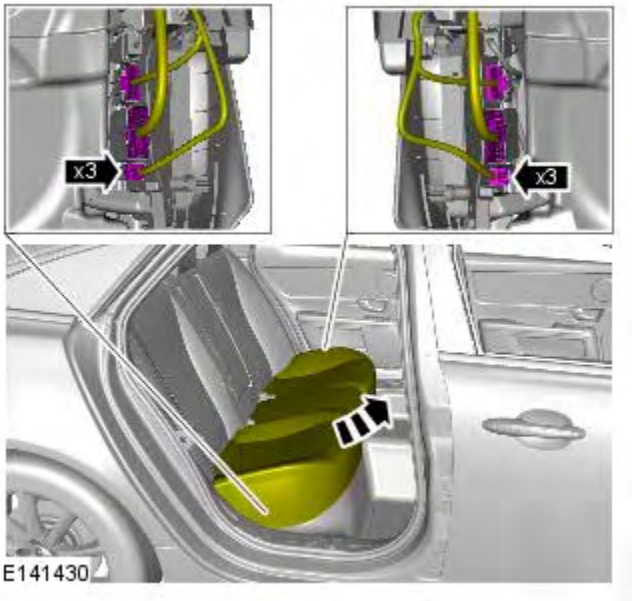
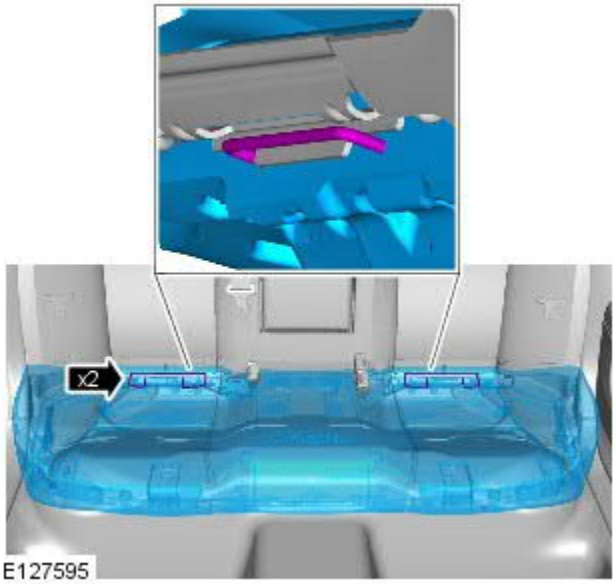


3.



E127595

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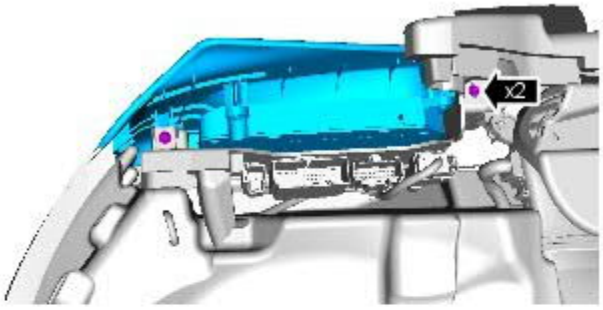

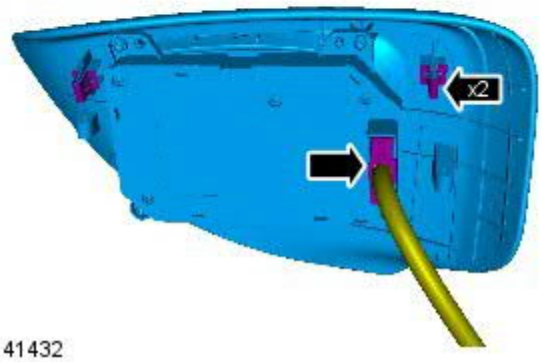

E141432

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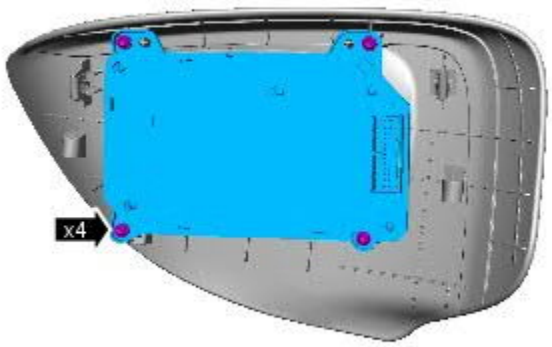


E141427

Installation

1. To install, reverse the removal procedure.

Published: 08-May-2012

Seating - Rear Seat Cushion

Removal and Installation

Removal

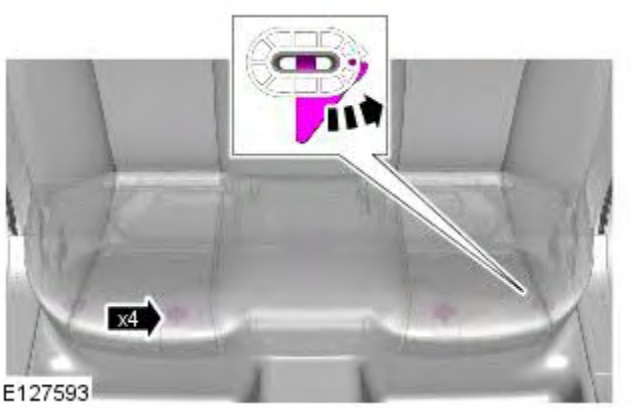
NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

Removal steps in this procedure may contain installation details.

All vehicles

1.



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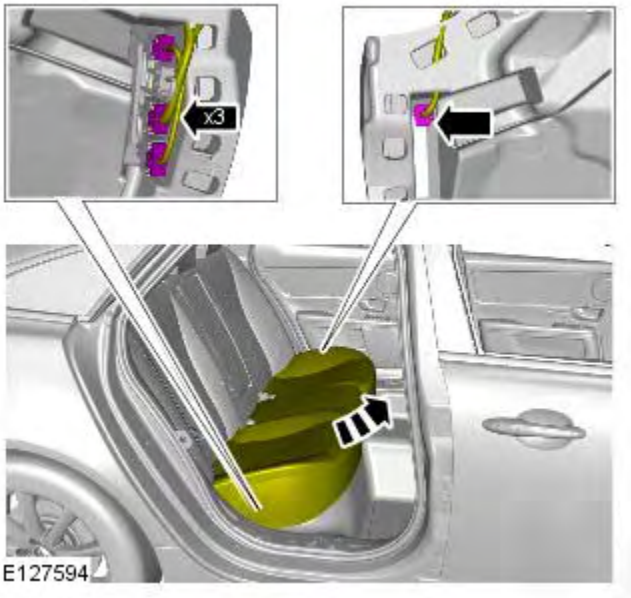

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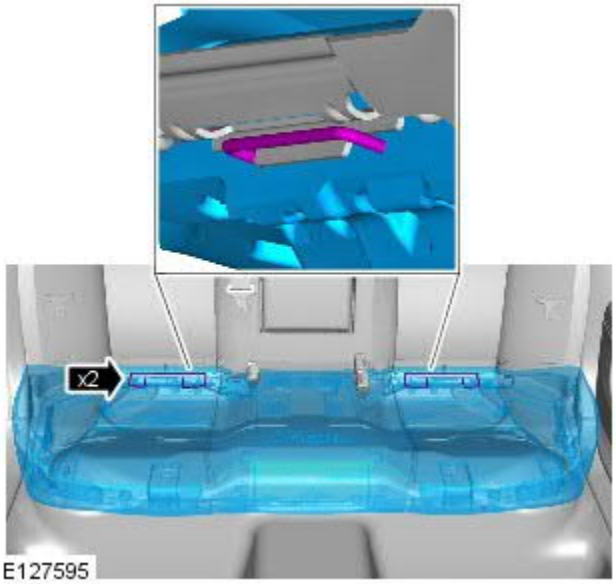
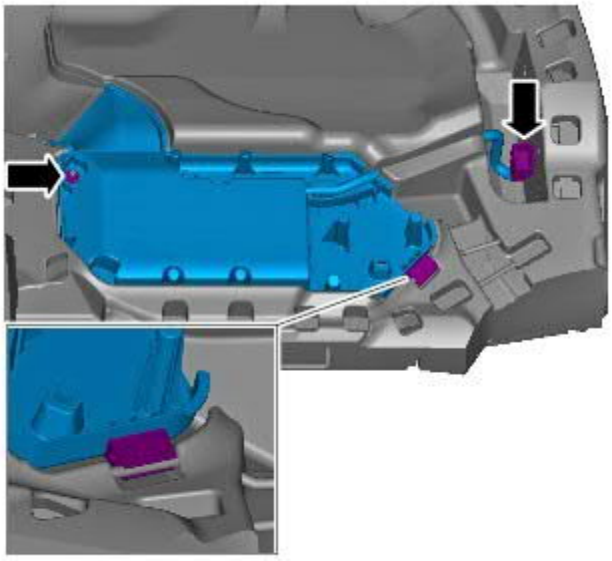


E127595

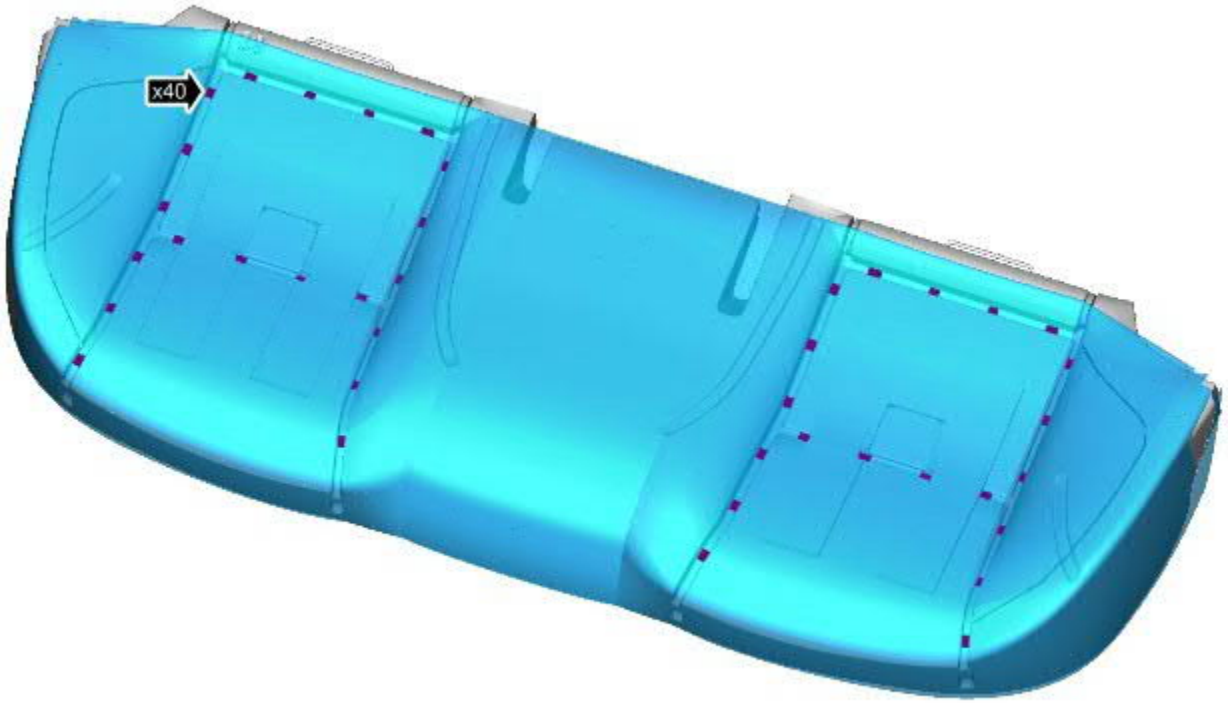
4.


E141405

5.

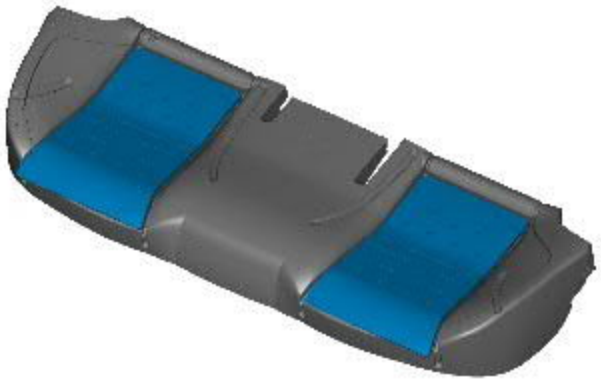
E141911

6.



E141813

7.

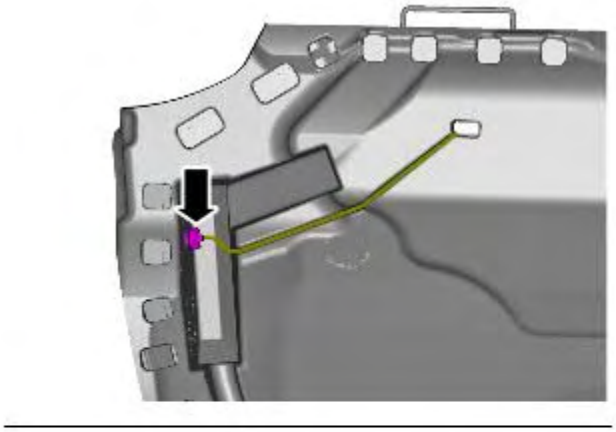


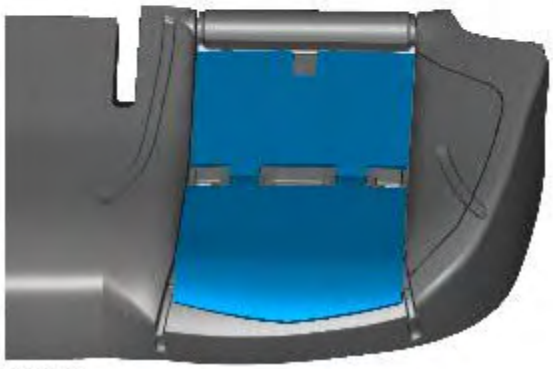
E141425

8.

E141424

Vehicles with heated rear seat



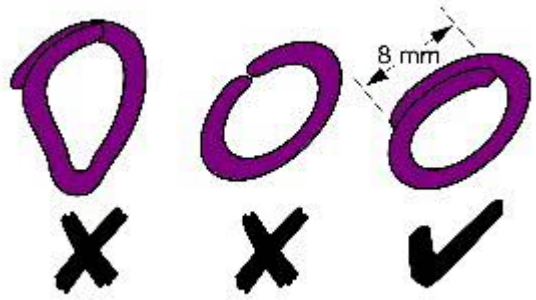


E141406

9. NOTES:

   - Repeat the procedure for the other side.
   - LH illustration shown, RH is similar.

Installation



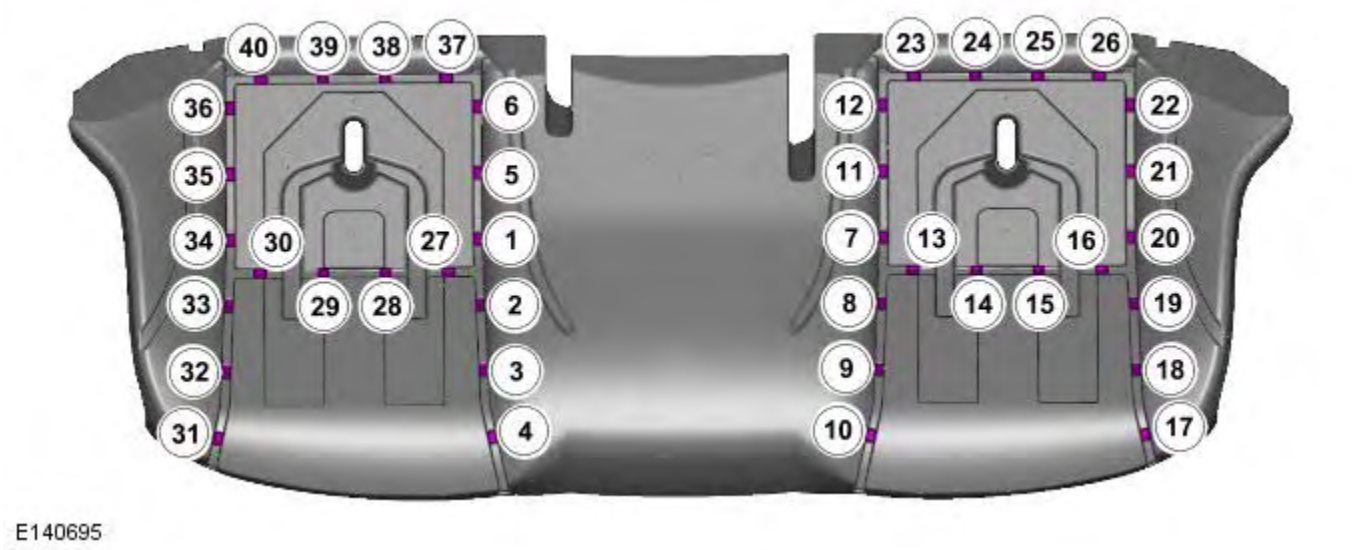
V4001063

1. NOTES:

   Make sure that new hog rings are installed.

   Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.

2. NOTE: Make sure that the hogrings are installed in the sequence shown.



E140695

3. To install, reverse the removal procedure.

Published: 22-Apr-2012

Seating - Rear Seat Cushion Blower Motor

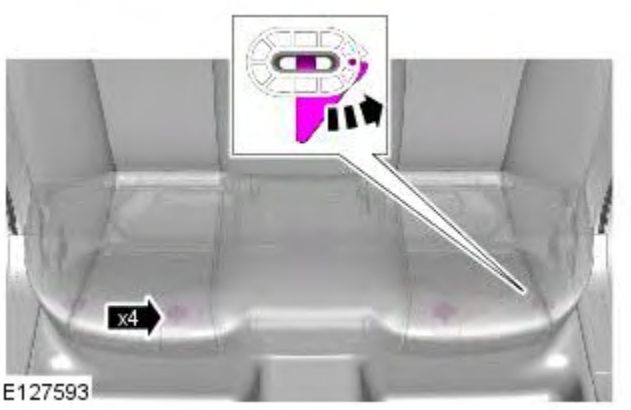
Removal and Installation

Removal

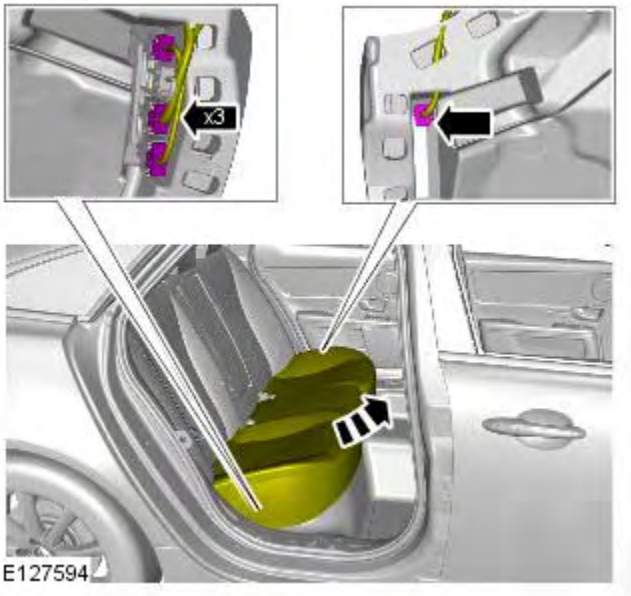
NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

Removal steps in this procedure may contain installation details.

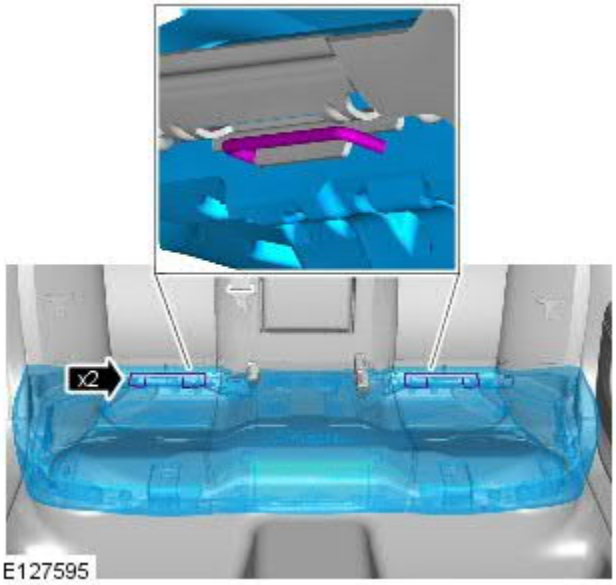


1.



2.

3.



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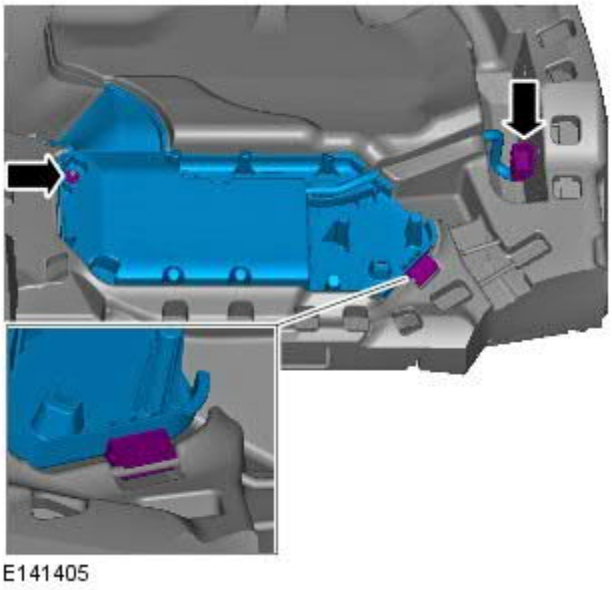


Installation

1. To install, reverse the removal procedure.

Published: 08-May-2012

Seating - Rear Seat Cushion Cover

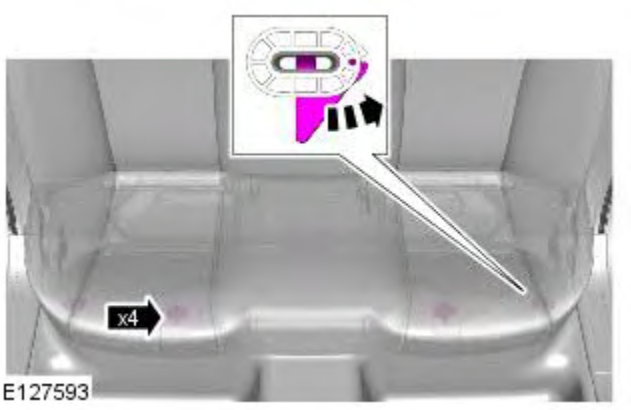
Removal and Installation

Removal

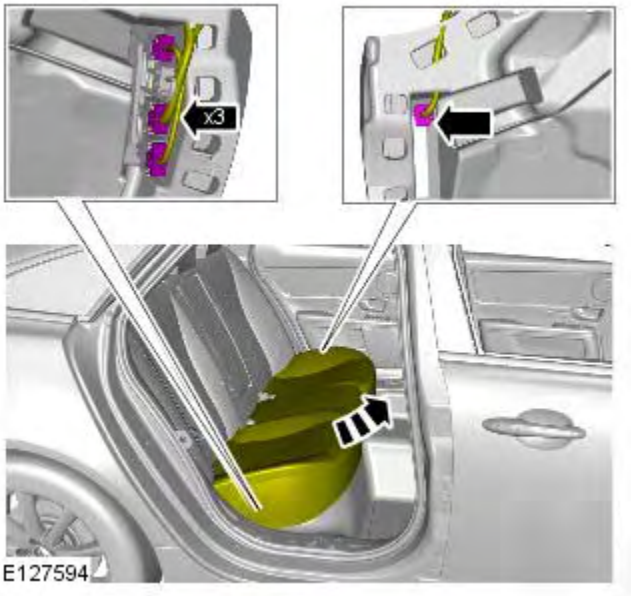
NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

Removal steps in this procedure may contain installation details.

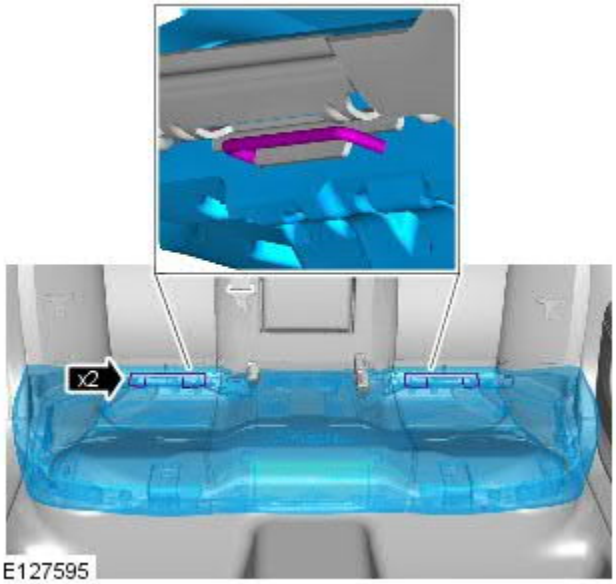


1.



2.

3.

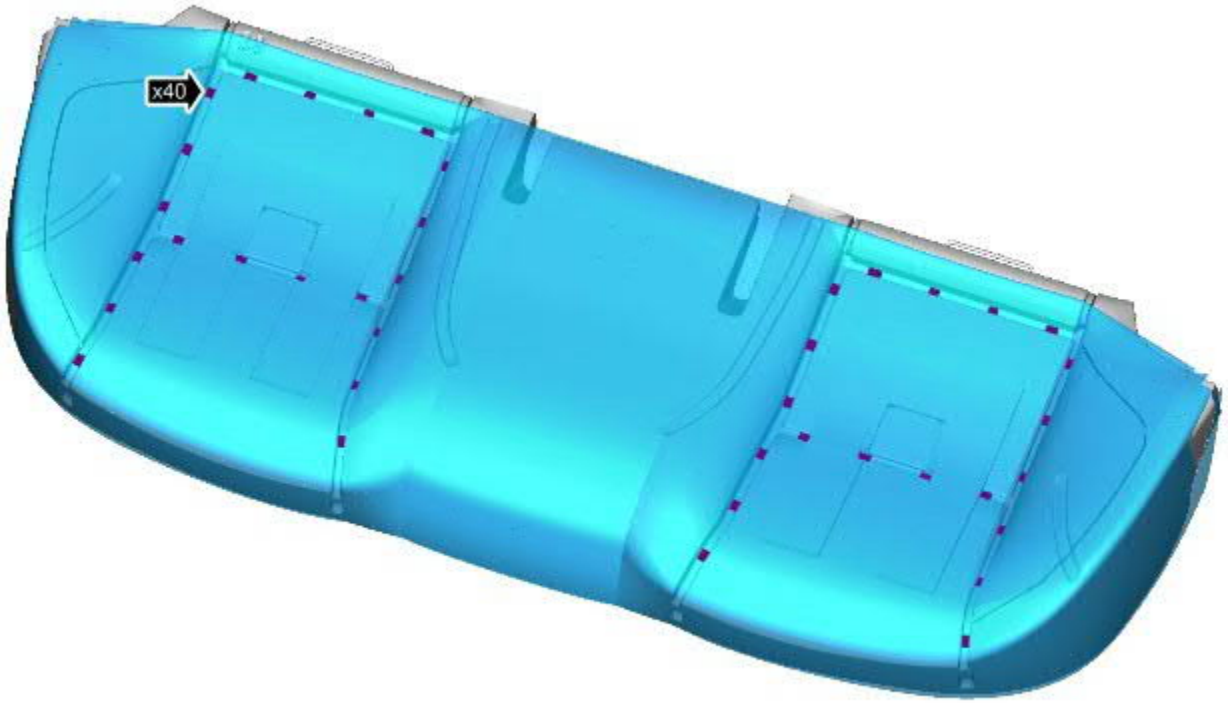


E127595

4.

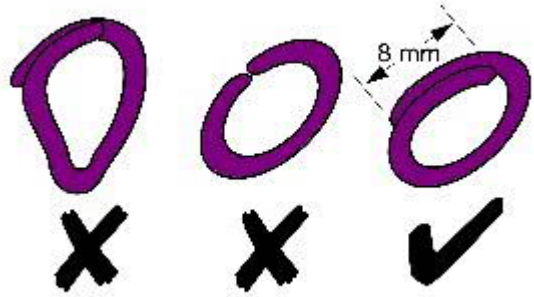
E141911

5.



E141813

Installation



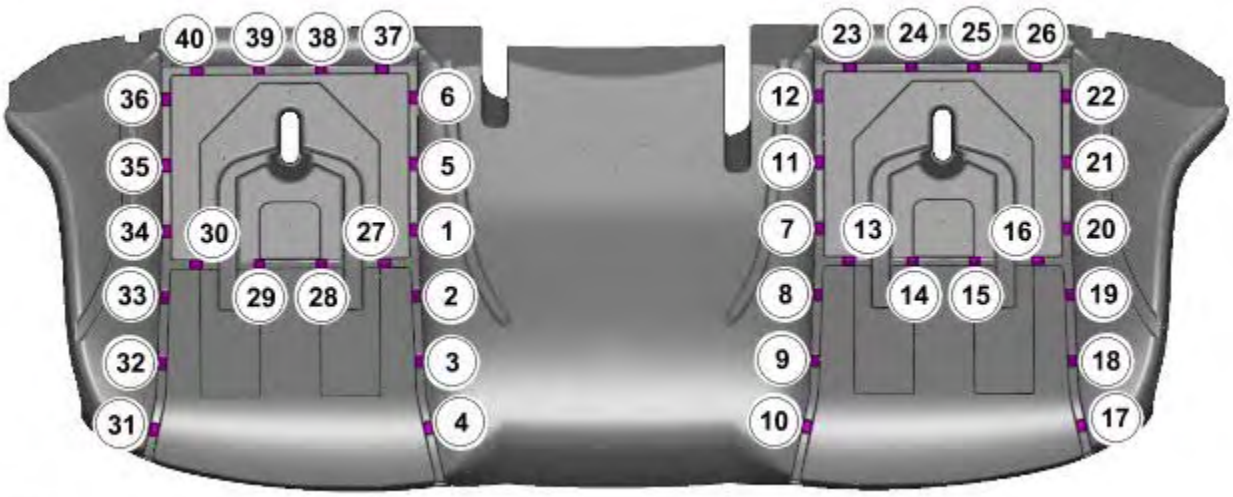
V4001063

1. NOTES:

   Make sure that new hog rings are installed.

   Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.

2. NOTE: Make sure that the hogrings are installed in the sequence shown.



E140695

3. To install, reverse the removal procedure.

Published: 08-May-2012

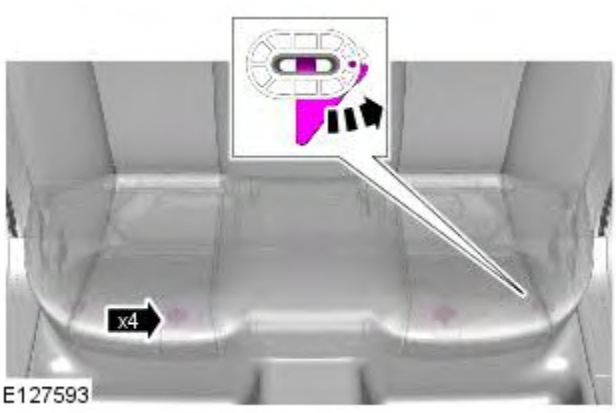
Seating - Rear Seat Cushion Heater Mat

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1.



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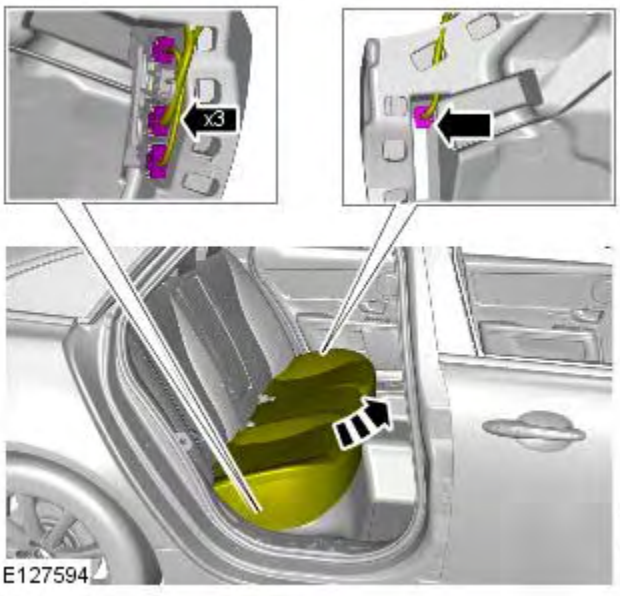

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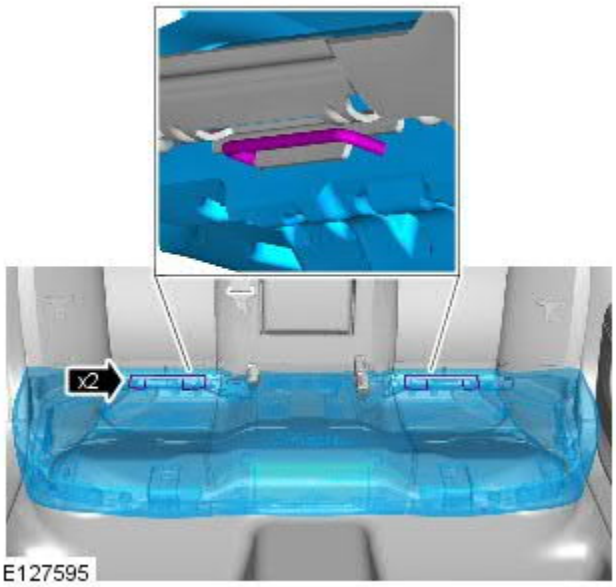
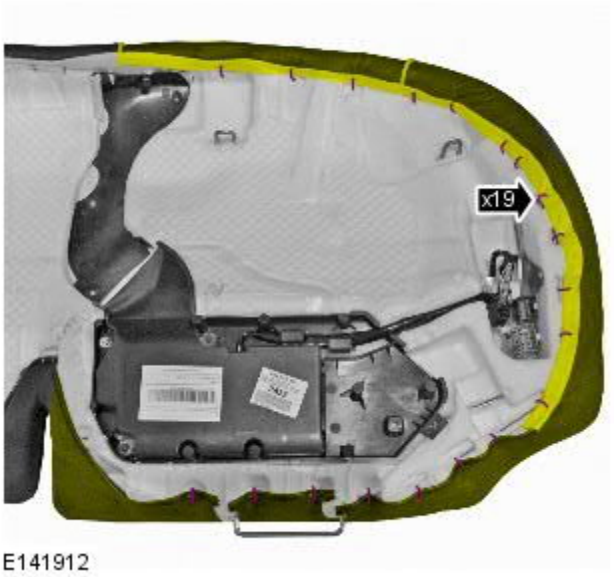


4. NOTES:

LH illustration shown, RH is similar.

Some variation in the illustrations may occur, but the essential information is always correct.



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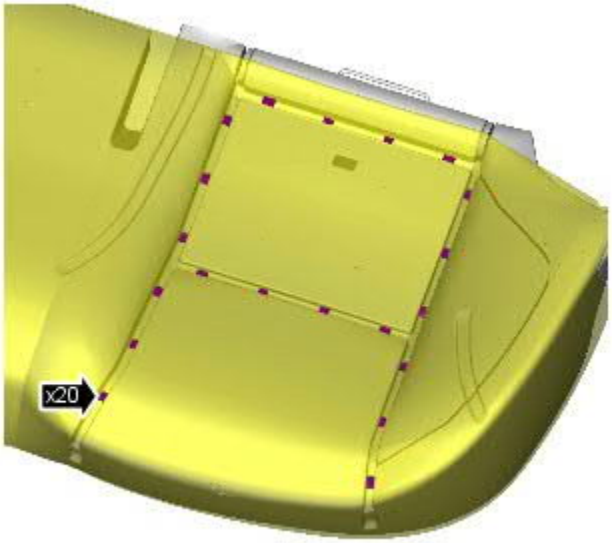
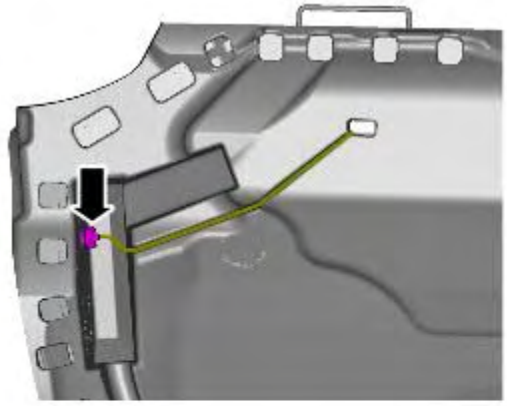
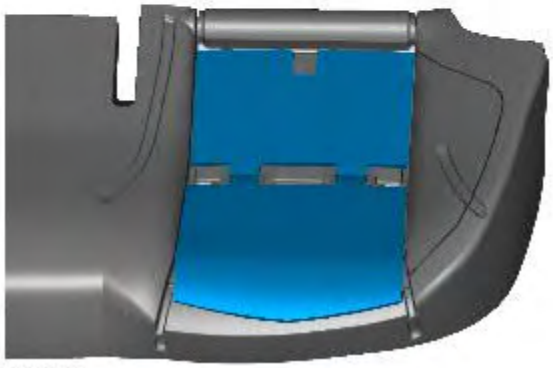


E141814

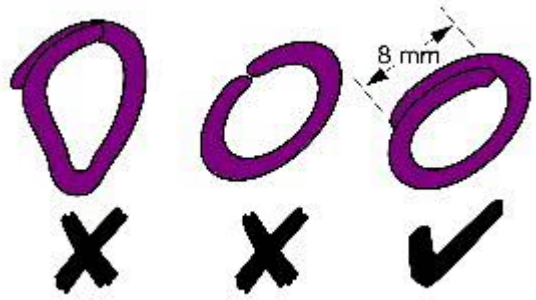
6. NOTE: LH illustration shown, RH is similar.





E141406

Installation



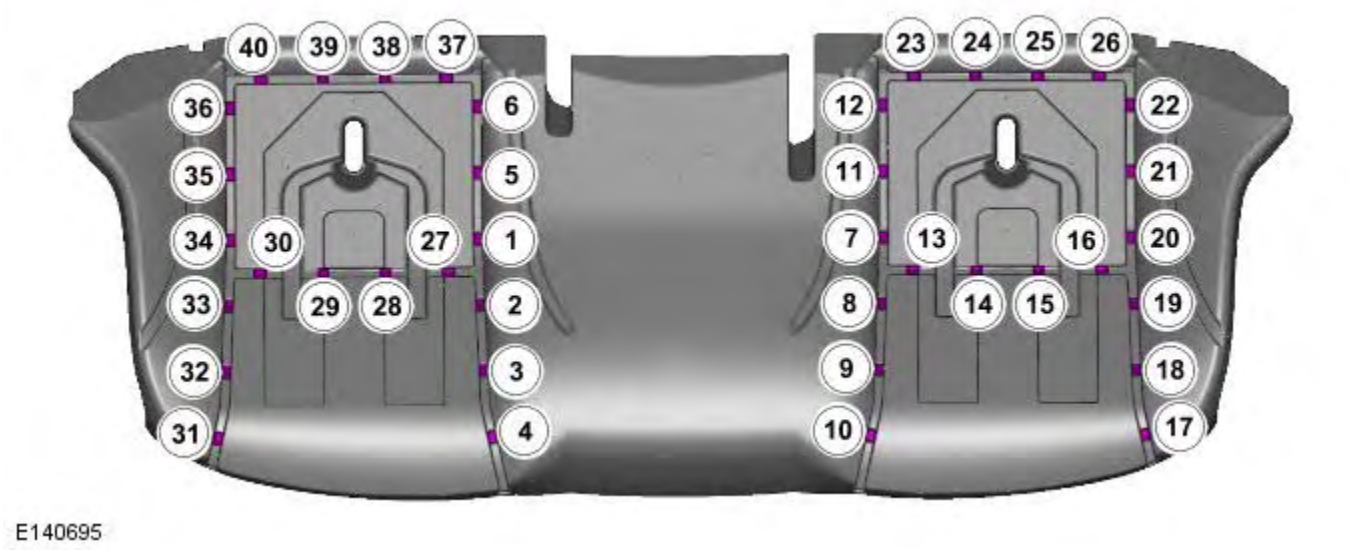
V4001063

1. NOTES:

   Make sure that new hog rings are installed.

   Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.

2. NOTE: Make sure that the hogrings are installed in the sequence shown.



E140695

3. To install, reverse the removal procedure.

Published: 22-Apr-2012

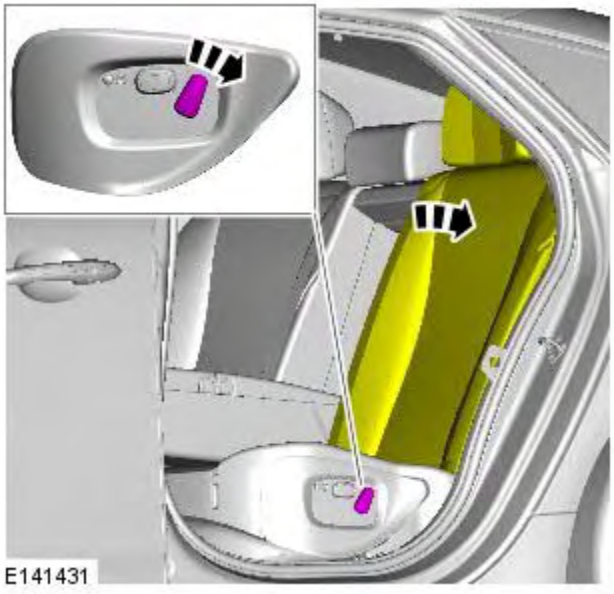
Seating - Rear Seat Massaging Lumbar Assembly

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1.



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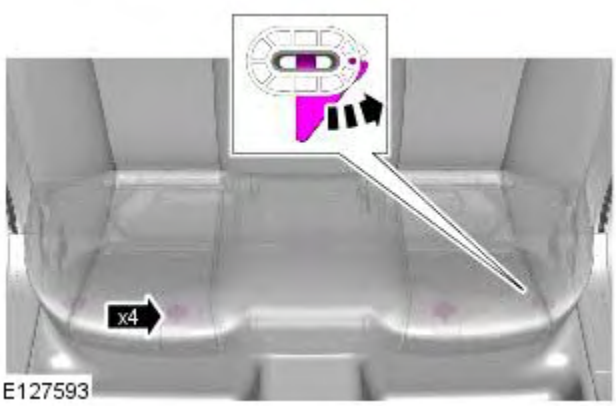

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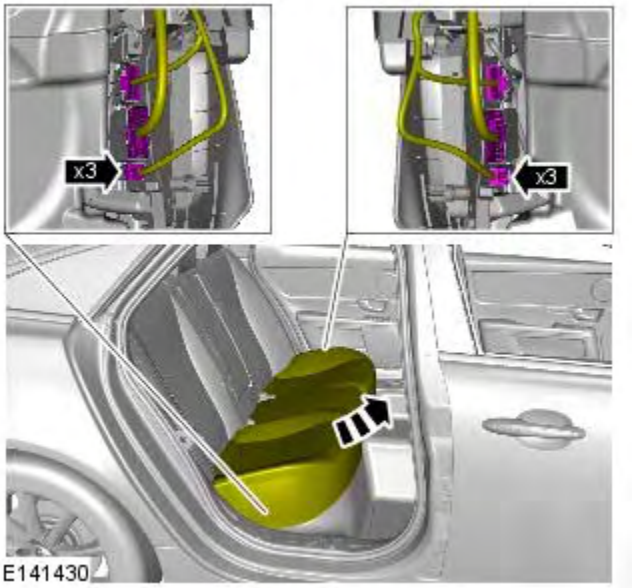

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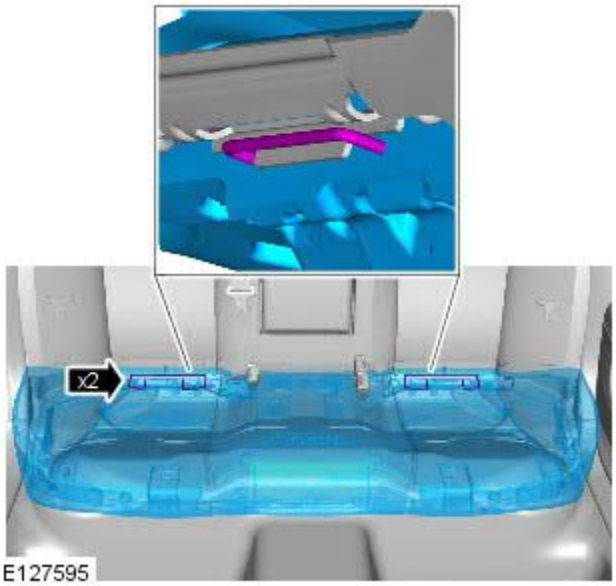

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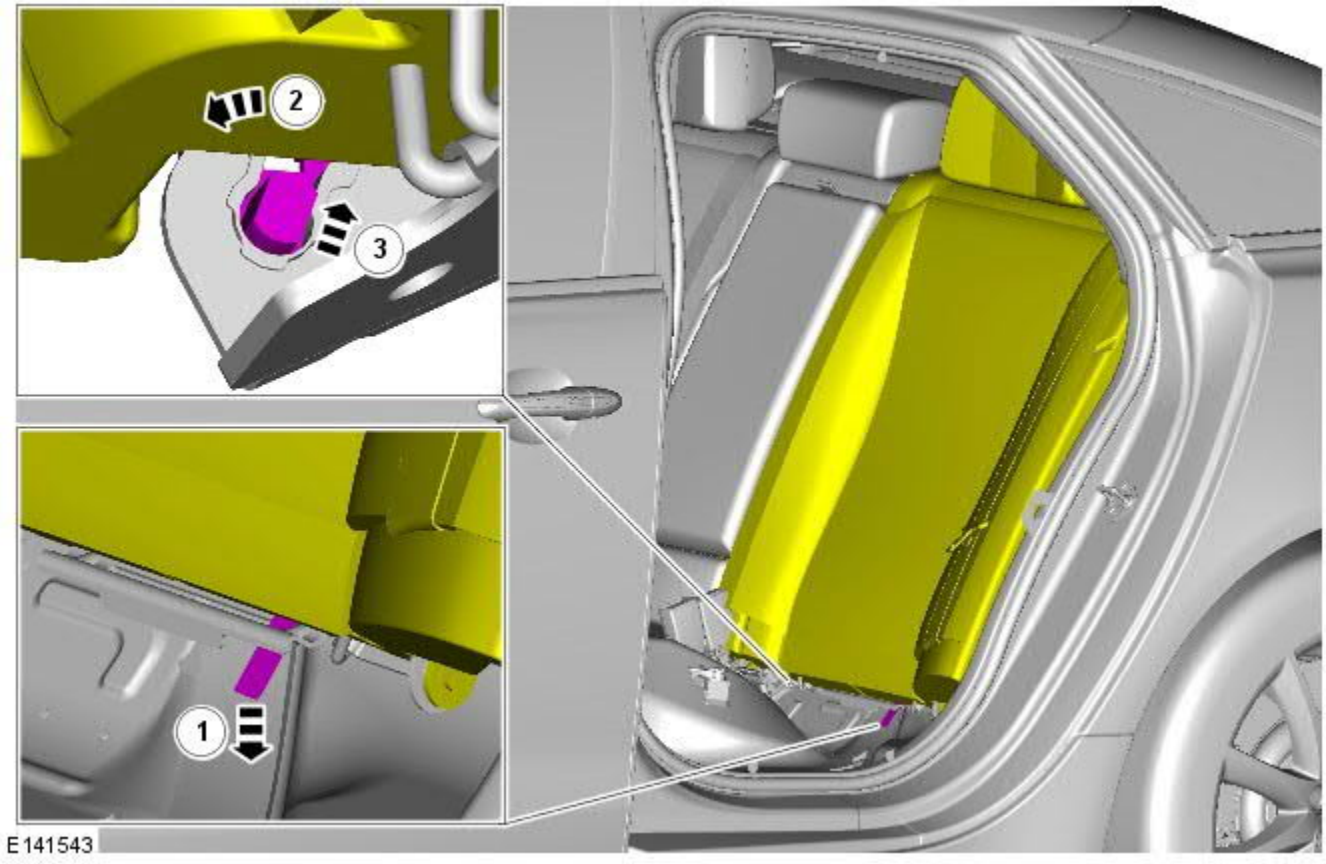
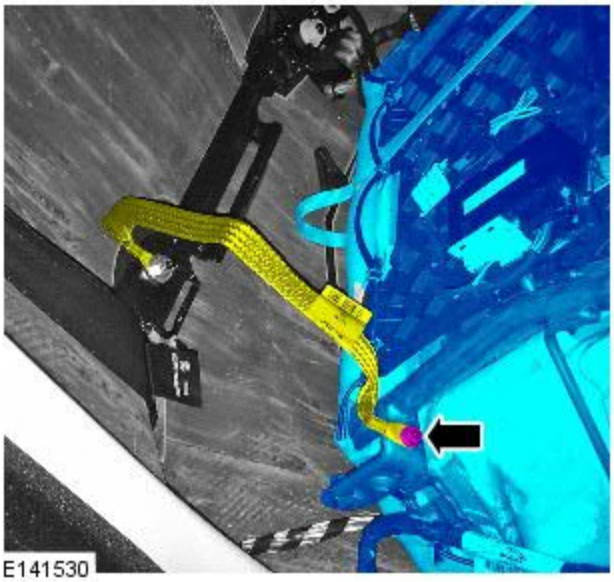
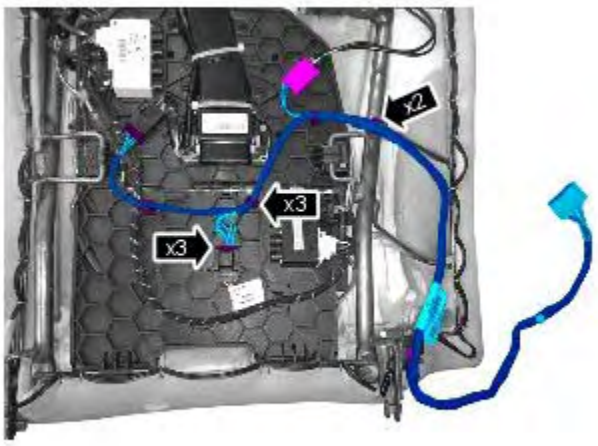




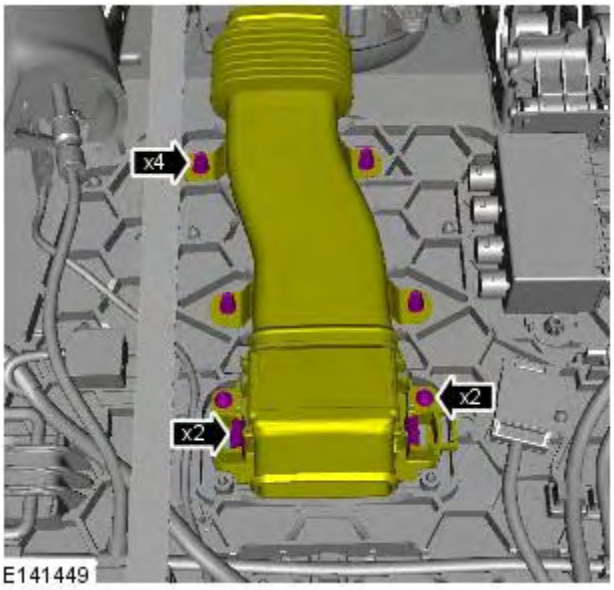
6. *Torque:* 10 Nm

7.



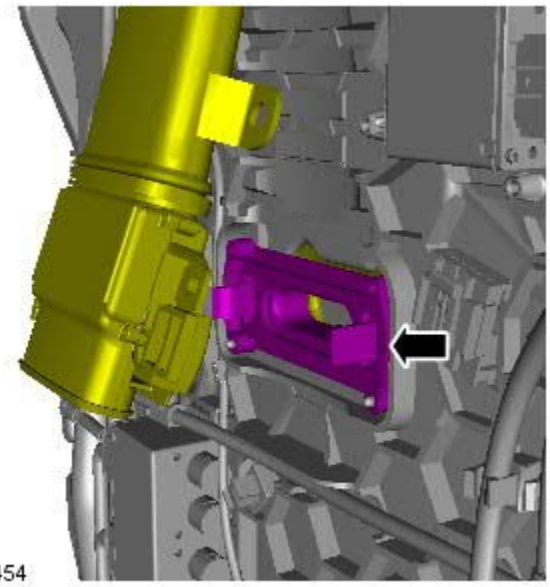
E141535

8.



E141449

9.



E141454

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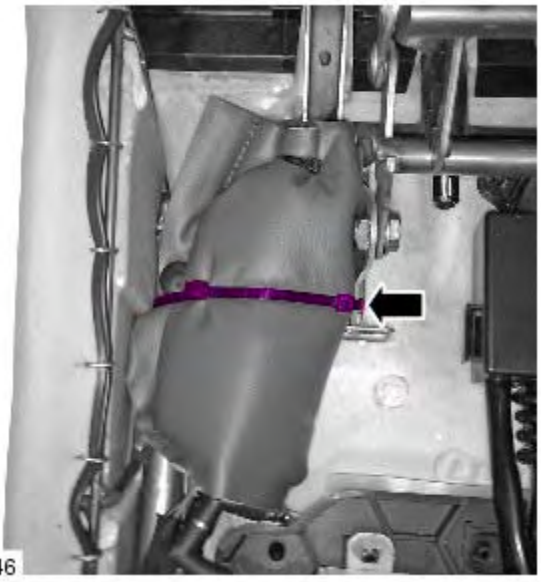
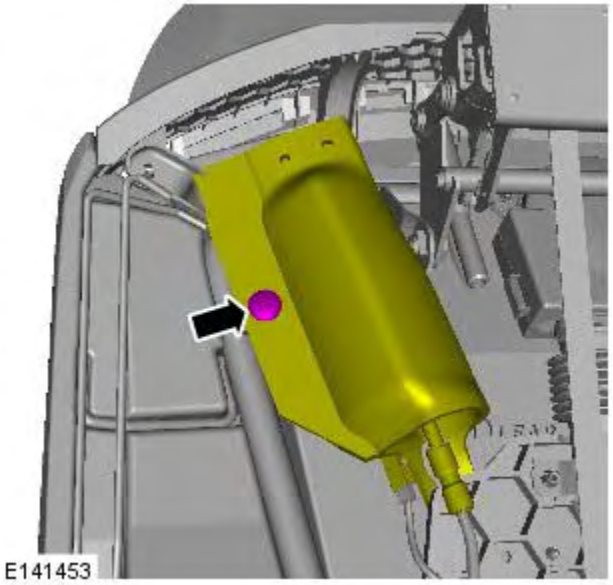


E141546

11.



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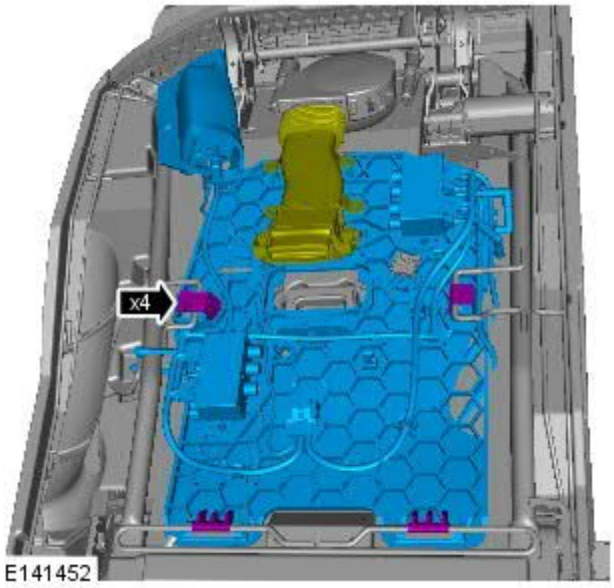
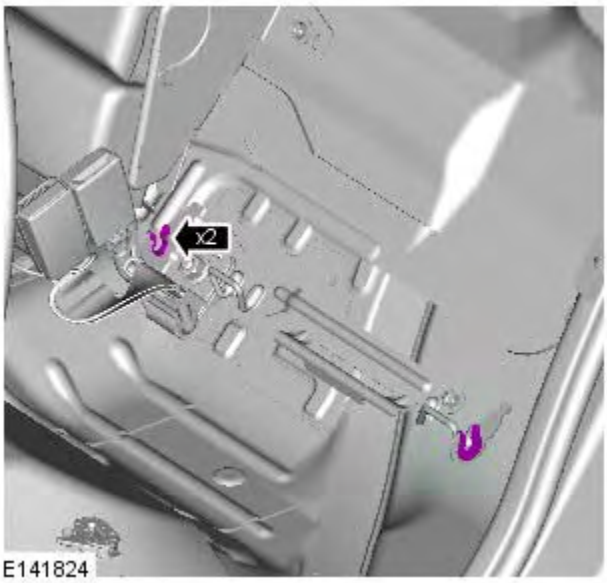


Installation



1. NOTE: Make sure that all the clips are correctly installed.

2. To install, reverse the removal procedure.

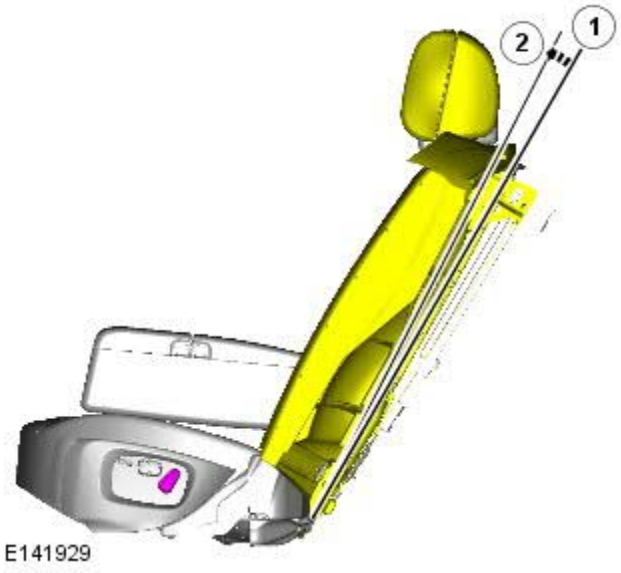
Published: 22-Apr-2012

Seating - Rear Seat Recliner Motor

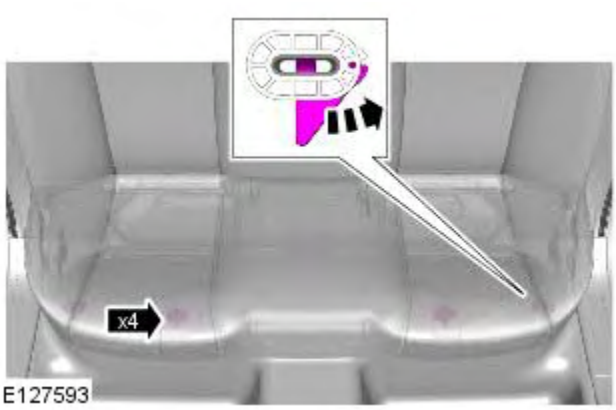
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

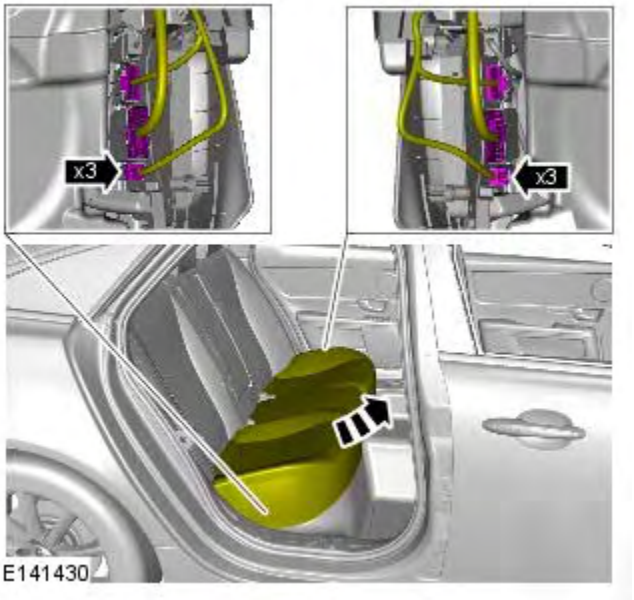


1. Fully recline the rear seat backrest, then adjust it slightly back up to aid access.



2.

3.



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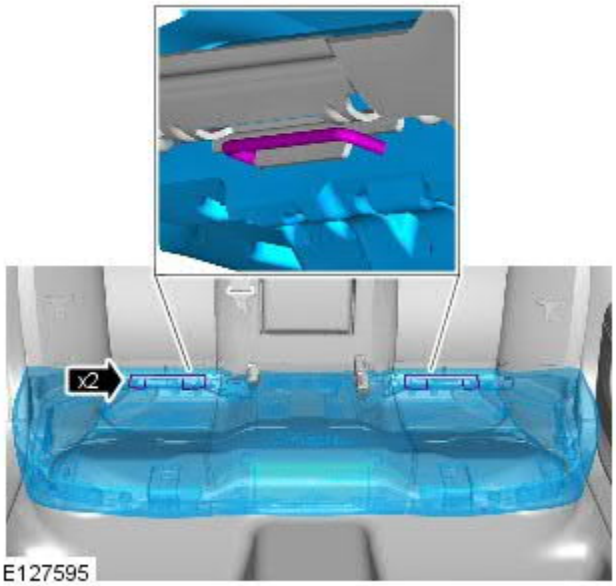
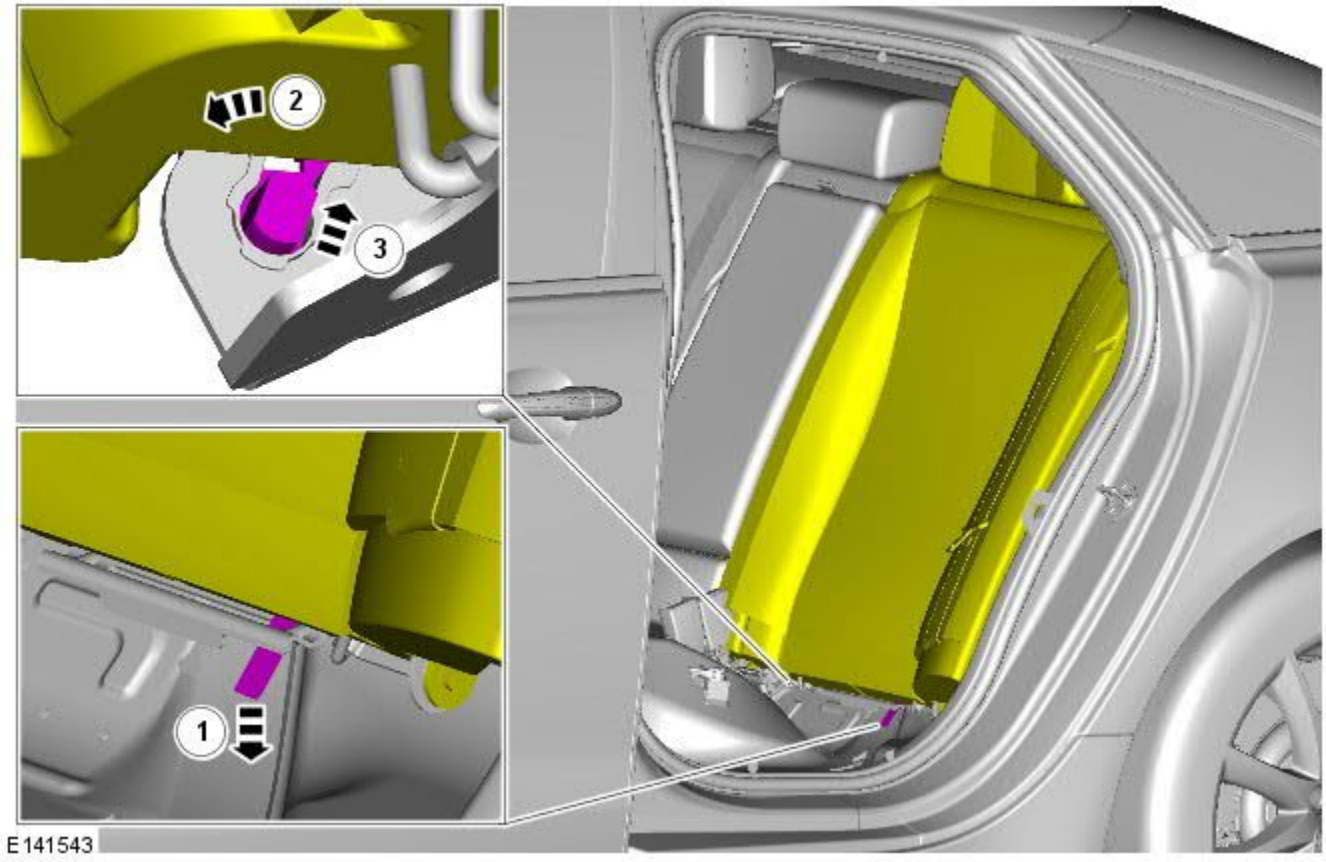
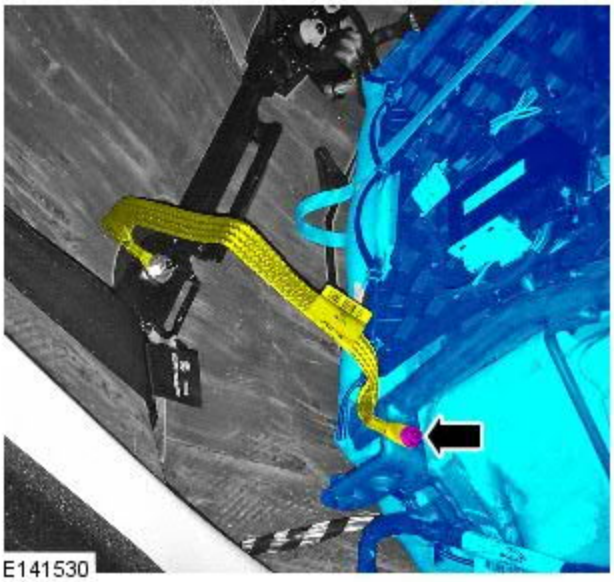


5.



6. *Torque:* 10 Nm



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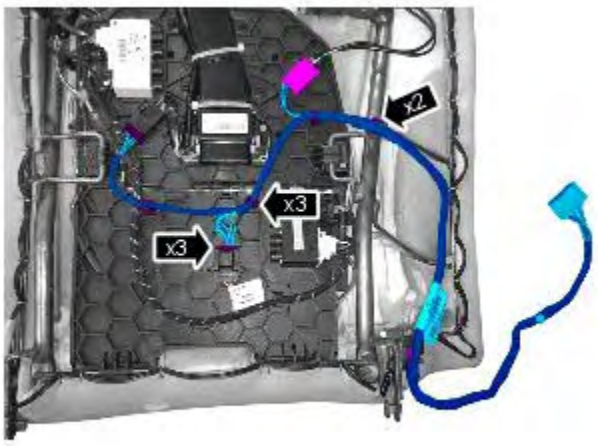

E141535

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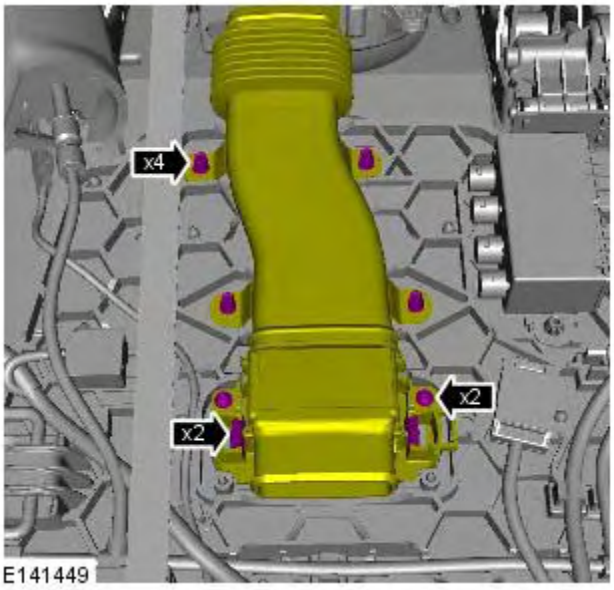

E141449

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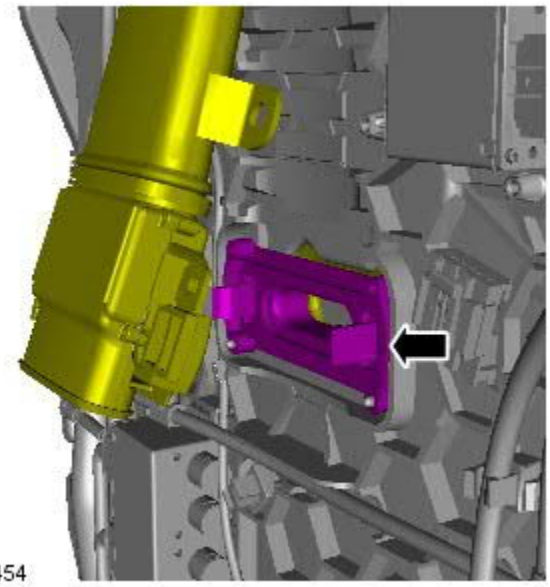

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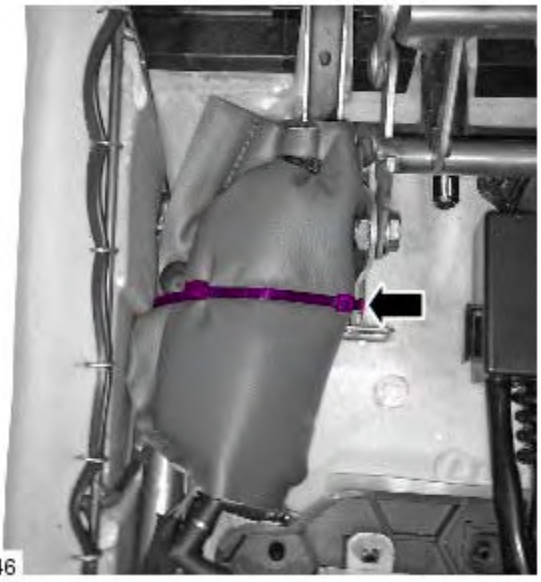

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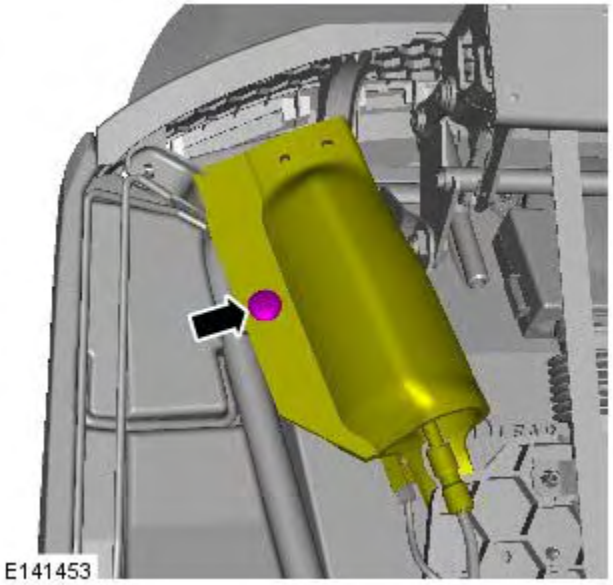

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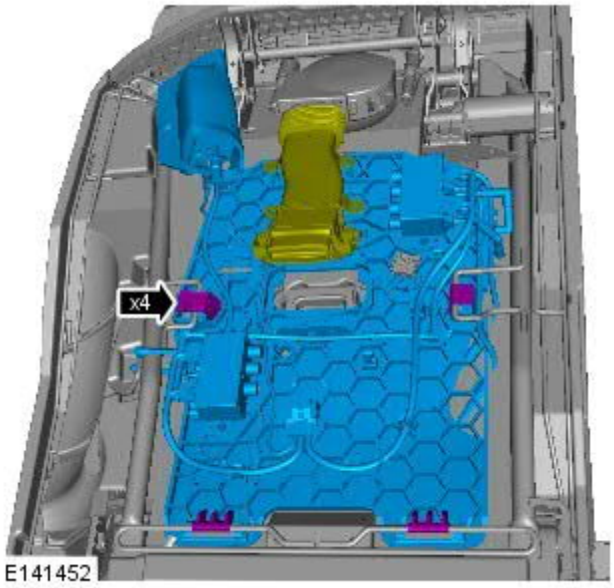

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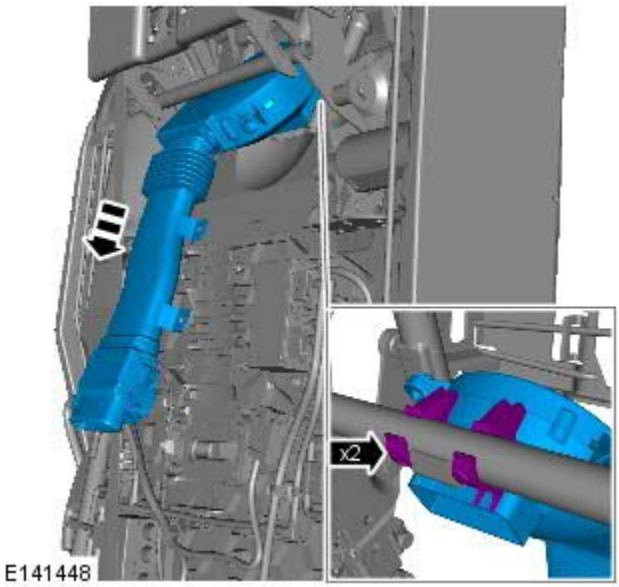

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15.

E141537

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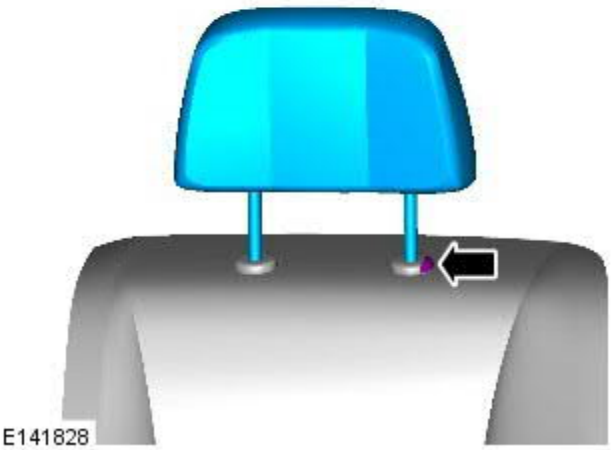
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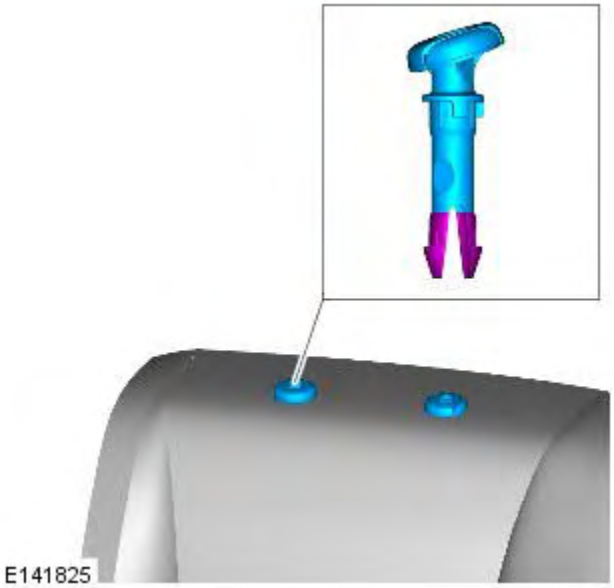

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E141531

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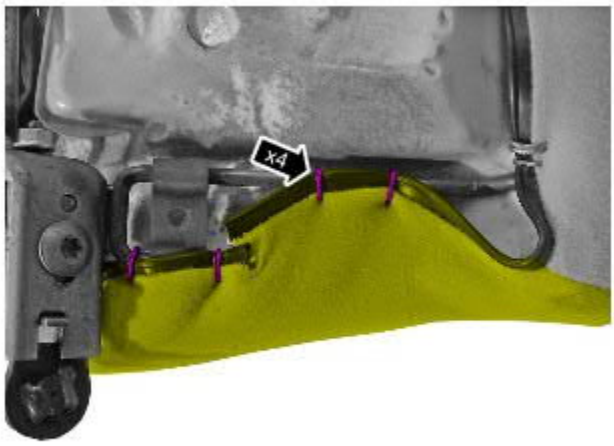

E141538

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E141533

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E141548

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E141534

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E141532

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E141827

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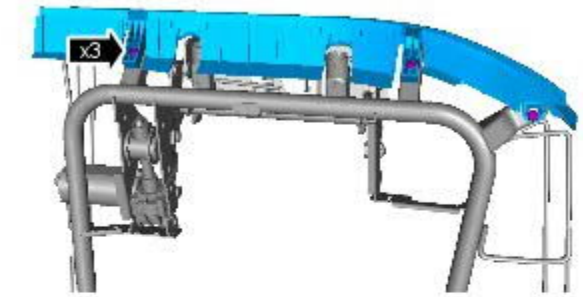
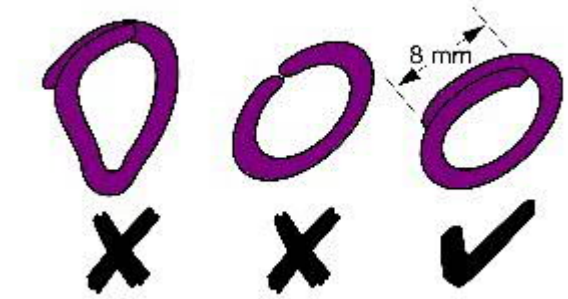


E141826

Installation

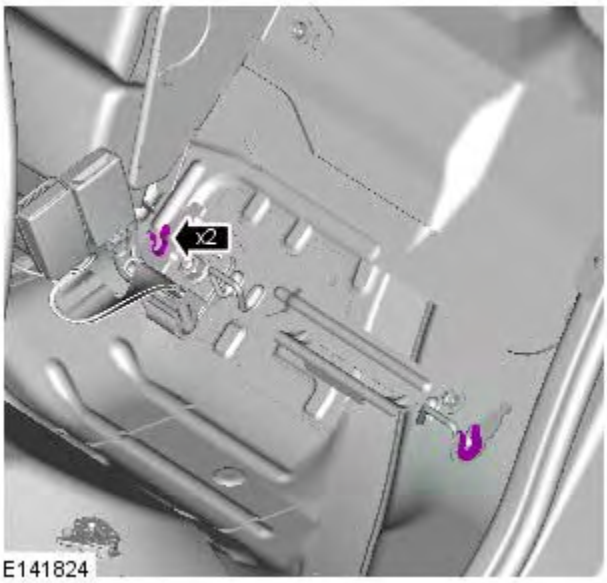


V4001063

1. NOTES:

   Make sure that new hog rings are installed.

   Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.



2. NOTE: Make sure that all the clips are correctly installed.

3. To install, reverse the removal procedure.

Published: 19-Apr-2012

Seating - Seat Base

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least one minute after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

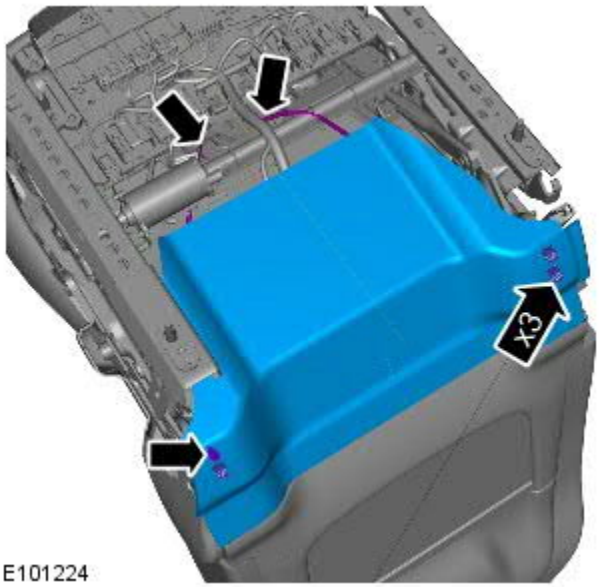
NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

Removal steps in this procedure may contain installation details.

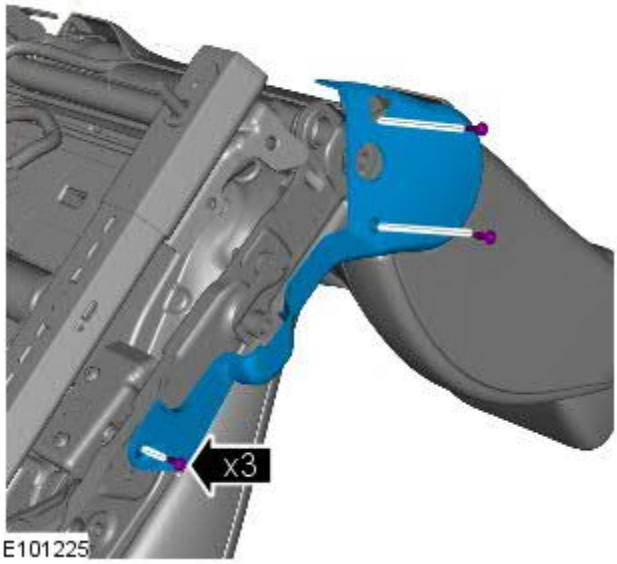
All vehicles

1. Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).
2. Refer to: Front Safety Belt Buckle (501-20A Safety Belt System, Removal and Installation).
3. Refer to: Front Seat Control Switch (501-10 Seating, Removal and Installation).



E101224

4. NOTE: Make sure that the clips are installed in the correct orientation.



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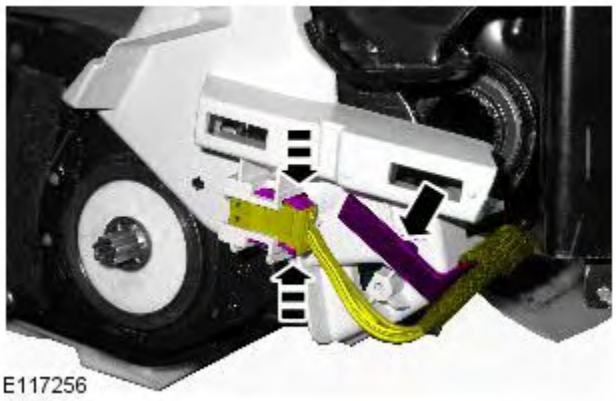
E117256

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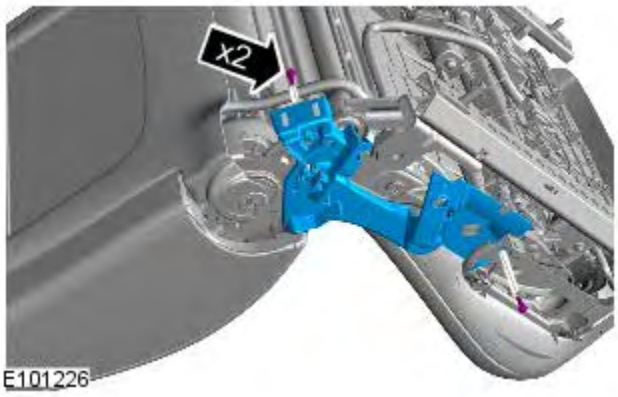
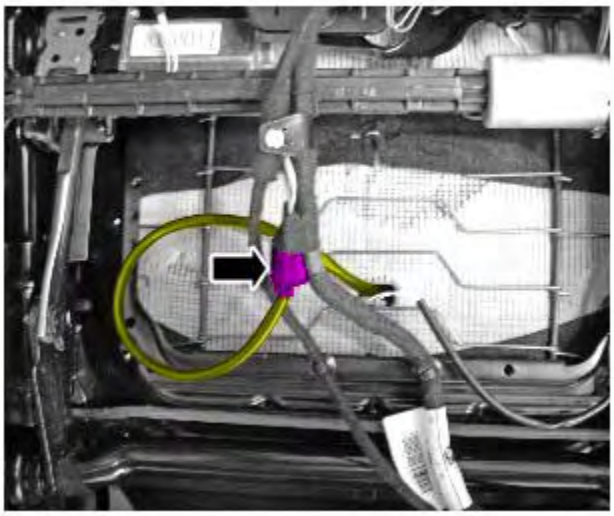


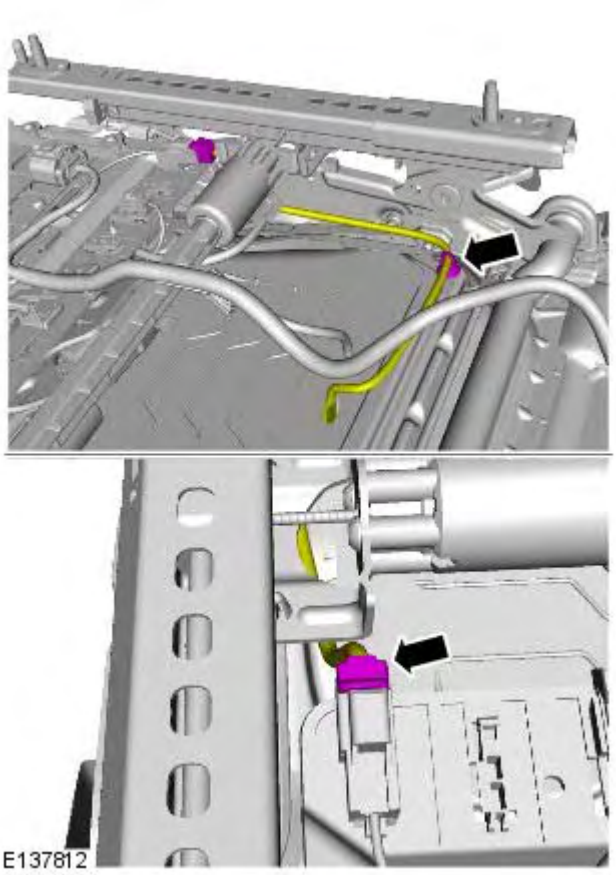
E101226

Vehicles with heated front seats

8. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

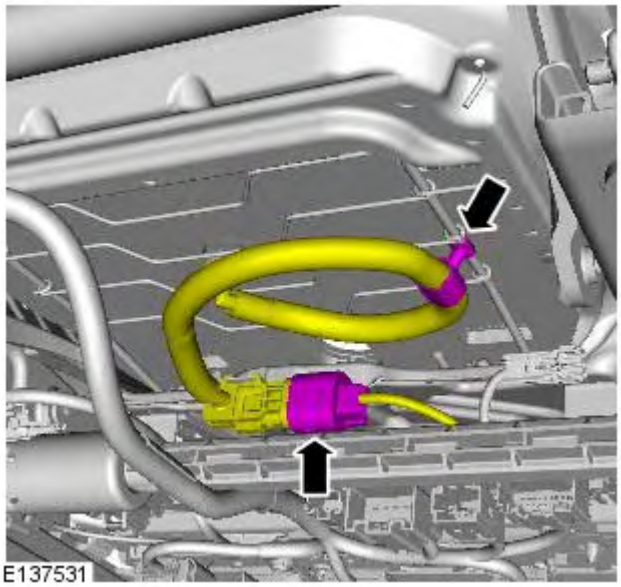

E137449

Non NAS vehicles



9. CAUTION: Make sure that the component is aligned and attached as shown.

NAS vehicles



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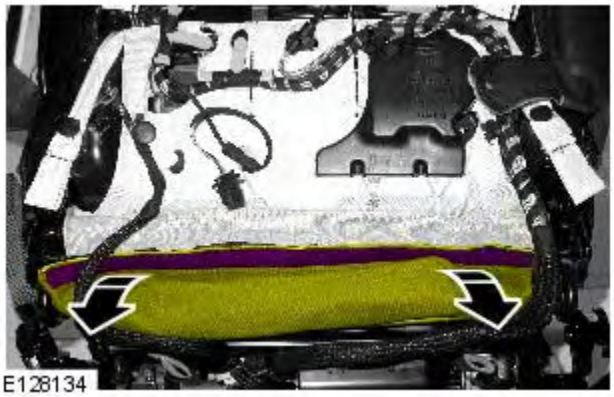
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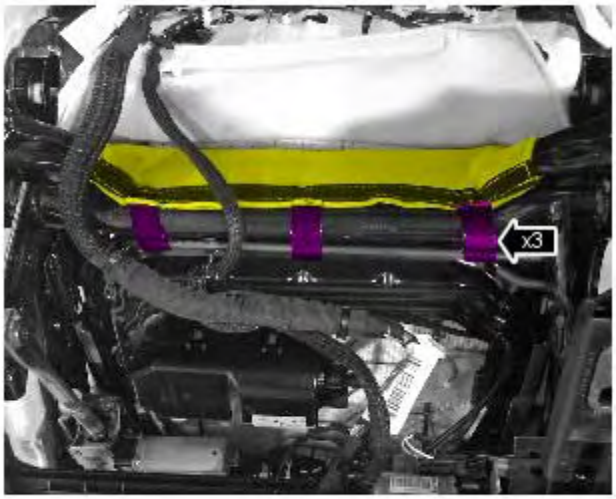

E140841

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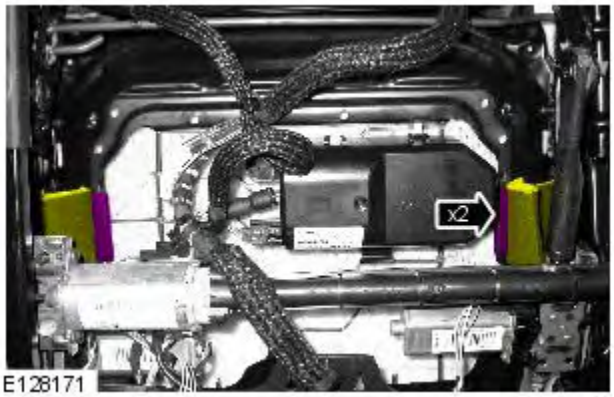
E117249

14.



E128171

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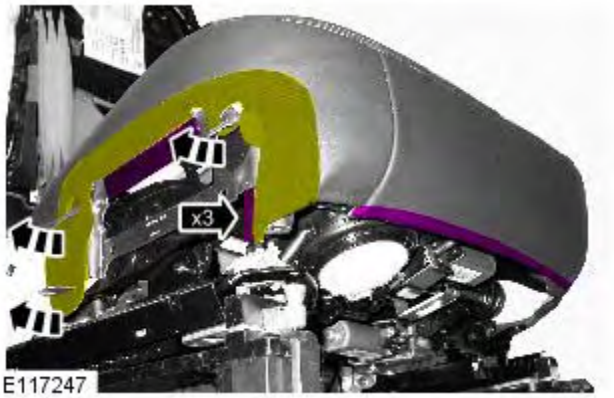

E117247

16.

E117248

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E140684

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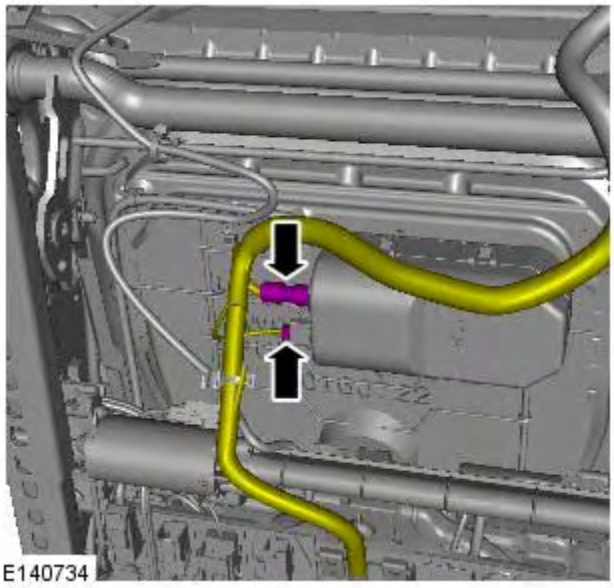

E140734

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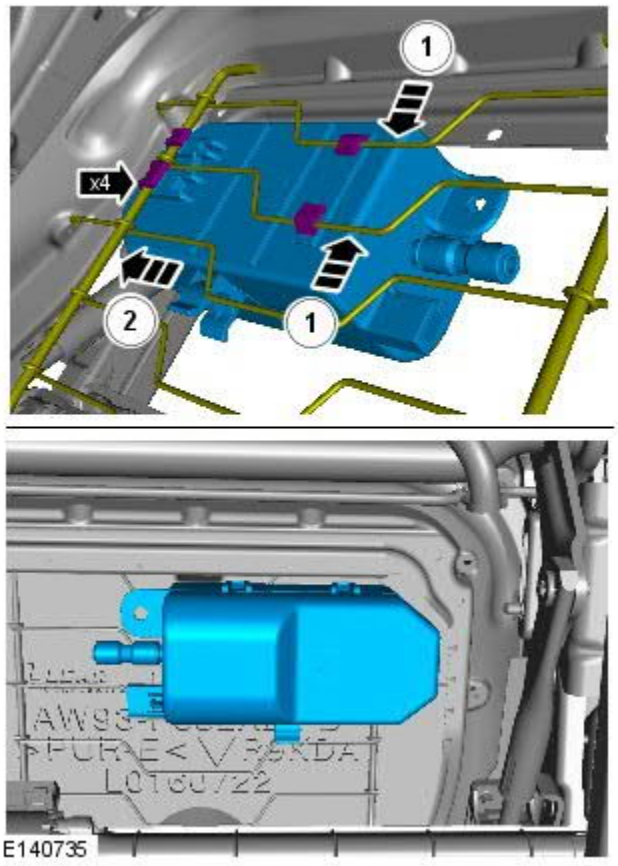
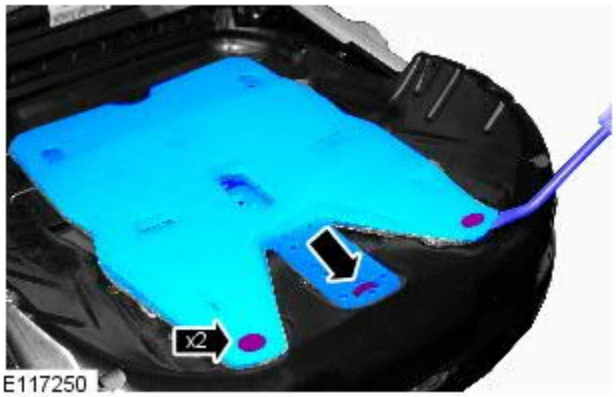


NAS vehicles

20.



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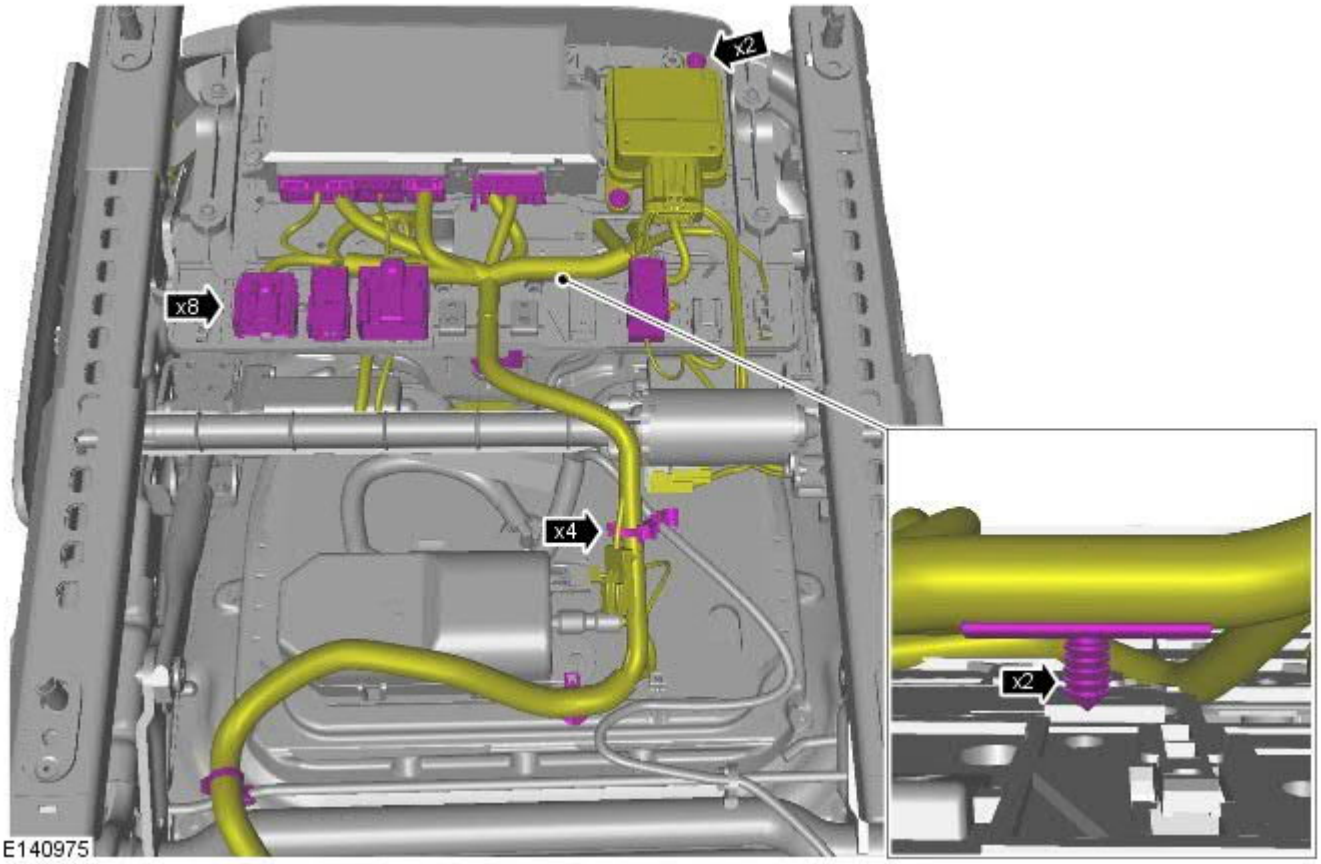
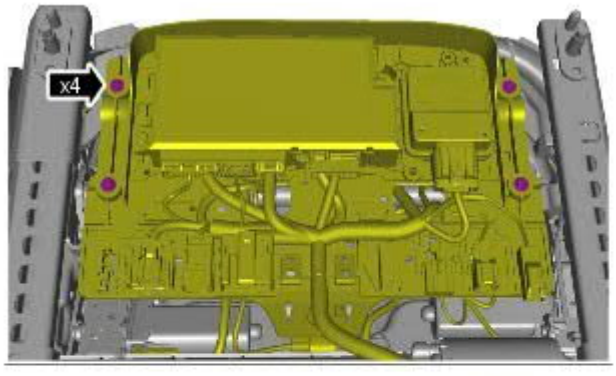
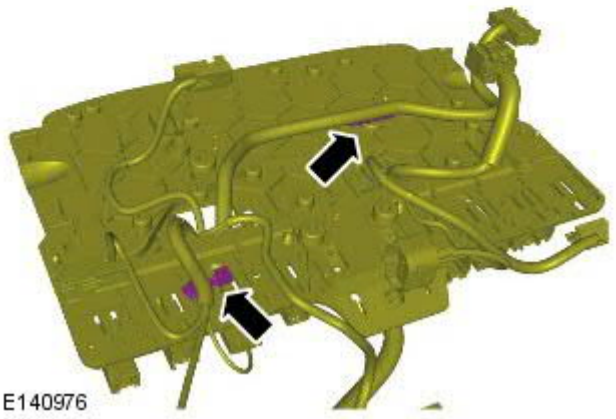
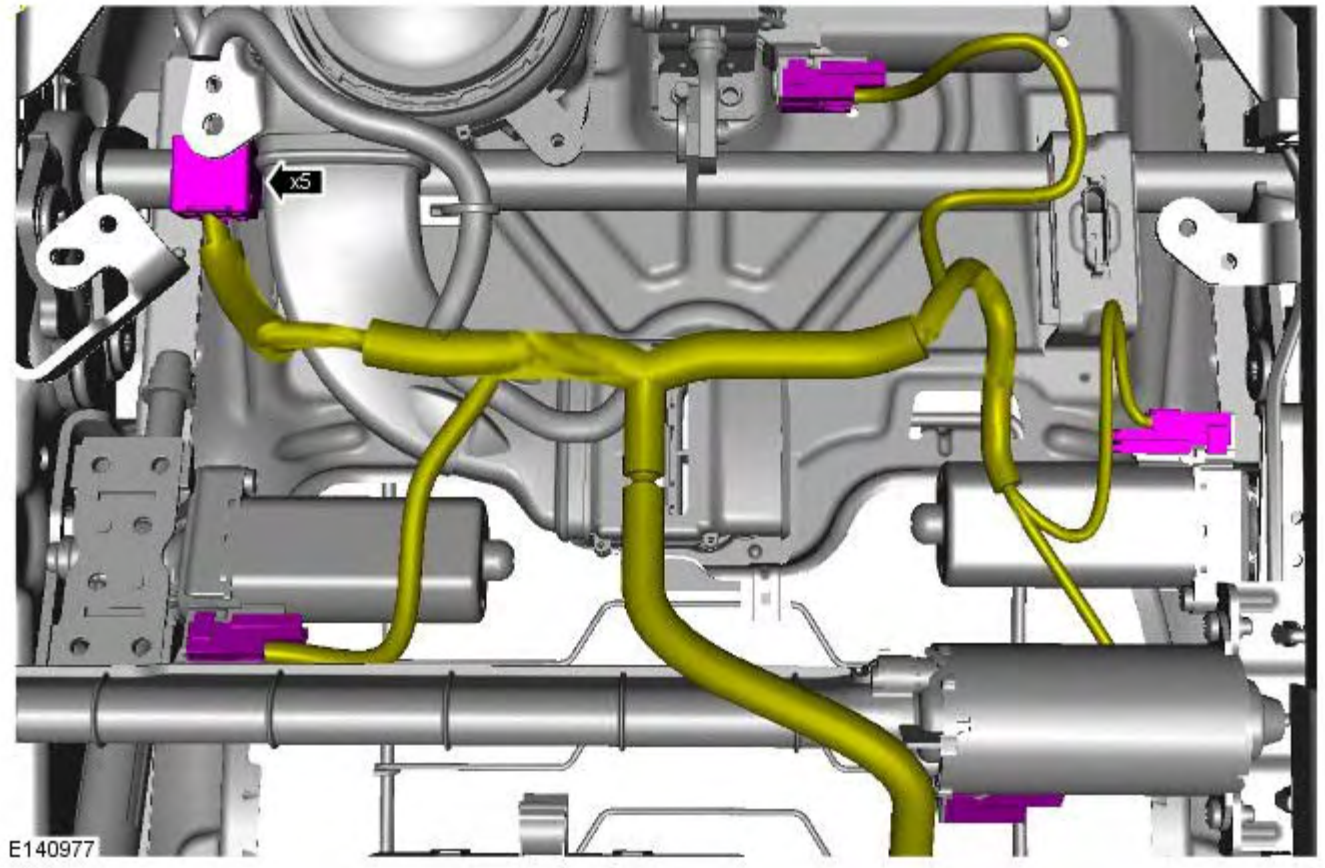


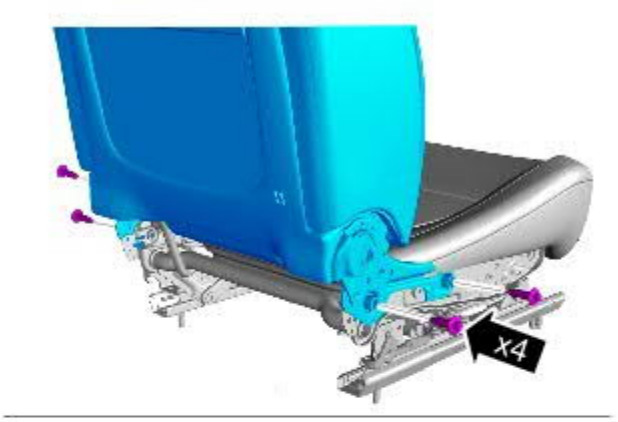
22. *Torque:* 10 Nm





23. NOTE: Note the position of the wiring harnesses to aid installation.

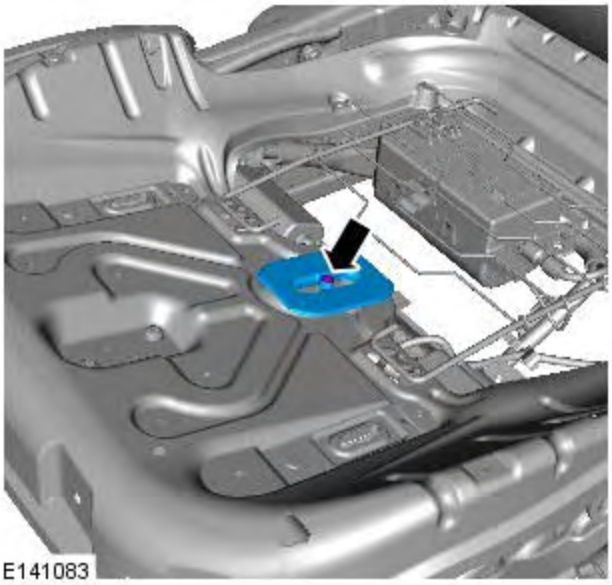




E142420

24. CAUTION: Take extra care not to damage the component.

Torque: 35 Nm



E141083

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26.

E141088

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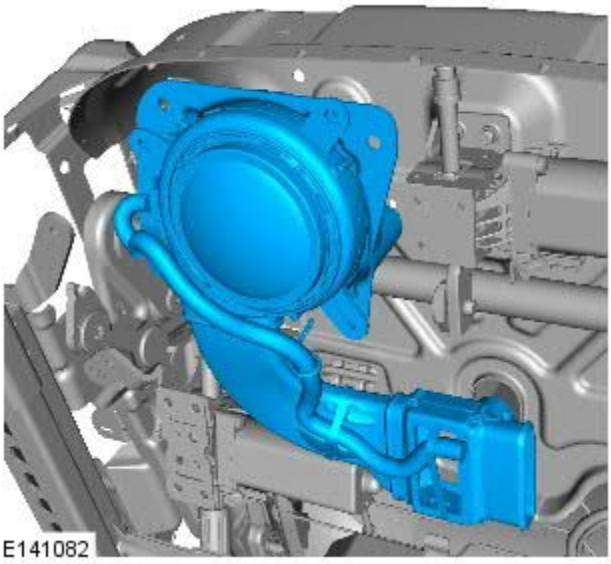


E141082

28.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Glass, Frames and Mechanisms -

Torque Specifications

Description	Nm	lb-ft	lb-in
Front door window glass regulator retaining screws to body	7	5	62
Front door window glass regulator motor retaining screw to panel	1.1	1	18
Front door weather shield retaining screws to body	2.2	1.5	19.5
Front door outer waist seal retaining screw	3	2.2	26.6
Rear door window glass regulator retaining screws to body	7	5	62
Rear door window glass regulator motor retaining screw to panel	1.1	1	18
Rear door weather shield retaining screws to body	2.2	1.5	19.5
Rear door outer waist seal retaining screws	3	2.2	26.6
Rear door glass run retaining nuts	4	3	35

Published: 12-Jun-2013

Glass, Frames and Mechanisms - Glass, Frames and Mechanisms

Diagnosis and Testing

Principles of Operation

For a detailed description of the glass, frames and mechanisms systems and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (501-11)

Glass, Frames and Mechanisms (Description and Operation),
Glass, Frames and Mechanisms (Description and Operation),
Glass, Frames and Mechanisms (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Window control switches condition and installation • Window motors/regulators • Window channels/runners • Window cables • Window seals	• Fuses • Harnesses and connectors • Window lift relay • Window control switches • Window motors

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Manual Sunblind Initialization Routine

Where a sunblind module has been replaced, there is an initialization routine available on the diagnostic tool. This requires a new module to be initially installed in the fully down position and running of the "Initialize Specified Function/Feature" diagnostic routine on the manufacturer approved diagnostic tool. Alternatively, the sunblind may be initialized manually by following the procedures described below:

1. Raise the sunblind to top (fully retracted) position
2. Press and hold the window 'down' switch for 15 seconds (the sunblind will go down and will then be in initialization mode)
3. Release window switch and press window 'down' switch again to drive blind fully into lower block
4. Activate window switch 'up' until the sunblind reaches the top (fully retracted) position and release switch
5. The sunblind is now initialized and should have 'one-touch' functionality

Symptom Chart

Symptom	Possible Cause	Action
Window(s) inoperative	• Fuse(s) • Switch fault • Front switch isolator fault • Motor/Regulator fault • Channel/Runner fault • Cable fault • Harness fault	Check the fuses. Check the suspect window operation from the individual door switch and from the driver door master switch (it is unlikely that both switches would fail at the same time, so if the window is inoperative from either switch, suspect a fault other than a switch). If the inoperative window is a rear unit, check the function of the isolator at the master switch.
Window(s) 'one-shot' function inoperative	• Window motor initialization required • Switch fault	If the battery has been disconnected, carry out the initialization procedure. Refer to the relevant section of the workshop manual. Check the switch function after initialization.

Window Regulator Diagnostic

This diagnostic procedure is to be carried out if the window glass, - Closes to the top, then reopens **Bounce back** - Does not **fully close** to the top of the door frame - The **One touch** function is disabled

PINPOINT TEST A : DIAGNOSTIC PROCEDURE	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: DOOR WINDOW GLASS - SEAL CONDITION / FOREIGN MATERIAL	
NOTE: To check that the door window glass seal is free from foreign material and has no sign of damage and is not worn in the door channels	
	1 Carry out visual inspection for: • Foreign material • Obstruction • Signs of damage or wear to door window glass seal
	Is the door window glass seal free from foreign material, damage and wear? **Yes** GO to A2. **No** Remove any foreign material or were necessary install new door window glass seal. Test the system for correct operation
A2: DOOR WINDOW GLASS - SEAL INSTALLATION	
NOTE: To check that the door window glass seal is installed correctly	
	1 Check that the door window glass seal is installed correctly, ensure that it is fully installed into the corner areas
	Is the door window glass seal installed correctly? **Yes** GO to A3. **No** Correctly install the door window glass seal. Test the system for correct operation
A3: DOOR WINDOW GLASS - SECURITY	
NOTE: To check the door window glass is secure	
	1 Check if the door glass installed correctly and secured to the door window regulator
	Is the door window glass correctly installed and secure? **Yes** GO to A4. **No** Adjust the door window glass referring to the door glass installation process REFER to: (501-11 Glass, Frames and Mechanisms) Front Door Window Glass (Removal and Installation), Rear Door Window Glass (Removal and Installation). Test the system for correct operation
A4: DOOR WINDOW GLASS - RESET PROCEDURE	
	1 Disconnect vehicle battery, wait for a minimum of 2 minutes, then reconnect the battery
	2 **For vehicles between VIN V03480 and V18030**, the latest version of the diagnostic software must be loaded. SDD must be loaded with SDD DVD126_V6.03 and Calibration File 77 (or later)
	3 With the vehicle engine running, initialize the window motors, REFER to: Door Window Motor Initialization (501-11 Glass, Frames and Mechanisms, General Procedures).
	4 Cycle the glass 20 times, using the 'one–touch' function to open and close the window
	5 **NOTE:** The window regulator motor may thermally cut out after too many operations, if this occurs wait 30 seconds before continuing
	Is window closing correctly and the **One-touch** function operational? **Yes** No further action requires **No** Replace the front door window regulator REFER to: Front Door Window Regulator and Motor (501-11 Glass, Frames and Mechanisms, Removal and Installation). , or rear door window regulator REFER to: Rear Door Window Regulator and Motor (501-11 Glass, Frames and Mechanisms, Removal and Installation). Test the system for correct operation

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Driver/Passenger Door Module (DDM/PDM) (100-00 General Information, Description and Operation).

Published: 09-Apr-2014

Glass, Frames and Mechanisms - Fixed Window Glass

Diagnosis and Testing

Principles of Operation

For a detailed description of the Glass, Frames and Mechanisms, refer to the relevant Description and Operation section in the workshop manual.

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:

If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

Refer to Section 100-00 General Information for window glass health and safety precautions.

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Electrical
• Physical damage to the windshield

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index
5. Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

Warranty Repairs

NOTES:

The warranty period for the windshield is twelve months with the exception of delamination and electrical faults.

Warranty repairs should be completed using genuine parts, in accordance with the Warranty Policy and Procedures Manual.

1. Draw a line around the windshield damage using a marker pen.
2. Photograph the entire windshield. If the damage extends behind any trim, remove the trim and take further photographs.
3. Photograph the trademark logo and code to validate the windshield as factory fitment.

Symptom Chart

Symptom	Possible Causes	Action
Scratches	• Debris trapped under a wiper blade	• GO to Pinpoint Test A.

Symptom	Possible Causes	Action
	• Foreign object damage • Fouling by trim	
Chips	• Foreign object damage	• GO to Pinpoint Test B.
Cracks	• Foreign object damage • Impact damage during assembly	• GO to Pinpoint Test C.
Delamination	• Manufacturing defect	• GO to Pinpoint Test D.

Pinpoint Tests

PINPOINT TEST A : SCRATCH TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: SCRATCH TEST 1	
NOTE: A scratch will usually be regular in shape, following the line of the object that caused it.	
	1 Probe using the tip of a pencil to identify a groove in the windshield surface.
	Is there a groove? **Yes** Windshield scratched. GO to A2. **No** Defect not valid.
A2: SCRATCH TEST 2	
	1 Check for trim, body panels, or foreign objects that may have caused the scratch.
	Was the scratch caused by a foreign object? **Yes** The damage is not due to a defect or an assembly error. **No** Rectify as appropriate.

PINPOINT TEST B : CHIP TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: CHIP TEST 1	
NOTE: Impact damage may cause a crack to form.	
	1 Assess the damage by probing with the tip of a pencil.
	Is the damaged area rough (indicating a breach of the windshield surface)? **Yes** Damage caused by the impact of a foreign object. Not a manufacturing defect. **No** Install a new windshield.

PINPOINT TEST C : CRACK TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: CRACK TEST 1	
	NOTE: A crack will be detectable as a step in the glass. 1 Confirm the presence of a crack by probing with the tip of a pencil.
	Is the windshield cracked? **Yes** Windshield cracked. GO to C2. **No** Windshield not cracked. GO to Pinpoint Test A.
C2: CRACK TEST 2	
NOTE: Multiple cracks will radiate out from the source.	
	1 Assess the source of the crack by probing with the tip of a pencil.
	Is there evidence of impact damage being the source of the crack? **Yes** GO to Pinpoint Test B. **No** Install a new windshield.

PINPOINT TEST D : DELAMINATION TESTS	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
D1: DELAMINATION TEST 1	
	1 Visually assess the windshield for delamination.
	Have the glass laminates separated? **Yes** Install a new windshield. **No** No further action.

DTC Index

For a complete list of all Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.

Published: 15-Jan-2013

Glass, Frames and Mechanisms - Door Window Motor Initialization

General Procedures

NOTES:

Make sure that the vehicle battery is fully charged before carrying out this procedure.

After the battery has been disconnected or a new window regulator and motor or door module has been installed, it is necessary to initialize each door window motor separately to operate the **one-touch** and anti-trap function.

In addition to this manual procedure, the approved diagnostic tool can also be used to initialize the door window motor.

1. Start the engine.
2. Operate the window control switch until the door window glass is in the fully closed position, continue to operate the window control switch for a further two seconds.
3. Release the window control switch.
4. Operate the window control switch in the closed position and continue to operate the window control switch for a further two seconds.
5. Operate the window control switch until the door window glass is in the fully open position (**one-touch** down).
6. NOTES:

   If the door window motor initialization has been completed correctly, when the window control switch is operated, the door window glass should move to the fully closed position (**one-touch** up) automatically.

   If the door window glass does not fully close automatically (**one-touch** up), repeat the complete procedure.

   Operate the window control switch once to the close position.
   - If multiple attempts have failed to initialize the door window motor, refer the diagnosis and testing procedure.
     For additional information, refer to: Glass, Frames and Mechanisms (501-11, Diagnosis and Testing).
7. Repeat the door window motor initialization for each door window motor.

Published: 30-Jul-2012

Glass, Frames and Mechanisms - Rear Glass Roof Panel Lubrication

General Procedures

Check

CAUTIONS:

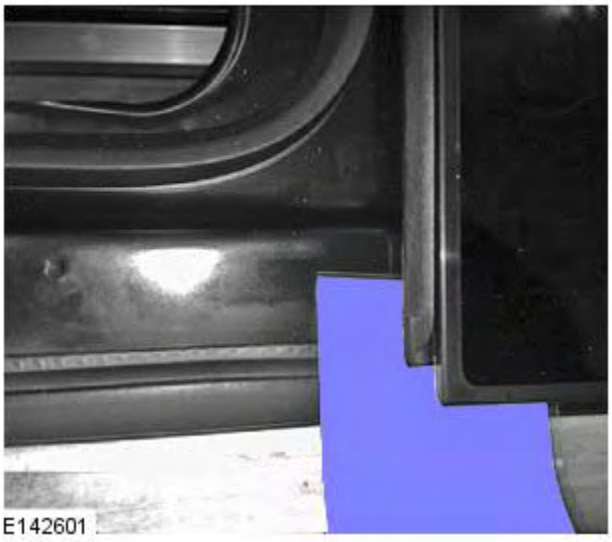
Make sure that the vehicle is clean and dry prior to commencing this procedure.

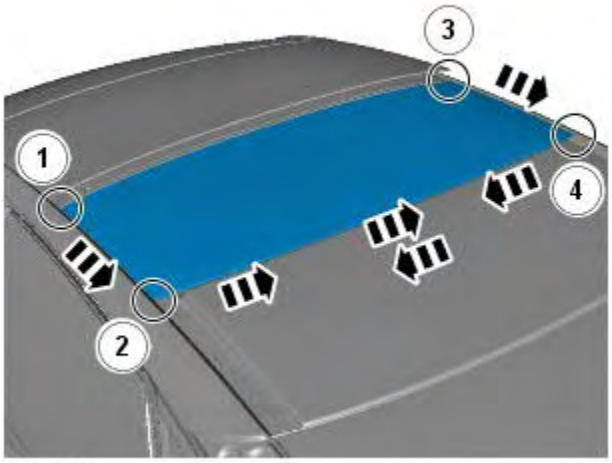
Make sure that the vehicle is kept in a dry environment and is not washed within 24 hours of completing this procedure, failure to follow this instruction will prevent the slip coat from curing correctly.

NOTE: **The lubricant used in this procedure (LIP AC612/21) is part of the Squeaks & Rattles Kit. For more information on the Squeaks & Rattles Kit, safety data sheets and details of how to order the kit or parts thereof, please visit (www.squeaksandrattles.info).**

1. Open the roof opening panel glass to the full tilt position.

2. Insert a suitable applicator card in to the position shown at the left hand front corner of the rear glass roof panel.



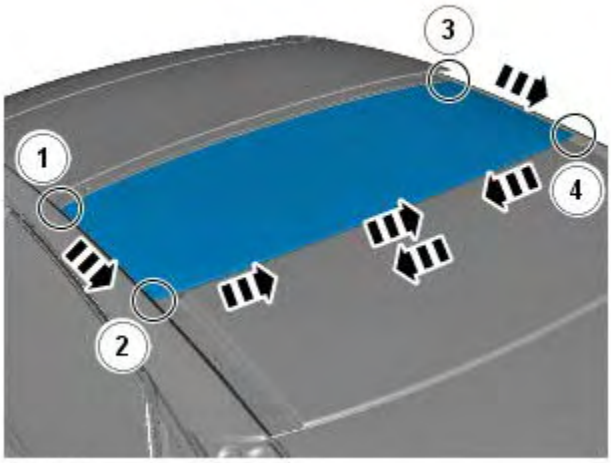


E142600

3. CAUTION: Make sure that the two areas that are cleaned with the applicator card overlap at the centre of the vehicle.
    - Starting at position 1 in the left hand front corner of the rear glass roof panel, carefully slide the applicator card around the rear glass roof panel through position 2 and past the centre point of the vehicle.
    - Remove and clean the applicator card.
    - Starting at position 3 in the right hand front corner of the rear glass roof panel, carefully slide the applicator card around the rear glass roof panel through position 4 and past the centre point of the vehicle.
    - Remove and clean the applicator card.

E142602

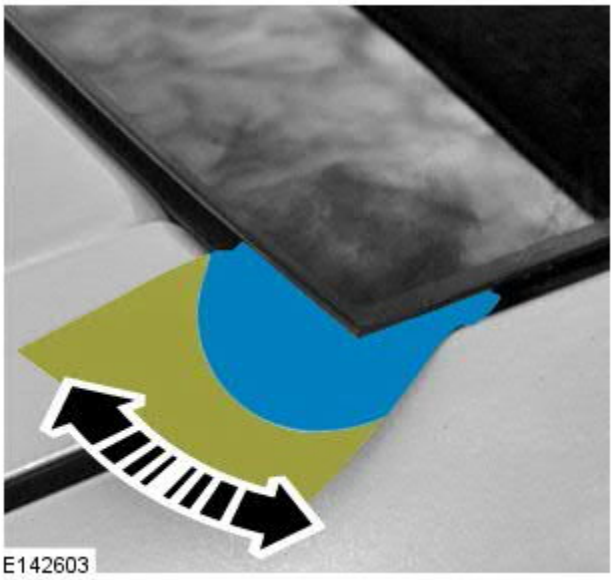
4. CAUTION: Make sure that the bottle is well shaken before applying the fluid to the applicator card.
    - Insert a suitable applicator card in to the position shown at the left hand front corner of the rear glass roof panel.
    - Spray a sufficient amount of LIP AC612/21 fluid on to the applicator card until the fluid runs between the rear glass fixed panel and the seal.



E142600

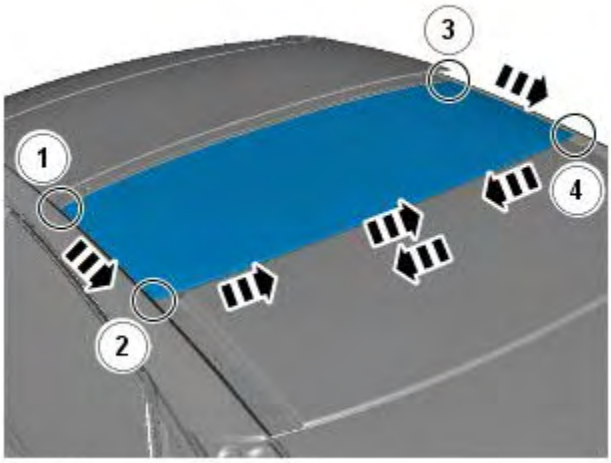
5. CAUTION: Make sure that the applicator card does not slip from under the rear glass roof panel as the card is rotated around the corners.

    - Carefully slide the applicator card along the edge of the rear fixed glass panel to position 2.
    - Slide the applicator card backwards and forwards from position 1 to 2 to make sure that a sufficient amount of fluid is applied to the rear fixed glass panel.
    - If required, apply more fluid to the applicator card and repeat the above step.


E142603

6. CAUTION: Make sure that the applicator card does not slip from under the rear glass roof panel as the card is rotated around the corners.

    - At the position 2, spray a sufficient amount of LIP AC612/21 fluid on to the applicator card until the fluid runs between the rear glass fixed panel and the seal.
    - Rotate the applicator card backwards and forwards 5 times at the corner of the rear fixed glass panel.



E142600

7. CAUTION: Make sure that the applicator card does not slip from under the rear glass roof panel as the card is rotated around the corners.
    - Carefully slide the applicator card along the edge of the rear fixed glass panel from position 2 past the centre of the vehicle.
    - If required, apply more fluid to the applicator card and repeat the above step.
    - Remove and clean the applicator card.
8. Repeat steps 4 to 7 for the other side of the vehicle.
9. Wipe away any excess fluid.

Published: 11-May-2011

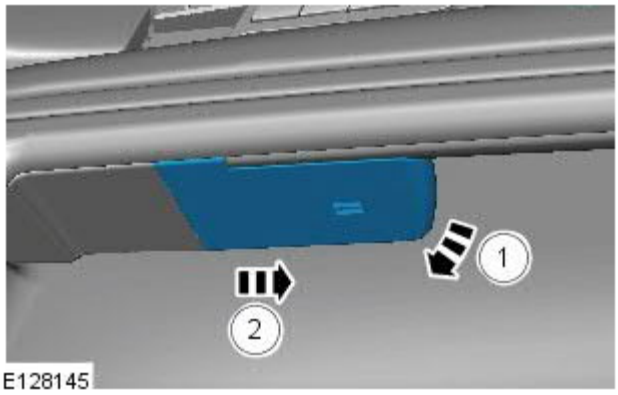
Glass, Frames and Mechanisms - Driver Door Window Control Switch

Removal and Installation

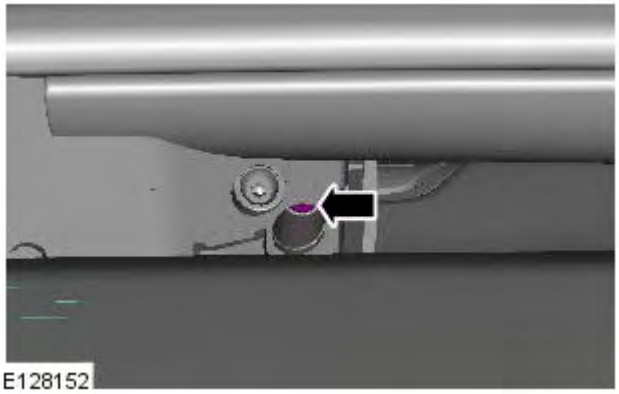
Removal

NOTE: **Some variation in the illustrations may occur, but the essential information is always correct.**

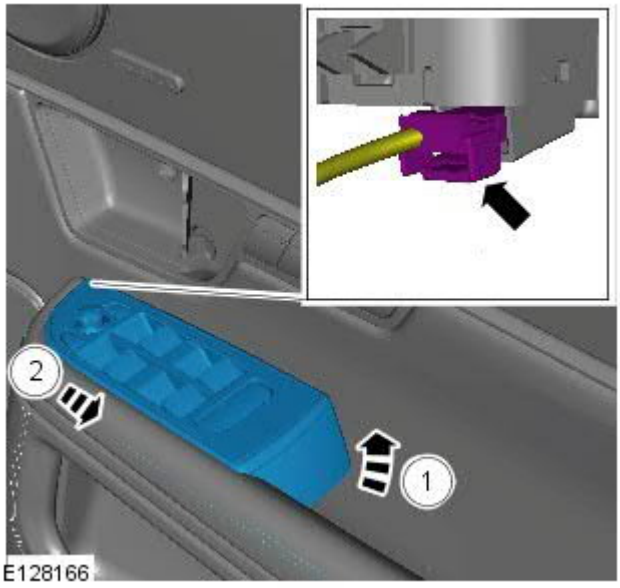
1.



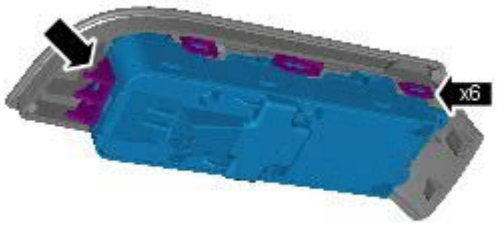
2.



3.



4.



E128148

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Glass, Frames and Mechanisms - Front Door Window Glass

Removal and Installation

Removal

NOTES:

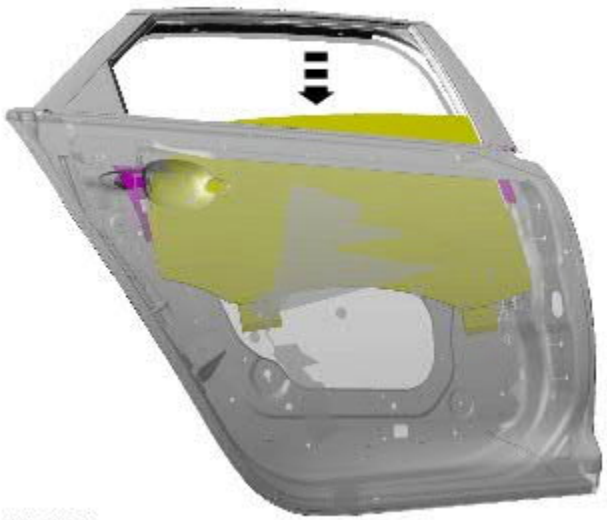
Removal steps in this procedure may contain installation details.

RH illustration shown, LH is similar.

Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Front Door Window Regulator and Motor (501-11 Glass, Frames and Mechanisms, Removal and Installation).

2.



E128184

3.

E128185

Installation

1. To install, reverse the removal procedure.

Published: 04-Sep-2013

Glass, Frames and Mechanisms - Front Glass Roof Panel

Removal and Installation

Removal

CAUTIONS:

Always protect the interior components when removing body glass.

Protect the surrounding paintwork to avoid damage.

Measure all gaps between the glass roof panels before prior to removal to help aid installation.

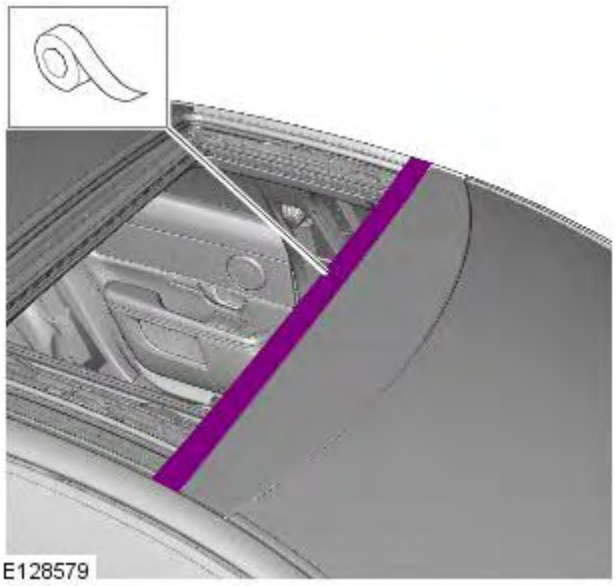
NOTE: The cutting blades used in this procedure are from the standard BTB glass removal kit.

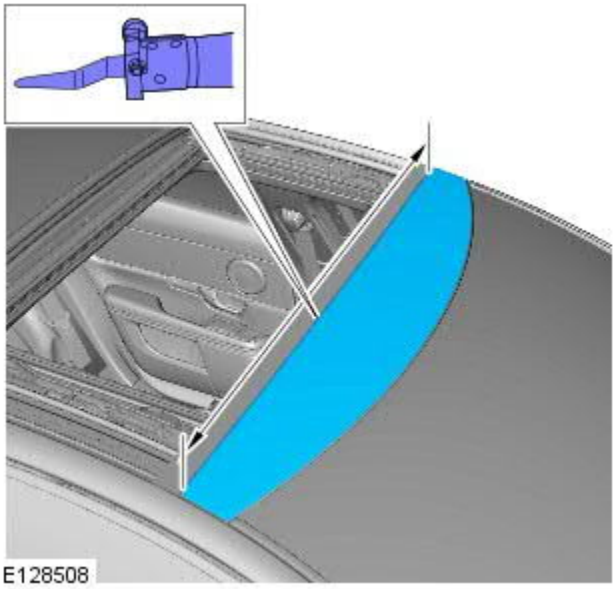
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. Refer to: Roof Opening Panel Glass (501-17 Roof Opening Panel, Removal and Installation).

3.
   - Prepare the PU adhesive in accordance with the instructions included with the PU adhesive kit.

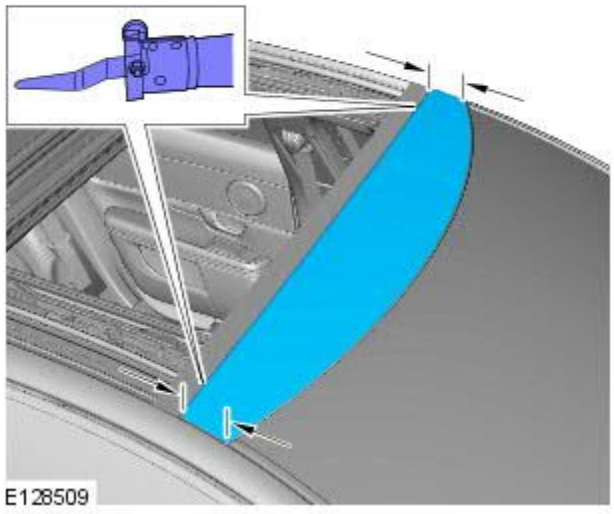
4. CAUTION: Use suitable tape to protect the roof opening panel weather strip.





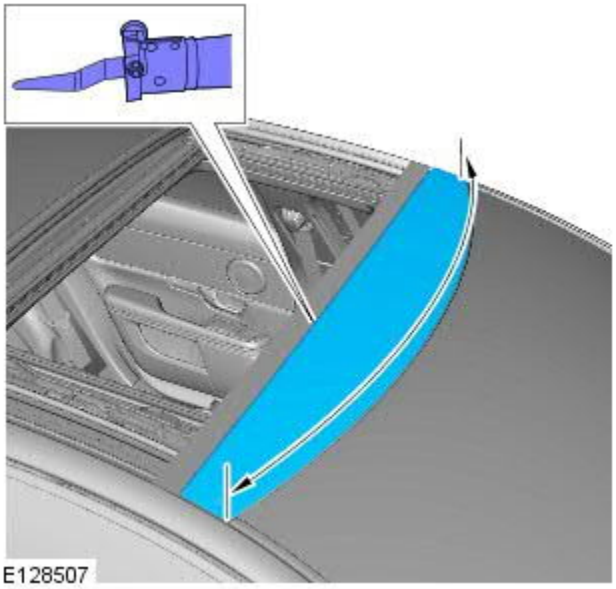
5. CAUTION: A metal strip should be installed between the bottom of the blade and the taped-down components. This will reduce friction and allow the blade to cut easier.

    - Use a WK24ZS blade, cutting with the flat side against the body.



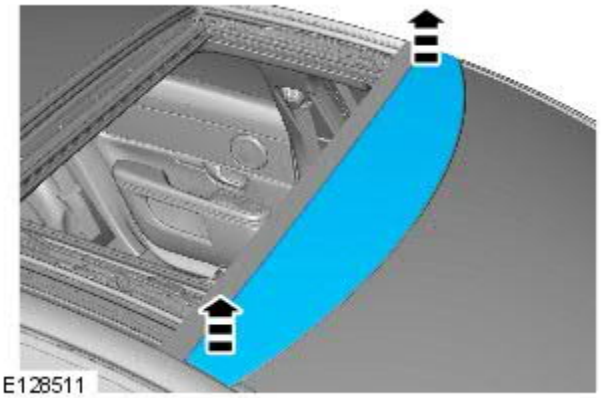
6. CAUTION: A metal strip should be installed between the bottom of the blade and the taped-down components. This will reduce friction and allow the blade to cut easier.

    - Use a WK2S blade, cutting with the flat side against the body. Use a WK11DW5 controller arm, set to 75mm to control the cutting depth.



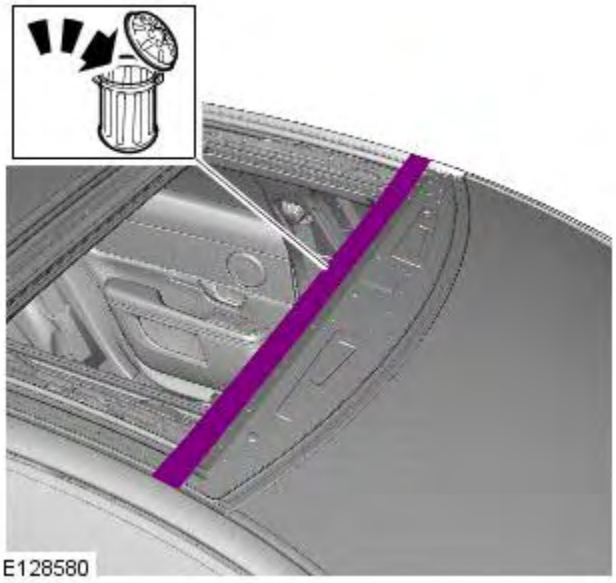
7. CAUTION: A metal strip should be installed between the bottom of the blade and the taped-down components. This will reduce friction and allow the blade to cut easier.

    - Use a WK2S blade, cutting with the flat side against the body. Use a WK11DW5 controller arm, the depth of the cut will vary from 75mm to 160mm as the glass widens towards the centre.

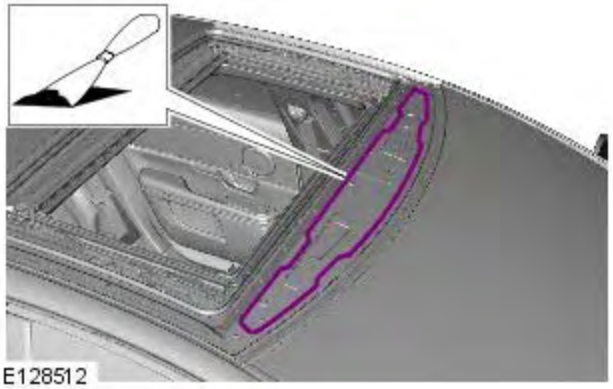


8.

Installation



1. NOTE: Remove the tape.

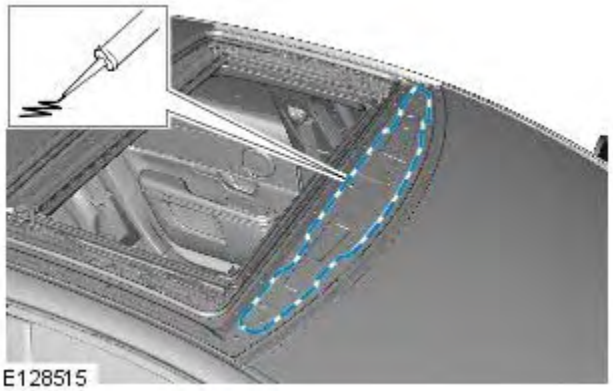


2. CAUTIONS:

   Make sure that the mating faces are clean and free of foreign material.

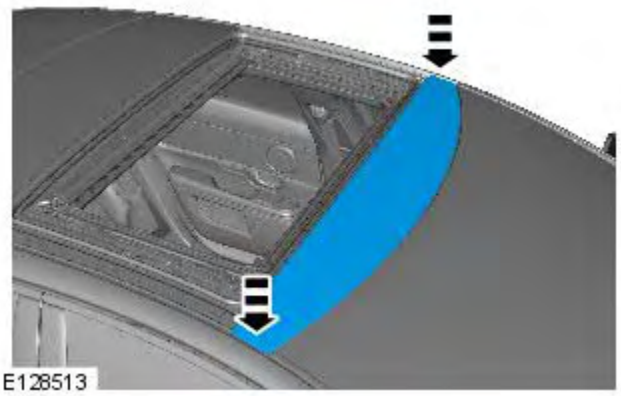
   Correct preparation of body apertures "post painting" to ensure satisfactory glass adhesion, must be carried out in line with industry practise.

   - Prepare the window glass, window glass flange and trimmed PU adhesive in accordance with the instructions included with the PU adhesive kit.



3. CAUTION: Touching the adhesive surface will impair rebonding.

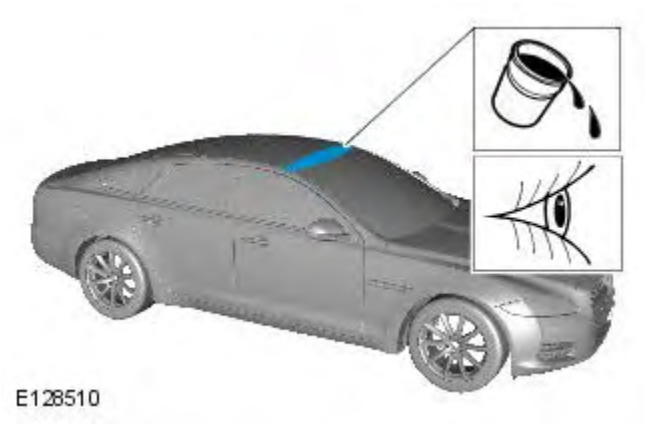
   NOTE: Install new spacers.



4.

   - Make sure the component is aligned with the measurements taken prior to removal. Failure to follow this instruction may result in damage to the glass panels during operation of the roof opening panel.
   - Use suitable weights or straps, apply a downward pressure to the glass to achieve the correct curvature.
   - Allow up to 1 hour, depending on temperature and humidity, to allow the adhesive to set before continuing with the procedure.

5. Refer to: Roof Opening Panel Glass (501-17 Roof Opening Panel, Removal and Installation).



6. CAUTION: Make sure that no excess sealant residue is evident.
    - If water is used as a means for the leak check, then allow sealant to dry before testing.
    - Spray water around the windshield glass, mark any area that leaks. Dry the windshield glass and sealant before applying additional sealant.

7. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 11-May-2011

Glass, Frames and Mechanisms - Front Door Window Regulator and Motor

Removal and Installation

Special Tool(s)

501-114 E54200	501-114 Release Lever, Door Glass

Removal

NOTES:

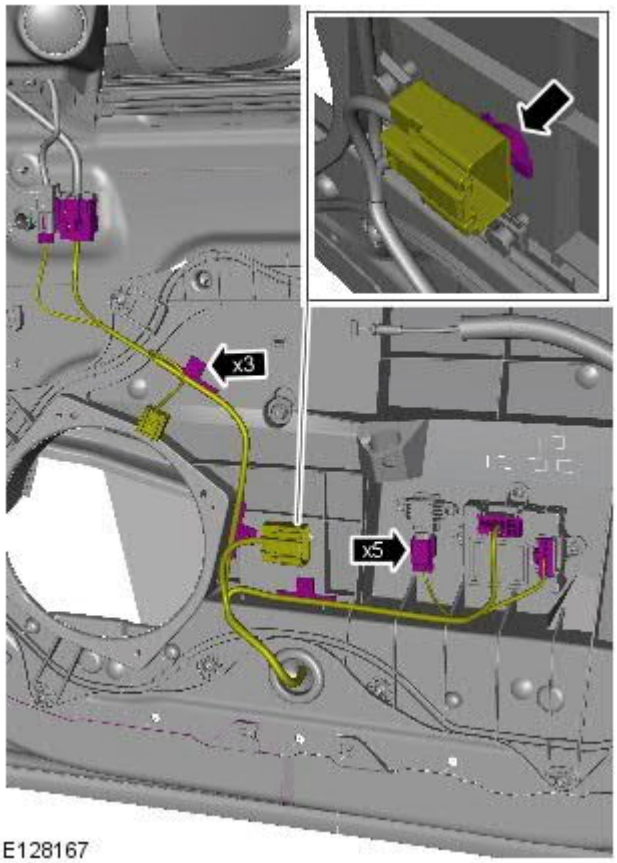
Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

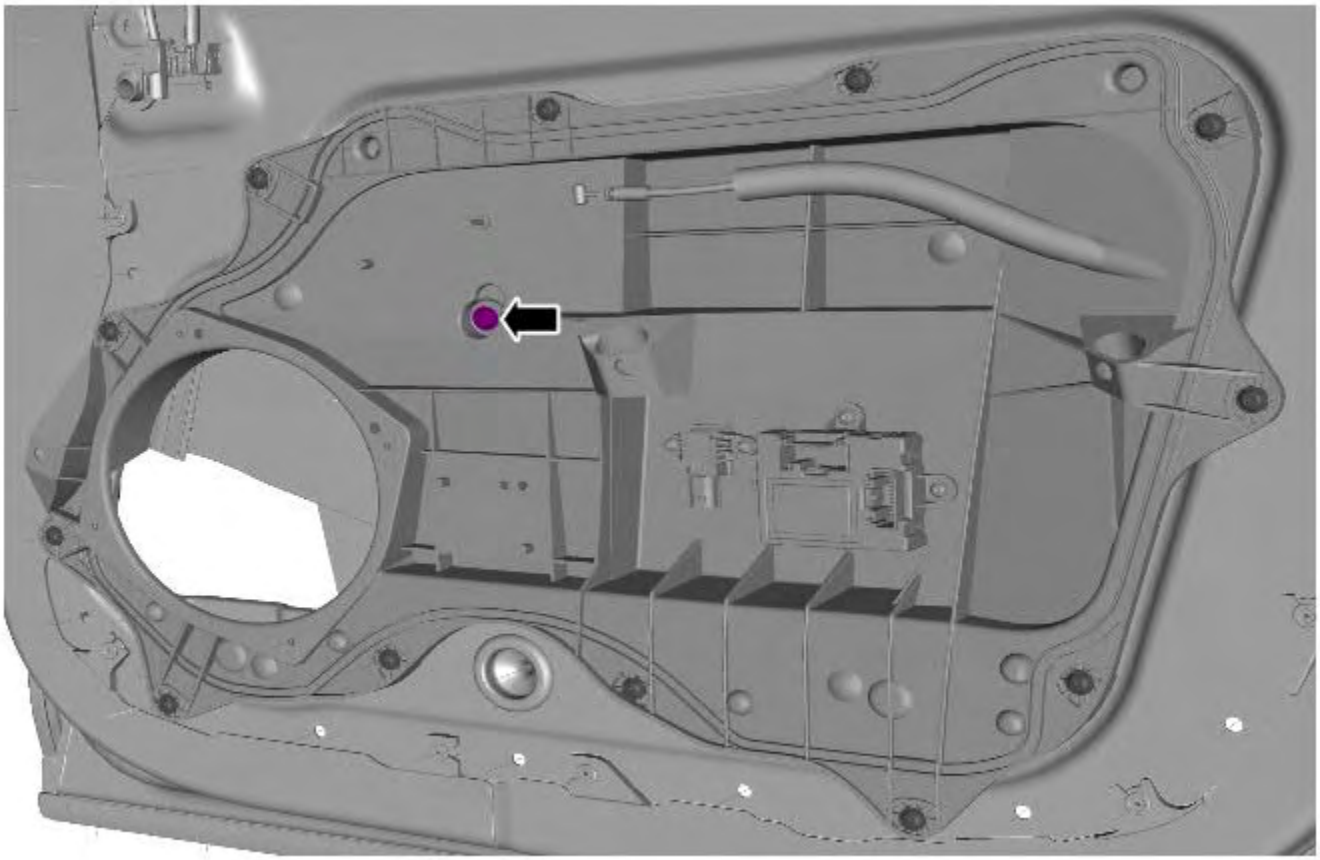
LH illustration shown, RH is similar.

1. Refer to: Front Door Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

2.

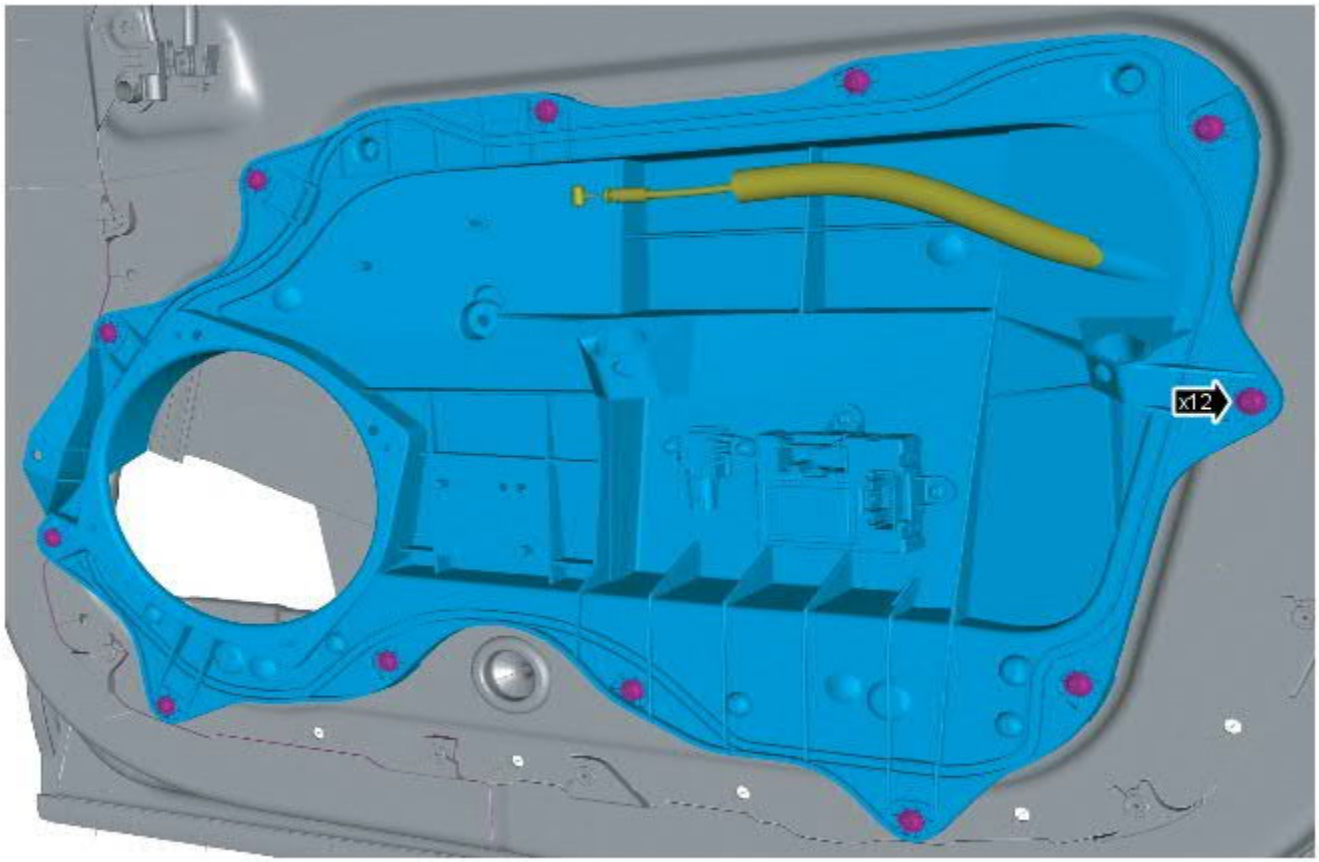


3. *Torque:* 1.1 Nm

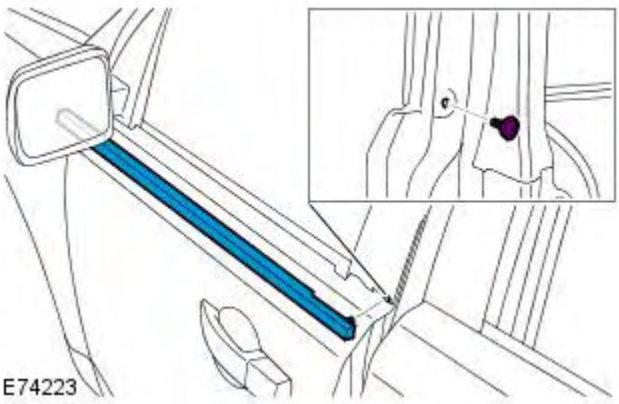


E128362

4. *Torque:* 2.2 Nm



E128170

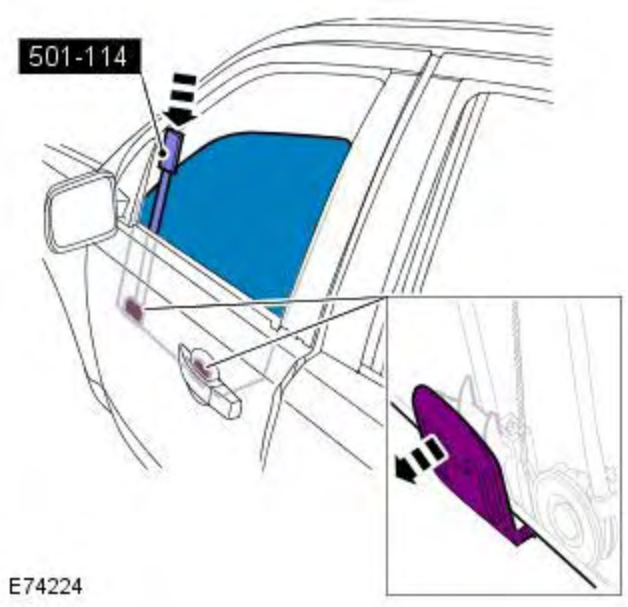


E74223

5. *Torque:* 3 Nm

6.

E94765

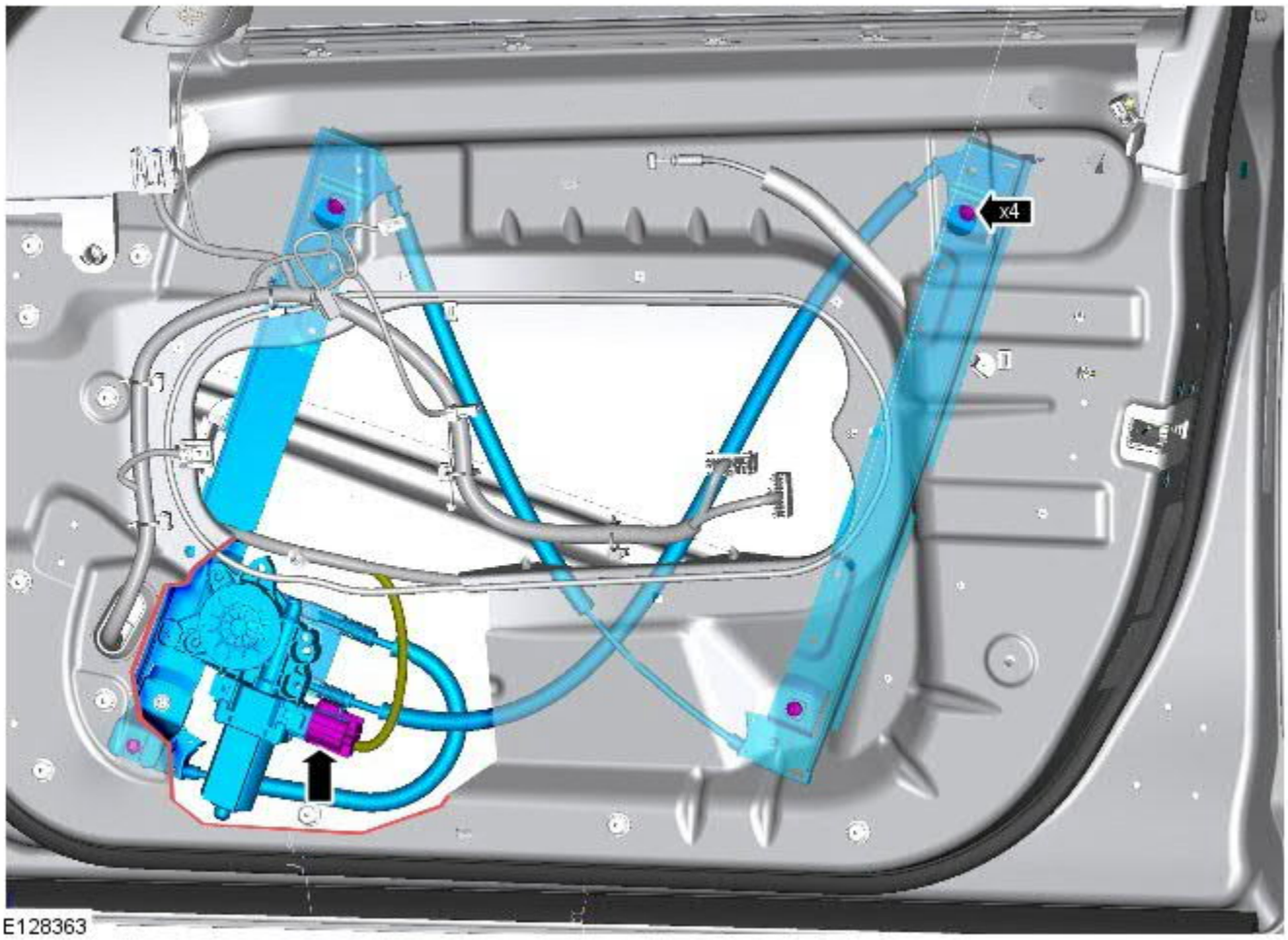


E74224

7. WARNING: Do not allow the glass to drop.

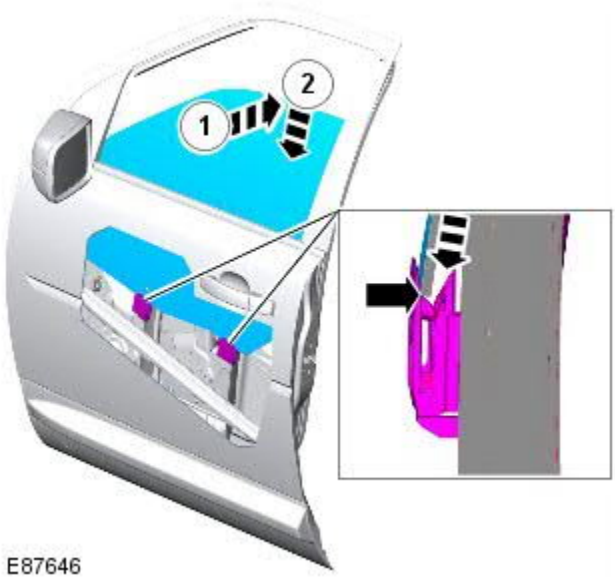
Special Tool(s): 501-114

8. *Torque:* 7 Nm



Installation

1. To install, reverse the removal procedure.



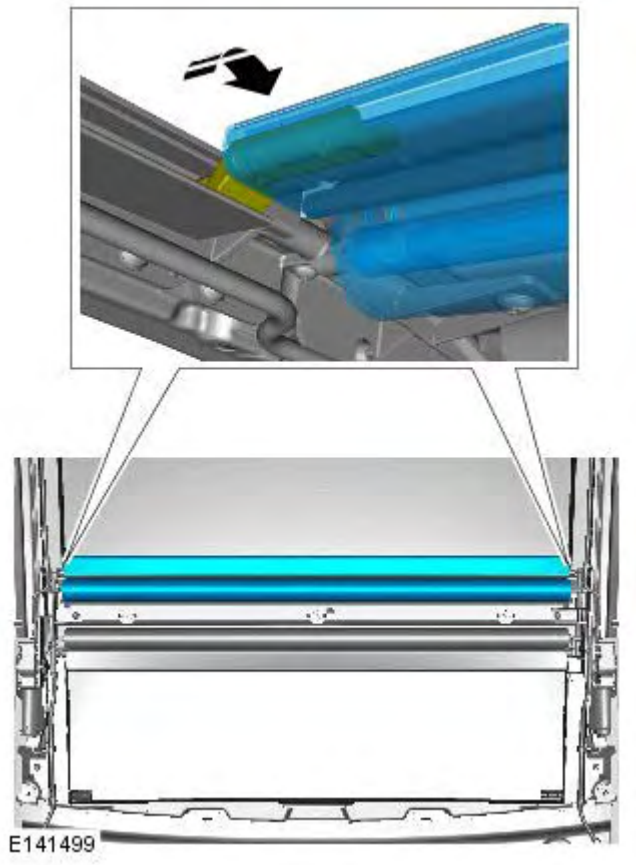
Published: 04-Apr-2012

Glass, Frames and Mechanisms - Glass Roof Panel Blind Drive Assembly

Removal and Installation

Removal

1. Refer to: Roof Opening Panel Blind (501-17 Roof Opening Panel, Removal and Installation).



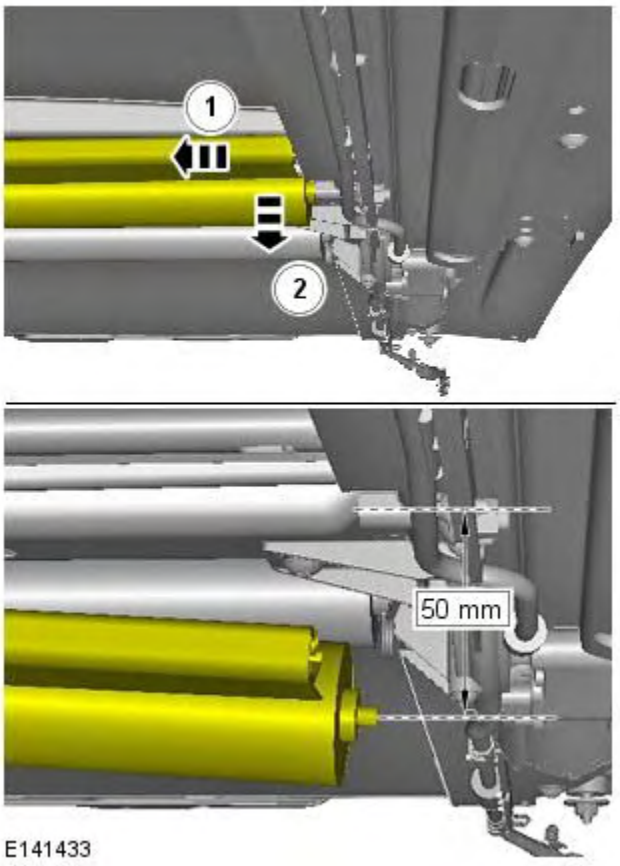
2. CAUTION: Make sure that the clips are correctly located.

   NOTES:

   Follow the animation to make sure the roof opening panel blind is removed and installed correctly from and to the guides.

   Roof opening panel blind shown, glass roof panel blind similar.

   Release the glass roof panel blind

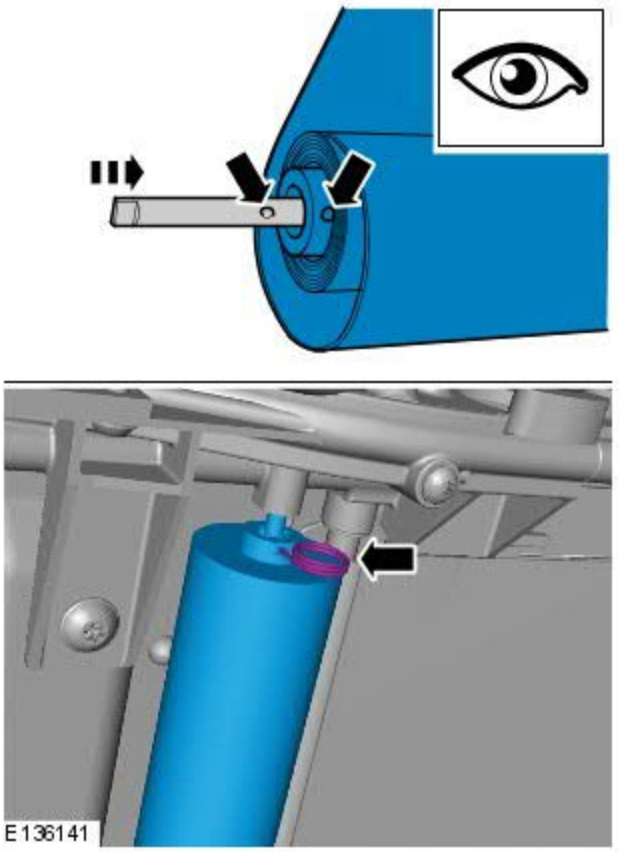


3. CAUTIONS:

Make sure that the roof opening panel blind is not lowered by more than 50 mm at one end whilst the other end is still located in to the drive mechanism.

Make sure that a firm pressure is applied to the roof opening panel blind so that tension is maintained until the retaining clip is correctly located.

NOTE: Roof opening panel blind shown, glass roof panel blind similar.



4. CAUTIONS:

Make sure that the clip is correctly located.

If the correct clip is not available, make sure that a suitable hardened pin is used such as a drill bit, do not use a paperclip.

Make sure that the roof opening panel blind is not released from the drive mechanism until the clip has been correctly located.

NOTE: Roof opening panel blind shown, glass roof panel blind similar.

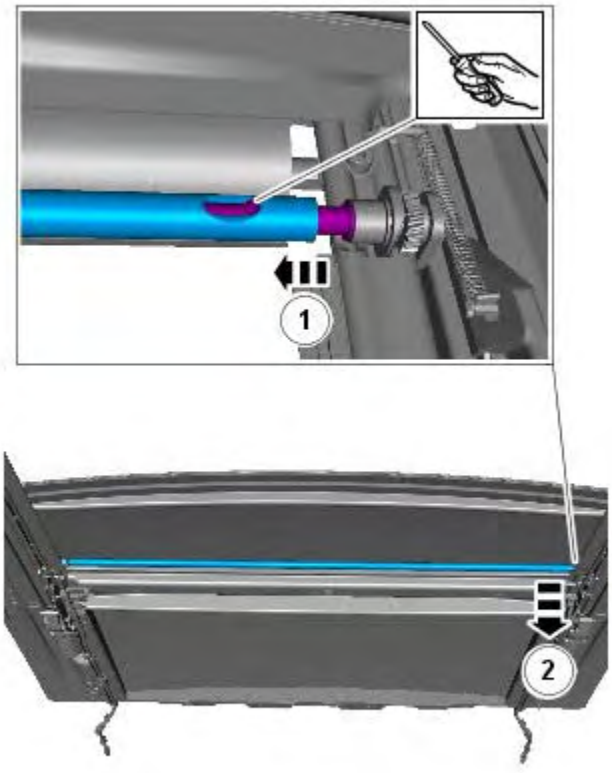
Install the retaining clip.

E141357

5. CAUTION: Note the installed position of the component prior to removal.

NOTE: The procedure must be carried out on the front and rear blind feet.

6.



E141938

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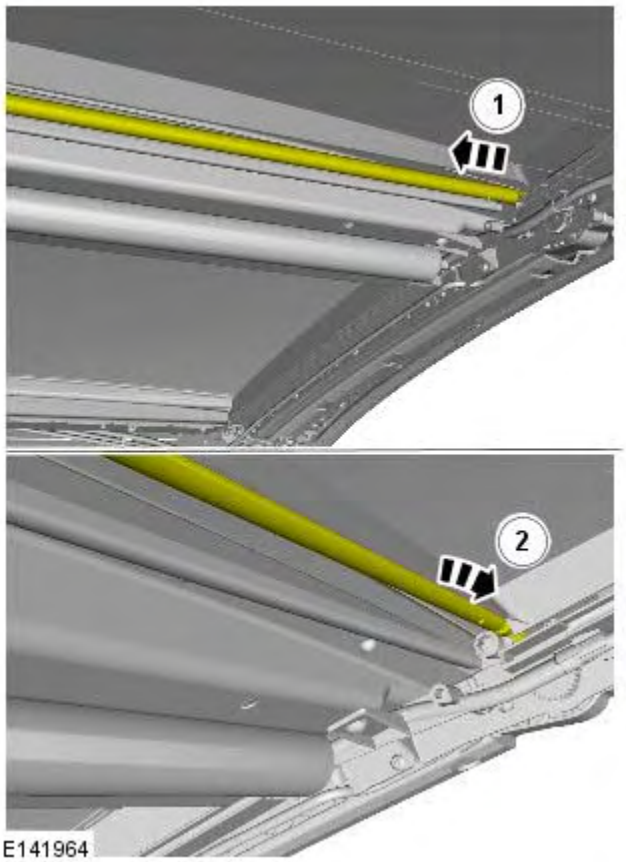
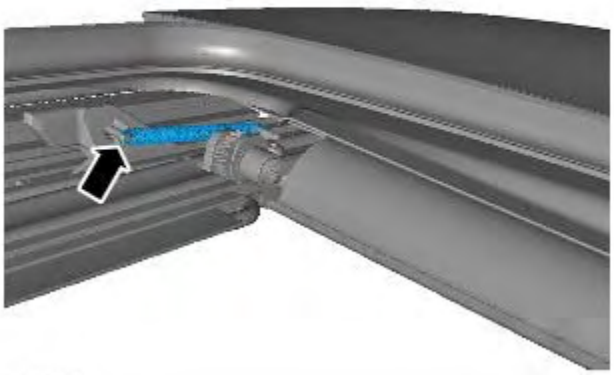


E141964

8.

E141942

9.



E141943

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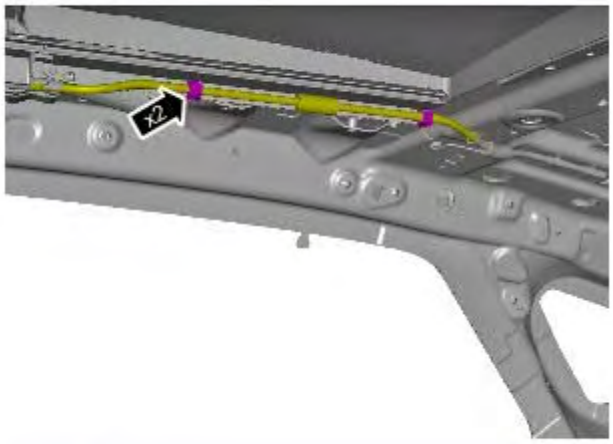
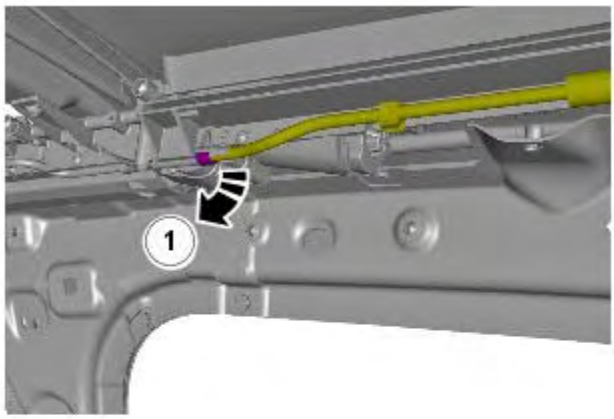
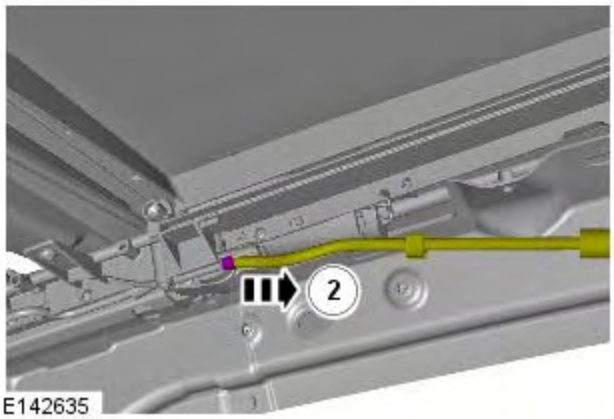
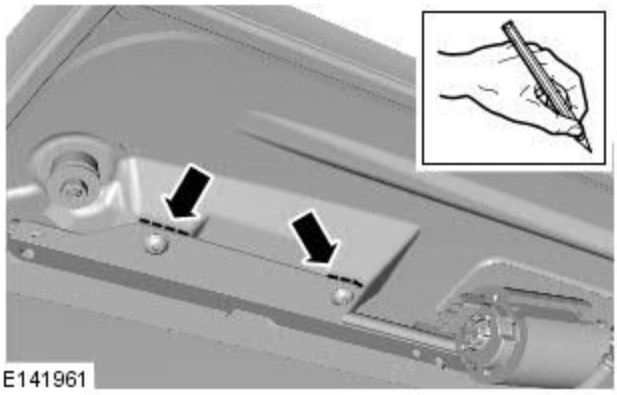


E142634

11.





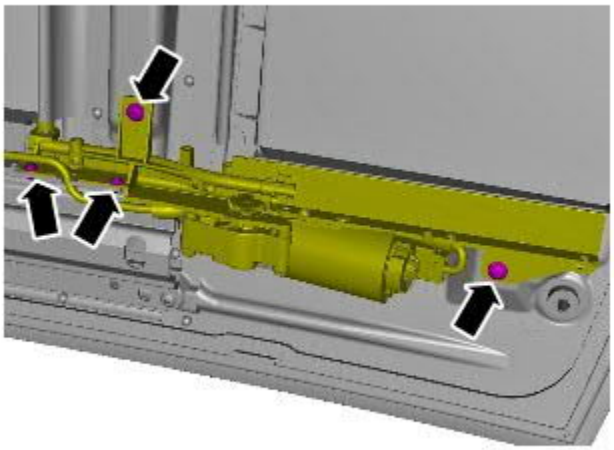


12. NOTES:

Long wheel base shown, short wheel base similar.

Long wheel base vehicle shown with 2 fixings, some long wheel base vehicles will have 1 fixing.

Short wheelbase

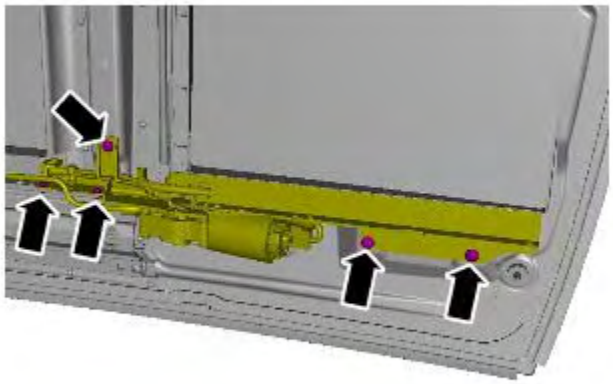


E142636

13. CAUTION: Note the orientation of the washers prior to removal.

NOTE: Remove and discard the washers.

Long wheelbase



E142637

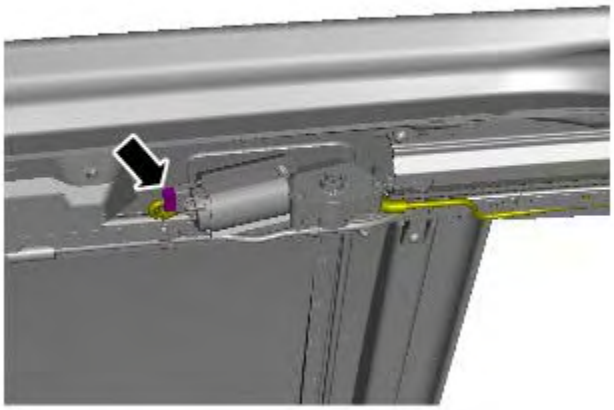
14. CAUTION: Note the orientation of the washers prior to removal.

NOTES:

Long wheel base vehicle shown with 5 fixings, some long wheel base vehicles will have 4 fixings.

Remove and discard the washers.

15.

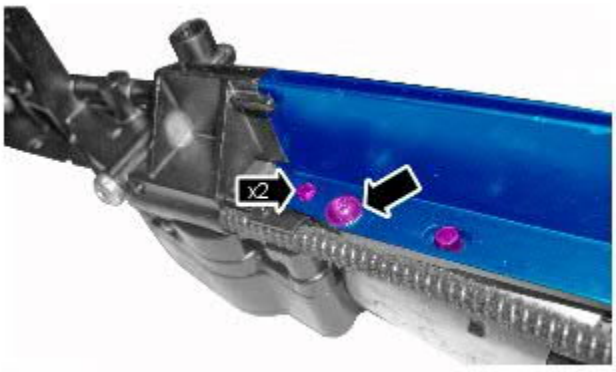


E142638

16. NOTE: Note the installed position of the blind drive mechanism cables during removal.

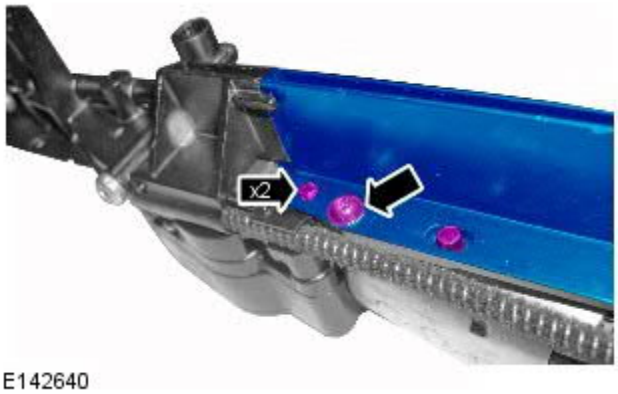
E142639

17. NOTE: Note the orientation of the blind drive mechanism cables during removal.



E142640

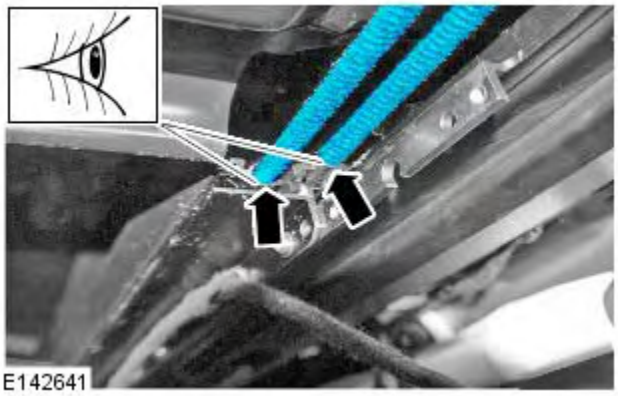
Installation



E142640

1. NOTE: Make sure that the blind drive mechanism cables are in the correct orientation before installing the rear guide.

   Torque: 4 Nm


E142641

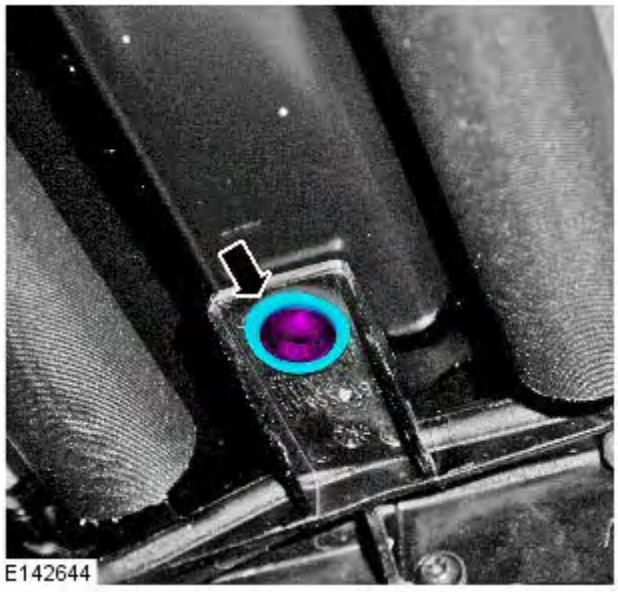
2. NOTE: Make sure that the blind drive mechanism cables are in the correct orientation before installing the rear guide.

E142642

3. NOTE: Make sure that the blind drive mechanism cables are correctly aligned to the installed position.

E142643

4. Slide the washer in from the centre of the vehicle until it is aligned with the threaded hole.

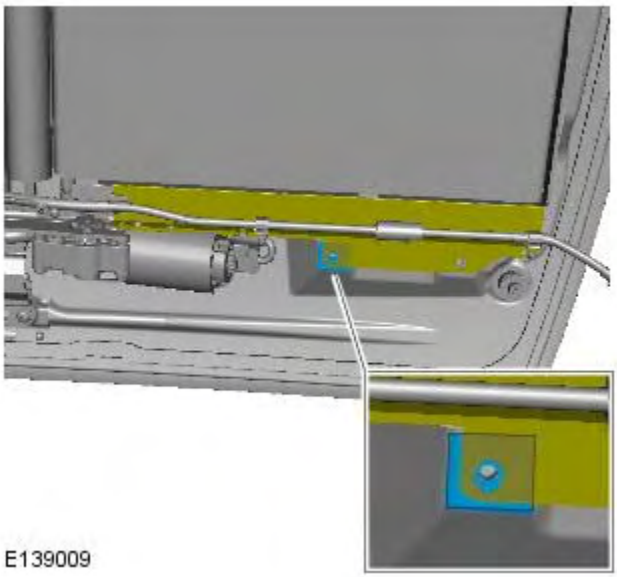

E142644

5. CAUTIONS:

   Make sure that the thread is free from foreign material and debris

   Do not fully tighten the Torx bolt at this stage.

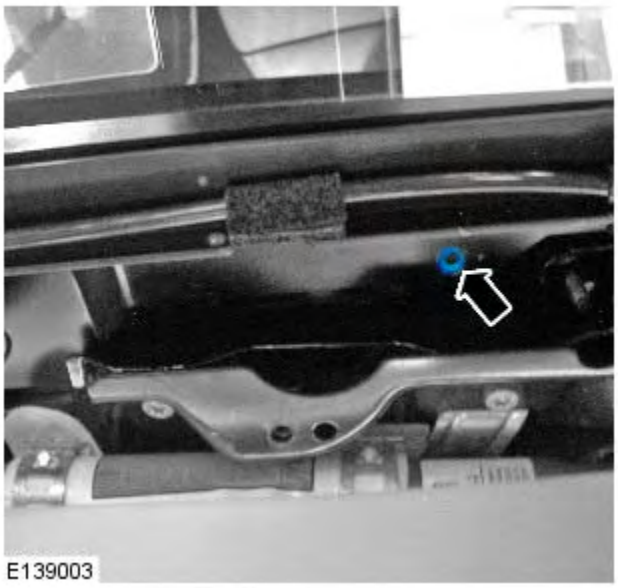
Long wheelbase



6. NOTE: Make sure that an adhesive pad is installed above the front fixing hole.

   If not already installed, install an adhesive pad above the front fixing hole.

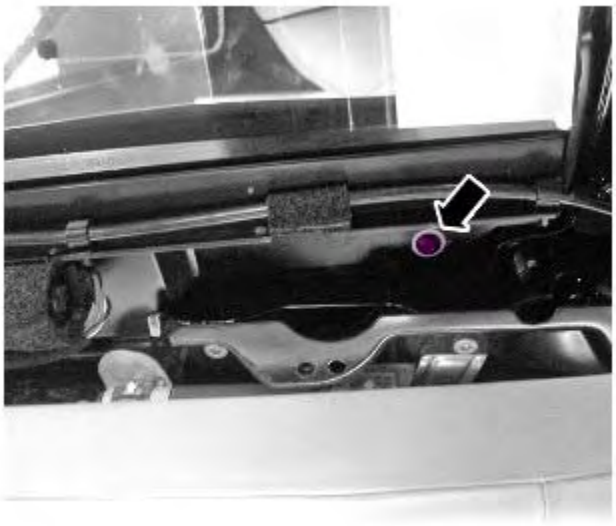
All vehicles



7. CAUTION: Do not install the front Torx bolt on long wheel base vehicles.

   NOTE: Long wheel base shown, short wheel base similar.

   Slide the washer in from the centre of the vehicle until it is aligned with the threaded hole.



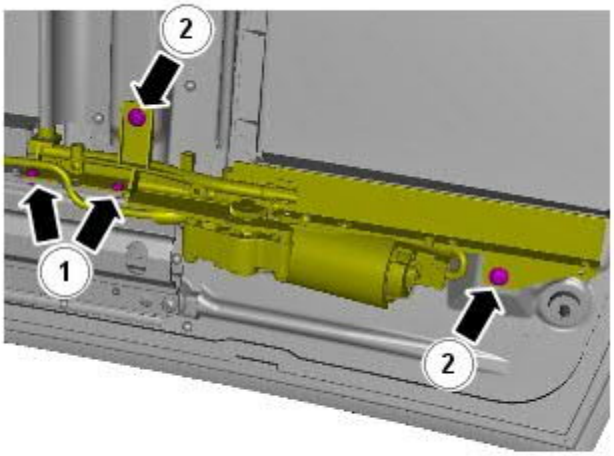
E139005

8. CAUTIONS:

   Make sure that the thread is free from foreign material and debris

   Do not fully tighten the Torx bolt at this stage.

   NOTE: Long wheel base shown, short wheel base similar.



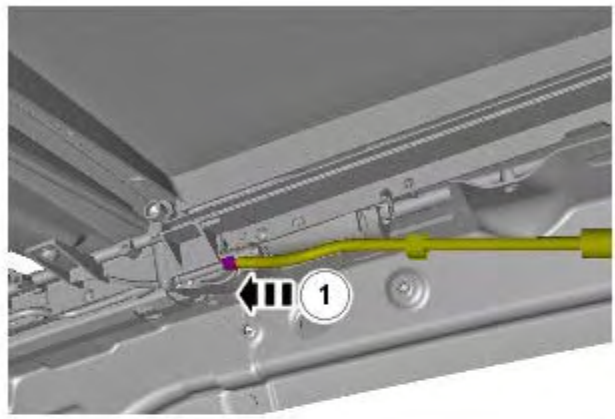
E142648

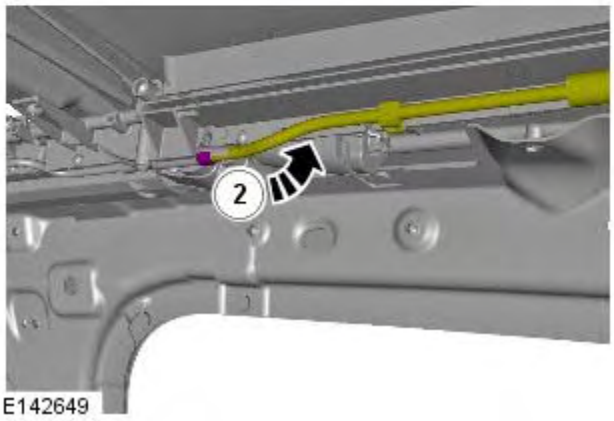
9. CAUTION: Make sure that the roof rail is correctly aligned.

   NOTE: Short wheel base shown, long wheel base similar.

   Torque: 4 Nm

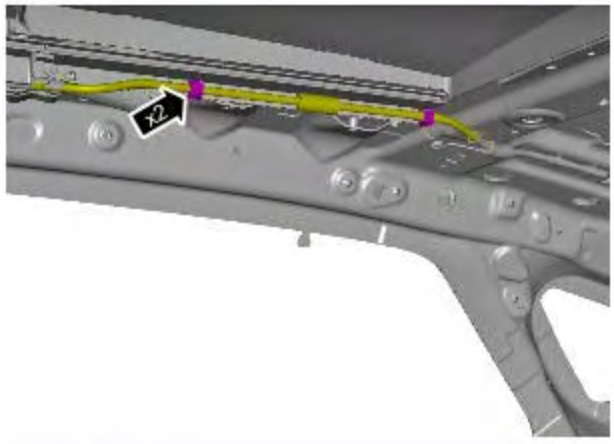
10.





E142649

11.



E142634

E141337

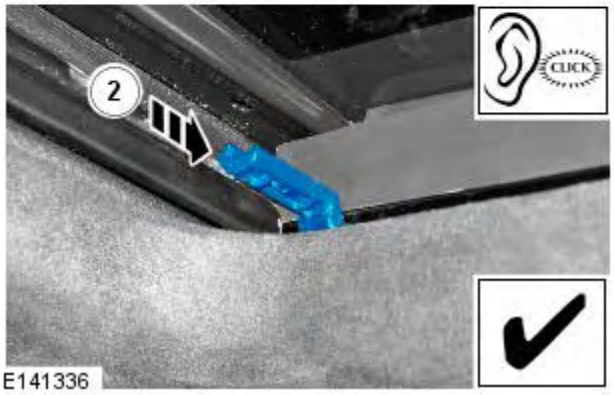
12. CAUTION: Do not directly force the blind feet in to the installed position. Failure to follow this instruction may result in damage to the component.

13. NOTES:

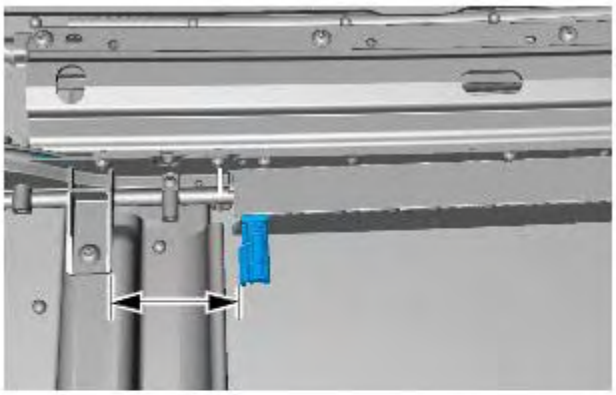
An audible click can be heard when the component is correctly located.

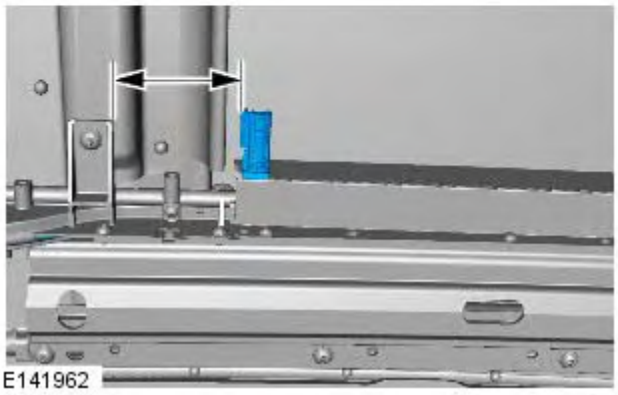
The procedure must be carried out on the front and rear blind feet.

1. Hold the blind foot at an angle and slide it along the rail until contact is made with the drive mechanism.
2. Rotate the blind foot in to the installed position.



E141336



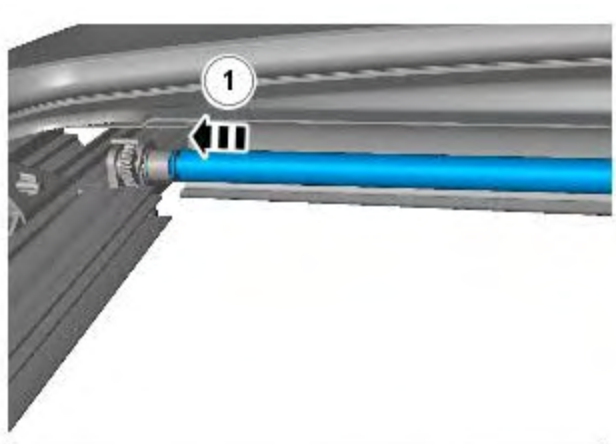


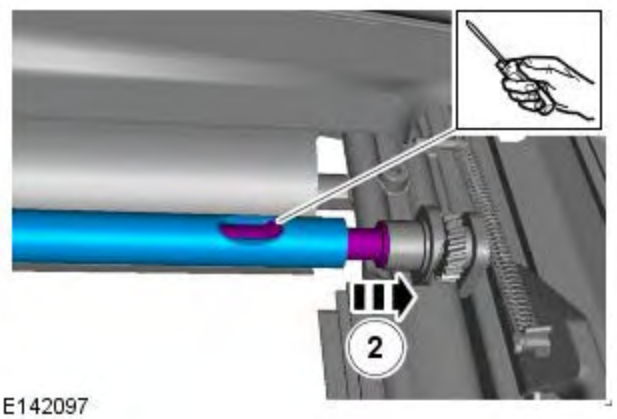
E141962

14. CAUTION: Make sure that the blind feet for each blind are positioned at an equal distance from the center of the vehicle.

NOTE: The procedure must be carried out on the front and rear blind feet.

Slide the blind foot along the guide until it is level with the foot on the other side of the vehicle.

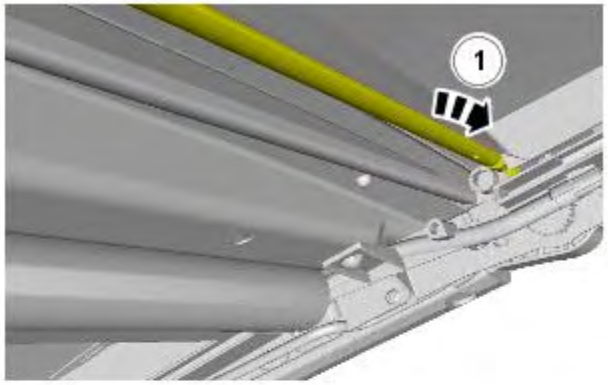


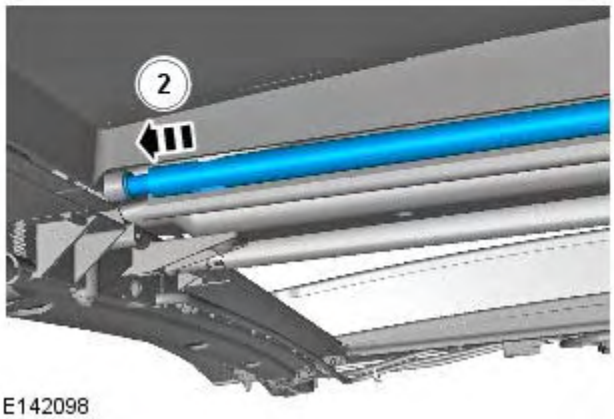


E142097

15.

16.





E142098

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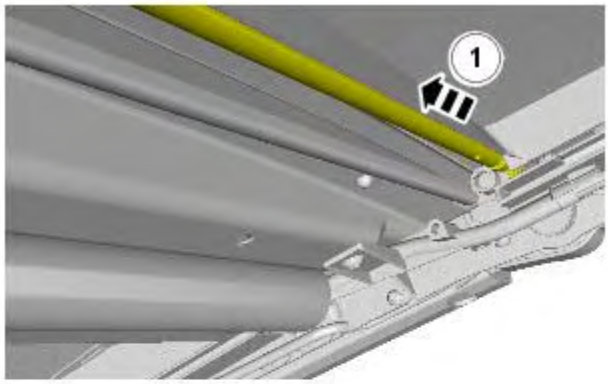
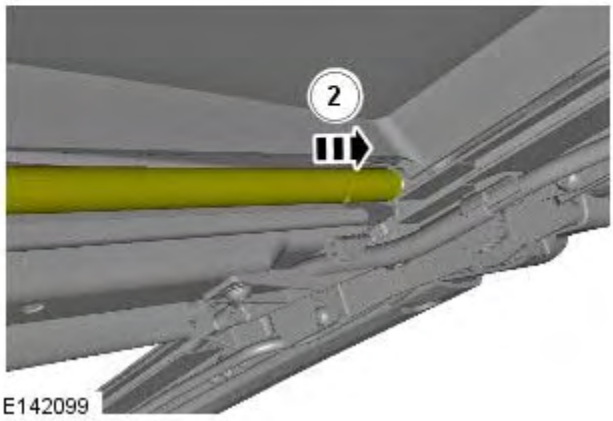
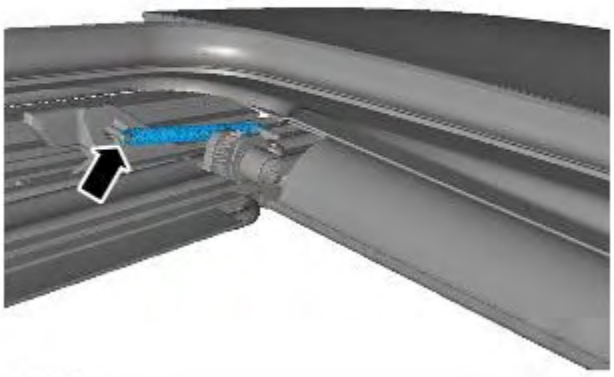




E142099

18.



E141943

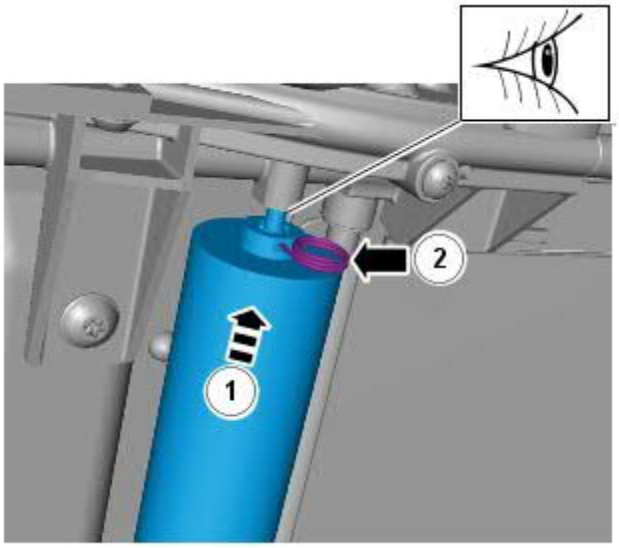
19. CAUTIONS:

Make sure that a firm pressure is applied to the glass roof panel blind so that tension is maintained until the glass roof opening blind is correctly located.

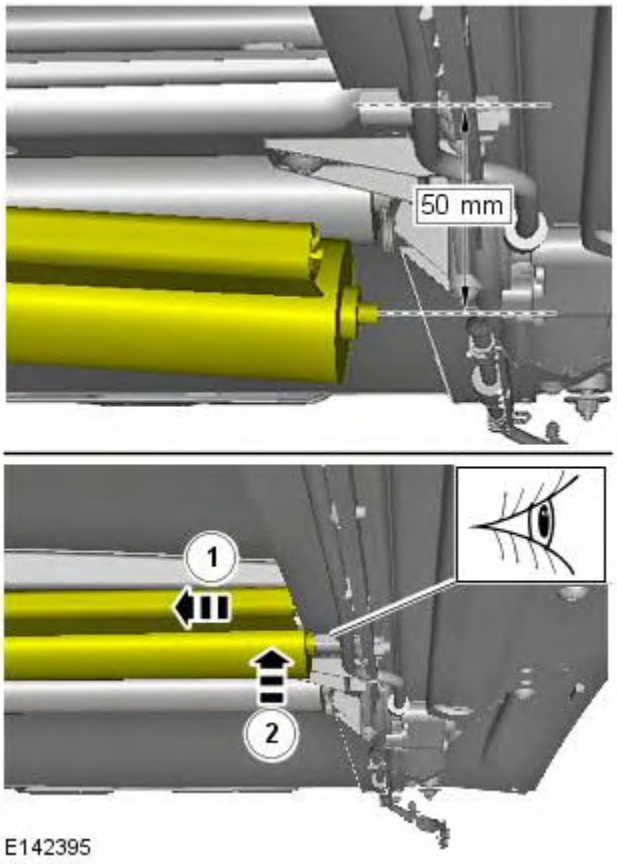
Make sure that the glass roof panel blind is not lowered by more than 50 mm at one end whilst the other end is still located in to the drive mechanism.

NOTE: Roof opening panel blind shown, glass roof panel blind similar.

Remove the retaining clip.



E142394

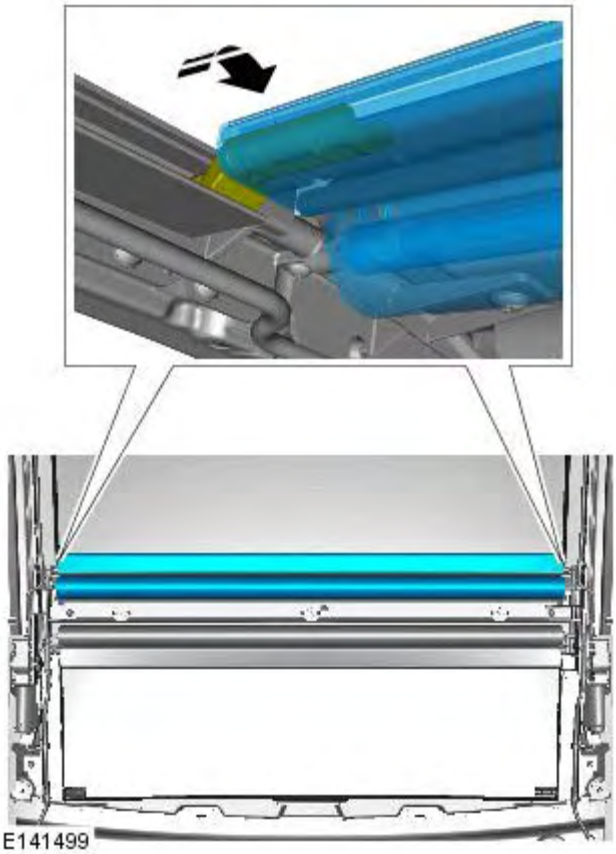


20. CAUTIONS:

    Make sure that a firm pressure is applied to the glass roof panel blind so that tension is maintained until the glass roof opening blind is correctly located.

    Make sure that the glass roof panel blind is not lowered by more than 50 mm at one end whilst the other end is still located in to the drive mechanism.

    NOTE: Roof opening panel blind shown, glass roof panel blind similar.



21. CAUTION: Make sure that the clips are correctly located.

    NOTES:

    Follow the animation to make sure the roof opening panel blind is removed and installed correctly from and to the guides.

    Roof opening panel blind shown, glass roof panel blind similar.

    Secure the glass roof panel blind

22. Refer to: Roof Opening Panel Blind (501-17 Roof Opening Panel, Removal and Installation).

This section contains no data

Published: 11-May-2011

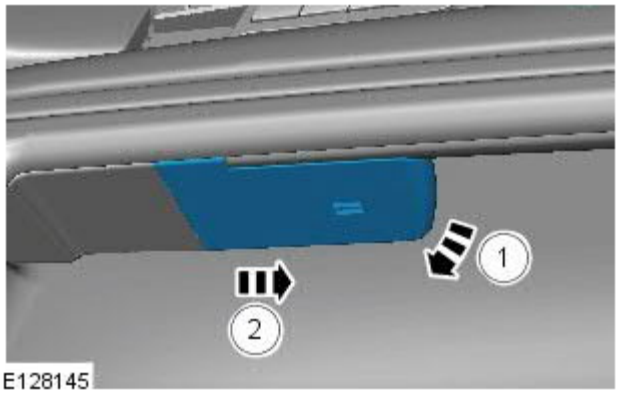
Glass, Frames and Mechanisms - Passenger Door Window Control Switch

Removal and Installation

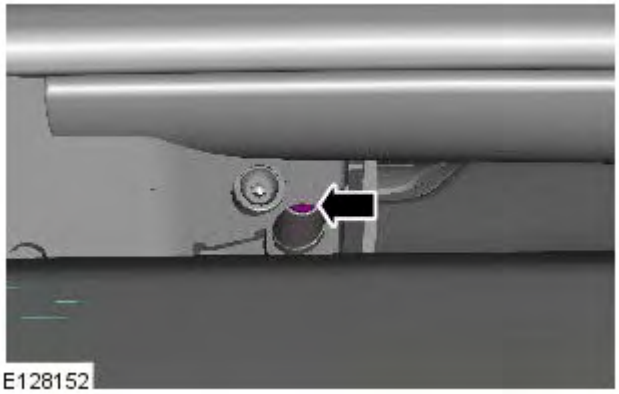
Removal

NOTE: **Some variation in the illustrations may occur, but the essential information is always correct.**

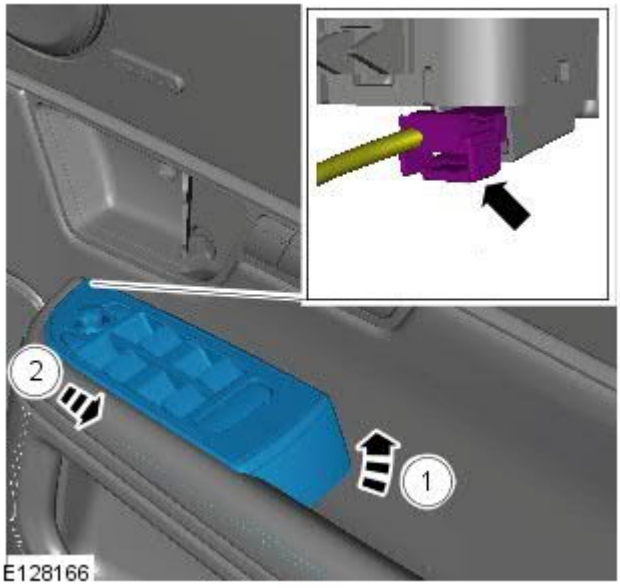
1.



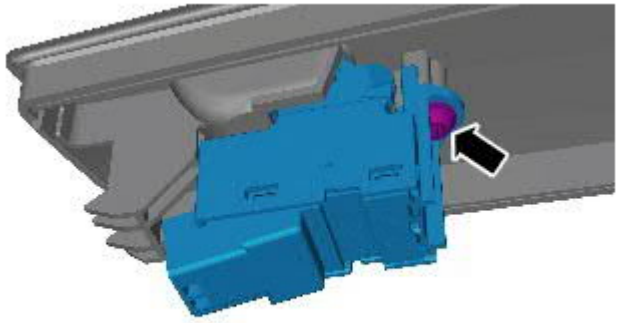
2.



3.



4.



E128149

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Glass, Frames and Mechanisms - Rear Door Window Glass

Removal and Installation

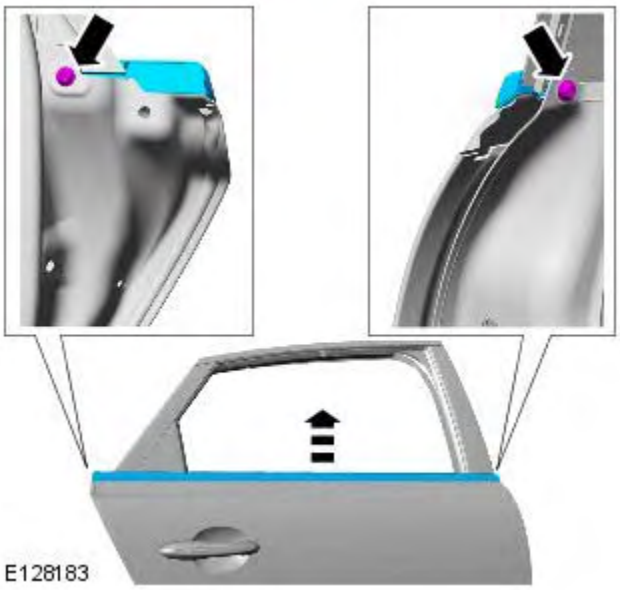
Removal

NOTES:

Removal steps in this procedure may contain installation details.

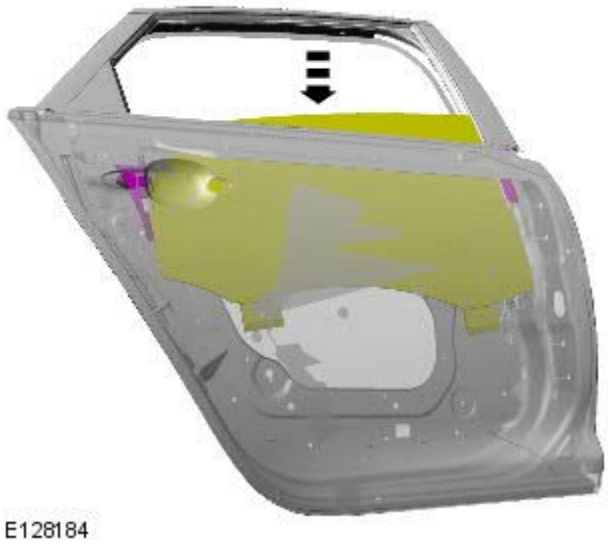
RH illustration shown, LH is similar.

1. Refer to: Rear Door Window Regulator and Motor (501-11 Glass, Frames and Mechanisms, Removal and Installation).



2. *Torque:* 5 Nm

3.



4.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Glass, Frames and Mechanisms - Rear Door Window Regulator and Motor

Removal and Installation

Removal

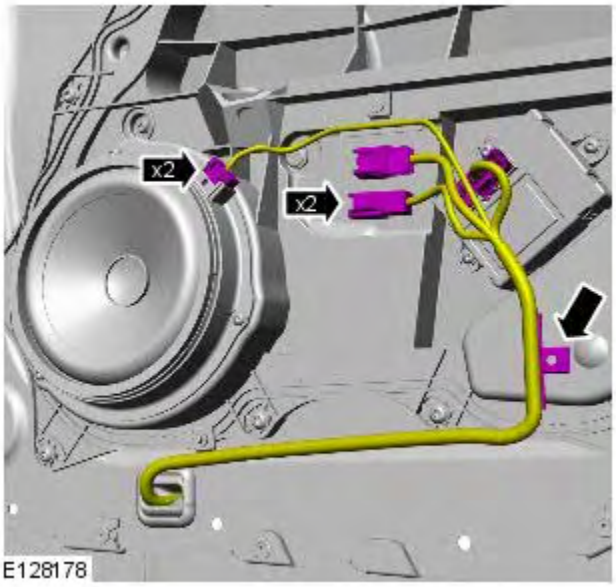
NOTES:

Removal steps in this procedure may contain installation details.

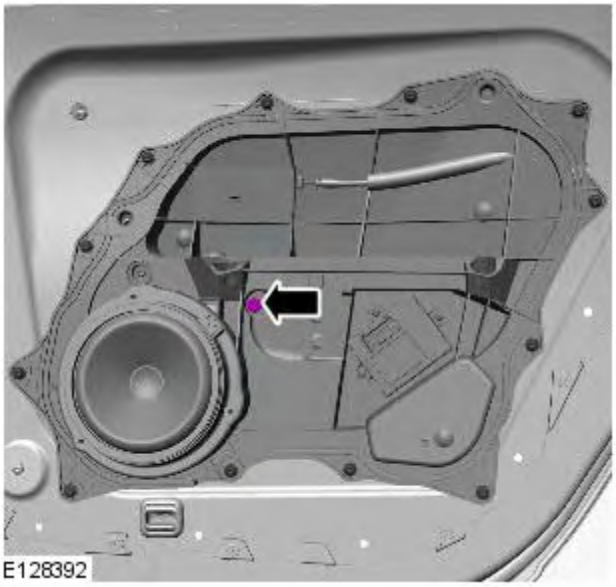
RH illustration shown, LH is similar.

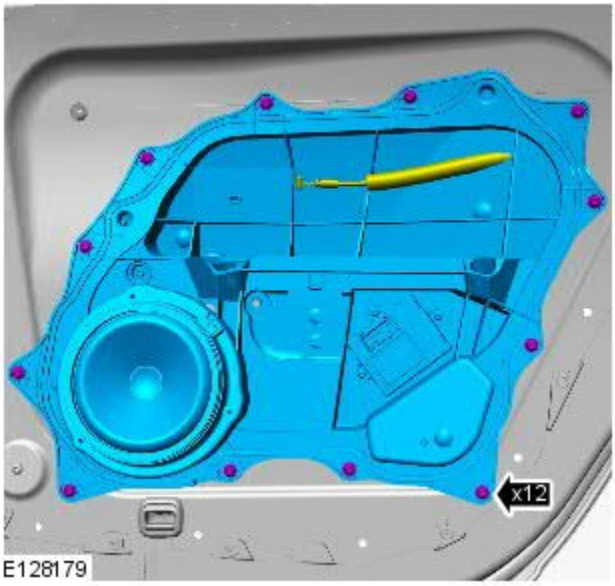
1. Refer to: Rear Door Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

2.

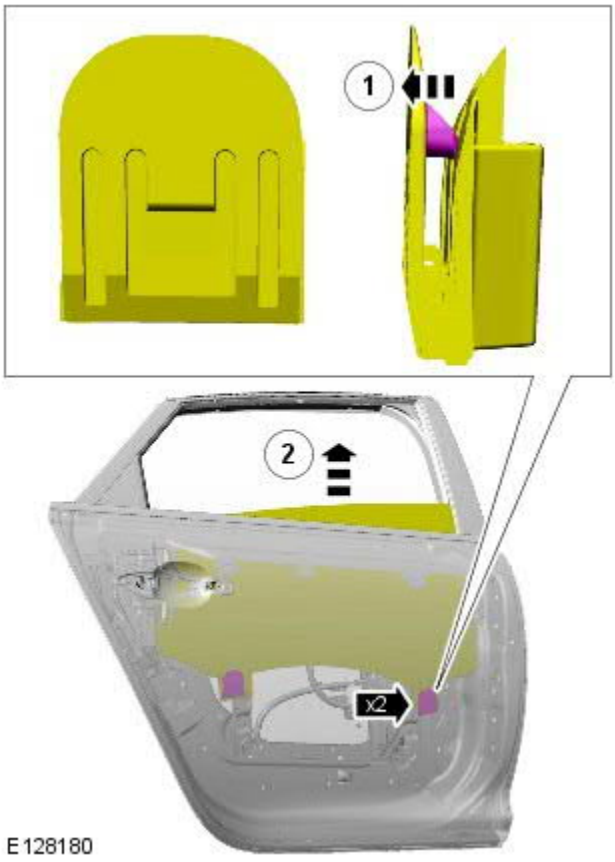


3. *Torque:* 1.1 Nm

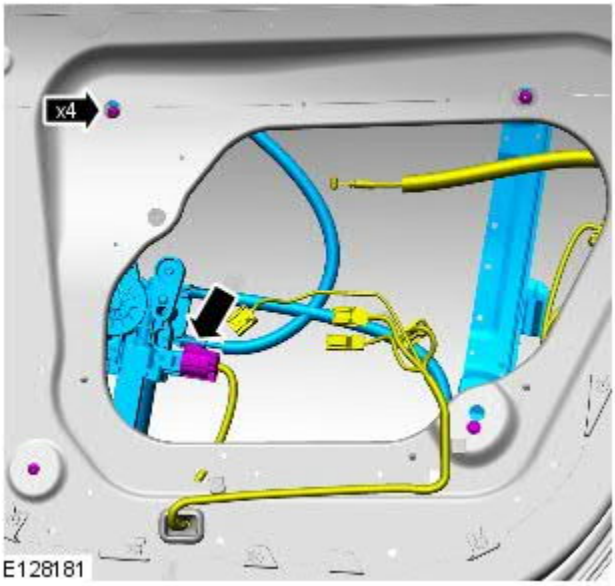




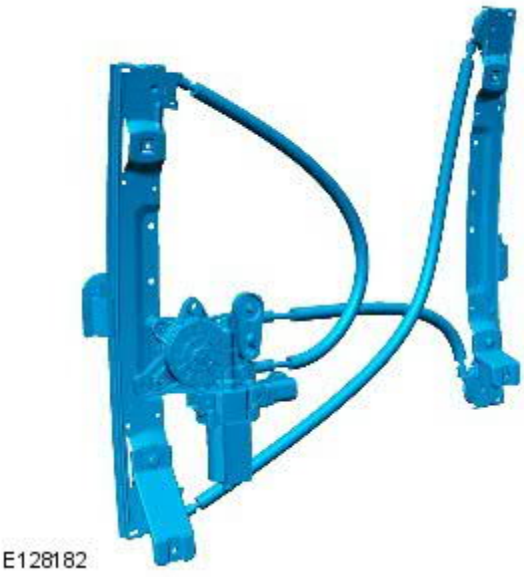
4. *Torque:* 2.2 Nm



5.



6. *Torque:* 7 Nm



7.

Installation

1. To install, reverse the removal procedure.

Published: 04-Sep-2013

Glass, Frames and Mechanisms - Rear Glass Roof Panel

Removal and Installation

Removal

CAUTIONS:

Always protect the interior components when removing body glass.

Protect the surrounding paintwork to avoid damage.

Measure all gaps between the glass roof panels before prior to removal to help aid installation.

NOTE: The cutting blades used in this procedure are from the standard BTB glass removal kit.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. Refer to: Interior Rear View Mirror (501-09 Rear View Mirrors, Removal and Installation).

3. Refer to: Overhead Console (501-12 Instrument Panel and Console, Removal and Installation).

4. NOTE: The procedure must be carried out on both sides.

   Refer to: Sun Visor (501-05 Interior Trim and Ornamentation, Removal and Installation).

5. NOTE: The procedure must be carried out on both sides.

   Refer to: A-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

6. NOTE: The procedure must be carried out on both sides.

   Refer to: B-Pillar Upper Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

7. NOTE: The procedure must be carried out on both sides.

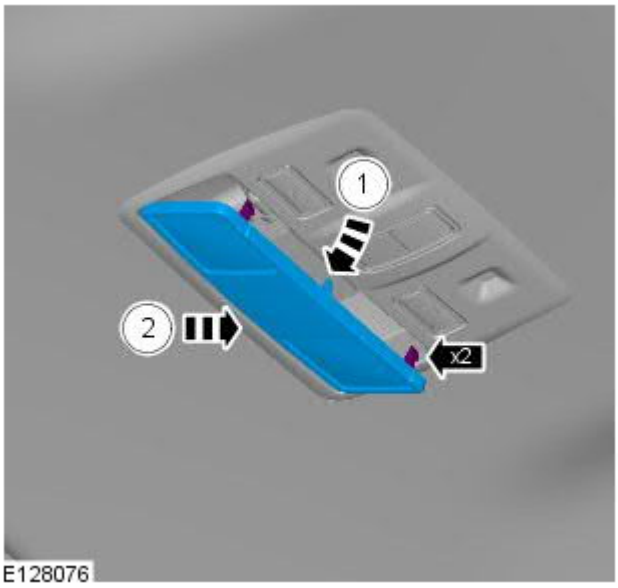
   Refer to: C-Pillar Lower Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

8. NOTE: The procedure must be carried out on both sides.

   Refer to: Front Seat (501-10 Seating, Removal and Installation).

9. *Torque:* 2 Nm

10.



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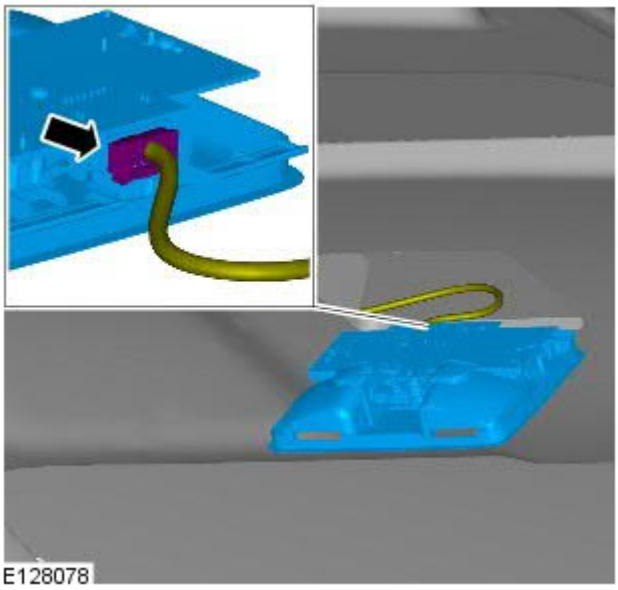

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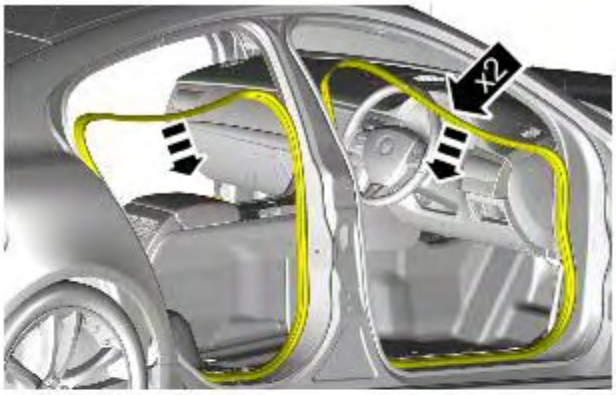
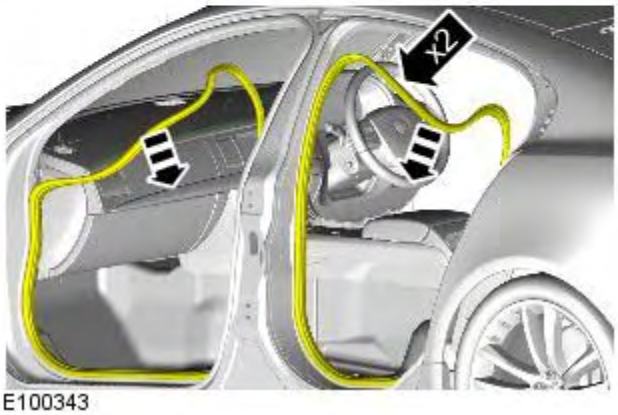
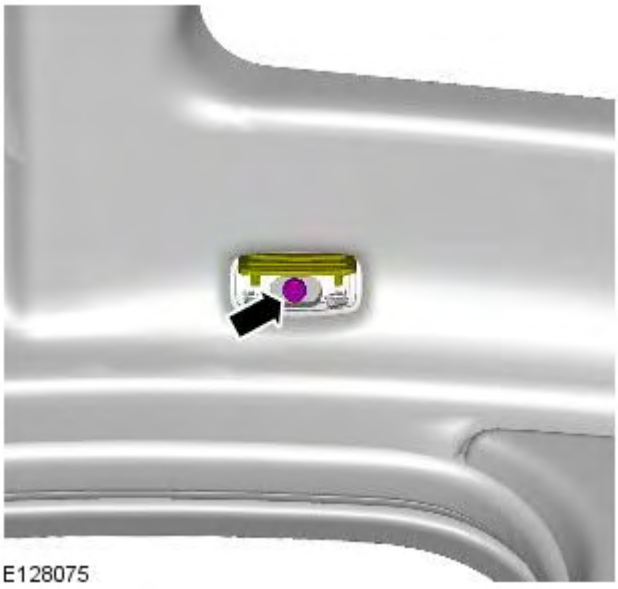




E100343



E128075

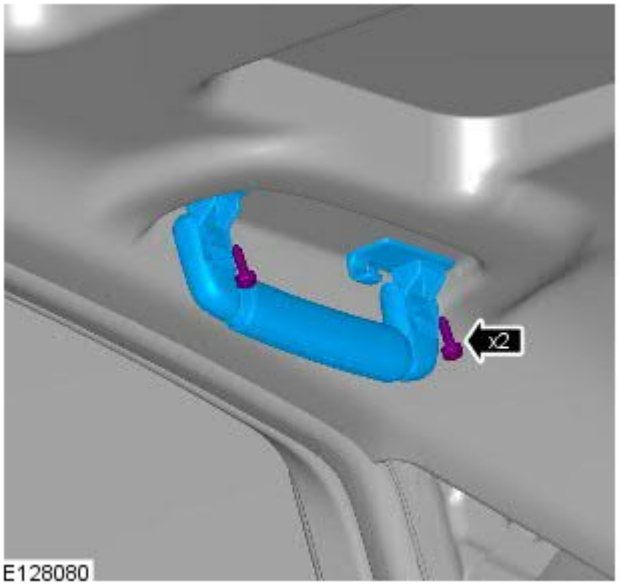
13. CAUTION: Note the fitted position of the component prior to removal.

NOTES:

Right-hand shown, left-hand similar.

The procedure must be carried out on both sides.

Torque: 2 Nm



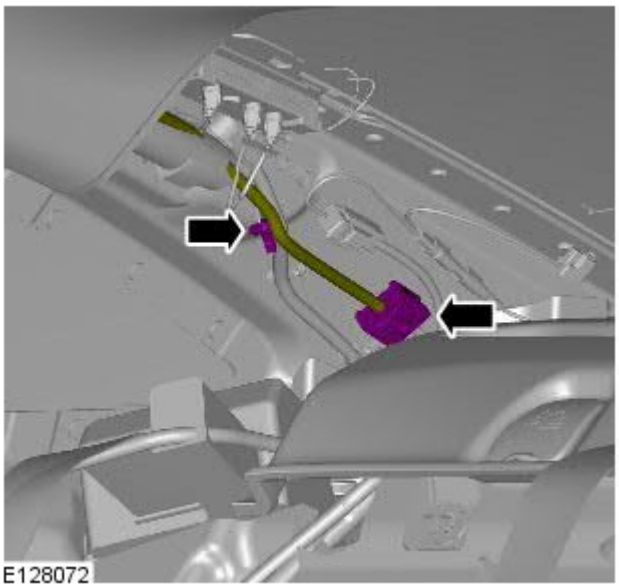
14. CAUTION: Note the fitted position of the component prior to removal.

    NOTES:

    Right-hand shown, left-hand similar.

    The procedure must be carried out on both sides.

    Torque: 2 Nm



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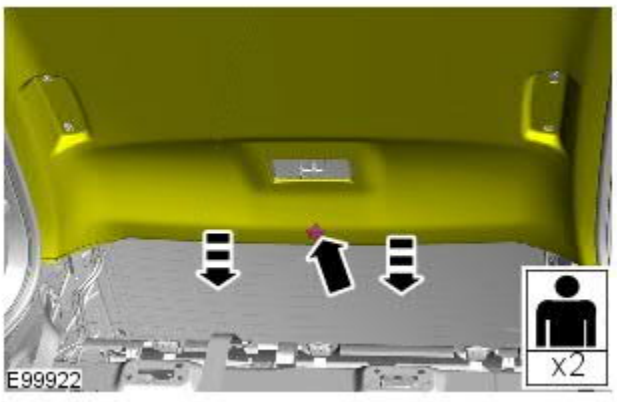
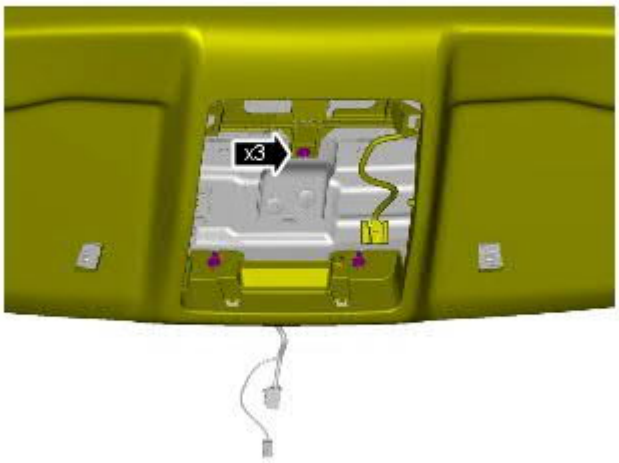


16. WARNING: This step requires the aid of another technician.

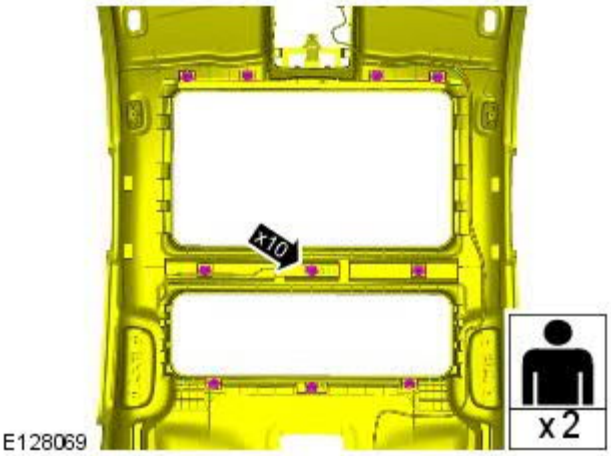
17. WARNING: This step requires the aid of another technician.

CAUTION: Note the fitted position of the component prior to removal.



E128070

18. NOTE: This step requires the aid of another technician.



E128069

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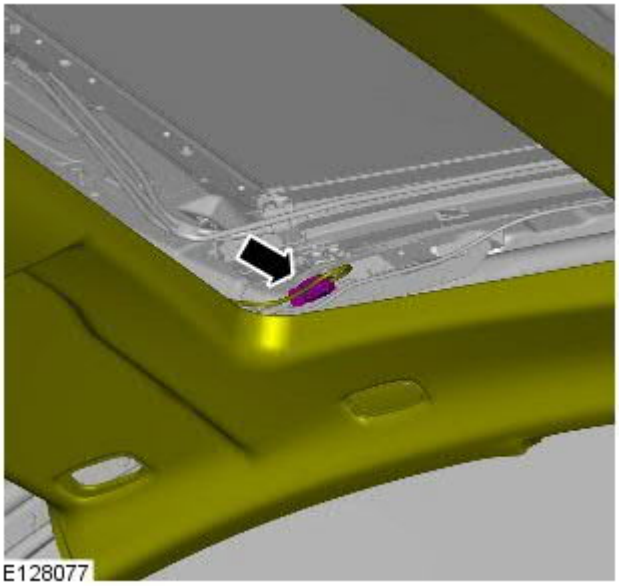
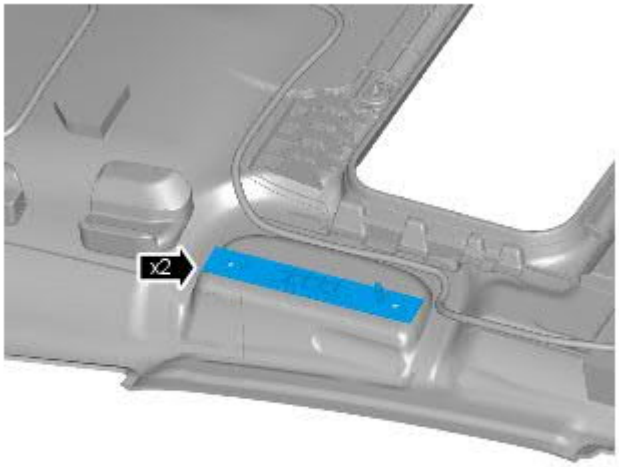

E128077

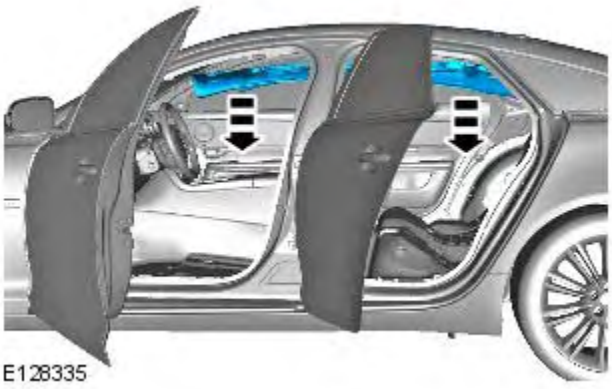
19. NOTE: This step requires the aid of another technician.



E128068

20. CAUTION: Note the fitted position of the component prior to removal.

NOTE: Right-hand shown, left-hand similar.


E128335

21. CAUTION: Protect the surrounding trim to avoid damage.

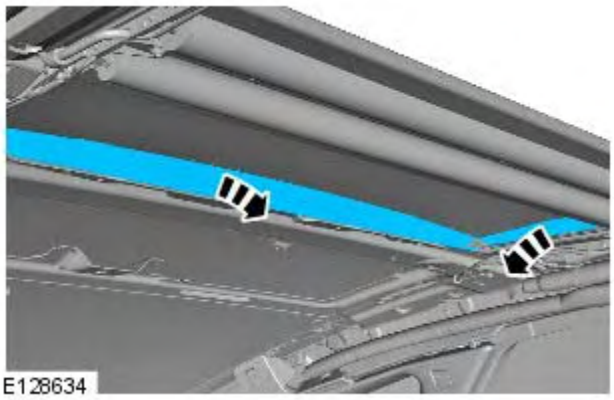
NOTE: Lower and reposition the headliner to aid access.

22. Refer to: Roof Opening Panel Glass (501-17 Roof Opening Panel, Removal and Installation).

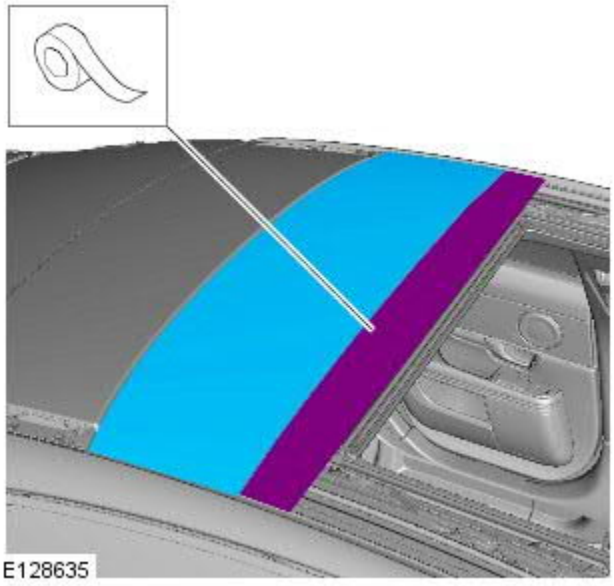
23.

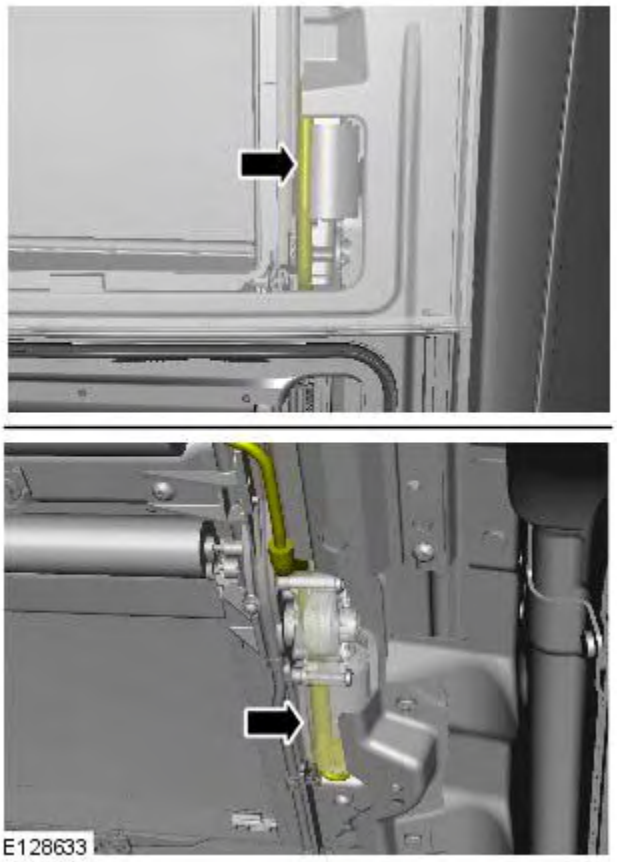
- Prepare the PU adhesive in accordance with the instructions included with the PU adhesive kit.

24.

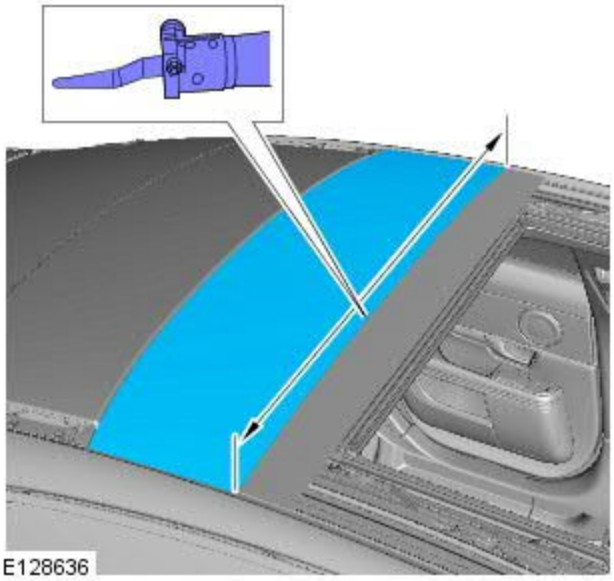


25. CAUTION: Use suitable tape to protect the roof opening panel weather strip.





26. CAUTION: Using suitable tape, protect the roof opening panel bilnd motor wiring harness.

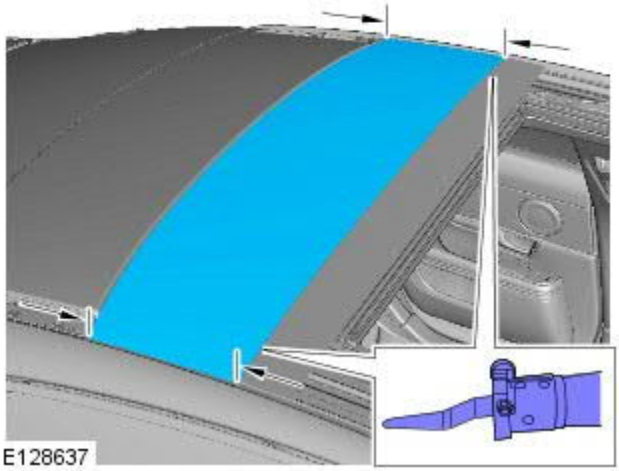


27. CAUTION: A metal strip should be installed between the bottom of the blade and the taped-down components. This will reduce friction and allow the blade to cut easier.

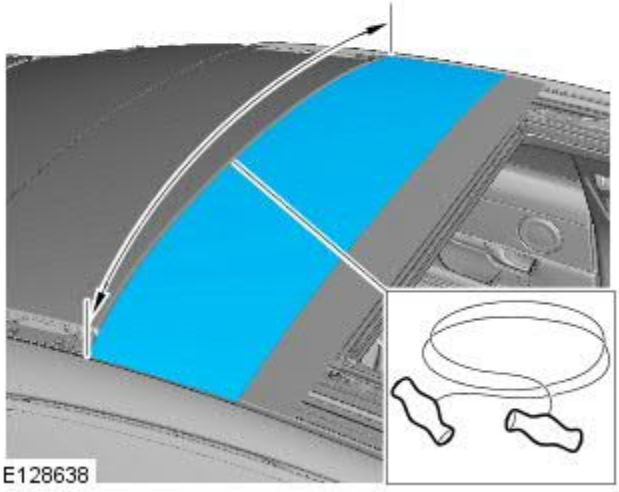
- Use a WK2S blade, cutting with the flat side against the body.

28. CAUTION: A metal strip should be installed between the bottom of the blade and the taped-down components. This will reduce friction and allow the blade to cut easier.

- Use a WK2S blade, cutting with the flat side against the body, a WK1X blade may be needed for long wheelbase vehicles.



29. CAUTION: Using cheese wire to carry out this operation will potentially cause damage to the glass plastic lamination. A new component must be installed if the glass plastic lamination is damaged.



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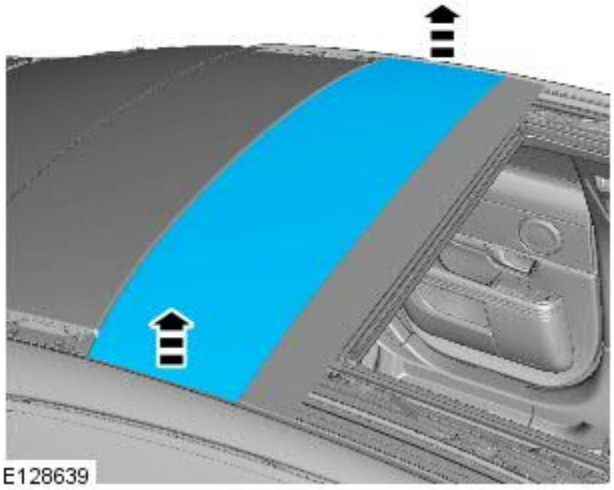
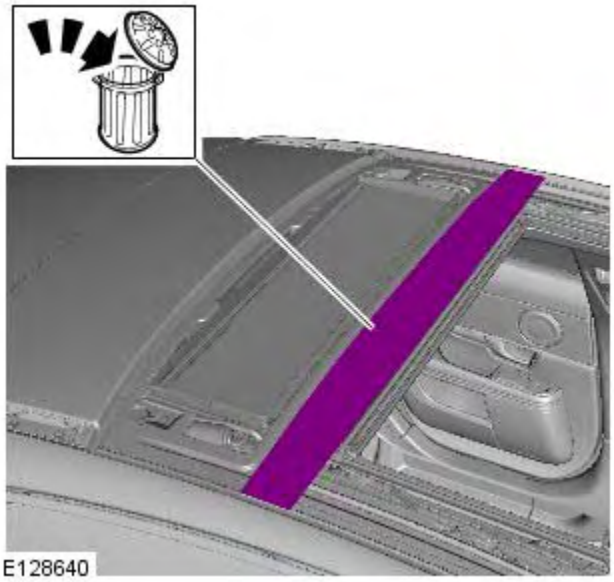
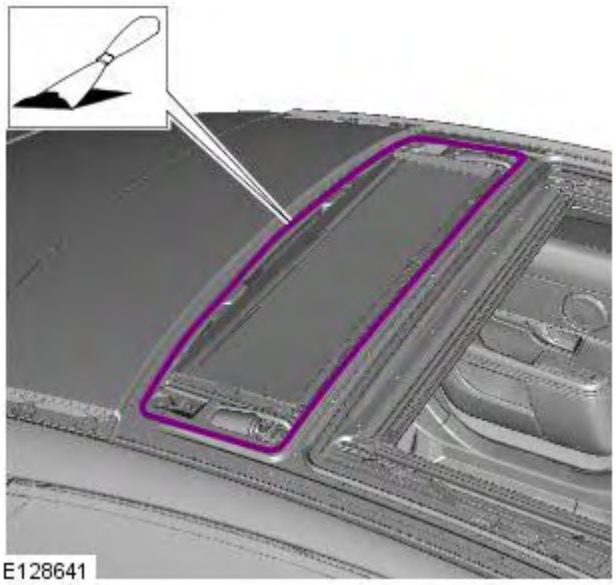


Installation



1. NOTE: Remove the tape.

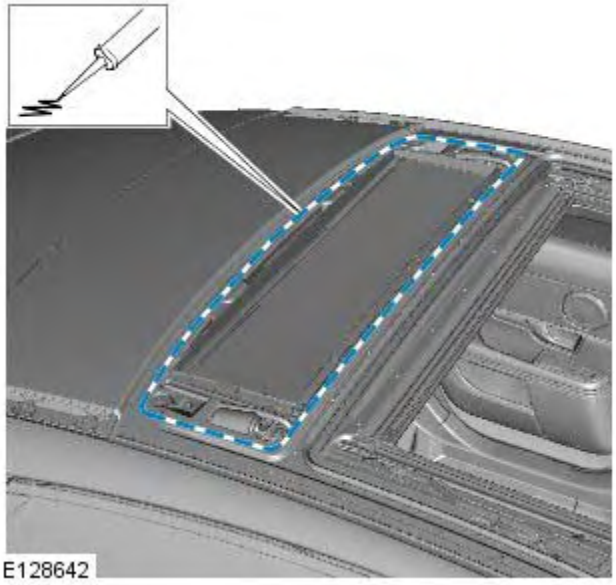


2. CAUTIONS:

   Make sure that the mating faces are clean and free of foreign material.

   Correct preparation of body apertures "post painting" to ensure satisfactory glass adhesion, must be carried out in line with industry practise.

   - Prepare the window glass, window glass flange and trimmed PU adhesive in accordance with the instructions included with the PU adhesive kit.

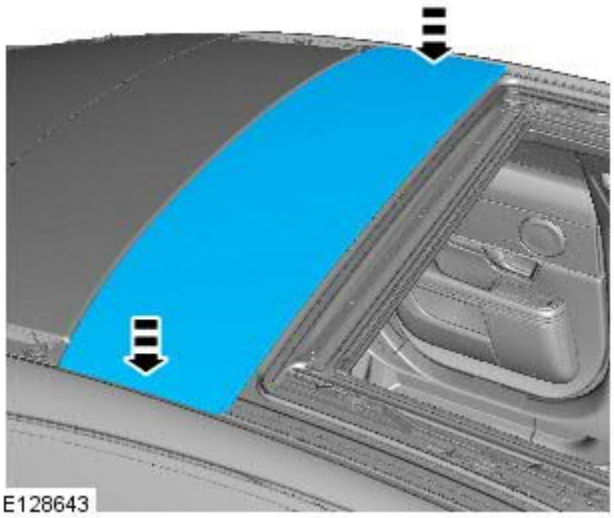


3. CAUTION: Touching the adhesive surface will impair rebonding.

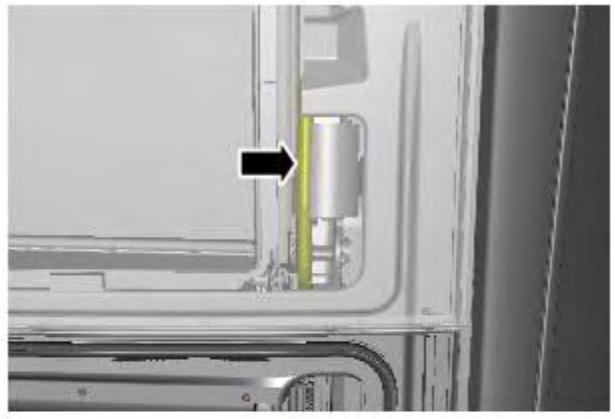
   NOTE: Install new spacers.

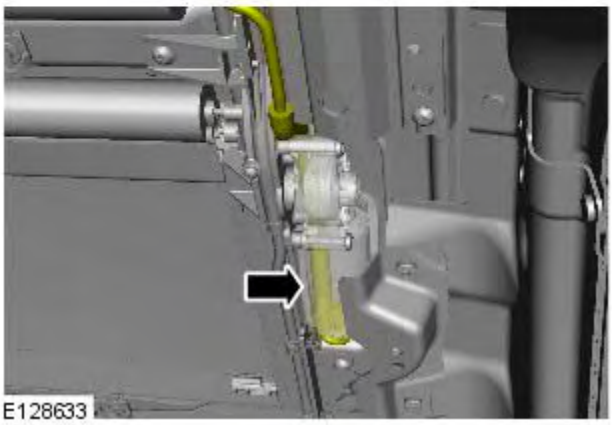
4.

- Make sure the component is aligned with the measurements taken prior to removal. Failure to follow this instruction may result in damage to the glass panels during operation of the roof opening panel.
- Use suitable weights or straps, apply a downward pressure to the glass to achieve the correct curvature of the glass.
- Allow up to 1 hour, depending on temperature and humidity, to allow the adhesive to set before continuing with the procedure.



5. NOTE: Remove the tape.





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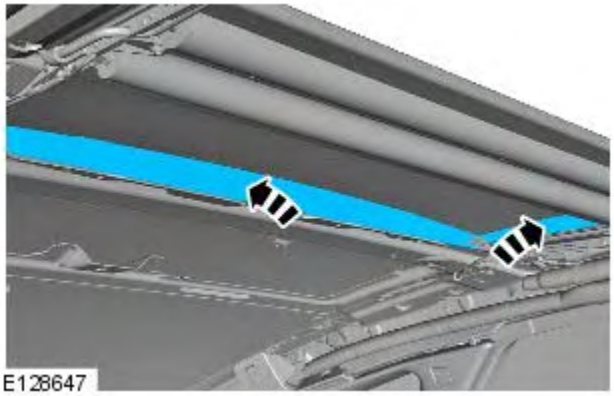
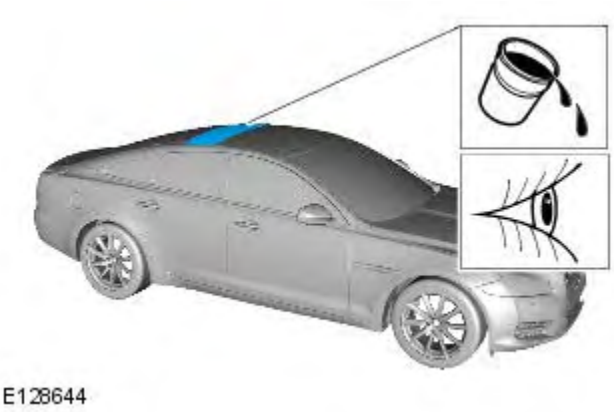

E128647

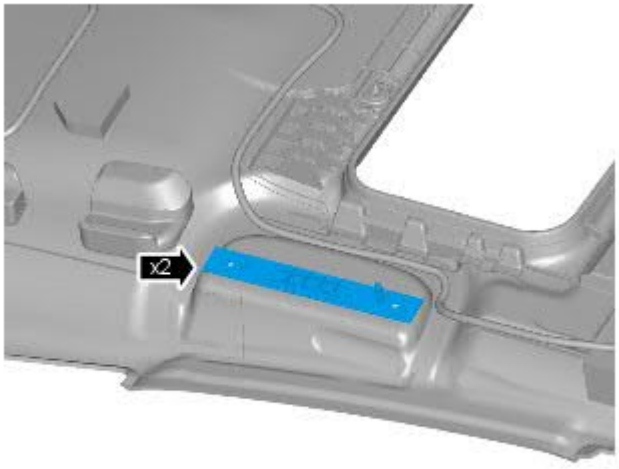
7. Refer to: Roof Opening Panel Glass (501-17 Roof Opening Panel, Removal and Installation).


E128644

8. CAUTION: Make sure that no excess sealant residue is evident.
   - If water is used as a means for the leak check, then allow sealant to dry before testing.
   - Spray water around the windshield glass, mark any area that leaks. Dry the windshield glass and sealant before applying additional sealant.

E128514

9. CAUTION: Protect the surrounding trim to avoid damage.

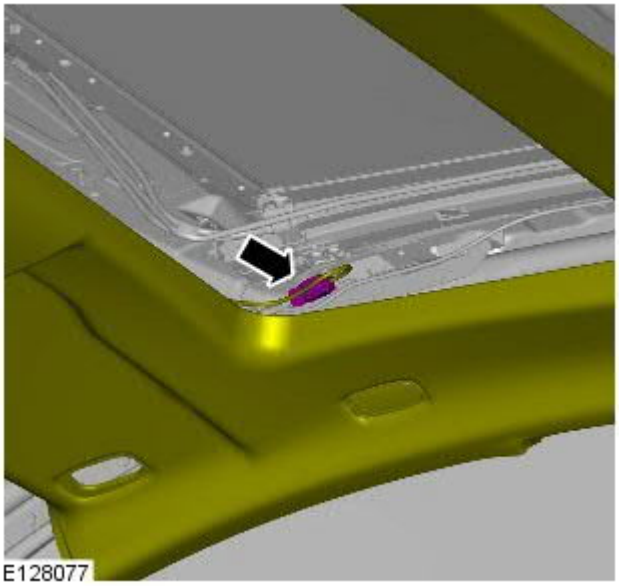


E128068

10. NOTES:

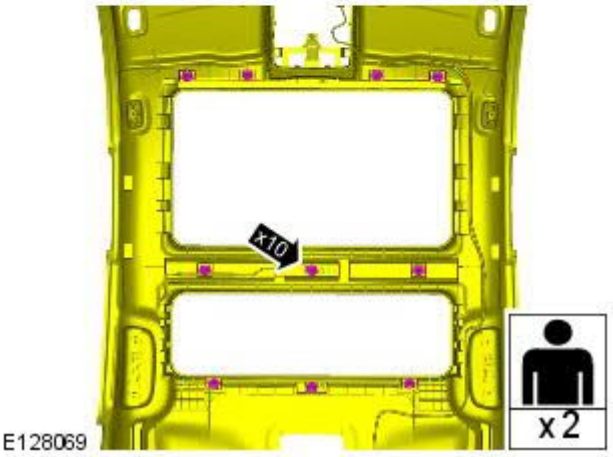
Make sure that the component is installed to the position noted on removal.

Right-hand shown, left-hand similar.



E128077

11. NOTE: This step requires the aid of another technician.

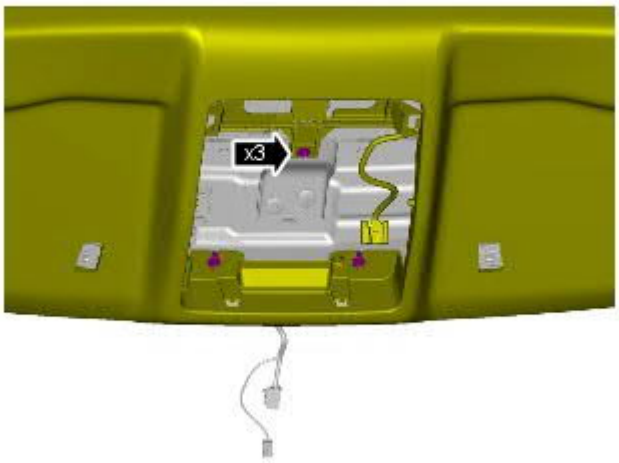


E128069

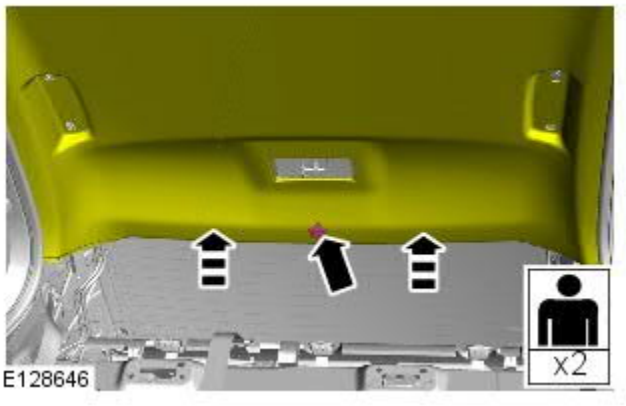
12. NOTE: This step requires the aid of another technician.

13. WARNING: This step requires the aid of another technician.

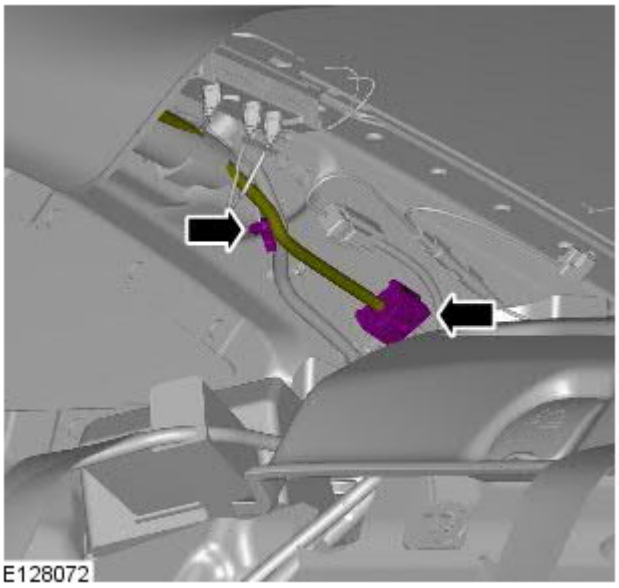
CAUTION: Make sure that these components are installed to the noted removal position.



E128070



14. WARNING: This step requires the aid of another technician.



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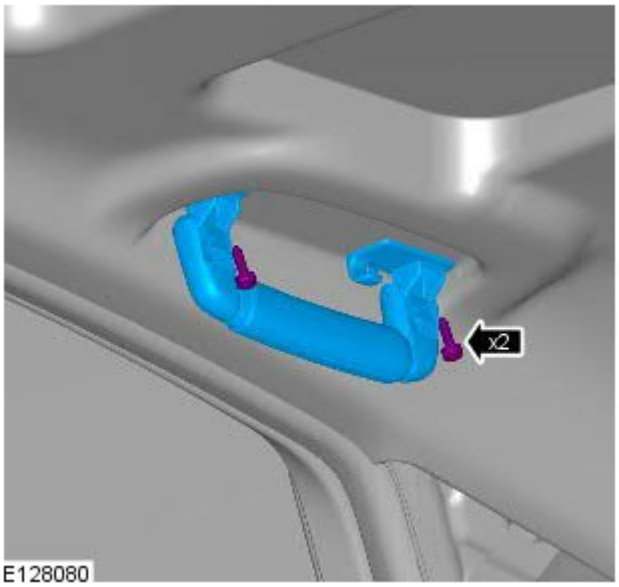


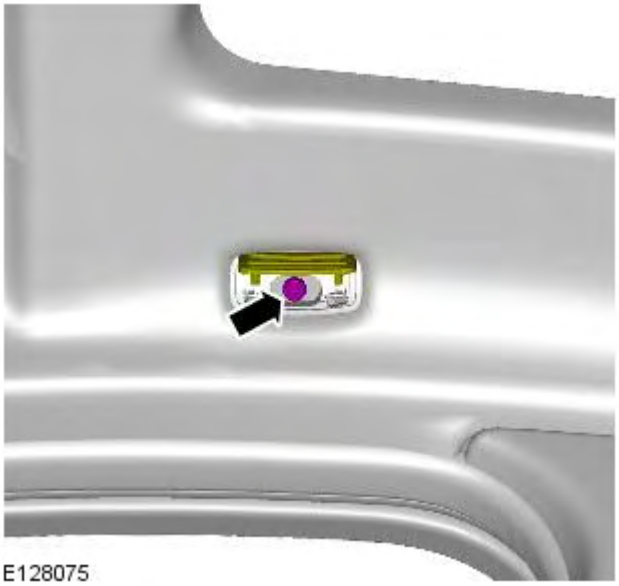
16. NOTES:

Make sure that the component is installed to the position noted on removal.

Right-hand shown, left-hand similar.

The procedure must be carried out on both sides.

Torque: 2 Nm



E128075

17. NOTES:

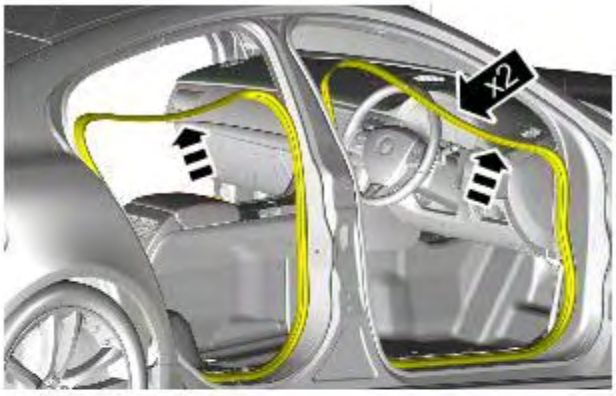
Make sure that the component is installed to the position noted on removal.

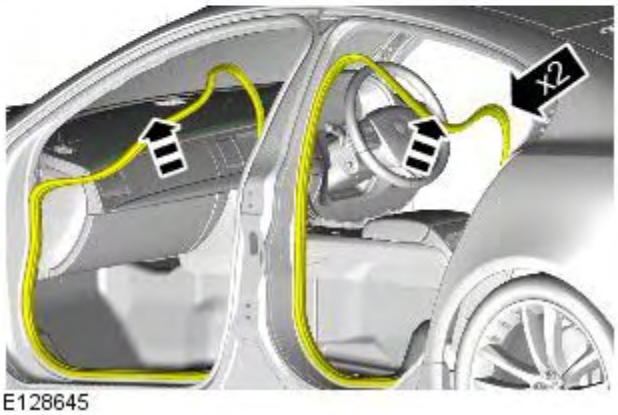
Right-hand shown, left-hand similar.

The procedure must be carried out on both sides.

Torque: 2 Nm

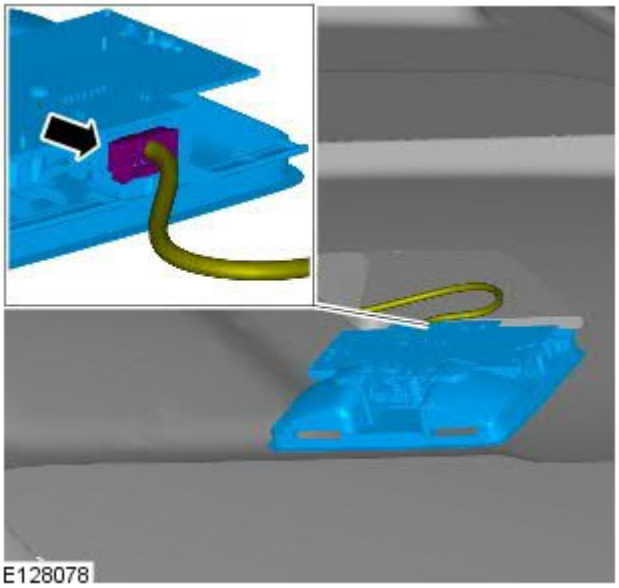
18.





E128645

19.



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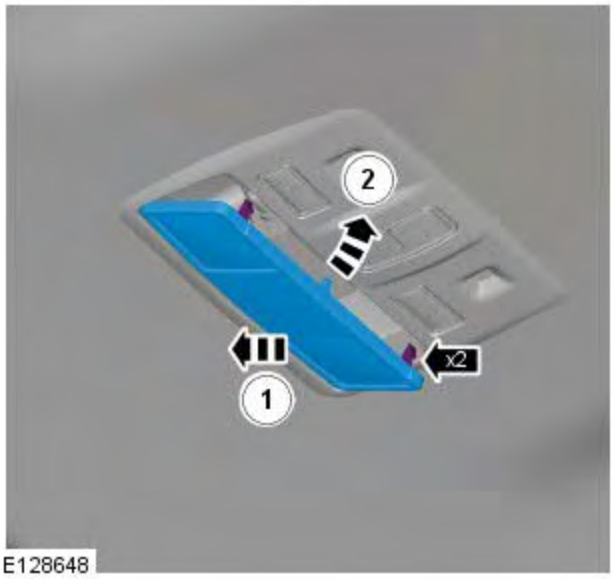


21. *Torque:* 2 Nm

22. NOTE: The procedure must be carried out on both sides.

Refer to: Front Seat (501-10 Seating, Removal and Installation).

23. NOTE: The procedure must be carried out on both sides.

    Refer to: C-Pillar Lower Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

24. NOTE: The procedure must be carried out on both sides.

    Refer to: B-Pillar Upper Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

25. NOTE: The procedure must be carried out on both sides.

    Refer to: A-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

26. NOTE: The procedure must be carried out on both sides.

    Refer to: Sun Visor (501-05 Interior Trim and Ornamentation, Removal and Installation).

27. Refer to: Overhead Console (501-12 Instrument Panel and Console, Removal and Installation).

28. Refer to: Interior Rear View Mirror (501-09 Rear View Mirrors, Removal and Installation).

29. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 04-Sep-2013

Glass, Frames and Mechanisms - Rear Quarter Window Glass

Removal and Installation

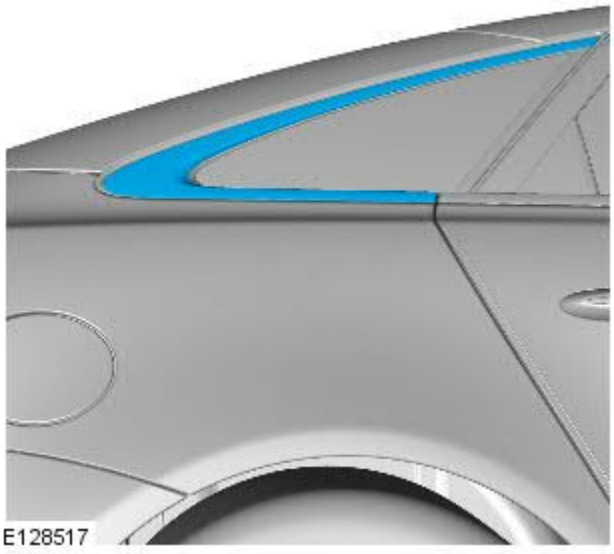
Removal

NOTE: RH illustration shown, LH is similar.

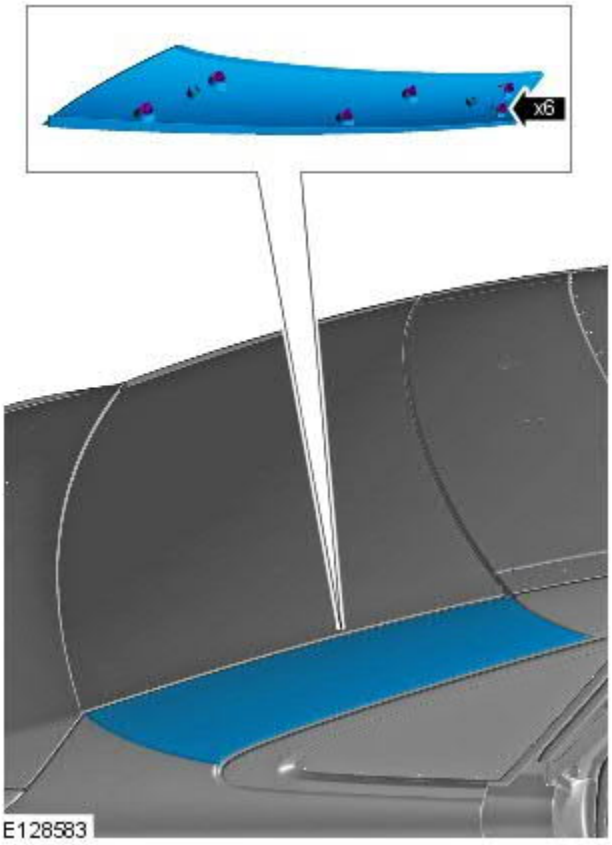
1. Refer to: C-Pillar Lower Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

2.
   - Prepare the PU adhesive in accordance with the instructions included with the PU adhesive kit.

3. CAUTION: Discard the component.



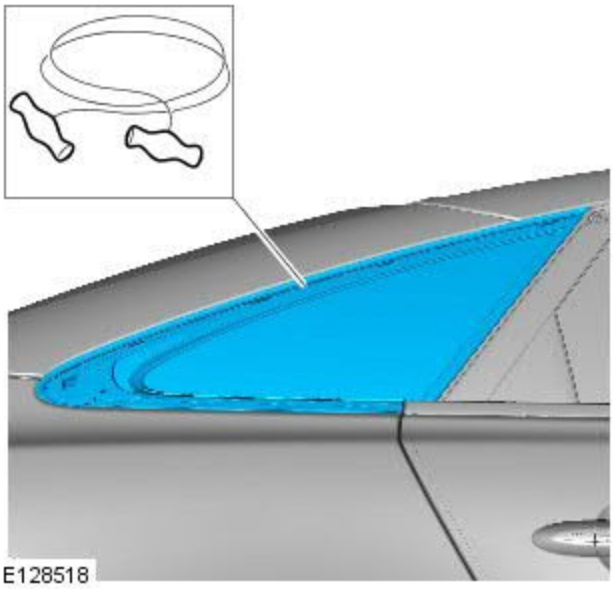
4.



5. CAUTIONS:

Protect the surrounding components.

Protect the surrounding paintwork to avoid damage.



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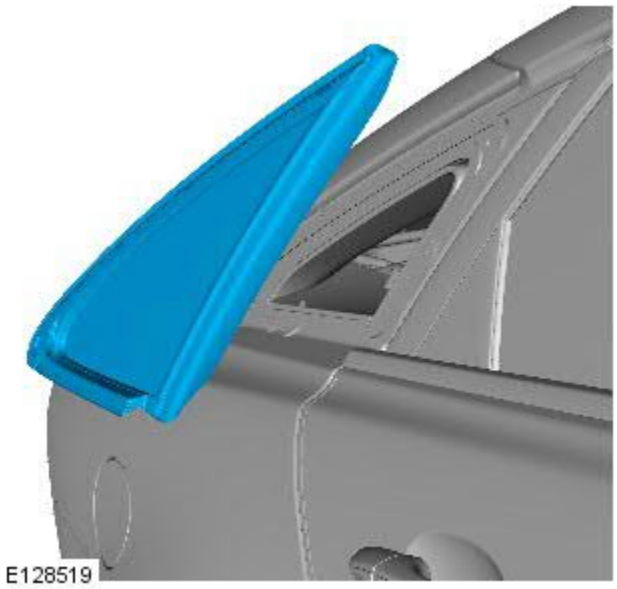
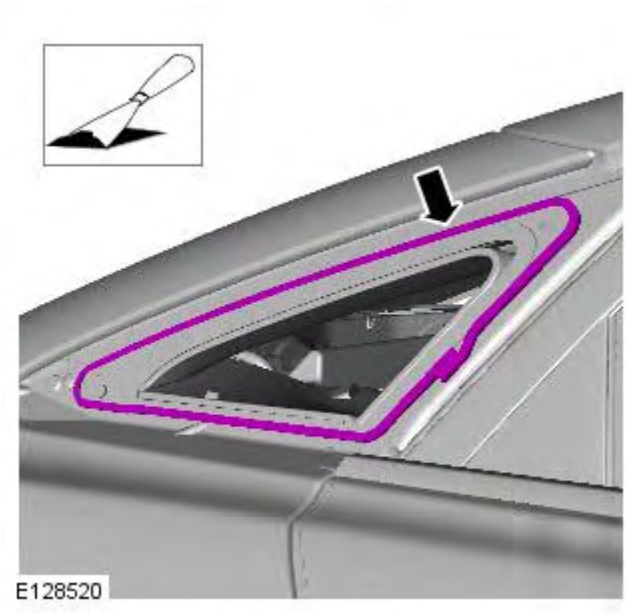


Installation

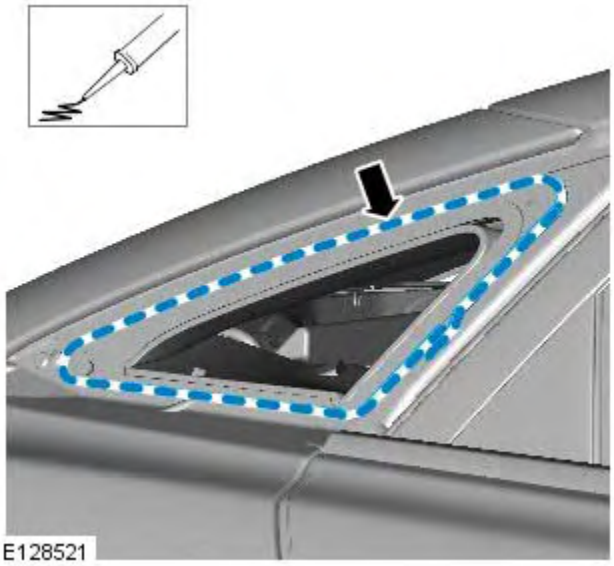


1. CAUTIONS:

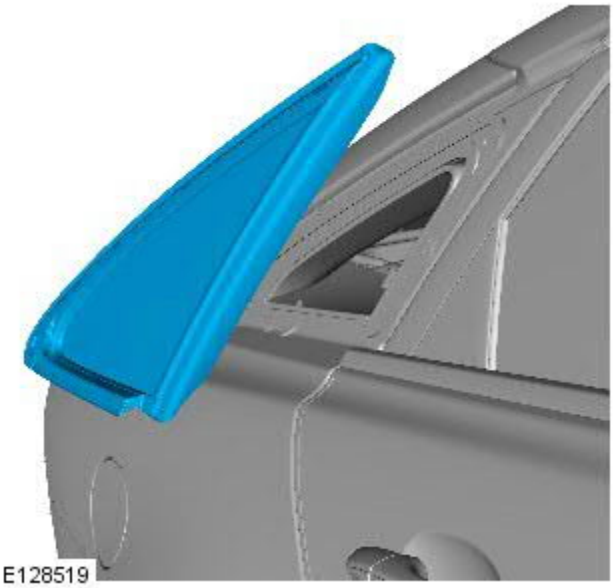
   Make sure that the mating faces are clean and free of foreign material.

   Correct preparation of body apertures “post painting” to ensure satisfactory glass adhesion, must be carried out in line with industry practise.

   - Prepare the window glass, window glass flange and trimmed PU adhesive in accordance with the instructions included with the PU adhesive kit.



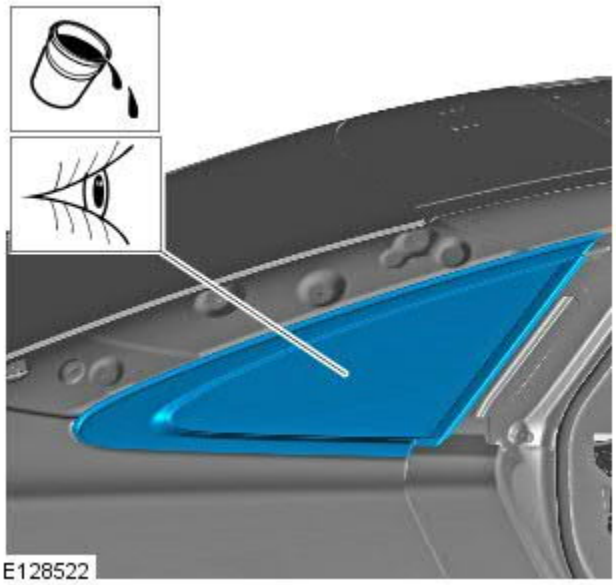
2. CAUTION: Touching the adhesive surface will impair rebonding.



3. CAUTION: Make sure that equal pressure is applied to the full length of the component.

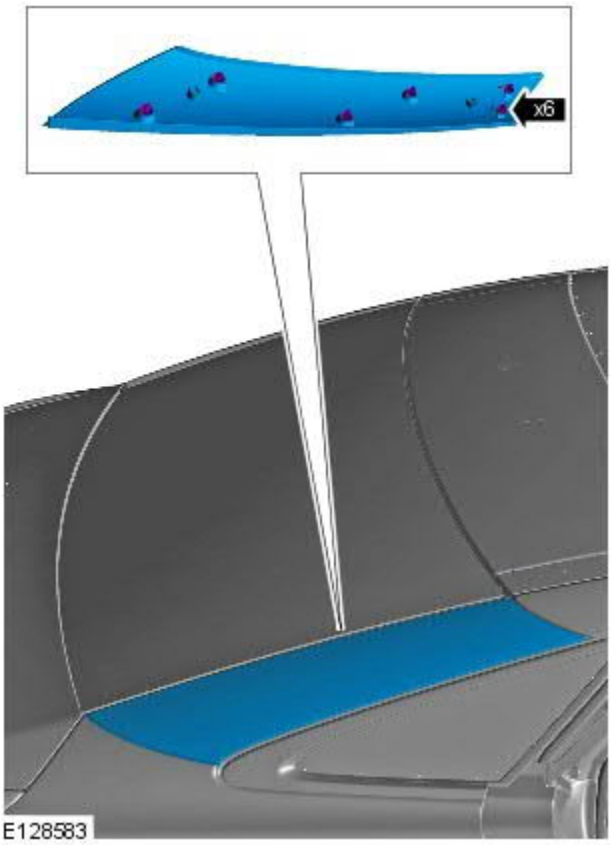
NOTE: Align to the orientation noted on removal.

- Install the rear quarter window glass.
- If the ambient temperature falls below 10 degrees C, apply warm air (25 degrees C) continuously for 15 minutes.



4. CAUTION: Make sure that no excess sealant residue is evident.
    - If water is used as a means for the leak check, then allow sealant to dry before testing.
    - Spray water around the windshield glass, mark any area that leaks. Dry the windshield glass and sealant before applying additional sealant.

5.



6. Refer to: C-Pillar Lower Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

Published: 04-Sep-2013

Glass, Frames and Mechanisms - Rear Window Glass

Removal and Installation

Removal

CAUTIONS:

Always protect paintwork and glass when removing exterior components.

Always protect the interior components when removing body glass.

Lay the glass on felt covered supports. Do not stand on edge as this can cause chips which subsequently develop into cracks.

NOTES:

The following equipment is required: l Cutting wire and handles l Kent knife l Glazing knife l Windshield replacement kit l Sealant applicator gun l Suction cups l A felt covered table or stand to support glass

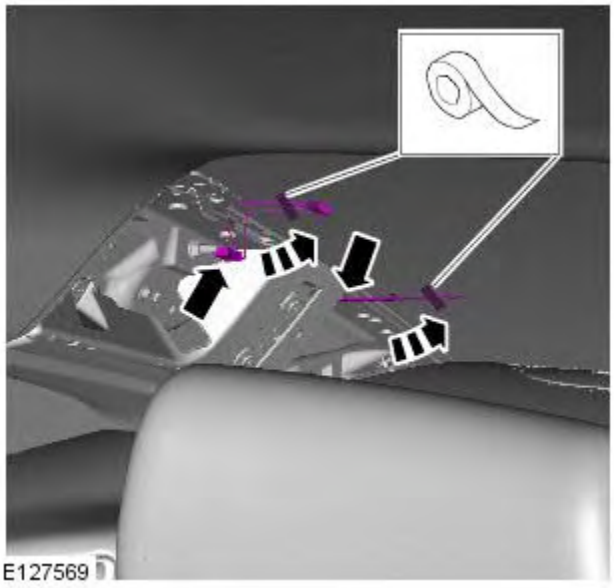
Removal steps in this procedure may contain installation details.

1. NOTE: The procedure must be carried out on both sides.

   Refer to: C-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

2.
   - Prepare the PU adhesive in accordance with the instructions included with the PU adhesive kit.

3.



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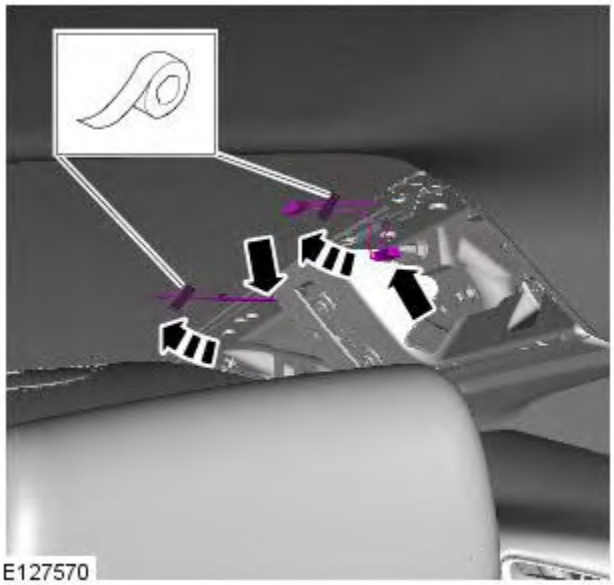
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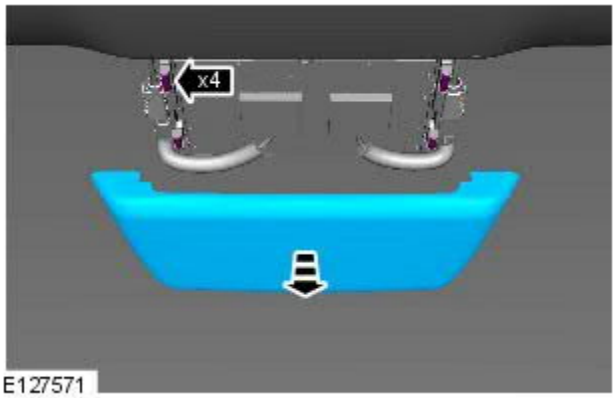

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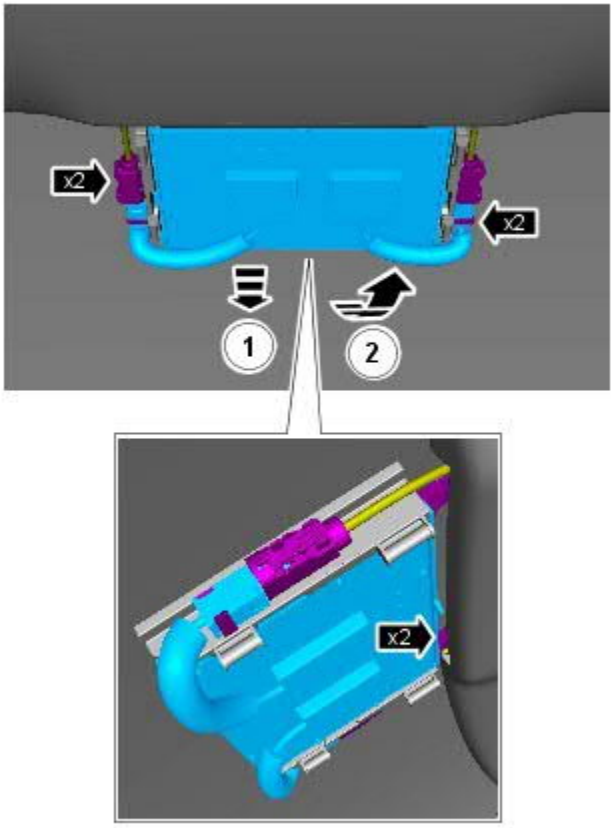
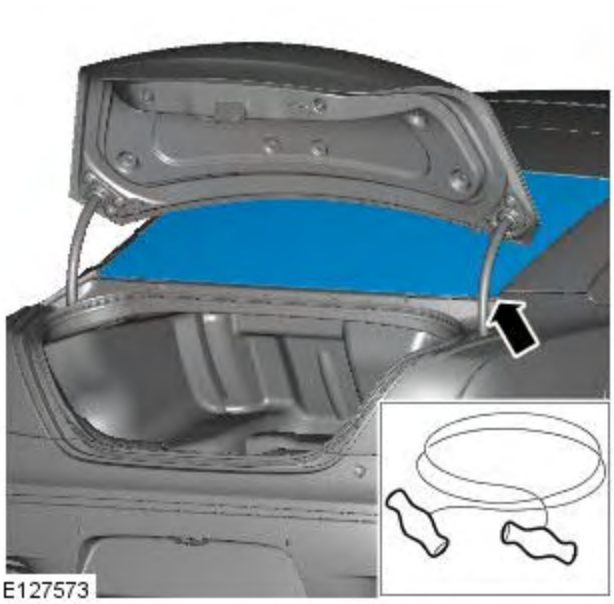


E127572

7. CAUTIONS:

Protect the surrounding components.

Protect the surrounding paintwork to avoid damage.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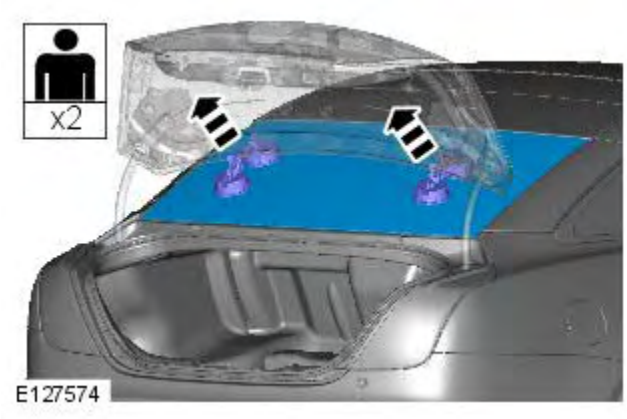
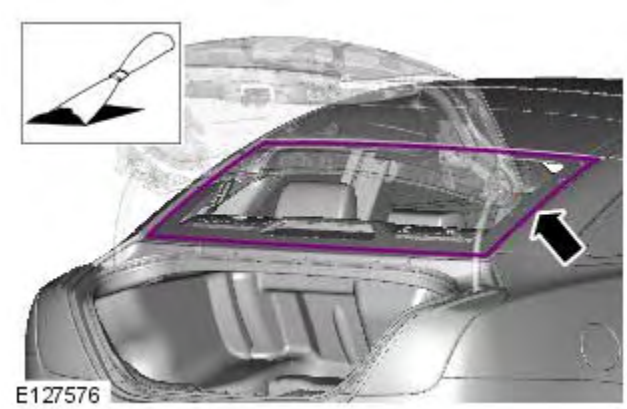


8. WARNING: This step requires the aid of another technician.

Installation

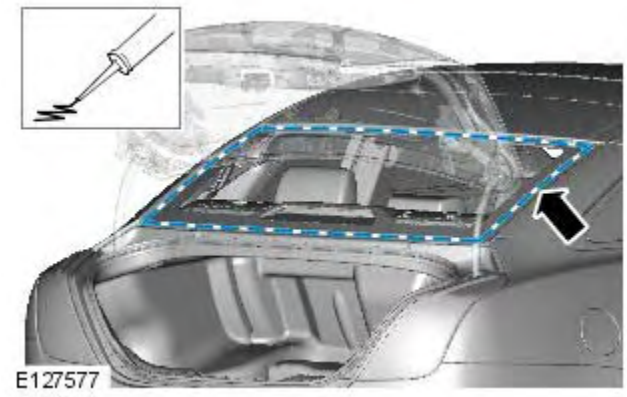


1. CAUTIONS:

   Make sure that the mating faces are clean and free of foreign material.

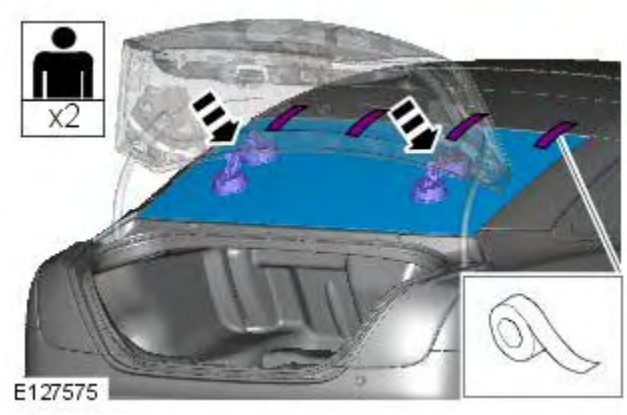
   Correct preparation of body apertures “post painting” to ensure satisfactory glass adhesion, must be carried out in line with industry practise.

   - Prepare the window glass, window glass flange and trimmed PU adhesive in accordance with the instructions included with the PU adhesive kit.



2. CAUTION: Touching the adhesive surface will impair rebonding.

   NOTE: Install new spacers.



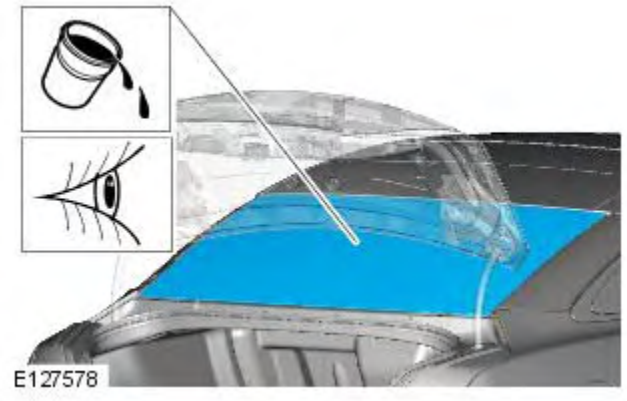
3. WARNING: This step requires the aid of another technician.

   CAUTIONS:

   Make sure that the component is correctly located on the locating dowels.

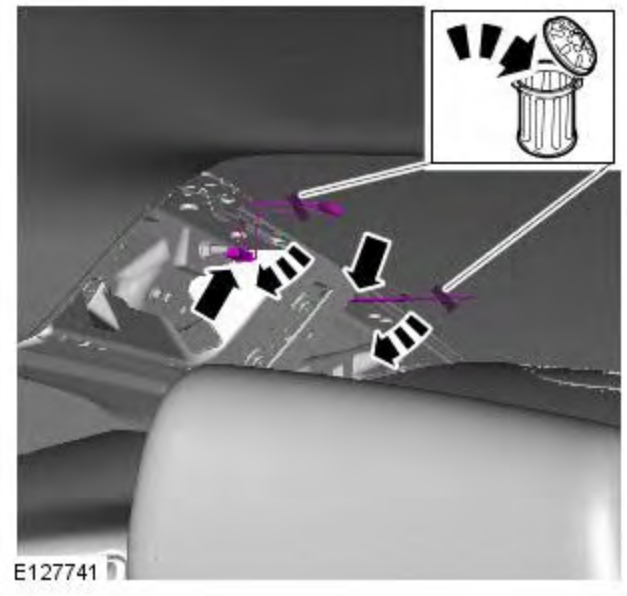
   Make sure that equal pressure is applied to the full length of the component.

   - With assistance, install and align the windshield glass.
   - If the ambient temperature falls below 10 degrees C, apply warm air (25 degrees C) continuously for 15 minutes.



4. CAUTION: Make sure that no excess sealant residue is evident.

   - If water is used as a means for the leak check, then allow sealant to dry before testing.
   - Spray water around the windshield glass, mark any area that leaks. Dry the windshield glass and sealant before applying additional sealant.



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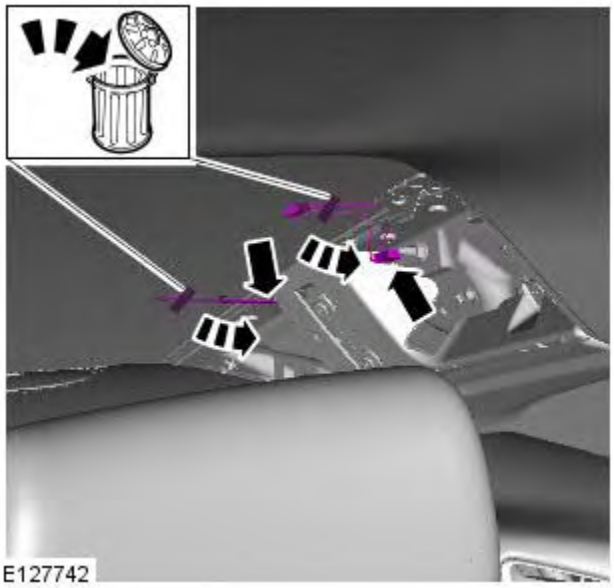
6.



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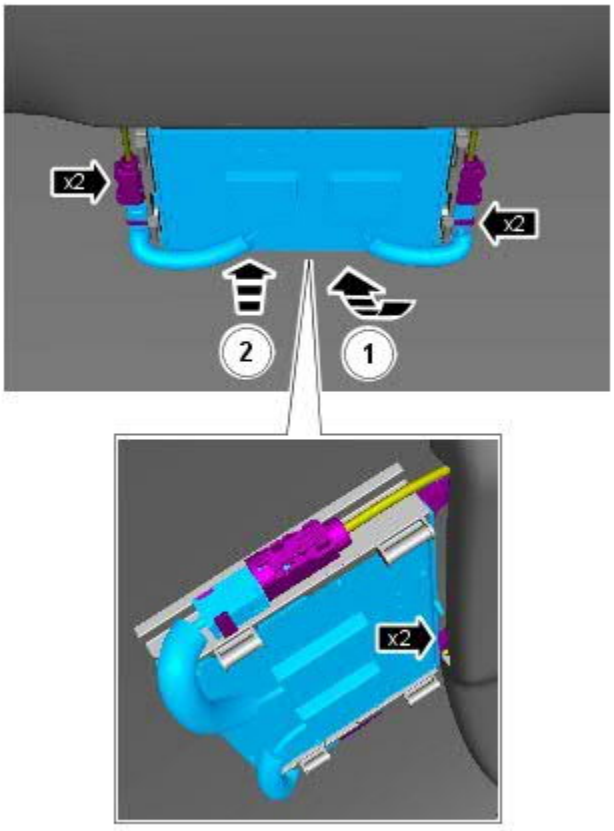

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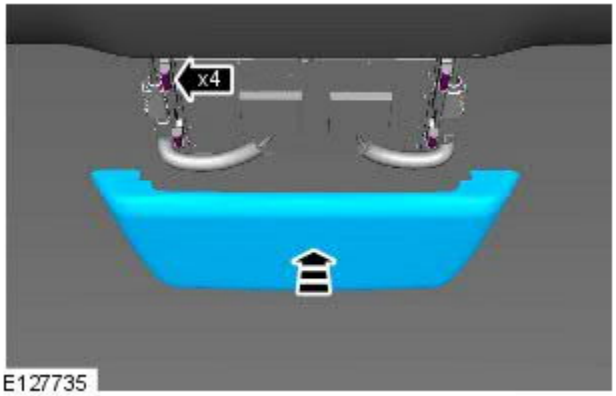


9. NOTE: The procedure must be carried out on both sides.

   Refer to: C-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

Published: 04-Sep-2013

Glass, Frames and Mechanisms - Windshield Glass

Removal and Installation

Removal

CAUTIONS:

Always protect paintwork and glass when removing exterior components.

Always protect the interior components when removing body glass.

Lay the glass on felt covered supports. Do not stand on edge as this can cause chips which subsequently develop into cracks.

NOTES:

The following equipment is required: l Cutting wire and handles l Kent knife l Glazing knife l Windshield replacement kit l Sealant applicator gun l Suction cups l A felt covered table or stand to support glass

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Cowl Vent Screen (501-02 Front End Body Panels, Removal and Installation).

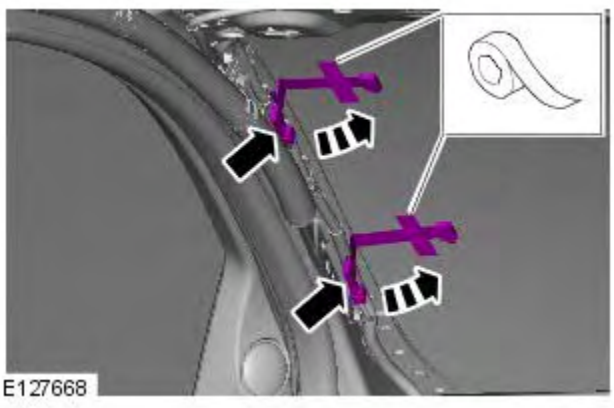
2. NOTE: The procedure must be carried out on both sides.

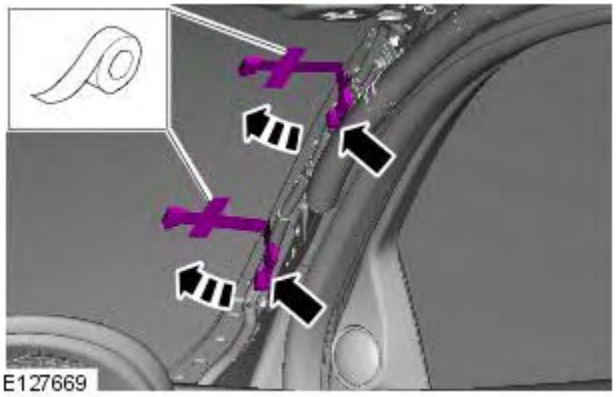
   Refer to: A-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. Refer to: Rain Sensor (501-16 Wipers and Washers, Removal and Installation).

4.
   - Prepare the PU adhesive in accordance with the instructions included with the PU adhesive kit.

5.





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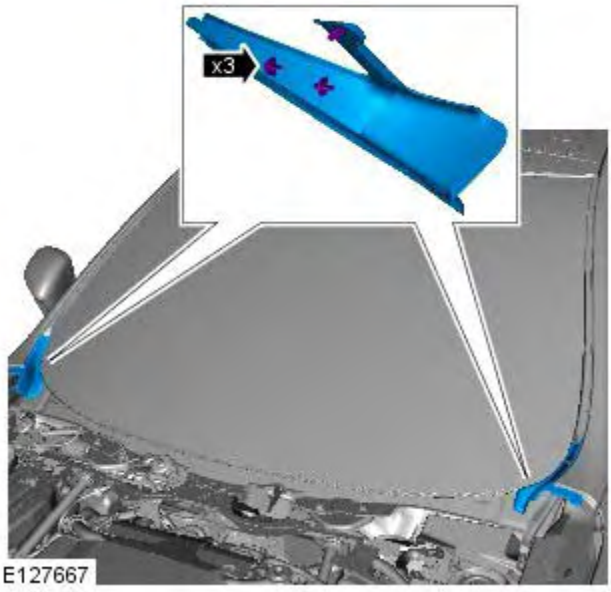

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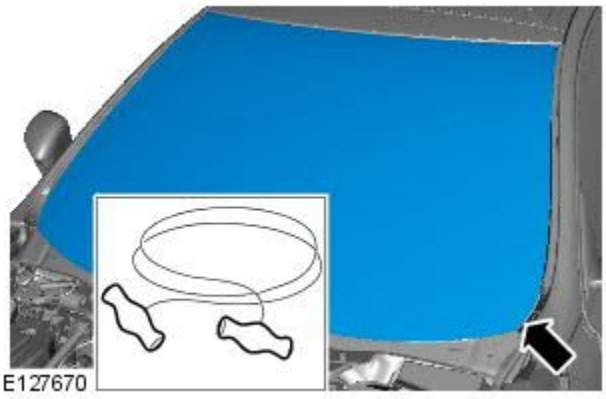
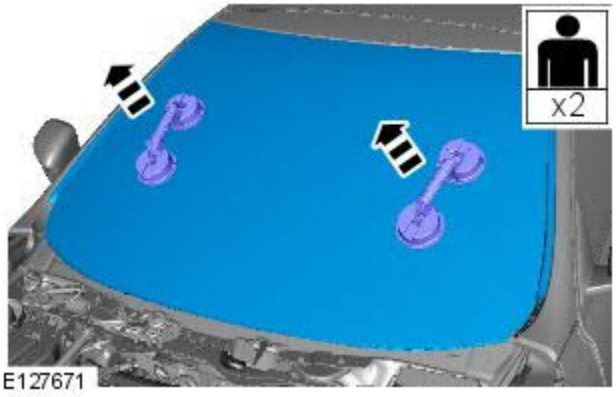


8. CAUTIONS:

Protect the surrounding components.

Protect the surrounding paintwork to avoid damage.



9. WARNING: This step requires the aid of another technician.

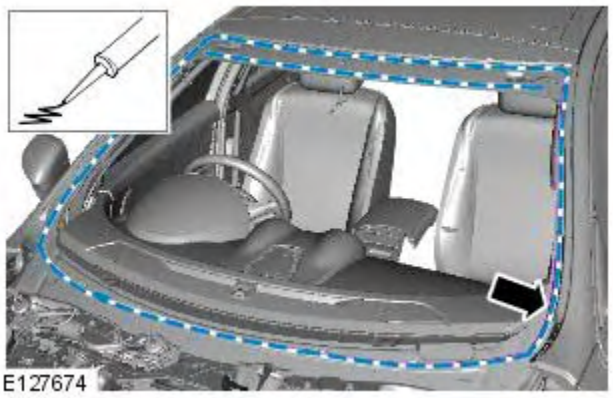
Installation

1. CAUTIONS:

   Make sure that the mating faces are clean and free of foreign material.

   Correct preparation of body apertures “post painting” to ensure satisfactory glass adhesion, must be carried out in line with industry practise.

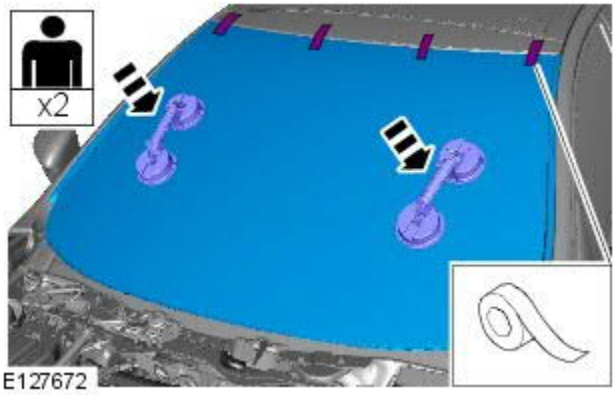
   - Prepare the window glass, window glass flange and trimmed PU adhesive in accordance with the instructions included with the PU adhesive kit.



2. CAUTION: Touching the adhesive surface will impair rebonding.

   NOTE: Install new spacers.

   Modify the nozzle to achieve a bead section in the shape of a right angle triangle with a base of 8 mm and a vertical height of 12 mm.



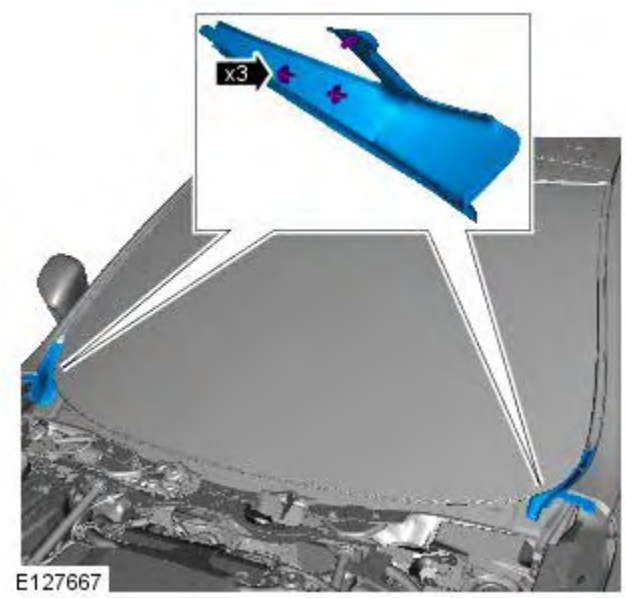
3. WARNING: This step requires the aid of another technician.

   CAUTIONS:

   Make sure that the component is correctly located on the locating dowels.

   Make sure that equal pressure is applied to the full length of the component.

   - With assistance, install and align the windshield glass.
   - If the ambient temperature falls below 10 degrees C, apply warm air (25 degrees C) continuously for 15 minutes.



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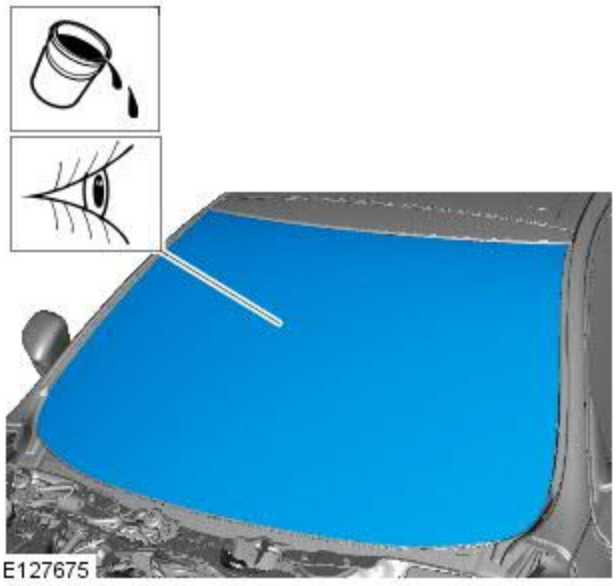
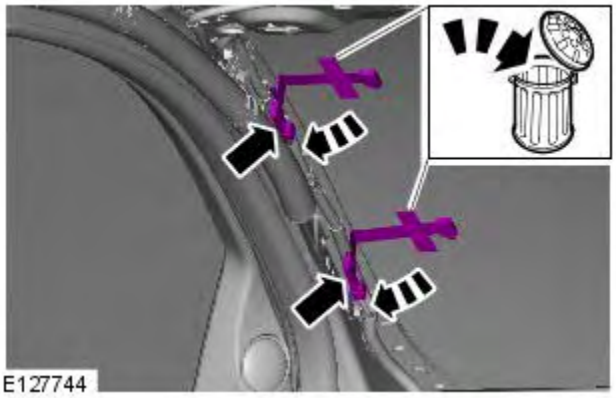


5. CAUTION: Make sure that no excess sealant residue is evident.

   - If water is used as a means for the leak check, then allow sealant to dry before testing.
   - Spray water around the windshield glass, mark any area that leaks. Dry the windshield glass and sealant before applying additional sealant.

6.



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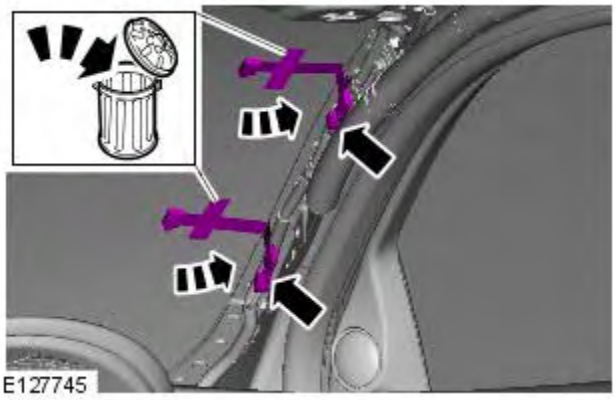


8. Refer to: Rain Sensor (501-16 Wipers and Washers, Removal and Installation).

9. NOTE: The procedure must be carried out on both sides.

   Refer to: A-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

10. Refer to: Cowl Vent Screen (501-02 Front End Body Panels, Removal and Installation).

Published: 11-May-2011

Instrument Panel and Console -

Torque Specifications

Description	Nm	lb-ft	lb-in
Instrument panel upper section retaining bolts	9	7	80
Instrument panel upper section retaining screws	4	-	35
Instrument panel center reinforcement section retaining bolts	9	7	80
Instrument panel lower cover retaining bolts	9	7	80
Instrument panel lower cover retaining screws	2.5	-	22
Floor console retaining nuts	5	-	44
Floor console retaining screws	5	-	44
Floor console side trim panel retaining screws	2.5	-	22
Floor console double cup holder retaining screws	4	-	35
Transmission shift control module retaining screws	4	-	35
Audio and climate control assembly retaining screws	4	-	35
Glove compartment retaining bolts	9	7	80
Glove compartment retaining screws	2.5	-	22

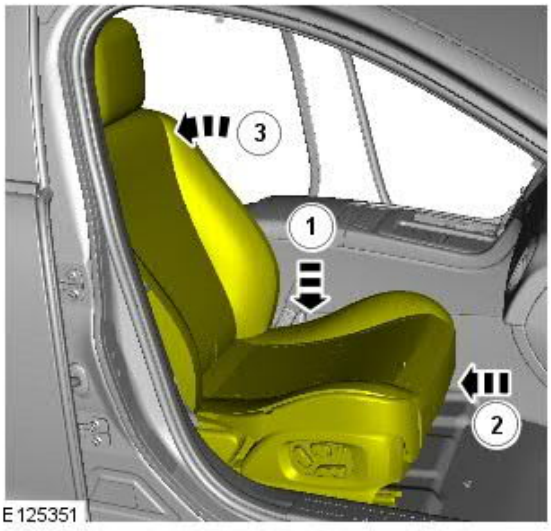
Published: 11-May-2011

Instrument Panel and Console - Floor Console

Removal and Installation

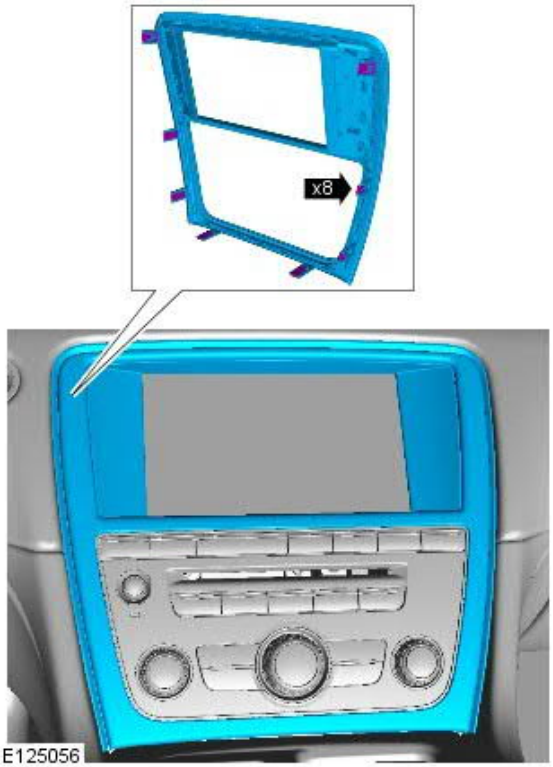
Removal

NOTE: Removal steps in this procedure may contain installation details.



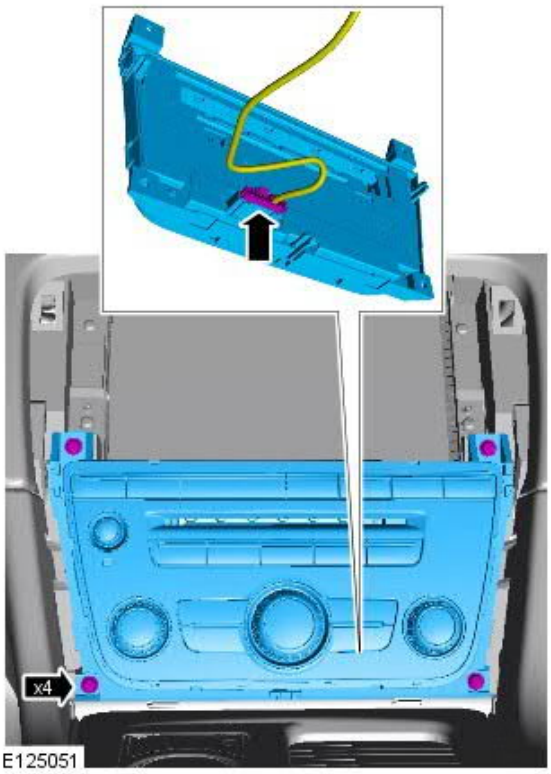
1. NOTE: The procedure must be carried out on both sides.

2.



3. CAUTION: Take extra care not to damage the edges of the component.

4. *Torque:* 4 Nm



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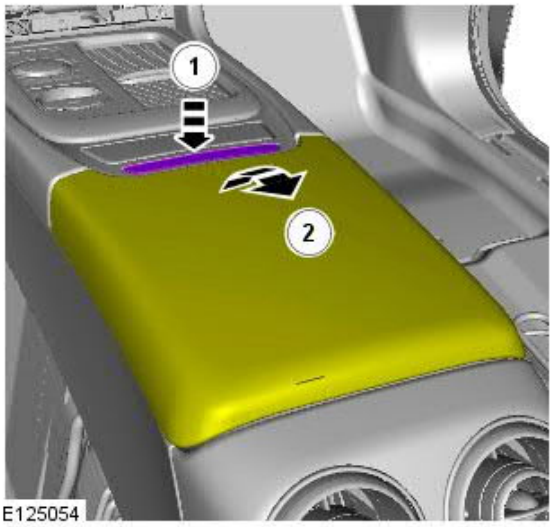
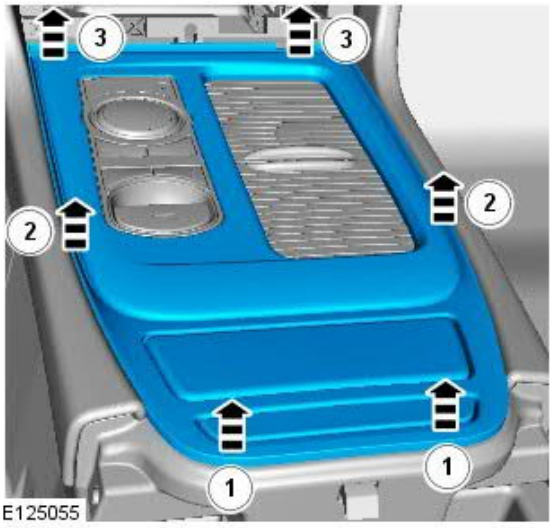
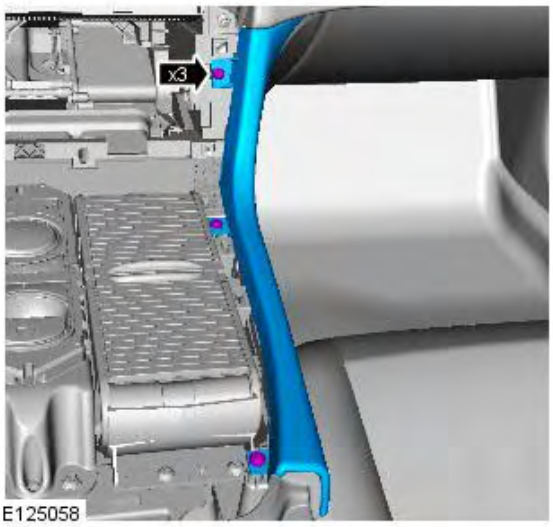




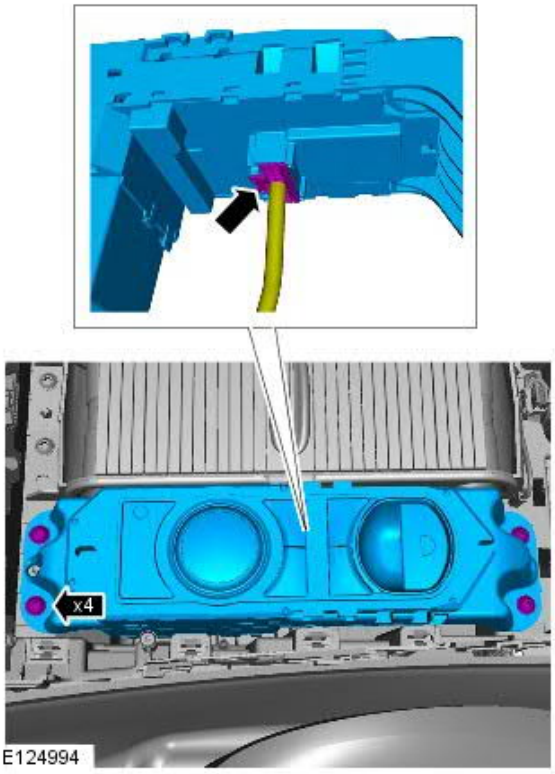
6. CAUTION: Take extra care not to damage the edges of the component.



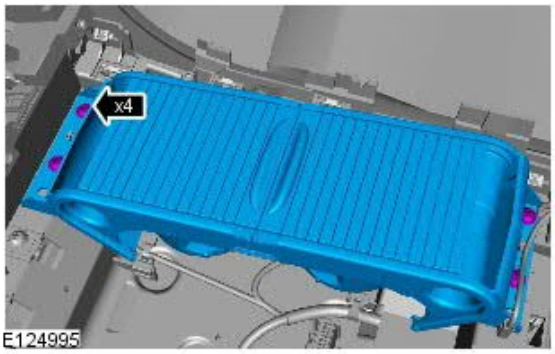
7. NOTE: RH illustration shown, LH is similar.

Torque: 2.5 Nm

8. *Torque:* 4 Nm



9. *Torque:* 4 Nm



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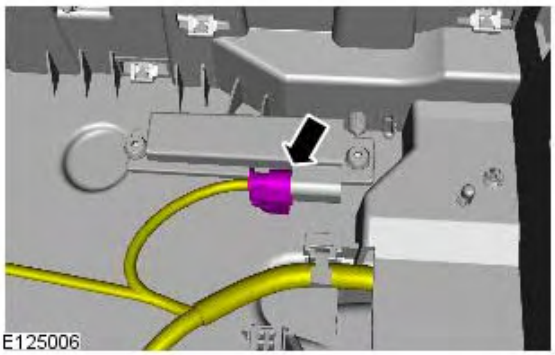

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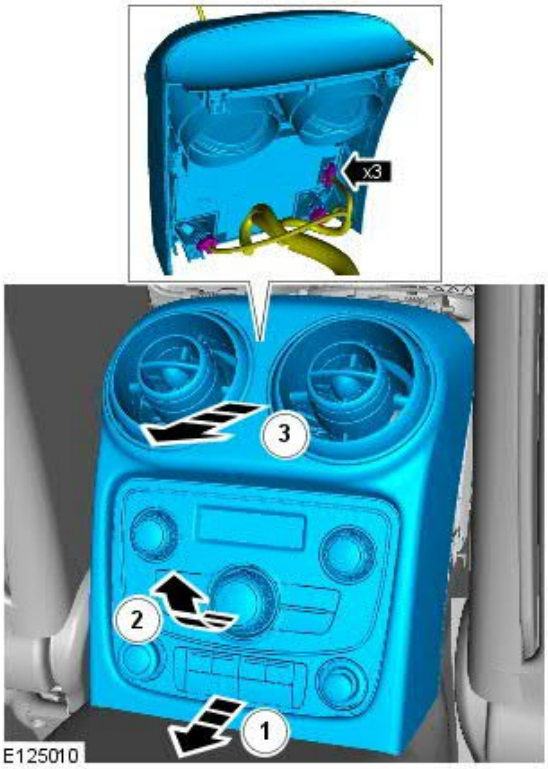
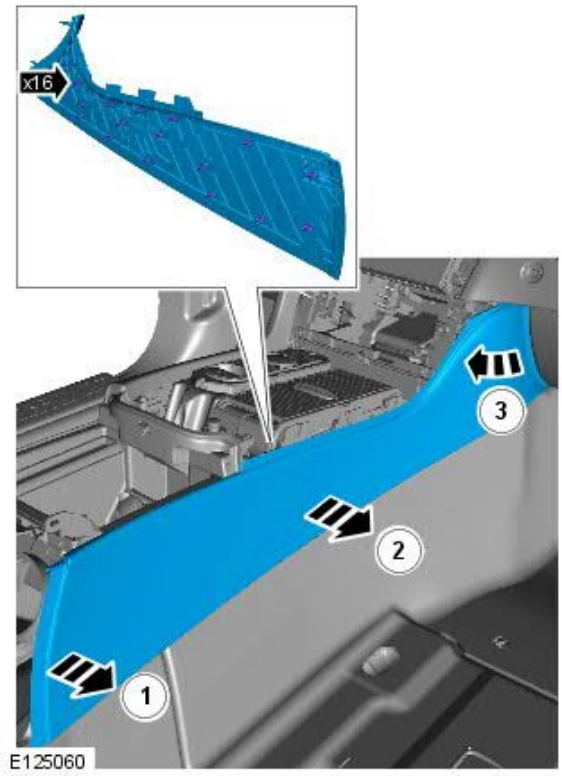


12. NOTE: The procedure must be carried out on both sides.



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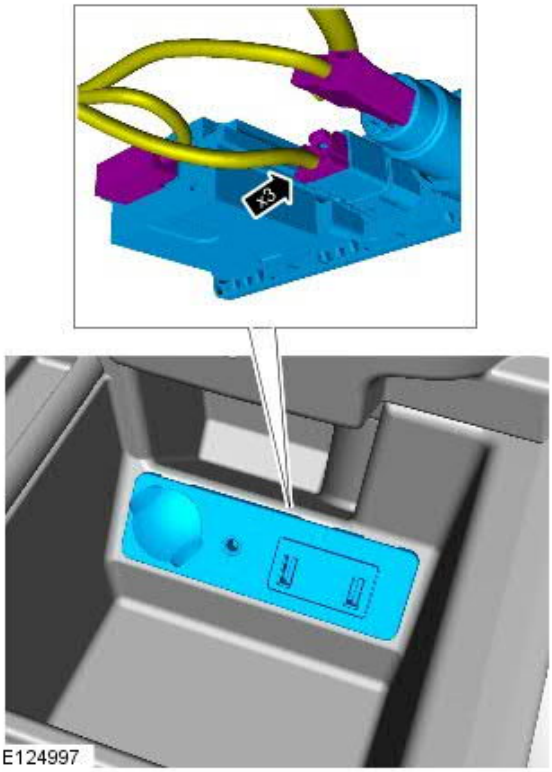
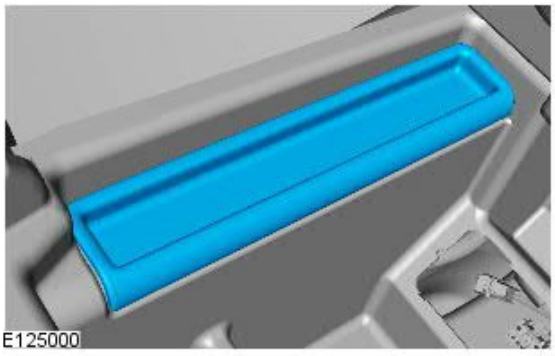


14.

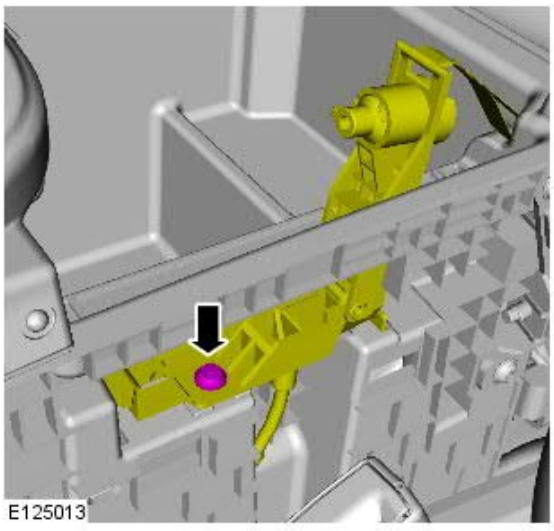


15. CAUTIONS:

Make sure that the vehicle is parked on level ground.

Apply the parking brake, chock the wheels and ensure that all personnel are clear of the vehicle before carrying out the following procedure.

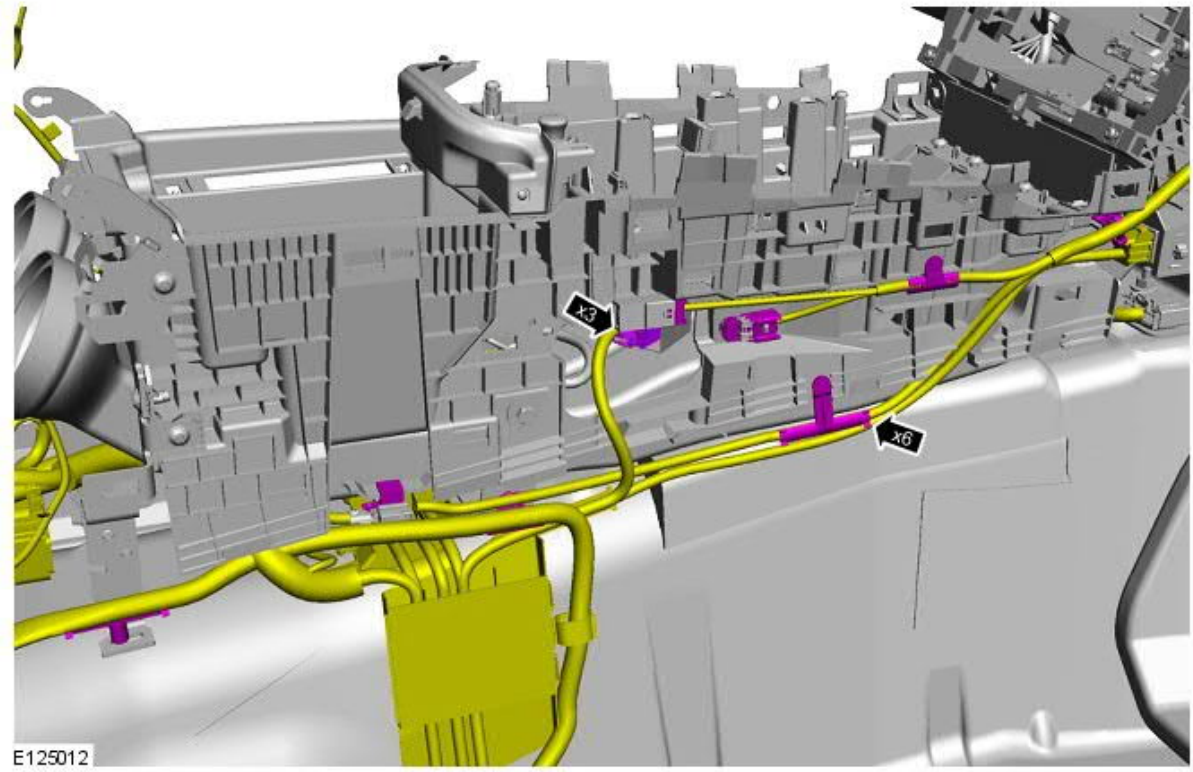
Torque: 1 Nm



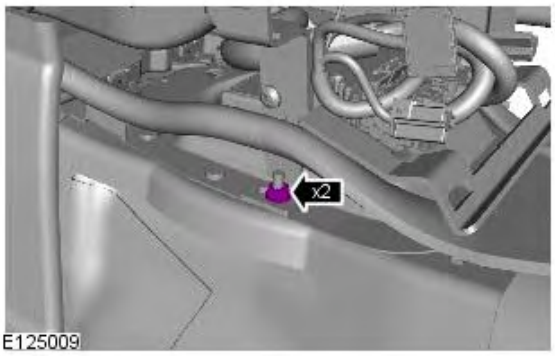
16.

E125008

17.

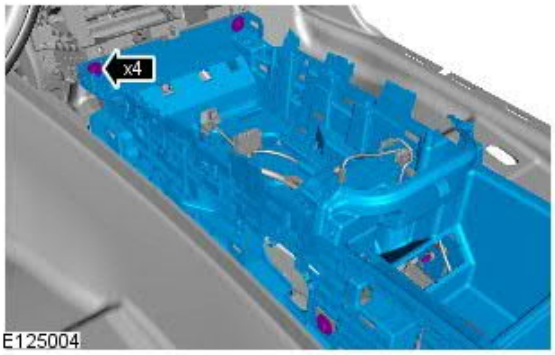


E125012



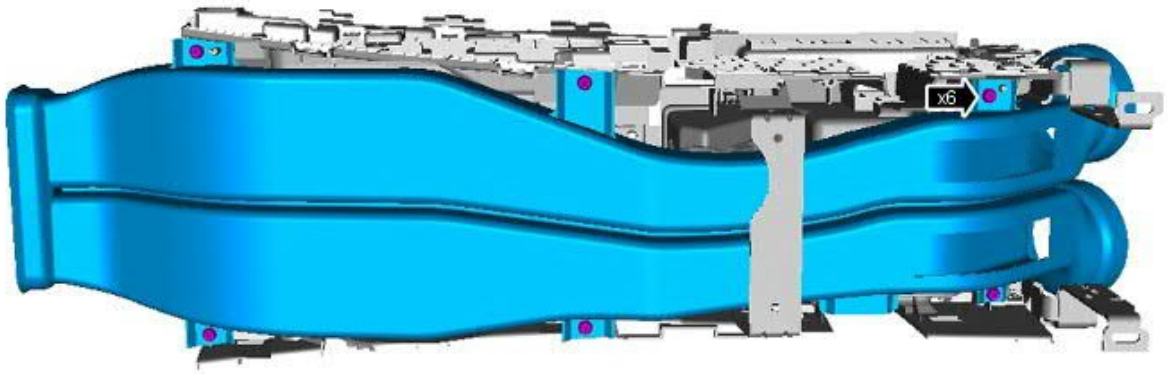
18. NOTE: The procedure must be carried out on both sides.

Torque: 5 Nm

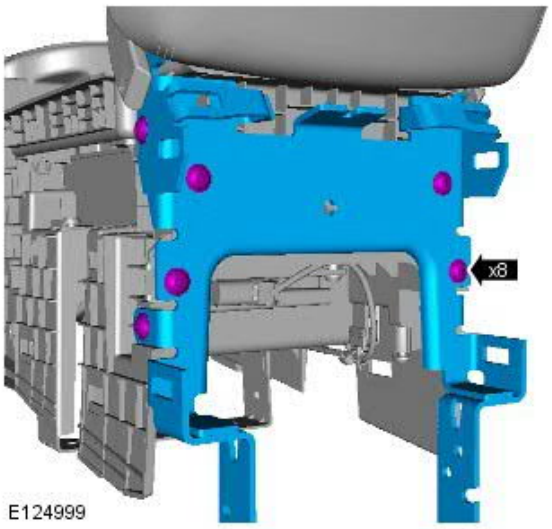


19. *Torque:* 5 Nm

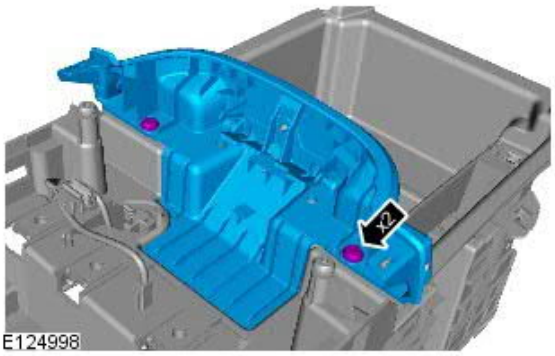
20. NOTE: Do not disassemble further if the component is removed for access only.



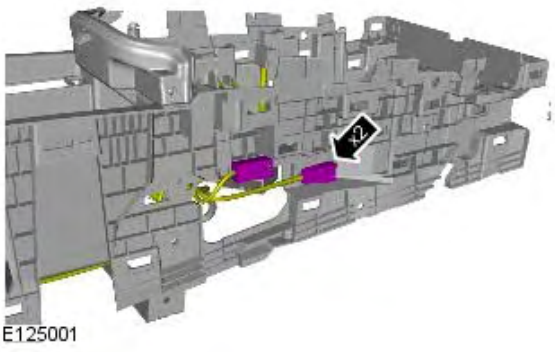
21. *Torque:* 5 Nm



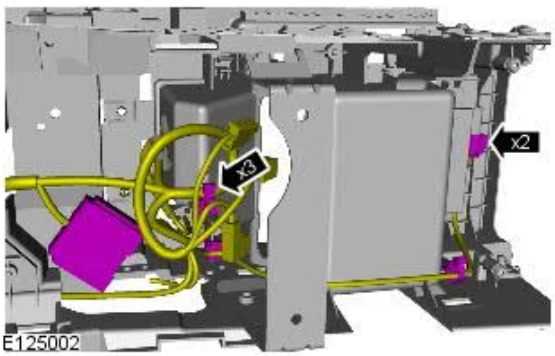
22. *Torque:* 1 Nm



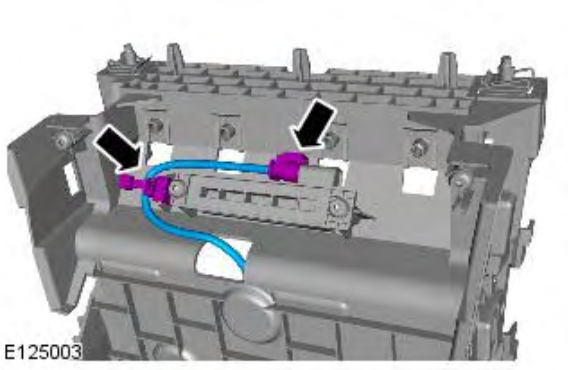
23.



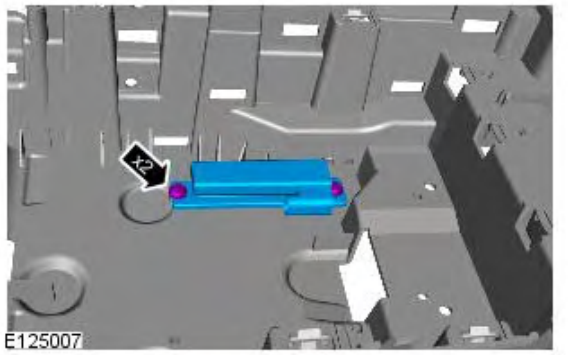
24.



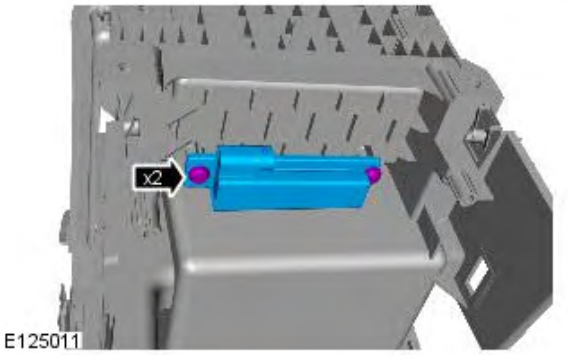
25.



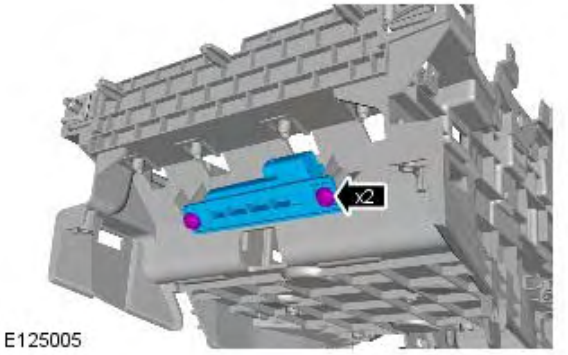
26. *Torque:* 1 Nm



27. *Torque:* 1 Nm



28. *Torque:* 1 Nm



Installation

1. To install, reverse the removal procedure.

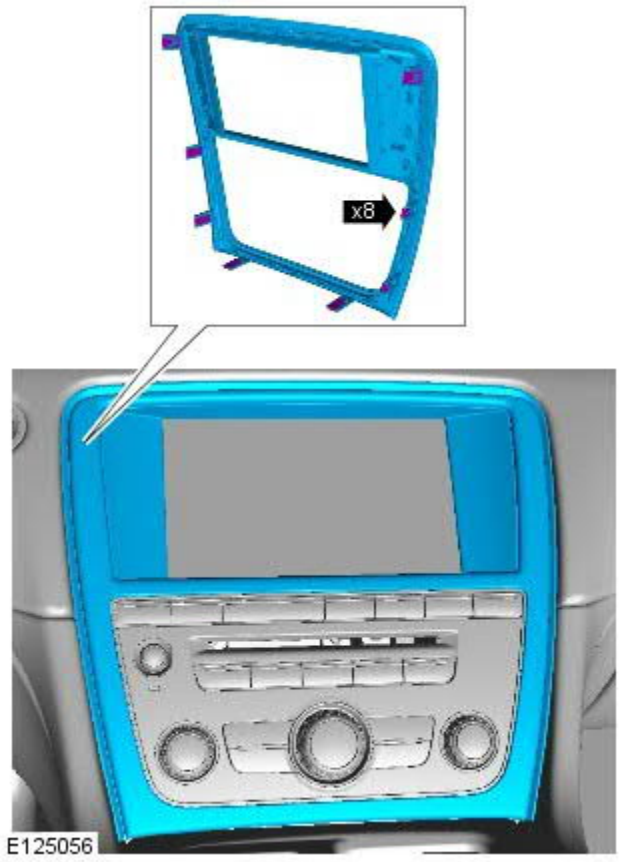
Published: 11-May-2011

Instrument Panel and Console - Floor Console Double Cup Holder

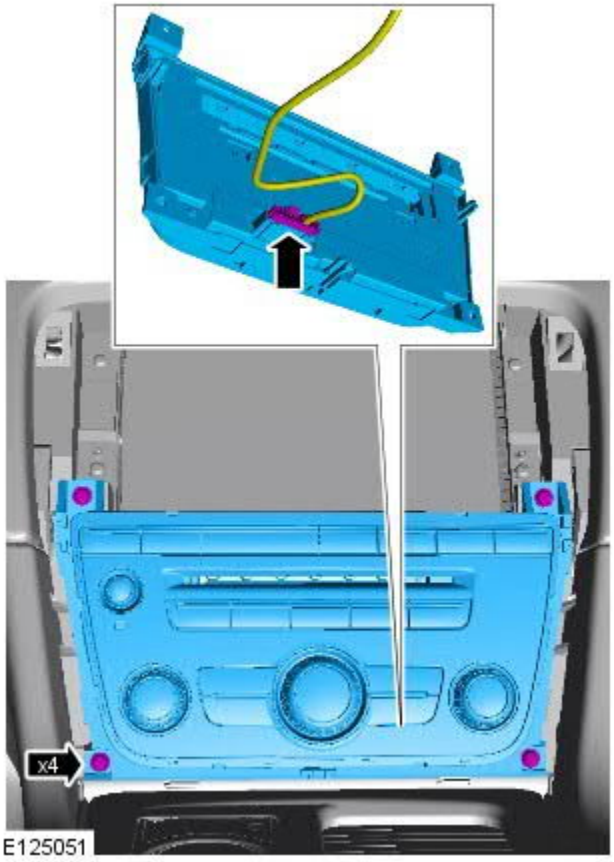
Removal and Installation

Removal

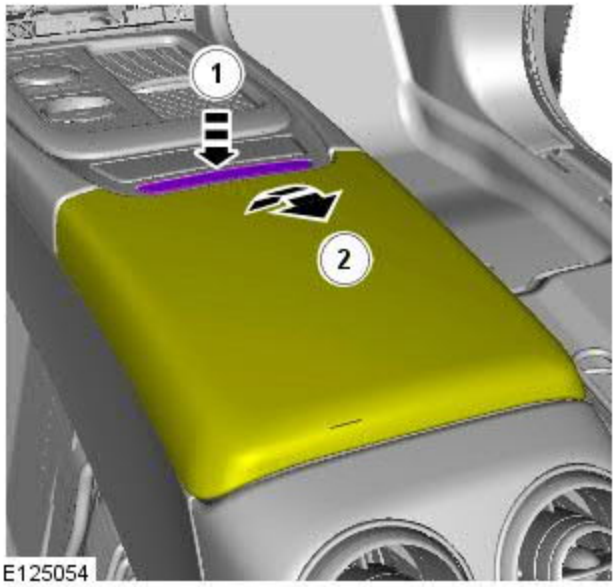
NOTE: Removal steps in this procedure may contain installation details.



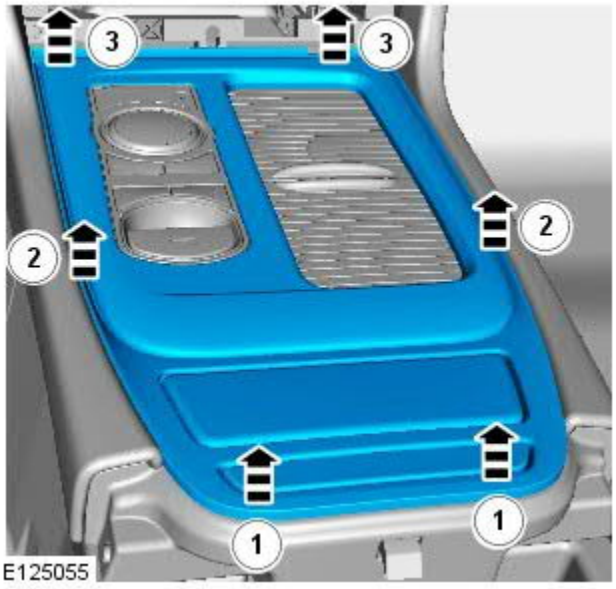
1. CAUTION: Take extra care not to damage the edges of the component.



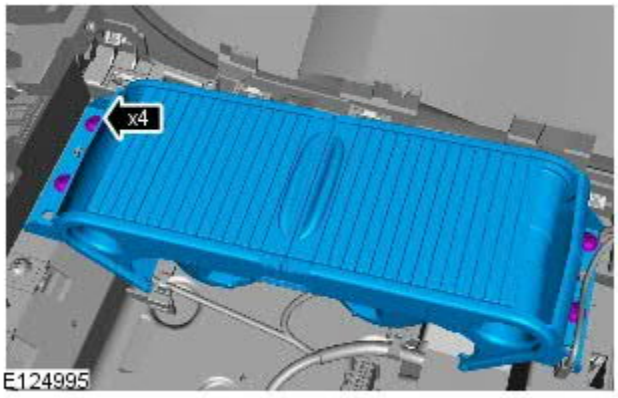
2. *Torque:* 2.5 Nm



3.



4. CAUTION: Take extra care not to damage the edges of the component.



5. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Torque: 4 Nm

Installation

1. To install, reverse the removal procedure.

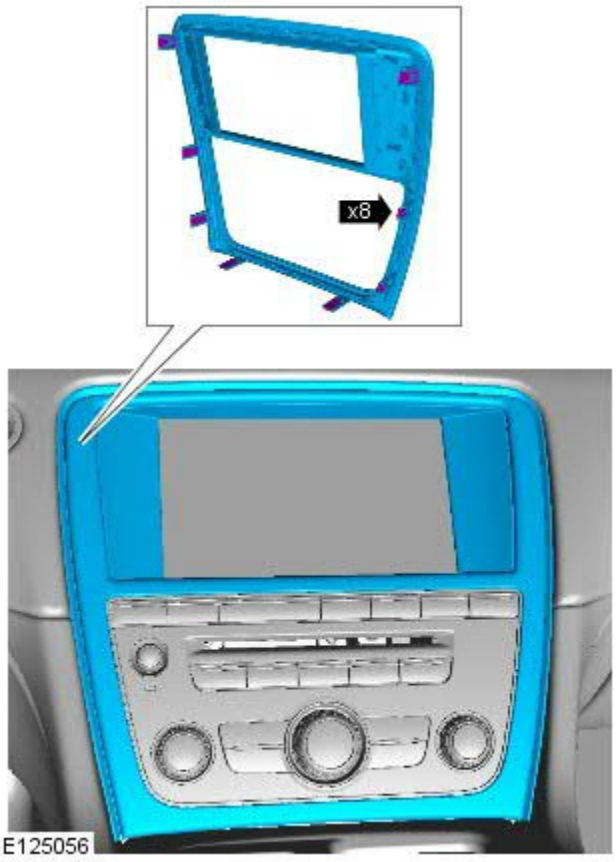
Published: 11-May-2011

Instrument Panel and Console - Floor Console Side Trim Panel

Removal and Installation

Removal

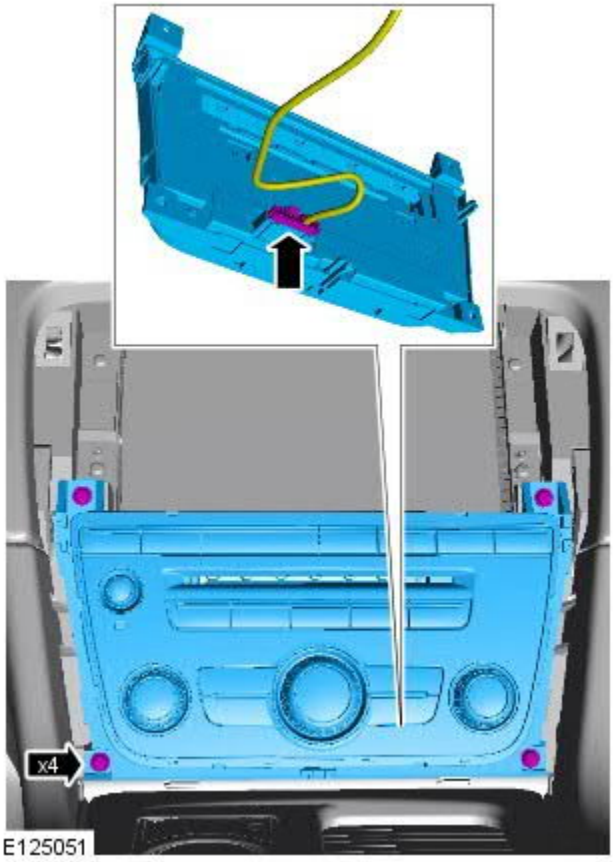
NOTE: Removal steps in this procedure may contain installation details.



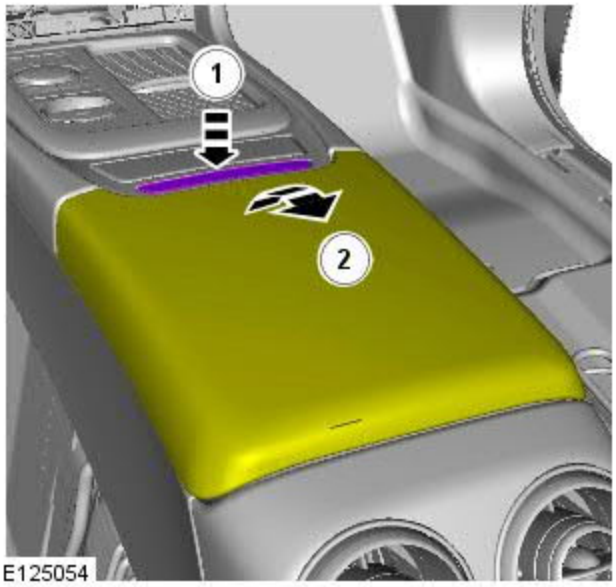
1. CAUTIONS:

   Take extra care not to damage the edges of the component.

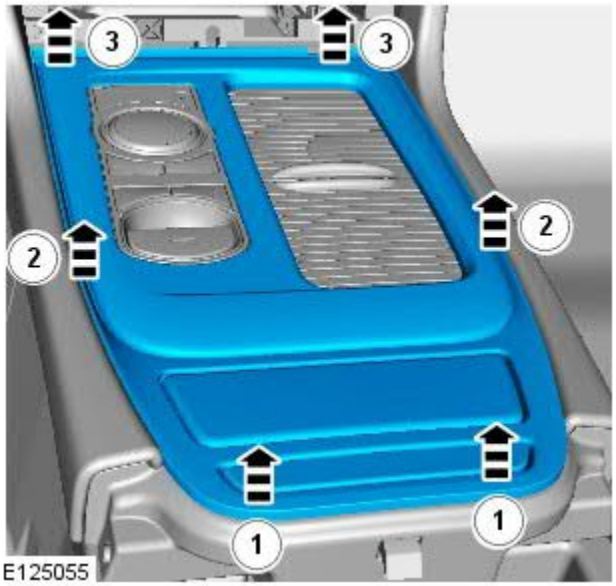
   Protect the surrounding trim from damage when changing the component.



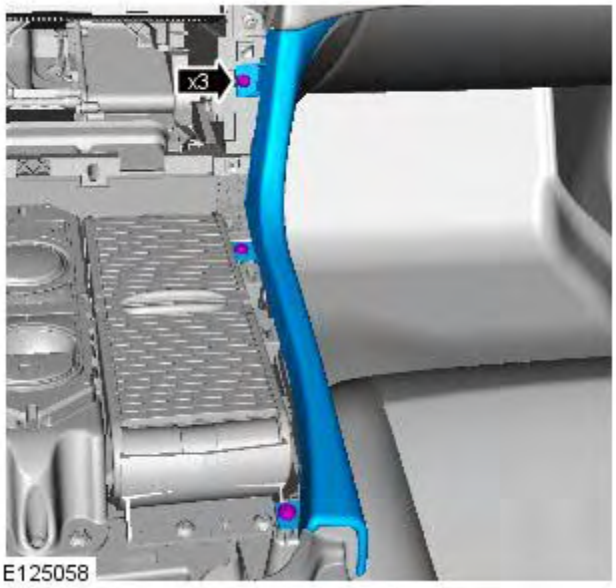
2. *Torque:* 2.5 Nm



3.

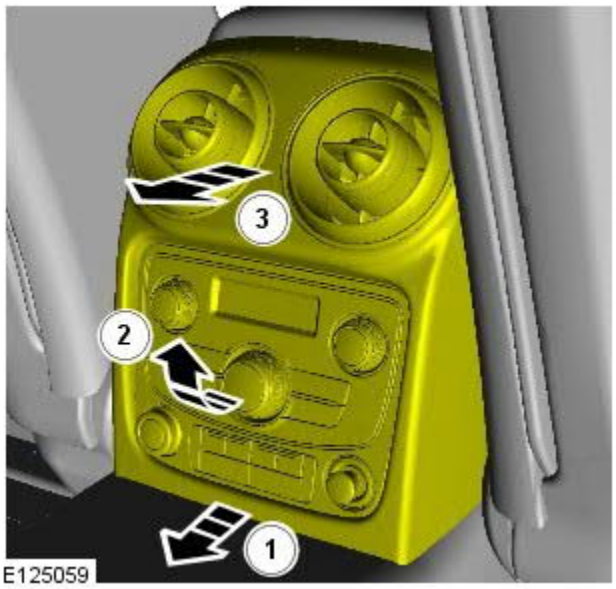


4. CAUTION: Take extra care not to damage the edges of the component.

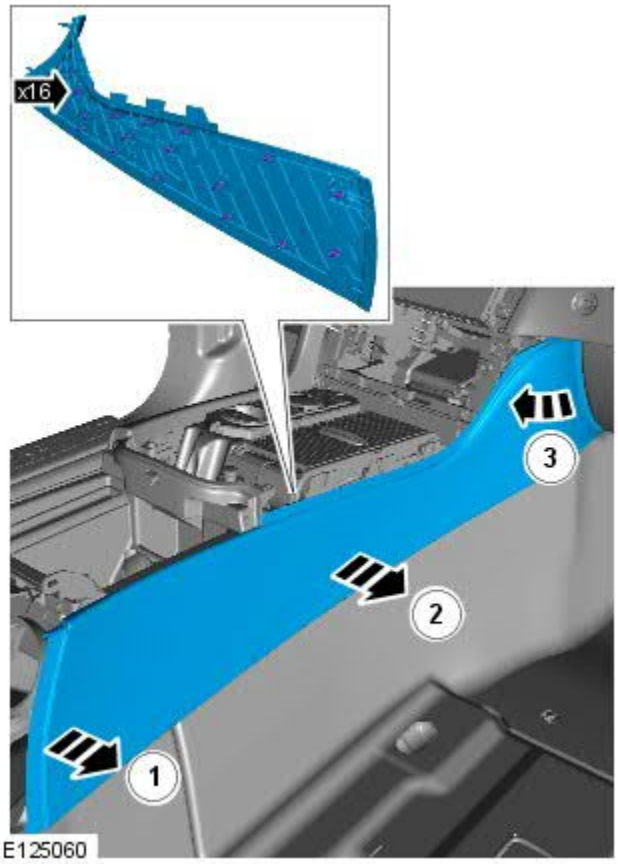


5. NOTE: RH illustration shown, LH is similar.

Torque: 2.5 Nm



6.



7. NOTES:

RH illustration shown, LH is similar.

Make sure that the component is installed to the position noted on removal.

Installation

1. To install reverse the removal procedure.

Published: 11-May-2011

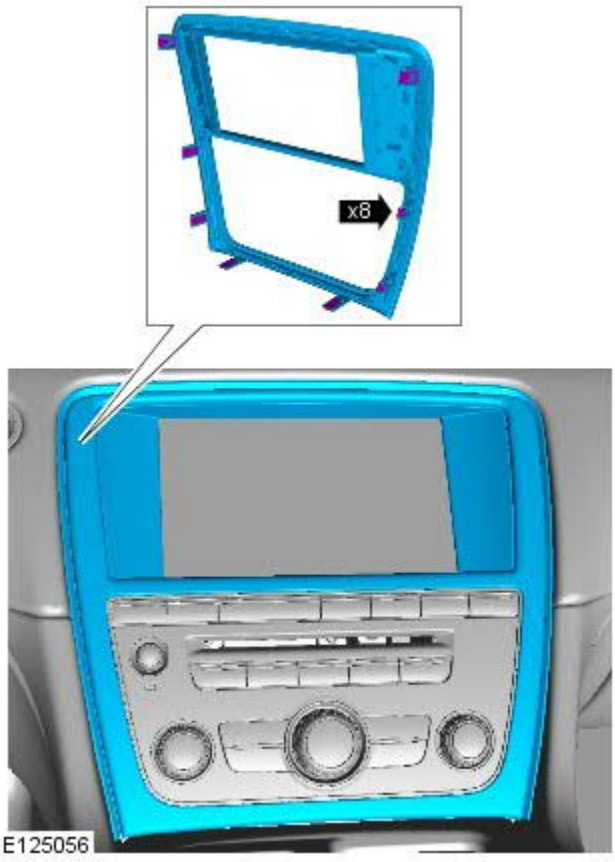
Instrument Panel and Console - Floor Console Stowage Compartment Lid Latch

Removal and Installation

Removal

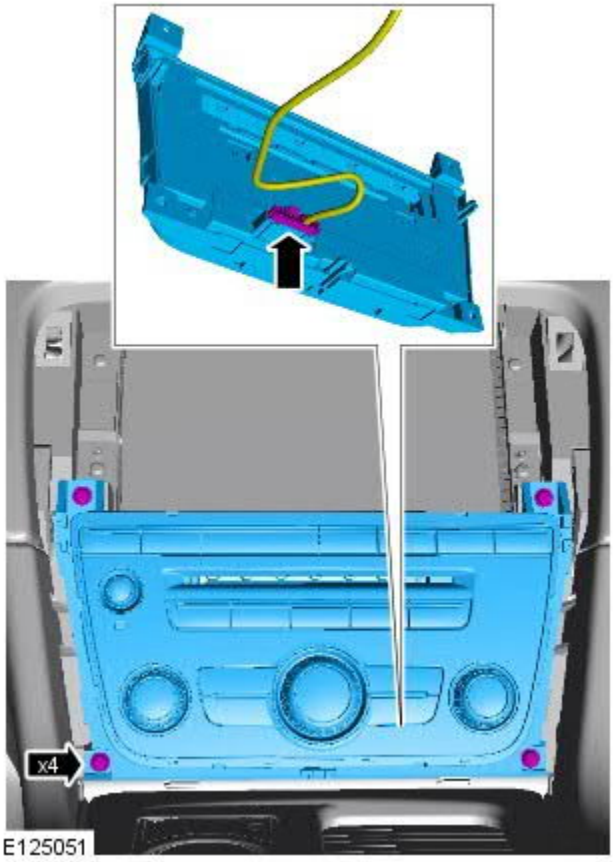
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

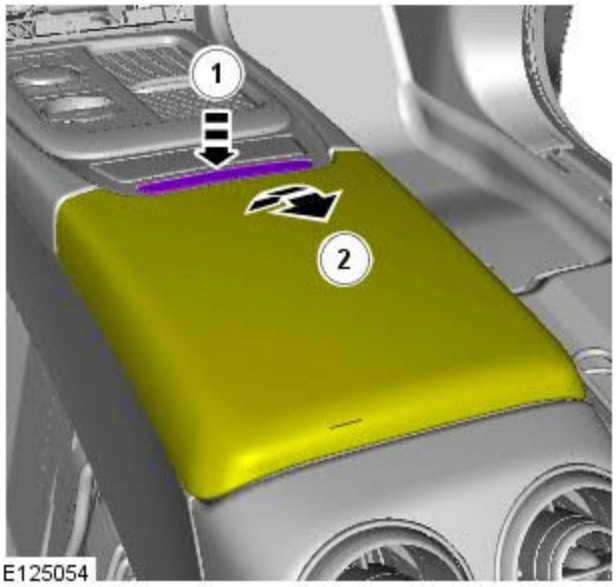


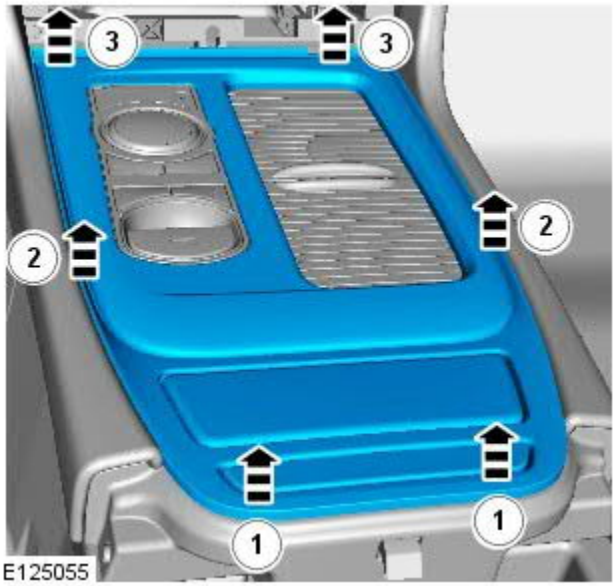
2. CAUTION: Take extra care not to damage the edges of the component.

3. *Torque:* 4 Nm

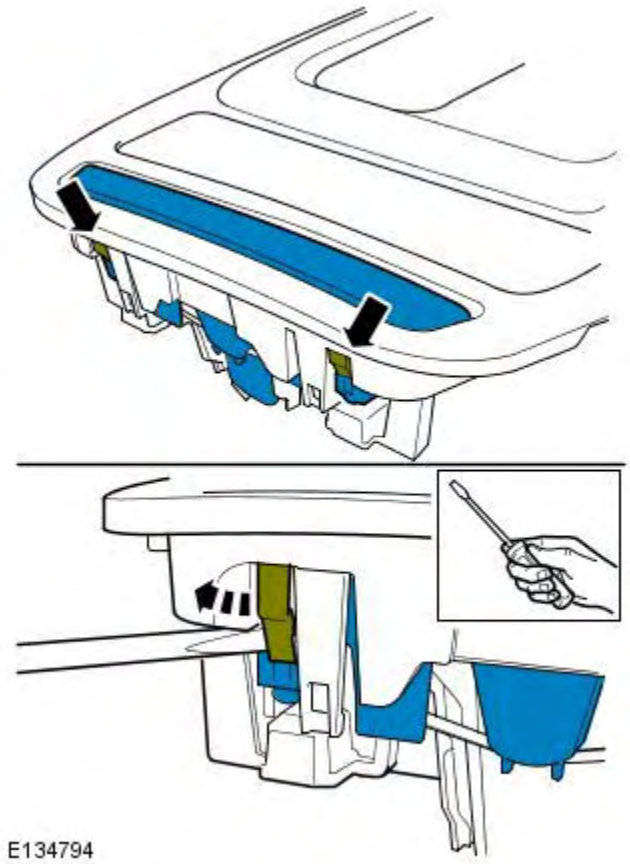


4.



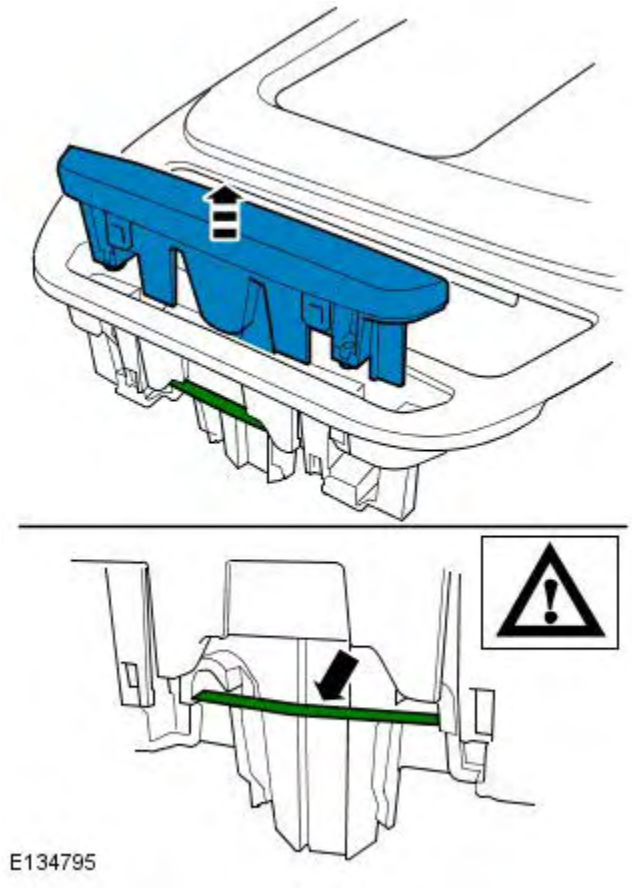


5. CAUTION: Take extra care not to damage the edges of the component.



6.

7.



Installation

1. To install, reverse the removal procedure.

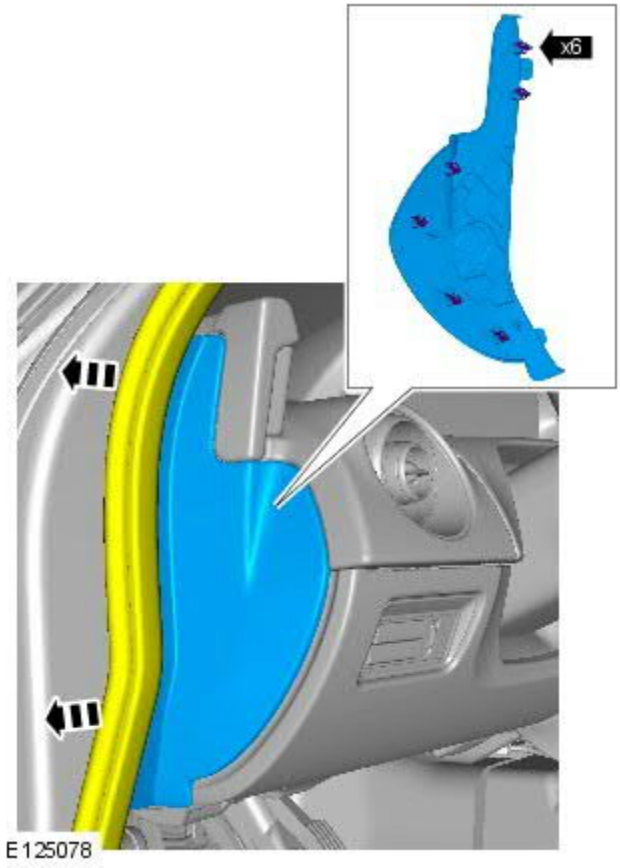
Published: 11-May-2011

Instrument Panel and Console - Glove Compartment

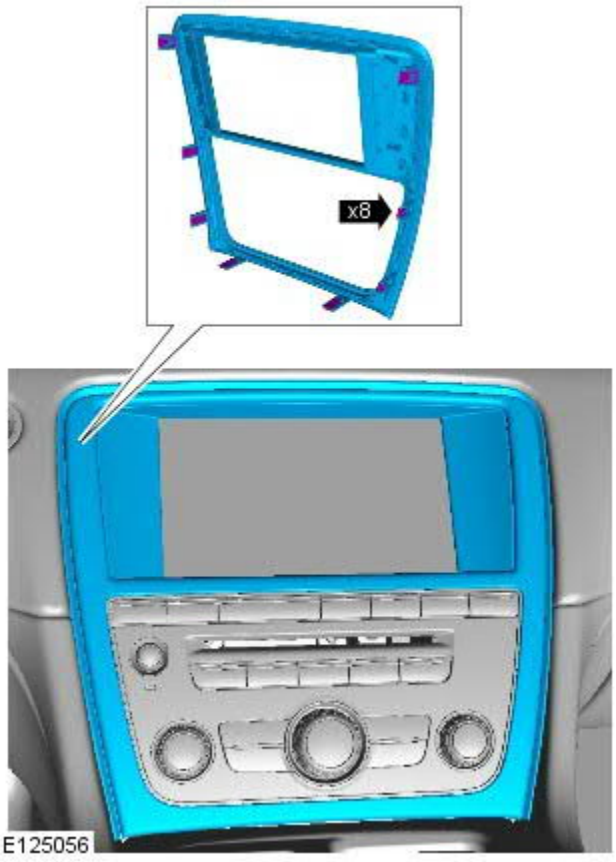
Removal and Installation

Removal

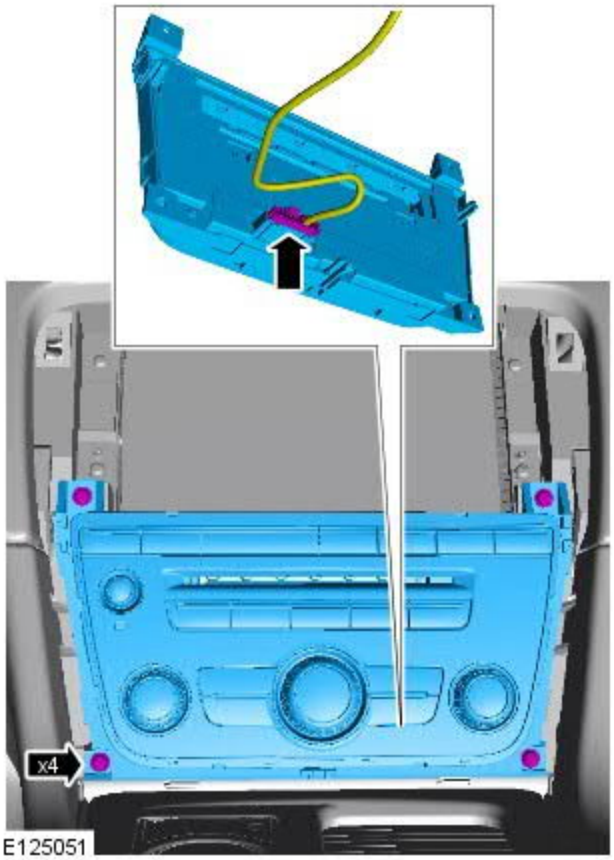
NOTE: Removal steps in this procedure may contain installation details.



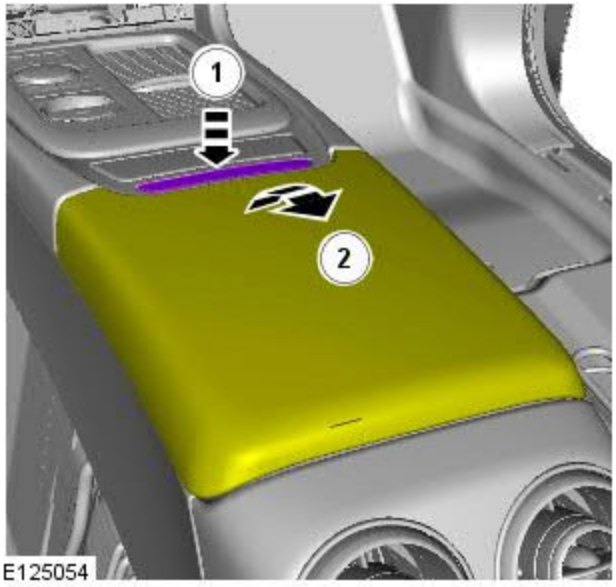
1.



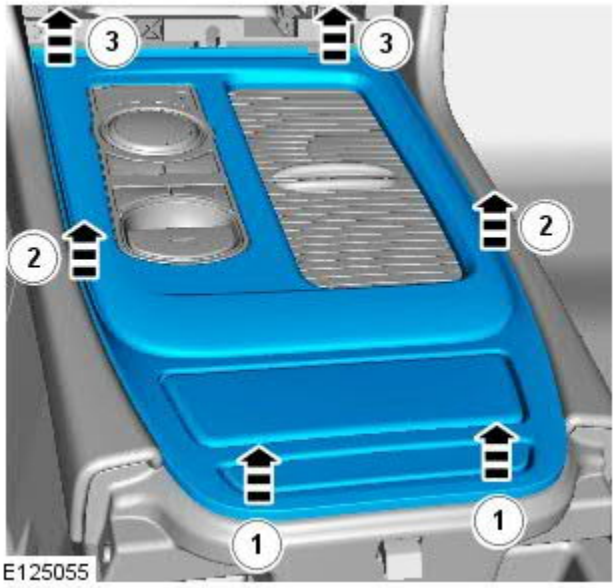
2. CAUTION: Take extra care not to damage the edges of the component.



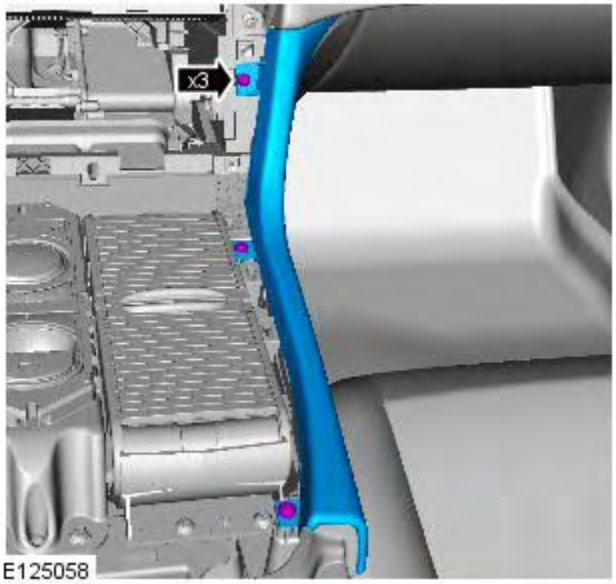
3.



4.

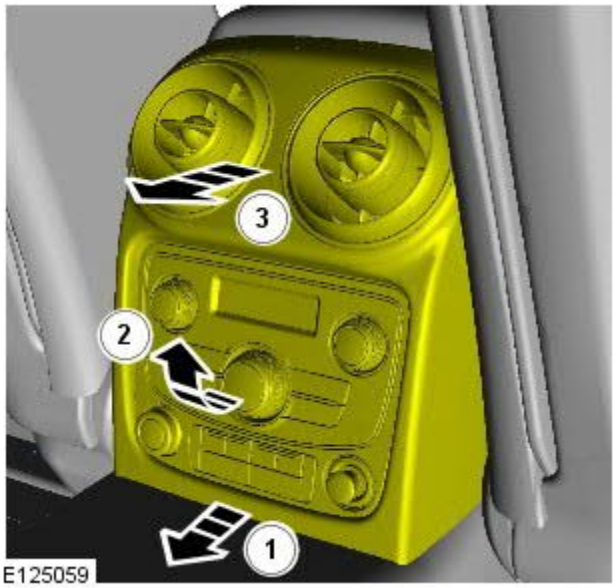


5. CAUTION: Take extra care not to damage the edges of the component.



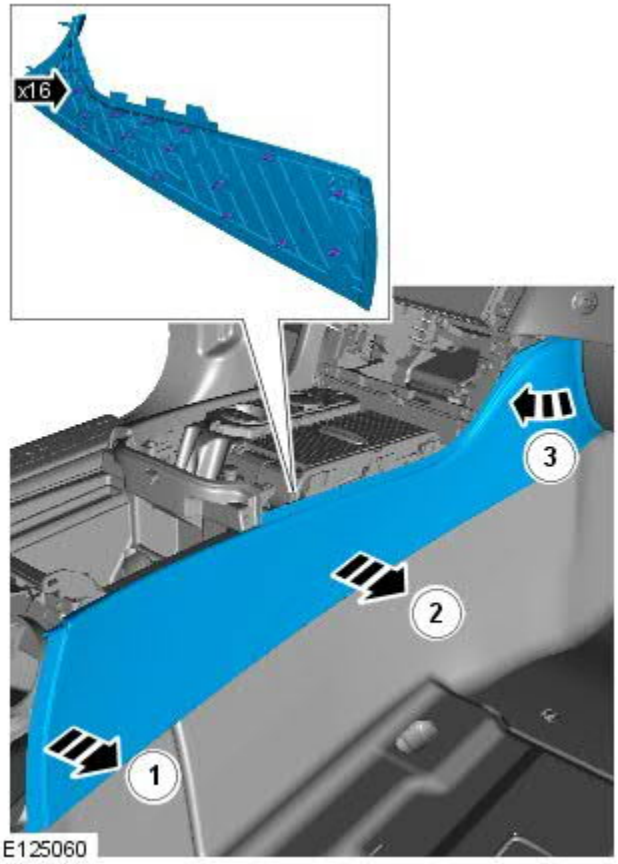
E125058

6. *Torque:* 2 Nm

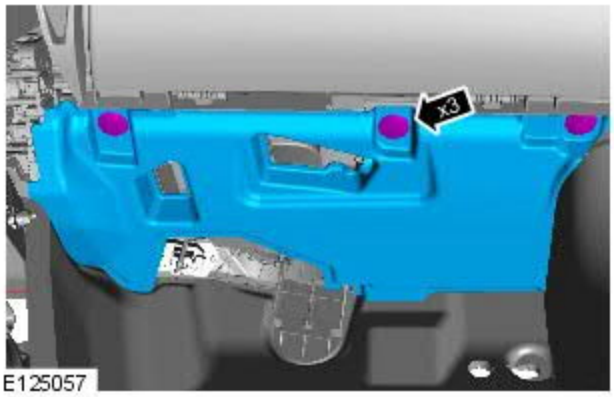


E125059

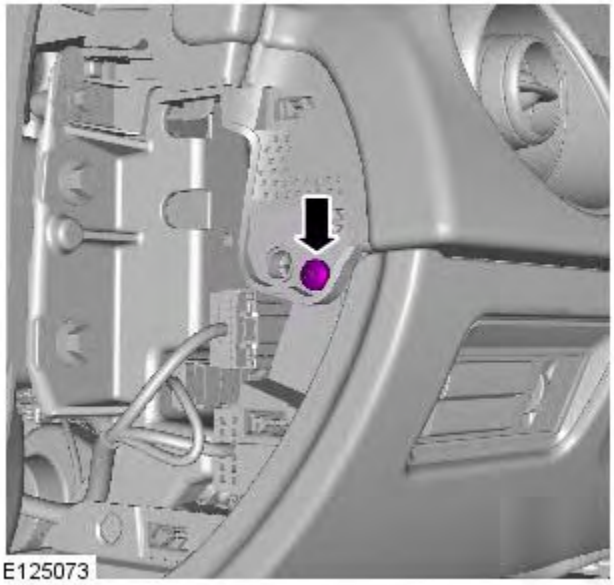
7.



8. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

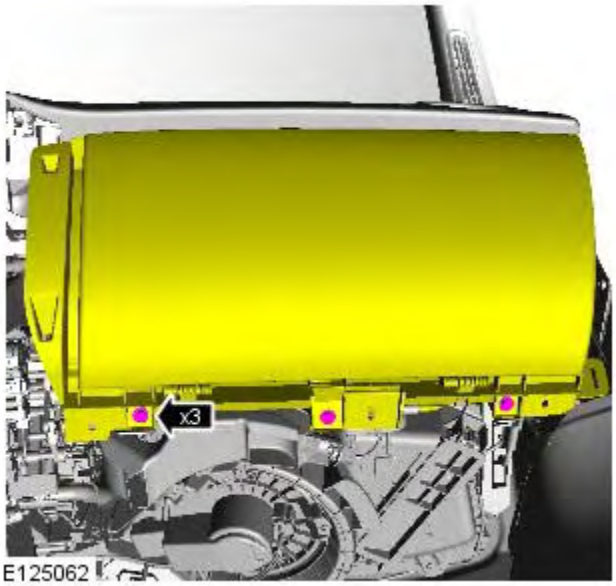


9.



10. CAUTION: LH illustration shown, RH is similar.

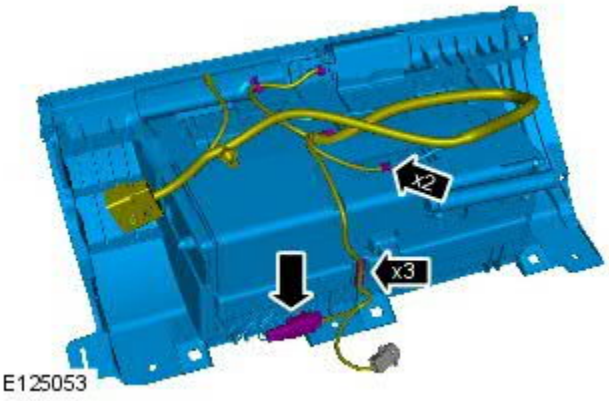
    Torque: 2.5 Nm



11. *Torque:* 9 Nm

12. *Torque:* 2.5 Nm

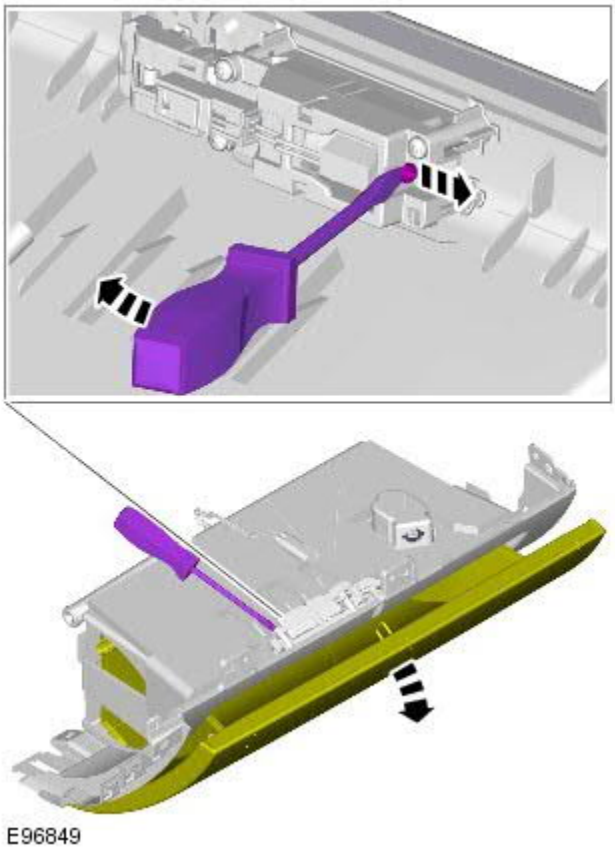
13.



14. NOTES:

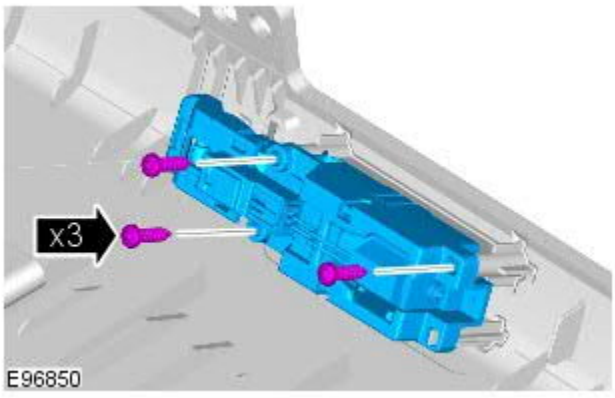
Some variation in the illustrations may occur, but the essential information is always correct.

Do not disassemble further if the component is removed for access only.

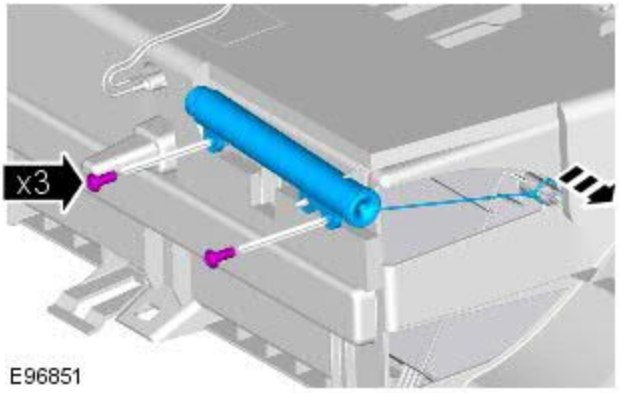


15. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Torque: 2 Nm



www.JagDocs.com



16. *Torque:* 2 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

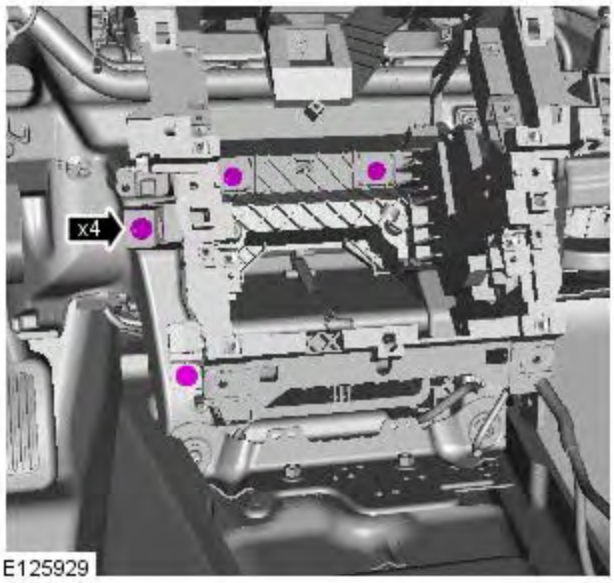
Instrument Panel and Console - Instrument Panel Center Reinforcement

Removal and Installation

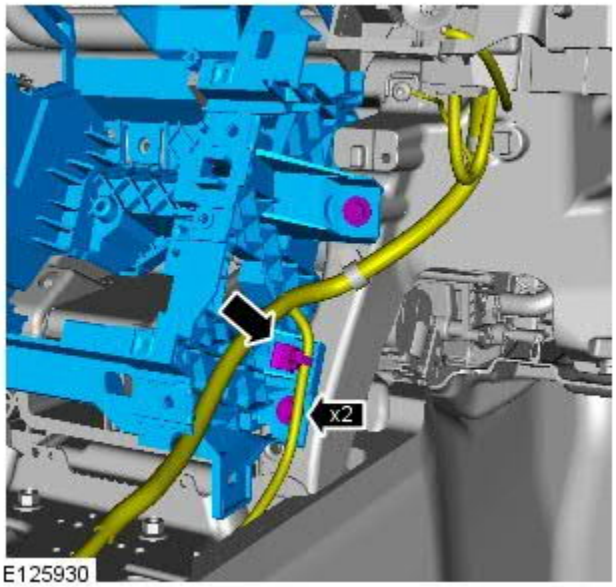
Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: Floor Console (501-12 Instrument Panel and Console, Removal and Installation).
3. Refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).



4. *Torque:* 9 Nm



5. *Torque:* 9 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Instrument Panel and Console - Instrument Panel Lower Section

Removal and Installation

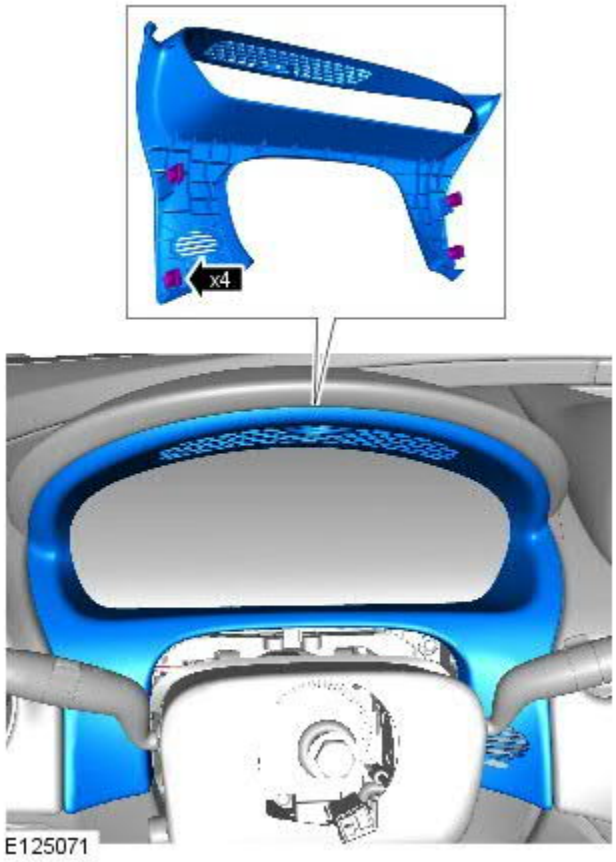
Removal

NOTE: Removal steps in this procedure may contain installation details.

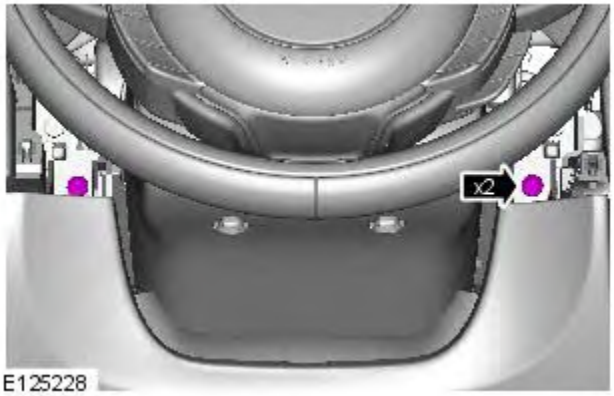
1. Refer to: Floor Console Side Trim Panel (501-12 Instrument Panel and Console, Removal and Installation).

2. NOTE: The steering wheel is shown removed for clarity.

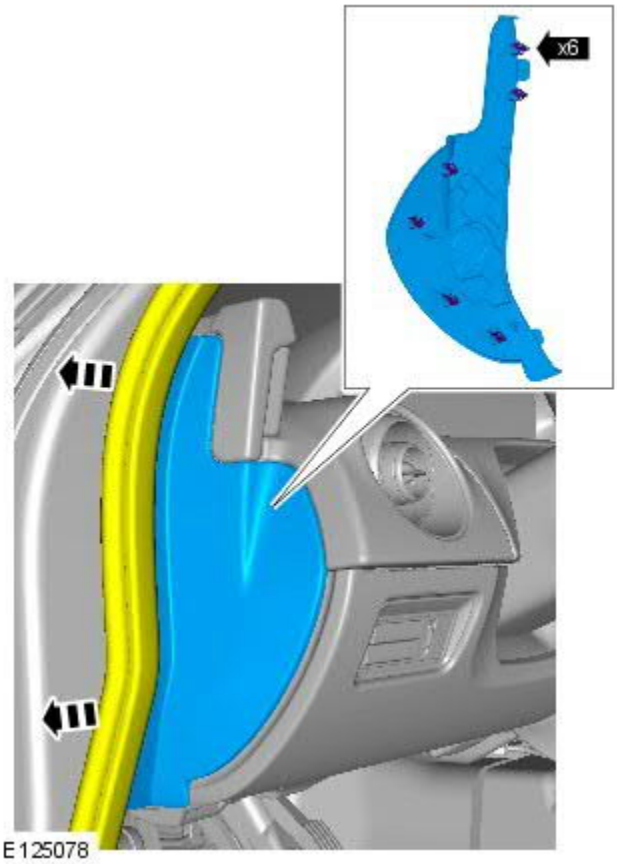
   Torque: 2 Nm



3. NOTE: The steering wheel is shown removed for clarity.



4. *Torque:* 2.5 Nm



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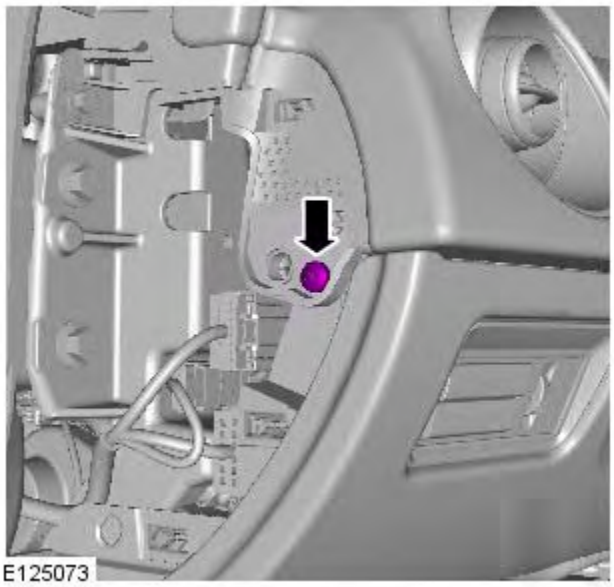
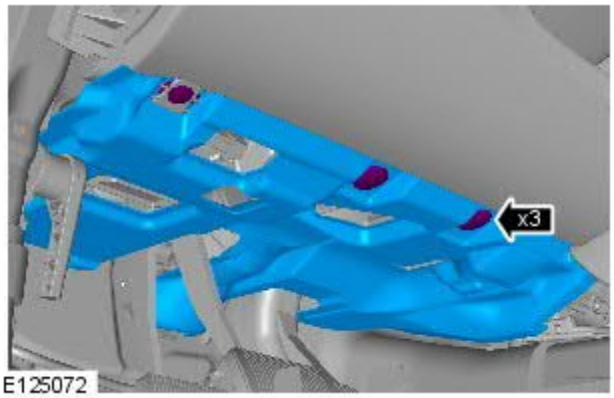

E125073

6. *Torque:* 2.5 Nm

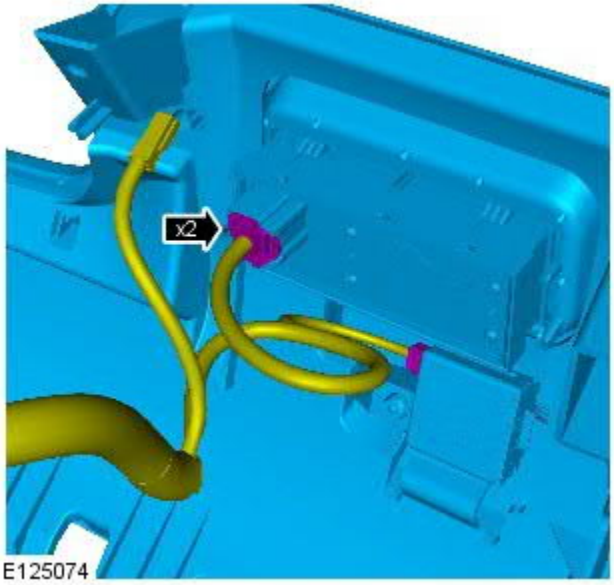


E125072

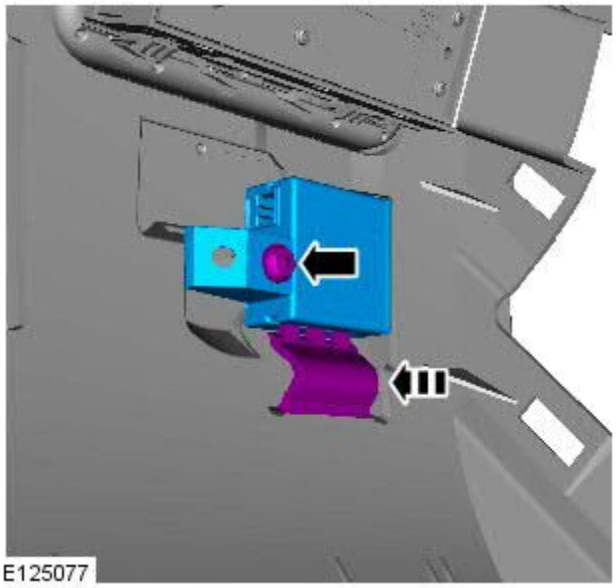
7.

E125075

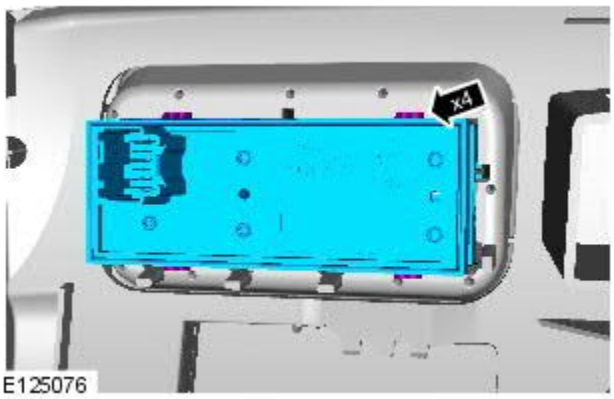
8. *Torque:* 9 Nm



9. NOTE: Do not disassemble further if the component is removed for access only.



10. *Torque:* 2 Nm



11.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Instrument Panel and Console - Instrument Panel Upper Section

Removal and Installation

Special Tool(s)

	JLR-412-147 Remover, Register

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least one minute after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

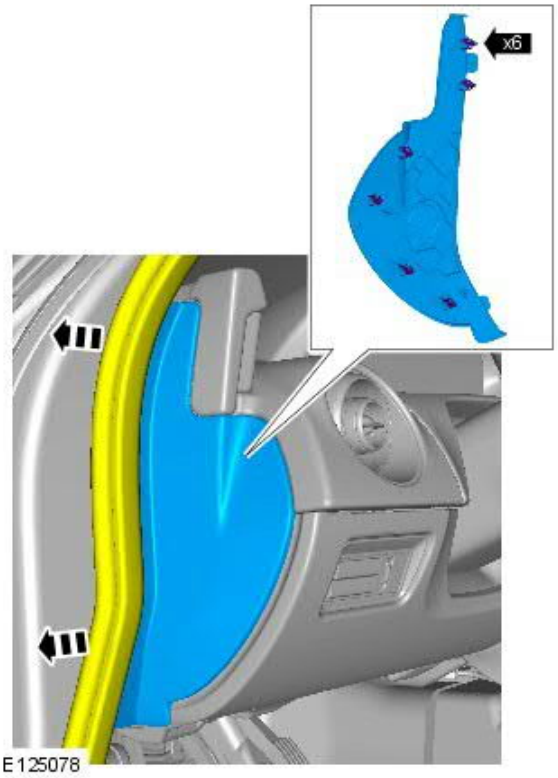
Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

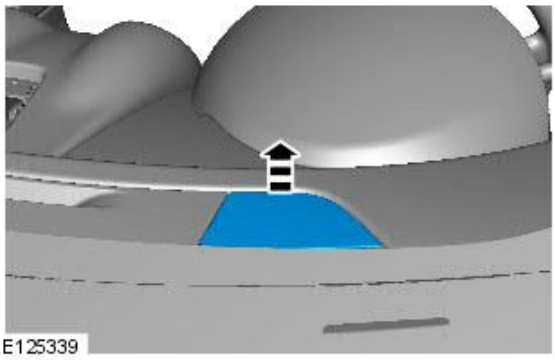
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: Steering Wheel (211-04 Steering Column, Removal and Installation).
3. NOTE: The procedure must be carried out on both sides.

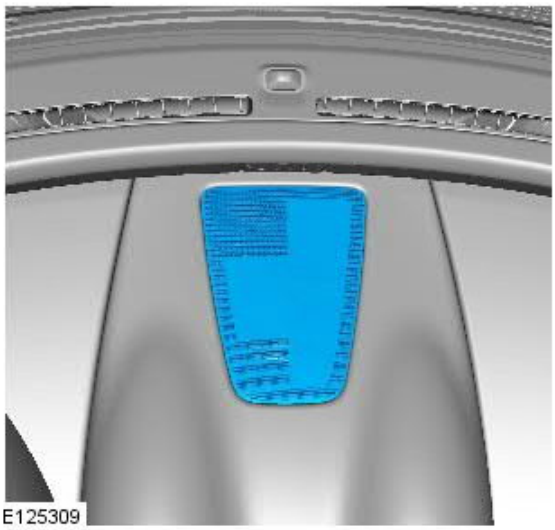
   Refer to: A-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).
4. Refer to: Glove Compartment (501-12 Instrument Panel and Console, Removal and Installation).
5. Refer to: Instrument Cluster (413-01 Instrument Cluster, Removal and Installation).
6. Refer to: Instrument Panel Lower Section (501-12 Instrument Panel and Console, Removal and Installation).
7. Fully extend the steering column for access.



8. NOTE: The procedure must be carried out on both sides.

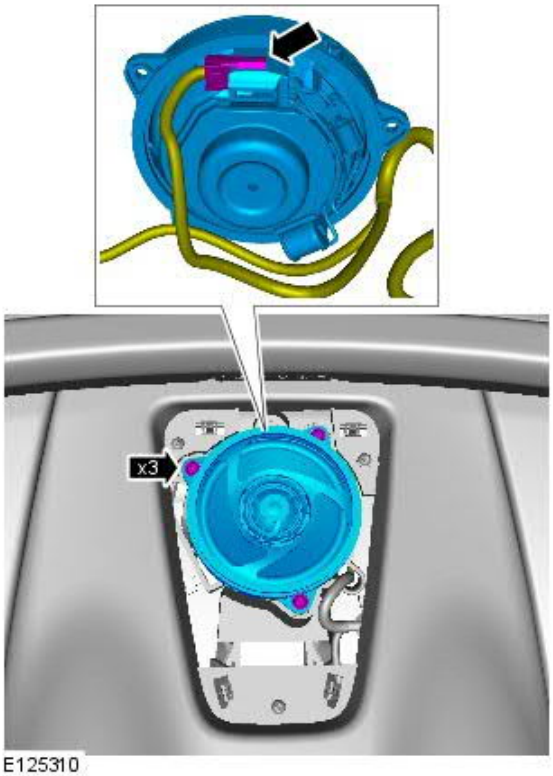


9. NOTE: The procedure must be carried out on both sides.



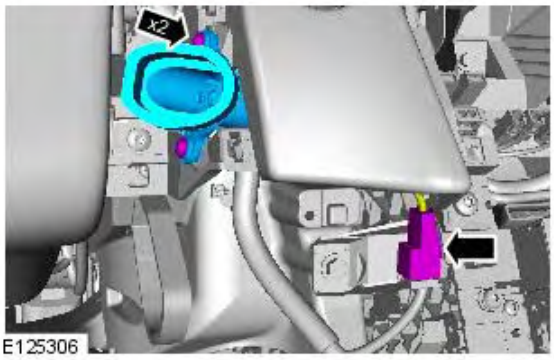
10.

11. *Torque:* 2.5 Nm

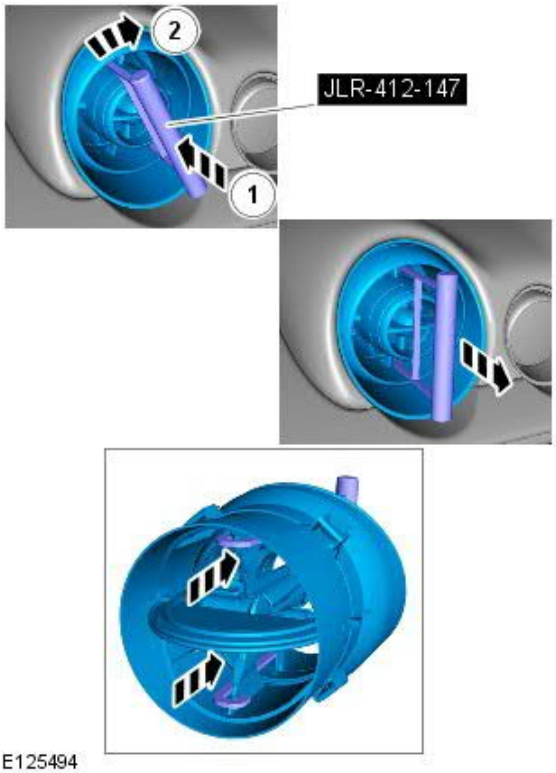


E125310

12. *Torque:* 2.5 Nm



E125306



E125494

13. CAUTIONS:

Before inserting the special tool, make sure that the register is fully open.

Care must be taken to avoid damage to the internal components of the center registers.

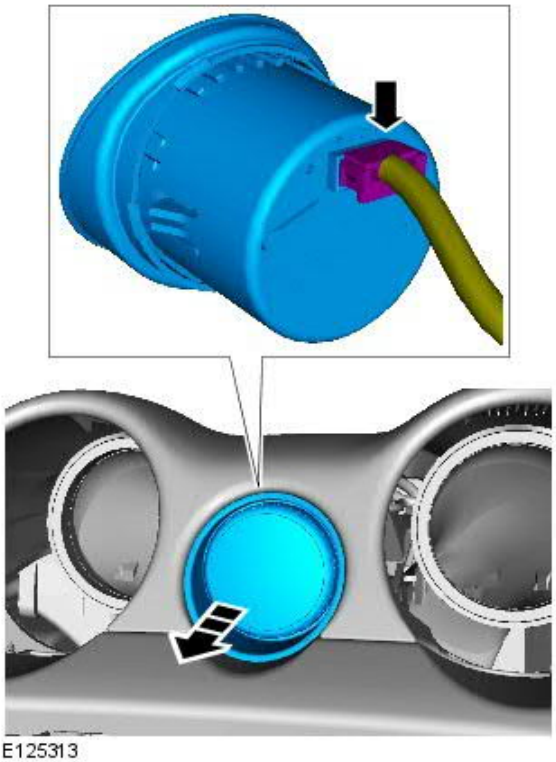
Repeat for the other centre register secured to the instrument panel.

To install the register, align the securing clips and push the register into the housing until firmly secured in it's seated position.

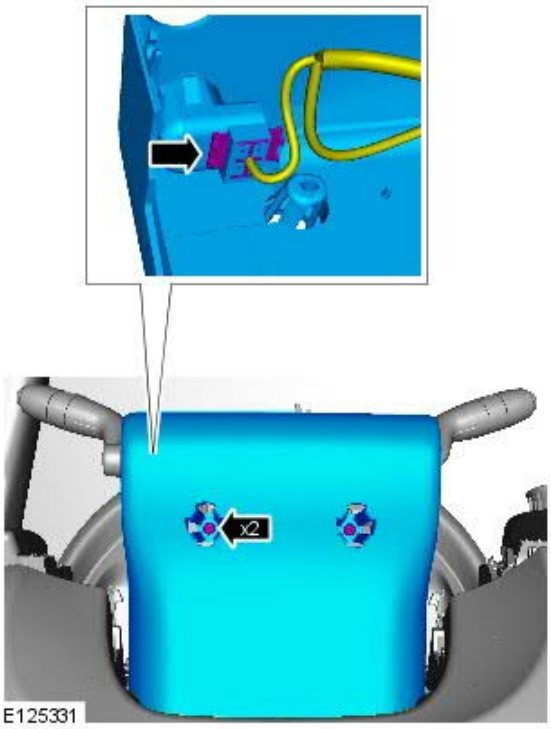
During removal, care must be taken not to damage the instrument panel covering with the register clips.

Special Tool(s): JLR-412-147

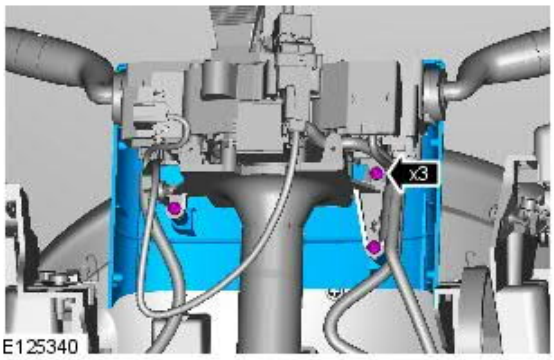
14.


E125313

15. *Torque:* 2.5 Nm



16. *Torque:* 2.5 Nm



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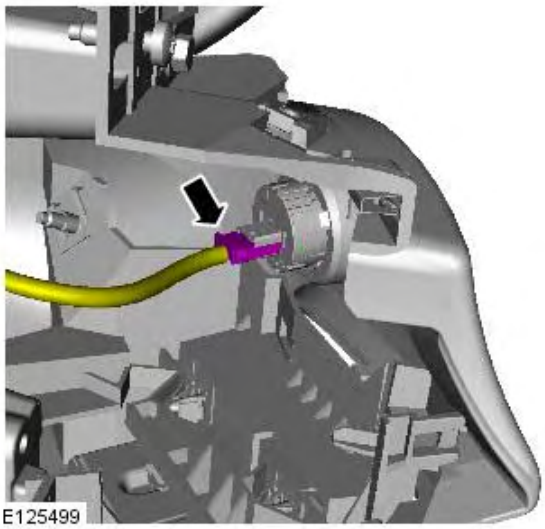

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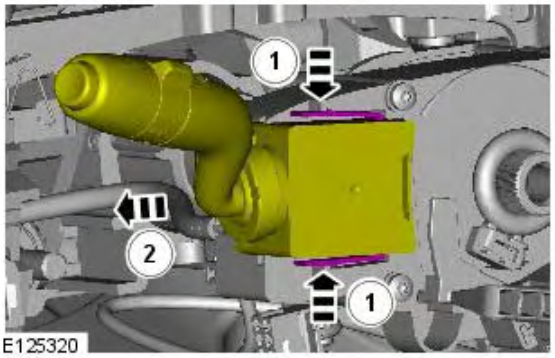

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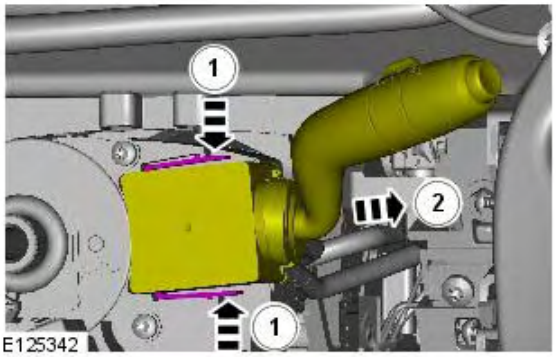

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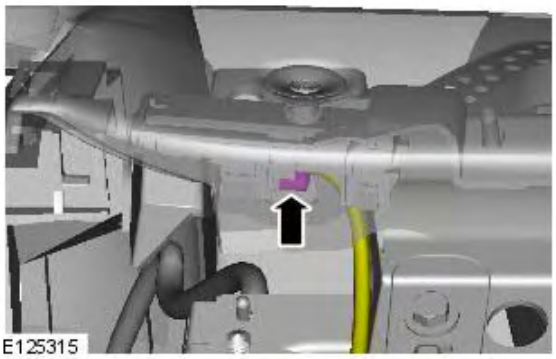

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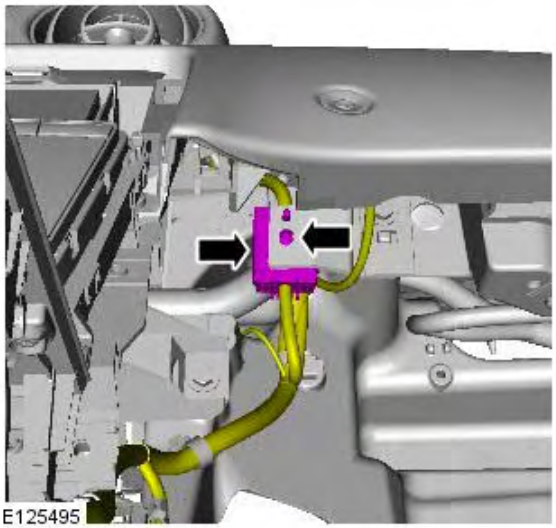
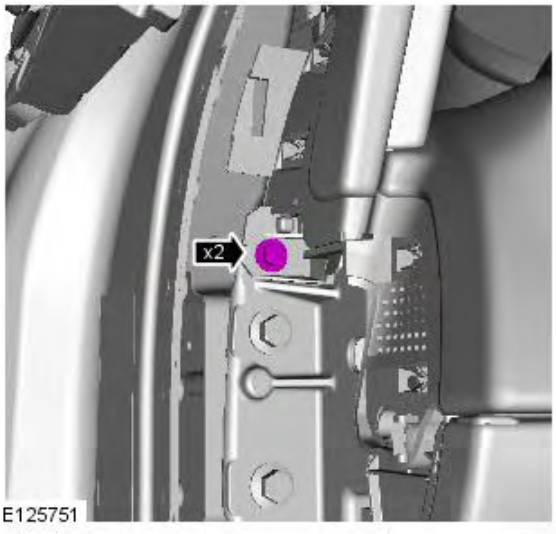
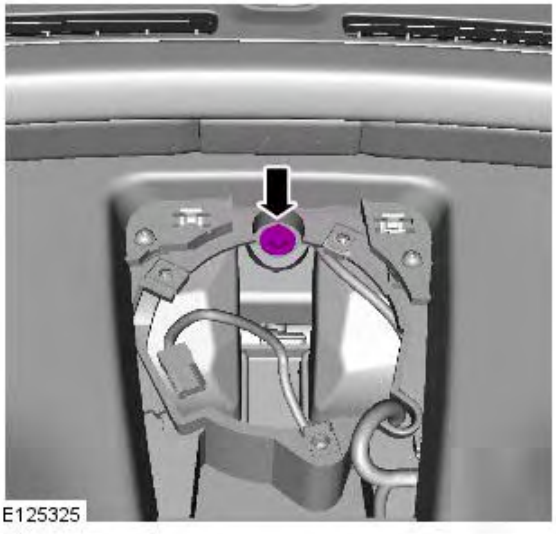


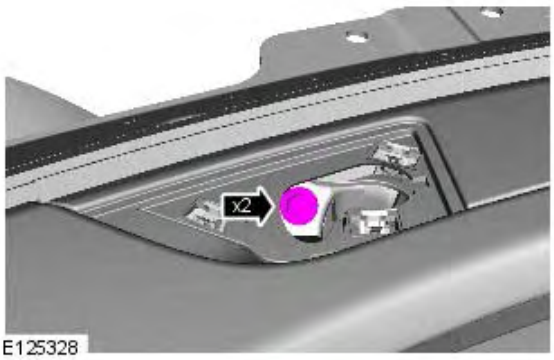


22. NOTE: The procedure must be carried out on both sides.

Torque: 9 Nm

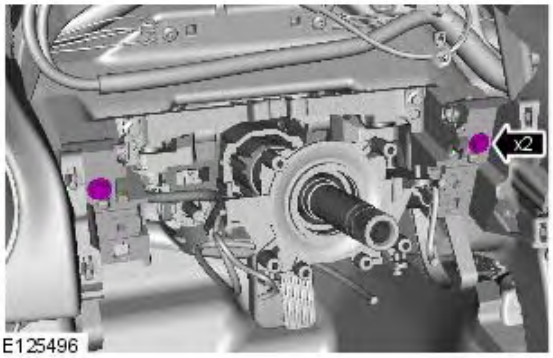


23. *Torque:* 9 Nm

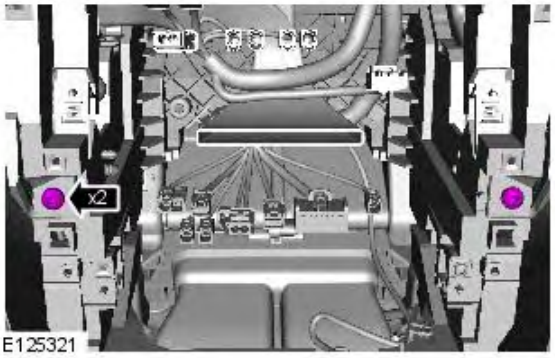


24. NOTE: The procedure must be carried out on both sides.

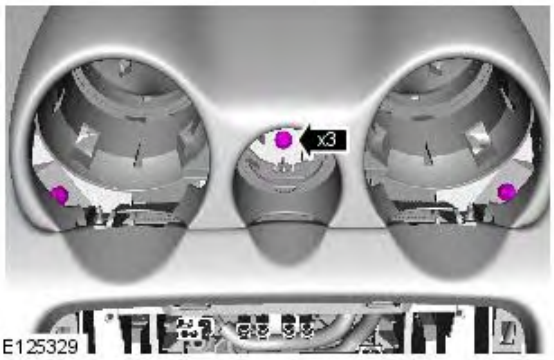
Torque: 9 Nm



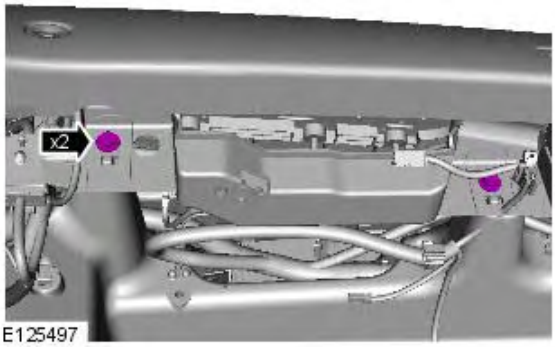
25. *Torque:* 9 Nm



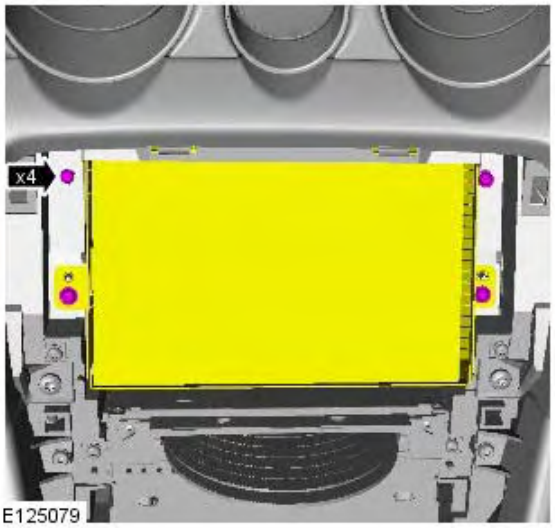
26. *Torque:* 4 Nm



27. *Torque:* 4 Nm



28. *Torque:* 9 Nm

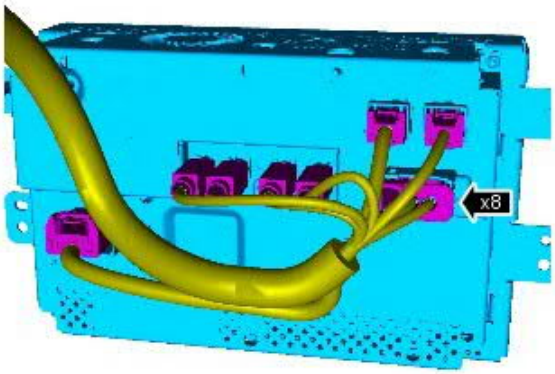


E125079

29. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

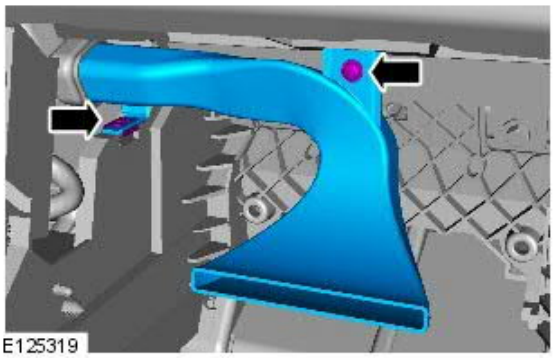
Torque: 4 Nm

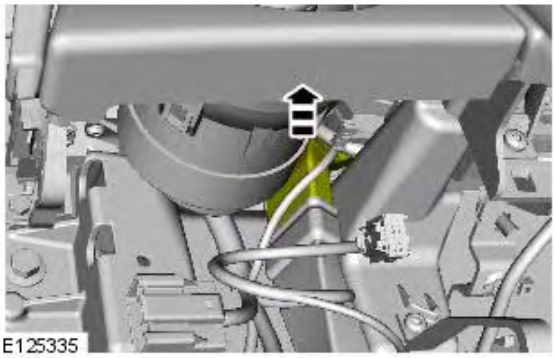
30.



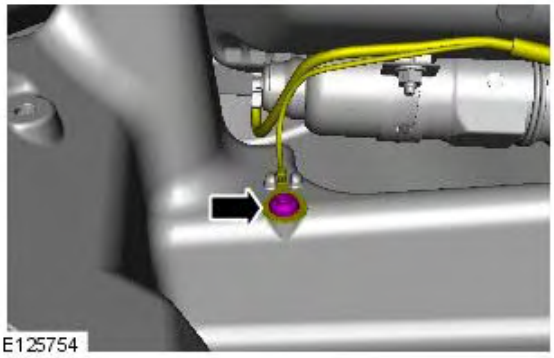
E125080

31. *Torque:* 2.5 Nm


E125319



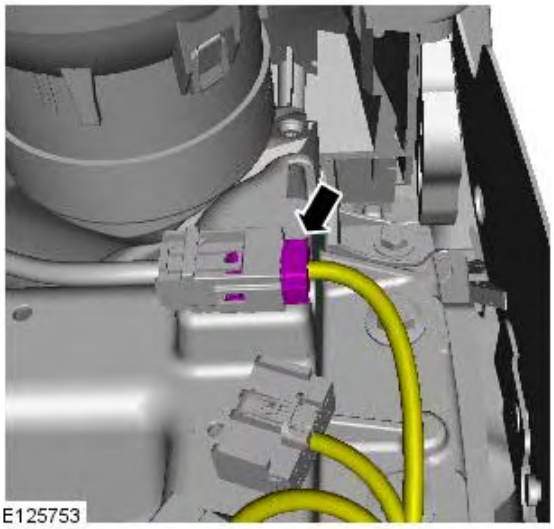
32. CAUTION: Note the fitted position of the component prior to removal.



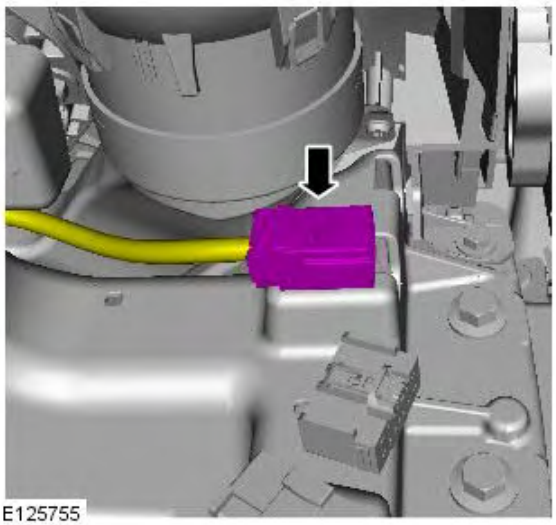
33. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Torque: 9 Nm

34.



35.



36. CAUTIONS:

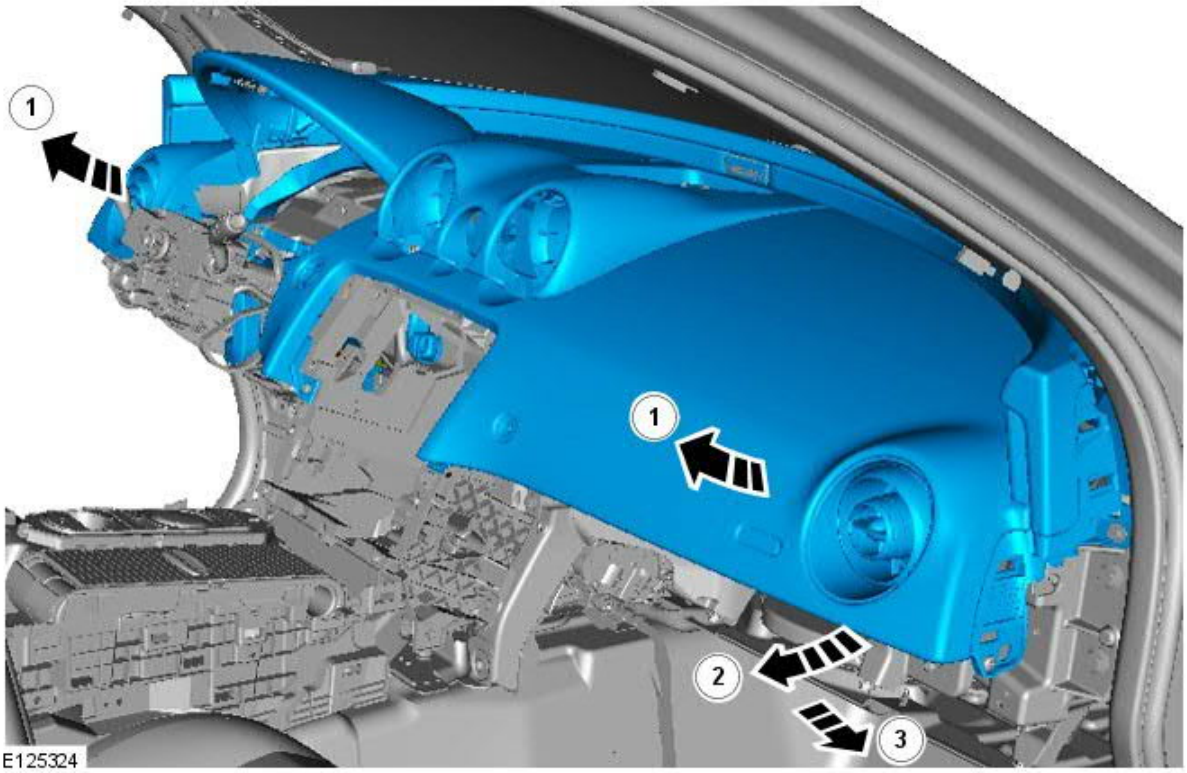
Note the fitted position of the component prior to removal.

Take extra care not to damage the edges of the component.

NOTES:

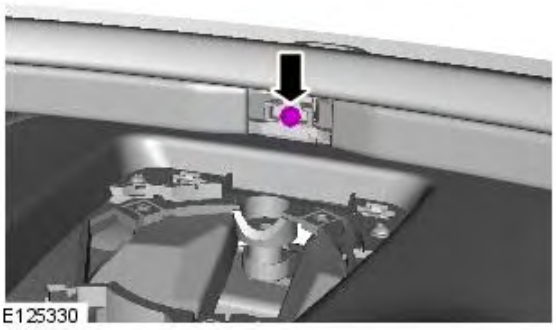
This step requires the aid of another technician.

LHD illustration shown, RHD is similar.



37. NOTE: Do not disassemble further if the component is removed for access only.

38. *Torque:* 2.5 Nm



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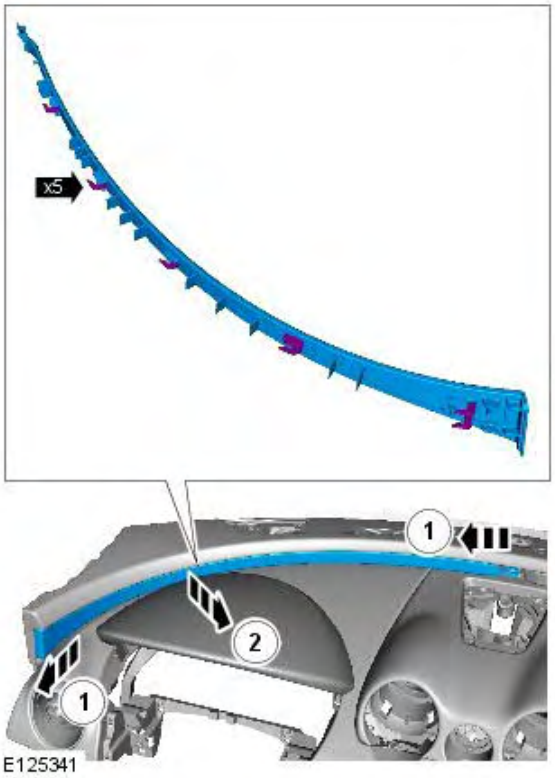
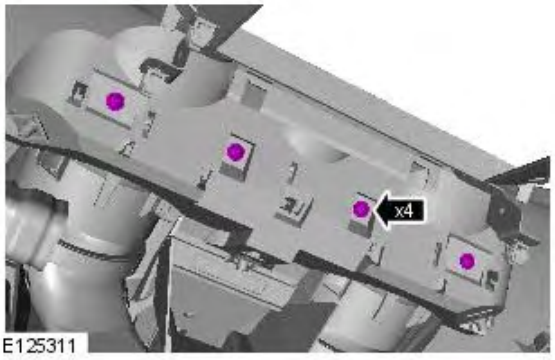
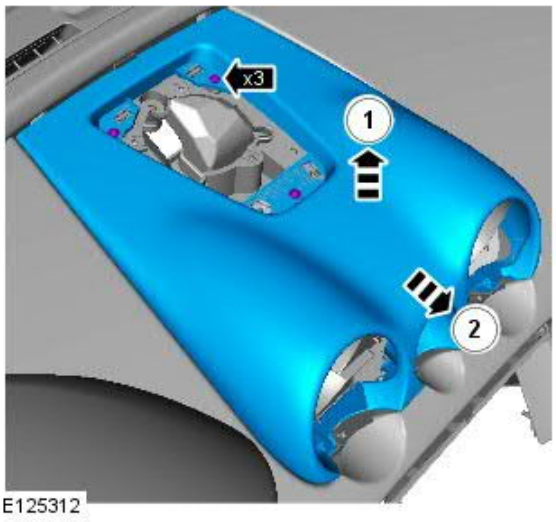


40. *Torque:* 2.5 Nm

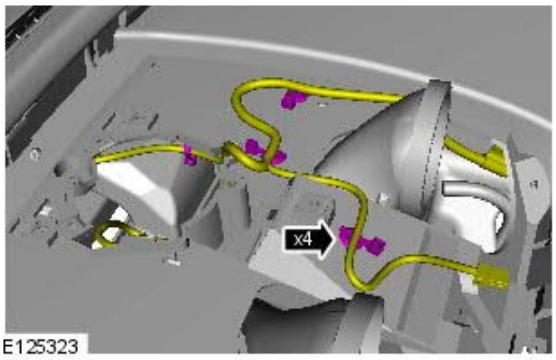


41. *Torque:* 2.5 Nm

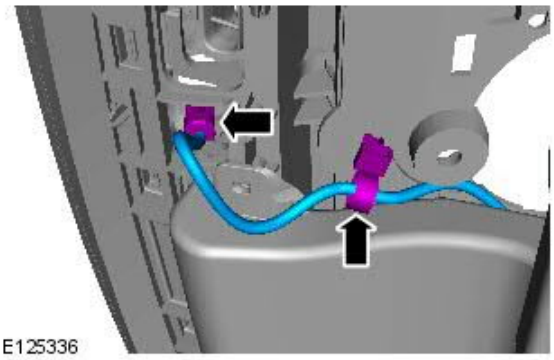


E125312

42.

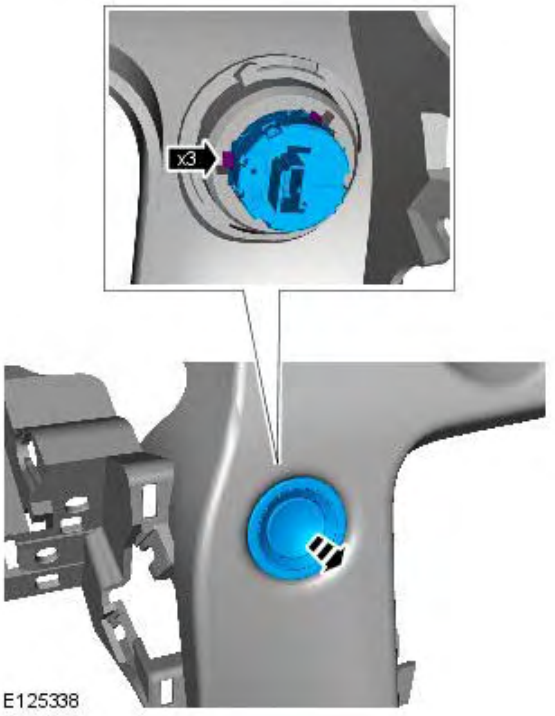


E125323


E125336

43. CAUTION: Note the fitted position of the component prior to removal.

44.



45. CAUTIONS:

Care must be taken to avoid damage to the seal register and running surface.

Repeat for each of the registers secured to the instrument panel.

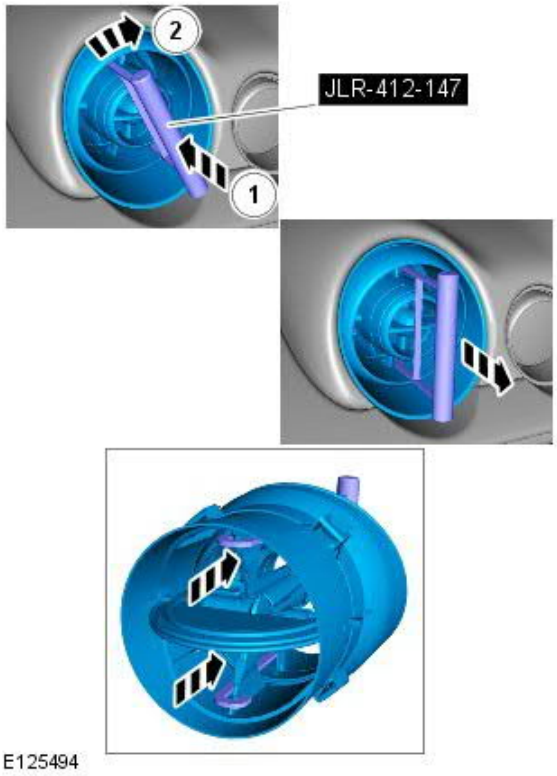
Before inserting the special tool, make sure that the register is fully open.

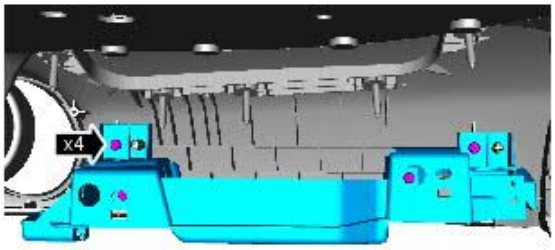
To install the register, align the securing clips and push the register into the housing until firmly secured in it's seated position.

During removal, care must be taken not to damage the instrument panel covering with the register clips.

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

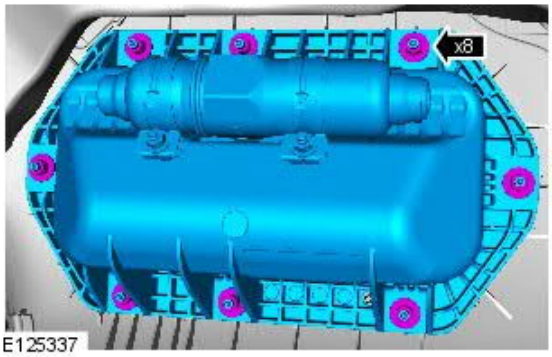
Special Tool(s): JLR-412-147





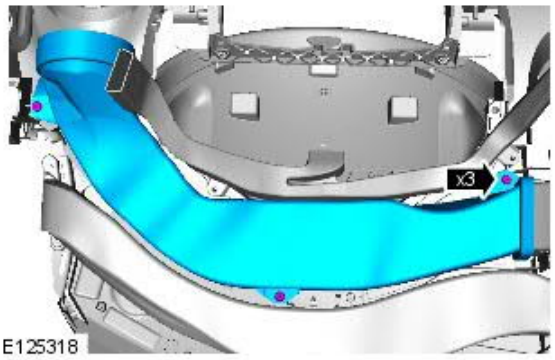
E125333

46. *Torque:* 2.5 Nm



E125337

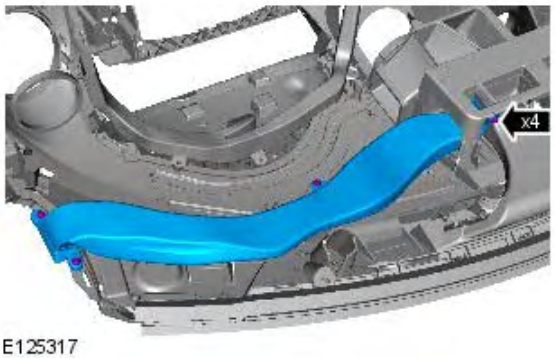
47. *Torque:* 4.5 Nm



E125318

48. NOTE: The procedure must be carried out on both sides.

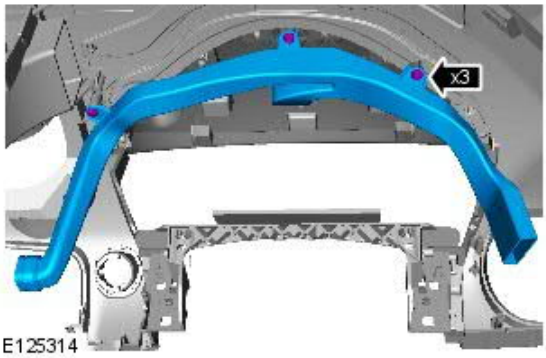
Torque: 2.5 Nm



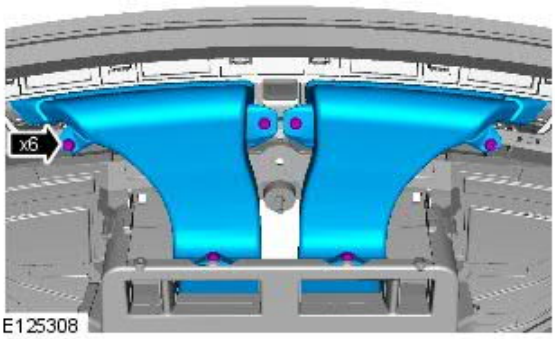
E125317

49. *Torque:* 2.5 Nm

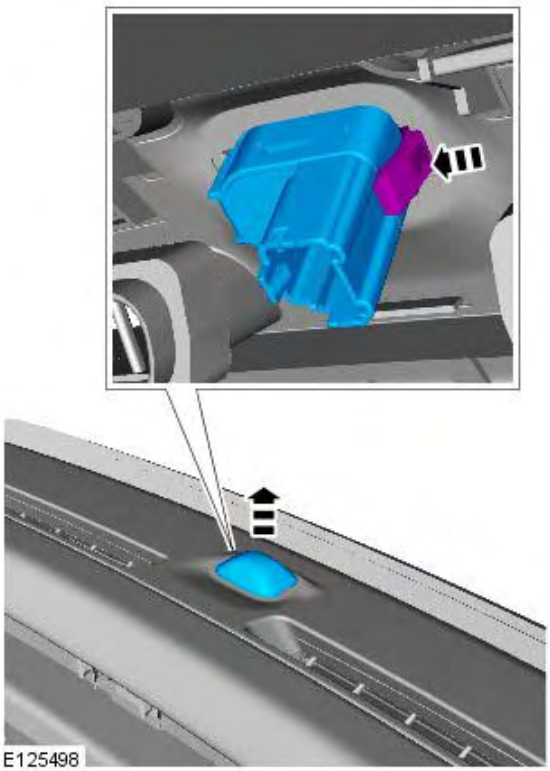
50. *Torque:* 2.5 Nm



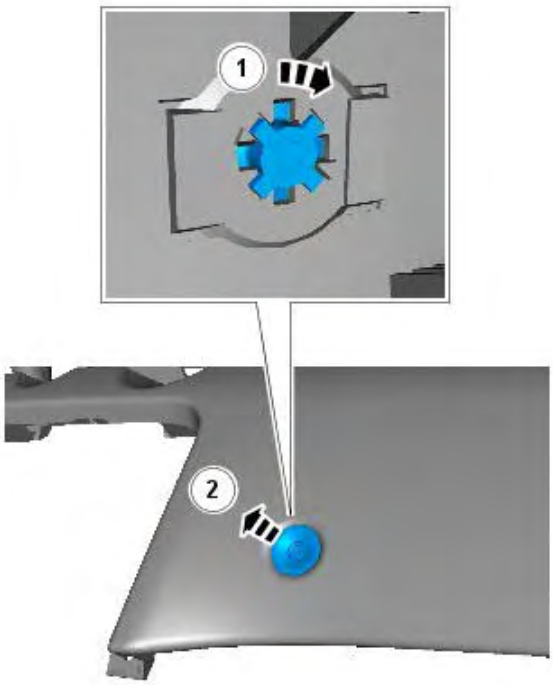
51. *Torque:* 2.5 Nm



52.



53.



E125752

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Instrument Panel and Console - Overhead Console

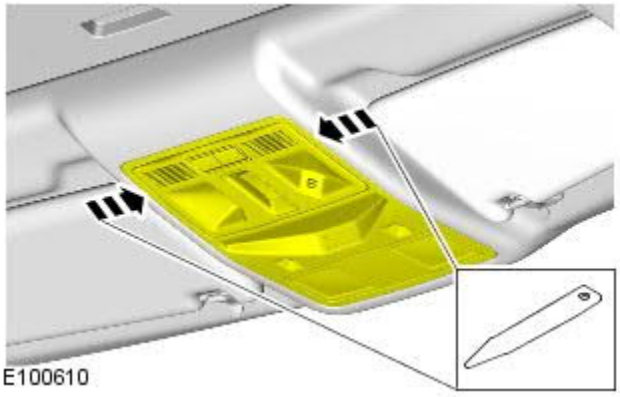
Removal and Installation

Removal

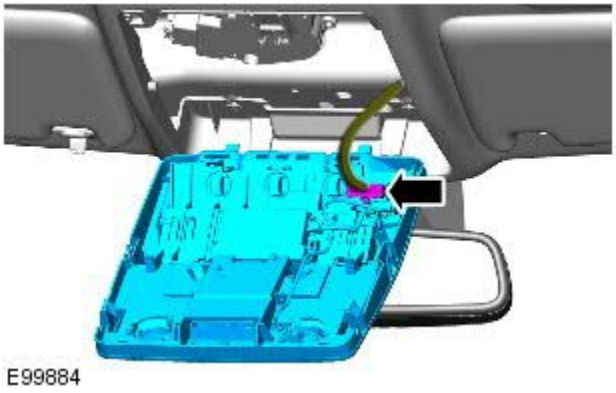
NOTES:

Removal steps in this procedure may contain installation details.

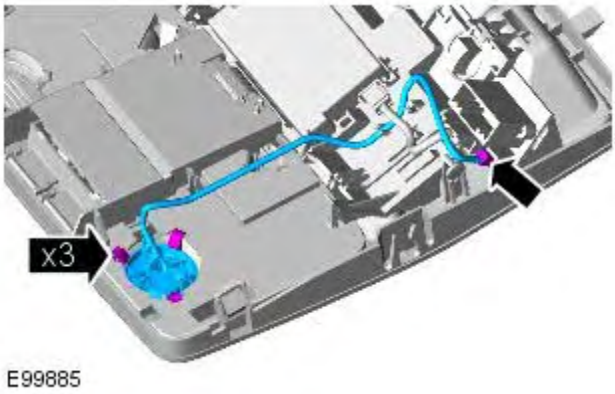
Some variation in the illustrations may occur, but the essential information is always correct.



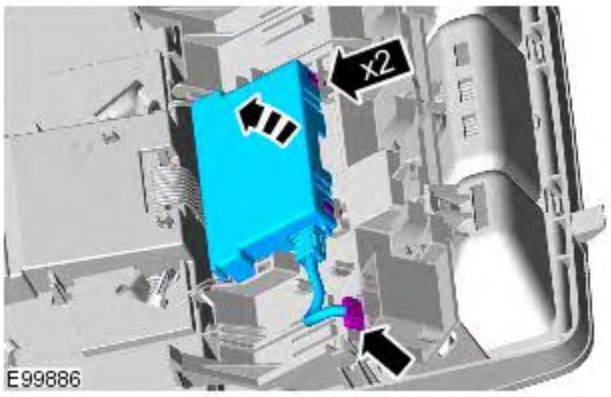
1. CAUTION: Take extra care not to damage the edges of the component.



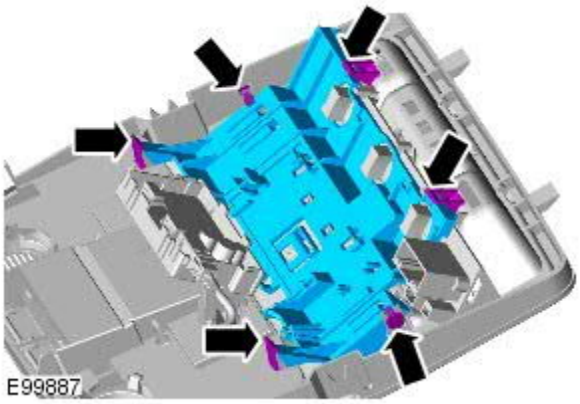
2.



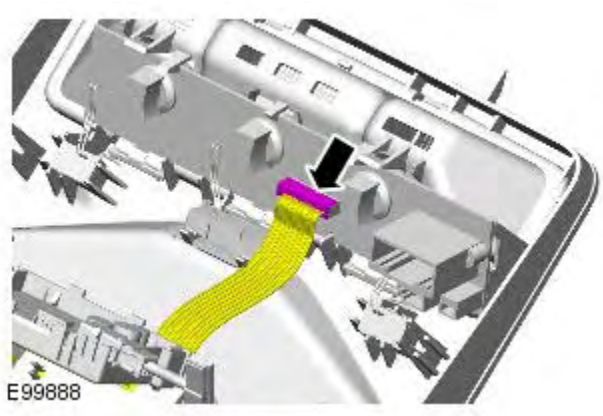
3. NOTE: Do not disassemble further if the component is removed for access only.



4. CAUTION: Take extra care not to damage the wiring harnesses.
    - Take precautions to avoid any electrostatic charging, which could damage this comopnent.

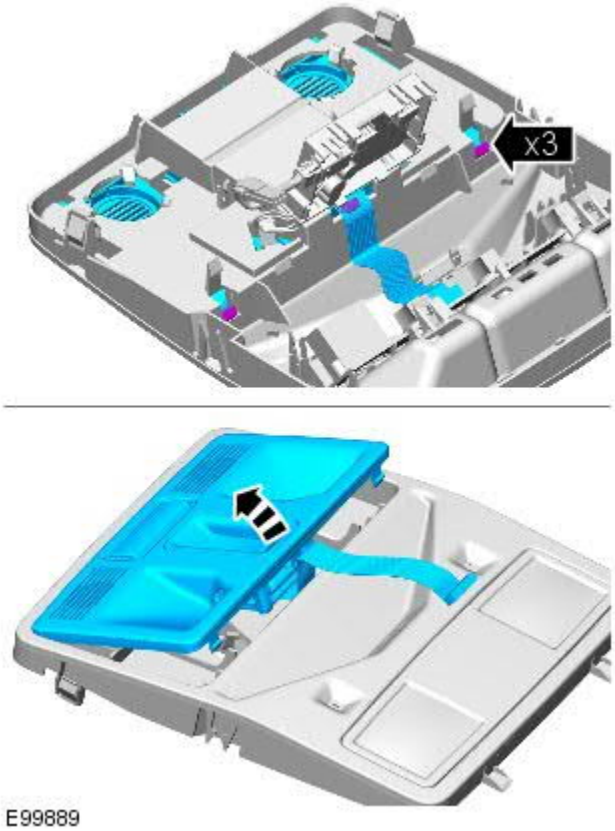


5.



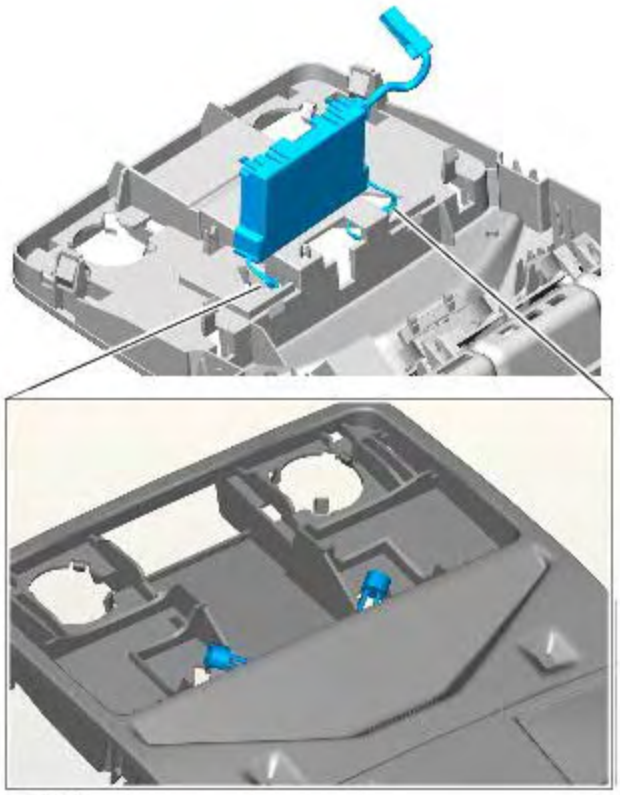
6. CAUTION: Take extra care not to damage the wiring harnesses.

7.



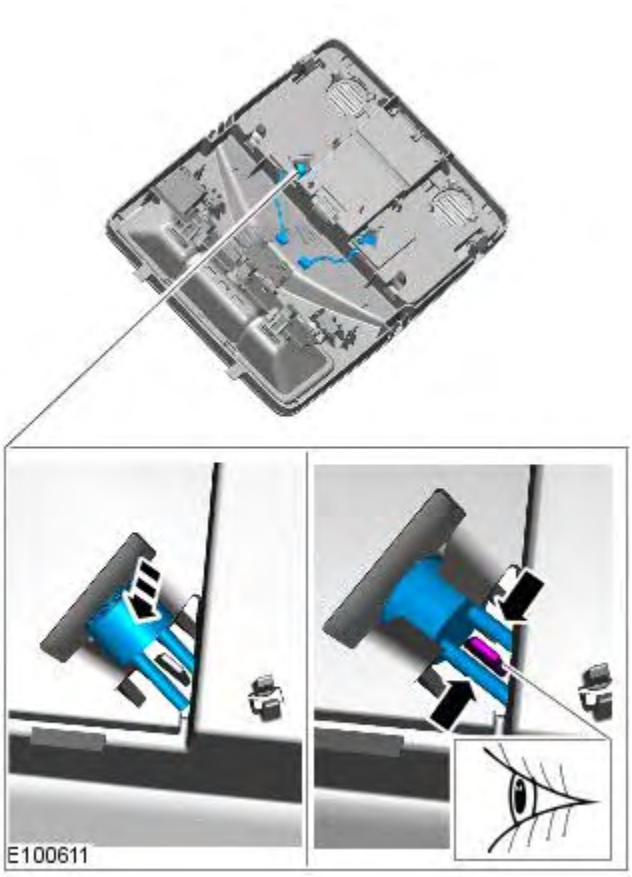
E99889

8.



E99890

Installation



1. CAUTION: Take extra care not to damage the wiring harnesses.

   To install, reverse the removal procedure.

Published: 11-May-2011

Handles, Locks, Latches and Entry Systems -

Torque Specifications

Description	Nm	lb-ft	lb-in
Front and rear door latch retaining screw	7	5	62
Front and rear exterior door handle / door lock captive retaining screw	4	3	36
Front and rear exterior door handle seperate retaining screw	3	2.2	28
Front and rear door striker retaining screw	25	18	221
Interior door handle retaining screw	1.3	-	11.5
Hood latch reataining screw	10	8	88
Hood striker retaining screw	22	17	195
Trunk latch retaining screw	20	15	177
Trunk striker retaining screw	22	17	195
Trunk latch actuator retaining screws	7	5	28

Published: 20-Aug-2013

Handles, Locks, Latches and Entry Systems - Handles, Locks, Latches and Entry Systems - Component Location

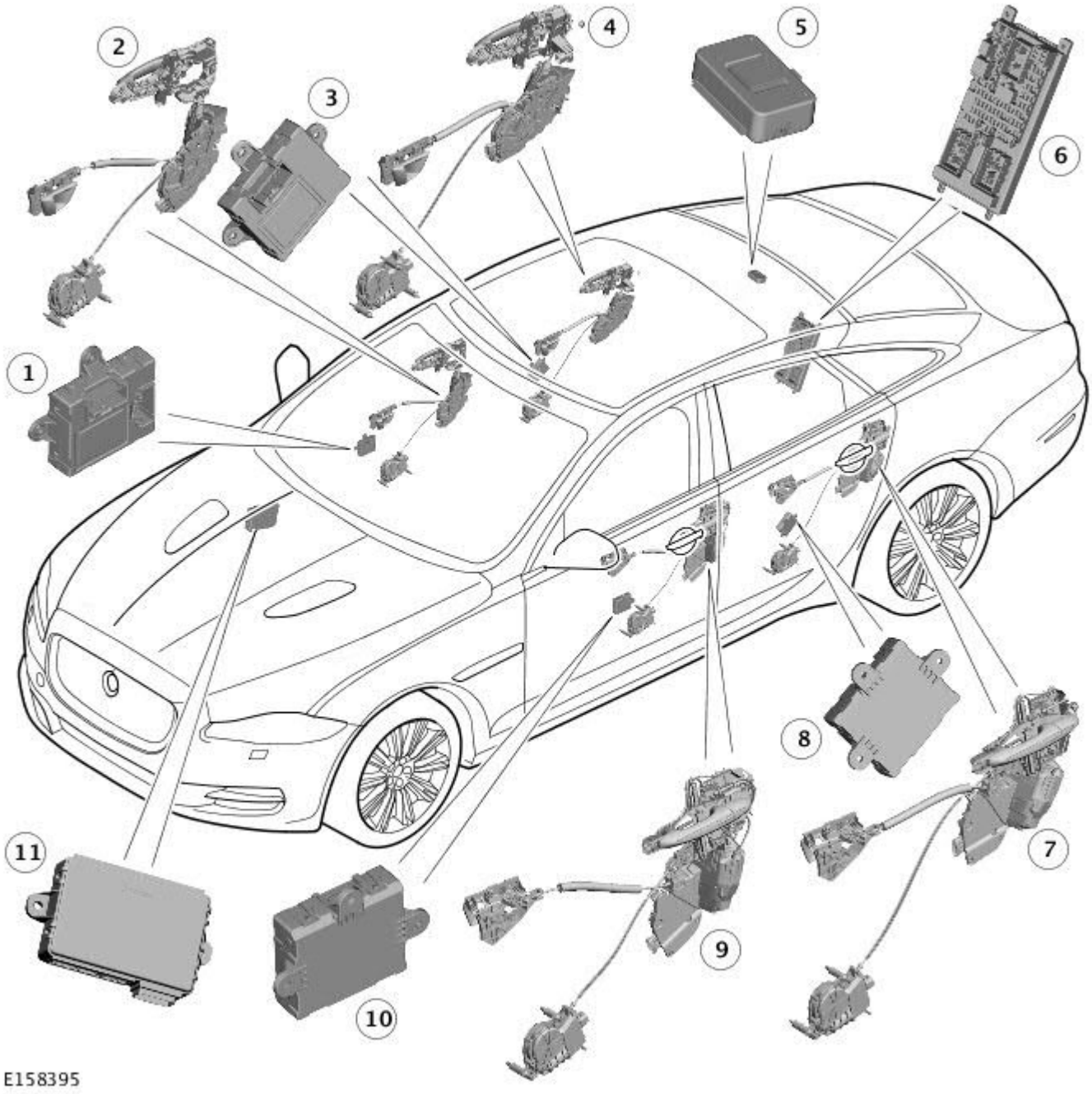
Description and Operation

Locks and Latches – Component Location

Item	Description
1	RH front door - closing motor
2	RH front door handles, latch and motor
3	RH rear door - closing motor
4	RH rear door handles, latch and motor
5	Fuel filler door and motor
6	Luggage compartment lid – closing motor
7	Luggage compartment lid – striker and latch assembly
8	LH rear door handles, latch and motor

9	LH rear door - closing motor
10	Emergency key barrel – LH front door only
11	LH front door handles, latch and motor
12	LH front door – closing motor
13	Engine compartment lid – release lever and cable
14	Engine compartment lid - striker
15	Engine compartment lid – safety hook and guide

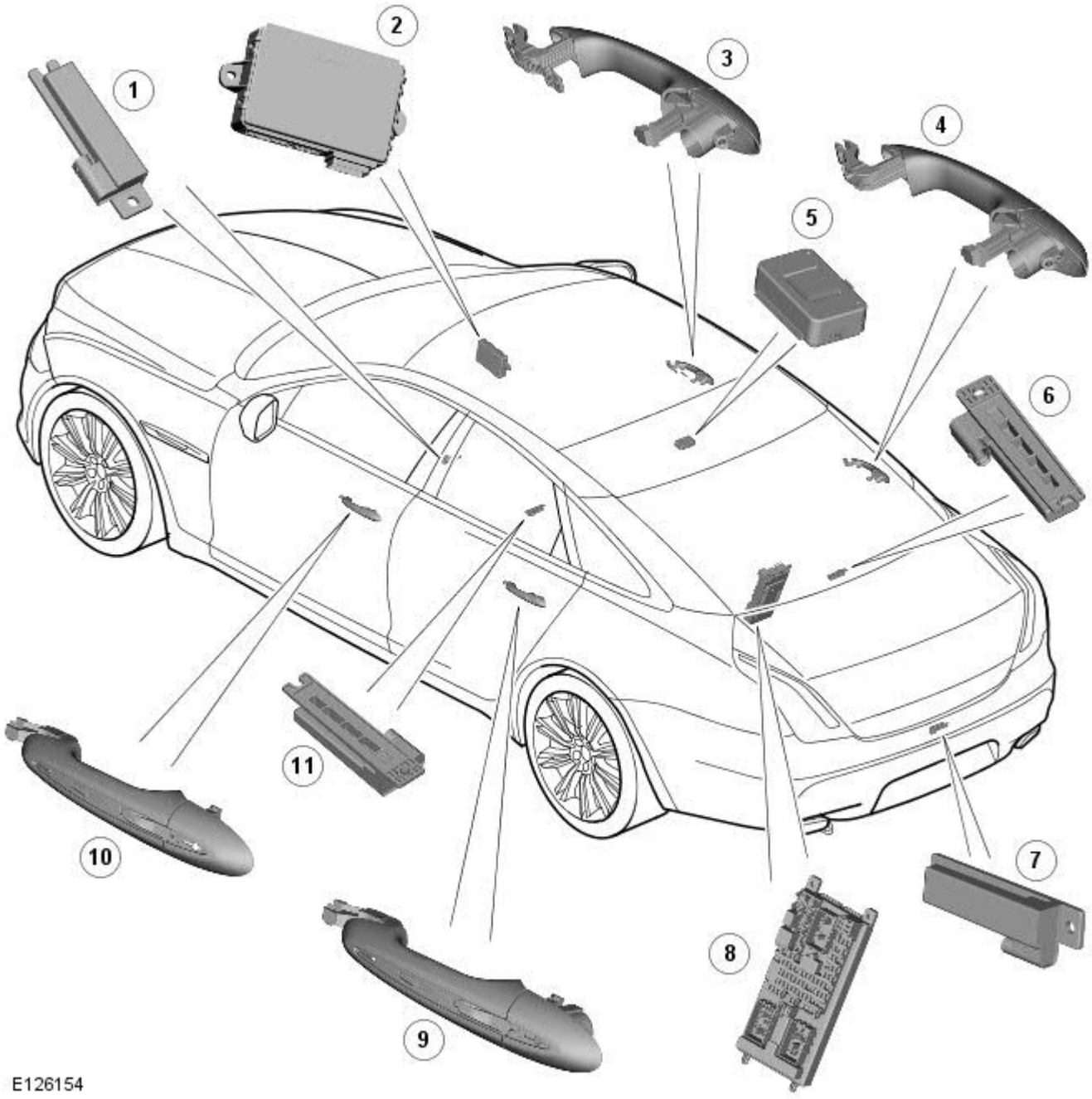
Central Locking – Component Location



Item	Description
1	RH (right-hand) front door module
2	RH front door handles, latch, motor and closing motor
3	RH rear door module
4	RH rear door handles, latch, motor and closing motor
5	Radio frequency receiver

6	CJB (central junction box)
7	LH (left-hand) rear door handles, latch, motor and closing motor
8	LH rear door module
9	LH front door module
10	LH front door handles, latch, motor and closing motor
11	KVM (Keyless Vehicle Module)

Passive Entry – Component Location



Item	Description
1	Antenna – located in center console (front)
2	KVM (Keyless Vehicle Module)
3	RH front antenna – integral to handle
4	RH rear antenna – integral to handle
5	Radio frequency receiver
6	Antenna – located below rear parcel shelf

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7	Antenna – located behind rear bumper cover
8	CJB
9	LH rear antenna – integral to handle
10	LH front antenna – integral to handle
11	Antenna – located in center console (rear)

Published: 20-Aug-2013

Handles, Locks, Latches and Entry Systems - Handles, Locks, Latches and Entry Systems - Overview

Description and Operation

Overview

The hinged panels are secured with latches and strikers. A remotely operated central locking system controls the locking and unlocking of the door and luggage compartment latches. A radio frequency Smart Key allows the vehicle to be locked and unlocked by pressing the appropriate handset buttons. Two levels of central locking system are available:

- remote central locking, and an
- optional passive entry system.

The remote central locking system provides locking and unlocking of the vehicle from inside and outside of the vehicle. The system is operated using buttons on the Smart Key, which transmits radio frequency signals to the central locking, radio frequency receiver.

The closing mechanism of the doors is by an electronic latch with the addition of a soft-closing motor. The closing motor pulls the latch closed for the last 6 mm of travel.

On vehicles fitted with the optional passive entry system, the vehicle can be unlocked without the use of a key or pressing buttons on the Smart Key. The passive entry system functions when the Smart Key is within a particular distance of the vehicle.

Published: 20-Aug-2013

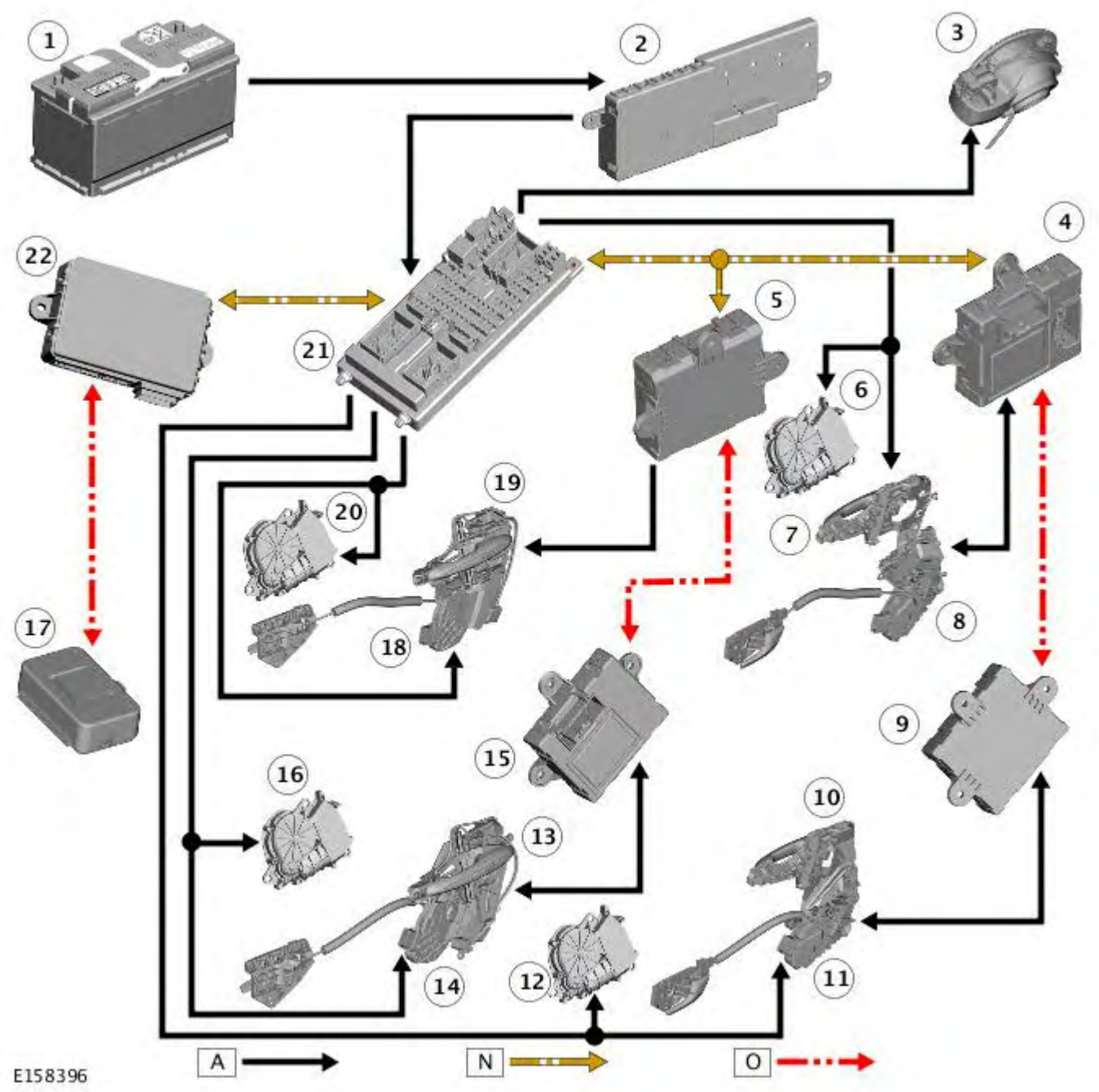
Handles, Locks, Latches and Entry Systems - Handles, Locks, Latches and Entry Systems - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: **A** = Hardwired; **N** = Medium Speed CAN; **O** = LIN Bus

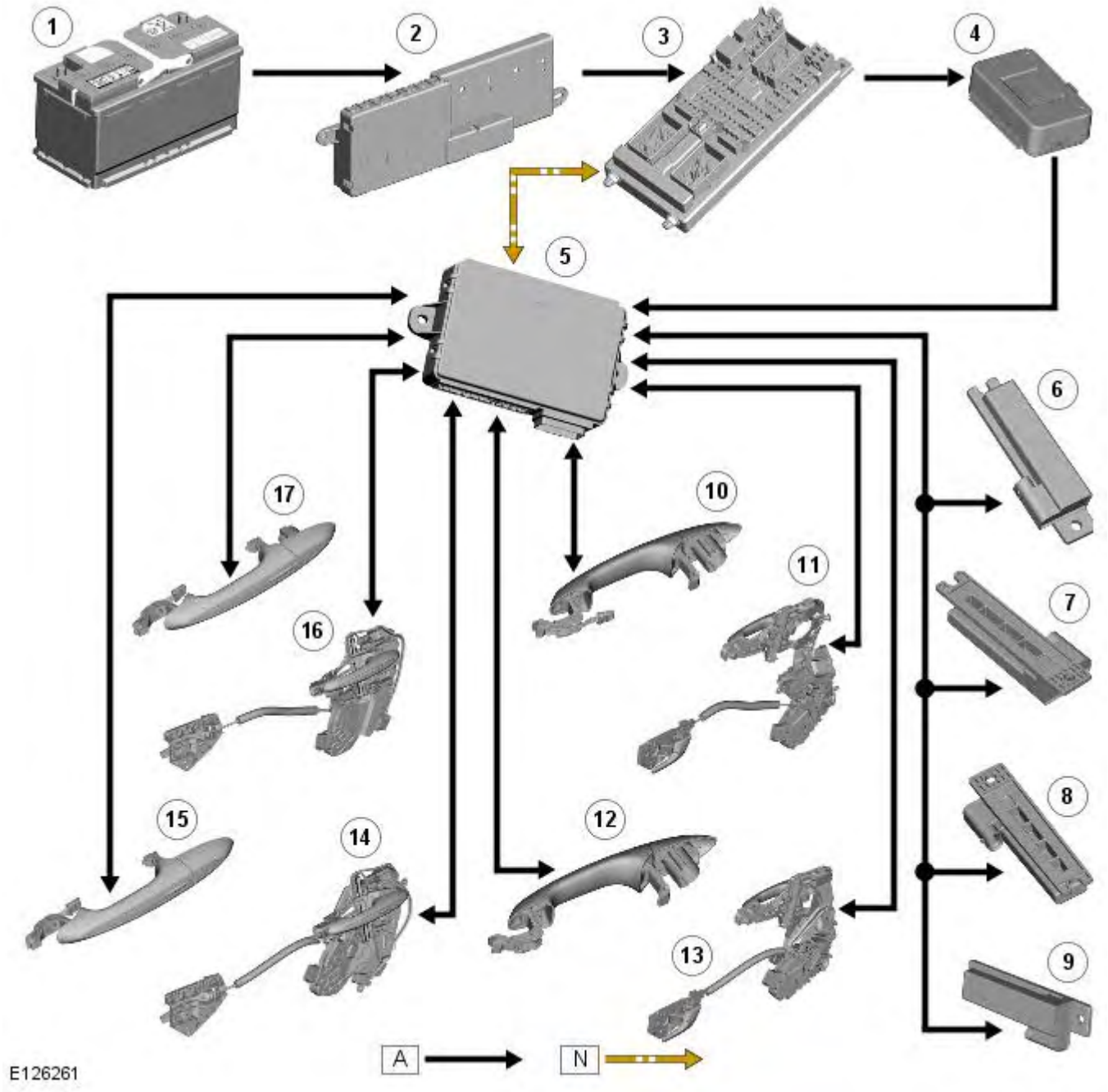
Central Locking Control Diagram



Item	Description
1	Battery
2	BJB (battery junction box)
3	Fuel filler door and motor
4	Door module – driver door

5	Door module – passenger front door
6	Closing motor – driver door
7	Door latch – driver door
8	Door ajar switch – driver door
9	Door module – passenger rear door
10	Door latch - passenger rear door
11	Door ajar switch – passenger rear door
12	Closing motor – passenger rear door
13	Door latch – passenger rear door
14	Door ajar switch – passenger rear door
15	Door module - passenger rear door
16	Closing motor – passenger rear door
17	Radio frequency receiver
18	Door ajar switch – passenger rear door
19	Door latch – passenger rear door
20	Closing motor – passenger rear door
21	CJB (central junction box)
22	KVM (Keyless Vehicle Module)

Passive Entry Control Diagram



Item	Description
1	Battery
2	BJB
3	CJB
4	Radio frequency receiver
5	KVM (Keyless Vehicle Module)
6	Antenna – located in center console - front
7	Antenna – located in center console - rear
8	Antenna – located below rear parcel shelf
9	Antenna – located behind rear bumper cover
10	Door handle, lock/unlock switch and antenna - RH front
11	Door latch and fast latch - RH front
12	Door handle, lock/unlock switch and antenna - RH rear
13	Door latch and fast latch - RH rear
14	Door latch and fast latch - LH rear

15	Door handle, lock/unlock switch and antenna - LH rear
16	Door latch and fast latch - LH front
17	Door handle, lock/unlock switch and antenna - LH front

System Operation

System Operation

The hinged panels are secured with latches and strikers. A remotely operated central locking system controls the locking and unlocking of the door and luggage compartment latches. A radio frequency Smart Key allows the vehicle to be locked and unlocked by pressing the appropriate handset buttons. Two levels of central locking system are available: remote central locking and an optional passive entry system.

The passive entry and associated passive start system allows the driver to unlock and start the vehicle without using a vehicle key in a door-lock or ignition switch. The passive entry system is an optional fitment while the passive start system is a standard fitment on all vehicles. The passive start system is combined with the passive anti-theft immobilization system.
Refer to: Anti-Theft - Passive (419-01B Anti-Theft - Passive, Description and Operation).

Emergency access to the vehicle is provided by a concealed key barrel located in the front left-hand door handle. The key barrel is concealed by a plastic cover which can be removed by inserting the blade of the emergency key into a slot in the cover. The removable emergency key blade is located in the Smart Key. There is no emergency unlocking key aperture in the luggage compartment lid.

Operation of the key barrel unlocks the vehicle but does not disarm the alarm system. Locking and unlocking conditions using the emergency key in the door key barrel are:

- If the alarm is not armed the vehicle can be centrally unlocked.
- If the alarm is armed the door only can be opened and the alarm will be triggered.
- The vehicle cannot be double locked or the alarm system armed using the emergency key.

The vehicle can be centrally locked and unlocked from inside using the interior handle release levers on the front doors only. The driver can select locking options, single point entry or drive away locking for example, from a menu available on the touch screen.

Central Locking – Radio Frequency Remote System

The radio frequency central locking system provides locking and unlocking from inside the vehicle and outside within a 20 meter range. The system is operated using buttons on the Smart Key, which transmits radio frequency signals to the radio frequency receiver.

Additional buttons on the Smart Key provide for the convenience operation of the headlamp delay, panic alarm and luggage compartment lid release.
Refer to: Body Closures (501-03 Body Closures, Description and Operation).

Depending on vehicle market functions offered by the Jaguar Smart Key include:

- Double locking the doors from outside the vehicle if the lock button on the Smart Key is pressed twice within 3 seconds.
- Drive-away locking - switched on or off by the customer using the vehicle security settings menu available on the touch screen.
- Single or two stage unlocking - single-stage unlocking unlocks all doors with a single press; two-stage unlocking unlocks the driver's door only with a single press and all other doors with a second press.

Changing the unlocking mode between single stage and two stage also affects the unlocking mode for passive entry (see below). The single or two-stage unlocking function can be switched on or off, as can remote global open or close for the electric windows using the vehicle security settings menu available on the touch screen.

Actuated from the front door levers only, the doors can be locked from inside the vehicle by pressing the interior door release levers inwards and unlocked by pulling the levers. The Touch-screen incorporates a valet mode feature which inhibits access to the boot and the glove box while also limiting the use of the Touch-screen.

On leaving the vehicle with passive entry the user must press an external button on the door handle once to centrally lock the vehicle or twice within 3 seconds to double lock. The user has a further 3 seconds to pull the door handle to check the vehicle is locked without the Jaguar Smart Key proximity function unlocking the door again. Pulling the handle after the 3 seconds has lapsed will unlock the door as normal.

If any aperture is not fully closed when the locking process is initiated, either passively or by Jaguar Smart Key transmitter, the locking function will be inhibited and an audible error indication will be given. If the ignition is left on an audible warning will be given if the user exits the vehicle, if the user attempts to lock the vehicle (ignition on), another audible indication will be given, and the locking function will be inhibited.

If the door is closed without locking and no key left in the car the ignition will be switched off immediately. If the ignition is left on at any time without starting the vehicle it will switch off automatically after 60 minutes.

If the door is opened by the mechanical key, the full alarm system will sound until the user enters the vehicle and presses either the start/stop button, remote unlock button, or places the Jaguar Smart Key next to the IAU (immobilizer antenna unit) whilst pressing the start/stop button.

The fuel filler flap is locked by the global locking function. It is not locked by drive-away locking, or if doors are locked from inside the vehicle using the handles.

Passive Entry

On vehicles fitted with the optional passive entry system, the vehicle can be unlocked without the use of a key blade or pressing buttons on the Smart Key. The Smart Key operates the passive entry system in addition to the passive start system.
Refer to: Anti-Theft - Passive (419-01B Anti-Theft - Passive, Description and Operation).

The passive entry system is controlled by the keyless vehicle module and low frequency antennas strategically situated within the vehicle; including one in each door handle. When in the vehicle the antennas ensure the Jaguar Smart Key is always within the active transmission zone of the antennas, wherever the key is placed inside the vehicle. For this reason the orientation and positioning of the antennas is critical to the correct functioning of the system.

When a vehicle door handle is pulled to the first five-percent of its travel and the Smart Key is within one meter of the handle; the Smart Key receives the low-frequency signal transmitted from the keyless vehicle module.

The Smart Key responds with a radio frequency transmission of its authorization code. The radio frequency signal is received by the radio-frequency receiver and passed to the keyless vehicle module which checks and approves the code as valid.

Once the handle is pulled to eighty percent of its travel the keyless vehicle module then drives the fast latch directly to allow the door to be opened. The keyless vehicle module also transmits an unlock request to the CJB (central junction box). The CJB then passes an unlock request to the door modules.

Locking of the vehicle is performed by pressing one of the buttons located on each exterior door handle, with the Smart Key within a one meter range of the vehicle. When the door handle button is pressed, the keyless vehicle module transmits a low-frequency signal via the low-frequency handle antenna to the Smart Key. The Smart Key transmits a radio frequency signal which is verified by the keyless vehicle module and allows the doors to be locked or double locked and the alarm system to be armed.

To double lock the vehicle, the button on the exterior door handle must be pressed twice within three seconds, with the Smart Key within one meter range of the vehicle. If a door, engine-compartment lid or the luggage compartment lid is ajar when an attempt to lock the vehicle is made, an error tone is emitted and no locking action will occur.
Refer to: Anti-Theft - Active (419-01A Anti-Theft - Active, Description and Operation).

When unlocking the vehicle using passive entry with single stage unlocking selected and a valid Jaguar Smart key present, pulling the door handle will centrally unlock the vehicle. When the vehicle is configured for two stage unlocking and the drivers door handle is pulled with a valid smart key present only the drivers door will unlock, however if a passenger door handle is pulled with a valid smart key present the vehicle will centrally unlock. If the boot is unlocked and opened with a valid smart key present all the doors remain locked.

Provided the key is within range of the desired point of entry, approximately one meter from vehicle door or luggage compartment lid, it need only be on the driver's person, for example in a pocket, handbag, or briefcase to provide access to the vehicle. The driver has to pull the door handle, or press the luggage compartment lid release button and the vehicle then unlocks according to the current security setting; either single-stage or two-stage entry.

NOTE: Passive unlocking of the luggage compartment lid does not unlock the rest of the vehicle.

Component Description

Engine Compartment Lid Latches

Two engine-compartment lid latches are located on the front crossmember. An engine-compartment lid release lever is located below the instrument panel on the left-hand 'A' pillar and is connected with a cable to the latches. An engine-compartment lid ajar switch is integrated in the engine-compartment lid latch.

Door Latches

The door latches are located at the rear of each door and engage with a striker on the adjacent pillar. Each door latch motor assembly contains micro-switches for lock, unlock and door ajar. Motors provide for the central door locking and the double locking feature. The electrical control for the door latch components is provided by the CJB via the driver's and passenger door modules.

When the latch engages with the striker plate a signal transmitted from the latch actuator mechanism to the door module confirms the latch is engaged. The module activates the closing motor to pull the latch closed through the last 6 mm of travel. A mechanical cable connection between the motor and latch assembly is used to complete the closing process.

The interior door handles are connected by a cable to the latch release mechanisms. The interior door handles also incorporate a locking facility to allow the doors to be locked from inside the vehicle when all the doors are closed. If a door is ajar the locking feature is inhibited.

Luggage Compartment Lid Latch

Luggage compartment lid; refer to:
Refer to: Body Closures (501-03 Body Closures, Description and Operation).
(501-03 Body Closures, Luggage Compartment Lid, Description and Operation).

Fuel Filler Door

The fuel filler door is electrically locked by a motor located on the fuel door housing. The filler flap will only be locked closed when the vehicle is centrally locked.

Published: 18-Mar-2014

Handles, Locks, Latches and Entry Systems - Locks, Latches and Entry Systems

Diagnosis and Testing

Principle of Operation

For a detailed description of the locks, latches and entry systems and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: Handles, Locks, Latches and Entry Systems (501-14, Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests

1. Verify the customer concern, to be sure the correct issue is investigated
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
• Incorrectly aligned door(s), hood or tailgate • Fuel filler door lock actuator • Hood release handle • Hood release cables • Hood latch(es) • Exterior door handle(s) • Interior door handle(s) • Cable(s) • Tailgate release switch • Rear window release switch	• Fuses • Wiring harness • Wiring connector(s) • Door lock actuator(s) • Remote transmitter (key-fob or smart key) • Central locking switches • Controller Area Network (CAN) circuits • Radio frequency (RF) receiver • Central junction box (CJB) • Loose or corroded connections

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index

Symptom Chart

NOTE: **Complete the diagnostic steps below to confirm any concern prior to replacing any component**

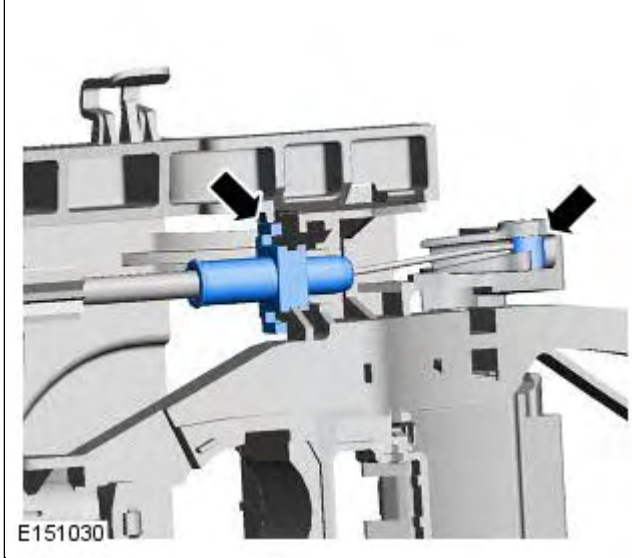
Symptom	Possible Causes	Action
The message center indicates that the hood, the luggage compartment is open when it appears to be closed Vehicle indicates a miss-lock when the hood, luggage compartment appear to be closed	• Incorrect striker alignment/adjustment • Ajar switch circuit short circuit to ground • Ajar switch failure	• Check/adjust the strikers as necessary • Check for DTCs indicating an ajar switch fault. Refer to the DTC index
Fuel flap does not lock/unlock	• Fuel flap cable detached from body • Fuel flap actuator detached from mounting bracket • Fuel flap actuator disconnected • Fuel flap actuator failure	• Check the condition and installation of the fuel flap cable • Check the security of the fuel flap actuator and bracket • Check the security of the actuator electrical connector • Check for DTCs indicating a fuel flap actuator fault. Refer to the DTC index
Door(s) will not unlatch/open when using outside door handle	• Exterior door handle condition/installation • Exterior release cable disconnected from exterior door handle or door latch	• Check the exterior door handle condition and installation • Check the condition and security of the exterior release cable • **Single door will not open from the**

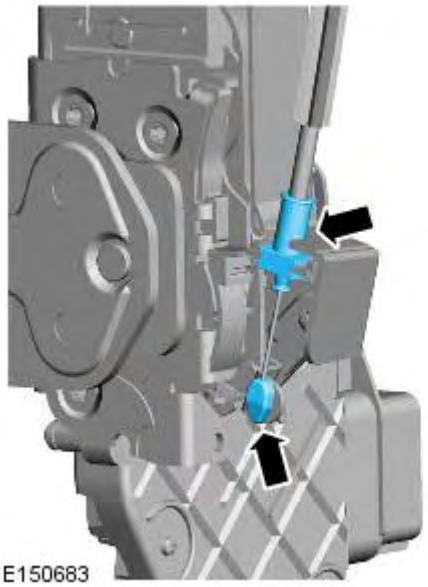
Symptom	Possible Causes	Action
		outside (but opens from the inside) GO to Pinpoint Test A.
Door(s) will not unlatch/open when using inside door handle	• Child lock(s) engaged • Interior door handle condition/installation • Interior release cable disconnected from interior door handle or door latch	• Check that the child locks are disengaged • Check the interior door handle condition and installation • Check the condition and security of the interior release cable • **Single Door Will Not Open From The Inside (but opens from the outside)** GO to Pinpoint Test B.
Door(s) will not lock/unlock from key fob, key or internal lock switch	• Wiring harness/connectors • Central junction box (CJB) • Door lock switch • Cable fault	• Check for relevant stored DTCs • Once any DTC related faults have been rectified continue with the diagnostic steps below • **No lock / unlock function from key-fob** GO to Pinpoint Test C.
Door ajar or miss lock signal at message centre when door(s) are closed or alarm triggering	• Wiring harness • Instrument cluster • Incorrect striker alignment/adjustment • Ajar switch circuit short circuit to ground • Ajar switch failure	• **Latch Mounted Door Ajar Switch Test** GO to Pinpoint Test D.

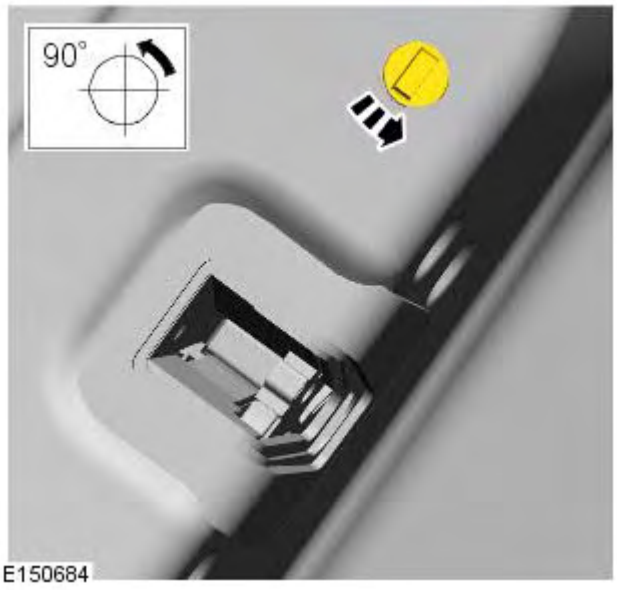
DTC Index

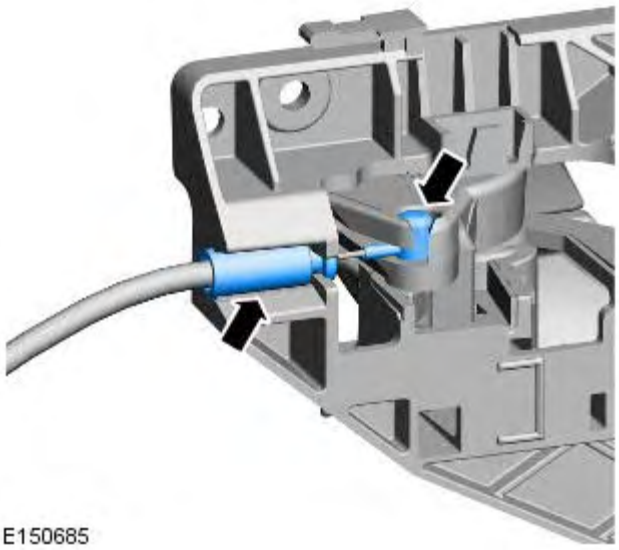
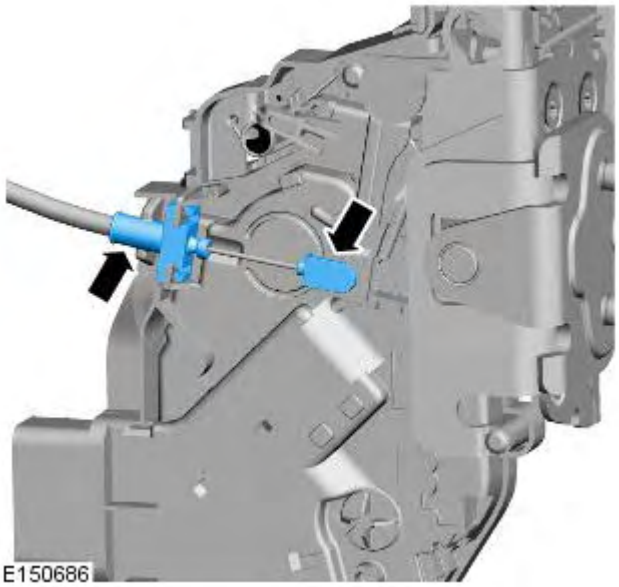
For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Communications Network (418-00, Diagnosis and Testing) /
Locks, Latches and Entry Systems - DTC: With (501-14, Diagnosis and Testing).

Pinpoint Test

PINPOINT TEST A : SINGLE DOOR WILL NOT OPEN FROM THE OUTSIDE (BUT OPENS FROM THE INSIDE)	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: CHECK THE EXTERIOR DOOR RELEASE CABLE TO EXTERIOR DOOR HANDLE IS INSTALLED CORRECTLY	
	1 Remove the door trim panel as necessary
	2 Confirm the exterior door release cable is correctly installed to the exterior door handle
	Is the cable correctly installed? **Yes** GO to A2. **No**

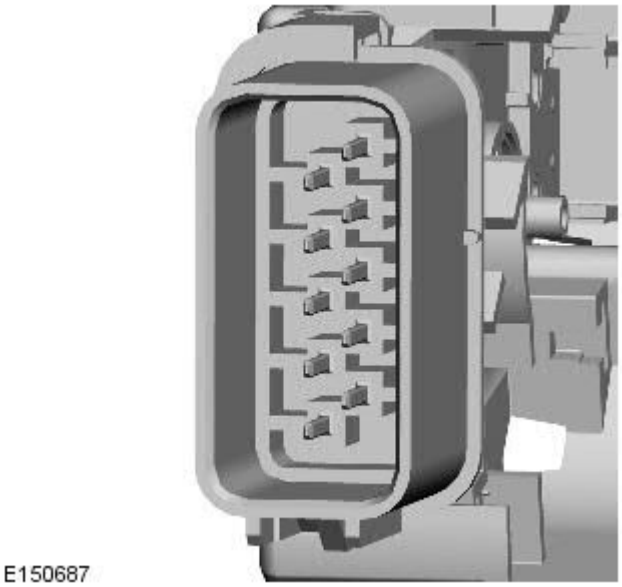
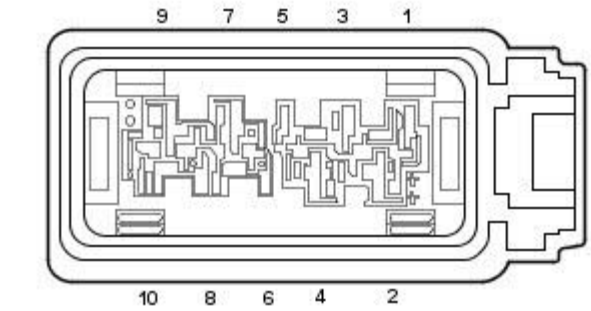
	Connect the door release cable correctly. **If the cable is damaged, install a new door release cable**. Test the system for normal operation
A2: CHECK THE EXTERIOR DOOR HANDLE RELEASE CONNECTION TO THE DOOR LATCH	
 E150683	1 Confirm the exterior door handle release connection to the door latch is installed correctly
	Is the exterior door handle release cable installed correctly? **Yes** GO to Pinpoint Test C. **No** Connect the door release cable correctly. **If the cable is damaged, install a new door release cable**. Test the system for normal operation

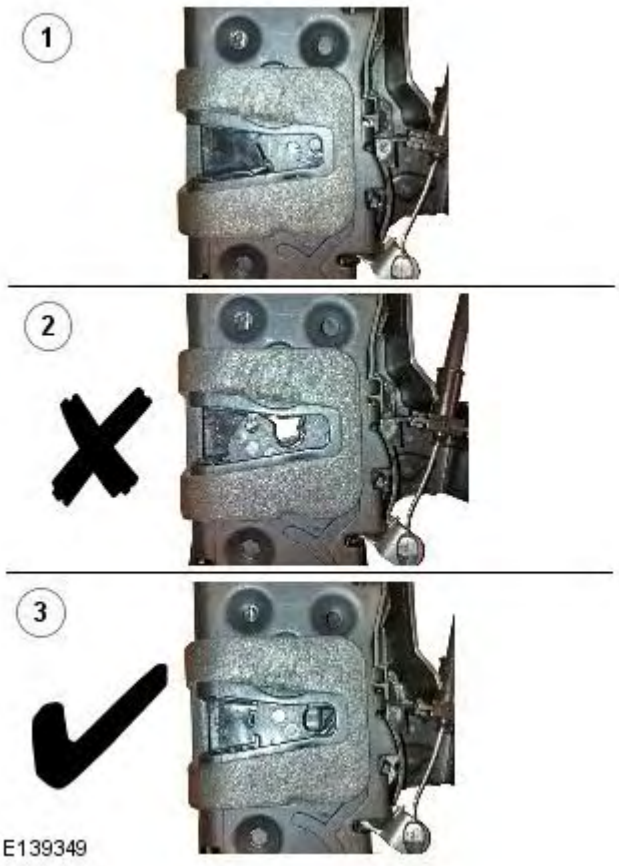
PINPOINT TEST B : SINGLE DOOR WILL NOT OPEN FROM THE INSIDE (BUT OPENS FROM THE OUTSIDE)	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
B1: CHECK THE INTERIOR DOOR RELEASE CABLE TO INTERIOR DOOR HANDLE IS INSTALLED CORRECTLY	
 E150684	NOTE: Figure A - Child lock off position shown 1 Make sure the child lock is disengaged (rear door only)

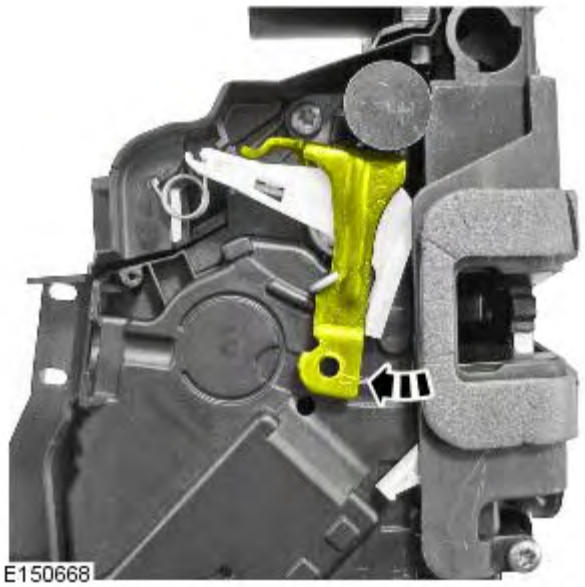
 E150685	2 Remove the door trim panel as necessary
	3 Confirm the interior door release cable is correctly installed to the interior door handle
	Is the cable correctly installed? **Yes** GO to B2. **No** Connect the door release cable correctly. **If the cable is damaged, install a new door release cable**. Test the system for normal operation
B2: CHECK THE INTERIOR DOOR HANDLE RELEASE CONNECTION TO THE DOOR LATCH	
 E150686	1 Confirm the interior door handle release connection to the door latch is installed correctly
	Is the interior door handle release cable installed correctly? **Yes** GO to Pinpoint Test C. **No** Connect the door release cable correctly. **If the cable is damaged, install a new door release cable**. Test the system for normal operation

PINPOINT TEST C : DOOR LATCHING AND LOCKING FUNCTION TEST	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
C1: HARNESS CONNECTION	

NOTE: Test as a single component to ensure that the door latch is not replaced unnecessarily, when another component may be at fault

	1 Remove the door trim panel as necessary
 E150687	2 Disconnect harness from latch, check for corrosion or damage to both connectors at socket points and pins. Re-connect harness ensuring robust assembly when all parts confirmed to be in good order. If harness or latch connectors are damaged, install new harness/latch as necessary. Test the system for normal operation
	Check for normal operation, does latch function correctly? **Yes** Re-assemble door trim and test for normal operation **No** GO to C2.
C2: LOCK COMMAND SIGNAL FROM VEHICLE HARNESS	
 E139357	1 Close all vehicle doors apart from door being investigated, please note which door, left side or right side is under investigation
	2 Disconnect harness from latch to enable access to socket points to carry-out conductivity testing as detailed
	3 Monitor the circuit for momentary power when locking the vehicle via the key-fob or smart key between terminals **5 and 7 left side** or **5 and 7 right side**
	Is there momentary power (for approx 8 seconds) between terminals **5 and 7 left side** or **5 and 7 right side** when locking the vehicle via the key-fob or smart key **Yes** The vehicle electrical system is locking correctly, providing the signal to the latch GO to C3. **No** Refer to the electrical circuit diagrams and investigate why vehicle electrical system is not providing signals to the latch. Using the manufacturer approved diagnostic system check for logged DTCs to localize the fault
C3: UNLOCK COMMAND SIGNAL FROM VEHICLE HARNESS	
	1 Monitor the circuit for momentary power when unlocking the vehicle via the key-fob or smart key between terminals **5 and 7 left side** or **5 and 7 right side**

	Is there momentary power (for approx 8 seconds) between terminals **5 and 7 left side** and **5 and 7 right side** when unlocking the vehicle via the key-fob or smart key? **Yes** The vehicle electrical system is unlocking correctly, providing the signal to the latch GO to C4. **No** Refer to the electrical circuit diagrams and investigate why vehicle electrical system is not providing signals to the latch. Using the manufacturer approved diagnostic system check for logged DTCs to localize the fault
C4: PHYSICAL TEST 1	
	1 Remove latch module from door
	2 Inspect latch module for any visual damage
	3 With the latch in hand, connect the electrical connector(s) to connect door latch to door harness
	NOTE: THE LATCH IS NOW READY TO TEST 4 Close all vehicle doors except the door being investigated
	NOTES: Figure 1 - Unlatched position shown Figure 2 - First safety latched position shown Figure 3 - Fully latched position shown Test will not work if latch is only in first safety latch position 5 Rotate latch claw (using a small screw driver or similar), to the fully latched position (figure 3)



NOTE: Unlocked position shown

6 Confirm that the latch interior release lever is in the unlocked position as shown

NOTE: Locked position shown

7 Press the **lock** button on the key-fob or smart key

Does the latch interior release lever move from the unlocked position to the locked position?

Yes

GO to C5.

No

If this is a repeat test and the vehicle electrical test section has been completed and confirmed that vehicle is working correctly, then replace the door latch. If replacing latch as part of a warranty claim, please quote reference code **LKINOP** in the technician comments section of the warranty claim

C5: PHYSICAL TEST 2

NOTE: Unlocked position shown

1 With the latch in the locked state (i.e. the latch interior release lever is in the locked position), press the key-fob or smart key **unlock** button

Does the latch interior release lever move from the locked position to the unlocked position?

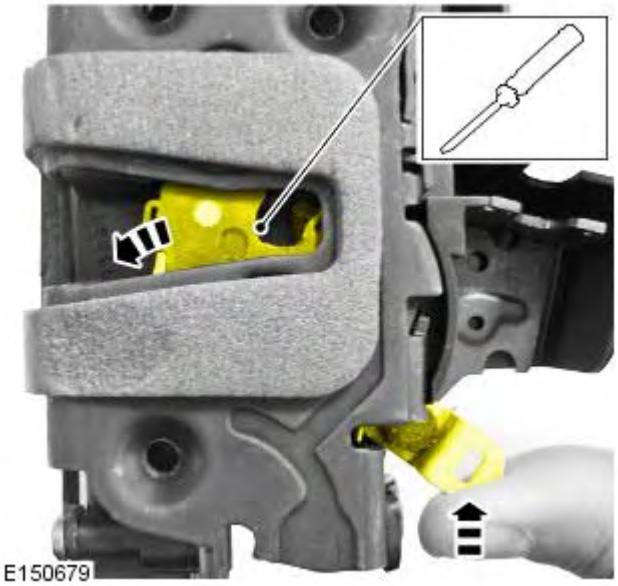
Yes

GO to C6.

No

If this is a repeat test and the vehicle electrical test section has been completed and confirmed that vehicle is working correctly, then replace the door latch. If replacing latch as part of a warranty claim, please quote reference code **LKINOP** in the technician comments section of the warranty claim

C6: PHYSICAL TEST 3



NOTE: Fully latched position shown

1 With the latch in its unlocked state, push the latch exterior release lever against its return spring, whilst simultaneously applying a light pressure to release the latch claw using a small screw driver or similar

Does the latch claw release?

Yes

GO to C7.

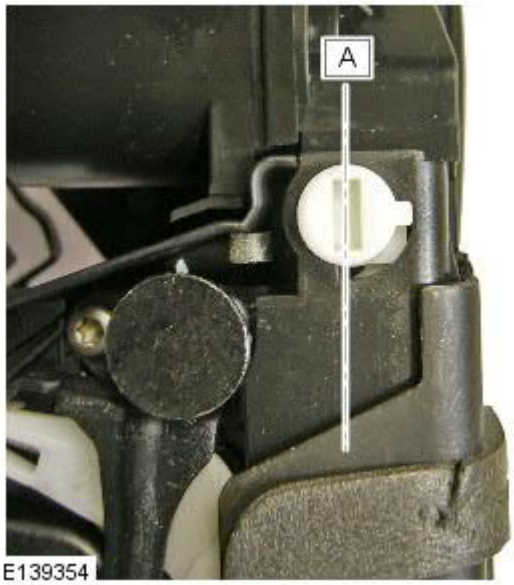
No

Repeat tests **C5** and **C6** to confirm the fault GO to C5. If the repeat test has confirmed that the exterior release lever will not release the claw on an unlocked latch replace the door latch. If replacing latch as part of a warranty claim, please quote reference code **EXTINOP** in the technician comments section of the warranty claim

C7: PHYSICAL TEST 4

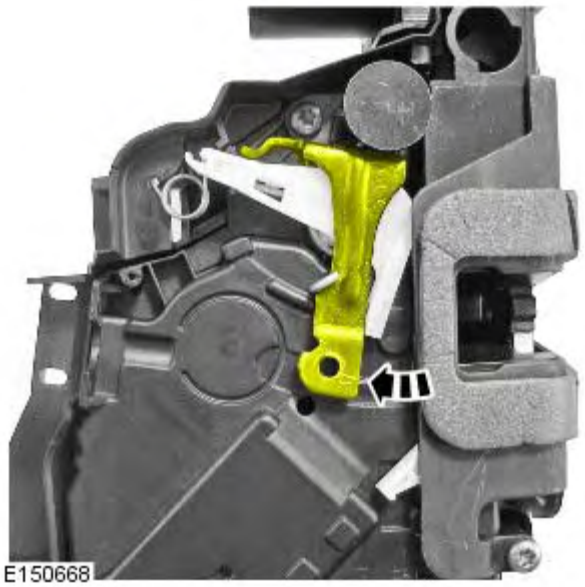
NOTE: Fully latched position shown

1 Using a small screw driver or similar, rotate latch claw to the second fully latched position



NOTE: Figure A - Child lock off position shown

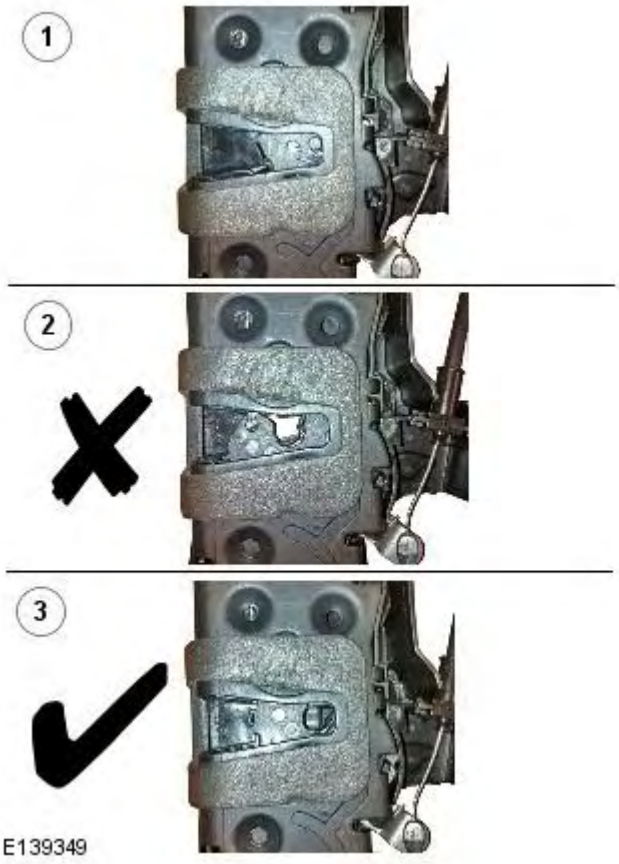
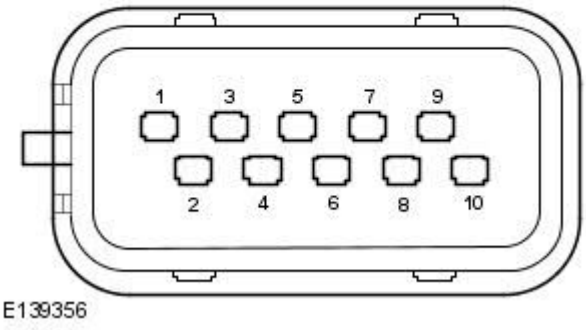
2 If testing a rear door latch, ensure that the child lock is turned to the off position

 E150668	NOTE: Unlocked position shown 3 Confirm that the latch interior release lever is in the unlocked position as shown
 E139355	4 Whilst the latch is still in its unlocked state, push the latch interior release lever against its return spring, whilst simultaneously applying a light pressure to release the latch claw using a small screw driver or similar
	Does the latch claw release? **Yes** Latch has passed all tests to confirm its correct function. **DO NOT REPLACE LATCH** as part of any attempts to resolve any locking functionality issues **No** Repeat test GO to C7. If repeat test has confirmed that the interior release lever will not release the claw when the latch is in the unlocked state, then replace the latch. If replacing latch as part of a warranty claim, please quote reference code **INTINOP** in the technician comments section of the warranty claim

PINPOINT TEST D : LATCH MOUNTED DOOR AJAR SWITCH TEST	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
D1: TEST 4 DOOR LATCH	
NOTES: If a customer is complaining of issues relating to a door ajar signal e.g. door latch won't lock, or alarm system triggering (indicated via DTC's), there may be several components that generate the fault, including	

- Body wiring harness / connectors
- Door wiring harness / connectors
- Alarm control module
- Central junction box (CJB)
- Door Latch ajar switch

To investigate the functioning of the door ajar switch contained within the door latch, to prove or eliminate the door latch mounted door ajar switch as the root cause, follow the process below. This will prevent the unnecessary replacement of a correctly functioning door latch

	1 Remove door trim from door
	2 Disconnect door harness from latch for access to connector pins for latch electrical testing
	3 Inspect latch module for any visual damage
	NOTES: Figure 1 - Unlatched position shown Figure 2 - First safety latched position shown Figure 3 - Fully latched position shown **Test will not work if latch is only in first safety latch position** 4 Using a small screw driver or similar, rotate latch claw to the second fully latched position (figure 3)
	5 Carry out continuity test between terminals **1 and 4 (left side)** or **8 and 4 (right side)** with claw closed
	Does the continuity test pass? **Yes** The latch ajar switch is working correctly. **Do not replace latch**. Investigate for fault elsewhere in vehicle system

	No Release latch claw and repeat test from step 4 to confirm result. If this is a repeat test and you are sure that the ajar switch does not provide continuity when fully latched. Replace the latch. If replacing latch as part of a warranty claim, please quote reference code **AJARINOP** in the technician comments section of the warranty claim

Published: 11-May-2011

Handles, Locks, Latches and Entry Systems - Exterior Front Door Handle

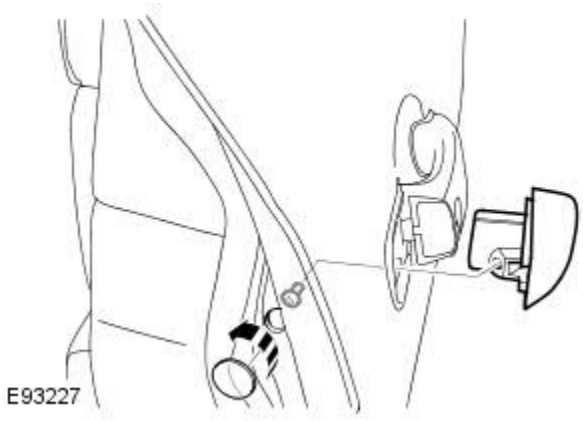
Removal and Installation

Removal

NOTES:

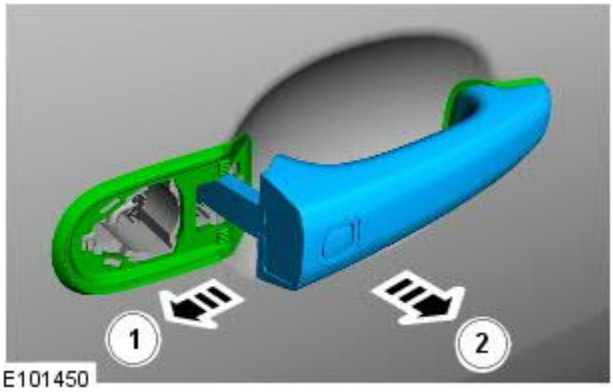
Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

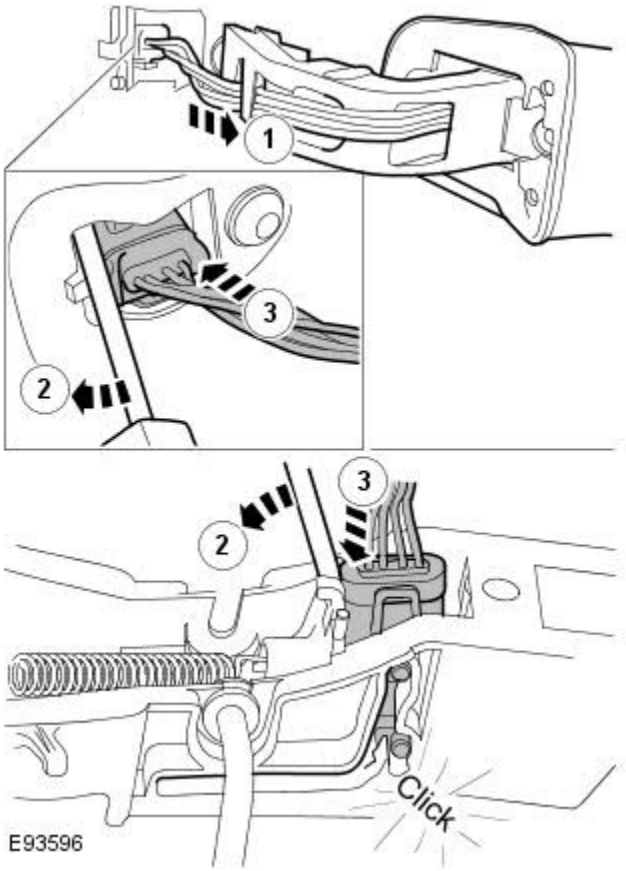


1. NOTE: Remove the screw sufficiently, only to release the component.

   Torque: 4 Nm



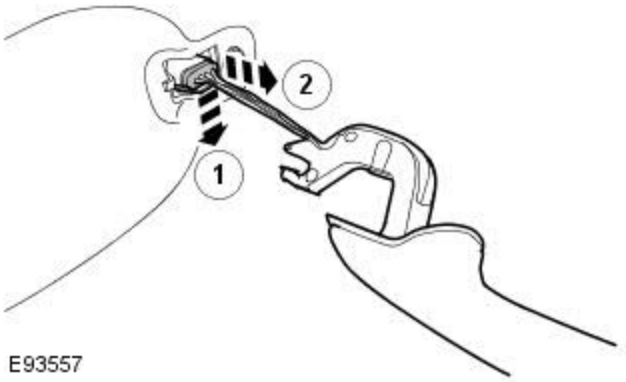
2.



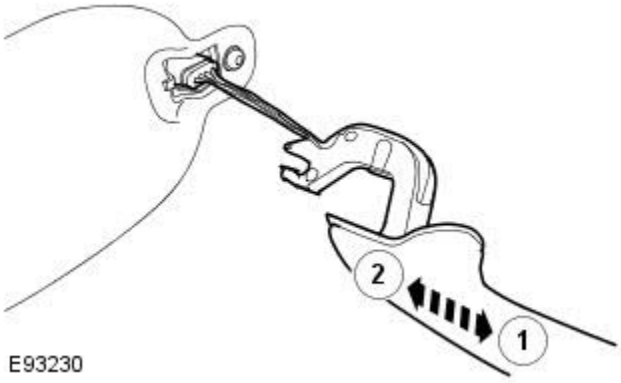
3. CAUTION: Take extra care not to damage the wiring harnesses.

NOTE: Secure the connection in the service position.

4.



Installation



1. CAUTION: Make sure that the wiring harnesses are correctly located.

   To install, reverse the removal procedure.

Published: 11-May-2011

Handles, Locks, Latches and Entry Systems - Exterior Luggage Compartment Lid Release Switch

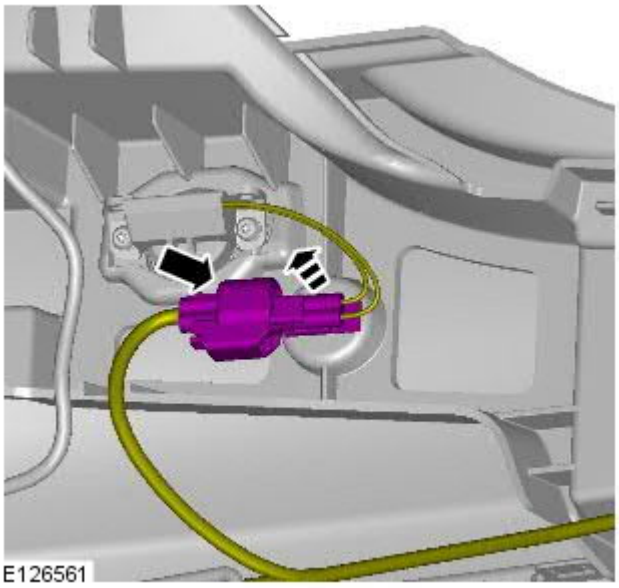
Removal and Installation

Removal

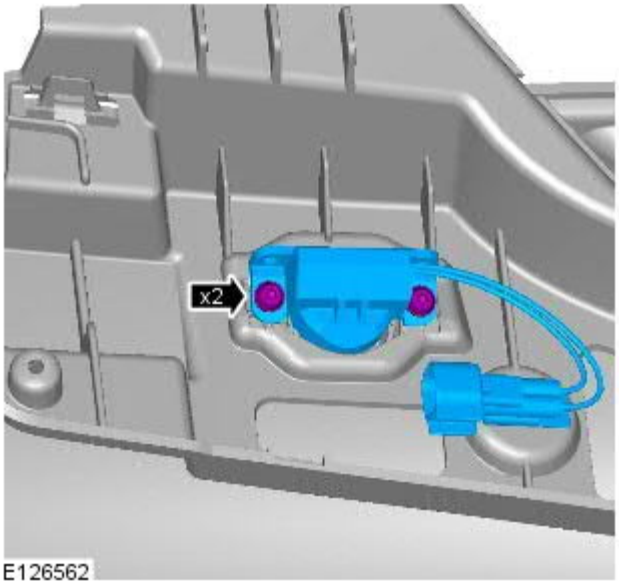
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Rear Bumper Cover (501-19 Bumpers, Removal and Installation).

2.



3. *Torque:* 1.5 Nm



Installation

1. To install, reverse the removal procedure.

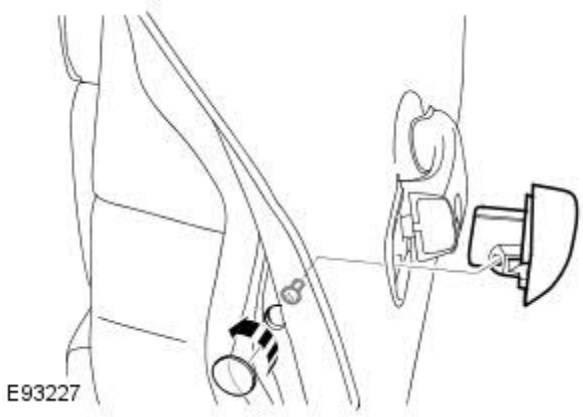
Published: 11-May-2011

Handles, Locks, Latches and Entry Systems - Exterior Rear Door Handle

Removal and Installation

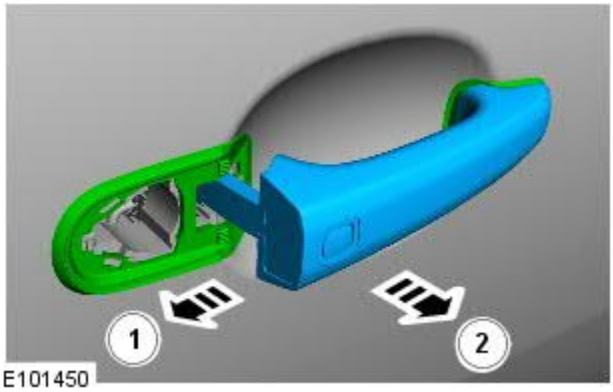
Removal

NOTE: Removal steps in this procedure may contain installation details.

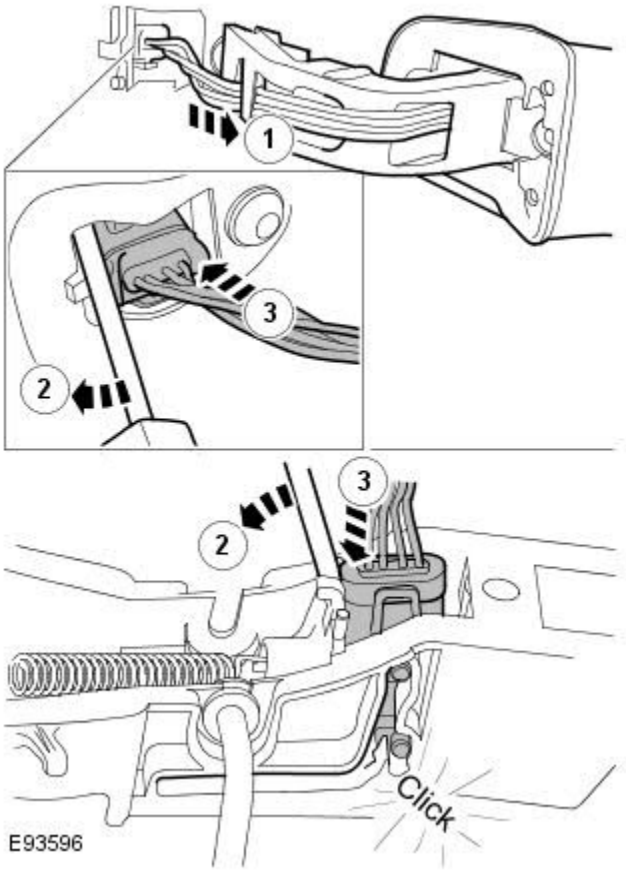


1. NOTE: Remove the screw sufficiently, only to release the component.

   Torque: 4 Nm



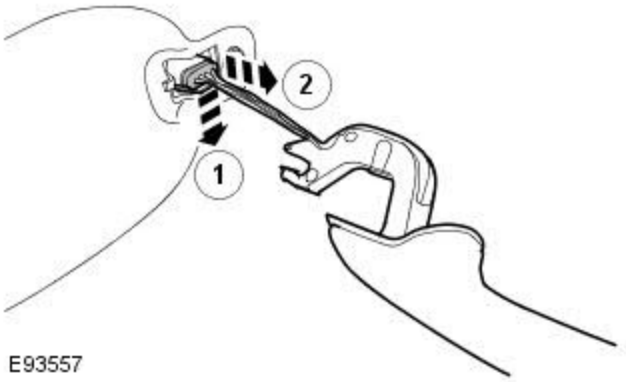
2. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



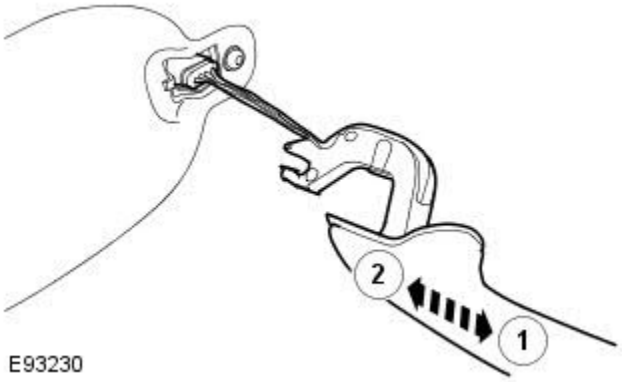
3. CAUTION: Take extra care not to damage the wiring harnesses.

NOTE: Secure the connection in the service position.

4.



Installation



1. CAUTION: Make sure that the wiring harnesses are correctly located.

   To install, reverse the removal procedure.

Published: 05-Feb-2013

Handles, Locks, Latches and Entry Systems - Front Door Latch

Removal and Installation

Removal

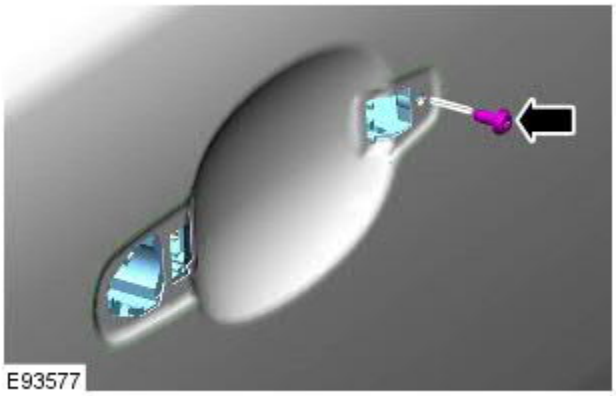
NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

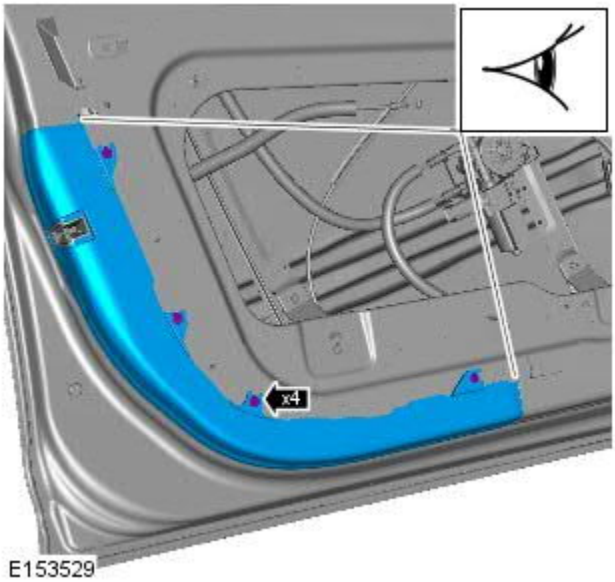
1. Refer to: Front Door Window Regulator and Motor (501-11 Glass, Frames and Mechanisms, Removal and Installation).

2. Refer to: Exterior Front Door Handle (501-14 Handles, Locks, Latches and Entry Systems, Removal and Installation).

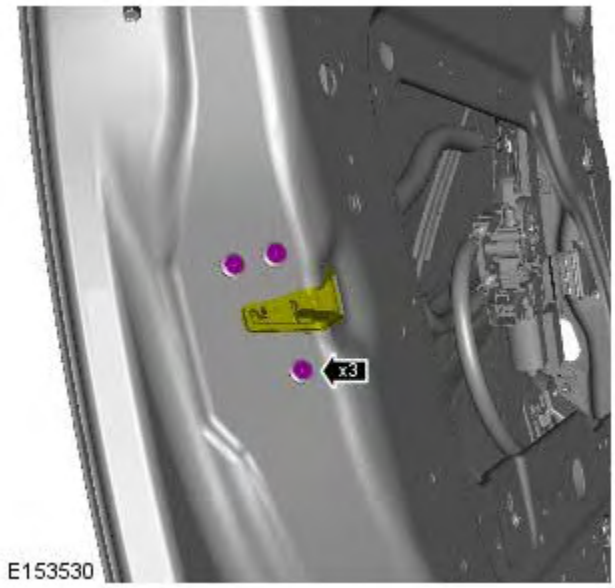


3. NOTE: Right-hand shown, left-hand similar.

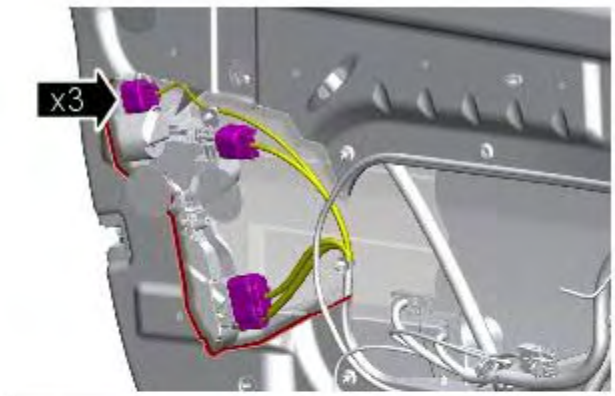
   Torque: 3 Nm



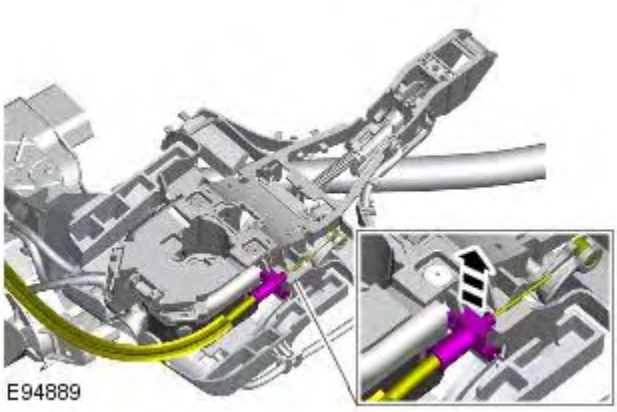
4.



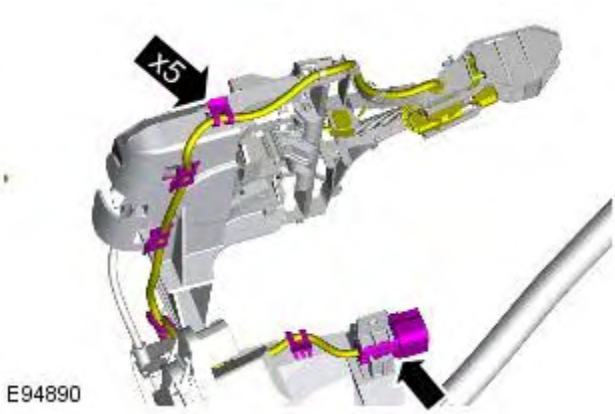
5. *Torque:* 7 Nm



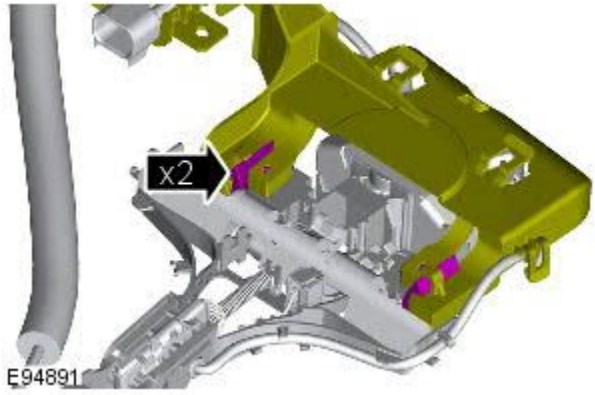
6. NOTE: Left-hand shown, right-hand similar.



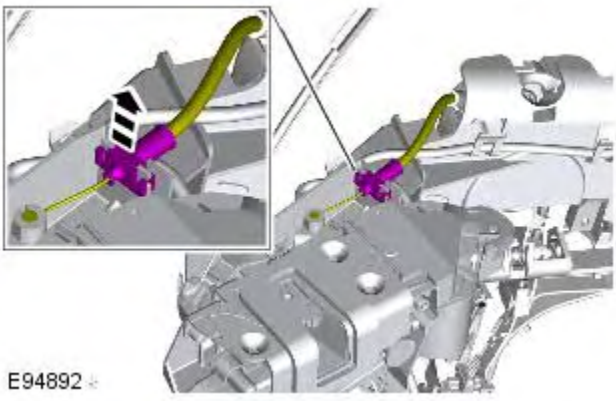
7. NOTE: Do not disassemble further if the component is removed for access only.



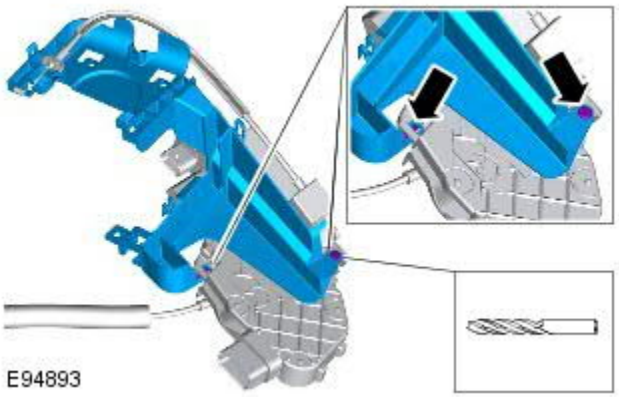
8. NOTE: Note the position of the wiring harness.



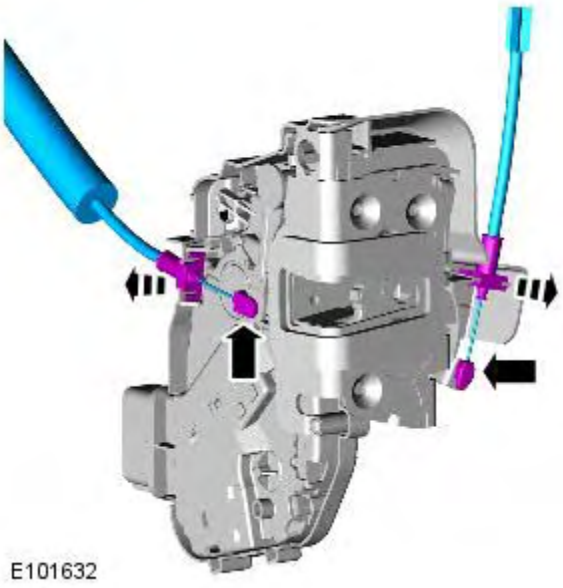
9.



10.



11.



12.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

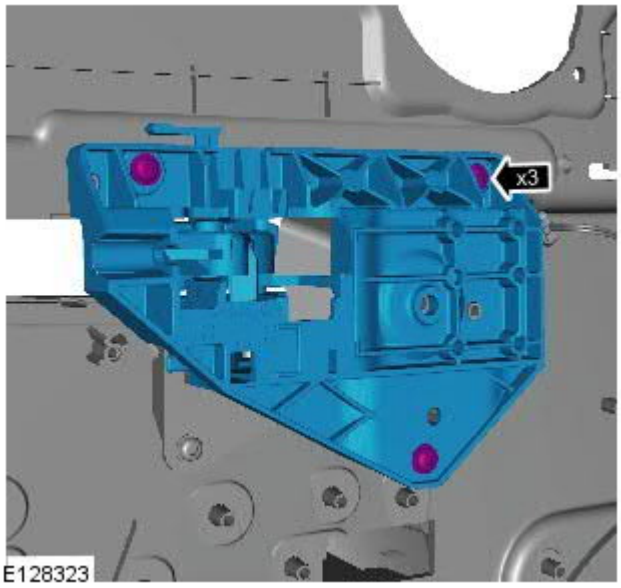
Handles, Locks, Latches and Entry Systems - Interior Front Door Handle

Removal and Installation

Removal

1. Refer to: Front Door Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

2.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Handles, Locks, Latches and Entry Systems - Luggage Compartment Lid Latch

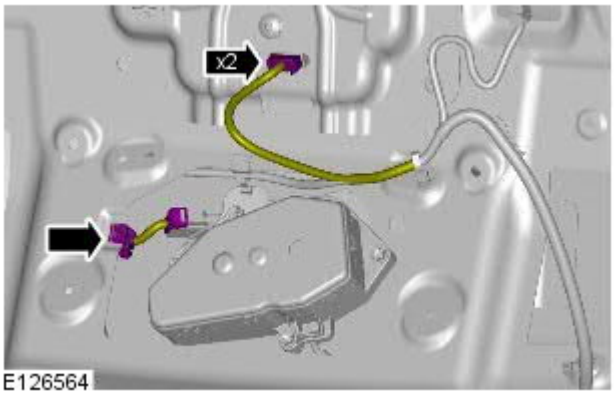
Removal and Installation

Removal

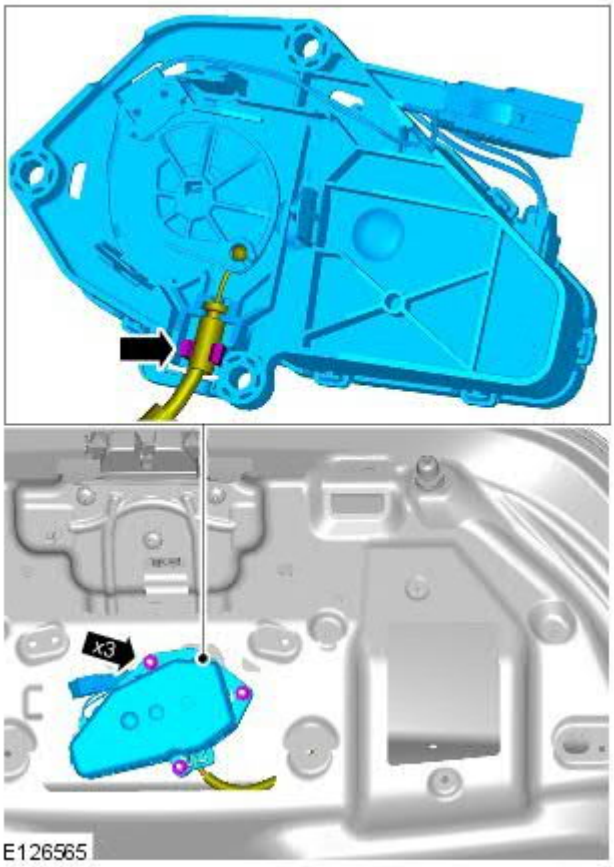
NOTE: Removal steps in this procedure may contain installation details.

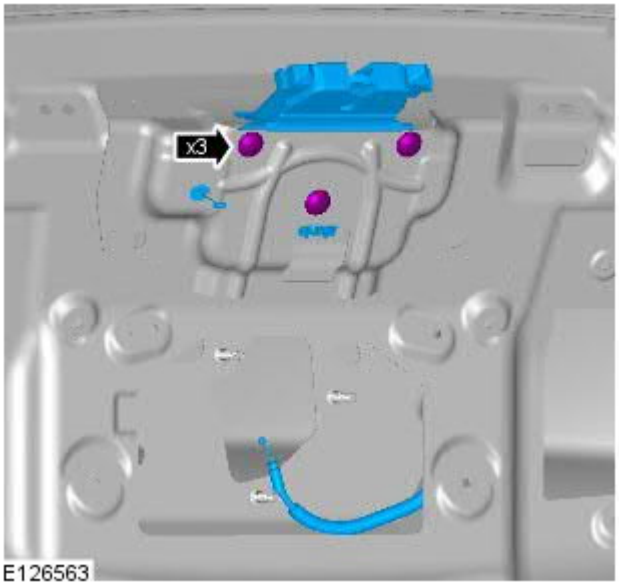
1. Refer to: Luggage Compartment Lid Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

2.



3. *Torque:* 7 Nm





4. *Torque:* 20 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

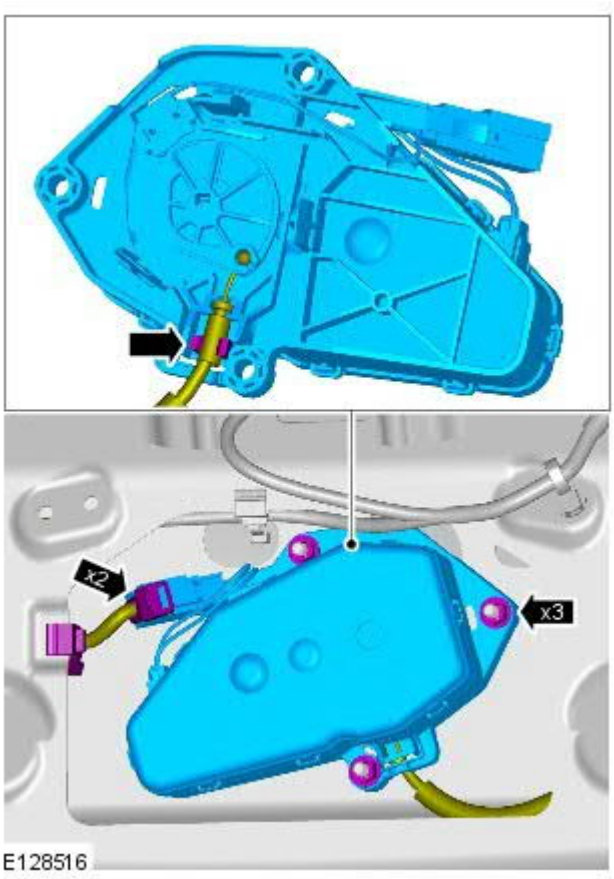
Handles, Locks, Latches and Entry Systems - Luggage Compartment Lid Latch Actuator

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Luggage Compartment Lid Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).



2. *Torque:* 7 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Handles, Locks, Latches and Entry Systems - Rear Door Latch

Removal and Installation

Removal

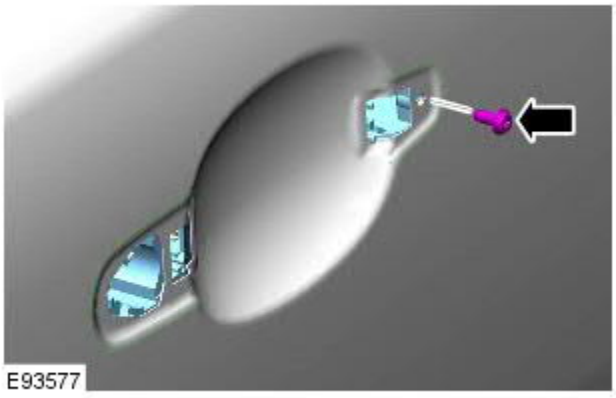
NOTES:

Removal steps in this procedure may contain installation details.

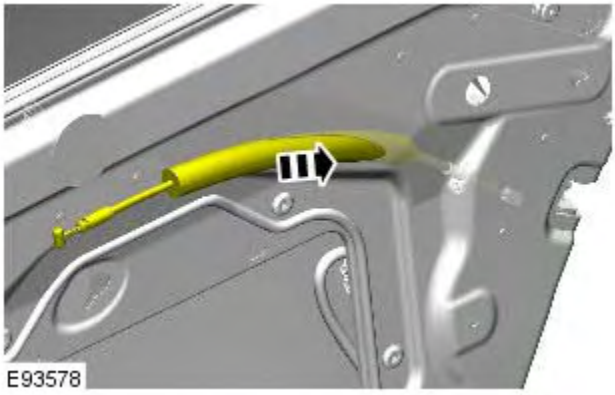
Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Rear Door Window Regulator and Motor (501-11 Glass, Frames and Mechanisms, Removal and Installation).

2. Refer to: Exterior Rear Door Handle (501-14 Handles, Locks, Latches and Entry Systems, Removal and Installation).



3. *Torque:* 3 Nm



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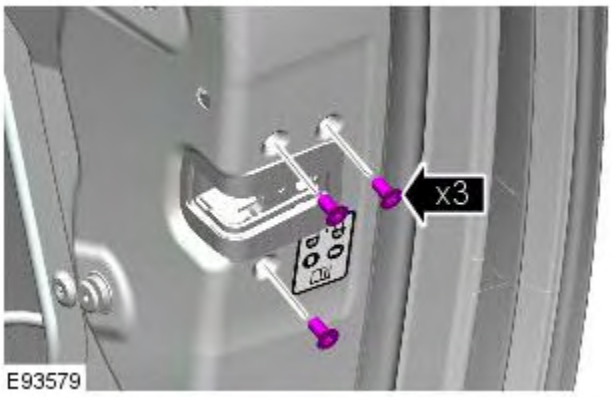
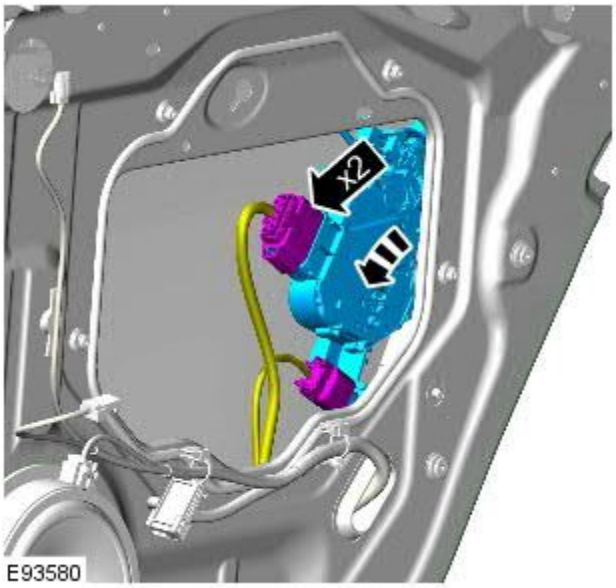


5. *Torque:* 7 Nm



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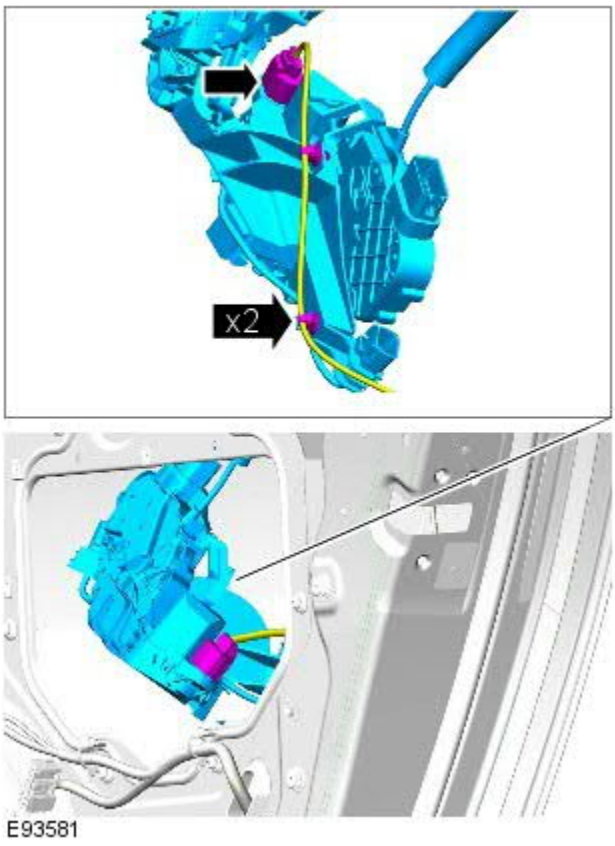
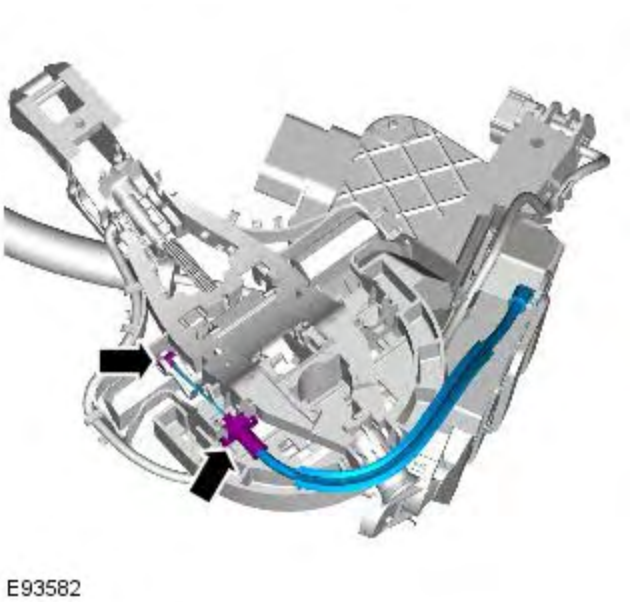


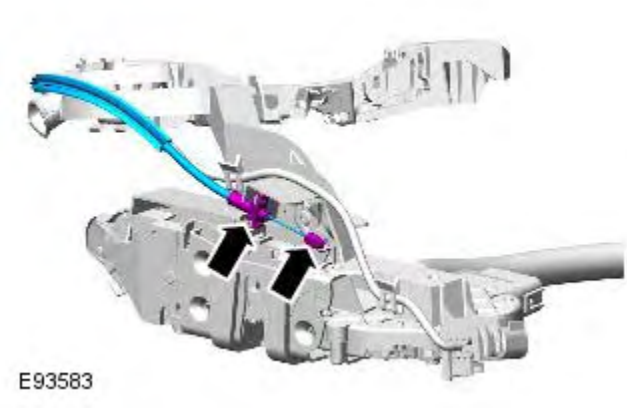
E93581

7. CAUTION: Note of the routing of the wiring harnesses.


E93582

8. NOTE: Do not disassemble further if the component is removed for access only.

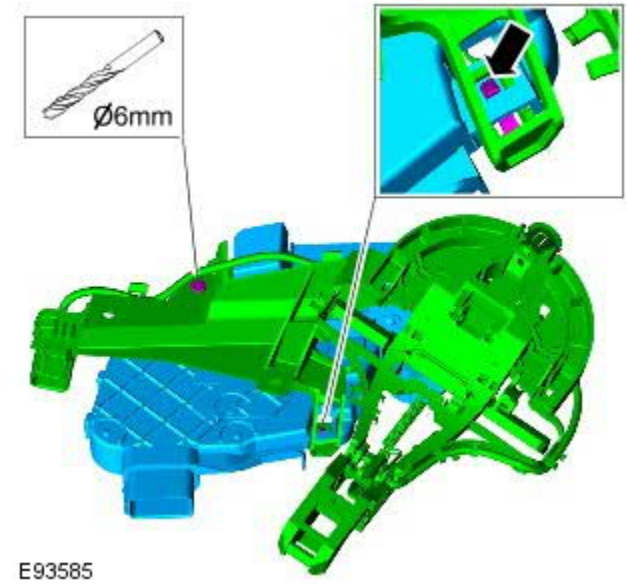
9.



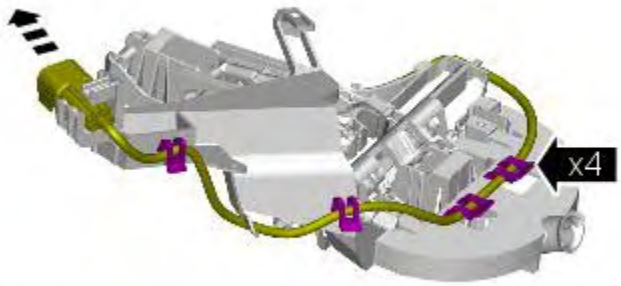
10.

11.

- Drill out the rivet.
- Release the clip.

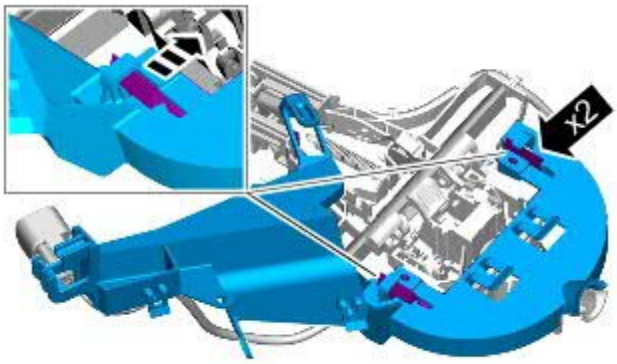


12. CAUTION: Note the routing of the wiring harness.



E93586

13.



E93587

Installation

1. CAUTION: Make sure that the wiring harnesses are correctly located.

   To install, reverse the removal procedure.

This section contains no data

Published: 11-May-2011

Wipers and Washers -

Torque Specifications

Description	Nm	lb-ft	lb-in
Wiper arm retaining nuts	22	16.2	194.7
Wiper linkage bolts / screws	11	8.1	97.4

Published: 11-May-2011

Wipers and Washers - Wipers and Washers

Diagnosis and Testing

Principles of Operation

For a detailed description of the wipers and washers system and operation, refer to the relevant Description and Operation section of the workshop manual.

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Windshield for damage or contamination e.g. road film or general residue deposits • Wiper blades, arms and linkage for wear, security, damage and freedom of movement • Windshield/Headlamp washer fluid level • Washer pipes and jets for leaks, restrictions and damage	• Battery condition and state of charge • Fusible links • Fuses • Relays • Electrical connections • Front wiper motors • Wiper switch • Washer pumps • Rain/light sensor • Heated front washer jets • Ignition switch • Light switch • Ambient air temperature sensor • Central Junction Box (CJB) • Battery Junction Box (BJB) • Anti-Lock Braking System (ABS) module • Automatic Temperature Control Module (ATCM) • Instrument Panel Cluster (IPC) module • Controller Area Network (CAN) circuits

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Wiper blade(s) drag/judder across the windshield	• Contamination of the windshield • Incorrectly installed wiper arm(s) • Wiper arm(s) incorrectly aligned to the screen • Wiper arm(s) spring tension inadequate	Clean the windshield. Check for the correct installation and tension of the wiper arm(s). Refer to the relevant section of the workshop manual. Rectify as necessary.
Very slow operation of the wiper(s) across the windshield Wiper(s) inoperative	• Low battery voltage • Front wiper linkage seized or fouling • Wiper circuit fault • Wiper switch fault, high resistance	Check the battery condition and state of charge. Check the wiper linkage for fouling. Disconnect the motor from the linkage. Refer to the relevant section of the workshop manual. Check the linkage operation. Check for DTCs indicating a wiper circuit fault. Rectify as necessary.
Noisy operation of wiper(s)	• Wiper motor/linkage fault	Lift the wiper arm(s) from the windshield/rear window and recheck the noise level during the wiper sweep operation.

Symptom	Possible Cause	Action
Noisy operation of washers	• Washer motor(s) faulty • Washer system blocked or partially blocked	Listen for washer motor operation. Check and top up washer fluid level. Check and rectify blocked washer circuit. Check the wiper/washer circuit for DTCs indicating a fault. Rectify as necessary.
Washers do not operate	• Fluid level low • Washer circuit blocked • Washer circuit faulty	

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Central Junction Box (BCM) (100-00 General Information, Description and Operation).

Published: 11-May-2011

Wipers and Washers - Headlamp Washer Jet

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

The ignition must be switched off.

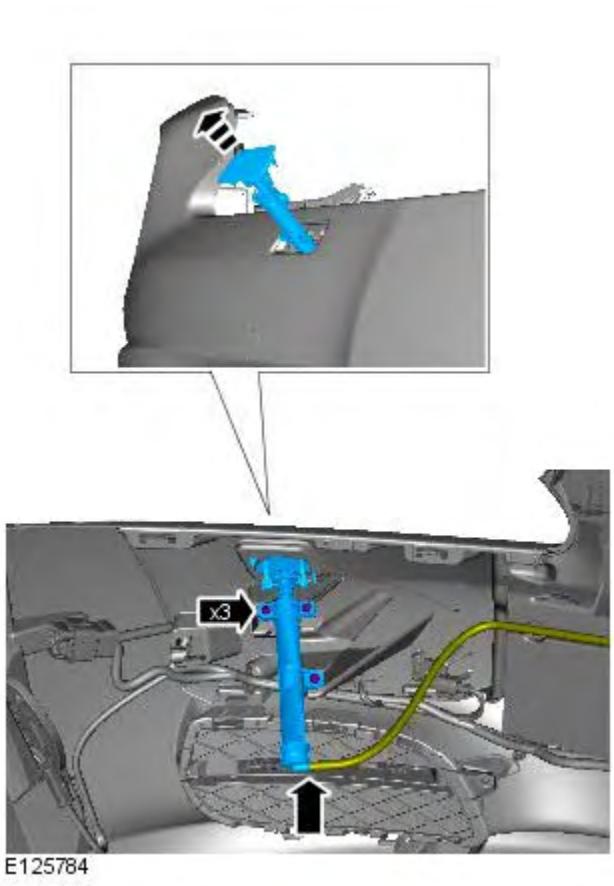
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

3. NOTE: LH illustration shown, RH is similar.

   Torque: 2.5 Nm



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Wipers and Washers - Headlamp Washer Pump

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

The ignition must be switched off.

1. WARNING: Make sure to support the vehicle with axle stands.

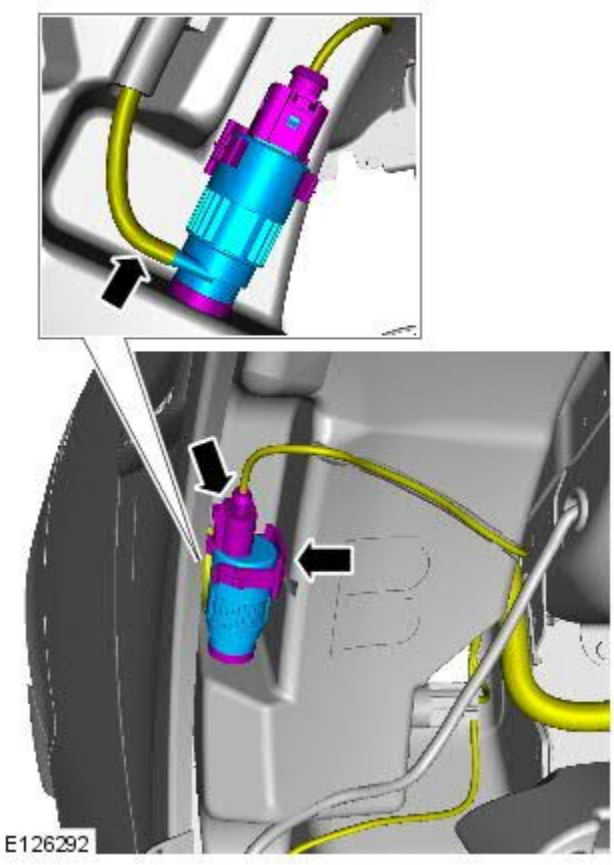
   Raise and support the vehicle.

2. Remove the RH rear wheel and tire.

   Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

3. Refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

4. CAUTION: Be prepared to collect escaping fluids.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Wipers and Washers - Rain Sensor

Removal and Installation

Removal

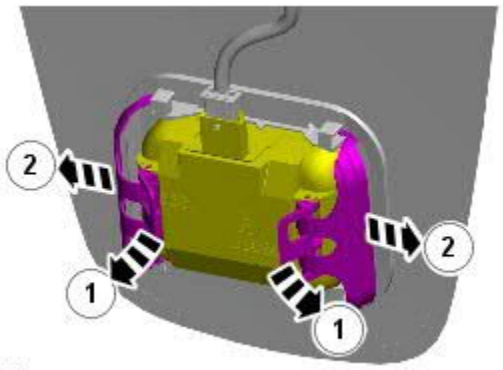
NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

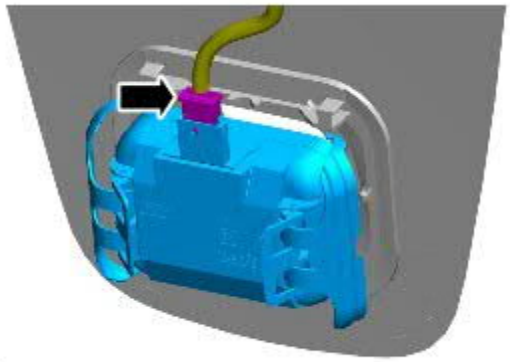
1. Refer to: Interior Rear View Mirror (501-09 Rear View Mirrors, Removal and Installation).

2.



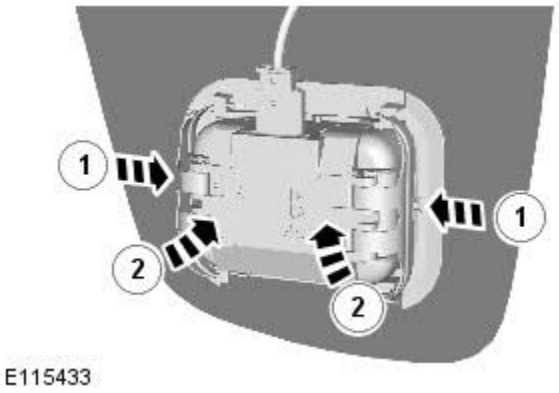
E99897

3.



E99898

Installation



E115433

1. CAUTIONS:

   Make sure that the component is secured in the retainer.

   Make sure that the clips are correctly located.

   To install, reverse the removal procedure.

Published: 11-May-2011

Wipers and Washers - Windshield Washer Reservoir

Removal and Installation

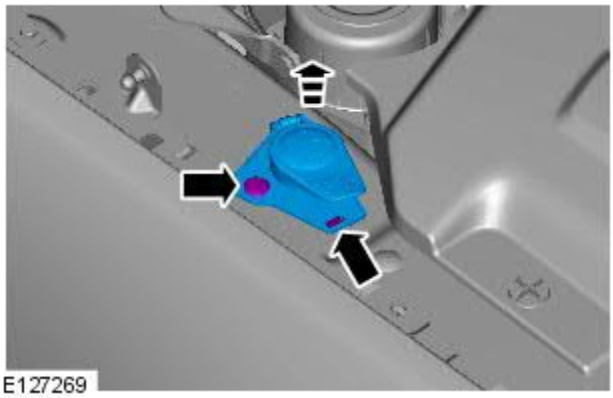
Removal

WARNING: If the fluid is spilled on the paintwork, the affected area must be immediately washed down with cold water.

NOTES:

Removal steps in this procedure may contain installation details.

The ignition must be switched off.



1. CAUTION: Make sure that the clip is correctly located.

2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

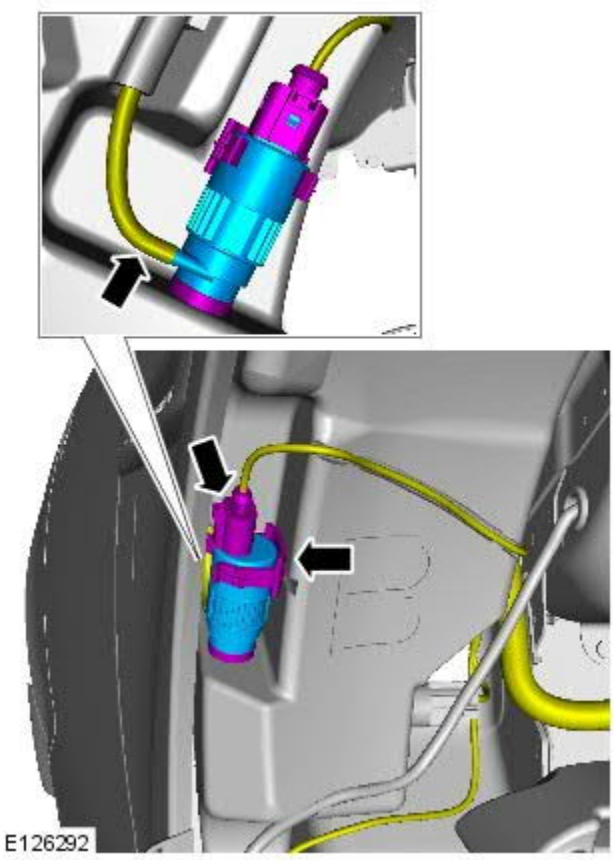
3. Remove the RH front wheel and tire.

   Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

4. CAUTION: LH illustration shown, RH is similar.

   Remove the front RH fender splash shield.

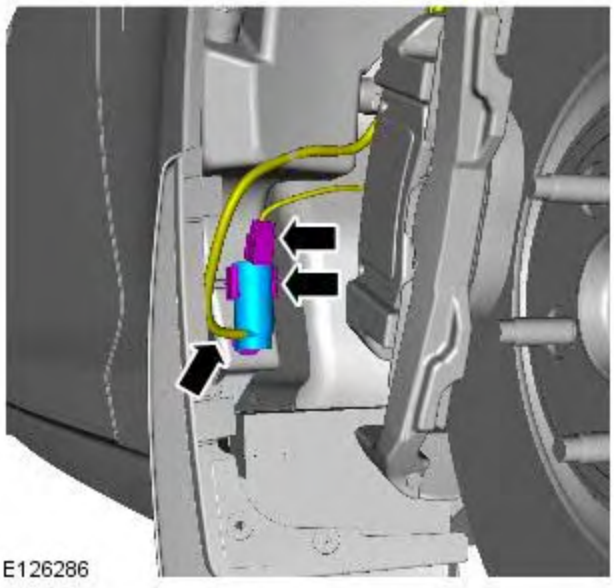
   Refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).



5. CAUTIONS:

Be prepared to collect escaping fluids.

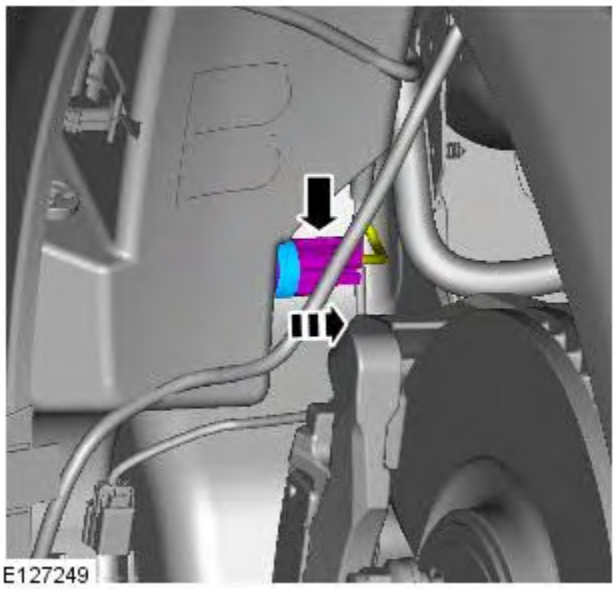
Note the routing of the lines and hoses.



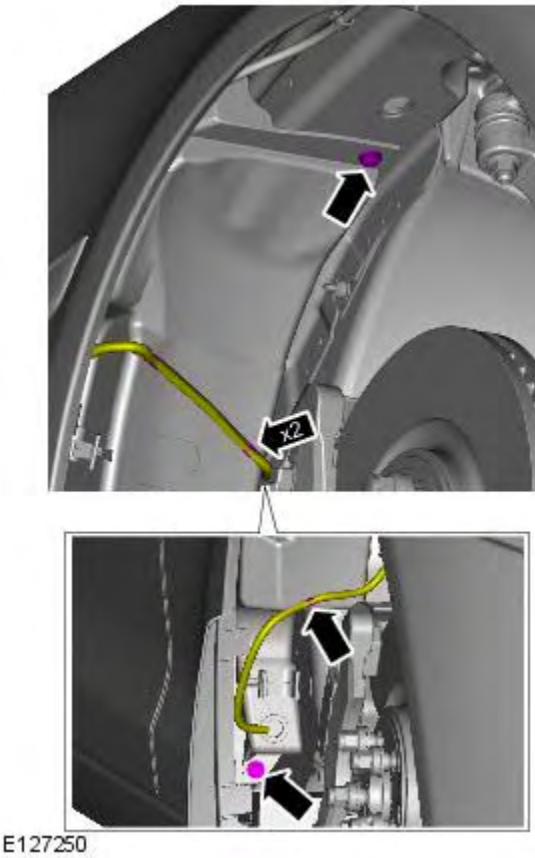
6. CAUTIONS:

Be prepared to collect escaping fluids.

Note the routing of the lines and hoses.

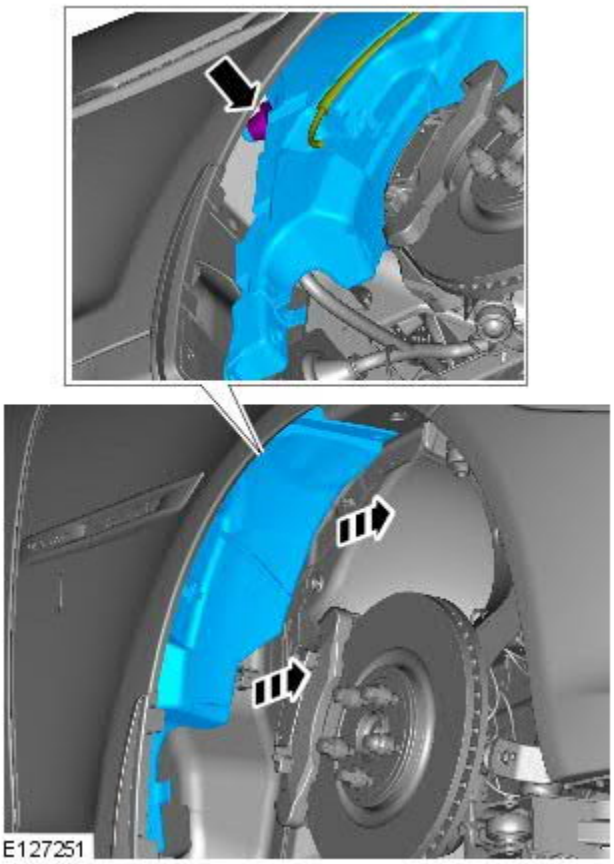


7. CAUTION: Be prepared to collect escaping fluids.



8. NOTE: Support as necessary.

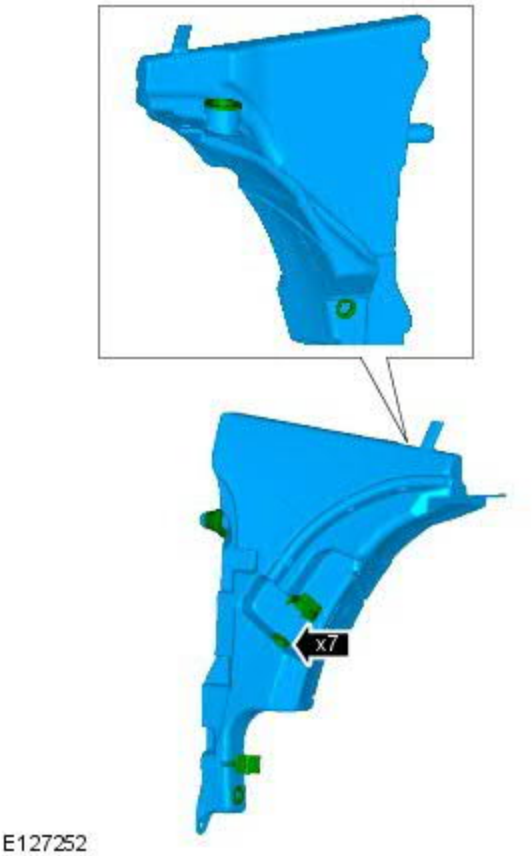
Torque: 4.1 Nm



9. CAUTIONS:

   Make sure that the component is correctly located on the locating dowels.

   Protect the surrounding components.



10. NOTE: Do not disassemble further if the component is removed for access only.

Installation

1. CAUTIONS:

   Do not over fill the reservoir.

   Only use new fluid from a sealed container.

   To install, reverse the removal procedure.

Published: 17-Jul-2013

Wipers and Washers - Windshield Wiper Motor LHD RWD

Removal and Installation

Removal

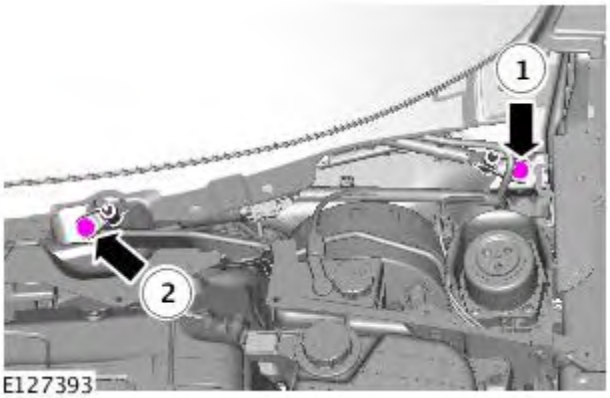
NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

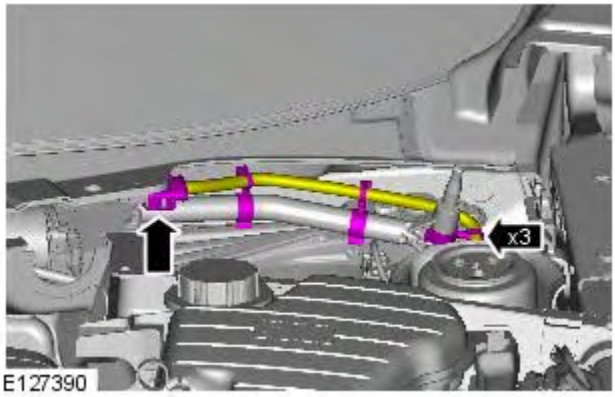
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. Refer to: Secondary Bulkhead Panel LH (501-02 Front End Body Panels, Removal and Installation).



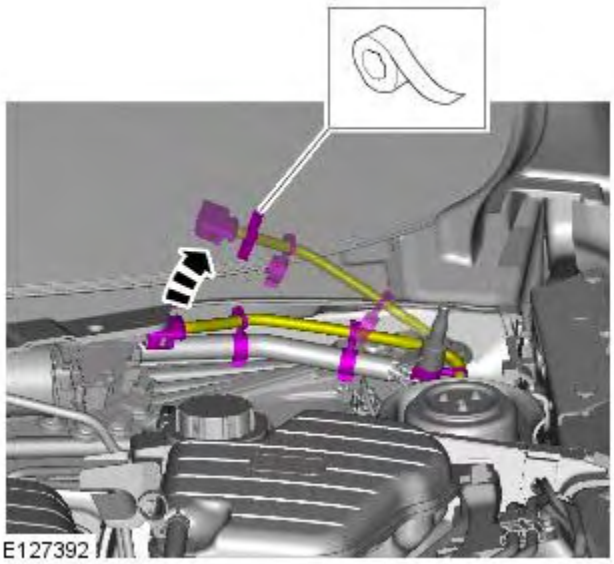
3. CAUTION: Tighten the bolts in the sequence shown.

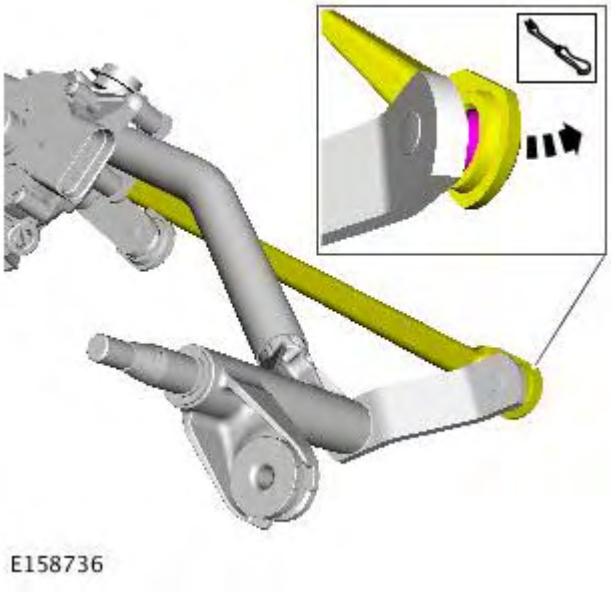
   Torque: 11 Nm



4.

5.



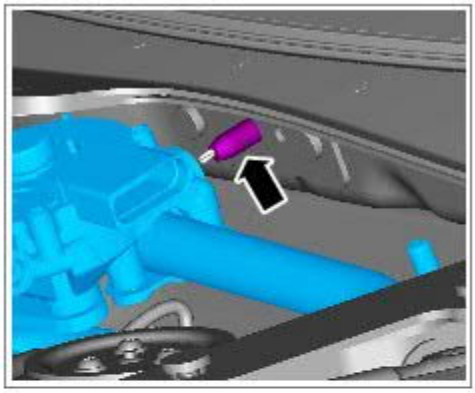


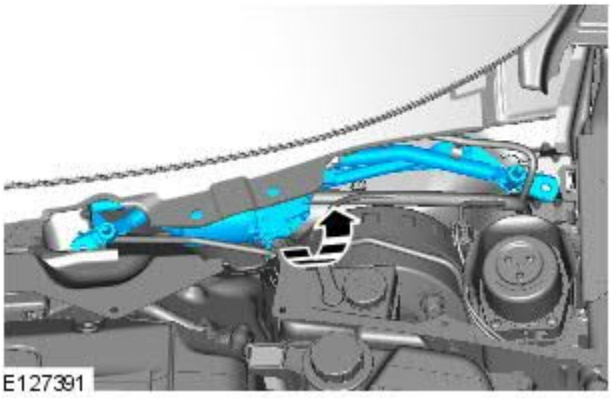
6. NOTES:

Component shown removed for clarity.

RHD illustration shown, LHD is similar.

Disconnect the link arm from the pivot to assist removal of the wiper motor assembly.





7. CAUTIONS:

   Make sure that the component is correctly located on the locating dowels.

   Protect the surrounding trim from damage when changing the component.

Installation

1. To install, reverse the removal procedure.

Published: 17-Jul-2013

Wipers and Washers - Windshield Wiper Motor RHD RWD

Removal and Installation

Removal

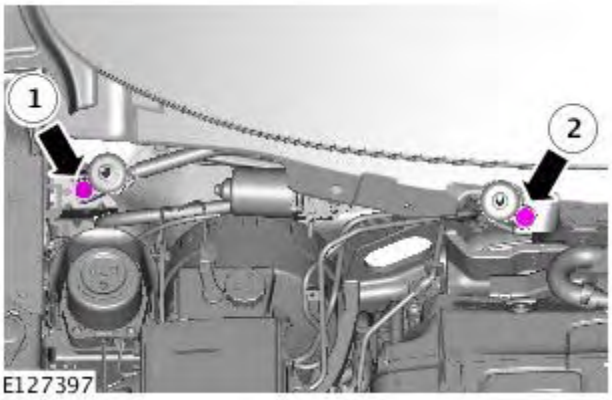
NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

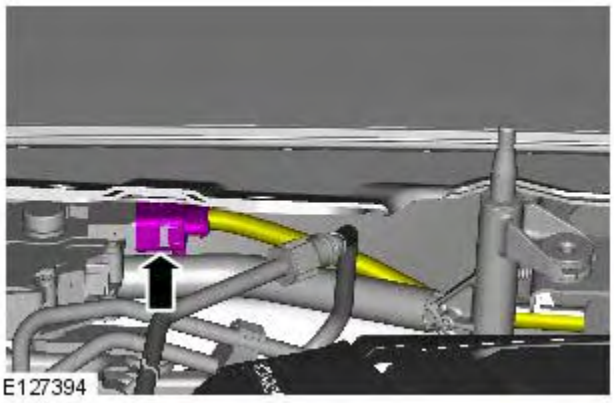
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. Refer to: Secondary Bulkhead Panel RH (501-02 Front End Body Panels, Removal and Installation).



3. CAUTION: Tighten the bolts in the sequence shown.

   Torque: 11 Nm



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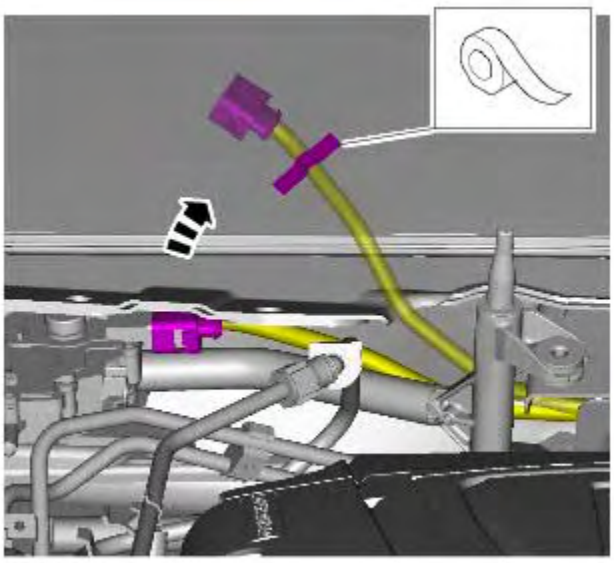
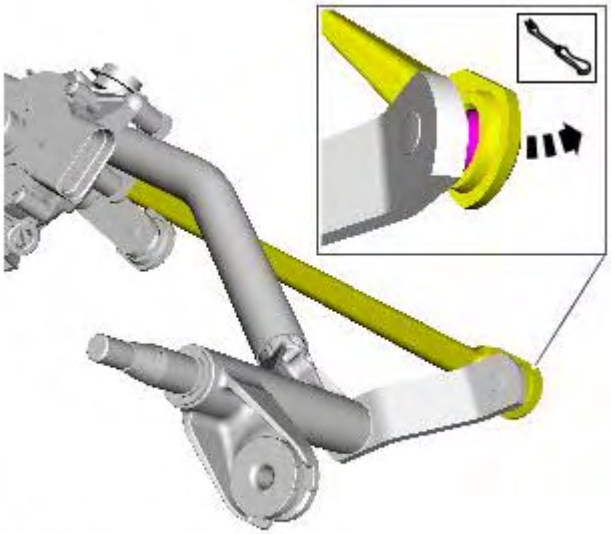


E127396

5.

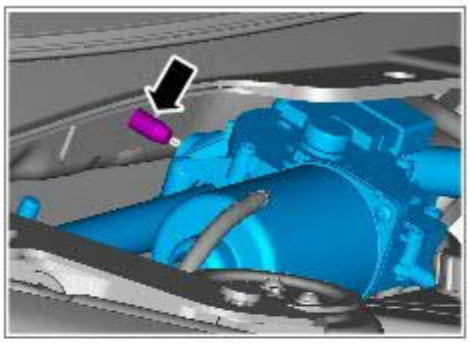


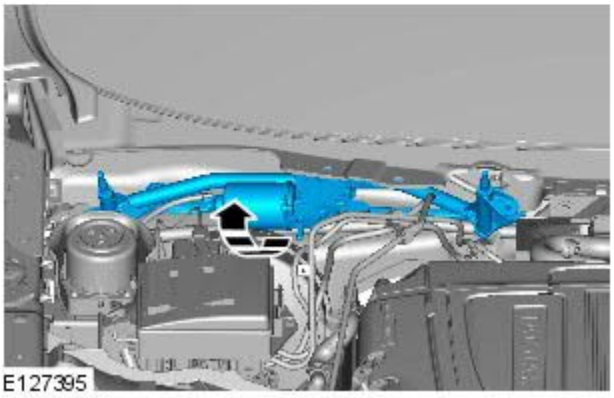
E158736

6. CAUTION: Make sure the area around the component is clean and free of foreign material.

NOTE: Component shown removed for clarity.

Disconnect the link arm from the ball joint to assist removal of the wiper motor assembly.





7. CAUTIONS:

   Make sure that the component is correctly located on the locating dowels.

   Protect the surrounding trim from damage when changing the component.

Installation

1. To install, reverse the removal procedure.

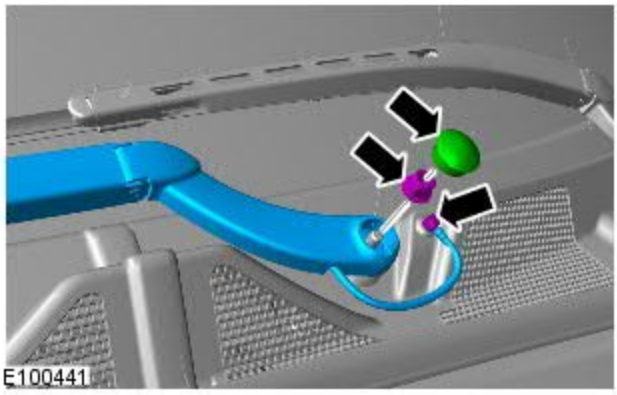
Published: 11-May-2011

Wipers and Washers - Windshield Wiper Pivot Arm

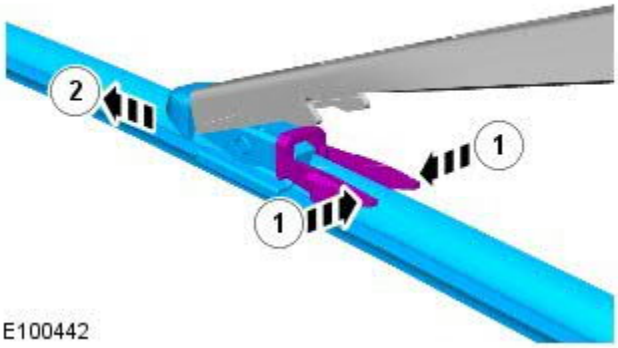
Removal and Installation

Removal

CAUTION: Always protect paintwork and glass when removing exterior components.



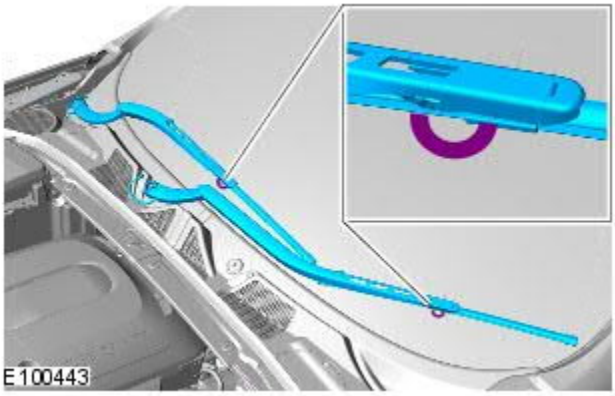
1.



2. NOTE: Do not disassemble further if the component is removed for access only.

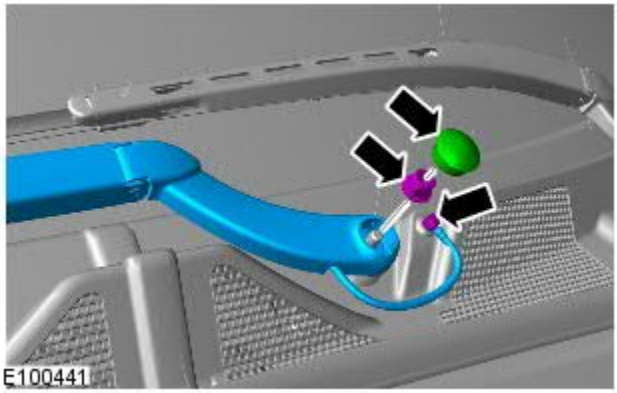
Installation

1. Install the wiper blade.



2. CAUTION: Align the wiper blades onto the centre of the windshield circle mark.

NOTE: After the wiper pivot arm nuts have been tightened to the correct torque value, lift the wiper pivot arm from the windshield and return to the windshield. Make sure that wiper blades are not positioned below any point of the windshield circle mark.



3.

- *Torque:* 22 Nm

Published: 11-May-2011

Wipers and Washers - Windshield Washer Pump

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

The ignition must be switched off.

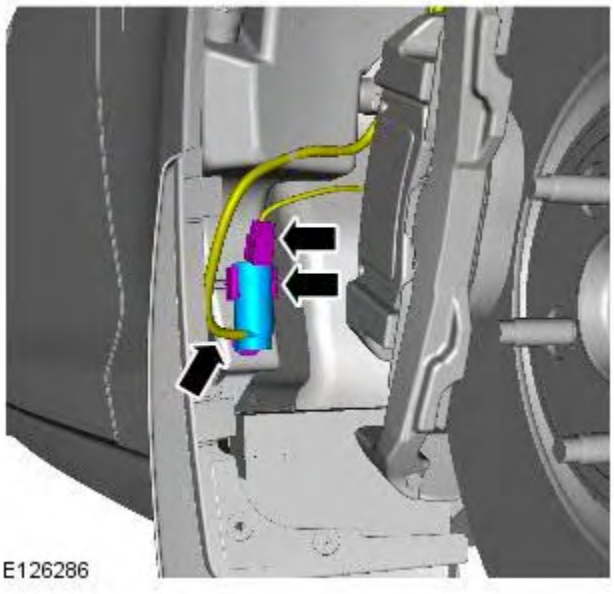
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Remove the RH rear wheel and tire.

   Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

3. Refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).



4. CAUTION: Be prepared to collect escaping fluids.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Roof Opening Panel -

Torque Specifications

Description	Nm	lb-ft	lb-in
Roof opening panel frame retaining bolts	8	6	71
Roof opening panel motor retaining bolts	5	-	44
Roof opening panel glass retaining screws	7	5	62

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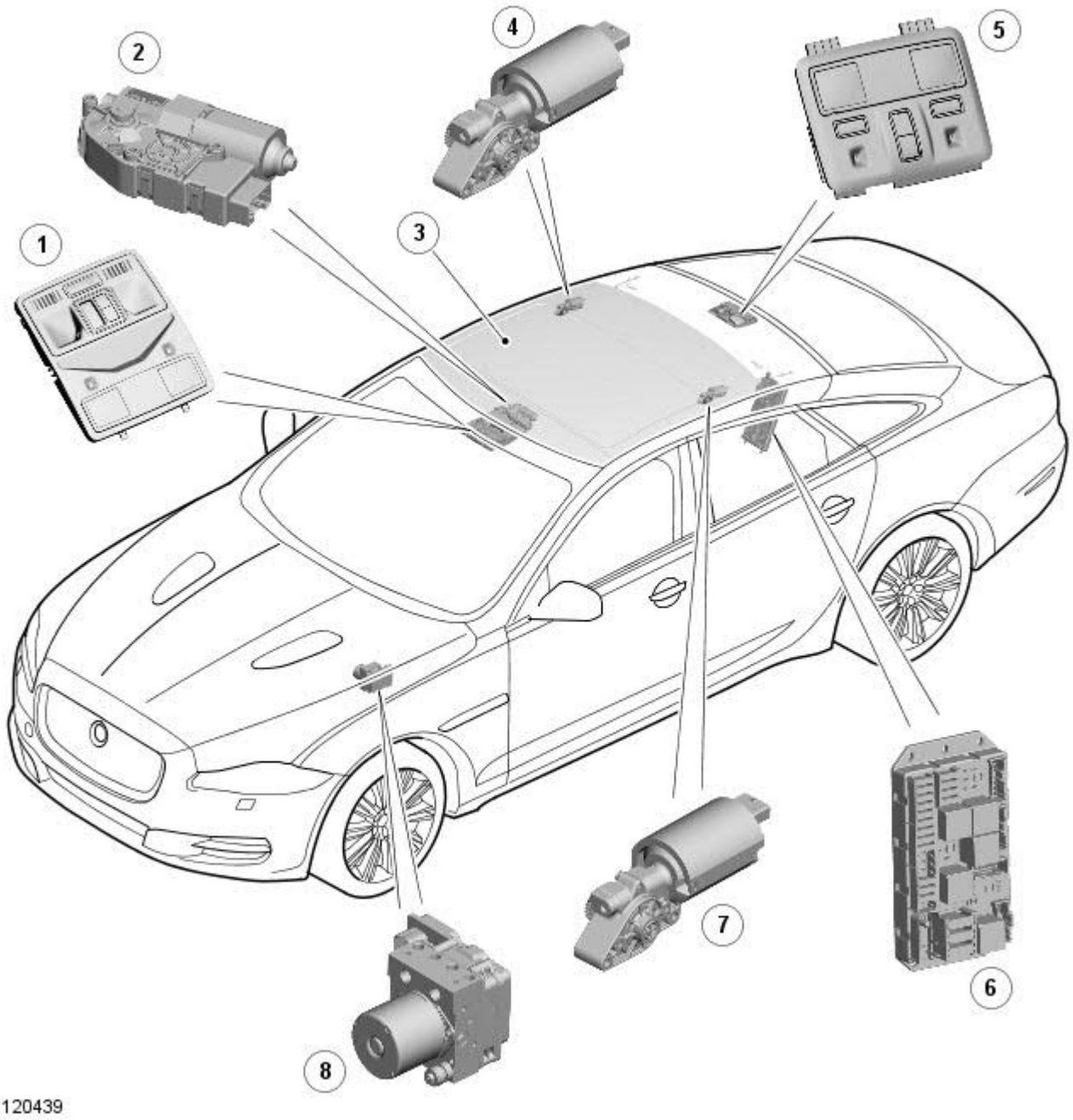
Roof Opening Panel - Roof Opening Panel - Component Location

Description and Operation

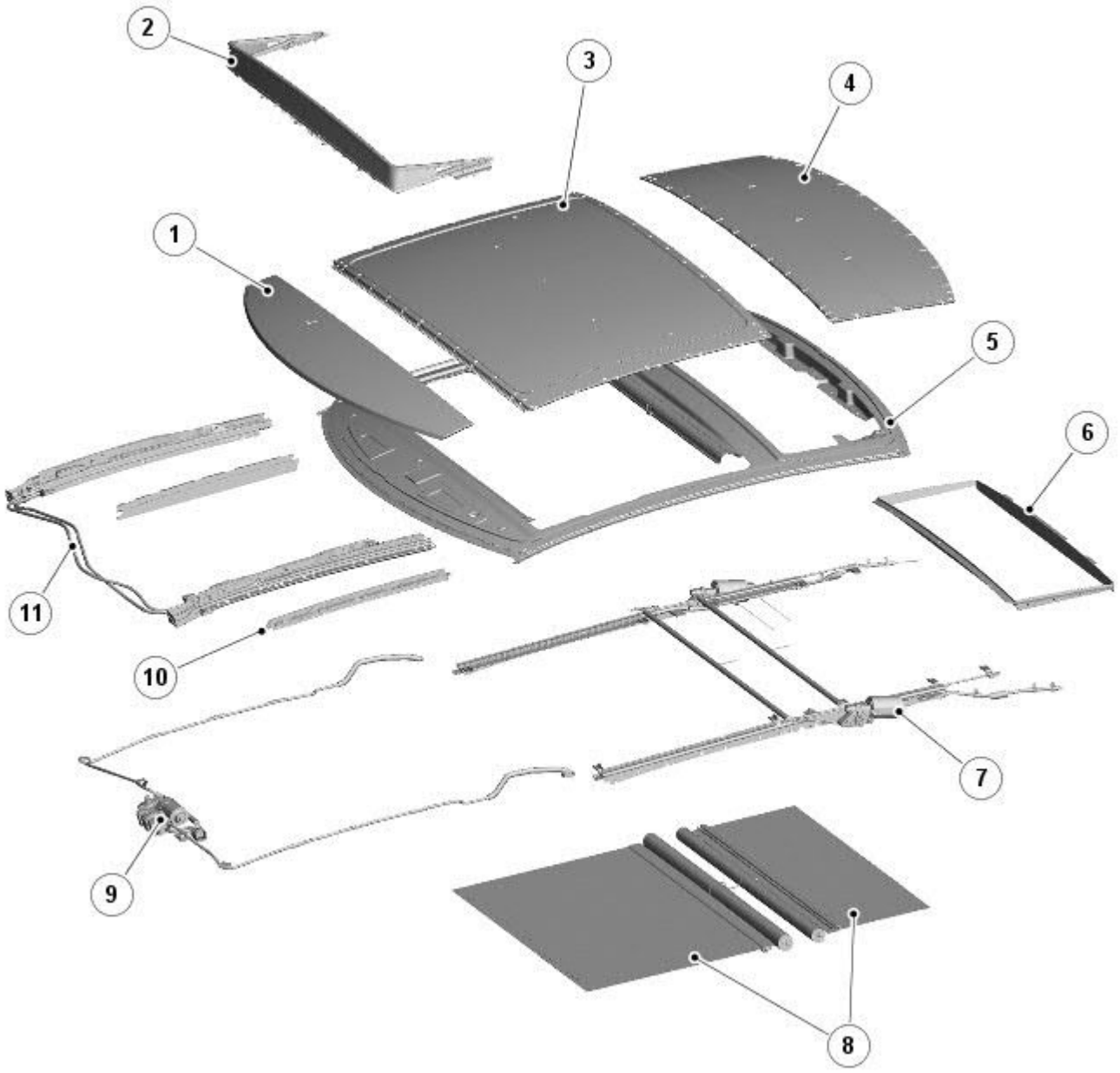
Roof Opening Panel Components 1



Roof Opening Panel components

Item	Description
1	Front overhead console - switches
2	Sliding glass panel - motor and module
3	Roof opening panel assembly
4	Roller blind motor
5	Rear overhead console – switch
6	CJB (central junction box)
7	Roller blind motor
8	ABS module - vehicle speed signal

Roof Opening Panel Components 2



E120440

Roof Opening Panel Components

Item	Description
1	Glass panel - front
2	Wind deflector
3	Sliding glass panel
4	Glass panel - rear
5	Perimeter frame
6	Trim ring
7	Roller blind guide rails and drive assembly
8	Roller blinds - front and rear
9	Drive motor and harness for sliding glass panel
10	Sight shield
11	Drive cables for sliding glass panel

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Roof Opening Panel - Roof Opening Panel - Overview

Description and Operation

Overview

The roof opening panel assembly is built into a steel perimeter frame and incorporates the:

- fixed glass panels
- sliding glass panel
- roller blinds
- electric operating motors and mechanisms
- wiring harness, and
- wind deflector.

The motor located at the front of the assembly powers the sliding glass panel. The motors operating the roller blinds are in the side rails. The steel frame is bonded into an aperture extending the full width of the roof, between the cant rails of the vehicle’s aluminum body.

The sliding glass panel and roller blinds are controlled by the switch pack in the front overhead console. The rear roller blind can also be controlled by a button in the rear overhead console. The rear overhead switch function can be isolated by isolating the rear electric windows on the drivers window switch pack.

Published: 10-Jun-2013

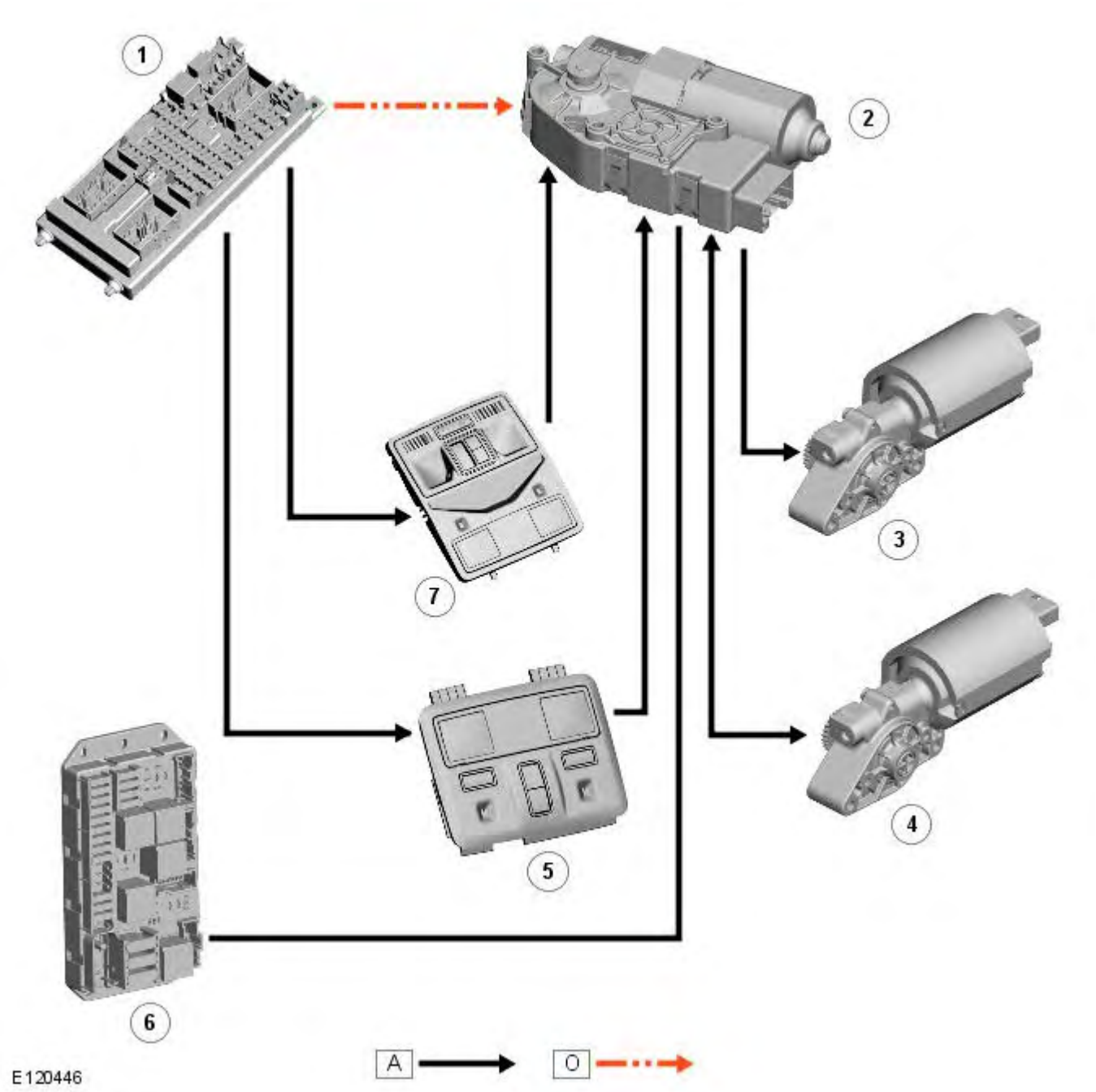
Roof Opening Panel - Roof Opening Panel - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: **A** = Hardwired; **O** = LIN Bus

Roof Opening Panel - Control Diagram



Item	Description
1	CJB (central junction box)
2	Sliding glass panel - motor and module
3	Roller blind motor
4	Roller blind motor

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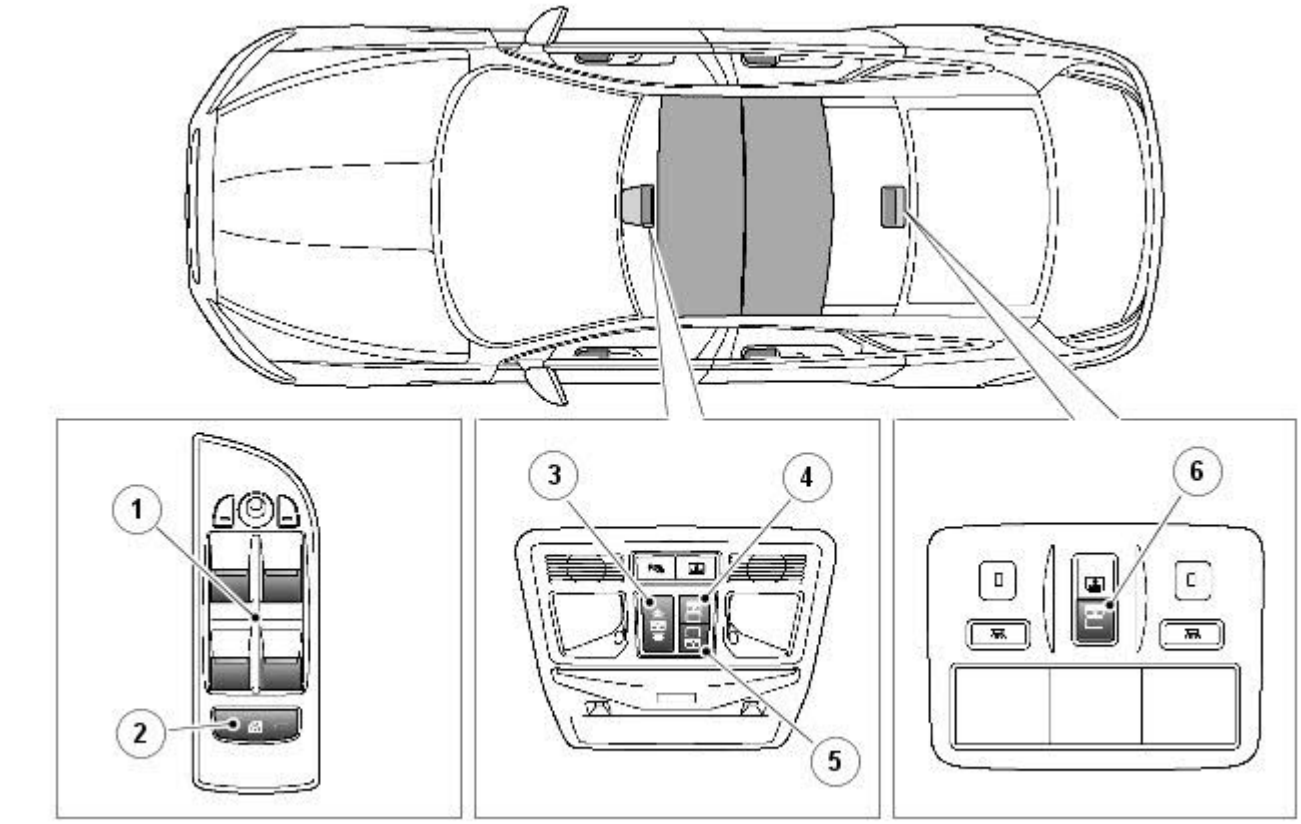
5	Rear overhead console
6	RJB (rear junction box)
7	Front overhead console

System Operation

Roof Opening Panel Operation

The sliding glass panel and roller blinds are controlled by the switch pack in the front overhead console. The rear roller blind can also be controlled by a button in the rear overhead console. The rear overhead switch function can be isolated by isolating the rear electric windows on the drivers window switch pack.

Roof Opening Panel



E128731

Item	Description
1	Window switch pack - driver door
2	Isolator switch - rear windows and roof panel rear-blind
3	Switch - roof sliding glass panel
4	Switch - roof panel rear-blind
5	Switch - roof panel front-blind
6	Switch - roof panel rear-blind

A rocker switch in the front overhead console controls the opening and closing of the sliding glass panel with a one-touch function in the direction required:

- Press (3) once to tilt the panel.
- Once tilted, press (3) again to open the panel.
- Press (3) to close the panel from tilt.
- From the fully open position, press (3) once to close to the tilt position, then press again to close fully.
- Sliding glass panel movement can be halted at any time by pressing the button (3) again.

Anti-trap mechanism

If the roof panel encounters resistance when closing it will stop, and then open a set distance in the opposite direction. This is to prevent serious injury or damage to the mechanism. The anti-trap mechanism can be overridden to allow the roof to be closed when movement is restricted by dirt. To override the anti-trap mechanism, press and hold the front of the switch until the roof reaches the closed position.

Roof Blinds

CAUTION: To prevent damage to the roof blind mechanism the blinds must not be operated manually.

Front blind

One push of the button (5) will fully open or close the blind. The blind is either fully open or closed and cannot be halted part way.

The front blind opens automatically as the roof panel is opened, preventing wind affecting the blind. The blind cannot be closed when the roof is open.

Rear blind

One push of the buttons (4) or (6) will fully open or close the blind. The blind is either fully open or closed and cannot be halted part way.

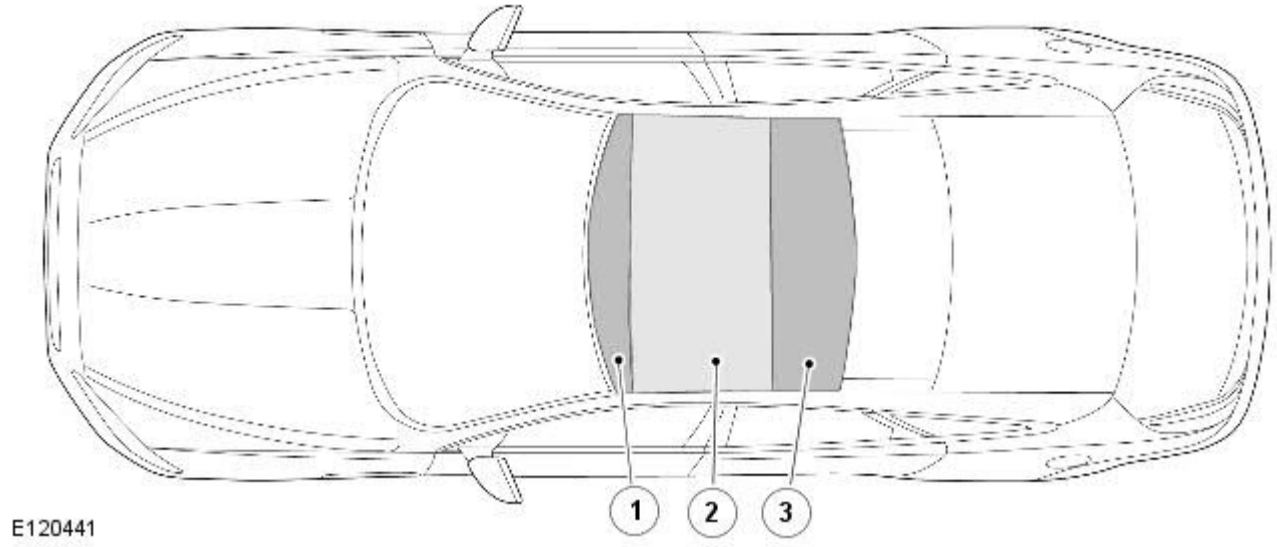
Pressing the dual purpose isolator switch (2) in the driver's door switch pack (1) will inhibit the rear passenger's operating the rear windows and roof panel rear-blind.

NOTE: Global open/close functionality is not enabled on the roof module.

Component Description

The front half of the roof opening panel components are common for both long and short wheelbase vehicles, although the frames are unique to each type of vehicle. The steel frame forms a structural contribution to the vehicle body, helping maintain the rigidity of the shell even with the majority of the aluminum roof removed.

Glass Panels



Glass panels

Item	Description
1	Fixed front glass panel
2	Sliding glass panel
3	Fixed rear glass panel

The glass section of the roof begins at the top edge of the windscreen and extends back to a line mid-way between the 'B' and 'C' pillars. The external surface of the roof opening panel comprises the following three glass elements:

- Fixed front glass panel (5mm thick)
- Sliding glass panel (4mm thick)
- Fixed rear glass panel (4mm thick)

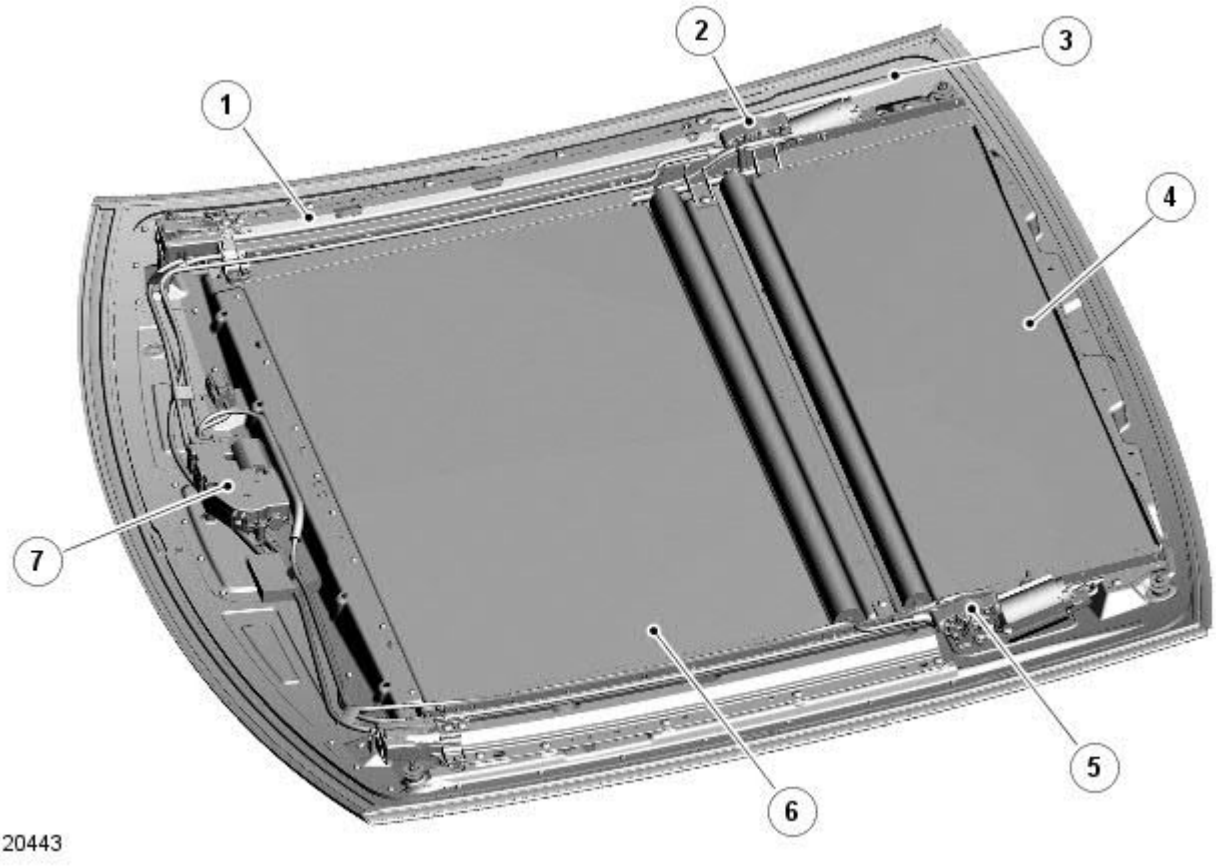
All three panels are manufactured in a tinted toughened glass with a Protec safety film bonded onto the lower surface to prevent shards of glass entering the vehicle cabin in the event of a breakage.

The tinted glass provides a high degree of solar protection allowing only 8.2 percent heat transmission into the vehicle. The fixed front panel fills the space between the windscreen and the sliding center panel. The fixed rear panel above the rear passenger compartment sits between the rear of the sliding panel and the rear section of the aluminum roof.

A wider rear glass panel accommodates the 125mm difference in roof length between standard and long wheelbase vehicles.

The sliding glass panel features an electrically powered tilt and slide mechanism. On opening, the rear of the panel tilts upwards before moving rearwards above the fixed glass panel. As the sliding panel opens a wind deflector rises automatically across the leading edge of the aperture. The deflector manufactured from a mesh type material is used to reduce wind-noise.

Roof Opening Panel Components - Interior View



Roof Components - Interior View

Item	Description
1	Perimeter frame
2	Roller blind motor
3	Roller blind guide rails and drive assembly
4	Rear blind
5	Roller blind motor
6	Front blind
7	Sliding glass panel motor and control module

The roof opening panel assembly features electrically powered front and rear roller blinds that can be independently operated. Guided by side rails, each blind rolls to-and-from the center of the roof opening panel with the:

- front blind closing forwards, and the
- rear blind closing rearwards.

Control Module and Motor

The opening and closing function of the sliding glass panel and roller-blinds are controlled by the roof module which is integral with the sliding glass panel motor. The module receives a permanent battery power supply from the RJB.

To open or close the sliding glass panel and blinds the module receives hardwired 'open/close' inputs from the switches located in the front and rear overhead console panels.

The control module has a non-volatile memory, if battery power to the module is lost the sliding roof panel and blind positions are retained and the one-touch feature does not require re-initializing. However due to the software condition if the battery power to the control module is interrupted when the ignition is switched on, the one-touch feature must be re-initialized.

Once the power supply is restored, reset the roof mechanism as follows:

1. Switch the ignition on.
2. Fully close the roof.
3. Press the front of the roof switch, and hold for 45 seconds.
4. NOTE: The roof blinds do not close on completion of the one touch setup sequence.

   After 45 seconds the roof will begin to move. Keep the front of the switch pressed until the roof and the roof blinds have fully opened, then the roof panel is fully closed.
5. Once the open/close cycle has completed and the roof has stopped moving, release the switch.
6. The roof can now be operated as normal.

The motor that operates the sliding glass panel uses a drive gear which engages and drives two cables within a sleeved tube. Each cable is linked to the sliding glass panel's open and close mechanism located either side of the panel. The rotation of the motor drives the cables in the required direction. Signals from a Hall effect sensor located in the motor enables the control module to calculate the exact position and operating speed of the glass sliding panel.

The Hall effect sensor is also an operational component of the anti-trap function. The control module uses the operating speed of the sliding glass panel and the current draw of the motor to detect an obstruction. If the sliding glass panel closing speed decreases below a set threshold and the current draw from the motor increases the power feed to the motor is reversed. This will then open the sliding glass panel a set distance in the opposite direction of travel. In an emergency the anti-trap function can be overridden by holding the operating switch in the close position.

Depending on vehicle speed the closing threshold of the anti-trap function is adjusted to counteract the force of air pressure acting upon the sliding roof panel. Vehicle speed signal is transmitted from the ABS module via the high-speed CAN bus to the CJB where the signal is processed and transmitted over a LIN bus connection to the roof module. As vehicle speed increases, air pressure forces acting upon the sliding panel simultaneously increase, affecting the anti-trap functionality. The vehicle speed signal is used by the control module to re-calibrate the anti-trap algorithm, accounting for the extra force acting on the sliding panel. This function adapts the sliding panel closing speed threshold of the anti-trap function, dependant on vehicle speed.

Both the sliding glass panel and front blind motors have a thermal protection device built into the control module software to protect them from overheating. The operating parameters are as follows:

- If the motor temperature is between 60 and 77 degrees C the roof operation is restricted to a close only function.
- If the motor temperature exceeds 77 degrees C during the closing function the movement will not be interrupted.
- If the motor temperature exceeds 77 degrees C when the roof is closed movement will be inhibited.
- If the anti-trap function is operational when closing, the reverse movement of the motor will complete its movement regardless of motor temperature.

Thermal protection for the sliding glass panel motor and front blind motor are functioned in unison, therefore if one motor exceeds 60 or 77 degrees C the same restrictions, as defined above, will apply to both motors. For example if the front blind cannot be opened due to thermal protection the sliding glass panel will also ignore the opening command.

Published: 16-Apr-2012

Roof Opening Panel - Roof Opening Panel

Diagnosis and Testing

Principle of Operation

For a detailed description of the roof opening panel system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (501-17 Roof Opening Panel)

Roof Opening Panel (Description and Operation),
Roof Opening Panel (Description and Operation),
Roof Opening Panel (Description and Operation).

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Glass panel assembly • Glass panel seal • Frame assembly • Roller blind(s) • Deflector • Access panel • Roof opening panel cables	• Fuses • Battery Junction Box (BJB) • Central Junction Box (CJB) • Wiring harness • Loose or corroded connector(s) • Roof opening panel motor and control module • Roof opening panel switch

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

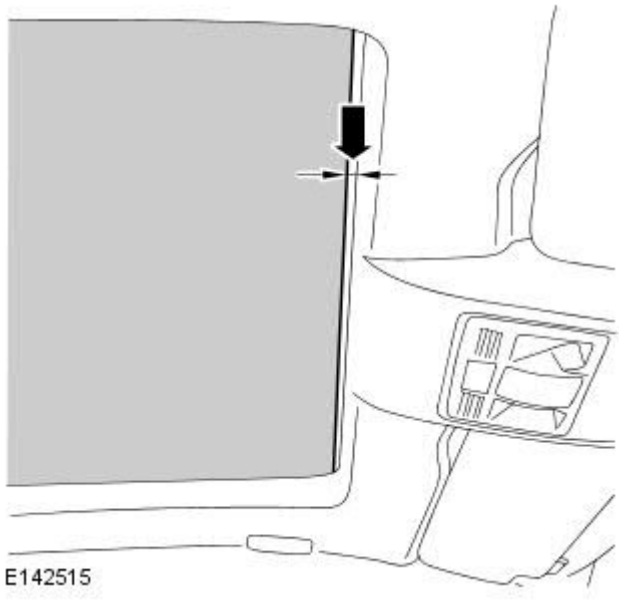
Symptom	Possible Cause	Action
Roof opening panel inoperative	• Roof opening panel calibration lost • Fuse(s) blown • Control circuit fault • Supply circuit fault • Motor fault	• Calibrate the roof opening panel REFER to: Motor Synchronization (501-17 Roof Opening Panel, General Procedures). • Check the fuse(s) • Check the roof opening panel circuits • Carry out hard battery reset • Check the switch and motor function
Roof opening panel creak	• Contact between sunroof frame seal and vehicle body • Sunroof frame twist • Moving panel contact to sunroof frame • Ice formation between the body and sunroof	• GO to Pinpoint Test F.
Roof opening panel sticking or juddering	• Debris in the channels/guides • Cable(s) sticking/damaged • Roof opening panel incorrectly aligned • Switch fault • Motor fault	• Check for general debris • Inspect, clean and lubricate the cable(s) and guides • Check the roof opening panel alignment. REFER to: Roof Opening Panel Alignment (501-17 Roof Opening Panel, General Procedures). • Check the switch and motor function
Water ingress from roof opening panel	• Debris in the channels/guides • Damage to the glass panel seal • Roof opening panel incorrectly aligned • Failed bond of sunroof frame to	• Check for general debris • Inspect, clean and lubricate the cable(s) and guides • Check the glass panel seal • Check the roof opening panel alignment

Symptom	Possible Cause	Action
	body • Failed bond of fixed glass panels to sunroof frame	REFER to: Roof Opening Panel Alignment (501-17 Roof Opening Panel, General Procedures).
Roof opening panel blind - gap to headliner	• Miss-alignment of blind closing position • Broken / incorrectly installed headliner clips	• GO to Pinpoint Test A.
Roof opening panel blind noise	• Broken / incorrectly installed blind feet • Warped blind drive mechanism casting • Blind spring rattle	• GO to Pinpoint Test B.
Wind noise	• Damage to the glass panel seal • Cable(s) sticking/damaged • Roof opening panel incorrectly aligned	• Check the glass panel seals • Inspect, clean and lubricate the cable(s) and guides • Check the roof opening panel alignment REFER to: Roof Opening Panel Alignment (501-17 Roof Opening Panel, General Procedures).

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Central Junction Box (BCM) (100-00 General Information, Description and Operation).

PINPOINT TEST A : ROOF OPENING PANEL BLIND GAP	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: BLIND OPERATION	
	1 Operate the roof opening panel blind from open to closed **twice**, using the console mounted switch
	Does the roof opening panel blind operate correctly? **Yes** GO to A2. **No** GO to Pinpoint Test B.
A2: BLIND TO HEADLINER GAP	
	1 Carry out a visual inspection of the condition of the closed blind to the headliner
	Is there an excessive or abnormal gap between the blind and headliner? **Yes** GO to A3. **No** No further action required
A3: GAP ORIENTATION	

	1 Carry out a visual inspection of the condition of the closed blind to the headliner
	Is the gap from the leading edge of the blind to the edge of the headliner in the X-direction (fore/aft)? **Yes** Calibrate the roof opening panel REFER to: Motor Synchronization (501-17 Roof Opening Panel, General Procedures). Then GO to A4. **No** Check headliner is correctly retained. Re-secure as required. If customer concern is still evident follow the procedure REFER to: Headliner (501-05 Interior Trim and Ornamentation, Removal and Installation). Replace the headliner clips. Then GO to A5.
A4: BLIND - FEET	
	1 Operate the roof opening panel blind from open to closed **twice**, using the console mounted switch
	2 Carry out a visual inspection of the condition of the closed blind to the headliner
	Is the customer concern still evident? **Yes** Carry out visual inspection of the blind feet for correct installation and damage, re-install or replace as required REFER to: Roof Opening Panel Blind Feet (501-17 Roof Opening Panel, Removal and Installation). Then GO to A5. **No** No further action required
A5: CLEARANCE APERTURE - VISUAL CHECK	
	1 Operate the roof opening panel blind from open to closed **twice**, using the console mounted switch
	2 Carry out a visual inspection of the condition of the closed blind to the headliner
	Is the customer concern still evident? **Yes** If customer concern is still evident contact dealer technical support **No** No further action required

PINPOINT TEST B : ROOF OPENING PANEL BLIND - MOTOR – NOISE OR INOPERATIVE	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
B1: MOTOR OPERATION	
	1 Operate the roof opening panel blind using the console mounted switch
	2 Listen for noise that would indicate that the motor is operating

	Is there a noise generated when the blind switch is pressed? **Yes** GO to B2. **No** GO to Pinpoint Test E.
B2: HIGH LEVEL NOISE	
	1 Operate the roof opening panel blind using the console mounted switch
	Does the blind make a loud ratcheting noise when the switch is pressed? **Yes** Replace the glass panel blind drive assembly **(Front)** REFER to: Roof Opening Panel Blind Drive Assembly (501-17 Roof Opening Panel, Removal and Installation). **(Rear)** REFER to: Glass Roof Panel Blind Drive Assembly (501-11 Glass, Frames and Mechanisms, Removal and Installation). **No** Carry out visual inspection of the blind feet for correct installation and damage, replace as required REFER to: Roof Opening Panel Blind Feet (501-17 Roof Opening Panel, Removal and Installation). Then GO to B3.
B3: HIGH LEVEL NOISE - CHECK	
	1 Operate the roof opening panel blind using the console mounted switch
	Is the customer concern still evident? **Yes** If customer concern is still evident contact dealer technical support **No** No further action required

PINPOINT TEST C : ROOF OPENING PANEL BLIND – NOISE	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
C1: BLIND - FEET	
	1 Operate the roof opening panel blind using the console mounted switch
	Is the noise only present during operation of the blind **Yes** Carry out visual inspection of the blind feet for correct installation and damage, replace as required, as per procedure REFER to: Roof Opening Panel Blind Feet (501-17 Roof Opening Panel, Removal and Installation). Then GO to C2. **No** GO to Pinpoint Test D.
C2: BLIND - RETENSION	
	1 Operate the roof opening panel blind using the console mounted switch
	Is the customer concern still evident? **Yes** Re-tension the blind REFER to: Roof Opening Panel Blind Rewind Procedure (501-17 Roof Opening Panel, General Procedures). Then GO to C3. **No** No further action required
C3: REPLACEMENT	
	1 Operate the roof opening panel blind using the console mounted switch
	Is the customer concern still evident? **Yes** Replace the blind assembly REFER to: Roof Opening Panel Blind (501-17 Roof Opening Panel, Removal and Installation). Then GO to C4. **No** No further action required
C4: AUDIBLE NOISE - CHECK	
	1 Operate the roof opening panel blind using the console mounted switch
	Is the customer concern still evident? **Yes** If customer concern is still evident contact dealer technical support **No** No further action required

PINPOINT TEST D : ROOF OPENING PANEL BLIND – NOISE / RATTLE	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
D1: RATTLE - VEHICLE IN MOTION	
	1 Verify the customer concern by performing a road test (Observe the road test safety guidelines)
	2 Check if the concern is evident with the blind in open and closed positions

	Is the noise present when the blind is closed? **Yes** Contact dealer technical support **No** GO to D2.
D2: RATTLE - VEHICLE IN MOTION	
	1 Confirm the vehicle identification number
	Is the VIN number below V17000 **Yes** Replace the blind assembly REFER to: Roof Opening Panel Blind (501-17 Roof Opening Panel, Removal and Installation). If customer concern is still evident contact dealer technical support **No** Contact dealer technical support

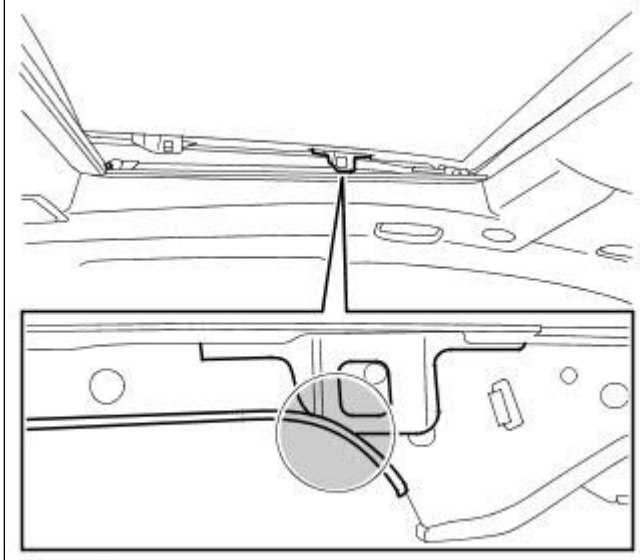
PINPOINT TEST E : ROOF BLIND OPERATION	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
E1: OPERATION	
	1 Operate the opening panel using the roof mounted switch
	Does the opening panel operate correctly? **Yes** GO to E2. **No** Refer to the electrical circuit diagrams. Check the fused links to the roof opening panel, roof blinds module and the front overhead console. Replace as required. If the fused link is intact refer to **(roof opening panel inoperative)** in the symptom chart above
E2: VOLTAGE TO BLIND MOTORS	
NOTE: Blind motor + (red wire) should be at battery voltage during opening movement, blind motor – (black wire) should be at battery voltage during closing movement	
	1 Lower the headliner REFER to: Headliner (501-05 Interior Trim and Ornamentation, Removal and Installation).
	2 **Front** blind failure. Operate to roof blind switch. Refer to the electrical circuit diagrams check for voltage between connector **- C9PR153A/5 -** and **- C9PR153A/1 -**
	3 **Rear** blind failure. Operate to roof blind switch. Refer to the electrical circuit diagrams check for voltage between connector **- C9PR155A/1 -** and **- C9PR155A/5 -**
	Does the supply circuit operate as expected? **Yes** Suspect blind motor internal failure. Replace the glass panel blind drive assembly **(Front)** REFER to: Roof Opening Panel Blind Drive Assembly (501-17 Roof Opening Panel, Removal and Installation). **(Rear)** REFER to: Glass Roof Panel Blind Drive Assembly (501-11 Glass, Frames and Mechanisms, Removal and Installation). GO to E6. **No** GO to E3.
E3: SENSOR AND SUPPLY CIRCUIT CHECKS	
	1 **Front** blind failure. Refer to the electrical circuit diagrams check the circuit for continuity and for short to power, ground or open circuit between connectors **- C9PR32A -** and **- C9PR153A -**
	2 **Rear** blind failure. Refer to the electrical circuit diagrams check the circuit for continuity and for short to power, ground or open circuit between connectors **- C9PR32A -** and **- C9PR155A -**
	Did the circuit pass the tests? **Yes** GO to E4. **No** Repair or replace the blind harness. Then GO to E6.
E4: SWITCH CIRCUIT CHECK	
	1 Refer to the electrical circuit diagrams check the circuit for continuity and for short to power, ground or open circuit between connectors **- C9PR32A -** and **- C9LN28 -**
	Did the circuit pass the tests? **Yes** GO to E5. **No** Repair or replace the switch circuit harness. Then GO to E6.
E5: SWITCH PACK	
NOTE: Blind circuit operation (one touch), a ground is supplied while the switch is pressed	
	1 Refer to the electrical circuit diagrams and monitor voltage on the blind open / close circuits as the switch is pressed

	Did the switch circuits pass the tests? **Yes** GO to E6. **No** If the blind operation is the only fault suspect the front overhead console switch replace as required. Then GO to E6.
E6: CORRECT OPERATION	
	1 Operate the moving panel using the roof mounted switch
	Does the moving panel operate correctly? **Yes** No further action required **No** If customer concern is still evident contact dealer technical support

PINPOINT TEST F : ROOF OPENING PANEL - FRAME CREAK

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
F1: NOISE - WHEN PANEL IN VENT POSITION	
	NOTE: These tests are to be carried out to determine the cause of the sunroof based creak noises
	1 Verify the customer concern by performing a road test (Observe the road test safety guidelines)
	2 Determine if the issue is present: • When the opening panel is in the vent position • When the opening panel is in the closed position • On flat roads • When the car is under torsion (e.g. driving slowly up a curb, or turning onto an inclined drive-way)
	Is the noise present when the sunroof panel is in the vent position? **Yes** GO to F2. **No** GO to Pinpoint Test G.
F2: NOISE - WHEN VEHICLE UNDER TORSION	
	1 Using the results obtained
	Is the noise present on flat roads as well as when the vehicle is under torsion? **Yes** GO to F5. **No** GO to F3.
F3: VIN RANGE	
	1 Check the vehicle VIN (vehicle identity number).
	Is vehicle VIN below **V25000**? **Yes** GO to F4. **No** Contact dealer technical support
F4: FRAME WASHERS - CHECK	
	1 Operate the roof opening panel using the roof mounted switch to the fully open position
	2 Carry out visual inspection of the front corners fixings to confirm the presence of the frame washers
	Are the frame washers present? **Yes** Contact dealer technical support **No** Install frame washers REFER to: (501-17 Roof Opening Panel) Roof Opening Panel Frame Washers - Front (Removal and Installation), Roof Opening Panel Frame Washers - Centre (Removal and Installation), Roof Opening Panel Frame Washers - Rear (Removal and Installation). If the customer concern is still evident contact dealer technical support
F5: REAR PANEL SEAL LUBRICATION	
	1 Lubricate the rear fixed panel seal REFER to: Rear Glass Roof Panel Lubrication (501-11 Glass, Frames and Mechanisms, General Procedures).
	Is the customer concern still evident? **Yes** Contact dealer technical support **No** No further action required

PINPOINT TEST G : ROOF OPENING PANEL - GLASS PANEL CREAK

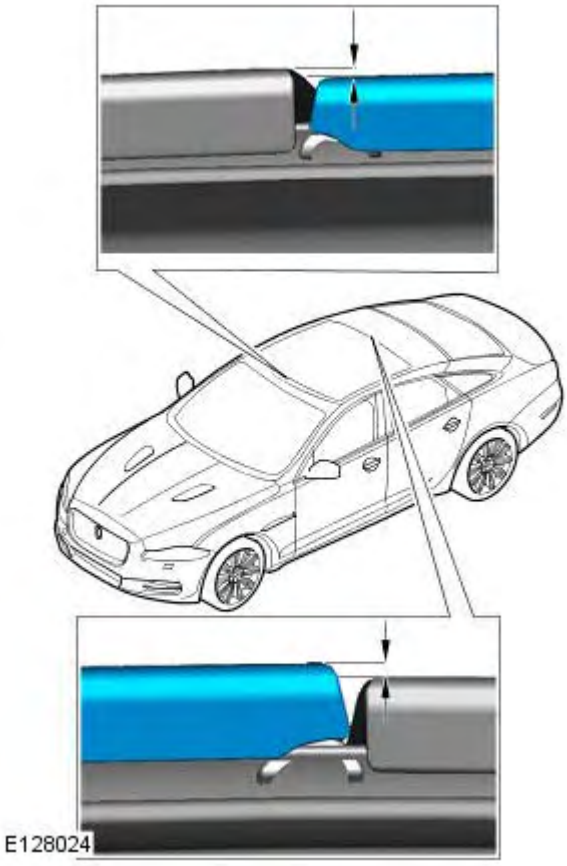
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G1: GLASS PANEL PROFILE	
	1 With the glass panel in the closed position. Check the roof opening panel alignment. REFER to: Roof Opening Panel Alignment (501-17 Roof Opening Panel, General Procedures).
	Is the profile correct? **Yes** GO to G2. **No** Check the roof opening panel alignment REFER to: Roof Opening Panel Alignment (501-17 Roof Opening Panel, General Procedures). If the concern persists, GO to G2.
G2: MECHANISM - CLEARANCE TO FRAME	
	1 Remove the side covers from the glass panel
 E142516	2 With the glass panel in the tilt position carry out a visual inspection of the mechanism clearance to the frame on both left and right side of the vehicle
	Does the mechanism contact the frame? **Yes** Contact dealer technical support **No** GO to G3.
G3: MECHANISM ARM CREAK	
	1 Remove the moving glass panel REFER to: Roof Opening Panel Glass (501-17 Roof Opening Panel, Removal and Installation).
	2 Close the mechanism and gently flex the rear end of the mechanism arm inboard – both left side and right side arms
	Does this produce a creaking noise? **Yes** If customer concern is still evident contact dealer technical support **No** GO to G4.
G4: DEBRIS IN WIND NOISE SEAL	
	1 Compress the side wind noise seals along their length to check for any debris contaminating the section area
	Is there any debris? **Yes** Remove any debris from the section area by sliding a suitable tool inside the seal GO to G5. **No** GO to G5.
G5: MOVING PANEL SEAL LUBRICATION	
	1 Clean all moving panel seals using a damp cloth
	2 Apply AC602/2 lubricant to the all moving panel seals using a suitable clean cloth

	Is the customer concern still evident? **Yes** If customer concern is still evident contact dealer technical support **No** No further action required

Published: 10-Jan-2012

Roof Opening Panel - Roof Opening Panel Alignment

General Procedures



Check

1. NOTE: With the sunroof closed, check the alignment of the glass to the roof panel. The glass should be central in its aperture. Profile of sunroof to body: front edge, set flush or up to 1.0 mm (0.040 inch) low; rear edge, set flush or up to 1.0 mm (0.040 inch) high.

Adjustment

1. Open the roof opening panel blind.

2. CAUTION: Note the orientation of the component prior to removal.

   NOTE: The procedure must be carried out on both sides.

   Remove the inner cover.

E141157

3. CAUTION: Note the orientation of the component prior to removal.

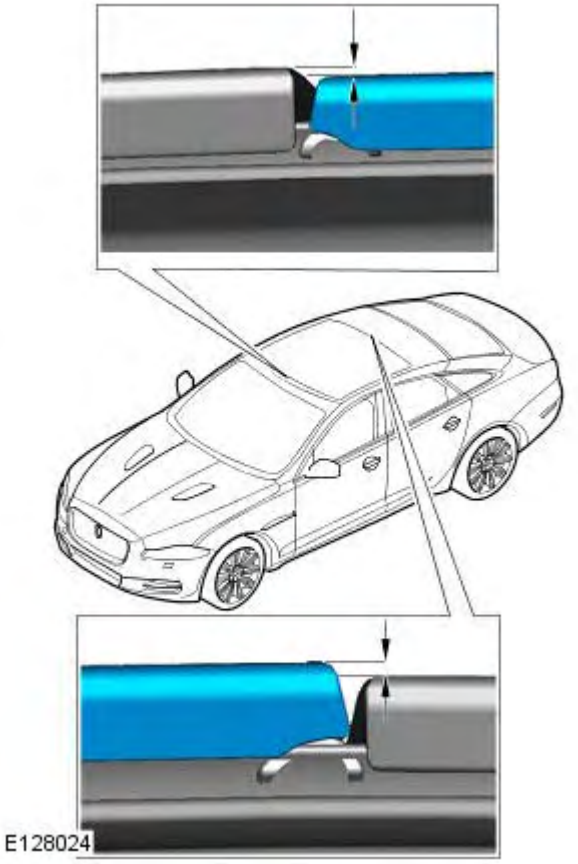
   NOTE: The procedure must be carried out on both sides.

   Remove the outer cover.

E128026

4. NOTE: The procedure must be carried out on both sides.

   Loosen but do not remove the 3 roof opening panel Torx bolts.



5. Align the roof opening panel.

6. NOTES:

With the sunroof closed, check the alignment of the glass to the roof panel. The glass should be central in its aperture. Profile of sunroof to body: front edge, set flush or up to 1.0 mm (0.040 inch) low; rear edge, set flush or up to 1.0 mm (0.040 inch) high.

Make sure that the alignment of the roof is equal on both sides of the vehicle.

The procedure must be carried out on both sides.

Torque: 7 Nm

E141158

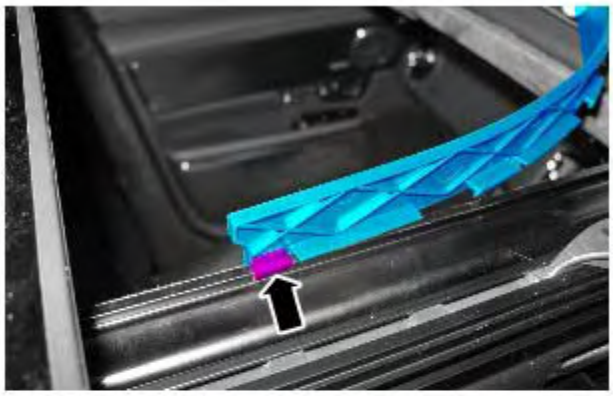
7. NOTES:

   Make sure that the cover is positioned as far forward as possible.

   The procedure must be carried out on both sides.

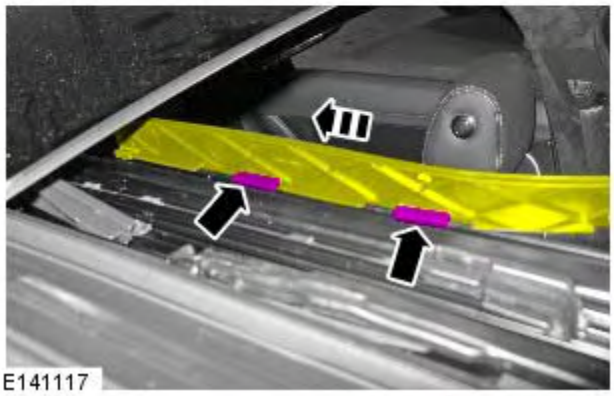
   Install the outer cover.

8. Fully open the roof opening panel glass.

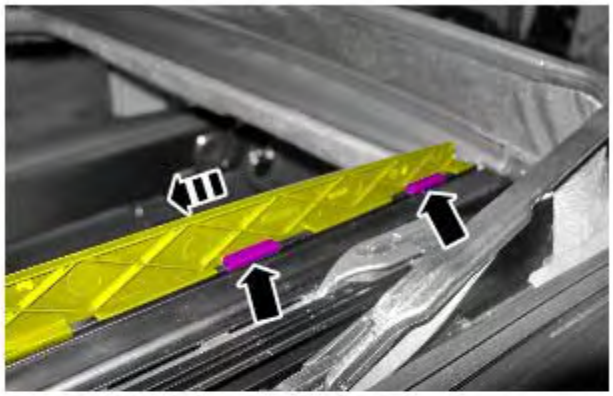


9. NOTE: The procedure must be carried out on both sides.

   Carefully secure the clips whilst sliding the inner cover rearwards.

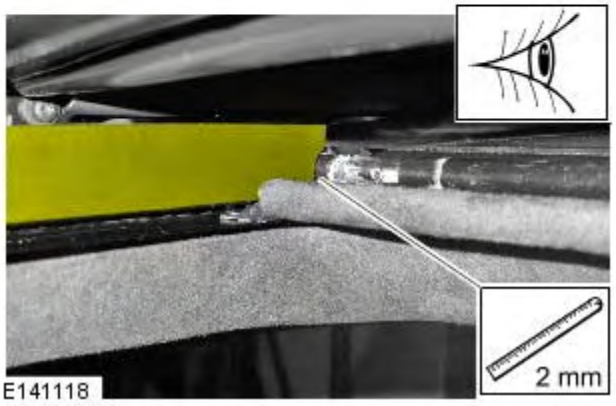


E141117



10. NOTE: The procedure must be carried out on both sides.

    Secure the clips and slide the inner cover rearward until it is 2mm from the roof opening panel blind drive spindle .



11. Close the roof opening panel glass.

12. Close the roof opening panel blind.

Published: 09-Jan-2012

Roof Opening Panel - Motor Synchronization

General Procedures

1. CAUTIONS:

   Make sure that the ambient temperature is above 5°C and below 40°C before carrying out this procedure.

   Make sure that the gear selector is in the P position.

   - Set the ignition to the ON position.
   - Start the engine.
   - Press and hold the front of the switch, hold down until the roof opening panel is fully closed.

2. - Press and hold the front of the roof opening panel switch.
   - After approximately 45 seconds the roof opening panel will begin to move. Keep the front of the switch pressed until the roof opening panel and the roof blinds have fully opened, then closed.

3. - Once the open/close cycle has completed and the roof opening panel has stopped moving, release the switch.
   - The roof opening panel is now synchronized.
   - The roof opening panel can now be operated as normal.

4. - Turn off the engine.
   - Set the ignition to the OFF position.

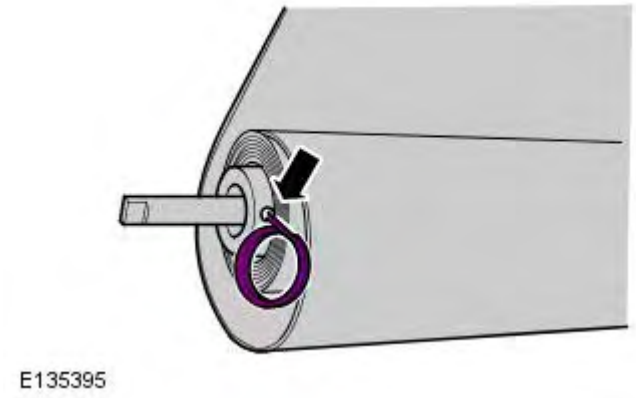
Published: 03-Jan-2012

Roof Opening Panel - Roof Opening Panel Blind Rewind Procedure

General Procedures

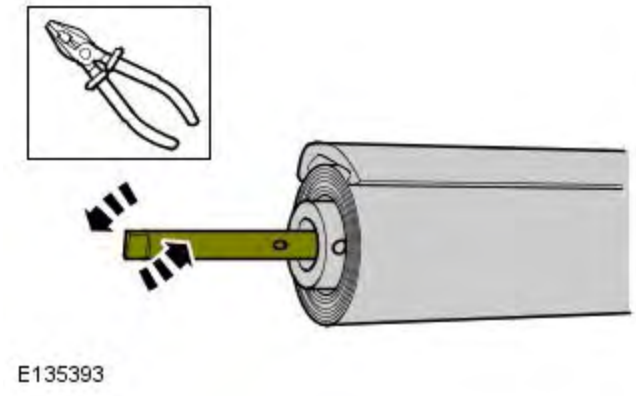
Activation

1. Refer to: Roof Opening Panel Blind (501-17 Roof Opening Panel, Removal and Installation).



E135395

2. Remove the retaining clip.



E135393

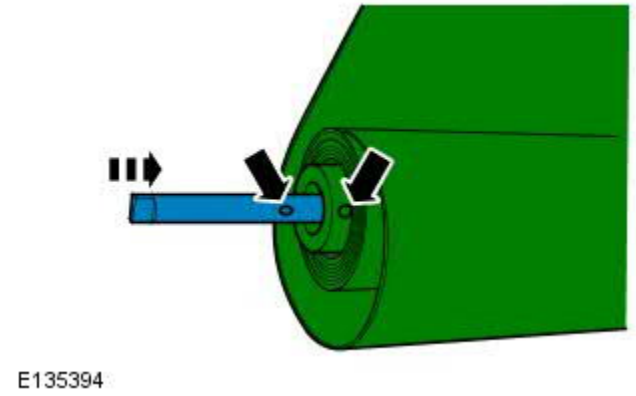
3. CAUTIONS:

   Rotating the shaft clockwise will result in permanent damage to the tension spring.

   Make sure that the tension is retained on the shaft until the clip is installed.

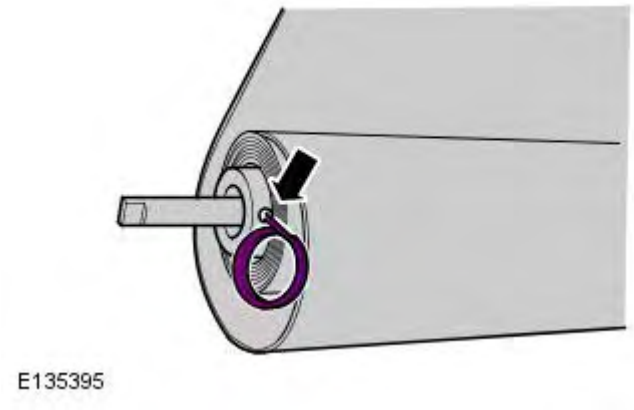
   NOTE: Make sure that any residual tension is released by gently pressing inwards on the shaft 2-3 times.

   Using a suitable tool, rotate the shaft 10 full rotations counter clockwise.



E135394

4. Align the holes between the shaft and the blind.


E135395

5. Install the retaining clip.

6. Refer to: Roof Opening Panel Blind (501-17 Roof Opening Panel, Removal and Installation).

Published: 13-Mar-2012

Roof Opening Panel - Roof Opening Panel Blind

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1. NOTE: The procedure must be carried out on both sides.

   Refer to: A-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

2. NOTE: The procedure must be carried out on both sides.

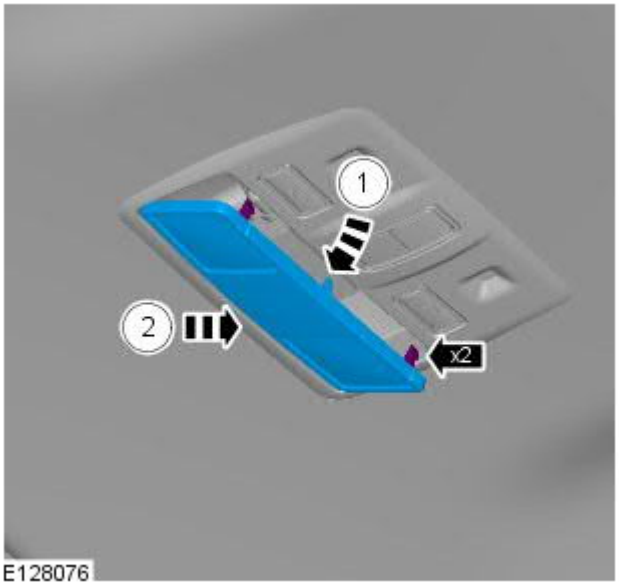
   Refer to: Sun Visor (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. *Torque:* 2 Nm

4. NOTE: The procedure must be carried out on both sides.

   Refer to: C-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

5.



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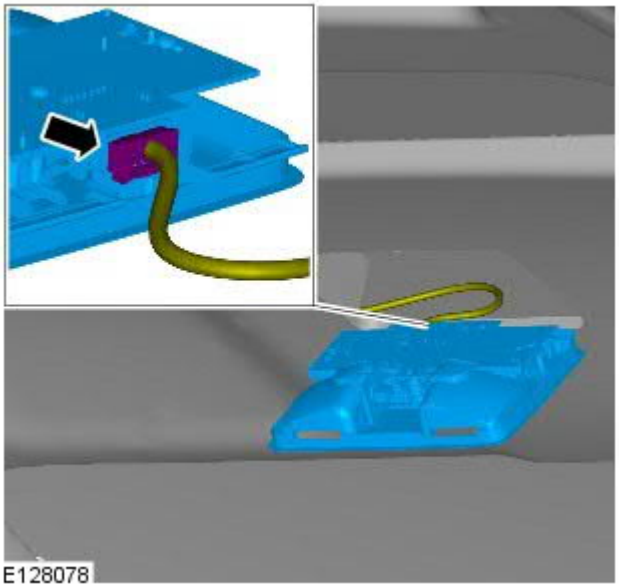
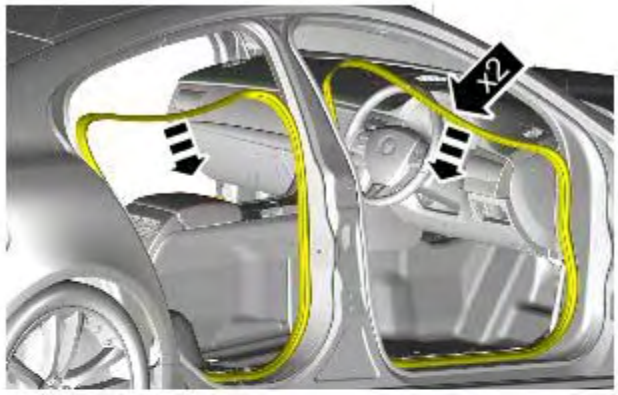
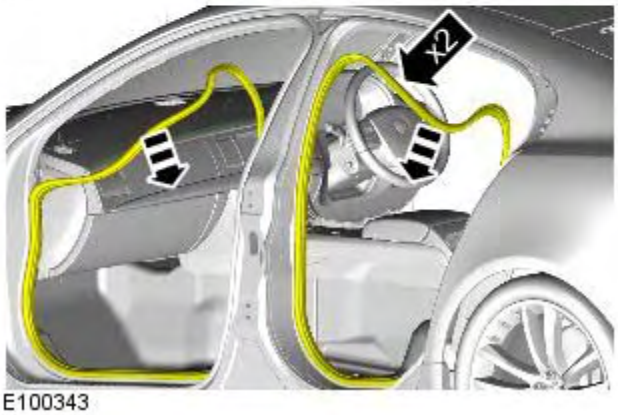
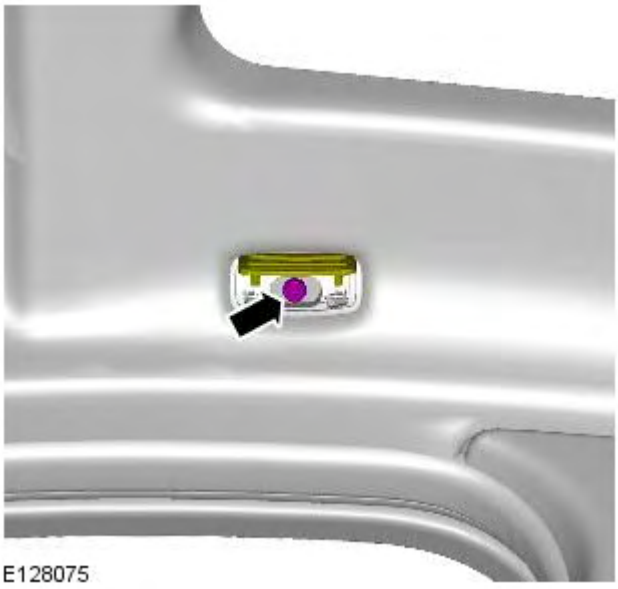






E100343

7. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E128075

8. NOTES:

Make sure that the component is installed to the position noted on removal.

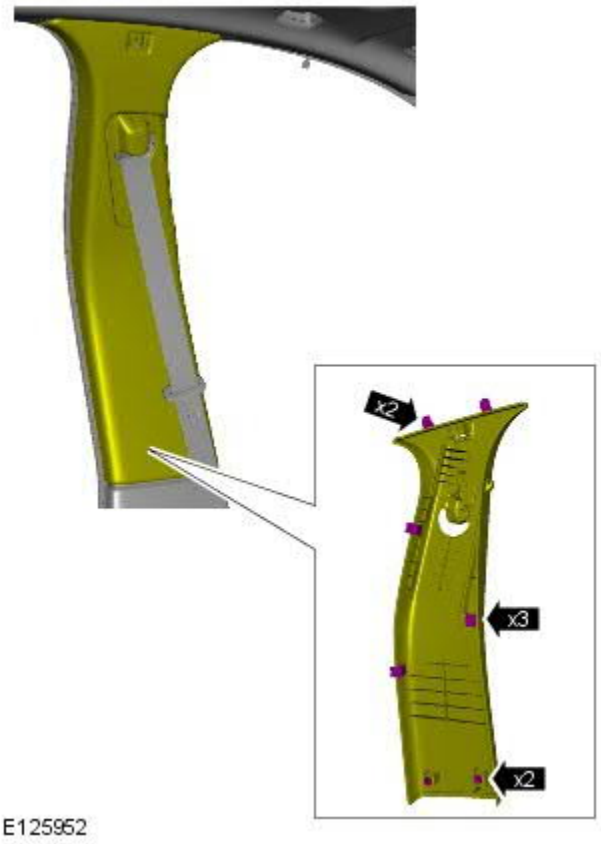
Right-hand shown, left-hand similar.

The procedure must be carried out on both sides.

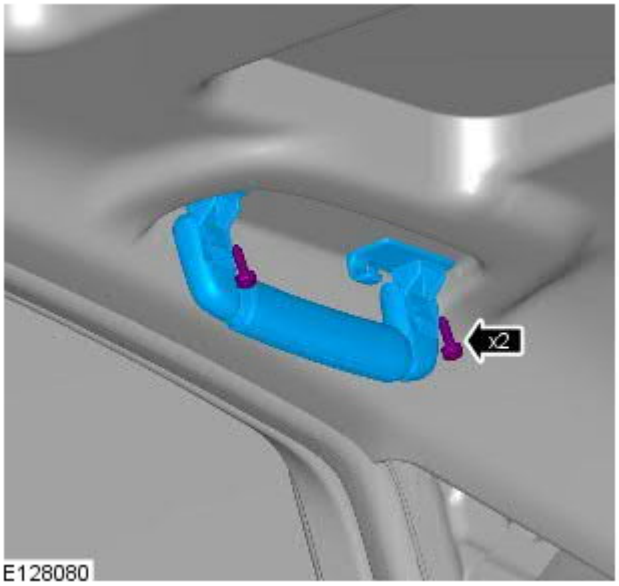
Torque: 2 Nm

9. NOTE: The procedure must be carried out on both sides.

   Torque: 6 Nm



10. NOTE: The procedure must be carried out on both sides.

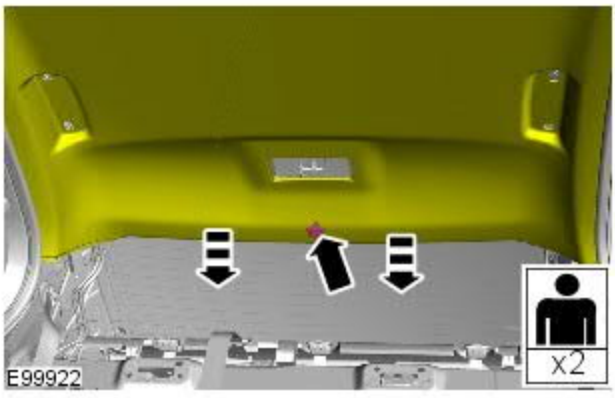


11. NOTES:

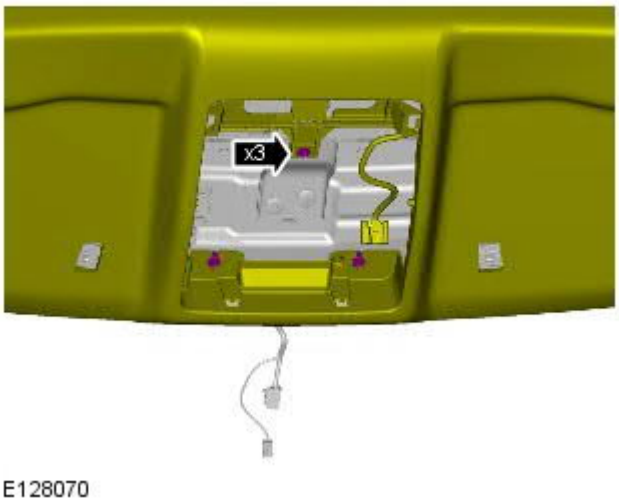
Make sure that the component is installed to the position noted on removal.

The procedure must be carried out on both sides.

Torque: 2 Nm



12. WARNING: This step requires the aid of another technician.

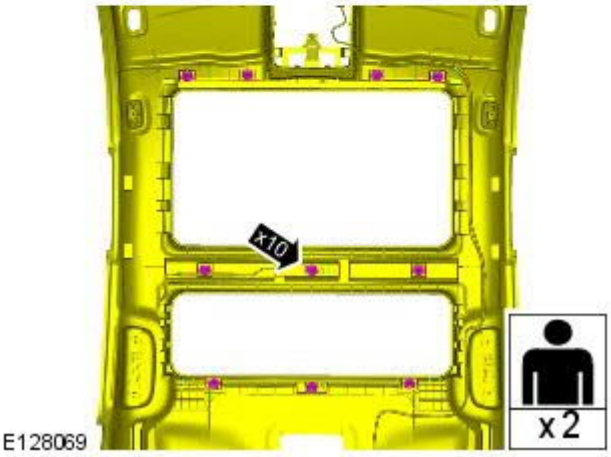


13. WARNING: This step requires the aid of another technician.

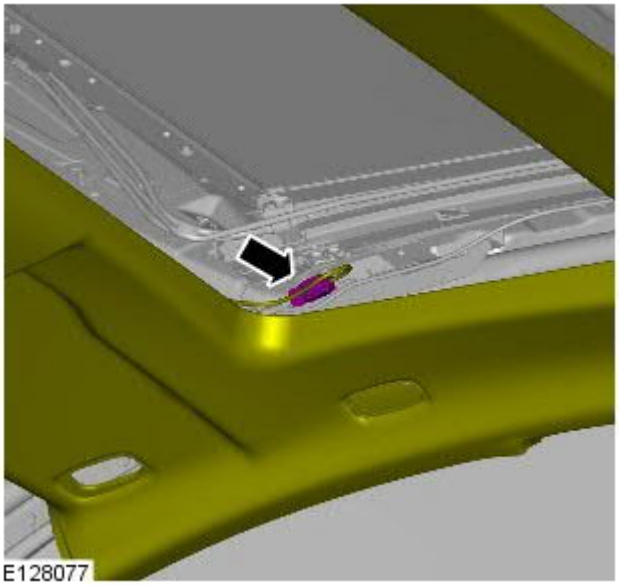
CAUTIONS:

Note the fitted position of the component prior to removal.

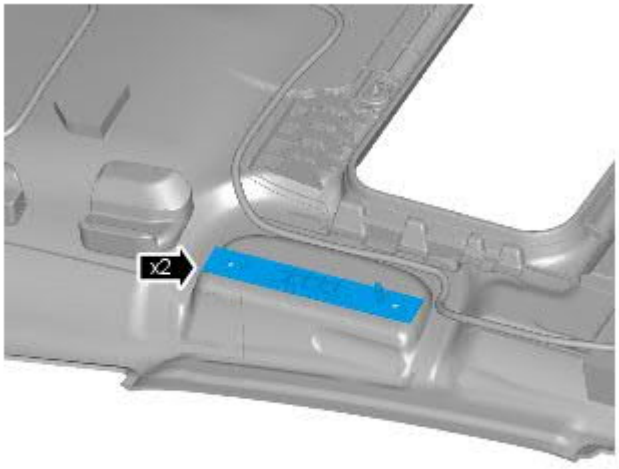
Make sure that these components are installed to the noted removal position.



14. NOTE: This step requires the aid of another technician.



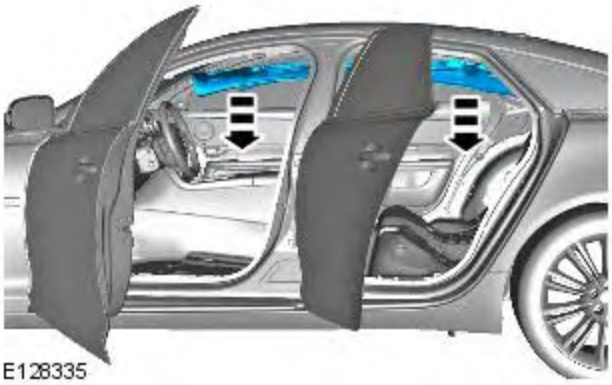
15. NOTE: This step requires the aid of another technician.



E128068

16. CAUTION: Note the fitted position of the component prior to removal.

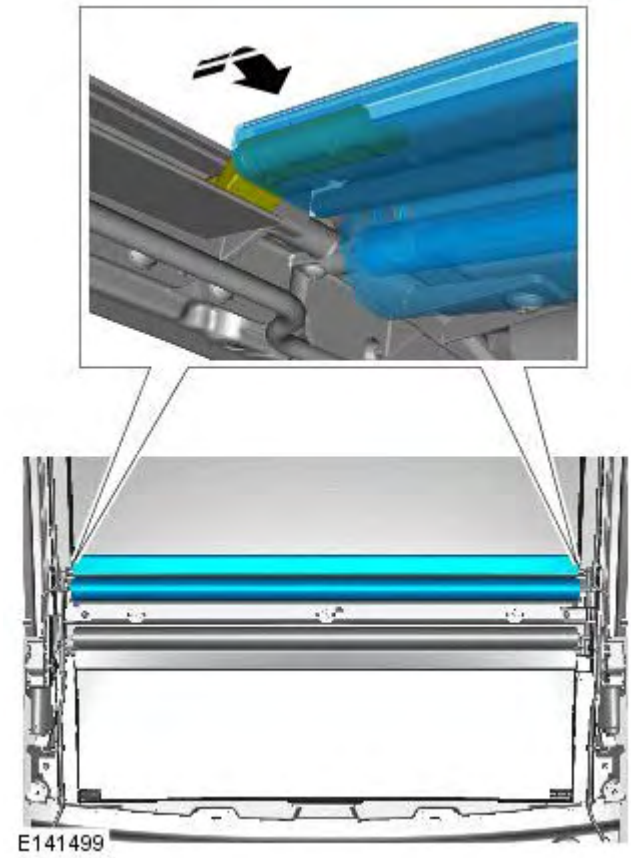
NOTE: Make sure that the component is installed to the position noted on removal.



E128335

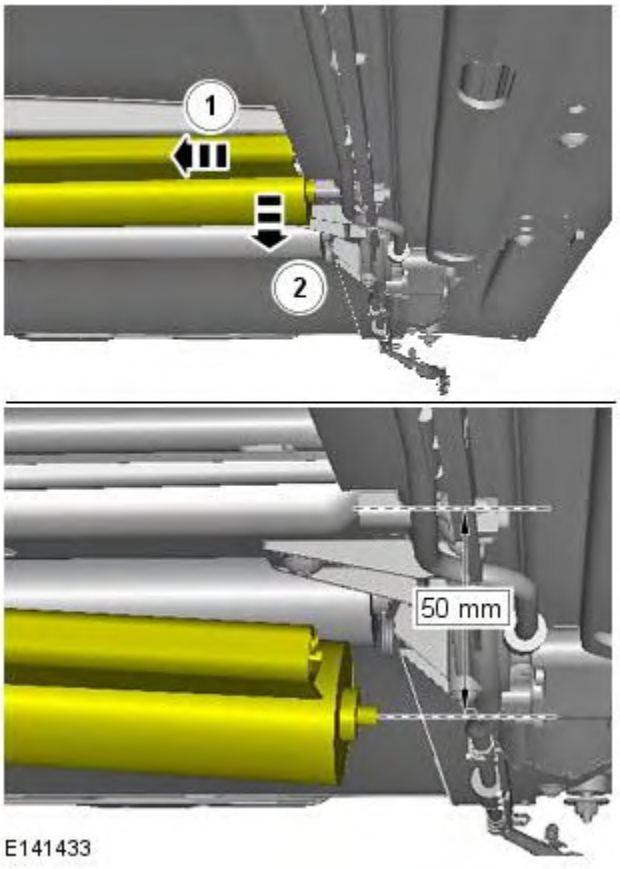
17. CAUTION: Protect the surrounding trim to avoid damage.

NOTE: Lower and reposition the headliner to aid access.


E141499

18. CAUTION: Make sure that the clips are correctly located.

NOTE: Follow the animation to make sure the roof opening panel blind is removed and installed correctly from and to the guides.

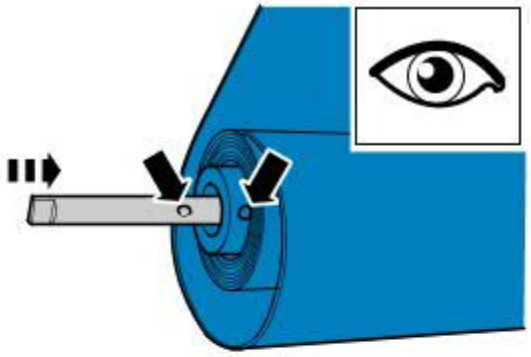


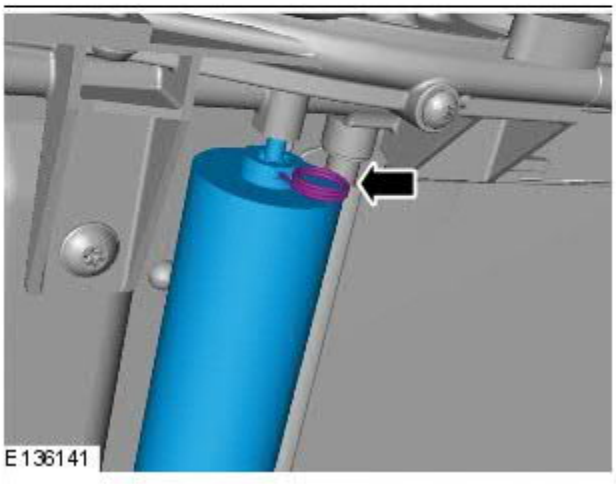
E141433

19. CAUTIONS:

Make sure that the roof opening panel blind is not lowered by more than 50 mm at one end whilst the other end is still located in to the drive mechanism.

Make sure that a firm pressure is applied to the roof opening panel blind so that tension is maintained until the retaining clip is correctly located.





20. CAUTIONS:

    Make sure that the clip is correctly located.

    If the correct clip is not available, make sure that a suitable hardened pin is used such as a drill bit, do not use a paperclip.

    Make sure that the roof opening panel blind is not released from the drive mechanism until the clip has been correctly located.

    Install the retaining clip.

Installation

1. Make sure that the roof opening panel blind tension is correct prior to installation. If the tension has been released refer to the roof opening panel blind rewind procedure.

   Refer to: Roof Opening Panel Blind Rewind Procedure (501-17 Roof Opening Panel, General Procedures).

2. To install, reverse the removal procedure.

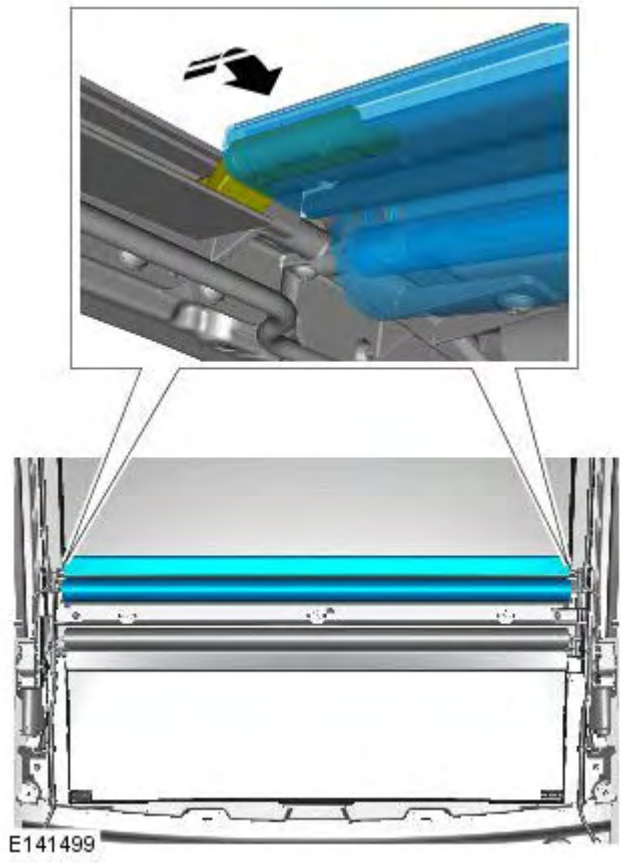
Published: 04-Apr-2012

Roof Opening Panel - Roof Opening Panel Blind Drive Assembly

Removal and Installation

Removal

1. Refer to: Roof Opening Panel Blind (501-17 Roof Opening Panel, Removal and Installation).



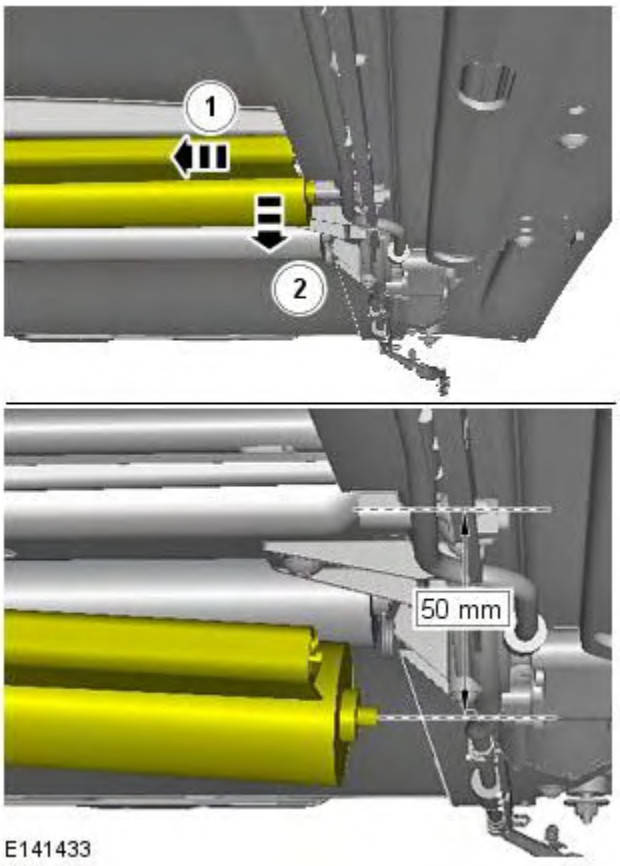
2. CAUTION: Make sure that the clips are correctly located.

   NOTES:

   Follow the animation to make sure the roof opening panel blind is removed and installed correctly from and to the guides.

   Roof opening panel blind shown, glass roof panel blind similar.

   Release the glass roof panel blind

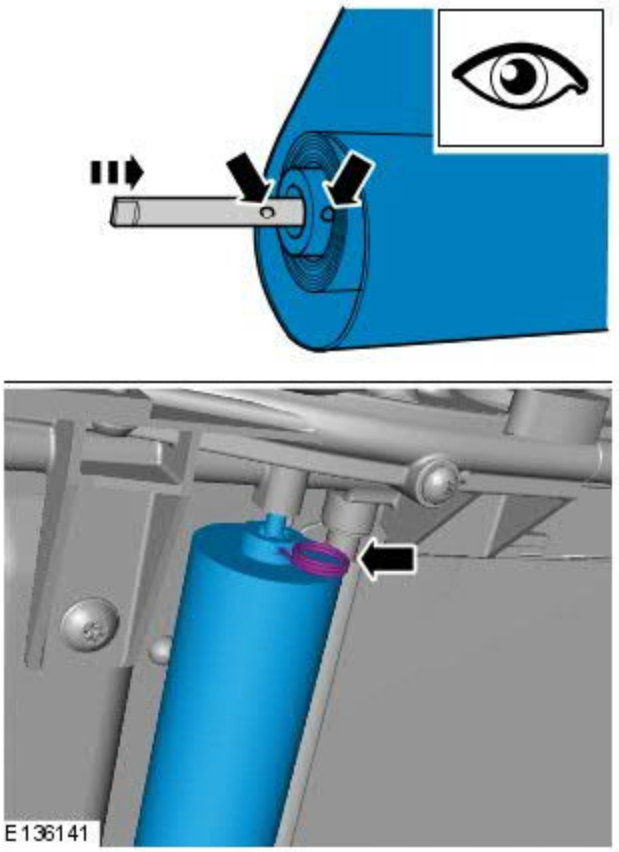


3. CAUTIONS:

Make sure that the roof opening panel blind is not lowered by more than 50 mm at one end whilst the other end is still located in to the drive mechanism.

Make sure that a firm pressure is applied to the roof opening panel blind so that tension is maintained until the retaining clip is correctly located.

NOTE: Roof opening panel blind shown, glass roof panel blind similar.



4. CAUTIONS:

Make sure that the clip is correctly located.

If the correct clip is not available, make sure that a suitable hardened pin is used such as a drill bit, do not use a paperclip.

Make sure that the roof opening panel blind is not released from the drive mechanism until the clip has been correctly located.

NOTE: Roof opening panel blind shown, glass roof panel blind similar.

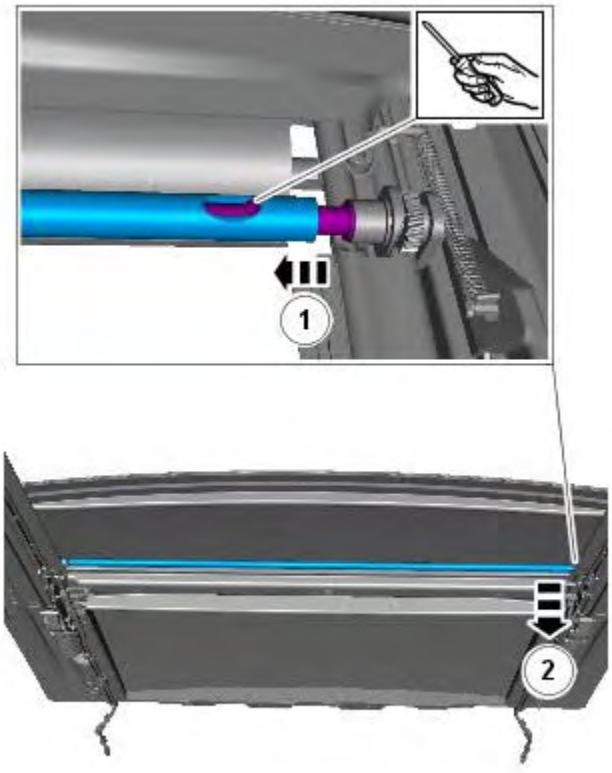
Install the retaining clip.

E141357

5. CAUTION: Note the installed position of the component prior to removal.

NOTE: The procedure must be carried out on the front and rear blind feet.

6.



E141938

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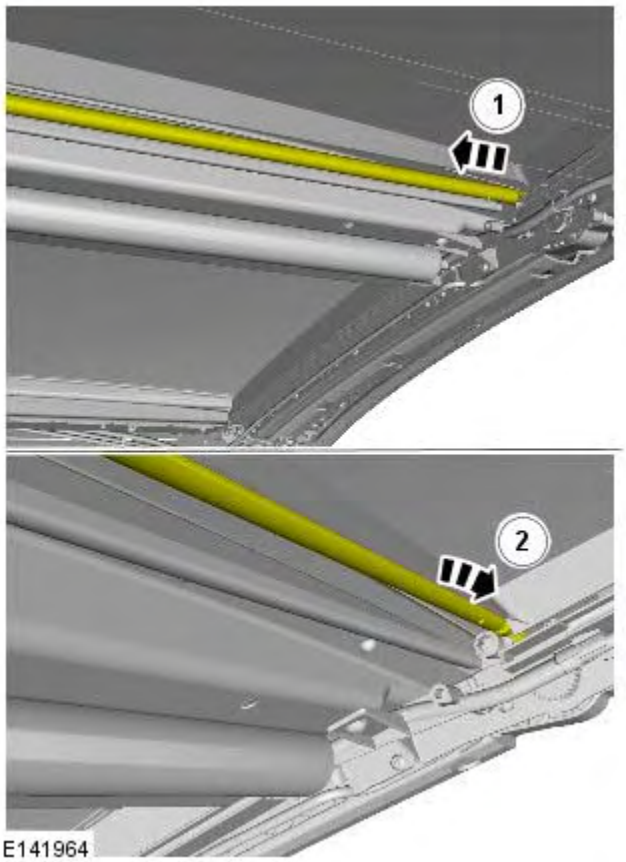

E141964

8.

E141942

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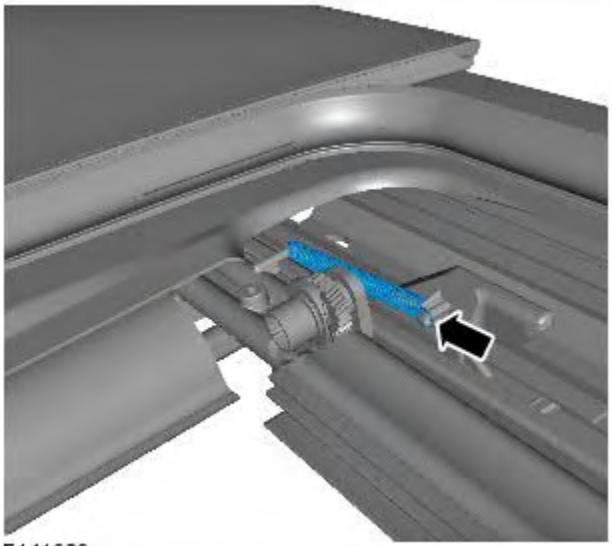

E141939

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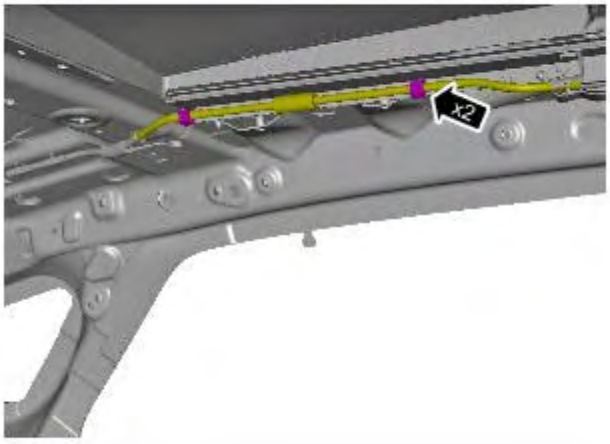
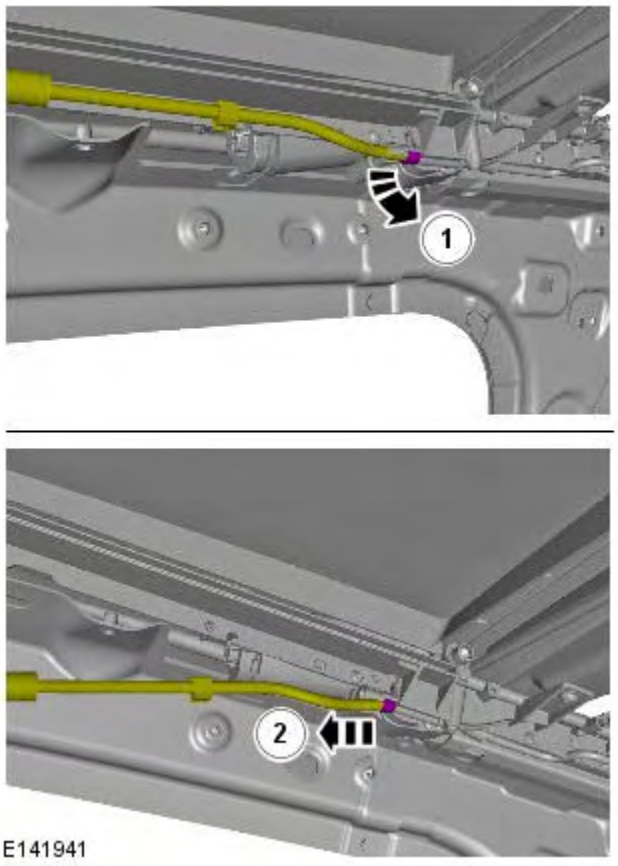
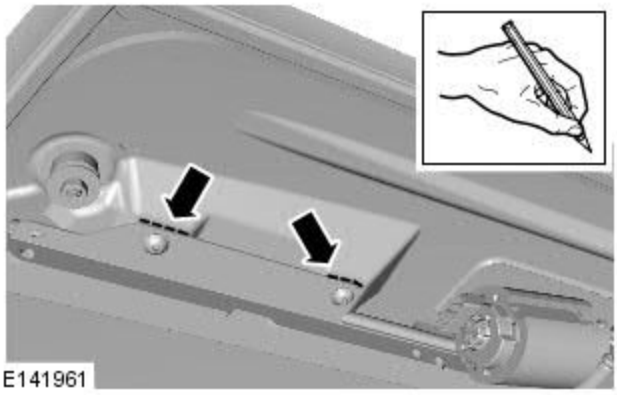


E141944

11.



12. NOTES:

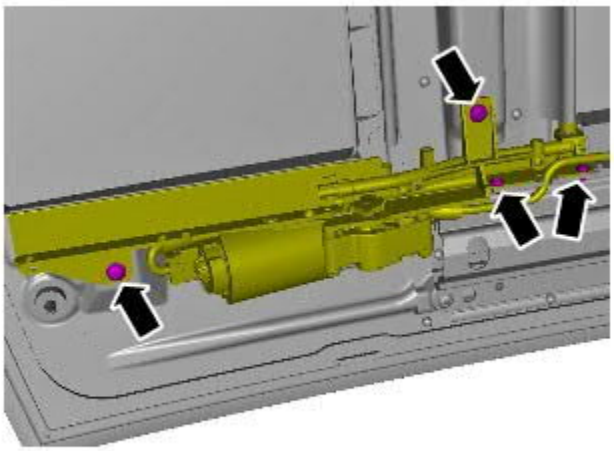


Right hand shown, left hand similar.

Long wheel base shown, short wheel base similar.

Long wheel base vehicle shown with 2 fixings, some long wheel base vehicles will have 1 fixing.

Short wheelbase

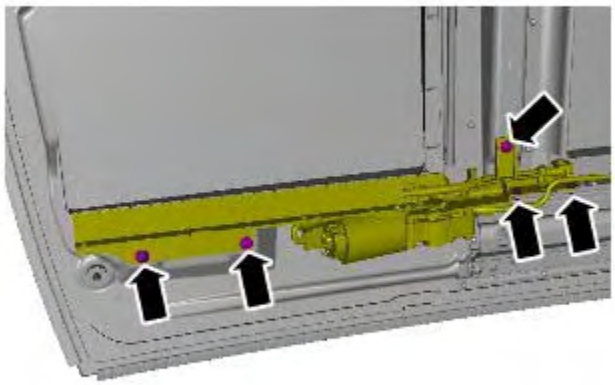


E141965

13. CAUTION: Note the orientation of the washers prior to removal.

NOTE: Remove and discard the washers.

Long wheelbase



E142000

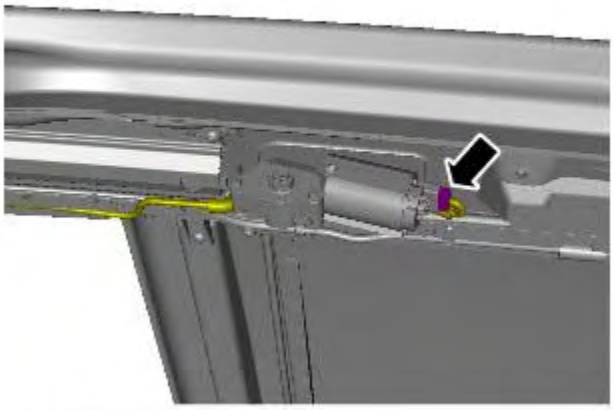
14. CAUTION: Note the orientation of the washers prior to removal.

NOTES:

Long wheel base vehicle shown with 5 fixings, some long wheel base vehicles will have 4 fixings.

Remove and discard the washers.

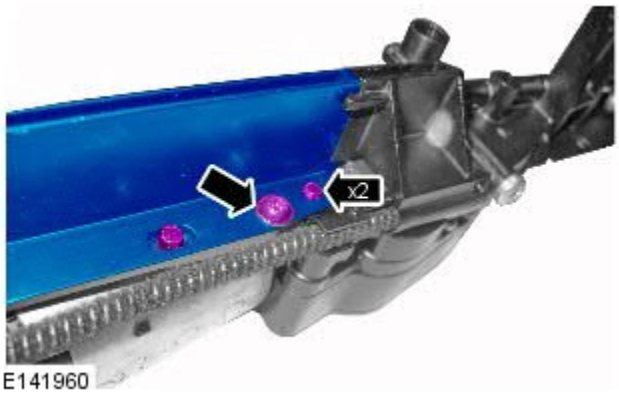
15.



E141940

E142002

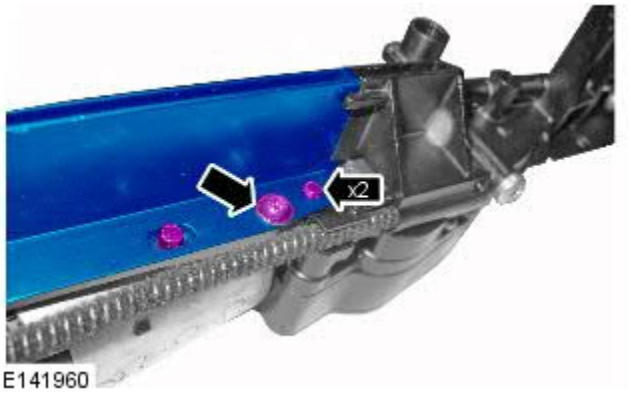
16. NOTE: Note the installed position of the blind drive mechanism cables during removal.



E141960

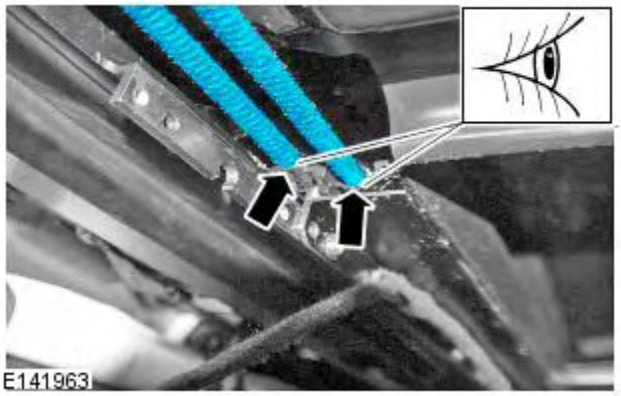
17. NOTE: Note the orientation of the blind drive mechanism cables during removal.

Installation



1. NOTE: Make sure that the blind drive mechanism cables are in the correct orientation before installing the rear guide.

   Torque: 4 Nm

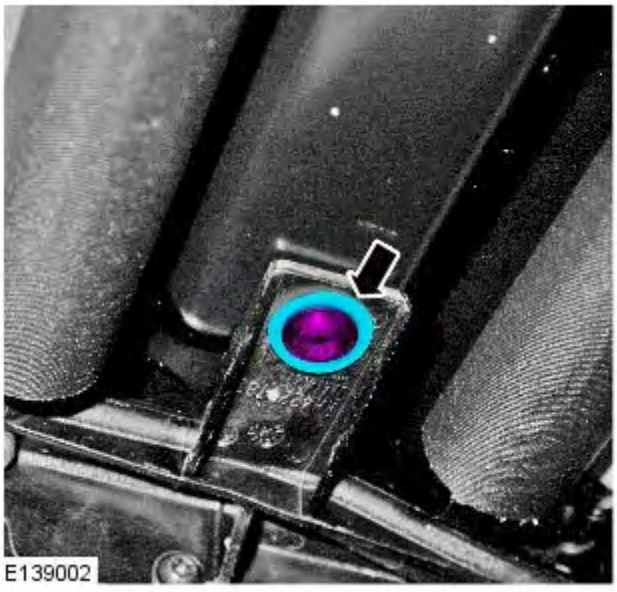


2. NOTE: Make sure that the blind drive mechanism cables are in the correct orientation before installing the rear guide.

3. NOTE: Make sure that the blind drive mechanism cables are correctly aligned to the installed position.

E139001

4. Slide the washer in from the centre of the vehicle until it is aligned with the threaded hole.

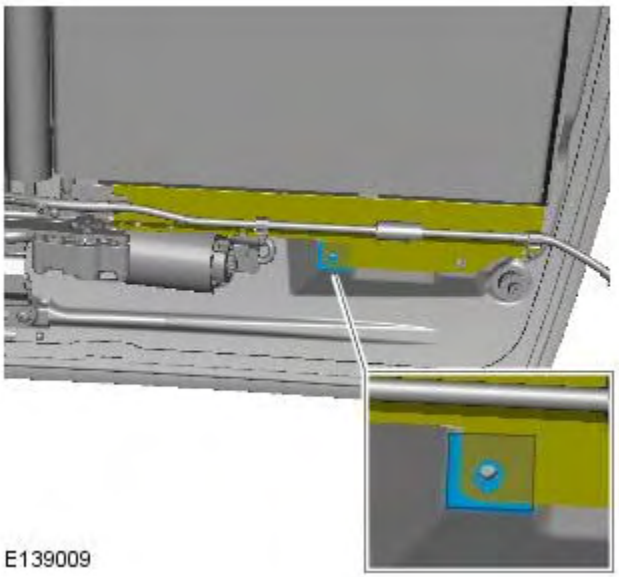

E139002

5. CAUTIONS:

   Make sure that the thread is free from foreign material and debris

   Do not fully tighten the Torx bolt at this stage.

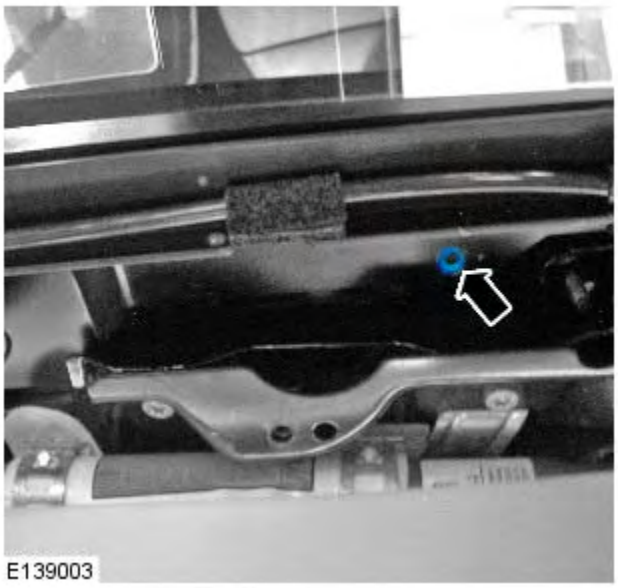
Long wheelbase



6. NOTE: Make sure that an adhesive pad is installed above the front fixing hole.

   If not already installed, install an adhesive pad above the front fixing hole.

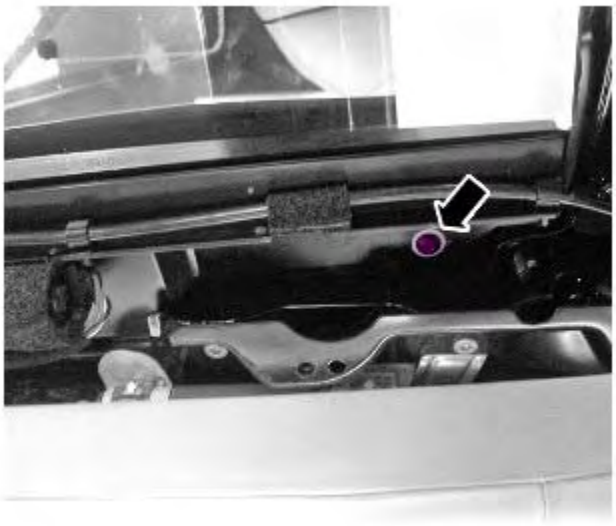
All vehicles



7. CAUTION: Do not install the front Torx bolt on long wheel base vehicles.

   NOTE: Long wheel base shown, short wheel base similar.

   Slide the washer in from the centre of the vehicle until it is aligned with the threaded hole.



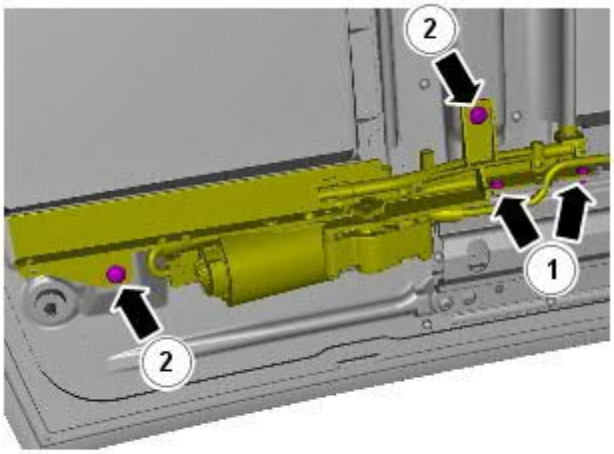
E139005

8. CAUTIONS:

   Make sure that the thread is free from foreign material and debris

   Do not fully tighten the Torx bolt at this stage.

   NOTE: Long wheel base shown, short wheel base similar.



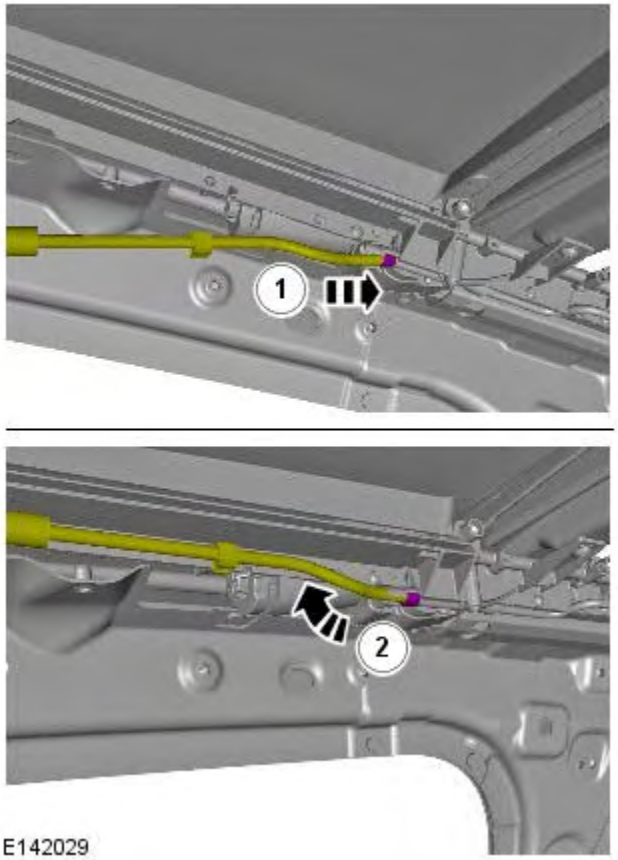
E142161

9. CAUTION: Make sure that the roof rail is correctly aligned.

   NOTE: Short wheel base shown, long wheel base similar.

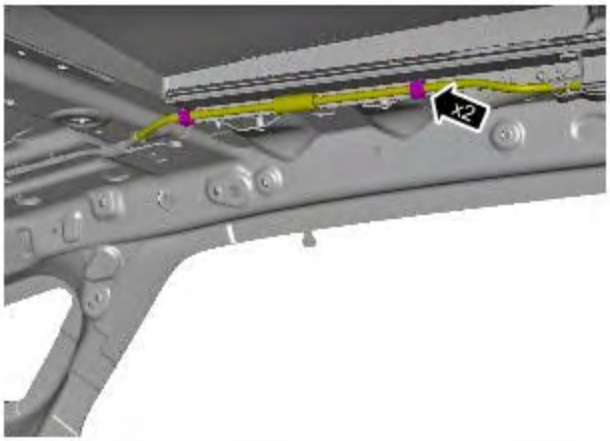
   Torque: 4 Nm

10.



E142029

11.



E141944

E141337

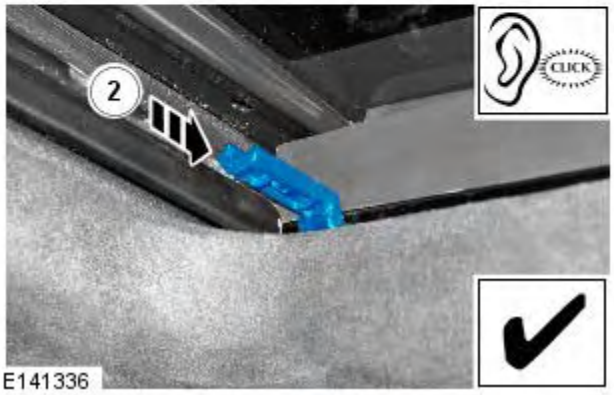
12. CAUTION: Do not directly force the blind feet in to the installed position. Failure to follow this instruction may result in damage to the component.

13. NOTES:

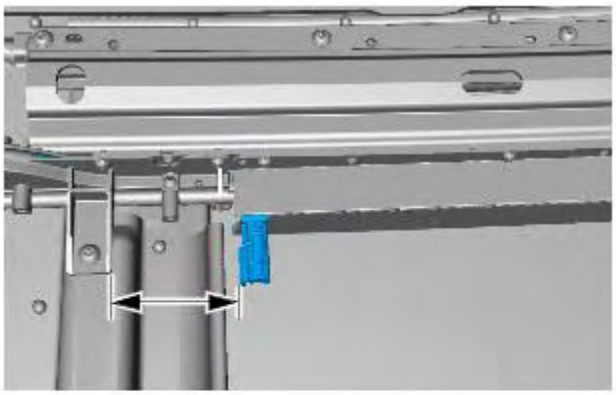
An audible click can be heard when the component is correctly located.

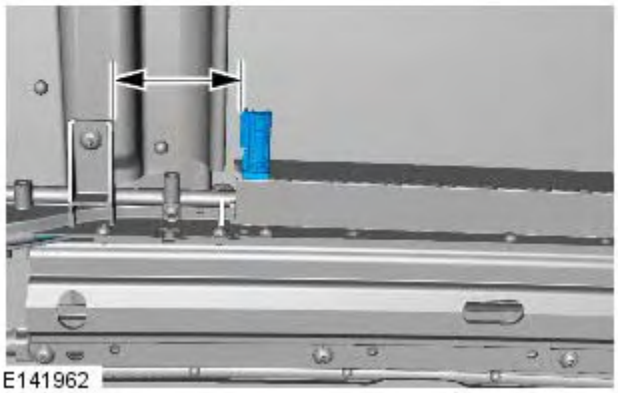
The procedure must be carried out on the front and rear blind feet.

1. Hold the blind foot at an angle and slide it along the rail until contact is made with the drive mechanism.
2. Rotate the blind foot in to the installed position.



E141336



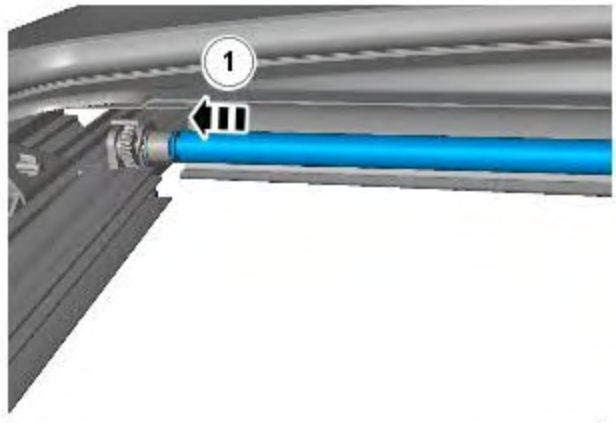


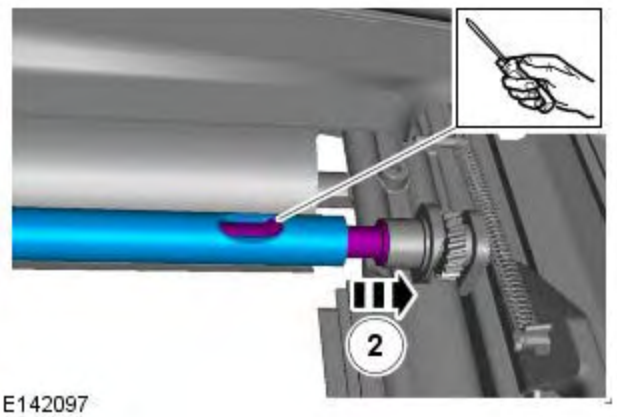
E141962

14. CAUTION: Make sure that the blind feet for each blind are positioned at an equal distance from the center of the vehicle.

NOTE: The procedure must be carried out on the front and rear blind feet.

Slide the blind foot along the guide until it is level with the foot on the other side of the vehicle.

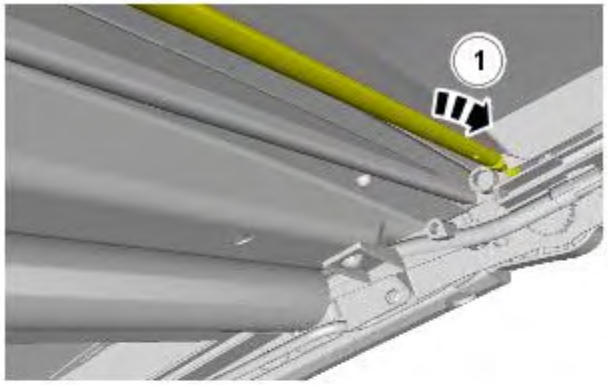


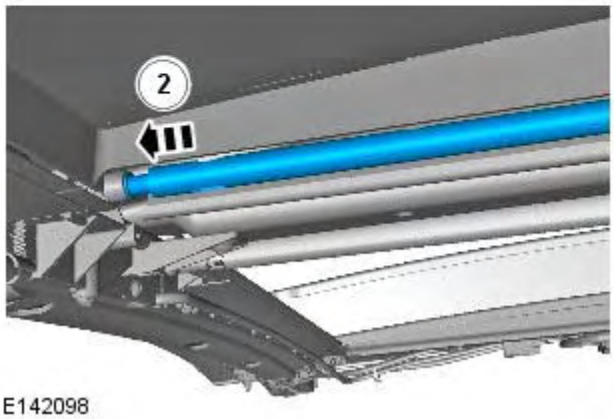


E142097

15.

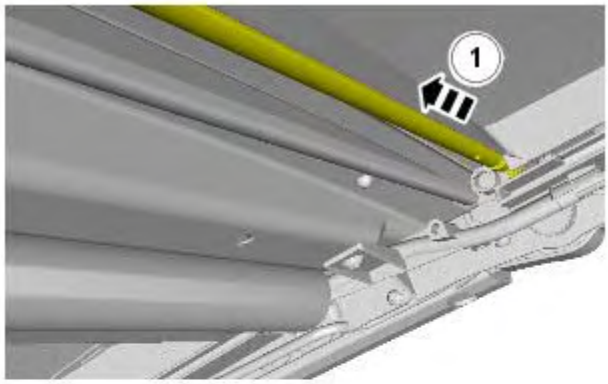
16.

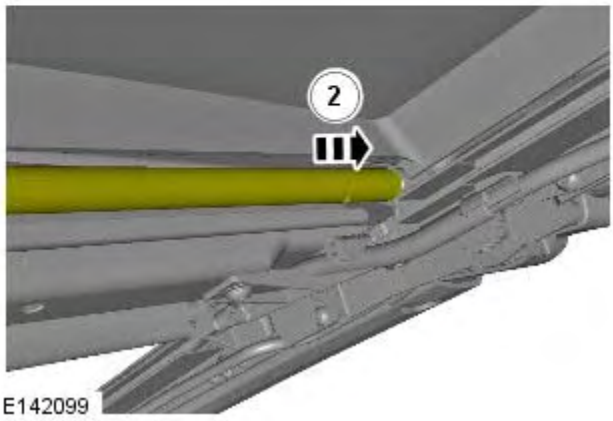




E142098

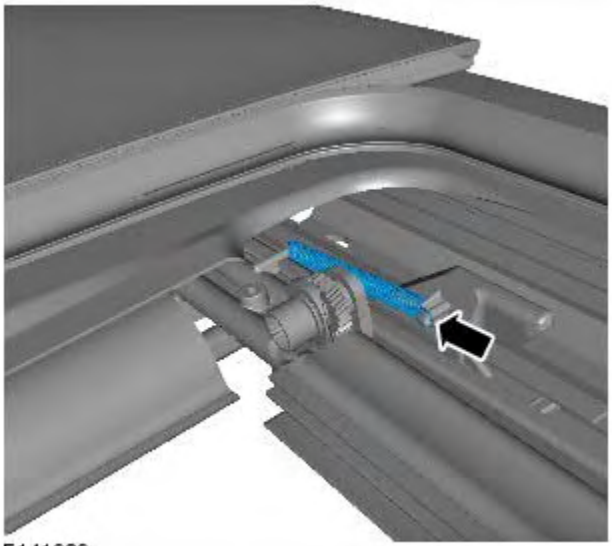
17.





E142099

18.



E141939

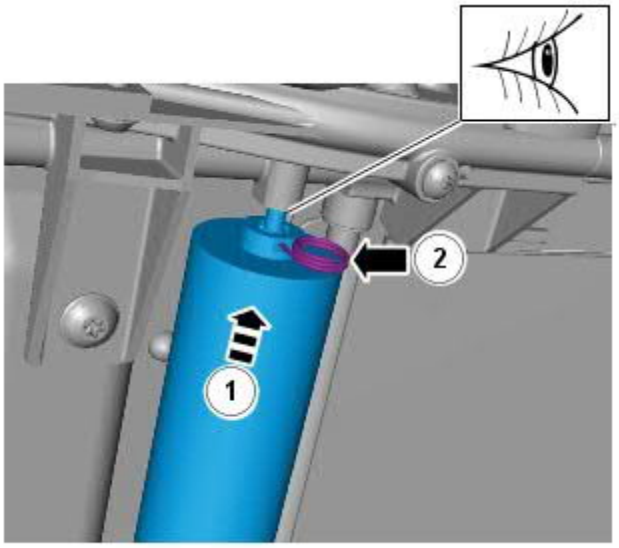
19. CAUTIONS:

Make sure that a firm pressure is applied to the glass roof panel blind so that tension is maintained until the glass roof opening blind is correctly located.

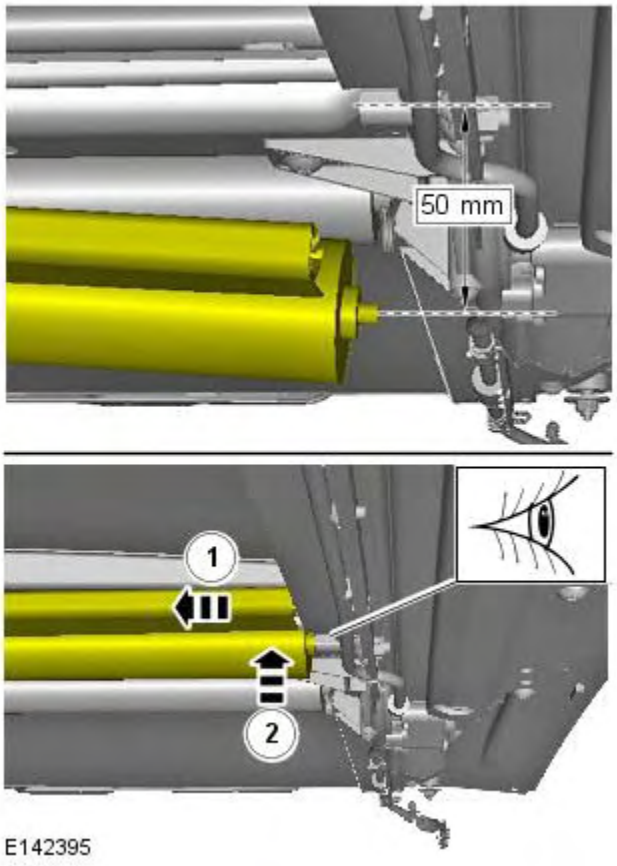
Make sure that the glass roof panel blind is not lowered by more than 50 mm at one end whilst the other end is still located in to the drive mechanism.

NOTE: Roof opening panel blind shown, glass roof panel blind similar.

Remove the retaining clip.



E142394

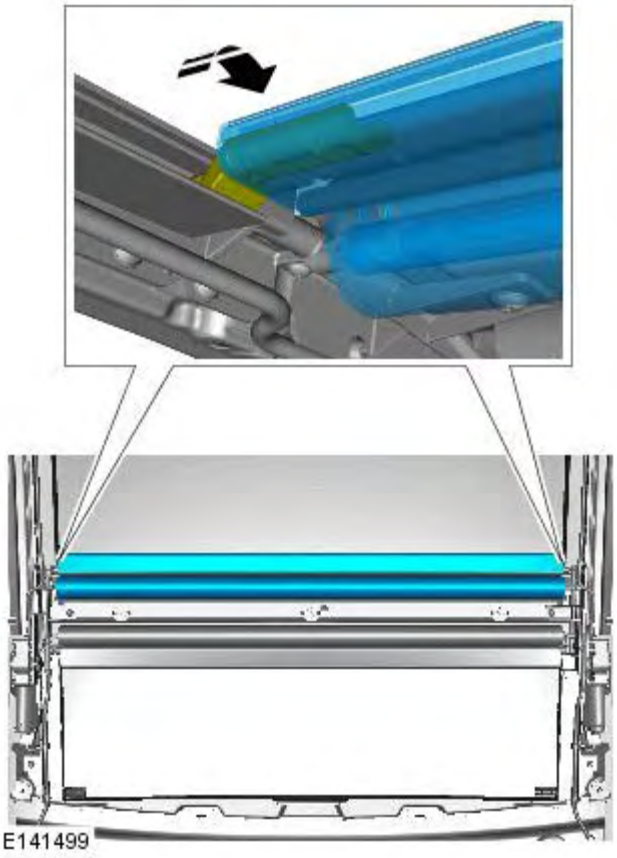


20. CAUTIONS:

    Make sure that a firm pressure is applied to the glass roof panel blind so that tension is maintained until the glass roof opening blind is correctly located.

    Make sure that the glass roof panel blind is not lowered by more than 50 mm at one end whilst the other end is still located in to the drive mechanism.

    NOTE: Roof opening panel blind shown, glass roof panel blind similar.



21. CAUTION: Make sure that the clips are correctly located.

    NOTES:

    Follow the animation to make sure the roof opening panel blind is removed and installed correctly from and to the guides.

    Roof opening panel blind shown, glass roof panel blind similar.

    Secure the glass roof panel blind

22. Refer to: Roof Opening Panel Blind (501-17 Roof Opening Panel, Removal and Installation).

Published: 03-Jan-2012

Roof Opening Panel - Roof Opening Panel Blind Feet

Removal and Installation

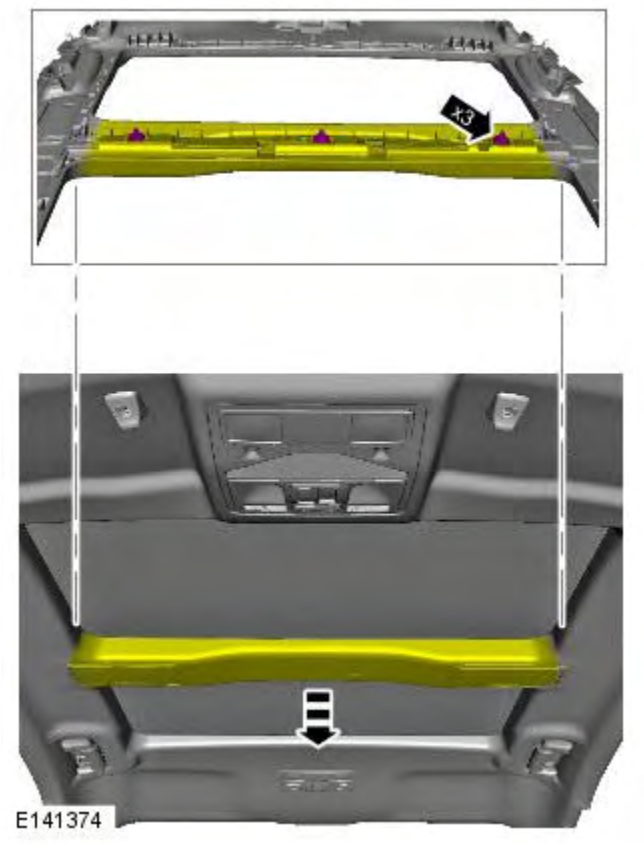
Removal

NOTES:

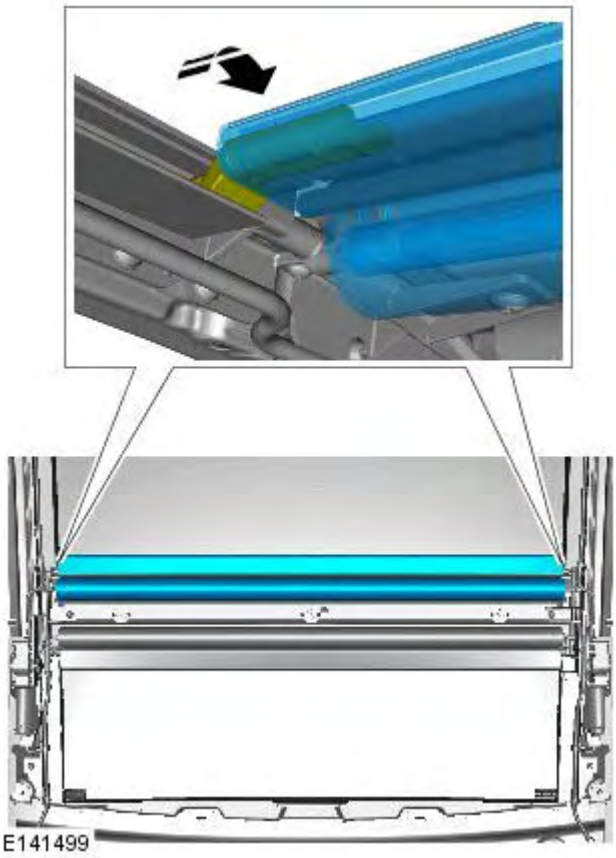
Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1. Open the roof opening panel glass to the full tilt position.



2. CAUTION: Carefully release the 3 clips on the headliner. Do not use excessive force



3. CAUTION: Make sure that the clips are correctly located.

   NOTES:

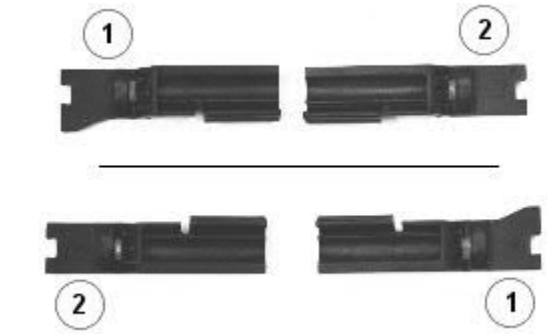
   Follow the animation to make sure the roof opening panel blind is removed and installed correctly from and to the guides.

   Carefully allow the roof opening panel blind to retract in to the aperture above the headliner.

4. CAUTION: Note the orientation of the component prior to removal.

   NOTE: The procedure must be carried out on both sides.

Installation

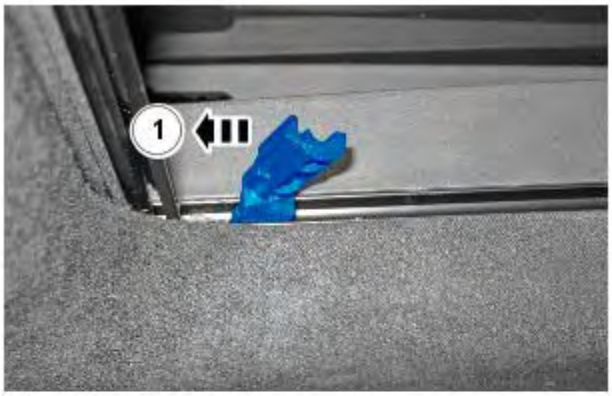


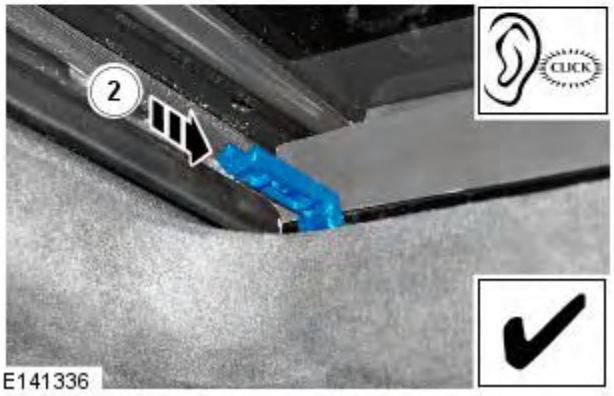
E141322

1. CAUTION: The roof opening panel blind feet are handed. Make sure that the feet labelled 1 are installed to the left hand side of the roof opening panel blind and to the right hand side of the glass roof panel blind. Make sure that the feet labelled 2 are installed to the right hand side of the roof opening panel blind and to the left hand side of the glass roof panel blind.

E141337

2. CAUTION: Do not directly force the blind feet in to the fitted position. Failure to follow this instruction may result in damage to the component.



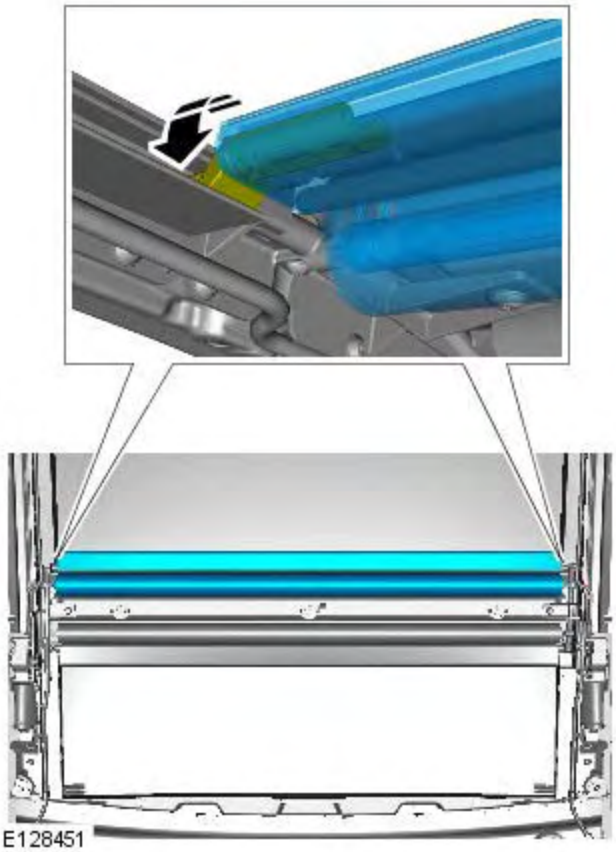


3. NOTES:

   An audible click can be heard when the component is correctly located.

   The procedure must be carried out on both sides.

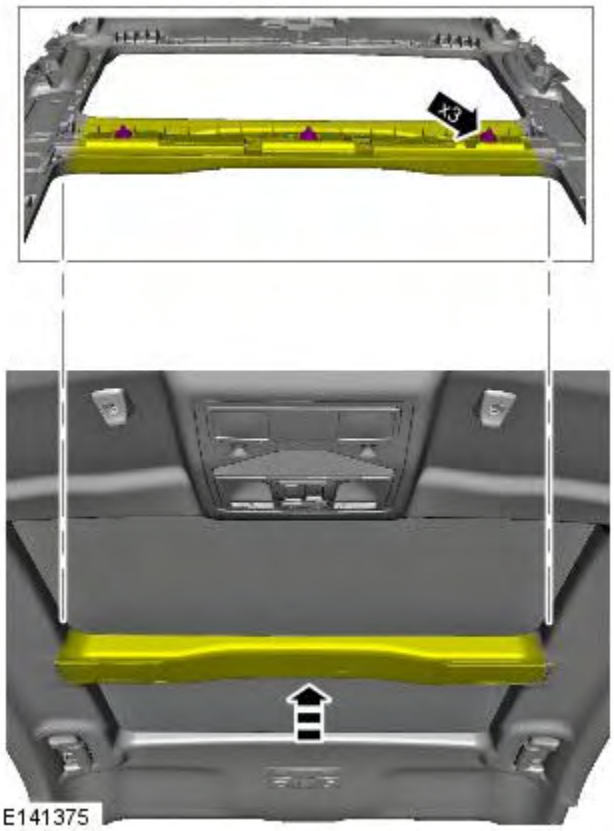
   1. Hold the blind foot at an angle and slide it along the rail until contact is made with the drive mechanism.
   2. Rotate the blind foot in to the fitted position.



4. CAUTION: Make sure that the clips are correctly located.

   NOTE: Follow the animation to make sure the roof opening panel blind is removed and installed correctly from and to the guides.

5.



Published: 05-Apr-2012

Roof Opening Panel - Roof Opening Panel Frame

Removal and Installation

Removal

CAUTIONS:

Always protect the interior components when removing body glass.

Protect the surrounding paintwork to avoid damage.

Measure all gaps between the glass roof panels before prior to removal to help aid installation.

NOTES:

The cutting blades used in this procedure are from the standard BTB glass removal kit.

In addition to the standard BTB glass removal kit, cutting blades WK29L and WK30L will be required.

1. NOTE: The procedure must be carried out on both sides.

   Refer to: A-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

2. NOTE: The procedure must be carried out on both sides.

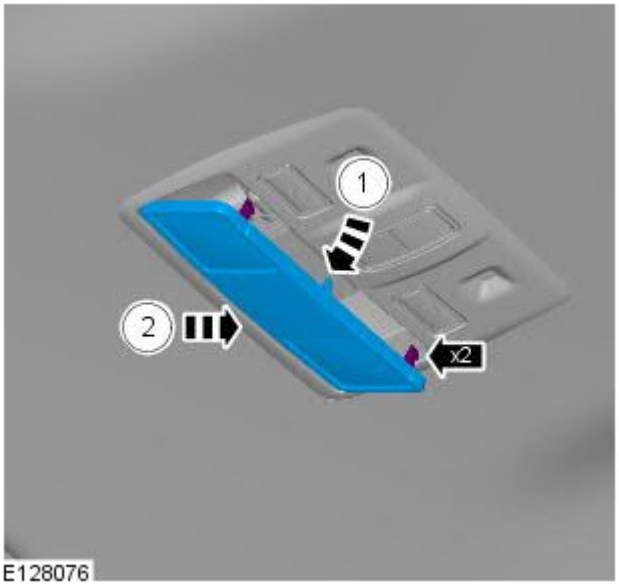
   Refer to: Sun Visor (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. *Torque:* 2 Nm

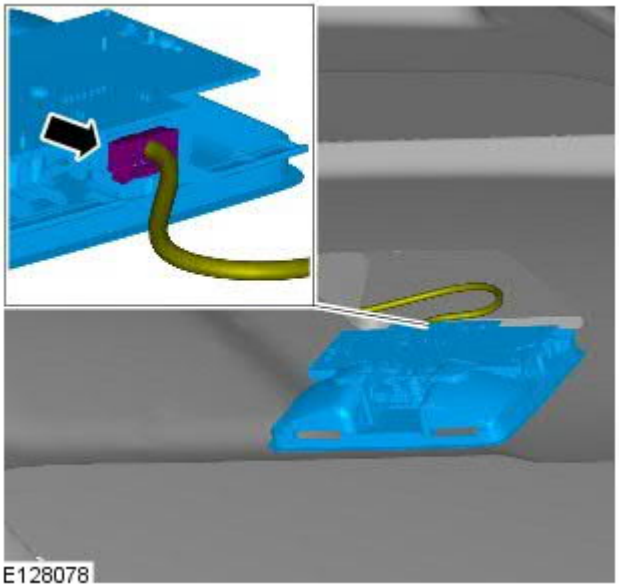
4. NOTE: The procedure must be carried out on both sides.

   Refer to: C-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

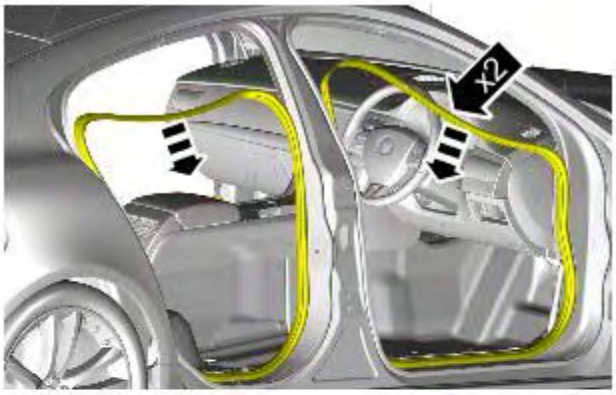
5.

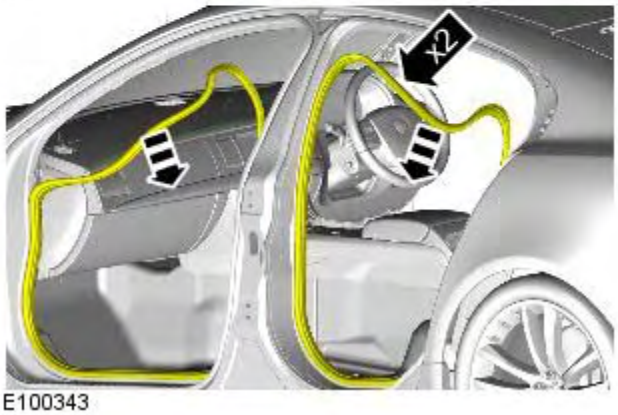


6.

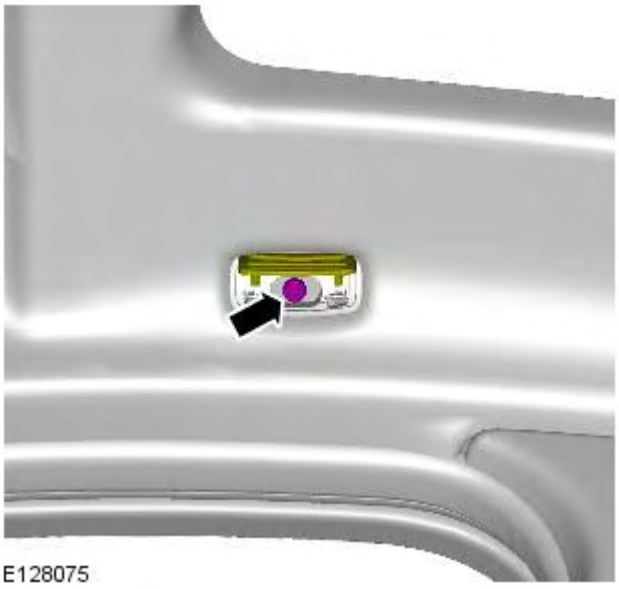


7.





E100343



E128075

8. CAUTION: Note the fitted position of the component prior to removal.

NOTES:

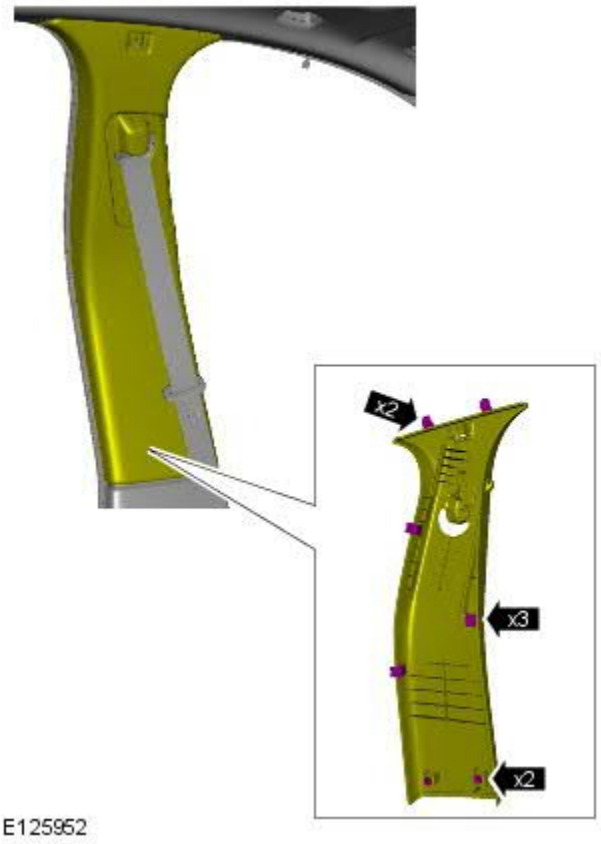
Right-hand shown, left-hand similar.

The procedure must be carried out on both sides.

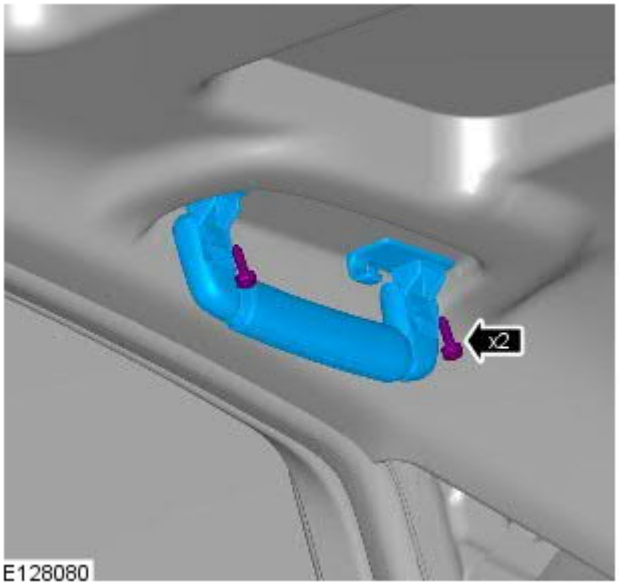
Torque: 2 Nm

9. NOTE: The procedure must be carried out on both sides.

   Torque: 6 Nm



10. NOTE: The procedure must be carried out on both sides.



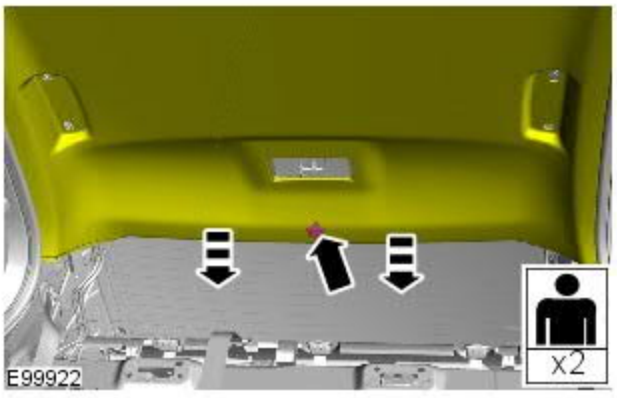
11. CAUTION: Note the fitted position of the component prior to removal.

    NOTES:

    Right-hand shown, left-hand similar.

    The procedure must be carried out on both sides.

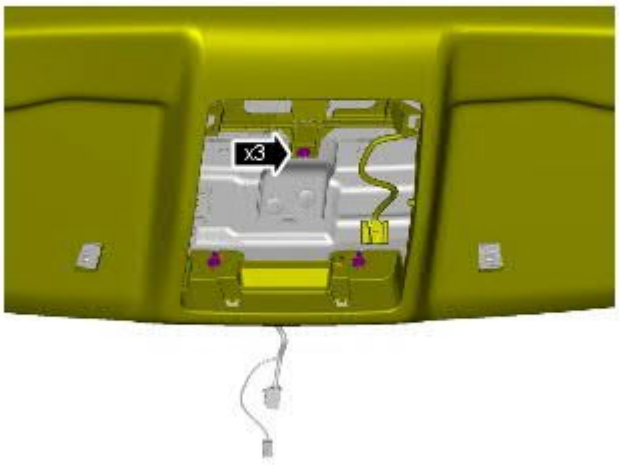
    Torque: 2 Nm

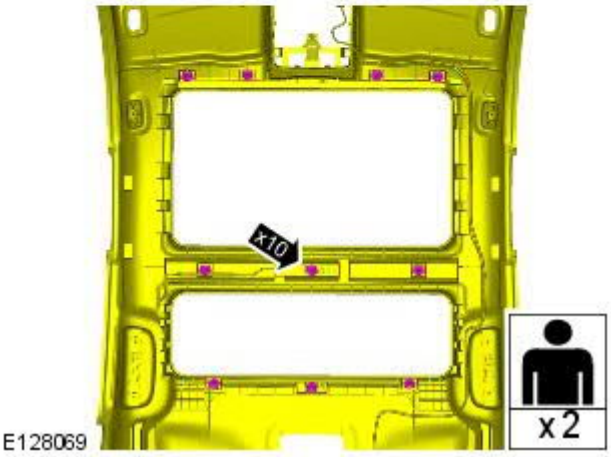


12. WARNING: This step requires the aid of another technician.

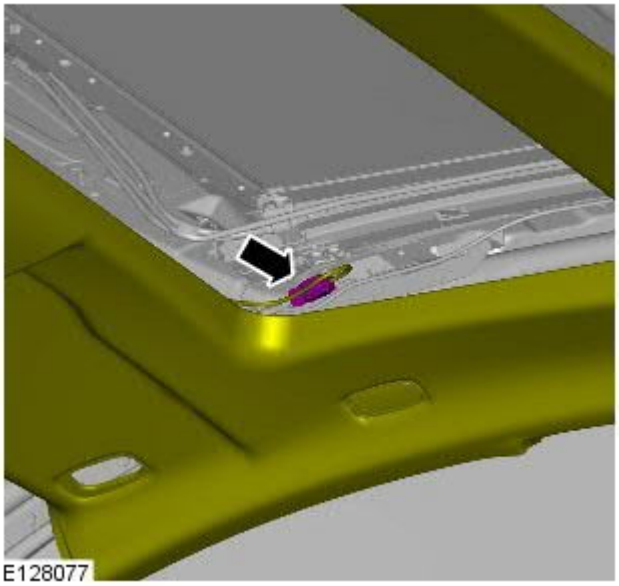
13. WARNING: This step requires the aid of another technician.

    CAUTION: Note the fitted position of the component prior to removal.

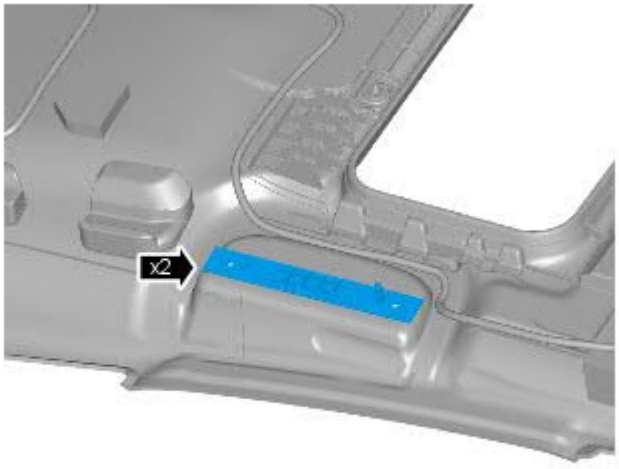




14. NOTE: This step requires the aid of another technician.



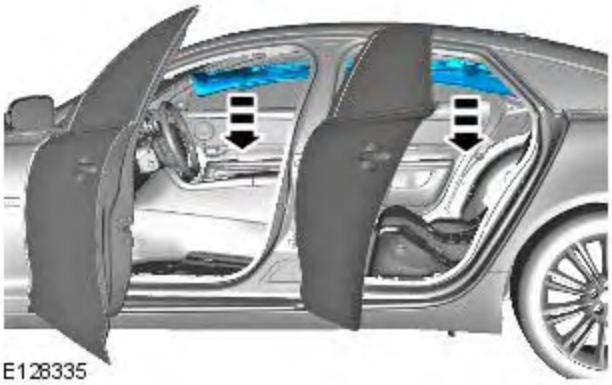
15. NOTE: This step requires the aid of another technician.



E128068

16. CAUTION: Note the fitted position of the component prior to removal.

NOTE: Right-hand shown, left-hand similar.



E128335

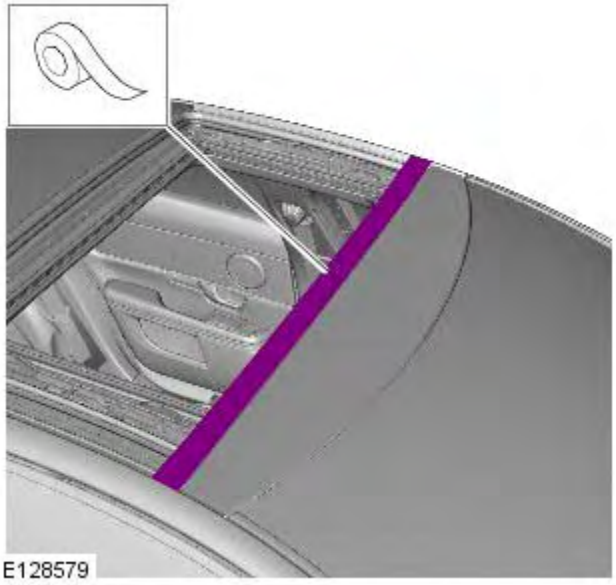
17. CAUTION: Protect the surrounding trim to avoid damage.

NOTE: Lower and reposition the headliner to aid access.

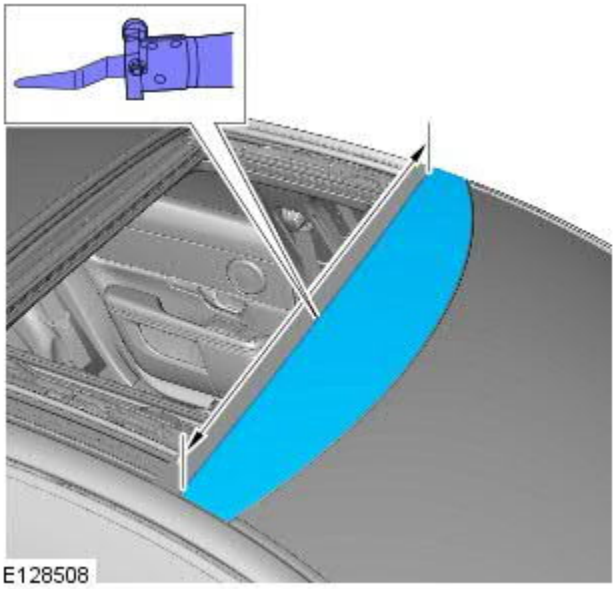
18. Refer to: Roof Opening Panel Glass (501-17 Roof Opening Panel, Removal and Installation).

19. Prepare the PU adhesive in accordance with the instructions included with the PU adhesive kit.

20. NOTE: The procedure must be carried out on both sides.

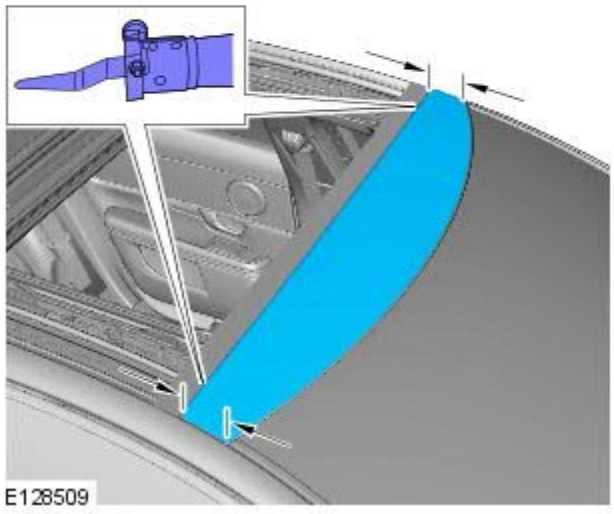


21. CAUTION: Use suitable tape to protect the roof opening panel weather strip.



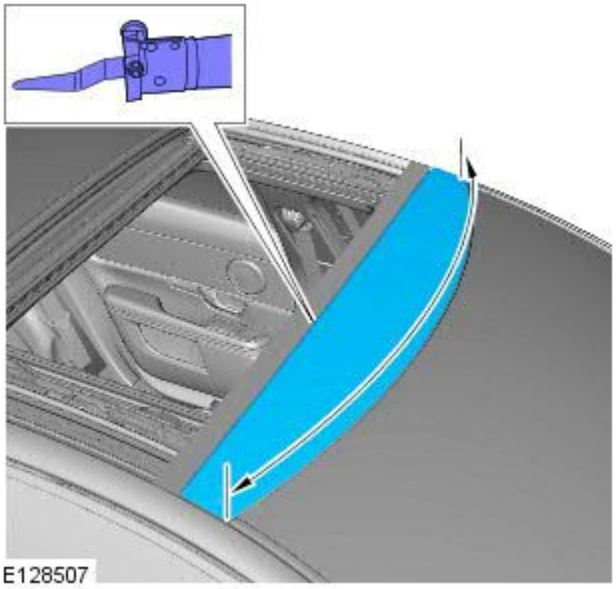
22. CAUTION: A metal strip should be installed between the bottom of the blade and the taped-down components. This will reduce friction and allow the blade to cut easier.

    - Use a WK24ZS blade, cutting with the flat side against the body.



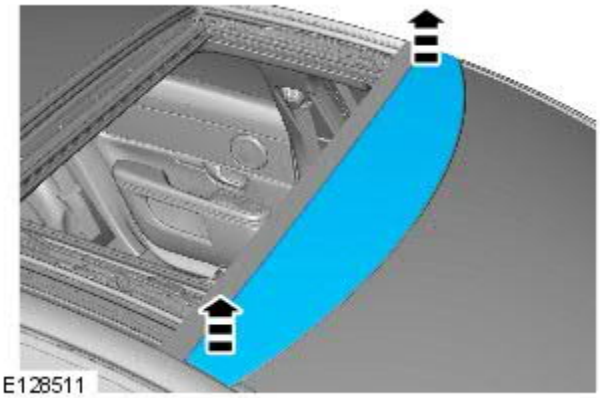
23. CAUTION: A metal strip should be installed between the bottom of the blade and the taped-down components. This will reduce friction and allow the blade to cut easier.

    Use either a left facing WK29L blade or a right facing WK30L blade, cutting with the flat side against the body. Use a WK11DW5 controller arm, set to 75 mm to control the cutting depth.

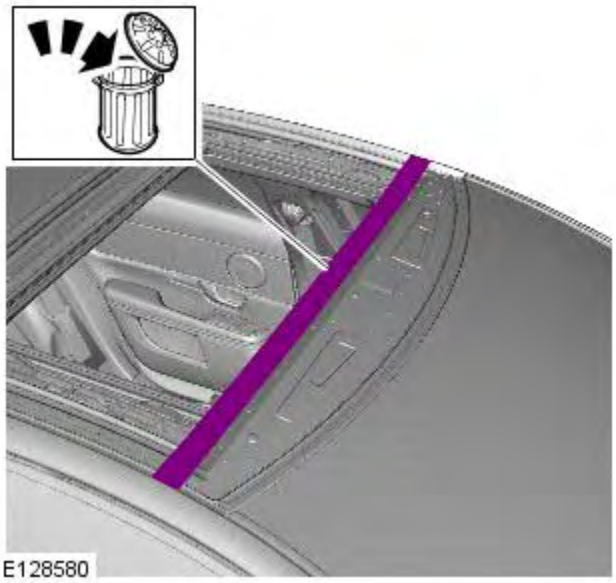


24. CAUTION: A metal strip should be installed between the bottom of the blade and the taped-down components. This will reduce friction and allow the blade to cut easier.

    Use a WK2S blade, cutting with the flat side against the body. Use a WK11DW5 controller arm, the depth of the cut will vary from 75 mm to 160 mm as the glass widens towards the centre.

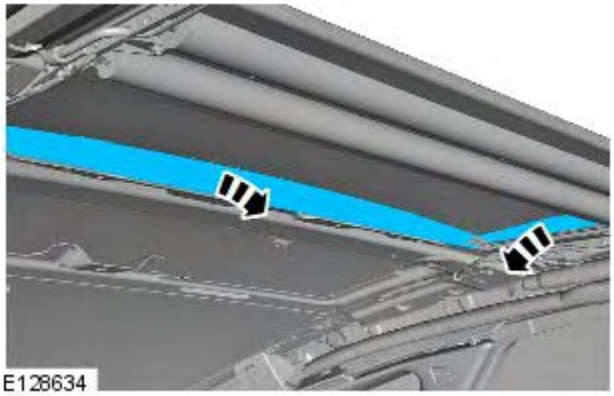


25.

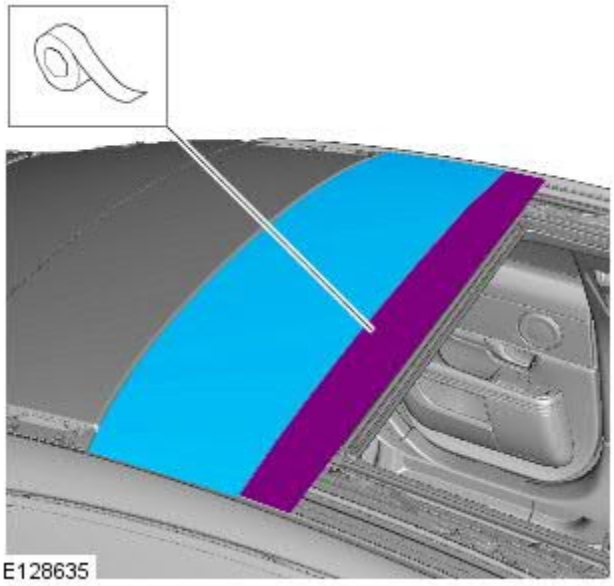


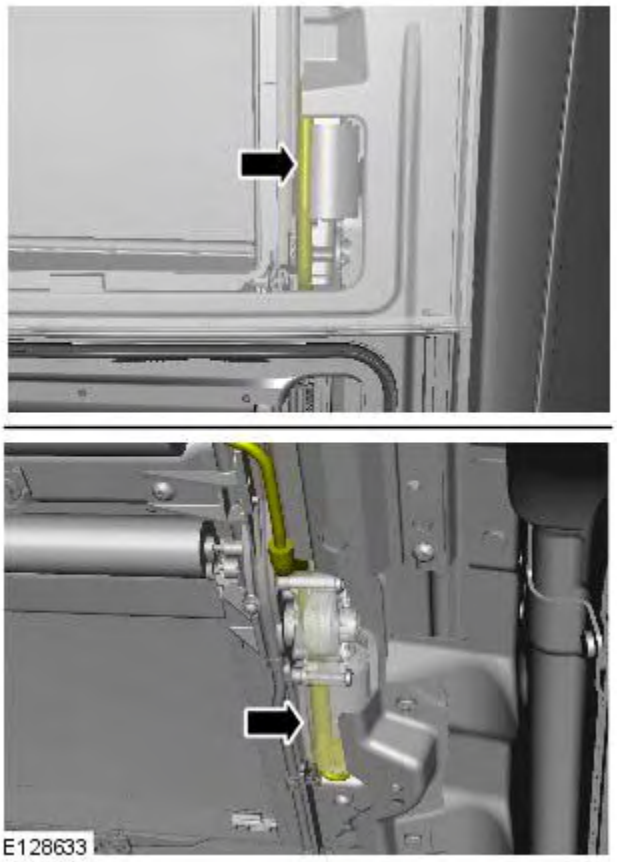
26. NOTE: Remove the tape.

27.



28. CAUTION: Use suitable tape to protect the roof opening panel weather strip.

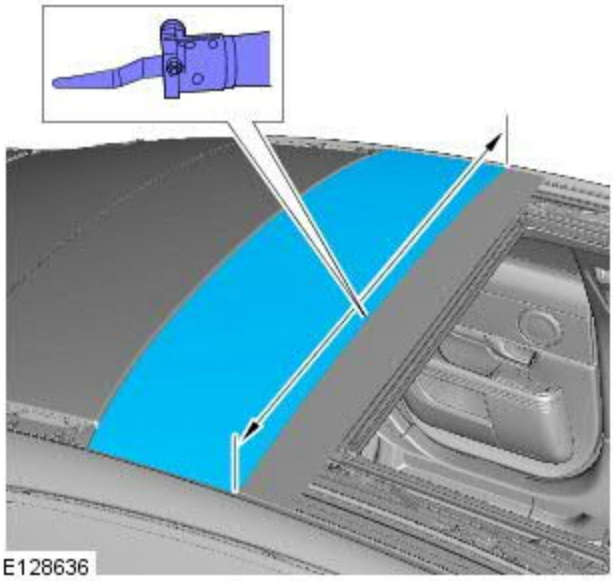




29. CAUTIONS:

    Use suitable tape to protect the roof opening panel blind motor wiring harness.

    Use suitable tape to protect the bodywork around the roof aperture.

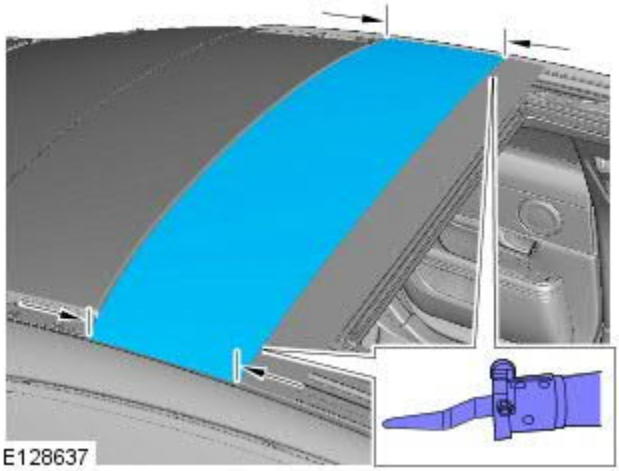


30. CAUTION: A metal strip should be installed between the bottom of the blade and the taped-down components. This will reduce friction and allow the blade to cut easier.

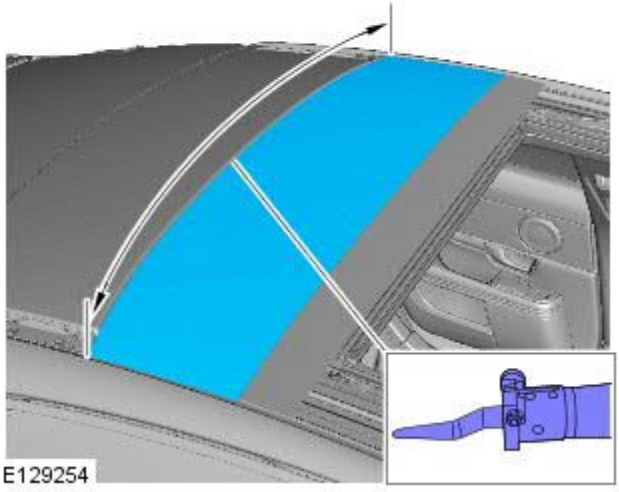
    Use a WK2S blade, cutting with the flat side against the body.

31. CAUTION: A metal strip should be installed between the bottom of the blade and the taped-down components. This will reduce friction and allow the blade to cut easier.

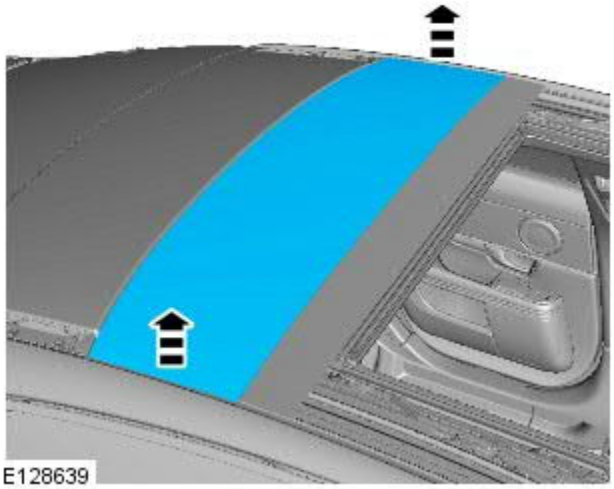
    Use either a left facing WK29L blade or a right facing WK30L blade, cutting with the flat side against the body.



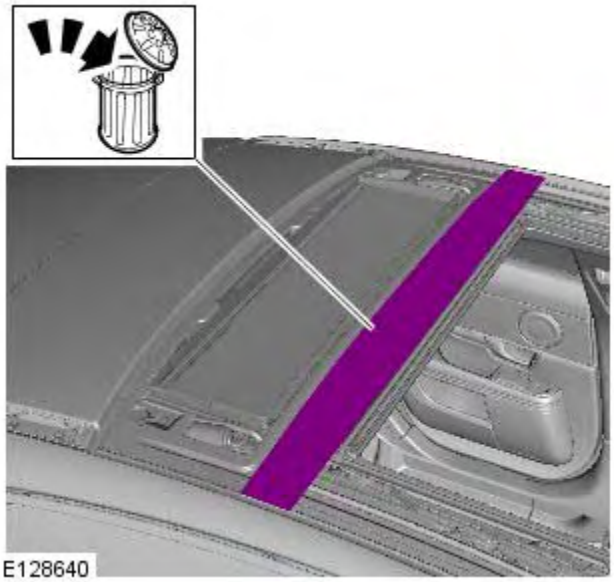
32. Use either a left facing WK29L blade or a right facing WK30L blade, cutting with the flat side against the body.



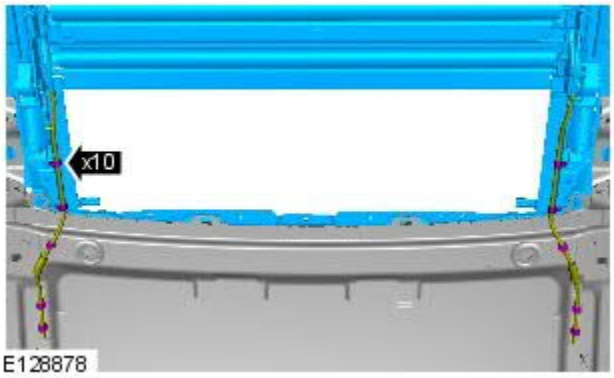
33.

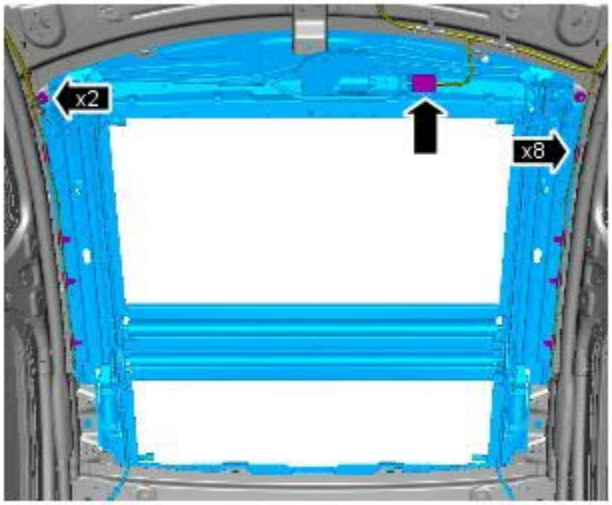


34. NOTE: Remove the tape.



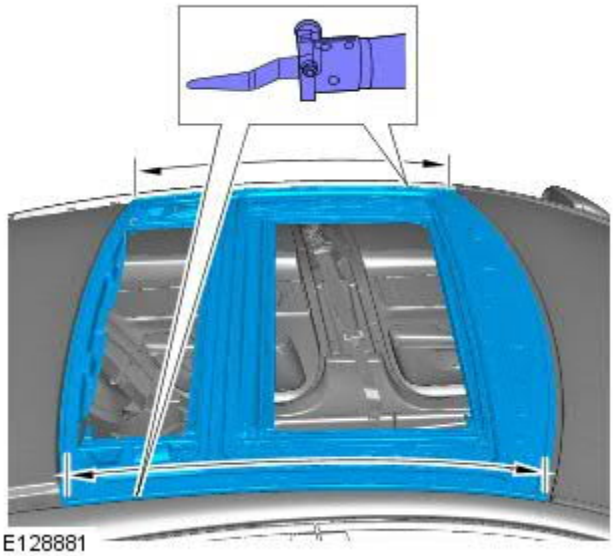
35.





E129217

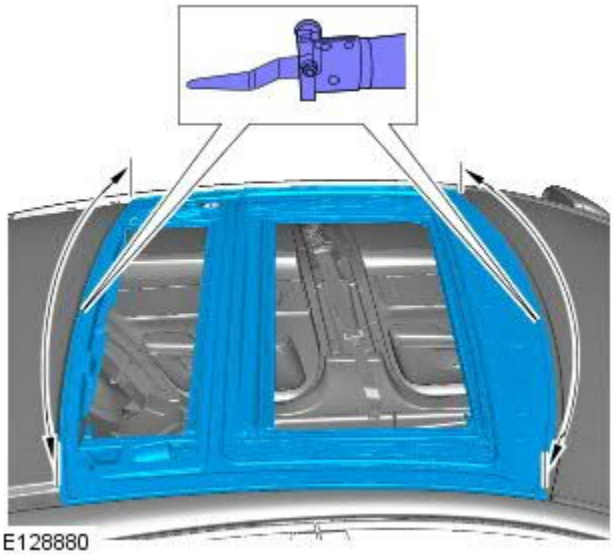
36. CAUTION: Take extra care not to damage the wiring harnesses.



E128881

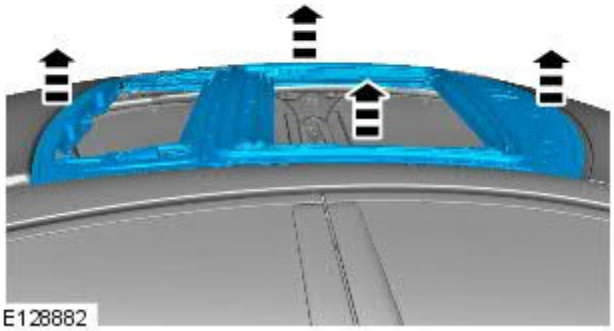
37. Use either a left facing WK29L blade or a right facing WK30L blade, cutting with the flat side against the body.

38. Use either a left facing WK29L blade or a right facing WK30L blade, cutting with the flat side against the body.



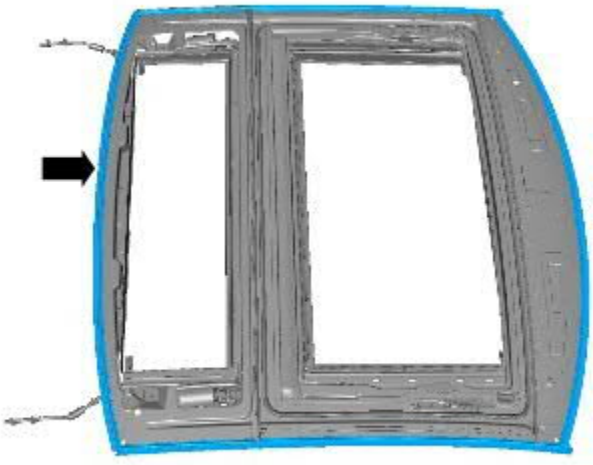
E128880

39. NOTE: This step requires the aid of another technician.



E128882

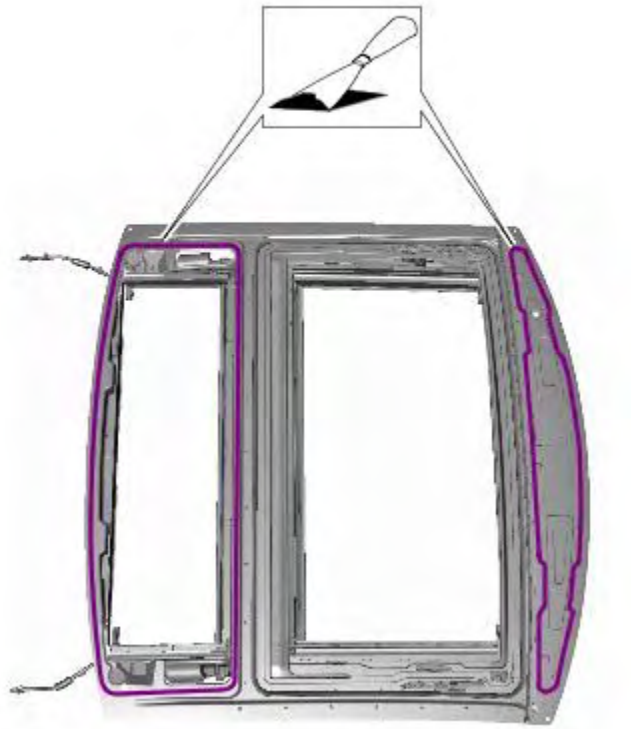
40.



E128883

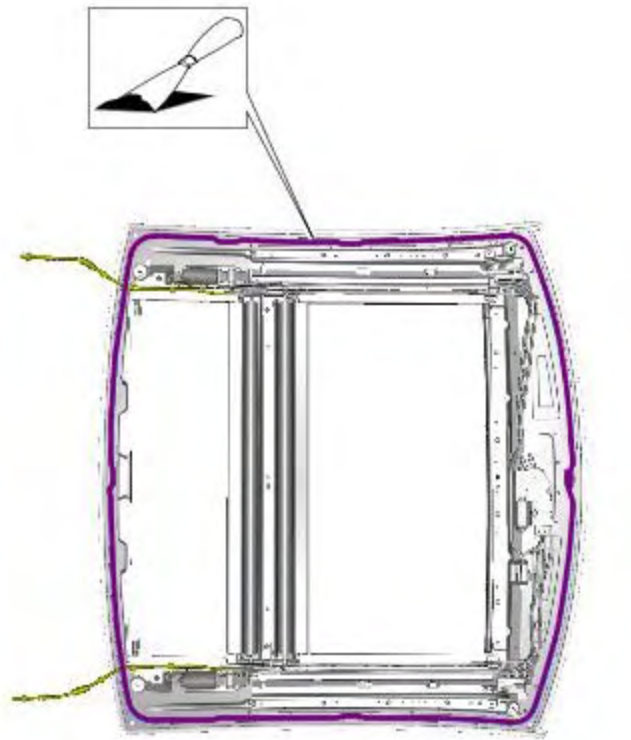
41. CAUTION: Make sure that the mating faces are clean and free of corrosion and foreign material.

Prepare the glass roof cassette flange and trim the PU adhesive in accordance with the instructions included with the PU adhesive kit.

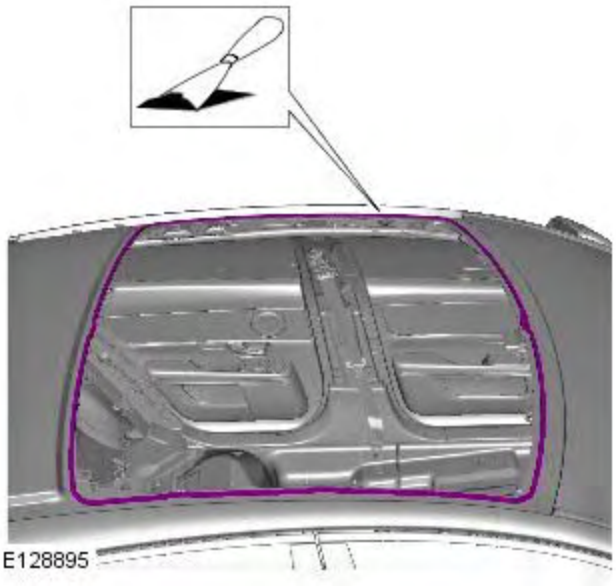


E128896

42. CAUTION: Make sure that the mating faces are clean and free of corrosion and foreign material.

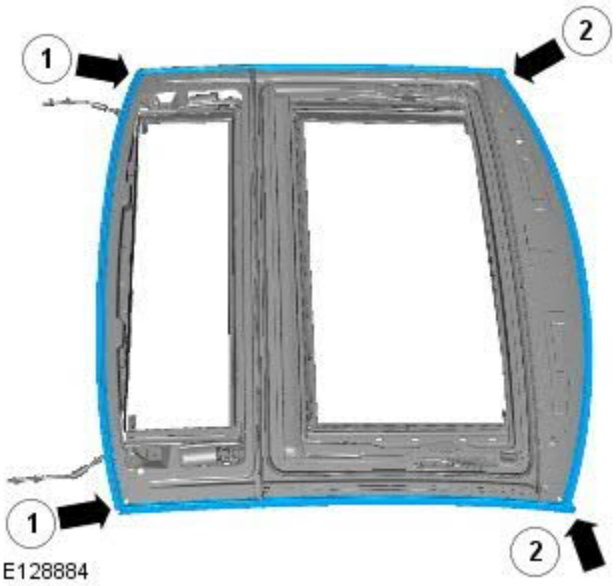


E128894

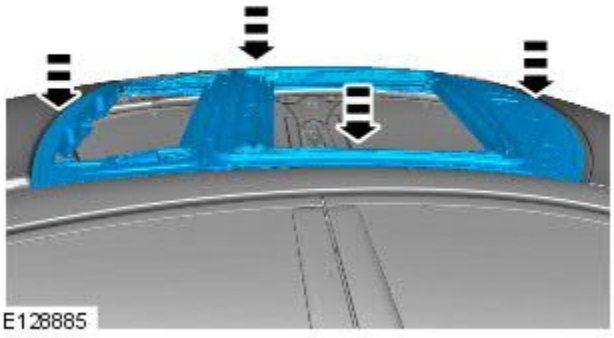


43. CAUTION: Make sure that the mating faces are clean and free of corrosion and foreign material.

Installation



1. Fit the cassette frame edge seal back corners first, then fit the front corners, as the sequence depicts in the graphic.



2. CAUTION: Make sure that the component is correctly located on the locating dowels.

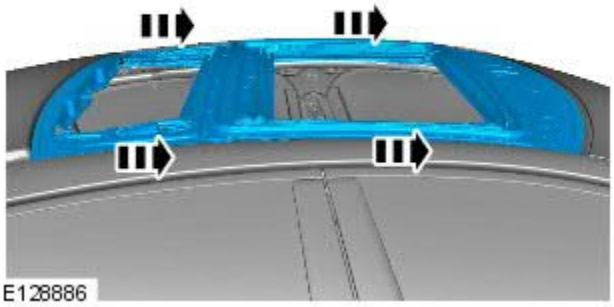
   NOTES:

   This step requires the aid of another technician.

   Install new spacers.

   Make sure that the cassette frame edge seal is in contact with the cant rail evenly across both sides of the vehicle. It is critical that the cassette is central.

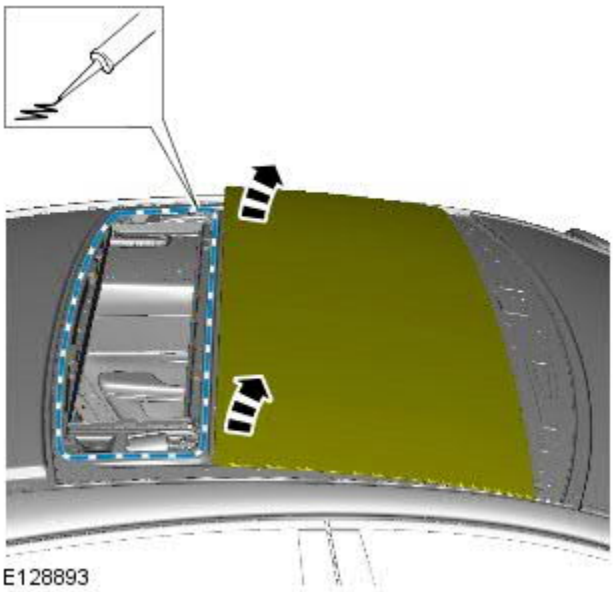
3. With the 4 installation pins correctly located into the holes in the cant rail assemblies, push the cassette fully forward towards the front of the vehicle.



4. CAUTION: Only tighten the nuts finger-tight at this stage.

   Install the 2 new nuts to the rear of the cassette frame to ensure correct alignment to the body.

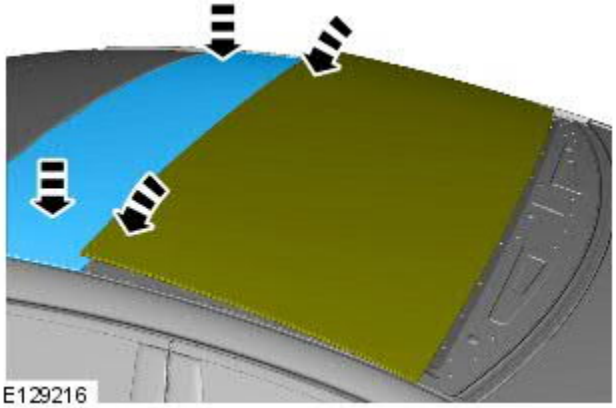
5. Refer to: Roof Opening Panel Glass (501-17 Roof Opening Panel, Removal and Installation).



6. CAUTION: Touching the adhesive surface will impair rebonding.

   NOTE: Install new spacers.

   - Prepare the PU adhesive in accordance with the instructions included with the PU adhesive kit.
   - Using the mechanical adjuster on the roof opening panel motor, wind the motor until the glass is slightly raised from the cassette frame edge seal, to aid the installation of the rear glass panel.



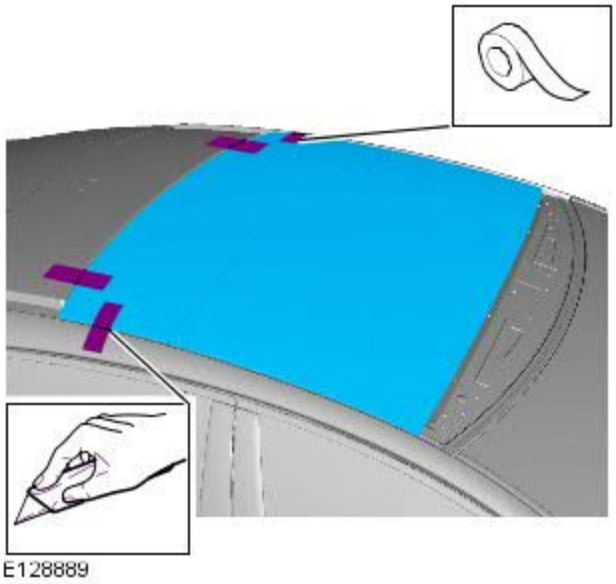
7. NOTES:

   With the sunroof closed, check the alignment of the glass to the roof panel. The glass should be central in its aperture. Profile of sunroof to body: front edge, set flush or up to 1.0 mm (0.040 inch) low; rear edge, set flush or up to 1.0 mm (0.040 inch) high.

   With the sunroof closed, check the alignment of the rear glass roof panel to the sunroof glass panel. The glass should be central in its aperture. Profile of rear glass roof panel to body: front edge, set flush or up to 1.0 mm (0.040 inch) low; rear edge, set flush or up to 1.0 mm (0.040 inch) high.

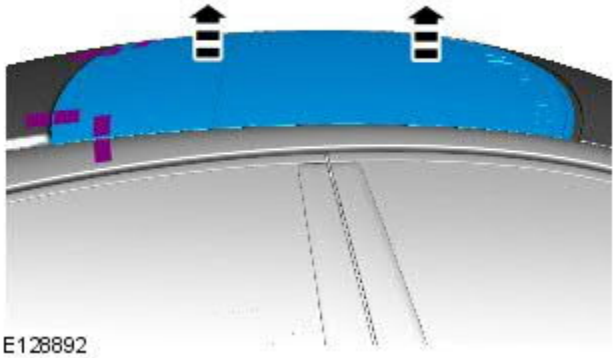
   - Using the mechanical adjuster on the roof opening panel motor, wind the motor until the glass is sitting flush against the cassette frame edge seal.
   - Make sure the component is aligned with the measurements taken prior to removal. Failure to follow this instruction may result in damage to the glass panels during operation of the roof opening panel.
   - Use suitable weights or straps, apply a downward pressure to the glass to achieve the correct curvature of the glass.

8. Refer to: Roof Opening Panel Alignment (501-17 Roof Opening Panel, General Procedures).



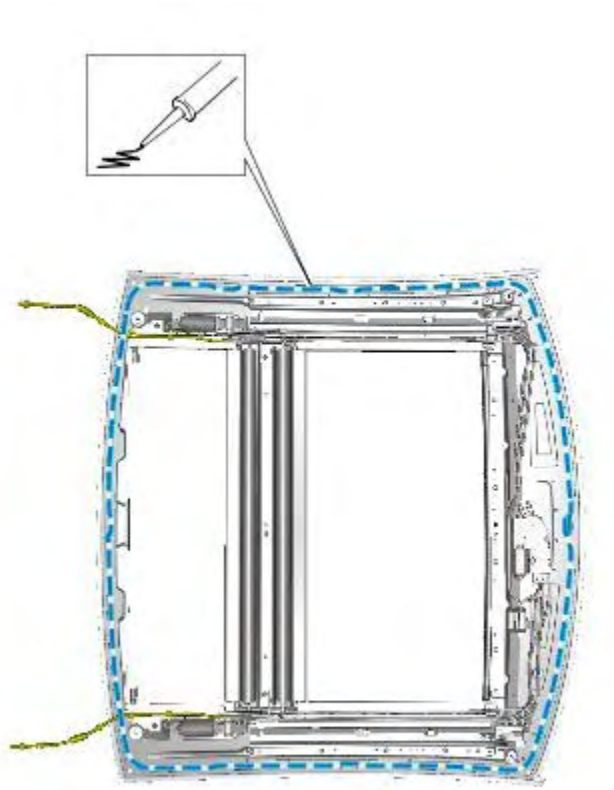
9.

   - Apply tape to the rear corners of the glass roof to create alignment markings to aid installation.



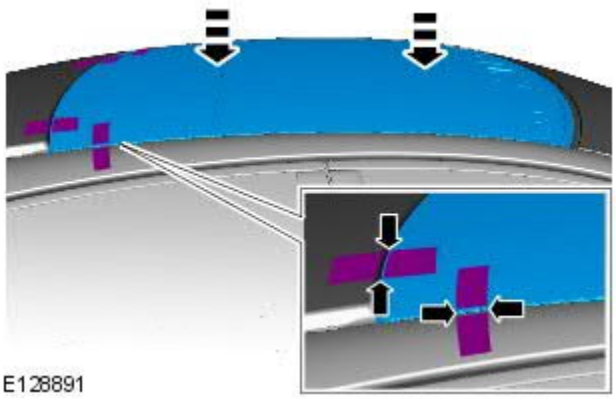
E128892

10. NOTE: This step requires the aid of another technician.



E128888

11. CAUTION: Touching the adhesive surface will impair rebonding.



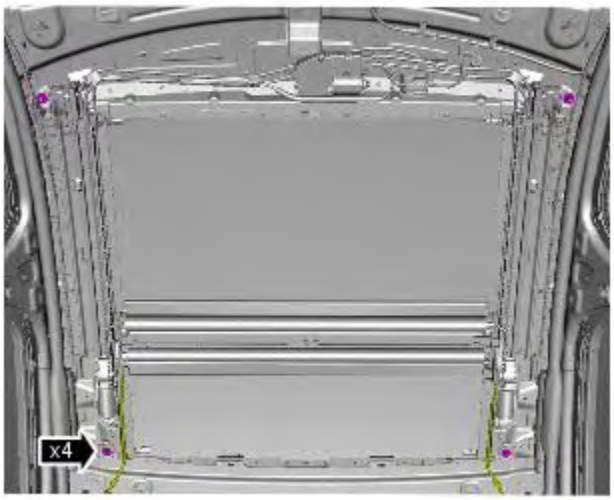
E128891

12. CAUTION: The component must be aligned with the installation markings.

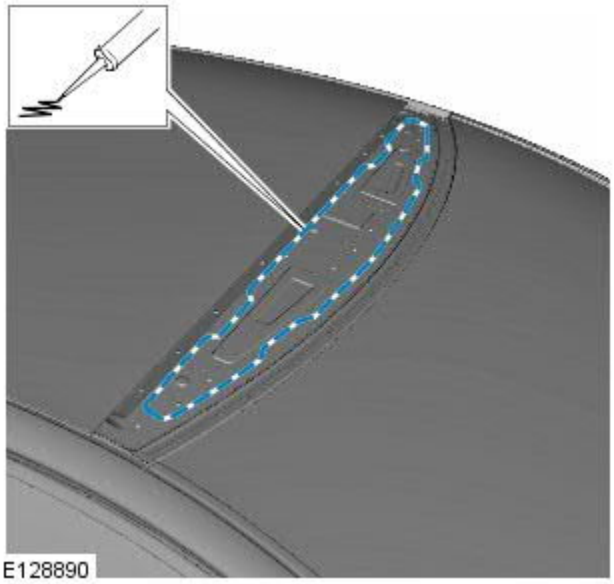
NOTE: This step requires the aid of another technician.

Prepare the PU adhesive in accordance with the instructions included with the PU adhesive kit.

13. *Torque:* 9 Nm



E128934

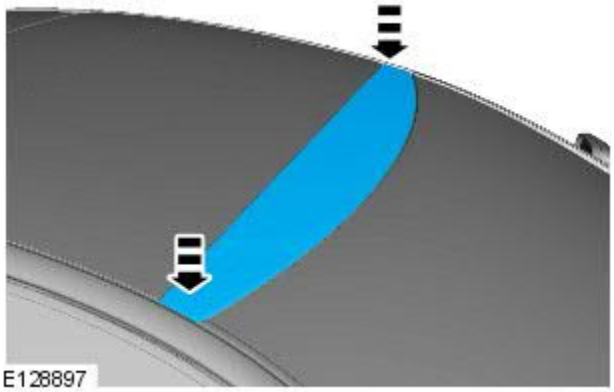


E128890

14. CAUTION: Touching the adhesive surface will impair rebonding.

NOTE: Install new spacers.

Prepare the PU adhesive in accordance with the instructions included with the PU adhesive kit.

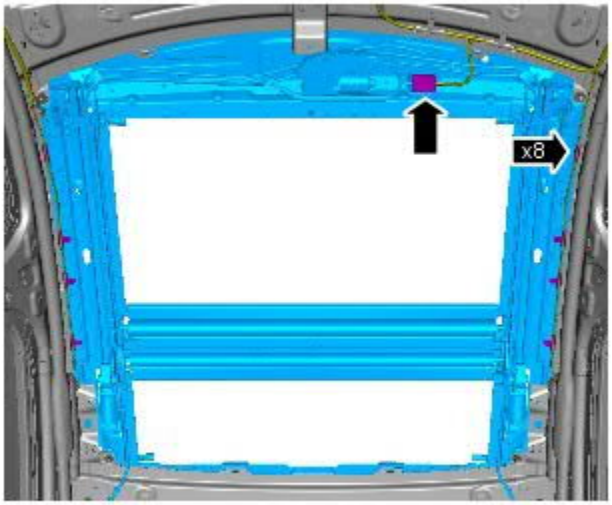


E128897

15.

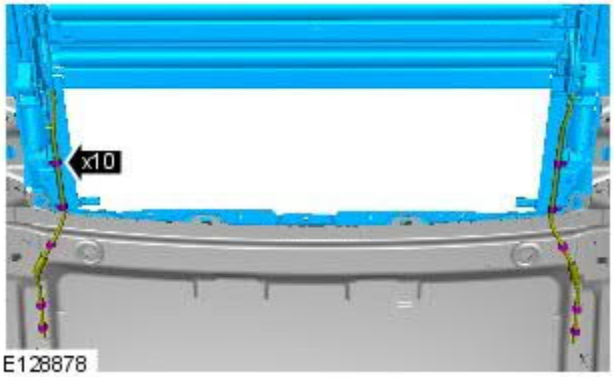
- Make sure the component is aligned with the measurements taken prior to removal. Failure to follow this instruction may result in damage to the glass panels during operation of the roof opening panel.
- Use suitable weights or straps, apply a downward pressure to the glass to achieve the correct curvature of the glass.

16.

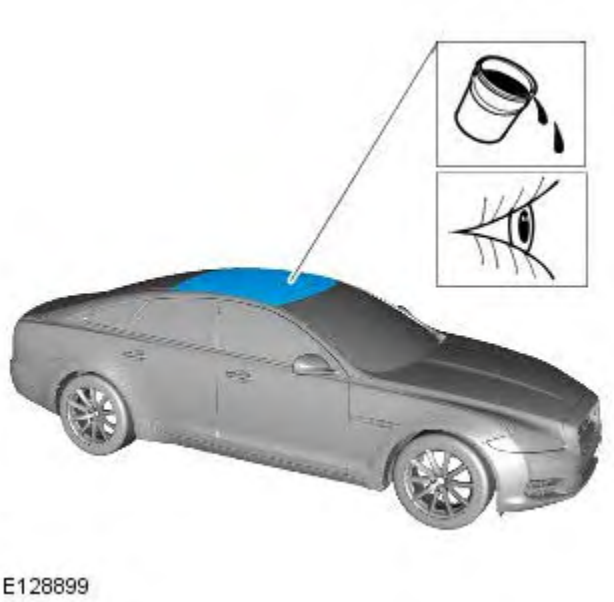


E128935

17.



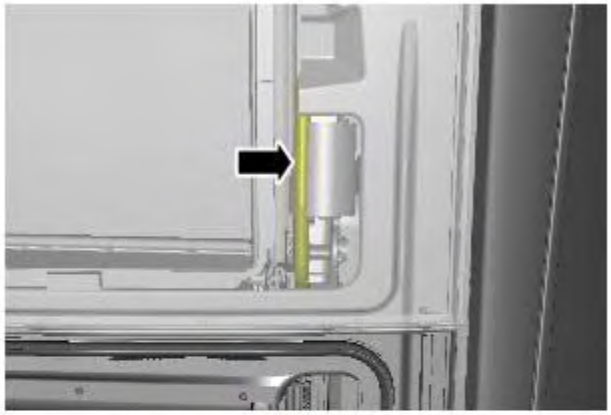
E128878

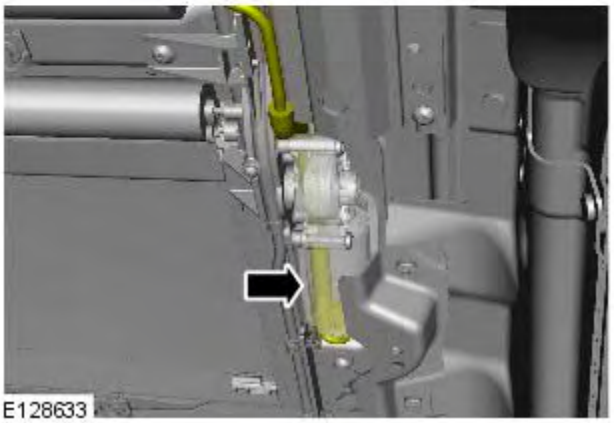


E128899

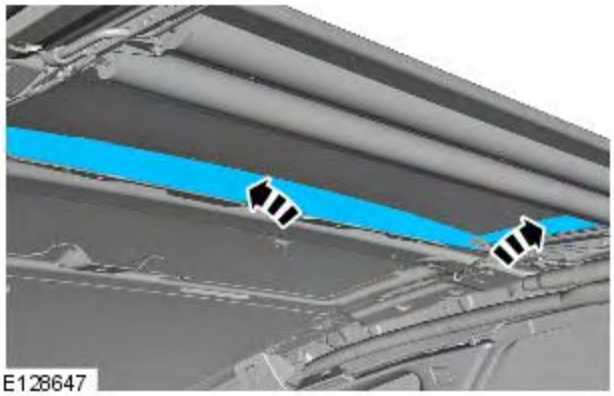
18. CAUTION: Make sure that no excess sealant residue is evident.

- If water is used as a means for the leak check, then allow sealant to dry before testing.
- Spray water around the windshield glass, mark any area that leaks. Dry the windshield glass and sealant before applying additional sealant.
- Spray water around the roof area and mark any area that leaks. Dry the roof glass and sealant before applying additional sealant.



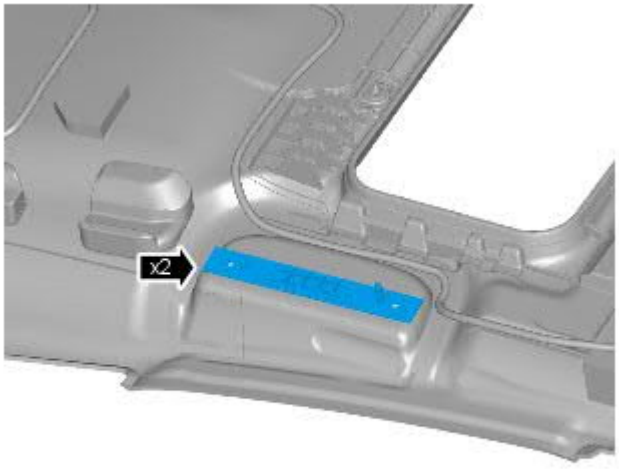


19. NOTE: Remove the tape.



20.

21. CAUTION: Protect the surrounding trim to avoid damage.

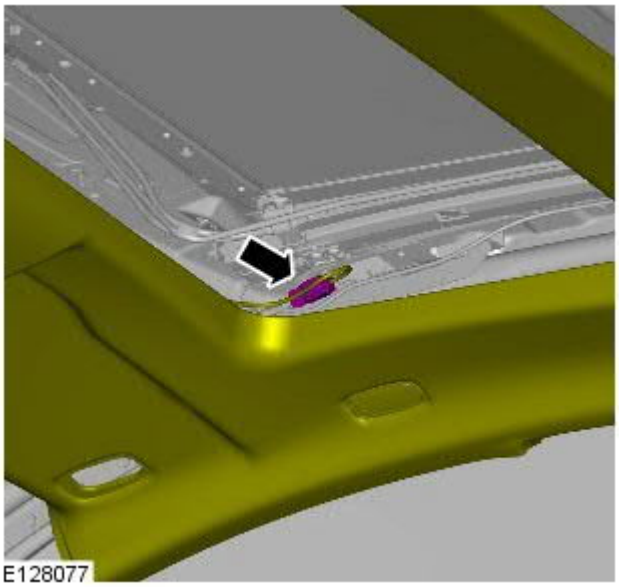


E128068

22. NOTES:

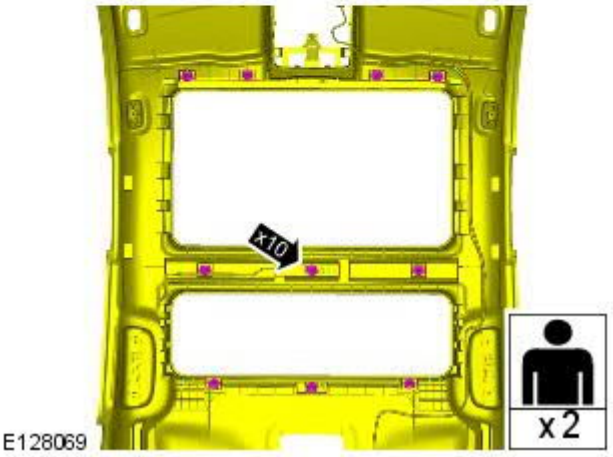
Make sure that the component is installed to the position noted on removal.

Right-hand shown, left-hand similar.



E128077

23. NOTE: This step requires the aid of another technician.

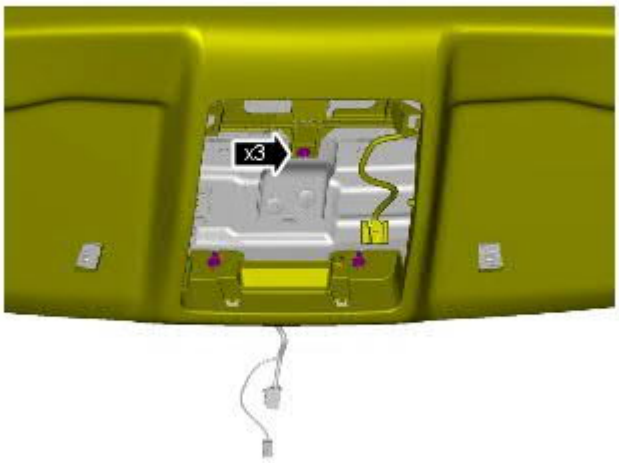


E128069

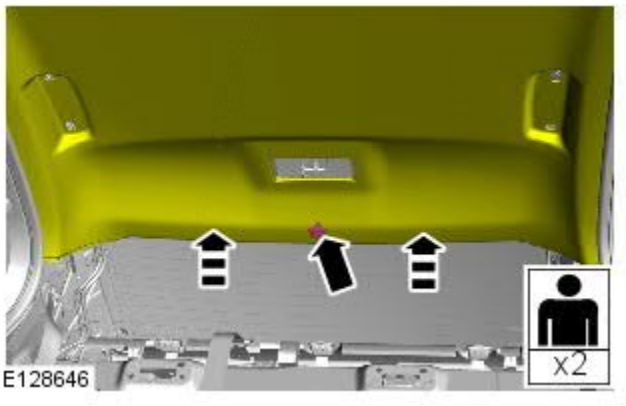
24. NOTE: This step requires the aid of another technician.

25. WARNING: This step requires the aid of another technician.

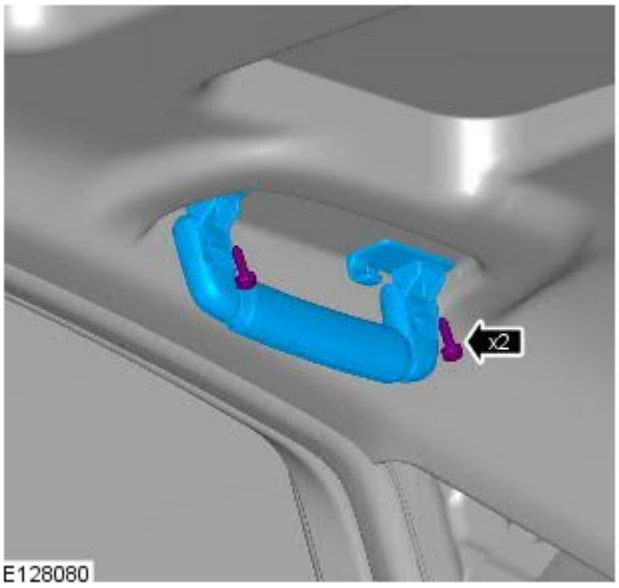
CAUTION: Make sure that these components are installed to the noted removal position.



E128070



26. WARNING: This step requires the aid of another technician.



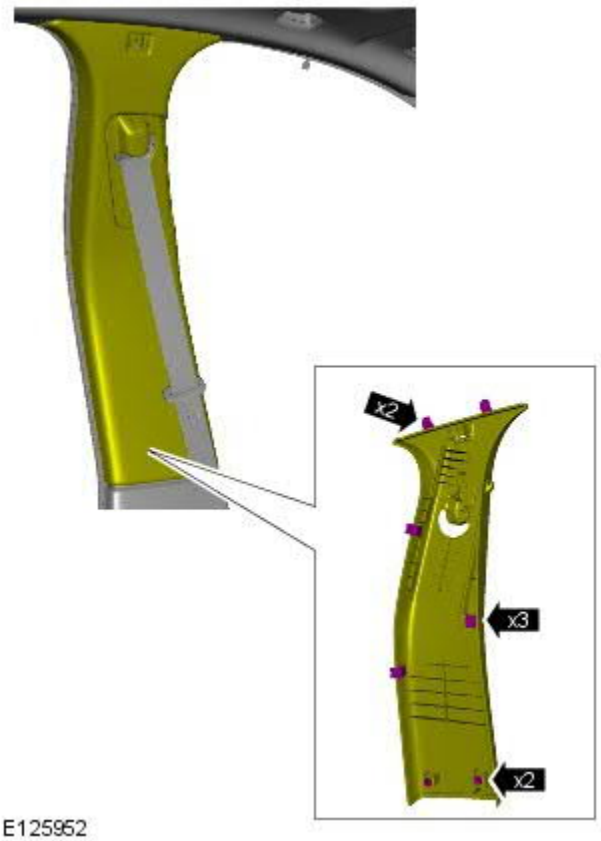
27. NOTES:

Make sure that the component is installed to the position noted on removal.

Right-hand shown, left-hand similar.

The procedure must be carried out on both sides.

Torque: 2 Nm



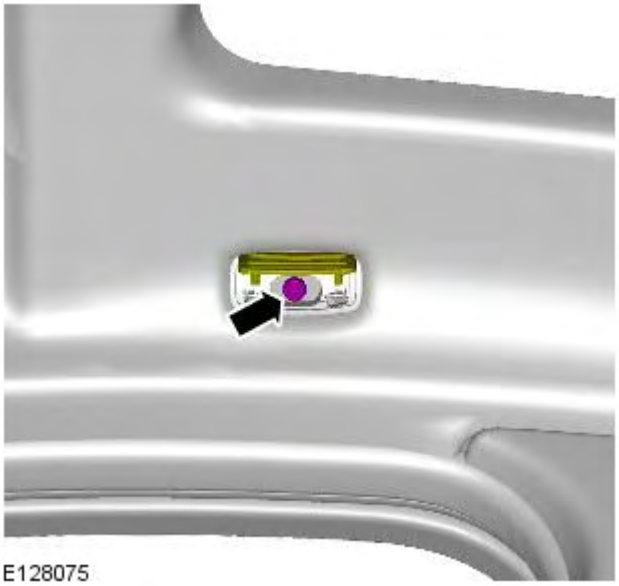
E125952

28. NOTE: The procedure must be carried out on both sides.

E125950

29. NOTE: The procedure must be carried out on both sides.

Torque: 6 Nm



E128075

30. NOTES:

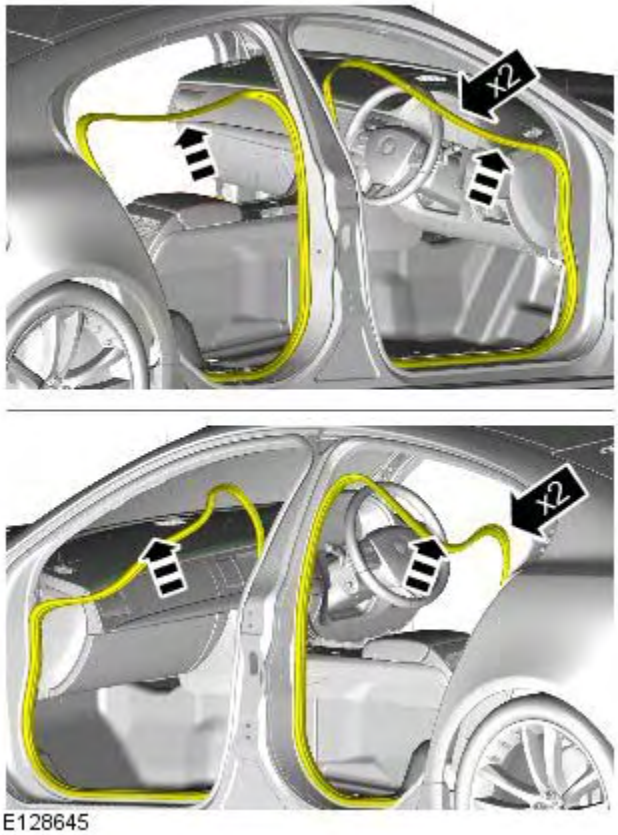
Make sure that the component is installed to the position noted on removal.

Right-hand shown, left-hand similar.

The procedure must be carried out on both sides.

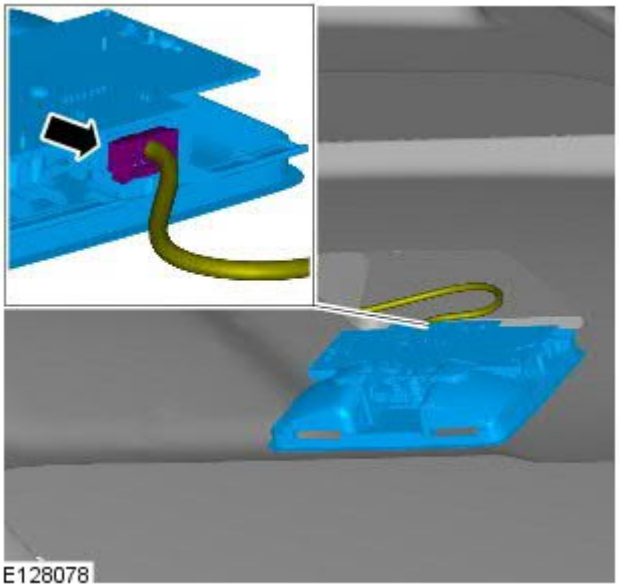
Torque: 2 Nm

31.

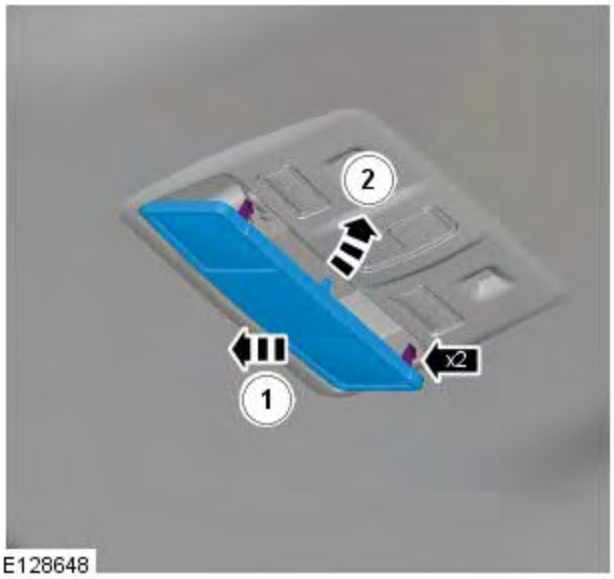


E128645

32.



33.



34. NOTE: The procedure must be carried out on both sides.

Refer to: C-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

35. *Torque:* 2 Nm

36. NOTE: The procedure must be carried out on both sides.

    Refer to: Sun Visor (501-05 Interior Trim and Ornamentation, Removal and Installation).

37. NOTE: The procedure must be carried out on both sides.

    Refer to: A-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

Published: 17-Feb-2012

Roof Opening Panel - Roof Opening Panel Frame Washers - Centre

Removal and Installation

Removal

CAUTION: Make sure that no more than one fixing is removed from the roof assembly at any one time.

NOTES:

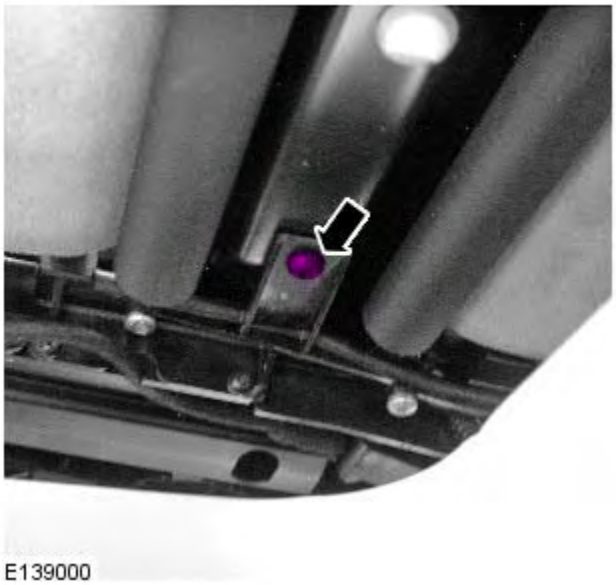
Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1. CAUTION: Make sure that the front washers are replaced prior to replacing the centre washers.

   NOTE: Do not secure the headlining until the centre and rear washers have been replaced.

   Refer to: Roof Opening Panel Frame Washers - Front (501-17 Roof Opening Panel, Removal and Installation).



E139000

2. CAUTION: Make sure that the thread is free from foreign material and debris

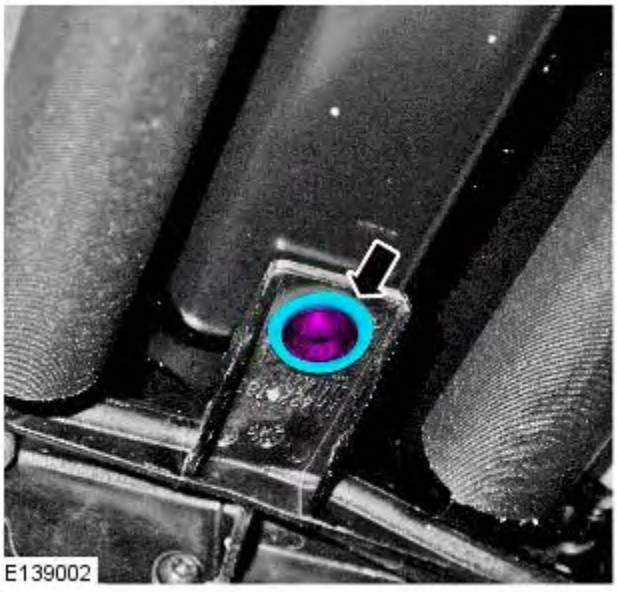
   NOTE: If installed, remove and discard the washers.

   - Remove and discard the Torx bolt.
   - Remove any traces of locking adhesive from the thread.

Installation

1. CAUTION: Note the orientation of the component prior to removal.

   Slide the washer in from the centre of the vehicle until it is aligned with the threaded hole.



2. CAUTION: Make sure that the thread is free from foreign material and debris

   Torque: 4 Nm

3. Repeat the above procedure for the other side.

4. CAUTION: Make sure that the rear washers are installed prior to the securing the headliner

   Refer to: Roof Opening Panel Frame Washers - Rear (501-17 Roof Opening Panel, Removal and Installation).

Published: 17-Feb-2012

Roof Opening Panel - Roof Opening Panel Frame Washers - Front

Removal and Installation

Removal

CAUTION: Make sure that no more than one fixing is removed from the roof assembly at any one time.

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1. NOTE: The procedure must be carried out on both sides.

   Refer to: A-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

2. NOTE: The procedure must be carried out on both sides.

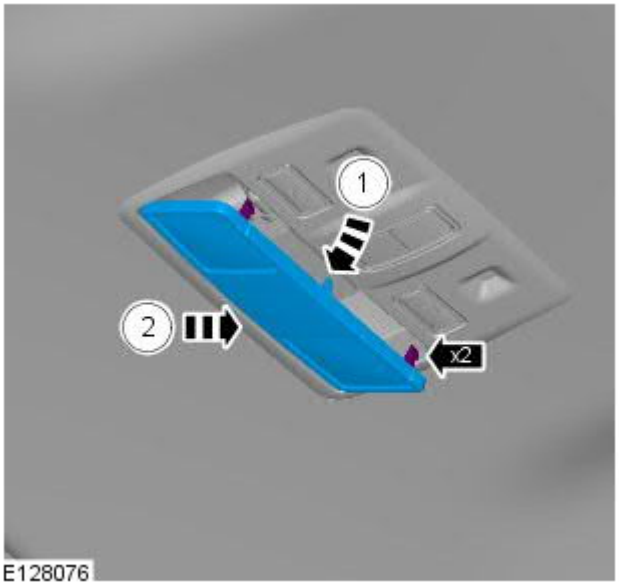
   Refer to: Sun Visor (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. *Torque:* 2 Nm

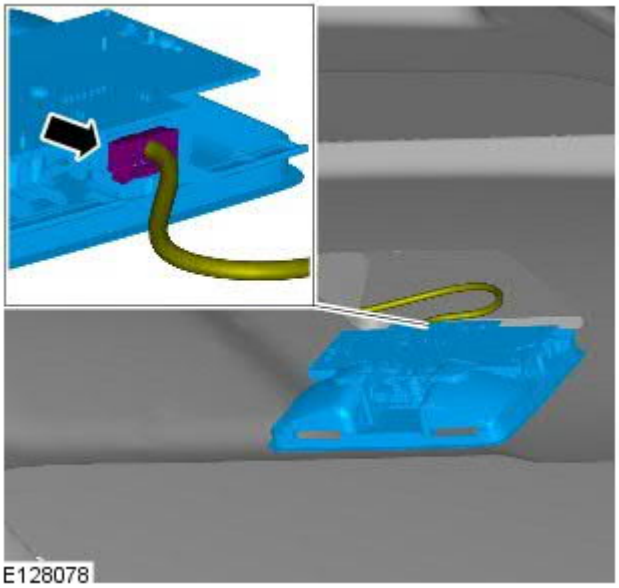
4. NOTE: The procedure must be carried out on both sides.

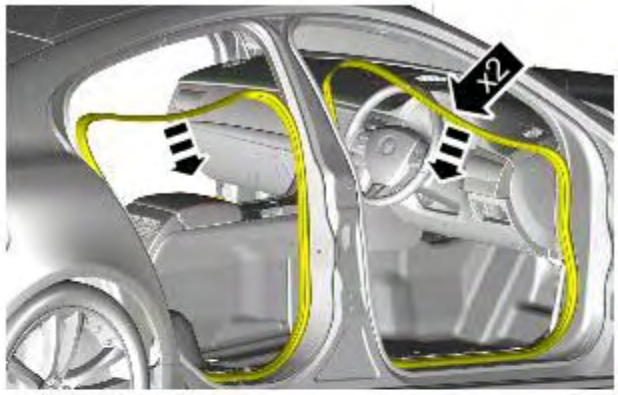
   Refer to: C-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

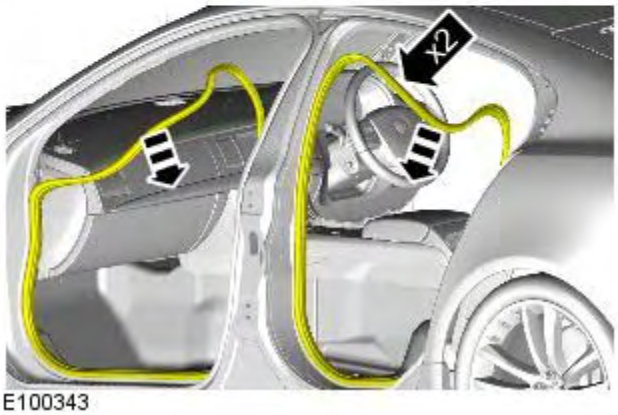
5.



6.

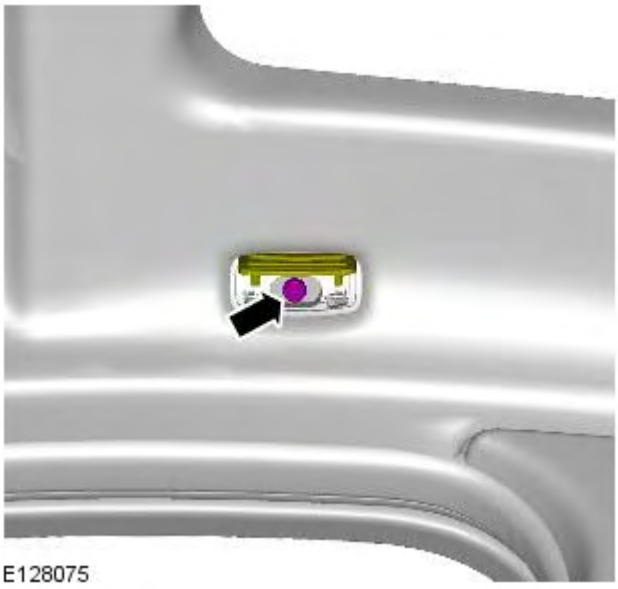






E100343

7. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E128075

8. NOTES:

Make sure that the component is installed to the position noted on removal.

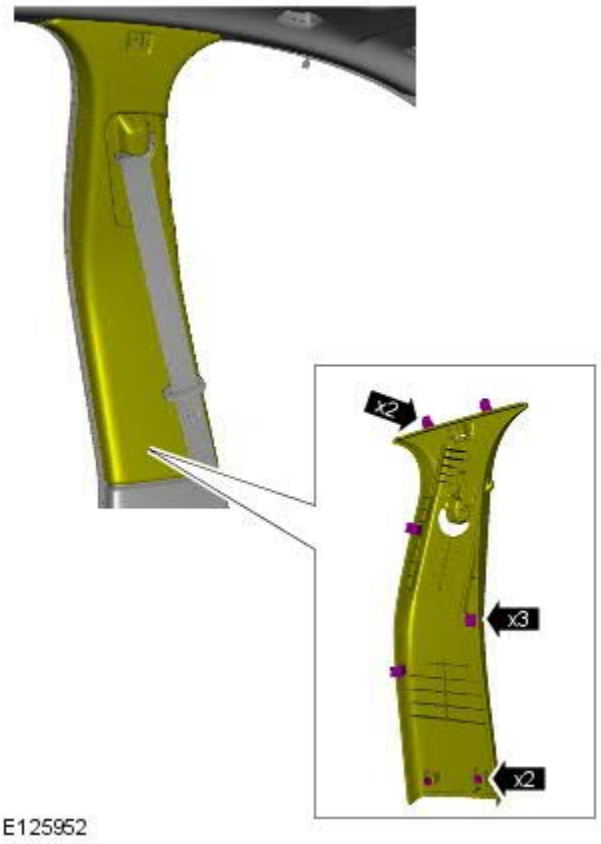
Right-hand shown, left-hand similar.

The procedure must be carried out on both sides.

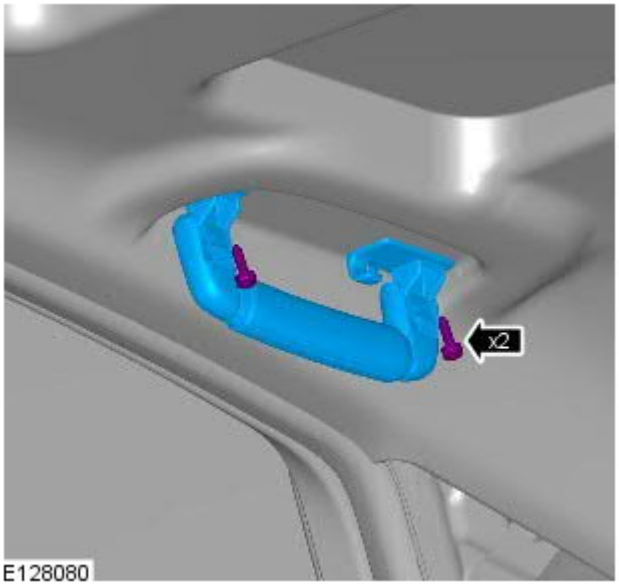
Torque: 2 Nm

9. NOTE: The procedure must be carried out on both sides.

   Torque: 6 Nm



10. NOTE: The procedure must be carried out on both sides.

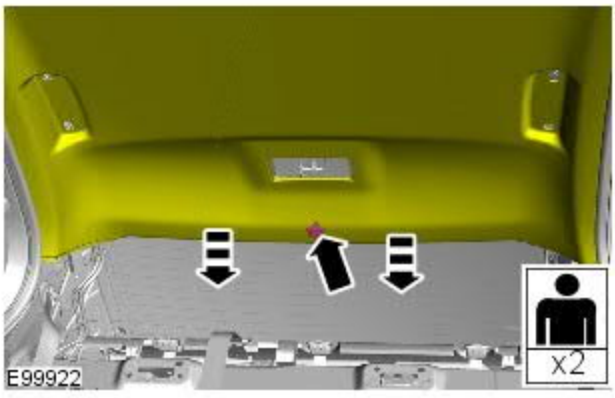


11. NOTES:

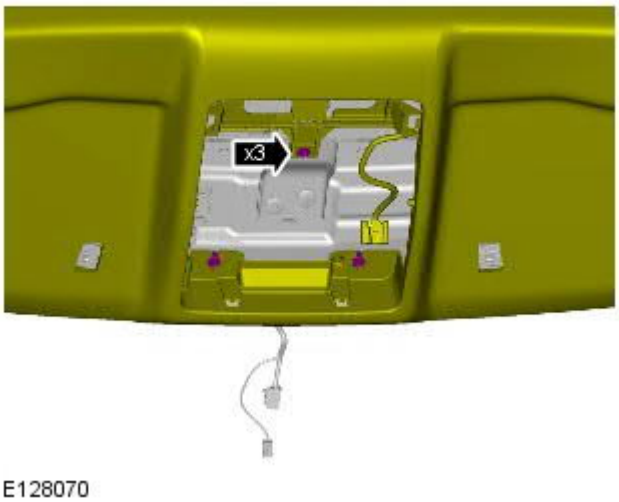
Make sure that the component is installed to the position noted on removal.

The procedure must be carried out on both sides.

Torque: 2 Nm



12. WARNING: This step requires the aid of another technician.

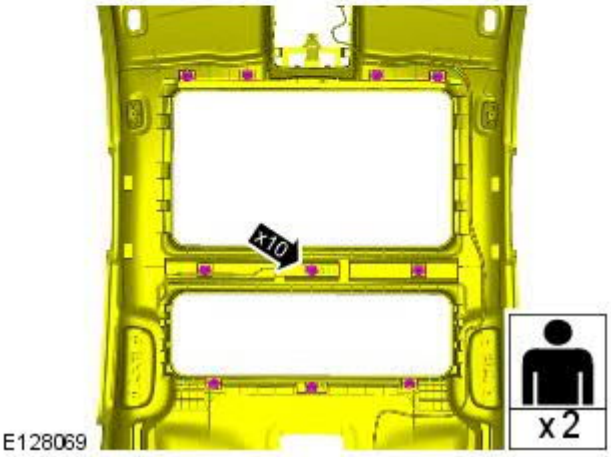


13. WARNING: This step requires the aid of another technician.

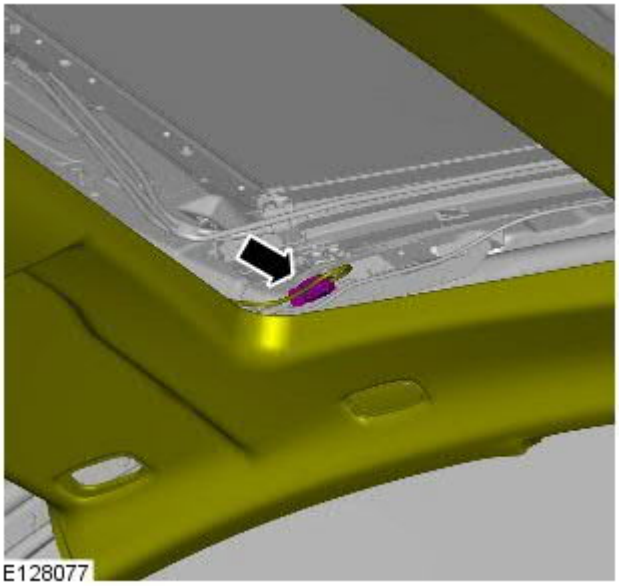
CAUTIONS:

Note the fitted position of the component prior to removal.

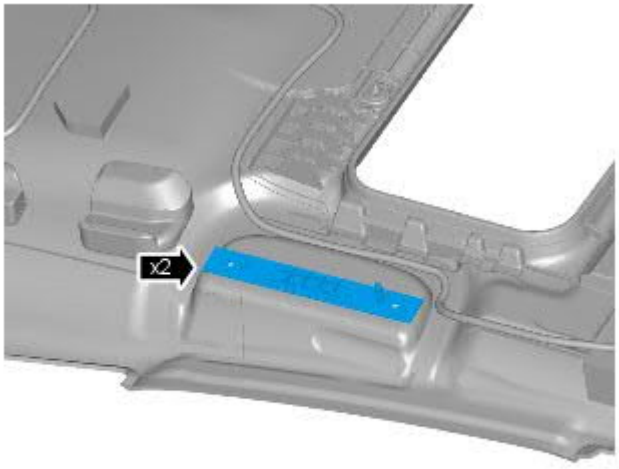
Make sure that these components are installed to the noted removal position.



14. NOTE: This step requires the aid of another technician.



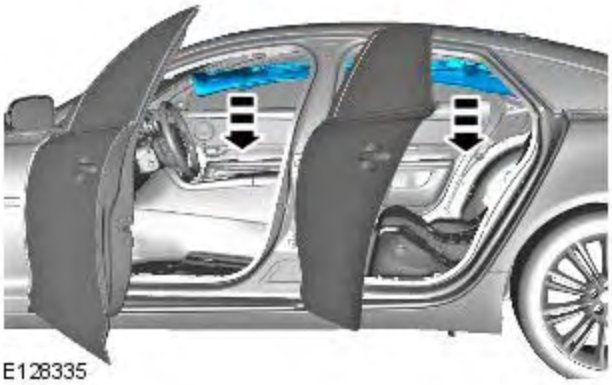
15. NOTE: This step requires the aid of another technician.



E128068

16. CAUTION: Note the fitted position of the component prior to removal.

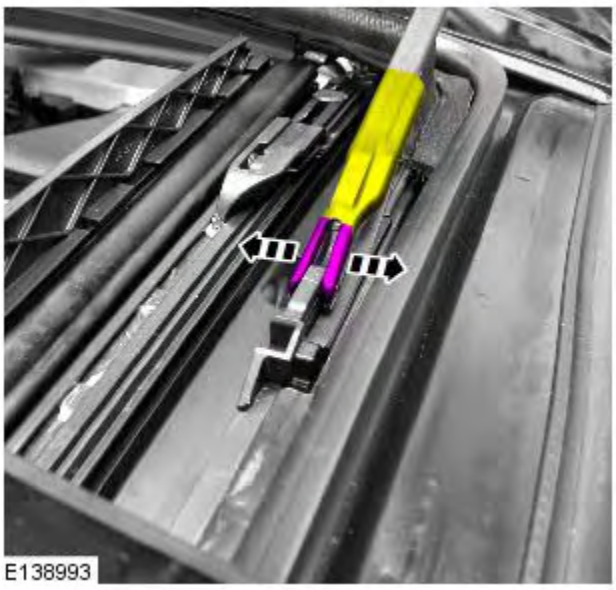
NOTE: Make sure that the component is installed to the position noted on removal.



E128335

17. CAUTION: Protect the surrounding trim to avoid damage.

NOTE: Lower and reposition the headliner to aid access.



E138993

18. CAUTION: Note the fitted position of the component prior to removal.

NOTES:

Make sure that the component is installed to the position noted on removal.

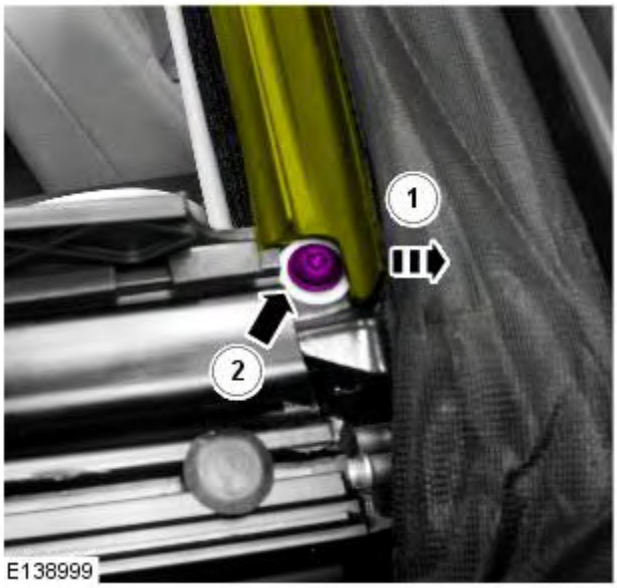
The procedure must be carried out on both sides.

E138994

19. NOTES:

Make sure that the component is installed to the position noted on removal.

The procedure must be carried out on both sides.

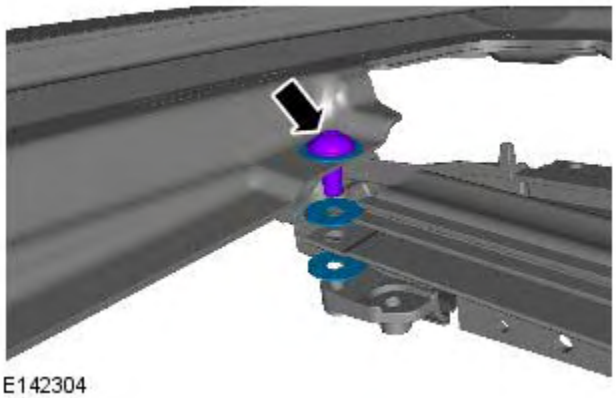


E138999

20. CAUTION: Make sure that the thread is free from foreign material and debris

NOTE: Apply gentle pressure to the trim to aid access to the Torx bolt.

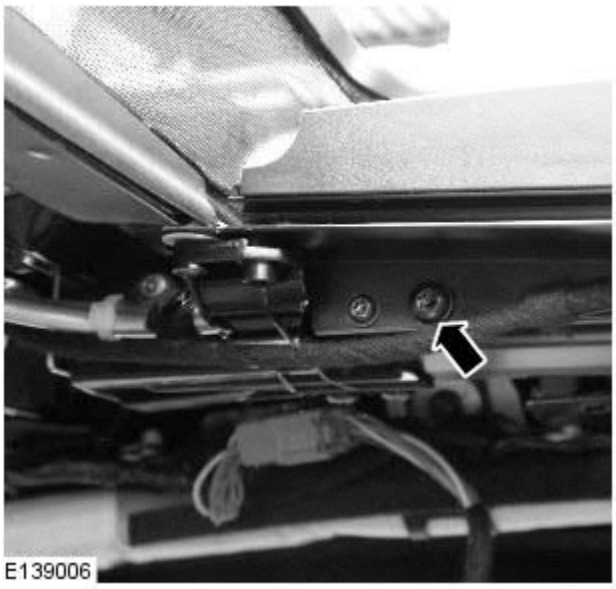
- Remove and discard the Torx bolt.
- Remove any traces of locking adhesive from the thread.


E142304

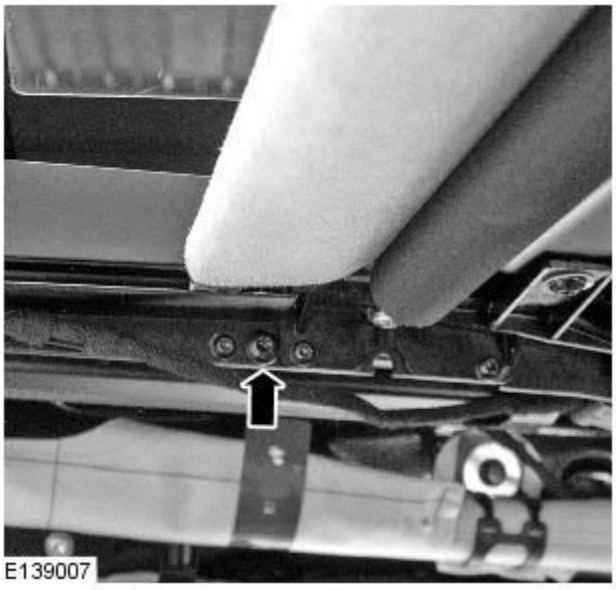
21. NOTES:

If installed, remove and discard the 3 washers.

Note the required locations of the washers within the roof assembly.

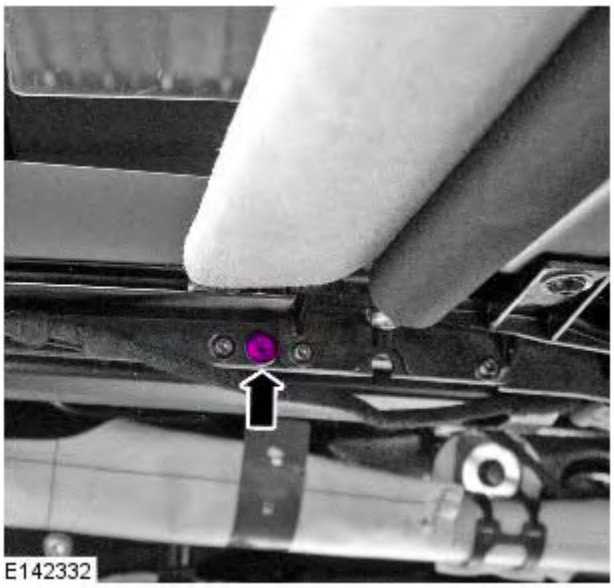


22. NOTE: If installed, remove and discard the Torx bolt and nut.

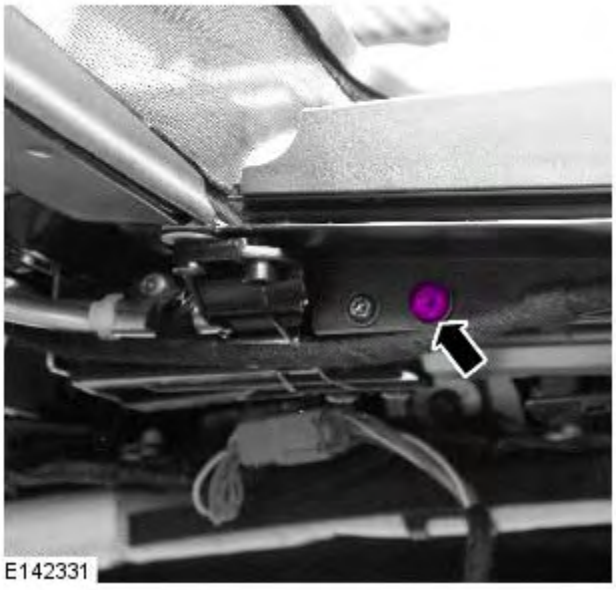


23. NOTE: If installed, remove and discard the Torx bolt and nut.

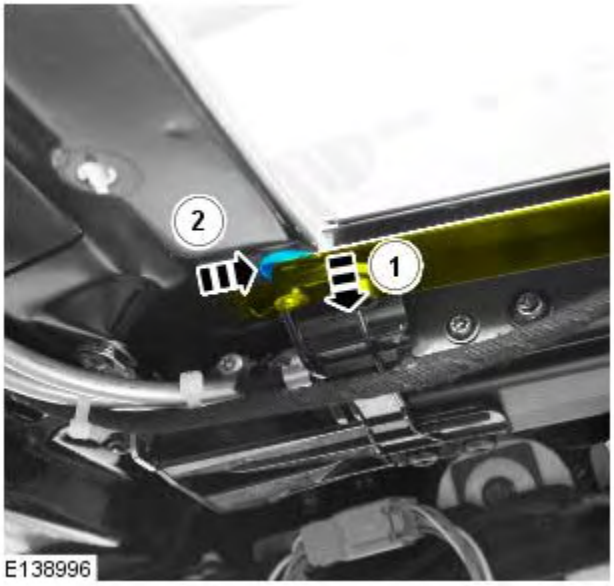
Installation



1. *Torque:* 6 Nm

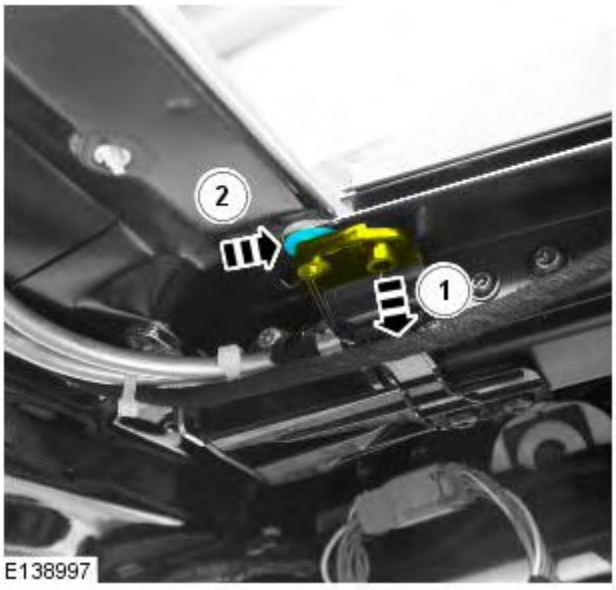


2. *Torque:* 6 Nm



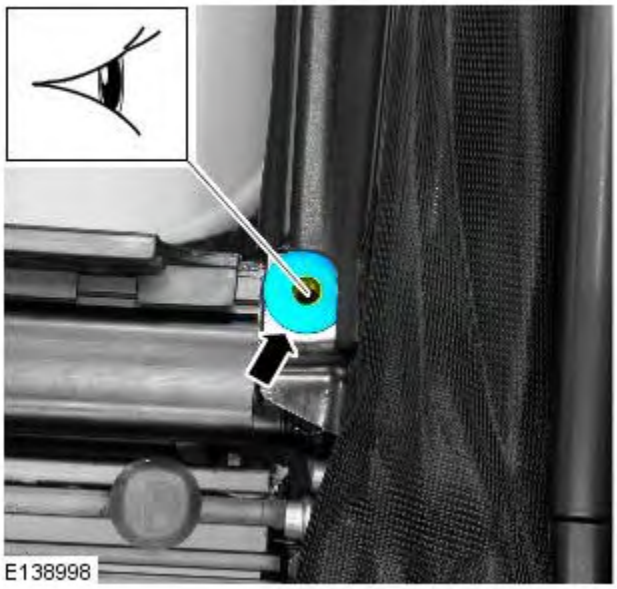
3. CAUTION: Apply gentle pressure downwards to create a gap for the washer.

   Slide the washer in from the front of the vehicle until it is aligned with the threaded hole.

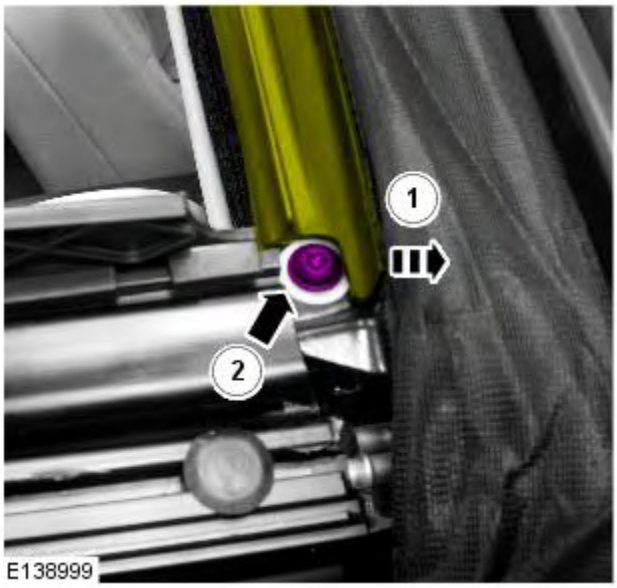


4. CAUTION: Apply gentle pressure downwards to create a gap for the washer.

   Slide the washer in from the front of the vehicle until it is aligned with the threaded hole.



5. CAUTION: Make sure that the 3 washers are correctly aligned with the threaded hole.



6. CAUTIONS:

   Make sure that the Torx bolt is not cross threaded during installation.

   Fixings must be tightened by hand to prevent damage to threads.

   Make sure that the thread is free from foreign material and debris

   NOTE: Apply gentle pressure to the trim to aid access to the Torx bolt.

   - *Torque:* 4 Nm
   - If the upper washer is free to rotate after the Torx bolt is tightened, progressively tighten the Torx bolt until the washer is fully clamped.
   - *Torque:* 90°

7. Repeat the above procedure for the other side.

8. CAUTION: Make sure that the centre and rear washers are installed prior to the securing the headliner

   Refer to: Roof Opening Panel Frame Washers - Centre (501-17 Roof Opening Panel, Removal and Installation).
   Refer to: Roof Opening Panel Frame Washers - Rear (501-17 Roof Opening Panel, Removal and Installation).

9. To install, reverse the removal procedure.

Published: 17-Feb-2012

Roof Opening Panel - Roof Opening Panel Frame Washers - Rear

Removal and Installation

Removal

CAUTION: Make sure that no more than one fixing is removed from the roof assembly at any one time.

NOTES:

Removal steps in this procedure may contain installation details.

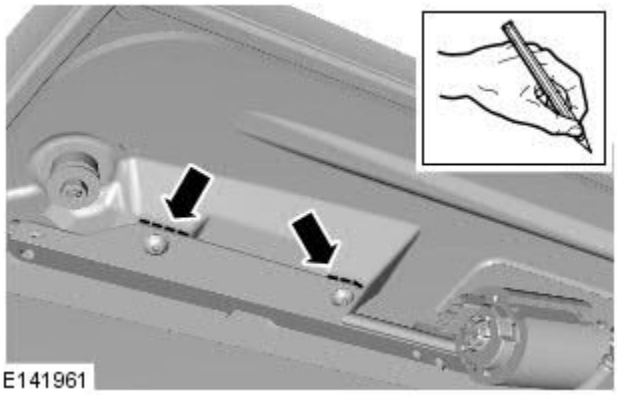
Some variation in the illustrations may occur, but the essential information is always correct.

1. CAUTION: Make sure that the front and centre washers are replaced prior to replacing the rear washers.

   NOTE: Do not secure the headlining until the front, centre and rear washers have been replaced.

   Refer to: Roof Opening Panel Frame Washers - Centre (501-17 Roof Opening Panel, Removal and Installation).

2.



3. CAUTION: Make sure that the thread is free from foreign material and debris

   NOTES:

   If installed, remove and discard the washers.

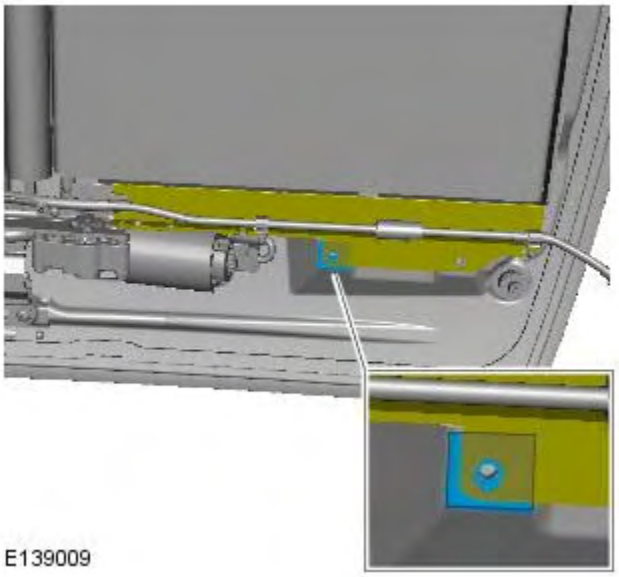
   LWB shown, SWB similar.

   LWB may have one or two Torx bolts installed, SWB has one Torx bolt installed

   - Remove and discard the Torx bolt(s)
   - Remove any traces of locking adhesive from the thread.

Installation

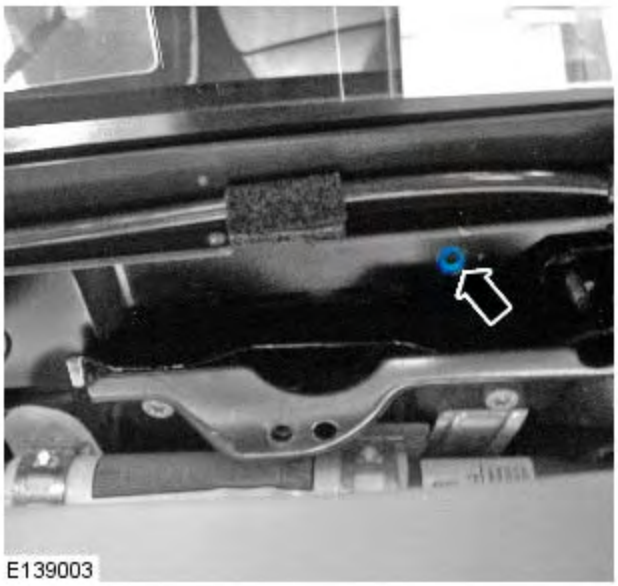
Long wheelbase



1. NOTE: Make sure that an adhesive pad is installed above the front fixing hole.

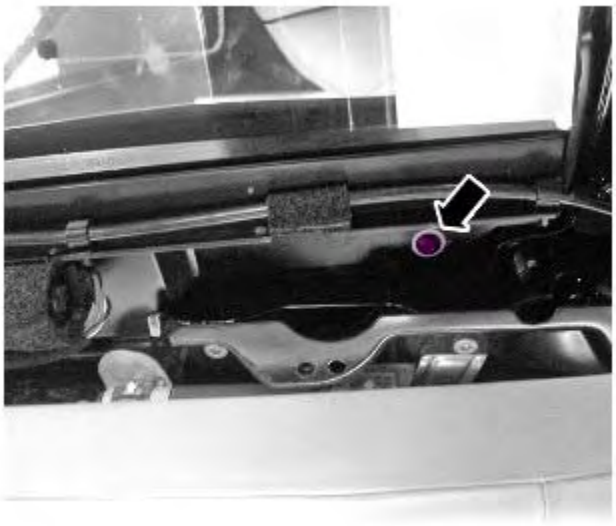
   If not already installed, install an adhesive pad above the front fixing hole.

All vehicles



2. CAUTION: Do not install the front Torx bolt on LWB vehicles.

   Slide the washer in from the centre of the vehicle until it is aligned with the threaded hole.



E139005

3. CAUTIONS:

   Make sure that the thread is free from foreign material and debris

   Make sure that the roof rail is correctly aligned.

   Torque: 4 Nm

4. Repeat the above procedure for the other side.

Published: 20-Nov-2013

Roof Opening Panel - Roof Opening Panel Glass

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

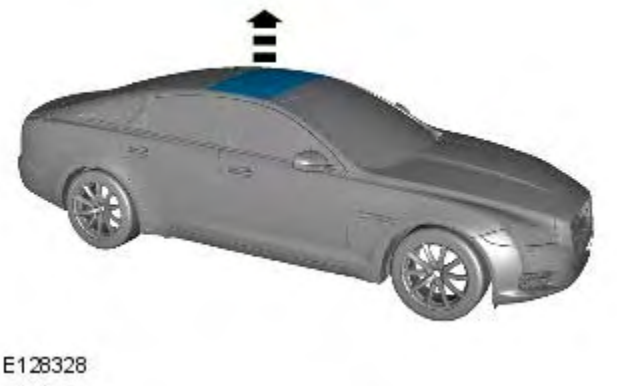
1. Refer to: Motor Synchronization (501-17 Roof Opening Panel, General Procedures).

2. Refer to: Roof Opening Panel Alignment (501-17 Roof Opening Panel, General Procedures).

3. NOTE: The procedure must be carried out on both sides.

4. NOTE: The procedure must be carried out on both sides.

   Torque: 7 Nm

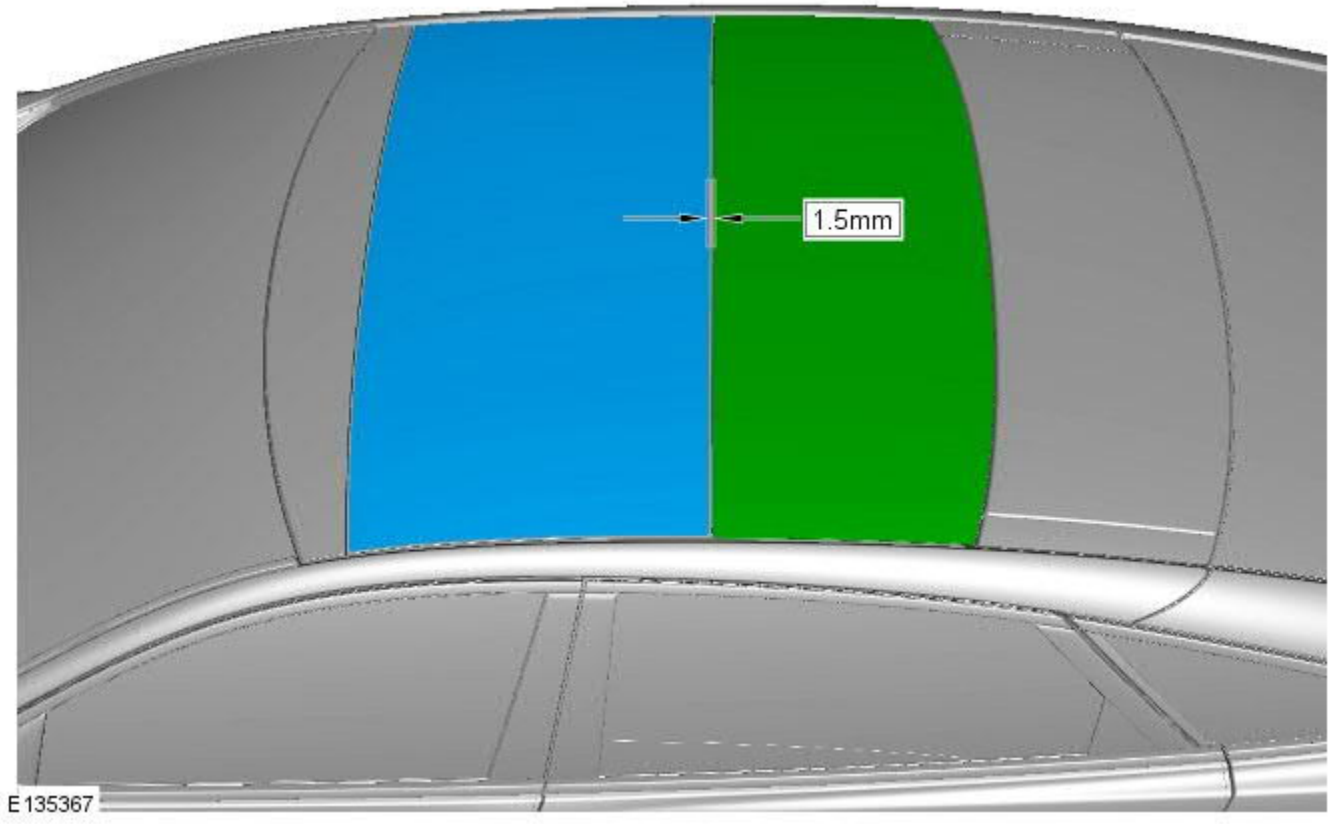


5. NOTE: This step requires the aid of another technician.

Installation

1. CAUTION: Make sure that the gap between the glass panels is as illustrated.

   To install, reverse the removal procedure.



Published: 03-Jan-2012

Roof Opening Panel - Roof Opening Panel Motor

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1. NOTE: The procedure must be carried out on both sides.

   Refer to: A-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

2. NOTE: The procedure must be carried out on both sides.

   Refer to: Sun Visor (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. *Torque:* 2 Nm

4. NOTE: The procedure must be carried out on both sides.

   Refer to: C-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

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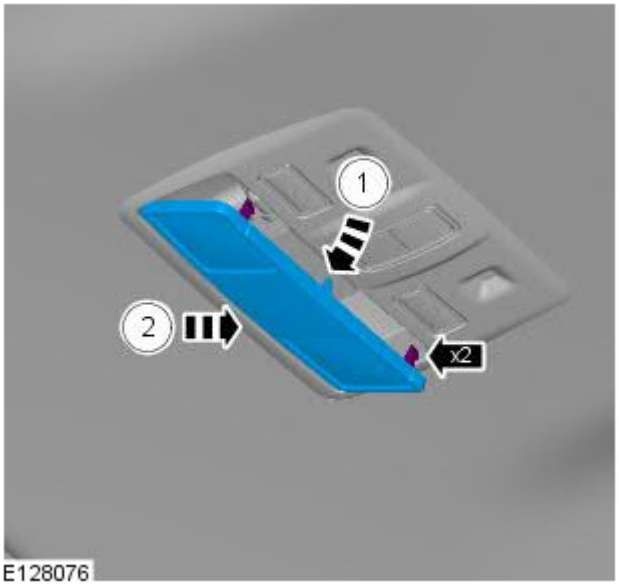
5.



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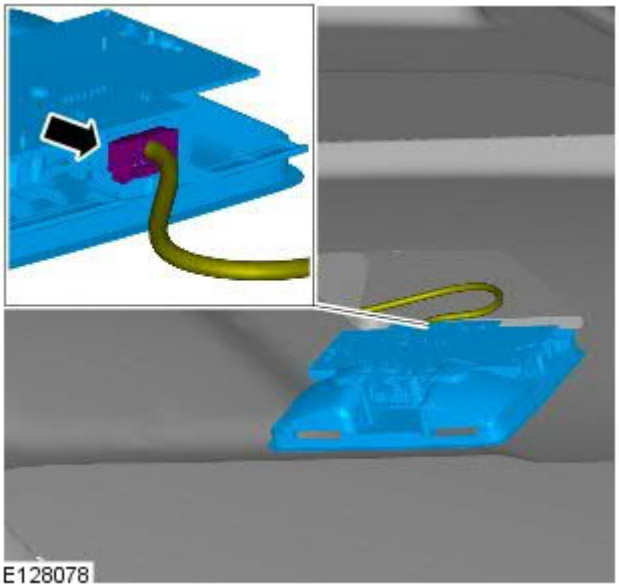
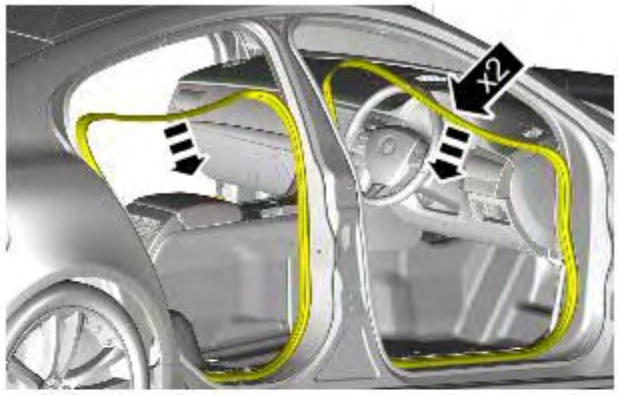
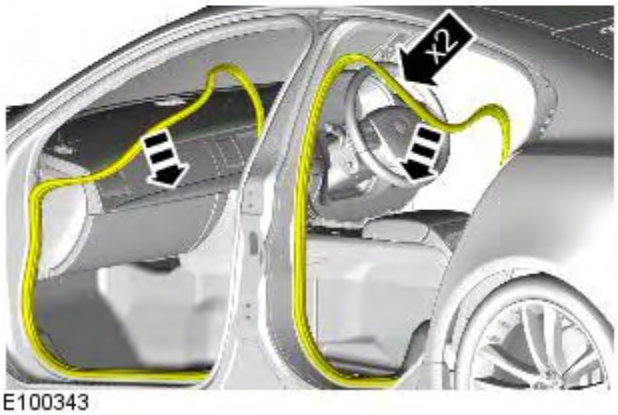
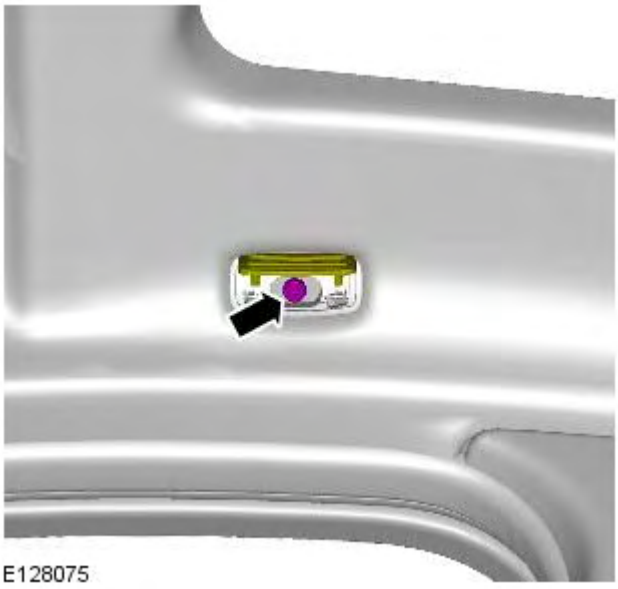






E100343

7. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E128075

8. NOTES:

Make sure that the component is installed to the position noted on removal.

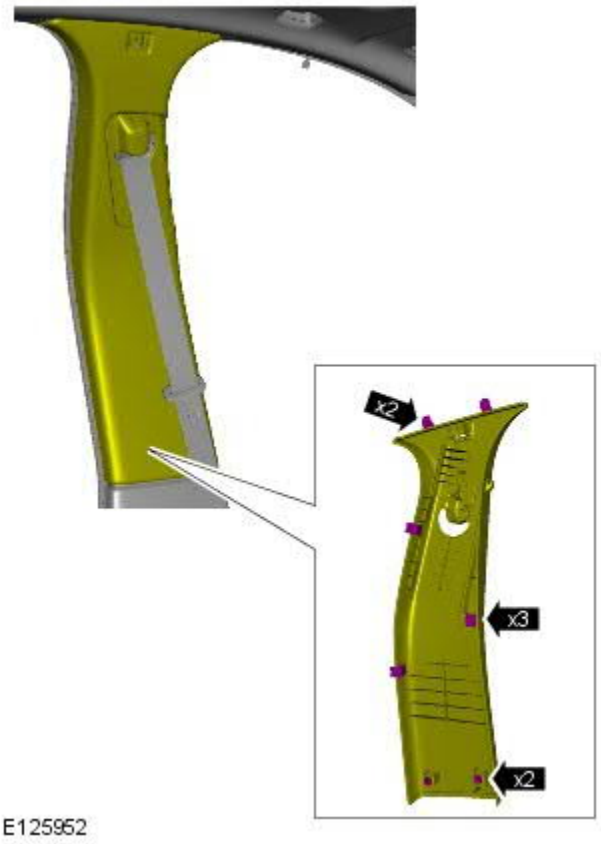
Right-hand shown, left-hand similar.

The procedure must be carried out on both sides.

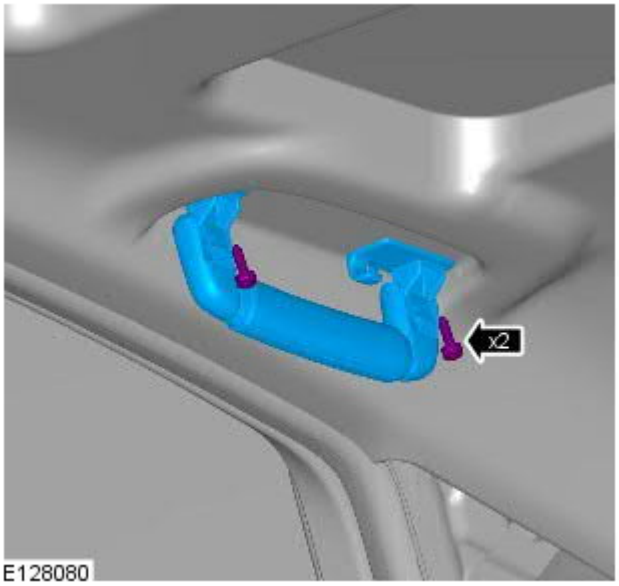
Torque: 2 Nm

9. NOTE: The procedure must be carried out on both sides.

   Torque: 6 Nm



10. NOTE: The procedure must be carried out on both sides.

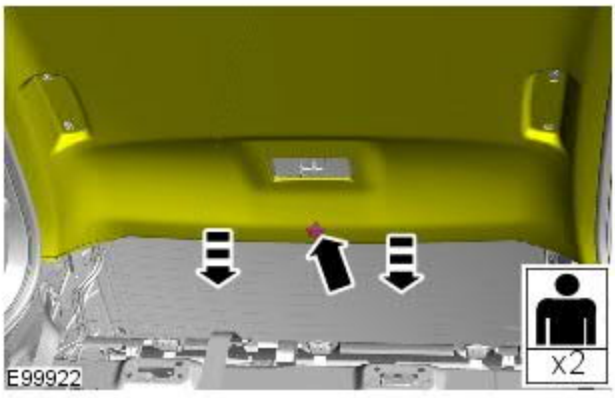


11. NOTES:

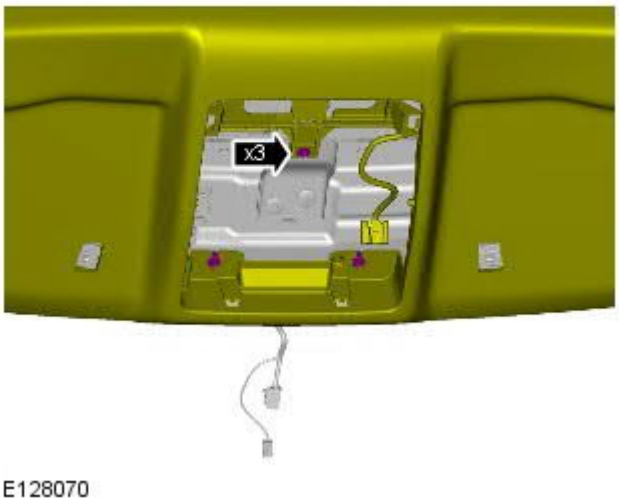
Make sure that the component is installed to the position noted on removal.

The procedure must be carried out on both sides.

Torque: 2 Nm



12. WARNING: This step requires the aid of another technician.

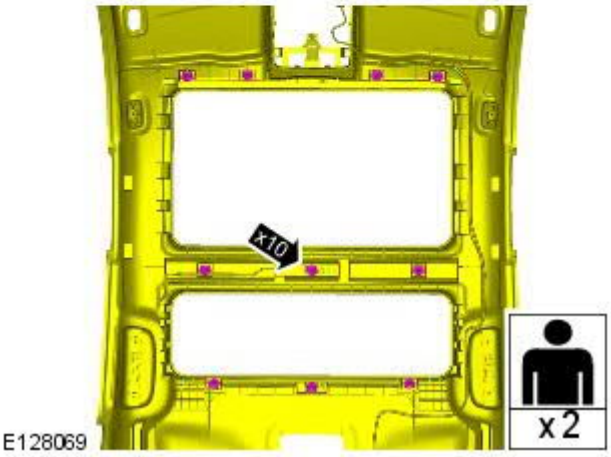


13. WARNING: This step requires the aid of another technician.

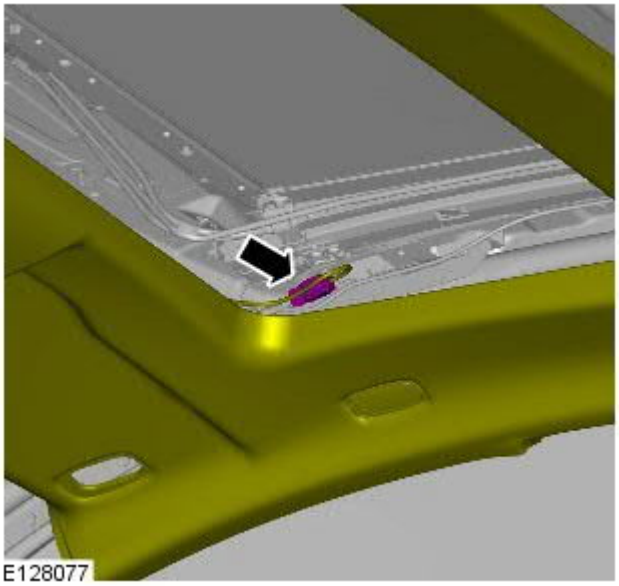
CAUTIONS:

Note the fitted position of the component prior to removal.

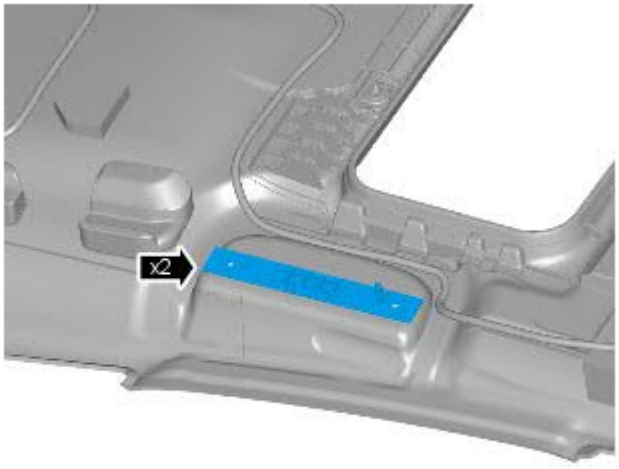
Make sure that these components are installed to the noted removal position.



14. NOTE: This step requires the aid of another technician.



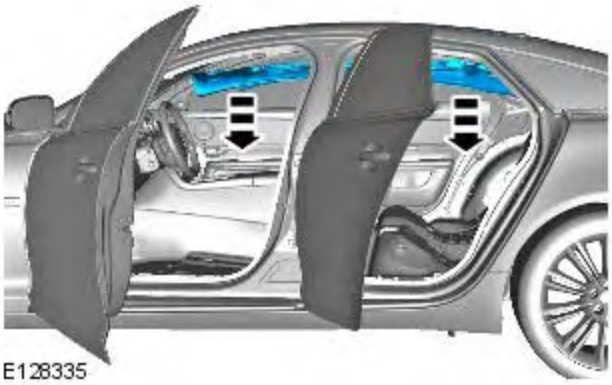
15. NOTE: This step requires the aid of another technician.



E128068

16. CAUTION: Note the fitted position of the component prior to removal.

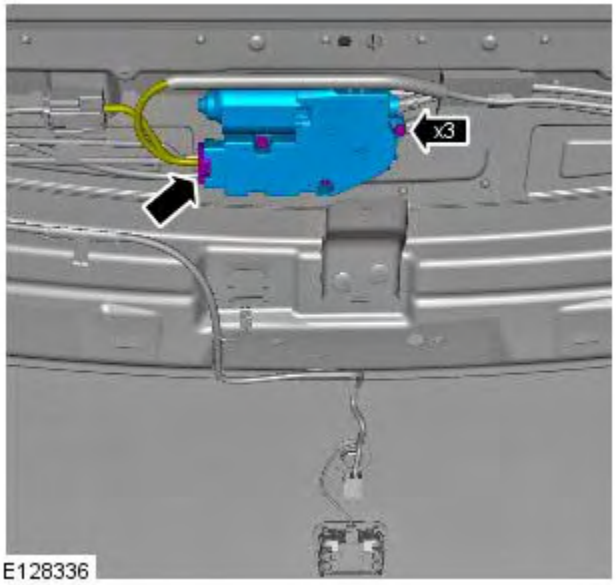
NOTE: Make sure that the component is installed to the position noted on removal.



E128335

17. CAUTION: Protect the surrounding trim to avoid damage.

NOTE: Lower and reposition the headliner to aid access.



E128336

18. *Torque:* 6 Nm

Installation

1. To install, reverse the removal procedure.

Published: 03-Jan-2012

Roof Opening Panel - Roof Opening Panel Regulator

Removal and Installation

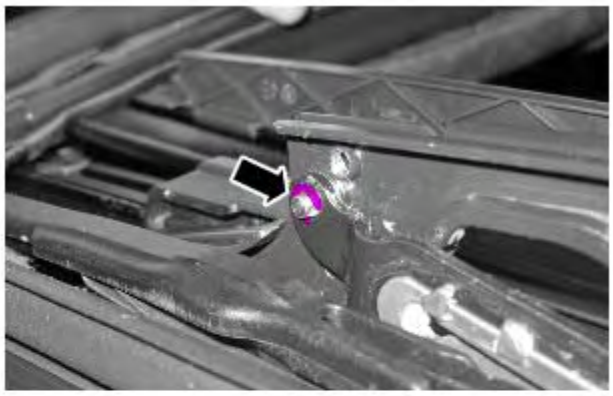
Removal

NOTES:

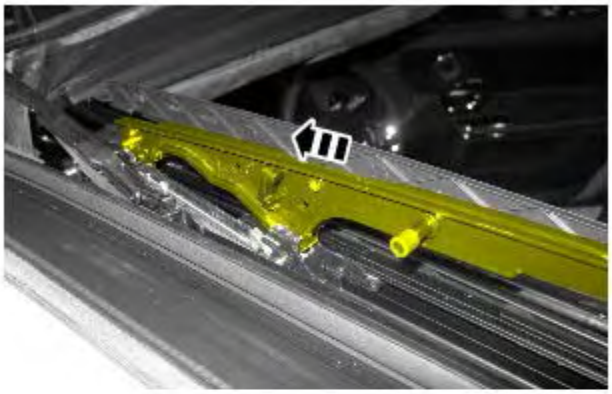
Removal steps in this procedure may contain installation details.

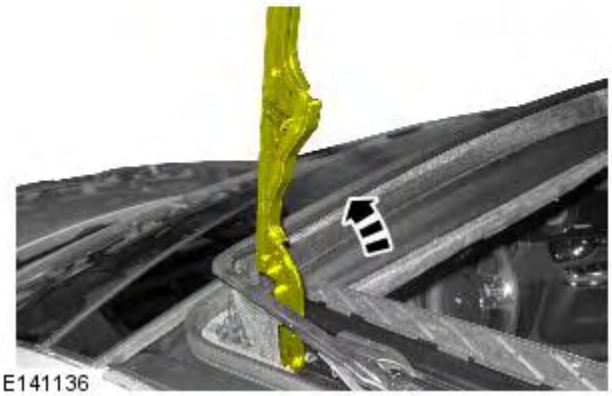
Some variation in the illustrations may occur, but the essential information is always correct.

1. Open the roof opening panel to 15 cm from the front glass roof panel.
2. Refer to: Roof Opening Panel Glass (501-17 Roof Opening Panel, Removal and Installation).
3.

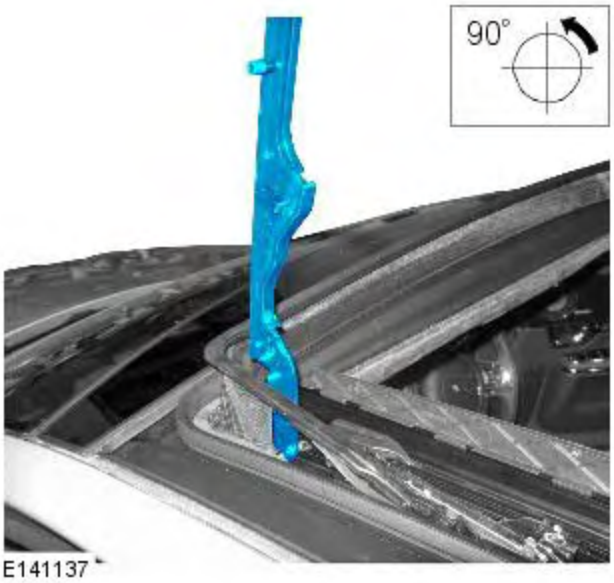


4.





5. CAUTION: Note the orientation of the component prior to removal.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

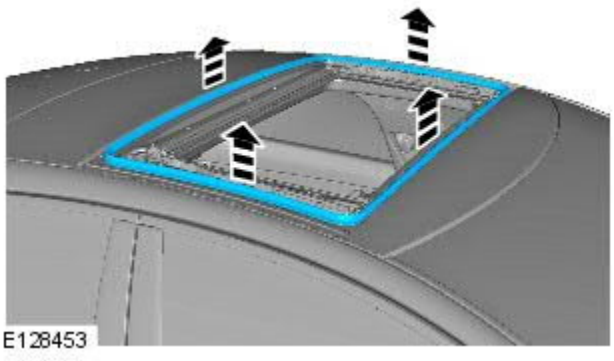
Roof Opening Panel - Roof Opening Panel Weatherstrip

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Roof Opening Panel Glass (501-17 Roof Opening Panel, Removal and Installation).



2. NOTES:

   Make sure that all traces of the old sealant are removed from the mating faces.

   The new adhesive seal must be installed between the alignment lines marked on the frame.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Bumpers -

Description	Nm	lb-ft	lb-in
Radiator splash shield outer retaining bolts	3.2	2.3	28.3
Radiator splash shield inner retaining bolts (M6)	7	5.2	62
Radiator splash shield inner retaining screws	3.2	2.3	28.3
Side bracket, wheel arch liners, and lower bumper wing retaining screws	1.5	1.1	13.3
Front bumper cover upper retaining bolts	1.9	1.4	16.8
Rear bumper bracket retaining bolts	3.2	2.3	28.3
Front bumper armature retaining bolts	55	40.5	468.8
Rear bumper armature retaining bolts	30	22.1	265.5

Published: 11-May-2011

Bumpers - Front Bumper
Removal and Installation

Removal

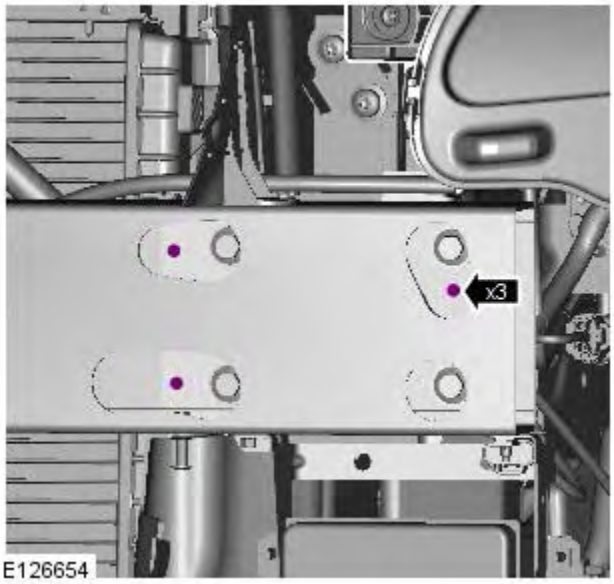
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

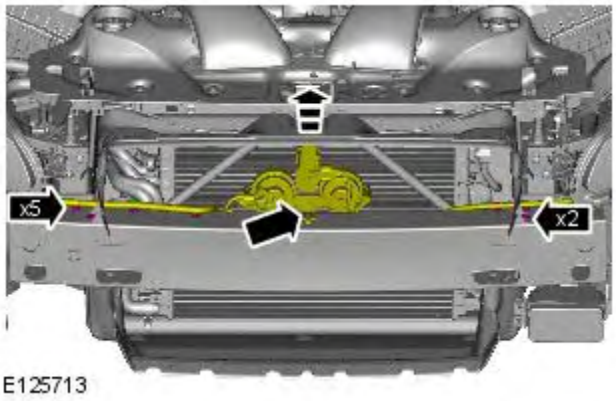


4. CAUTIONS:

   Use a drill stop. Do not drill deeper than 5 mm.

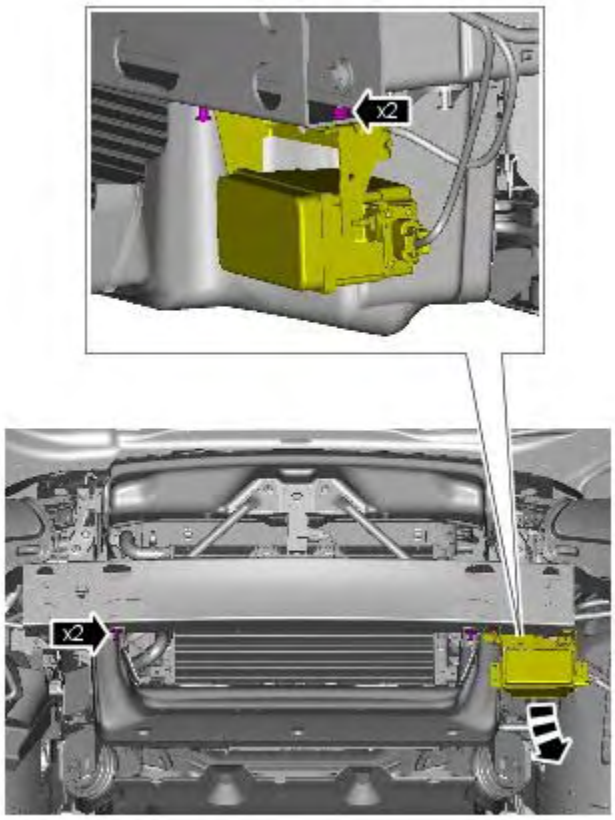
   LH illustration shown, RH is similar.

   NOTE: The procedure must be carried out on both sides.



5. NOTE: Support as necessary.

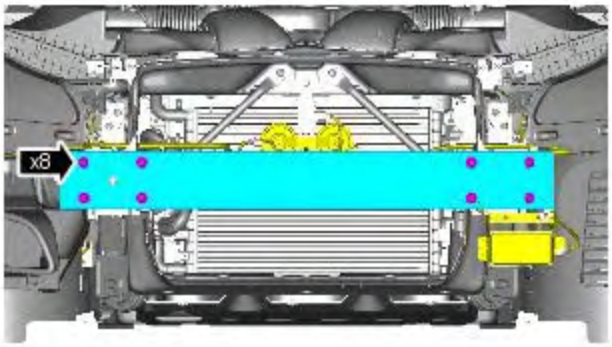
   Torque: 10 Nm



E125714

6. NOTE: Support as necessary.

Torque: 10 Nm



E125715

7. CAUTION: Protect the surrounding components.

Torque: 55 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Bumpers - Front Bumper Cover

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

The ignition must be switched off.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

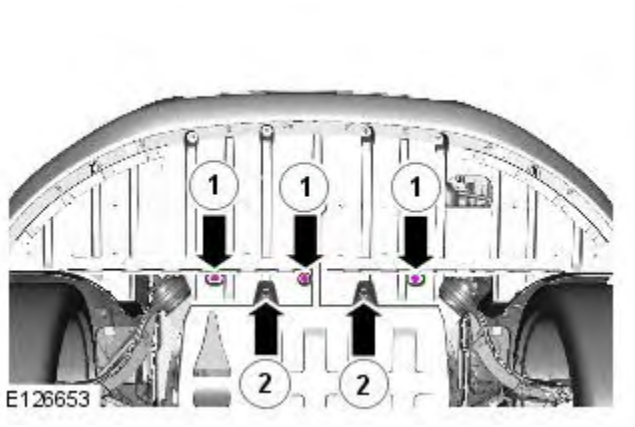
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Remove both the front wheels and tires.

   Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

4. *Torque:*
   1 7 Nm
   2 3.2 Nm

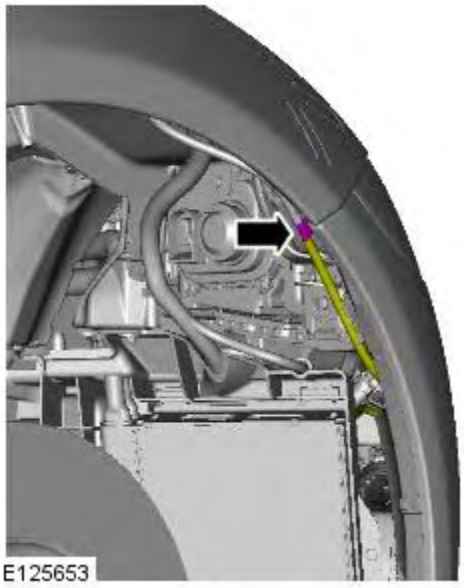


5. NOTES:

   RH illustration shown, LH is similar.

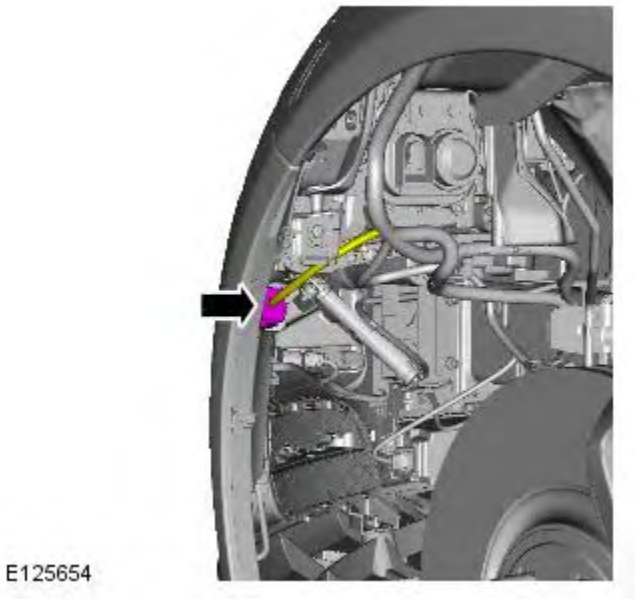
   The procedure must be carried out on both sides.

   Torque: 1.5 Nm



6.

7.

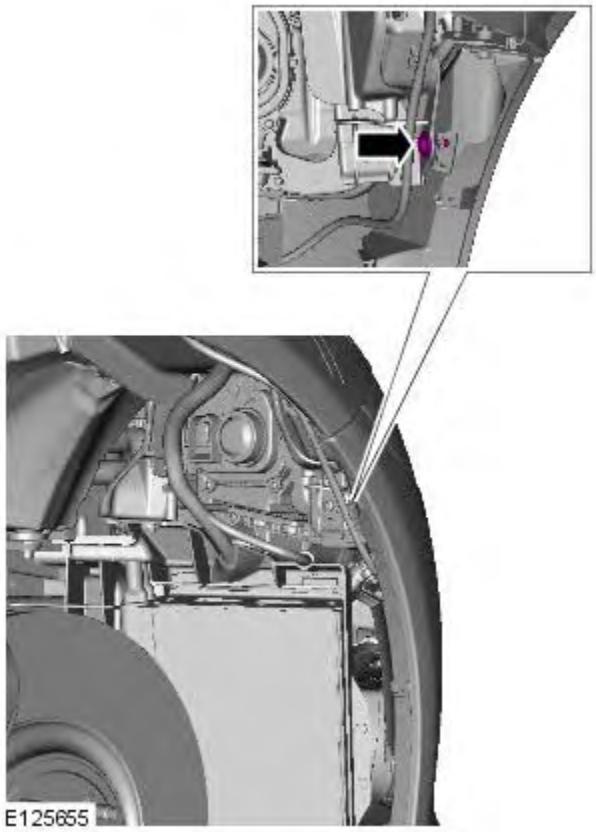


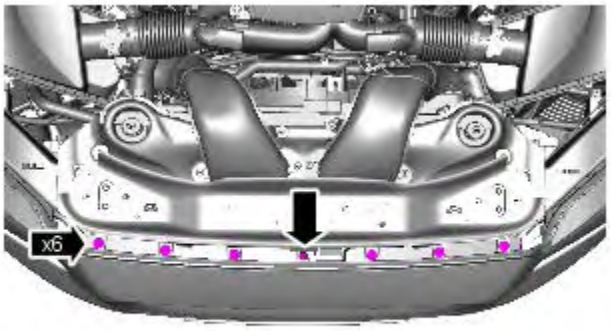
8. NOTES:

RH illustration shown, LH is similar.

The procedure must be carried out on both sides.

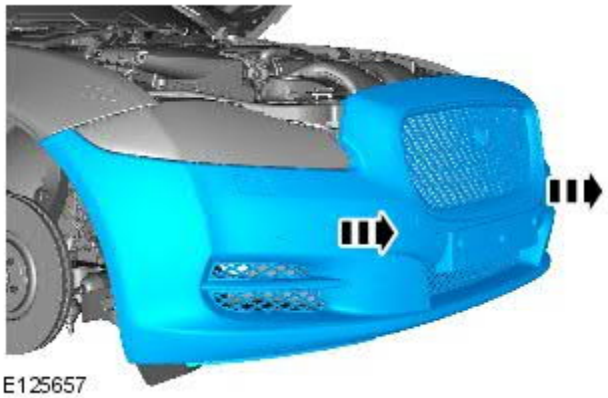
Torque: 3.2 Nm





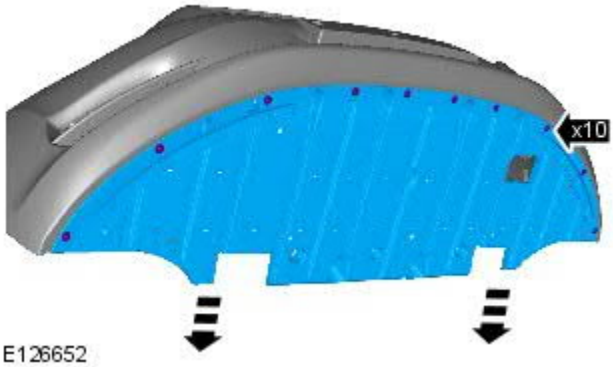
E125656

9. *Torque:* 1.9 Nm



E125657

10.

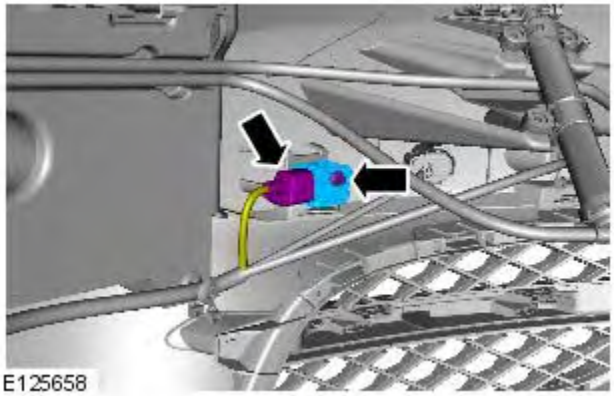


E126652

11. CAUTION: Make sure that the clips are correctly located.

NOTE: Do not disassemble further if the component is removed for access only.

Torque: 7 Nm



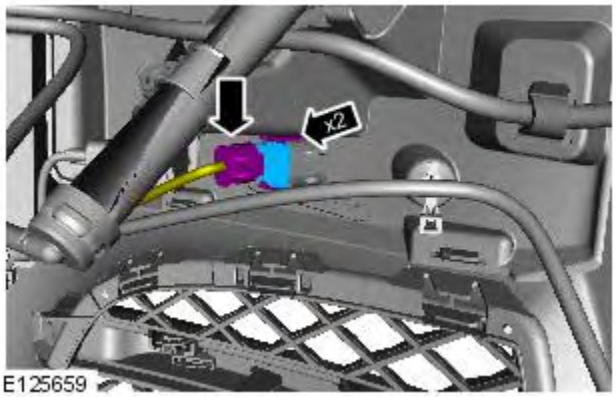
E125658

12. NOTES:

The procedure must be carried out on both sides.

RH illustration shown, LH is similar.

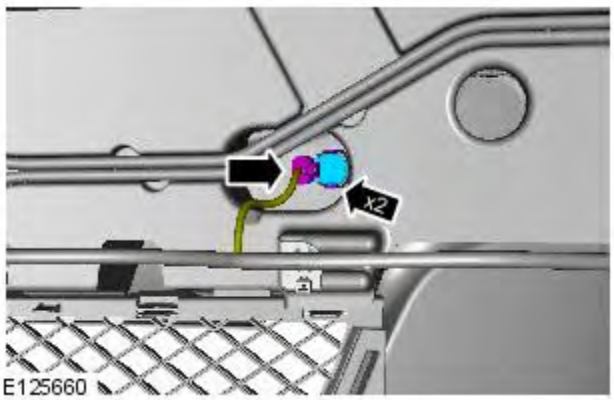
Torque: 3.2 Nm



13. NOTES:

RH illustration shown, LH is similar.

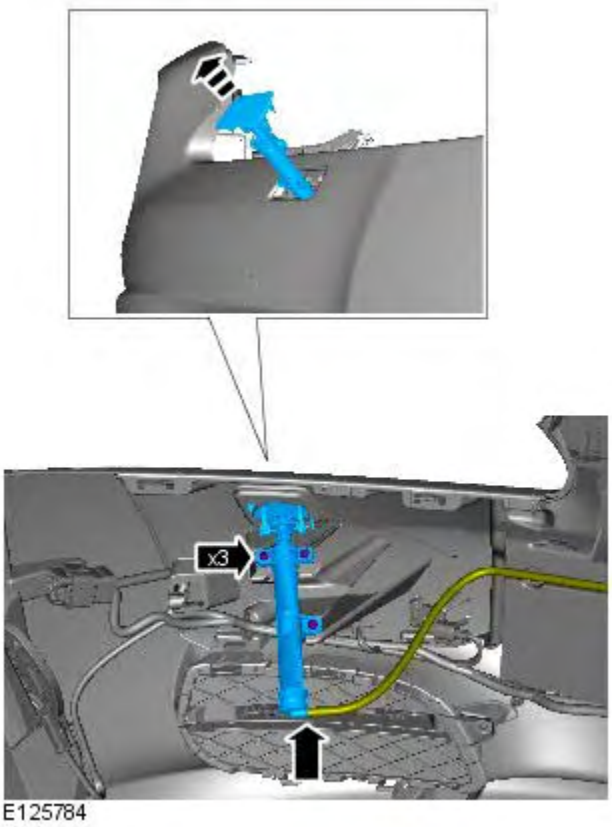
The procedure must be carried out on both sides.



14. NOTES:

RH illustration shown, LH is similar.

The procedure must be carried out on both sides.

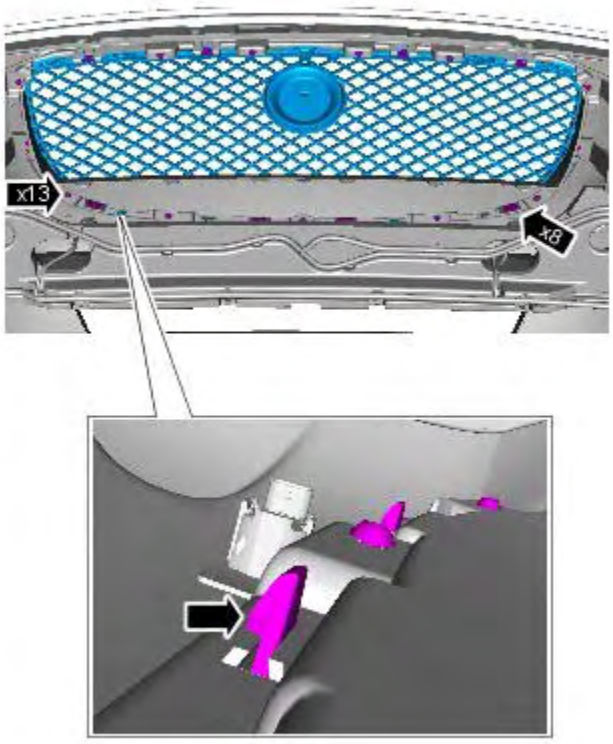


15. NOTES:

LH illustration shown, RH is similar.

The procedure must be carried out on both sides.

Torque: 1.5 Nm



E126651

16. CAUTIONS:

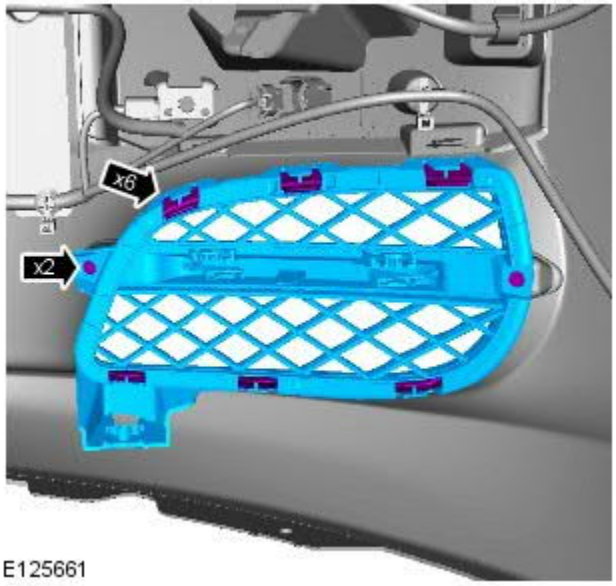
Protect the surrounding paintwork to avoid damage.

Take extra care not to damage the clips.

Torque: 1.5 Nm

17.

E126650



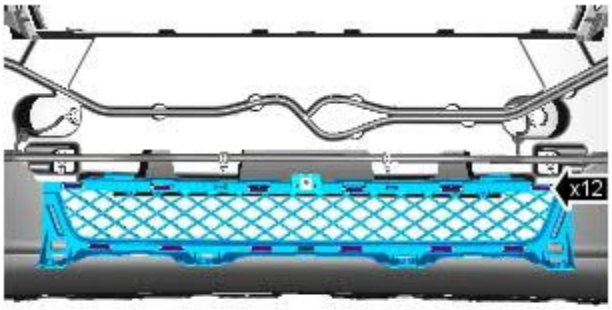
E125661

18. NOTES:

RH illustration shown, LH is similar.

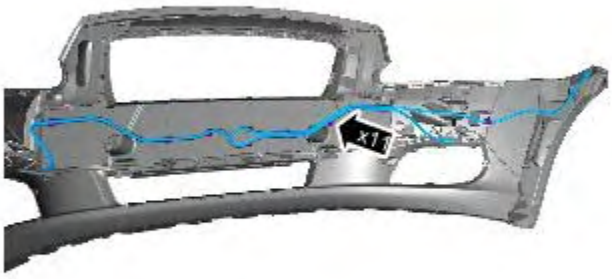
The procedure must be carried out on both sides.

Torque: 1.5 Nm



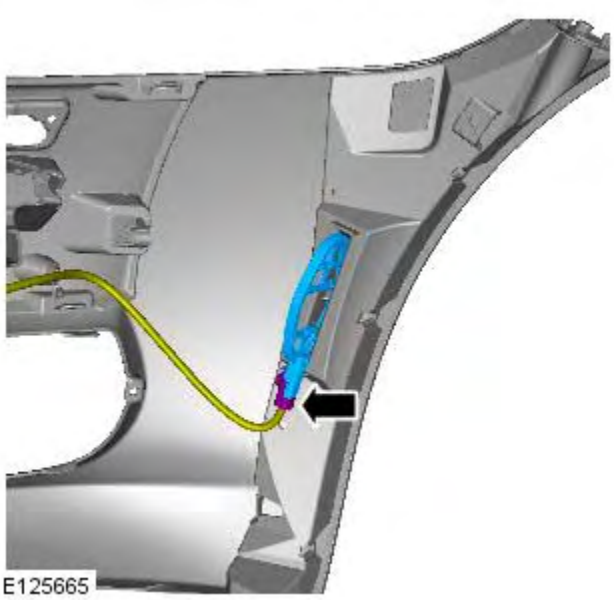
E125662

19. CAUTION: Take extra care not to damage the clips.



E125664

20. NOTE: Take note of the routing.


E125665

21. NOTES:

RH illustration shown, LH is similar.

The procedure must be carried out on both sides.

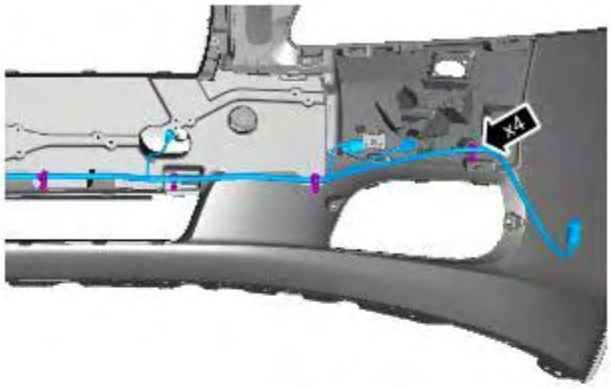
E125666

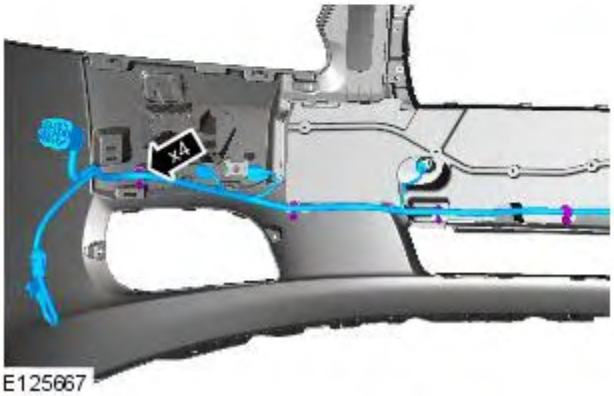
22. CAUTION: Make sure the locating dowels are installed correctly.

NOTES:

RH illustration shown, LH is similar.

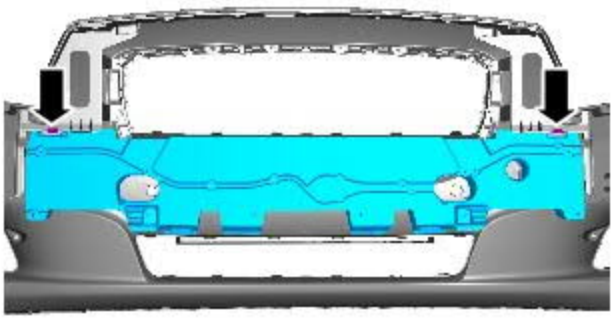
The procedure must be carried out on both sides.





E125667

23. NOTE: Make sure the wiring harness is routed correctly.



E125668

24.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

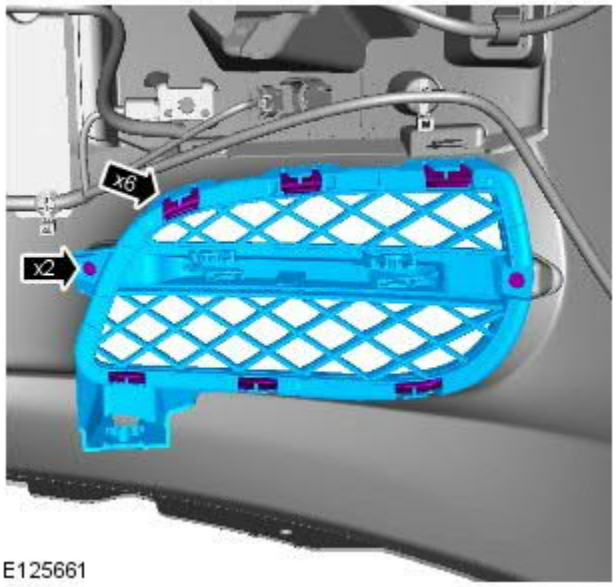
Bumpers - Front Bumper Cover Insert

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

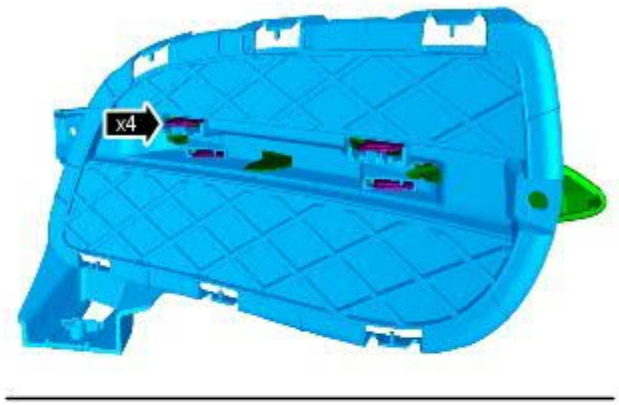
1. Refer to: Radiator Splash Shield (501-02 Front End Body Panels, Removal and Installation).

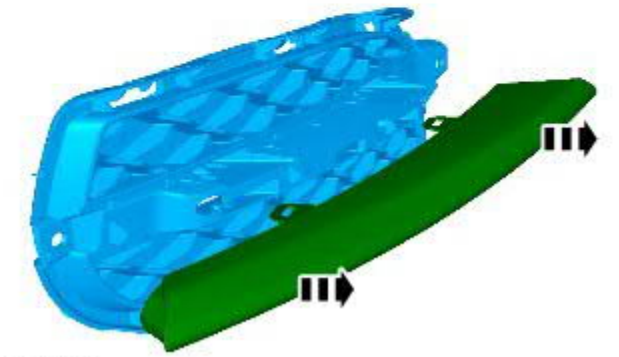


E125661

2. NOTE: RH illustration shown, LH is similar.

   Torque: 1.5 Nm





E127405

3. NOTES:

   Do not disassemble further if the component is removed for access only.

   RH illustration shown, LH is similar.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Bumpers - Rear Bumper Cover

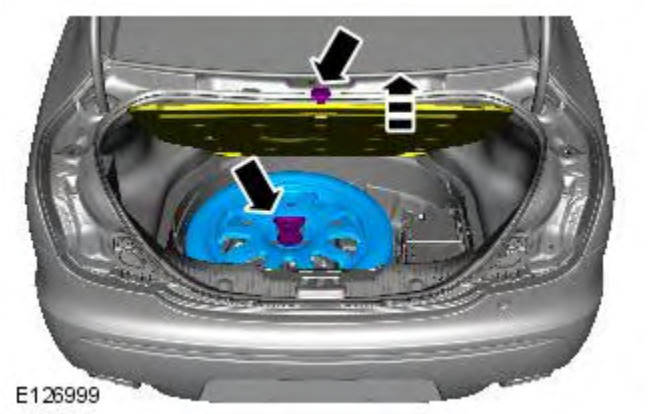
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

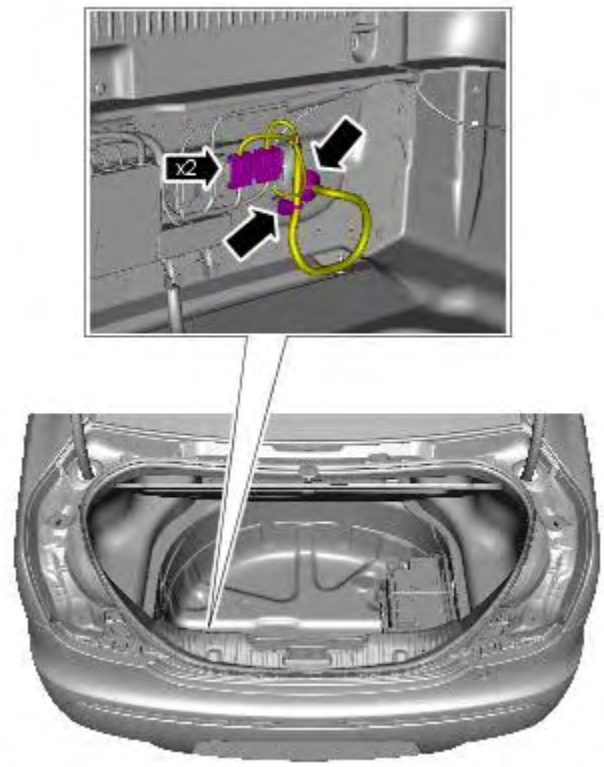
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.
3. NOTE: The procedure must be carried out on both sides.

   Refer to: Rear Lamp Assembly (417-01 Exterior Lighting, Removal and Installation).
4. 

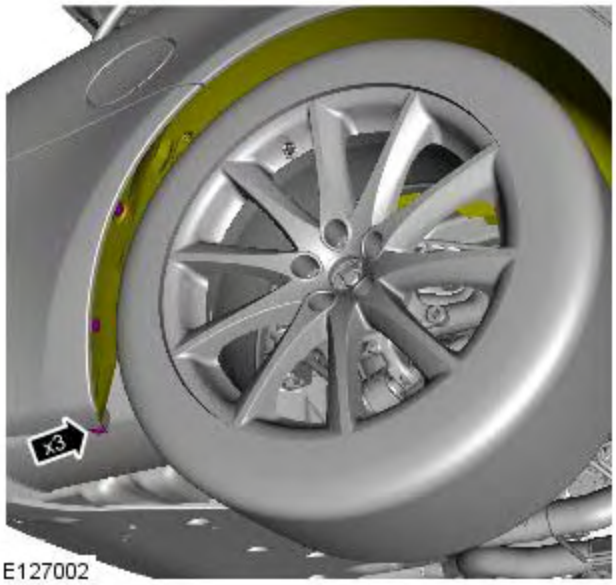
5.

www.JagDocs.com



E127001

6. CAUTION: Take extra care not to damage the wiring harnesses.



E127002

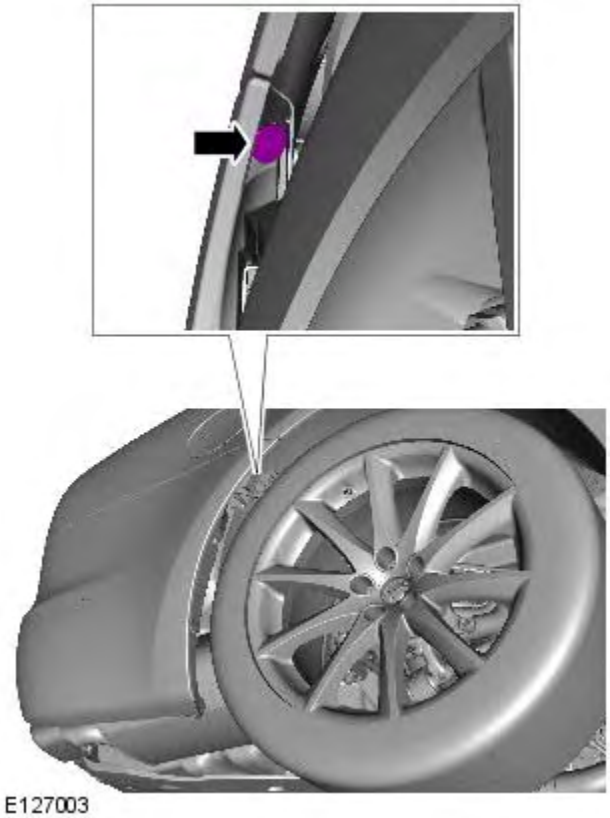
7. CAUTION: Protect the surrounding trim to avoid damage.

NOTES:

RH illustration shown, LH is similar.

The procedure must be carried out on both sides.

Torque: 1.5 Nm


E127003

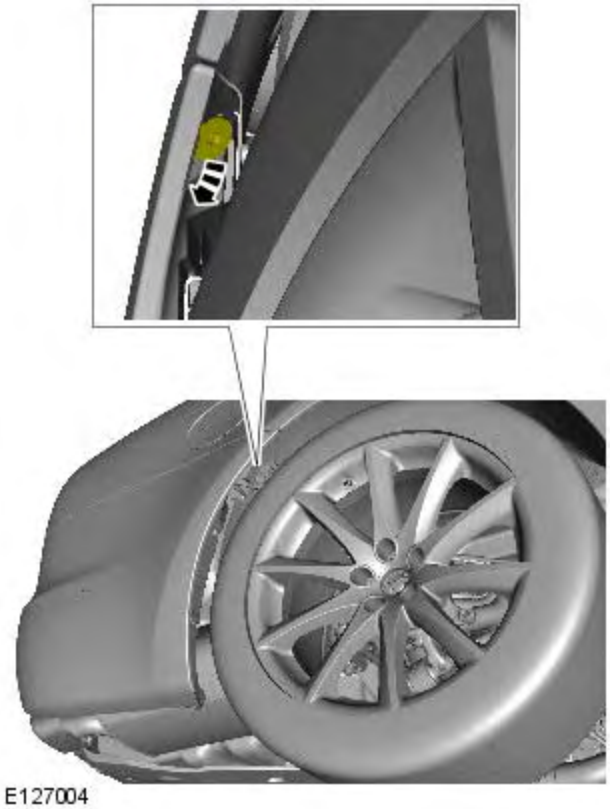
8. CAUTION: Protect the surrounding trim to avoid damage.

   NOTES:

   RH illustration shown, LH is similar.

   The procedure must be carried out on both sides.

   Torque: 1.5 Nm


E127004

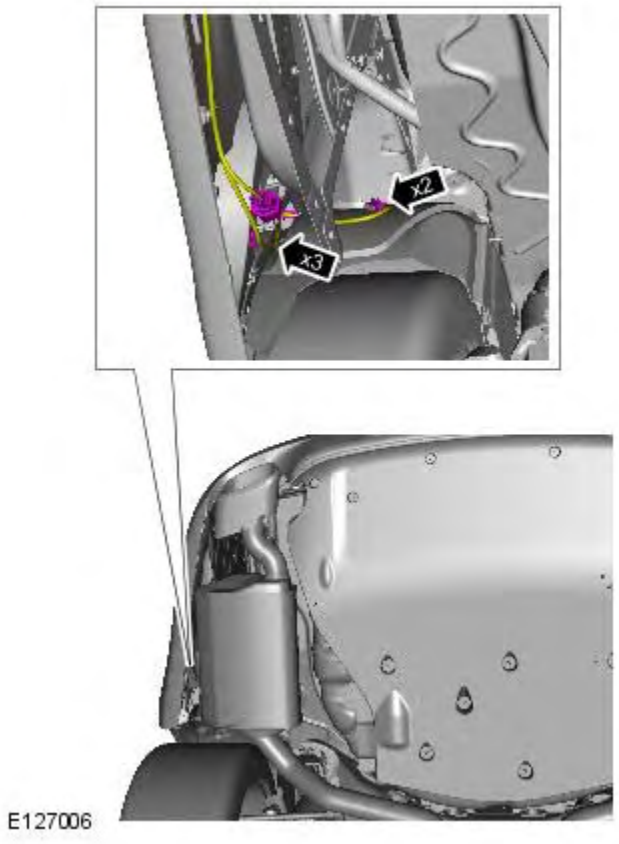
9. CAUTION: Protect the surrounding trim to avoid damage.

   NOTES:

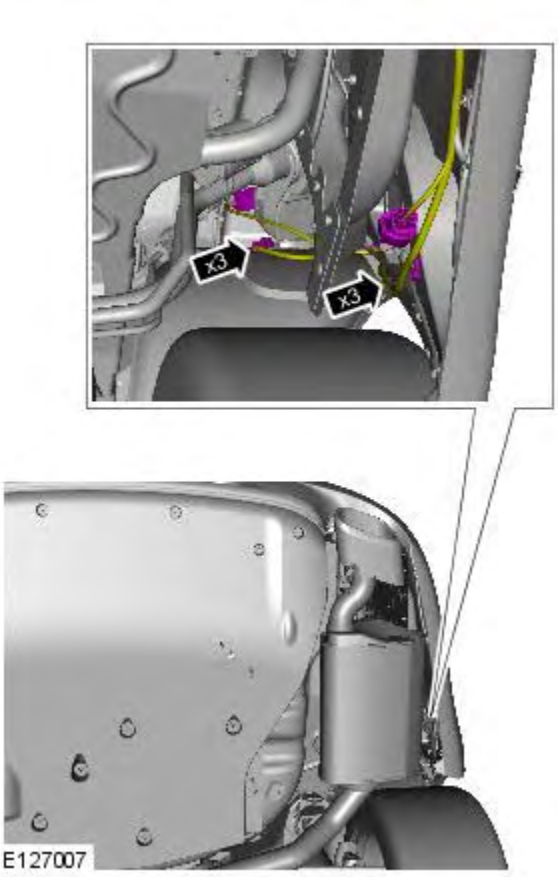
   RH illustration shown, LH is similar.

   The procedure must be carried out on both sides.

10. *Torque:* 3.2 Nm

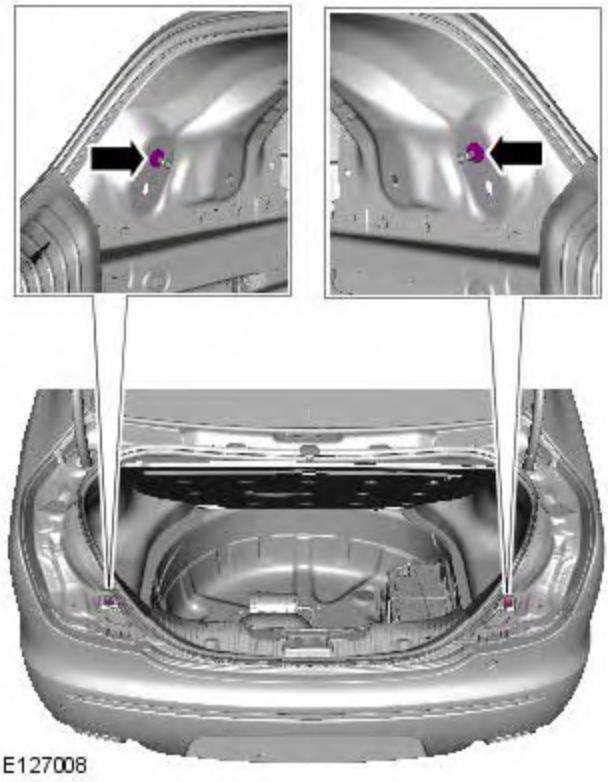


11. CAUTION: Take extra care not to damage the wiring harnesses.

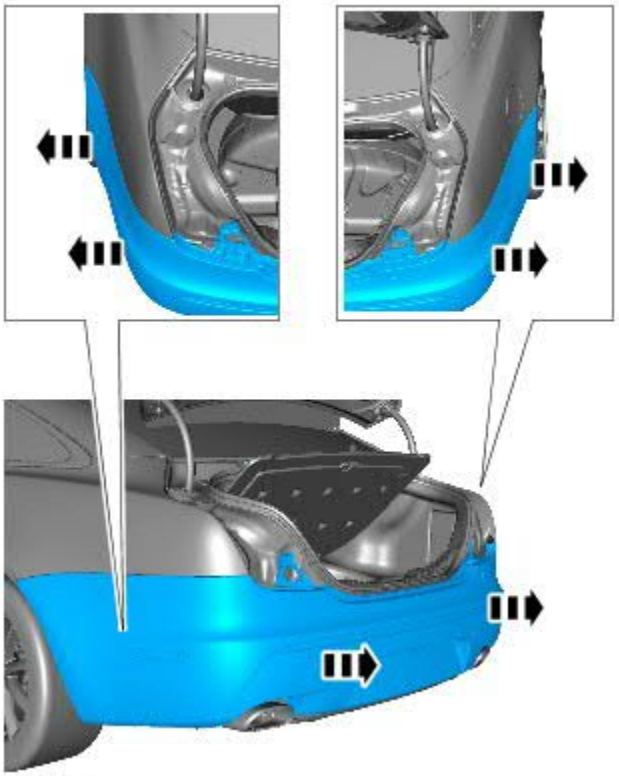


12. CAUTION: Take extra care not to damage the wiring harnesses.

13. *Torque:* 3.2 Nm



14. CAUTION: Note of the routing of the wiring harnesses.


E127009

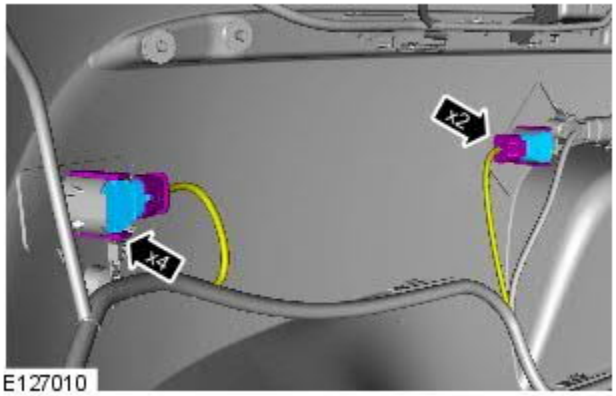
15. CAUTION: Take extra care not to damage the wiring harnesses.

NOTES:

Do not disassemble further if the component is removed for access only.

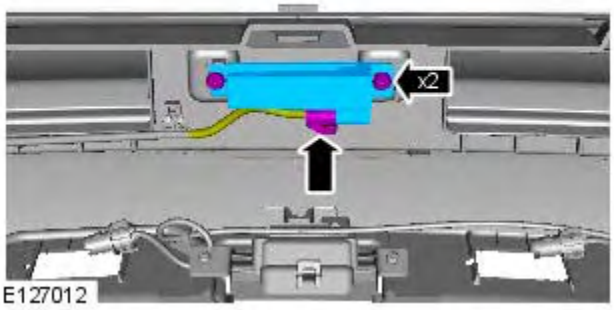
RH illustration shown, LH is similar.

The procedure must be carried out on both sides.



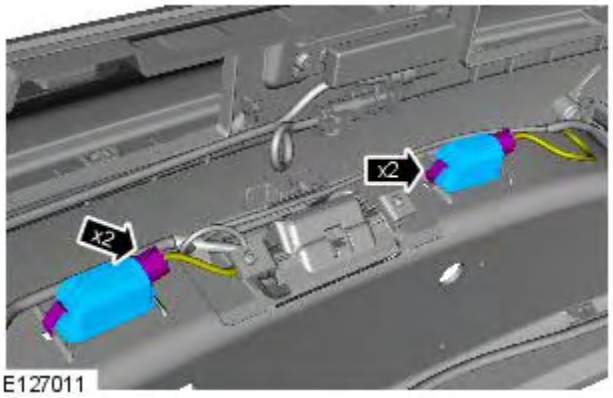
E127010

16. *Torque:* 1.5 Nm



E127012

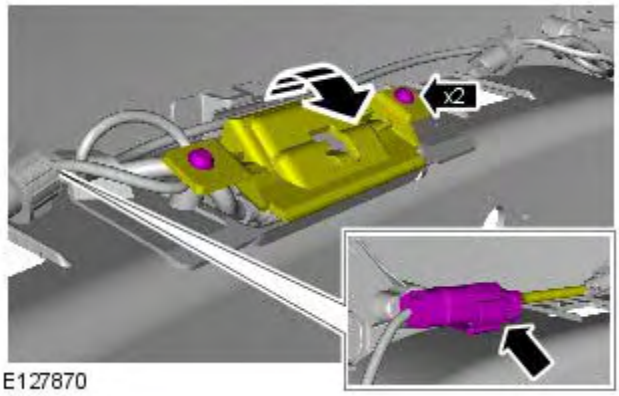
17.



E127011

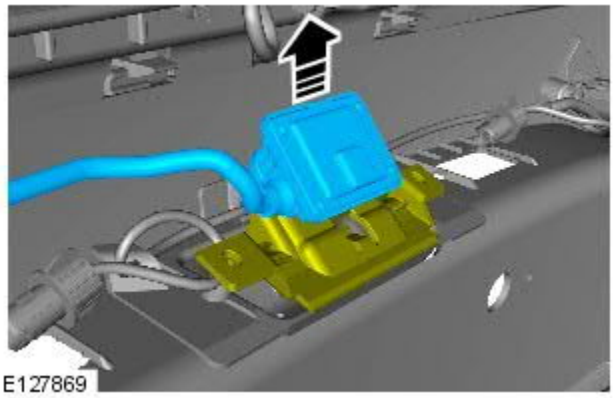
18. CAUTION: Take extra care not to damage the component.

Torque: 1.5 Nm

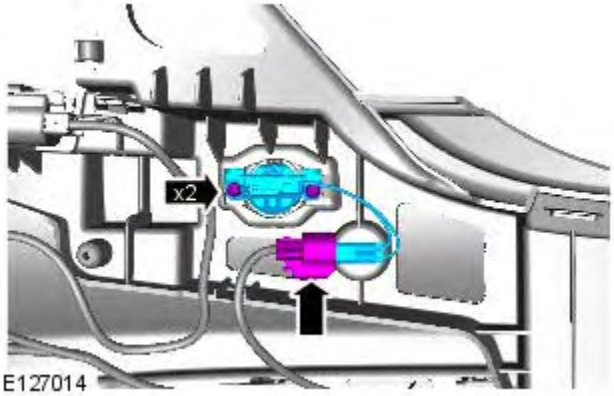


E127870

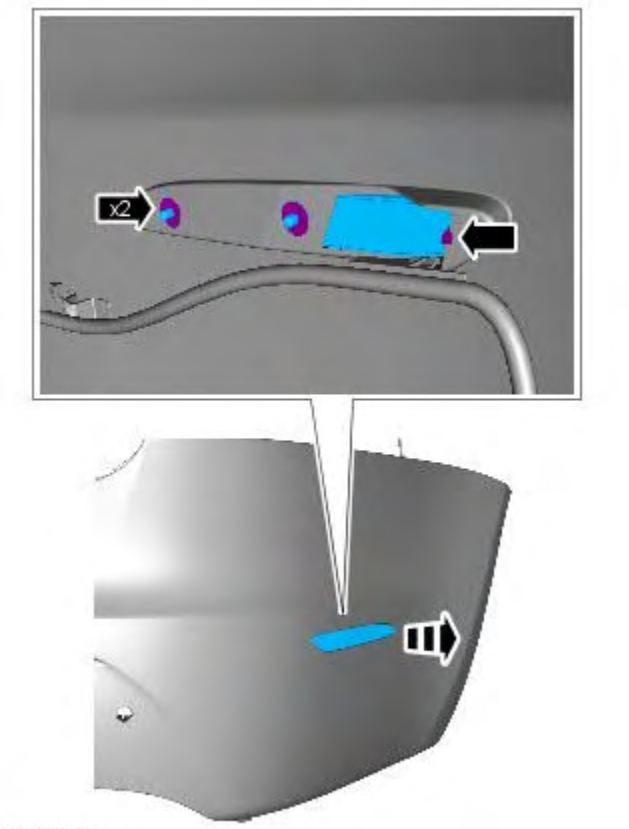
19.


E127869

20. *Torque:* 1.5 Nm



E127014



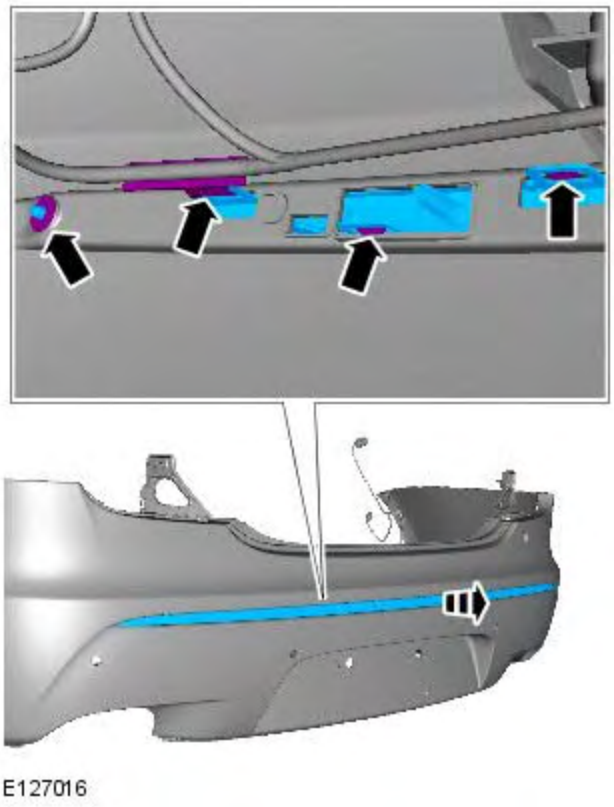
E127015

21. CAUTION: Take extra care not to damage the clips.

NOTES:

RH illustration shown, LH is similar.

The procedure must be carried out on both sides.

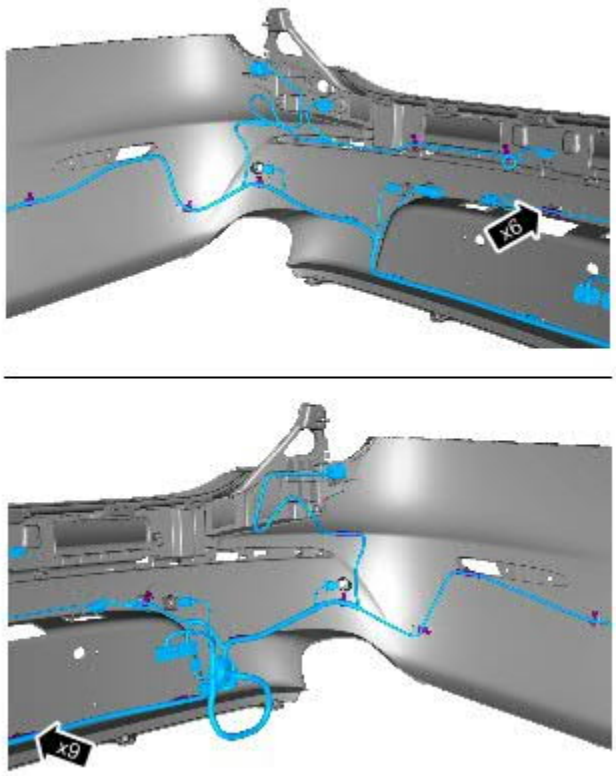


E127016

22. CAUTION: Take extra care not to damage the clips.

NOTE: The procedure must be carried out on both sides.

23. CAUTION: Note of the routing of the wiring harnesses.



E127017

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Bumpers - Rear Bumper

Removal and Installation

Removal

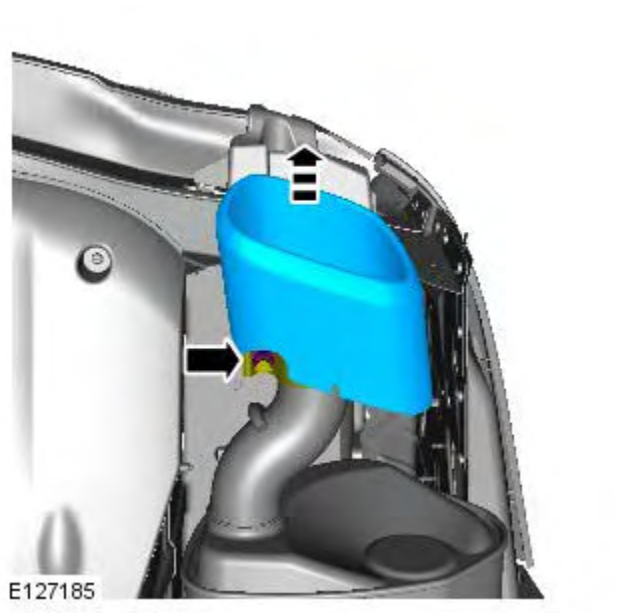
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Refer to: Rear Bumper Cover (501-19 Bumpers, Removal and Installation).



4. NOTES:

   RH illustration shown, LH is similar.

   The procedure must be carried out on both sides.

   Torque: 25 Nm

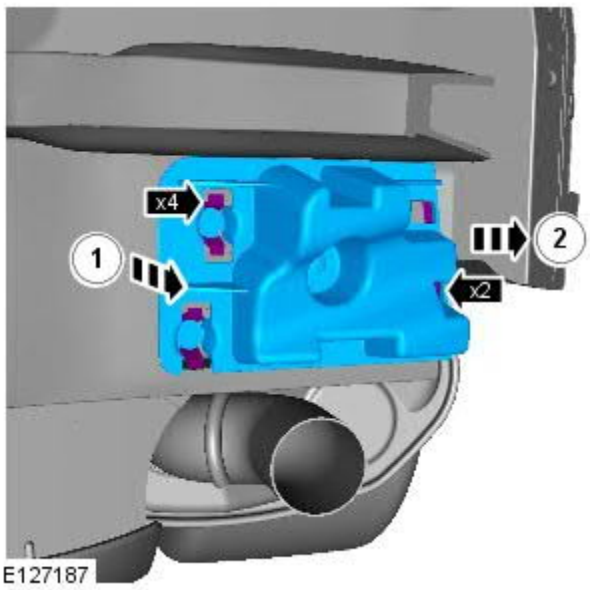
5. CAUTION: Make sure that the exhaust system is supported with suitable retaining straps.

   NOTES:

   RH illustration shown, LH is similar.

   The procedure must be carried out on both sides.

   Torque: 25 Nm



6. NOTES:

   RH illustration shown, LH is similar.

   The procedure must be carried out on both sides.

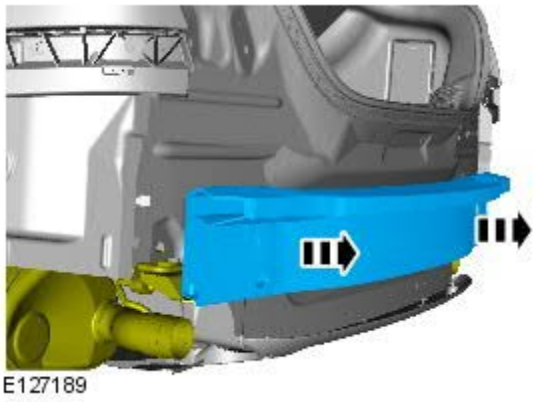
7. NOTES:

   RH illustration shown, LH is similar.

   The procedure must be carried out on both sides.

   Support as necessary.

   Torque: 30 Nm



8.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Safety Belt System -

Torque Specifications

Description	Nm	lb-ft	lb-in
Front safety belt retractor to seat track retaining bolt	40	30	-
Front safety belt retractor retaining bolt	40	30	-
Front safety belt D loop retaining bolt	40	30	-
Front safety belt buckle retaining bolt	40	30	-
Front safety belt shoulder height adjuster retaining bolts	25	18	-
Rear centre safety belt retractor retaining bolts	40	30	-
Rear safety belt long end retaining bolts	40	30	-
Rear safety belt D loop retaining bolt	40	30	-
Rear safety belt long end retaining bolt	40	30	-
Rear safety belt buckle retaining bolts	40	30	-

Published: 18-Sep-2012

Safety Belt System - Safety Belt System - Component Location

Description and Operation

COMPONENT LOCATION

Item	Description
1	Belt tension sensor (NAS Vehicles Only)
2	RH (right-hand) front safety belt retractor and pretensioner (if fitted)
3	RH front safety belt
4	RH child seat mounting bracket
5	RH rear safety belt
6	RH rear safety belt retractor
7	Parcel tray child seat anchor (3 off)
8	Center rear safety belt retractor
9	LH (left-hand) rear safety belt retractor
10	LH child seat mounting bracket
11	LH and center rear safety belt buckles
12	RH rear safety belt buckle
13	LH front safety belt
14	LH front safety belt retractor and pretensioner
15	LH front safety belt buckle and pretensioner
16	RH front safety belt buckle and pretensioner

Published: 18-Sep-2012

Safety Belt System - Safety Belt System - Overview

Description and Operation

OVERVIEW

A three point safety belt is installed at each seat position. The front safety belts have height adjusters installed on the B/C pillars.

As part of the SRS (supplemental restraint system) system, a pyrotechnic pretensioner is integrated into each front safety belt buckle and each front safety belt retractor. A tension sensor is installed on the anchor point of the front passenger safety belt for NAS only vehicles.
Refer to: Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) (501-20B Supplemental Restraint System, Description and Operation).

NOTE: Prior MY11 NAS vehicles only, you will find a pretensioner on the safety belt buckle and safety belt retractor on the driver's side only and a pretensioner on the safety buckle on passenger side.

A safety belt reminder and a belt minder system warn the driver if the safety belt of an occupied front seat is not fastened, or if a front or rear safety belt is unfastened during the journey.

ISOFIX anchor points are provided for the installation of rear child seats. Three anchor points are attached to the parcel tray and two mounting brackets are incorporated into the rear seat hinge brackets.

Published: 18-Sep-2012

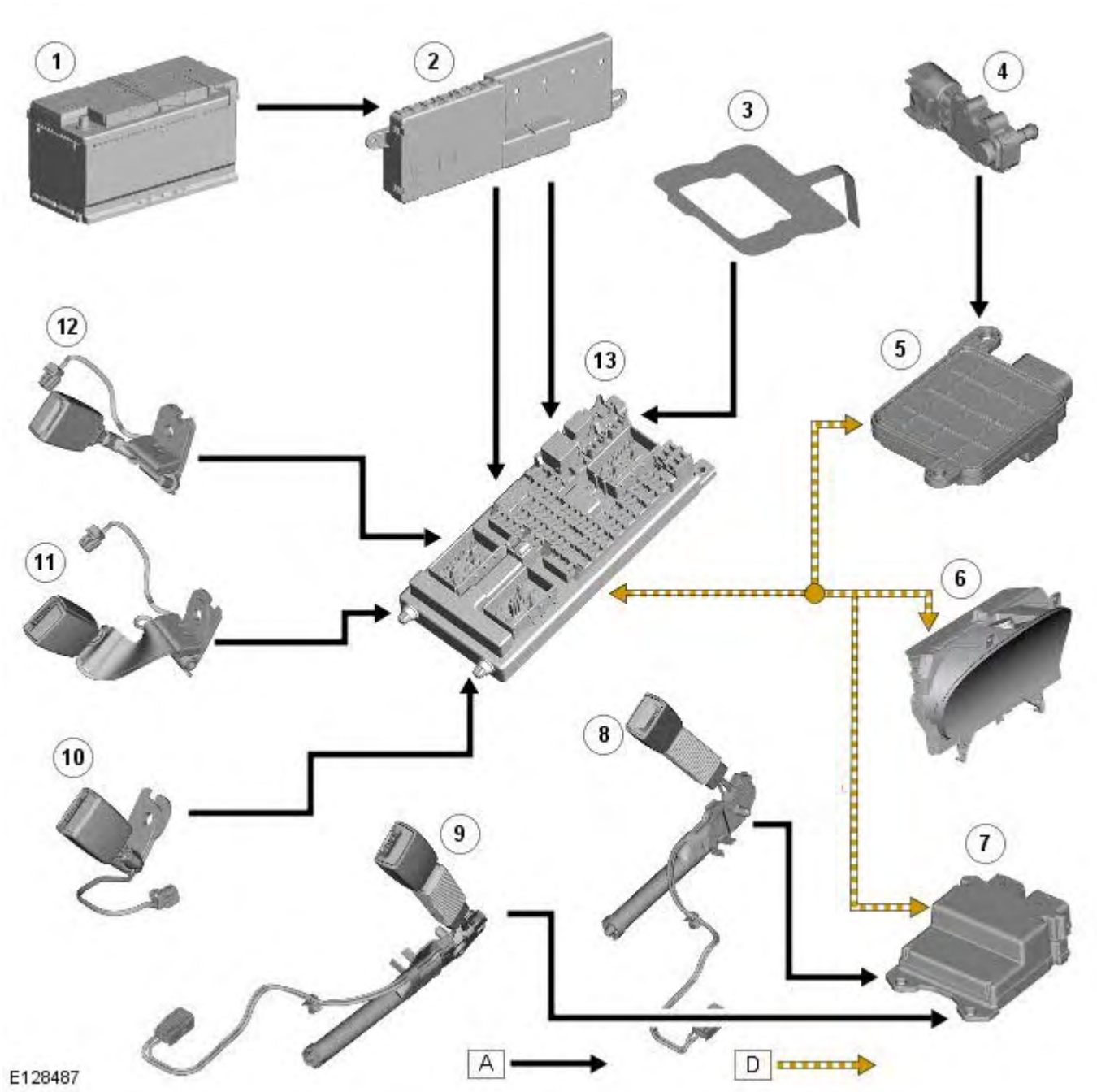
Safety Belt System - Safety Belt System - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: A = Hardwired; D = High speed CAN (controller area network) bus.

SAFETY BELT REMINDER/BELTMINDER SYSTEM



Item	Description
1	Battery
2	BJB (battery junction box) (40 A midi fuse (2 off))
3	Occupant detection sensor (where fitted)
4	Pressure sensor (where fitted)

5	Occupant classification module (where fitted)
6	Instrument cluster
7	RCM (restraints control module)
8	LH (left-hand) front buckle switch
9	RH (right-hand) front buckle switch
10	RH rear buckle switch
11	Center rear buckle switch
12	LH rear buckle switch
13	CJB (central junction box)

System Operation

SAFETY BELT REMINDER

The safety belt warning indicator comes on if the driver safety belt, or the safety belt of an occupied front passenger seat, is not fastened. The indicator goes off when the offending safety belt is fastened.

The CJB controls the operation of the safety belt warning indicator with a high speed CAN bus message to the instrument cluster. The status of the front safety belts is provided by a high speed CAN bus message from the RCM. Front passenger seat occupancy status is provide by a hardwired input from the occupant detection sensor (all except NAS), or a high speed CAN bus message from the classification module (NAS only).

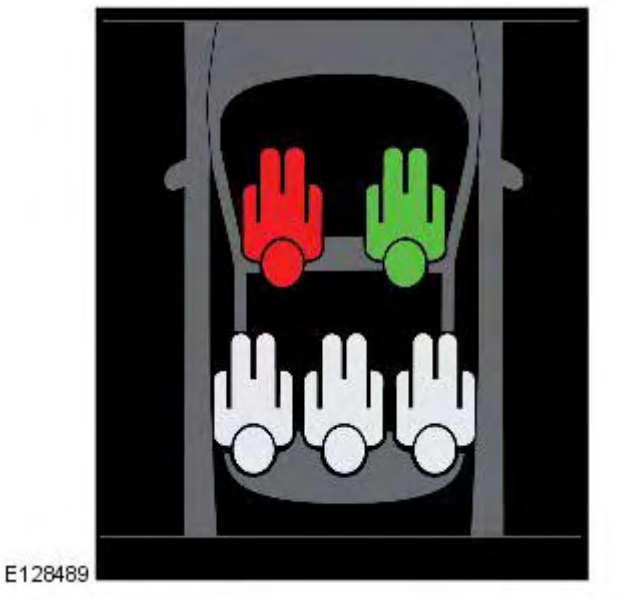
Safety Belt Warning Indicator

BELTMINDER SYSTEM

The beltminder system augments the safety belt reminder. At vehicle speeds above 10 mph (16 km/h), if the safety belt of the driver seat or an occupied front passenger seat has not been fastened, or if a front or rear safety belt is unfastened, the beltminder system activates an intermittent warning tone, flashes the safety belt warning indicator and displays a warning message indicating which safety belt triggered the warning.

The CJB controls the operation of the beltminder system with a high speed CAN bus message to the instrument cluster. The status of the safety belts is provided by hardwired inputs from each of the rear safety belt buckles, and a high speed CAN bus message from the RCM. Front passenger seat occupancy status is provide by a hardwired input from the occupant detection sensor (all except NAS), or a high speed CAN bus message from the classification module (NAS only).

Message Center Beltminder Graphic



A vehicle graphic in the message center shows the status of the safety belts. Each seating position is represented by a passenger icon, the color of which indicates the safety belt status:

- No color - safety belt not fastened.
- Green - safety belt fastened.
- Red - safety belt status changed from fastened to unfastened.

A beltminder warning triggered by one of the rear safety belts can be cancelled by pressing the information button on the steering wheel.

Although not advisable, it is possible to disable the beltminder system using Jaguar approved diagnostic equipment.

NOTE: If a heavy object is placed on the front passenger seat, it may trigger a beltminder warning.

Component Description

GENERAL

Each safety belt retractor incorporates a pretensioner, a load limiting function and a dual locking function. The safety belt pretensioner are used to tighten the seatbelt during a collision to ensure the occupants are securely held in their seats. The load limiting function progressively releases a small amount of webbing when the belt tension exceeds a certain level, to reduce the loads on an occupant's chest during an impact. The dual locking function locks the retractor if the webbing is pulled out of the retractor too quickly, or the vehicle is subject to unusually high acceleration or tilts beyond a given angle.

NOTE: Prior MY11 NAS vehicles only, you will find a pretensioner on the safety belt buckle and safety belt retractor on the driver’s side only and a pretensioner on the safety buckle on passenger side.

Published: 13-Jun-2013

Safety Belt System - Safety Belt System

Diagnosis and Testing

Principle of Operation

For a detailed description of the seatbelt system and operation, refer to the relevant description and operation section of the workshop manual REFER to: (501-20A Safety Belt System)

Safety Belt System (Description and Operation),
Safety Belt System (Description and Operation),
Safety Belt System (Description and Operation).

Safety Information

WARNINGS:

To avoid accidental deployment the back-up power supply must be depleted before beginning any work on the SRS system or its components. Failure to follow this instruction may result in personal injury

Do not use a multimeter to probe an SRS module. It is possible for the power from the multimeter battery to trigger the activation of the module. Failure to follow this instruction may result in personal injury

NOTE: Do not to use a cellular phone or to have a cellular phone in close proximity when working on the SRS system or components

Power supply depletion

Before beginning any work on the SRS system or related components:

1. Remove the ignition key
2. Disconnect the battery leads, ground first
3. Wait 2 minutes for the power circuit to discharge

There are comprehensive instructions on the correct procedures for SRS system repairs, refer to the relevant section of the workshop manual

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle

NOTE: Check and rectify basic faults before beginning diagnostic routines including pinpoint tests

1. Verify the customer concern by operating the seatbelt
2. Visually inspect for obvious signs of mechanical or electrical damage

Visual Inspection

Mechanical	Electrical
• Check for the installation of non-standard accessories which may affect or obstruct the function of the seatbelt system • Frayed or damaged webbing • Missing or damaged button stop • Pretensioner(s) Buckles/Stalks	• Fuses • Wiring harness fault • Correct engagement of electrical connectors • Loose or corroded connections • Warning lamp bulb(s) • Impact sensor(s) • Buckle sensor(s) • Pretensioner(s) • Belt tension sensor(s) • Restraints control module

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, carry out the test methods described below, alternatively check for diagnostic trouble codes and refer to the relevant diagnostic trouble code index

For a complete list of all diagnostic trouble codes that could be logged on this vehicle, please refer to section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Restraints Control Module (RCM) (100-00 General Information, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - DTC: Restraints Control Module (RCM) (100-00, Description and Operation).

Symptom Chart for Seatbelt Rows 1, 2

Symptom	Possible Causes	Action
Seatbelt jammed - Webbing tight	• Backlock effect in action (webbing retracted quickly and came to sudden stop) • Seatbelt retractor not installed correctly • Automatic locking retractor activated (clicking – during retraction only)	• GO to Pinpoint Test A. • GO to Pinpoint Test F. • See the automatic locking retractor description below
Seatbelt jammed - Webbing loose	• Seatbelt webbing trapped in seat • Seatbelt retractor webbing guide loose • Twist in webbing • Interference in webbing routing • D-loop not rotating correctly	• GO to Pinpoint Test B. • GO to Pinpoint Test C. • GO to Pinpoint Test D. • GO to Pinpoint Test E. • GO to Pinpoint Test G.
Seatbelt - Intermittent jamming	• Seatbelt retractor not installed correctly	• GO to Pinpoint Test F.
Seatbelt - Slow retraction	• Seatbelt retractor webbing guide loose • Twist in seatbelt webbing • Interference in webbing routing • Seatbelt retractor not installed correctly • D-loop not rotating correctly • Foreign object/debris	• GO to Pinpoint Test C. • GO to Pinpoint Test D. • GO to Pinpoint Test E. • GO to Pinpoint Test F. • GO to Pinpoint Test G. • GO to Pinpoint Test E.
Seatbelt - Not retracting	• Seatbelt retractor webbing guide loose • Twist in seatbelt webbing • D-loop not rotating correctly • Interference in webbing routing • Foreign object/debris	• GO to Pinpoint Test C. • GO to Pinpoint Test D. • GO to Pinpoint Test G. • GO to Pinpoint Test E. • GO to Pinpoint Test E.
Seatbelt - Not extracting	• Backlock effect-in action (webbing retracted quickly and came to sudden stop) • Seatbelt retractor not installed correctly • Seatbelt retractor webbing guide loose • Twist in seatbelt webbing • D-loop not rotating correctly • Interference in webbing routing • Foreign object/debris • Automatic locking retractor activated (clicking – during retraction only)	• GO to Pinpoint Test A. • GO to Pinpoint Test F. • GO to Pinpoint Test C. • GO to Pinpoint Test D. • GO to Pinpoint Test G. • GO to Pinpoint Test E. • GO to Pinpoint Test E. • See the automatic locking retractor description below
Seatbelt - Noisy during operation	• Automatic locking retractor activated (clicking– during retraction only) • Interference in webbing routing (rubbing)	• GO to Pinpoint Test B. • GO to Pinpoint Test E.
Seatbelt buckle - Not latching / jammed	• Foreign object/debris	CAUTION: Do not insert any objects or tools into the buckle head • GO to Pinpoint Test H.

Inertia Reel Seatbelts

The vehicle is equipped with (two row one) and (three row two) inertia reel seatbelts

These seatbelts are **"dual sensitive"** which means that they have:

- **Car sense system - A vehicle motion sensor, which locks the seatbelt webbing under braking, cornering, on steep hills and in adverse camber conditions, when parked on a steep incline or driveway or two wheels on a high curb**
- **Web sense system - A webbing motion sensor, which locks when the seatbelt webbing is extracted suddenly**

The seatbelts in the following positions are equipped with an automatic locking retractor function:

Carline	Market	Seat position	Automatic Locking Retractor Installed	From Model Year
XK (X150)	All	Driver	No	2007

Carline	Market	Seat position	Automatic Locking Retractor Installed	From Model Year
XK (X150)	ROW	Passenger	No	2007
XK (X150)	US	Passenger	Yes	2007
XK (X150)	ROW	Row 2	Yes	2007
XK (X150)	US	Row 2	Yes	2007
XF (X250)	All	Driver	No	2009
XF (X250)	ROW	Passenger	No	2009
XF (X250)	US	Passenger	Yes	2009
XF (X250)	ROW	Row 2	No	2009
XF (X250)	US	Row 2	Yes	2009
XJ (X351)	All	Driver	No	2010
XJ (X351)	ROW	Passenger	No	2010
XJ (X351)	US	Passenger	Yes	2010
XJ (X351)	ROW	Row 2	No	2010
XJ (X351)	US	Row 2	Yes	2010

The **automatic locking retractor function** is a feature to secure a child seat or heavy load to the seat

Activation	Deactivation
NOTE: When automatic locking retractor is activated, no further webbing can be drawn from the seatbelt retractor, prior to disengagement of the automatic locking. This can be mistaken as a jammed seatbelt retractor Activated by total extraction of the webbing	Automatic locking retractor is deactivated by allowing the webbing to retract until the clicking stops (close to park position)
When activated the automatic locking retractor is identified by a clicking noise during webbing retraction	When deactivated the automatic locking retractor seatbelt changes state, from a **static** seatbelt to an **automatic** seatbelt

Seatbelt Locking Test

With the vehicle stationary and on level ground take firm hold of the seatbelt webbing (on the tongue side of the upper seatbelt anchor) and withdraw sharply, **the retractor should lock**. Preventing further webbing release **(repeat this test 3 times)**. Any seatbelt retractor which fails to lock **must not be used** and a **new seatbelt must be installed**.

DTC Index

For a list of diagnostic trouble codes that could be logged on this vehicle, please refer to Section 100-00 or for removal and installation/description and operation see Section 501-20.

Diagnostic Guide Inertia Reel Seatbelts

PINPOINT TEST A : BACKLOCK	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: BACKLOCK	
	1 Visually inspect the condition of the suspect seatbelt
	2 Draw a maximum of 20mm of the webbing from the seatbelt retractor with moderate force. Then release the webbing
	3 Check for correct operation twice
	Does the webbing move freely then retract correctly? **Yes** No further action required **No** For first row seatbelt GO to Pinpoint Test C. For second and third row seatbelts GO to Pinpoint Test B.

PINPOINT TEST B : WEBBING-TRAPPED IN SEAT	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
B1: WEBBING-TRAPPED IN SEAT	
	1 Visually inspect the condition of the suspect seatbelt
	2 Lift the seat base or release the seat backrest as required
	3 Free the trapped webbing, allow the webbing to retract **Note: If the automatic locking retractor is activated, allow the webbing to retract until the clicking stops**
	4 Check for correct operation **twice**
	Does the webbing move freely then retract correctly? **Yes** No further action required **No** GO to Pinpoint Test C.

PINPOINT TEST C : SEATBELT RETRACTOR-WEBBING GUIDE LOOSE	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
C1: SEATBELT RETRACTOR-WEBBING GUIDE LOOSE	
	1 Refer to 501-20 removal and installation section of the workshop manual, remove any trim panels required to expose the D loop (anchor point) and seatbelt retractor
	2 Check the webbing is not trapped or twisted and is centrally located on the seatbelt retractor spindle
	3 Attempt to withdraw the webbing from the seatbelt retractor **NOTE: If the seatbelt webbing is jammed, the automatic locking retractor could be engaged**
	4 To release the automatic locking retractor, manually wind the webbing onto the spindle until the automatic locking retractor deactivates (clicking stops)
	5 Fully extract webbing
	6 Confirm webbing guide location is correct , Confirm the fixing lugs are correctly located in the retractor frame
	7 Allow webbing to retract
	8 Check for correct operation **twice**
	Does the webbing move freely then retract correctly? **Yes** Refer to the 501-20 removal and installation section of the workshop manual, reinstall any trim panels, ensure there are no obstructions and the webbing does not catch or rub. No further action required **No** GO to Pinpoint Test D.

PINPOINT TEST D : TWIST IN WEBBING	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
D1: TWIST IN WEBBING	
	1 Refer to section 501-20 removal and installation section of the workshop manual, remove any trim panels required to expose the D loop (anchor point)
	2 Twist the webbing back the correct way in the loop
	3 Pass the twist through the pillar loop or escutcheon as required
	4 Check for correct operation **twice**
	Does the webbing move freely then retract correctly? **Yes** Refer to the 501-20 removal and installation section of the workshop manual, reinstall any trim panels, ensure there are no obstructions and the webbing does not catch or rub. No further action required **No** GO to Pinpoint Test E.

PINPOINT TEST E : INTERFERENCE-WEBBING ROUTING	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
E1: INTERFERENCE-WEBBING ROUTING	
	1 Refer to the 501-20 removal and installation section of the workshop manual, remove any trim panels required to expose the D loop (anchor point)
	2 Remove obstructions and foreign objects ensure the webbing does not catch or rub
	3 Confirm the seatbelt does not contact the wiring harness
	4 Check for correct operation **twice**
	Does the webbing move freely then retract correctly? **Yes** Refer to the 501-20 removal and installation section of the workshop manual, reinstall any trim panels, ensure there are no obstructions and the webbing does not catch or rub. No further action required **No** GO to Pinpoint Test F.

PINPOINT TEST F : SEATBELT RETRACTOR-INCORRECT INSTALLATION	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
F1: SEATBELT RETRACTOR-INCORRECT INSTALLATION	
	1 Refer to the 501-20 removal and installation section of the workshop manual, remove any trim panels required to expose the D loop (anchor point) and the seatbelt retractor
	2 Refer to the 501-20 removal and installation section of the workshop manual, correctly reinstall the seatbelt retractor ensure that the locating "T bar" and "anti rotation pins" are correctly located
	3 Check for correct operation **twice**
	Does the webbing move freely then retract correctly? **Yes** Refer to the 501-20 removal and installation section of the workshop manual, reinstall any trim panels, ensure there are no obstructions and the webbing does not catch or rub. No further action required **No** GO to Pinpoint Test G.

PINPOINT TEST G : D-LOOP NOT ROTATING CORRECTLY	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
G1: D-LOOP NOT ROTATING CORRECTLY	
	1 Refer to the 501-20 removal and installation section of the workshop manual, remove any trim panels required to expose the D loop (anchor point) and the seatbelt retractor
	2 Ensure there are no obstructions and the webbing does not catch or rub, the D loop (anchor point) rotates correctly and if installed the confirm the height adjuster operates correctly
	3 Check for correct operation **twice**
	Does the webbing move freely then retract correctly? **Yes** Refer to the 501-20 removal and installation section of the workshop manual, reinstall any trim panels, ensure there are no obstructions and the webbing does not catch or rub. No further action required **No** Replace as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component

PINPOINT TEST H : SEATBELT BUCKLE – NOT LATCHING/JAMMED	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
H1: SEATBELT BUCKLE – NOT LATCHING/JAMMED	
CAUTION: Do not insert any objects or tools into the buckle head	
	1 Visually inspect the buckle head for evidence of damage. If damaged replace as required
	2 Depress the buckle release (red button) and **(Using a torch)** carry out visual inspection for any evidence of debris/material or foreign objects in the buckle head
	3 If required remove the pretensioner from the vehicle. Remove the seat. Remove the pretensioner from the seat frame
	4 **Do not insert any objects or tools buckle head** With the buckle removed invert and attempt to shake out any debris
	5 Attempt to latch the tongue in the buckle
	Does the seat belt buckle operate correctly **Yes** Reinstall any components, no further action required **No** Replace the pretensioner, REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Restraints Control Module (RCM) (100-00 General Information, Description and Operation), Rear Safety Belt Buckle (501-20A Safety Belt System, Removal and Installation).

Published: 11-May-2011

Safety Belt System - Front Safety Belt Buckle

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least two minutes after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

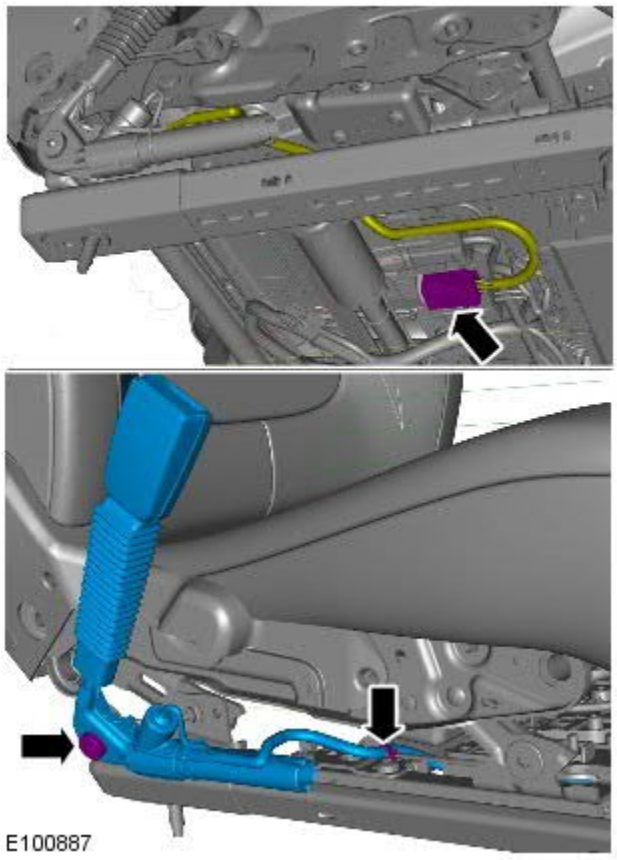
NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

2. Refer to: Front Seat (501-10 Seating, Removal and Installation).



3. CAUTION: Discard the bolt.

   Torque: 40 Nm

Installation

1. CAUTION: Make sure that a new bolt is installed.

   To install, reverse the removal procedure.

Published: 11-May-2011

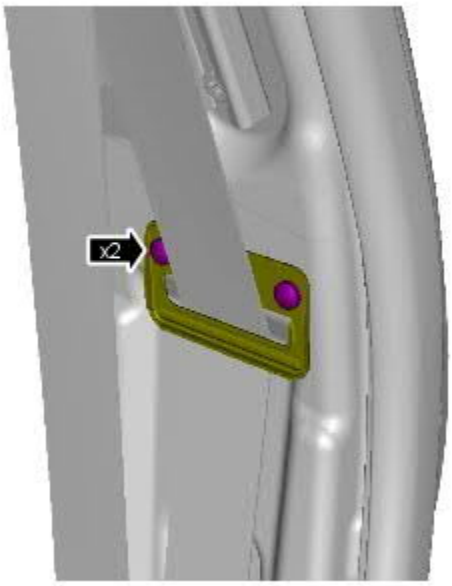
Safety Belt System - Front Safety Belt Retractor

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: B-Pillar Upper Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).



E127641

2. *Torque:* 9 Nm

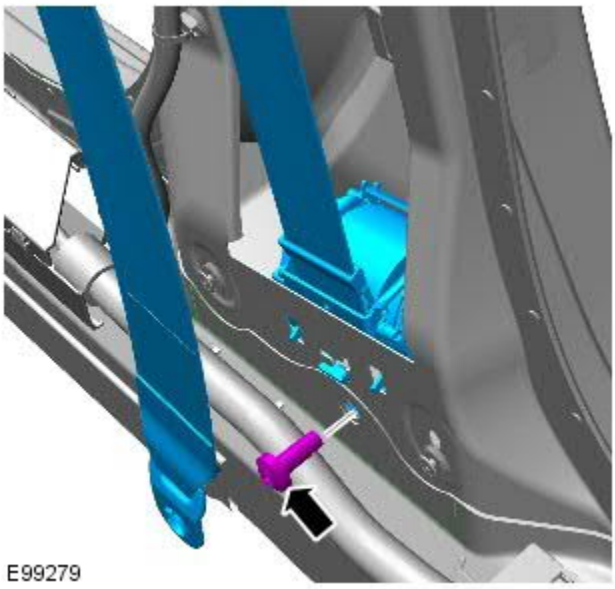
E99277

3. CAUTIONS:

   Discard the bolt.

   Make sure that a new bolt is installed.

   Torque: 40 Nm



4. CAUTIONS:

   Discard the bolt.

   Make sure that a new bolt is installed.

   Torque: 40 Nm

Installation

1. CAUTION: Fixings must be started by hand to avoid damaging threads.

   To install, reverse the removal procedure.

Published: 11-May-2011

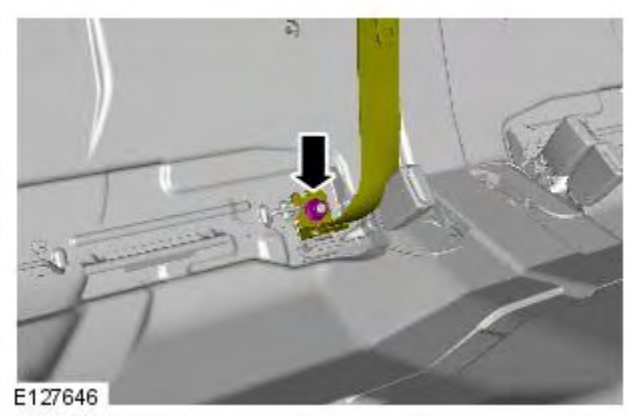
Safety Belt System - Rear Center Safety Belt Retractor

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Parcel Shelf (501-05 Interior Trim and Ornamentation, Removal and Installation).

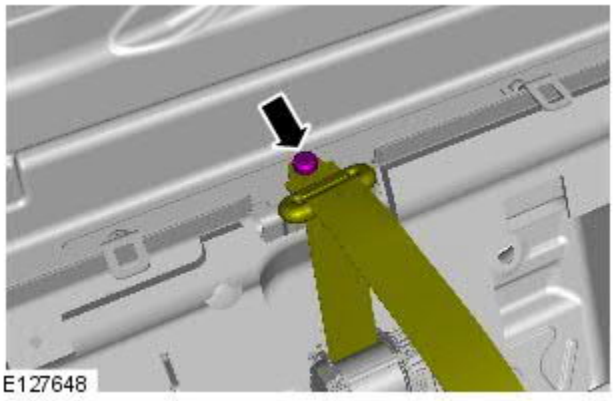


2. CAUTIONS:

   Discard the nut.

   Make sure that a new nut is installed.

   Torque: 40 Nm

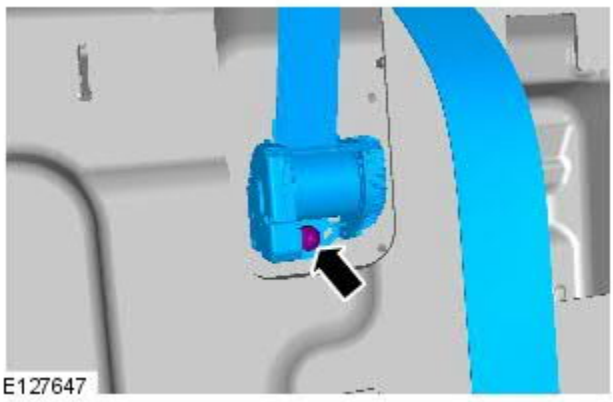


3. CAUTIONS:

   Discard the bolt.

   Make sure that a new bolt is installed.

   Torque: 40 Nm



4. CAUTIONS:

   Discard the bolt.

   Make sure that a new bolt is installed.

   Torque: 40 Nm

Installation

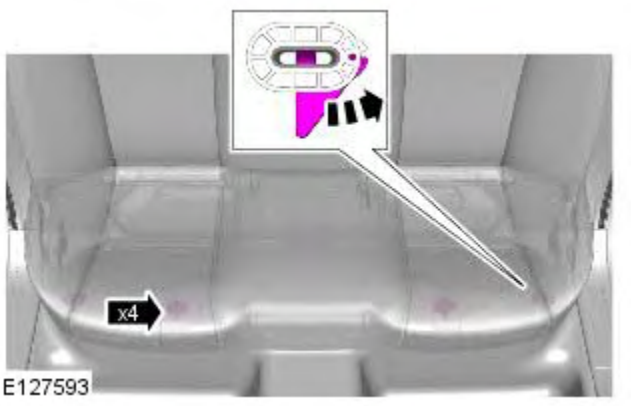
1. To install, reverse the removal procedure.

Published: 10-Feb-2012

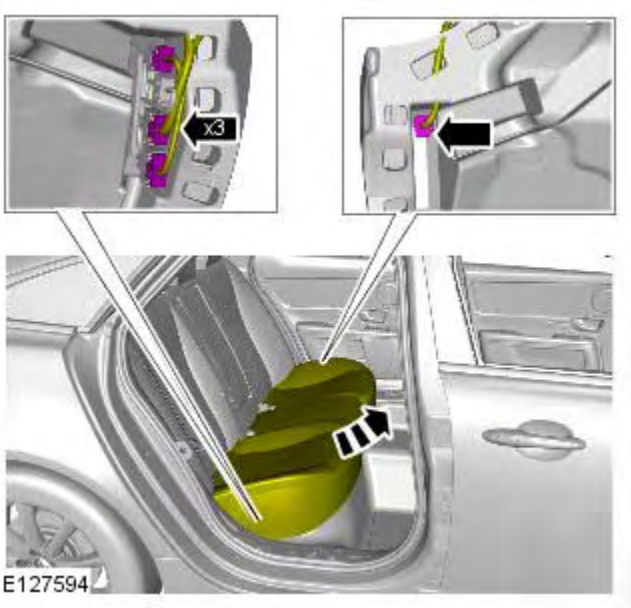
Safety Belt System - Rear Safety Belt Buckle

Removal and Installation

Removal

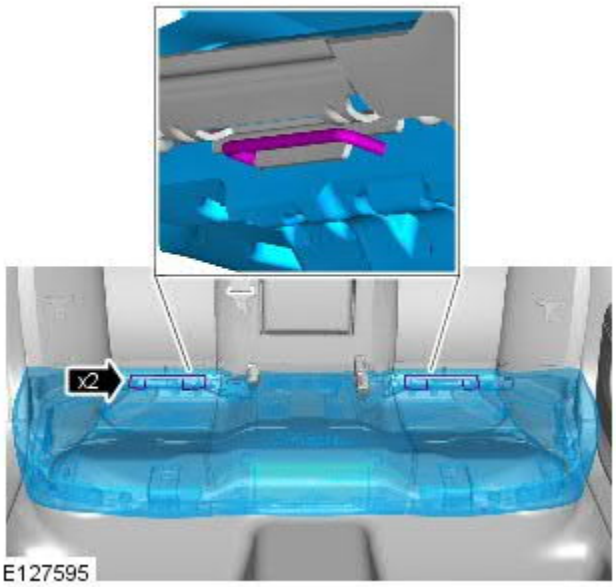


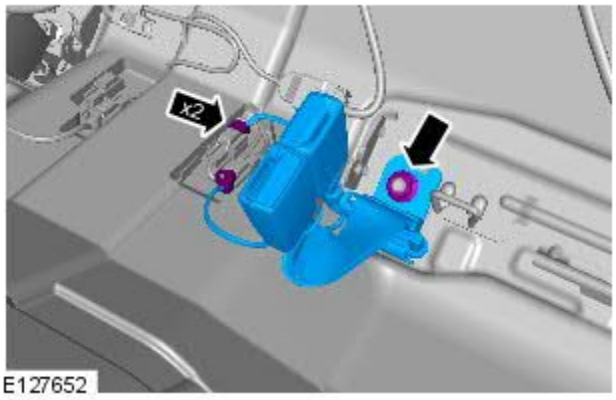
1.



2.

3.





4. CAUTIONS:

   Discard the bolt.

   Make sure that a new bolt is installed.

   Torque: 40 Nm

Installation

1. To install, reverse the removal procedure.

Published: 10-Feb-2012

Safety Belt System - Rear Safety Belt Retractor

Removal and Installation

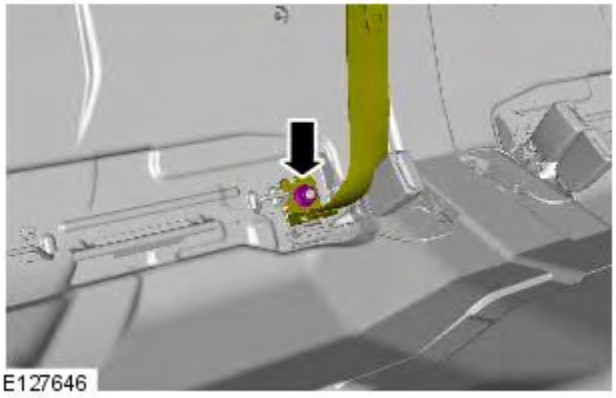
Removal

NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

Removal steps in this procedure may contain installation details.

1. Refer to: C-Pillar Lower Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).



2. WARNING: Make sure that a new nut is installed.

   CAUTION: Discard the nut.

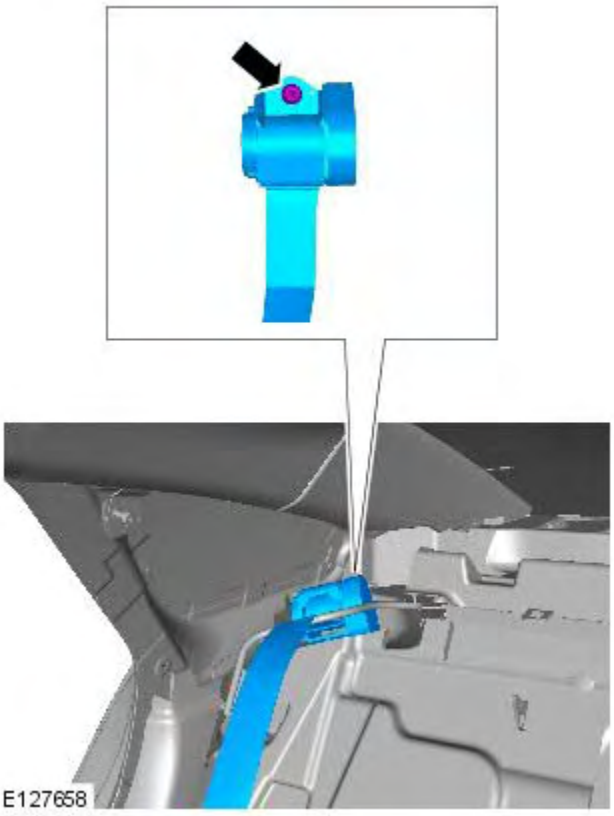
   Torque: 40 Nm

3. CAUTIONS:

   Discard the bolt.

   Make sure that a new bolt is installed.

   Torque: 40 Nm



Installation

1. CAUTION: Make sure that a new bolt is installed.

   To install, reverse the removal procedure.

Published: 11-May-2011

Safety Belt System - Safety Belt Shoulder Height Adjuster

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: B-Pillar Upper Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

2. CAUTIONS:

   Discard the bolt.

   Make sure that a new bolt is installed.

   Torque: 40 Nm

3. *Torque:* 25 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Supplemental Restraint System -

Torque Specifications

Description	Nm	lb-ft	lb-in
Passenger air bag module bolts	4.5	-	40
Restraints control module (RCM) nuts	10.5	-	93
Side air curtain module tether straps bolts	9	-	80
Side air bag module nuts	7	-	62
Occupant classification sensor control module bolts	4	-	35
C-pillar side impact sensor bolt	10.5	-	93
Front crash sensor bolt	10.5	-	93
Clock spring bolts	6	-	53

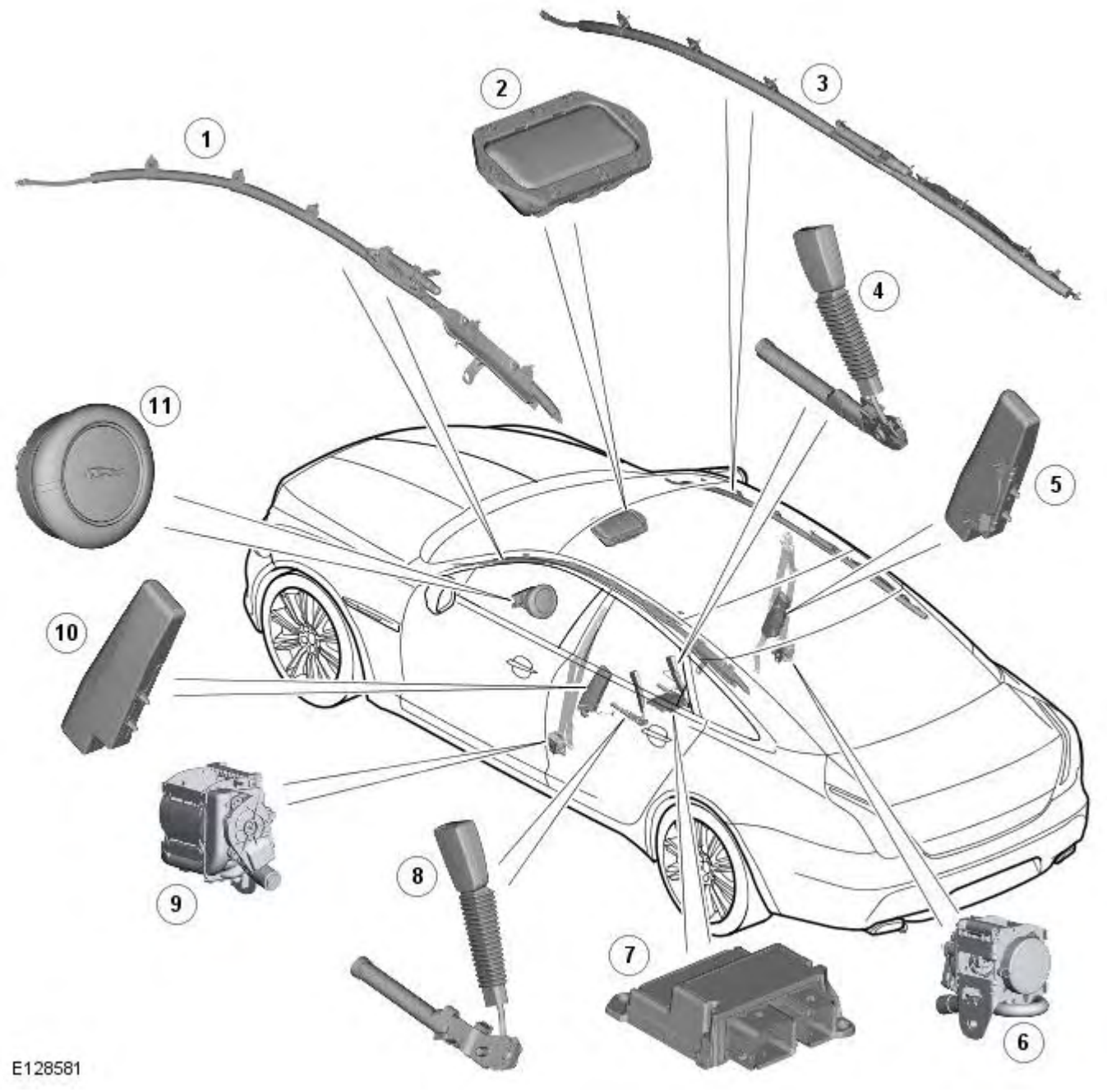
Published: 18-Sep-2012

Supplemental Restraint System - Air Bag and Safety Belt Pretensioner
Supplemental Restraint System (SRS) - Component Location

Description and Operation

NOTE: LHD (left-hand drive) installations shown; RHD (right-hand drive) installations similar.

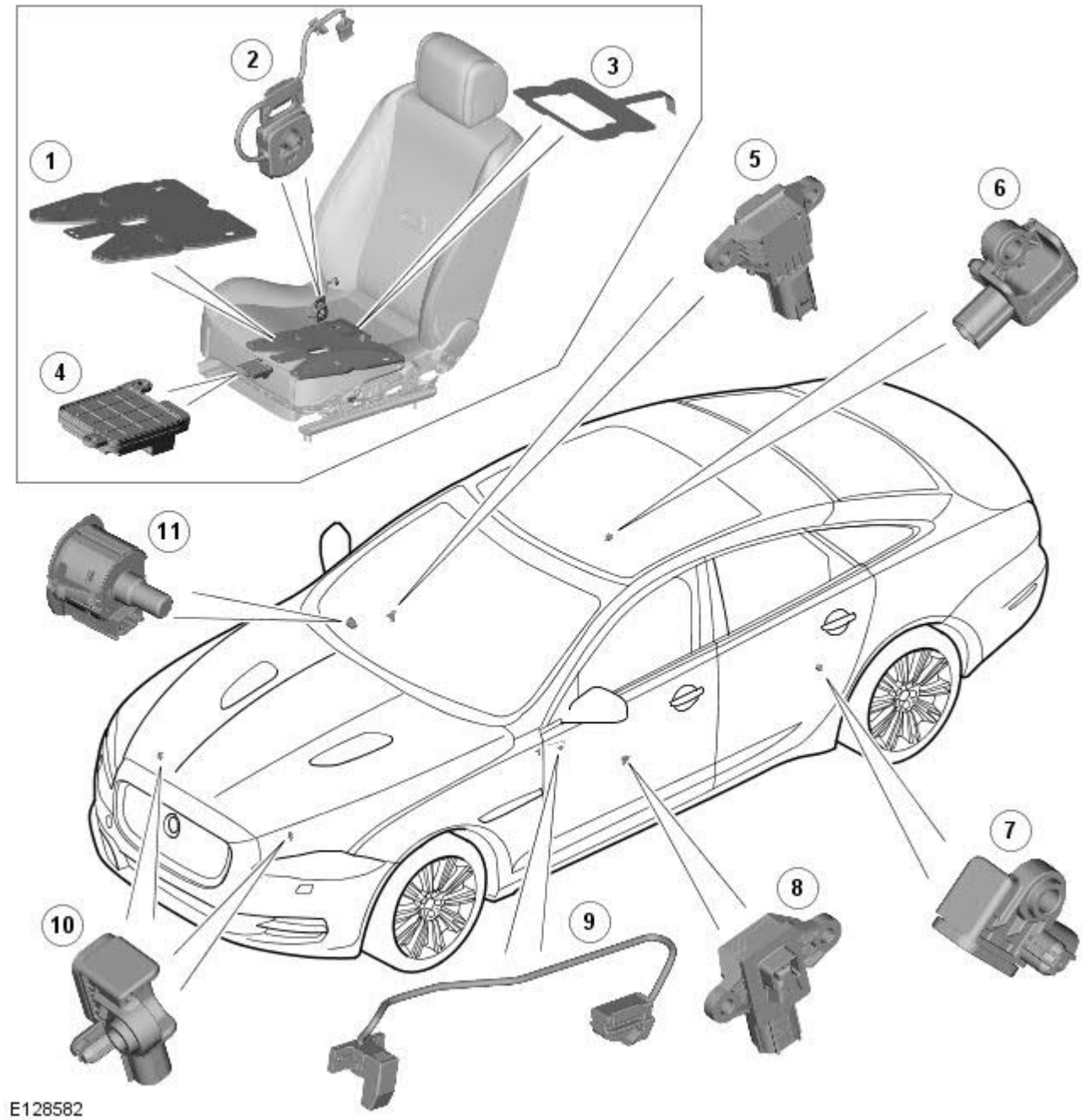
COMPONENT LOCATION - SHEET 1 OF 2



Item	Description
1	LH (left-hand) side air curtain
2	Passenger air bag
3	RH (right-hand) side air curtain
4	Passenger pretensioner
5	Passenger side airbag
6	RH safety belt retractor pretensioner (if fitted)

7	RCM (restraints control module)
8	Driver pretensioner
9	LH safety belt retractor pretensioner
10	Driver side air bag
11	Driver air bag

COMPONENT LOCATION - SHEET 2 OF 2



Item	Description
1	Bladder and pressure sensor (NAS only)
2	Safety belt tension sensor (NAS only)
3	Occupant detection sensor (all except NAS)
4	Control module (NAS only)
5	RH pressure sensor
6	RH rear impact sensor
7	LH rear impact sensor

8	LH pressure sensor
9	Driver seat position sensor
10	Front impact sensor (2 off)
11	PAD (passenger air bag deactivation) switch (where fitted)

Published: 11-May-2011

Supplemental Restraint System - Air Bag and Safety Belt Pretensioner
Supplemental Restraint System (SRS) - Overview

Description and Operation

OVERVIEW

WARNING: All pyrotechnic devices are dangerous. Before performing any procedures on any pyrotechnic device, read all information contained within the Service Information section of this manual. Refer to: General Service Information (100-00, Description and Operation).

The SRS (supplemental restraint system) provides additional protection for vehicle occupants in certain impact conditions by selective activation of twin stage driver and passenger air bags, side air bags, side air curtains and front safety belt pretensioners. Operation of the system is controlled by a RCM (restraints control module).

The RCM receives inputs from various sensors around the vehicle to determine which devices, if any, should be activated during an accident. The inputs include those from an occupant monitoring system for the front passenger seat, front and side impact sensors and side pressure sensors.

In all markets except NAS, a PAD (passenger air bag deactivation) switch is a dealer fit option that allows the passenger air bag to be disabled.

The activation status of the passenger air bag is given by an indicator on the overhead console. The status of the SRS is given by an air bag warning indicator in the instrument cluster.

Published: 18-Sep-2012

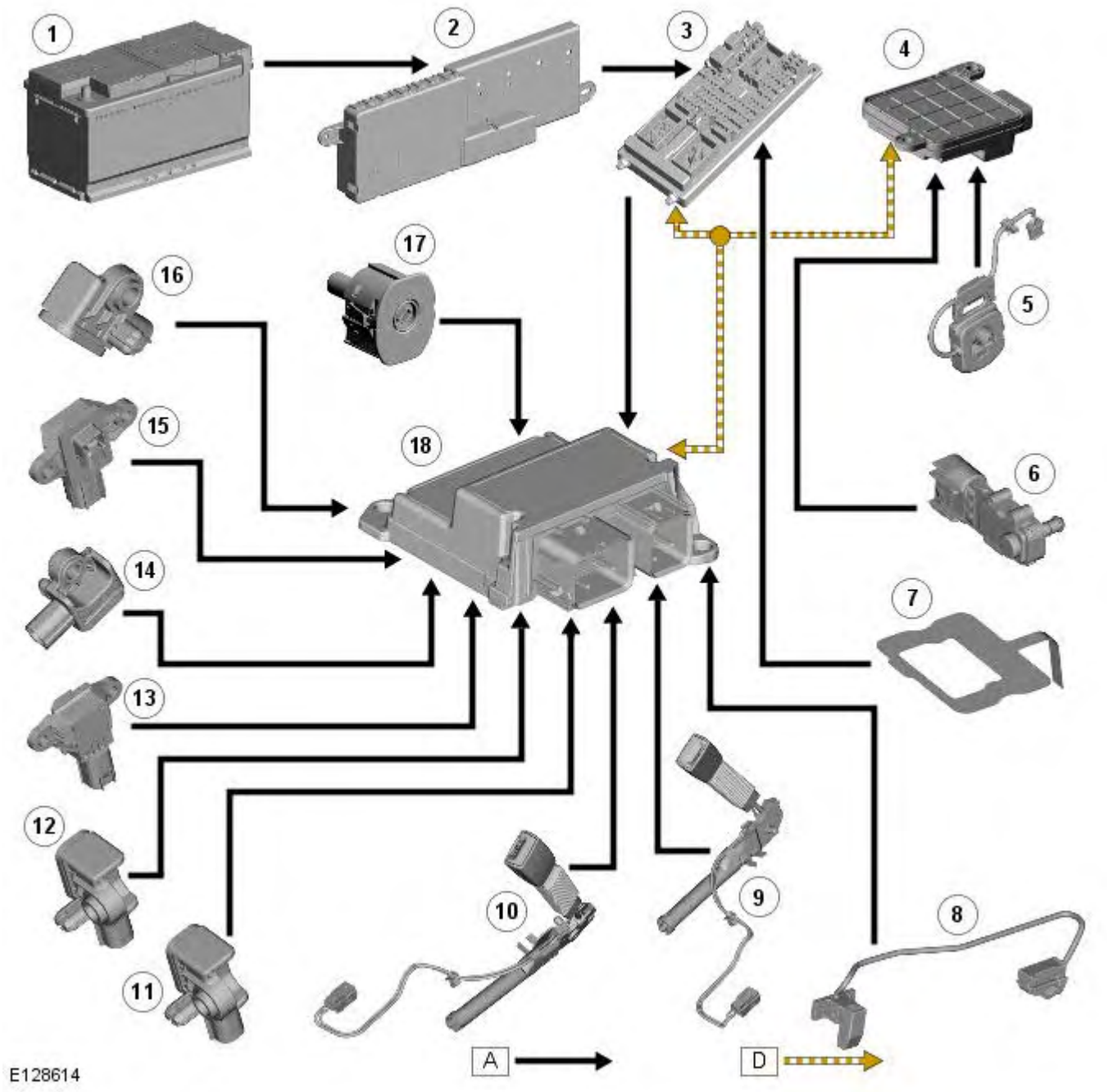
Supplemental Restraint System - Air Bag and Safety Belt Pretensioner
Supplemental Restraint System (SRS) - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: A = Hardwired; D = High speed CAN (controller area network) bus.

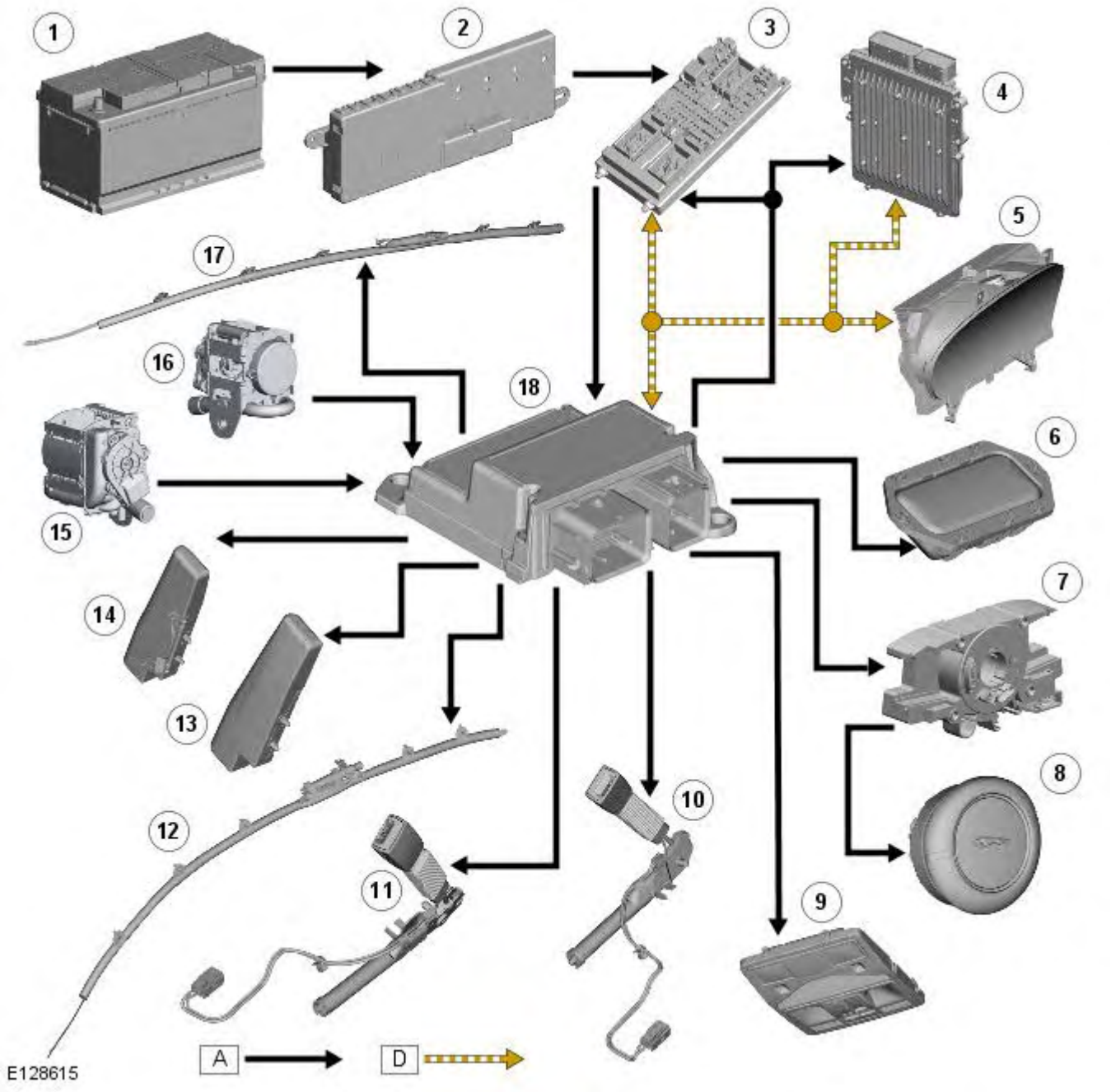
SHEET 1 OF 2



Item	Description
1	Battery
2	BJB (battery junction box)
3	CJB (central junction box) (restraints relay)

4	Occupant classification system control module (NAS only)
5	Safety belt tension sensor (NAS only)
6	Occupant classification system pressure sensor (NAS only)
7	Occupant detection sensor (all except NAS)
8	Driver seat position sensor
9	Passenger safety belt buckle switch
10	Driver safety belt buckle switch
11	LH (left-hand) front impact sensor
12	RH (right-hand) front impact sensor
13	RH side pressure sensor
14	RH side impact sensor
15	LH side pressure sensor
16	LH side impact sensor
17	PAD (passenger air bag deactivation) switch (where fitted)
18	RCM (restraints control module)

SHEET 2 OF 2



Item	Description
1	Battery
2	BJB
3	CJB (restraints relay)
4	ECM (engine control module)
5	Instrument cluster
6	Passenger air bag
7	Clockspring
8	Driver air bag
9	PAD indicator
10	Passenger pretensioner
11	Driver pretensioner
12	LH side air curtain
13	Driver side air bag
14	Passenger side air bag

15	LH safety belt retractor pretensioner
16	RH safety belt retractor pretensioner (if fitted)
17	RH side air curtain
18	RCM

System Operation

PRINCIPLES OF OPERATION

In a collision, the sudden deceleration or acceleration is measured by the impact sensors and the accelerometers in the RCM. The RCM evaluates the readings to determine the impact point on the vehicle and whether the deceleration/acceleration readings exceed the limits for firing any of the air bags and pretensioners. During a collision, the RCM only fires the air bags and pretensioners if the safing function confirms that the data from the impact sensor(s) indicates an impact limit has been exceeded.

The RCM incorporates the following impact thresholds to cater for different accident scenarios:

- Front impact, pretensioners.
- Front impact, driver and passenger air bags stage 1, belt unfastened.
- Front impact, driver and passenger air bags stage 1, belt fastened.
- Front impact, driver and passenger air bags stage 2, belt unfastened.
- Front impact, driver and passenger air bags stage 2, belt fastened.
- Rear impact.
- Driver side impact.
- Passenger side impact.

Firing Strategies

The safety belt pretensioners are fired when the pretensioner impact limit is exceeded. The RCM only fires the pretensioners if the related safety belt is fastened.

The driver and passenger air bags are only fired in a frontal impact. If an impact exceeds a stage 1 limit, but is less than the corresponding stage 2 limit, only one inflator in each air bag is fired (stage 2 is still fired for disposal after a delay of 100 ms). If an impact exceeds the stage 2 limit, the two inflators in each air bag are fired simultaneously.

The passenger air bag is disabled unless the front passenger seat is occupied by a large person (NAS only), or the passenger air bag deactivation switch is on (all except NAS and Australia).

The stage 2 inflator of the driver air bag is disabled if the driver seat is forward of the switching point of the seat position sensor.

If there is a fault with a safety belt buckle switch, the RCM assumes the related safety belt is fastened for the pretensioner firing strategy and unfastened for the driver and passenger air bag firing strategies. If there is a fault with the occupant classification sensor, the RCM disables the passenger air bag. If there is a fault with the passenger air bag deactivation switch, the RCM disables the passenger air bag.

If a side impact limit is exceeded, the RCM fires the side air bag and the side head air bag on that side of the vehicle. If the side impact limit on the front passenger side of the vehicle is exceeded, the RCM also evaluates the input from the occupant classification sensor, and fires the side air bag only if the front passenger seat is occupied by a large person (NAS only).

If multiple impacts occur during a crash event, after responding to the primary impact the RCM will output the appropriate fire signals in response to any further impacts if unfired units are available.

Front and Rear Impact Firing Strategy (All Except NAS)

Safety Belt Status		Strategy		
Driver	Front Passenger	Applicable Pretensioner	Driver Air Bag	Passenger Air Bag
Fastened	-	Fired at pretensioner threshold	Fired at belt fastened threshold	-
Unfastened	-	Not fired	Fired at belt unfastened threshold	-
-	Fastened	Fired at pretensioner threshold	-	Fired at belt fastened threshold
-	Unfastened	Not fired	-	Fired at belt unfastened threshold

Front and Rear Impact Firing Strategy (NAS)

Safety Belt Status		Passenger Seat Status	Strategy		
Driver	Passenger		Applicable Pretensioner	Driver Air Bag	Passenger Air Bag
Fastened	-	-	Fired at pretensioner threshold	Fired at belt fastened threshold	-
Unfastened	-	-	Not fired	Fired at belt unfastened threshold	-
-	Fastened	Occupied allow	Fired at pretensioner threshold	-	Fired at belt fastened threshold
-	Fastened	Unoccupied inhibit/empty	Fired at pretensioner threshold	-	Not fired

Safety Belt Status		Passenger Seat Status	Strategy		
Driver	Passenger		Applicable Pretensioner	Driver Air Bag	Passenger Air Bag
-	Unfastened	Occupied allow	Not fired	-	Fired at belt unfastened threshold
-	Unfastened	Unoccupied inhibit/empty	Not fired	-	Not fired

Crash Signal

When the RCM outputs any of the fire signals it also outputs a crash signal to the CJB and the ECM on the high speed CAN. The crash signal is also hardwired to the ECM and the CJB. On receipt of the crash signal, the ECM cuts the power supply to the fuel pump relay and the CJB goes into crash mode. In the crash mode, the CJB:

- Activates all of the unlock signals of the vehicle locking system, even if the vehicle is already unlocked.
- Ignores all locking/superlocking inputs until it receives an unlock input, when it returns the locking system to normal operation.
- Activates the interior lamps. The interior lamps remain on permanently until they are manually switched off at the lamp unit, or the CJB crash mode is switched off and they return to normal operation.
- Disables the rear window child lock input until the crash mode is switched off.
- Activates the hazard flashers. The hazard flashers remain on until cancelled by the hazard warning switch or the crash mode is switched off.

The CJB crash mode is switched off by a valid locking and unlocking cycle of the locking system.

Component Description

RESTRAINTS CONTROL MODULE

E128616

The RCM is installed on the top of the transmission tunnel, in line with the B/C pillars, and controls operation of the SRS (supplemental restraint system). The main functions of the RCM include:

- Crash detection and recording.
- Air bag and pretensioner firing.
- Self test and system monitoring, with status indication via the air bag warning indicator and non volatile storage of fault information.

The RCM determines which elements of the SRS are to be deployed by using two internal areas:

- Crash severity evaluation.
- Deployment handler.

Crash severity evaluation uses data from the RCM internal accelerometer, the front crash sensor and the safety belt buckle switch. Based on this data, the RCM decides which level of air bag module deployment is required and forwards the information to the second area, the deployment handler.

The deployment handler evaluates the status of the seat track position sensor and safety belt buckle sensors before a decision is made about which restraints should finally be deployed.

Data from the side crash sensors is used by the RCM in conjunction with acceleration data from the RCM internal accelerometer to make a deployment decision. The RCM processes the acceleration data and, subject to an impact being of high enough severity, decides whether the side air bag module and air curtain should be deployed.

On board testing of the air bag modules, front safety belt pretensioner firing circuits, warning indicator circuits and module status is performed by the RCM together with the storing of fault codes. The impact and pressure sensors perform basic

self-tests.

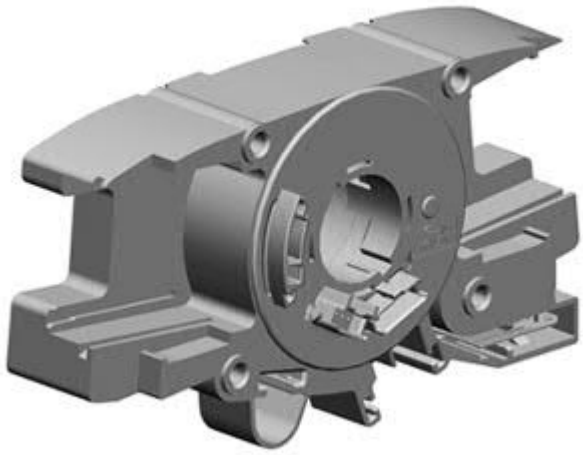
The RCM drives the air bag warning indicator via a high speed CAN signal. If the warning indicator fails, a fault code is recorded and a warning tone is sounded in place of the indicator if a further fault occurs. The RCM also provides a temporary back-up power supply to operate the air bag modules in the event that in crash conditions, the battery supply is lost. In the event of a crash, it records certain data which can be accessed via the diagnostic connector.

A safing sensor in the RCM provides confirmation of an impact to verify if air bag and pretensioner activation is necessary. A roll-over sensor monitors the lateral attitude of the vehicle. Various firing strategies are employed by the RCM to ensure that during an accident only the appropriate air bags and pretensioners are fired. The firing strategy used also depends on the inputs from the safety belt buckle switches and the occupant monitoring system.

An energy reserve in the RCM ensures there is always a minimum of 150 milliseconds of stored energy available if the power supply from the ignition switch is disrupted during a crash. The stored energy is sufficient to produce firing signals for the driver air bag, the passenger air bag and the safety belt pretensioners.

When the ignition is switched on the RCM performs a self test and then performs cyclical monitoring of the system. If a fault is detected the RCM stores a related fault code and illuminates the air bag warning indicator. The faults can be retrieved by Jaguar approved diagnostic equipment over the CAN bus. If a fault that could cause a false fire signal is detected, the RCM disables the respective firing circuit, and keeps it disabled during a crash event.

CLOCKSPRING



E128617

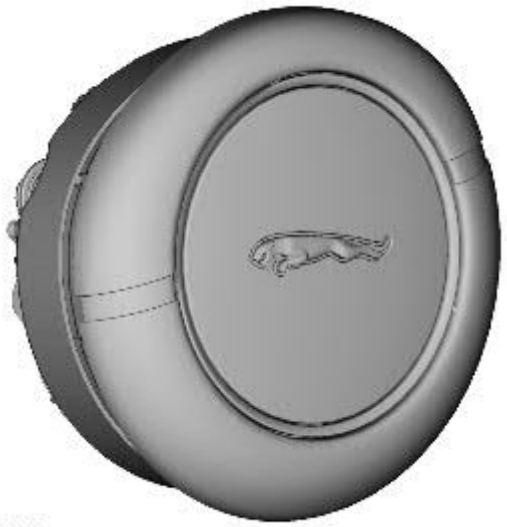
The clockspring is installed on the steering column to provide the electrical interface between the fixed wiring harness of the steering column and the components that rotate with the steering wheel.

The clockspring consists of a plastic cassette which incorporates an outer cover fixed to the steering column and an inner rotor which turns with the steering wheel. Four securing lugs attach the cover to the multifunction switch on the steering column. The rotor is keyed to the steering wheel. A lug on the underside of the rotor operates the self-cancelling feature of the turn signal indicator switch. A ribbon lead, threaded on rollers in the rotor, links a connector on the cover to two connectors on the rotor. Link leads for the driver air bag are installed in one of the connectors on the rotor.

To prevent damage to the ribbon lead, both the steering and the clockspring must be centralized when removing and installing the clockspring or the steering wheel.

Replacement clocksprings are fitted with a rotor lock, which locks the cover to the rotor, in the central position. The rotor lock must be removed when the replacement clockspring is installed.

DRIVER AIR BAG



E128618

The driver air bag is controlled by the RCM, which chooses between single or dual stage deployment, depending on the occupant position and the crash severity. To reduce the risk of an air bag induced injury to a driver who is positioned close to the steering wheel, the 690 mm diameter air bag deploys radially. The volume of the driver air bag is 57 liters.

The driver air bag has a non-azide propellant that reduces particulates and effluents. It consists of a two stage inflator with separate chambers for the two inflation stages, each being independently activated by the RCM. It has two electrical connectors that are color coded and mechanically keyed to the respective connector on the inflator.

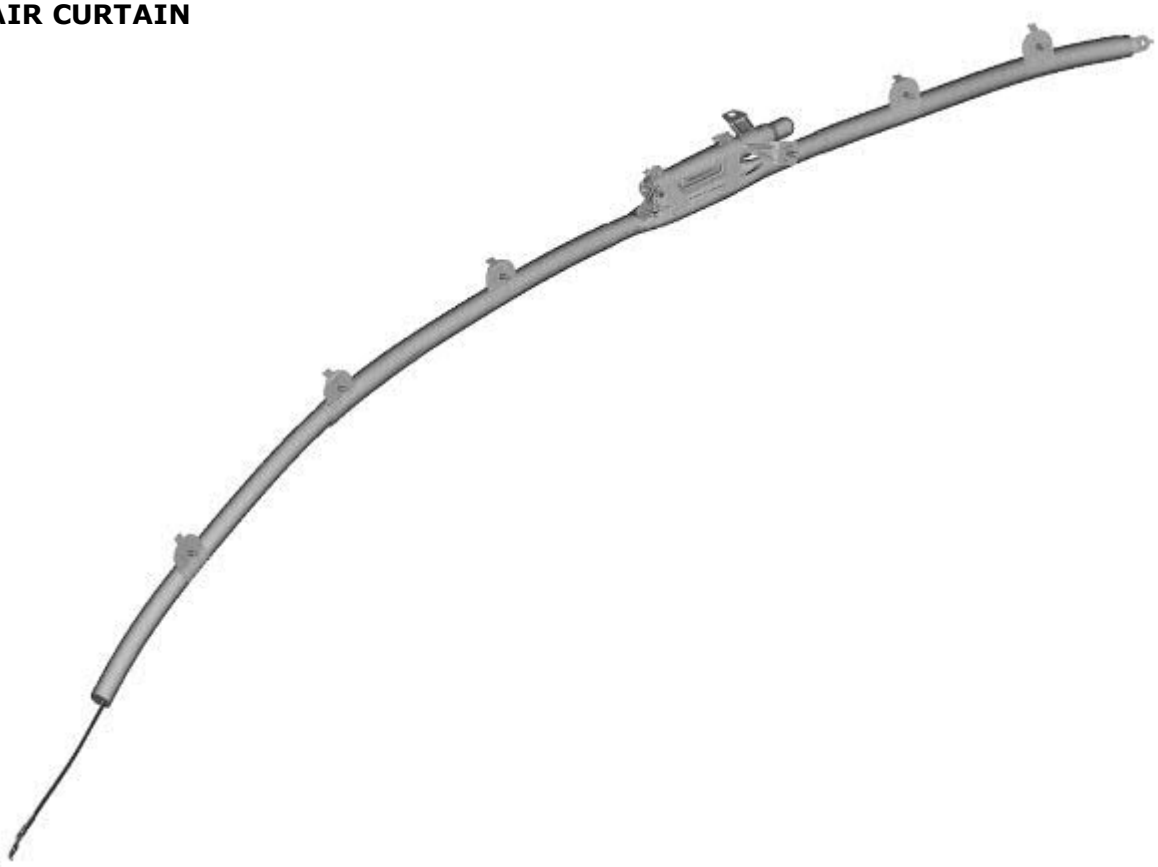
PASSENGER AIR BAG

E128619

The passenger air bag is controlled by the RCM, which chooses between single or dual stage deployment, depending on the occupant status and the crash severity. It consists of a two stage inflator with two air bag electrical connectors to accommodate the two stage inflation. The volume of the passenger air bag is 110 - 120 liters.

The heated gas inflator consists of a high-pressure mix of clean air and hydrogen gas, triggered by two separate ignition squibs. It produces a controlled generation of clean gas to rapidly fill the air bag. It is classified as a stored flammable gas (not as an explosive) and as such, has less restrictive storage and transportation requirements. It produces a very clean burn and almost no particulates and is almost free of any toxins, making disposal or recycling much easier.

SIDE AIR CURTAIN



E128620

The side air curtains have a capacity of approximately 29 liters and are fitted along both sides of the car. They deploy from behind the headliner above the doors, and are anchored at their front and rear extremities to maintain tension across the lower edge of the curtain. Their deployment area extends between the A and C pillar trims, passing over the upper B pillar trim. The inflated portion of the curtain provides head protection for outer occupants in both the front and rear of the car, and a significant level of protection against objects such as poles and trees.

The side air curtains have a rapid fill time of less than 25 ms and, when fully inflated, are approximately 150 mm thick. The curtains are internally divided into separate chambers and, when an area of the inflated air bag is impacted, gases transfer through internal vents to chambers further away from the impact, absorbing energy.

The side air curtains use standard hybrid inflators, which inflate the curtains with gas produced from a combination of pyrotechnic charge and compressed gas.

SIDE AIR BAG

E128621

The side air bags are mounted in the outer sides of the front seats where they provide thorax, rib and pelvis protection. Each side air bag consists of a folded air bag and a pyrotechnic inflator contained in a nylon fabric cover.

Side air bags inflate in less than 15 ms, and absorb the energy of an impact by venting the inflation gas through a vent in the fabric material of the air bag. The venting used is able to discriminate between small and large sized occupants, and adjust the cushion stiffness to suit.

IMPACT SENSORS

E128622

Impact sensors are installed in the front and both sides of the vehicle. A front impact sensor is attached to each headlamp surround panel, below the headlamp. A side impact sensor is attached to the base of each D pillar.

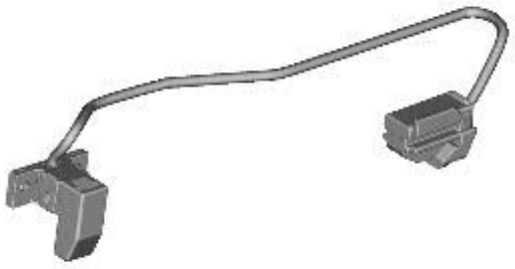
The impact sensors are accelerometers that allow the RCM to detect the sudden acceleration that occurs during an impact.

IMPACT PRESSURE SENSOR

E128623

An impact pressure sensor is installed in each front door, attached to the closure panels. The pressure sensors allow the RCM to detect the sudden pressure pulse that occurs in the front door during a side impact.

SEAT POSITION SENSOR



E128624

The seat position sensor allows the RCM to detect when the driver seat is forward of a given point on the seat track. The seat position sensor consists of a Hall effect sensor attached to the driver seat frame. While the ignition is on, the RCM supplies the sensor with power, and monitors the return current. When the seat frame moves forwards, the sensor moves over the edge of the seat track, which changes the reluctance of the sensor. The change of current is detected by the RCM and used as a switching point. The switching point is when the center of the sensor is 3 ± 4 mm from the leading edge of the seat track.

When the driver seat is forward of the switching point, the RCM increases the time delay between firing the two stages of the inflator in the driver air bag. When the driver seat is rearward of the switching point, the RCM uses the normal time delay between firing the two stages.

PRETENSIONERS

E128625

The pretensioners are used to tighten the front safety belts during a collision to ensure the occupants are securely held in their seats. A pretensioner is integrated into each front safety belt buckle and attached to a bracket on the inboard side of the seat.

RETRACTOR PRETENSIONERS

E149532

A pretensioner is incorporated into each of the safety belt retractors. They are pyrotechnic devices that are controlled by the RCM (restraints control module) in the SRS (supplement restraint system). When deployed both the safety belt retractor pretensioner and safety belt buckle pretensioner fire in conjunction with each other and tighten the seatbelt during a collision to ensure the occupants are securely held in their seats.

NOTE: Prior MY11 NAS vehicles only, you will find a pretensioner on the safety belt buckle and safety belt retractor on the driver's side only and a pretensioner on the safety buckle on passenger side.

SAFETY BELT BUCKLE SWITCHES

The buckle of each front safety belt incorporates a switch that provides a safety belt status signal to the RCM. The RCM broadcasts the status on the high speed CAN bus for use by the safety belt reminder and beltminder systems in the instrument cluster.

In the event of a front impact, the RCM will deploy the pretensioners provided the safety belt buckles are fastened. The pretensioners have a lower deployment threshold than the air bags. Hence it is possible during a minor collision, which exceeds the deployment threshold, that only the pretensioners will deploy.

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AIR BAG WARNING INDICATOR

The air bag warning indicator consists of a red LED (light emitting diode) behind a SRS graphic in the instrument cluster.

Operation of the air bag warning indicator is controlled by a high speed CAN bus message from the RCM to the instrument cluster. The RCM sends the signal to illuminate the air bag warning indicator if a fault is detected, and for approximately 6 seconds during the bulb check at the beginning of each ignition cycle.

OCCUPANT MONITORING

There are two types of occupant monitoring:

- In all markets except NAS and Australia, vehicles have an occupant detection system.
- In NAS markets, vehicles have an occupant classification system.

Occupant Detection Sensor

For markets which have an occupant detection sensor, this has no interface with the restraints system and only provides the belt reminder function.

Occupant Classification System

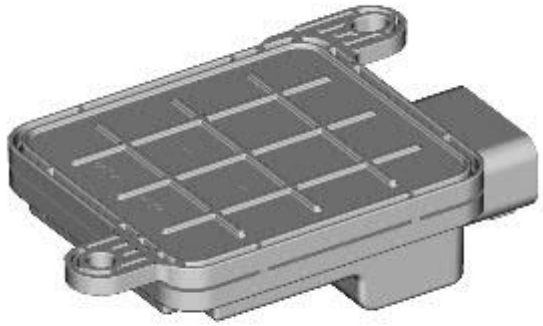
Pressure Pad and Sensor

E128628

Safety Belt Tension Sensor

E98178

Occupant Classification Module



E128661

For markets that have an occupant classification system, this provides the RCM with the occupancy status of the front passenger seat. The restraints control module uses this and the seat buckle status in the evaluation of the firing strategy for the passenger air bag, the passenger side air bag and the front passenger safety belt pretensioner.

The occupant classification system can determine if the front passenger seat is unoccupied, occupied by a small person, or occupied by a large person. The occupant classification system consists of:

- A pressure pad, installed under the cushion of the front passenger seat, which is connected to a pressure sensor.
- A safety belt tension sensor, integrated into the anchor point of the front passenger safety belt.
- An occupant classification module, installed under the front passenger seat.

The pressure pad is a silicone filled bladder. Any load on the pressure pad is detected by the pressure sensor.

The safety belt tension sensor is a strain gauge that measures the load applied by the safety belt anchor to the anchor bolt. The sensor is located in the lower safety belt anchor point.

The occupant classification module supplies a reference voltage to the pressure sensor and the safety belt tension sensor and, from the returned signals, measures the loads acting on the pressure pad and the safety belt tension sensor. The load measurement from the safety belt tension sensor is used to produce a correction factor for the load measurement from the pressure pad. The tightness of the safety belt affects the load acting on the pressure pad, so without the correction factor the occupant classification module cannot derive an accurate occupancy status.

The occupant classification module translates the load readings into a seat occupancy status and transmits the result to the RCM, on a dedicated high speed CAN bus link. The occupant classification module incorporates two load limits for the seat cushion: When the load exceeds the lower limit, but is less than the upper limit, the occupant is classified as small; when the upper limit is exceeded, the occupant is classified as large.

PASSENGER AIR BAG DEACTIVATION INDICATOR

E128751

The passenger air bag deactivation indicator is installed on the center switch pack of the instrument panel. When appropriate, the indicator illuminates to advise front seat occupants that the passenger air bag is disabled. Operation of the indicator is controlled by the RCM. The RCM illuminates the indicator when:

- There is a fault with the passenger air bag firing circuit(s).
- The passenger air bag is deactivated with the PAD switch (where fitted) and the front passenger seat is occupied.
- Required by passenger seat occupant classification (where fitted).

PASSENGER AIR BAG DEACTIVATION SWITCH (ALL EXCEPT NAS)

E128629

Where fitted, the PAD switch provides a method of manually disabling the passenger air bag. The switch is installed in the front passenger end of the instrument panel and operated by the emergency key.

When the PAD switch is operated, it changes a ground connection between two pins in the connectors of the RCM. When the PAD switch is selected to OFF, the RCM disables the passenger air bag and, if the front passenger seat is occupied, illuminates the PAD indicator in the overhead console.

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Supplemental Restraint System - Air Bag Supplemental Restraint System (SRS)

Diagnosis and Testing

Principle of Operation

For a detailed description of the Supplemental Restraints system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (501-20B Supplemental Restraint System)

Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) (Description and Operation),
Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) (Description and Operation),
Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) (Description and Operation).

Given the potential for damage/injury, the preferred method of diagnosis is the manufacturer approved diagnostic system, and even when using this, the following safety information should be followed at all times:

Safety Information

WARNINGS:

To avoid accidental deployment the back-up power supply must be depleted before beginning any work on the SRS system or its components. Failure to follow this instruction may result in personal injury.

Do not use a multimeter to probe an SRS module. It is possible for the power from the metre battery to trigger the activation of the module. Failure to follow this instruction may result in personal injury.

NOTES:

It is advisable not to use a cellular phone or to have a cellular phone in close proximity when working on the SRS system or components.

Given the legal implications of a restraints system failure, harness repairs to Air Bag module circuits are not acceptable. Where the text refers to "REPAIR the circuit", this will normally mean the replacement of a harness.

Power Supply Depletion

Before beginning any work on the SRS system or related components:

1. Remove the ignition key.
2. Disconnect the battery leads, ground first.
3. Wait 2 minutes for the power circuit to discharge.

There are comprehensive instructions on the correct procedures for SRS system repairs in the manual. Refer to the relevant section of the workshop manual.

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern.
   - Confirm the function of the warning lamp (if the warning lamp is inoperative, system faults will be signalled by an audible chime)
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
• Check for the installation of non-standard accessories which may affect or obstruct the function of the SRS system • Check the condition of trim, etc at the SRS system components • Sensor(s) • Pretensioner(s) • Air bag module(s)	• Fuses • Wiring harness • Make sure all electrical connector(s) are engaged correctly on the air bag circuits • Make sure the Restraints Control Module (RCM) is correctly installed

Mechanical	Electrical
• Occupant detection/classification sensors • Seat position sensor	• Warning lamp bulb(s) • Impact sensor(s) • Buckle sensor(s) • Pretensioner(s) • Air bag module(s) • Air bag deactivation switch • Air bag deactivation warning lamp • Occupant detection/classification sensors • Seat position sensor • Clockspring

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
    - Faults in SRS harnesses would normally mean replacement of the relevant harness. SRS harness repairs are **not** recommended
4. If the cause is not visually evident check the system for any logged Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Restraints Control Module (RCM) (100-00 General Information, Description and Operation) /
Diagnostic Trouble Code (DTC) Index - DTC: Occupant Classification System (OCS) (100-00 General Information, Description and Operation).

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Supplemental Restraint System - Air Bag Disposal

General Procedures

Deployed Air Bag

1. WARNING: Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

   Deployed air bag modules are to be disposed of as special waste and must comply with local environmental requirements, if in doubt, contact Authority for disposal requirements.

2. NOTE: The storage, transportation, disposal, and/or recycling of air bag module components must be carried out in accordance with all applicable federal, state and local regulations including, but not limited to, those governing building and fire codes, environmental protection, occupational health and safety, and transportation.

   Modules removed and deployed by Jaguar service are to be returned to the importer for disposal.

Undeployed Air Bag — Inoperative

1. WARNING: Carry a live air bag module with the air bag and trim cover or deployment door pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment. Failure to follow this instruction may result in personal injury.

   NOTE: All inoperative air bag modules have been placed on the Mandatory Return List. All discolored or damaged air bag modules must be treated the same as any inoperative live air bag being returned. Failure to follow this instruction may result in personal injury.

   Remove the inoperative driver air bag module or passenger air bag module. For additional information
   For additional information, refer to: Driver Air Bag Module (501-20B Supplemental Restraint System, Removal and Installation).
   or
   For additional information, refer to: Passenger Air Bag Module (501-20B Supplemental Restraint System, Removal and Installation).
   in this section.

Undeployed Air Bag — Scrapped Vehicle

Remote Deployment

1. WARNINGS:

   Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

   Carry a live air bag module with the air bag and trim cover or deployment door pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment. Failure to follow this instruction may result in personal injury.

   Remote deployment is to be carried out outdoors with all personnel at least 6.1 meters (20 feet) away to ensure personal safety. Due to the

loud report which occurs when the air bag is deployed, hearing protection is required. Failure to follow this instruction may result in personal injury.

Do not place the driver or passenger air bag module with the trim cover or deployment door facing down, as the forces of the deploying air bag can cause it to ricochet and cause personal injury. Failure to follow this instruction may result in personal injury.

Equipment required: Universal deployment tool-Part N° 418-135 and 12V Battery.

2. The deployment procedure should be carried out outdoors away from other personnel.

3. Remove any loose debris from around air bag. Make sure that no flammable liquids are present.

4. Disconnect the battery ground and positive cables.

5. Disconnect the relevant air bag module electrical connector.

6. Connect the appropriate adaptor lead to the restraint device.

7. Connect the deployment lead to the adaptor lead. Pass wire of the deployment tool through window, close all doors, leave window with lead for deployment tool open.

8. WARNING: Before proceeding, make sure precautions have been taken to warn personnel of a possible loud noise upon activation. Do not allow anybody to approach closer to restraint device than six meters. Failure to follow this instruction may result in personal injury.

   Move as far from restraint device as possible and connect the tool clips to a 12V vehicle battery.

9. WARNING: Do not handle the deployed device immediately after activation - it may be hot. Allow the unit to cool for at least 20 minutes. Cooling modules should be continuously monitored to make sure heat does not create a fire with spilled liquids or other debris. Failure to follow this instruction may result in personal injury.

   Deploy the module by depressing both switches on the tool. If activation does not occur, disconnect battery from tool and seek advise from Jaguar Engineering and wait for further instructions.

10. Repeat procedure for all air bags in vehicle.

11. The vehicle is now to be scrapped in the normal manner with modules installed.

Disposal of live air bag modules for all air bags, using tyres

1. Equipment required: Deployment tool 418-S135, Battery (12V), Safety goggles to BS2092 grade 2, Rubber gloves to PrEN 374 class 2, Ear protectors that have been measured to BS.EN 24869, Particulate respirator to EN 149 grade FFP2S

2. The deployment procedure should be carried out outdoors, away from

other personnel.

3. Stack four scrap tyres, securing together with heavy gauge wire or cable. while disconnected from any electrical power source, connect deployment harness and place air bag adaptor portion under tyre stack, ready for connection to air bag.

4. WARNING: Power must not be connected during this step. Failure to follow this instruction may result in personal injury.

   CAUTION: Make sure the connector is not in contact with the inflator or it will be damaged during the test.

   Connect air bag to air bag connector, make sure the locking sleeve is fully engaged. position the air bag with the cover facing upwards.

5. Make sure battery connections of deployment harness are ten meters away from the tyre stack

6. Remove any loose from around the air bag . Make sure that no flammable liquids are present.

7. WARNING: Before proceeding, make sure precautions have been taken to warn personnel of a possible loud noise upon activation. Do not allow anybody to approach closer to restraint device than six meters. Failure to follow this instruction may result in personal injury.

   Move as far from restraint device as possible and connect the tool clips to a 12V vehicle battery.

8. WARNING: Do not handle the deployed device immediately after activation - it may be hot. Allow the unit to cool for at least 20 minutes. Cooling modules should be continuously monitored to make sure heat does not create a fire with spilled liquids or other debris. Failure to follow this instruction may result in personal injury.

   Deploy the module by depressing both switches on the tool. If activation does not occur, disconnect battery from tool and seek advise from Jaguar Engineering and wait for further instructions.

9. Allow the air bag to cool for at least 20 minutes. Cooling modules should be continuously monitored to make sure heat generated a fire with spilled liquids or other debris.

10. Remove the air bag from the tyre stack and seal in a plastic bag, ready for disposal.

11. In the event of any problems or queries arising from this procedure, contact Jaguar Engineering.

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Supplemental Restraint System - Clockspring

Removal and Installation

Special Tool(s)

E43628	211-326 Locking Tool, Clockspring

Removal

WARNINGS:

Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module.

Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment. Failure to follow this instruction may result in personal injury.

Do not set a live air bag module down with the trim cover face down. Failure to follow this instruction may result in personal injury.

After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards. Failure to follow this instruction may result in personal injury.

Never probe the connectors on the air bag module. Doing so may result in air bag deployment, which may result in personal injury. Failure to follow this instruction may result in personal injury.

Air bag modules with discolored or damaged trim covers must be replaced, not repainted.

Vehicle sensor orientation is critical for correct system operation. If a vehicle equipped with an air bag supplemental restraint system (SRS) is involved in a collision, inspect the sensor mounting bracket and wiring pigtail for deformation. If damaged, replace the sensor whether or not the air bag is deployed.

To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplemental restraint system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait for two minutes. Failure to follow this instruction may result in personal injury.

CAUTION: Make sure the wheels are in the straight-ahead position. Failure to follow this instruction may result in damage to the component.

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

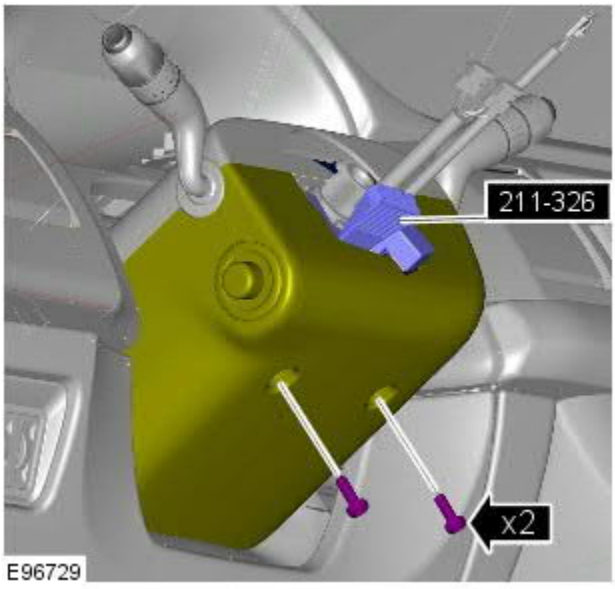
1. Make the SRS system safe.

   Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

2. CAUTION: Make sure that special tool 211-326 is installed to the clockspring.

   Refer to: Steering Wheel (211-04 Steering Column, Removal and Installation).

3. *Special Tool(s):* 211-326



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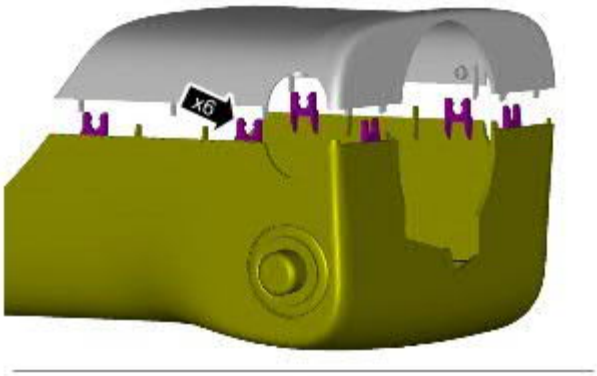

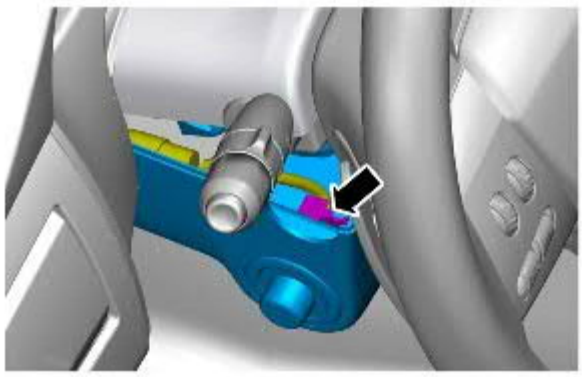

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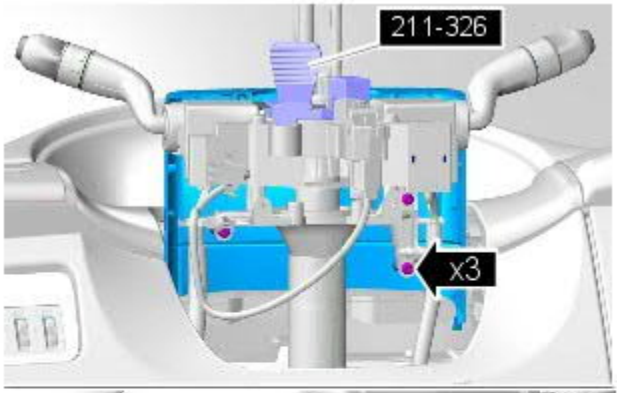
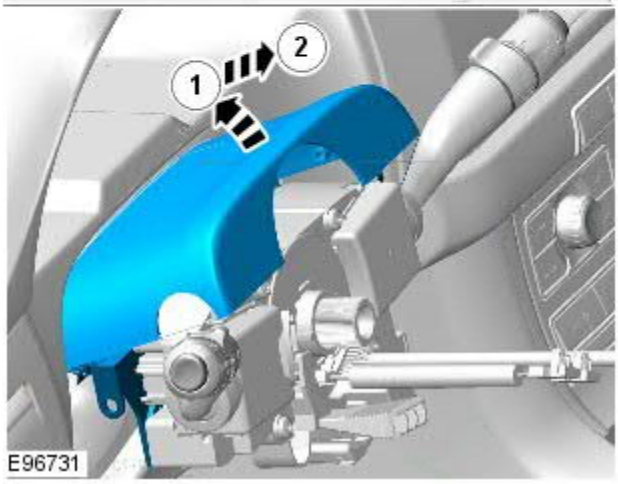
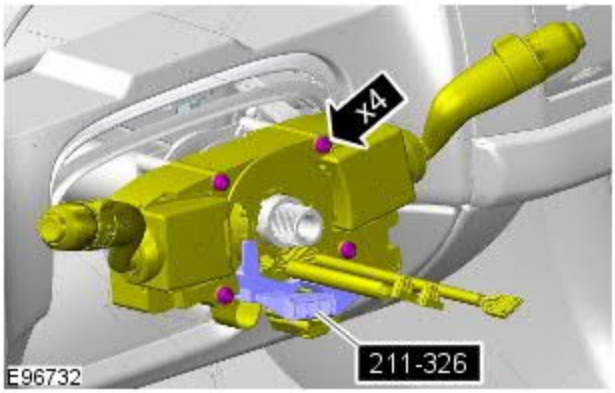




6. *Torque:* 6 Nm



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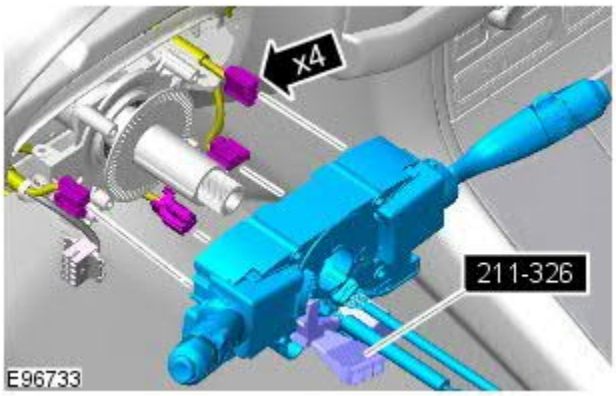
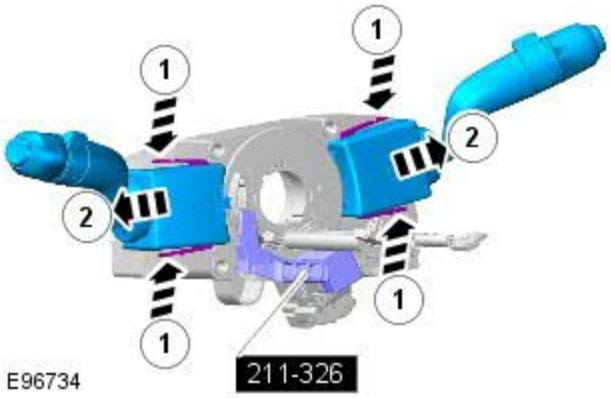
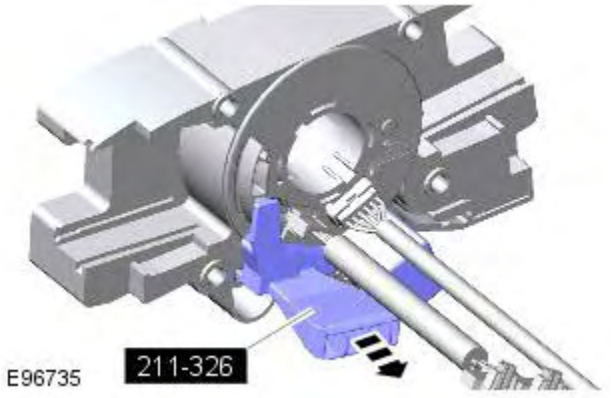


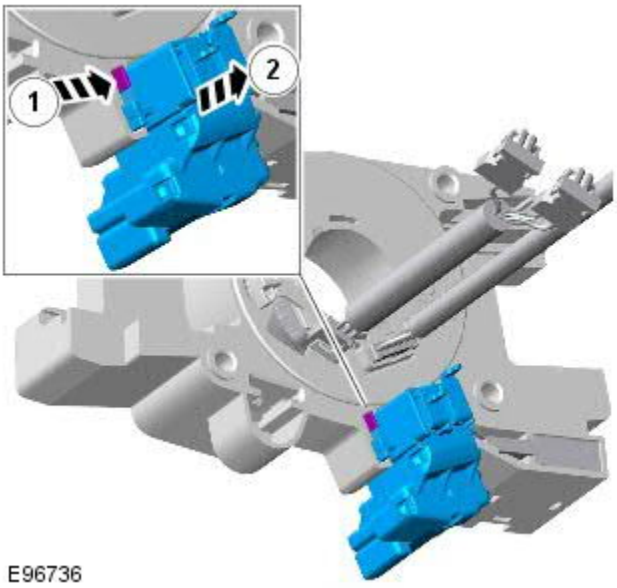


8. NOTE: Do not disassemble further if the component is removed for access only.



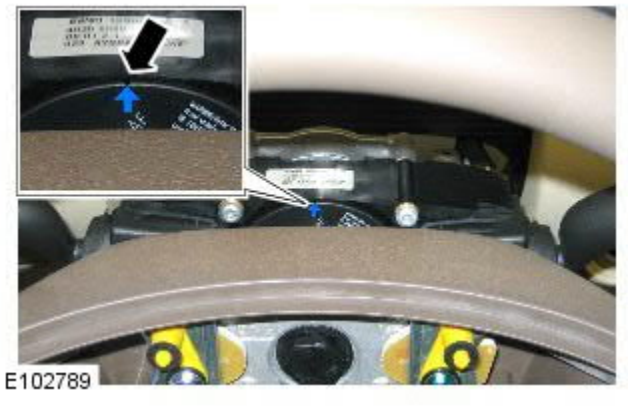
9. Remove the special tool from the clockspring.

   Special Tool(s): 211-326



10.

Installation



1. CAUTIONS:

   Make sure that special tool 211-326 is installed to the clockspring.

   Make sure that the arrow on the cassette is centered and pointing vertically (**make sure that the steering wheel has remained in the 12 o'clock position and that it has not been turned by +/- 360 degrees**) prior to the steering wheel installation. On removal of the special tool, keep the clockspring cables taught to prevent the cassette moving from the set position. Failure to follow this instruction may result in damage to the component.

   Make sure that the road wheels are in the straight ahead position, failure to follow this instruction may result in damage to the vehicle.

   To install, reverse the removal procedure.

Published: 10-Feb-2012

Supplemental Restraint System - C-Pillar Side Impact Sensor

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least two minutes after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

NOTE: Removal steps in this procedure may contain installation details.

All vehicles

1. Make the air bag supplemental restraint system (SRS) safe.

   Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

2. WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplementary restraints system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait for one minute. Failure to follow this instruction may result in personal injury.

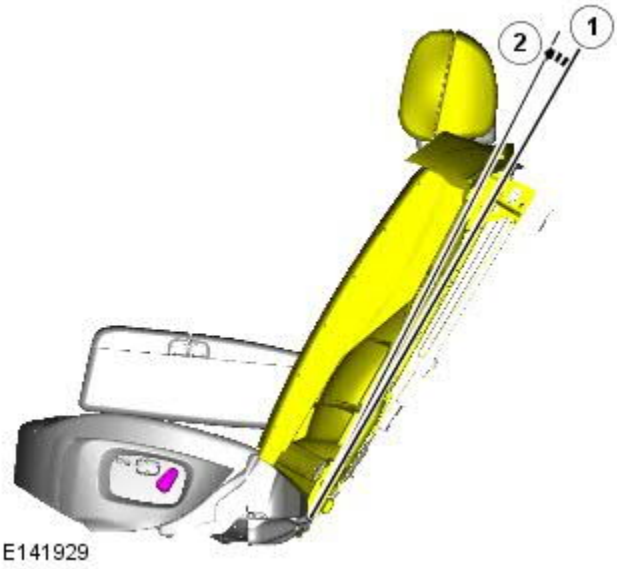
   Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

3. Refer to: Rear Scuff Plate Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

Vehicles with split rear seat backrest

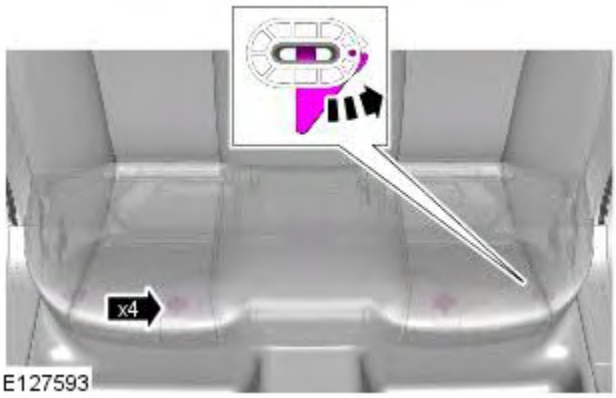
NOTE: If equipped.

4. Fully recline the rear seat backrest, then adjust it slightly back up to aid access.



All vehicles

5.



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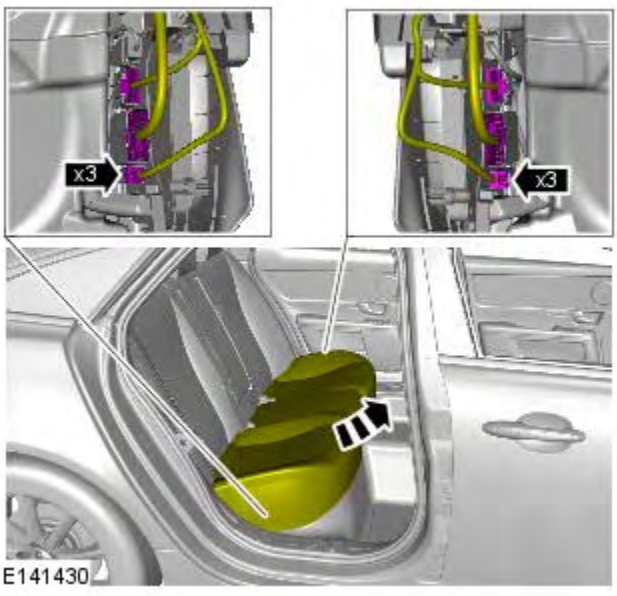

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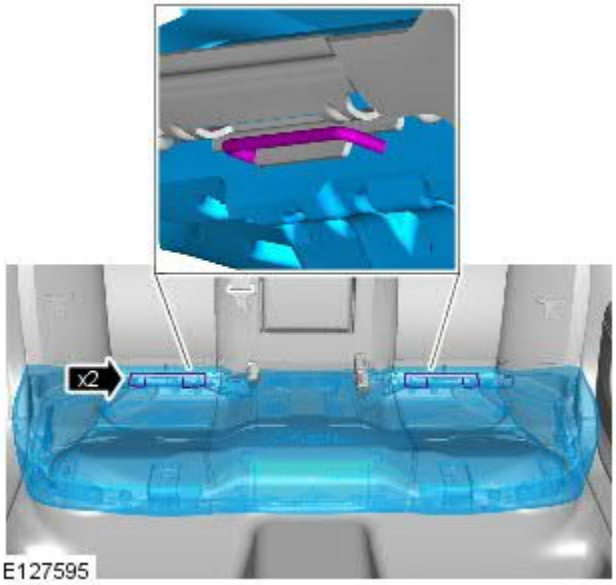
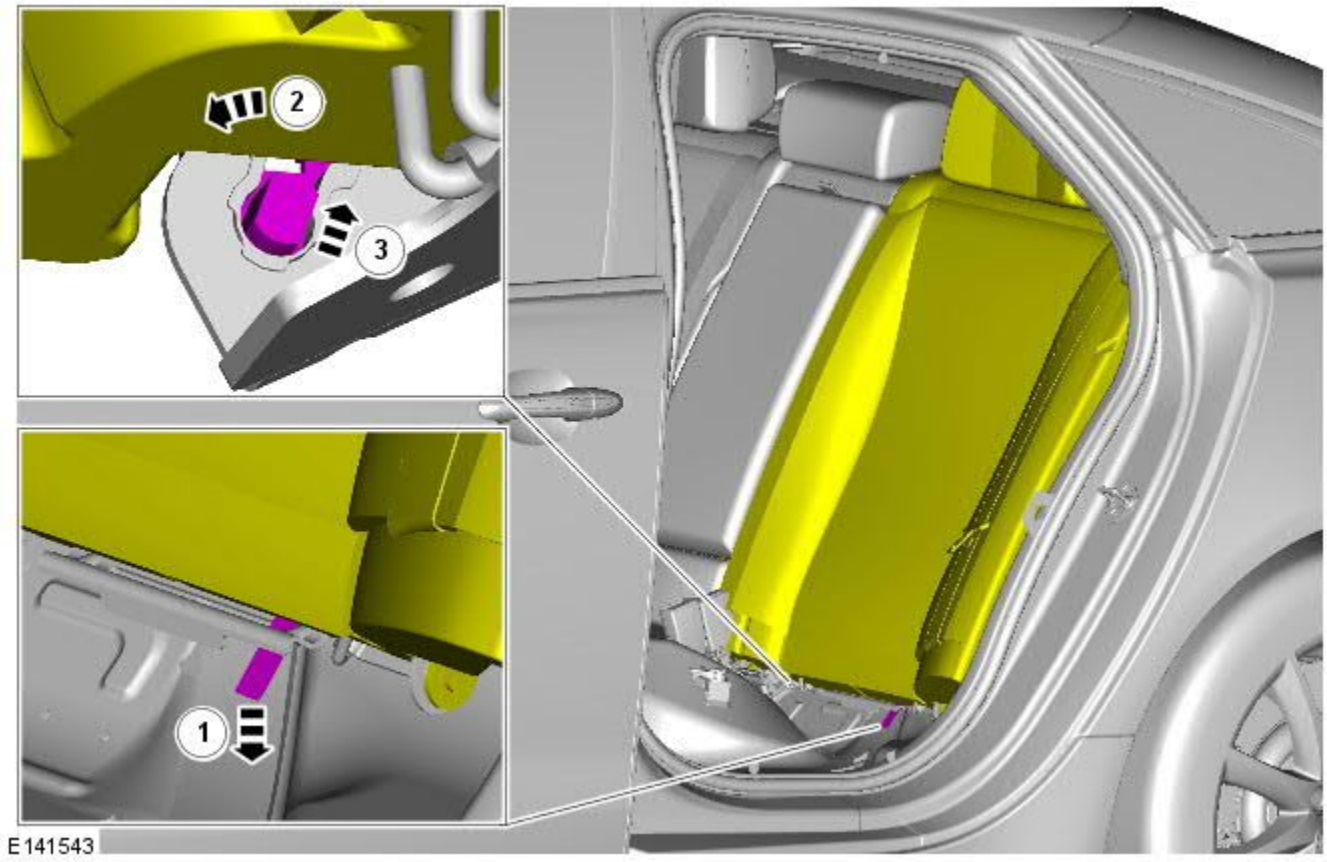


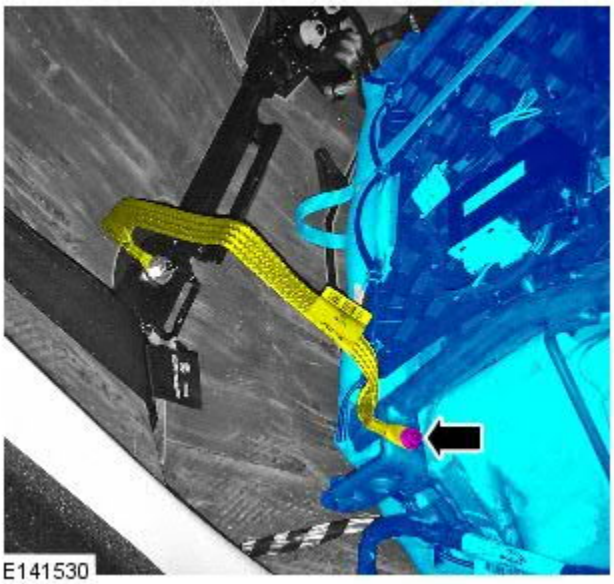
Vehicles with split rear seat backrest

NOTE: If equipped.

8.

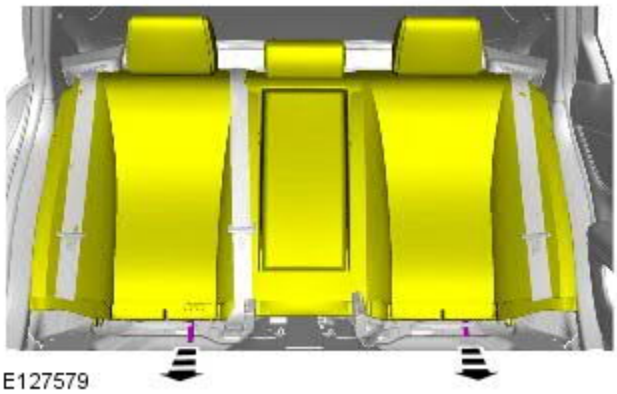


9. *Torque:* 10 Nm


E141530

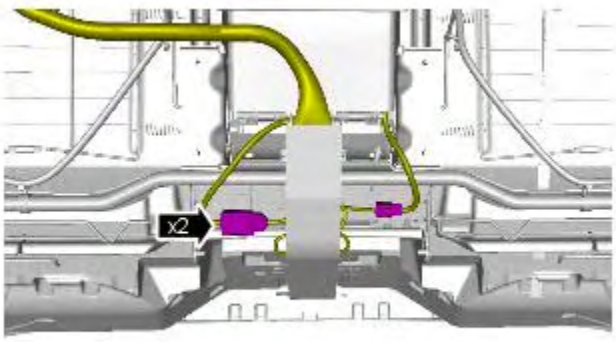
All vehicles

10.


E127579

Vehicles with rear passenger entertainment system

11.

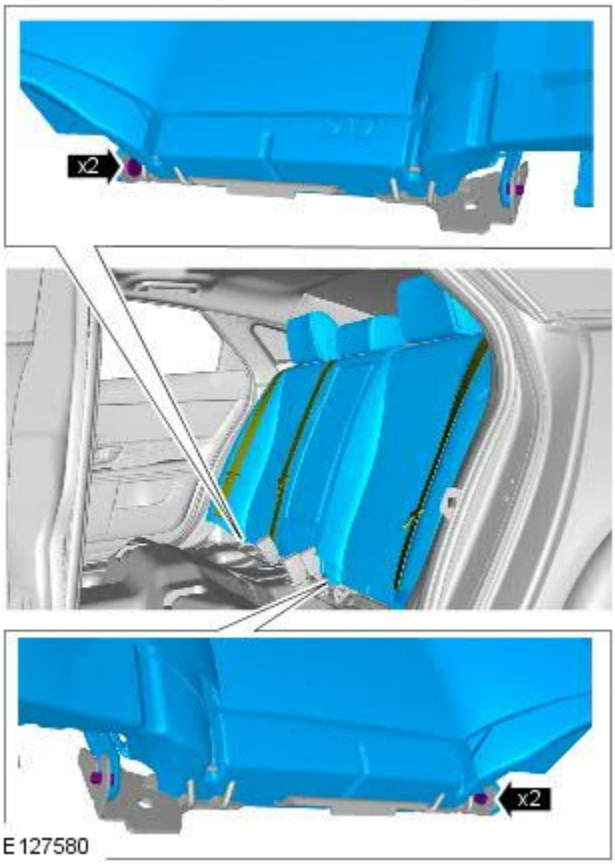


E127581

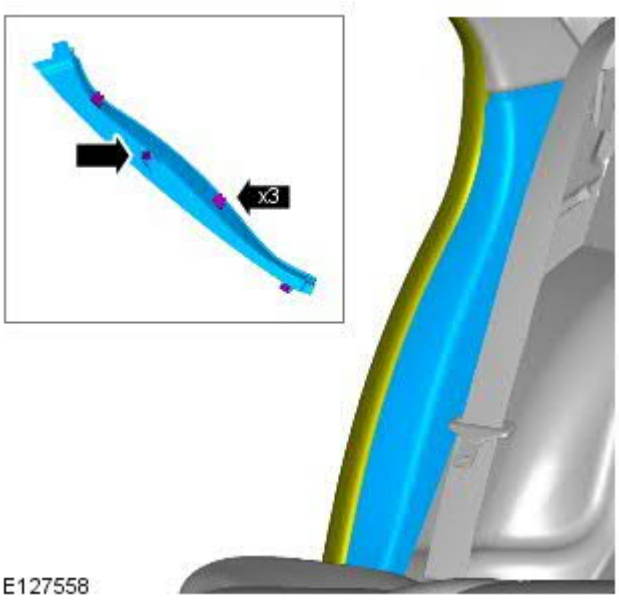
E128812

12. NOTE: Note the position of the wiring harnesses to aid installation.

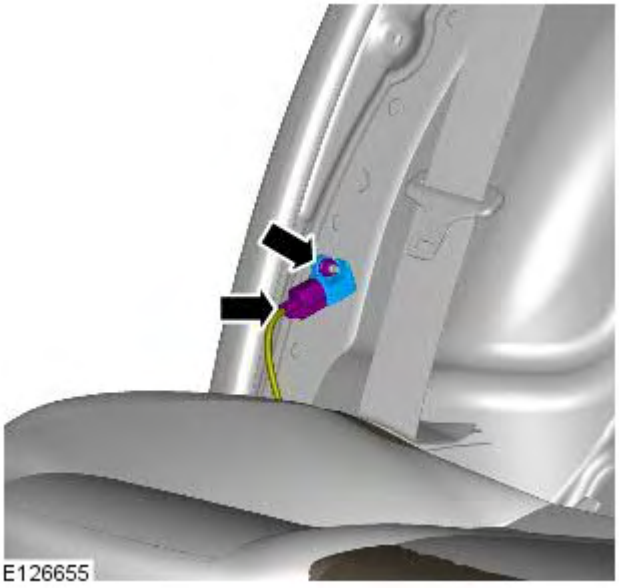
13.



E127580



14. NOTE: Right-hand shown, left-hand similar.

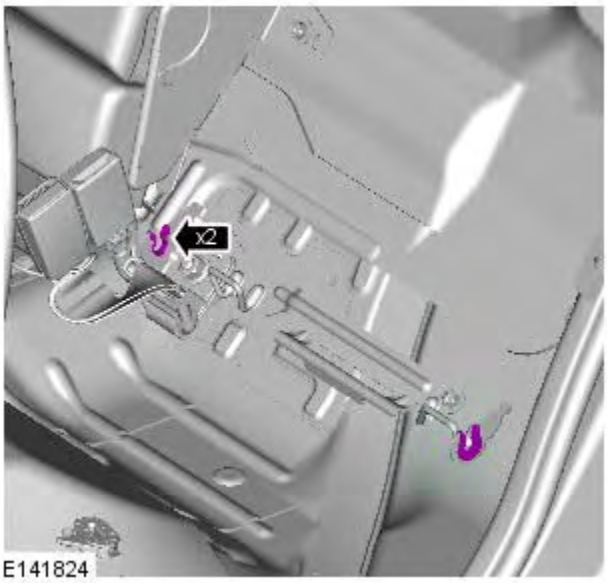


15. NOTE: Right-hand shown, left-hand similar.

Torque: 12 Nm

Installation

1. To install, reverse the removal procedure.



2. NOTE: Make sure that all the clips are correctly installed.

3. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Published: 11-May-2011

Supplemental Restraint System - Crash Sensor

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least two minutes after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

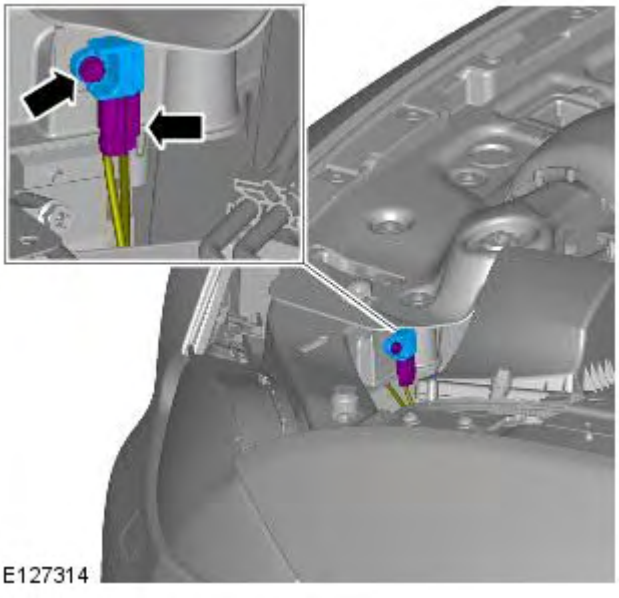
NOTE: Removal steps in this procedure may contain installation details.

1. Make the air bag supplemental restraint system (SRS) safe.

   Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

2. WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplementary restraints system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait for one minute. Failure to follow this instruction may result in personal injury.

   Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).



3. NOTE: Left-hand shown, right-hand similar.

   Torque: 10.5 Nm

Installation

1. Install is the reverse of removal.

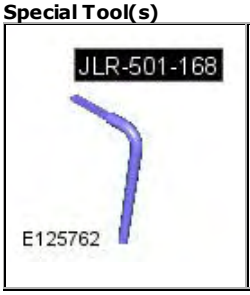
2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Published: 11-May-2011

Supplemental Restraint System - Driver Air Bag Module

Removal and Installation

Special Tool(s)

	JLR-501-168 Remover, Driver Airbag Module

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least two minutes after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

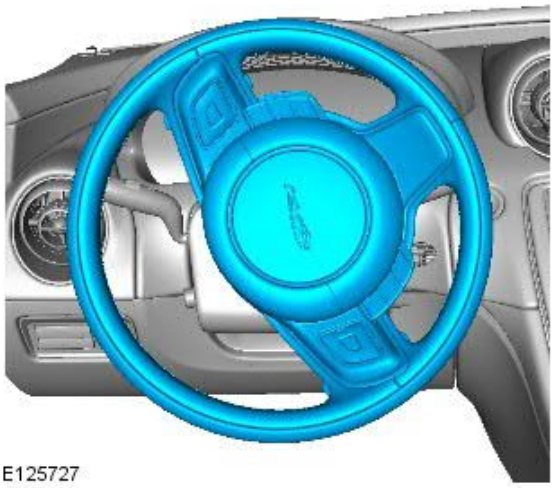
Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

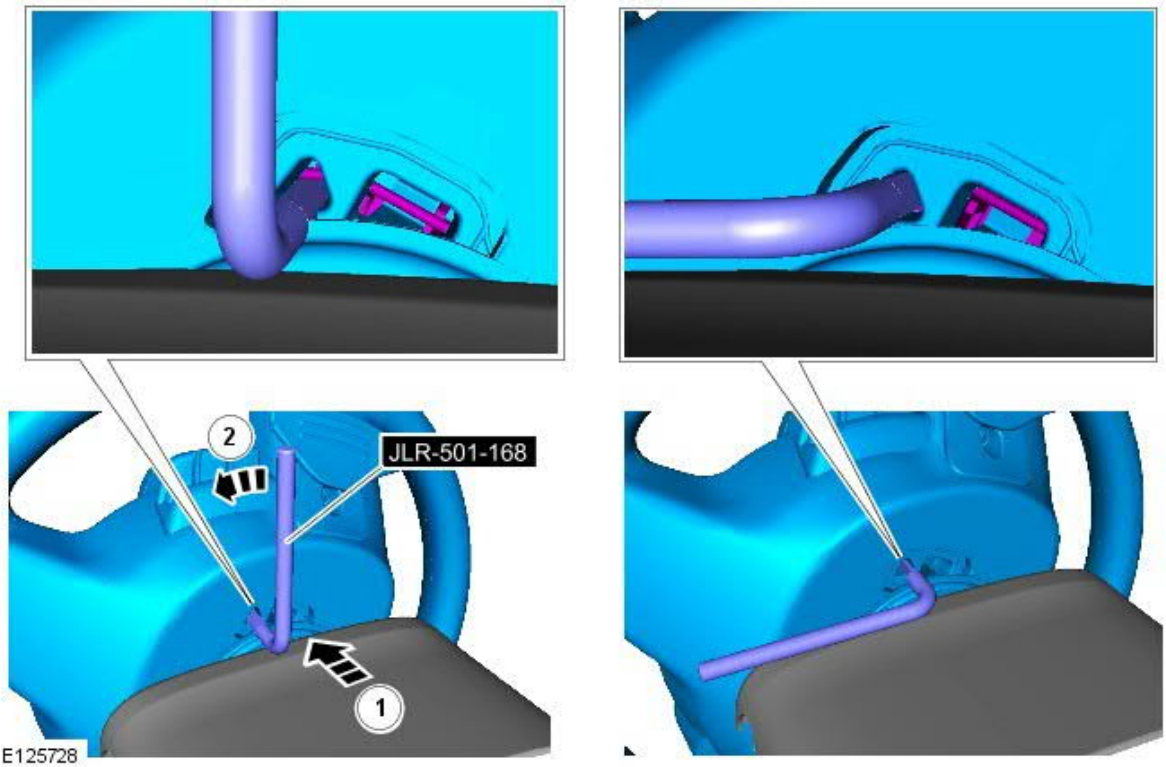
Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2.





3. NOTES:

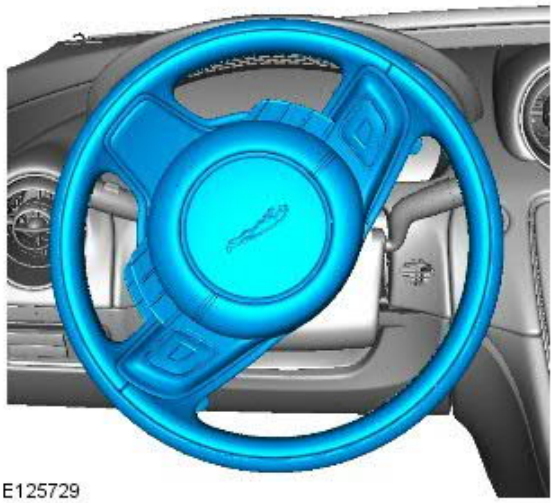
An audible click can be heard when the airbag module has been released from each side of the steering wheel.

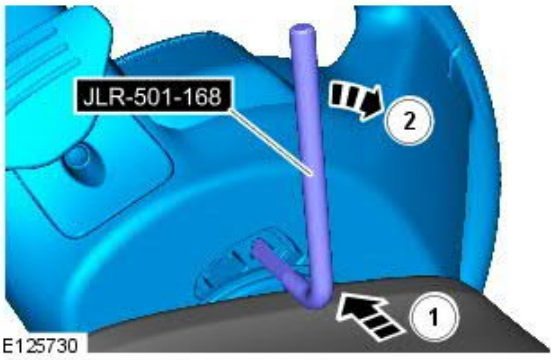
Gently pull on the side of the airbag module which has been released until it has been withdrawn sufficiently to clear the spring clip.

Special Tool(s): JLR-501-168

4. Remove the special tool.

5.


E125729



E125730

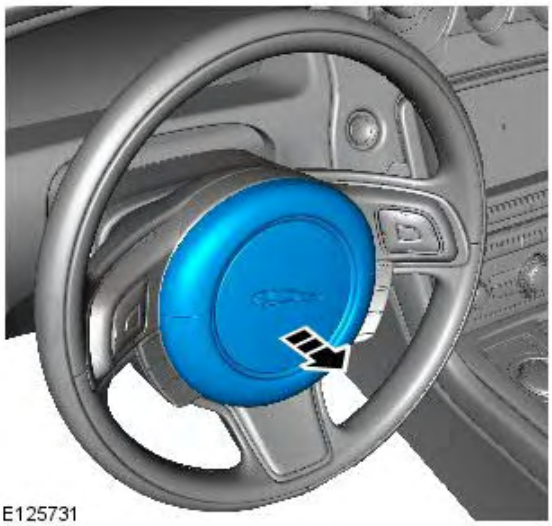
6. NOTES:

Gently pull on the side of the airbag module which has been released until it has been withdrawn sufficiently to clear the spring clip.

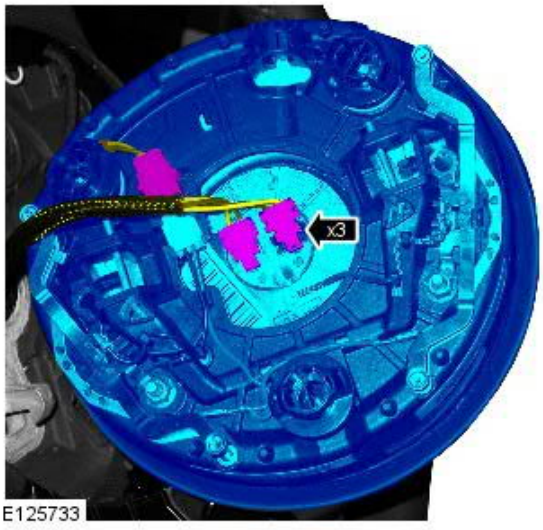
An audible click can be heard when the airbag module has been released from each side of the steering wheel.

Special Tool(s): JLR-501-168

7. Remove the special tool.

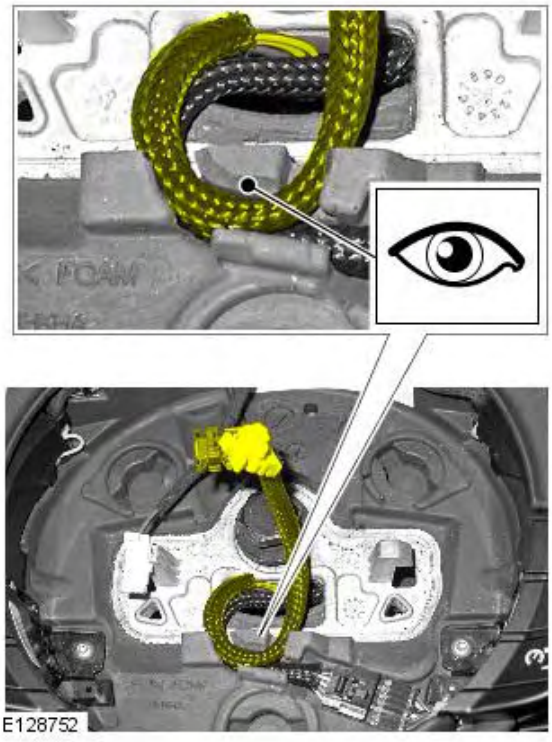

E125731

8. CAUTION: Make sure the wiring harness is installed to its original position.



9. WARNING: Driver air bag module installation can be confirmed by hearing 2 audible clicks, 1 for each clip.

Installation



1. CAUTION: Make sure that the wiring harnesses are correctly routed.

   To install, reverse the removal procedure.

Published: 11-May-2011

Supplemental Restraint System - Front Door Side Impact Sensor

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least one minute after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

NOTE: Removal steps in this procedure may contain installation details.

1. Make the air bag supplemental restraint system (SRS) safe.

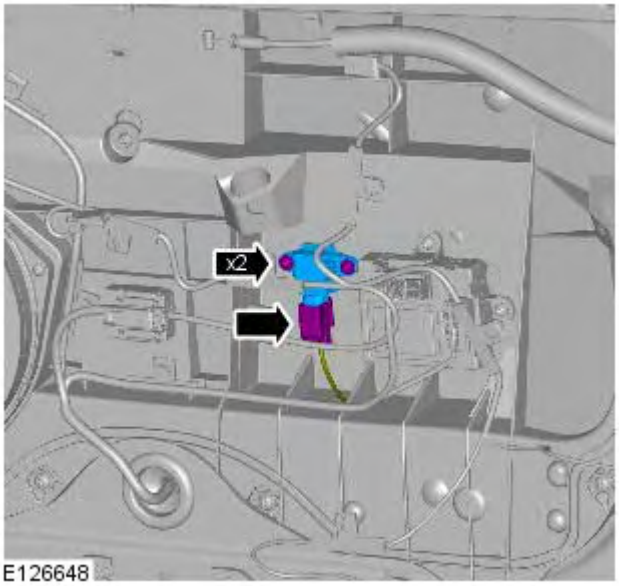
   Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

2. WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplementary restraints system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait for one minute. Failure to follow this instruction may result in personal injury.

   Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

3. Refer to: Front Door Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

4.



Installation

1. To install, reverse the removal procedure.

2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Published: 11-May-2011

Supplemental Restraint System - Passenger Air Bag Module

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least two minutes after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

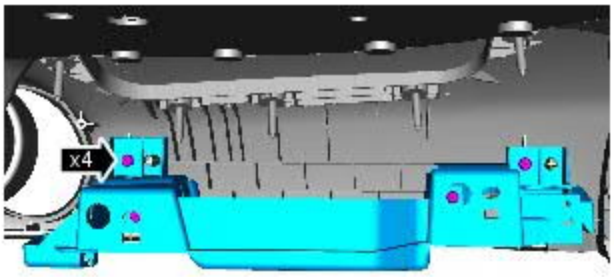
To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

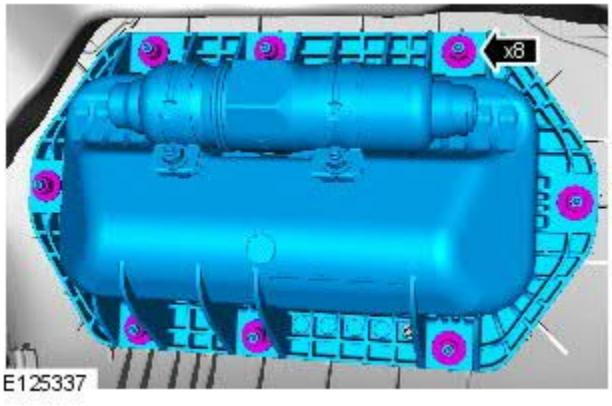
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).



E125333

2. *Torque:* 2.5 Nm



3. *Torque:* 4.5 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Supplemental Restraint System - Restraints Control Module (RCM)

Removal and Installation

Removal

WARNINGS:

Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module.

Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment. Failure to follow this instruction may result in personal injury.

Do not set a live air bag module down with the trim cover face down. Failure to follow this instruction may result in personal injury.

After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards. Failure to follow this instruction may result in personal injury.

Never probe the connectors on the air bag module. Doing so may result in air bag deployment, which may result in personal injury. Failure to follow this instruction may result in personal injury.

Air bag modules with discolored or damaged trim covers must be replaced, not repainted.

Vehicle sensor orientation is critical for correct system operation. If a vehicle equipped with an air bag supplemental restraint system (SRS) is involved in a collision, inspect the sensor mounting bracket and wiring pigtail for deformation. If damaged, replace the sensor whether or not the air bag is deployed.

To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplemental restraint system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait two minutes. Failure to follow this instruction may result in personal injury.

To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplemental restraint system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait one minute. Failure to follow this instruction may result in personal injury.

CAUTION: Make sure the wheels are in the straight-ahead position. Failure to follow this instruction may result in damage to the component.

NOTE: Removal steps in this procedure may contain installation details.

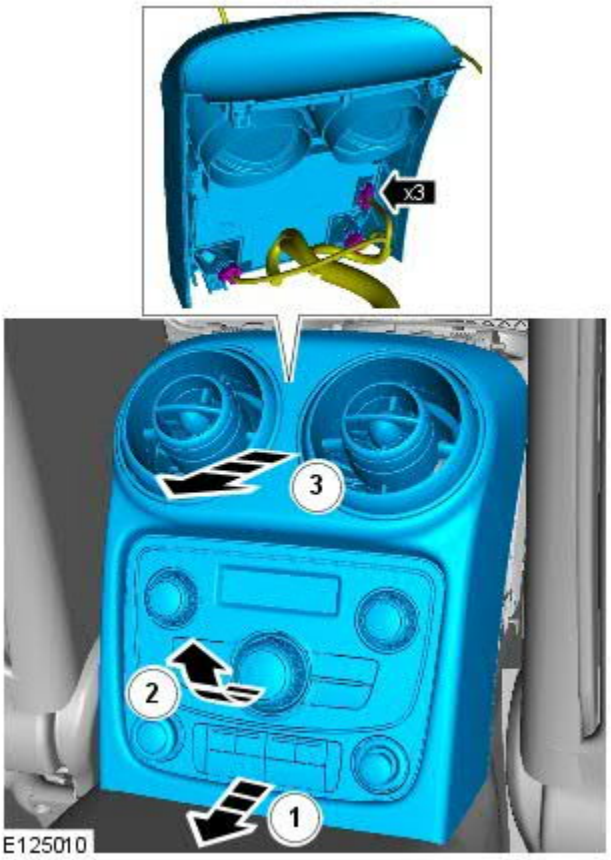
1. Make the air bag supplemental restraint system (SRS) safe.

   Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

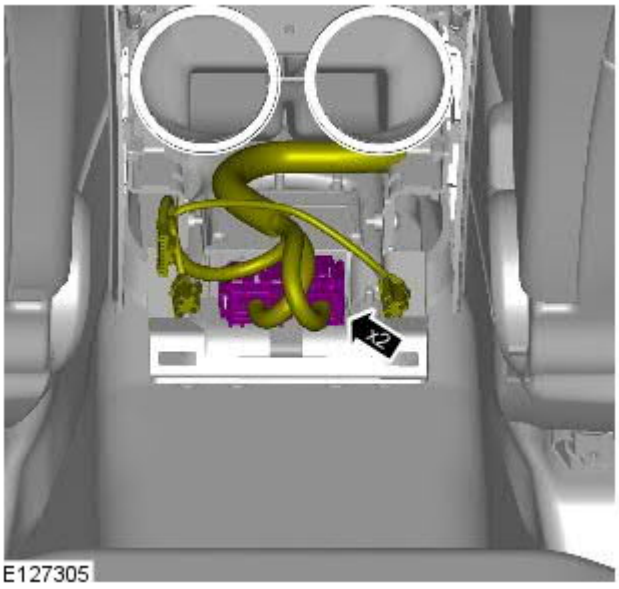
2. WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplementary restraints system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait for one minute. Failure to follow this instruction may result in personal injury.

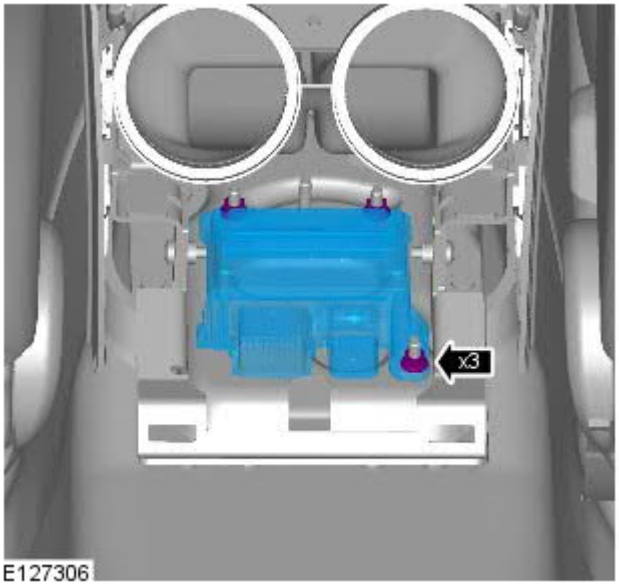
   Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

3.



4.





5. *Torque:* 10.5 Nm

Installation

1. To install, reverse the removal procedure.

2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Published: 11-May-2011

Supplemental Restraint System - Seat Position Sensor

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least two minutes after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

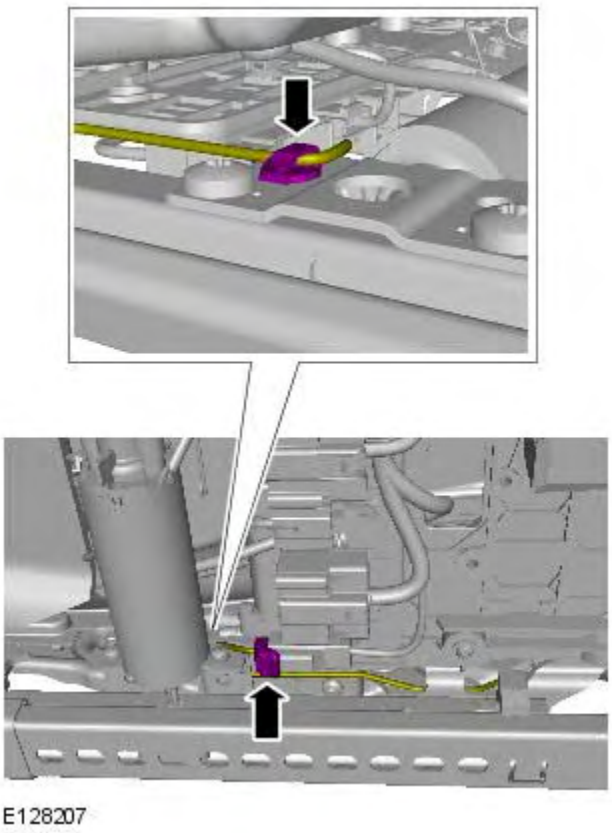
Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

NOTE: Removal steps in this procedure may contain installation details.

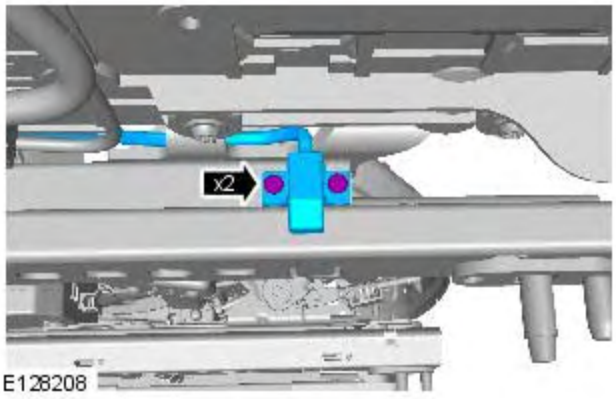
1. Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

2. Refer to: Front Seat (501-10 Seating, Removal and Installation).

3.



4.



Installation

1. CAUTION: Make sure that the sensor is correctly installed.

   To install, reverse the removal procedure.

Published: 03-Dec-2011

Supplemental Restraint System - Side Air Bag Module

Removal and Installation

Removal

WARNINGS:

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least two minutes after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

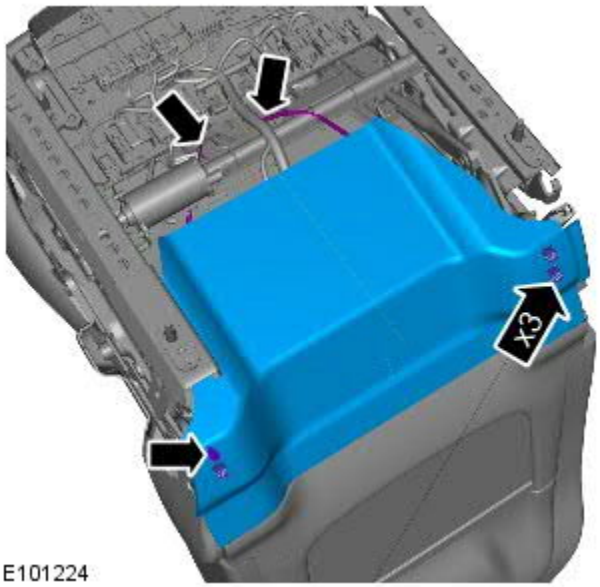
NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

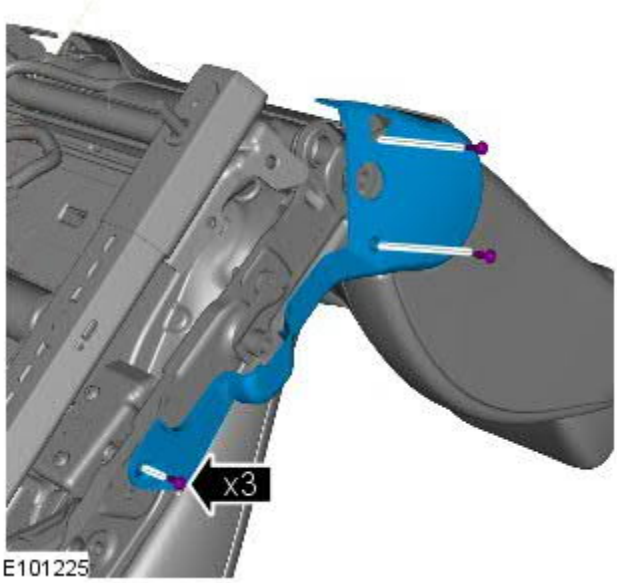
1. Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).

2. Refer to: Front Seat (501-10, Removal and Installation).



E101224

3. NOTE: Make sure that the clips are installed in the correct orientation.



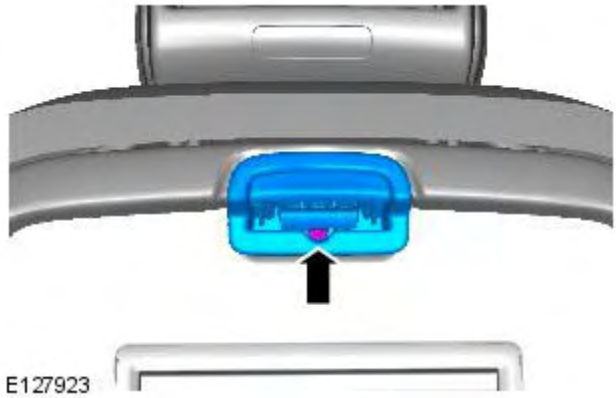
E101225

4.

5.

E127925

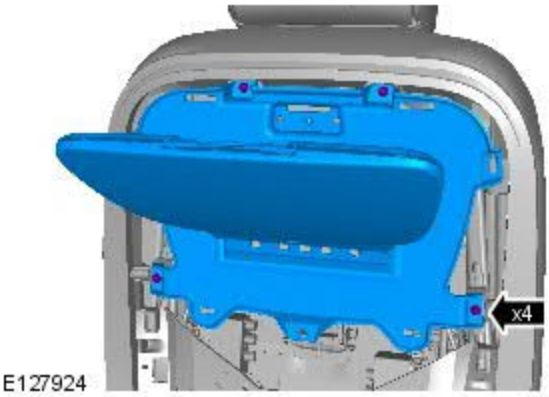
6.



E127923

E127922

7. NOTE: Make sure that the clips are installed in the correct orientation.



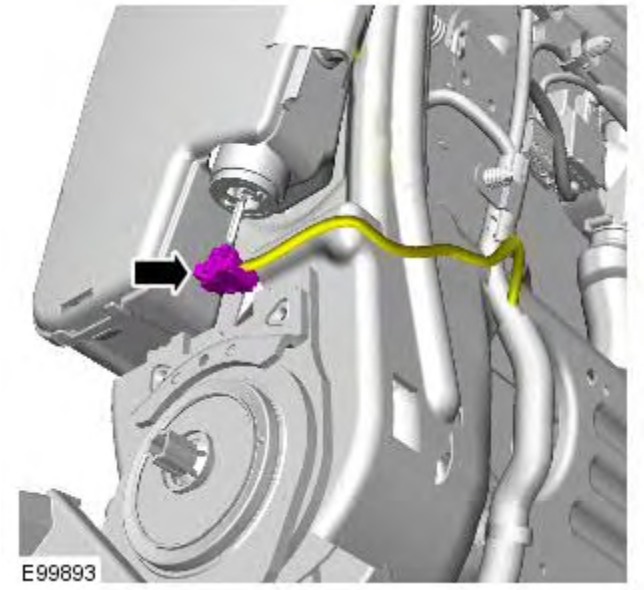
E127924

8. *Torque:* 5 Nm

9.

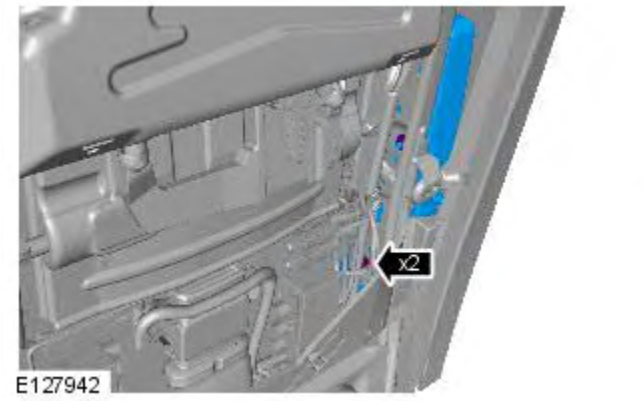
10. WARNING: The SRS electrical connectors are unique. DO NOT force, or attempt to connect electrical connectors to the wrong sockets.

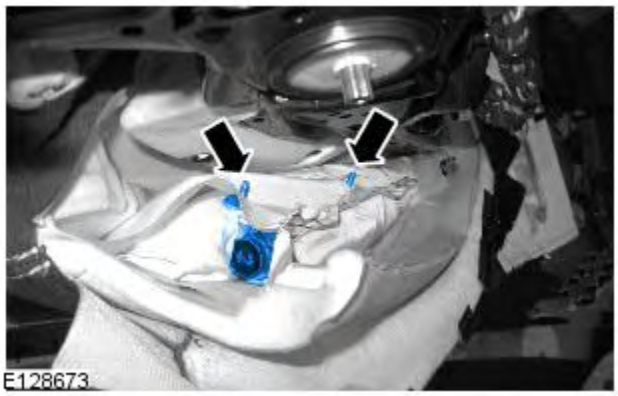
CAUTION: LH illustration shown, RH is similar.



11. CAUTION: Note the fitted position of the component prior to removal.

Torque: 7 Nm





12. WARNING: Make sure that the air bag is correctly installed in to the fabric chute. Failure to follow this instruction may result in incorrect operation of the air bag.

    CAUTION: Note the fitted position of the component prior to removal.

Installation

1. To install, reverse the removal procedure.

2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Published: 10-Feb-2012

Supplemental Restraint System - Side Air Curtain Module

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least two minutes after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module.

Take extra care when handling supplemental restraint system (SRS) components.

Vehicle sensor orientation is critical for correct system operation. If a vehicle equipped with an air bag supplemental restraint system (SRS) is involved in a collision, inspect the sensor mounting bracket and wiring pigtail for deformation. If damaged, replace the sensor whether or not the air bag is deployed.

Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module.

Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment. Failure to follow this instruction may result in personal injury.

Do not set a live air bag module down with the trim cover face down. Failure to follow this instruction may result in personal injury.

After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards. Failure to follow this instruction may result in personal injury.

Never probe the connectors on the air bag module. Doing so may result in air bag deployment, which may result in personal injury. Failure to follow this instruction may result in personal injury.

Air bag modules with discolored or damaged trim covers must be replaced, not repainted.

Vehicle sensor orientation is critical for correct system operation. If a vehicle equipped with an air bag supplemental restraint system (SRS) is involved in a collision, inspect the sensor mounting bracket and wiring pigtail for deformation. If damaged, replace the sensor whether or not the air bag is deployed.

NOTES:

Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: Interior Rear View Mirror (501-09 Rear View Mirrors, Removal and Installation).
3. Refer to: Overhead Console (501-12 Instrument Panel and Console, Removal and Installation).

4. NOTE: The procedure must be carried out on both sides.

   Refer to: Sun Visor (501-05 Interior Trim and Ornamentation, Removal and Installation).

5. NOTE: The procedure must be carried out on both sides.

   Refer to: A-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

6. NOTE: The procedure must be carried out on both sides.

   Refer to: B-Pillar Upper Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

7. NOTE: The procedure must be carried out on both sides.

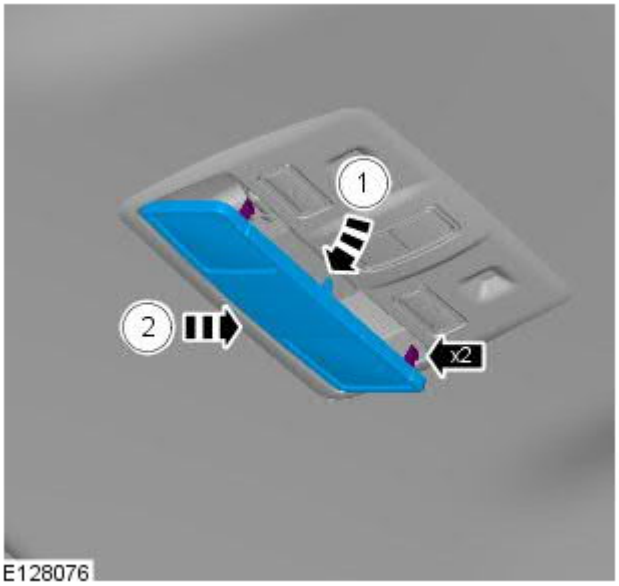
   Refer to: C-Pillar Lower Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

8. NOTE: The procedure must be carried out on both sides.

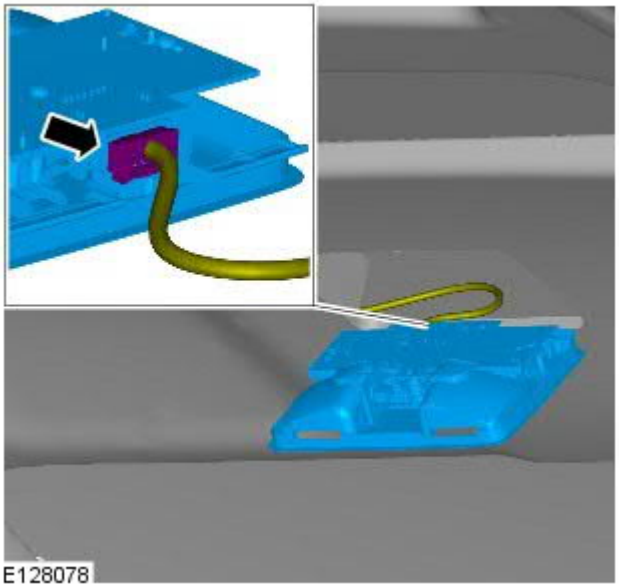
   Refer to: Front Seat (501-10 Seating, Removal and Installation).

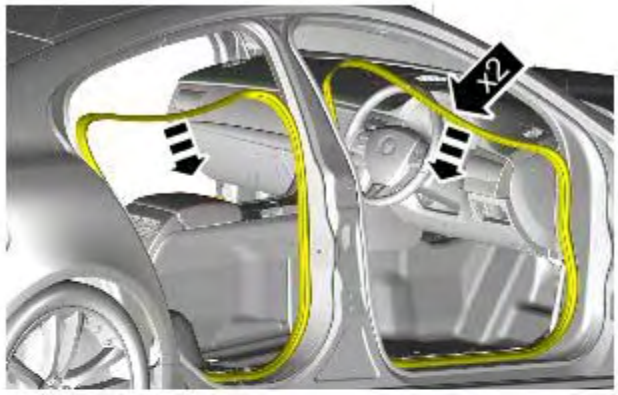
9. *Torque:* 2 Nm

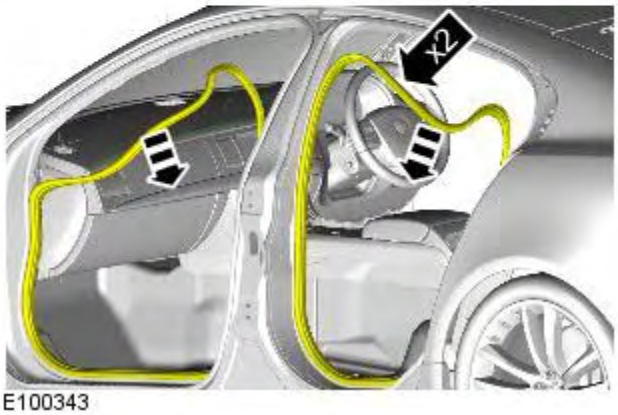
10.



11.

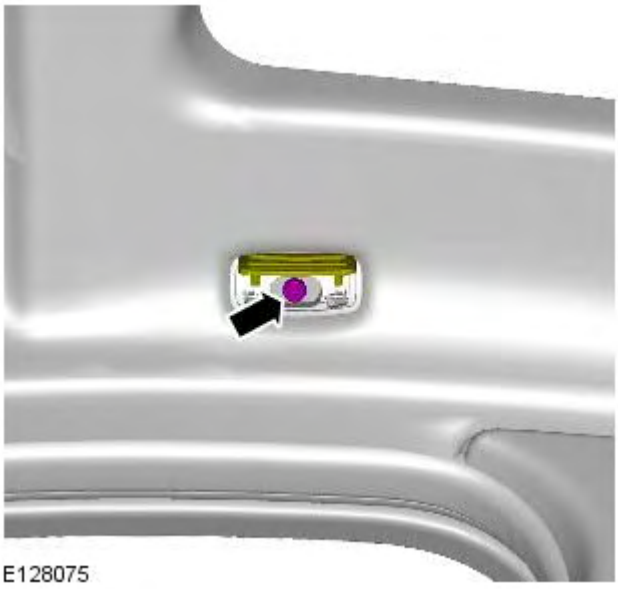






E100343

12. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E128075

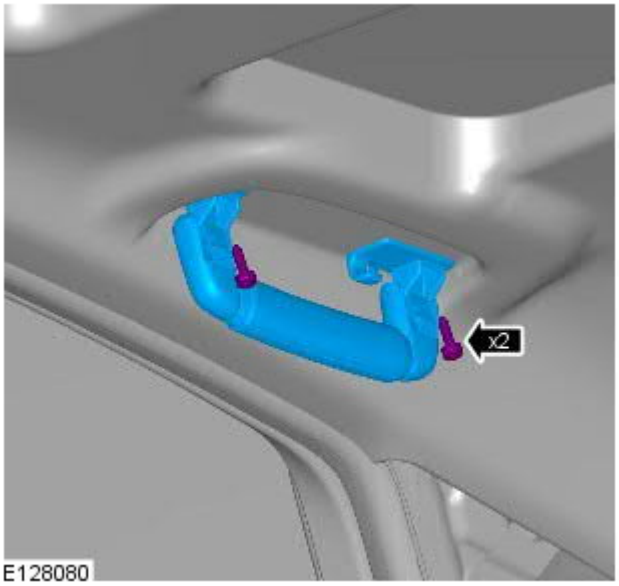
13. NOTES:

Make sure that the component is installed to the position noted on removal.

Right-hand shown, left-hand similar.

The procedure must be carried out on both sides.

Torque: 2 Nm



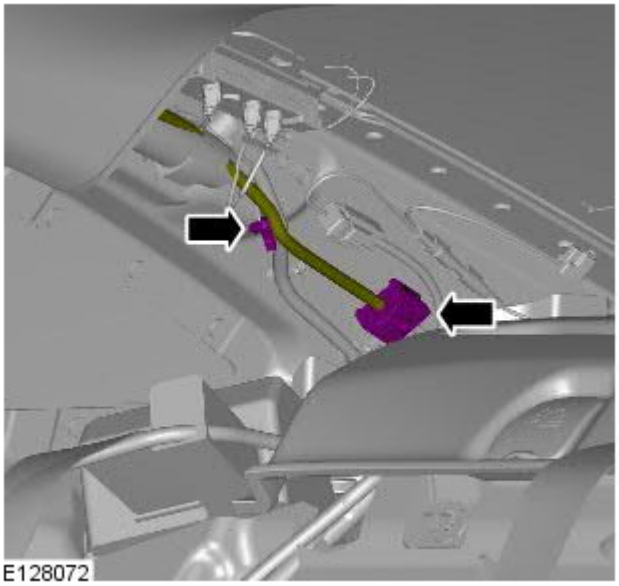
14. NOTES:

Make sure that the component is installed to the position noted on removal.

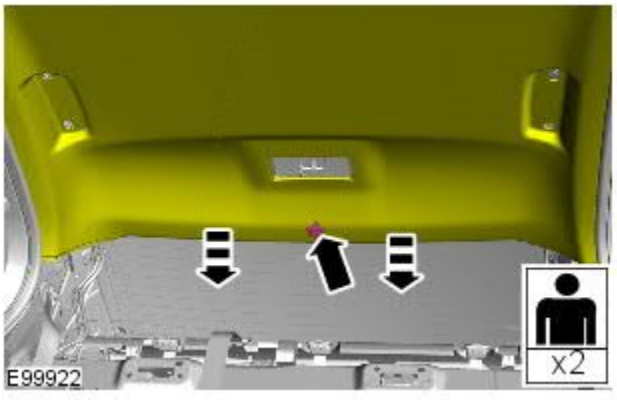
Right-hand shown, left-hand similar.

The procedure must be carried out on both sides.

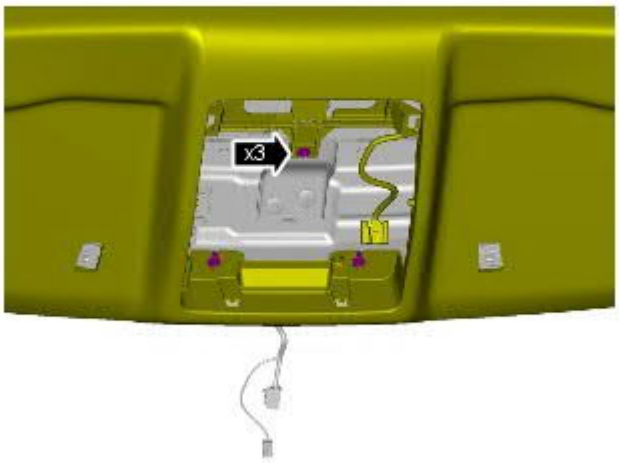
Torque: 2 Nm



15.



16. WARNING: This step requires the aid of another technician.



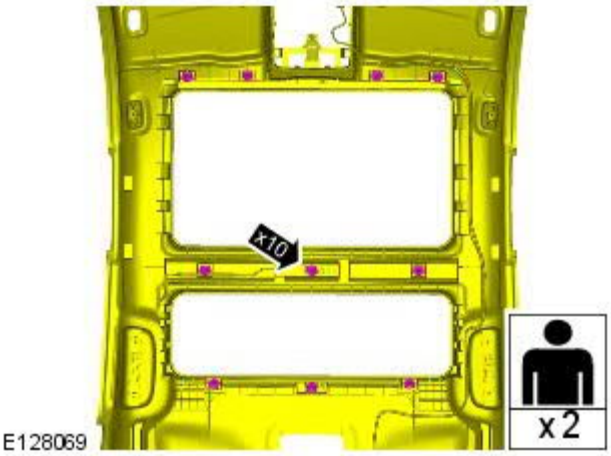
E128070

17. WARNING: This step requires the aid of another technician.

CAUTIONS:

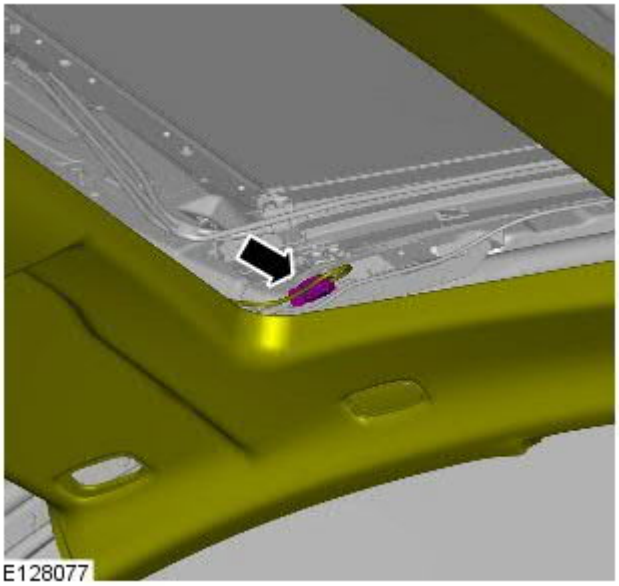
Note the fitted position of the component prior to removal.

Make sure that these components are installed to the noted removal position.

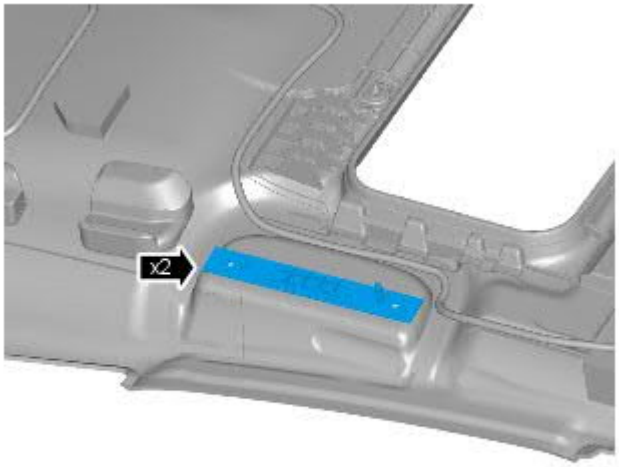


E128069

18. NOTE: This step requires the aid of another technician.


E128077

19. NOTE: This step requires the aid of another technician.



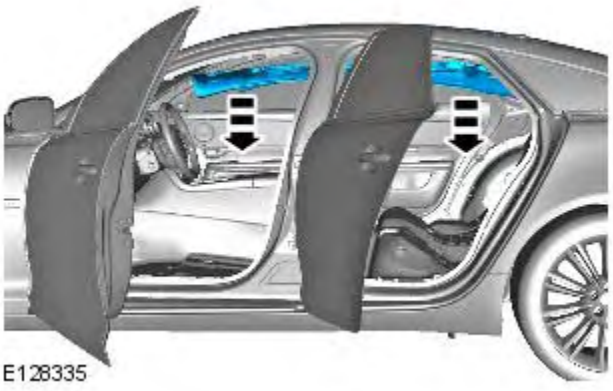
E128068

20. CAUTION: Note the fitted position of the component prior to removal.

NOTES:

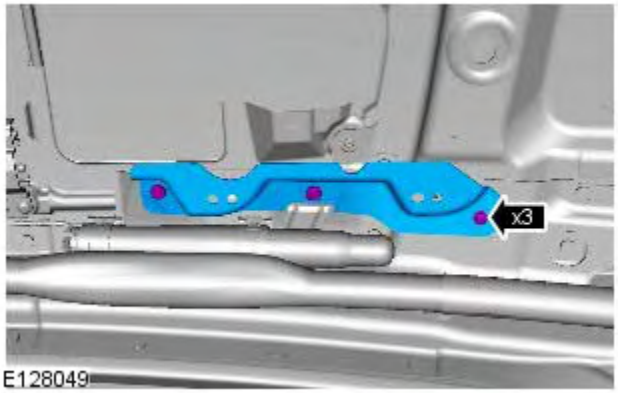
Make sure that the component is installed to the position noted on removal.

Right-hand shown, left-hand similar.


E128335

21. CAUTION: Protect the surrounding trim to avoid damage.

NOTE: Lower and reposition the headliner to aid access.



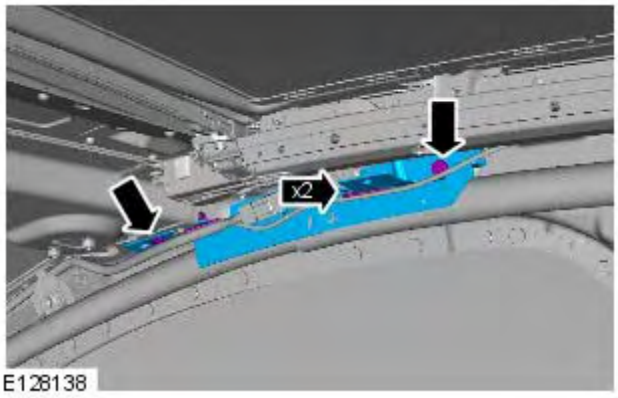
22. CAUTION: Make sure that the component is correctly located on the locating dowels.

    NOTES:

    When installing the side air curtain module, make sure that the component is tucked under the bracket.

    If the side air curtain module has deployed, new retaining brackets must be installed.

    Torque: 9 Nm



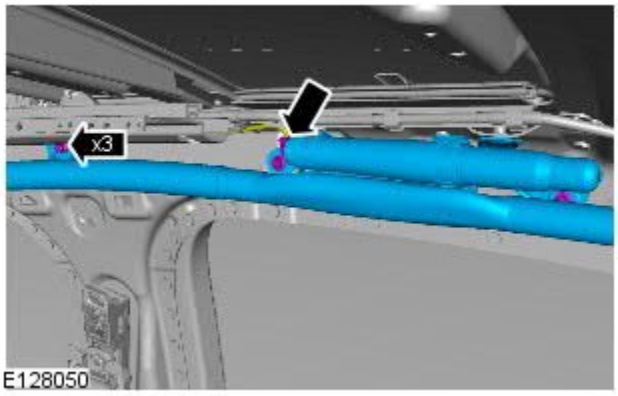
23. CAUTION: Make sure that the component is correctly located on the locating dowels.

    NOTES:

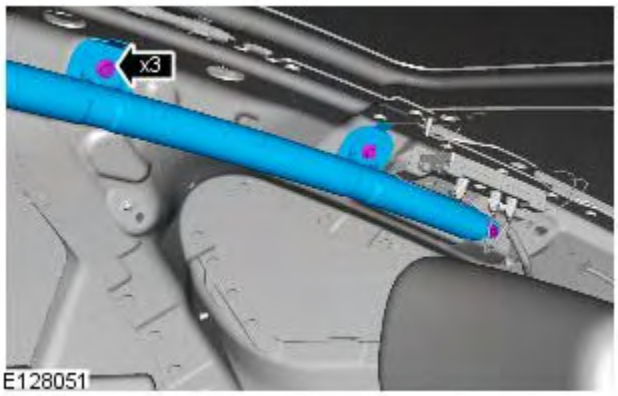
    If the side air curtain module has deployed, new retaining brackets must be installed.

    When installing the side air curtain module, make sure that the component is tucked under the bracket.

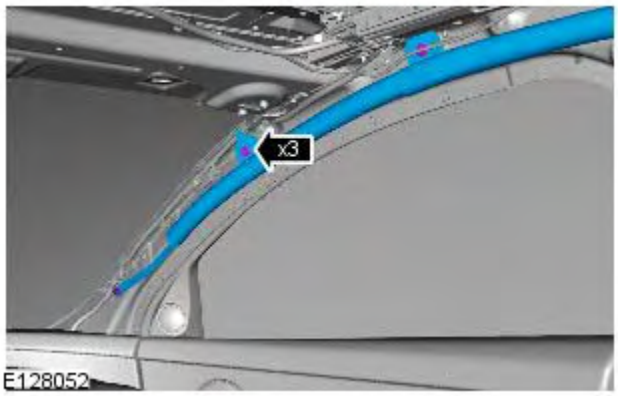
    Torque: 9 Nm



24. *Torque:* 9 Nm



25. *Torque:* 9 Nm



26. *Torque:* 9 Nm

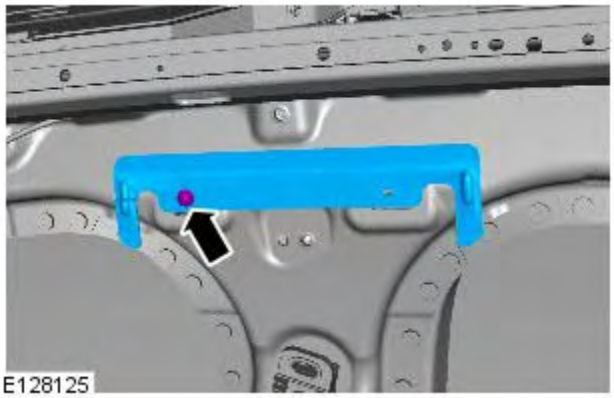
27. CAUTIONS:

Take extra care not to damage the component.

Note the fitted position of the component prior to removal.

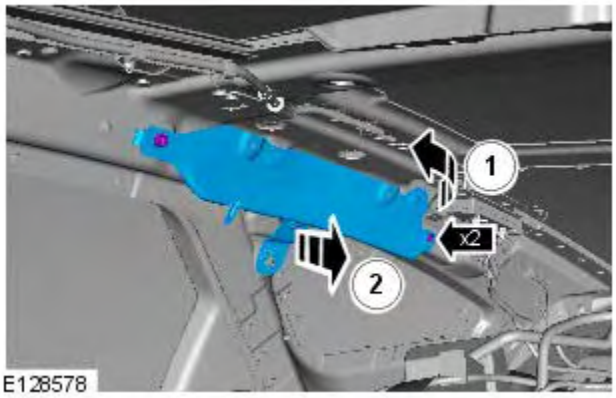
Do not allow the side air curtain module to twist. Failure to follow this instruction may result in damage to the component.

NOTE: Make sure that the component is installed to the position noted on removal.



28. NOTE: If the side air curtain module has deployed, new retaining brackets must be installed.

Torque: 9 Nm



29. CAUTION: Make sure that the clip is correctly located.

NOTES:

Make sure the locating tang is installed in the correct position.

If the side air curtain module has deployed, new retaining brackets must be installed.

Torque: 9 Nm

Installation

1. To install, reverse the removal procedure.

Published: 03-Dec-2011

Supplemental Restraint System - Occupant Detection Sensor

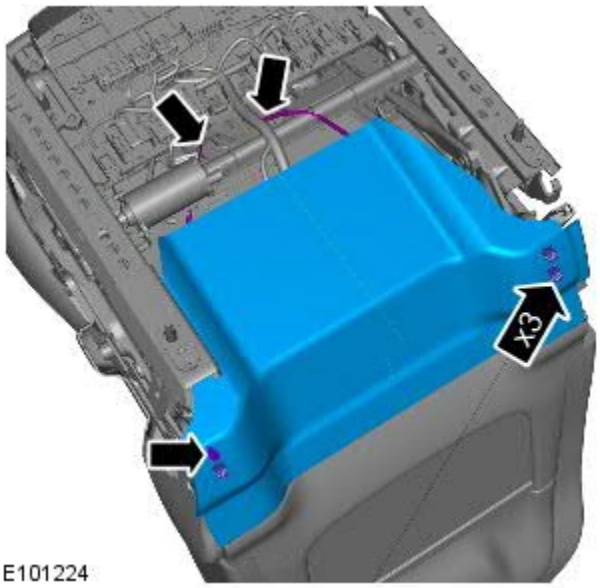
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

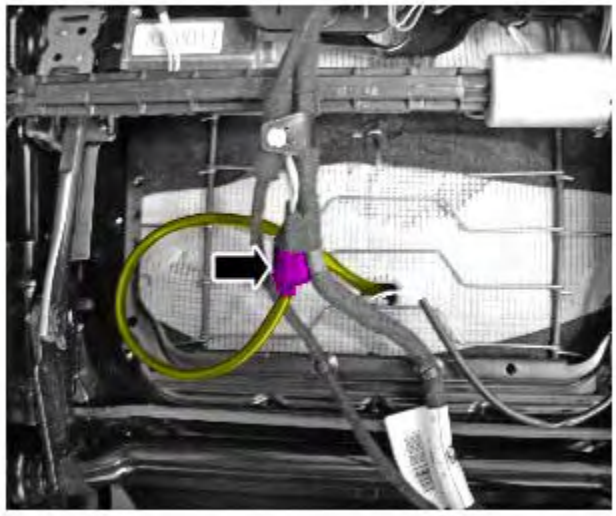
All vehicles

1. Refer to: Front Seat (501-10, Removal and Installation).
2. Refer to: Front Seat Control Switch (501-10, Removal and Installation).
3.



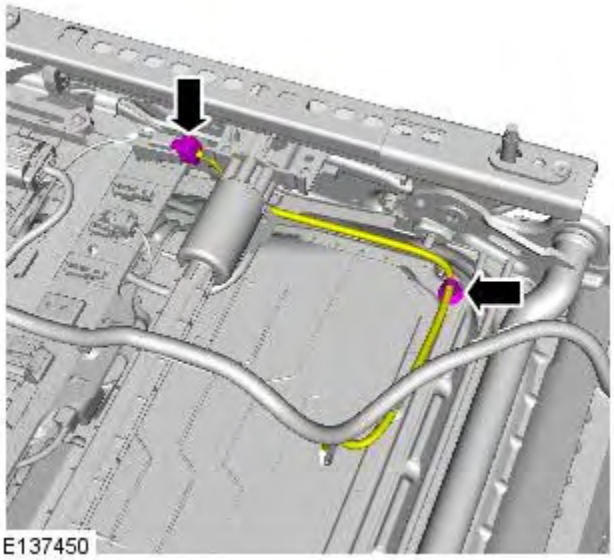
E101224

Vehicles with heated front seats

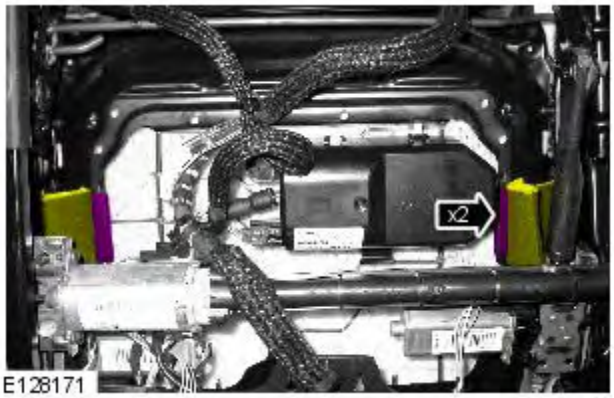


E137449

4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



5. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



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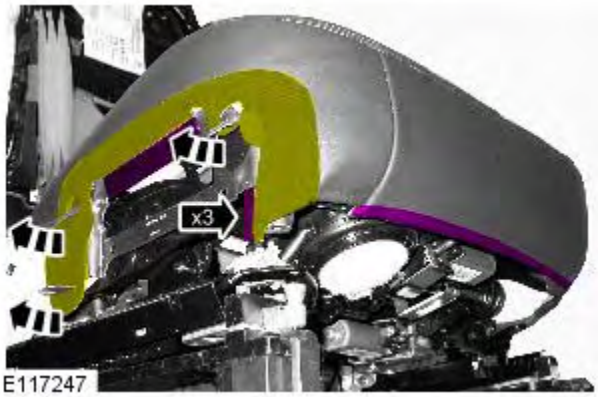
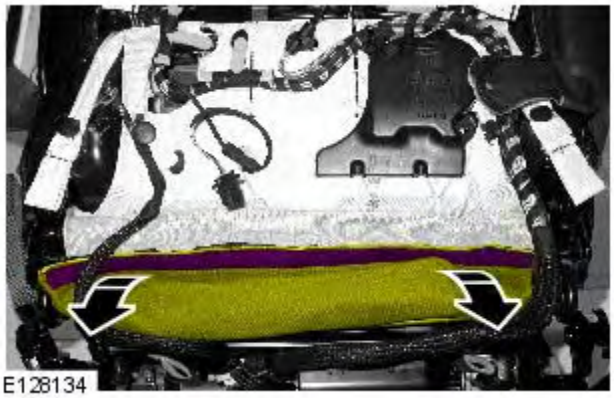


7.

8.

E117248

9.



E128134

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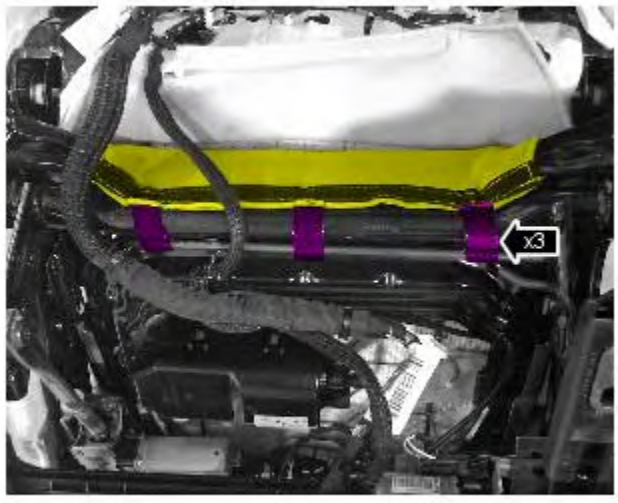


E140841

11.

E117249

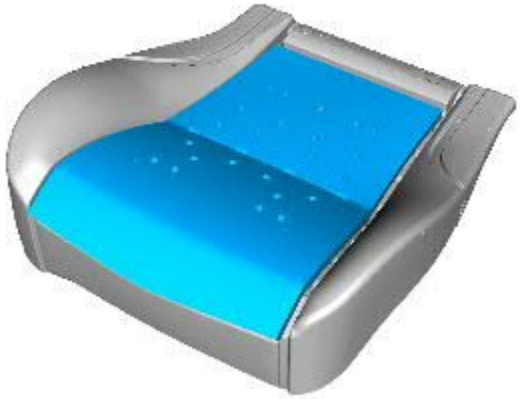
12.

E140684

13. NOTE: Make sure that new hog rings are installed.

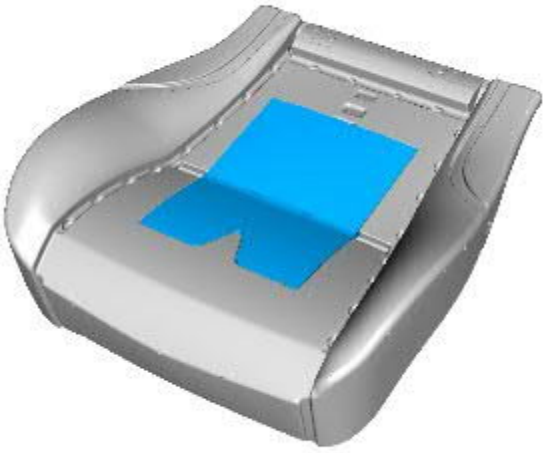
E101234

14.



E140687

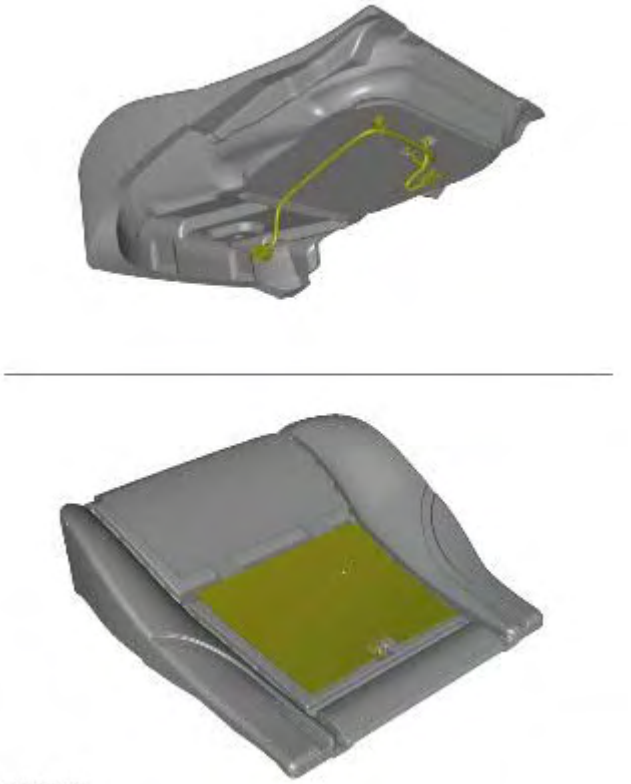
15.



E140688

Vehicles with heated front seats

16.



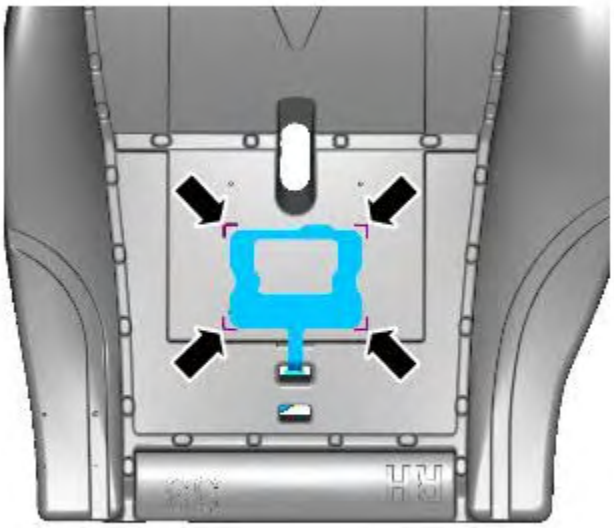
E140920

All vehicles

17.

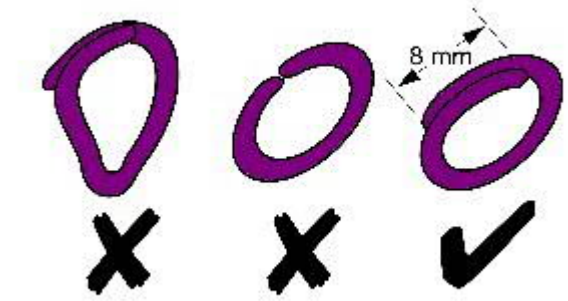
E140686

Installation



E140685

1. CAUTION: Make sure the component is aligned as shown.



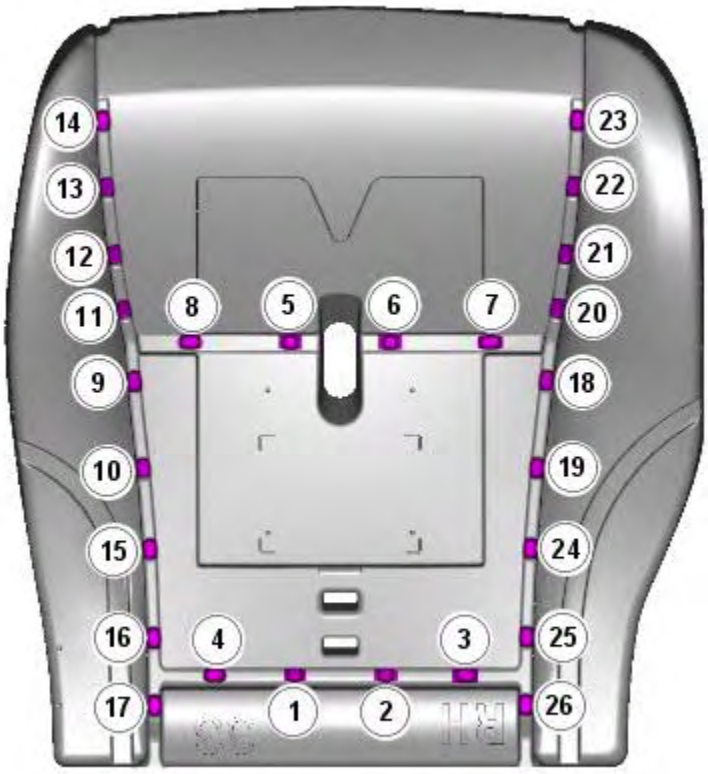
V4001063

2. NOTES:

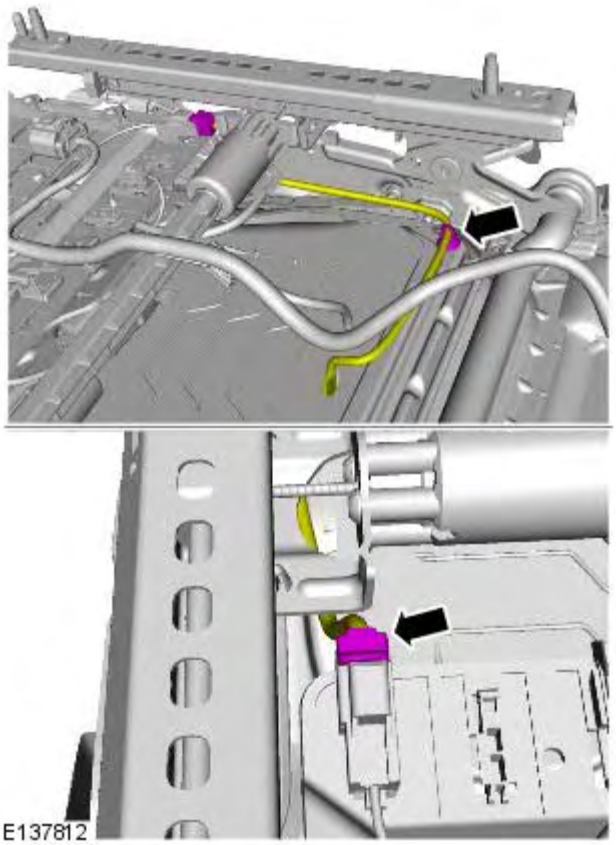
   Make sure that new hog rings are installed.

   Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.

3. NOTE: Make sure that the hogrings are installed in the sequence shown.



E140733



E137812

4. CAUTION: Make sure the component is aligned as shown.

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

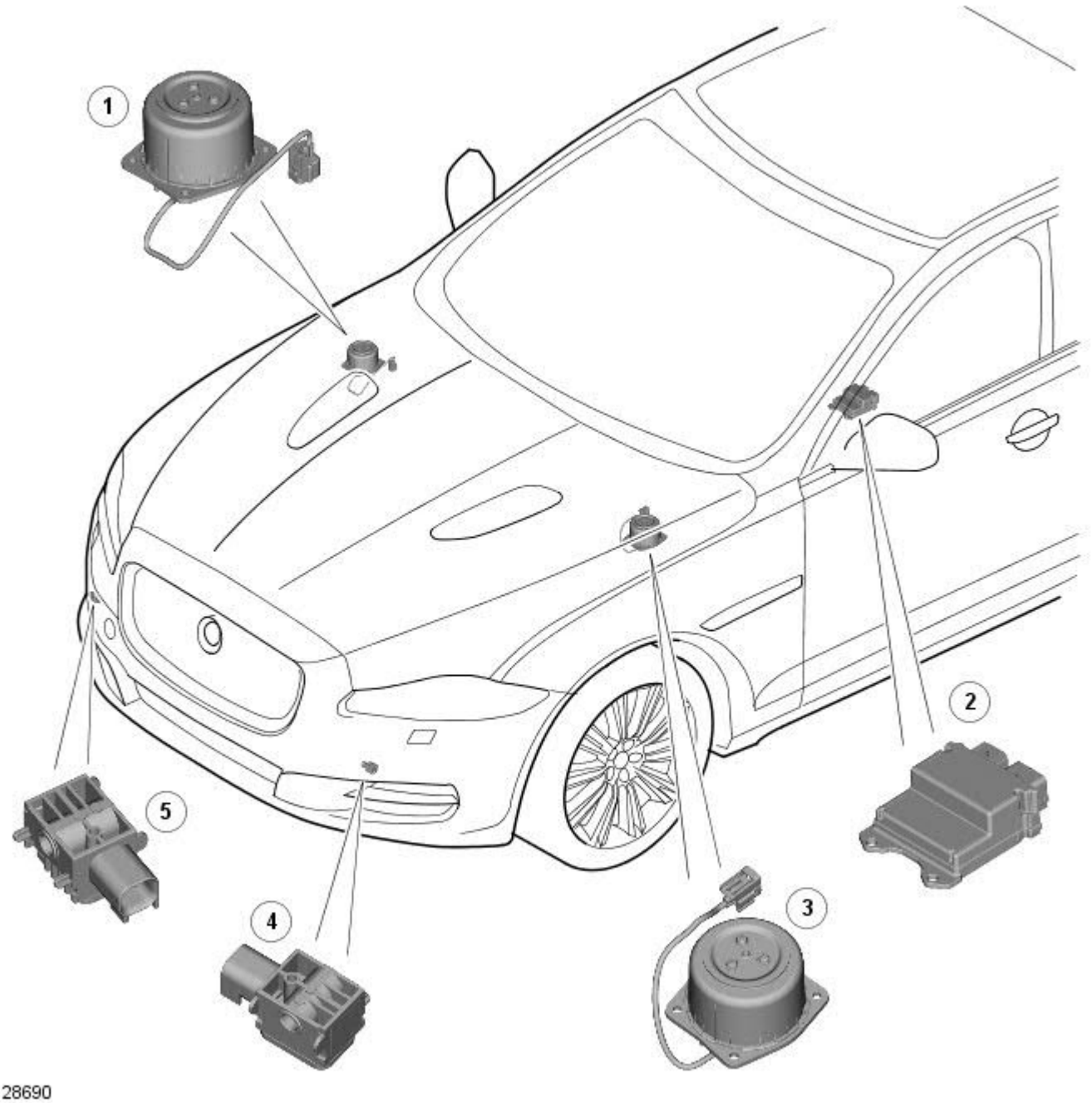
5. To install, reverse the removal procedure.

Published: 11-May-2011

Pedestrian Protection System - Pedestrian Protection System - Component Location

Description and Operation

COMPONENT LOCATION



E128690

Item	Description
1	RH (right-hand) hood actuator
2	RCM (restraints control module)
3	LH (left-hand) hood actuator
4	LH pedestrian impact sensor
5	RH pedestrian impact sensor

Published: 11-May-2011

Pedestrian Protection System - Pedestrian Protection System - Overview

Description and Operation

OVERVIEW

WARNING: All pyrotechnic devices are dangerous. Before performing any procedures on any pyrotechnic device, read all information contained within the Service Information section of this manual. Refer to: General Service Information (100-00, Description and Operation).

The pedestrian protection system is designed to mitigate injuries in a pedestrian collision with the vehicle. It does this by utilizing a pair of pyrotechnic actuators to lift the hood away from the engine, creating a cushioned impact between the pedestrian and the vehicle.

The pedestrian protection system is controlled by the RCM (restraints control module), but operates independently of the SRS (supplemental restraint system).
Refer to: Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) (501-20B Supplemental Restraint System, Description and Operation).

Pedestrian protection is also provided by passive protection integrated into the bumper system and the structure of the hood.

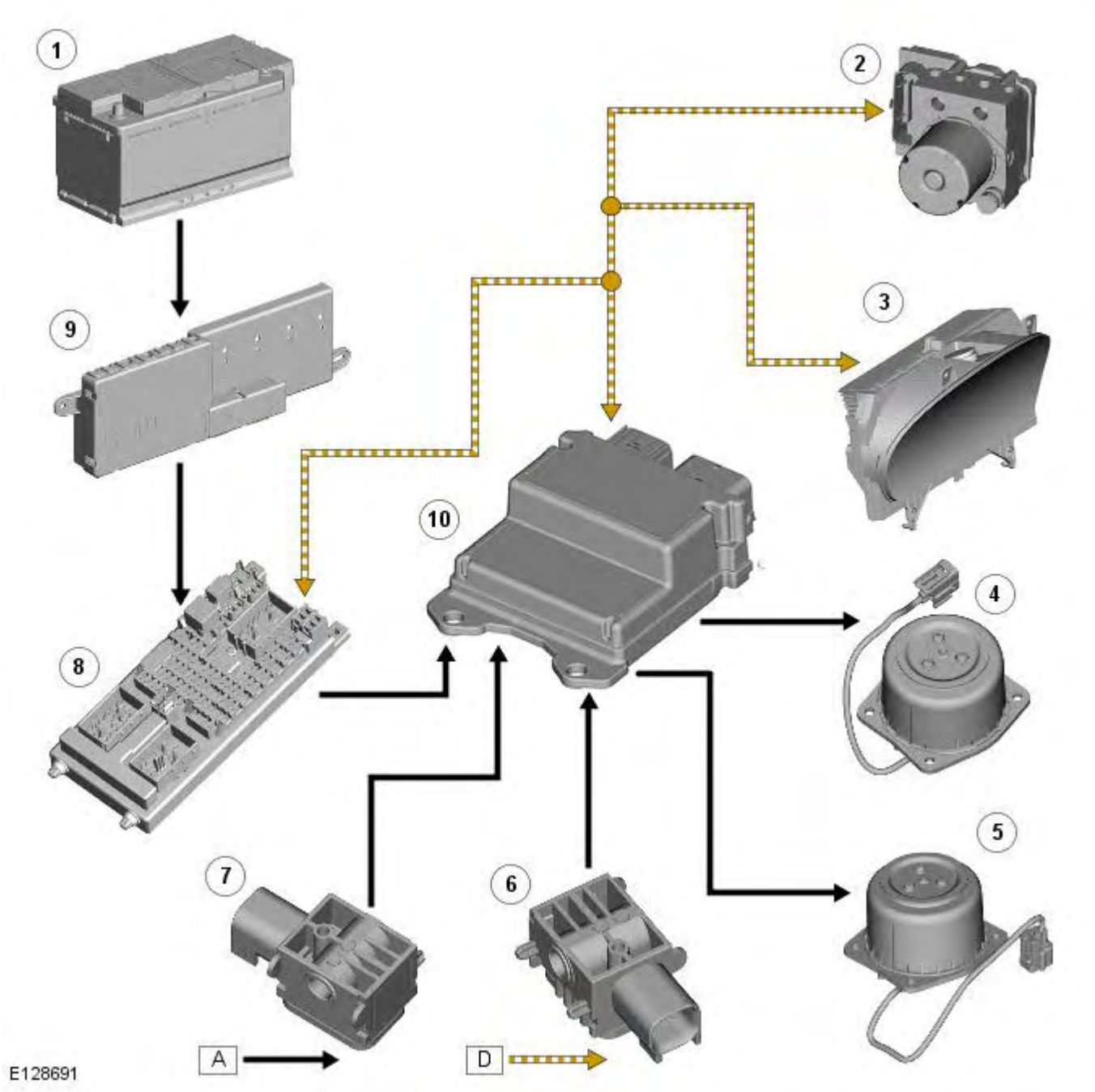
Published: 11-May-2011

Pedestrian Protection System - Pedestrian Protection System - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: A = Hardwired; D = High speed CAN (controller area network) bus.



Item	Description
1	Battery
2	ABS (anti-lock brake system) module
3	Instrument cluster
4	LH (left-hand) hood actuator
5	RH (right-hand) hood actuator
6	RH pedestrian impact sensor

7	LH pedestrian impact sensor
8	CJB (central junction box)
9	BJB (battery junction box)
10	RCM (restraints control module)

System Operation

PRINCIPLES OF OPERATION

The pedestrian protection system is operational when the vehicle is traveling at speeds between approximately 20 and 45 km/h (12.4 and 28 mph). A vehicle speed signal is received by the RCM over the high speed CAN bus.

The system is able to determine if contact is made with a pedestrian or another object, such as a traffic cone, using signals from the pedestrian impact sensors. When the system determines contact is made with a pedestrian, it fires the hood actuators to lift the rear of the hood approximately 130 mm (5.2 in.) within 35 ms of the 'fire' signal.

When an impact condition is registered, the RCM outputs an impact signal on the high speed CAN bus. This signal is used by the CJB to initiate the hazard warning lamps. If this occurs, the hazard warning lamp switch is disabled for the remainder of the current ignition cycle.

If the RCM detects a fault with the system, it outputs a message on the high speed CAN bus to the instrument cluster message center. On receipt of this, the message center will display the message Check Pedestrian System.

When the vehicle is delivered from the factory the pedestrian protection system is in a safe 'plant' mode. Normal operating mode must be activated using Jaguar approved diagnostic equipment during the PDI (pre-delivery inspection) prior to delivery to the customer.

Failure Mode Detection

In service, if any fault is detected, the message center displays the warning Check Pedestrian System.

The hood deployment actuators are non-serviceable components. If they are replaced their bar code labels must be read and recorded in the service database against the VIN (vehicle identification number) for security purposes.

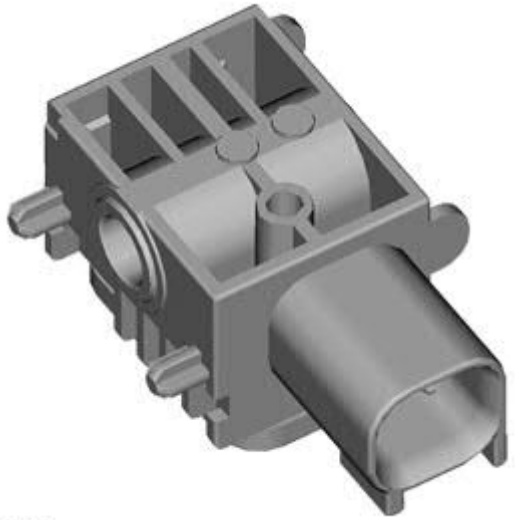
After deployment of the pedestrian protection system, the vehicle must be stopped as soon as it is safe to do so. The hazard warning lamps will be activated and can only be switched off by pressing the engine START/STOP button to turn the engine off and on again. A warning message Check Pedestrian System will appear in the message center and the vehicle should be transported to the nearest dealer/authorised repairer. The vehicle must not be driven when the hood has been deployed.

Component Description

HOOD ACTUATORS

The hood actuators are pyrotechnic air bags installed on mounting brackets next to the hood hinges. When the hood actuators are deployed, interface plates on the actuators contact reinforced areas on the hood, and raise the rear of the hood.

PEDESTRIAN IMPACT SENSORS



E128693

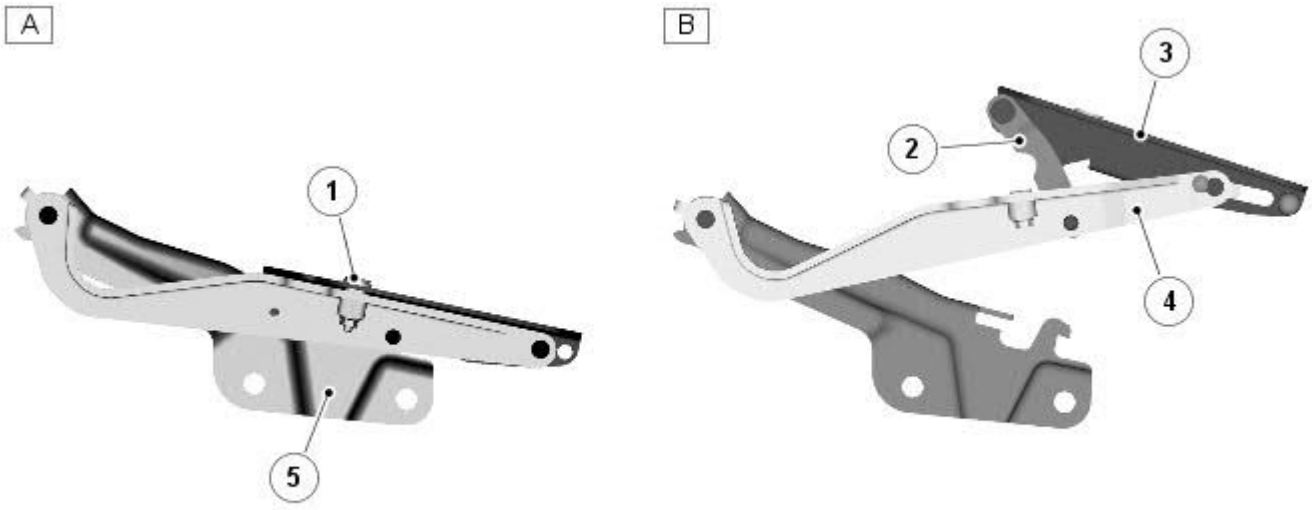
The pedestrian impact sensors are accelerometers mounted on the rear of the front bumper. The RCM uses the sensor inputs to monitor for low level impacts typical of pedestrian accidents.

HOOD

The two-piece hood is fabricated from aluminum. The inner panel has a hexagonal structure, which allows the energy from an impact to be absorbed effectively across the full area of the hood. The hood also has sufficient strength in the rear cross-beam to accept the forces from the actuators and maintain a stable condition.

When deployed, the front hood latches act as the pivot points and the rear hinges allow a controlled degree of upward movement before retaining the hood at the end of its deployment, thus limiting its total upward travel and stabilizing its position.

Hood Hinges



E95115

Item	Description
A	Non-deployed hinge
B	Deployed hinge
1	Firing pin
2	Stabilizing link
3	hood leaf
4	Intermediate leaf
5	Body leaf

The hood hinges incorporate a number of leaves. This includes a leaf attached to the body, an intermediate leaf and a leaf attached to the hood. During normal operation the hinge opens and closes using the hood and intermediate leaves. These are attached together by a firing pin. When the actuators are fired the firing pins fail. This allows the hood and intermediate leaves to separate and deploy the hood upwards.

The hinges deform during the deployment process and will need to be replaced.

Published: 09-Dec-2013

Pedestrian Protection System - Pedestrian Protection System

Diagnosis and Testing

Principles of Operation

For a detailed description of the Pedestrian Protection System, refer to the relevant Description and Operation section in the workshop manual.
REFER to: Pedestrian Protection System (501-20C Pedestrian Protection System, Description and Operation) / Pedestrian Protection System (501-20C Pedestrian Protection System, Description and Operation) / Pedestrian Protection System (501-20C Pedestrian Protection System, Description and Operation).

Inspection and Verification

WARNINGS:

TO AVOID ACCIDENTAL DEPLOYMENT AND POSSIBLE PERSONAL INJURY, THE BACKUP POWER SUPPLY MUST BE DEPLETED BEFORE REPAIRING OR REPLACING ANY PEDESTRIAN PROTECTION SYSTEM COMPONENTS. TO DEPLETE THE BACKUP POWER SUPPLY ENERGY, DISCONNECT THE BATTERY GROUND CABLE AND WAIT TWO MINUTES. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN PERSONAL INJURY.

Do not use a multimeter to probe the pedestrian protection system actuators. It is possible for the power from the multimeter battery to trigger the activation of the actuator. Failure to follow this instruction may result in personal injury.

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:

If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

It is advisable not to use a cellular phone or to have a cellular phone in close proximity when working on the pedestrian protection system or components

Given the legal implications of a restraints system failure, harness repairs to pedestrian protection system circuits are not acceptable. Where the text refers to "REPAIR the circuit", this will normally mean the replacement of a harness.

After 5 hood deployment events, a new Restraints Control Module (RCM) and wiring harness must be installed.

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
• Hood • Hood hinges • Hood deployment controls	• Fuses • Wiring harnesses and connectors • Restraints Control Module (RCM) • Impact sensors • Hood deployment controls

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index

5. Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

Symptom Chart

Symptom	Message	Possible Causes	Action
Hood deployed	CHECK PEDESTRIAN SYSTEM	• Low speed collision with pedestrian or other object	WARNING: The vehicle must not be driven if the hood has been deployed. NOTE: Repairs due to a collision are not warrantable. • Check the vehicle for collision damage. Repair as necessary
Hood not deployed	CHECK PEDESTRIAN SYSTEM	• Restraints system fault	NOTE: The vehicle may be driven if a pedestrian protection system fault is present but the hood has not been deployed. • Check the vehicle for collision damage. Repair as necessary. Using the manufacturer approved diagnostic system, check the restraints control module for related DTCs and refer to the relevant DTC index

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Restraints Control Module (RCM) (100-00, Description and Operation).

Published: 11-May-2011

Pedestrian Protection System - Pedestrian Impact Sensor

Removal and Installation

Removal

NOTES:

Removal steps in this procedure may contain installation details.

RH illustration shown, LH is similar.

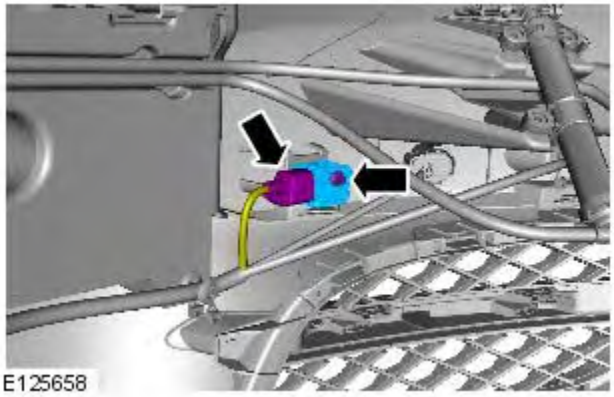
The ignition must be switched off.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).



4. WARNING: Allow a period of 10 minutes to elapse after disconnecting the battery before undertaking any work on the SRS.

   NOTE: RH illustration shown, LH is similar.

   Torque: 3.2 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Pedestrian Protection System - Pedestrian Protection Hood Actuator LH

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least two minutes after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.

To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

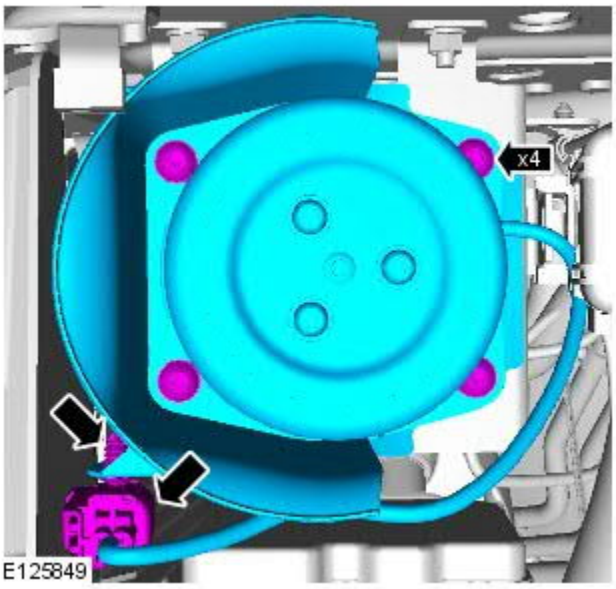
To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.

Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.

Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).
2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
3. Refer to: Cowl Vent Screen (501-02 Front End Body Panels, Removal and Installation).



4. *Torque:* 8 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Pedestrian Protection System - Pedestrian Protection Hood Actuator RH

Removal and Installation

Removal

WARNINGS:

To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least two minutes after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.

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To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.

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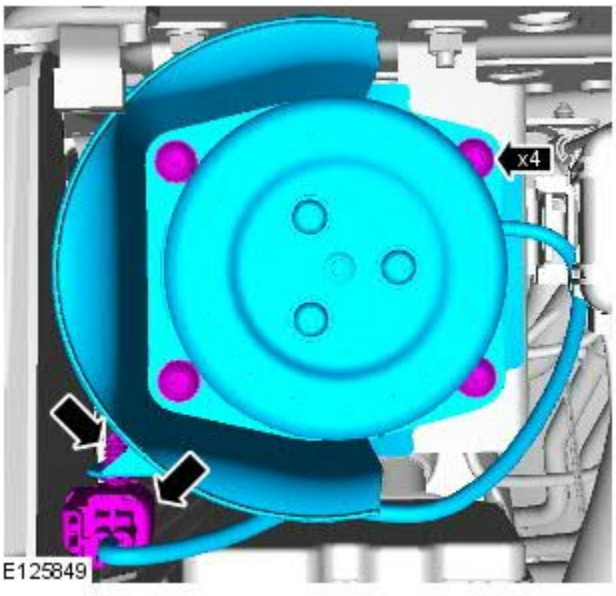
Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00 General Information, Description and Operation).
2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
3. Refer to: Cowl Vent Screen (501-02 Front End Body Panels, Removal and Installation).



4. NOTE: Left-hand shown, right-hand similar.

   Torque: 8 Nm

Installation

1. To install, reverse the removal procedure.

Published: 21-Jun-2012

Body Repairs - General Information - Body Repairs

Description and Operation

General Information

Introduction

The body plays a significant role in the increasing trend of ever more rapidly changing model variants. The different customer groups are strongly influenced by the design and shape of the body. At the same time the stability of the body plays the most important part in ensuring passenger and driver safety. Lightweight construction, alternative materials, composite materials, plastics and appropriate joining processes are all design features that characterise modern Jaguar vehicle bodies.

In terms of manufacturing technology, modern safety cell bodies can be produced almost without any problems. Jaguar guarantee high quality standards by ensuring that mechanical strength properties are tried and tested in numerous computer simulations, crash tests, by testing materials and by employing sophisticated manufacturing technologies. In the event of repairs it is vital that the production quality standards are upheld. This requires a well-equipped workshop, and places particular emphasis on the qualifications of the workshop technicians. Up-to-date knowledge of current manufacturing technologies and continuous training on new repair methods and techniques are vital for high-quality body repairs. The model-specific repair manuals and the general repair techniques provide valuable support when undertaking body repairs.

Always follow the repair instructions published in this manual. Failure to observe this instruction can result in serious impairment of vehicle safety. All specified safety requirements must be met after the work has been carried out.

Contents

This document includes technical data and information for the all new Jaguar XJ aluminium range. The information contained within is valid at the time of production and incorporates:

- Who should use this information?
- Category A and B definition
- Accident damage and diagnosis
- Impact effects on the body
- Planning a repair
- Estimating
- Identifying the correct Jaguar Approved Body Repair Facilities
- Obtaining spare parts
- Equipment
- Aluminium information
- Galvanic corrosion and housekeeping
- Panel replacement times
- Fixings
- Bonding
- Materials
- Aluminium Welding
- Tolerances and gap specification
- Body alignment

The methods described for panel replacement operations have been obtained from a study of physical repair operations.

In line with Jaguars continuous improvement programme, information and data contained will be updated periodically.

All activities described within are based on the use of genuine Jaguar Parts, tools and approved materials.

Who should use this information?

The information and repair methods listed are designed as an aid for Jaguar Approved Body Repair Facilities achieving the Jaguar approved Bodyshop Operating Standards. The relevant section should be read completely before commencing any repairs. Only technicians who have successfully completed the approved XJ aluminium range training programme should work on the model. Jaguar Approved Bodyshop Operating Standards require that the skills of technicians be regularly assessed and that any training needs identified are addressed within a reasonable time. This information complements the Jaguar training programme.

The authorised repair network is divided into category A and B. The following describes the process required to identify category A or B damage.

Definition of category A and B

Category A

NOTE: Specific equipment and facilities are required to carry out Category A repairs, see the equipment section of this manual.

Damage that requires panel(s) to be replaced with any one or combination of the following procedures:

- Welded panel
- Bonded panel
- Panel secured with fixings

The following list identifies Category A procedures:

Category A procedures

- Fender apron closing panel front section
  For additional information, refer to: Fender Apron Closing Panel Front Section (501-27 Front End Sheet Metal Repairs, Removal and Installation).
- Fender apron panel
  For additional information, refer to: Fender Apron Panel (501-27 Front End Sheet Metal Repairs, Removal and Installation).
- Fender apron panel closing panel
  For additional information, refer to: Fender Apron Panel Closing Panel (501-27 Front End Sheet Metal Repairs, Removal and Installation).
- Fender apron panel front section
  For additional information, refer to: Fender Apron Panel Front Section (501-27 Front End Sheet Metal Repairs, Removal and Installation).
- Front side member
  For additional information, refer to: Front Side Member (501-27 Front End Sheet Metal Repairs, Removal and Installation).
- Front side member and suspension top mount assembly
  For additional information, refer to: Front Side Member and Suspension Top Mount Assembly (501-27 Front End Sheet Metal Repairs, Removal and Installation).
- Front side member closing panel
  For additional information, refer to: Front Side Member Closing Panel (501-27 Front End Sheet Metal Repairs, Removal and Installation).
- Front side member closing panel section
  For additional information, refer to: Front Side Member Closing Panel Section (501-27 Front End Sheet Metal Repairs, Removal and Installation).
- Front side member section
  For additional information, refer to: Front Side Member Section (501-27 Front End Sheet Metal Repairs, Removal and Installation).
- Front side member to deformation element bracket
  For additional information, refer to: Front Side Member To Deformation Element Bracket (501-27 Front End Sheet Metal Repairs, Removal and Installation).
- Suspension top mount
  For additional information, refer to: Suspension Top Mount (501-27 Front End Sheet Metal Repairs, Removal and Installation).
- Roof panel
  For additional information, refer to: Roof Panel (501-28 Roof Sheet Metal Repairs, Removal and Installation).
- A-pillar outer panel
  For additional information, refer to: A-Pillar Outer Panel (501-29 Side Panel Sheet Metal Repairs, Removal and Installation).
- A-pillar reinforcement
  For additional information, refer to: A-Pillar Reinforcement (501-29 Side Panel Sheet Metal Repairs, Removal and Installation).
- Rocker panel rear section
  For additional information, refer to: Rocker Panel Rear Section (501-29, Removal and Installation).
- Back panel

For additional information, refer to: Back Panel (501-30 Rear End Sheet Metal Repairs, Removal and Installation).

- Quarter panel
  For additional information, refer to: Quarter Panel (501-30 Rear End Sheet Metal Repairs, Removal and Installation).
- Quarter panel lower extension
  For additional information, refer to: Quarter Panel Lower Extension (501-30 Rear End Sheet Metal Repairs, Removal and Installation).
- Rear floor side extension
  For additional information, refer to: Rear Floor Side Extension (501-30 Rear End Sheet Metal Repairs, Removal and Installation).
- Rear side member closing panel section
  For additional information, refer to: Rear Side Member Closing Panel Section (501-30 Rear End Sheet Metal Repairs, Removal and Installation).
- Rear side member section
  For additional information, refer to: Rear Side Member Section (501-30 Rear End Sheet Metal Repairs, Removal and Installation).
- Rear wheelhouse outer
  For additional information, refer to: Rear Wheelhouse Outer (501-30 Rear End Sheet Metal Repairs, Removal and Installation).
- Spare wheel well
  For additional information, refer to: Spare Wheel Well (501-30 Rear End Sheet Metal Repairs, Removal and Installation).

Category B

Damage associated to bolt on panel(s) that are replaced, or light surface damage to exterior cosmetic panels.

The following list identifies Category B procedures:

Category B procedures

- Front bumper cover
  For additional information, refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).
- Front bumper
  For additional information, refer to: Front Bumper (501-19 Bumpers, Removal and Installation).
- Side member deformation element
  For additional information, refer to: Side Member Deformation Element (501-27 Front End Sheet Metal Repairs, Removal and Installation).
- Hood
  For additional information, refer to: Hood (501-02 Front End Body Panels, Removal and Installation).
- Hood hinge
  For additional information, refer to: Hood Hinge (501-27 Front End Sheet Metal Repairs, Removal and Installation).
- Hood latch panel
  For additional information, refer to: Hood Latch Panel (501-27 Front End Sheet Metal Repairs, Removal and Installation).
- Hood latch panel mounting panel
  For additional information, refer to: Hood Latch Panel Mounting Bracket (501-27 Front End Sheet Metal Repairs, Removal and Installation).
- Front fender
  For additional information, refer to: Front Fender (501-27 Front End Sheet Metal Repairs, Removal and Installation).
- Front door
  For additional information, refer to: Front Door (501-03 Body Closures, Removal and Installation).
- Rear door
  For additional information, refer to: Rear Door (501-03 Body Closures, Removal and Installation).
- Luggage compartment lid
  For additional information, refer to: Luggage Compartment Lid (501-03 Body Closures, Removal and Installation).
- Luggage compartment lid hinge
  For additional information, refer to: Luggage Compartment Lid Hinge (501-03 Body Closures, Removal and Installation).
- Rear bumper cover
  For additional information, refer to: Rear Bumper Cover (501-19 Bumpers, Removal and Installation).
- Rear bumper
  For additional information, refer to: Rear Bumper (501-19 Bumpers, Removal and Installation).

Accident damage and diagnosis

General notes:

- Exact diagnosis of the extent of the damage enables proper repair planning
- All body repairs must be carried out in accordance with the guidelines in this Body Repair Manual
- The stability and strength properties of the body must be taken into account during body repairs. The body has exact defined deformation patterns that must not be affected by any repair work
- For instance, the crumple zones absorb the bulk of the impact energy. If any unprofessional repair techniques or methods are used in these areas then this can pose a fundamental threat to vehicle safety

Hidden damage:

- As well as looking at external indicators like flaked off paint, it is vital to check for hidden body damage or deformation that is not visible from the outside. Large attached parts like bumpers and inner fenders often need to be removed to allow accurate assessment of damage to underlying body parts
- Gap dimensions offer another alternative for diagnosis by visual inspection. If any changes or misaligned edges are apparent, then this usually indicates that the dimensions of the affected part are incorrect

Impact effects on the body

It is possible to deduce the overall extent of damage from the direction and magnitude of the impact forces. This does however require extensive body-specific knowledge.

If, for instance, an impact occurs at the front left-hand side member, then the right-hand side member is usually also affected as a result of the rigid body-shell design (crossmember). Often the length of this side member will not have changed, but because of the rigid body-shell design it may have moved from its original position (often only by a very small amount). If any deviations are present this can usually be detected by checking the gap dimensions between door and fender or by checking for changes in dimension.

In the case of more severe impacts, the front part of the body cannot absorb all of the impact energy, and the passenger cell is also deformed. Here the impact energy is transferred via the side member to the A-pillar. This results in deformations in the area of the roof and the door rocker panel.

Planning a repair

The following decisions have to be made before the repairs are started

- Does the vehicle need to be put on a body repair jig?
- Does the body need to be measured?
- Do aggregates like engine or axles need to be removed?
- Which body parts need to be renewed?
- Which body parts can be repaired?

Estimating

The authorised repair network is divided into category A and B. This section describes the process required to identify category A or B damage. Should damage be identified as category A the vehicle should be referred to the nearest category A facility.

In line with the Jaguar continuous improvement programme, information and data contained in this manual will be updated through Jaguar technical bulletins.

The estimating process

Step 1:

Visual inspection, assess overall vehicle condition. Has damage travelled, distorting internal structural panels?

This is a visual check of the complete vehicle.

Possible indicators:

- Panel misalignment
- Panel gaps no longer uniform
- Hinged panels catch on locks
- Exterior cosmetic panels show signs of stress distortion
- Customer describes unusual driving characteristics post incident

If structural distortion is visible, vehicle body alignment should be checked/corrected on a body repair jig, refer to category A facility.

If no visual indications of damage transfer, go to Step 2.

Step 2:

If no visual signs indicate distortion to internal structural panels, but the customer is concerned with unusual driving characteristics post incident, and there is no damage to the suspension. Vehicle body alignment should be checked using four-wheel alignment geometry equipment.

If structural distortion is identified refer to category A facility.

Step 3:

If there is no sign or concern regarding vehicle body alignment, focus on the local area of damage.

Do any of the panels require replacement?

If no, go to Step 4.

If yes, are any of the panels secured with:

- Bonding adhesive?
- Fixings?
- Weld?

If yes, refer to category A facility.

Step 4

Do any of the panels require welding i.e. ripped or torn aluminium panel?

If no, go to Step 5.

If yes, refer to category A facility.

Step 5

Can the damage be repaired by hand using serrated spoon, dolly, file and/or hot air?

If no, refer to category A facility.

Identifying the correct Jaguar Approved Body Repair Facilities

Through extensive research, Jaguar has identified the most appropriate method to rectify aftermarket damage. It is key to safety and vehicle integrity that only the approved methods, materials and equipment are used.

Issues that could arise from the use of non approved methods, materials and equipment include:

- Warranty invalidation
- Safety
- Galvanic corrosion

Therefore category A damage should always be referred to a category A Jaguar Approved Body Repair Facility.

Obtaining spare parts

The availability of spare parts often determines how easily the body repairs can be carried out. The following procedure is recommended:

- Obtain all the data for the vehicle, including type, vehicle identification number, trim code, engine identification letters, initial registration etc
- Establish all of the metal parts that need to be renewed
- Establish all of the attached parts that need to be renewed, including small parts like rivets, clips etc

Equipment

All Jaguar approved body repair facilities are expected to be equipped in line with Jaguar Body and Paint Centre of Excellence Operating Standards.

The approved body equipment for the all new XJ aluminium range is listed as either:

- Category A
- Category B

All approved equipment is available on a Worldwide basis from:

Country	Phone	Fax
Austria	+800-291714	+800-291694
Belgium (flemish)	00800-36733731	00800-36733292
Belgium (french)	0800-36733732	0800-36733292
Denmark	+800-36733732	+800-36733292
Finland	+800-36733732	+800-36733292
France	0800-904986	0800-901329
Germany	0800-3673373	0800-3673329
Greece	00800-49129046	00800-49129057
Hungary	+800-36733732	+800-36733292
Ireland	1800-409574	1800-409580
Italy	0800-790959	0800-780959
Netherlands	00800-36733732	00800-36733292
Norway	+800-36733732	+800-36733292
Poland	00800-4911241	00800-4911240
Portugal	+800-36733732	+800-36733292
Spain	900-998303	900-998304
Sweden	+800-36733732	+800-36733292
Swiss french	00800-36733732	00800-36733292
Swiss German	00800-36733731	00800-36733291
Turkey	00800-44910087	00800-44910096
UK	0800-214390	0800-281705
All other markets	+49 2203 106199	+49 2203 106241

A copy of the approved equipment standards for category 'A' and 'B' repair facilities is available on request from:

Jaguar Equipment Programme (JEP)

Unit 6

Wollaston Crescent

Burnt Mills Industrial Estate

Basildon

Essex

SS13 1QD

0800 214390

Alternatively, you can access the programme via the website: www.eqseurope.com

Aluminium information

The design of the modern motor vehicle attempts to overcome two conflicting needs:

- Fuel economy - lighter, aerodynamic and fuel sensitive technology
- High levels of comfort - this often equates to higher specifications and more accessories

Aluminium alloy is the ideal material to meet these demands; it provides a lighter vehicle body with improved rigidity. aluminium is different from traditional steel, with the correct knowledge and suitable tools it is easily repaired.

There are two aluminium alloys discussed in this manual, the attributes detailed in the following table should be considered when deciding to repair or replace:

	6111	5754
Material Description	6000 Series is a Magnesium/Silicon/Copper aluminium alloy	5000 Series is an aluminium alloy with Magnesium content
Location on Vehicle	This alloy is used mainly in the outer body panels. Thickness: 0.9 - 2.0mm	Internal structural panels Thickness: 1.0 - 3.0mm
Attributes	High dent resistance	Strength and durability
Repairability	Yes - Light damage only	NOTE: All repairs to 5754 are restricted to Category A Jaguar approved Body Repair Facilities only. Yes - Light damage only. Limited straightening is acceptable
Heat During Repair	Yes - **caution** material sensitive to heat. Range: 140 - 160°C Ideal panel temperature: **150°C**	Yes - **must** be heated to maintain original alloy properties. Ideal panel temperature: **250°C**
Notes	Equipment: Hot air gun. Use panel temperature indicator strips	Equipment: Heat inducer. Use panel temperature indicator strips. Heat must be applied and maintained during the straightening process

Other materials are used in the construction of the all new XJ aluminium range, however, repair of these materials is not covered as they fall outside the scope of this manual.

Steel, (including Bake Hardened (BH) and High Strength Low Alloy (HSLA): Used in seat belt anchorages, hinge reinforcements and various small brackets and mountings.

Magnesium Die Cast Alloy (AM60B): Used in the hood latch panel.

Plastics: Used in the front fender support bracket and for reinforcements in the B-pillar and rear side member.

The following illustrations identify the aluminium alloys and other materials used in body construction.

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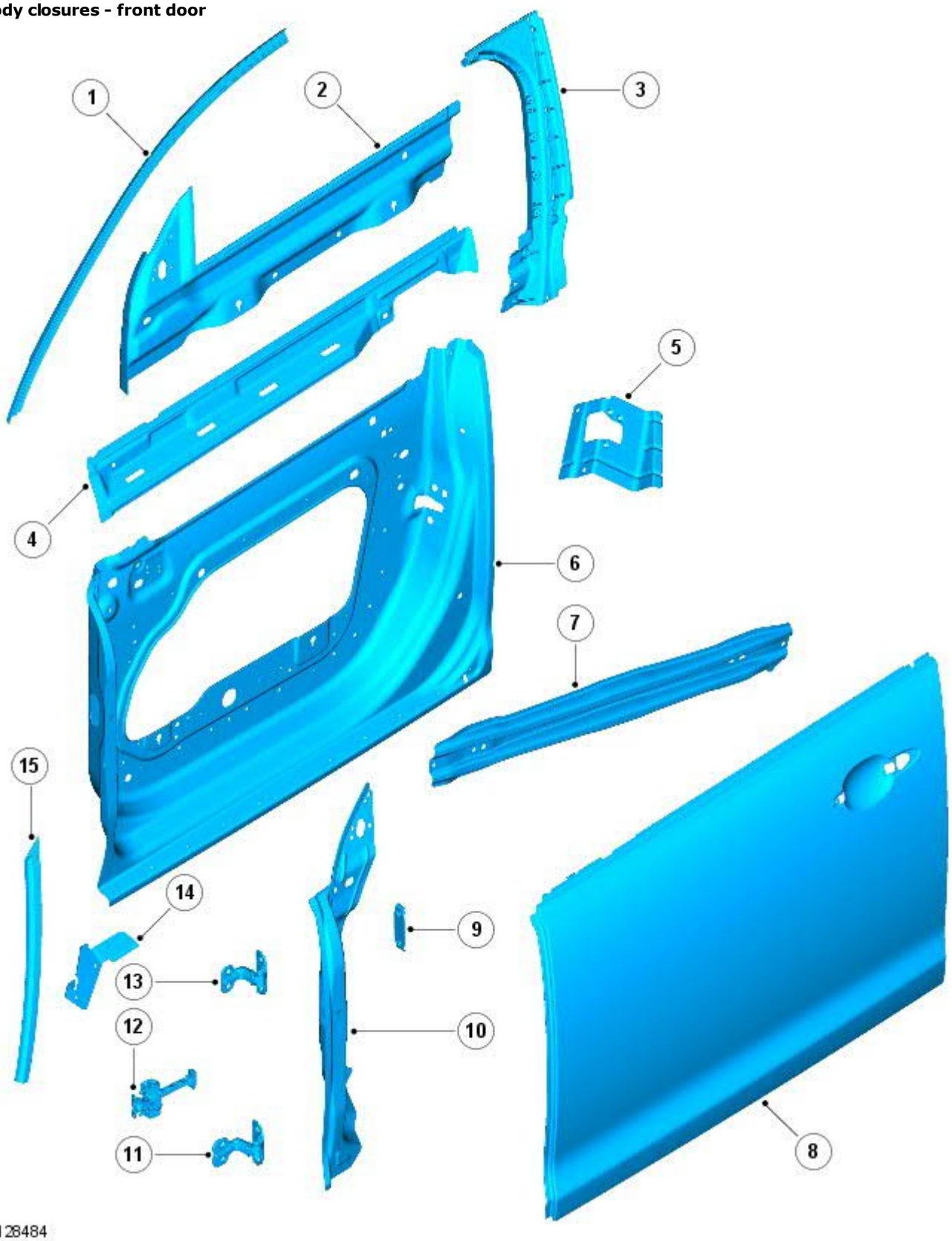
Item	Description
1	Bodyshell

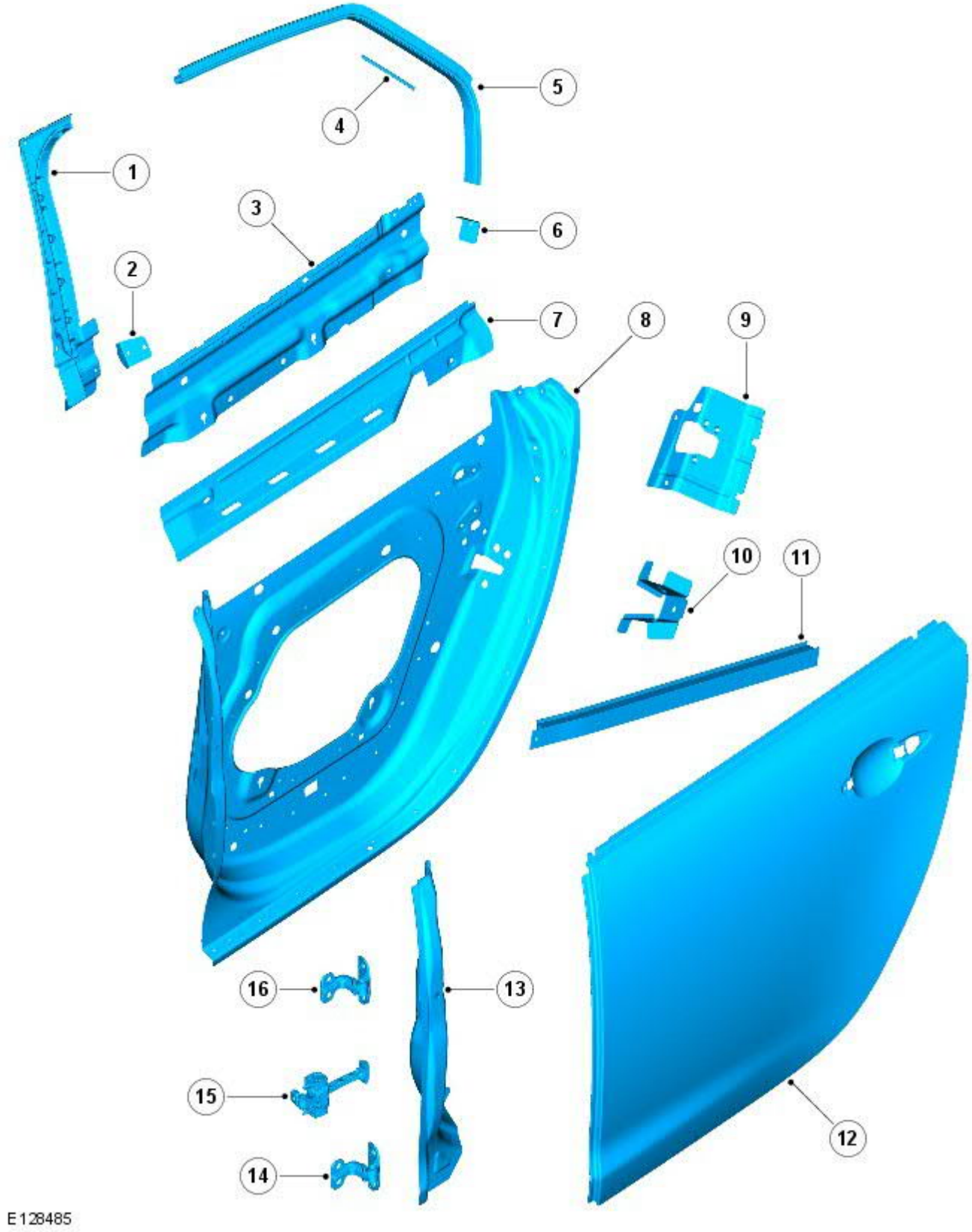
Body closures - front door



Item	Material code	Material description
1	6060-T4	6000 Series aluminium alloy
2	5754NG	5000 Series aluminium alloy
3	HPDC	High Pressure Die Cast Aluminium
4	5754NG	5000 Series aluminium alloy
5	5754NG	5000 Series aluminium alloy

Item	Material code	Material description
6	5182	5000 Series aluminium alloy
7	Boron	Boron Steel
8	6111-T4	6000 Series aluminium alloy
9	MS1-3	Maraging steel
10	5754NG	5000 Series aluminium alloy
11	Steel	Steel
12	Steel	Steel
13	Steel	Steel
14	5754NG	5000 Series aluminium alloy
15	6060-T4	6000 Series aluminium alloy

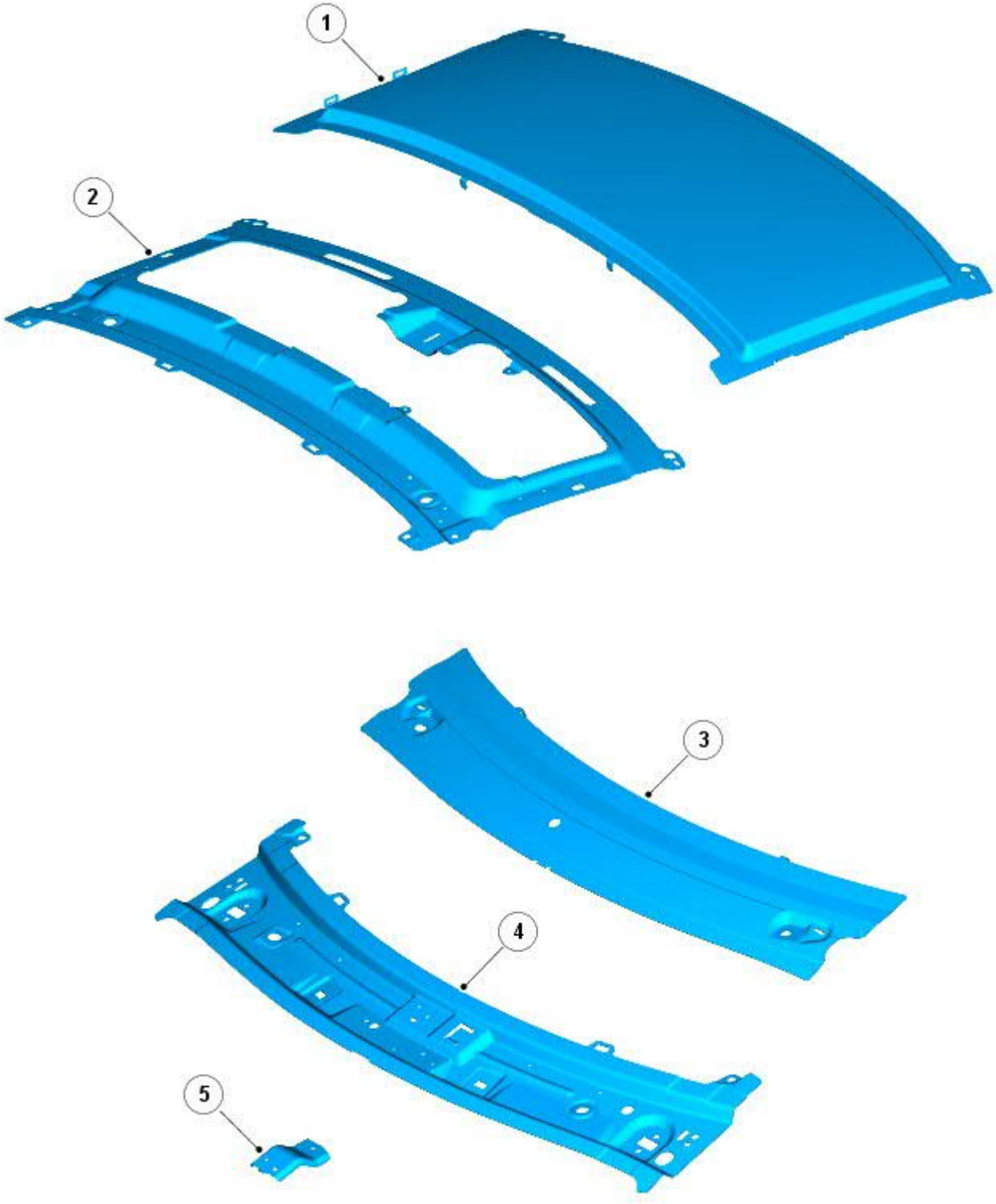
Body closures - rear door



Item	Material code	Material description
1	5754NG	5000 Series aluminium alloy
2	5754NG	5000 Series aluminium alloy
3	5754NG	5000 Series aluminium alloy
4	5754NG	5000 Series aluminium alloy
5	MS1-3	Maraging steel

Item	Material code	Material description
6	5754NG	5000 Series aluminium alloy
7	5754NG	5000 Series aluminium alloy
8	5182	5000 Series aluminium alloy
9	5754NG	5000 Series aluminium alloy
10	6111-T4	6000 Series aluminium alloy
11	6082-T6	6000 Series aluminium alloy
12	6111-T4	6000 Series aluminium alloy
13	5754NG	5000 Series aluminium alloy
14	Steel	Steel
15	Steel	Steel
16	Steel	Steel

Roof panels



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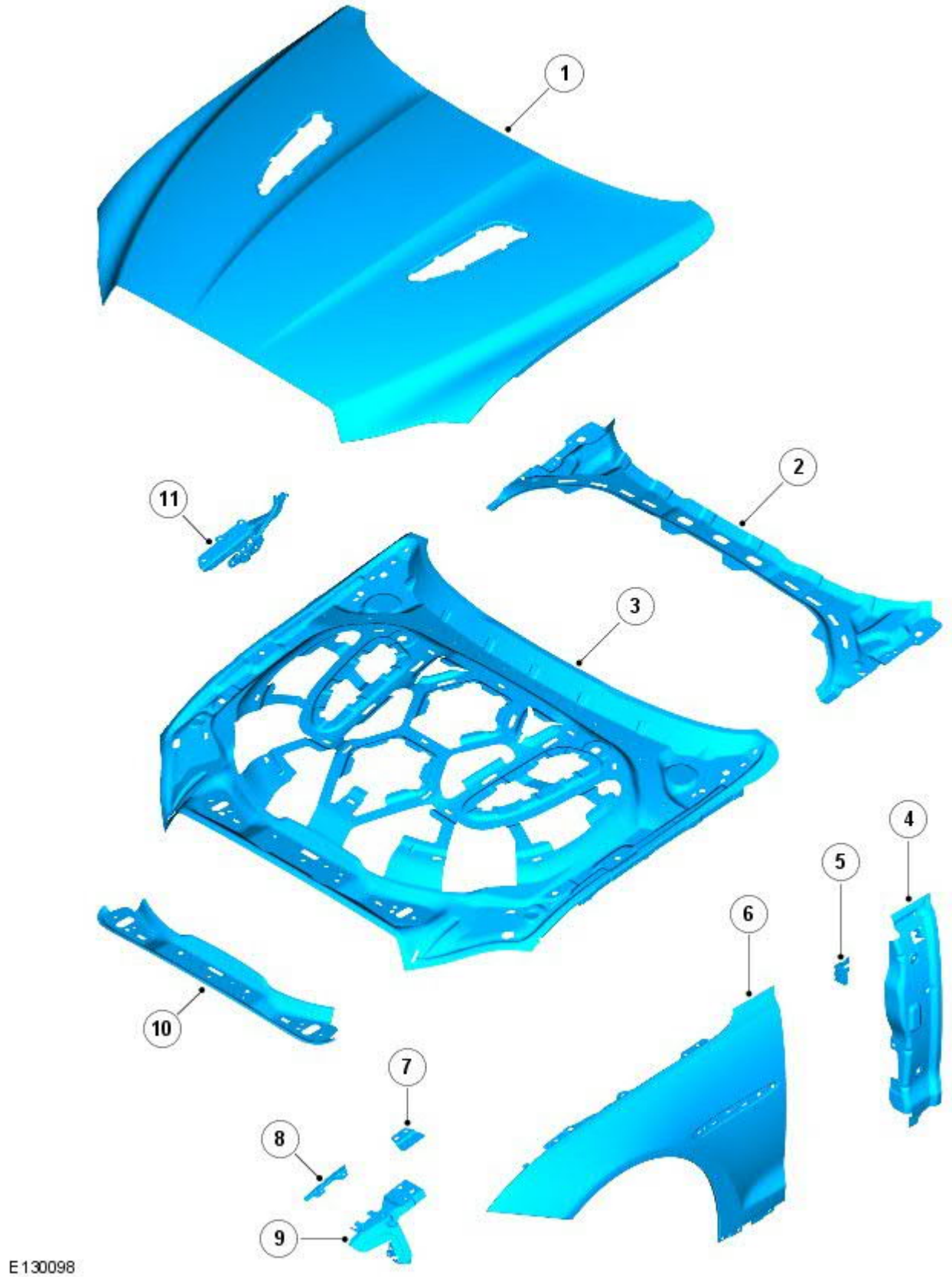
Item	Material code	Material description
1	6111-T4	6000 Series aluminium alloy
2	6111-T4	6000 Series aluminium alloy
3	6111-T4	6000 Series aluminium alloy
4	6111-T4	6000 Series aluminium alloy
5	5754NG	5000 Series aluminium alloy

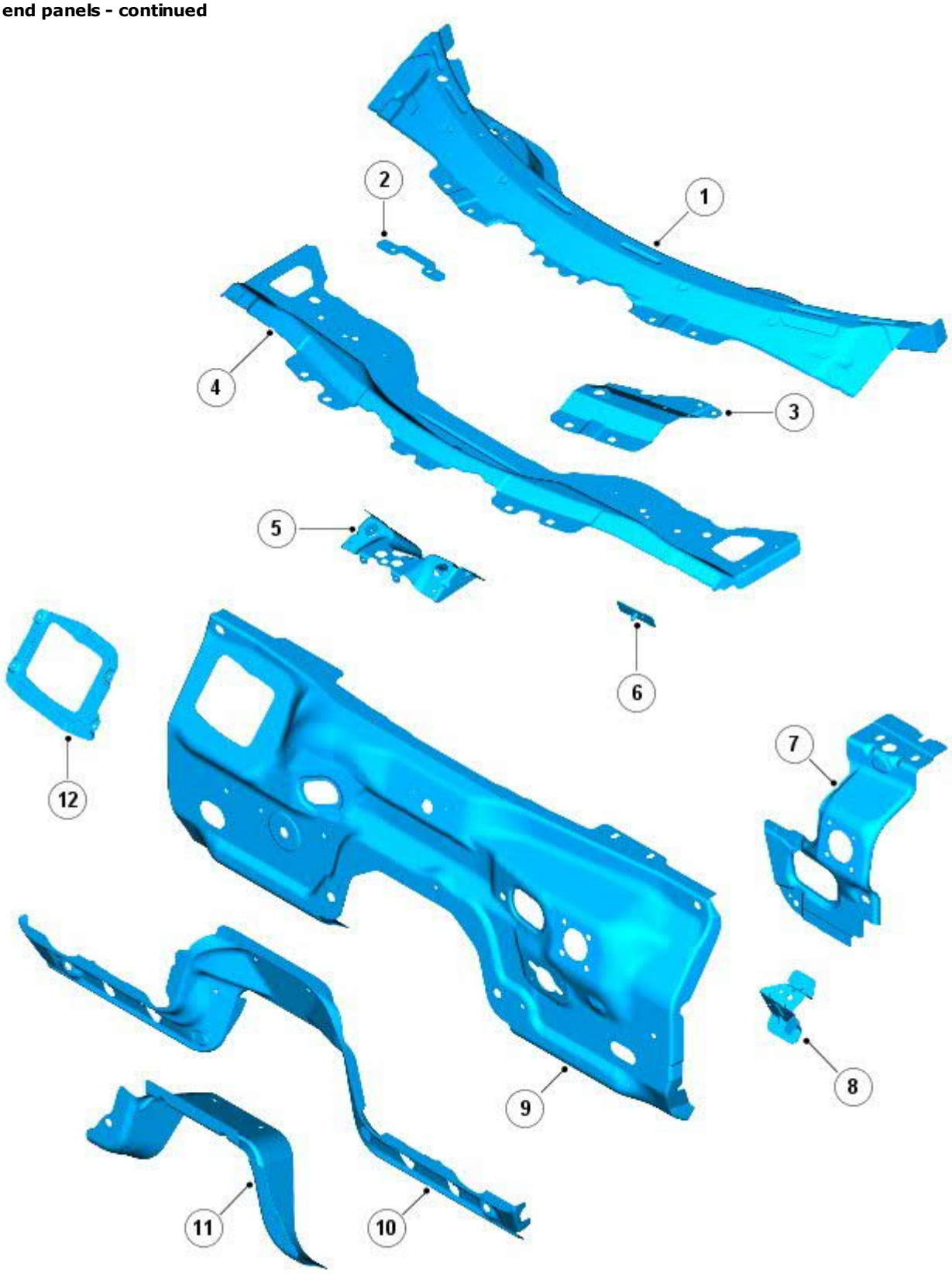
Front end panels



Item	Material code	Material description
1	6111-T4	6000 Series aluminium alloy
2	5182	5000 Series aluminium alloy
3	5182	5000 Series aluminium alloy

Item	Material code	Material description
4	5754-NG	5000 Series aluminium alloy
5	MS1-3	Maraging steel
6	6111-T4	6000 Series aluminium alloy
7	MS1-3	Maraging steel
8	5754-NG	5000 Series aluminium alloy
9	5754-NG	5000 Series aluminium alloy
10	5182	5000 Series aluminium alloy
11	Steel	Steel

Front end panels - continued



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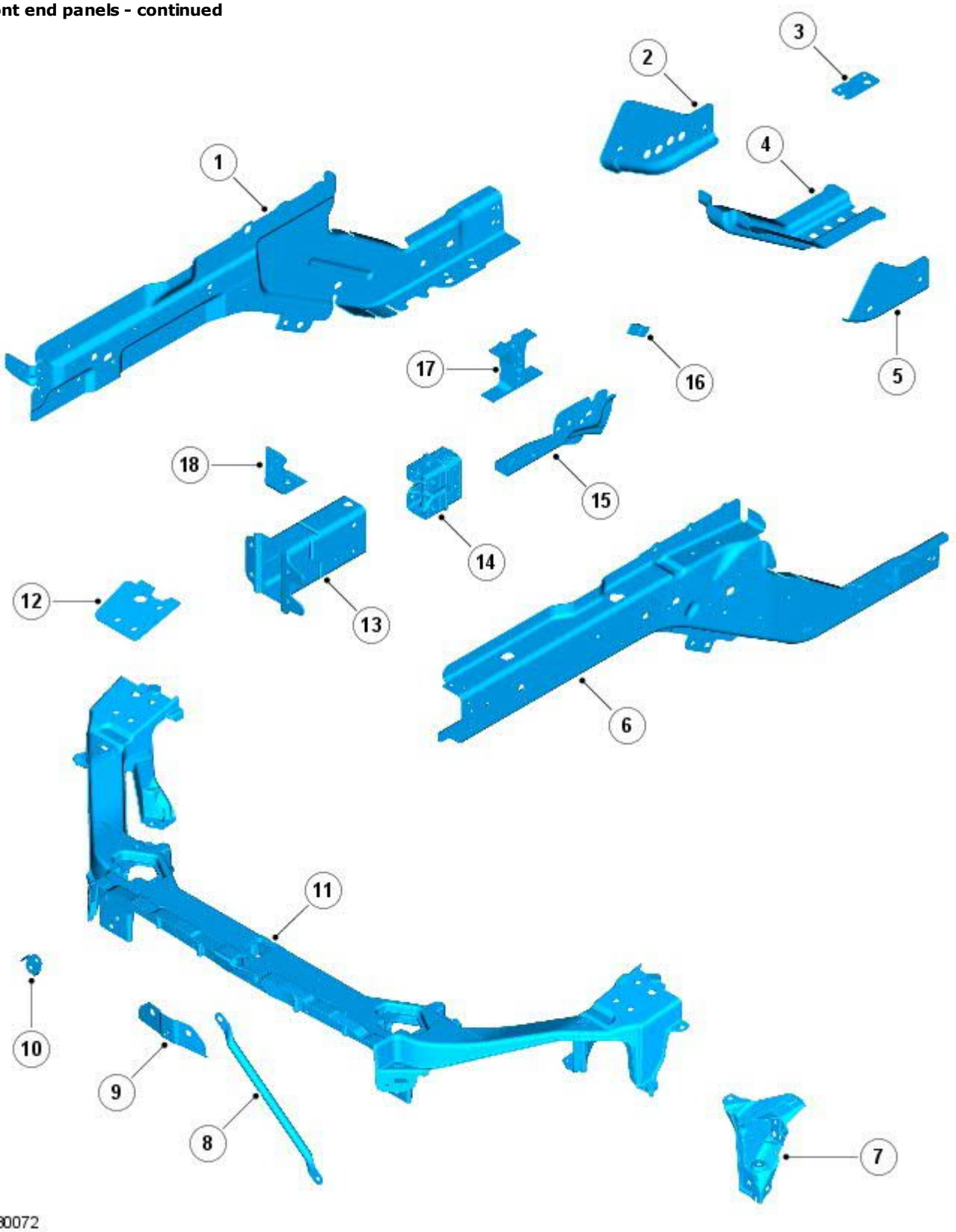
Item	Material code	Material description
1	5754-NG	5000 Series aluminium alloy
2	HSLA340	High Strength Low Alloy Steel - 340MPa
3	6111-T4	6000 Series aluminium alloy
4	5754-NG	5000 Series aluminium alloy
5	MS1-3	Maraging steel

Item	Material code	Material description
6	MS1-3	Maraging steel
7	5754-NG	5000 Series aluminium alloy
8	5754-NG	5000 Series aluminium alloy
9	5754-NG	5000 Series aluminium alloy
10	5754-NG	5000 Series aluminium alloy
11	5754-NG	5000 Series aluminium alloy
12	5754-NG	5000 Series aluminium alloy

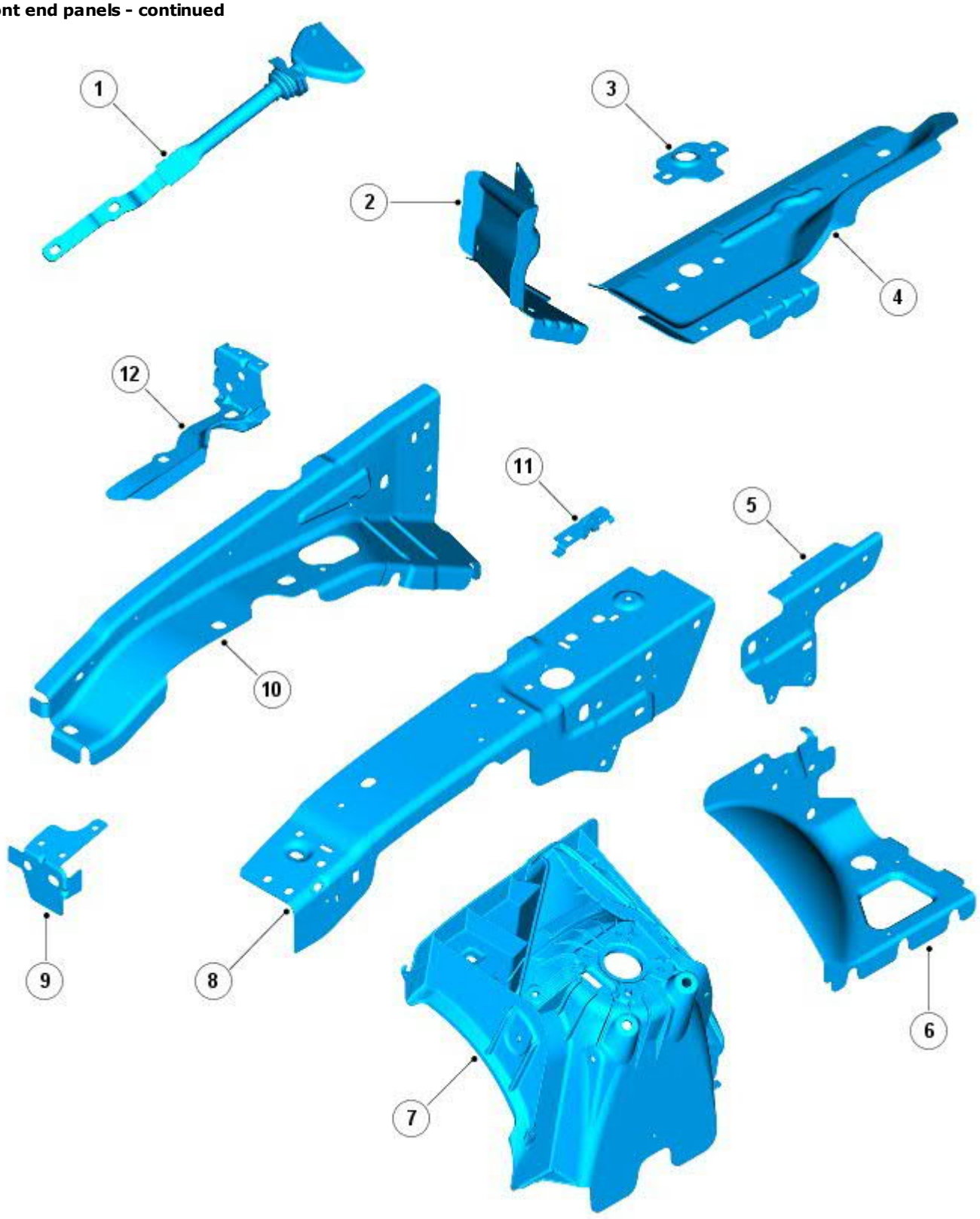
Front end panels - continued



Item	Material code	Material description
1	5754-NG	5000 Series aluminium alloy
2	5754-NG	5000 Series aluminium alloy
3	5754-NG	5000 Series aluminium alloy
4	5754-NG	5000 Series aluminium alloy
5	5754-NG	5000 Series aluminium alloy

Item	Material code	Material description
6	5754-NG	5000 Series aluminium alloy
7	PA66-GF35	Plastic/Glass fibre
8	MS1-3	Maraging steel
9	5754-NG	5000 Series aluminium alloy
10	5754-NG	5000 Series aluminium alloy
11	AM60B	Magnesium die cast alloy
12	5754-NG	5000 Series aluminium alloy
13	6014-T6/7	6000 Series aluminium alloy
14	GDC	Gravity Die-Cast Aluminium
15	5754-NG	5000 Series aluminium alloy
16	5754-NG	5000 Series aluminium alloy
17	6063-T6	6000 Series aluminium alloy
18	6014-T6/7	6000 Series aluminium alloy

Front end panels - continued



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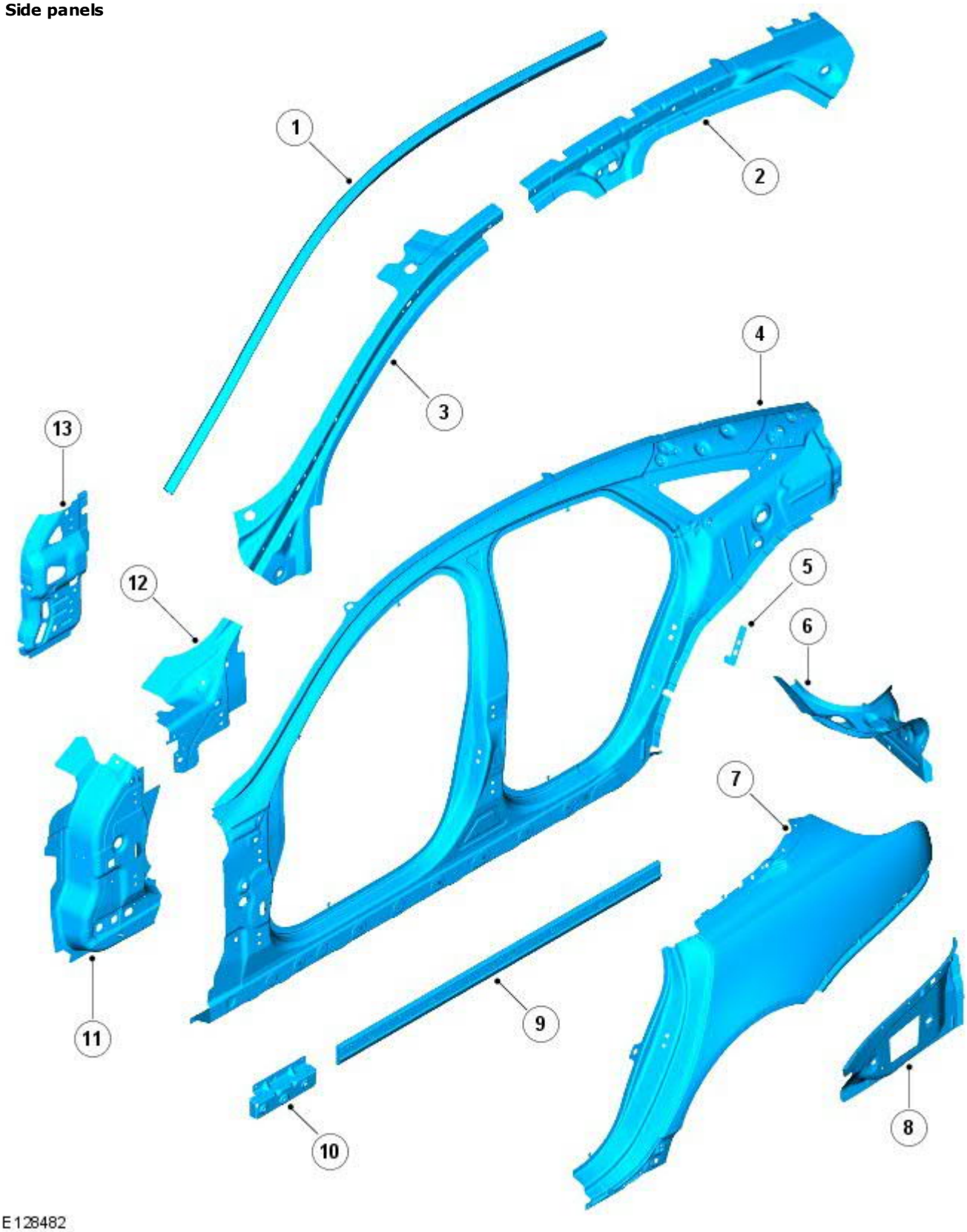
Item	Material code	Material description
1	MS1-3	Maraging steel
2	5754-NG	5000 Series aluminium alloy
3	5754-NG	5000 Series aluminium alloy
4	5754-NG	5000 Series aluminium alloy
5	HSLA300	High Strength Low Alloy Steel - 300MPa

Item	Material code	Material description
6	5754-NG	5000 Series aluminium alloy
7	HPDC	High Pressure Die Cast Aluminium
8	5754-NG	5000 Series aluminium alloy
9	HSLA300	High Strength Low Alloy Steel - 300MPa
10	5754-NG	5000 Series aluminium alloy
11	MS1-3	Maraging steel
12	5754-NG	5000 Series aluminium alloy

Side panels



Item	Material code	Material description
1	6082-T6	6000 Series aluminium alloy
2	6111-T4	6000 Series aluminium alloy
3	6111-T4	6000 Series aluminium alloy
4	6111-T4	6000 Series aluminium alloy
5	MS1-3	Maraging steel

Item	Material code	Material description
6	5754-NG	5000 Series aluminium alloy
7	6111-T4	6000 Series aluminium alloy
8	5754-NG	5000 Series aluminium alloy
9	6082-T6	6000 Series aluminium alloy
10	6111-T4	6000 Series aluminium alloy
11	5754-NG	5000 Series aluminium alloy
12	5754-NG	5000 Series aluminium alloy
13	5754-NG	5000 Series aluminium alloy

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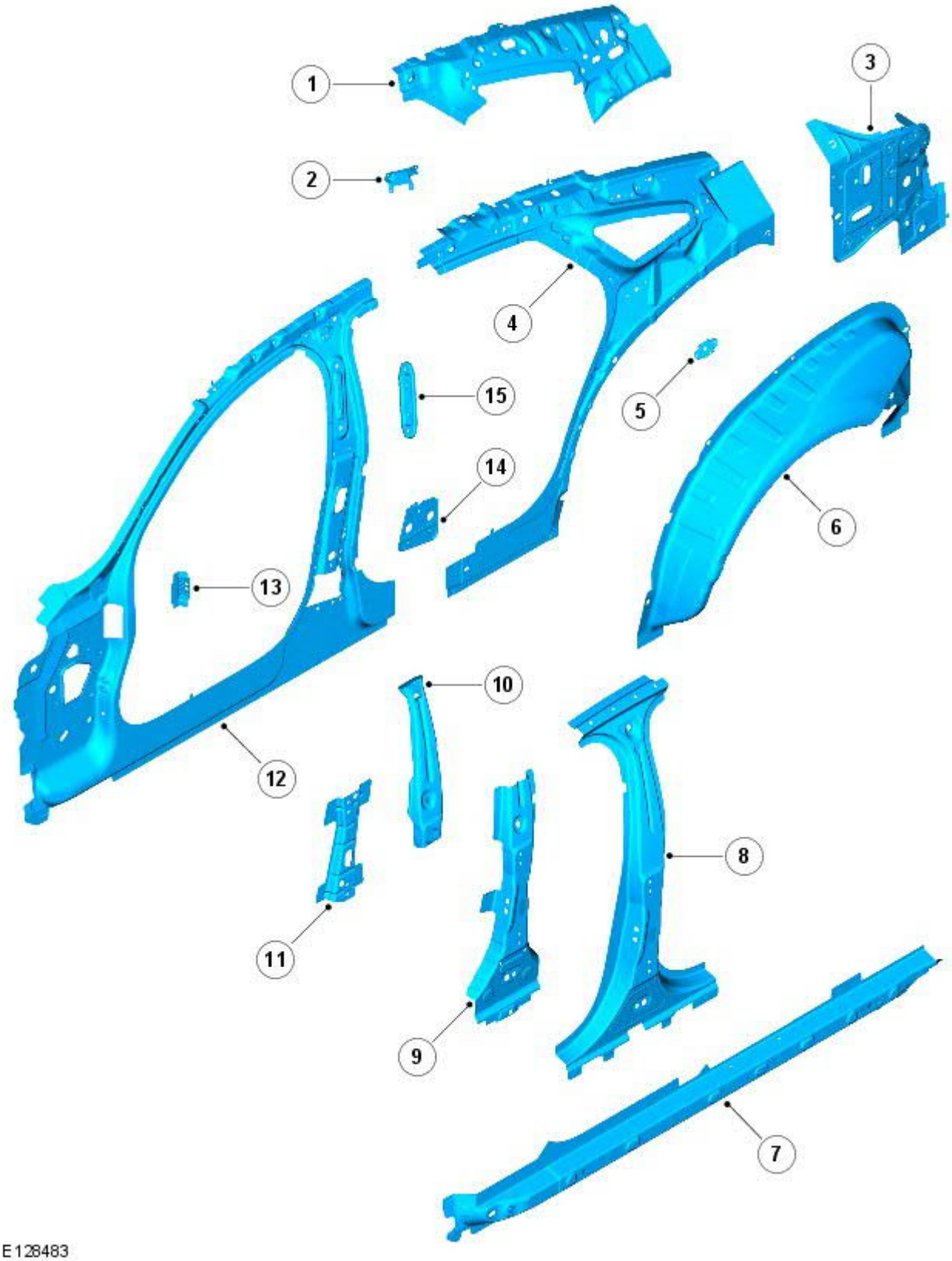
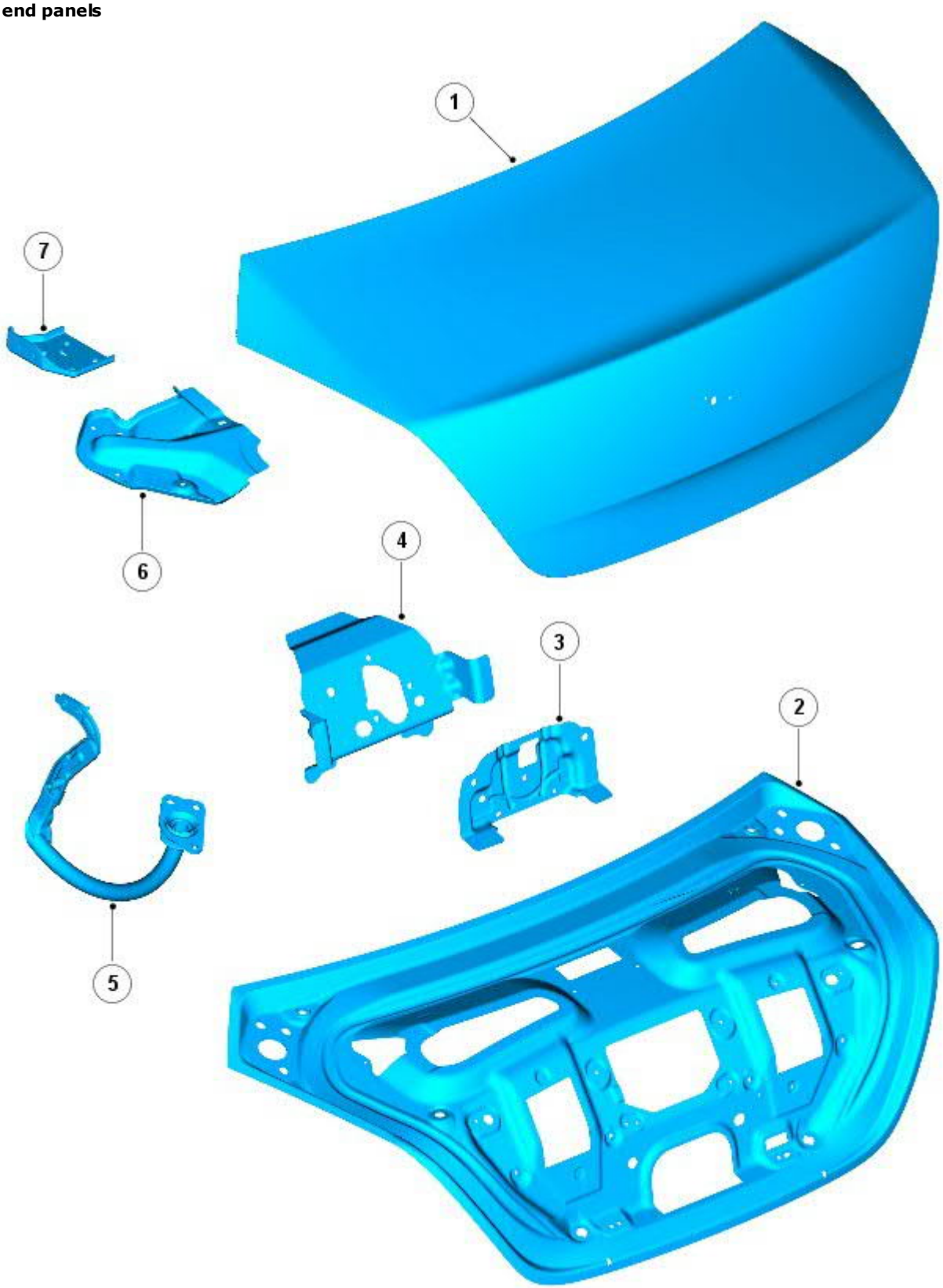
Side panels - continued



Item	Material code	Material description
1	5754-NG	5000 Series aluminium alloy
2	MS1-3	Maraging steel
3	5754-NG	5000 Series aluminium alloy
4	5754-NG	5000 Series aluminium alloy
5	MS1-3	Maraging steel

Item	Material code	Material description
6	5754-NG	5000 Series aluminium alloy
7	5754-NG	5000 Series aluminium alloy
8	6111-T4	6000 Series aluminium alloy
9	6111-T4	6000 Series aluminium alloy
10	Plastic	Plastic
11	6111-T4	6000 Series aluminium alloy
12	5754-NG	5000 Series aluminium alloy
13	MS1-3	Maraging steel
14	BH220	Bake Hardened Steel - 220MPa
15	HSLA340	High Strength Low Alloy Steel - 340MPa

Rear end panels



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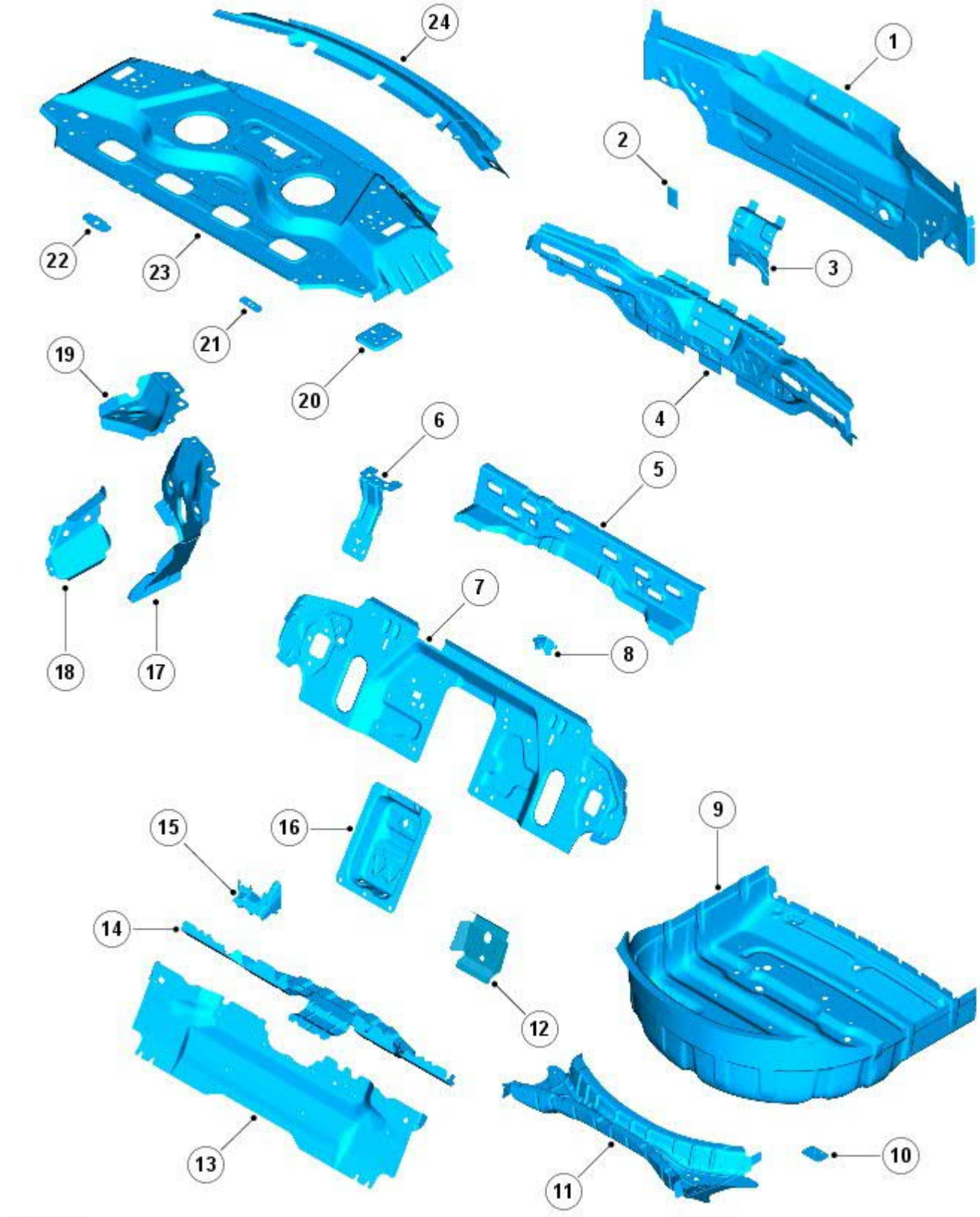
Item	Material code	Material description
1	6111-T4	6000 Series aluminium alloy
2	5182	5000 Series aluminium alloy
3	5182	5000 Series aluminium alloy
4	5182	5000 Series aluminium alloy
5	Steel	Steel

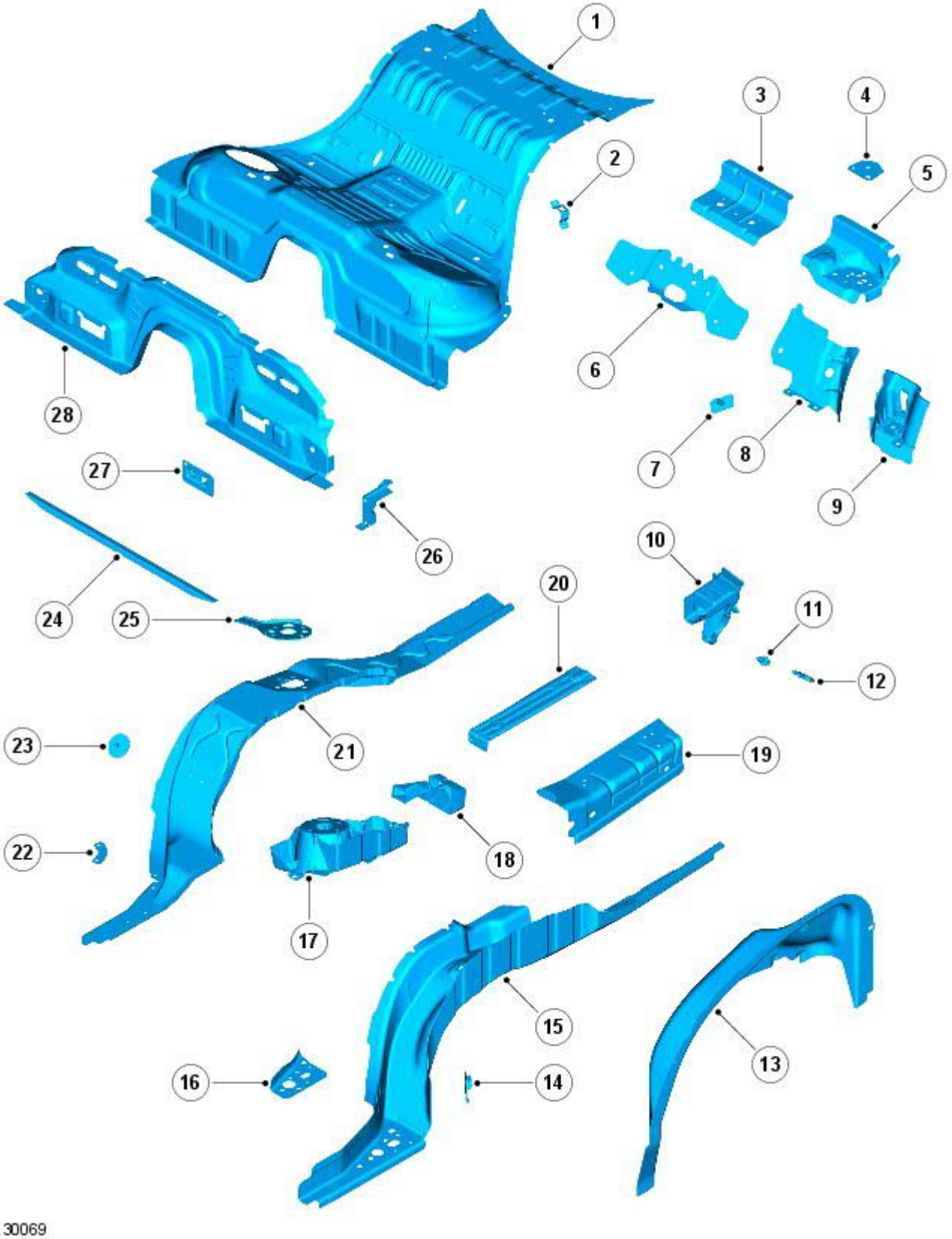
Item	Material code	Material description
6	5182	5000 Series aluminium alloy
7	MS1-3	Maraging steel

Rear end panels - continued



Item	Material code	Material description
1	5754-NG	5000 Series aluminium alloy
2	5754-NG	5000 Series aluminium alloy
3	Steel	Steel
4	5754-NG	5000 Series aluminium alloy
5	5754-NG	5000 Series aluminium alloy
6	Steel	Steel
7	5754-NG	5000 Series aluminium alloy
8	MS1-3	Maraging steel
9	5754-NG	5000 Series aluminium alloy
10	Steel	Steel
11	5754-NG	5000 Series aluminium alloy
12	Steel	Steel
13	5754-NG	5000 Series aluminium alloy
14	5754-NG	5000 Series aluminium alloy
15		Plastic
16	BH220	Bake Hardened Steel - 220MPa
17	5754-NG	5000 Series aluminium alloy
18	5754-NG	5000 Series aluminium alloy
19	BH220	Bake Hardened Steel - 220MPa
20	Steel	Steel
21	Steel	Steel
22	Steel	Steel
23	5754-NG	5000 Series aluminium alloy
24	5754-NG	5000 Series aluminium alloy

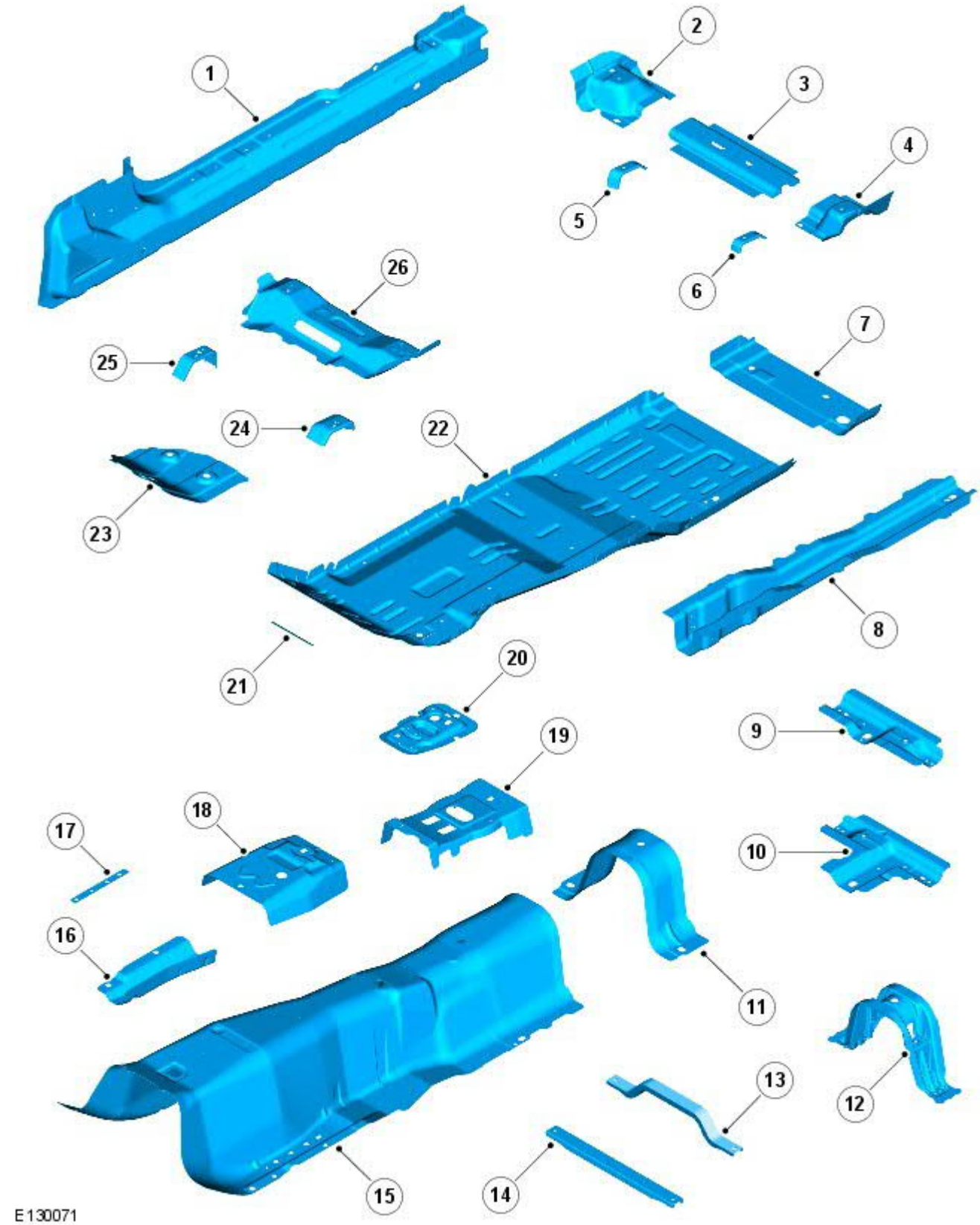
Floor panels - rear



Item	Material code	Material description
1	5754-NG	5000 Series aluminium alloy
2	Steel	Steel
3	5754-NG	5000 Series aluminium alloy
4	Steel	Steel
5	5754-NG	5000 Series aluminium alloy

Item	Material code	Material description
6	Steel	Steel
7	Steel	Steel
8	5754-NG	5000 Series aluminium alloy
9	HPDC	High Pressure Die Cast Aluminium
10	GDC	Gravity Die-Cast Aluminium
11	Steel	Steel
12	Steel	Steel
13	5754-NG	5000 Series aluminium alloy
14	Steel	Steel
15	5754-NG	5000 Series aluminium alloy
16	Steel	Steel
17	HPDC	High Pressure Die Cast Aluminium
18	Plastic	
19	5754-NG	5000 Series aluminium alloy
20	6111-T4	6000 Series aluminium alloy
21	5754-NG	5000 Series aluminium alloy
22	MS1-3	Maraging steel
23	Steel	Steel
24	MS1-3	Maraging steel
25	Steel	Steel
26	5754-NG	5000 Series aluminium alloy
27	MS1-3	Maraging steel
28	5754-NG	5000 Series aluminium alloy

Floor panels - centre



Item	Material code	Material description
1	5754-NG	5000 Series aluminium alloy
2	MS1-3	Maraging steel
3	6014-T6/7	6000 Series aluminium alloy
4	MS1-3	Maraging steel
5	Steel	Steel

Item	Material code	Material description
6	Steel	Steel
7	5754-NG	5000 Series aluminium alloy
8	5754-NG	5000 Series aluminium alloy
9	5754-NG	5000 Series aluminium alloy
10	5754-NG	5000 Series aluminium alloy
11	5754-NG	5000 Series aluminium alloy
12	HPDC	High Pressure Die Cast Aluminium
13	MS1-3	Maraging steel
14	MS1-3	Maraging steel
15	5754-NG	5000 Series aluminium alloy
16	5754-NG	5000 Series aluminium alloy
17	Steel	Steel
18	5754-NG	5000 Series aluminium alloy
19	5754-NG	5000 Series aluminium alloy
20	MS1-3	Maraging steel
21	5754-NG	5000 Series aluminium alloy
22	5754-NG	5000 Series aluminium alloy
23	5754-NG	5000 Series aluminium alloy
24	Steel	Steel
25	Steel	Steel
26	5754-NG	5000 Series aluminium alloy

Galvanic corrosion and housekeeping

Galvanic corrosion is the cross-contamination of dissimilar metals, in this case aluminium and steel. Avoidance of galvanic corrosion is an important issue to be considered in the repair of aluminium bodied vehicles. Precautions to prevent the contamination of exposed bare aluminium surfaces should be taken. Good housekeeping and cleanliness should be adopted throughout repairs and especially prior to welding, pre-treatment and adhesive bonding. The repair environment requires control and protection from dust and debris from conventional steel body repairs. All equipment must be clearly identified and used solely on aluminium. Tools should be kept clean and in good order. Steel fastenings are coated to prevent galvanic corrosion. Fastenings should be examined during repairs and where damaged or suspect must be renewed. The use of graphite, penetrating oil, or copper based anti-seize compounds upon the steel fixings is not recommended.

Panel replacement times

Panel replacement times are available for the following:

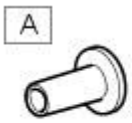
- Front end sheet metal.
  For additional information, refer to: Front End Sheet Metal (501-27 Front End Sheet Metal Repairs, Description and Operation).
- Side panel sheet metal.
  For additional information, refer to: Side Panel Sheet Metal (501-29 Side Panel Sheet Metal Repairs, Description and Operation).
- Rear end sheet metal.
  For additional information, refer to: Rear End Sheet Metal (501-30 Rear End Sheet Metal Repairs, Description and Operation).
- Roof sheet metal.
  For additional information, refer to: Roof (501-28 Roof Sheet Metal Repairs, Description and Operation).

Fixings

There are five groups of fixings used on the all new XJ aluminium range, other than conventional nuts and bolts. It is important that the correct procedures are followed for the removal and replacement of these fixings and, where applicable, the correct tools are used.

- Self-Piercing Rivet (SPR)
- Hemlok (rivet)
- Monobolt (rivet)
- Countersunk Monobolt (rivet)
- Torx Screw and Rivnut

Self-Piercing Rivet (SPR)



E74390

Self-Piercing Rivets are available in various sizes dependant on the size of the stack of panels to which they are fitted. A stack refers to the combined gauge of the panels being Rivetted. The following table identifies the sizes and part numbers available:

NOTE: It is important to identify and select the correct size fixing by referencing this table prior to installation.

Size	Stack	Jaguar Service Number
4.8mm x 5.0mm	3.0mm	C2C 20589
4.8mm x 7.0mm	4.0mm	C2C 20590
4.8mm x 8.0mm	5.0mm	C2C 20591
4.8mm x 8.5mm	5.5mm	C2C 20592
4.8mm x 9.0mm	6.0mm	C2C 20593
4.8mm x 9.5mm	6.5mm	C2C 20594
4.8mm x 11.0mm	8.0mm	C2C 20595

Removal

The ESN50 is the approved removal tool for Self Piercing Fixings. The ESN50 can be used with an optional, larger, 200mm C frame for improved access. Where tool access is impossible, drill out the remnant using a 6.5mm Cryobit drill bit. Remove all debris.

Installation

The ESN50 is the approved installation tool for Self Piercing Fixings. Where the original panel is being refitted, the new fixings should be placed adjacent to the original. Only where the ESN50 cannot be used, or there is insufficient space on the panel, should the fixings be replaced with Hemloks, unless the repair method dictates otherwise.

E72041

Using the ESN50

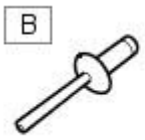
Make sure there is access for the ESN50 on both sides of the fixing to be removed/installed, including the optional C frame if required.

Removal: Align the plunger and anvil over the fixing and depress the trigger. Depressing the trigger will allow the plunger to act on the fixing and remove it from the panel.

NOTE: Prior to replacing a self piercing fixing, a test, using identical materials from waste panels, should be performed, to make sure that all settings are correct and an acceptable joint has been achieved.

Installation: Load new fixing into ESN50. Align the ESN50 over the fixing position and depress the trigger. As the trigger is depressed the ESN50 will clamp itself onto the work piece and install the fixing.

Hemlok (rivet)



E74391

NOTE: It is important to identify and select the correct size fixing by referencing the following table prior to installation.

Hemloks are available in various sizes dependant on the size of the stack of panels to which they are fitted. A stack refers to the combined gauge of the panels being Rivetted. The following table identifies the sizes and part numbers available:

Size	Stack	Jaguar Service Number
6.4mm x 13.7mm	1.5mm - 3.0mm	C2C-45252
6.4mm x 15.0mm	2.8mm - 4.8mm	C2C-36006
6.4mm x 17.0mm	4.8mm - 6.8mm	C2C-36026
6.4mm x 19.0mm	6.8mm - 8.8mm	C2C-36024
6.4mm x 20.0mm	7.5mm - 9.5mm	tbc
6.4mm x 21.0mm	8.8mm - 10.8mm	C2C-36008

Removal

Hemloks are not used in production, however, if a previous repair has been carried out they may be present. Remove the centre of the fixing using a 4mm punch - in some instances it may be necessary to loosen the centre using a hardened centre punch. Once the centre has been removed, drill out the remnant using a 6.5mm Cryobit drill bit. Remove all debris.

Installation

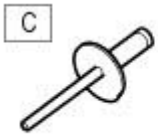
The Genesis G4 is the approved installation tool for Hemloks. Prior to replacement make sure the fixing hole has been drilled to 6.5mm, using a Cryobit drill bit and all debris has been removed.

E72044

Using the Genesis G4

Make sure the fixing hole has been drilled to 6.5mm and all debris has been removed. Check that you have the correct size Hemlok for replacement and insert it into the Genesis G4. Use the weight of the Genesis G4 to apply light pressure as the Hemlok is inserted into its hole. Depress the trigger which will tighten the Hemlok in the hole, the wasted stud will be ejected into the Genesis G4 once a pre-determined pressure is reached.

Monobolt (rivet)



E74392

Removal

Remove the centre of the fixing using a 4mm punch - in some instances it may be necessary to loosen the centre using a hardened centre punch. Once the centre has been removed, drill out the remnant using a 6.5mm Cryobit drill bit. Remove all debris.

Installation

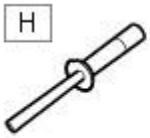
The Genesis G4 is the approved installation tool for Monobolts. Prior to replacement make sure the fixing hole has been drilled to 6.5mm, using Cryobit drill bit and all debris has been removed.

E72044

Using the Genesis G4

Make sure the fixing hole has been drilled to 6.5mm and all debris has been removed. Insert a new Monobolt into the Genesis G4, (there is only one size of Monobolt used on the all new XJ aluminium Range). Use the weight of the Genesis G4 to apply light pressure as the Monobolt is inserted into its hole. Depress the trigger which will tighten the Monobolt in the hole, the wasted stud will be ejected into the Genesis G4 once a pre-determined pressure is reached.

Countersunk Monobolt (rivet)



E74398

Countersunk Monobolts are used in replacement where a Self-Piercing Rivet, (SPR), cannot be replicated and where a Hemlok cannot be used because a flush surface is required.

Removal

Countersunk Monobolts are not used in production, however, if a previous repair has been carried out they may be present. Remove the centre of the fixing using a 4mm punch - in some instances it may be necessary to loosen the centre using a hardened centre punch. Once the centre has been removed, drill out the remnant using a 6.5mm Cryobit drill bit. Remove all debris.

Installation

The Genesis G4 is the approved installation tool for Countersunk Monobolts. Prior to replacement make sure the fixing hole has been drilled to 6.5mm, using Cryobit drill bit, the hole has been countersunk, using a countersink drill bit and all debris has been removed.

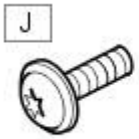
E72044

Using the Genesis G4

Make sure the fixing hole has been drilled to 6.5mm and all debris has been removed. Insert a new Countersunk Monobolt into the Genesis G4, (there is only one size of Countersunk Monobolt used on the all new XJ aluminium Range). Use the weight of the Genesis G4 to apply light pressure as the Countersunk Monobolt is inserted into its hole. Depress the trigger which will tighten the Countersunk Monobolt in the hole, the wasted stud will be ejected into the Genesis G4 once a pre-determined

pressure is reached.

Torx Screw and Rivnut



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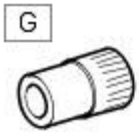


E74397

A Torx Screw and Rivnut are used where the fitment of a Hemlok would give a poor cosmetic appearance. There are also occasions where the Torx Screw and Rivnut replaces a Monobolt, where there is no access for the Genesis G4. The Rivnut acts as the thread.

Description	Jaguar Service Number
Rivnut (G)	C2C 10348
Torx Screw (J)	C2G 1964

Removal

The removal of the Torx Screw is carried out using a T30 Torx Driver. The Rivnut is not an original fixing.

Installation

E72042

The Torx Screw is installed using a T30 Torx Driver. The Rivnut is installed using the Wurth HES412 Rivet Nut Thread Setter, (Part No: 964948900).

Bonding

This section provides information on the bonded joints used in repair throughout the all new XJ aluminium body. The following topics are covered:

- Equipment
- Materials
- Bonding Pre Treatment
- Bonding Application

It is a pre-requisite that any person undertaking any repairs which involve panel bonding has attended Jaguar Approved Training and has achieved the correct skill level to undertake these processes. Bonding is classed as a Category 'A' repair.

Equipment

The approved bonding equipment consists of:

- Pyrosil gas applicator kit
- Approved two-pack adhesive applicator

Bonding Pre Treatment

Pre-treating the panels to be bonded, as described in this section, promotes the improved adhesion of the bonding adhesive.

The pre-treatment is carried out using the approved "Pyrosil kit". The kit contains all of the equipment required to perform the pre-treatment process.

CAUTION: Bonding without pre-treatment will reduce the performance of the joint.

The pre-treatment application is a two stage process:

- Chemical application via a flame
- Coupling Agent

Performing the Pre-treatment Application

CAUTION: Apply caution when using a naked flame. Remove all risk of combustion. Do not overheat the alloy. Move the flame over the work piece at a constant velocity.

The application is colourless and has no visual indication.

- Remove any original adhesive, or E-Coat from new panels
- Clean surface to be treated using approved pre-cleaner/degreaser
- Using the Pyrosil torch, pass the flame, (use the blue tip which is the oxidisation flame), across the surface of the joint
- Immediately brush coupling agent (primer) onto panel surface and allow to dry

CAUTION: Apply the bonding adhesive immediately after the pre-treatment process.

Bonding Application

The approved bonding adhesive is supplied in a two pack cartridge.

A two-pack cartridge gun with a disposable mixing nozzle is used for the application of the adhesive.

NOTE: The curing process of the adhesive begins once mixed and has a working time of approx 30 minutes.

Apply a 5mm "zig zag" bead directly to either the replacement panel or vehicle structure.

Make sure a continuous bead of adhesive surrounds fixing holes.

On completion the mixing nozzle must be discarded. Make sure an air tight seal is provided for the cartridges.

Materials

The materials listed in this section are those approved to be used on the all new XJ aluminium range in conjunction with the repairs shown in this manual.

Approved Materials

Consumable	Material	Supplier
Weld Crack Penetrant	Rocol	Jaguar Equipment Programme
Weld Crack Developer	Rocol	Jaguar Equipment Programme
Weld Crack Cleaner	Rocol	Jaguar Equipment Programme
Pyrosil coupling agent (primer)	SurAlink GP15	Jaguar Equipment Programme
Pyrosil refill cartridge	Sura - Pyrosil	Jaguar Equipment Programme
Bonding Adhesive	Structural Adhesive DP490	3M
Bonding Adhesive	Structural Adhesive 8115	3M
Cavity Foam	DM4330 Foam	3M
Semi Rigid Sealer	0893-2251	Wurth
Seam Sealer	Terostat 1K PUR 11272C (4500010)	Teroson
Cleaner/De-greaser	08984	3M
Cleaner/De-greaser	3608S	DuPont
MIG Weld Wire (6111)	4043/4047 Filler Wire	Fronius Dealer Network
MIG Weld Wire (5754)	5554 Filler Wire	Fronius Dealer Network
Abrasive Discs	Roloc Bristle Discs 07528	3M
Self Piercing Fixings (all variants)	JEPC	Jaguar Dealer Network
Hemlok Fixings (all variants)	JEPC	Jaguar Dealer Network

Aluminium Welding

Health and Safety

Refer to equipment manufacturers' manual.

Set Up/Equipment Check

Refer to equipment manufacturers operator's manual.

Weld Process

This section provides information on aftermarket aluminium welding for the all new XJ aluminium range. It covers the following areas:

- Equipment: Metal Inert Gas (MIG)
- Materials: Extruded and pressed aluminium sheet alloy.
- Weld Structure: Fusion welding process: Metal Inert Gas (MIG).

- Weld Procedures: Pre-weld, test weld, weld and post weld checks.
- Weld Types: Lap weld, Butt weld, Plug weld.

Equipment

NOTE: Approved equipment is obtained from the Jaguar Equipment Programme, (JEP).

Approved MIG Welder: Fronius 2700 Alu Edition Pulsed MIG Welder

The Fronius 2700 Alu Edition MIG Welder utilises a 100% digitally controlled power source, this produces final weld attributes of:

- Smoothness
- Refinement
- Consistency
- Repeatability

The accuracy of the approved equipment enables the delivery of one droplet of wire per pulse. This enables welding of incredibly thin parent material, i.e 0.6mm sheet can be welded using a 1.2mm filler wire.

The approved MIG welder uses Direct Current, (DC) and does not produce High Frequency, (HF), at start up, (initial arc).

Welder Set Up

NOTE: The user should always refer to the operators manual for detailed instructions.

The following provides an overview of the set-up procedure:

- Health and Safety - read operators manual
- Check correct power supply
- Check gas supply
- Check all equipment parts - safety check
- Attach power cables, connect to supply
- Purge gas bottle, attach
- Attach clamp

Approved equipment obtained from the Jaguar Equipment Programme, (JEP):

- Speedglas with Adflo face shield/weld mask
- Approved fume extractor
- Stainless Steel Brush

- Personal Protection Equipment (PPE)

Materials

Prior to any welding activity, it is necessary to identify the type of material to be welded. The all new XJ aluminium range is constructed from a number of aluminium Alloys, each has different attributes that should be considered prior to the weld process.

Body Materials

The repair methods shown focus on the replacement of:

- Pressed Aluminium Alloy sheet - 6111 - Used in skin-panels
- Extruded Aluminium Alloy - 5754 - Used in structural panels

Weld Wire

The approved weld wires for these alloys are:

- 6111 - 4043 or 4047 filler wire
- 5754 - 5554 filler wire

Weld Structure

The approved aftermarkets weld process is based on Fusion Welding:

- Metal Inert Gas (MIG) Welding

The approved MIG welder uses DC current. The Electrode, (filler wire), is Positive Pole and the work piece is Negative Pole. The arc burns between a melting electrode, (which also acts as the filler wire) and the work piece. The shielding gas is Argon, Helium or a mixture of these, (MIG).

Successful aluminium welding is partly dependent on the removal of surface Oxidisation. Oxide **MUST** be removed prior to welding.The oxide melts at a different temperature:

- Aluminium melting temperature - approximately 660°C
- Aluminium Oxide melting temperature - approximately 2040°C

Weld Procedures

Pre Weld

Prior to starting any weld procedure, the following safety precautions should always be implemented:

- Disconnect the vehicle battery
- Disconnect the generator electrical connectors
- Remove any ECMs within 500mm of the weld area
- Remove the battery before carrying out welding work in its vicinity
- Utmost care must be taken when welding near the fuel tank or other components that contain fuel. If the tank filler neck or a fuel line must be detached to allow access for welding work, then the fuel tank must be drained and removed
- Adjacent vehicle parts and adjacent vehicles must be shielded against flying sparks and heat

The aluminium surfaces **MUST** be cleaned prior to welding. Cleaning will aid penetration and avoid contamination. There are three steps to this process:

1. **Clean surface:**

To remove wax and any other contaminants use a chemical surface cleaner:

- Jaguar approved product: DuPont 3608S
- Alternatively, an Isopropyl based product

2. **Remove Oxide**

This can be achieved through a number of processes:

NOTE: Items used to remove oxide should not be contaminated by use on a steel vehicle.

- Stainless Steel brush
- 80 Grit abrasive paper
- Non-Metallic scuff pad

3. **Remove Oxide Dust**

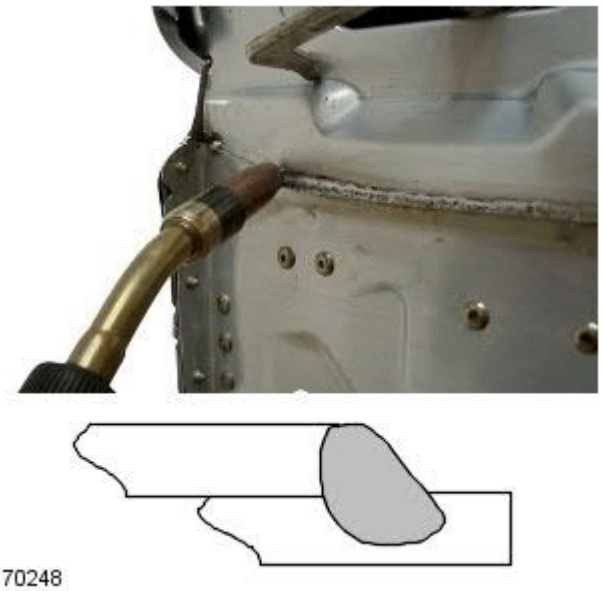
- Remove dust with a lint free cloth

NOTE: Oxide builds up very quickly, therefore, perform steps 2 and 3 immediately prior to welding. If left for a period of time, steps 2 and 3 should be repeated.

Weld Types

The following identifies the three types of joint used in Category A panel replacement. It is not a guide to welding, as all Category A repairers will have staff who are suitably qualified in welding aluminium. This section highlights the key points for each weld type.

Lap Weld



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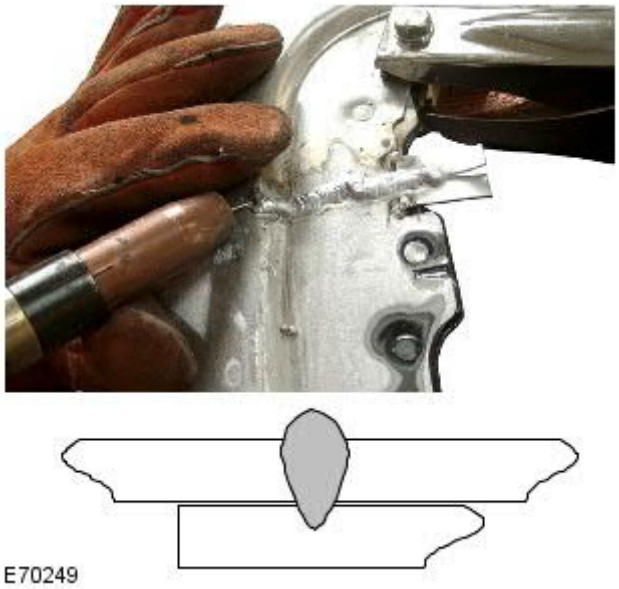
Key points:

- Run-In/Out distance of 5mm
- Minimum overall length of 20mm
- Must use Start/Finish tabs

Butt Weld



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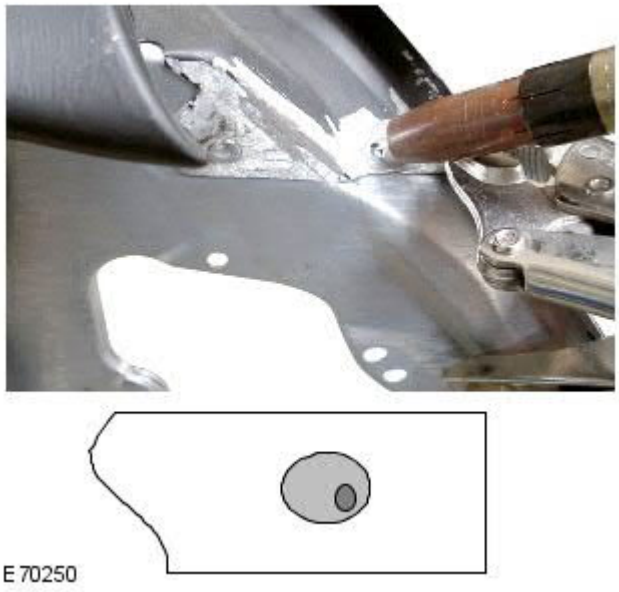
Key Points:

- Run-In/Out distance of 5mm
- Minimum overall length of 20mm
- Must use Start/Finish tabs
- Nominal penetration of fillet required

Plug Weld



Key Points:

- Hole size 10mm
- Position of MIG nozzle - vertical

Test Weld

A test weld using identical coupons from waste panels should take place prior to working on the vehicle. The test piece is then visually checked and destructively tested to make sure all settings are correct and an acceptable weld has been achieved.

Prior to starting, the following should be checked:

- Gas - Correct for the type of job
- Filler Wire - Correct for the type of material to be welded

An effective weld should demonstrate the following qualities:

- All visible weld surfaces shall be clean, bright and of a uniform profile
- The weld seam should show uniform height and width over its entire length
- There shall be complete fusion between the surfaces of the work piece and the weld metal deposit

Correct level of penetration will be visible at the rear of the coupon as a fine continuous line.

Effective Weld Length

The effective weld length is the weld seam as described in the Body Repair Sections. The effective weld length does not include allowances for the run-in/run-out, or termination defects, (start/stop), of the weld seam. It is permissible that the overall weld length is longer than detailed in the repair section, as the overall weld will include a minimum of 5mm at both the start and the stop of the weld seam, provided the function of the part is not affected, or the weld finishes on the edge of a panel.

Post Weld Checks

Weld inspections take the form of a visual examination, non-destructive and destructive testing.

Visual Examination

A visual examination of fusion welds should be carried out in accordance with the acceptance criteria detailed in the following Imperfections/Defect Levels table.

Imperfection/Defect Levels Table

Defect/Imperfection Type	Details	Limits
Burn-through	Burn holes	Not permitted
Seam offset, sides melted away	Incomplete fusion	Not permitted within effective weld length
Cracks	Any form of cracking is not permitted at any position along the entire length of the weld seam	Not permitted
Fused weld spatter		Limited acceptance. Not permitted on visible surfaces or in areas where functional performance of the part is affected, e.g. mating surfaces, sealing surfaces, etc. In such instances spatter is to be removed. All loosely adherent spatters must be removed
Visible ignition marks	Local melting of parent metal due to arc	Permitted provided functional performance of the component is not affected.
Open end crater	Reduces the cross sectional area of the weld seam	Not permitted
Visual pores		Not permitted
Weld skip	Discontinuity/interruption in weld seam	Not permitted at any position along the entire length of the weld seam

Non Destructive

Dye penetrate testing **MUST** be used for detection of discontinuities, such as cracks, laps, folds, porosity and lack of fusion that are open to the surface of the material. Typical defects include start, (cold start/incomplete fusion) and stop, (crater cracking), defects within a fusion weld run. In addition to this lack of fusion/coalescence at the weld toe, solidification cracks in the weld bead may also be detected.

Non Destructive Crack Inspection Process

Use the product as listed in the Approved Materials Section, this product is supplied within the Category A tool kit. The product is an aerosol applied dye system. It is designed to penetrate the finest cracks and flaws to facilitate detection, the system includes: Cleaner, Penetrant and Developer.

The process is as follows:

- 1. Use the cleaner to de-grease/clean the test area, then wipe with a lint free cloth.
- 2. When the surface is completely dry apply the penetrant. Cover the test area and allow a minimum contact time of 10 minutes.
- 3. Remove excess penetrant from the surface with a lint free cloth wetted with the cleaner.
- 4. Apply a **THIN** film of the developer and leave for a minimum of 10 minutes to draw up the retained dye from flaws or cracks.
- 5. Suspect areas should then be examined under natural or electric light for signs of flaws and/or cracks. Cracks will show up as lines whilst porosity will appear as pin holes.

Destructive Testing

Each test weld should be pulled apart to check the quality and penetration of the weld.

Published: 28-Dec-2012

Body Repairs - Corrosion Protection - Corrosion Protection

Description and Operation

Corrosion Protection

General

The application of additional corrosion protection following body repair is not necessary and not recommended. However, it is important to be aware of **galvanic corrosion** and take steps to prevent its occurrence.

Galvanic Corrosion

Galvanic corrosion is the cross-contamination of dissimilar metals, in this case aluminium and steel. Avoidance of galvanic corrosion is an important issue to be considered in the repair of aluminium bodied vehicles.

Precautions to prevent the contamination of exposed bare aluminium surfaces should be taken. Good housekeeping and cleanliness should be adopted throughout repairs and especially prior to welding, pre-treatment, (Pyrosil), and adhesive bonding.

The repair environment requires control and protection from dust and debris from conventional steel body repairs. All equipment must be clearly identified and used solely on aluminium.

Tools should be kept clean and in good order. Steel fastenings are coated to prevent galvanic corrosion. Fastenings should be examined during repairs and where damaged or suspect must be renewed.

The use of graphite, penetrating oil, or copper based anti-seize compounds upon the steel fixings is not recommended.

Where the original equipment surface protection (paint), is removed it must be repainted to the recommended standard.

Only Jaguar Land Rover Limited original bodywork components and Jaguar Land Rover Limited approved repair materials, (sealer, paint, etc), are to be used for bodywork repairs.

Published: 11-May-2011

Body Repairs - Water Leaks - Water Leaks

Description and Operation

General

If water leaks occur after bodywork repairs, the cause can be established using the checks described below. A systematic and logical procedure is required to locate water leaks. Before beginning extensive checks, a thorough visual inspection must be carried out.

Visual Inspection

- The following characteristics may indicate existing leaks:
- Check the clearance and accurate fit of ancillary components such as the hood, tailgate, liftgate, doors, and so on.
- Check for correct fit and possible damage to sealing elements such as blanking plugs, rubber door weather strips, and so on.
- Check water drain holes for unhindered flow.

Various tests can be used to provide further information on possible leaks:

- Water test
- Washer test
- Road test
- Chalk (powder) test

Practical execution of tests and checks

Water test

NOTE: Never aim a jet of water directly at a door weather strip or rubber seals.

Carry out the water test with a second person present (in the passenger compartment).
Use variable washer nozzles (concentrated water jet to fine spray mist).
Start in the lower section and spray the whole area, working upwards in stages.

Washer test

Further tests can be carried out in the washer system.
Some leaks originate here, or only occur here.
The relevant passenger compartment should be checked using a torch during the wash procedure.

Road test

If no leaks are located during the tests above, road tests should be carried out on wet roads.
Road tests under various conditions:

- At various speeds.
- On various road surfaces (asphalt to cobbles).
- With loaded or unloaded vehicle.
- Driving through puddles (splash water).

Chalk test (powder test)

In this test, the clamping load and the bearing surface of the seal are checked.
Performing the test:

- Dust the door seal with powder or coat with chalk.
- Coat the bearing surface of the seal with a thin film of petroleum jelly.
- Slowly close the door and open it again.
- Check the width and continuity of the imprint on the door seal.

Other test equipment

Other equipment such as stethoscopes, UV lamps, special mirrors or ultrasound measuring instruments can be used to locate leaks.

Rectifying the leak using recommended tools, auxiliary equipment and materials

Tools and auxiliary equipment:

- Dry, absorbent cloths
- Variable washer nozzle
- Torch, fluorescent tube
- Mirror
- Compressed air
- Seal lip installer
- Wet/dry vacuum cleaner
- Sealing compound compressor
- Remover for interior trim
- Cutter blade or pocket knife
- Wedge (wood or plastic)
- Hot air blower
- Special mirror for concealed leaks

- Air flow checker
- Sealing compound (tape and plastic compound)
- Multi-purpose sticker
- Clinched flange sealer
- Window sealing compound
- Water shield (PVC)
- Double-sided adhesive tape for water shield
- Methylated spirit (available from trade outlets)
- PU adhesive
- Silicone remover
- Tar remover

Water leaks according to mileage or running time

Increasing mileage has an effect on the problem of leaks in a vehicle. Possible influencing factors are:

Servicing and maintenance of seals:
- No maintenance, lack of maintenance or incorrect maintenance
- Using an incorrect agent

Damaged seals:
- As a result of aging, wear or incorrect handling/assembly.

Heavy soiling of the vehicle:
- Heavy soiling of a vehicle can seriously impair the function of water drainage channels in particular, and also of rubber seals.

Age-related factors:
- Environmental factors
- UV radiation
- Extreme climatic conditions

Corrosion can have a serious impact on bodywork, in particular as a result of:
- Lightly or heavily rusted seal carriers
- Rusted body seal welds
- Perforation corrosion

Water leaks after body repairs

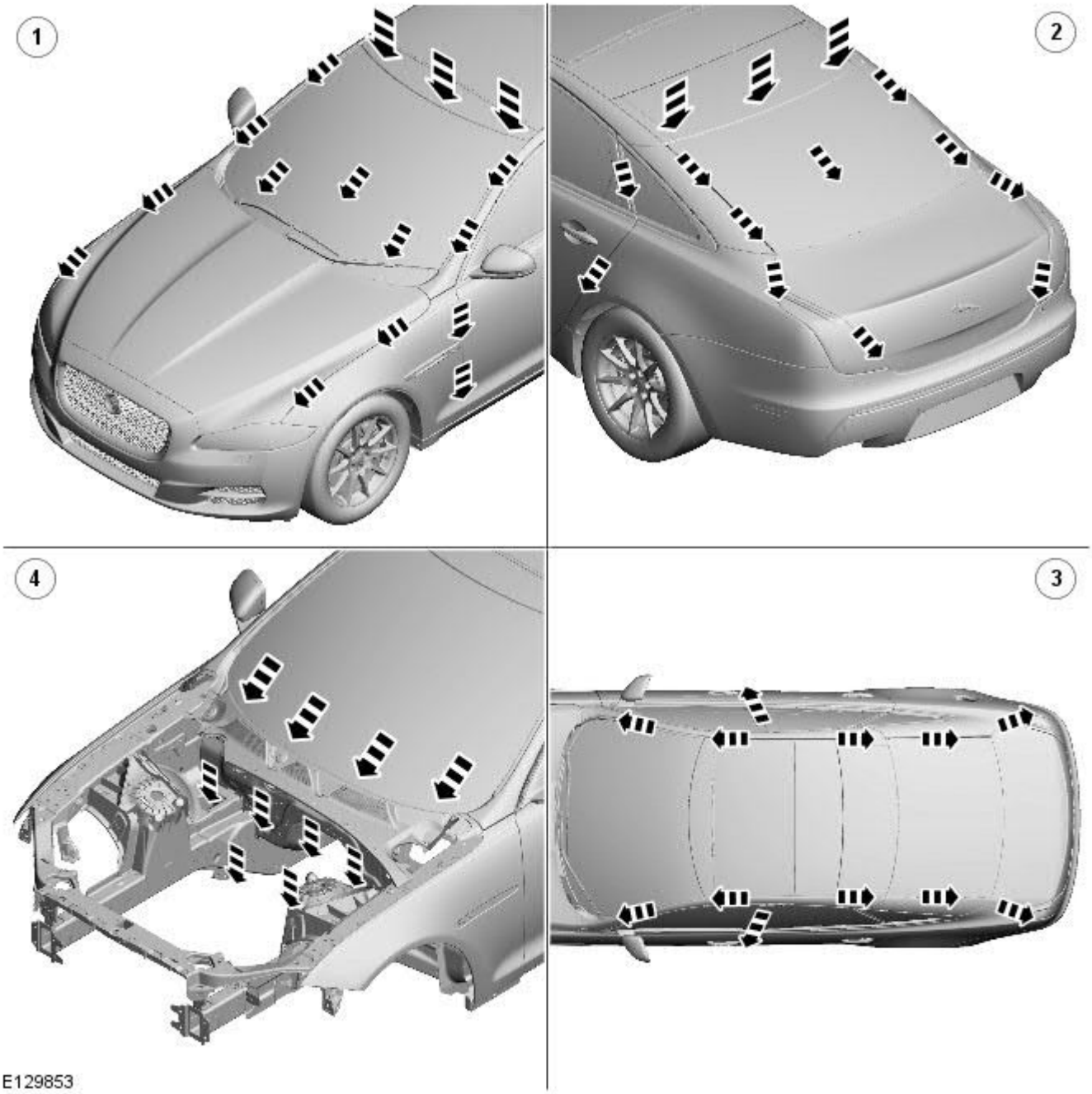
If a vehicle develops a leak after body repairs, the following points must be taken into consideration in particular:

The correct seating of ancillary components and their seals must be checked.
The correct alignment of doors/tailgate and liftgate must be checked. The associated seals must not be damaged and must be installed correctly.
Check that panel seams are correctly sealed.
The correct seating of rubber grommets must be checked.
Directly-glazed windows must have correct and complete bonding.

Water drainage system

If a vehicle develops water leaks, then areas into which water is routed or drained should be checked first.

Water drainage system (illustration for reference only)



Item		Description
1		Water drainage, front
2		Water drainage, side and rear
3		Roof drainage
4		Engine compartment drainage

Water leaks, diagnosis and corrective action: Front passenger compartment

Windscreen

Diagnosis:
- Ingress of water into A-pillar area or instrument cluster area and rocker panel area.

Cause:
- Breaks in adhesive beads.
- The breaks in adhesive beads can be located from inside by using compressed air. The leak can be identified from outside by the escaping air.
- The second test method is by means of a water test. The outer trims must be raised carefully using a plastic wedge. The leak should be located from inside by a second assistant.

Corrective action:
- Remove the windscreen. Remove the existing adhesive bead and reapply using the correct bonding procedure.

Side windows

In the case of side windows, the same problems can arise as for a windscreen. The same corrective actions must therefore be used.

Door seal

Diagnosis:
- Water ingress in the lower part of the interior door trim or in the rocker panel area.

Cause:
- The water shield fitted behind the interior door trim exists to drain off water that has entered the door via the drainage holes, either downwards or outwards. If the water shield seal is damaged or has been fitted incorrectly, then water can get into the passenger compartment.
- In addition to this, the drainage holes can become clogged with leaves, dirt or excess cavity protection agents. Water gathers in the door and ingresses into the passenger compartment.
- Check water shield for damage or correct fitting.
- If the water shield needs to be re-bonded, then approved seam sealer should be used.
- Before the water shield is installed, the drainage holes must be checked for unhindered flow.

Door seals

Diagnosis:
- Ingress of water into the rocker panel area

Cause:
- Insufficient clamping load between seal and door.

Corrective action:

NOTE: When adjusting the clamping load, the profile alignment of the relevant components must always be taken into consideration.

NOTE: Do not realign the flange too far in the direction of the door, as this can reduce the bearing surface of the seal to the door.

- Check clamping load:
- The easiest way to check the clamping load of a seal to the respective bearing surface is by means of a paper strip test. This consists of trapping strips of paper at various points between the door and the seal, and fully closing the door. If it is possible to pull out the paper with no great resistance, then the clamping load is too low.
- Adjust the clamping load:
- The clamping load is normally adjusted using the striker. When doing so, the edge alignment from the door to the side panel, or from the front door to the rear door must be taken into account.
- Another setting method is to realign the panel flange for the seal mounting. The clamping load is increased by moving the flange towards the door.
- Check the bearing surface:
- Apply chalk evenly to the surface of the seal. Evenly coat the bearing surface of the door with petroleum jelly.
- Close the door fully, the lock must engage. Open the door. The imprint of the chalk (bearing surface) can be identified in the film of petroleum jelly.
- The bearing surface should be at least 5mm across at all points.

Other causes:
- The door seal must completely seal the door where it meets the bodywork.
- Water can ingress directly or indirectly into the interior of the vehicle if the seal is damaged at any point.

Corrective action:
- A damaged or worn door seal must always be installed in full.
- When installing the seal, the following must be taken into account:
- Always fit the seal first in the area of the narrow radii (corner points).
- Next, secure the seal to the flange evenly by tapping lightly with a rubber hammer. The installed seal must not be kinked at any point.

NOTE: The prescribed length of a seal must not be shortened.

Other cause:
- The door seal is attached to the welded flange all the way round. If this welded flange is uneven or damaged at any point (usually in areas with small radii) then this point could be subject to leaks.
- A stretched seal carrier can also cause a leak.
- In both cases, water gets into the vehicle interior under the seal carrier.

Corrective action:
- Align the deformed welded flange using a hammer and anvil block, prevent and, if necessary, repair any paint damage.

Roof opening panel - front and rear fixed glass panels

In the case of the roof opening panel - front and rear fixed glass panels, the same problems can arise as for a windscreen. The same corrective actions must therefore be used.

Roof opening panel - sliding central glass panel

NOTE: In the case of the sliding central glass panel, the rubber seals and the lock actuator or latch mechanism must be checked first of all.

Diagnosis:
- Ingress of water at the roof opening panel.

Cause:
- The roof opening panel frame incorporates drain holes in each front corner allowing water to drain via the A-pillars and each rear corner allowing water to drain via the roof panel channels.
- Damaged, worn, or incorrectly fitted seals on the sliding central glass panel.
- Incorrect alignment of the sliding central glass panel.
- Damaged, worn, or incorrectly fitted seals on the roof opening panel frame.
- Water drain channels or water drain holes blocked.

Corrective action:
- Check the seals on the sliding central glass panel, install as necessary.
- Check the correct adjustment of the sliding central glass panel, adjust as necessary, replace any worn or damaged components as necessary.
- Check the internal seal of the roof opening panel frame, realign or install as necessary.
- Check the water drain channels and holes for blockages, clear blockages as necessary.
- Check the drainage system for unhindered flow.

Luggage compartment lid

Diagnosis:
- Ingress of water into the luggage area.

Cause:
- The leak problems of the luggage compartment lid correspond to those of the doors.
- In addition to this, the area to be sealed is much bigger. The routing holes for cables and hoses must also be sealed.
- The rubber grommets for the routing holes must be checked for damage and correct seating (fully unhooked).
- The grommets around the luggage compartment lid hinges may leak.

Corrective action:
- Check the rubber grommets and re-position, reseal or install new, if necessary.

Forced air extraction

Diagnosis:
- Ingress of water into side luggage compartment area

Cause:
- The forced air extraction for the vehicle interior is located in the quarter panel lower extension.
- The rubber flap of the forced air extraction must be able to move freely.

Corrective action:
- Remove the forced air extraction.
- Check the seal area between the bodywork and housing, as well as the rubber flap.
- Install a new seal if necessary.

Rear window

Diagnosis:
- Ingress of water into the passenger compartment area

Cause:
- Rear window leaking via breaks in the adhesive bead.
- Check for leaks in the same way as for a leaking windscreen.

Corrective action:
- In the case of the rear window, the same problems can arise as for a windscreen. The same corrective actions must therefore be used.

Published: 11-May-2011

Body Repairs - Vehicle Specific Information and Tolerance Checks - Body and Frame

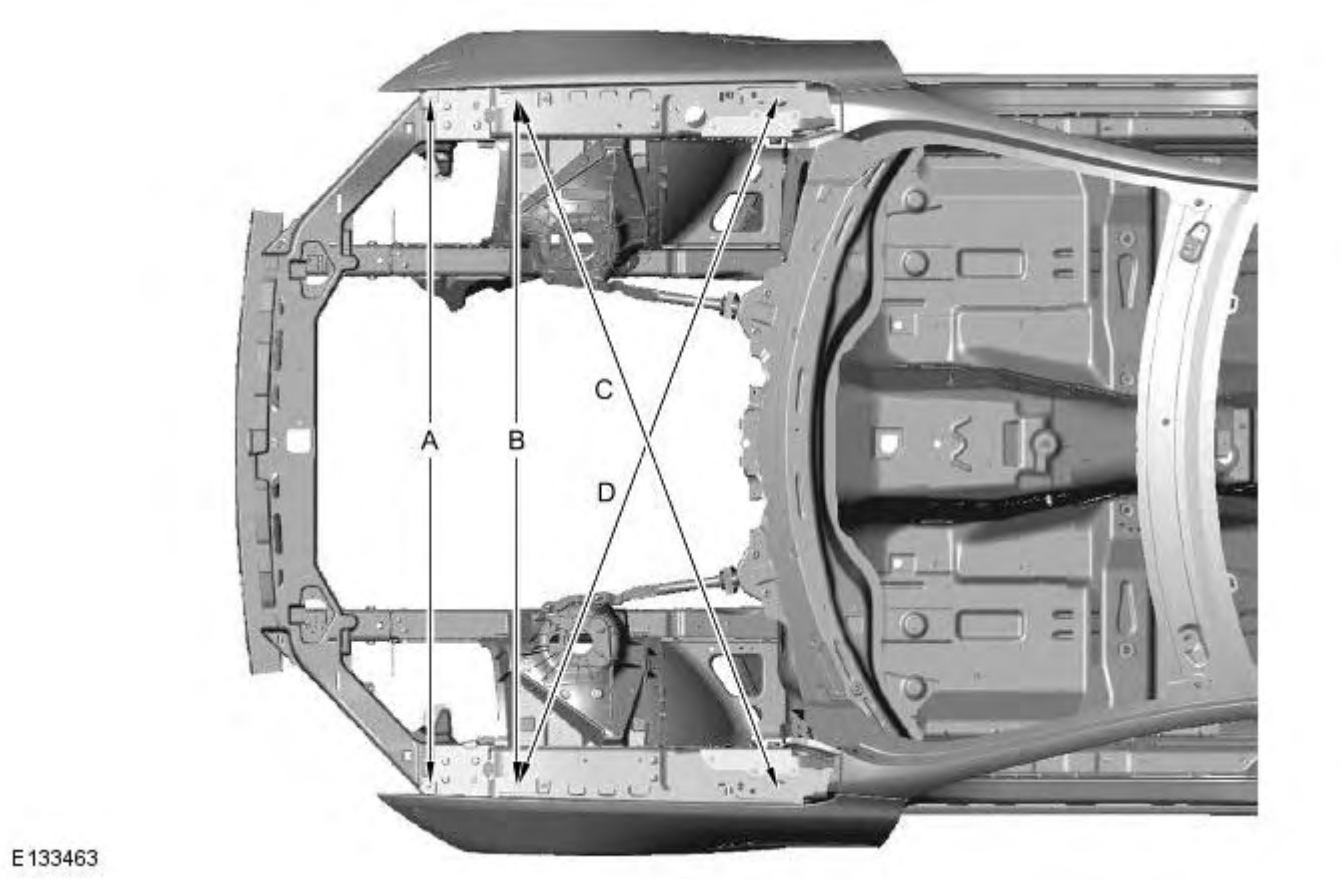
Description and Operation

Front End Body Dimensions

NOTES:

All dimensions shown are in millimetres (mm).

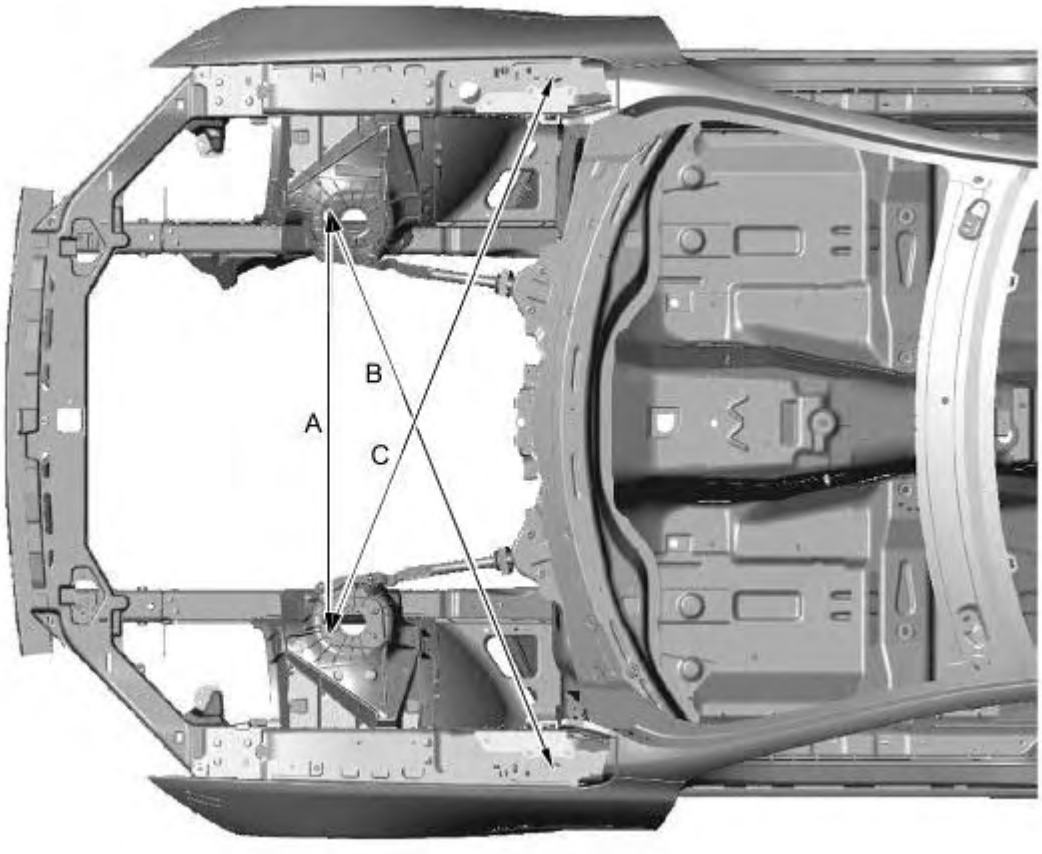
Dimensions shown to holes, are always taken from/to the hole centre. They are also always to the body panel surface, not to the top of bolts or components.



Item	From	To	Dimension
A	Front fender RH, front fixing hole	Front fender LH, front fixing hole	1580.0
B	Front fender RH, second front fixing hole	Front fender LH, second front fixing hole	1570.0
C	Front fender RH, second front fixing hole	Front fender LH, rear fixing hole	1689.4
D	Front fender LH, second front fixing hole	Front fender RH, rear fixing hole	1689.4

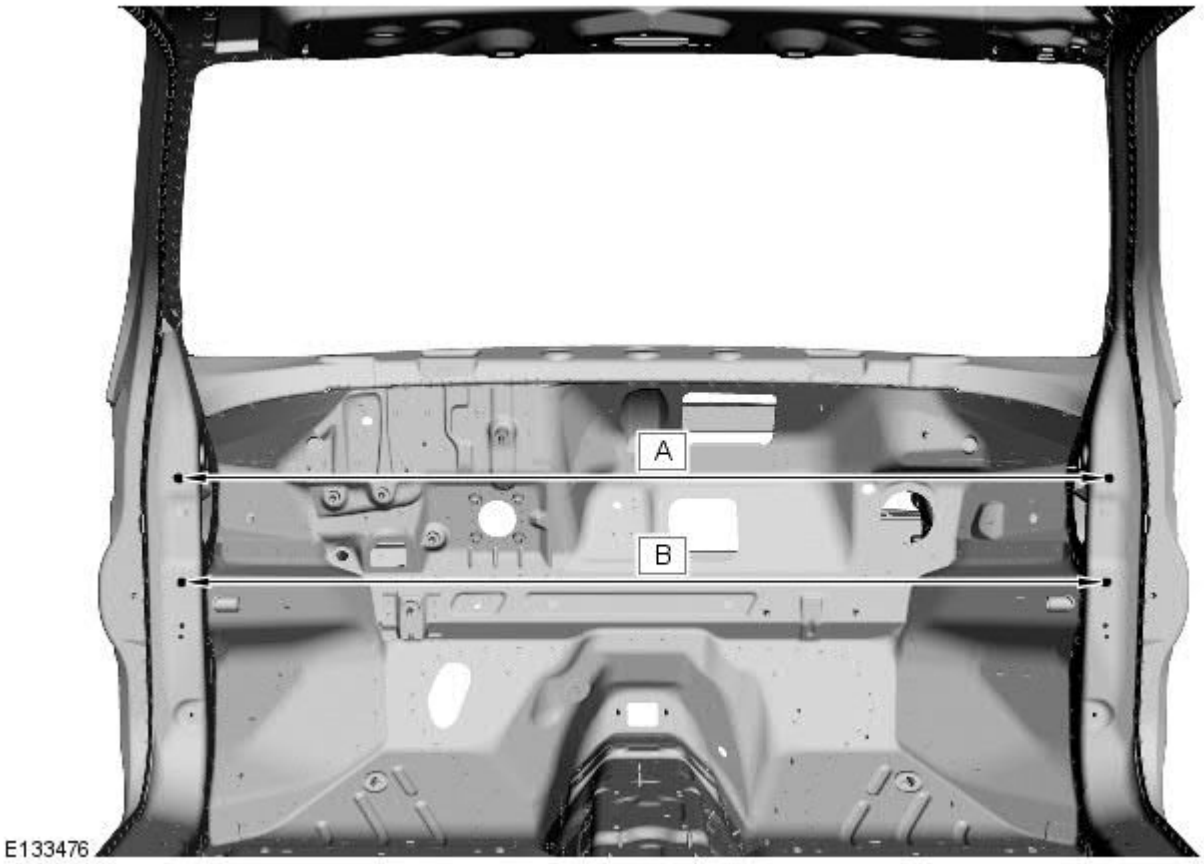
E133467

Item	From	To	Dimension
A	Side member deformation element RH, top inboard fixing hole	Side member deformation element LH, top inboard fixing hole	712.5



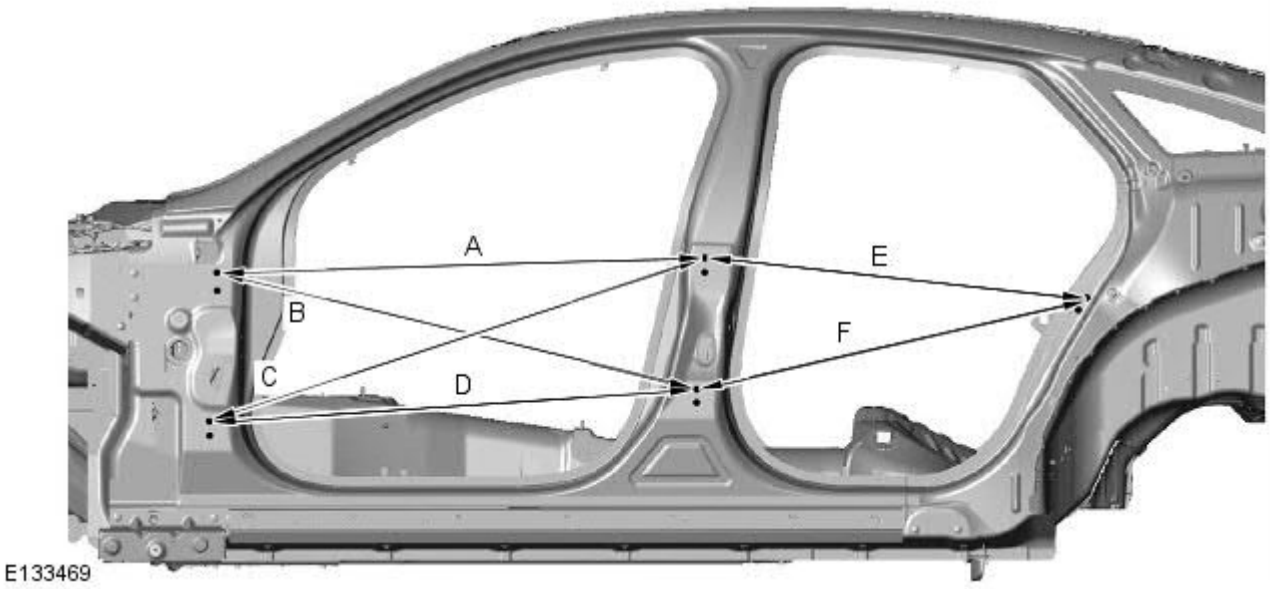
E133468

Item	From	To	Dimension
A	Suspension top mount RH, front outboard fixing	Suspension top mount LH, front outboard fixing	986.5
B	Suspension top mount RH, front outboard fixing	Front fender LH, rear fixing	1379.9
C	Suspension top mount LH, front outboard fixing	Front fender RH, rear fixing	1379.9



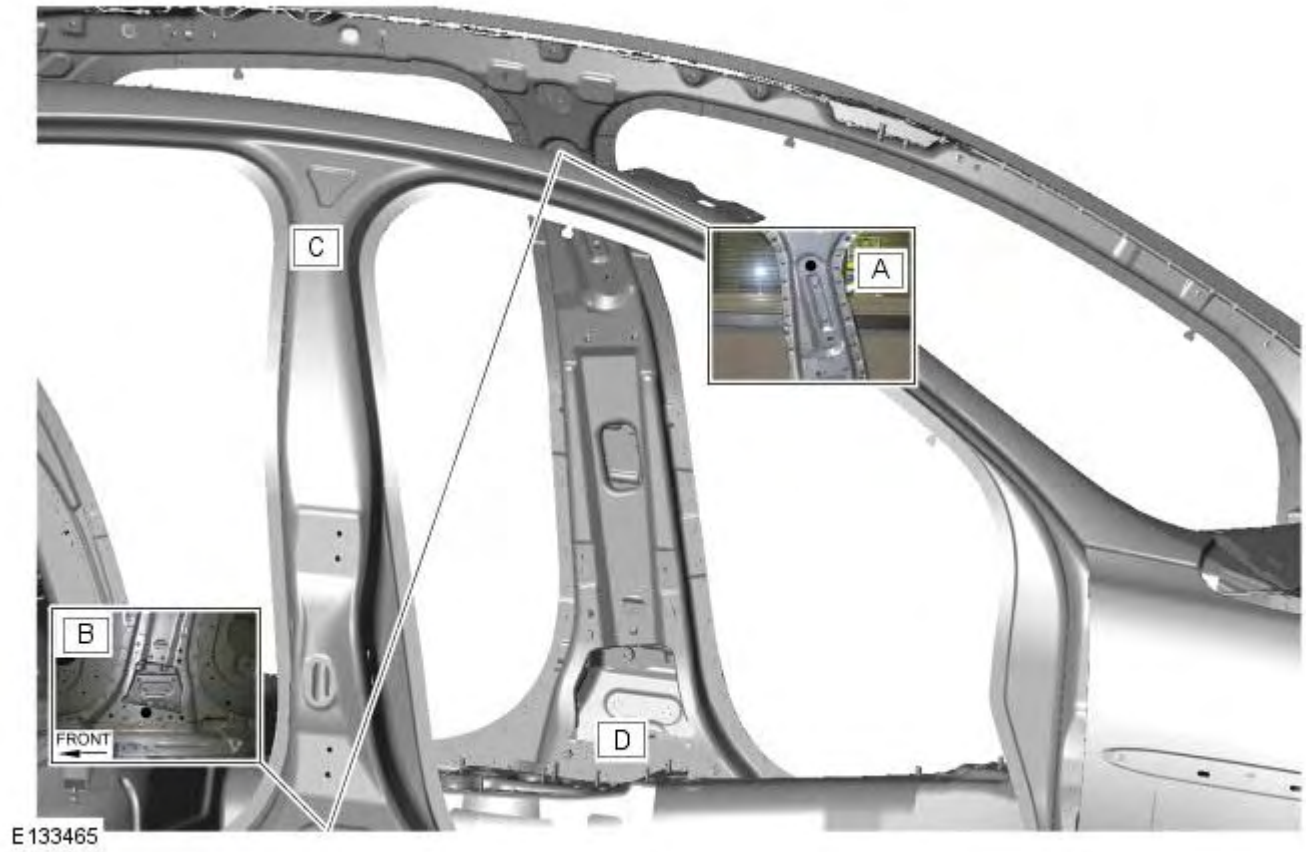
Item	From	To	Dimension
A	Instrument panel carrier RH top fixing hole	Instrument panel carrier LH top fixing hole	1416
B	Instrument panel carrier RH bottom fixing hole	Instrument panel carrier LH bottom fixing hole	1416

Side Panel Dimensions



Item	From	To	Dimension
A	Front door top hinge, top fixing hole	Rear door top hinge, top fixing hole	1109.1

Item	From	To	Dimension
B	Front door top hinge, top fixing hole	Rear door bottom hinge, top fixing hole	1119.9
C	Front door bottom hinge, top fixing hole	Rear door top hinge, top fixing hole	1184.8
D	Front door bottom hinge, top fixing hole	Rear door bottom hinge, top fixing hole	1108.9
E (short wheel base)	Rear door top hinge, top fixing hole	Rear door striker, top fixing hole	885.6
E (long wheel base)	Rear door top hinge, top fixing hole	Rear door striker, top fixing hole	1009.5
F (short wheel base)	Rear door bottom hinge, top fixing hole	Rear door striker, top fixing hole	914.0
F (long wheel base)	Rear door bottom hinge, top fixing hole	Rear door striker, top fixing hole	1036.8



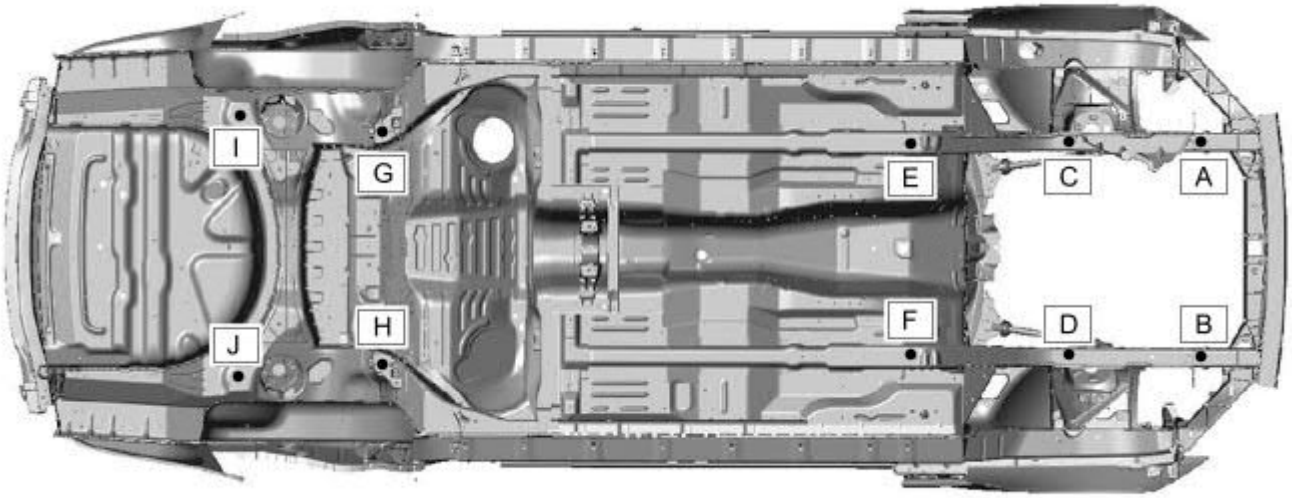
Item	From	To	Dimension
A-B	Front seat belt adjuster LH, top fixing hole	Front seat belt retractor RH, mounting hole	1606.2
C-D	Front seat belt adjuster RH, top fixing hole	Front seat belt retractor LH, mounting hole	1606.2

Rear End Body Dimensions

E133464

Item	From	To	Dimension
A	Rear bumper RH lower fixing hole	Rear bumper LH lower fixing hole	995.92

Under Body Dimensions



E133470

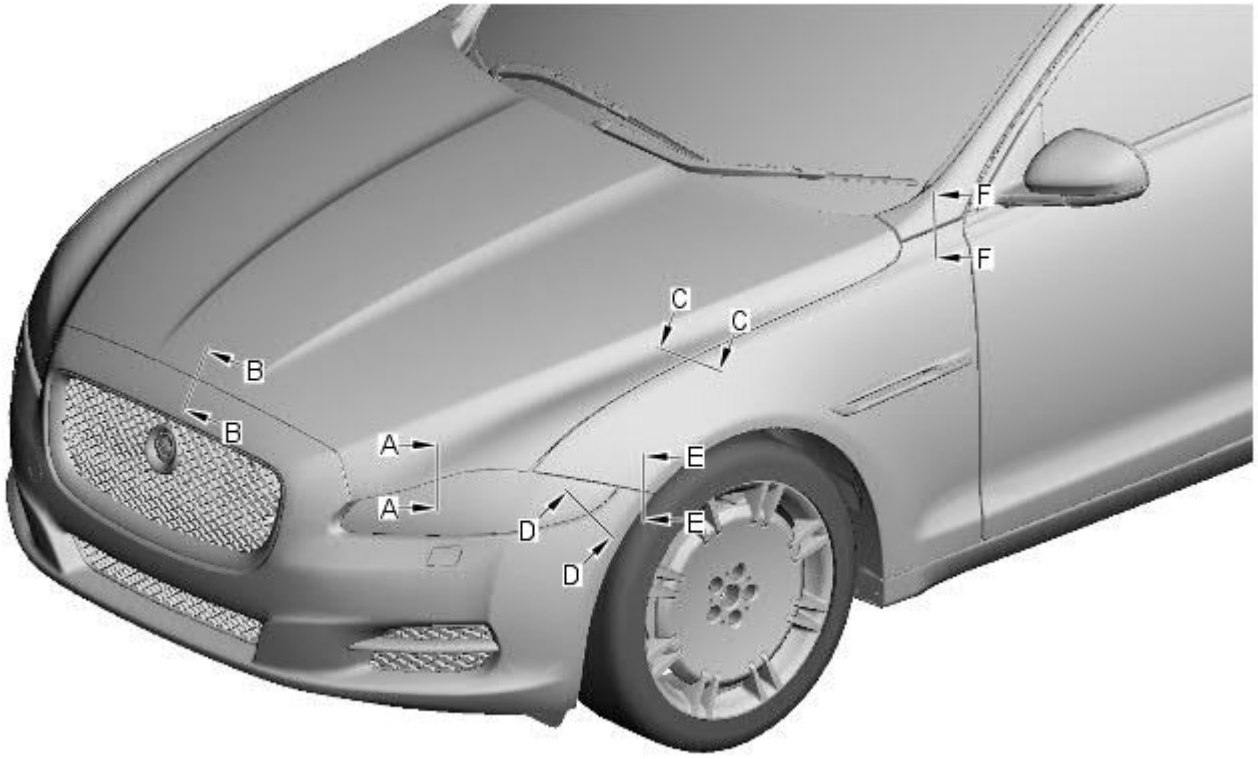
Item	From	To	Dimension
A-B	Front subframe, RH front fixing hole	Front subframe, LH front fixing hole	839.0
C-D	Front subframe, RH rear fixing hole	Front subframe, LH rear fixing hole	833.0
E-F	Front side member RH, tooling hole	Front side member LH, tooling hole	820.0
A-D	Front subframe, RH front fixing hole	Front subframe, LH rear fixing hole	982.5
B-C	Front subframe, LH front fixing hole	Front subframe, RH rear fixing hole	982.5
A-F	Front subframe, RH front fixing hole	Front side member LH, tooling hole	1412.2

Item	From	To	Dimension
B-E	Front subframe, LH front fixing hole	Front side member RH, tooling hole	1412.4
G-H	Rear subframe, RH front fixing hole	Rear subframe, LH front fixing hole	908.9
I-J	Rear subframe, RH rear fixing hole	Rear subframe, LH rear fixing hole	1015.3
G-J	Rear subframe, RH front fixing hole	Rear subframe, LH rear fixing hole	1136.9
H-I	Rear subframe, LH front fixing hole	Rear subframe, RH rear fixing hole	1136.9
A-G (short wheel base)	Front subframe, RH front fixing hole	Rear subframe, RH front fixing hole	3181.6
B-H (short wheel base)	Front subframe, LH front fixing hole	Rear subframe, LH front fixing hole	3181.6
A-H (short wheel base)	Front subframe, RH front fixing hole	Rear subframe, LH front fixing hole	3299.3
B-G (short wheel base)	Front subframe, LH front fixing hole	Rear subframe, RH front fixing hole	3299.3
A-G (long wheel base)	Front subframe, RH front fixing hole	Rear subframe, RH front fixing hole	3306.6
B-H (long wheel base)	Front subframe, LH front fixing hole	Rear subframe, LH front fixing hole	3306.6
A-H (long wheel base)	Front subframe, RH front fixing hole	Rear subframe, LH front fixing hole	3419.9
B-G (long wheel base)	Front subframe, LH front fixing hole	Rear subframe, RH front fixing hole	3419.9

Gap and Profile measurements

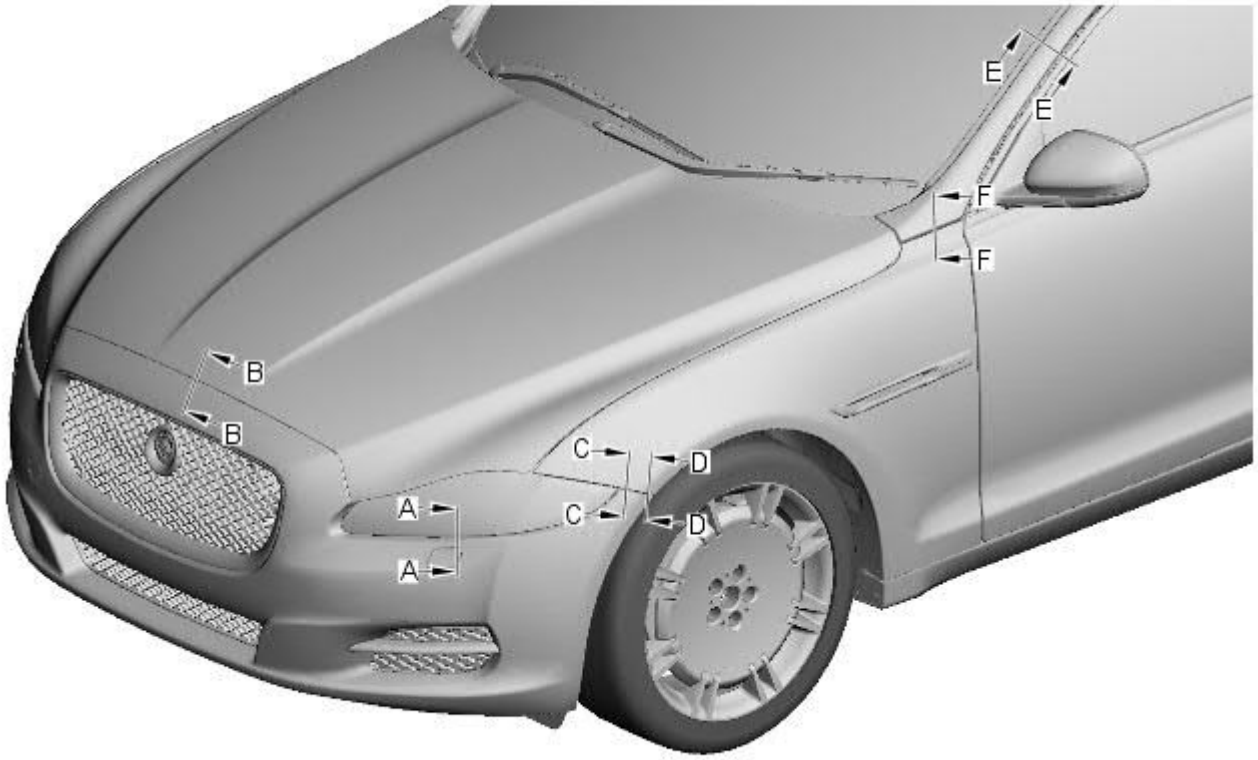
The following information is to be used as a guide to assist the technician in installing exterior body panels and trim items so as to achieve a correctly aligned and cosmetically acceptable vehicle.

NOTE: All dimensions shown are in millimetres, (mm).



E133471

A-A	Hood to headlamp	6.0 ± 1.0
B-B	Hood to front bumper cover	3.5 ± 1.0
C-C	Hood to front fender	3.5 ± 1.0
D-D	Front bumper cover to headlamp	1.0 ± 0.5
E-E	Front fender to front bumper cover	0.0 + 1.0
F-F	Front fender to A-pillar	3.5 ± 1.0



E133472

A-A	Front bumper cover to headlamp	1.0 ± 0.5
B-B	Hood to front bumper cover	3.5 ± 1.0
C-C	Front bumper cover to front fender	0.0 + 1.0
D-D	Front bumper cover to front fender	0.0 + 1.0
E-E	Front door to A-pillar	4.0 ± 1.0
F-F	Front fender to A-pillar	3.5 ± 1.0

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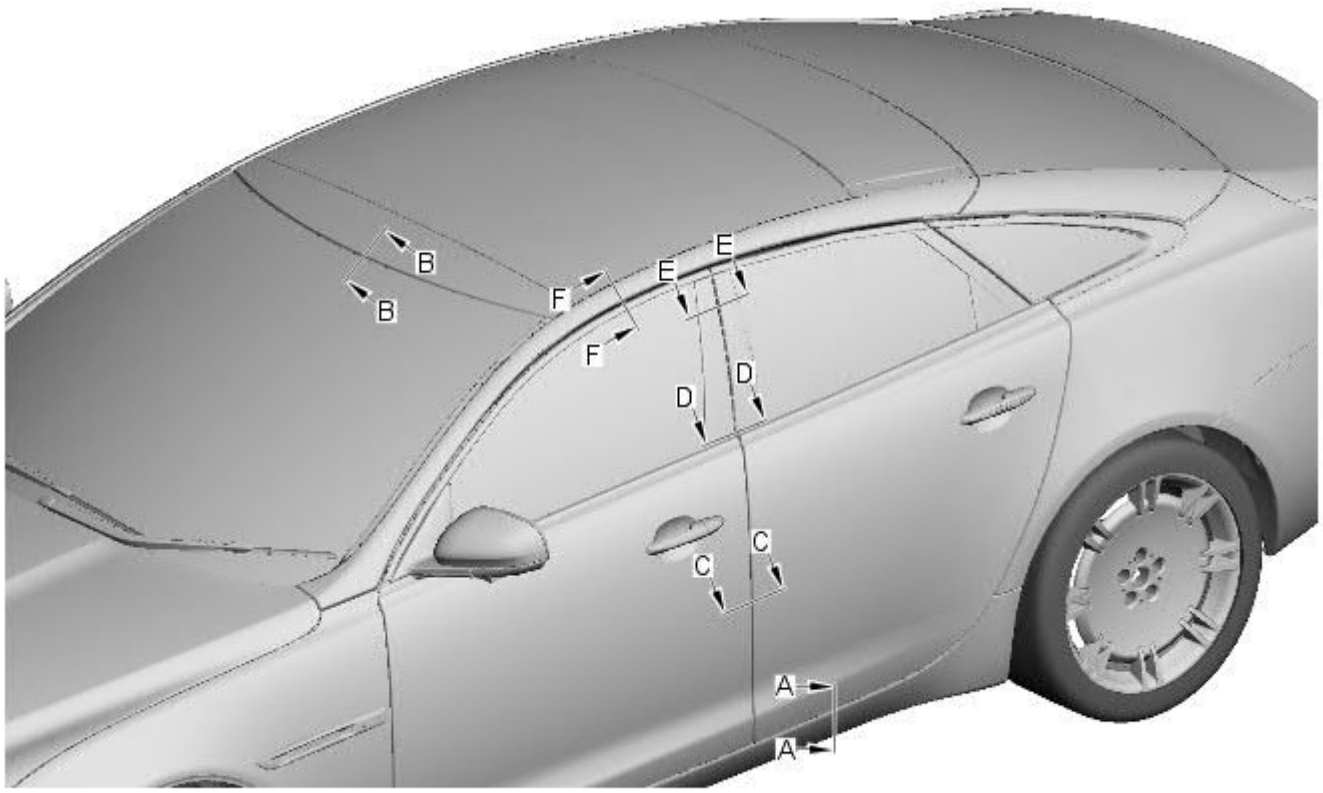
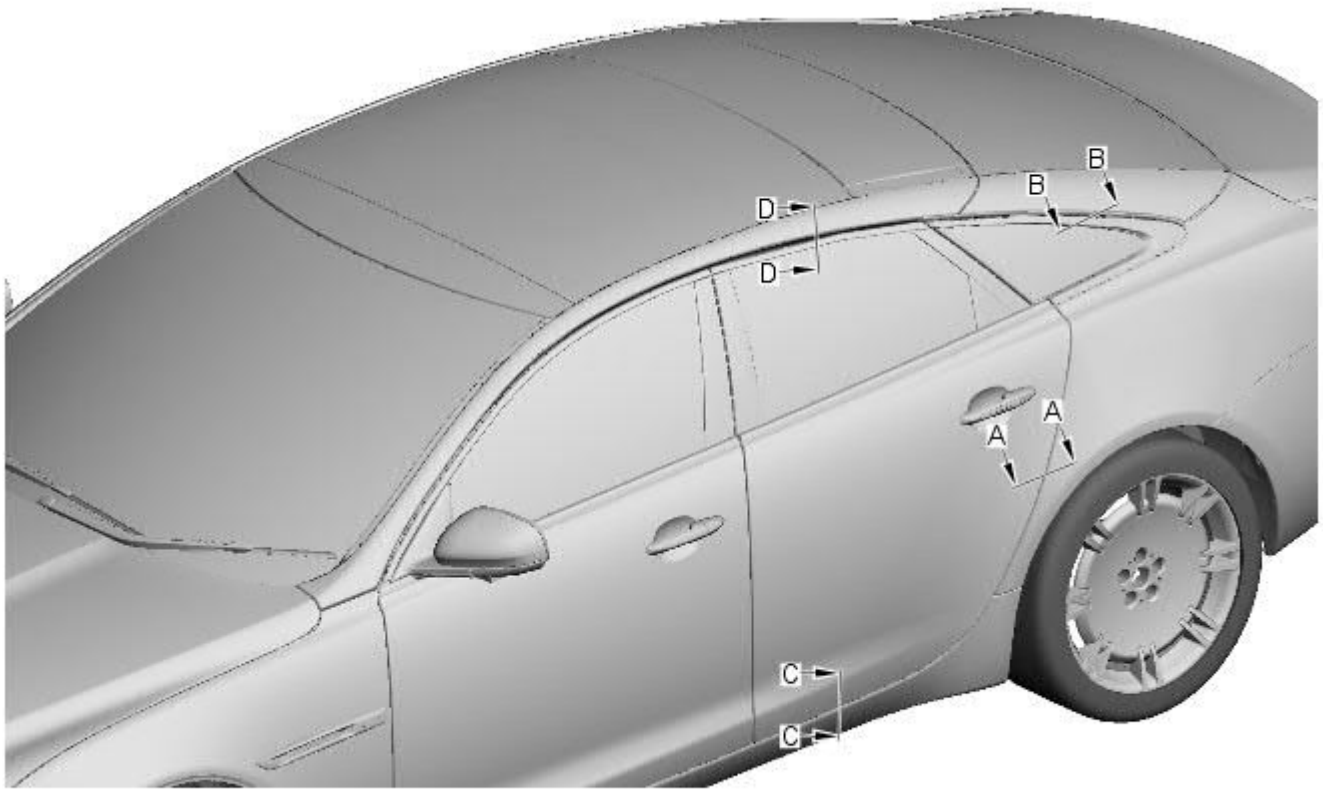


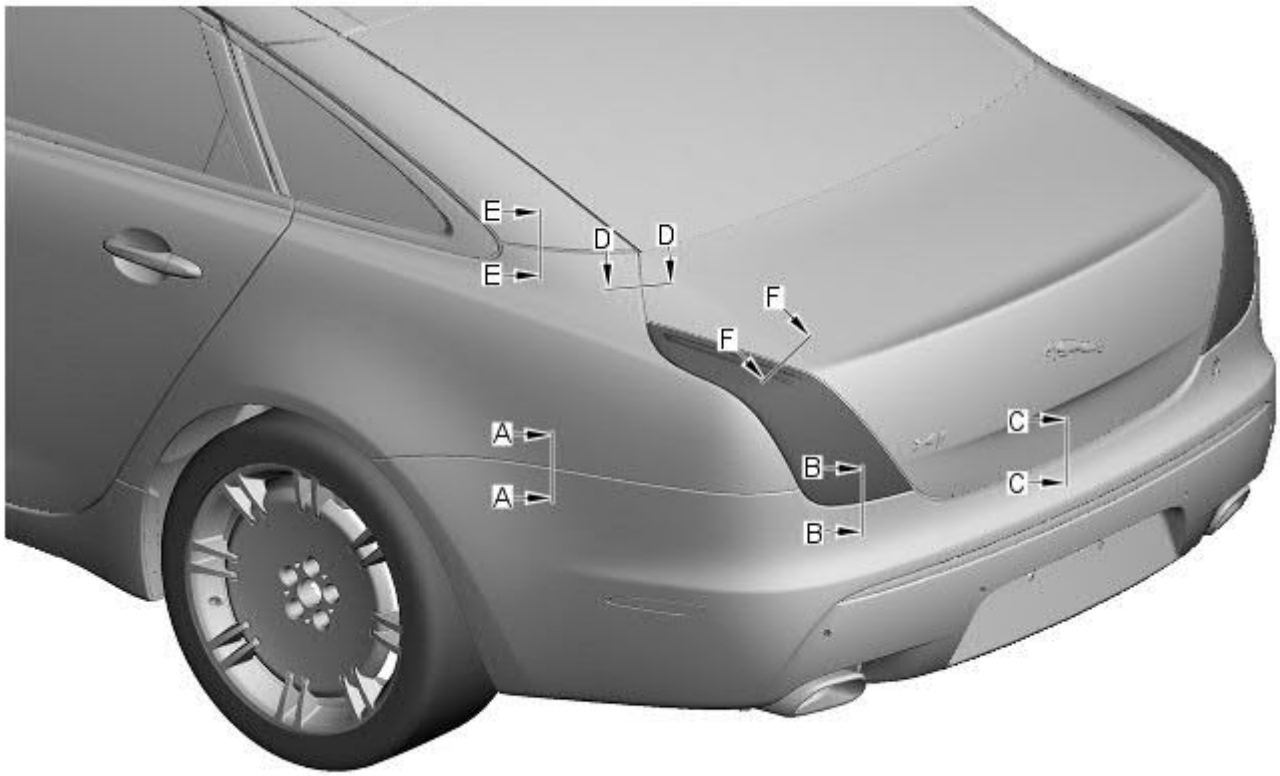
E133473

A-A	Rear door to rocker panel	5.0 ± 1.0
B-B	Windshield encapsulation to front glass roof panel encapsulation	0.0
C-C	Front door to rear door	4.0 ± 1.0
D-D	Front door to rear door	4.0 ± 1.0
E-E	Front door to rear door	4.0 ± 1.0
F-F	Front door to A-pillar / roof panel	6.5 ± 1.0



E133474

A-A	Rear door to quarter panel	4.0 ± 1.0
B-B	Rear quarter window glass encapsulation to quarter panel finisher	0.0
C-C	Rear door to rocker panel	5.0 ± 1.0
D-D	Rear door to roof panel	6.5 ± 1.0



E133475

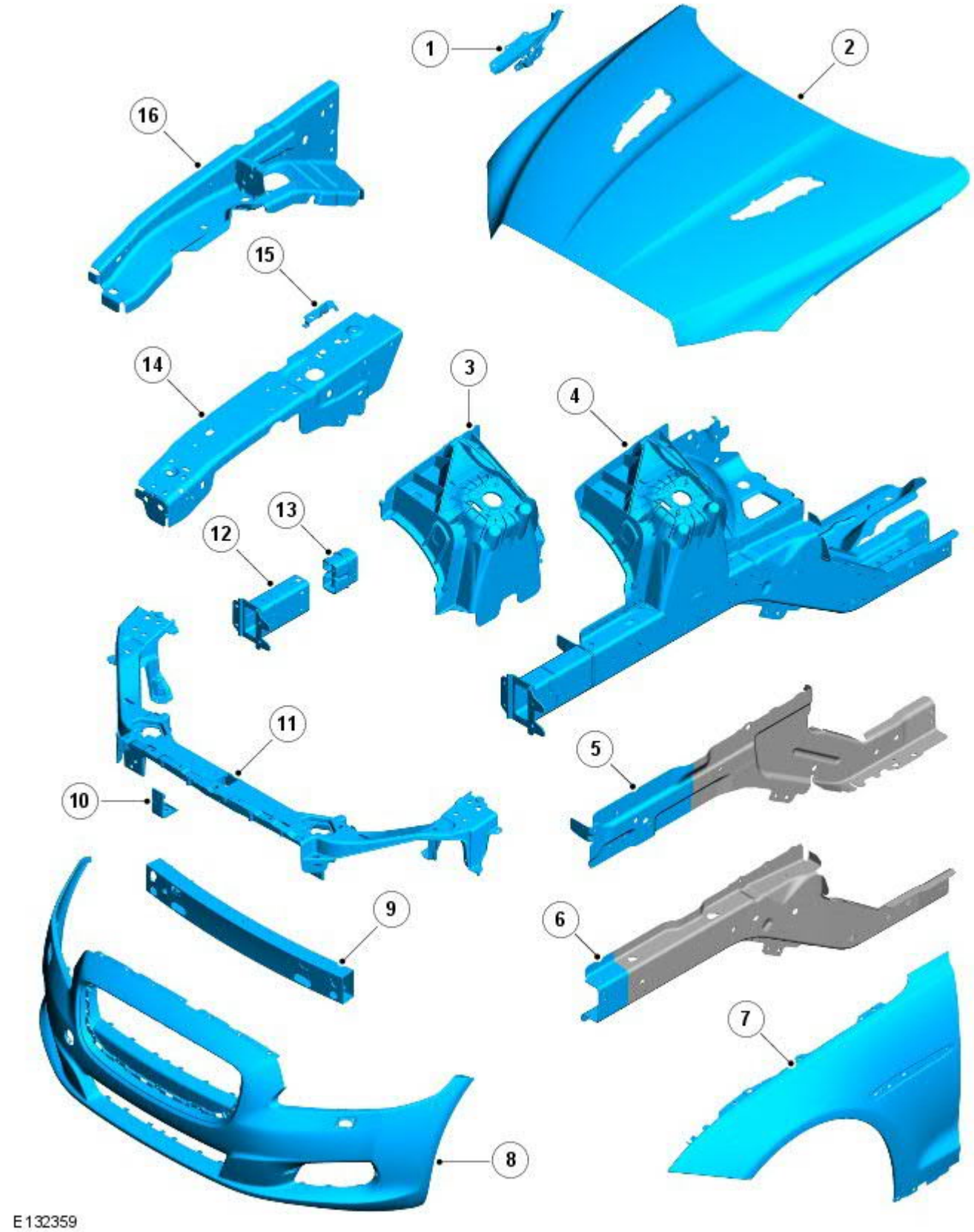
A-A	Rear bumper cover to quarter panel	0.0 + 1.0
B-B	Rear bumper cover to rear lamp assembly	1.0 ± 0.5
C-C	Rear bumper cover to luggage compartment lid	6.0 ± 1.0
D-D	Quarter panel to luggage compartment lid	6.0 ± 1.0
E-E	Quarter panel to quarter panel finisher	0.0 + 1.0
F-F	Luggage compartment lid to rear lamp assembly	3.5 ± 1.0

Published: 19-Dec-2012

Front End Sheet Metal Repairs - Front End Sheet Metal

Description and Operation

Front End Sheet Metal



NOTE: The illustration may indicate either hand of the service panel, the opposite hand will be similar.

Item	Description
1	Hood hinge
2	Hood

Item	Description
3	Suspension top mount
4	Front side member & suspension top mount assembly
5	Front side member closing panel section
6	Front side member section
7	Front fender
8	Front bumper cover
9	Front bumper
10	Hood latch panel mounting bracket
11	Hood latch panel
12	Side member deformation element
13	Front side member to deformation element bracket
14	Fender apron panel
15	Hood strut mounting bracket
16	Fender apron panel closing panel

Time Schedules, Front End Sheet Metal

The following information shows the total time taken to replace single panels. This time includes removal of Mechanical, Electrical and Trim, (MET), items, plus paint times based on Metallic Clear Over Base Paint, (blends for adjacent panels not included).

The times shown are to be used as a guide only.

Single panel times

Panel Description	Hours
Hood hinge	**0.60**
Suspension top mount	**10.50**
Front Side member and suspension top mount assembly	**20.60**
Front side member closing panel	**18.70**
Front side member	**18.70**
Front Fender	**5.30**
Hood latch panel	**11.00**
Side member deformation element	**TBC**
Front Side member to deformation element bracket	**TBC**
Fender apron panel	**4.80**
Fender apron panel closing panel	**4.80**

Published: 11-May-2011

Front End Sheet Metal Repairs - Fender Apron Panel

Removal and Installation

Removal

NOTE: The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being replaced in isolation, or, is being replaced in combination with panels other than those listed.

1. The fender apron panel is a category A repair.

2. NOTE: The fender apron panel is manufactured from aluminium alloy 5754-NG.

   The fender apron panel is serviced as a separate riveted and bonded panel, including the hood latch panel mounting and the hood hinge mounting. It does not include the hood strut mounting panel.

3. The fender apron panel closing panel is replaced in conjunction with:
   - Front bumper cover
   - Front fender
   - Front door
   - Hood
   - Hood hinge
   - Hood latch panel
   - Fender apron panel closing panel

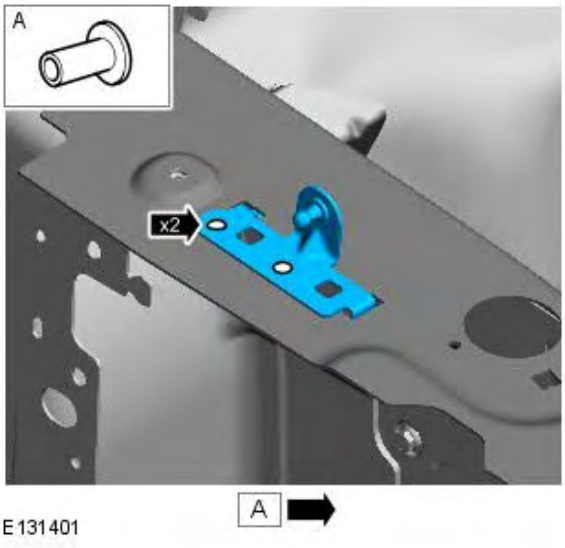
4. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

5. Disconnect the vehicle battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

6. Remove the fender apron panel closing panel.
   For additional information, refer to: Fender Apron Panel Closing Panel (501-27 Front End Sheet Metal Repairs, Removal and Installation).

7. Remove the hood hinge.
   For additional information, refer to: Hood Hinge (501-27 Front End Sheet Metal Repairs, Removal and Installation).

8. Prior to removal, mark the position of the fender apron panel in relation to adjacent panels, for ease of alignment on installation.

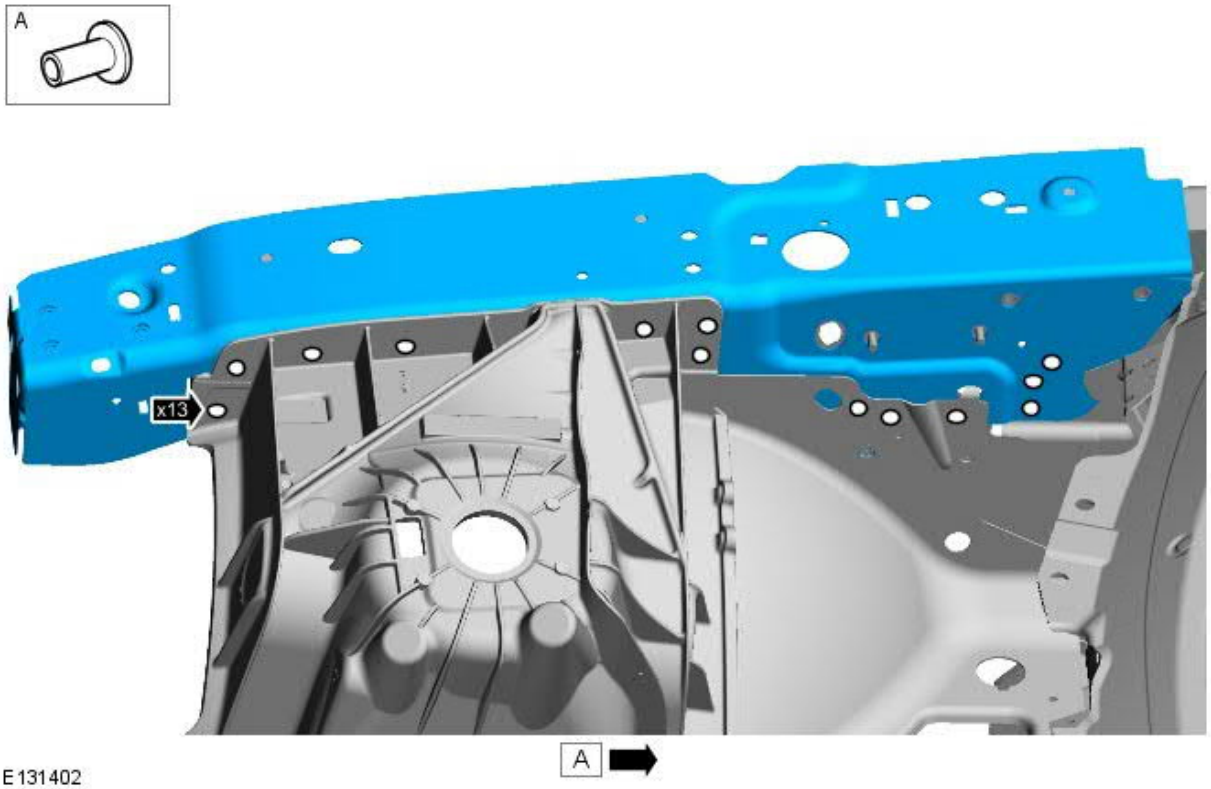


E131401

9. NOTE: If the hood strut mounting bracket is to be replaced, it is not necessary to remove it. Retain if being re-used.

   Using a 6.5mm Cryobit drill bit, remove the self piercing rivets to the hood strut mounting panel.

10. Using a 6.5mm Cryobit drill bit, remove the self piercing rivets.



E131402

11. Separate the joints and remove the old panel.

Installation

1. Remove rivet remnants.

2. Dress flanges where necessary.

3. Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.

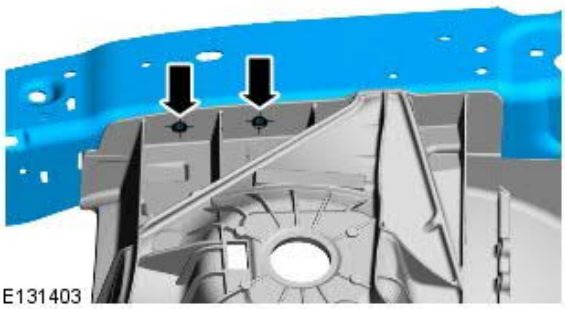
4. Using a Roloc fine bristle disc, clean and prepare the panel surfaces of the hood strut mounting panel.

5. NOTE: If a new hood strut mounting panel is required, it can be installed with 2 self piercing rivets using the ESN50.

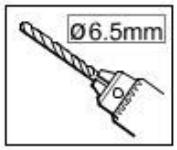
   Offer up the original hood strut mounting panel to the new fender apron panel, align and clamp into position.

6. NOTE: Where it is not possible to install Hemloks, due to tooling access, torx screws and rivet nuts must be installed.

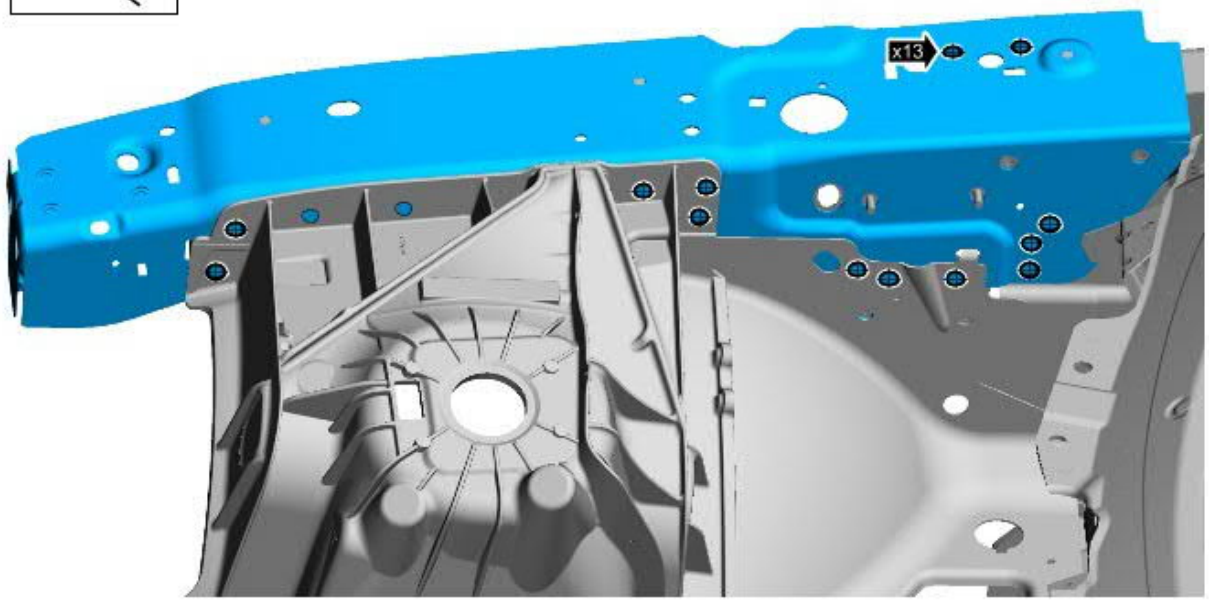
   Mark the position where the rivet nuts are to be installed.



E131403

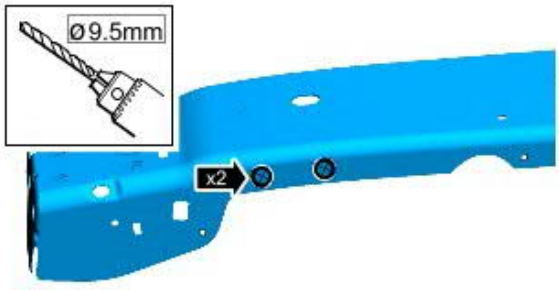


7. Using a 6.5mm Cryobit drill bit, drill holes at the points where Hemloks are to be installed.



E131404

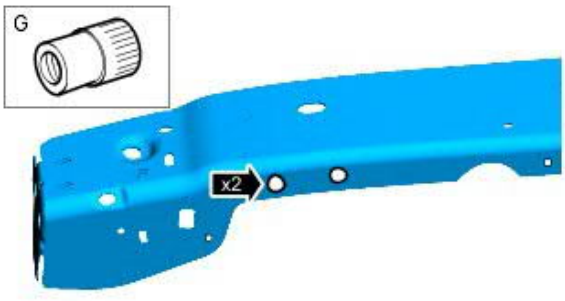
8. Remove the new panel and separate the hood hinge mounting panel.



E131405

9. Using a 9.5mm drill bit, drill the marked holes for the rivet nuts.

10. Debur the drilled holes.



E131406

G

11. Using the HES 412 rivet nut tool, insert the rivet nuts.

12. Offer up the new panel into position to ensure holes for rivets and torx screws are aligned. If correct proceed to next step, if not, rectify and recheck before proceeding.

13. Remove the new panel.

14. Using a Roloc fine bristle disc, clean and prepare the panel surfaces.

15. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

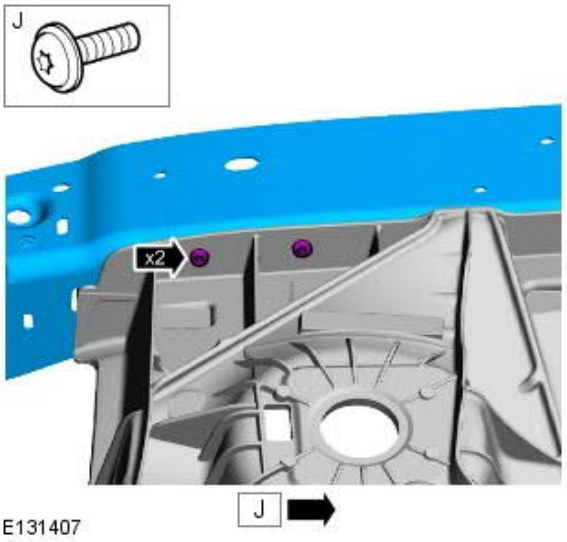
16. Apply the coupling agent where 3M 8115 adhesive is to be applied and allow to dry.

17. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes.

    Apply a 5mm zig zag bead of 3M 8115 adhesive to the body joints.

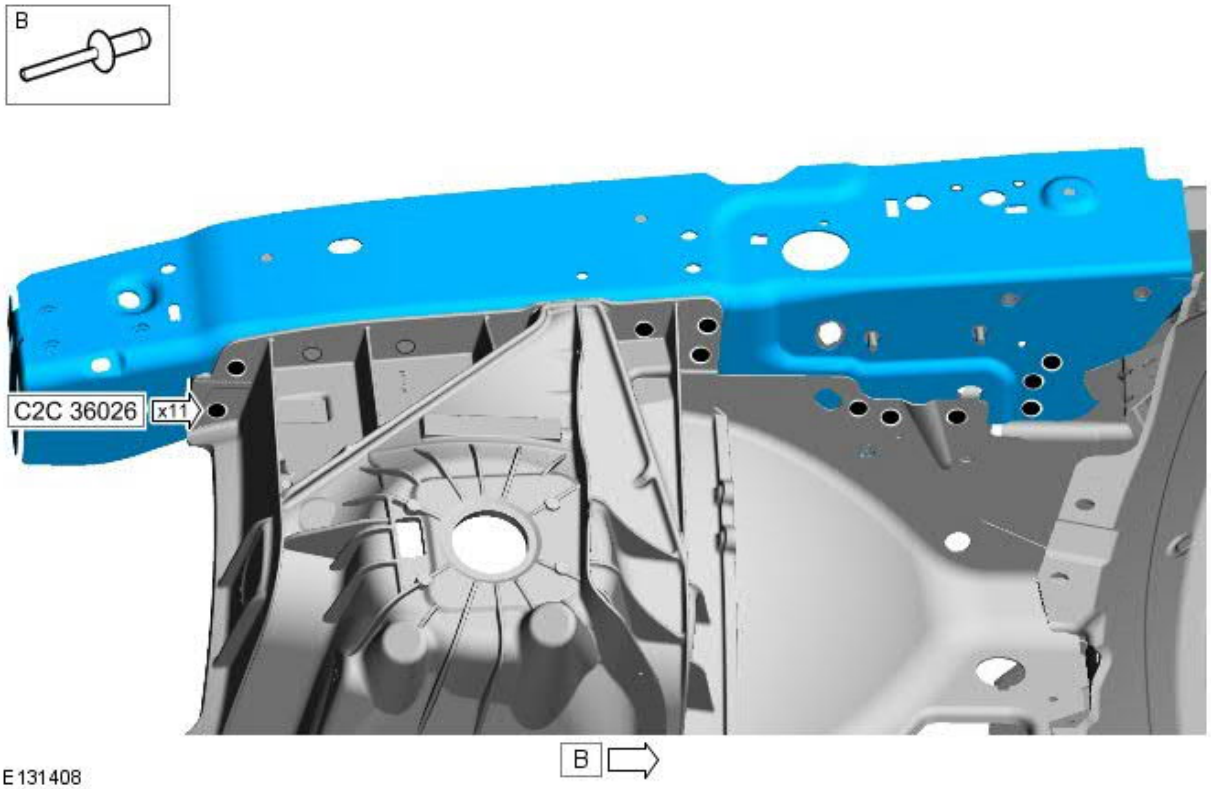
18. Offer up the new panel and clamp into position.

19. Loosely install the torx screws, do not tighten.

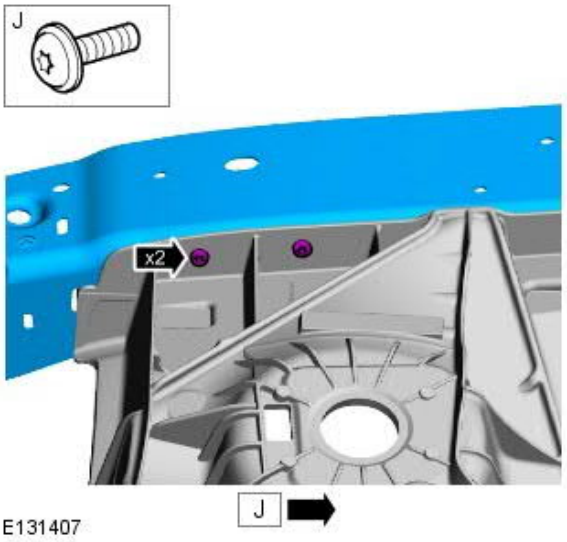


E131407

20. Using the Genesis G4, install the Hemloks.

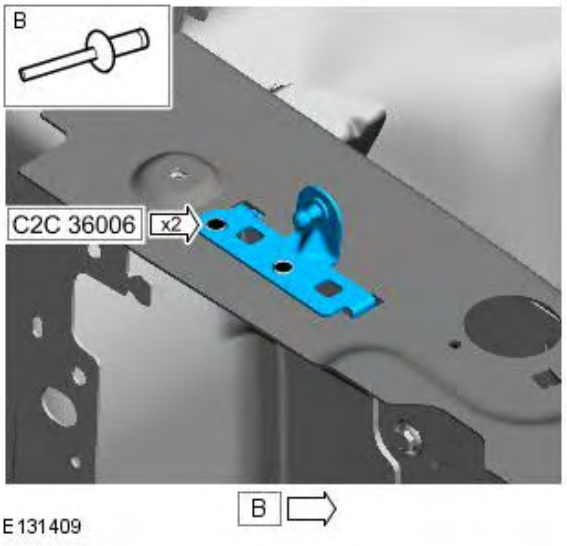


E131408



21. Fully tighten the torx screws.
    - Tighten to 6 Nm.

22. Remove any excess adhesive.



23. NOTES:

    The hood strut mounting panel is manufactured from mild steel, any mating surfaces should be suitably sealed prior to installation.

    If a new hood strut mounting panel is required, it can be installed with 2 self piercing rivets using the ESN50.

    Using the Genesis G4, install the Hemloks.

24. Make sure that any open or exposed panel joints are suitably sealed following this procedure.

25. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Front End Sheet Metal Repairs - Fender Apron Panel Closing Panel

Removal and Installation

Removal

NOTE: The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being replaced in isolation, or, is being replaced in combination with panels other than those listed.

1. The fender apron panel closing panel is a category A repair.

2. NOTE: The fender apron panel closing panel is manufactured from aluminium alloy 5754-NG.

   The fender apron panel closing panel is serviced as a separate riveted and bonded panel, including its inner reinforcement.

3. The fender apron panel closing panel is replaced in conjunction with:
   - Front bumper cover
   - Front fender
   - Front door
   - Hood
   - Hood latch panel

4. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

5. Disconnect the vehicle battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

6. Remove the hood latch panel.
   For additional information, refer to: Hood Latch Panel (501-27 Front End Sheet Metal Repairs, Removal and Installation).

7. Remove the front fender.
   For additional information, refer to: Front Fender (501-27 Front End Sheet Metal Repairs, Removal and Installation).

8. Remove the pedestrian protection hood actuator and its mounting bracket.
   For additional information, refer to: Pedestrian Protection Hood Actuator LH (501-20C Pedestrian Protection System, Removal and Installation) /
   Pedestrian Protection Hood Actuator RH (501-20C Pedestrian Protection System, Removal and Installation).

9. If the left-hand fender apron panel closing panel is to be replaced, remove the anti-lock brake system (ABS) module.
   For additional information, refer to: Anti-Lock Brake System (ABS) Module (206-09 Anti-Lock Control - Stability Assist, Removal and Installation).

10. If the left-hand fender apron panel closing panel is to be replaced, remove the fuel filter, (diesel engine only).
    For additional information, refer to: Fuel Filter (310-01A Fuel Tank and Lines - TDV6

3.0L Diesel, Removal and Installation).

11. If the left-hand fender apron panel closing panel is to be replaced, release and position the air conditioning (A/C) pipes to one side.

12. If the left-hand fender apron panel closing panel is to be replaced, remove the fuel lines.

13. If the left-hand fender apron panel closing panel is to be replaced, remove the anti-theft alarm horn.
For additional information, refer to: Anti-Theft Alarm Horn (419-01A Anti-Theft - Active, Removal and Installation).

14. If the right-hand fender apron panel closing panel is to be replaced, remove the engine junction box (EJB).
For additional information, refer to: Engine Junction Box (EJB) (418-00 Module Communications Network, Removal and Installation).

15. If the left-hand fender apron panel closing panel is to be replaced, remove the engine control module (ECM) and its mounting bracket.

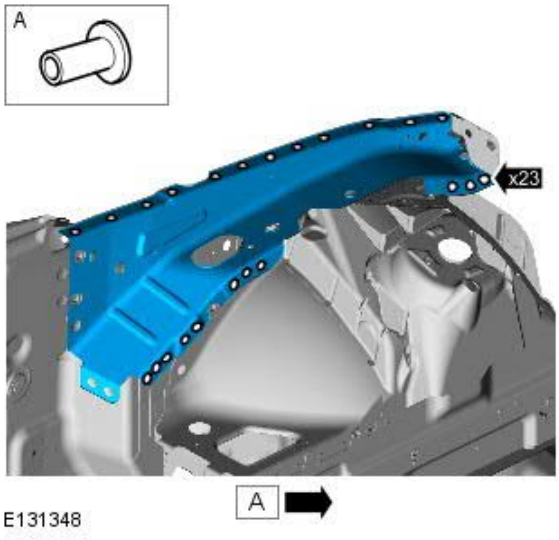
16. Remove any electrical components in the local area of repair to prevent damage.

17. Release the fender apron panel closing panel wiring harness and position it to one side.

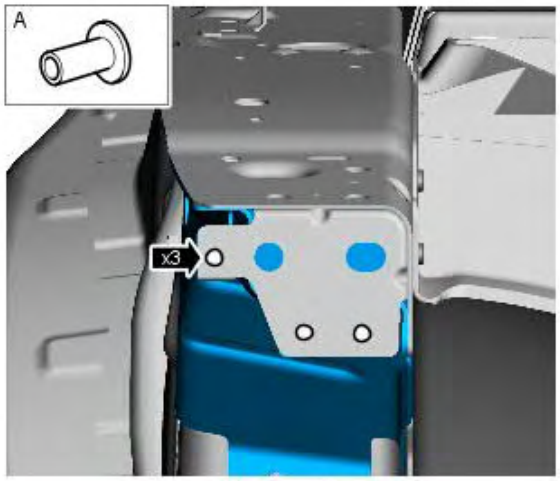
18. Remove any remaining miscellaneous components from the repair area as necessary.

19. Prior to removal, mark the position of the fender apron panel in relation to adjacent panels, for ease of alignment on installation.

20. Using a combination of the ESN50 and a 6.5mm Cryobit drill bit, remove the self piercing rivets.

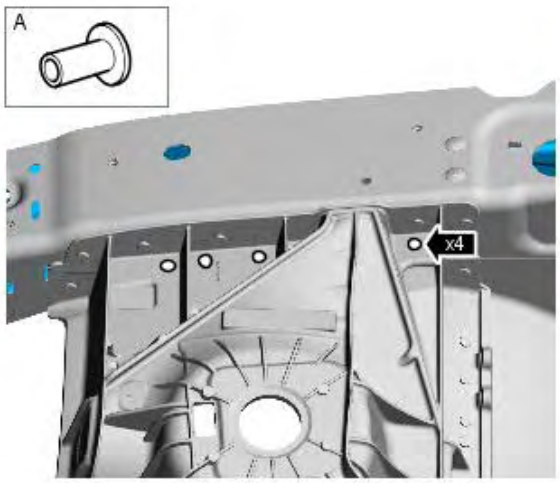


E131348



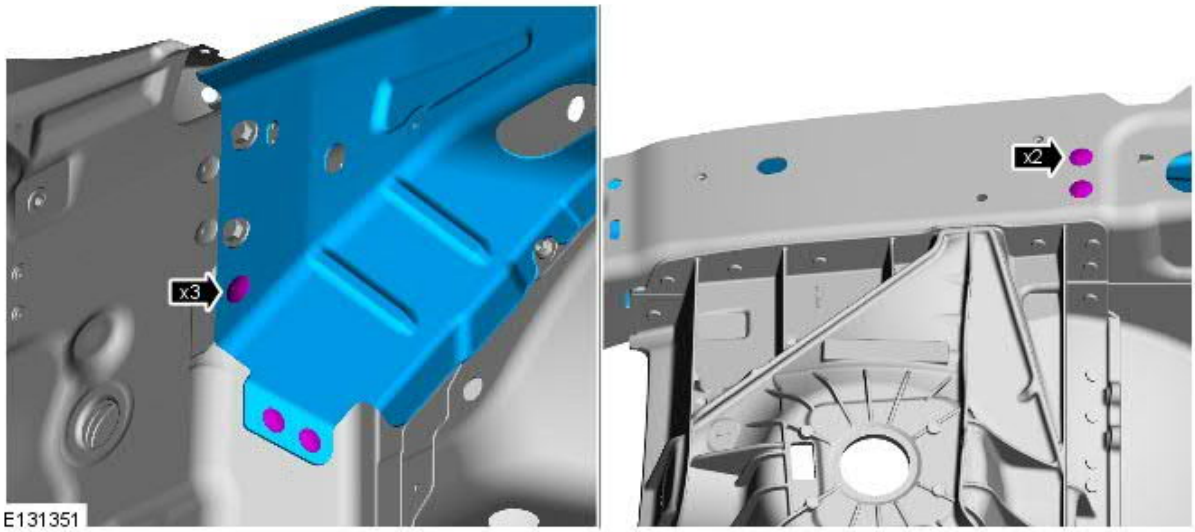
E131349

21. Using the ESN50, remove the self piercing rivets.



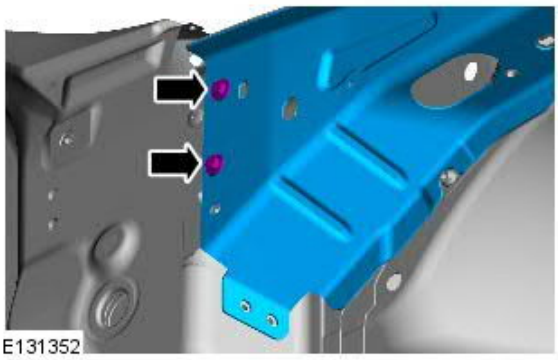
E131350

22. Using a 6.5mm Cryobit drill bit, remove the self piercing rivets.



E131351

23. Remove the monobolts.



24. Remove the bolts.

25. NOTE: Remove and retain the noise vibration and harshness (NVH) components if they are to be reused.

    Separate the joints and remove the old panel, also releasing the NVH components.

Installation

1. NOTE: New NVH components should be installed if the originals are damaged.

   If the original NVH components are to be reused, trim and prepare them and their mating surfaces.

2. Remove rivet remnants.

3. Dress flanges where necessary.

4. Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.

5. Using a 6.5mm Cryobit drill bit, drill holes through the old panels into the new panel, at the points where Hemloks are to be installed.

6. Remove the new panel.

7. Debur the drilled holes.

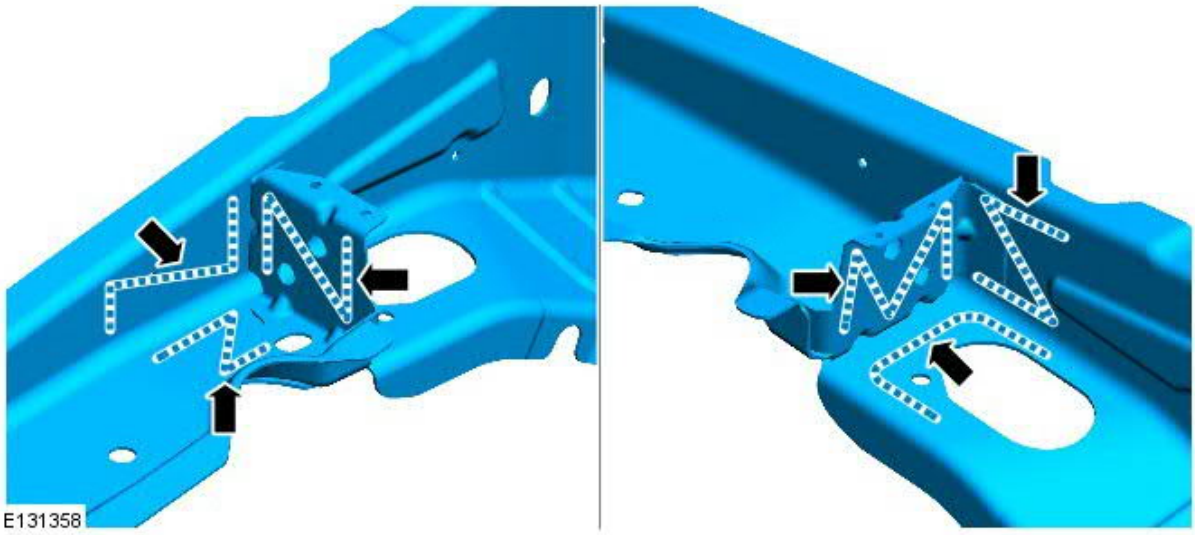
8. Using a Roloc fine bristle disc, clean and prepare the panel surfaces.

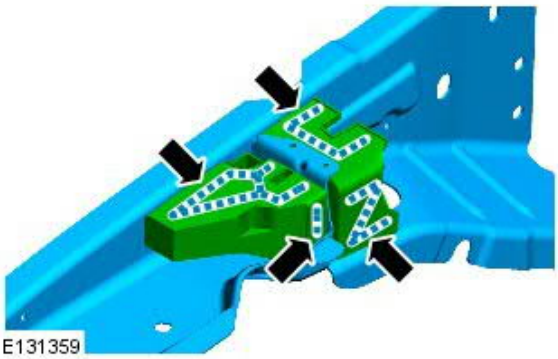
9. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

10. Apply the coupling agent where 3M 8115 adhesive is to be applied and allow to dry.

11. NOTE: Do not apply semi-rigid sealer in the areas where 3M 8115 adhesive is to be applied.

    Apply semi-rigid sealer to the new panel where the NVH components are to be installed. Install the NVH components.



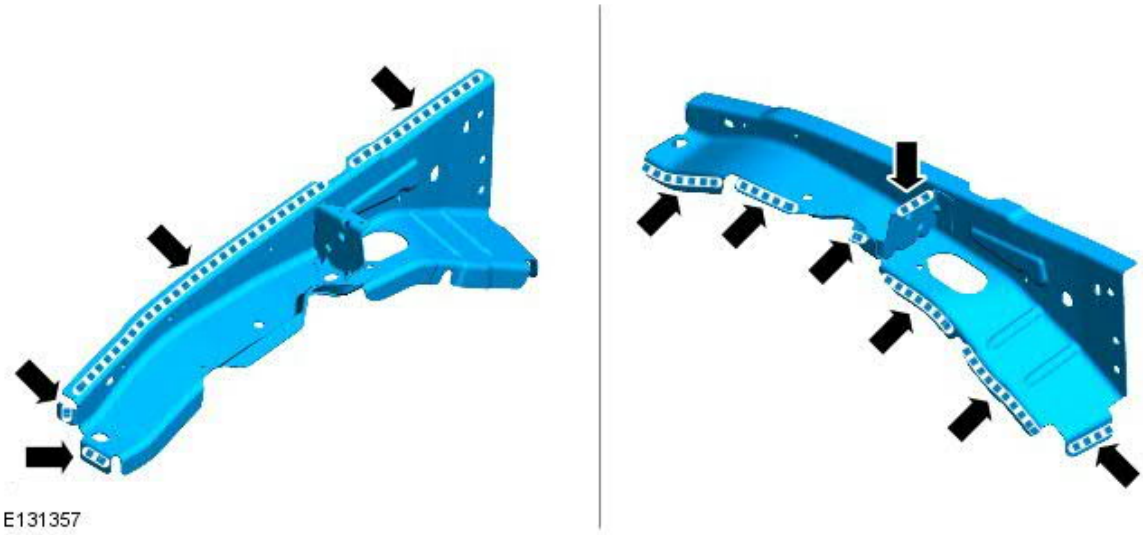


12. NOTE: Do not apply semi-rigid sealer in the areas where 3M 8115 adhesive is to be applied.

    Apply semi-rigid sealer to the NVH components.

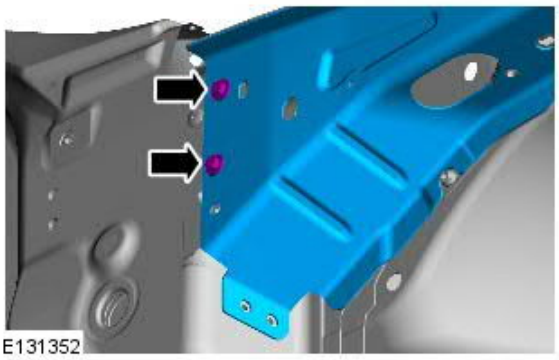
13. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes.

    Apply a 5mm zig zag bead of 3M 8115 adhesive as indicated.

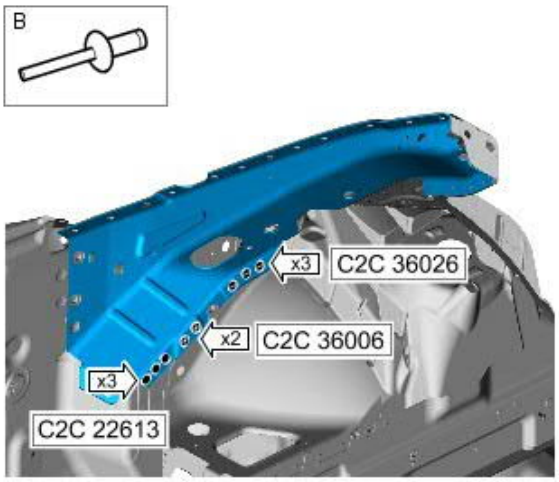


14. Offer up the new panel and clamp into position.

15. Loosely install the bolts, do not tighten.

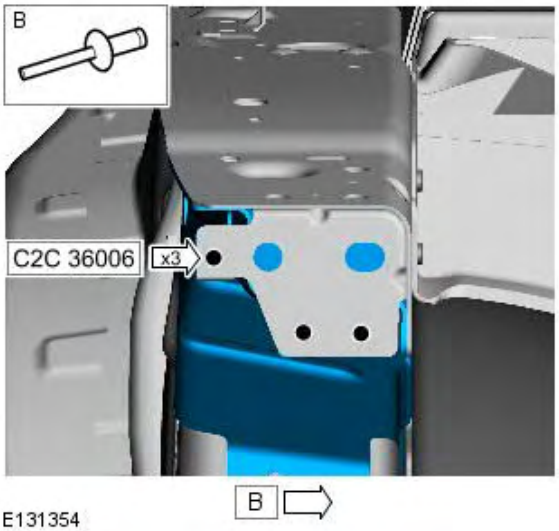

E131352

16. Using the Genesis G4, install the Hemloks.



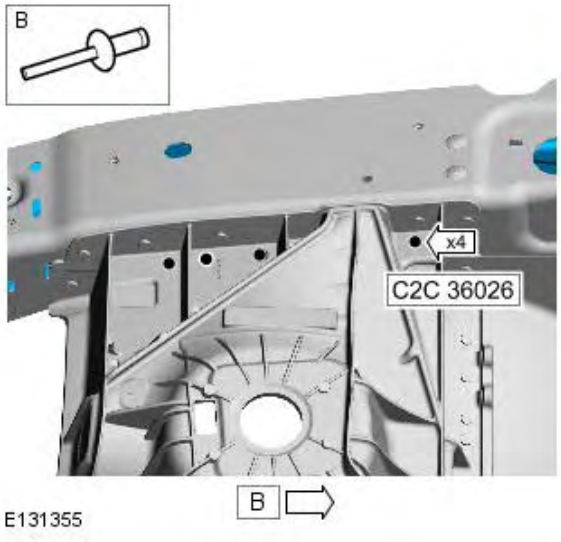
E131449

17. Using the Genesis G4, install the Hemloks.



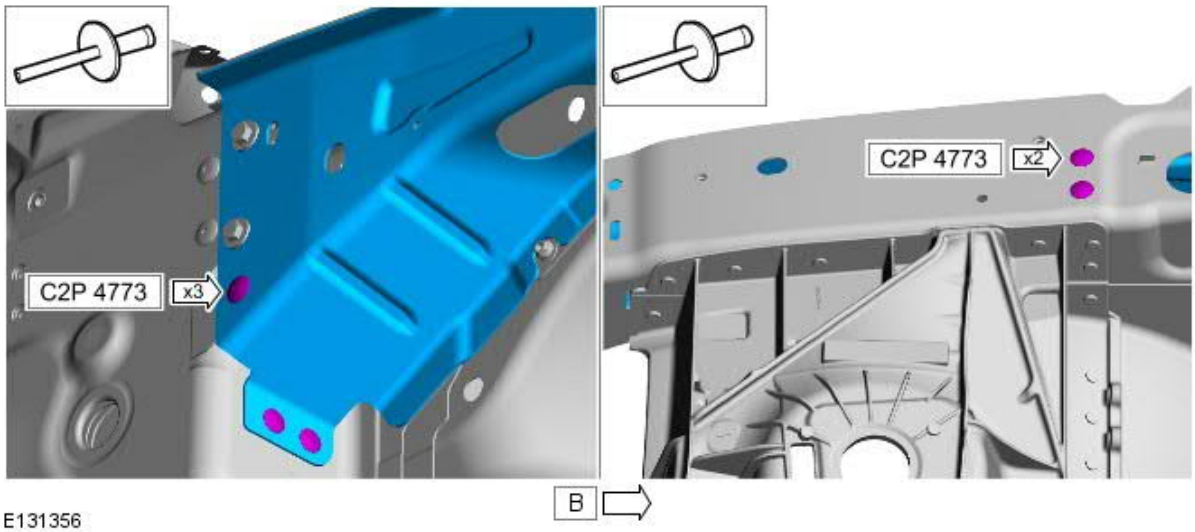
E131354

18. Using the Genesis G4, install the Hemloks.



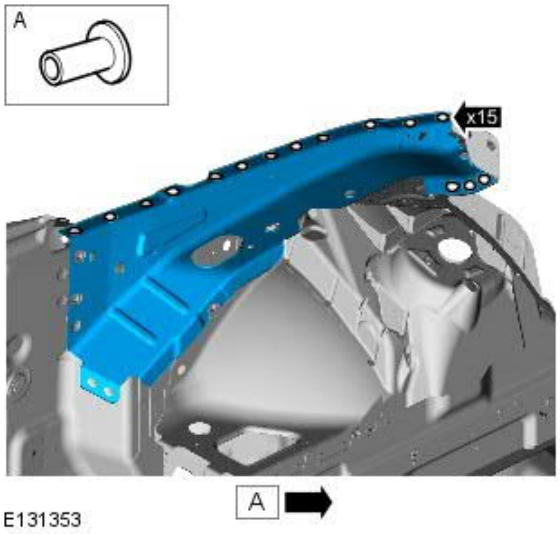
E131355

19. Using the Genesis G4, install the Monobolts.



E131356

20. Using the ESN50, install the self piercing rivets.



E131353

21. Fully tighten the bolts.

    NOTE: Bolts are pre-coated to inhibit galvanic corrosion and can be reused only if the coating is not damaged.

    - Tighten to 25 Nm.

22. Remove any excess adhesive.

23. Make sure that any open or exposed panel joints are suitably sealed following this procedure.

24. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Front End Sheet Metal Repairs - Front Fender

Removal and Installation

Removal

1. The front fender is a category B repair.

E128044

2. NOTE: The front fender is manufactured from aluminium alloy 6111-T4.

   The front fender is serviced as a separate bolt-on panel.

3. The front fender is replaced in conjunction with:
   - Front bumper cover

     NOTE: Removal of the front door allows access to the front fender retaining bolts.

   - Front door

4. WARNING: The front fender and its associated components form part of the pedestrian protection system, it is essential that any repair or replacement operations do not affect the safe working of the system.

   For additional information relating to the pedestrian safety system please see the following:
   For additional information, refer to: Pedestrian Protection System (501-20C Pedestrian Protection System, Description and Operation).

5. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

6. Disconnect the battery ground cable.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

7. If the right-hand front fender is to be repaired, remove the windshield washer reservoir.
   For additional information, refer to: Windshield Washer Reservoir (501-16 Wipers and Washers, Removal and Installation).

8. Remove the headlamp assembly.
   For additional information, refer to: Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation) /

Headlamp Assembly (417-01, Removal and Installation).

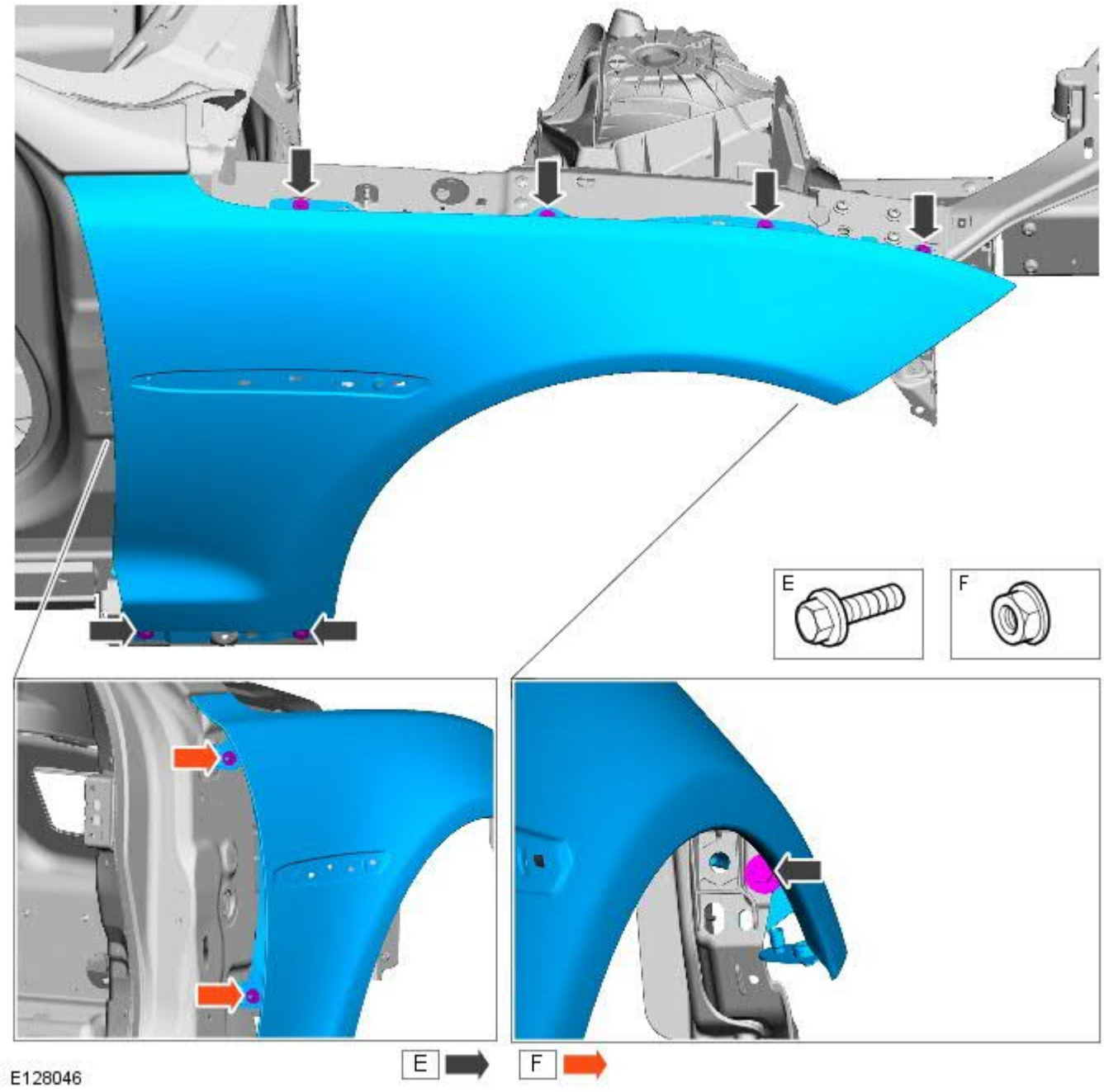
9. Remove the rocker panel outer moulding.

10. Remove the front door.
For additional information, refer to: Front Door (501-03 Body Closures, Removal and Installation).

11. Remove the plastic trim covering the front fender upper rear retaining nut.

12. NOTE: If necessary, remove and retain the front fender to A-pillar mounting brackets.

    Remove the front fender retaining bolts.



13. NOTE: Do not disassemble further if the component is removed for access only.

    Remove the front fender moulding.

Installation

1. Clean and prepare the panel joint surfaces where the sealer adhesive is to be applied.

E128048

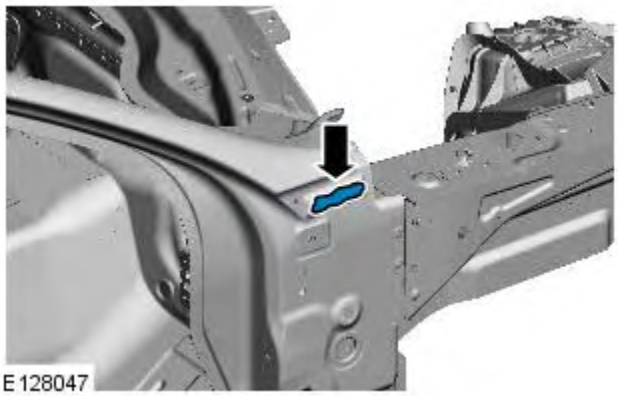
2. NOTES:

   If necessary, install the front fender to A-pillar mounting brackets to the front fender.

   To aid alignment of the front fender to the front door, there is an adjustable mounting in the rocker panel where the front fender mounts.

   Offer up the front fender and the front door. Check alignment, if correct proceed to next step, if not rectify and recheck before proceeding.

3. Remove the front fender and the front door.



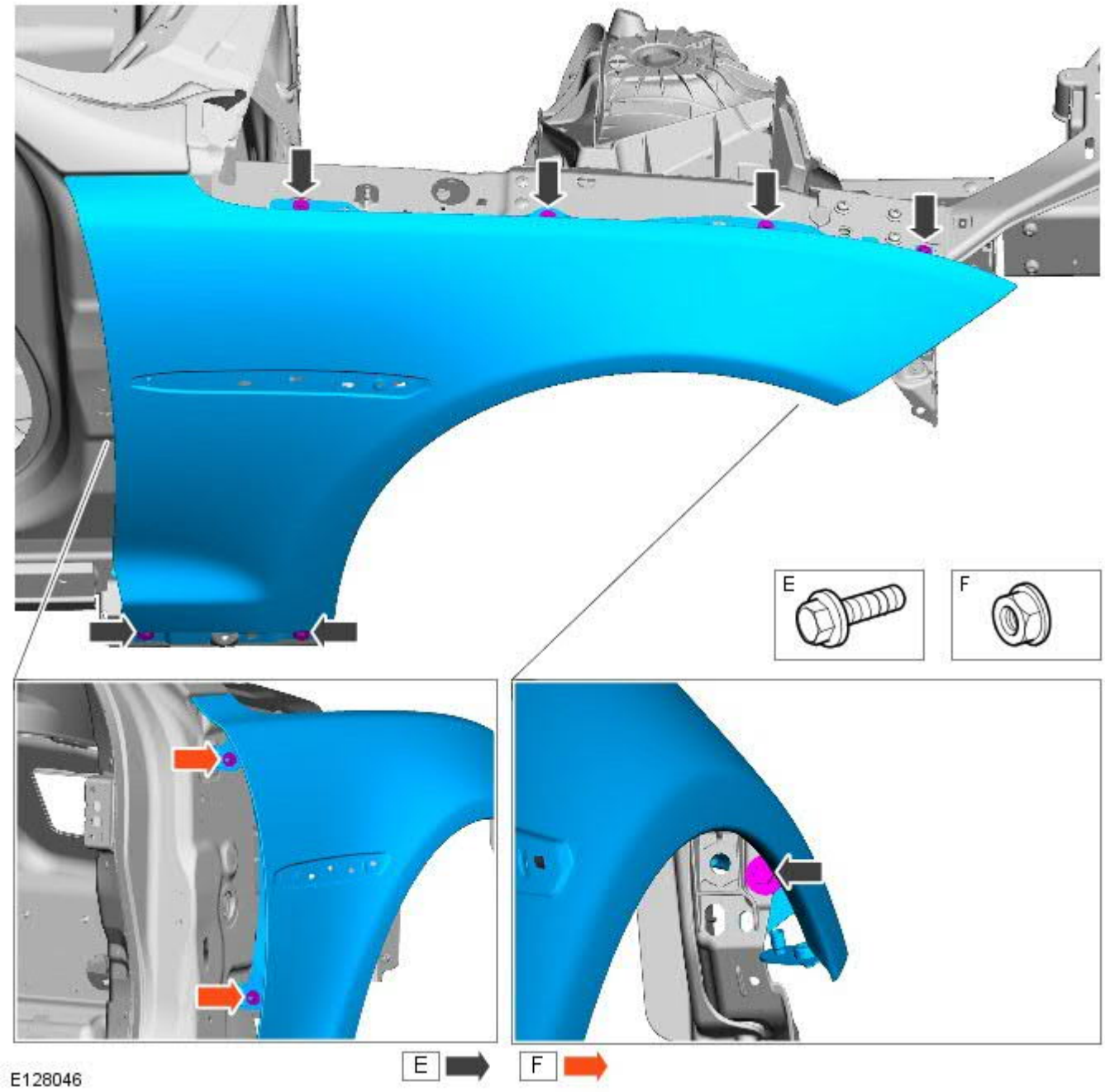
E128047

4. Apply sealer adhesive to the noise, vibration and harshness (NVH) components.

5. Offer up the front fender and the front door. Check alignment, if correct proceed to next step, if not rectify and recheck before proceeding.

   NOTE: Bolts are pre-coated to inhibit galvanic corrosion and can be reused only if the coating is not damaged.

   - Tighten to 10 Nm.



6. Remove the front door.

7. Install the plastic trim covering the front fender upper rear retaining nut.

8. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Front End Sheet Metal Repairs - Front Side Member and Suspension Top Mount Assembly

Removal and Installation

Removal

NOTE: The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being replaced in isolation, or, is being replaced in combination with panels other than those listed.

E131450

1. The suspension top mount is a category A repair.

2. NOTES:

   The front side member and suspension top mount assembly is, an assembly of panels, manufactured from aluminium alloy 5754-NG. The side member deformation element is manufactured from aluminium alloy 6014-T6/7.

   The right-hand front side member and suspension top mount assembly contains the stamped Vehicle Identification Number (VIN). When a new right hand front side member and suspension top mount assembly is requested it will be supplied stamped with the VIN. This operation is carried out within the Jaguar parts supply process

   The front side member and suspension top mount assembly is serviced as a separate riveted and bonded panel. The assembly includes, the deformation element, front side member to deformation element bracket, front side member, front side member closing panel, suspension top mount and the inner apron and wheelhouse panels.

3. In this procedure, to make sure that the vehicle is correctly aligned, it must be placed on an approved alignment jig.

4. The front side member and suspension top mount assembly is replaced in conjunction with:
   - Front bumper cover
   - Front bumper
   - Front fender
   - Hood
   - Hood hinge
   - Front door
   - Hood latch panel
   - Fender apron panel closing panel
   - Fender apron panel
   - Instrument panel upper section
   - Engine, transmission, front subframe and front suspension as an assembly

5. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

6. Disconnect the battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

7. Remove the front bumper.
   For additional information, refer to: Front Bumper (501-19 Bumpers, Removal and Installation).

8. Remove the fender apron panel.
   For additional information, refer to: Fender Apron Panel (501-27 Front End Sheet Metal Repairs, Removal and Installation).

9. Remove the instrument panel upper section.
   For additional information, refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).

10. Remove the engine, transmission, front subframe and front suspension as an assembly.

11. Remove the front seat.
    For additional information, refer to: Front Seat (501-10, Removal and Installation).

12. Remove the automatic transmission control mechanism.

13. Remove the floor console.
    For additional information, refer to: Floor Console (501-12 Instrument Panel and Console, Removal and Installation).

14. Remove the in-vehicle crossbeam.
    For additional information, refer to: In-Vehicle Crossbeam (501-12, Removal and Installation).

15. Remove the pedestrian protection hood actuator.
    For additional information, refer to: Pedestrian Protection Hood Actuator LH (501-20C Pedestrian Protection System, Removal and Installation) / Pedestrian Protection Hood Actuator RH (501-20C Pedestrian Protection System, Removal and Installation).

16. Remove the A-Pillar.
    For additional information, refer to: A-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

17. Remove the B-Pillar lower trim panels.
    For additional information, refer to: B-Pillar Lower Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

18. Remove the left-hand and right-hand front floor covering.

19. If the drivers side front side member and suspension top mount assembly is to be replaced, remove the heater pipes.

20. If the drivers side front side member and suspension top mount assembly is to be replaced, remove the pedal box.

21. If the drivers side front side member and suspension top mount assembly is to be replaced, remove the accelerator pedal.

22. If the drivers side front side member and suspension top mount assembly is to be replaced, remove the brake master cylinder and brake booster.
    For additional information, refer to: Brake Master Cylinder (206-06 Hydraulic Brake Actuation, Removal and Installation) /

Brake Booster (206-07 Power Brake Actuation, Removal and Installation).

23. If the drivers side front side member and suspension top mount assembly is to be replaced, remove the windshield wiper motor and pivot arm.
For additional information, refer to: Windshield Wiper Motor - LHD RWD (501-16 Wipers and Washers, Removal and Installation) / Windshield Wiper Pivot Arm (501-16 Wipers and Washers, Removal and Installation).

24. If the drivers side front side member and suspension top mount assembly is to be replaced, remove the front to rear brake pipes.

25. If the passenger side front side member and suspension top mount assembly is to be replaced, remove the engine control module, (ECM).
For additional information, refer to: Engine Control Module (ECM) (303-14A Electronic Engine Controls - TDV6 3.0L Diesel, Removal and Installation) / Engine Control Module (ECM) (303-14B Electronic Engine Controls - V8 S/C 5.0L Petrol, Removal and Installation) / Engine Control Module (ECM) (303-14C Electronic Engine Controls - V8 5.0L Petrol, Removal and Installation).

26. If the passenger side front side member and suspension top mount assembly is to be replaced, remove the brake pipes at the bulkhead.

27. If the passenger side front side member and suspension top mount assembly is to be replaced, remove the fuel supply and return pipes.

28. If the passenger side front side member and suspension top mount assembly is to be replaced, remove the fuel cooler (if equipped).
For additional information, refer to: Fuel Cooler (310-01A Fuel Tank and Lines - TDV6 3.0L Diesel, Removal and Installation).

29. If the passenger side front side member and suspension top mount assembly is to be replaced, remove the anti-lock brake system (ABS) module.
For additional information, refer to: Anti-Lock Brake System (ABS) Module (206-09 Anti-Lock Control - Stability Assist, Removal and Installation).

30. If the passenger side front side member and suspension top mount assembly is to be replaced, remove the air conditioning (A/C) pipes.

31. If the passenger side front side member and suspension top mount assembly is to be replaced, remove the side member heatshield.

32. If the passenger side front side member and suspension top mount assembly is to be replaced, remove the hood release cable.

33. If the passenger side front side member and suspension top mount assembly is to be replaced, remove the fuel filter (vehicles with diesel engine).
For additional information, refer to: Fuel Filter (310-01A Fuel Tank and Lines - TDV6 3.0L Diesel, Removal and Installation).

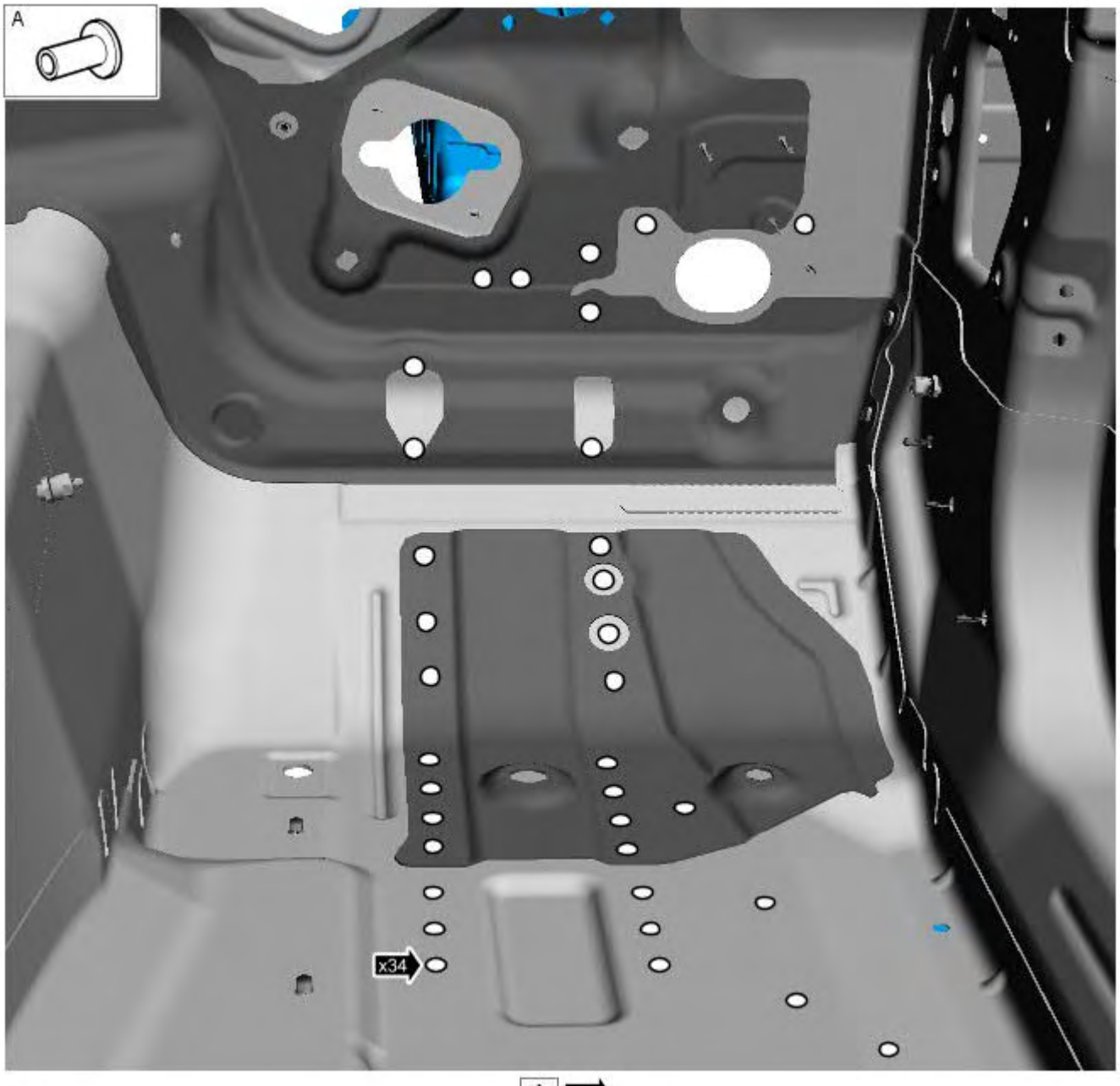
34. Release and position the front side member and suspension top mount wiring harness to one side.

35. Remove any remaining miscellaneous components from the repair area as necessary.

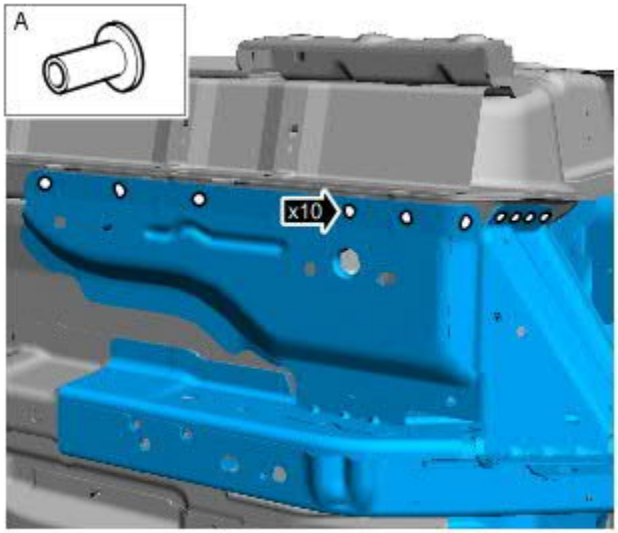
36. Remove the sealer and NVH (noise vibration and harshness), sound deadening material in the areas of repair, as required to reveal the panel joints.

37. Prior to removal, mark the position of the front side member and suspension top mount assembly in relation to adjacent panels for ease of alignment on installation.

38. Using a 6.5mm Cryobit drill bit, remove the self piercing rivets.

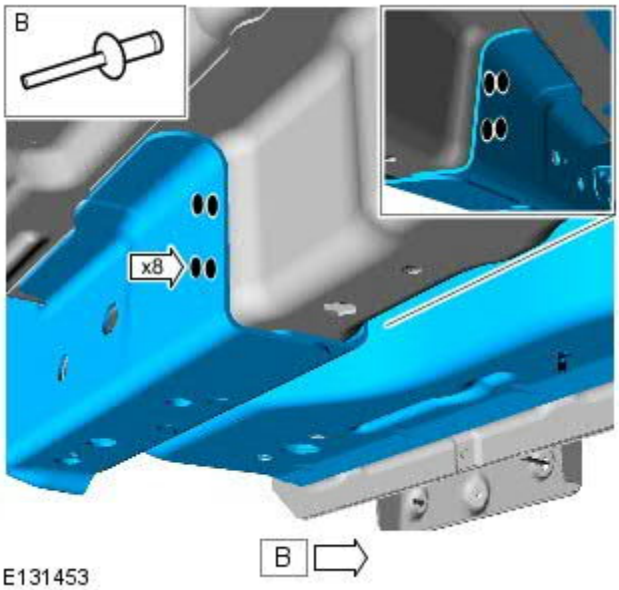


E131451



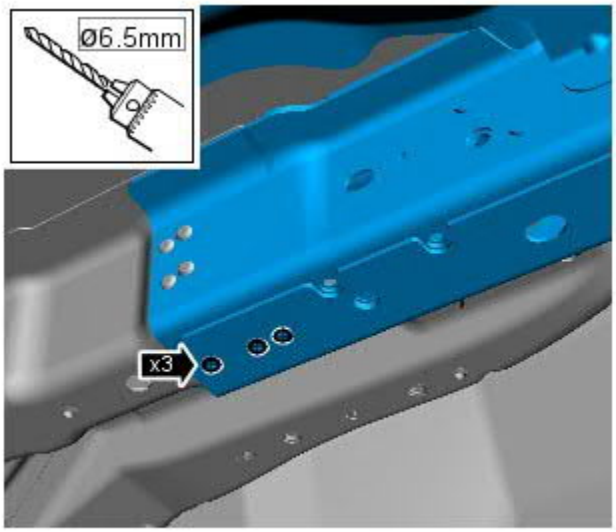
E131452

39. Using a 6.5mm Cryobit drill bit, remove the self piercing rivets.



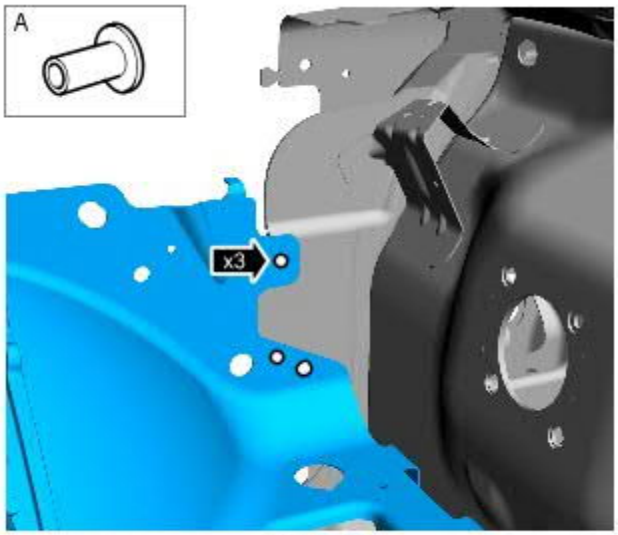
E131453

40. Remove the Hemloks.
    - Remove the centre of the fixings with a 4.0mm punch then drill with a 6.5mm Cryobit drill bit.



E131692

41. Using a 6.5mm Cryobit drill bit, remove the self piercing rivets.



E131454

42. Using a combination of the ESN50 and a 6.5mm Cryobit drill bit, remove the self piercing rivets.

43. CAUTION: This step requires the aid of another technician as the removed panel will be heavy.

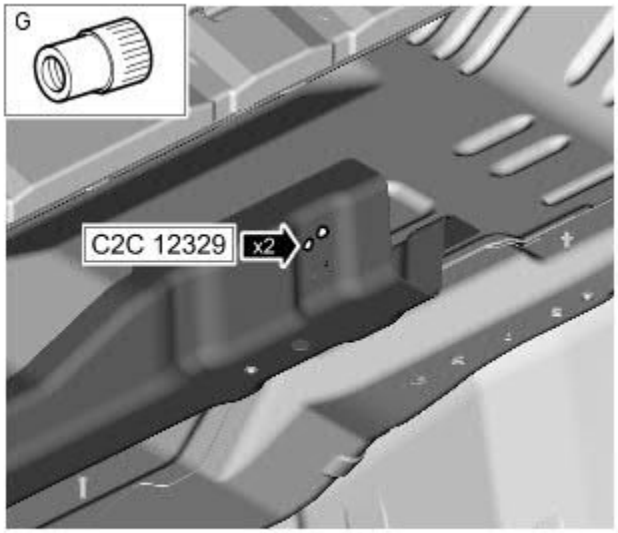
NOTE: Retain the old panel as it will be required for reference on installation.

Separate the joints and remove the old panel.

Installation

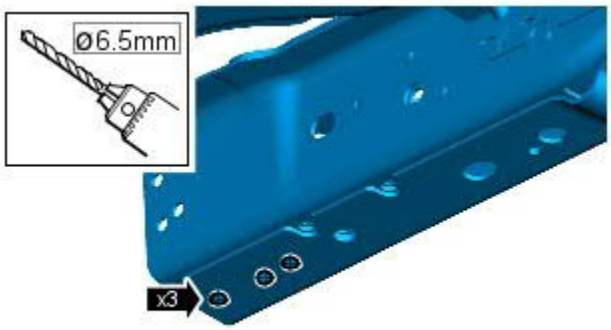
1. Remove rivet remnants.
2. Dress flanges where necessary.
3. Using a Roloc fine bristle disc, clean and prepare the panel surfaces,

removing any sealer and adhesive residue.



E131935

4. Enlage the 2 holes and using the HES 412 rivet nut tool, install 2 M6 rivet nuts as indicated.



E131693

5. Using the old panel for reference, mark the location and using a 6.5mm Cryobit drill bit, drill holes where Hemloks are to be installed as indicated.

6. Where there is no access to drill through both old and new panels when they are offered up on the vehicle, use the old panel for reference and measure and mark the Hemlok locations on the new panel. Using a 6.5mm Cryobit drill bit, drill the holes where Hemloks are to be installed prior to the offer up.

7. Debur the drilled holes.

8. CAUTION: This step requires the aid of another technician as the removed panel will be heavy.

   NOTE: make sure correct alignment of rivet nuts and drilled holes for Hemloks.

   Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.

9. Using a 6.5mm Cryobit drill bit, drill holes through the old panels into the new panel, at the points where Hemloks are to be installed.

10. Remove the new panel.

11. Debur the drilled holes.

12. Using a Roloc fine bristle disc, clean and prepare the panel surfaces.

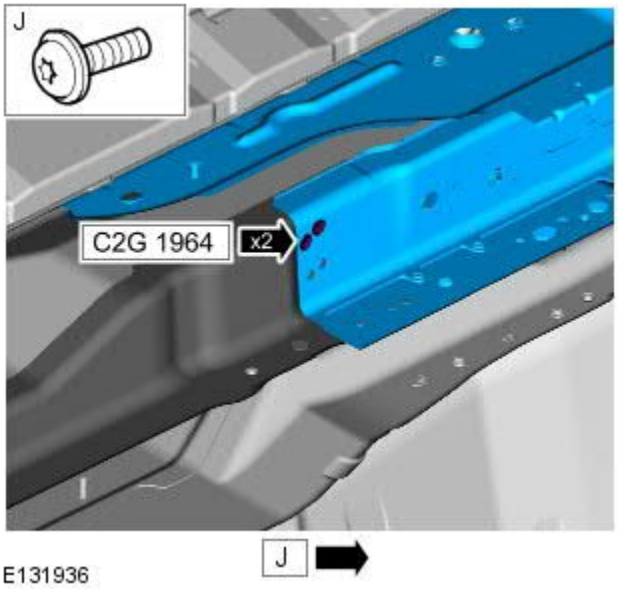
13. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

14. Apply the coupling agent where 3M 8115 adhesive is to be applied and allow to dry.

15. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes.

    Apply a 5mm zig zag bead of 3M 8115 adhesive to the body joints.

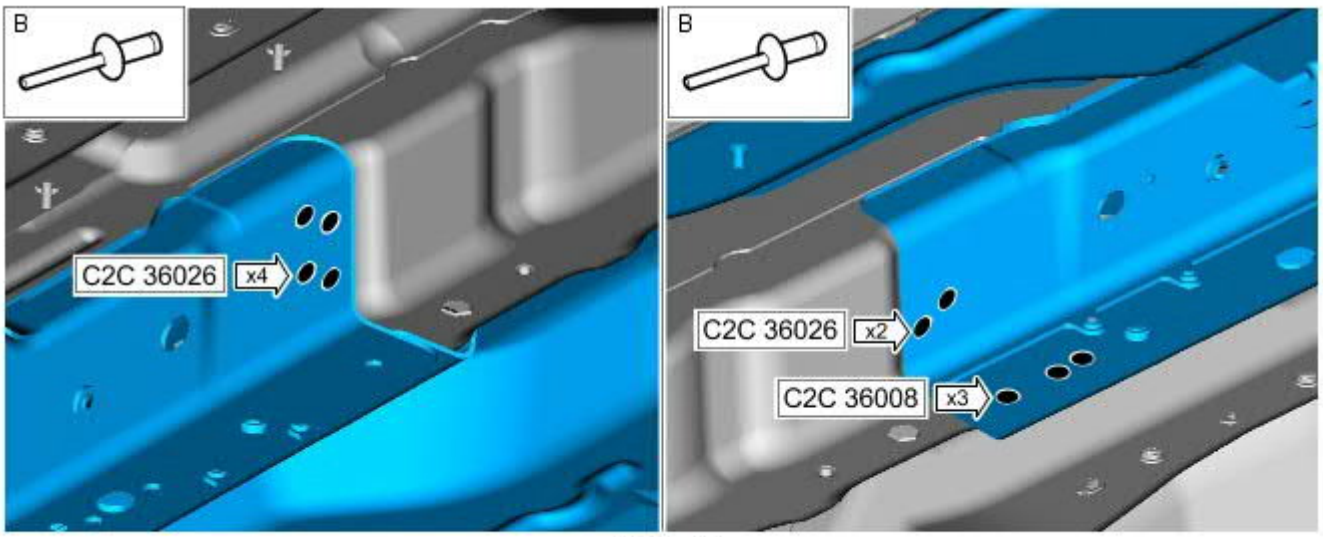
16. Offer up the new panel, align and clamp into position.



E131936

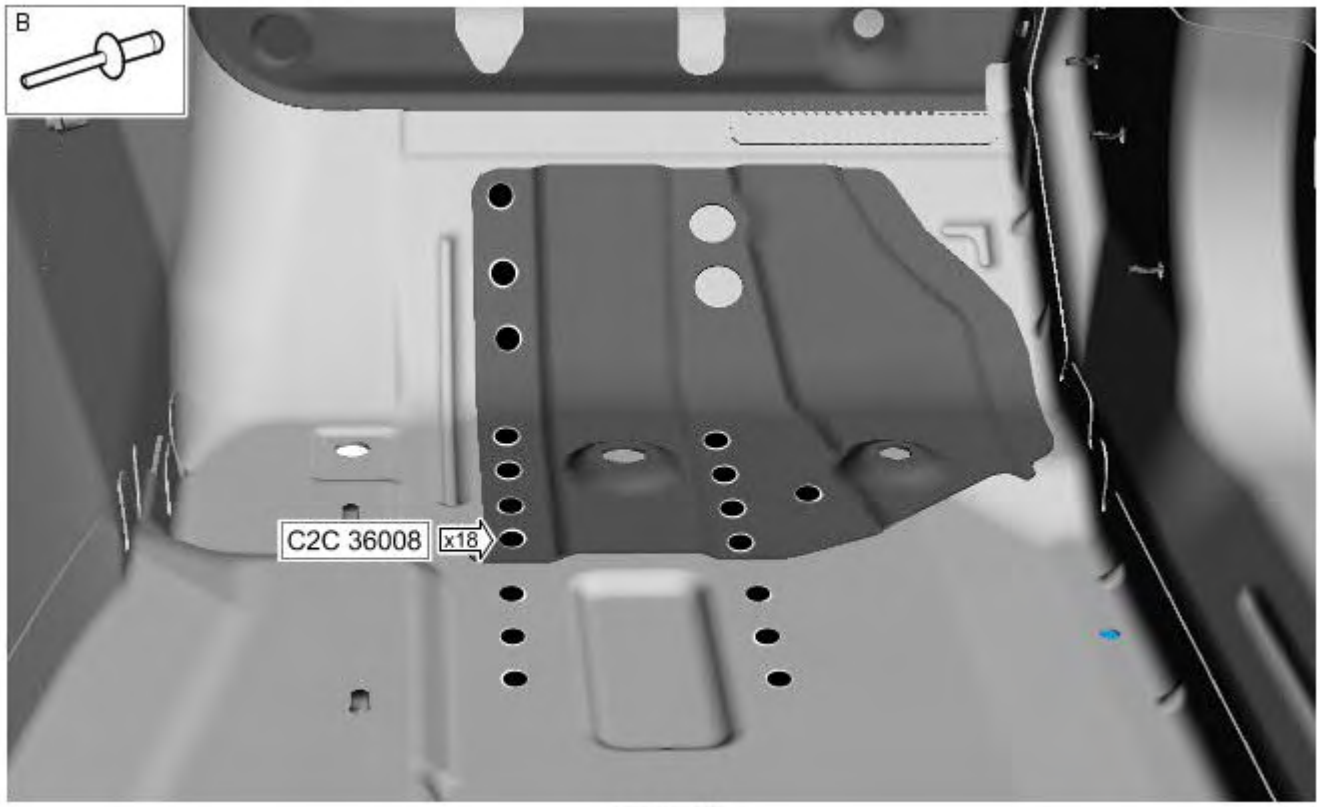
17. Loosely install the retaining screws.
    - Do not tighten the retaining screws at this stage.

18. Using the Genesis G4, install the Hemloks.



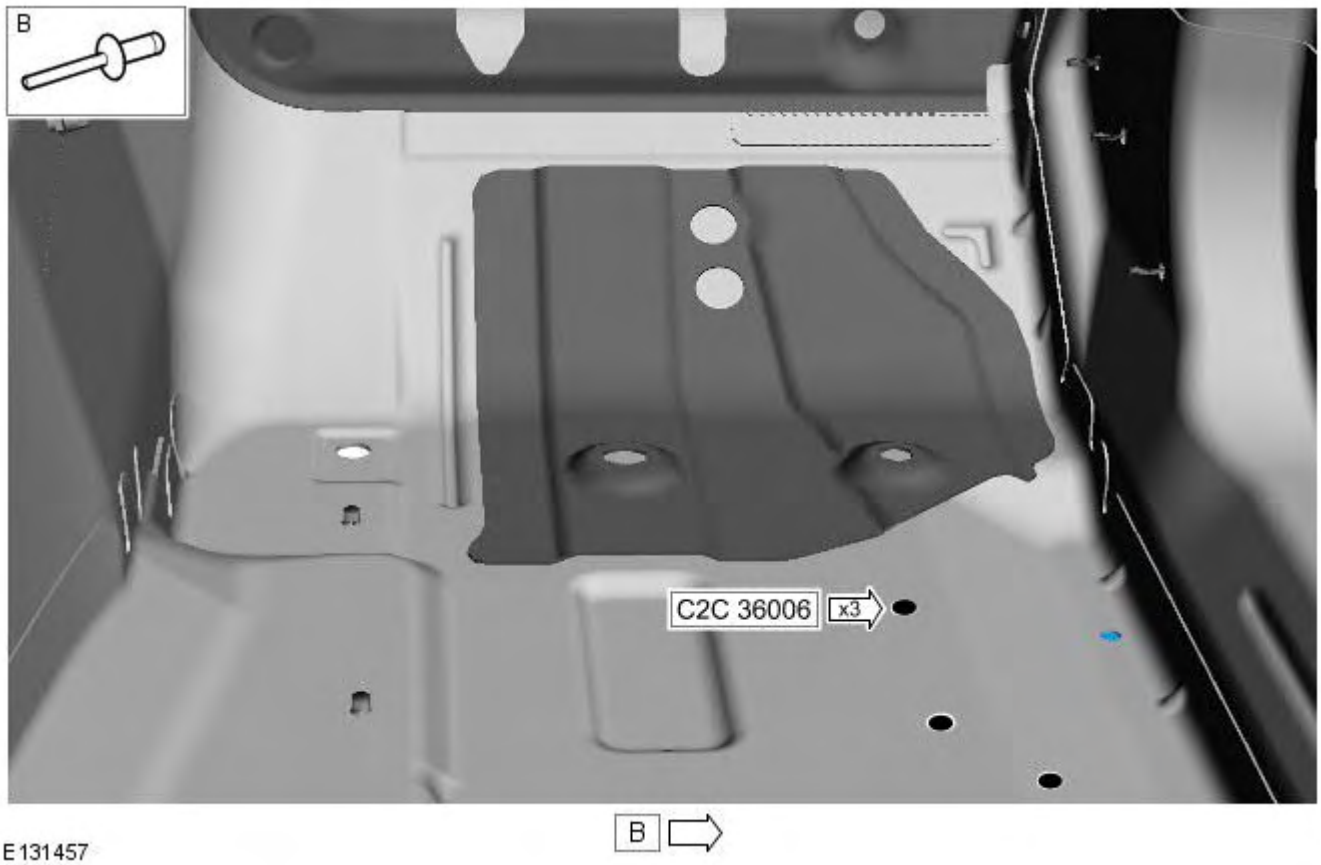
E131985

19. Using the Genesis G4, install the Hemloks.



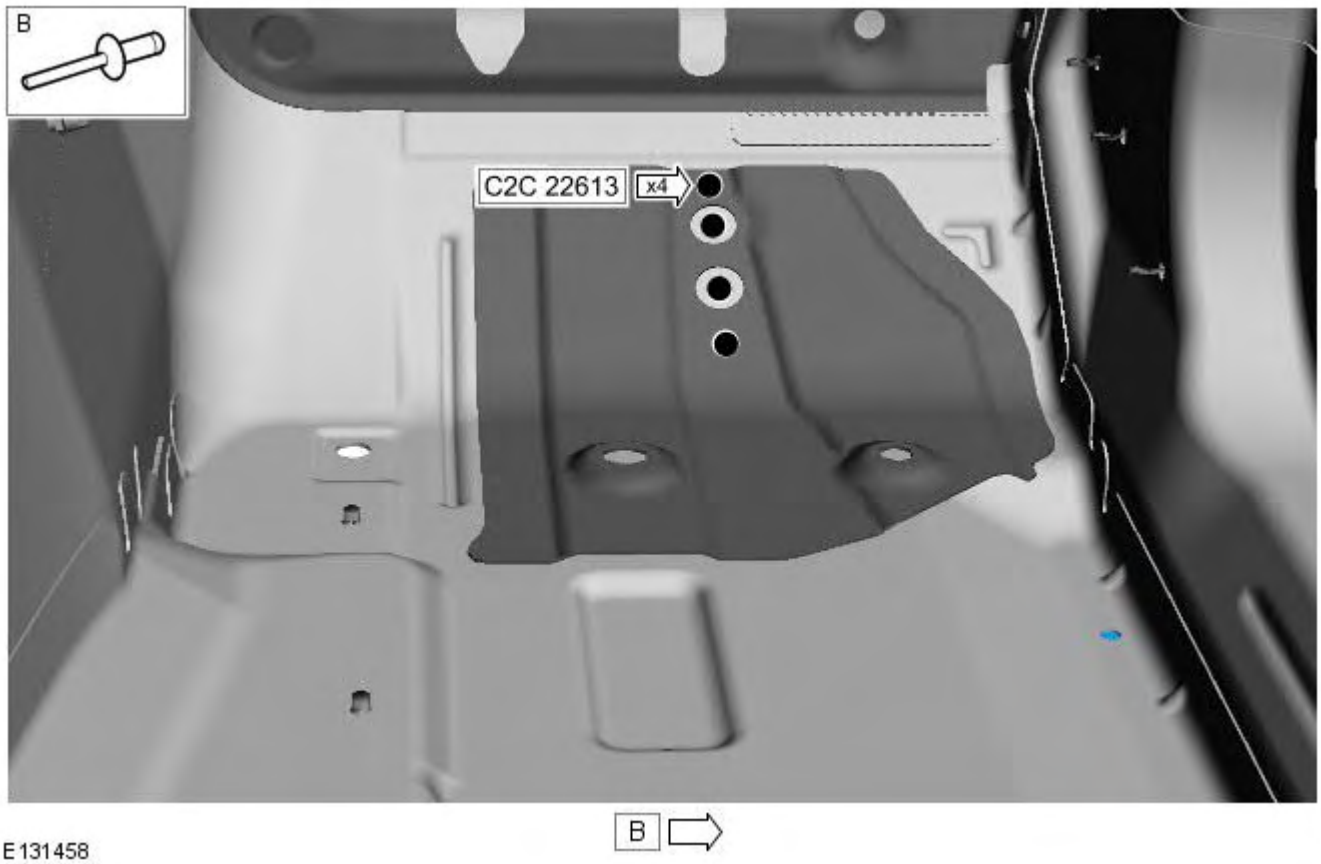
E131456

20. Using the Genesis G4, install the Hemloks.



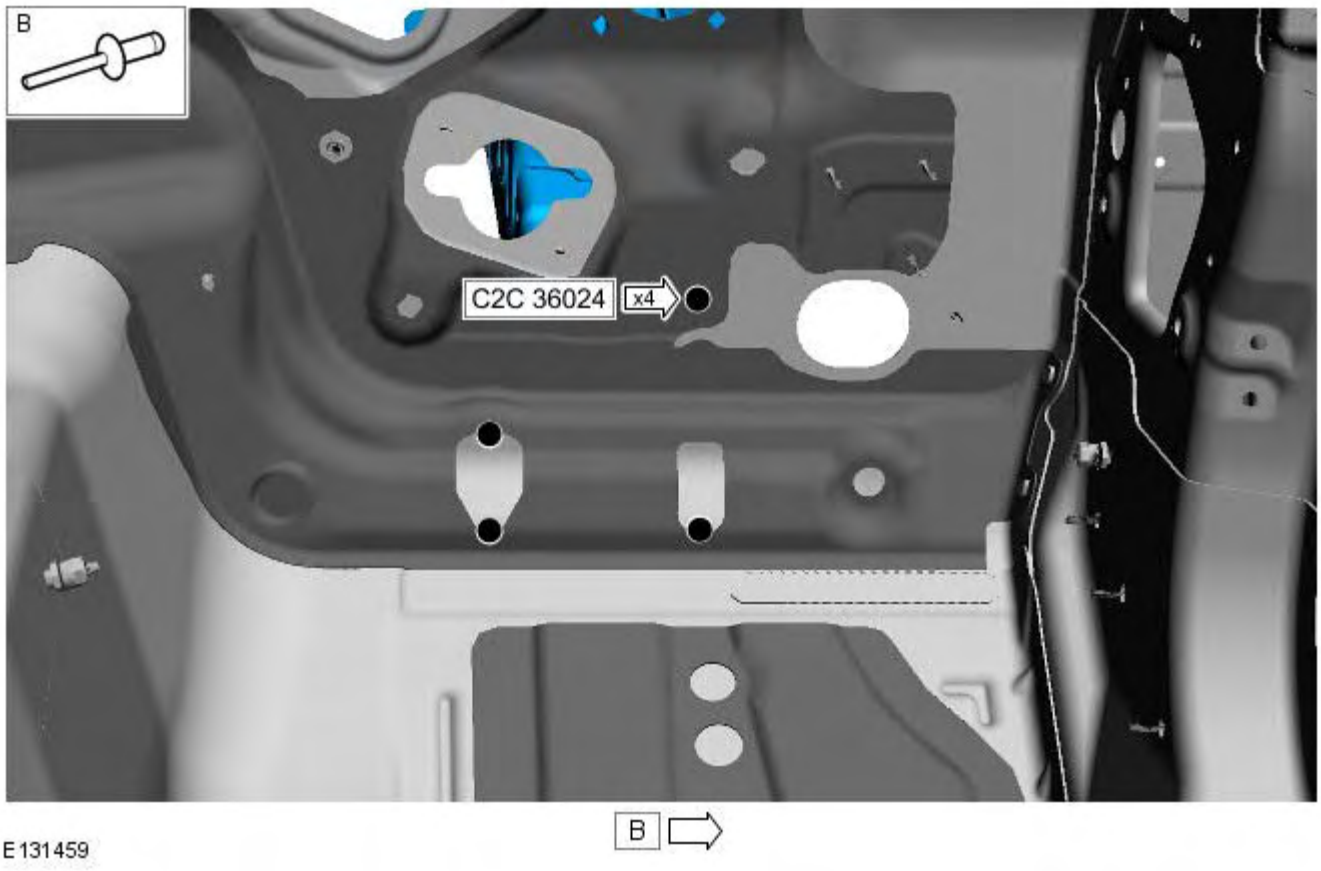
E131457

21. Using the Genesis G4, install the Hemloks.



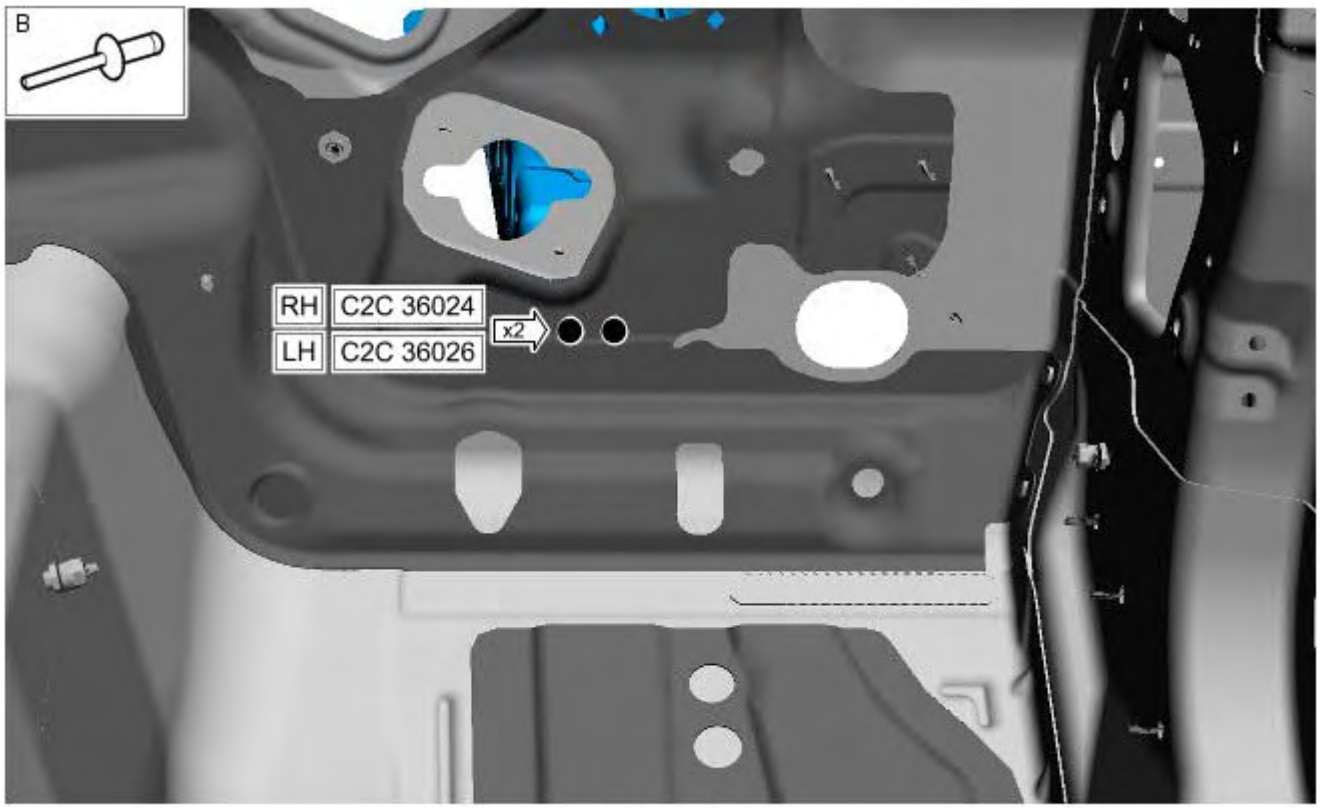
E131458

22. Using the Genesis G4, install the Hemloks.



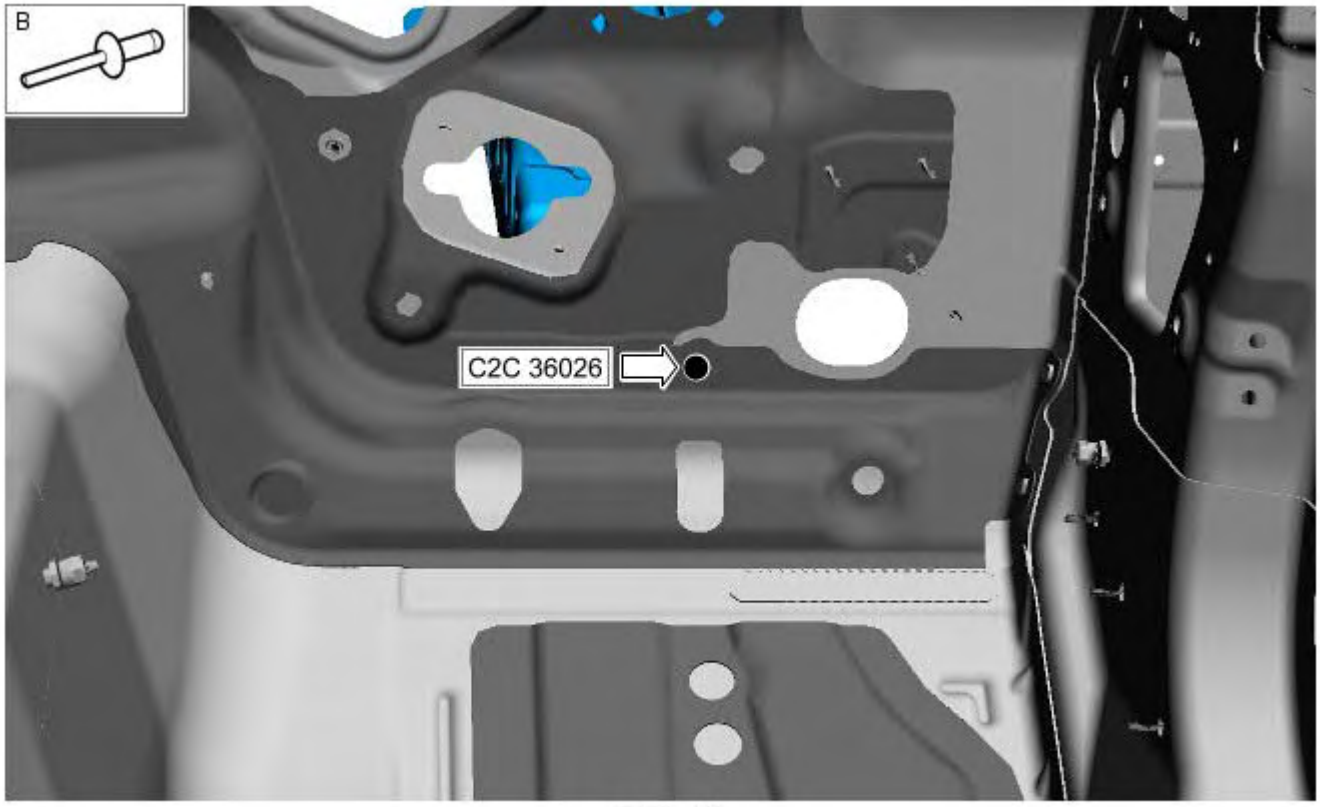
23. NOTE: The illustration shows a right-hand drive vehicle. The Hemloks installed to the drivers side, right-hand, differ to those installed on the passenger side, left-hand.

    Using the Genesis G4, install the Hemloks.



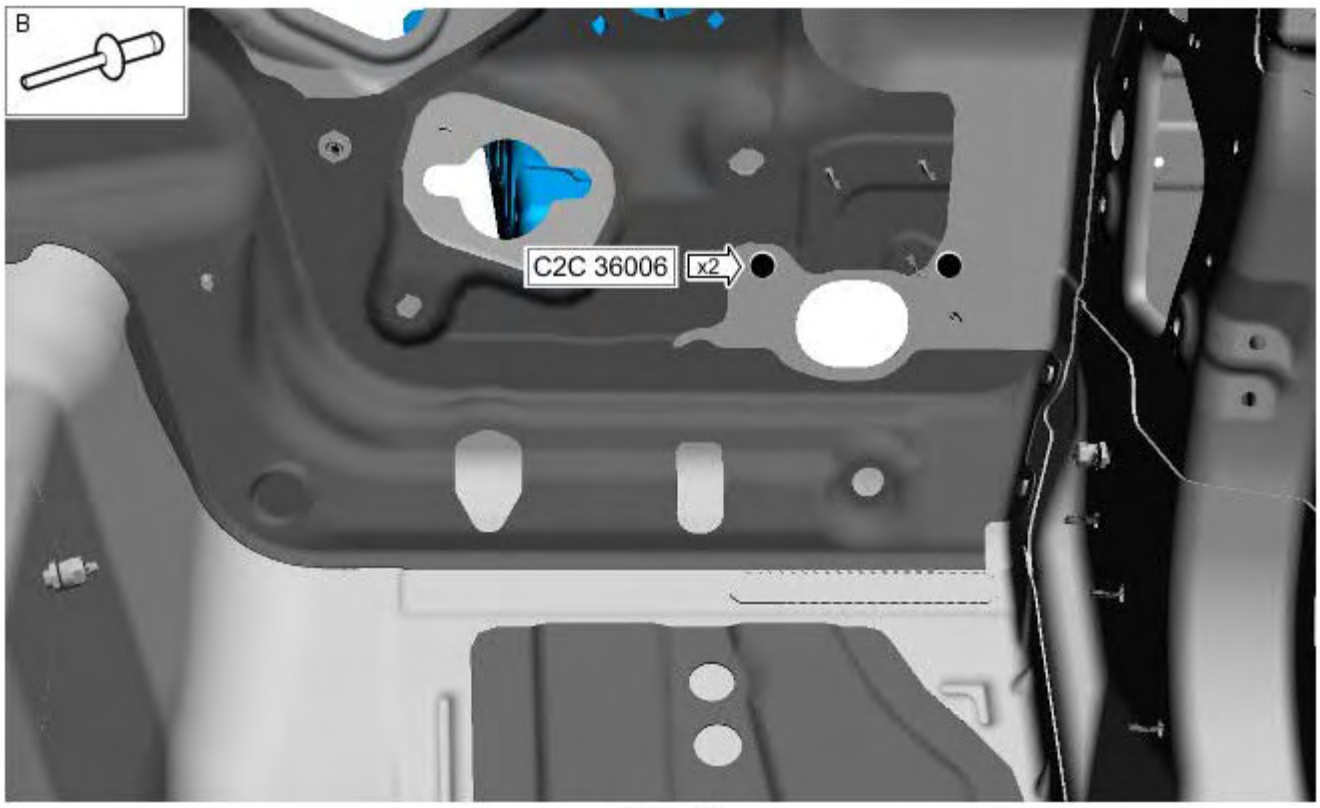
E131460

24. Using the Genesis G4, install the Hemloks.



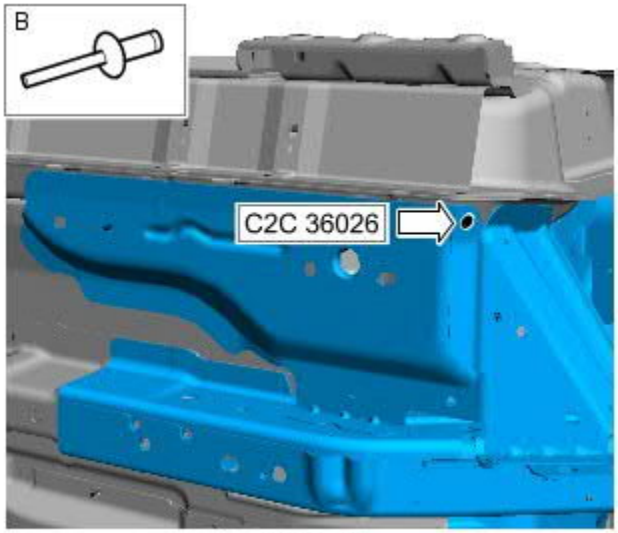
E131461

25. Using the Genesis G4, install the Hemloks.



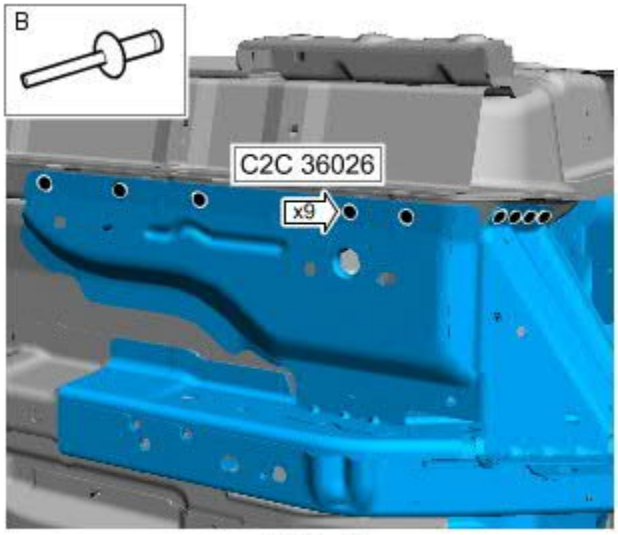
E131462

26. Using the Genesis G4, install the Hemlok.



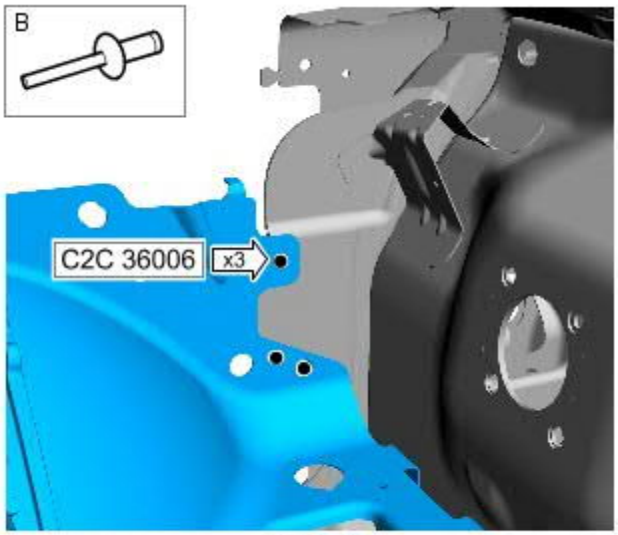
E131463

27. Using the Genesis G4, install the Hemloks.



E131464

28. Using the Genesis G4, install the Hemloks.



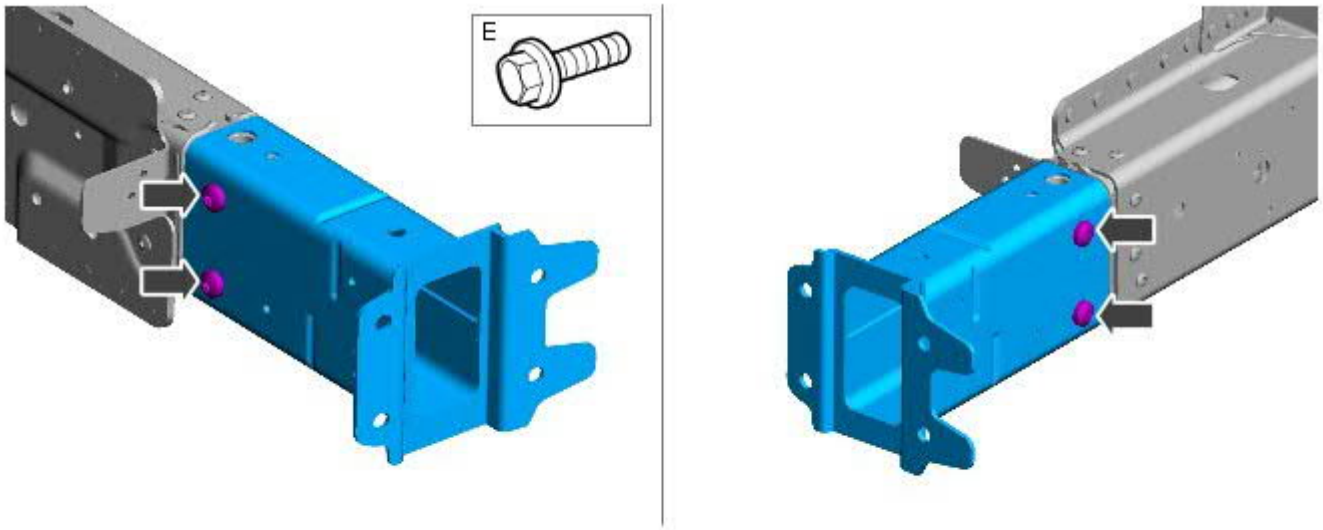
E131465

29. Remove any excess adhesive.

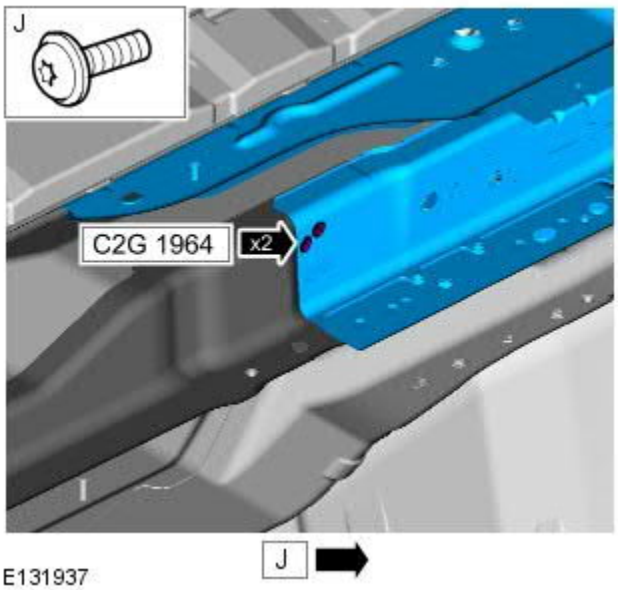
30. Check the tightness of the bolts to the side member deformation element bracket.

NOTE: Bolts are pre-coated to inhibit galvanic corrosion and can be reused only if the coating is not damaged.

- Tighten to 62 Nm.



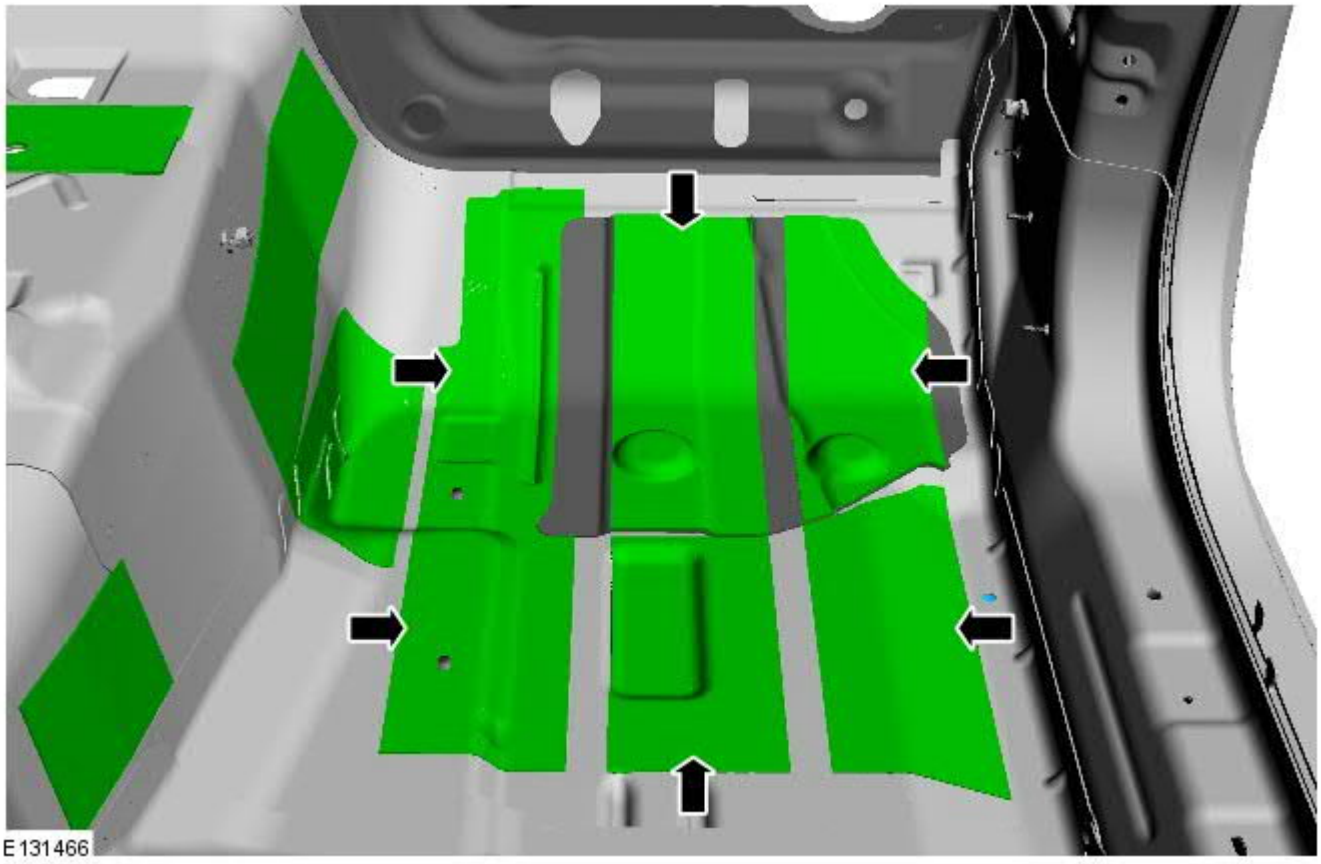
E129614



E131937

31. Fully tighten the retaining screws.
    - Tighten to 6 Nm.

32. Install the NVH material in the areas indicated.



33. Make sure that any open or exposed panel joints are suitably sealed following this procedure.

34. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Front End Sheet Metal Repairs - Front Side Member Closing Panel Section

Removal and Installation

Removal

NOTE: The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being replaced in isolation, or, is being replaced in combination with panels other than those listed.

1. The front side member closing panel section is a category A repair.

E129855

2. NOTE: The front side member closing panel section is manufactured from aluminium alloy 5754-NG.

   The front side member closing panel section is cut from the front side member closing panel service panel.

3. In this procedure, to make sure that the vehicle is correctly aligned, it must be placed on an approved alignment jig.

4. The front side member closing panel section is replaced in conjunction with:
   - Front bumper cover
   - Front bumper
   - Hood latch panel
   - Hood latch panel mounting bracket
   - Side member deformation element
   - Front side member to deformation element bracket
   - Front side member closing panel section
   - Engine, transmission / transaxle, front subframe and front suspension, as an assembly

5. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

6. NOTE: This procedure assumes that if the front side member closing panel section is damaged, the front side member section will also be damaged. Therefore the removal procedure for the front side member closing panel section is combined within the front side member section procedure.

   Remove the front side member section.
   For additional information, refer to: Front Side Member Section (501-27 Front End Sheet Metal Repairs, Removal and Installation).

Installation

1. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Front End Sheet Metal Repairs - Front Side Member Section

Removal and Installation

Removal

NOTE: The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being installed in isolation or is being installed in combination with panels other than those listed.

1. The front side member section is a category A repair.

E129854

2. NOTE: The front side member section is manufactured from aluminium alloy 5754-NG.

   The front side member section is cut from the front side member service panel.

3. In this procedure, to make sure that the vehicle is correctly aligned, it must be placed on an approved alignment jig.

4. NOTE: This procedure assumes that the front side member closing panel section is damaged. Therefore, the procedure combines the repair of the front side member section and the front side member closing panel section.

   The front side member section is replaced in conjunction with:
   - Front bumper cover
   - Front bumper
   - Hood latch panel
   - Hood latch panel mounting bracket
   - Side member deformation element
   - Front side member to deformation element bracket
   - Front side member closing panel section
   - Engine, transmission, front subframe and front suspension as an assembly

5. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

6. Remove the front bumper.
   For additional information, refer to: Front Bumper (501-19 Bumpers, Removal and Installation).

7. Remove the hood latch panel mounting bracket.
   For additional information, refer to: Hood Latch Panel Mounting Bracket (501-27 Front End Sheet Metal Repairs, Removal and Installation).

8. NOTE: Whenever there is damage to the front side member, the front side member to deformation element bracket must always be renewed. When renewing the bracket and side member in combination, removal of the bracket is not required.

   Remove the front side member to deformation element bracket.
   For additional information, refer to: Front Side Member To Deformation Element Bracket (501-27 Front End Sheet Metal Repairs, Removal and Installation).

9. Remove the engine, transmission, front subframe and front suspension, as an assembly.

10. Disconnect the battery.
    For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

11. Disconnect the generator electrical connectors.

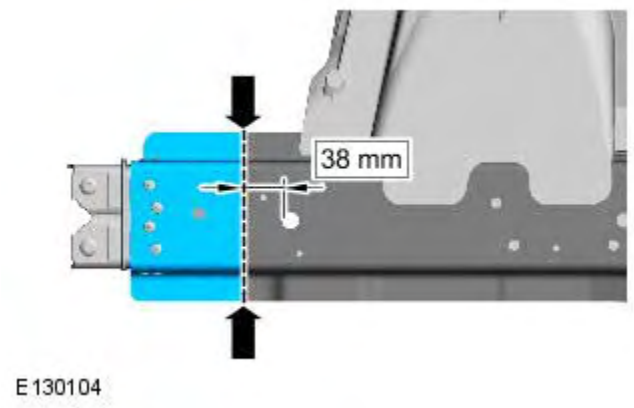
12. If the right-hand front side member section is to be repaired, remove the front side member heatshield.

13. If the right-hand front side member section is to be repaired, remove the auxiliary radiator.
    For additional information, refer to: Auxiliary Radiator (303-03A Engine Cooling - TDV6 3.0L Diesel, Removal and Installation) / Auxiliary Radiator (303-03B Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

14. If the left-hand front side member section is to be repaired, remove the air conditioning (A/C) high pressure line.

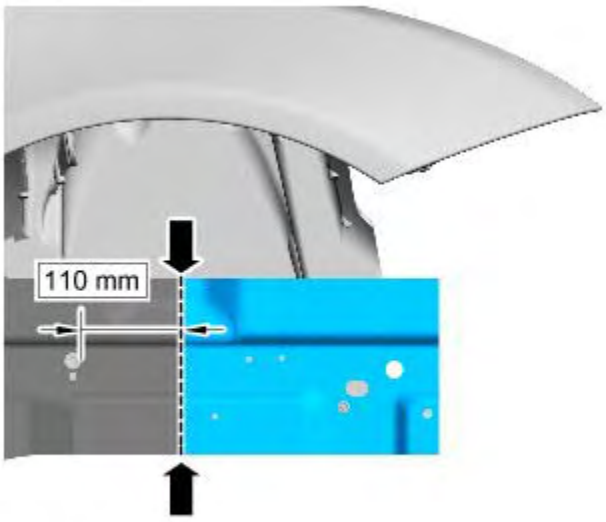
15. Release the front side member wiring harness and position it to one side.

16. Remove any miscellaneous components in the area of repair.



E130104

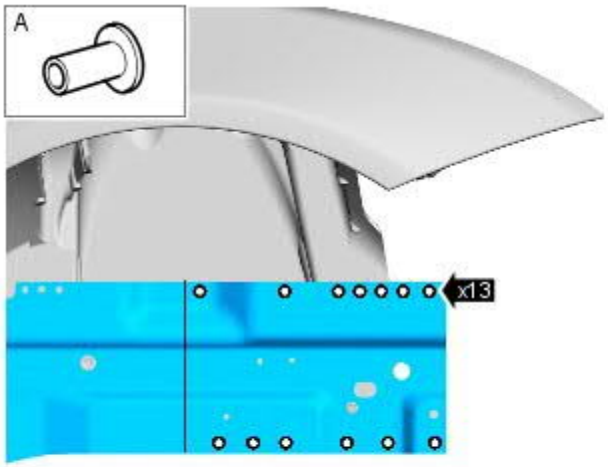
17. Mark out the position where the front side member section MIG butt joint is to be made. Cut through the front side member at this point, also cutting through the front side member closing panel, as indicated.



E130105

18. CAUTION: Care should be taken not to cut through into the front side member.

    Mark out the position where the front side member closing panel section MIG butt joint is to be made. Cut through the front side member closing panel at this point, as indicated.



E130222

A

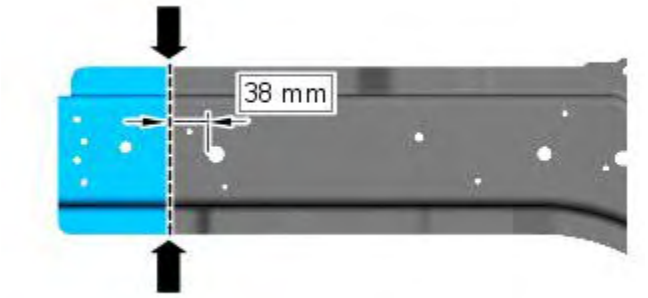
19. Using a combination of the ESN50 and a 6.5mm Cryobit drill bit, remove the self piercing rivets from the front side member.

20. Separate the joints and remove the front side member closing panel remnant.

Installation

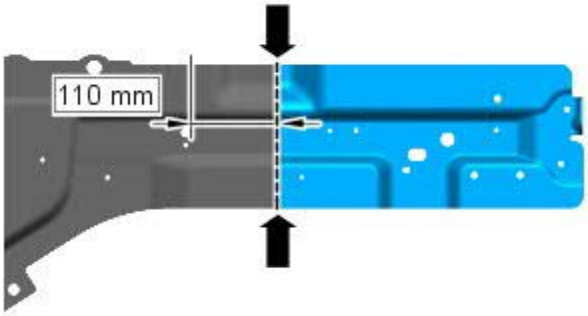
1. Remove the rivet remnants.

2. Dress the flanges where necessary.



E130219

3. Mark out the position on the front side member service panel, where the section MIG butt joint is to be made and cut the panel at this point as indicated.



E130220

4. Mark out the position on the front side member closing panel service panel, where the section MIG butt joint is to be made and cut the panel at this point as indicated.

5. Install the front side member to deformation element bracket into the side member deformation element.

6. Using panel pin clamps, temporarily install the front side member to deformation element bracket and side member deformation element assembly into the new front side member section.

7. Offer up the new front side member section, including the front side member to deformation element bracket and side member deformation element assembly and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

8. Offer up the new front side member closing panel section and using panel pin clamps align with the new front side member to deformation element bracket and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

9. Using a 6.5mm Cryobit drill bit, drill holes at the points where Hemloks are to be installed. Where it is not possible to drill, scribe mark the hole locations on the new panel.

10. Remove the new panels, leaving the side member deformation element and the front side member to deformation element bracket assembled.

11. Using a 6.5mm Cryobit drill bit, drill the marked holes.

12. Debur the drilled holes.

13. Using a Roloc fine bristle disc, clean and prepare the panel surfaces, including the inner panel surfaces where backing plates are to be welded.

14. Measure and cut a 50mm wide backing plate, (25mm each side of the MIG butt joint), from the discarded part of the new front side member panel, or from similar material. Two horizontal cuts are required, to remove a 10mm section from the backing plate so that it fits within the front side member.

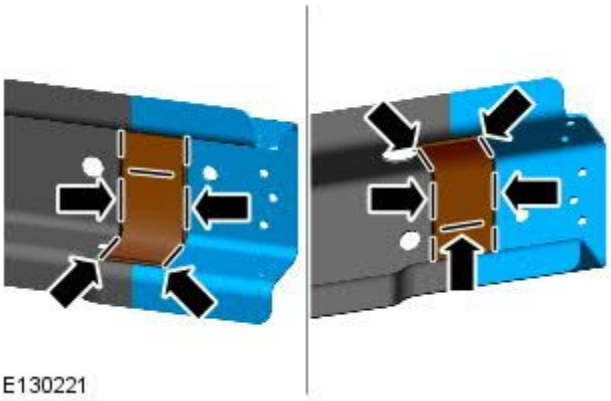
15. Measure and cut a 50mm wide backing plate, (25mm each side of the MIG butt joint), from the discarded part of the new front side member closing panel, or from similar material.

16. Cut 2 run on/run off tabs from the discarded part of the new front side member panel, or from similar material.

17. Cut 2 run on/run off tabs from the discarded part of the new front side member closing panel, or from similar material.

18. Using a Roloc fine bristle disc, clean and prepare the backing plates and run on/run off tabs.

19. Using panel pin clamps, temporarily install the side member deformation element and front side member to deformation element bracket assembly into the new front side member section. Offer up, align and clamp into position.



E130221

20. NOTE: The backing plates should be secured with 8 welds of 20mm, 4 at the top, 4 at the bottom and 1 central weld of 50mm.

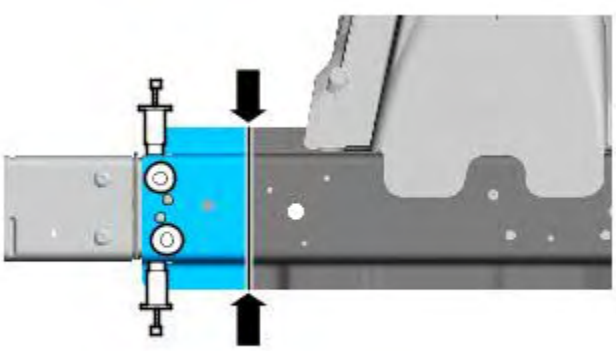
    MIG weld the backing plate into the front side member.

E130223

21. NOTE: The backing plate should be secured with 2 vertical welds of 20mm.

    MIG weld the backing plate onto the new front side member closing panel section.

22. Tack weld the run-on/run off tabs to the front side member section.



E130224

23. MIG weld the front side member section butt joint.

24. Cut off the run on/run off tabs.

25. Dress the inner part of the front side member section MIG butt joint.

26. Offer up the new front side member closing panel section, align and clamp into position.

27. Drill 2 holes through the front side member closing panel into the backing plate, to allow panel pin clamps to be installed.

28. Remove the front side member closing panel section.

29. Debur the drilled holes.

30. Remove the front side member to deformation element bracket and side member deformation element assembly.

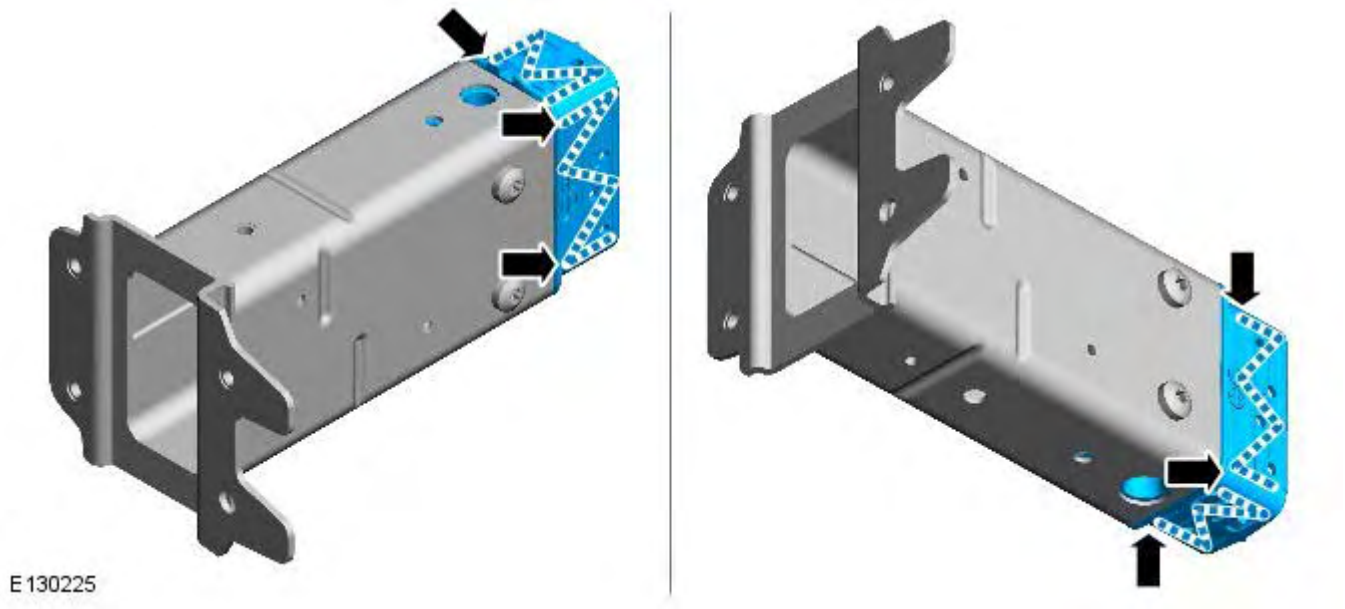
31. Using a Roloc fine bristle disc, clean and prepare the panel joints.

32. Pyrosil the joints.

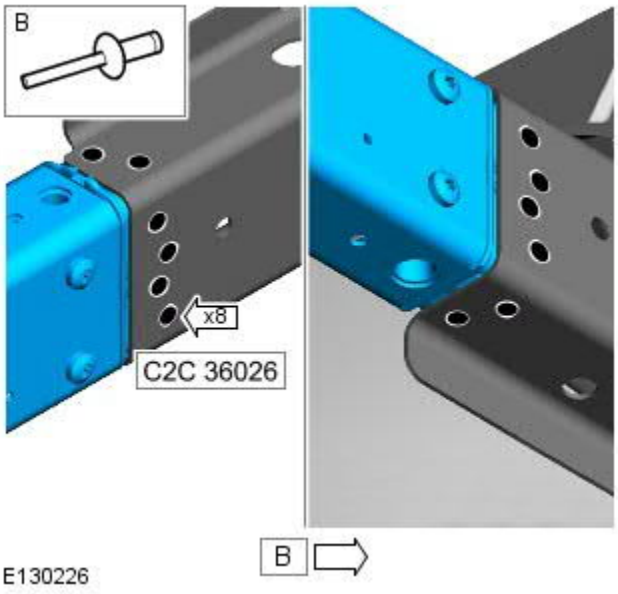
33. Apply the coupling agent and allow to dry.

34. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes.

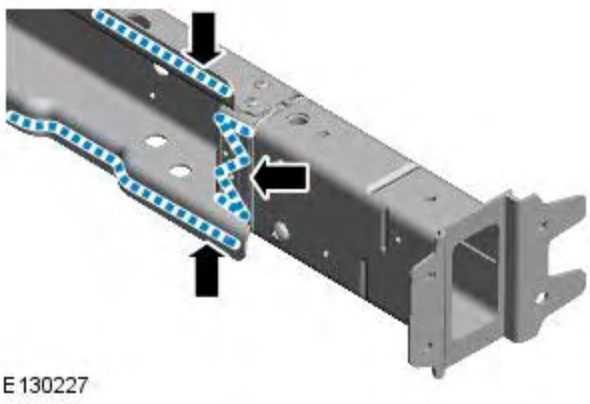
    Apply a 5mm zig zag bead of 3M 8115 adhesive to the front side member to deformation element bracket.



35. Offer up the front side member to deformation element bracket and side member deformation element assembly and align.



36. Using the Genesis G4, install the Hemloks.

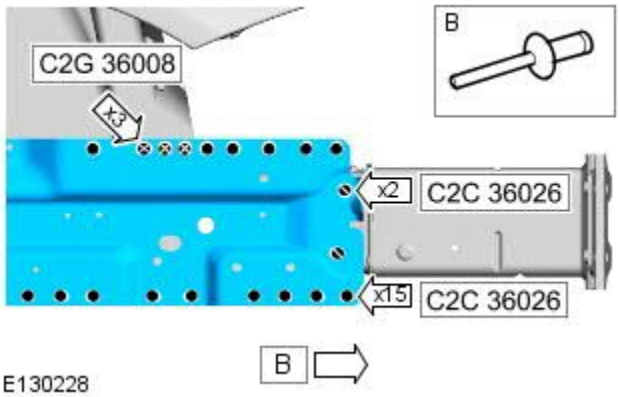


37. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes. Do not apply adhesive in the vicinity of the MIG plug welds.

Apply a 5mm zig zag bead of 3M 8115 adhesive to the front side member and to the deformation element bracket.

38. NOTE: The detached side of the backing plate is secured with panel pin clamps.

    Offer up the new front side member closing panel section, align and clamp into position.

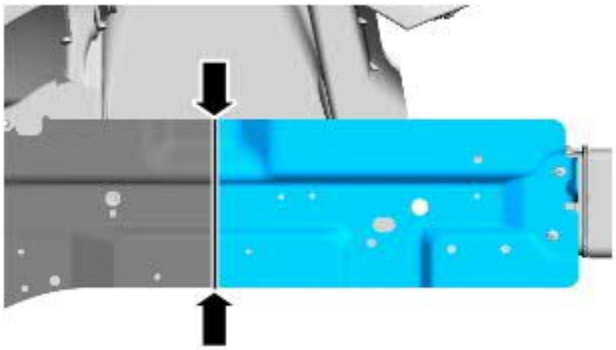


E130228

39. Using the Genesis G4, install the Hemloks.

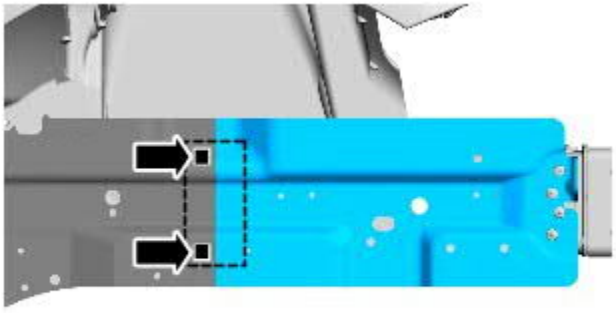
40. Remove any excess adhesive.

41. Tack weld the run-on/run off tabs to the front side member closing panel section.


E130229

42. MIG weld the front side member closing panel section butt joint.

43. Remove the panel pins from the front side member closing panel. Increase the 2 holes to 10mm in preparation for MIG plug welding.


E130271

44. Install 2 MIG plug welds.

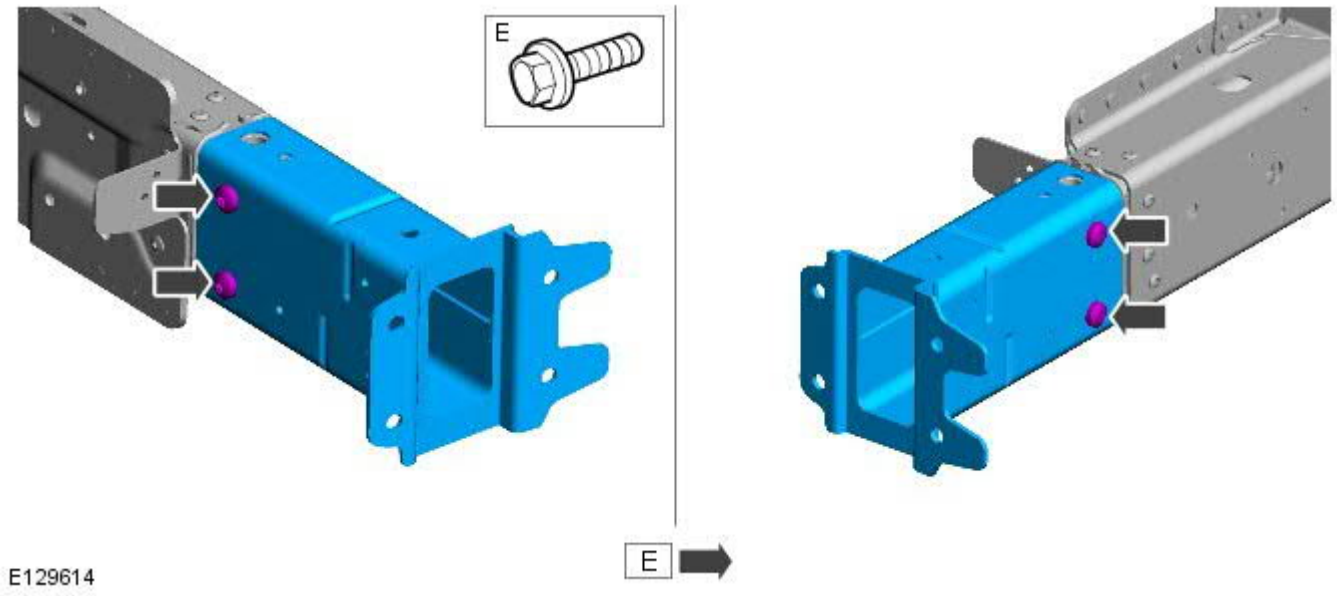
45. Carry out a non destructive crack inspection on the MIG butt joints. If correct proceed to next step, if not, rectify and recheck before proceeding.

46. Dress the welded joints.

47. Fully tighten the bolts to the side member deformation element bracket.

    NOTE: Bolts are pre-coated to inhibit galvanic corrosion and can be re-installed only if the coating is not damaged.

    - Tighten to 62 Nm.



48. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

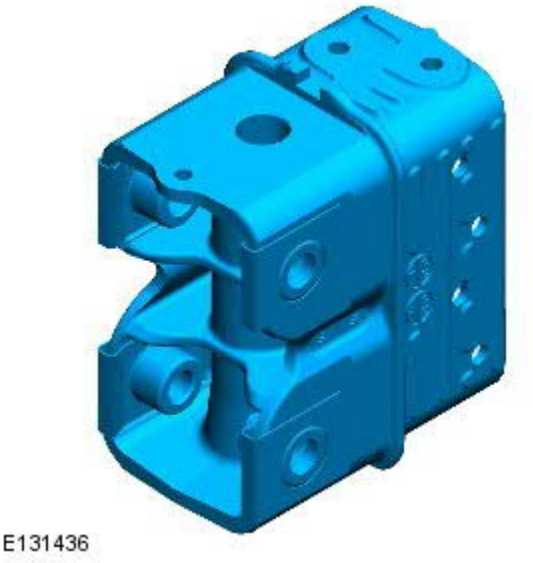
Front End Sheet Metal Repairs - Front Side Member To Deformation Element Bracket

Removal and Installation

Removal

NOTE: The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being replaced in isolation, or, is being replaced in combination with panels other than those listed.

1. The front side member to deformation element bracket is a category A repair.


E131436

2. NOTE: The front side member to deformation element bracket is manufactured from gravity die-cast (GDC) aluminium.

   The front side member to deformation element bracket is serviced as a separate bolted and bonded panel.

3. In this procedure, to make sure that the vehicle is correctly aligned, it must be placed on an approved alignment jig.

4. NOTE: Whenever there is damage to the front side member, the front side member to deformation element bracket must be renewed. When renewing the front side member to deformation element bracket and the front side member in combination, removal of the bracket is not required.

   The front side member section is replaced in conjunction with:
   - Front bumper cover
   - Front bumper
   - Hood latch panel
   - Hood latch panel mounting bracket
   - Side member deformation element
   - Removal of the front subframe is required for access.

5. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

6. Remove the side member deformation element.
For additional information, refer to: Side Member Deformation Element (501-27 Front End Sheet Metal Repairs, Removal and Installation).

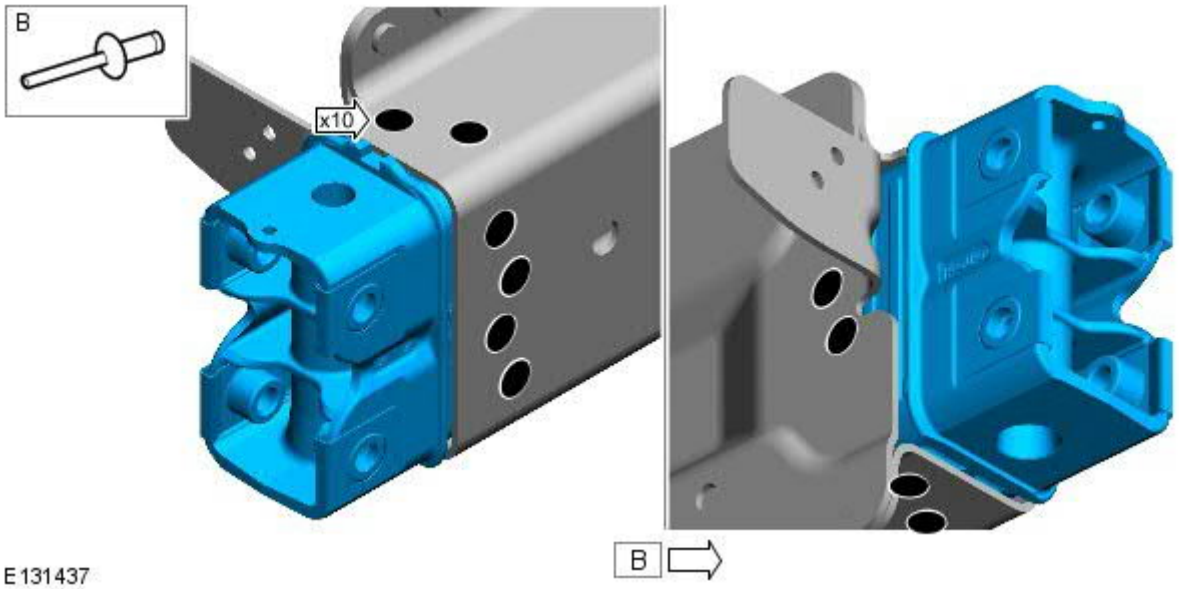
7. Disconnect the battery.
For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

8. NOTE: If damage dictates, it may be preferable to remove the engine, transmission and front subframe, as an assembly.

   Remove the front subframe.
   For additional information, refer to: Front Subframe - TDV6 3.0L Diesel (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation) /
   Front Subframe - V8 5.0L Petrol/V8 S/C 5.0L Petrol (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).

9. NOTE: Retain the washers for reuse on installation.

   Remove the Hemloks, remove the centre of the fixings with a 4.0mm punch then drill with a 6.5mm Cryobit drill bit.



E131437

10. CAUTION: Take care not to damage the front side member when removing the front side member to deformation element bracket.

    Separate and remove the front side member deformation element bracket from the front side member. Adhesive is applied in production so the bracket will need to be eased from the front side member, use a hammer and chisel on the lip of the bracket to remove.

Installation

1. Remove rivet remnants.

2. Debur the drilled holes.

3. CAUTION: Take care not to damage the front side member when removing the adhesive residue.

   Using a belt sander, remove adhesive residue from inside the front side member.

4. Dress flanges where necessary.

5. Using a Roloc fine bristle disc, clean and prepare the panel surfaces.

6. Offer up the front side member to deformation element bracket to the front side member.

7. Offer up the side member deformation element to the front side member to deformation element bracket.

8. NOTE: Do not tighten the bolts or install the Hemloks.

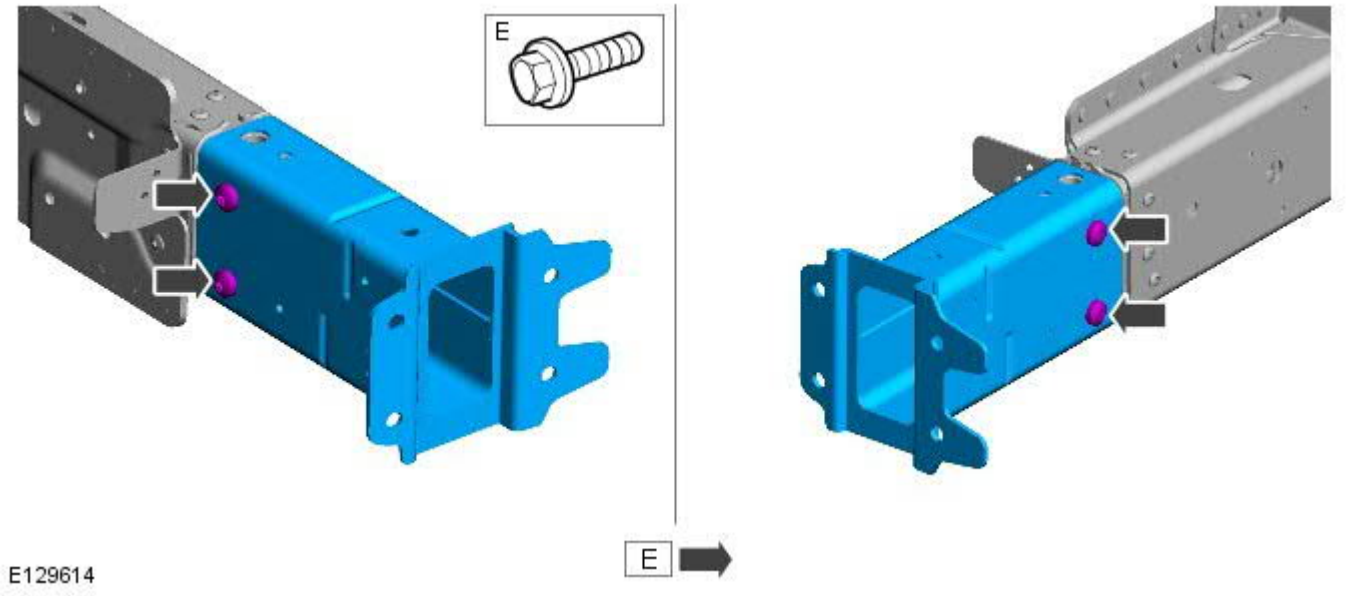
   Loosely fit the bolts to the side member deformation element and loosely fit the Hemloks to the front side member to deformation element bracket.

9. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

10. Install 4 T50 bolts to the side member deformation element bracket.

    NOTE: Bolts are pre-coated to inhibit galvanic corrosion and can be reused only if the coating is not damaged.

    - Tighten to 62 Nm.



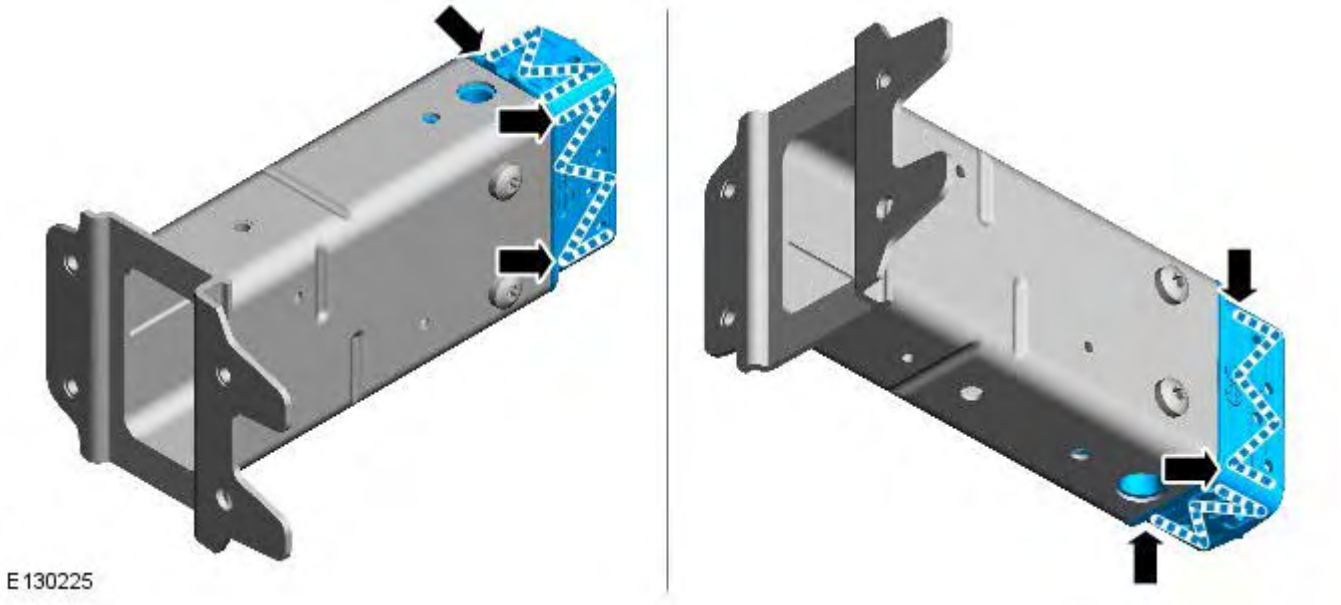
11. Remove the front side member deformation element and front side member deformation element bracket, as an assembly.

12. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

13. Apply the coupling agent where 3M 8115 adhesive is to be applied and allow to dry.

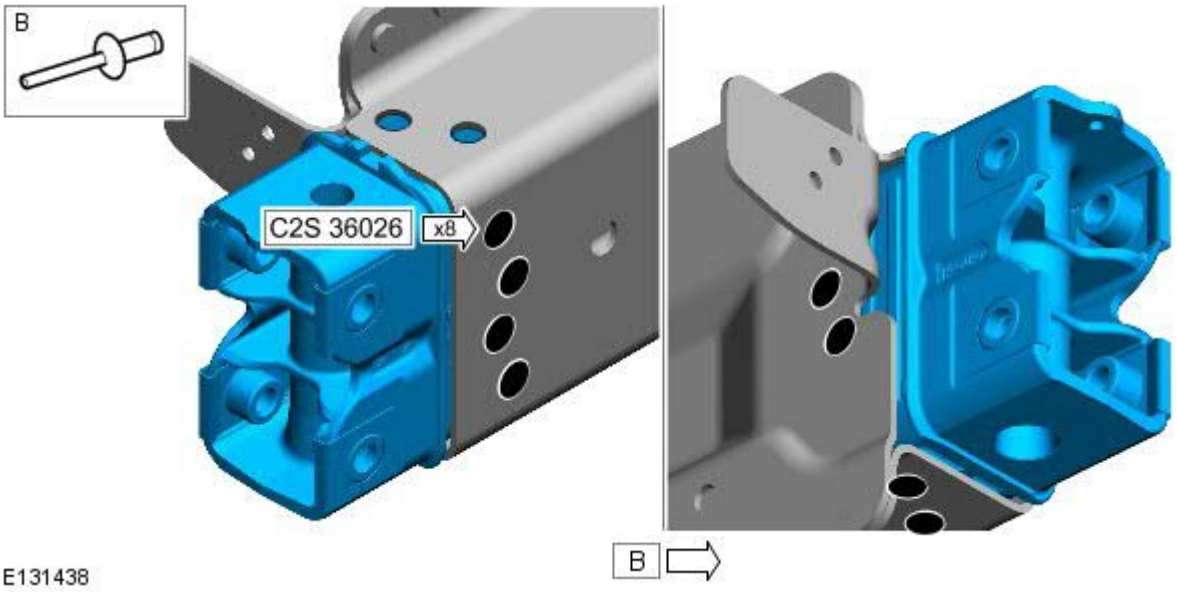
14. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes.

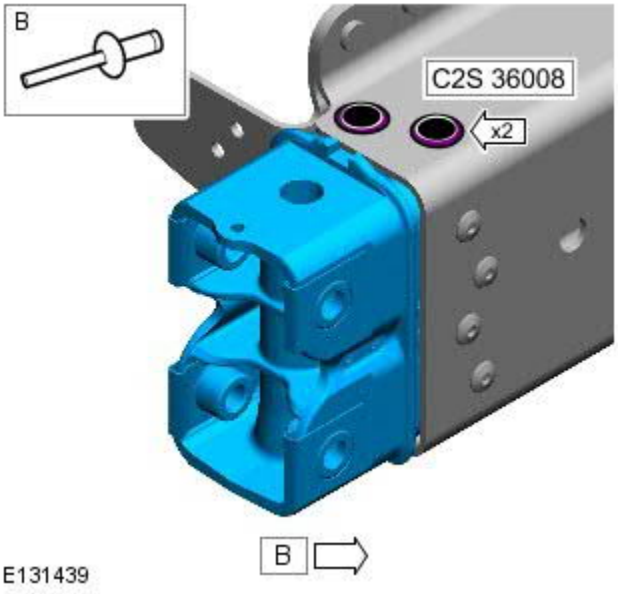
    Apply a 5mm zig zag bead of 3M 8115 adhesive to the new panel and to the body joints.



15. Offer up the front side member deformation element and front side member to deformation element bracket assembly to the front side member and align.

16. Using the Genesis G4, install the Hemloks.





17. NOTE: Make sure the washers are fitted to the Hemloks prior to installation.

    Using the Genesis G4, install the Hemloks.

18. Remove any excess adhesive.

19. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Front End Sheet Metal Repairs - Hood Hinge

Removal and Installation

Removal

1. The hood hinge is a category B repair.

E128354

2. NOTE: The hood hinge is manufactured from mild steel.

   The hood hinge is serviced as a separate bolt-on panel.

3. NOTE: The hood hinges deform during the pedestrian protection system deployment process and will need to be installed.

   The hood hinge is replaced in conjunction with:
   - Hood

4. WARNING: The hood hinge and its associated components form part of the pedestrian protection system, it is essential that any repair or replacement operations do not affect the safe working of the system.

   For additional information relating to the pedestrian safety system please see the following:
   For additional information, refer to: Pedestrian Protection System (501-20C Pedestrian Protection System, Description and Operation).

5. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

6. Remove the hood.
   For additional information, refer to: Hood (501-02 Front End Body Panels, Removal and Installation).

7. Disconnect the battery ground cable.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

8. Remove the cowl vent screen.
   For additional information, refer to: Windshield Wiper Motor - LHD RWD (501-16 Wipers and Washers, Removal and Installation).

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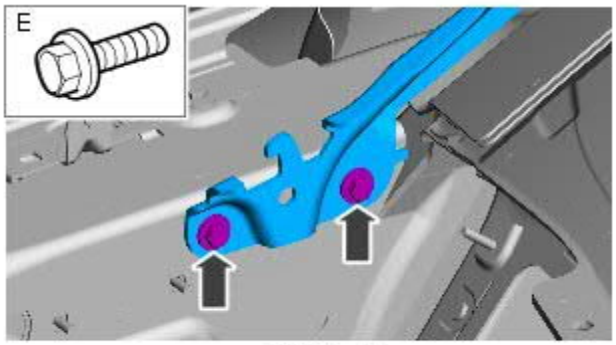
9. Remove the pedestrian protection hood actuator.
For additional information, refer to: Pedestrian Protection Hood Actuator LH (501-20C Pedestrian Protection System, Removal and Installation) / Pedestrian Protection Hood Actuator RH (501-20C Pedestrian Protection System, Removal and Installation).

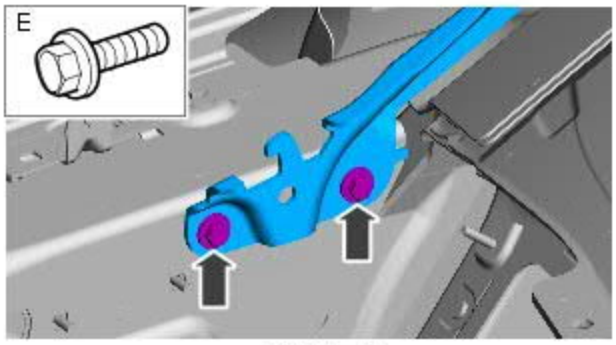


E128355

10. Remove the retaining bolts to the fender apron panel.

Installation

1. Offer up the hood hinge. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.



E128355

2. Tighten the hood hinge retaining bolts.

NOTE: Bolts are pre-coated to inhibit galvanic corrosion and are reusable only if the coating is undamaged.

- Tighten to 25 Nm.

3. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Front End Sheet Metal Repairs - Hood Latch Panel

Removal and Installation

Removal

1. The hood latch panel is a category B repair.

E128321

2. NOTE: The hood latch panel is manufactured from magnesium die cast alloy (AM60B).

   The hood latch panel is serviced as a separate bolt-on panel.

3. NOTE: It is possible to remove and install the hood latch panel by releasing the front fenders and carefully easing them aside. For method detail, refer to further instructions within this procedure.

   The hood latch panel is replaced in conjunction with:
   - Front bumper cover

4. WARNING: The hood latch panel and its associated components form part of the pedestrian protection system, it is essential that any repair or replacement operations do not affect the safe working of the system.

   For additional information relating to the pedestrian safety system please see the following:
   For additional information, refer to: Pedestrian Protection System (501-20C Pedestrian Protection System, Description and Operation).

5. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

6. Disconnect the battery ground cable.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

7. Remove both hood latch panel braces.

8. Remove both pedestrian impact sensors.
   For additional information, refer to: Pedestrian Impact Sensor (501-20C Pedestrian Protection System, Removal and Installation).

9. Remove both hood latches.

10. Remove the hood safety hook guide.

11. Remove both hood latch panel buffers.

12. Release the hood latch panel wiring harness and position it to one side.

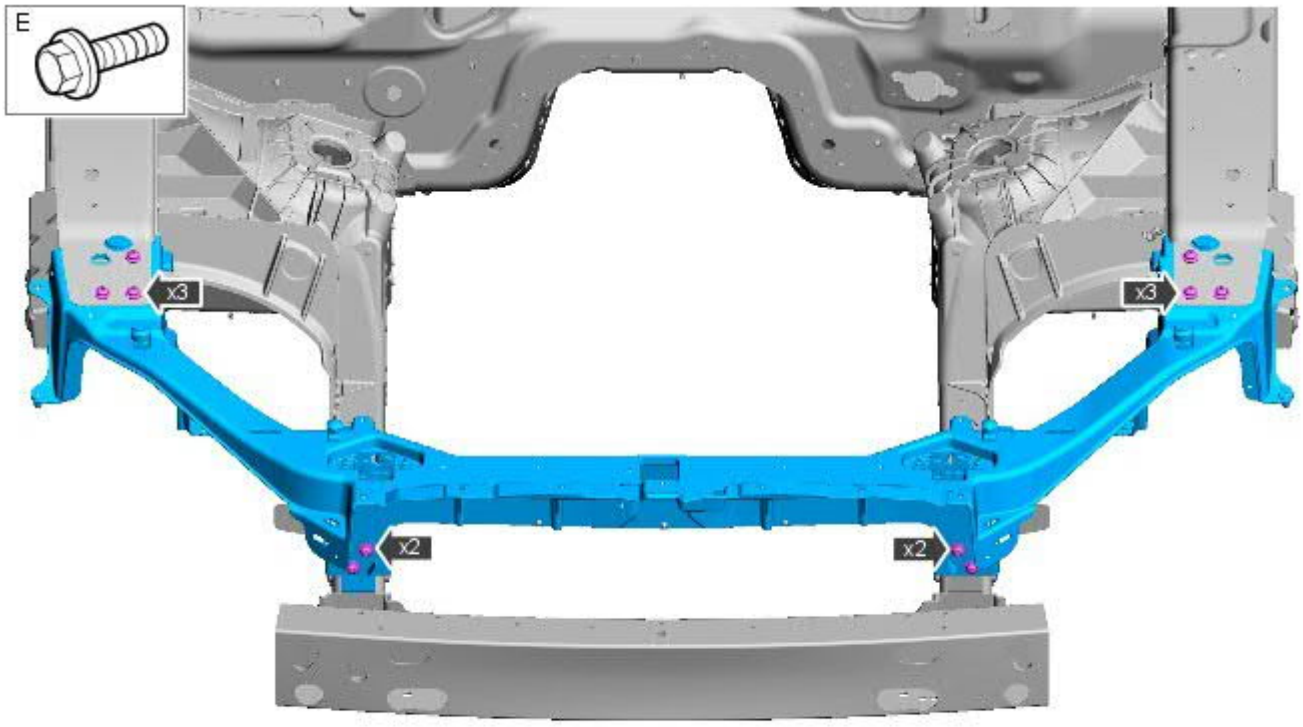
13. Release the air filter housing and move it aside for access.

14. Remove the RH and LH headlamp mounting brackets.

15. CAUTION: Protect the paintwork where the front fender meets the A-pillar and use care not to damage the front fenders or their noise, vibration and harshness (NVH) components.

    Release the RH and LH front fender upper fixings to allow the front fenders to be carefully eased aside.

16. Remove the hood latch panel.



E128322

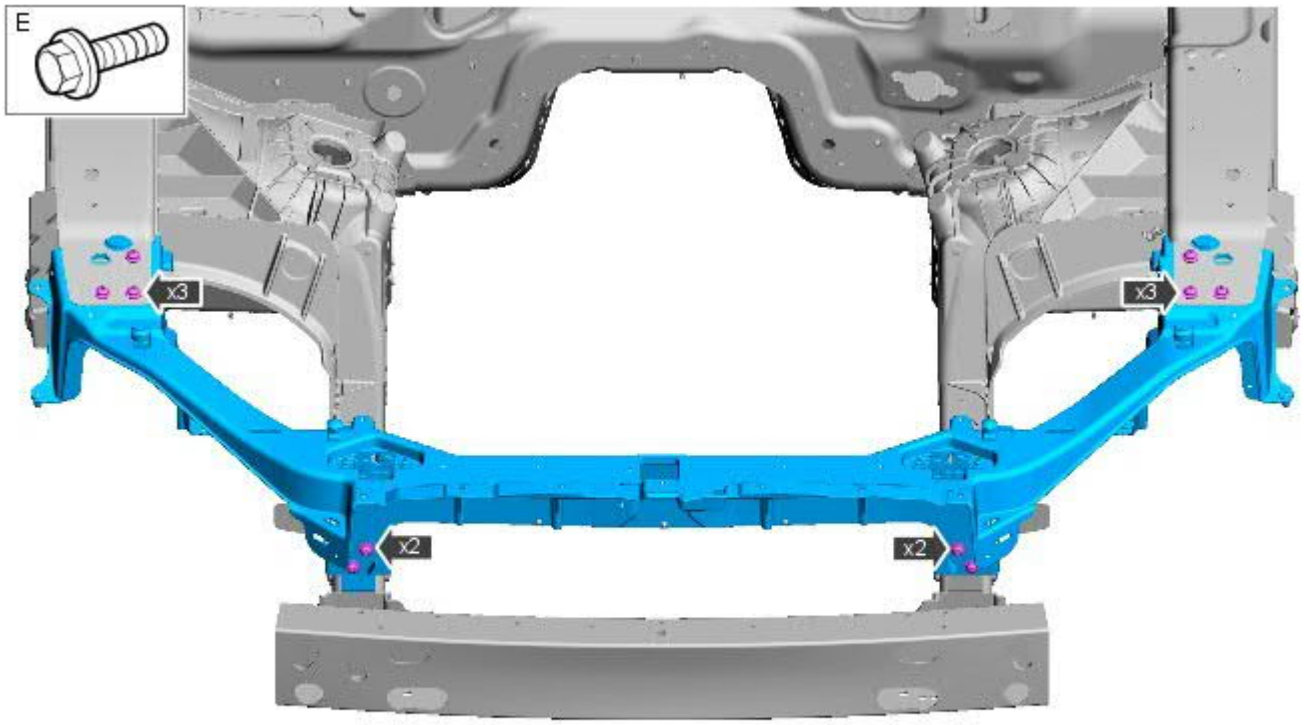
Installation

1. Offer up the hood latch panel. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

2. Install the hood latch panel.

NOTE: Bolts are pre-coated to inhibit galvanic corrosion and can be reused only if the coating is not damaged.

- Tighten to 25 Nm.



E128322

E

3. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Front End Sheet Metal Repairs - Hood Latch Panel Mounting Bracket

Removal and Installation

Removal

1. The hood latch panel mounting bracket is a category B repair.

E128319

2. NOTE: The hood latch panel mounting bracket is manufactured from aluminium alloy 6014-T6/7.

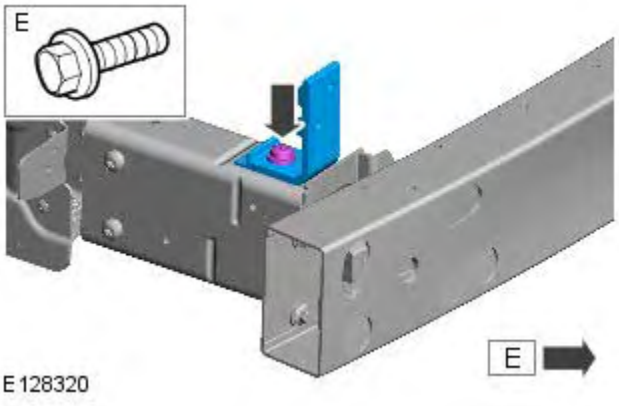
   The hood latch panel mounting bracket is serviced as a separate bolt-on panel.

3. The hood latch panel mounting bracket is replaced in conjunction with:
   - Front bumper cover
   - Hood latch panel
   - Front fender(s)

4. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) / Body Repairs (501-25A Body Repairs - General Information, Description and Operation) / Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) / Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

5. Disconnect the battery ground cable.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

6. Remove the hood latch panel.
   For additional information, refer to: Hood Latch Panel (501-27 Front End Sheet Metal Repairs, Removal and Installation).



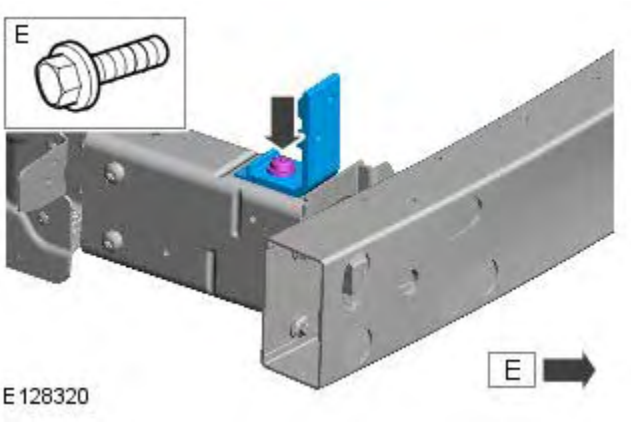
E128320

7. Remove the hood latch panel mounting bracket.

Installation

1. Loosely install the hood latch panel mounting bracket.

2. Offer up the hood latch panel. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.



3. With the hood latch panel correctly aligned, align and fully tighten the hood latch panel mounting bracket retaining bolt.

   NOTE: Bolts are pre-coated to inhibit galvanic corrosion and can be reused only if the coating is not damaged.

   - Tighten to 25 Nm.

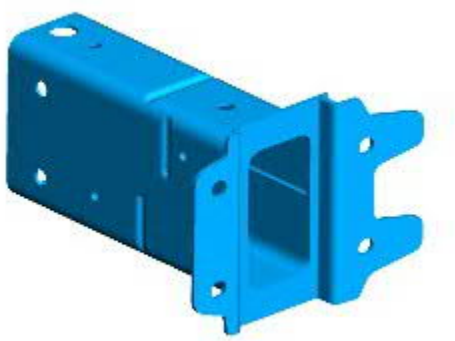
4. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Front End Sheet Metal Repairs - Side Member Deformation Element

Removal and Installation

Removal



E129613

1. NOTE: The side member deformation element is manufactured from aluminium alloy 6014-T6/7

   The side member deformation element is serviced as a separate bolt-on panel.

2. NOTE: Whenever there is damage to the side member deformation element, the front side member to deformation element bracket must always be checked for damage. Where damage is evident or suspected, a new bracket must be installed.

   The side member deformation element is replaced in conjunction with:
   - Front bumper cover
   - Front bumper
   - Hood latch panel
   - Hood latch panel mounting bracket

3. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

4. Remove the front bumper.
   For additional information, refer to: Front Bumper (501-19 Bumpers, Removal and Installation).

5. Remove the hood latch panel mounting bracket.
   For additional information, refer to: Hood Latch Panel Mounting Bracket (501-27 Front End Sheet Metal Repairs, Removal and Installation).

6. Remove the coolant expansion tank.
   For additional information, refer to: Coolant Expansion Tank (303-03A Engine Cooling - TDV6 3.0L Diesel, Removal and Installation) /
   Coolant Expansion Tank (303-03B Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

7. Remove the radiator.
   For additional information, refer to: Radiator (303-03A Engine Cooling - TDV6 3.0L Diesel, Removal and Installation) /
   Radiator - V8 S/C 5.0L Petrol (303-03B Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation) /
   Radiator - V8 5.0L Petrol (303-03B Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation) /

Radiator (303-03C Supercharger Cooling, Removal and Installation).

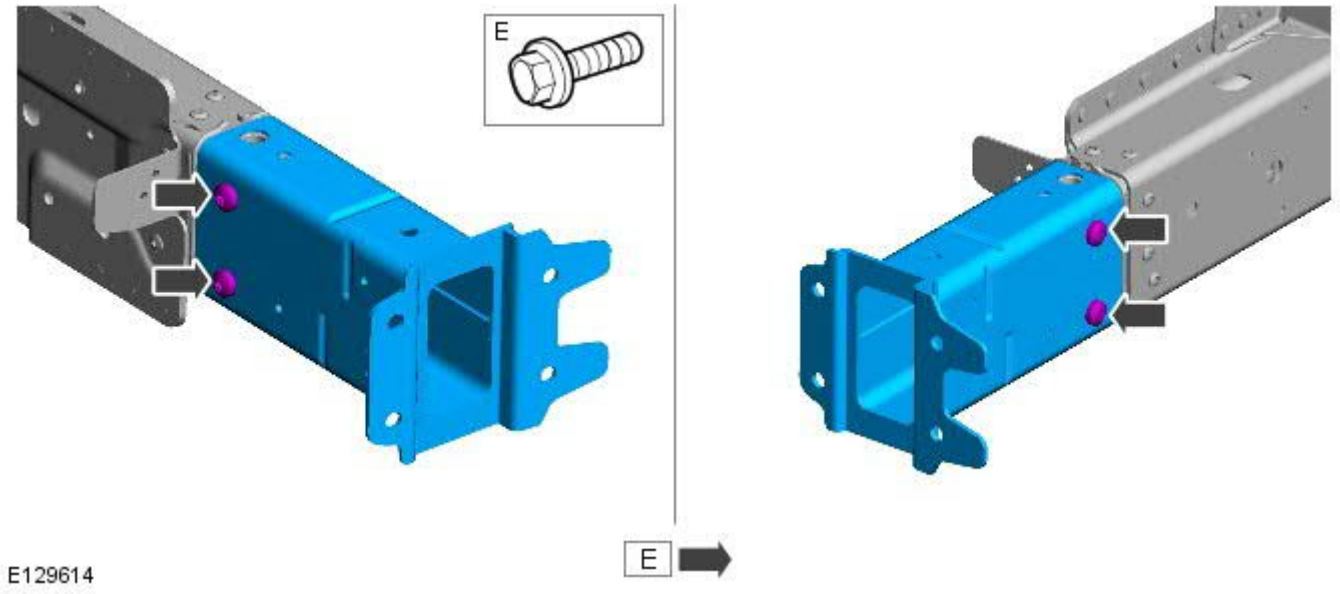
8. Remove the air cleaner(s).
   For additional information, refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel, Removal and Installation) / Air Cleaner LH (303-12B Intake Air Distribution and Filtering - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation) / Air Cleaner RH (303-12B Intake Air Distribution and Filtering - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

9. CAUTION: If both front subframe front retaining bolts are removed, the engine must be supported.

   Remove the front subframe front retaining bolts.

10. Release the side member deformation element wiring harness and position to one side.

11. Remove the bolts from the side member deformation element bracket.

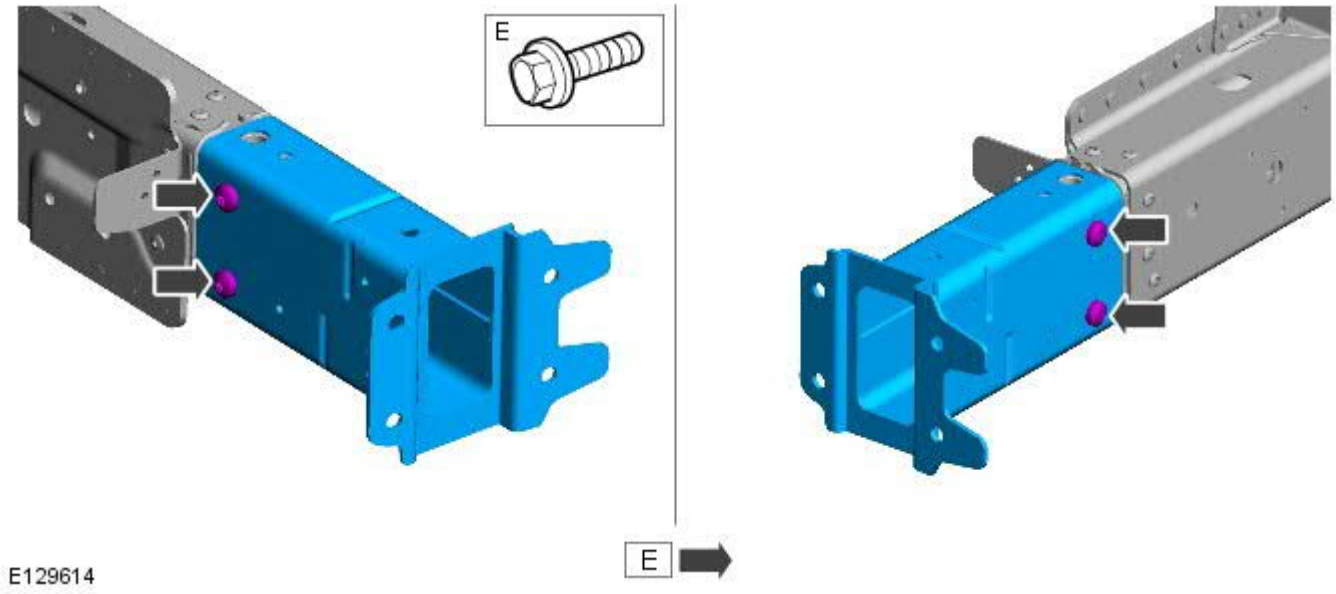


Installation

1. Offer up the side member deformation element. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

2. NOTE: Bolts are pre-coated to inhibit galvanic corrosion and can be re-installed only if the coating is not damaged.

   Install the bolts to the side member deformation element bracket.
   - Tighten to 62 Nm.



E129614

3. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Front End Sheet Metal Repairs - Suspension Top Mount

Removal and Installation

Removal

NOTE: The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being replaced in isolation, or, is being replaced in combination with panels other than those listed.

1. The suspension top mount is a category A repair.

2. NOTES:

   The suspension top mount is manufactured from high pressure die cast aluminium HPDC.

   The right-hand suspension top mount contains the stamped Vehicle Identification Number, (VIN). When a new right hand suspension top mount is requested it will be supplied stamped with the Vehicle Identification Number, (VIN). This operation is carried out within the Jaguar parts supply process.

   The suspension top mount is serviced as a separate riveted and bonded panel, including the hood latch panel mounting and the hood hinge mounting. It does not include the hood strut mounting panel. The suspension top mount is also part of the front side member and suspension top mount service panel.

3. In this procedure, to make sure that the vehicle is correctly aligned, it must be placed on an approved alignment jig.

4. The suspension top mount is replaced in conjunction with:
   - Front bumper cover
   - Front fender
   - Front door
   - Hood
   - Hood hinge
   - Hood latch panel
   - Fender apron panel
   - Fender apron panel closing panel.
   - Engine, transmission, front subframe and front suspension, as an assembly

5. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

6. Disconnect the battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

7. Remove the fender apron panel.
For additional information, refer to: Fender Apron Panel (501-27 Front End Sheet Metal Repairs, Removal and Installation).

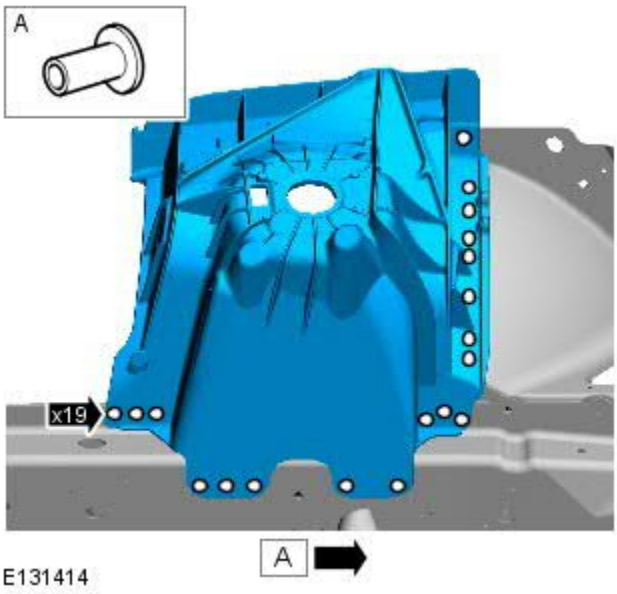
8. Remove the engine, transmission, front subframe and front suspension as an assembly.

9. If the right-hand suspension top mount is to be replaced, remove the side member heatshield.

10. Remove the insulating material from the outer bulkhead and transmission tunnel.

11. Remove the front suspension upper arm.
For additional information, refer to: Upper Arm LH - TDV6 3.0L Diesel (204-01 Front Suspension, Removal and Installation) / Upper Arm LH - V8 5.0L Petrol/V8 S/C 5.0L Petrol (204-01 Front Suspension, Removal and Installation) / Upper Arm RH - TDV6 3.0L Diesel (204-01 Front Suspension, Removal and Installation) / Upper Arm RH - V8 5.0L Petrol/V8 S/C 5.0L Petrol (204-01 Front Suspension, Removal and Installation).

12. Remove any remaining miscellaneous components from the repair area as necessary.

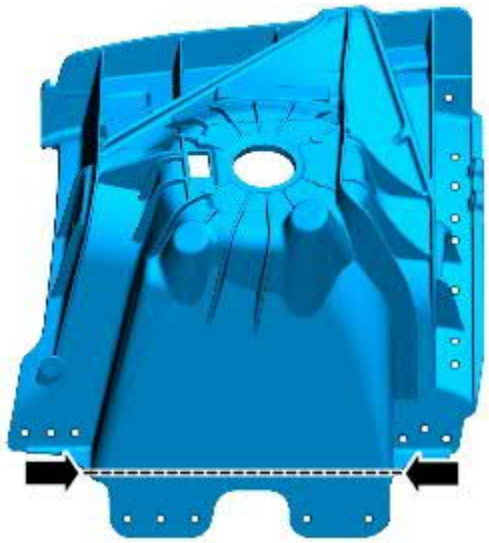


13. Using a combination of the ESN50 and a 6.5mm Cryobit drill bit, remove the self piercing rivets.

14. NOTE: Retain the old panel as it will be used as a template.

Separate the joints and remove the old panel.

15. Cut a section from the old panel to be used as a template, as indicated.



E131415

Installation

1. Remove rivet remnants.

2. Dress flanges where necessary.

3. Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.

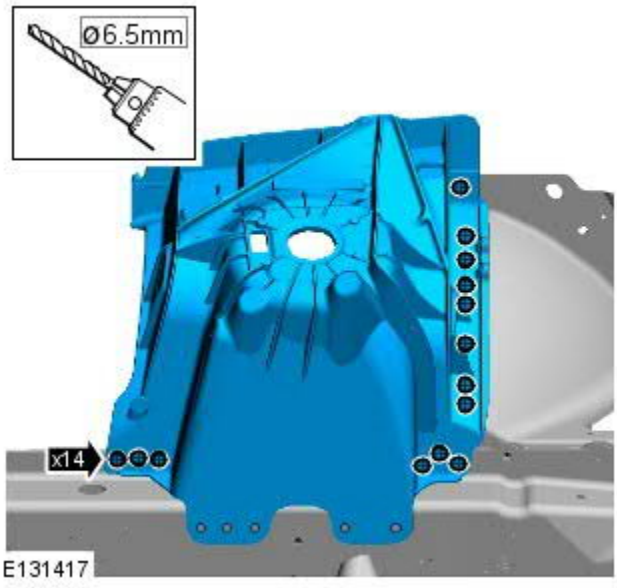
4. Remove the new panel.

5. Clamp the template to the new panel and using a 6.5mm Cryobit drill bit, drill holes through the template into the new panel, ready for Hemloks to be installed.

E131416

6. Debur the drilled holes.

7. Offer up the new panel and clamp into position.



8. Using a 6.5mm Cryobit drill bit, drill holes at the points where Hemloks are to be installed.

9. Remove the new panel.

10. Debur the drilled holes.

11. Using a Roloc fine bristle disc, clean and prepare the panel surfaces.

12. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

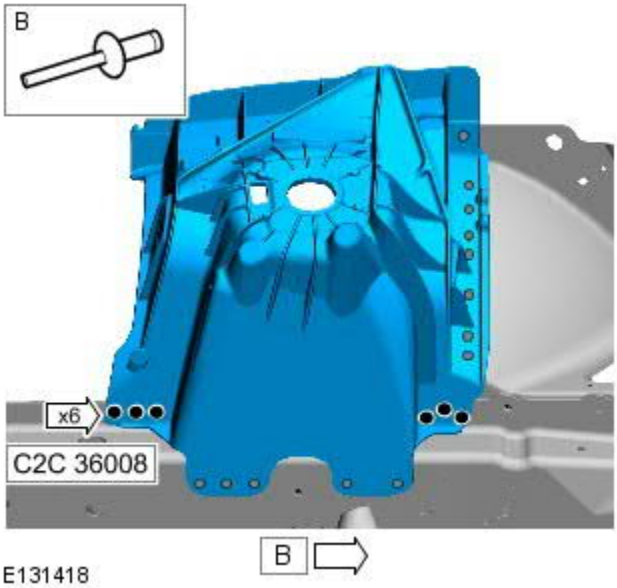
13. Apply the coupling agent where 3M 8115 adhesive is to be applied and allow to dry.

14. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes.

    Apply a 5mm zig zag bead of 3M 8115 adhesive to the body joints.

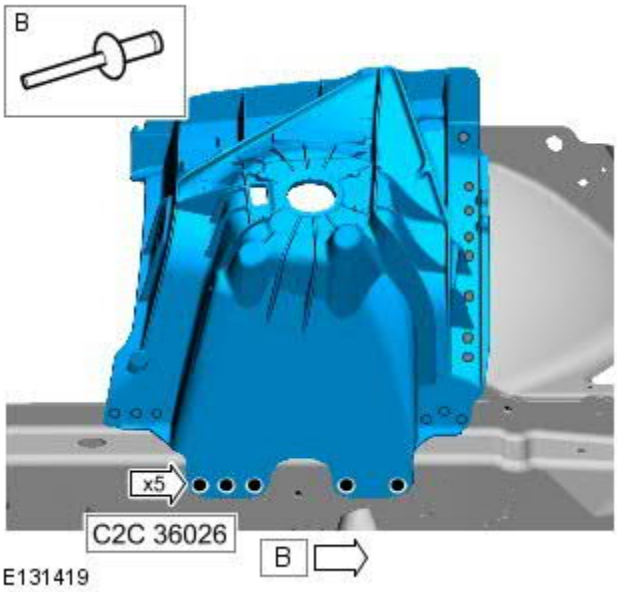
15. Offer up the new panel and clamp into position.

16. Using the Genesis G4, install the Hemloks.

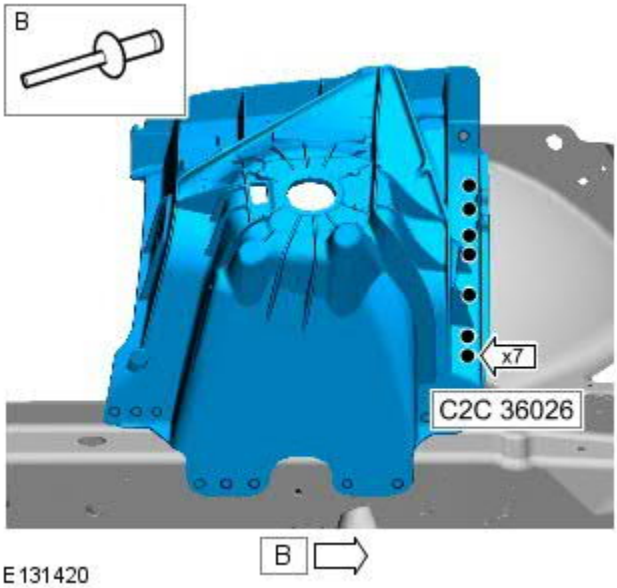


E131418

17. Using the Genesis G4, install the Hemloks.

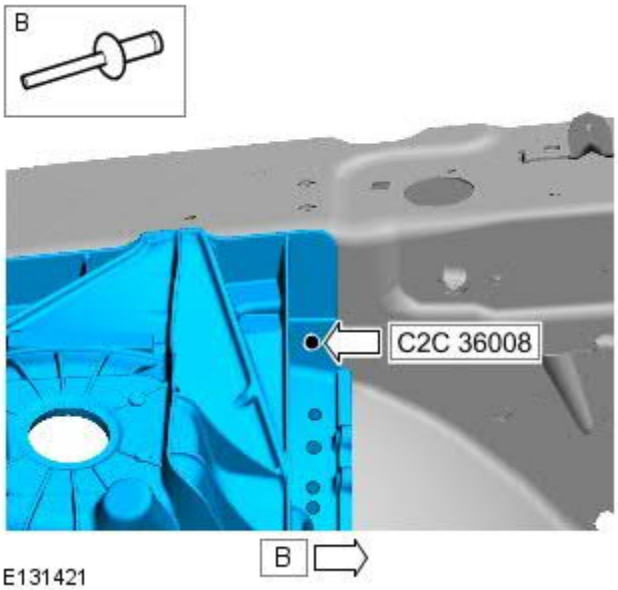


E131419



E131420

18. Using the Genesis G4, install the Hemloks.



E131421

19. NOTE: This Hemlok is installed following the installation of the fender apron panel and fender apron panel closing panel.

    Following the installation of the fender apron panel and the fender apron panel closing panel, install the Hemlok.

20. Remove any excess adhesive.

21. Make sure that any open or exposed panel joints are suitably sealed following this procedure.

22. The installation of associated panels and components is the reversal of removal procedure.

Published: 19-Dec-2012

Roof Sheet Metal Repairs - Roof

Description and Operation

Roof service panels

Item	Description
1	Roof panel

Time schedules, roof panels

The following information shows the total time taken to replace single panels. This time includes removal of Mechanical, Electrical and Trim, (MET), items, plus paint times based on Metallic Clear Over Base Paint, (blends for adjacent panels not included).

The times shown are to be used as a guide only.

Single panel times

Panel Description	Hours
Roof panel	**19.20**

Published: 11-May-2011

Roof Sheet Metal Repairs - Roof Panel

Removal and Installation

Removal

1. The roof panel is a category A repair.

E130313

2. NOTE: The roof panel is manufactured from aluminium alloy 6111-T4.

   The roof panel is serviced as a separate riveted and bonded panel.

3. The roof panel is replaced in conjunction with:

   NOTE: The headliner is released and lowered only and not removed from the vehicle.

   - Headliner
   - Roof opening panel frame
   - Rear window glass

4. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

5. Disconnect the battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

6. Remove the roof opening panel frame.
   For additional information, refer to: Roof Opening Panel Frame (501-17 Roof Opening Panel, Removal and Installation).

7. Remove the rear window glass.
   For additional information, refer to: Rear Window Glass (501-11 Glass, Frames and Mechanisms, Removal and Installation).

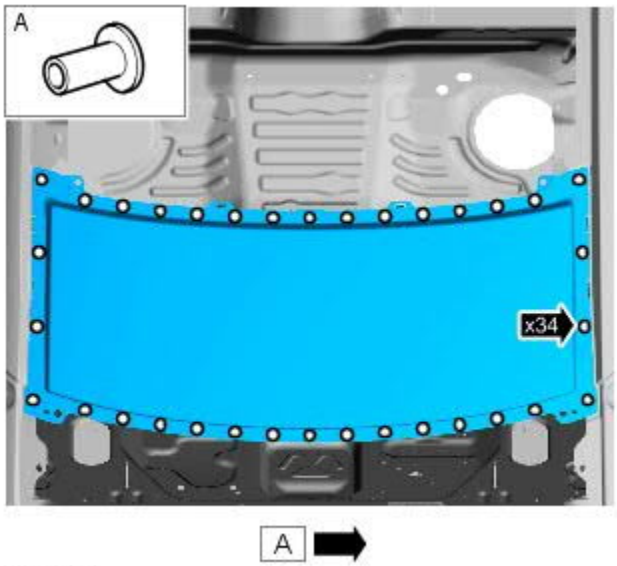
8. Remove the right-hand and left-hand side air curtain module(s).
   For additional information, refer to: Side Air Curtain Module (501-20B Supplemental Restraint System, Removal and Installation).

9. Remove the right-hand and left-hand roof mouldings.

10. Remove any electrical components in the local area of repair to prevent

damage.

11. Release and position the roof panel wiring harness to one side.



E130314

12. NOTE: Prior to removal, mark the position of the roof panel within its aperture for ease of alignment on installation.

    Using the ESN50, remove the self piercing rivets.

13. Separate the joints and remove the old panel.

Installation

1. Remove rivet remnants.

2. Dress flanges where necessary.

3. Using a Roloc fine bristle disc, clean and prepare the panel surfaces, removing any adhesive residue.

4. NOTE: Use the marks made prior to removal to aid alignment.

   Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.

E130317

5. Using a 6.5mm Cryobit drill bit, drill holes through the old panels into the new panel, at the points where Hemloks are to be installed.

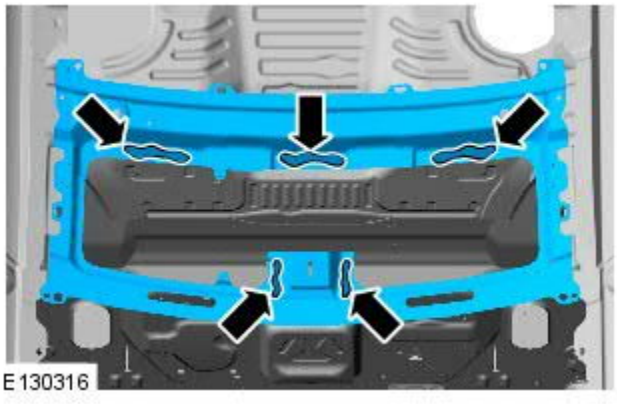
6. Remove the new panel.

7. Deburr the drilled holes.

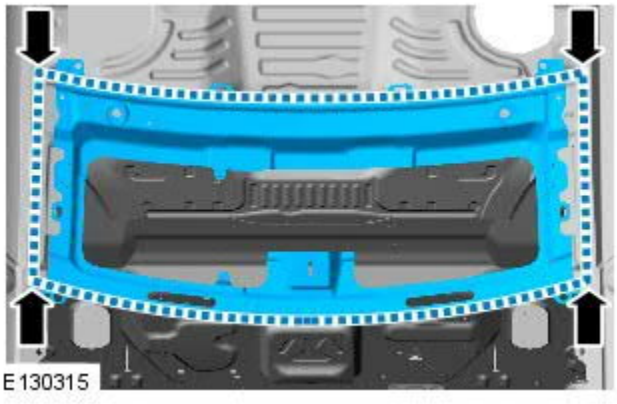
8. Using a Roloc fine bristle disc, clean and prepare the panel surfaces.

9. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

10. Apply the coupling agent where 3M 8115 adhesive is to be applied and allow to dry.



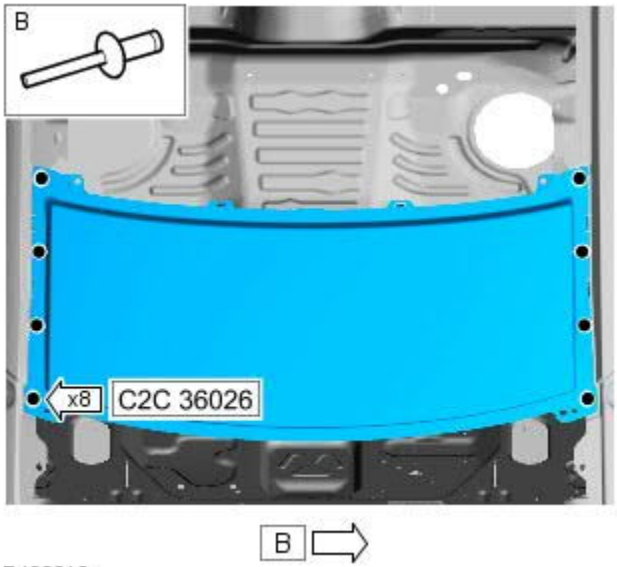
11. Apply semi-rigid sealer to the body at the points indicated.



12. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes.

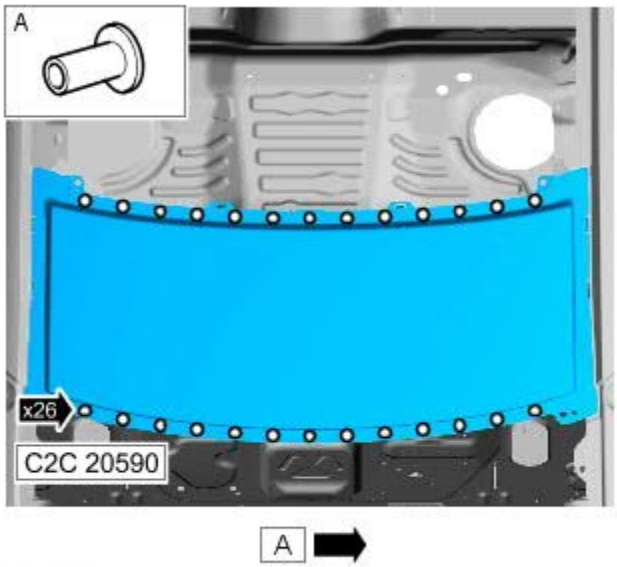
    Apply a 5mm zig zag bead of 3M 8115 adhesive to the body joints.

13. Offer up the new panel, align and clamp into position.



E130318

14. Using the Genesis G4, install the Hemloks.



E130319

15. Using the ESN50, install the self piercing rivets.

16. Remove any excess adhesive.

17. Make sure that any open or exposed panel joints are suitably sealed following this procedure.

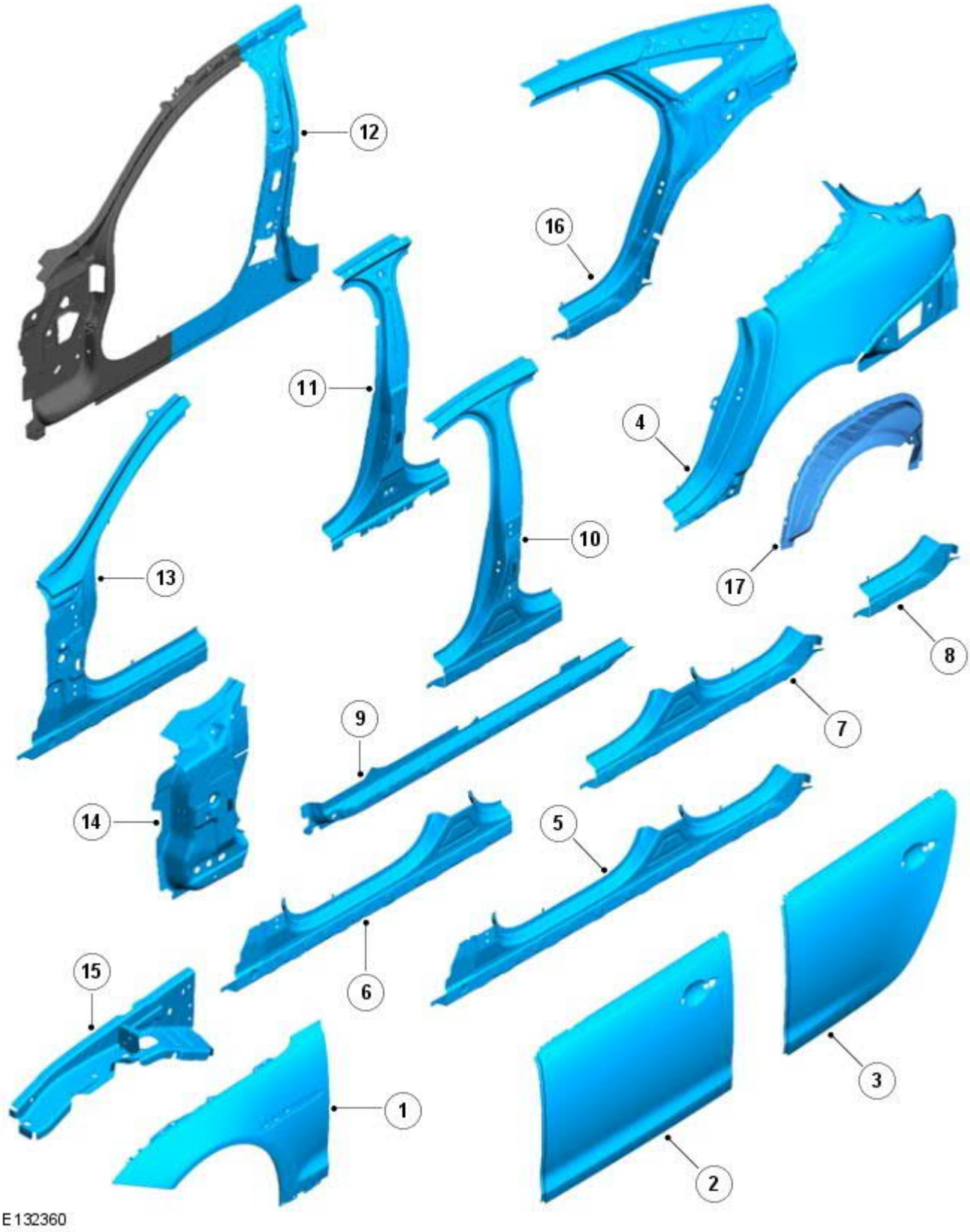
18. The installation of associated panels and components is the reversal of removal procedure.

Published: 19-Dec-2012

Side Panel Sheet Metal Repairs - Side Panel Sheet Metal

Description and Operation

Side service panels



NOTE: The illustration may indicate either hand of the service panel, the opposite hand will be similar.

Item	Description
1	Front fender
2	Front door
3	Rear door
4	Quarter panel
5	Rocker panel
6	Rocker panel front section (cut from rocker panel)
7	Rocker panel rear section (cut from rocker panel)
8	Rocker panel dogleg section (cut from rocker panel)
9	Rocker panel inner reinforcement
10	Rocker panel and B-pillar outer panel
11	B-pillar reinforcement
12	B-pillar inner panel
13	A-pillar outer panel
14	A-pillar reinforcement
15	Fender apron panel closing panel
16	Inner quarter panel rear section
17	Rear wheelhouse outer

Time schedules, side panels

The following information shows the total time taken to install single panels. This time includes removal of Mechanical, Electrical and Trim, (MET), items, plus paint times based on Metallic Clear Over Base Paint, (blends to adjacent panels are not included).

The times shown are to be used as a guide only.

Single panel times

Panel Description	Hours
A Pillar Outer Panel	**23.90**
A Pillar Reinforcement	**TBC**
Rocker Panel & B Pillar Outer Panel	**39.80**
B Pillar Reinforcement	**4.20**
Rocker Panel	**18.60**
Rocker Panel Inner Reinforcement	**TBC**

Published: 11-May-2011

Side Panel Sheet Metal Repairs - A-Pillar Outer Panel

Removal and Installation

Removal

NOTE: The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being replaced in isolation, or, is being replaced in combination with panels other than those listed.

1. The A-pillar outer panel is a category A repair.

2. NOTE: The A-pillar outer panel is manufactured from aluminium alloy 6111-T4.

   The A-pillar outer panel is serviced as a separate welded, bonded and riveted panel.

3. The A-pillar outer panel is replaced in conjunction with:
   - Front bumper cover
   - Hood
   - Hood hinge
   - Front door
   - Front fender
   - Headliner
   - Windshield glass remove and install
   - Instrument panel upper section

4. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) / Body Repairs (501-25A Body Repairs - General Information, Description and Operation) / Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) / Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

5. Disconnect the battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

6. Disconnect the generator electrical connectors.

7. Remove the front fender.
   For additional information, refer to: Front Fender (501-27 Front End Sheet Metal Repairs, Removal and Installation).

8. Remove the hood hinge.
For additional information, refer to: Hood Hinge (501-27 Front End Sheet Metal Repairs, Removal and Installation).

9. If the passenger side A-pillar outer panel is to be installed, remove the hood release cable.

10. Remove the instrument panel upper section.
For additional information, refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).

11. If the drivers side A-pillar outer panel is to be installed, remove the pedal box.

12. If the drivers side front side member and suspension top mount assembly is to be replaced, remove the brake master cylinder and brake booster.
For additional information, refer to: Brake Master Cylinder (206-06 Hydraulic Brake Actuation, Removal and Installation) / Brake Booster (206-07 Power Brake Actuation, Removal and Installation).

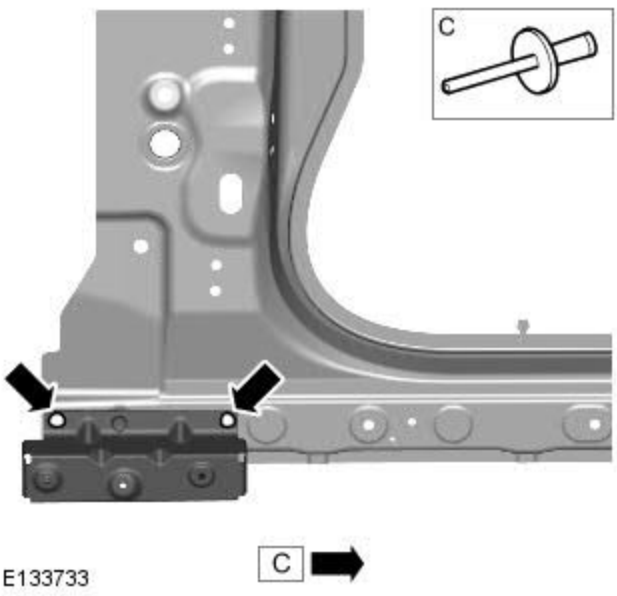
13. Remove the headliner.
For additional information, refer to: Headliner (501-05 Interior Trim and Ornamentation, Removal and Installation).

14. Remove the front seat.
For additional information, refer to: Front Seat (501-10, Removal and Installation).

15. Remove the side air curtain module.
For additional information, refer to: Side Air Curtain Module (501-20B Supplemental Restraint System, Removal and Installation).

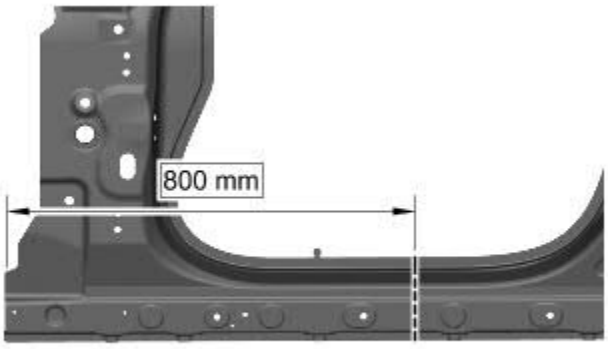
16. Remove any remaining miscellaneous components from the repair area as necessary.

17. Release the A-pillar outer panel wiring harness and position it to one side.



18. NOTE: If the front fender lower mounting bracket is undamaged, retain for re-use on installation.

Remove the monobolts as indicated.



E133734

19. CAUTION: Care should be taken not to cut through into inner panels or reinforcements.

NOTE: If necessary, cut locations can be adjusted to avoid self piercing rivets.

Measure, mark and cut the old panel as indicated.

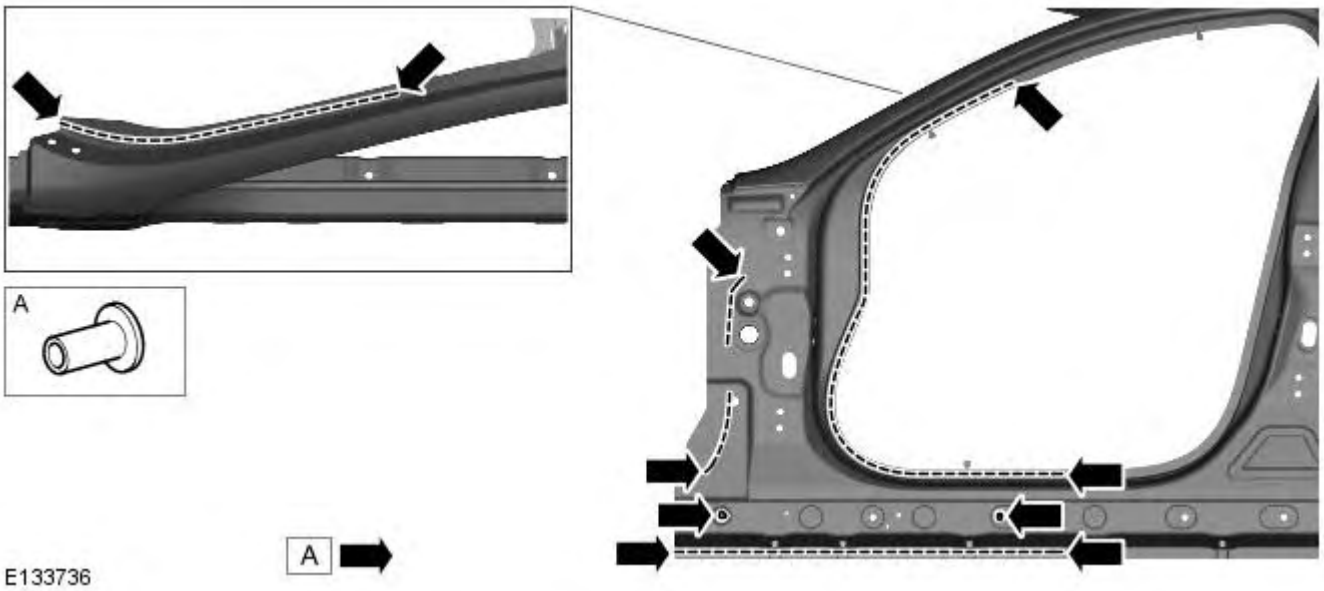
E133735

20. CAUTION: Care should be taken not to cut through into inner panels or reinforcements.

NOTE: If necessary, cut locations can be adjusted to avoid self piercing rivets.

Measure, mark and cut the old panel as indicated.

21. Using a combination of the ESN50 and a 6.5mm Cryobit drill bit, remove the self piercing rivets in the areas indicated.



E133736

22. NOTES:

    Retain the old panel remnant as it will be used in installation.

    Remove and retain the noise, vibration and harshness (NVH) component, if it is to be reused.

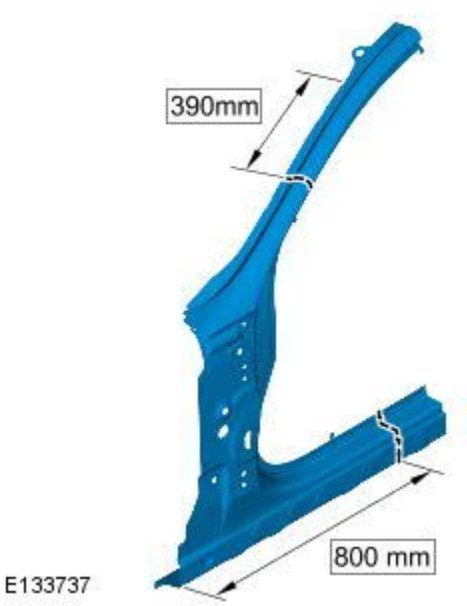
    Separate the joints and remove the old panel, also releasing the NVH components.

Installation

1. Remove rivet remnants.

2. Dress flanges where necessary.

3. Using a Roloc fine bristle disc, clean and prepare the panel surfaces, also removing any adhesive residue.



4. NOTE: Retain the remnants of the new panel as these may be used for backing strips on installation.

   Using the old panel for reference, measure, mark and cut the new A-pillar outer panel at the points where the MIG butt joints are to be made as indicated.

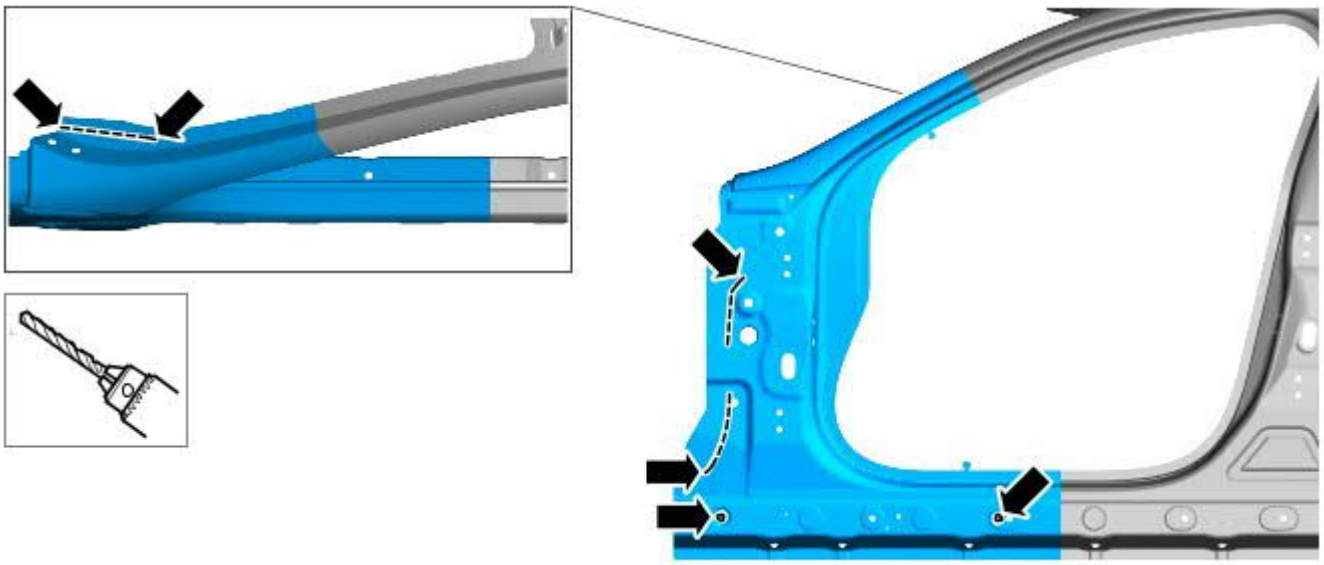
5. Debur the new panel.

6. Trim, clean and prepare the lower NVH component.

7. Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.

8. NOTE: The Hemloks will be installed adjacent to the original self piercing rivet location holes.

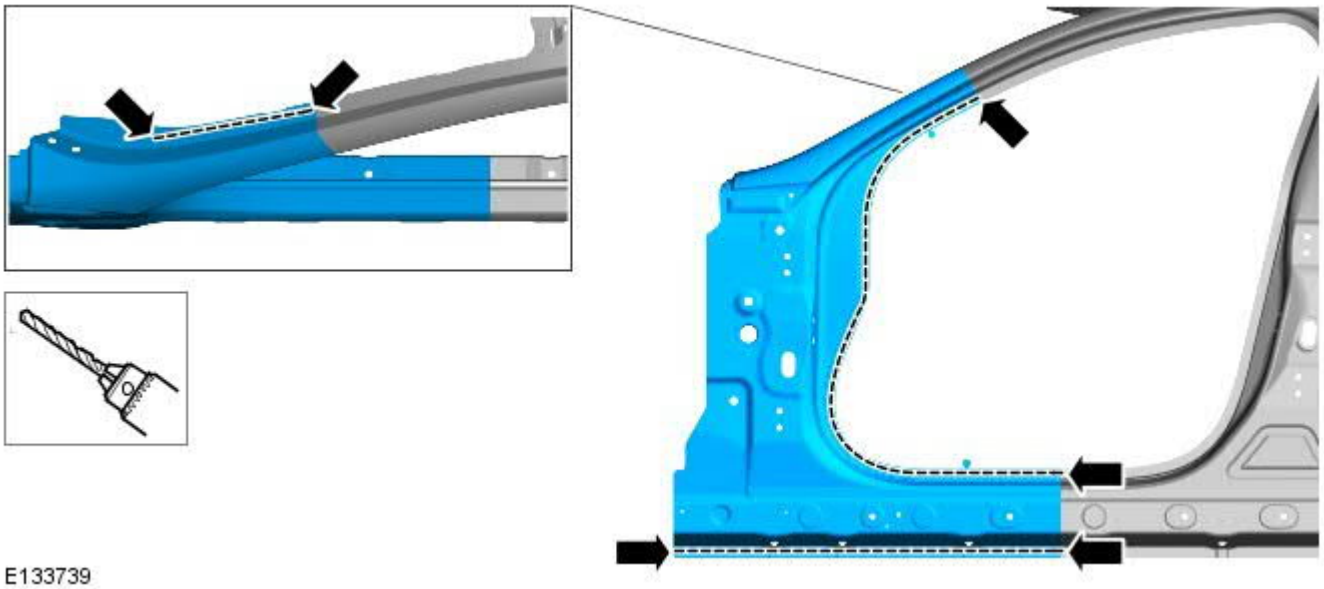
   Using the old panel for reference, measure the positions of the removed self piercing rivet locations and mark these onto the new panel. Using a 6.5mm Cryobit drill bit, drill holes adjacent to these locations at the points where Hemloks are to be installed as indicated.



E133738

9. NOTE: Replacement self piercing rivets should be installed adjacent to the removed originals wherever possible. If the pitch between the centres of removed self piercing rivets is less than 25mm, Hemloks should be installed in the hole created by the removed self piercing rivet(s).

   Where the pitch of the removed self piercing rivets is 25mm or less, or there is no access for the ESN50, use a 6.5mm Cryobit drill bit to drill through the removed self piercing rivet holes on the vehicle, into the new panel. Hemloks will be installed in these locations when the new A-pillar outer panel is installed.



E133739

10. Remove the new panel.

11. NOTE: The backing plates should be an interference fit.

    Fabricate backing plates from the old A-pillar outer panel remnant. Debur and offer up the backing plates to the vehicle. If correct proceed to next step, if not, rectify and recheck before proceeding.

12. Remove the backing plates.

13. Fabricate run-on/run-off tabs from the old A-pillar outer panel remnant.

14. Debur the run-on/run-off tabs.

15. Using a Roloc fine bristle disc, clean and prepare the backing plates and run on/run off tabs.

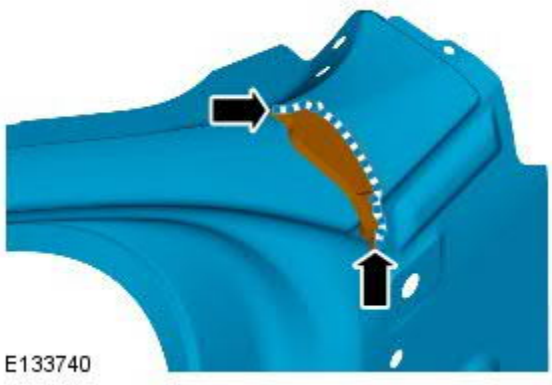
16. Using a Roloc fine bristle disc, clean and prepare the old and new panel joint surfaces.

17. NOTE: The backing plates are installed with an interference fit.

    Install and align the backing plates to the vehicle.

18. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

19. Apply the coupling agent where 3M 8115 adhesive is to be applied and allow to dry.

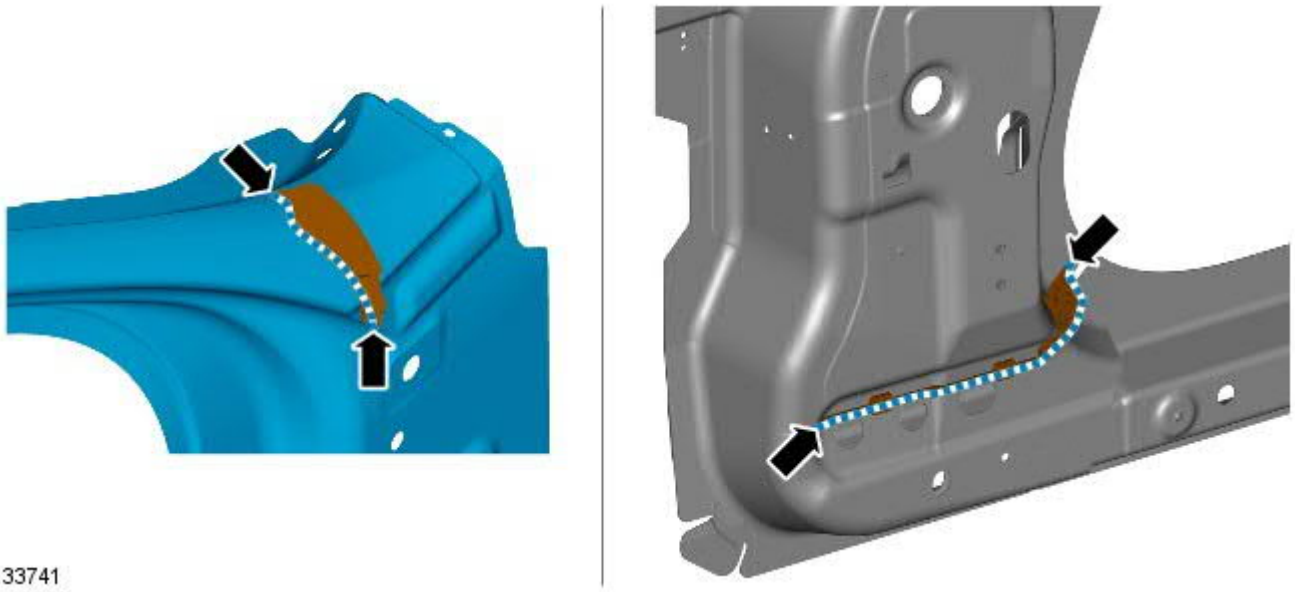


20. NOTE: Do not apply semi-rigid sealer in the areas where 3M 8115 adhesive is to be applied.

    Apply semi-rigid sealer to the upper NVH component and install to the new A-pillar outer panel as indicated.

21. NOTE: Do not apply semi-rigid sealer in the areas where 3M 8115 adhesive is to be applied.

    Apply semi-rigid sealer to the upper and lower NVH components.



E133741

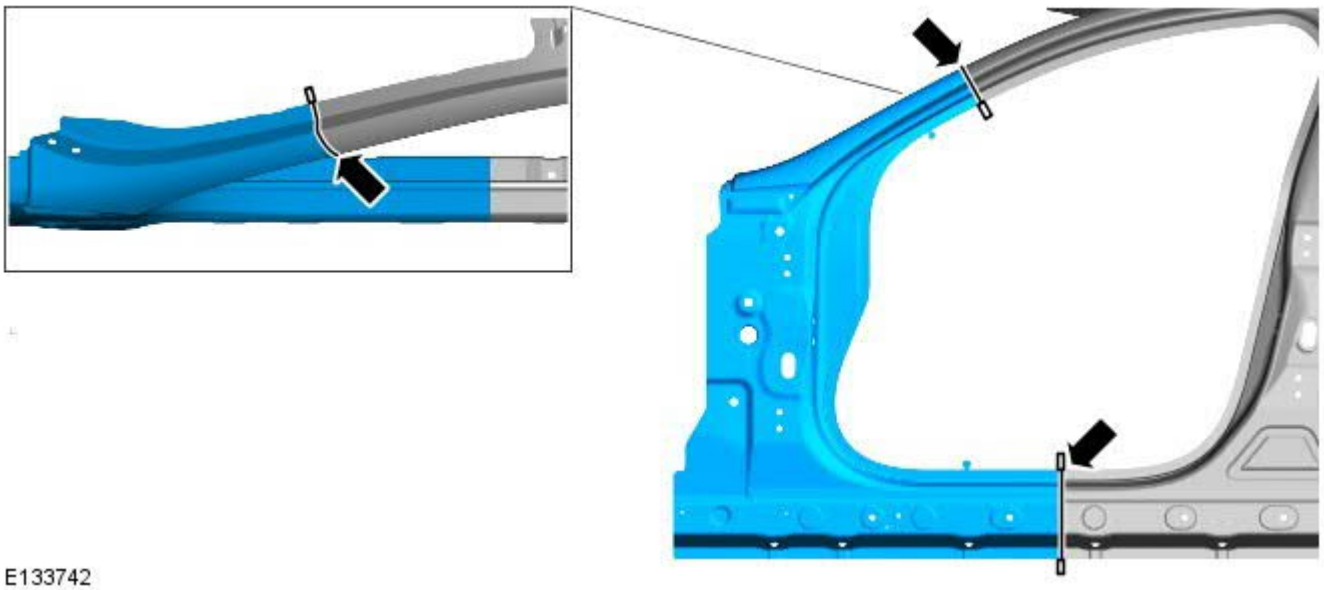
22. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes. Do not apply adhesive in the vicinity of the MIG welds.

    Apply a 5mm zig zag bead of 3M 8115 adhesive to all joints.

23. Offer up the new panel, align and clamp into position.

24. Tack weld the run-on/run-off tabs to all MIG butt joints.

25. MIG weld the MIG butt joints.

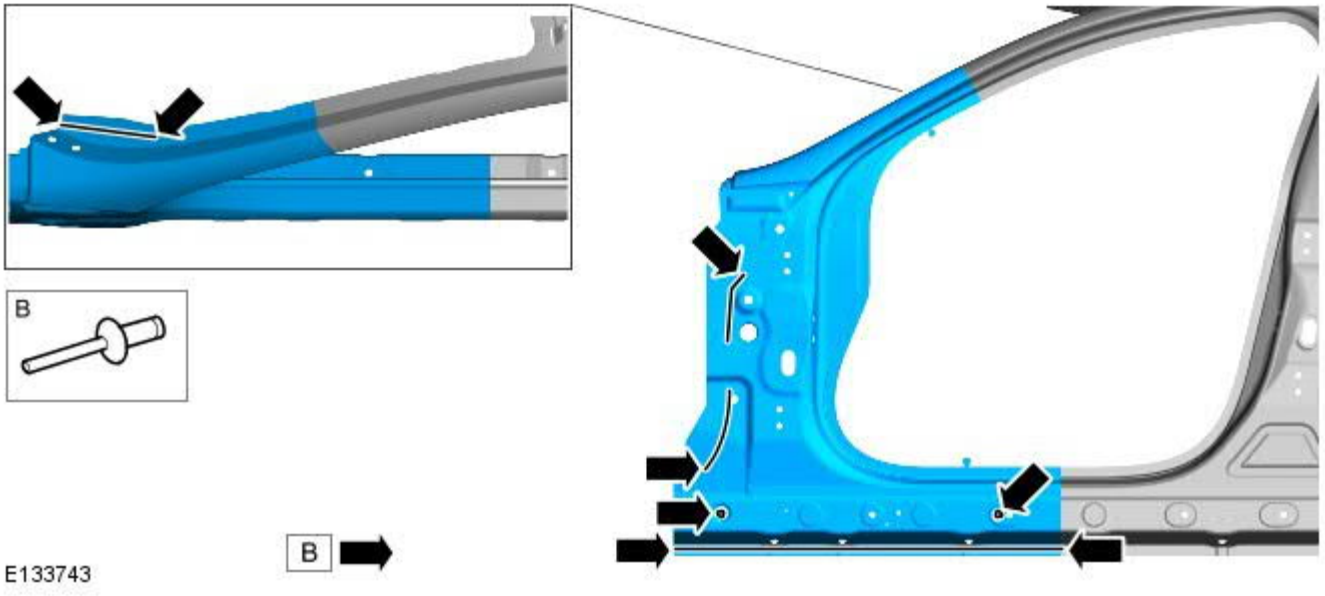


E133742

26. NOTE: It is important to identify and select the correct size fixing by referencing the following table prior to installation.

    Using the Genesis G4, install any remaining Hemloks in the areas as indicated.

Hemlok Rivet Size	Material Stack	Jaguar Service Number
6.4mm x 13.7mm	1.5mm - 3.0mm	C2S 45252
6.4mm x 15.0mm	2.8mm - 4.8mm	C2C 36006
6.4mm x 17.0mm	4.8mm - 6.8mm	C2C 36026
6.4mm x 19.0mm	6.8mm - 8.8mm	C2C 36024
6.4mm x 20.0mm	7.5mm - 9.5mm	C2C 22613
6.4mm x 21.0mm	8.8mm - 10.8mm	C2C 36008



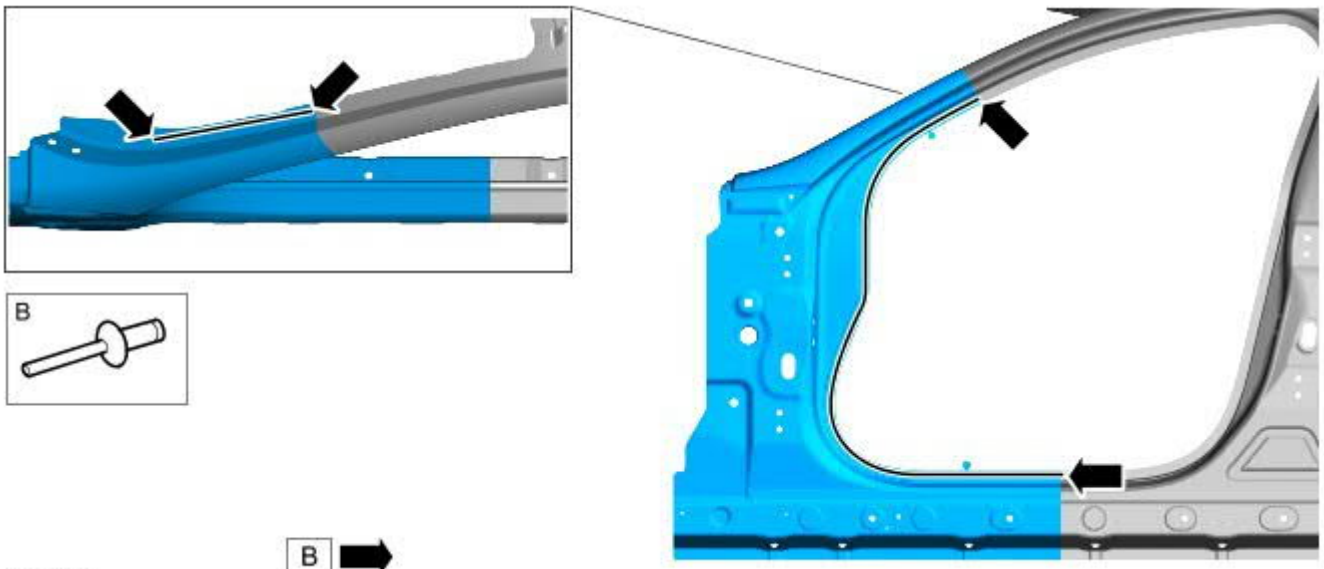
27. NOTES:

Replacement self piercing rivets should be installed adjacent to the removed originals wherever possible. If the pitch between the centres of removed self piercing rivets is less than 25mm, Hemloks should be installed in the hole created by the removed self piercing rivet(s).

It is important to identify and select the correct size fixing by referencing the following table prior to installation.

Using the Genesis G4, install any remaining Hemloks in the areas as indicated.

Hemlok Rivet Size	Material Stack	Jaguar Service Number
6.4mm x 13.7mm	1.5mm - 3.0mm	C2S 45252
6.4mm x 15.0mm	2.8mm - 4.8mm	C2C 36006
6.4mm x 17.0mm	4.8mm - 6.8mm	C2C 36026
6.4mm x 19.0mm	6.8mm - 8.8mm	C2C 36024
6.4mm x 20.0mm	7.5mm - 9.5mm	C2C 22613
6.4mm x 21.0mm	8.8mm - 10.8mm	C2C 36008



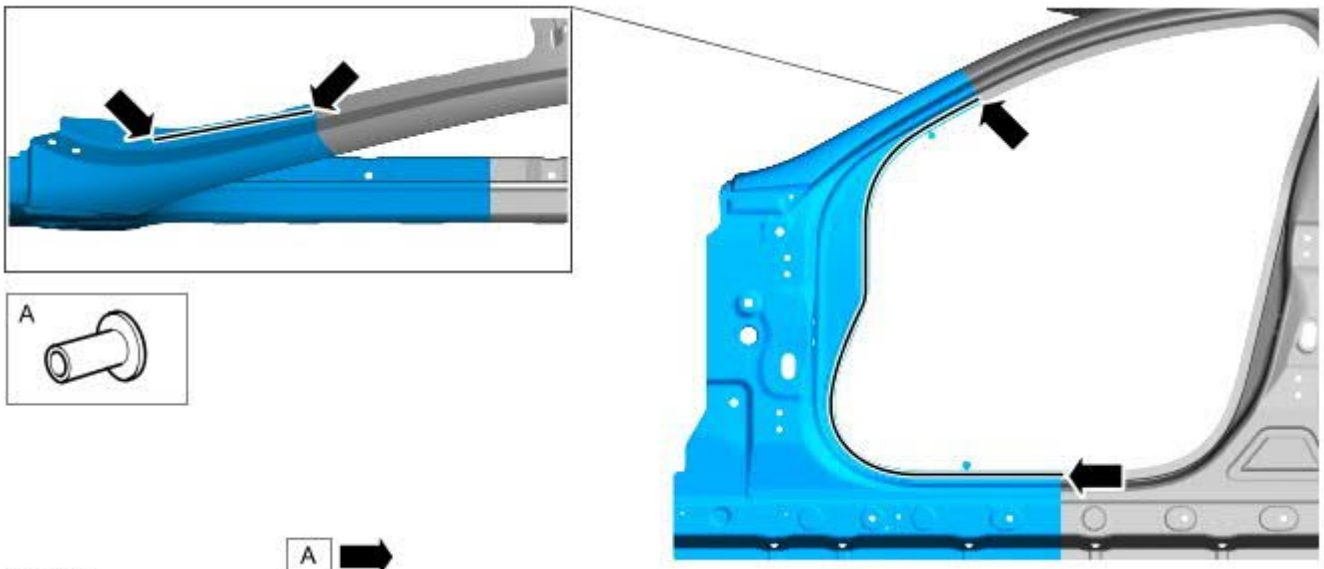
28. NOTES:

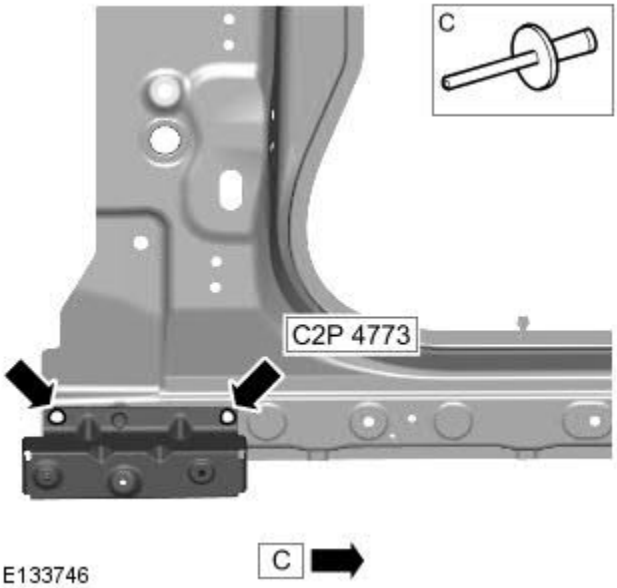
Replacement self piercing rivets should be installed adjacent to the removed originals wherever possible. If the pitch between the centres of removed self piercing rivets is less than 25mm, Hemloks should be installed in the hole created by the removed self piercing rivet(s).

It is important to identify and select the correct size fixing by referencing the following table prior to installation.

Using the ESN50, install the self piercing rivets in the areas as indicated.

Self Piercing Rivet Size	Material Stack	Jaguar Service Number
4.8mm x 5.0mm	3.0mm	C2C 20589
4.8mm x 7.0mm	4.0mm	C2C 20590
4.8mm x 8.0mm	5.0mm	C2C 20591
4.8mm x 8.5mm	5.5mm	C2C 20592
4.8mm x 9.0mm	6.0mm	C2C 20593
4.8mm x 9.5mm	6.5mm	C2C 20594
4.8mm x 11.0mm	8.0mm	C2C 20595





29. Using the Genesis G4, install the Monobolts to the front fender lower mounting bracket as indicated.

30. Remove any excess adhesive.

31. Remove the run-on/run-off tabs.

32. Dress the welded joints.

33. Carry out a non destructive crack inspection on the MIG butt joints. If correct proceed to next step, if not, rectify and recheck before proceeding.

34. Make sure that any open or exposed panel joints are suitably sealed following this procedure.

35. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Side Panel Sheet Metal Repairs - A-Pillar Reinforcement

Removal and Installation

Removal

NOTE: The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being replaced in isolation or, is being replaced in combination with panels other than those listed.

1. The A-pillar reinforcement is a category A repair.

E133169

2. NOTE: The A-pillar reinforcement is manufactured from aluminium alloy 5754-NG.

   The A-pillar reinforcement is serviced as a separate rivetted and bonded panel, it includes its inner reinforcements.

3. In this procedure, to make sure the vehicle is correctly aligned, it must be placed on an approved alignment jig.

4. The A-pillar reinforcement is replaced in conjunction with:
   - Front bumper cover
   - Hood
   - Hood hinge
   - Front door
   - Front fender
   - Hood latch panel
   - A-pillar outer panel
   - Fender apron panel closing panel
   - Headliner
   - Windshield glass remove and install
   - Instrument panel upper section

5. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

6. Disconnect the battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

7. Remove the fender apron panel closing panel.
For additional information, refer to: Fender Apron Panel Closing Panel (501-27 Front End Sheet Metal Repairs, Removal and Installation).

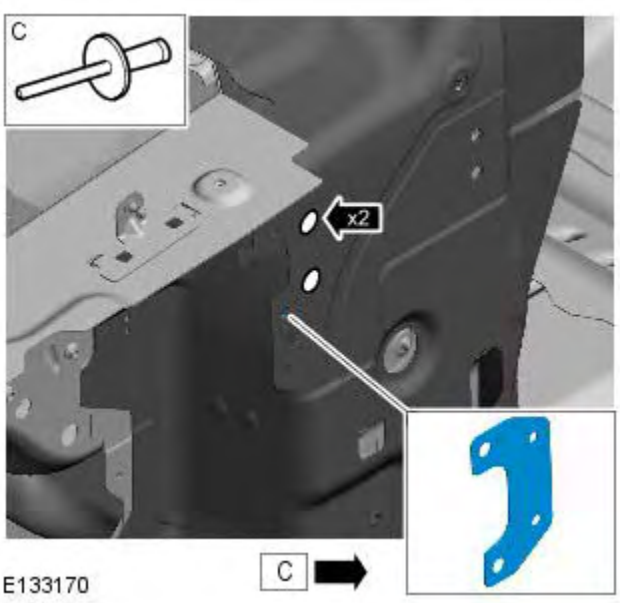
8. Remove the A-pillar outer panel.
For additional information, refer to: A-Pillar Outer Panel (501-29 Side Panel Sheet Metal Repairs, Removal and Installation).

9. Remove the hood hinge.
For additional information, refer to: Hood Hinge (501-27 Front End Sheet Metal Repairs, Removal and Installation).

10. Release the A-pillar wiring harness and position it to one side.

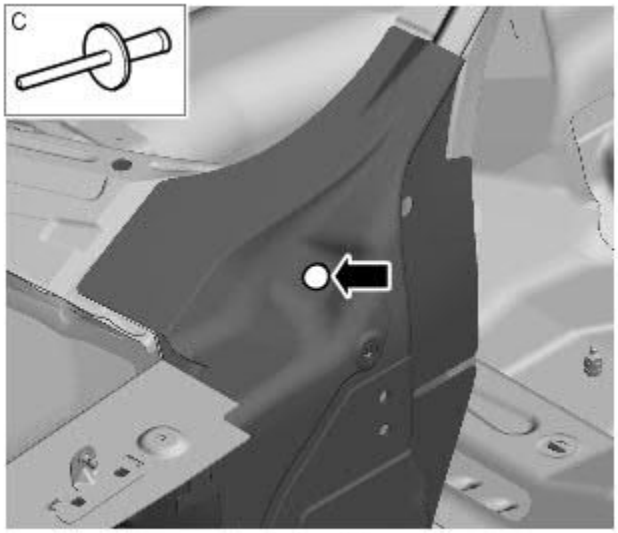
11. Remove any remaining miscellaneous components from the repair area as necessary.

12. Prior to removal, mark the position of the A-pillar reinforcement in relation to adjacent panels, for ease of alignment on installation.



13. NOTE: If the fender apron panel closing panel bracket is to be installed, it is not necessary to remove it. Retain if being re-used.

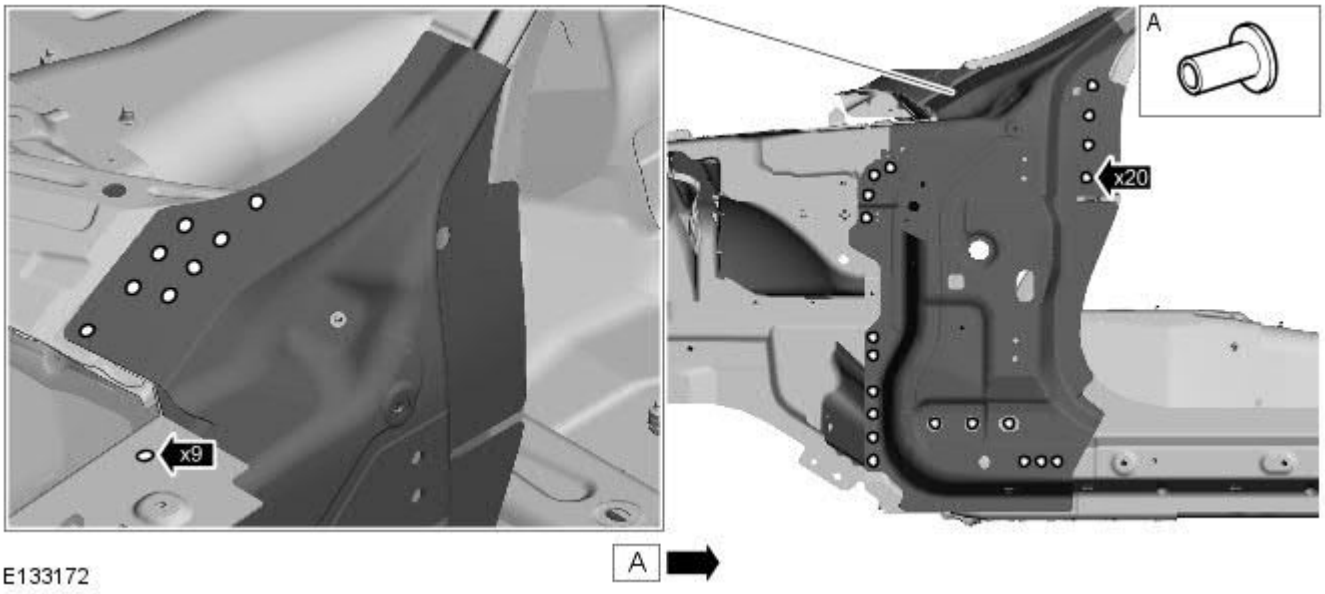
Remove the Monobolts, to release the fender apron panel closing panel bracket as indicated.



E133171

14. Remove the Monobolt as indicated.

15. Using a combination of the ESN50 and a 6.5mm Cryobit drill bit, remove the self piercing rivets.



E133172

16. NOTES:

Retain the old panel as it will be used as a template.

Remove and retain the noise, vibration and harshness (NVH) components, if they are to be reused.

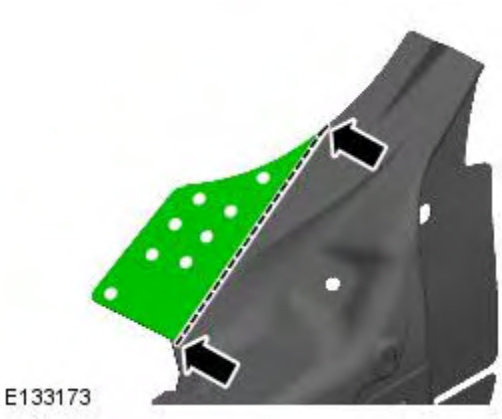
Separate the joints and remove the old panel, also releasing the inner NVH component.

Installation

1. Remove rivet remnants.

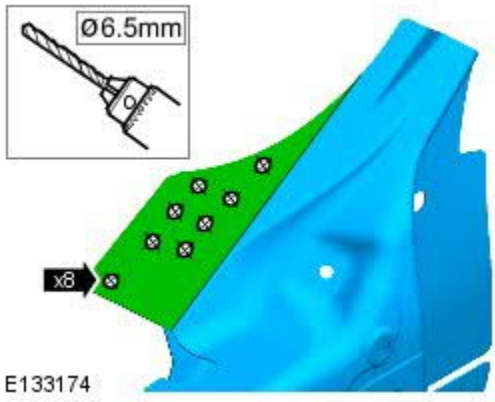
2. Dress flanges where necessary.

3. Cut a template from the old A-pillar reinforcement panel remnant as indicated.



4. Clean and dress the template.

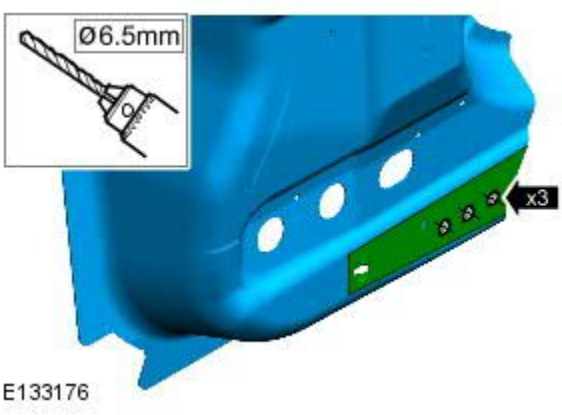
5. Offer up, align and clamp the template in place on the new A-pillar reinforcement service panel. Using a 6.5mm Cryobit drill bit, drill through the template into the new panel at the points indicated.



6. Remove the template.

7. Cut a template from the old A-pillar reinforcement panel remnant as indicated.

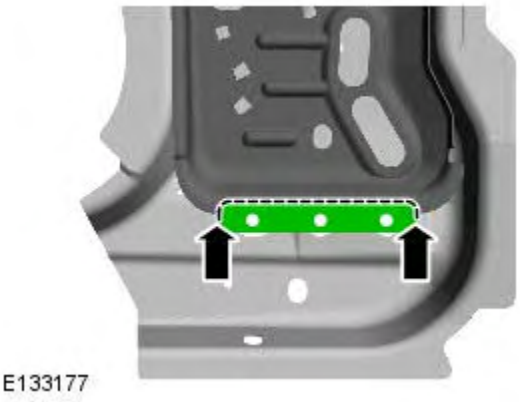
8. Clean and dress the template.



E133176

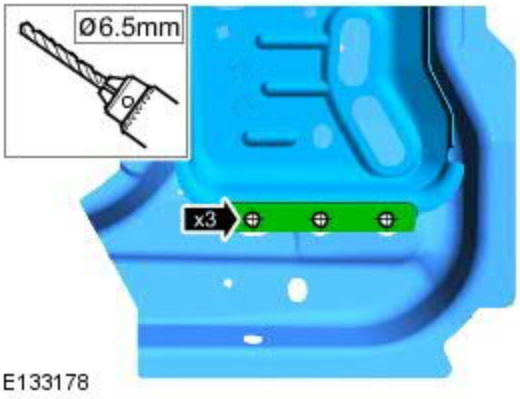
9. Offer up, align and clamp the template in place on the new A-pillar reinforcement service panel. Using a 6.5mm Cryobit drill bit, drill through the template into the new panel at the points indicated.

10. Remove the template.


E133177

11. Cut a template from the old A-pillar reinforcement panel remnant as indicated.

12. Clean and dress the template.



E133178

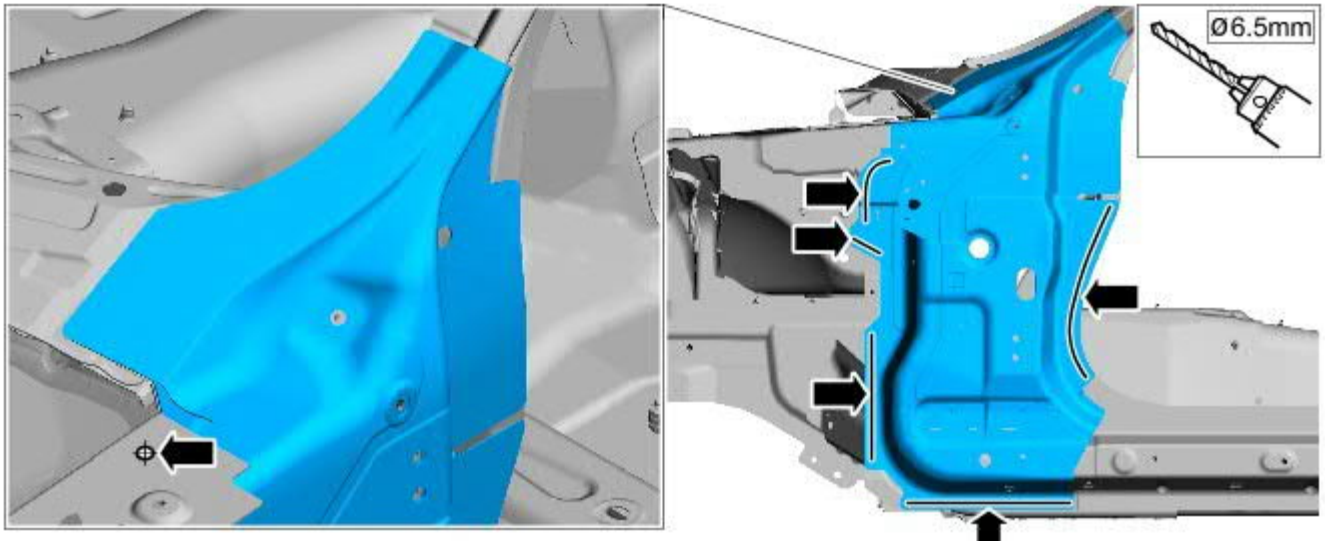
13. Offer up, align and clamp the template in place on the new A-pillar reinforcement service panel. Using a 6.5mm Cryobit drill bit, drill through the template into the new panel at the points indicated.

14. Remove the template.

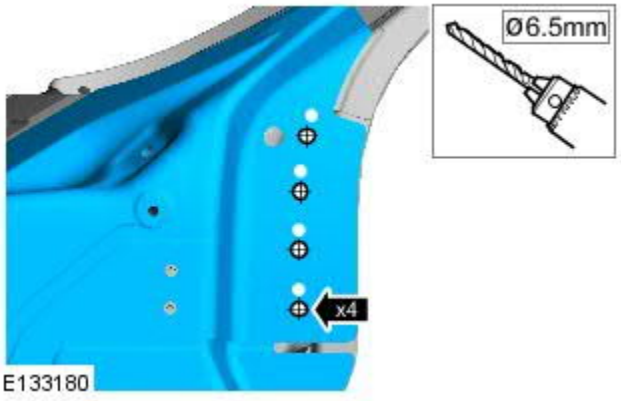
15. Debur the drilled holes in the new panel.

16. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

17. Using a 6.5mm Cryobit drill bit, drill holes through the removed self piercing rivet location holes in the areas as indicated.



E133179



E133180

18. Using the old panel for reference, mark and measure out the position of the removed self piercing rivet locations, as indicated. Using a 6.5mm Cryobit drill bit, drill holes below these locations at the points where Hemloks are to be installed as indicated.

19. Remove the new panel.

20. Debur the drilled holes in the new panel.

21. Using a Roloc fine bristle disc, clean and prepare the old and new panel surfaces.

22. Trim, clean and prepare the NVH components.

23. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

24. Apply the coupling agent where 3M 8115 adhesive is to be applied and allow to dry.

25. NOTE: Do not apply semi-rigid sealer in the areas where 3M 8115 adhesive is to be applied.

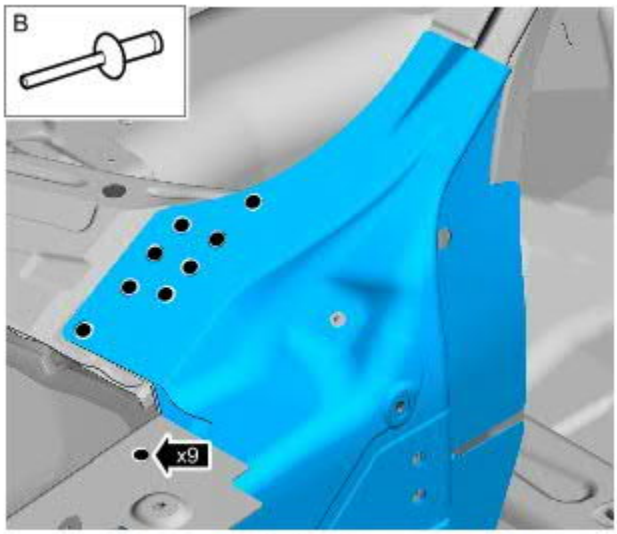
Apply semi-rigid sealer to the inner NVH component and install it to the new A Pillar Reinforcement, then apply semi-rigid sealer to the exposed edge of the NVH component for installation to the vehicle.

26. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes.

    Apply a 5mm zig zag bead of 3M 8115 adhesive to the body joints.

27. CAUTION: Make sure any panel joints containing adhesive are fully clamped to avoid any separation prior to the installation of external panels. These joints must be left clamped until the adhesive has cured.

    Offer up the new panel, align and clamp into position.

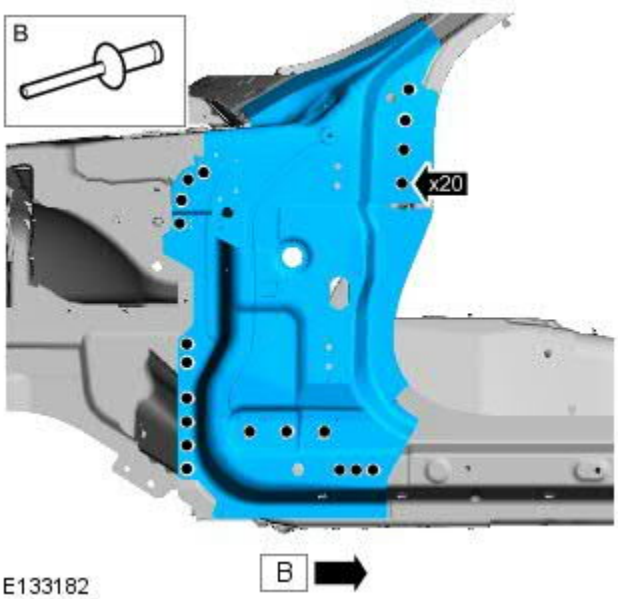


E133181

28. NOTE: It is important to identify and select the correct size fixing by referencing the following table prior to installation.

    Using the Genesis G4, install the Hemloks in the areas as indicated.

Hemlok Rivet Size	Material Stack	Jaguar Service Number
6.4mm x 13.7mm	1.5mm - 3.0mm	C2S 45252
6.4mm x 15.0mm	2.8mm - 4.8mm	C2C 36006
6.4mm x 17.0mm	4.8mm - 6.8mm	C2C 36026
6.4mm x 19.0mm	6.8mm - 8.8mm	C2C 36024
6.4mm x 20.0mm	7.5mm - 9.5mm	C2C 22613
6.4mm x 21.0mm	8.8mm - 10.8mm	C2C 36008



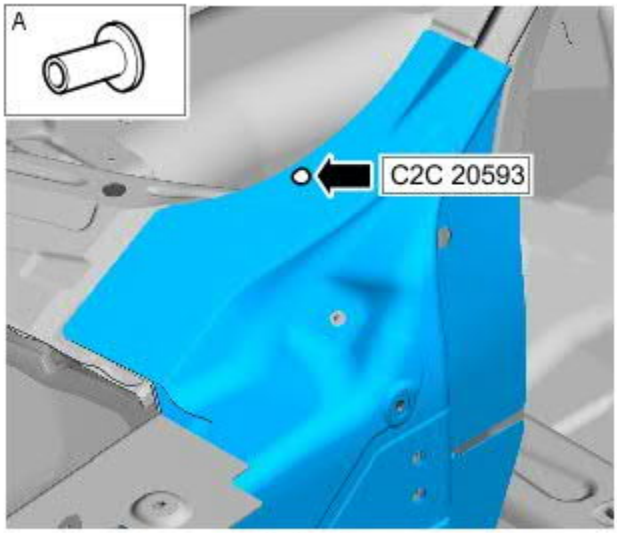
E133182

29. NOTE: It is important to identify and select the correct size fixing by referencing the following table prior to installation.

    Using the Genesis G4, install the Hemloks in the areas as indicated.

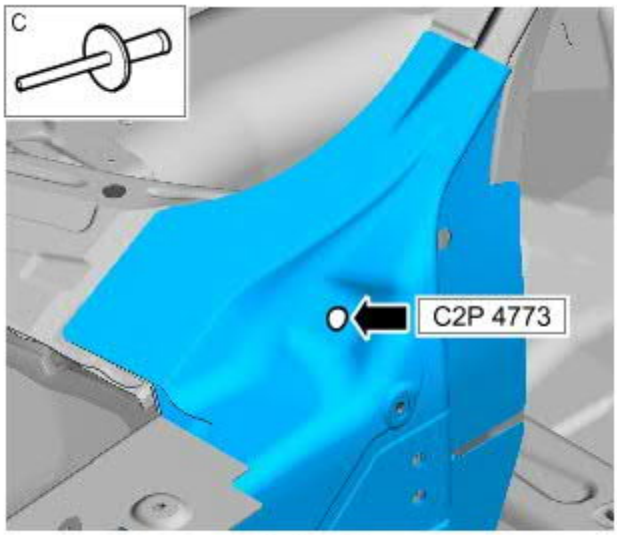
Hemlok Rivet Size	Material Stack	Jaguar Service Number
6.4mm x 13.7mm	1.5mm - 3.0mm	C2S 45252
6.4mm x 15.0mm	2.8mm - 4.8mm	C2C 36006
6.4mm x 17.0mm	4.8mm - 6.8mm	C2C 36026
6.4mm x 19.0mm	6.8mm - 8.8mm	C2C 36024
6.4mm x 20.0mm	7.5mm - 9.5mm	C2C 22613
6.4mm x 21.0mm	8.8mm - 10.8mm	C2C 36008

30. Using the ESN50, install the self piercing rivet as indicated.

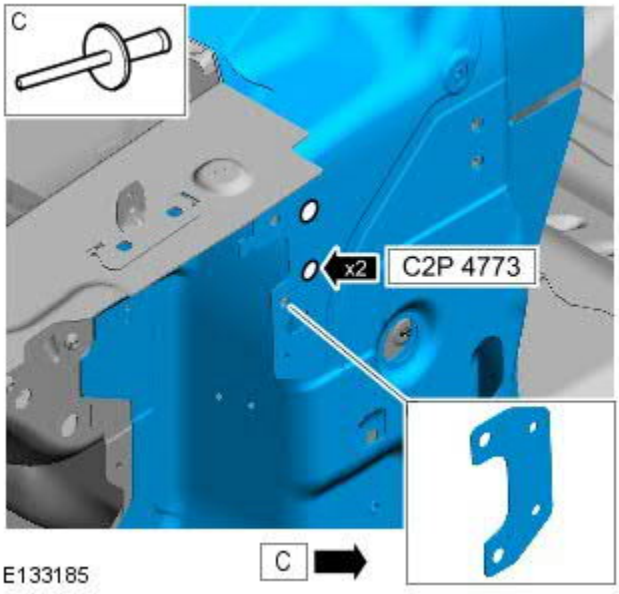


E133183

31. Using the Genesis G4, install the Monobolt.



E133184



32. Using the Genesis G4, install the Monobolts to the fender apron panel closing panel bracket as indicated.

33. Apply semi-rigid sealer to the outer lower NVH component and install it to the new A Pillar Reinforcement.

34. Remove any excess adhesive.

35. Make sure that any open or exposed panel joints are suitably sealed following this procedure.

36. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Side Panel Sheet Metal Repairs - Rocker Panel and B-Pillar Outer Panel

Removal and Installation

Removal

NOTE: The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being replaced in isolation, or, is being replaced in combination with panels other than those listed.

1. The rocker panel and B-pillar outer panel is a category A repair.

E133657

2. NOTE: The rocker panel and B-pillar outer panel is manufactured from aluminium alloy 6111-T4.

   The rocker panel and B-pillar outer panel is serviced as a separate welded, bonded and riveted panel.

3. The rocker panel and B-pillar outer panel is replaced in conjunction with:
   - Front door.
   - Rear door
   - Headliner
   - Windshield glass remove and install
   - Roof opening panel frame
   - Roof glass front
   - Roof glass rear

4. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

5. Disconnect the battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

6. Disconnect the generator electrical connectors.

7. Remove the roof opening panel frame.
   For additional information, refer to: Roof Opening Panel Frame (501-17 Roof Opening Panel, Removal and Installation).

8. Remove the front door.
For additional information, refer to: Front Door (501-03 Body Closures, Removal and Installation).

9. Remove the rear door.
For additional information, refer to: Rear Door (501-03 Body Closures, Removal and Installation).

10. Remove the rear door upper and lower hinges from the B-pillar.

11. Remove the front seat.
For additional information, refer to: Front Seat (501-10, Removal and Installation).

12. Remove the side air curtain module.
For additional information, refer to: Side Air Curtain Module (501-20B Supplemental Restraint System, Removal and Installation).

13. Remove the rocker panel outer moulding.

14. Remove the front safety belt retractor.
For additional information, refer to: Front Safety Belt Retractor (501-20A Safety Belt System, Removal and Installation).

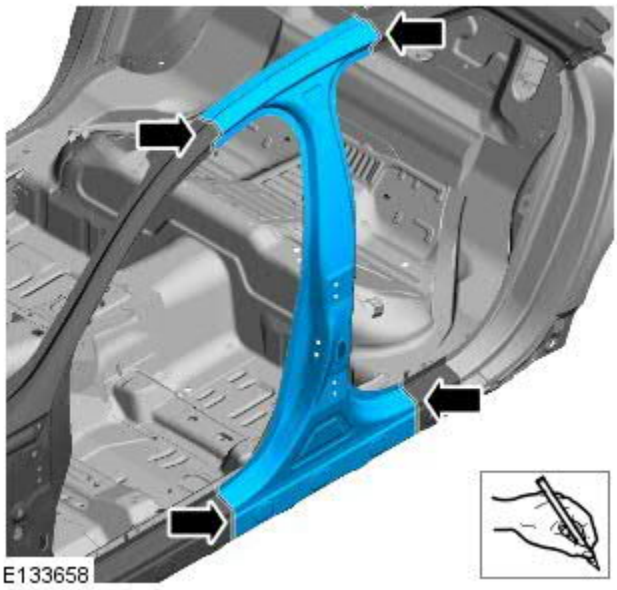
15. Remove the safety belt shoulder height adjuster.
For additional information, refer to: Safety Belt Shoulder Height Adjuster (501-20A Safety Belt System, Removal and Installation).

16. Release the floor covering and position it to one side.

17. Remove the underfloor splash shield.

18. Remove any remaining miscellaneous components from the repair area as necessary.

19. Release the inner rocker panel wiring harness and position to one side.



20. NOTE: The points marked on the vehicle are for reference only, do not cut the panels in these locations.

Offer up the new panel and clamp into position over the old panel. Mark the position of the new panel service cuts onto the vehicle as indicated.

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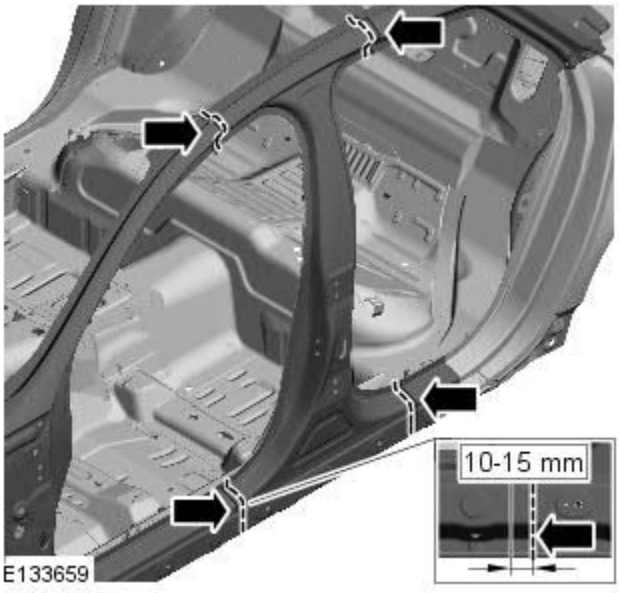
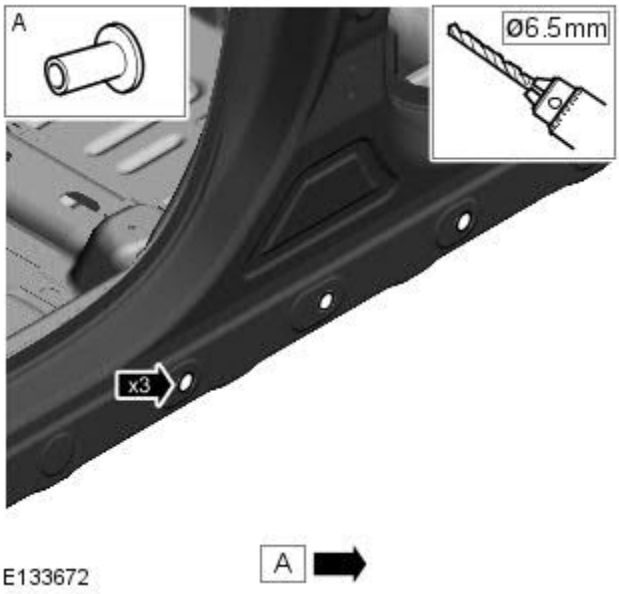
21. Remove the new panel.



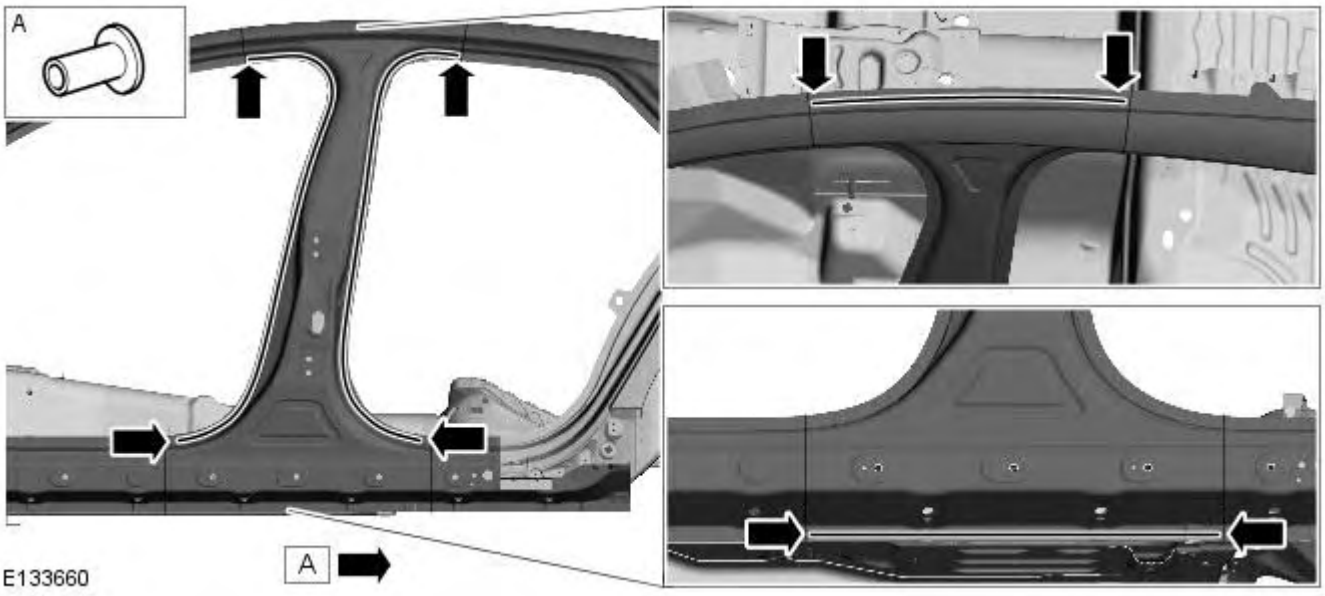
22. CAUTION: Care should be taken not to cut through into inner panels or reinforcements.

    Cut the old rocker panel and B-pillar outer panel 10-15mm inside the previously marked positions as indicated.



23. Using a 6.5mm Cryobit drill bit, remove the self piercing rivets.

24. Using a combination of the ESN50 and a 6.5mm Cryobit drill bit, remove the self piercing rivets.



25. NOTE: Retain the old panel remnant as it may be used as a template and to fabricate backing strips and run-on/run off tabs.

    Separate the joints and remove the old panel, also releasing it from the central noise, vibration and harshness (NVH) component.

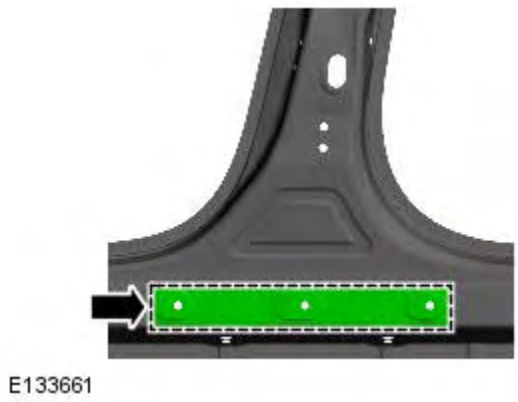
Installation

1. Remove rivet remnants.

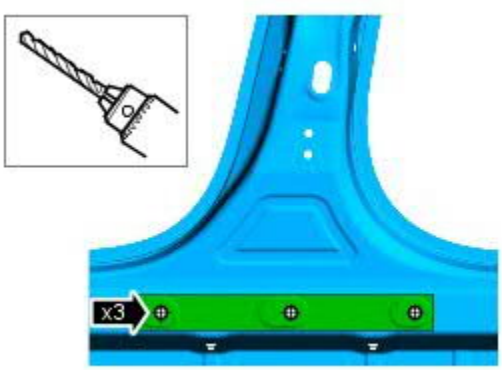
2. Dress flanges where necessary.

3. Using a Roloc fine bristle disc, clean and prepare the panel surfaces, also removing any adhesive residue.

4. Cut a template from the old rocker panel and B-pillar outer panel remnant as indicated.



5. Clean and dress the template.



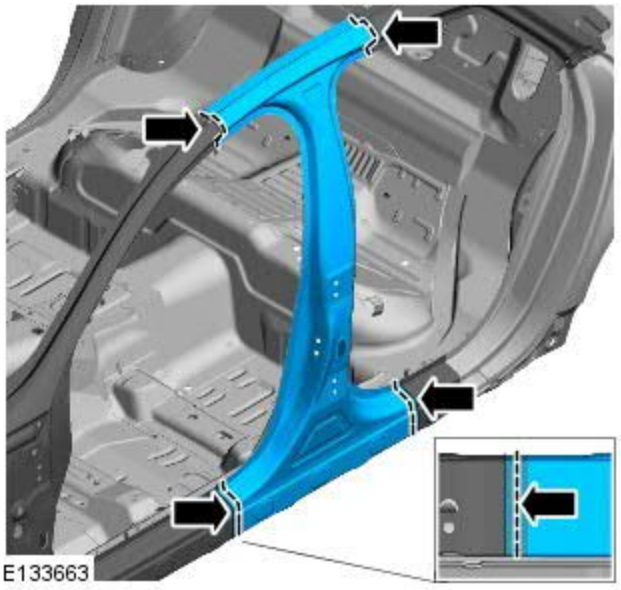
E133662

6. Offer up, align and clamp the template in place on the new rocker panel and B-pillar outer panel service panel. Drill through the template into the new panel at the points indicated.

7. Remove the template.

8. Debur the drilled holes in the new panel.

9. Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.


E133663

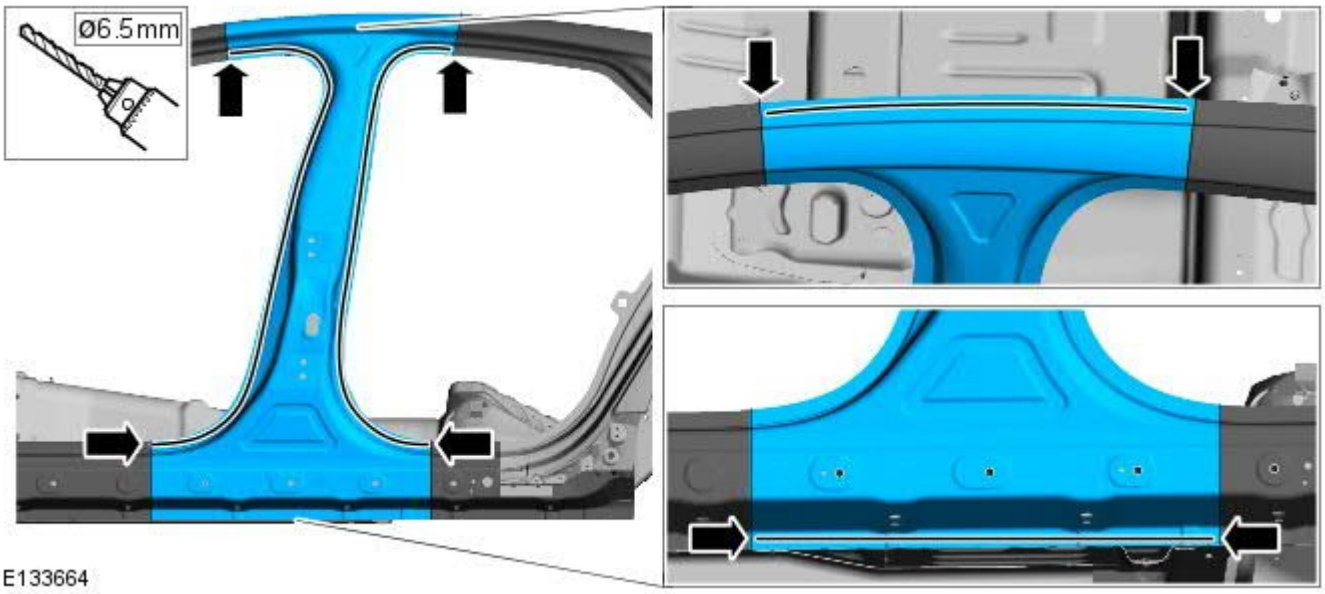
10. CAUTION: Care should be taken not to cut through into inner panels or reinforcements.

    NOTE: The new panel should be cut in approximately 5mm inside the service cuts.

    Cut through the new panel and the old panel as indicated.

11. NOTE: Replacement self piercing rivets should be installed adjacent to the removed originals wherever possible. If the pitch between the centres of removed self piercing rivets is less than 25mm, Hemloks should be installed in the hole created by the removed self piercing rivet(s).

    Where the pitch of the removed self piercing rivets is 25mm or less, or there is no access for the ESN50, use a 6.5mm Cryobit drill bit to drill through the removed self piercing rivet holes of the old panel, into the new panel. Hemloks will be installed in these locations when the new rocker panel and B-pillar outer panel is installed.



12. Remove the new panel

13. Remove the old panel remnants.

14. NOTE: The backing plates should be an interference fit.

    Fabricate backing plates from the old rocker panel and B-pillar outer panel remnant. Debur and offer up the backing plates to the rocker panel and B-pillar outer panel. If correct proceed to next step, if not, rectify and recheck before proceeding.

15. Remove the backing plates.

16. Fabricate run-on/run-off tabs from the old rocker panel and B-pillar outer panel remnant.

17. Debur the run-on/run-off tabs.

18. Trim, clean and prepare the central NVH component.

19. Using a Roloc fine bristle disc, clean and prepare the backing plates and run on/run off tabs.

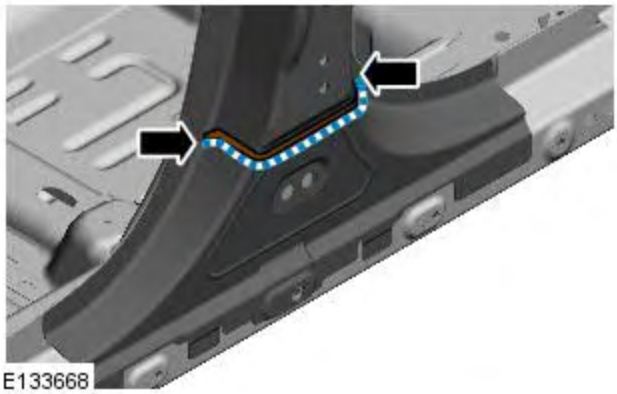
20. Using a Roloc fine bristle disc, clean and prepare the old and new panel joint surfaces.

21. NOTE: The backing plates are installed with an interference fit.

    Install and align the backing plates to the vehicle.

22. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

23. Apply the coupling agent where 3M 8115 adhesive is to be applied and allow to dry.



24. NOTE: Do not apply semi-rigid sealer in the areas where 3M 8115 adhesive is to be applied.

    Apply semi-rigid sealer to the central NVH component as indicated.

25. NOTE: Do not apply semi-rigid sealer in the areas where 3M 8115 adhesive is to be applied.

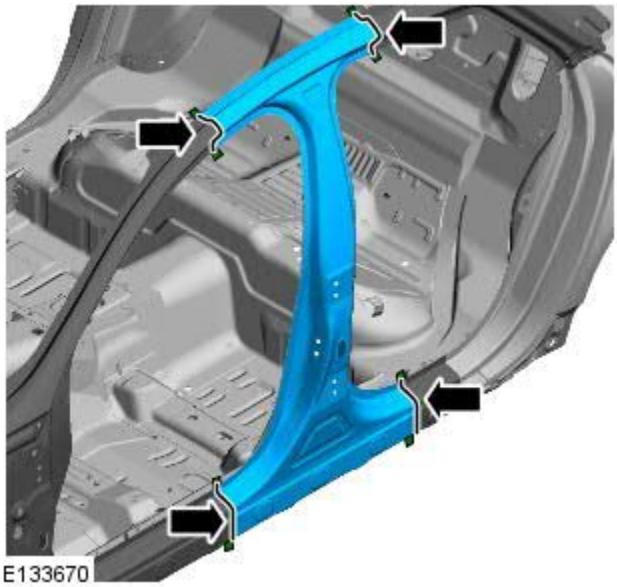
    Apply semi-rigid sealer to the B-pillar reinforcement as indicated.

26. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes. Do not apply adhesive in the vicinity of the MIG welds.

    Apply a 5mm zig zag bead of 3M 8115 adhesive to all joints.

27. Offer up the new panel, align and clamp into position.

28. Tack weld the run-on/run-off tabs to all MIG butt joints.

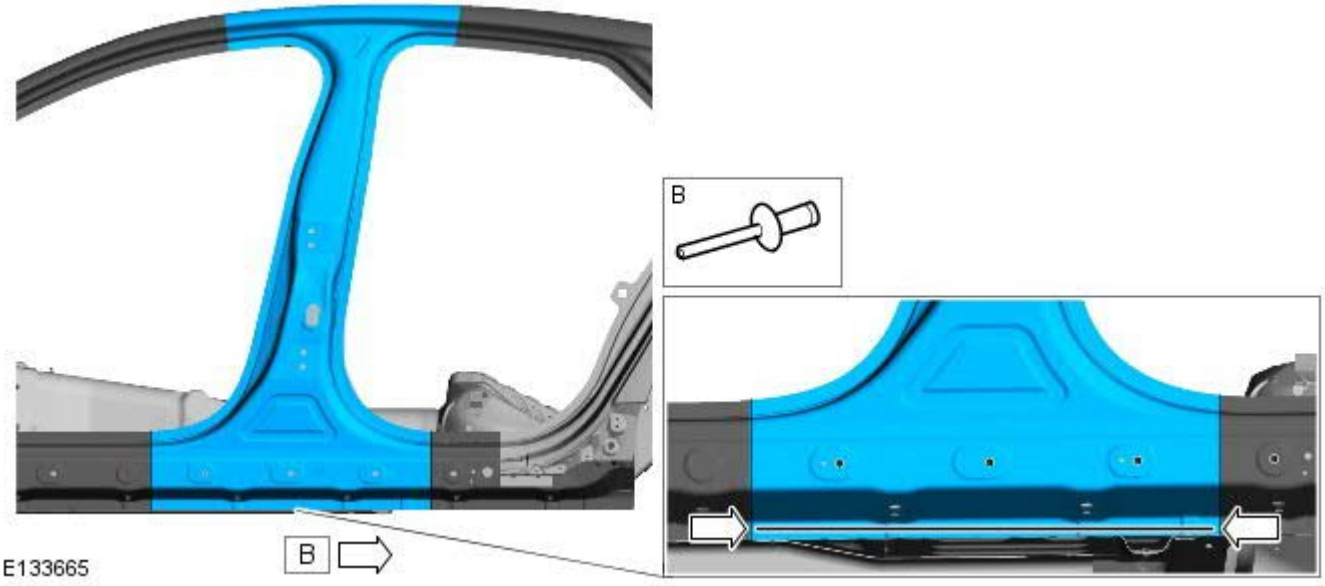

E133670

29. MIG weld the MIG butt joints.

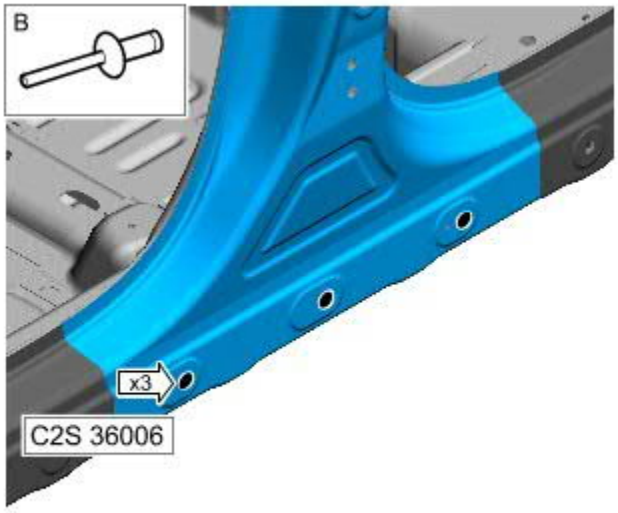
30. NOTE: It is important to identify and select the correct size fixing by referencing the following table prior to installation.

Using the Genesis G4, install the Hemloks in the areas as indicated.

Hemlok Rivet Size	Material Stack	Jaguar Service Number
6.4mm x 13.7mm	1.5mm - 3.0mm	C2S 45252
6.4mm x 15.0mm	2.8mm - 4.8mm	C2C 36006
6.4mm x 17.0mm	4.8mm - 6.8mm	C2C 36026
6.4mm x 19.0mm	6.8mm - 8.8mm	C2C 36024
6.4mm x 20.0mm	7.5mm - 9.5mm	C2C 22613
6.4mm x 21.0mm	8.8mm - 10.8mm	C2C 36008



E133665



E133671

B

31. Using the Genesis G4, install the Hemloks as indicated.

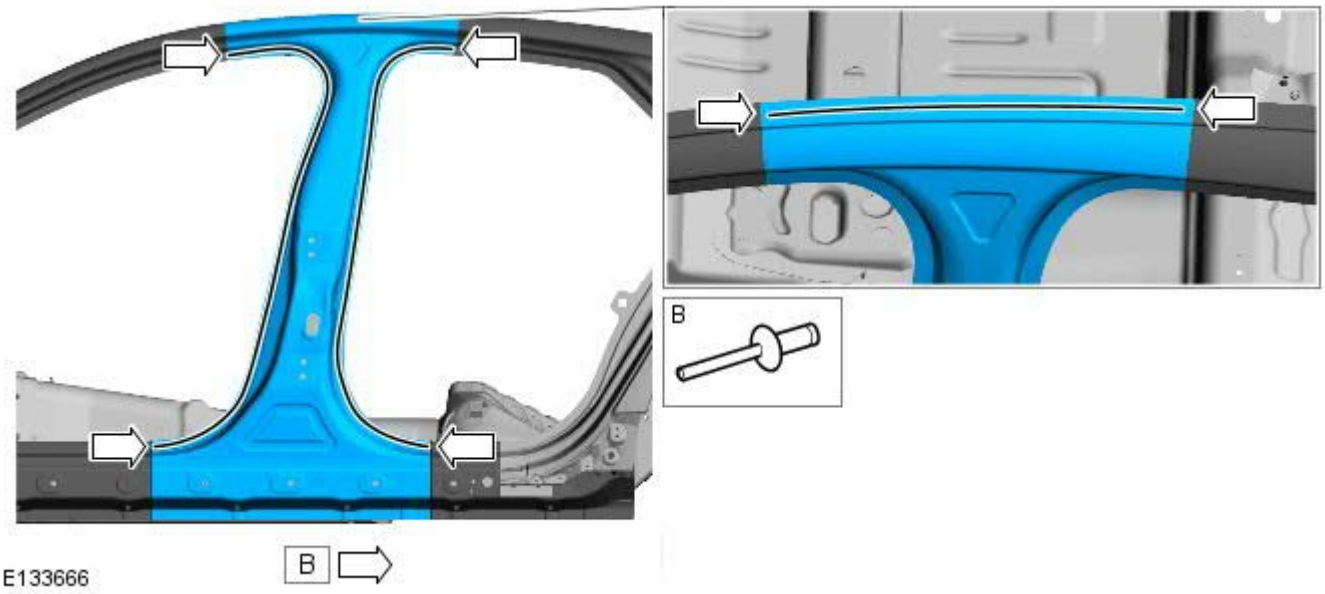
32. NOTES:

Replacement self piercing rivets should be installed adjacent to the removed originals wherever possible. If the pitch between the centres of removed self piercing rivets is less than 25mm, Hemloks should be installed in the hole created by the removed self piercing rivet(s).

It is important to identify and select the correct size fixing by referencing the following table prior to installation.

Using the Genesis G4, install any remaining Hemloks in the areas as indicated.

Hemlok Rivet Size	Material Stack	Jaguar Service Number
6.4mm x 13.7mm	1.5mm - 3.0mm	C2S 45252
6.4mm x 15.0mm	2.8mm - 4.8mm	C2C 36006
6.4mm x 17.0mm	4.8mm - 6.8mm	C2C 36026
6.4mm x 19.0mm	6.8mm - 8.8mm	C2C 36024
6.4mm x 20.0mm	7.5mm - 9.5mm	C2C 22613
6.4mm x 21.0mm	8.8mm - 10.8mm	C2C 36008



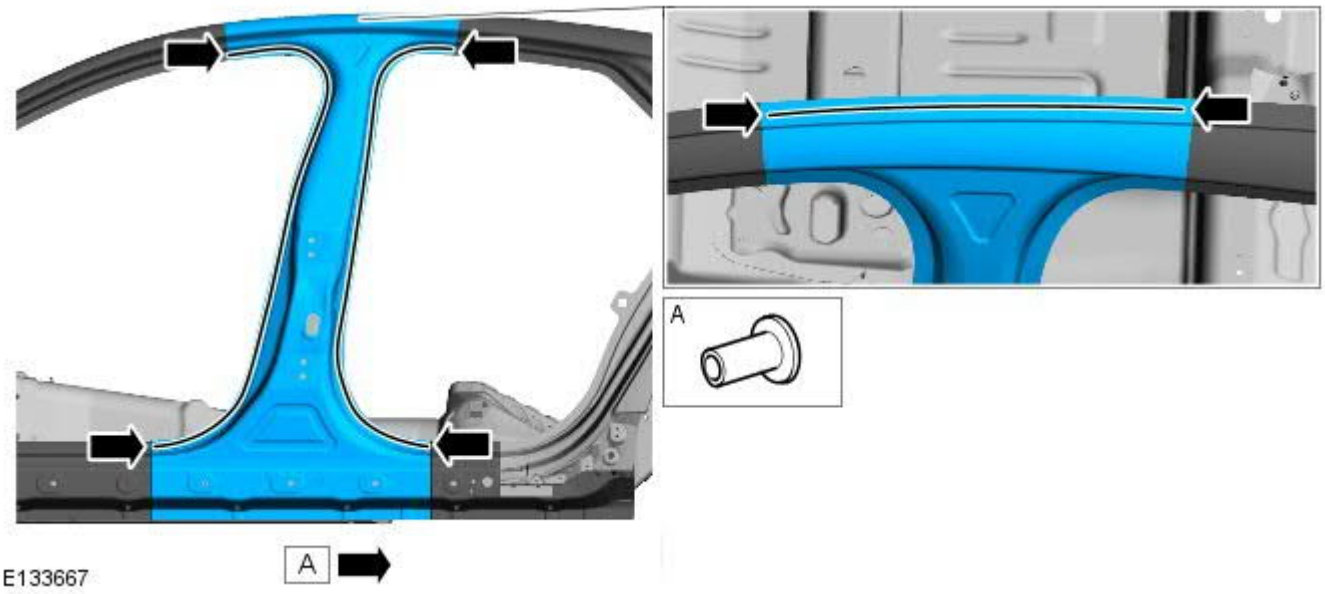
33. NOTES:

Replacement self piercing rivets should be installed adjacent to the removed originals wherever possible. If the pitch between the centres of removed self piercing rivets is less than 25mm, Hemloks should be installed in the hole created by the removed self piercing rivet(s).

It is important to identify and select the correct size fixing by referencing the following table prior to installation.

Using the ESN50, install the self piercing rivets in the areas as indicated.

Self Piercing Rivet Size	Material Stack	Jaguar Service Number
4.8mm x 5.0mm	3.0mm	C2C 20589
4.8mm x 7.0mm	4.0mm	C2C 20590
4.8mm x 8.0mm	5.0mm	C2C 20591
4.8mm x 8.5mm	5.5mm	C2C 20592
4.8mm x 9.0mm	6.0mm	C2C 20593
4.8mm x 9.5mm	6.5mm	C2C 20594
4.8mm x 11.0mm	8.0mm	C2C 20595



34. Remove any excess adhesive.

35. Remove the run-on/run-off tabs.

36. Dress the welded joints.

37. Carry out a non destructive crack inspection on the MIG butt joints. If correct proceed to next step, if not, rectify and recheck before proceeding.

38. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Side Panel Sheet Metal Repairs - B-Pillar Inner Panel

Removal and Installation

Removal

1. NOTE: The B-pillar inner panel is manufactured from aluminium alloy 5754-NG.

   The B-pillar inner panel is cut from the bodyside inner front section service panel.

2. In this procedure, to make sure the vehicle is correctly aligned, it must be placed on an approved alignment jig.

3. The B-pillar inner panel is replaced in conjunction with:
   - Front bumper cover
   - Rear bumper cover
   - Front door
   - Rear door
   - Front fender
   - Hood
   - Hood hinge
   - Luggage compartment lid
   - Hood latch panel
   - Fender apron panel closing panel
   - Quarter panel
   - A-pillar outer panel
   - A-pillar reinforcement
   - Rocker panel and b-pillar outer panel
   - B-pillar reinforcement
   - Rocker panel
   - Rocker panel inner reinforcement
   - Headliner
   - Windshield glass remove and install
   - Rear window glass
   - Instrument panel upper section
   - Roof opening panel frame
   - Roof glass front
   - Roof glass rear

4. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) / Body Repairs (501-25A Body Repairs - General Information, Description and Operation) / Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) / Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

5. Remove the B-pillar reinforcement.
   For additional information, refer to: B-Pillar Reinforcement (501-29 Side Panel Sheet Metal Repairs, Removal and Installation).

6. Remove the A-pillar reinforcement.
   For additional information, refer to: A-Pillar Reinforcement (501-29 Side Panel Sheet Metal Repairs, Removal and Installation).

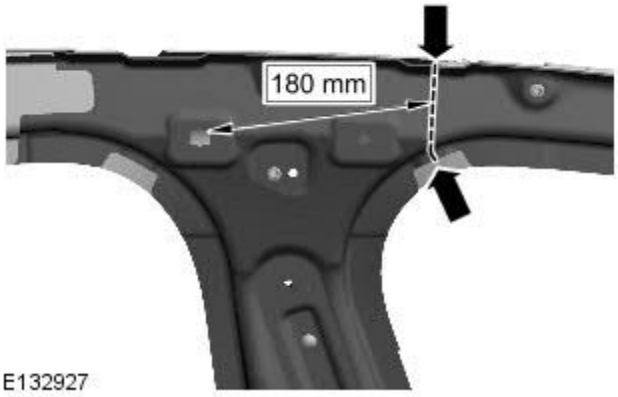
7. Remove the rocker panel inner reinforcement.
   For additional information, refer to: Rocker Panel Inner Reinforcement (501-29 Side Panel Sheet Metal Repairs, Removal and Installation).

8. Disconnect the battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

9. Disconnect the generator electrical connectors.

10. Remove any remaining miscellaneous components from the repair area as necessary.

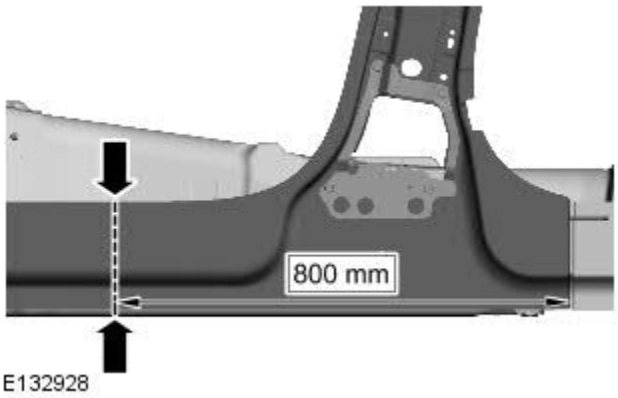
11. Prior to removal, mark the position of the B-pillar inner in relation to adjacent panels, for ease of alignment on installation.



E132927

12. CAUTION: Care should be taken not to cut through into inner panels or reinforcements.

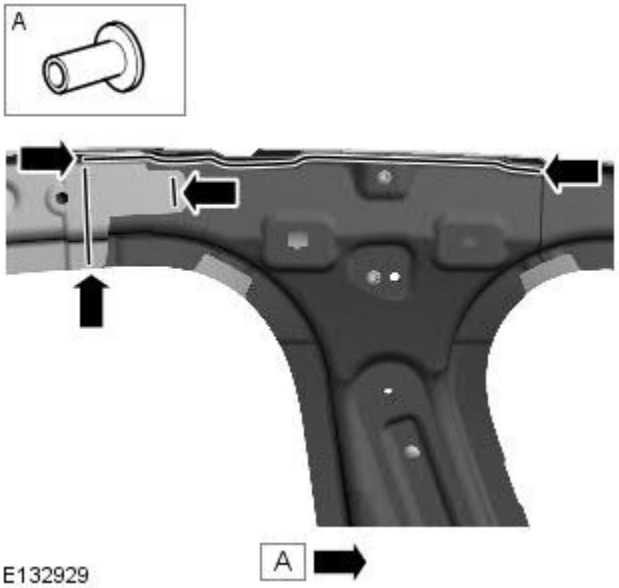
    Measure, mark and cut the old panel, at the point where the upper MIG butt joint is to be performed as indicated.



E132928

13. CAUTION: Care should be taken not to cut through into inner panels or reinforcements.

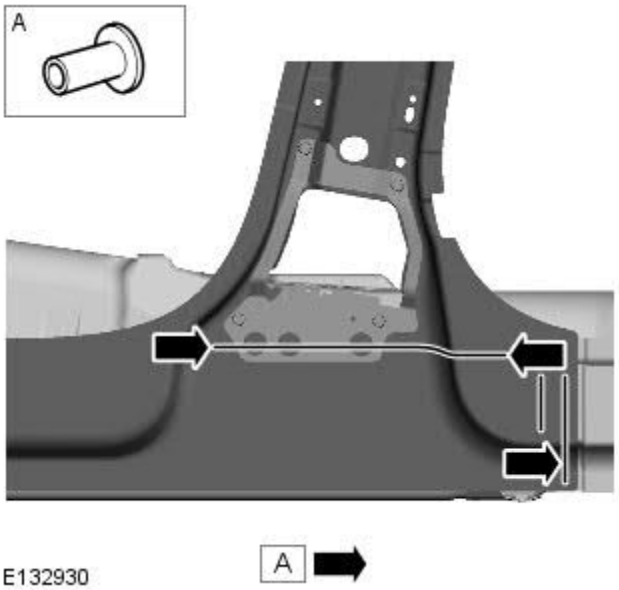
    Measure, mark and cut the old panel, at the point where the lower MIG butt joint is to be performed as indicated.



E132929

14. CAUTION: Care should be taken not to drill through into inner panels or reinforcements.

    Using a combination of the ESN50 and a 6.5mm Cryobit drill bit, remove any remaining self piercing rivets from the areas indicated.



E132930

15. Using a combination of the ESN50 and a 6.5mm Cryobit drill bit, remove any remaining self piercing rivets from the areas indicated.

16. NOTE: Retain the old panel remnant as it may be used as a template and to fabricate backing strips and run-on/run off tabs.

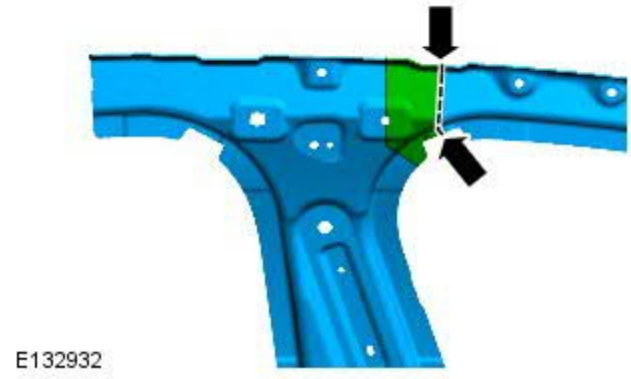
    Separate the joints and remove the old panel.

Installation

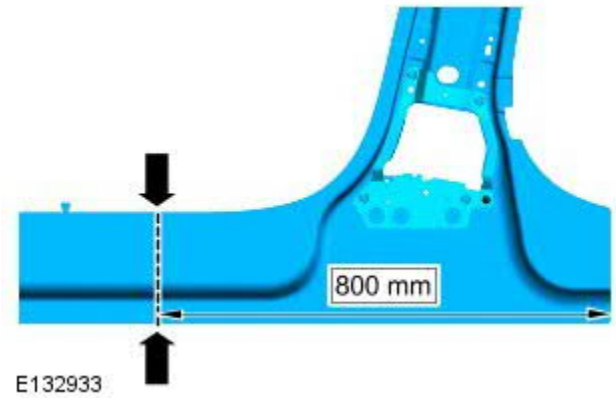
1. Remove rivet remnants.
2. Dress flanges where necessary.
3. Using a Roloc fine bristle disc, clean and prepare the panel surfaces.

E132931

4. Cut a template from the old B-pillar inner panel remnant as indicated. Clean and dress the template.


E132932

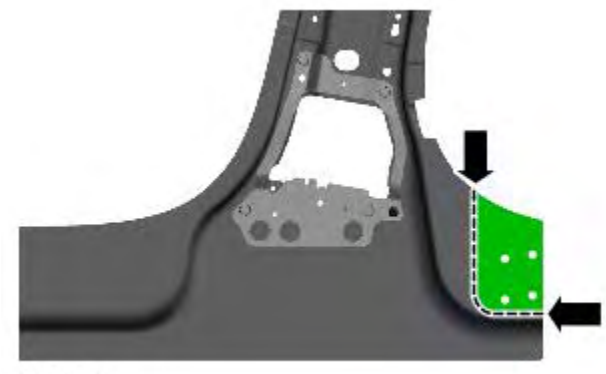
5. Offer up, align and clamp the template in place on the B-pillar inner service panel. Cut the B-pillar inner panel service panel at the point indicated.



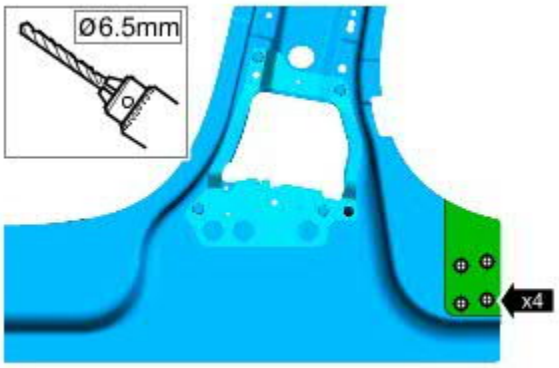
E132933

6. NOTE: Retain the new panel remnant as it will be used as a template and to fabricate backing strips and run-on/run off tabs.

   Measure, mark and cut the new panel, at the point where the lower MIG butt joint is to be performed as indicated.


E132934

7. Cut a template from the old B-pillar inner panel remnant as indicated. Clean and dress the template.



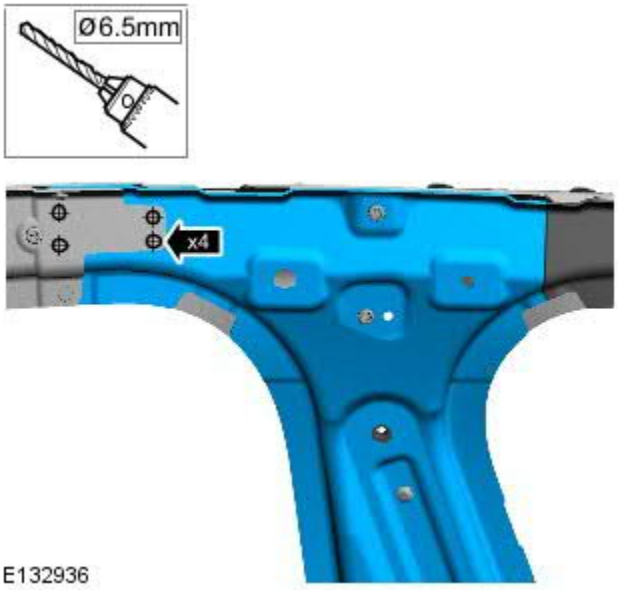
E132935

8. Offer up, align and clamp the template in place on the B-pillar inner service panel. Using a 6.5mm Cryobit drill bit, drill holes as indicated.

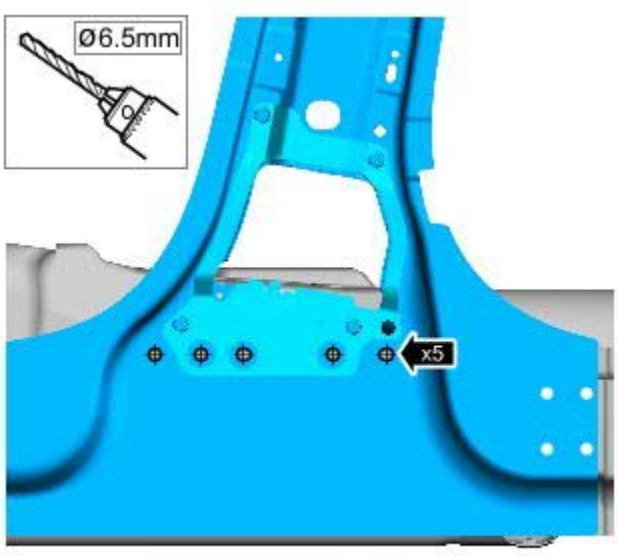
9. Debur the drilled holes and the section cuts.

10. Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.

11. Using a 6.5mm Cryobit drill bit, drill holes for Hemloks in the areas indicated.



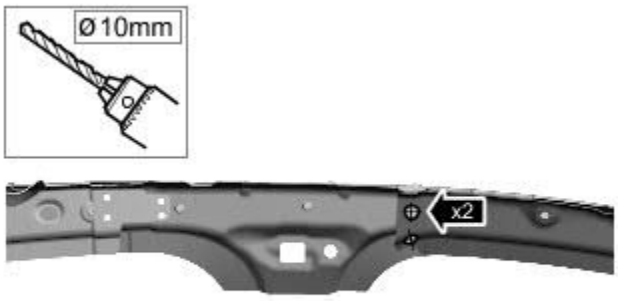
E132936



E132937

12. Using a 6.5mm Cryobit drill bit, drill holes for Hemloks in the areas indicated.

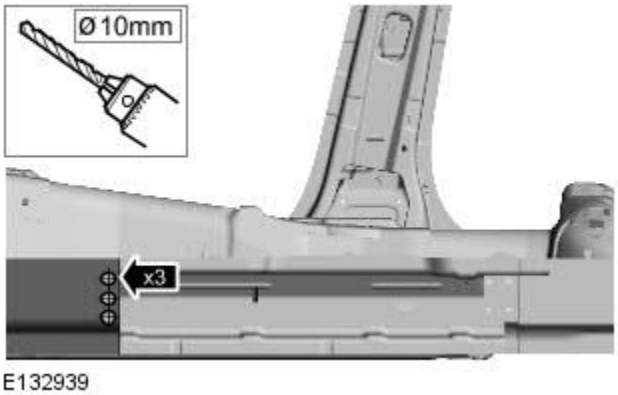
13. Remove the new panel.



E132938

14. CAUTION: Care should be taken not to drill through into inner panels or reinforcements.

    Using a 10mm drill bit, drill holes for MIG plug welds for the installation of the upper backing plate as indicated.



E132939

15. CAUTION: Care should be taken not to drill through into inner panels or reinforcements.

    Using a 10mm drill bit, drill holes for MIG plug welds for the installation of the lower backing plate as indicated.

16. Debur the drilled holes.

17. Cut run on/run off tabs from the unused part of the old/new B-pillar inner panel remnants.

18. NOTE: The backing plate should be wide enough to accommodate 10mm MIG plug welds.

    Fabricate backing plates from the old/new B-pillar inner panel remnants. Debur and offer up the backing plates to the vehicle. If correct proceed to next step, if not, rectify and recheck before proceeding.

19. Remove the backing plates.

20. Using a Roloc fine bristle disc, clean the backing plates and the panel surfaces where the backing plates are to be welded.

21. Offer up the backing plates, align and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

22. MIG plug weld the upper backing plate to the vehicle as indicated.

E132940

23. MIG plug weld the lower backing plate to the vehicle as indicated.

E132941

24. Clean and prepare all remaining panel joint surfaces including the run on/run off tabs.

25. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

26. Apply the coupling agent and allow to dry.

27. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes. Do not apply adhesive in the vicinity of the MIG weld.

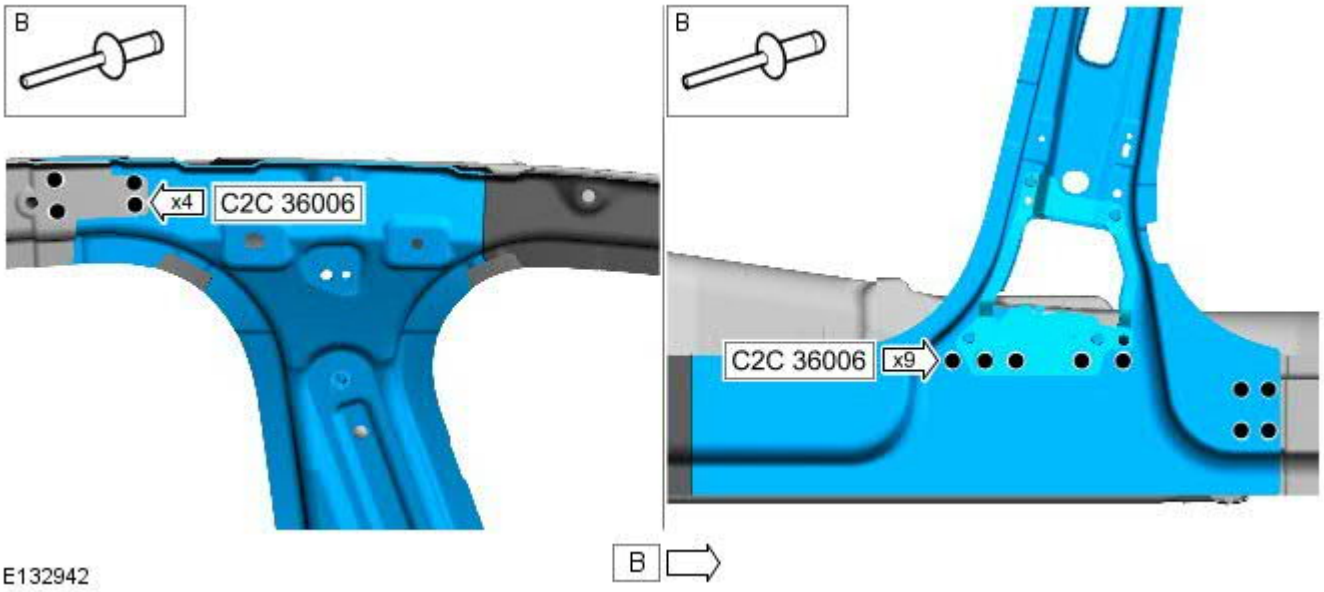
    Apply a 5mm zig zag bead of 3M 8115 adhesive to the vehicle.

28. CAUTION: Make sure any panel joints containing adhesive are fully clamped to avoid any separation prior to the installation of other panels. These joints must be left clamped until the adhesive has cured.

NOTE: If necessary and to aid alignment, the unattached side of the backing plate can be secured with panel pin clamps.

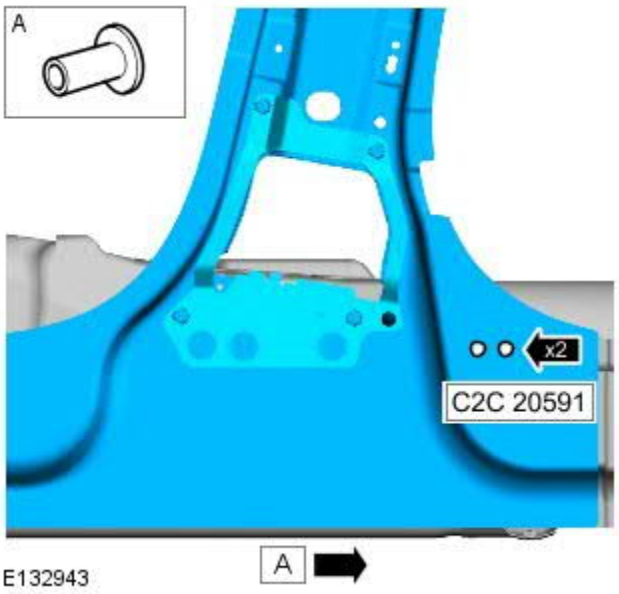
Offer up the new panel, align and clamp into position. If correct proceed to next step, if not, rectify and recheck before proceeding.

29. Using the Genesis G4, install the Hemloks.



E132942

30. Using the ESN50, install the self piercing rivets as indicated.

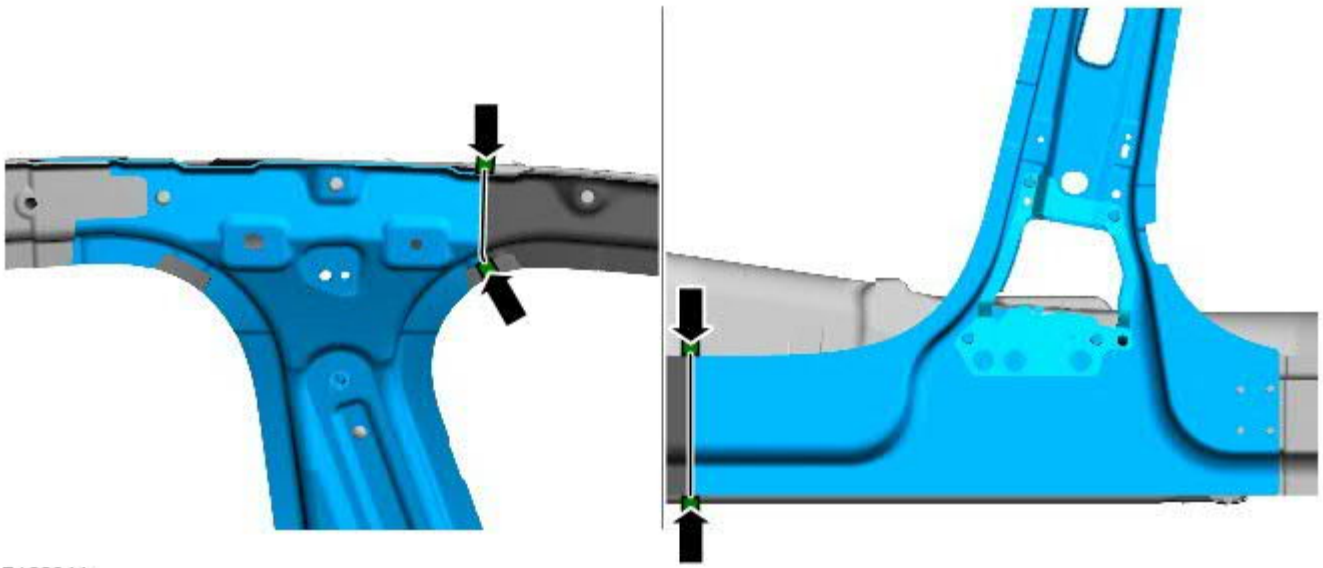


E132943

31. Tack weld the run-on/run-off tabs to the rear side member closing panel section.

32. Clean the area of the MIG butt joint prior to welding.

33. MIG weld the B-pillar inner panel butt joints.



E132944

34. Cut off the run on/run off tabs.

35. Carry out a non destructive crack inspection on the MIG butt joints. If correct proceed to next step, if not, rectify and recheck before proceeding.

36. Dress the MIG butt joints and the MIG plug welds.

37. Remove any excess adhesive.

38. Make sure that any open or exposed panel joints are suitably sealed following this procedure.

39. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Side Panel Sheet Metal Repairs - B-Pillar Reinforcement

Removal and Installation

Removal

NOTE: The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being replaced in isolation, or, is being replaced in combination with panels other than those listed.

1. The B-pillar reinforcement is a category A repair.

2. NOTE: The B-pillar reinforcement is manufactured from aluminium alloy 6111-T4.

   The B-pillar reinforcement is serviced as a separate riveted and bonded panel, it includes its inner reinforcements.

3. In this procedure, to make sure the vehicle is correctly aligned, it must be placed on an approved alignment jig.

4. The B-pillar reinforcement is replaced in conjunction with:
   - Front door.
   - Rear door
   - Rocker panel and B-pillar outer panel
   - Headliner
   - Windshield glass remove and install
   - Roof opening panel frame
   - Roof glass front
   - Roof glass rear

5. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

6. Remove the rocker panel and B-pillar outer panel.
   For additional information, refer to: Rocker Panel and B-Pillar Outer Panel (501-29 Side Panel Sheet Metal Repairs, Removal and Installation).

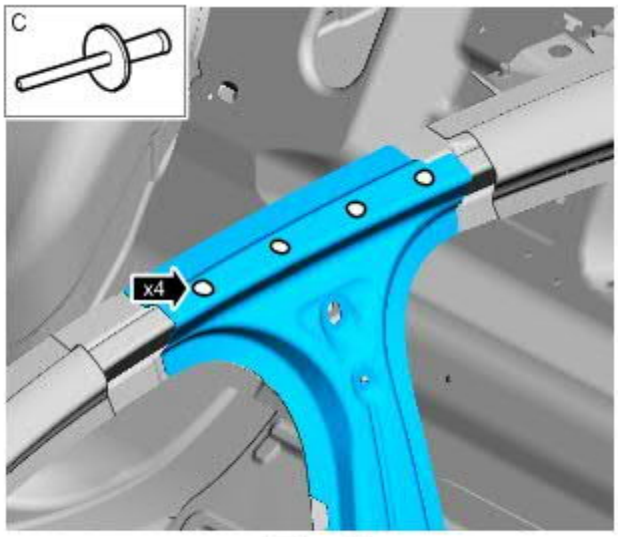
7. Disconnect the battery.

For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

8. Remove any remaining miscellaneous components from the repair area as necessary.

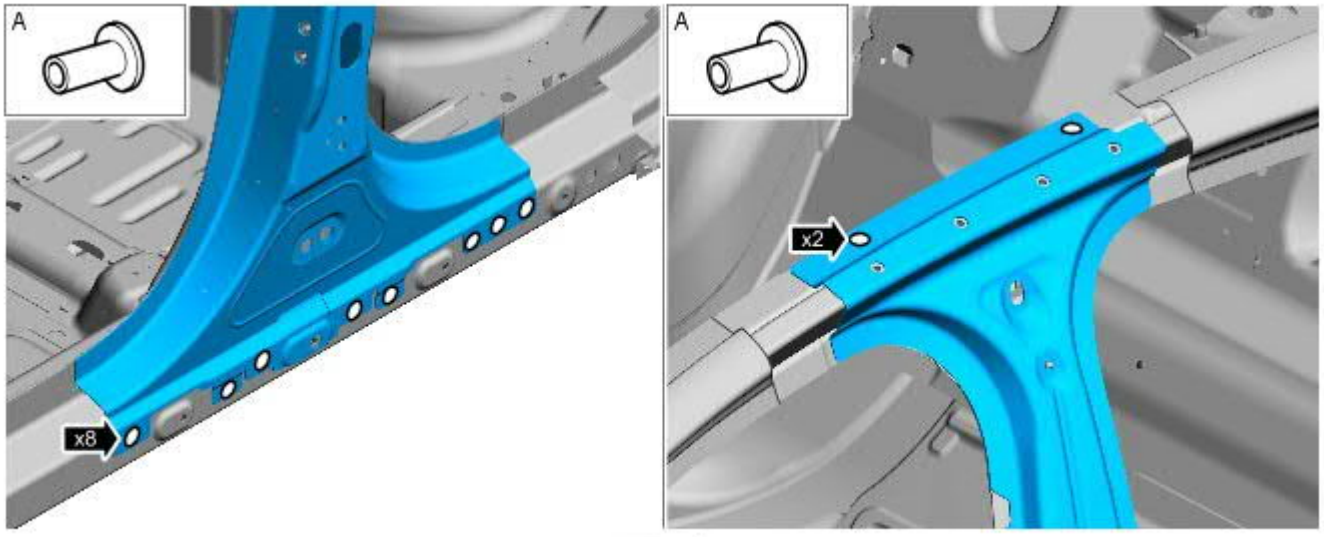
9. Prior to removal, mark the position of the B-pillar reinforcement in relation to adjacent panels, for ease of alignment on installation.

10. Remove the Monobolts as indicated.



E132835

11. Using a 6.5mm Cryobit drill bit, remove the self piercing rivets as indicated.



E132836

12. NOTES:

Retain the old panel as it will be used as a template.

Remove and retain the central noise, vibration and harshness (NVH) component, if it is to be reused.

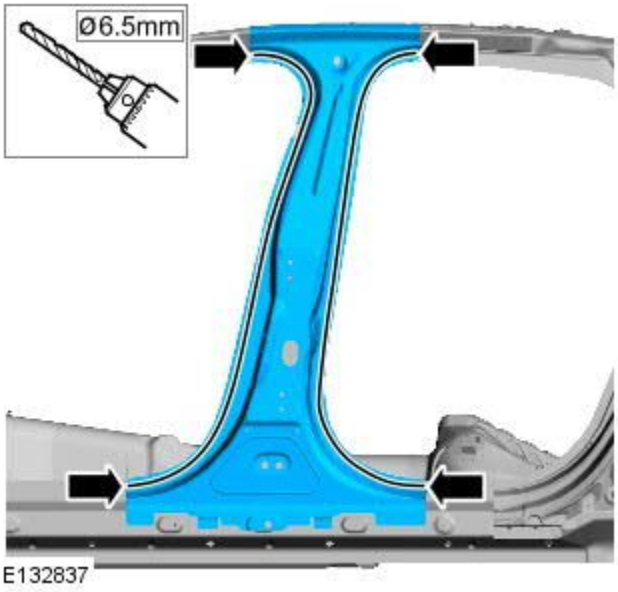
Separate the joints and remove the old panel, also releasing it from the lower NVH component.

Installation

1. Remove rivet remnants.

2. Dress flanges where necessary.

3. Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.

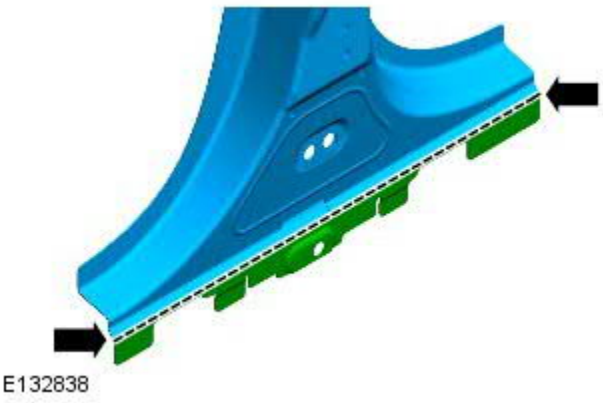


E132837

4. NOTE: New self piercing rivets should be installed adjacent to the removed originals wherever possible. If the pitch between the centres of removed self piercing rivets is less than 25mm, Hemloks should be installed in the hole created by the removed self piercing rivet(s).

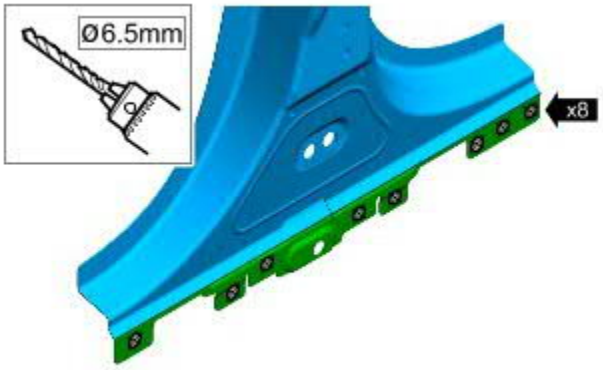
   Where the pitch of the removed self piercing rivets is 25mm or less, use a 6.5mm Cryobit drill bit to drill through the removed self piercing rivet holes of the old panel, into the new panel. Hemloks will be installed in these locations when the outer panel is installed.

5. Remove the new panel.


E132838

6. Cut a section from the lower part of the old panel to be used as a template as indicated.

7. Debur the template.



E132839

8. Offer up, align and clamp the template to the new panel. Using a 6.5mm Cryobit drill bit, drill holes through the template into the new panel, ready for Hemloks to be installed.

9. Remove the template from the new panel.

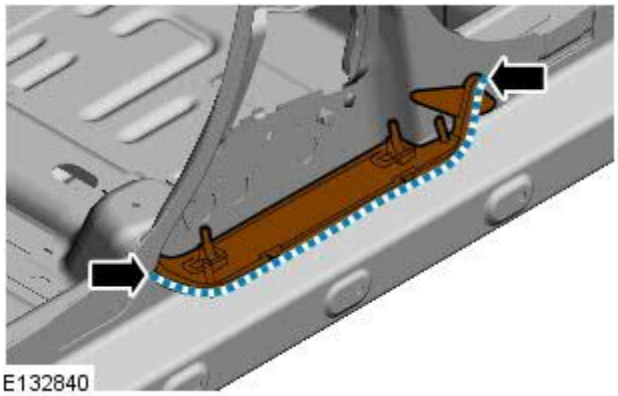
10. Debur the drilled holes in the new panel.

11. Using a Roloc fine bristle disc, clean and prepare the old and new panel surfaces.

12. Trim, clean and prepare the NVH components.

13. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

14. Apply the coupling agent where 3M 8115 adhesive is to be applied and allow to dry.


E132840

15. NOTE: Do not apply semi-rigid sealer in the areas where 3M 8115 adhesive is to be applied.

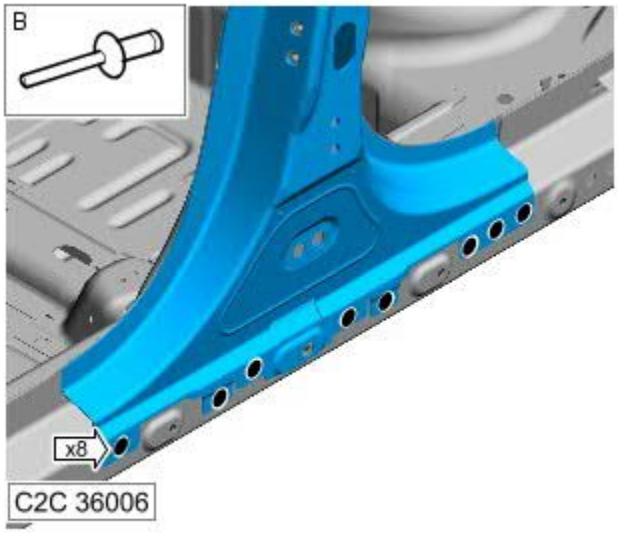
    Apply semi-rigid sealer to the lower NVH component.

16. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes.

    Apply a 5mm zig zag bead of 3M 8115 adhesive to the body joints.

17. CAUTION: Make sure any panel joints containing adhesive are fully clamped to avoid any separation prior to the installation of external panels. These joints must be left clamped until the adhesive has cured.

    Offer up the new panel, align and clamp into position.

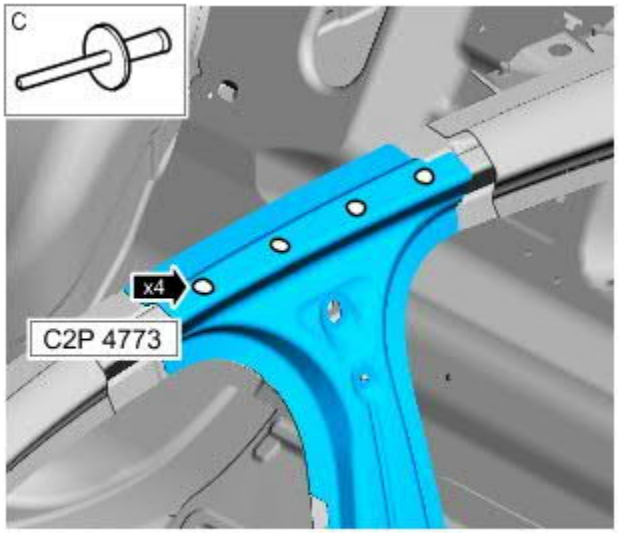


E132842

18. Using the Genesis G4, install the Hemloks.

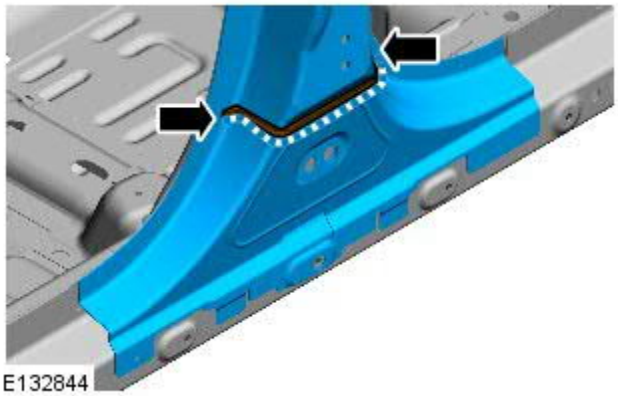
E132841

19. Using the ESN50, install the self piercing rivets as indicated.



E132843

20. Using the Genesis G4, install the Monobolts.



E132844

21. Apply semi rigid to the central NVH component and install.

22. Remove any excess adhesive.

23. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Side Panel Sheet Metal Repairs - Rocker Panel

Removal and Installation

Removal

NOTE: The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being replaced in isolation, or, is being replaced in combination with panels other than those listed.

1. The rocker panel is a category A repair.

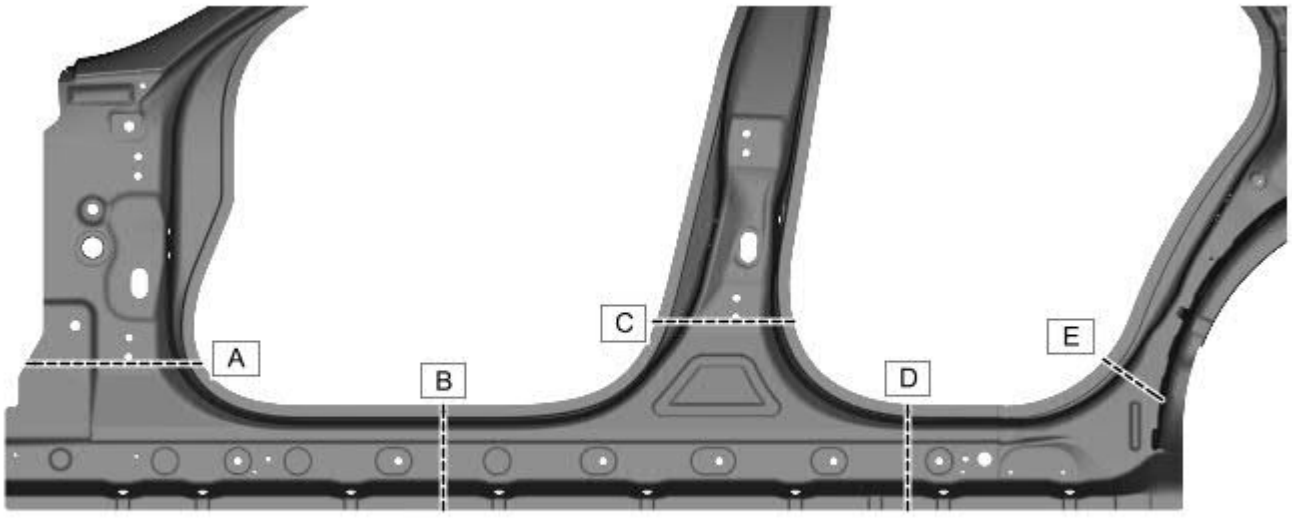
E133715

2. NOTE: The rocker panel is manufactured from aluminium alloy 6111-T4.

   The rocker panel is serviced as a separate riveted and bonded panel.

3. This procedure identifies the method for the replacement of the rocker panel in full. The following graphic and table identify possible alternative sections of the rocker panel that can be performed dependant on the extent of damage to the vehicle, and/or the replacement of associated panels. Where an alternative section is selected, some steps within this procedure may not be necessary.

Panel sections available	Cut locations
Rocker panel (full panel)	A + C + E
Rocker panel front section	A + C + D
Rocker panel rear section	B + C + E
Rocker panel dogleg section	D + E



E133717

4. The rocker panel is replaced in conjunction with:

- Front bumper cover
- Front fender
- Front door
- Rear door
- Quarter panel
- Rear bumper cover
- Rear bumper
- Luggage compartment lid
- Luggage compartment lid hinge
- Rear window glass

5. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

6. Disconnect the battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

7. Disconnect the generator electrical connectors.

8. Remove the quarter panel.
   For additional information, refer to: Quarter Panel (501-30 Rear End Sheet Metal Repairs, Removal and Installation).

9. Remove the front fender.
   For additional information, refer to: Front Fender (501-27 Front End Sheet Metal Repairs, Removal and Installation).

10. Remove the front seat.
    For additional information, refer to: Front Seat (501-10, Removal and Installation).

11. Remove the front wheel and tire.
    For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

12. Remove the A-Pillar trim panel.
    For additional information, refer to: A-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

13. Remove the B-Pillar lower trim panel.
    For additional information, refer to: B-Pillar Lower Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

14. Release the floor covering and position it to one side.

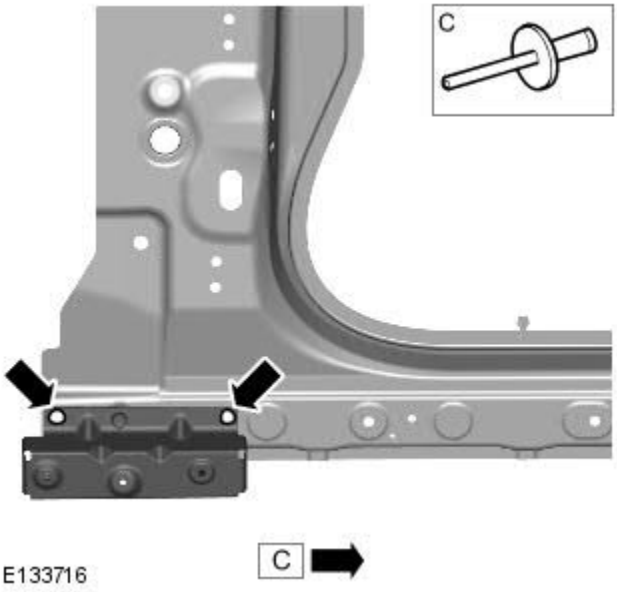
15. Remove the B-Pillar upper trim panel.
    For additional information, refer to: B-Pillar Upper Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

16. Remove the front safety belt retractor.
    For additional information, refer to: Front Safety Belt Retractor (501-20A Safety Belt System, Removal and Installation).

17. Remove the C-Pillar side impact sensor.
For additional information, refer to: C-Pillar Side Impact Sensor (501-20B Supplemental Restraint System, Removal and Installation).

18. Release the rocker panel wiring harness and position it to one side.

19. Remove any remaining miscellaneous components from the repair area as necessary.



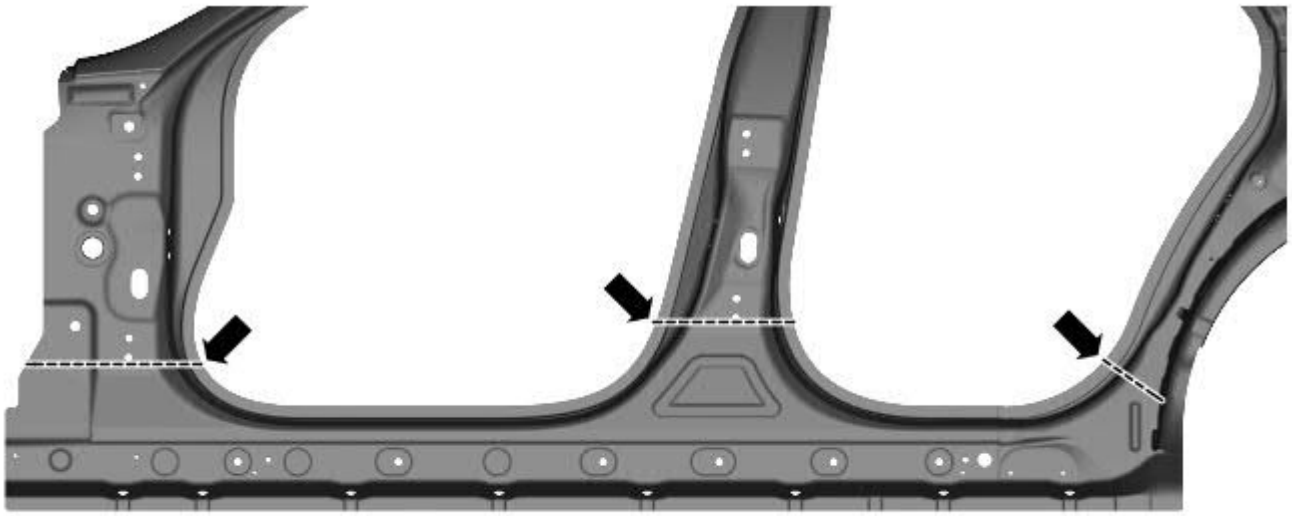
20. NOTE: If the front fender lower mounting bracket is undamaged, retain for re-use on installation.

Remove the monobolts as indicated.

21. CAUTION: Care should be taken not to cut through into inner panels or reinforcements.

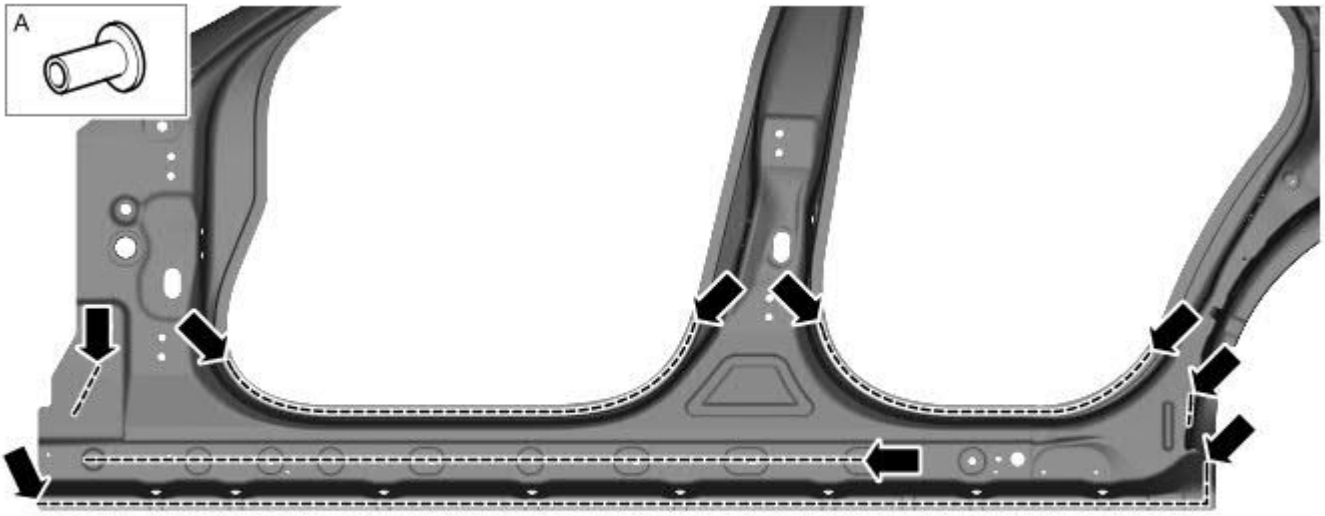
NOTE: If necessary, cut locations can be adjusted to avoid self piercing rivets.

Using the new panel for reference, mark and cut the old panel in the areas as indicated.



E133718

22. Using a combination of the ESN50 and a 6.5mm Cryobit drill bit, remove the self piercing rivets in the areas indicated.



E133719

23. NOTE: Retain the old panel remnant as it will be used in installation.

    Separate the joints and remove the old panel, also releasing the noise, vibration and harshness (NVH) components.

Installation

1. Remove rivet remnants.

2. Dress flanges where necessary.

3. Using a Roloc fine bristle disc, clean and prepare the panel surfaces, also removing any adhesive residue.

4. Using the old panel for reference, trim the excess from the new panel to allow for an overlap in the areas of the MIG butt joints

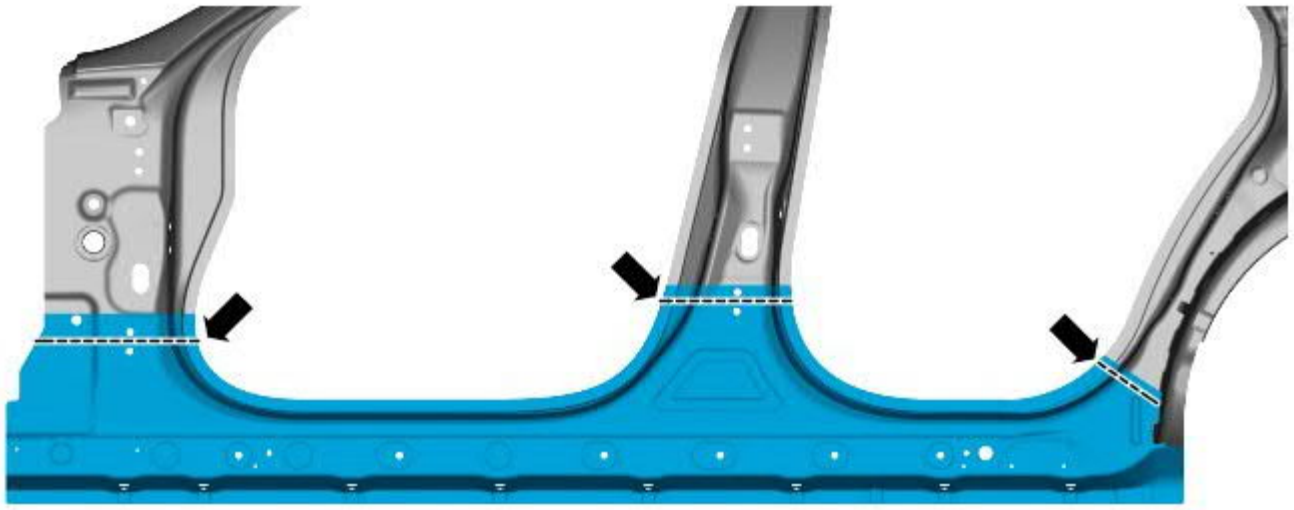
5. Debur the new panel.

6. Trim, clean and prepare the NVH components.

7. Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.

8. CAUTION: Care should be taken not to cut through into inner panels or reinforcements.

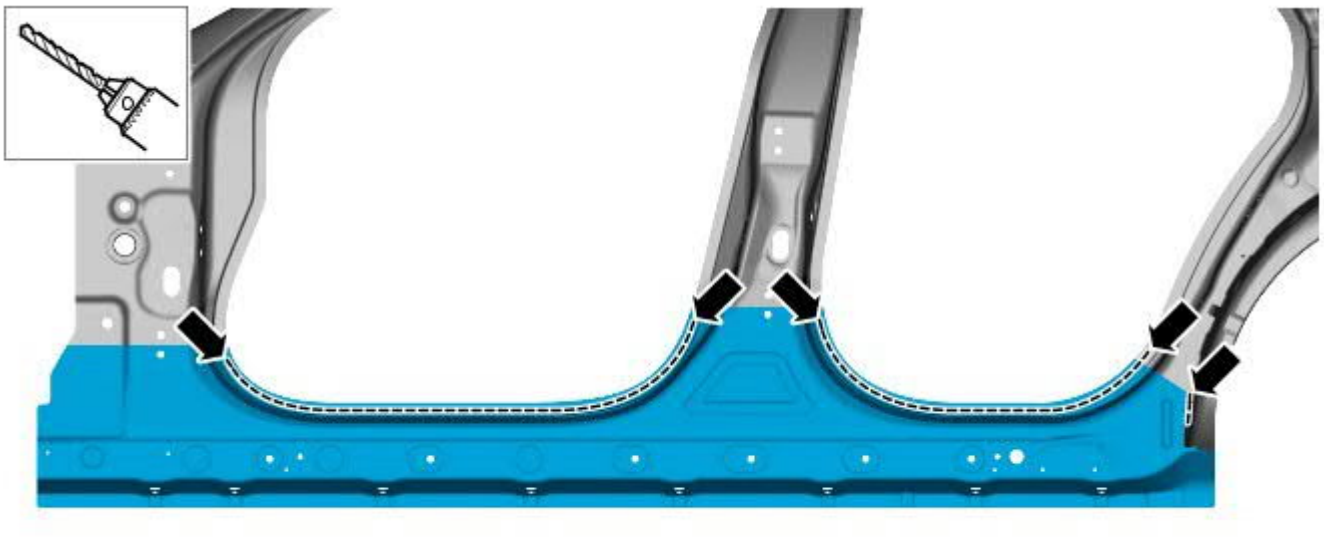
   Cut through the new panel and the old panel as indicated.



E133720

9. NOTE: Replacement self piercing rivets should be installed adjacent to the removed originals wherever possible. If the pitch between the centres of removed self piercing rivets is less than 25mm, Hemloks should be installed in the hole created by the removed self piercing rivet(s).

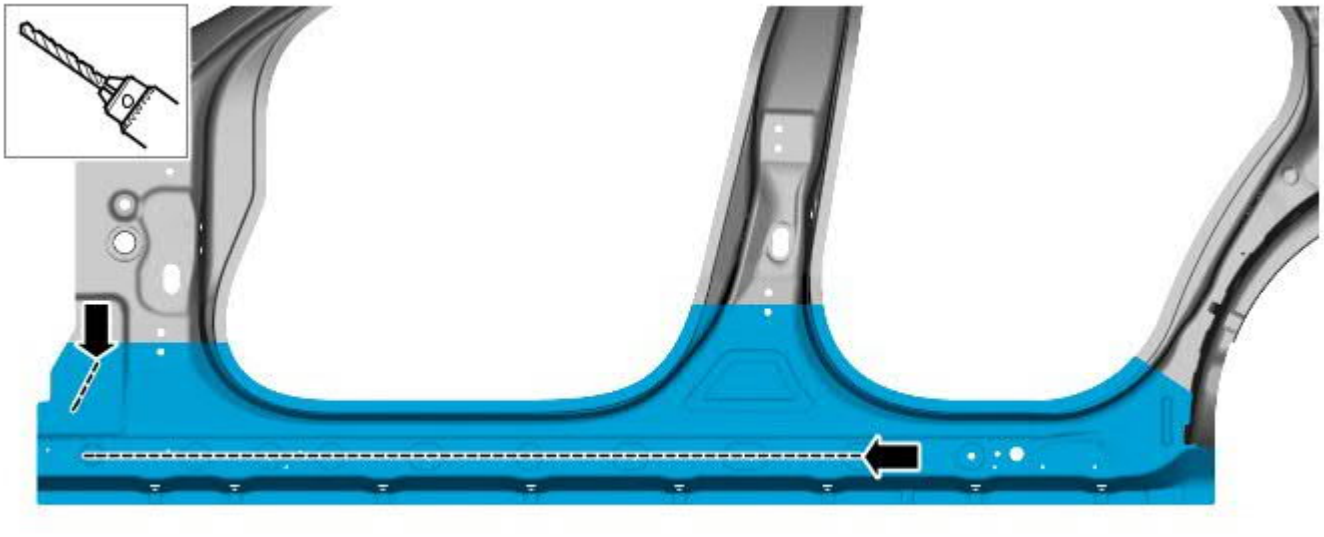
   Where the pitch of the removed self piercing rivets is 25mm or less, or there is no access for the ESN50, use a 6.5mm Cryobit drill bit to drill through the removed self piercing rivet holes of the old panel, into the new panel. Hemloks will be installed in these locations when the new rocker panel is installed.



E133721

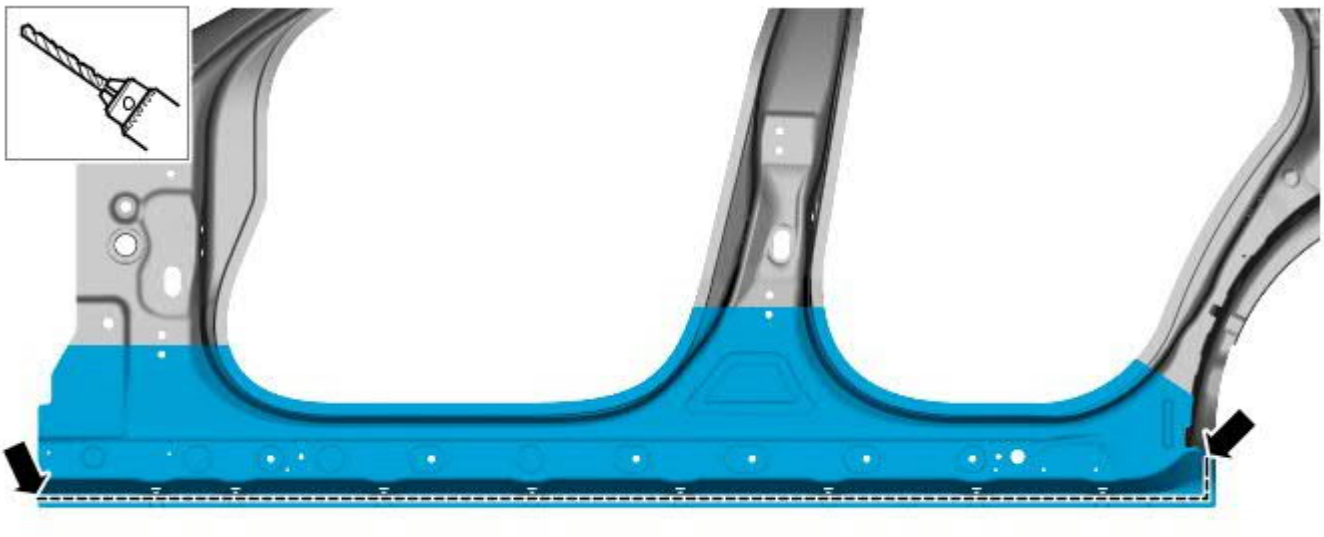
10. NOTE: The Hemloks will be installed adjacent to the original self piercing rivet location holes.

    Using the old panel for reference, measure the positions of the removed self piercing rivet locations and mark these onto the new panel. Using a 6.5mm Cryobit drill bit, drill holes adjacent to these locations at the points where Hemloks are to be installed as indicated.



E133722

11. Using a 6.5mm Cryobit drill bit, drill through the removed self piercing rivet holes of the old panel, into the new panel, at the points where Hemloks are to be installed as indicated.



E133723

12. Remove the new panel

13. Remove the old panel remnants and any remaining self piercing rivets.

14. NOTE: The backing plates should be an interference fit.

    Fabricate backing plates from the old rocker panel remnant. Debur and offer up the backing plates to the rocker panel. If correct proceed to next step, if not, rectify and recheck before proceeding.

15. Remove the backing plates.

16. Fabricate run-on/run-off tabs from the old rocker panel remnant.

17. Debur the run-on/run-off tabs.

18. Using a Roloc fine bristle disc, clean and prepare the backing plates and run on/run off tabs.

19. Using a Roloc fine bristle disc, clean and prepare the old and new panel joint surfaces.

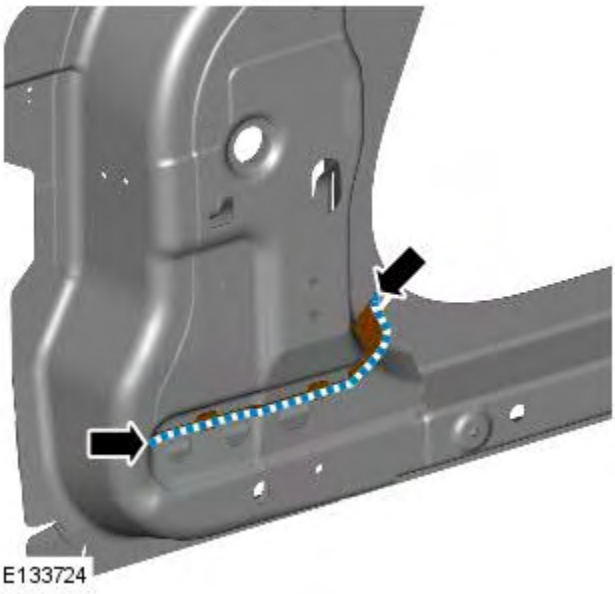
20. NOTE: The backing plates are installed with an interference fit.

    Install and align the backing plates to the vehicle.

21. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

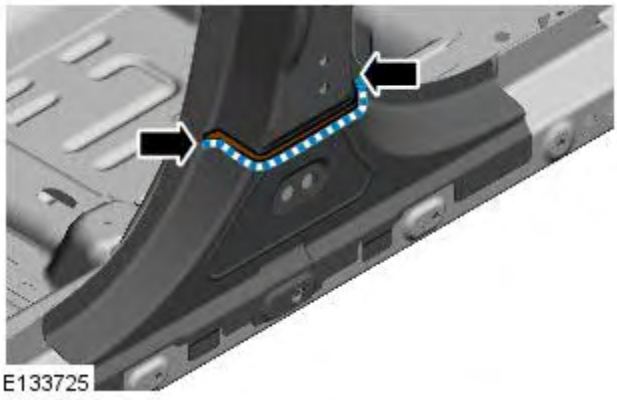
22. NOTE: Do not apply semi-rigid sealer in the areas where 3M 8115 adhesive is to be applied.

    Apply the coupling agent where 3M 8115 adhesive is to be applied and allow to dry.



23. NOTE: Do not apply semi-rigid sealer in the areas where 3M 8115 adhesive is to be applied.

    Apply semi-rigid sealer to the NVH component on the A-pillar reinforcement as indicated.



24. NOTE: Do not apply semi-rigid sealer in the areas where 3M 8115 adhesive is to be applied.

    Apply semi-rigid sealer to the NVH component on the B-pillar reinforcement as indicated.

25. NOTE: Do not apply semi-rigid sealer in the areas where 3M 8115 adhesive is to be applied.

    Apply semi-rigid sealer to the NVH component on the B-pillar reinforcement as indicated.

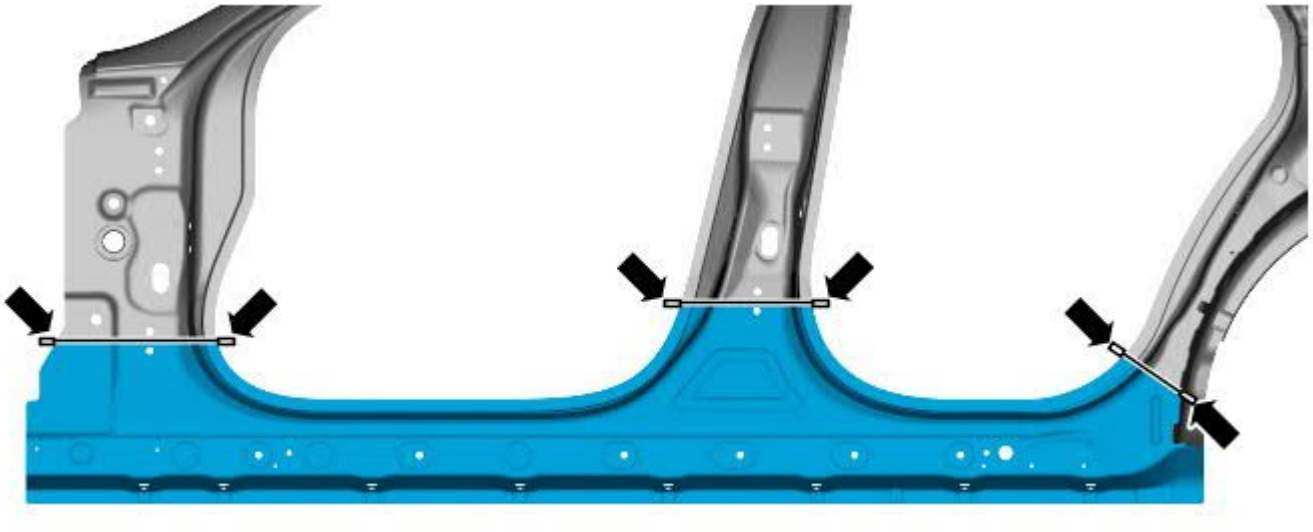
26. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes. Do not apply adhesive in the vicinity of the MIG welds.

    Apply a 5mm zig zag bead of 3M 8115 adhesive to all joints.

27. Offer up the new panel, align and clamp into position.

28. Tack weld the run-on/run-off tabs to all MIG butt joints.

29. MIG weld the MIG butt joints.

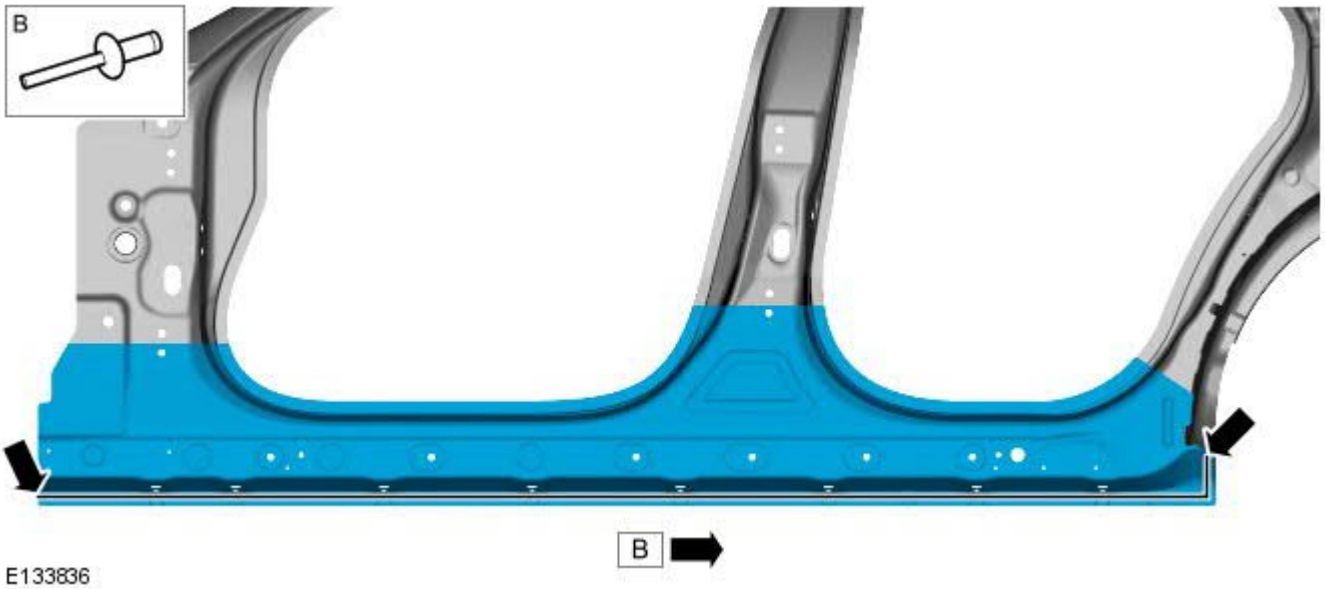


E133727

30. NOTE: It is important to identify and select the correct size fixing by referencing the following table prior to installation.

Using the Genesis G4, install the Hemloks in the areas as indicated.

Hemlok Rivet Size	Material Stack	Jaguar Service Number
6.4mm x 13.7mm	1.5mm - 3.0mm	C2S 45252
6.4mm x 15.0mm	2.8mm - 4.8mm	C2C 36006
6.4mm x 17.0mm	4.8mm - 6.8mm	C2C 36026
6.4mm x 19.0mm	6.8mm - 8.8mm	C2C 36024
6.4mm x 20.0mm	7.5mm - 9.5mm	C2C 22613
6.4mm x 21.0mm	8.8mm - 10.8mm	C2C 36008

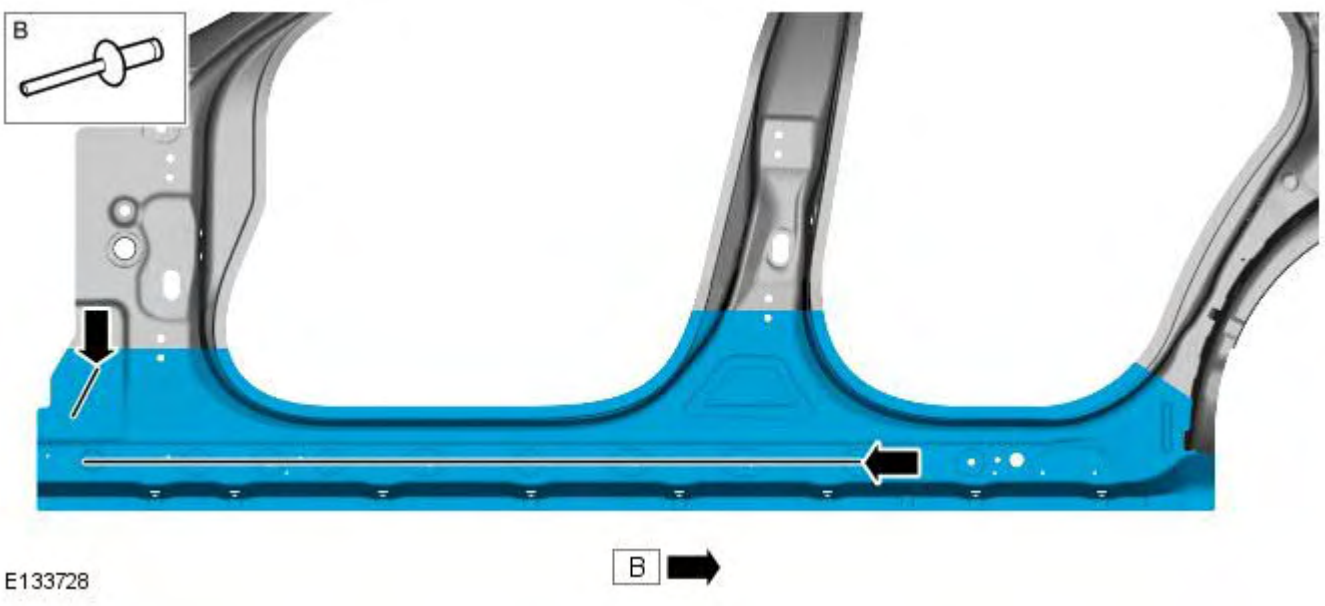


E133836

31. NOTE: It is important to identify and select the correct size fixing by referencing the following table prior to installation.

Using the Genesis G4, install the Hemloks in the areas as indicated.

Hemlok Rivet Size	Material Stack	Jaguar Service Number
6.4mm x 13.7mm	1.5mm - 3.0mm	C2S 45252
6.4mm x 15.0mm	2.8mm - 4.8mm	C2C 36006
6.4mm x 17.0mm	4.8mm - 6.8mm	C2C 36026
6.4mm x 19.0mm	6.8mm - 8.8mm	C2C 36024
6.4mm x 20.0mm	7.5mm - 9.5mm	C2C 22613
6.4mm x 21.0mm	8.8mm - 10.8mm	C2C 36008



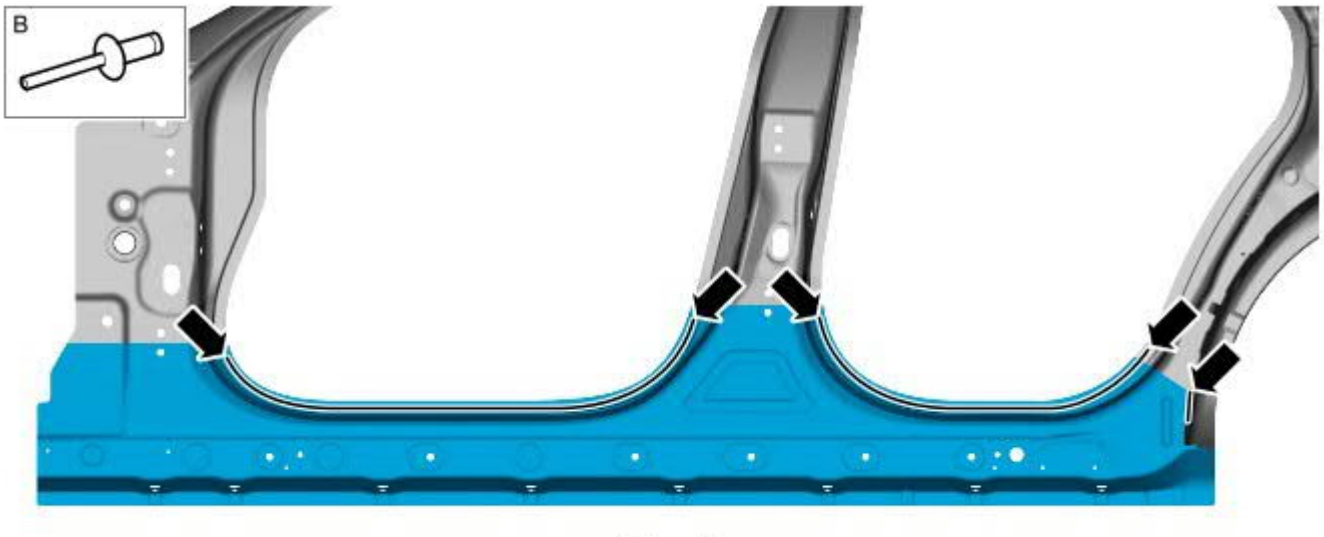
32. NOTES:

Replacement self piercing rivets should be installed adjacent to the removed originals wherever possible. If the pitch between the centres of removed self piercing rivets is less than 25mm, Hemloks should be installed in the hole created by the removed self piercing rivet(s).

It is important to identify and select the correct size fixing by referencing the following table prior to installation.

Using the Genesis G4, install the Hemloks in the areas as indicated.

Hemlok Rivet Size	Material Stack	Jaguar Service Number
6.4mm x 13.7mm	1.5mm - 3.0mm	C2S 45252
6.4mm x 15.0mm	2.8mm - 4.8mm	C2C 36006
6.4mm x 17.0mm	4.8mm - 6.8mm	C2C 36026
6.4mm x 19.0mm	6.8mm - 8.8mm	C2C 36024
6.4mm x 20.0mm	7.5mm - 9.5mm	C2C 22613
6.4mm x 21.0mm	8.8mm - 10.8mm	C2C 36008



E133729

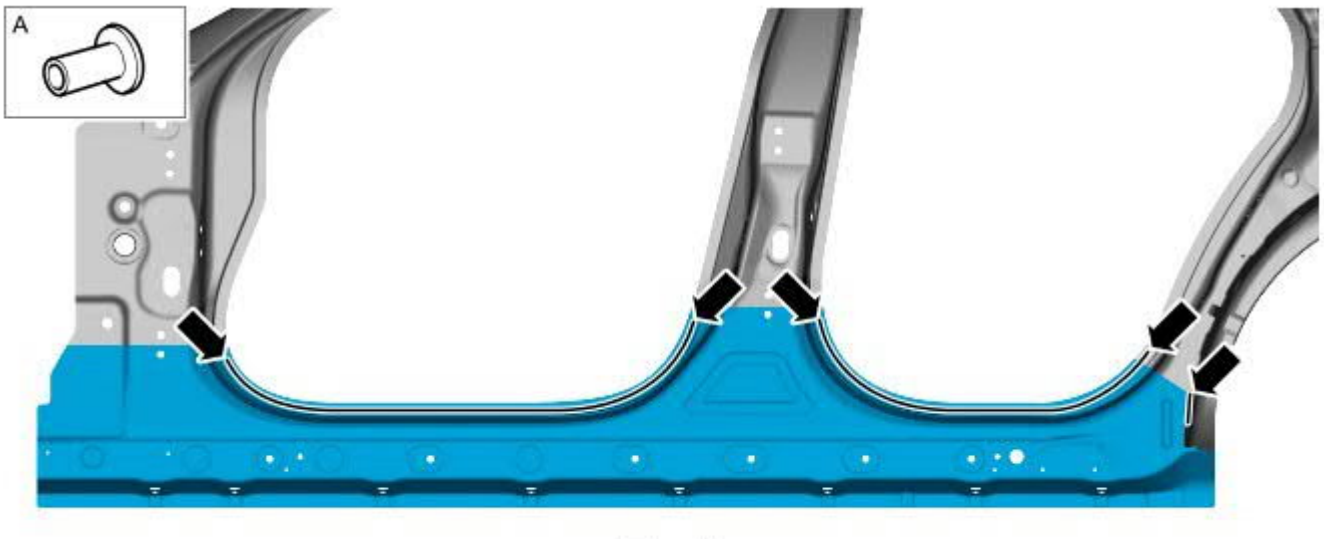
33. NOTES:

Replacement self piercing rivets should be installed adjacent to the removed originals wherever possible. If the pitch between the centres of removed self piercing rivets is less than 25mm, Hemloks should be installed in the hole created by the removed self piercing rivet(s).

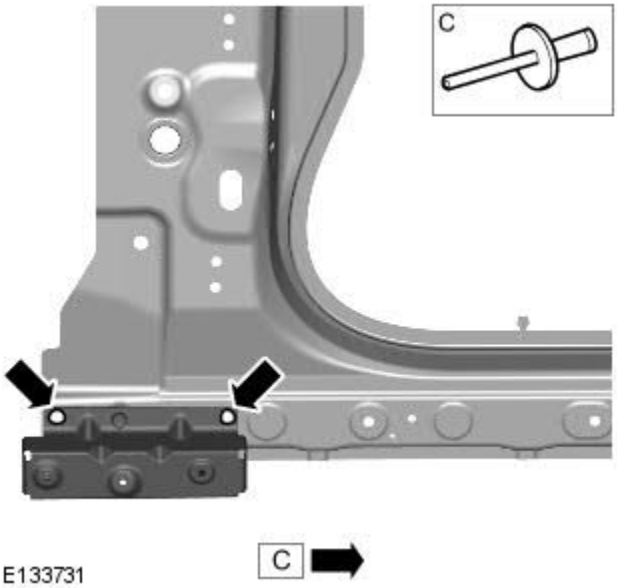
It is important to identify and select the correct size fixing by referencing the following table prior to installation.

Using the ESN50, install the self piercing rivets in the areas as indicated.

Self Piercing Rivet Size	Material Stack	Jaguar Service Number
4.8mm x 5.0mm	3.0mm	C2C 20589
4.8mm x 7.0mm	4.0mm	C2C 20590
4.8mm x 8.0mm	5.0mm	C2C 20591
4.8mm x 8.5mm	5.5mm	C2C 20592
4.8mm x 9.0mm	6.0mm	C2C 20593
4.8mm x 9.5mm	6.5mm	C2C 20594
4.8mm x 11.0mm	8.0mm	C2C 20595



E133730



E133731

34. Using the Genesis G4, install the Monobolts to the front fender lower mounting bracket as indicated.

35. Remove any excess adhesive.

36. Remove the run-on/run-off tabs.

37. Dress the welded joints.

38. Carry out a non destructive crack inspection on the MIG butt joints. If correct proceed to next step, if not, rectify and recheck before proceeding.

39. Make sure that any open or exposed panel joints are suitably sealed following this procedure.

40. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

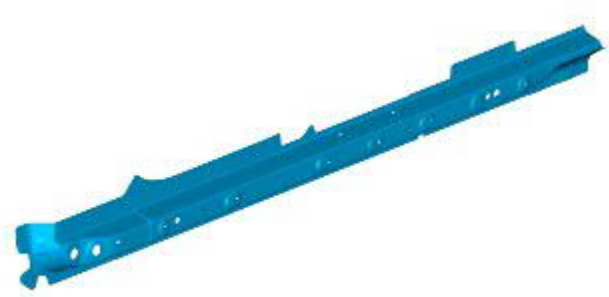
Side Panel Sheet Metal Repairs - Rocker Panel Inner Reinforcement

Removal and Installation

Removal

NOTE: The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being replaced in isolation, or, is being replaced in combination with panels other than those listed.

1. The rocker panel inner reinforcement is a category A repair.



E133564

2. NOTE: The rocker panel inner reinforcement is manufactured from aluminium alloy 5754-NG.

   The rocker panel inner reinforcement is serviced as a separate rivetted and bonded panel.

3. In this procedure, to make sure the vehicle is correctly aligned, it must be placed on an approved alignment jig.

4. The rocker panel inner reinforcement is replaced in conjunction with:
   - Front bumper cover
   - Rear bumper cover
   - Front door
   - Rear door
   - Front fender
   - Hood
   - Hood hinge
   - Luggage compartment lid
   - Hood latch panel
   - Fender apron panel closing panel
   - Quarter panel
   - A-pillar outer panel
   - A-pillar reinforcement
   - Rocker panel and b-pillar outer panel
   - B-pillar reinforcement
   - Rocker panel
   - Headliner
   - Windshield glass remove and install
   - Rear window glass
   - Instrument panel upper section
   - Roof opening panel frame
   - Roof glass front
   - Roof glass rear

5. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

6. Remove the B-pillar reinforcement.

For additional information, refer to: B-Pillar Reinforcement (501-29 Side Panel Sheet Metal Repairs, Removal and Installation).

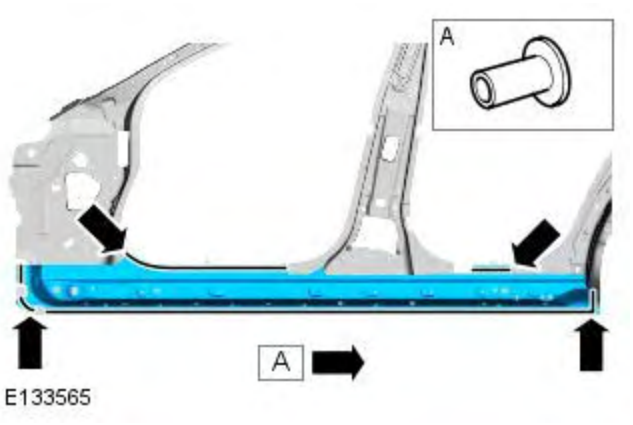
7. Remove the A-pillar reinforcement.
   For additional information, refer to: A-Pillar Reinforcement (501-29 Side Panel Sheet Metal Repairs, Removal and Installation).

8. Remove the rocker panel.
   For additional information, refer to: Rocker Panel (501-29 Side Panel Sheet Metal Repairs, Removal and Installation).

9. Disconnect the battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

10. Remove any remaining miscellaneous components from the repair area as necessary.

11. Prior to removal, mark the position of the rocker panel inner reinforcement in relation to adjacent panels, for ease of alignment on installation.



12. Using the ESN50, remove any remaining self piercing rivets from the areas indicated.

13. NOTE: Remove and retain the noise, vibration and harshness (NVH) component, if it is to be reused.

    Separate the joints and remove the old panel, also releasing the NVH component if required.

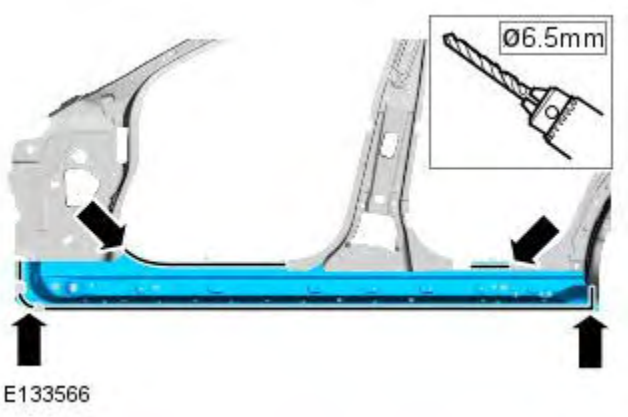
Installation

1. Remove rivet remnants.

2. Dress flanges where necessary.

3. Using a Roloc fine bristle disc, clean and prepare the panel surfaces, also removing any adhesive residue.

4. Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.



5. NOTE: Replacement self piercing rivets should be installed adjacent to the removed originals wherever possible. If the pitch between the centres of removed self piercing rivets is less than 25mm, Hemloks should be installed in the hole created by the removed self piercing rivet(s).

   Where the pitch of the removed self piercing rivets is 25mm or less, use a 6.5mm Cryobit drill bit to drill through the removed self piercing rivet holes of the old panel, into the new panel. Hemloks will be installed in these locations when the outer panel is installed.

6. Remove the new panel.

7. Debur the drilled holes in the new panel.

8. Using a Roloc fine bristle disc, clean and prepare the old and new panel surfaces, also removing any adhesive residue.

9. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

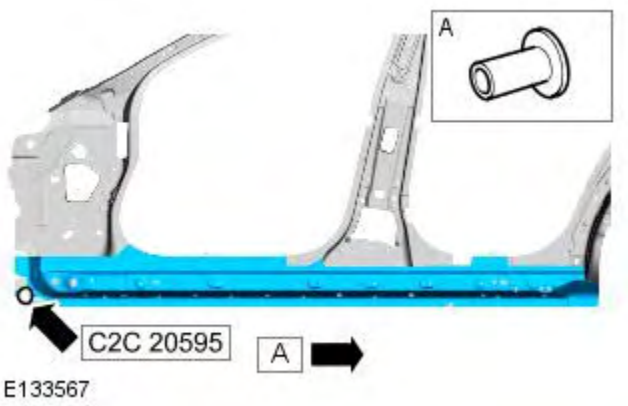
10. Apply the coupling agent where 3M 8115 adhesive is to be applied and allow to dry.

11. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes.

    Apply a 5mm zig zag bead of 3M 8115 adhesive to the vehicle.

12. CAUTION: Make sure any panel joints containing adhesive are fully clamped to avoid any separation prior to the installation of other panels. These joints must be left clamped until the adhesive has cured.

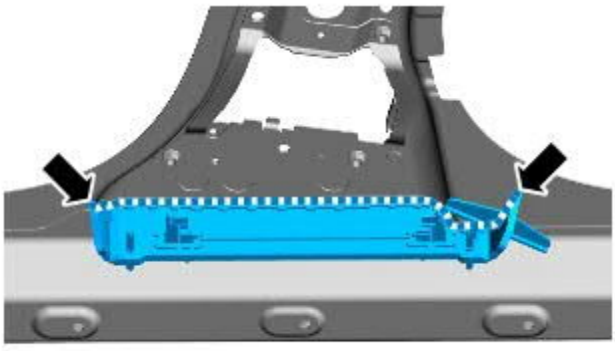
    Offer up the new panel, align and clamp into position. If correct proceed to next step, if not, rectify and recheck before proceeding.



13. Using the ESN50, install the self piercing rivet as indicated.

14. Remove any excess adhesive.

15. Trim, clean and prepare the NVH component.



E133568

16. Apply semi-rigid sealer to the NVH component and install to the new panel.

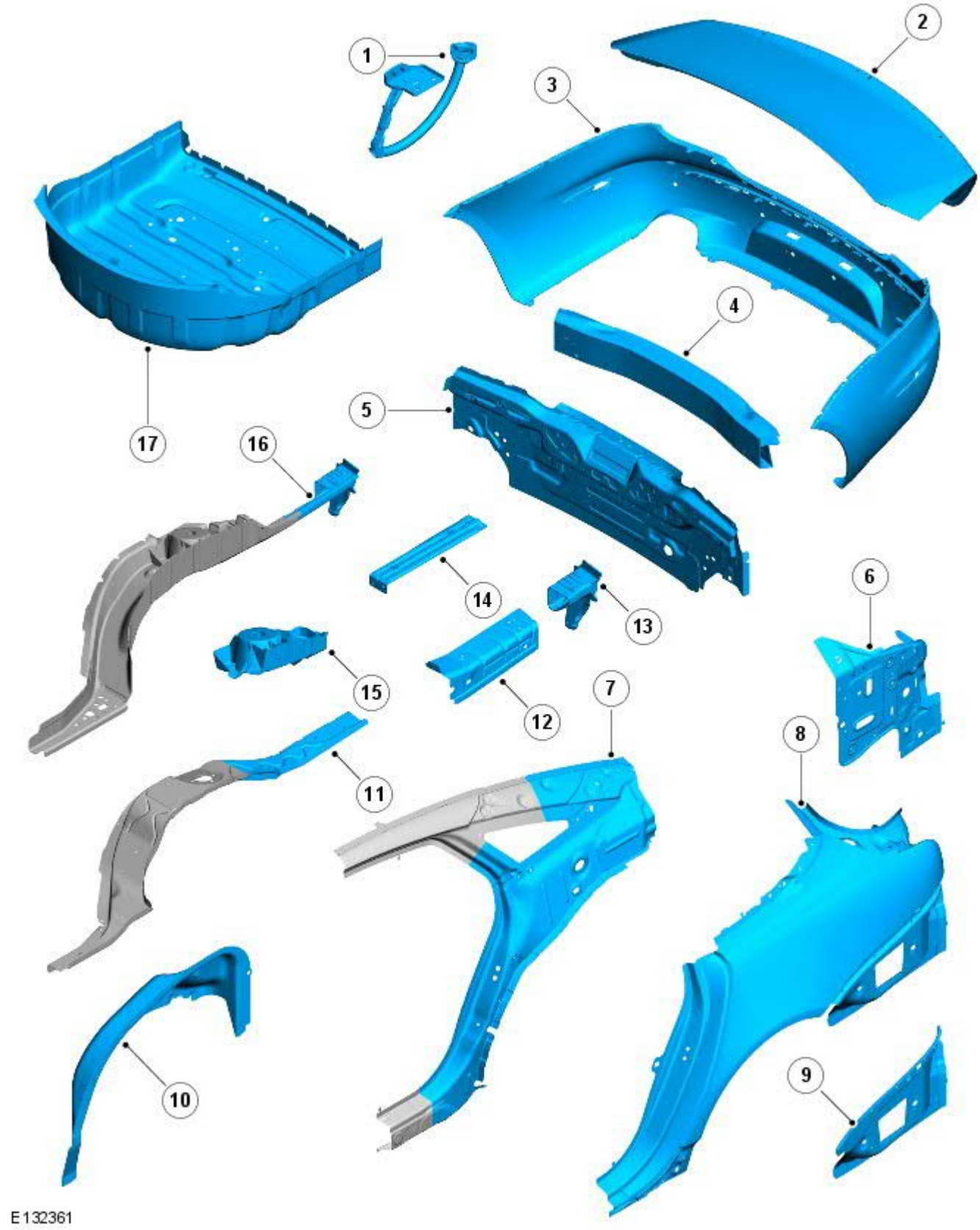
17. The installation of associated panels and components is the reversal of removal procedure.

Published: 19-Dec-2012

Rear End Sheet Metal Repairs - Rear End Sheet Metal

Description and Operation

Rear end service panels



NOTE: The illustration may indicate either hand of the service panel, the opposite hand will be similar.

Item	Description
1	Luggage compartment lid hinge L/H and R/H
2	Luggage compartment lid
3	Rear bumper cover
4	Rear bumper
5	Back panel
6	Inner quarter panel extension
7	Inner quarter panel rear section
8	Quarter panel
9	Quarter panel lower extension
10	Rear wheelhouse outer
11	Rear side member closing panel section
12	Rear floor side extension
13	Rear bumper mounting
14	Rear side member inner reinforcement
15	Rear suspension cast aluminium mounting
16	Rear side member section
17	Spare wheel well

Time Schedules, Front End Sheet Metal

The following information shows the total time taken to replace single panels. This time includes removal of Mechanical, Electrical and Trim, (MET), items, plus paint times based on Metallic Clear Over Base Paint, (blends for adjacent panels not included).

The times shown are to be used as a guide only.

Single panel times

Panel Description	Hours
Back Panel	**10.70**
Inner Quarter Panel Extension	**1.90**
Inner Quarter Panel Section	**9.30**
Quarter Panel	**11.40**
Quarter Panel Lower Extension	**TBC**
Rear Bumper Mounting	**TBC**
Rear Floor Side Extension	**TBC**
Rear Side Member Closing Panel	**13.40**
Rear Wheelhouse Outer	**3.00**
Spare Wheel Well	**12.10**

Published: 11-May-2011

Rear End Sheet Metal Repairs - Back Panel

Removal and Installation

Removal

NOTE: The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being replaced in isolation, or, is being replaced in combination with panels other than those listed.

1. The back panel is a category A repair.

E129307

2. NOTE: The back panel is manufactured from aluminium alloy 5754-NG.

   The back panel is serviced as a separate riveted and bonded panel, it includes the back panel inner.

3. The back panel is replaced in conjunction with:
   - Rear bumper cover
   - Rear bumper

4. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

5. Remove the rear bumper.
   For additional information, refer to: Rear Bumper (501-19 Bumpers, Removal and Installation).

6. Remove both the loadspace trim panels.
   For additional information, refer to: Loadspace Trim Panel LH (501-05 Interior Trim and Ornamentation, Removal and Installation) /
   Loadspace Trim Panel RH (501-05 Interior Trim and Ornamentation, Removal and Installation).

7. Remove the luggage compartment lid weatherstrip.

8. Disconnect the battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

9. Disconnect the generator electrical connectors.

10. Remove both the rear mufflers.
    For additional information, refer to: Rear Muffler (309-00A Exhaust

System - TDV6 3.0L Diesel, Removal and Installation) / Rear Muffler (309-00B Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

11. Remove the right-hand and left-hand rear muffler heatshields.

12. Remove the auxiliary junction box (AJB).
For additional information, refer to: Auxiliary Junction Box (AJB) (418-00 Module Communications Network, Removal and Installation).

13. Remove the rear junction box (RJB).
For additional information, refer to: Rear Junction Box (RJB) (418-00 Module Communications Network, Removal and Installation).

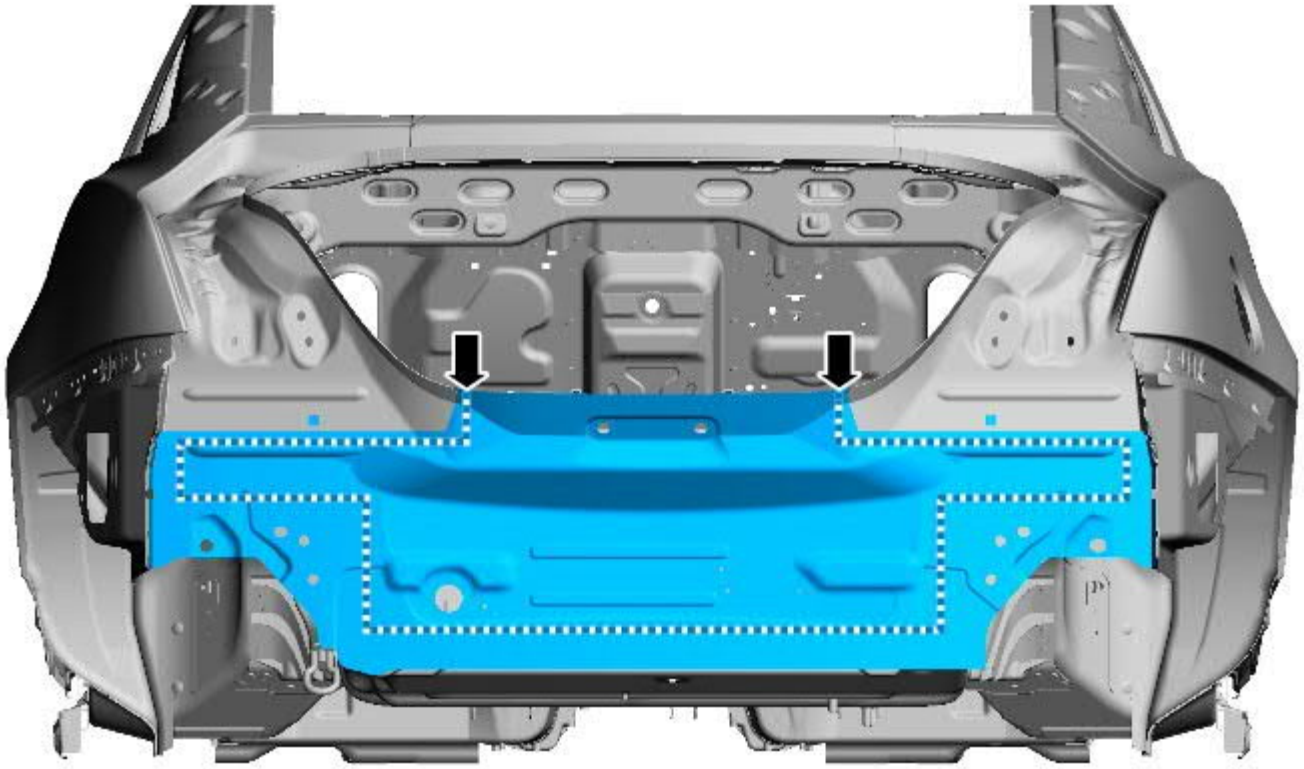
14. Release the back panel and loadspace wiring harness and position it to one side.

15. Remove the luggage compartment latch striker.

16. Remove the air suspension compressor.
For additional information, refer to: Air Suspension Compressor (204-05 Vehicle Dynamic Suspension, Removal and Installation).

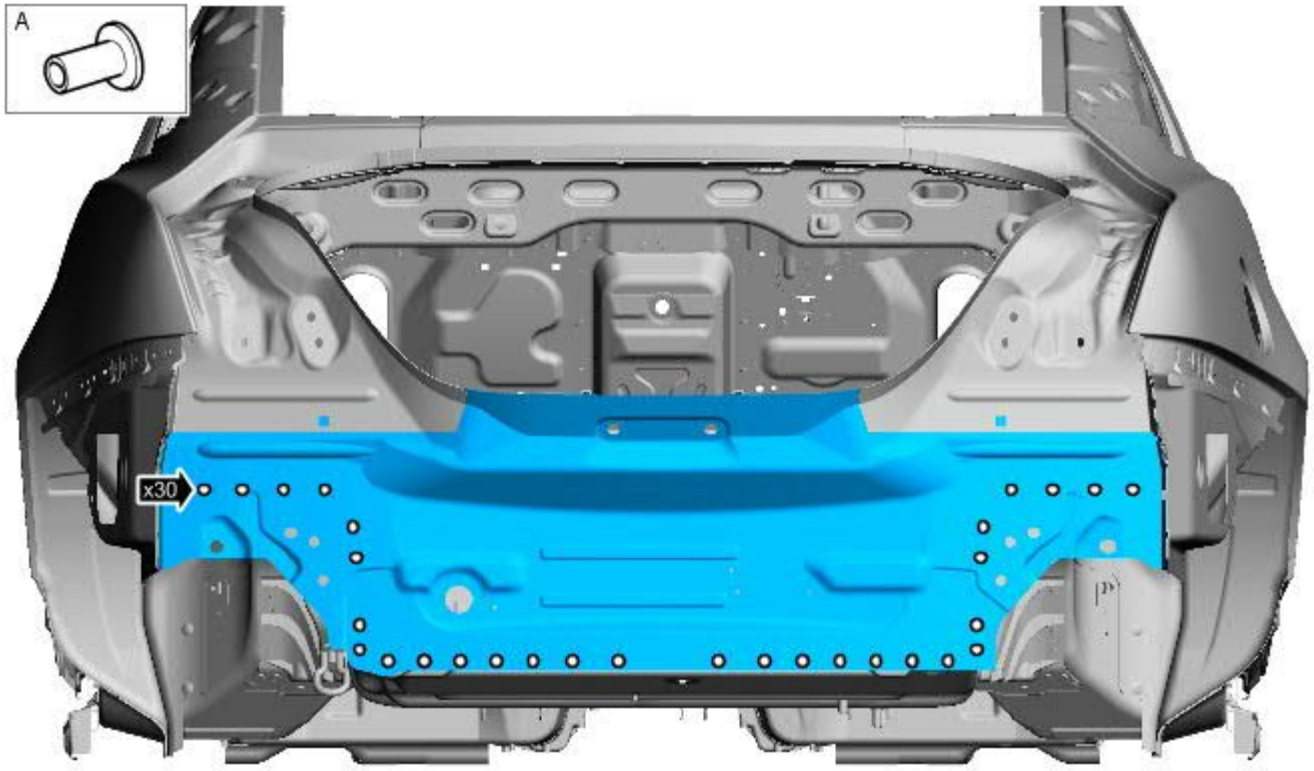
17. Remove any electrical components in the local area of repair to prevent damage.

18. Saw cut the old panel along the point shown in the illustration. This allows access to allow the use of the ESN50.



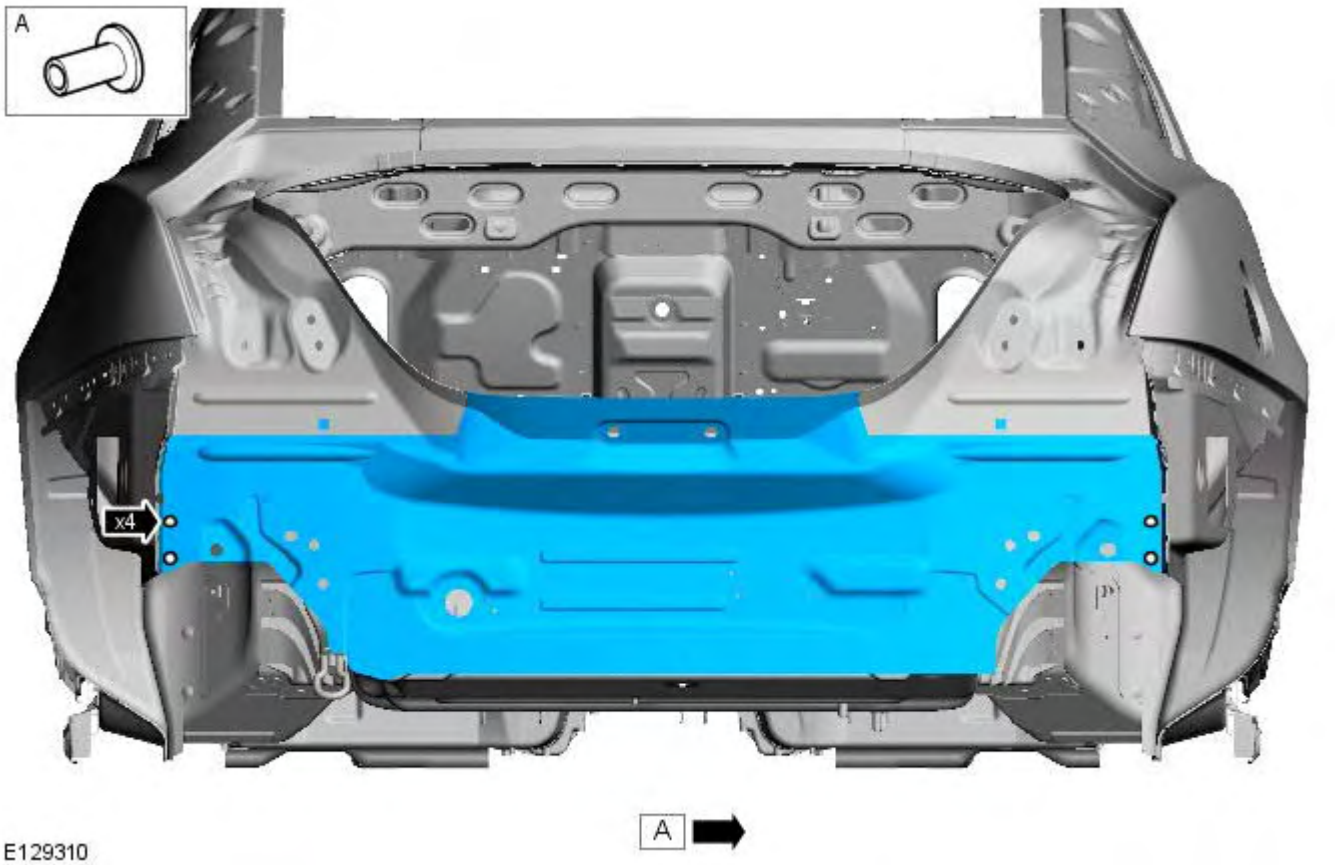
E129308

19. Using the ESN50, remove the self piercing rivets from the spare wheel well and rear side members.

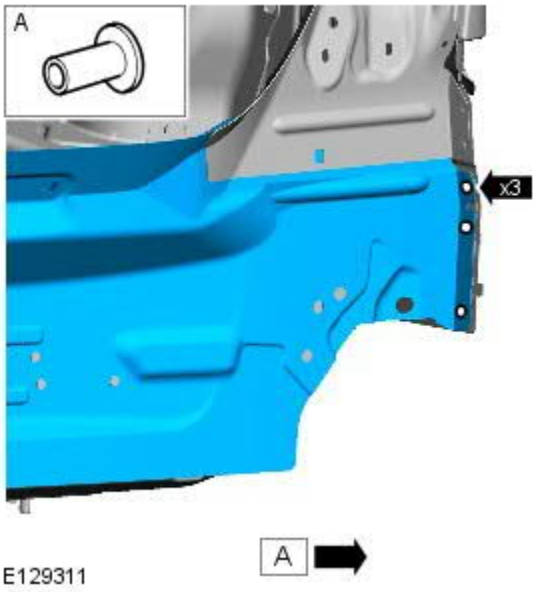


E129309

20. Using the ESN50, remove the self piercing rivets from the rear floor side extensions.

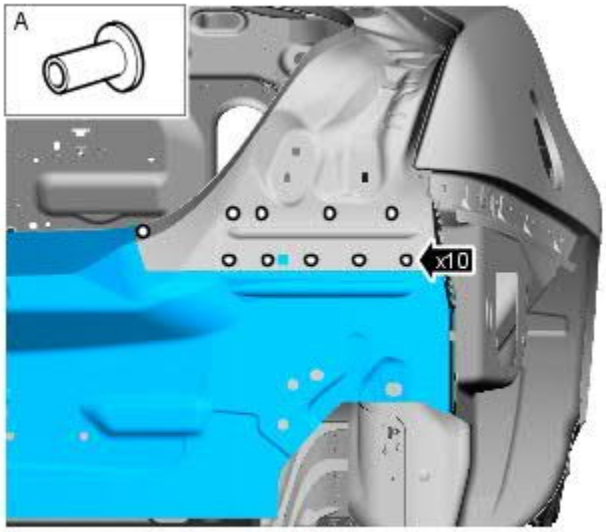


E129310



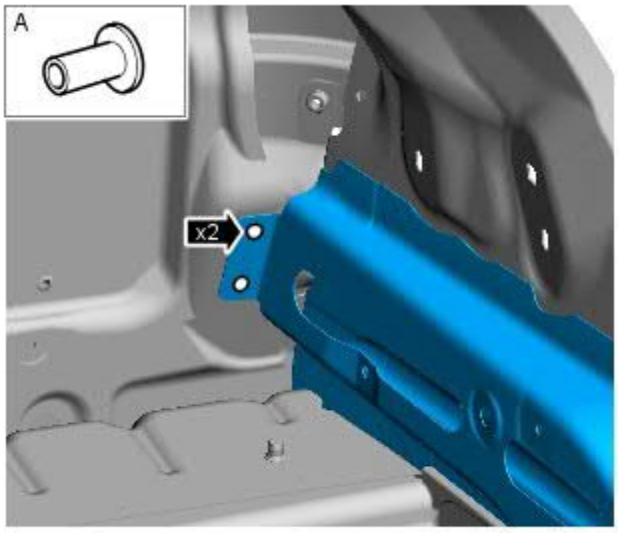
E129311

21. Using the ESN50, remove the self piercing rivets (3 each side) from the quarter panel lower extensions.



E129312

22. Using a combination of the ESN50 and a 6.5mm Cryobit drill bit, remove the self piercing rivets (10 each side) from the quarter panels.

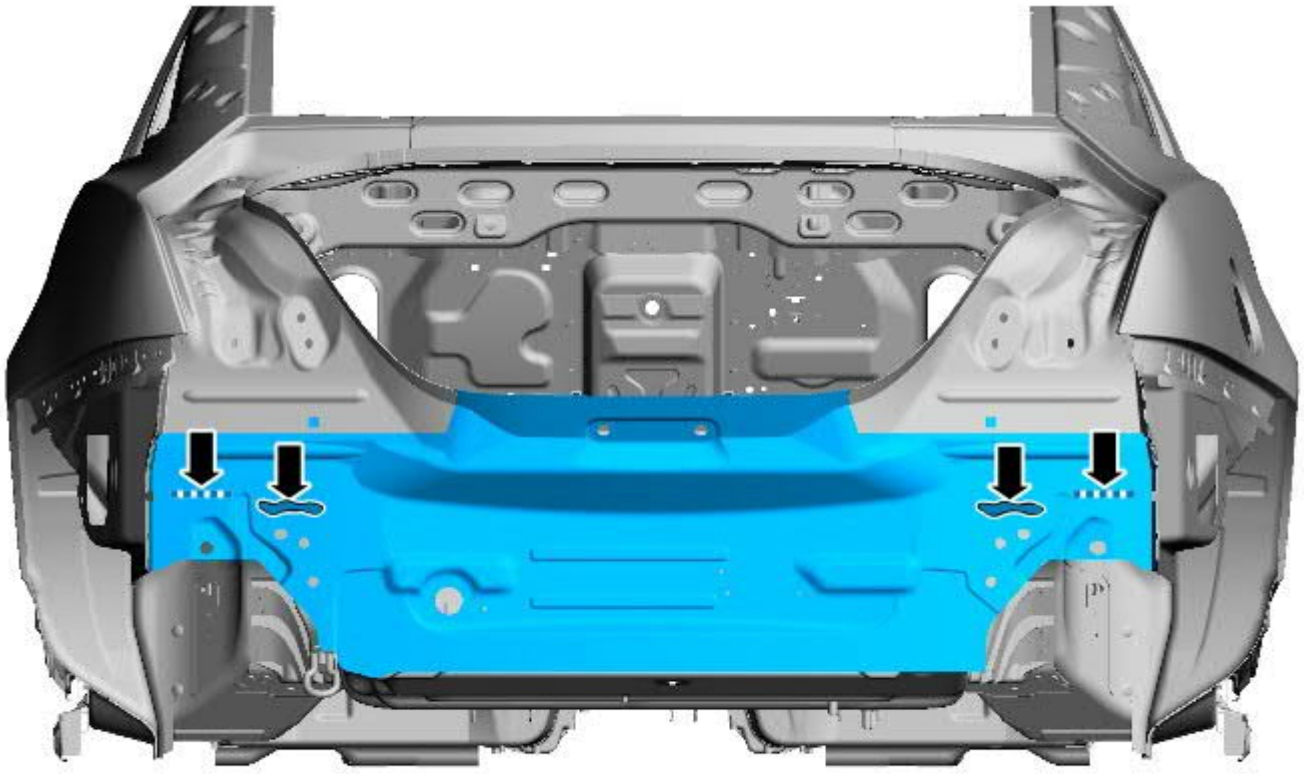


E129313

23. CAUTION: Use care not to drill through into inner panels.

    Using a 6.5mm Cryobit drill bit, remove the self piercing rivets (2 each side) from the junction box and modules mounting panels.

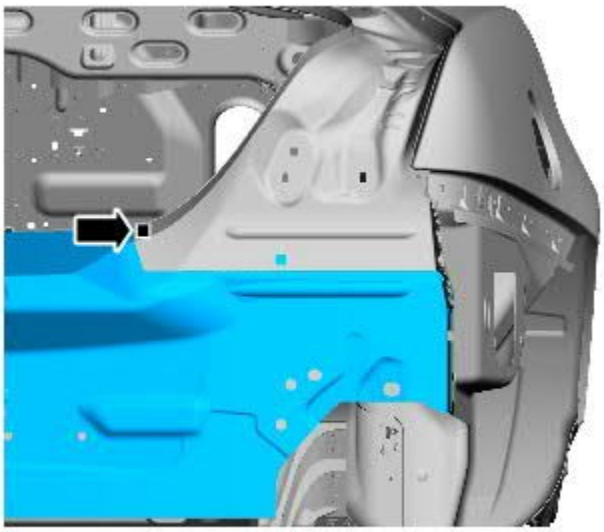
24. Separate the joints and remove the old panel, carefully releasing the adhesive at the points illustrated.



E129314

Installation

1. Remove rivet remnants.
2. Using a Roloc fine bristle disc, remove the adhesive residue.
3. Dress flanges where necessary.
4. Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.
5. Using a 6.5mm Cryobit drill bit, drill holes through the old panels into the new panel, at the points where Hemloks are to be installed. Where it is not possible to drill, scribe mark the hole locations on the new panel.
6. Remove the new panel.
7. Using a 6.5mm Cryobit drill bit, drill holes in the new panel at the scribe marked locations.



E129612

8. Using a 10mm drill bit, drill 2 holes in the old quarter panel ready for MIG plug welding.

9. Debur the drilled holes.

10. CAUTION: Use care not to damage the panel.

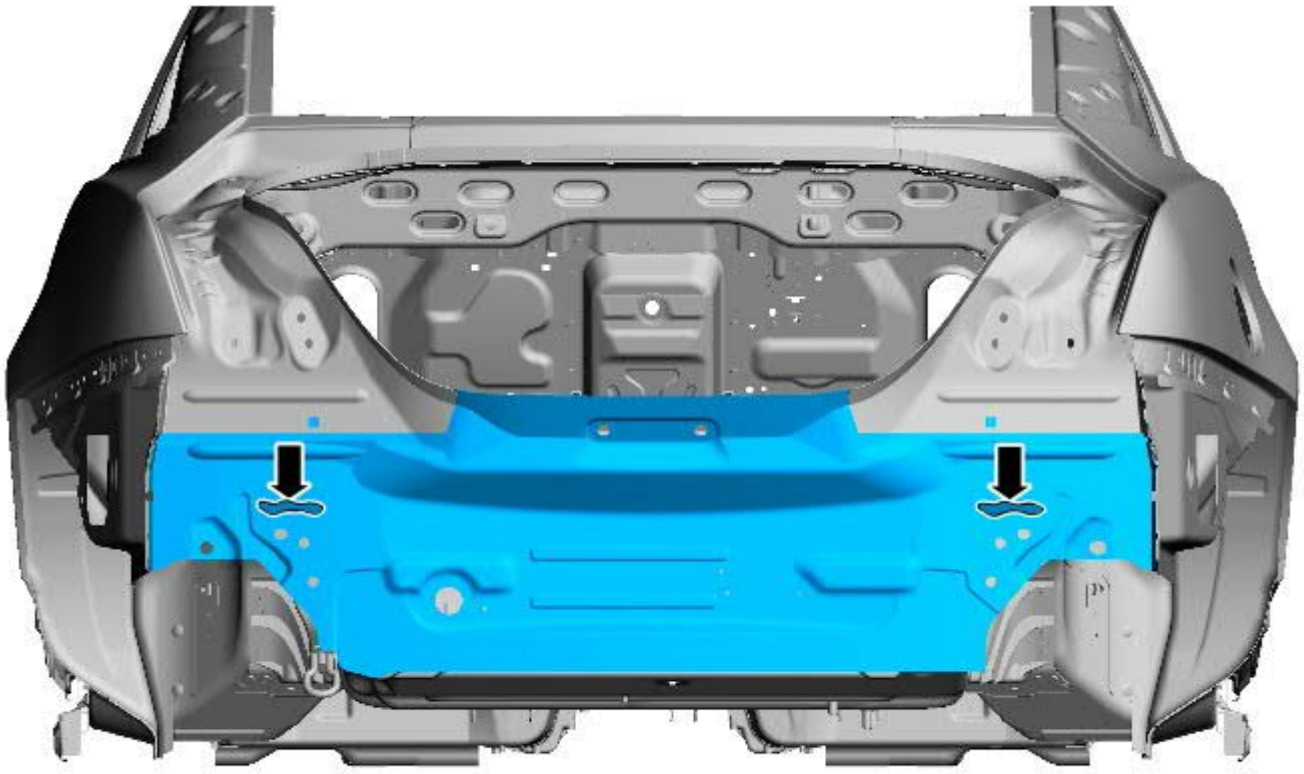
    Remove seam sealer where applicable.

11. Using a Roloc fine bristle disc, clean and prepare the panel surfaces.

12. Pyrosil the joints.

13. Apply the coupling agent and allow to dry.

14. Apply the semi-rigid sealer at the points illustrated.



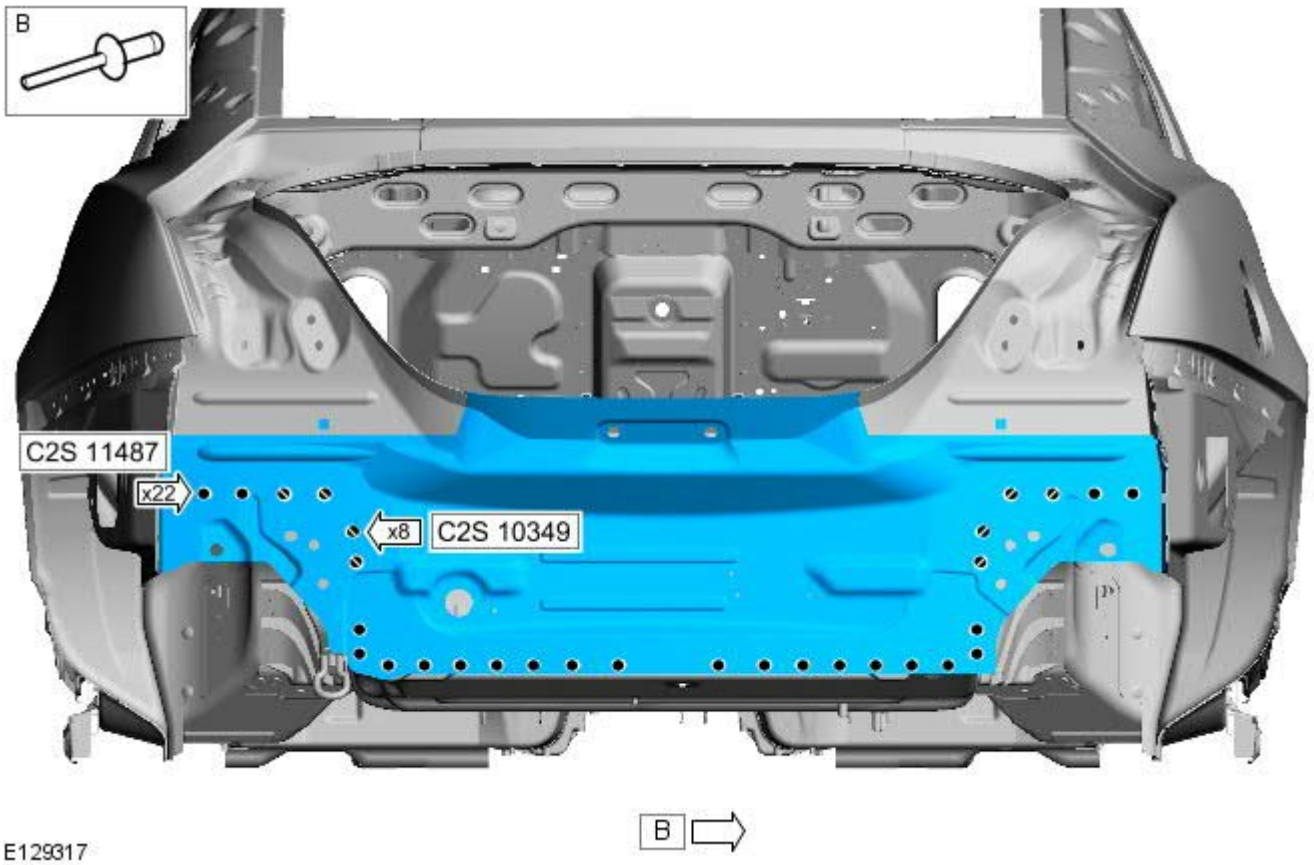
E129315

15. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes. Do not apply adhesive in the vicinity of the MIG plug welds.

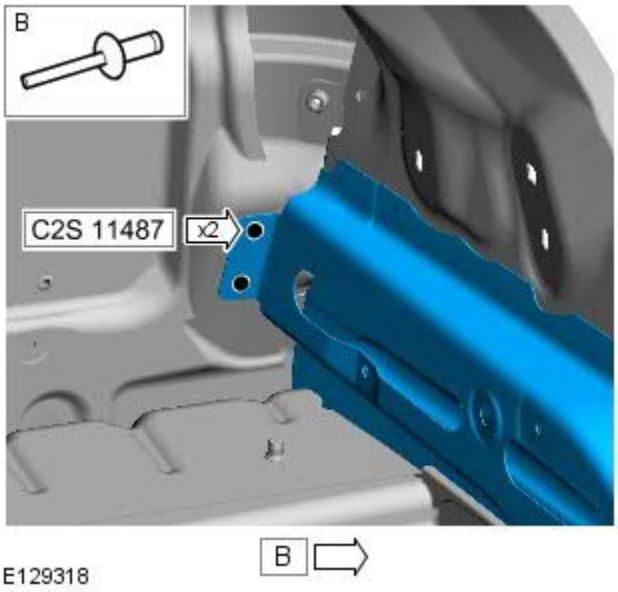
    Apply a 5mm zig zag style bead of 3M 8115 adhesive to the body joints.

16. Offer up the new panel and clamp into position.

17. Using the Genesis G4, install 8 Hemloks (4 each side) into the rear side member. Install a further 22 Hemloks (11 each side) into the spare wheel well and rear floor side extension.

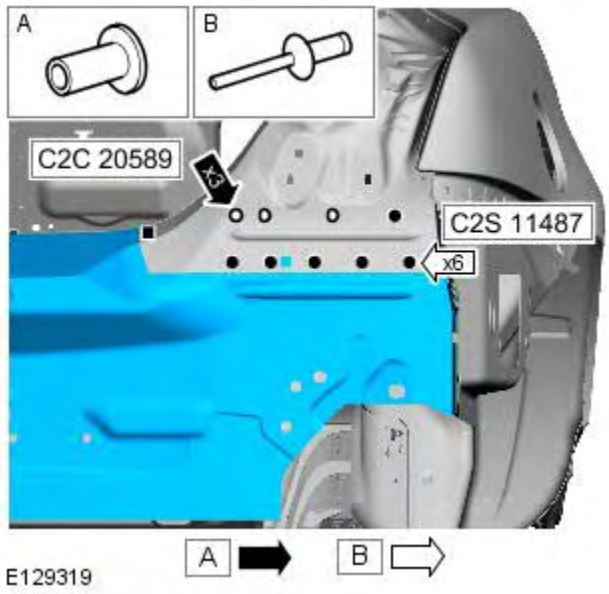


E129317



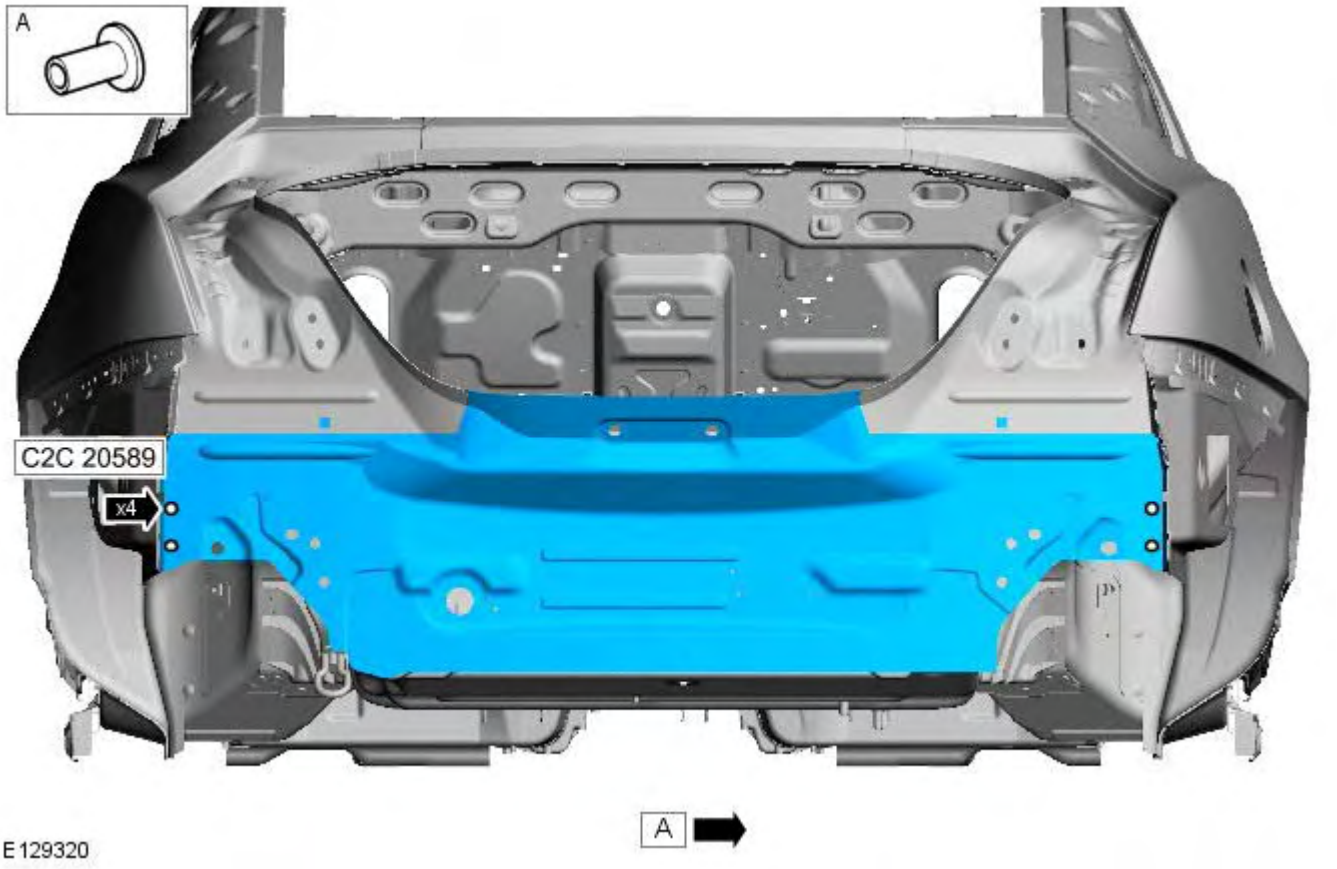
E129318

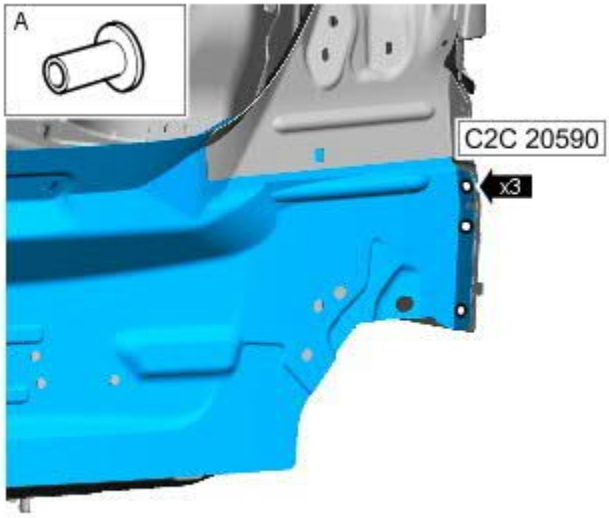
18. Using the Genesis G4, install the Hemloks (2 each side) into the junction box and modules mounting panels.



19. Using the Genesis G4, install 12 Hemloks (6 each side) into the quarter panel. Using the ESN50, install the self piercing rivets (3 each side) into the quarter panel.

20. Using the ESN50, install the self piercing rivets into the rear floor side extension.

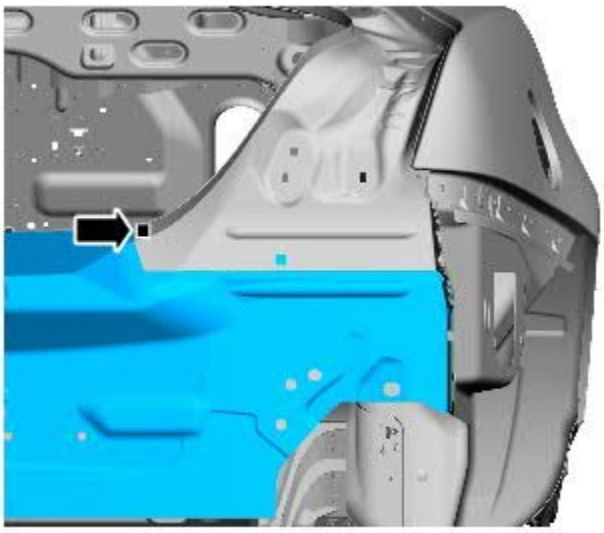




E129321

21. Using the ESN50, install the self piercing rivets (3 each side) into the quarter panel lower extension.

22. Remove any excess adhesive.



E129612

23. Install 2 MIG plug welds (1 each side) into the quarter panel.

24. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Rear End Sheet Metal Repairs - Inner Quarter Panel Extension

Removal and Installation

Removal

1. NOTE: The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being replaced in isolation, or, is being replaced in combination with panels other than those listed.

   The inner quarter panel extension is a category A repair.

2. NOTE: The inner quarter panel extension is manufactured from aluminium alloy 5754-NG.

   The inner quarter panel extension is serviced as a separate rivetted and bonded panel.

3. The inner quarter panel extension is installed in conjunction with:
   - Rear bumper cover
   - Rear bumper
   - Back panel
   - Luggage compartment lid
   - Luggage compartment lid hinge
   - Quarter panel
   - Rear window glass

4. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

5. Disconnect the battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

6. Remove the quarter panel.
   For additional information, refer to: Quarter Panel (501-30 Rear End Sheet Metal Repairs, Removal and Installation).

7. Remove the back panel.
For additional information, refer to: Back Panel (501-30 Rear End Sheet Metal Repairs, Removal and Installation).

8. Remove the rear suspension vertical accelerometer.
For additional information, refer to: Rear Suspension Vertical Accelerometer (204-05 Vehicle Dynamic Suspension, Removal and Installation).

9. If the right-hand inner quarter panel extension is to be installed, remove the differential locking module.

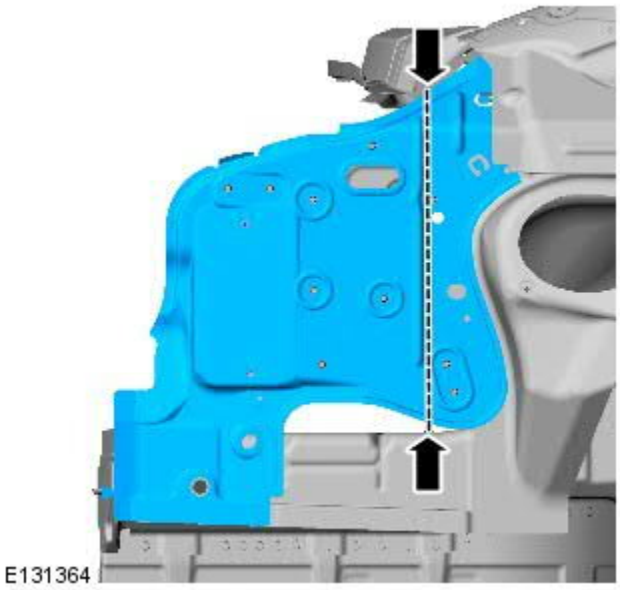
10. If the right-hand inner quarter panel extension is to be installed, remove the adaptive damping module.
For additional information, refer to: Adaptive Damping Module (204-05 Vehicle Dynamic Suspension, Removal and Installation).

11. If the right-hand inner quarter panel extension is to be installed, remove the air suspension control module.
For additional information, refer to: Air Suspension Control Module (204-05 Vehicle Dynamic Suspension, Removal and Installation).

12. Remove any electrical components in the local area of repair to prevent damage.

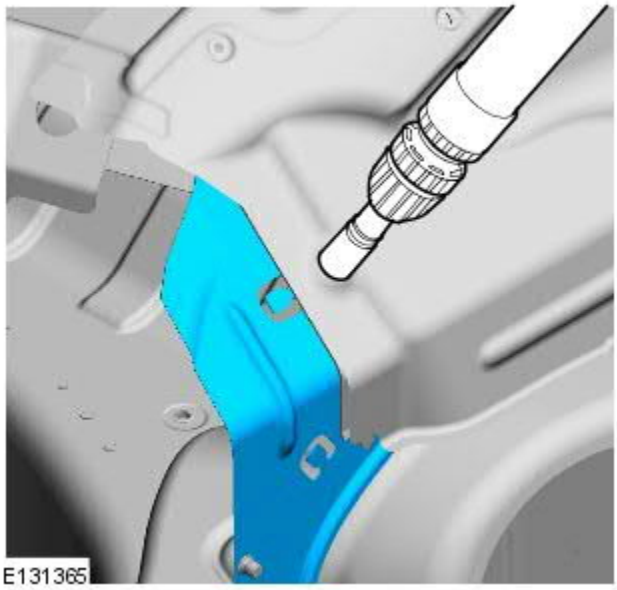
13. Release and position the loadspace wiring harness to one side.

14. Prior to removal, mark the position of the inner quarter panel extension in relation to adjacent panels for ease of alignment on installation.

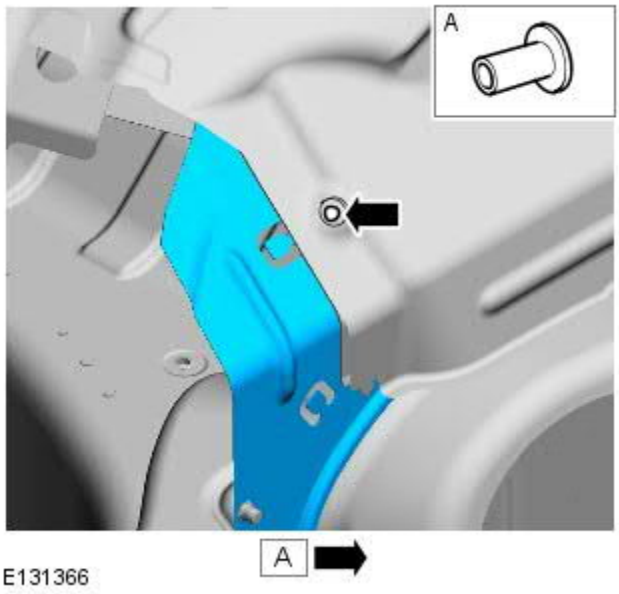

E131364

15. CAUTION: Use care not to damage adjacent panels.

Saw cut to remove the panel bulk as indicated.



16. Use a hole saw to cut an access hole to expose the hidden self piercing rivet.



17. Using a 6.5mm Cryobit drill bit, remove the self piercing rivet through the access hole.

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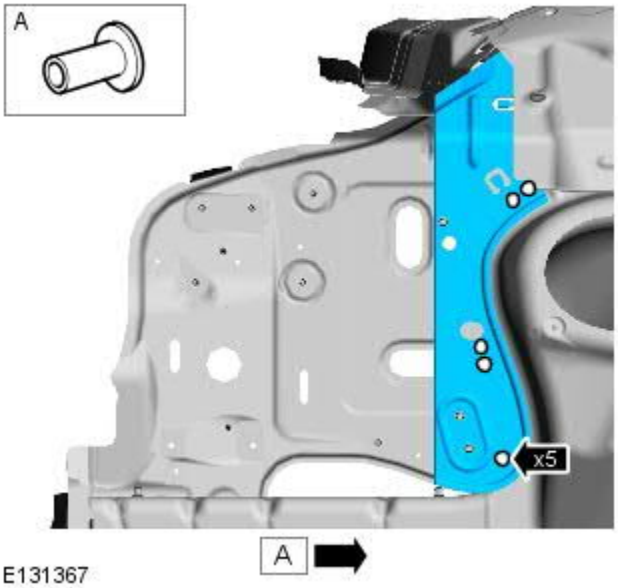
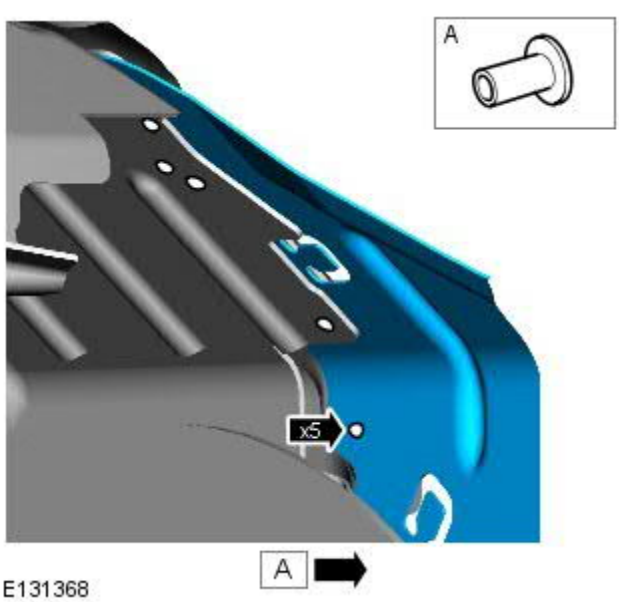


E131367

18. NOTE: Drill through all panels as Hemloks will be used for installation.

    Using a combination of the ESN50 and a 6.5mm Cryobit drill bit remove the self piercing rivets.



E131368

19. NOTE: Drill through all panels as Hemloks will be used for installation.

    Using a 6.5mm Cryobit drill bit, remove the self piercing rivets.

20. Separate the joints and remove the old panel remnant.

Installation

1. Remove rivet remnants.

2. Dress flanges where necessary.

3. NOTE: Use the marks made prior to removal to aid alignment.

   Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.

4. Using a 6.5mm Cryobit drill bit, drill holes through the old panels into

the new panel at the points where Hemloks are to be installed.

5. Remove the new panel.

6. Deburr the drilled holes.

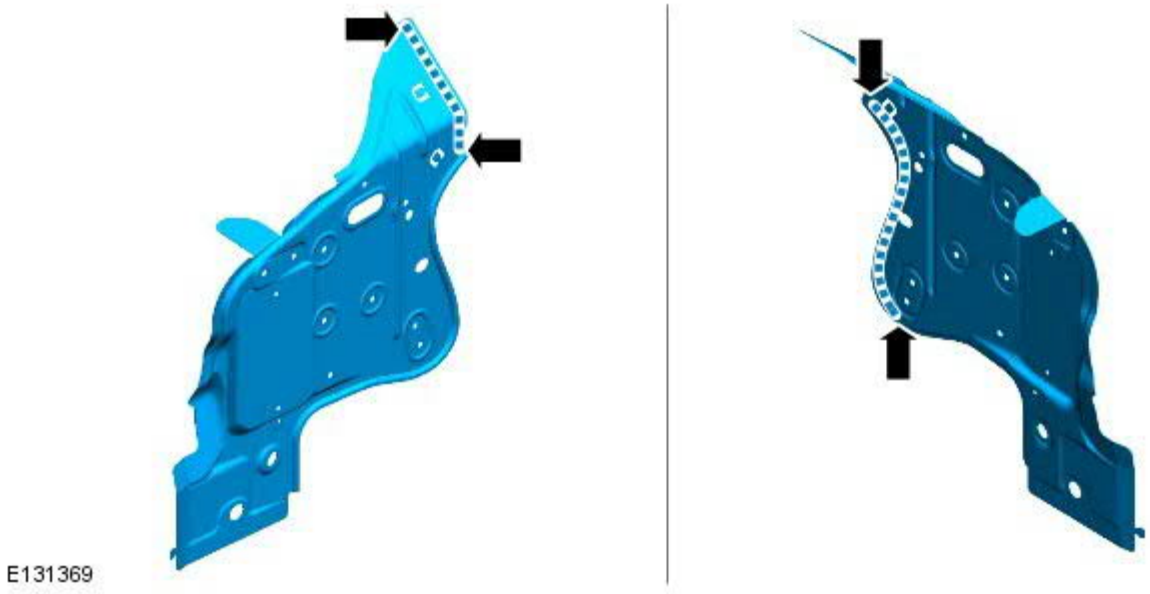
7. Using a Roloc fine bristle disc, clean and prepare the panel surfaces.

8. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

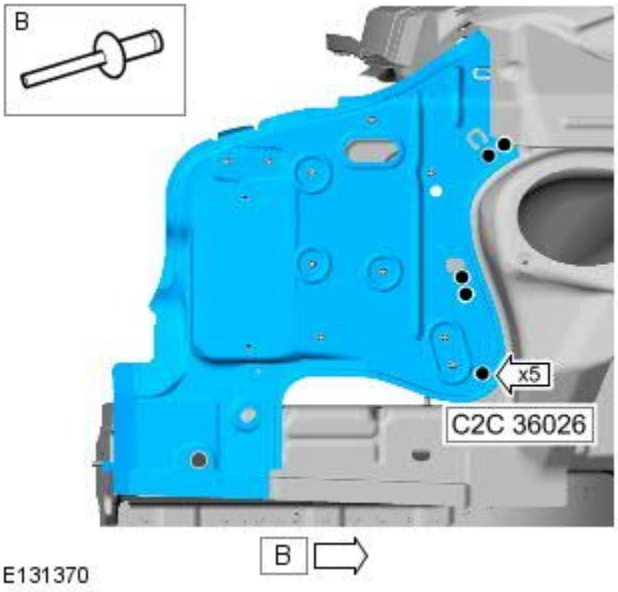
9. Apply the coupling agent where 3M 8115 adhesive is to be applied and allow to dry.

10. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes.

    Apply a 5mm zig zag bead of 3M 8115 adhesive to the body joints. Not to the quarter panel or back panel as these will be bonded later.

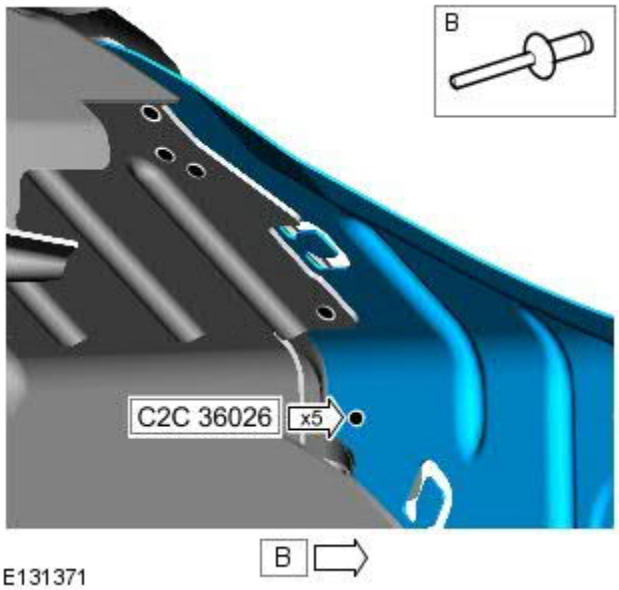


11. Offer up the new panel, align and clamp into position.



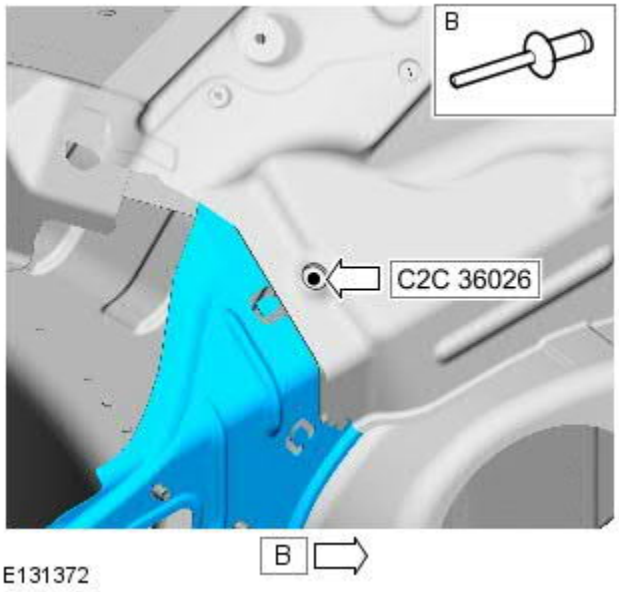
E131370

12. Using the Genesis G4, install the Hemloks.



E131371

13. Using the Genesis G4, install the Hemloks.



E131372

14. Using the Genesis G4, install the Hemloks.

15. Remove any excess adhesive.

16. CAUTION: Make sure that adhesive is applied between the rear floor side extension and the lower flange of the inner quarter panel extension when installing the quarter panel.

    The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Rear End Sheet Metal Repairs - Inner Quarter Panel Rear Section

Removal and Installation

Removal

NOTES:

The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being replaced in isolation, or, is being replaced in combination with panels other than those listed.

The procedure shown is for the right-hand inner quarter panel rear section, the procedure for the left-hand is similar.

1. The inner quarter panel rear section is a category A repair.

2. The inner quarter panel rear section is serviced as a separate welded, bonded and riveted panel.

E132009

3. The inner quarter panel rear section is replaced in conjunction with:
   - Rear bumper cover
   - Rear bumper
   - Rear Door
   - Quarter panel
   - Luggage compartment lid
   - Luggage compartment lid hinge
   - Rear window glass
   - Headliner

4. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

5. Disconnect the vehicle battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

6. Disconnect the generator electrical connectors.

7. Remove the quarter panel.
For additional information, refer to: Quarter Panel (501-30 Rear End Sheet Metal Repairs, Removal and Installation).

8. Remove the rear door.
For additional information, refer to: Rear Door (501-03 Body Closures, Removal and Installation).

9. Remove the headliner.
For additional information, refer to: Headliner (501-05 Interior Trim and Ornamentation, Removal and Installation).

10. Remove the side air curtain module.
For additional information, refer to: Side Air Curtain Module (501-20B Supplemental Restraint System, Removal and Installation).

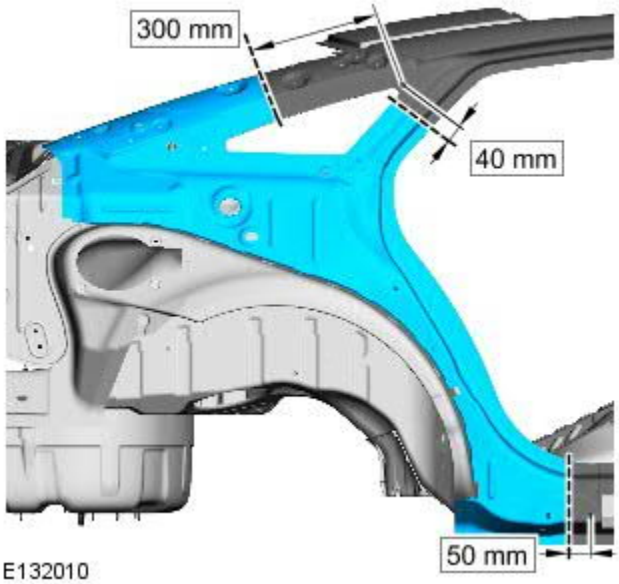
11. If the right-hand rear quarter panel is to be repaired, drain the fuel tank.
For additional information, refer to: Fuel Tank Draining - TDV6 3.0L Diesel (310-00 Fuel System - General Information, General Procedures) / Fuel Tank Draining - V8 5.0L Petrol/V8 S/C 5.0L Petrol (310-00 Fuel System - General Information, General Procedures).

12. If the right-hand rear quarter panel is to be repaired, remove the fuel filler pipe.
For additional information, refer to: Fuel Tank Filler Pipe (310-01A Fuel Tank and Lines - TDV6 3.0L Diesel, Removal and Installation).

13. Remove any remaining miscellaneous components from the repair area as necessary.

14. Release the inner quarter panel wiring harness and position to one side.

15. Prior to removal, mark the position of the inner quarter panel rear section in relation to adjacent panels for ease of alignment on installation.

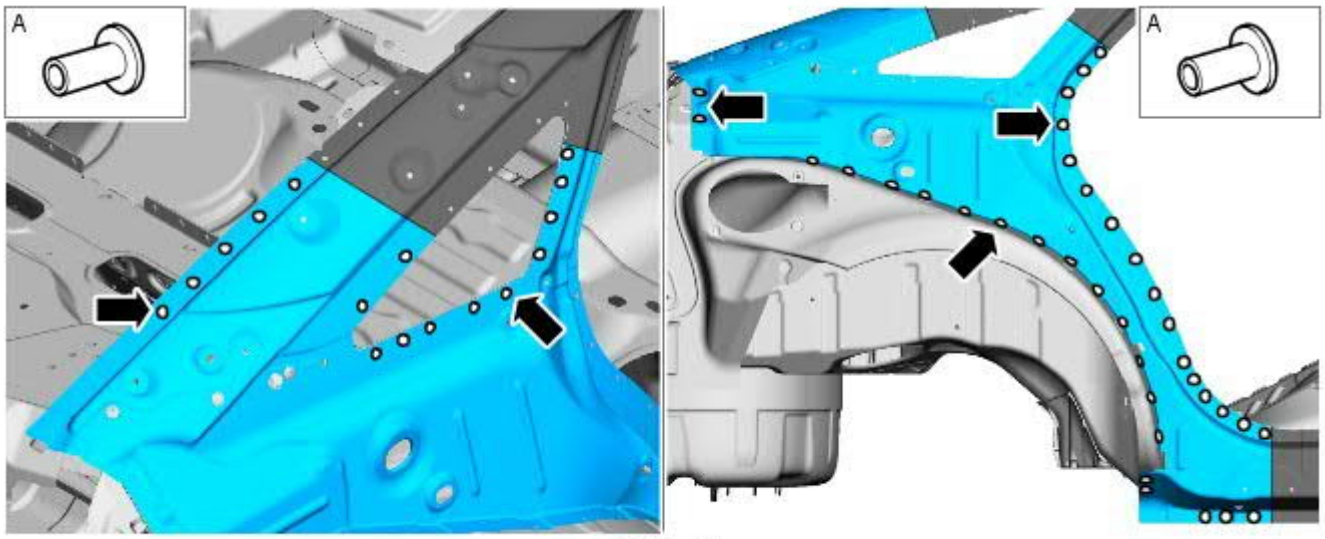


16. CAUTION: Care should be taken not to cut through into inner panels or reinforcements.

NOTE: If necessary, cut locations can be adjusted to avoid self piercing rivets.

Measure, mark and cut the old panel as indicated.

17. Using a combination of the ESN50 and a 6.5mm Cryobit drill bit, remove any remaining self piercing rivets to release the inner quarter panel rear section.



18. NOTES:

    Retain the old panel remnant as it will be used in installation.

    Remove and retain the noise vibration and harshness (NVH) components if they are to be reused.

    Separate the joints and remove the old panel, also releasing the NVH components.

Installation

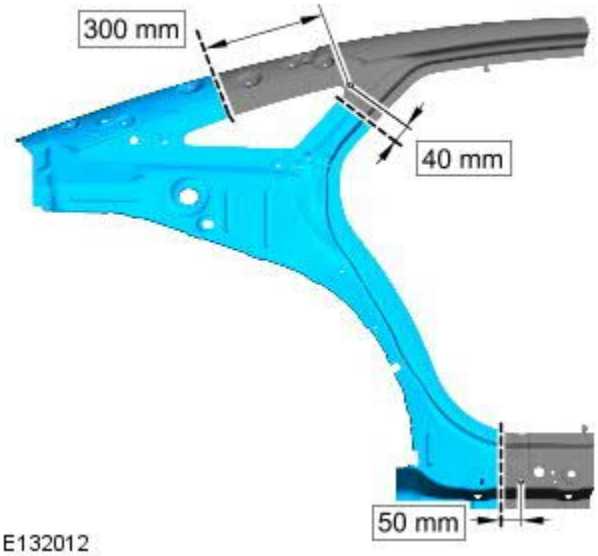
CAUTION: Installation of rivets should always be referenced against the stack size of the panels, access and the pitch between the original removed rivets locations, to make sure the correct type and size of rivet is installed.

NOTE: Installation of self piercing rivets should be installed adjacent to the removed originals wherever possible. If the pitch between the centres of removed self piercing rivets is less than 25mm, Hemloks should be installed in the hole created by the removed self piercing rivets.

1. Remove rivet remnants.

2. Using a Roloc fine bristle disc, clean and prepare the panel surfaces, removing any sealer and adhesive residue.

3. Dress flanges where necessary.



E132012

4. NOTE: Retain the remnants of the new panel as these may be used for backing strips on installation.

   Using the old panel for reference, measure, mark and cut the new inner quarter panel rear section at the points where the MIG butt joints are to be made as indicated.

5. Debur the new panel.

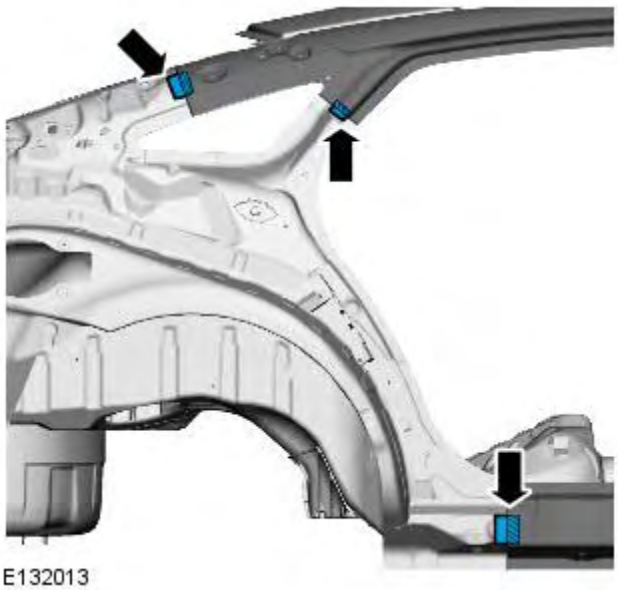
6. Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.

7. Using a 6.5mm Cryobit drill bit, drill holes at the points where Hemloks are to be installed.

8. Remove the new panel.

9. Debur the drilled holes.

10. Measure and cut backing plates and run on/run off tabs, from the old and new panel remnants.


E132013

11. NOTE: The backing plates should be an interference fit.

    Offer up the backing plates to the vehicle. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.

12. Remove the backing plates.

13. Using a Roloc fine bristle disc, clean and prepare the backing plates and run on/run off tabs.

14. Using a Roloc fine bristle disc, clean and prepare the panel surfaces.

15. NOTE: The backing plates are installed with an interference fit.

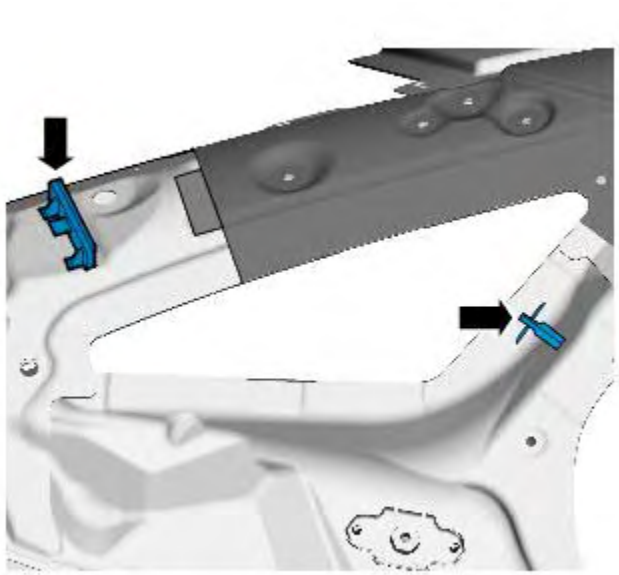
    Install and align the backing plates to the vehicle.

16. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

17. Apply the coupling agent where 3M 8115 adhesive is to be applied and allow to dry.

18. NOTE: Do not apply semi-rigid sealer in the areas where 3M 8115 adhesive is to be applied.

    Apply semi-rigid sealer to the new panel where the lower NVH component is to be installed. Install the NVH component to the new panel.


E132014

19. NOTE: Do not apply semi-rigid sealer in the areas where 3M 8115 adhesive is to be applied.

    Apply semi-rigid sealer to the NVH component as indicated.

20. NOTE: Do not apply semi-rigid sealer in the areas where 3M 8115 adhesive is to be applied.

    Apply semi-rigid sealer to the NVH component on the new panel.

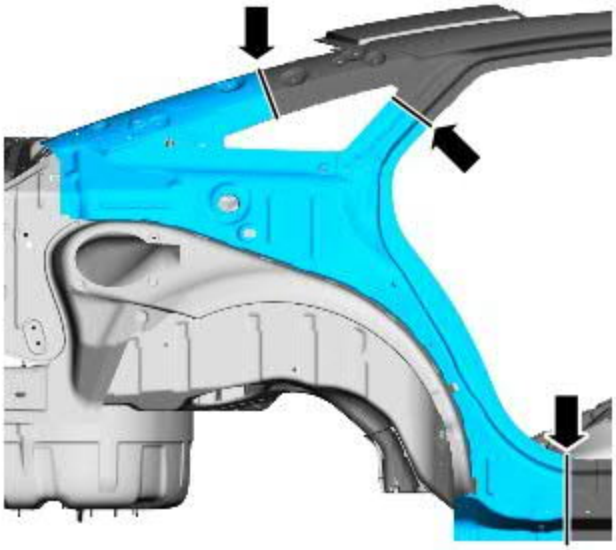
21. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes. Do not apply adhesive in the vicinity of the MIG welds.

    Apply a 5mm zig zag bead of 3M 8115 adhesive to all joints.

22. CAUTION: Make sure any panel joints containing adhesive are fully clamped to avoid any separation prior to the installation of external panels. These joints must be left clamped until the adhesive has cured.

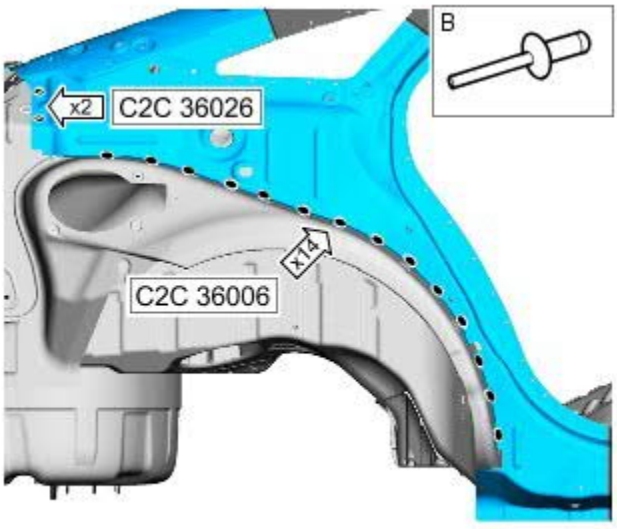
    Offer up the new panel, align and clamp into position.

23. Tack weld the run-on/run-off tabs to all MIG butt joints.



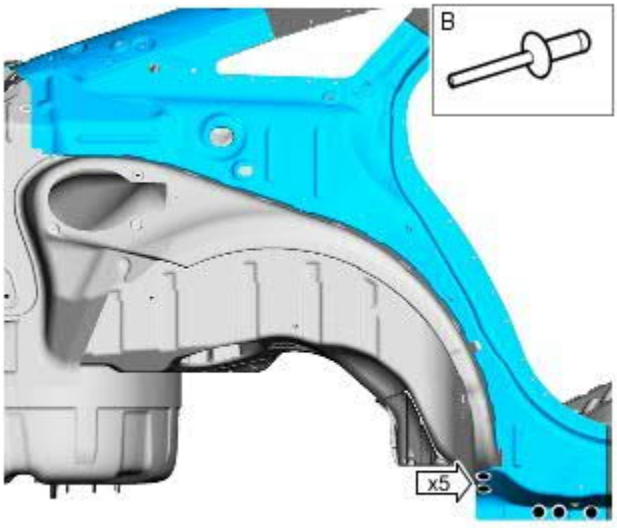
E132022

24. MIG weld the MIG butt joints.



E132015

25. Using the Genesis G4, install the Hemloks.



E132197

26. NOTE: It is important to identify and select the correct size fixing by referencing the following table prior to installation.

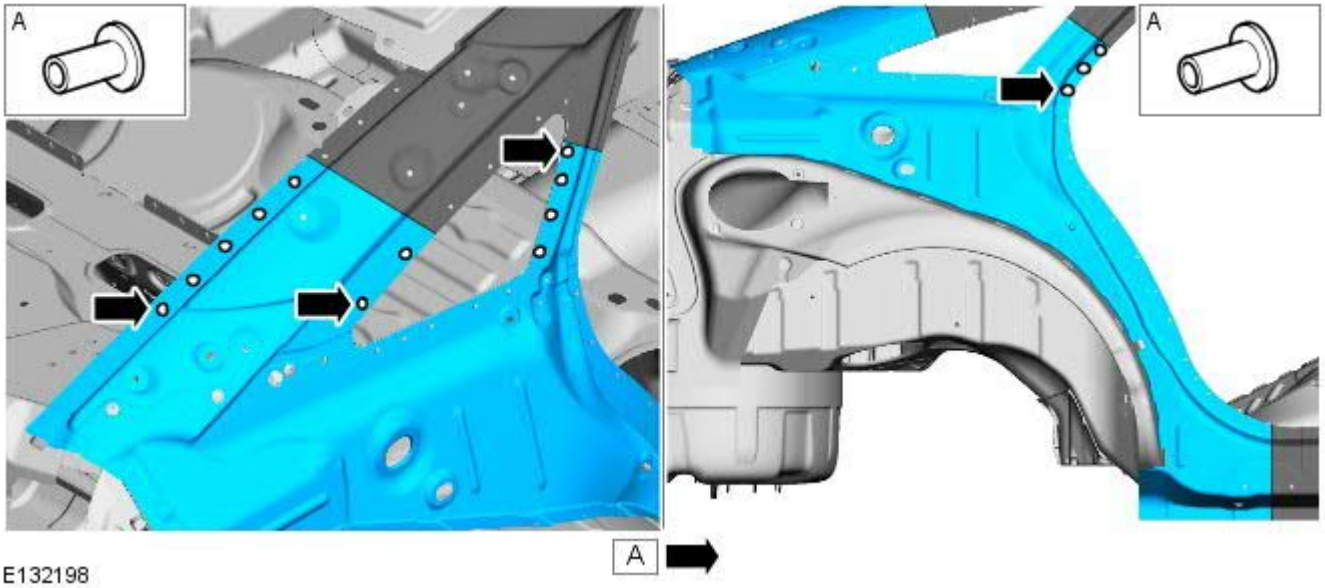
Using the Genesis G4, install the Hemloks in the areas as indicated.

Hemlok Rivet Size	Material Stack	Jaguar Service Number

27. NOTE: It is important to identify and select the correct size fixing by referencing the following table prior to installation.

    Using the ESN50, install the self piercing rivets in the areas as indicated.

Self Piercing Rivet Size	Material Stack	Jaguar Service Number
4.8mm x 5.0mm	3.0mm	C2C 20589
4.8mm x 7.0mm	4.0mm	C2C 20590
4.8mm x 8.0mm	5.0mm	C2C 20591
4.8mm x 8.5mm	5.5mm	C2C 20592
4.8mm x 9.0mm	6.0mm	C2C 20593
4.8mm x 9.5mm	6.5mm	C2C 20594
4.8mm x 11.0mm	8.0mm	C2C 20595



E132198

28. Remove any excess adhesive.

29. Remove the run-on/run-off tabs.

30. Dress the welded joints.

31. Carry out a non destructive crack inspection on the MIG butt joints. If correct proceed to next step, if not, rectify and recheck before proceeding.

32. Make sure that any open or exposed panel joints are suitably sealed following this procedure.

33. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Rear End Sheet Metal Repairs - Quarter Panel

Removal and Installation

Removal

NOTE: The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being installed in isolation or is being installed in combination with panels other than those listed.

1. The quarter panel is a category A repair.

E129125

2. NOTE: The quarter panel is manufactured from aluminium alloy 6111-T4.

   The quarter panel is serviced as a separate riveted and bonded panel, it includes the quarter panel lower extension.

3. The quarter panel is replaced in conjunction with:
   - Rear bumper cover
   - Rear bumper
   - Luggage compartment lid
   - Luggage compartment lid hinge
   - Rear window glass

4. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

5. Remove the rear bumper.
   For additional information, refer to: Rear Bumper (501-19 Bumpers, Removal and Installation).

6. Remove the rear window glass.
   For additional information, refer to: Rear Window Glass (501-11 Glass, Frames and Mechanisms, Removal and Installation).

7. Remove the luggage compartment lid hinge.
   For additional information, refer to: Luggage Compartment Lid Hinge (501-03 Body Closures, Removal and Installation).

8. Disconnect the battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

9. Disconnect the generator electrical connectors.

10. Remove the rear muffler.
For additional information, refer to: Rear Muffler (309-00A Exhaust System - TDV6 3.0L Diesel, Removal and Installation) / Rear Muffler (309-00B Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

11. Remove the rear muffler heatshields.

12. Remove both the loadspace trim panels.
For additional information, refer to: Loadspace Trim Panel RH (501-05 Interior Trim and Ornamentation, Removal and Installation) / Loadspace Trim Panel LH (501-05 Interior Trim and Ornamentation, Removal and Installation).

13. Remove the luggage compartment lid weatherstrip.

14. Remove the parcel shelf.
For additional information, refer to: Parcel Shelf (501-05 Interior Trim and Ornamentation, Removal and Installation).

15. Remove the B-Pillar lower trim panel.
For additional information, refer to: B-Pillar Lower Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

16. Remove the C-Pillar side impact sensor.
For additional information, refer to: C-Pillar Side Impact Sensor (501-20B Supplemental Restraint System, Removal and Installation).

17. Remove the rear quarter window glass.
For additional information, refer to: Rear Quarter Window Glass (501-11 Glass, Frames and Mechanisms, Removal and Installation).

18. Remove the rear safety belt retractor.
For additional information, refer to: Rear Safety Belt Retractor (501-20A Safety Belt System, Removal and Installation).

19. Remove the rear door striker.

20. Remove the rocker panel outer moulding.

21. Remove the quarter panel splash shield.

22. Remove the forced air extraction grille.

23. Remove the rear bumper cover side retainer.

24. If the right-hand quarter panel is to be repaired, remove the auxiliary junction box (AJB).
For additional information, refer to: Auxiliary Junction Box (AJB) (418-00 Module Communications Network, Removal and Installation).

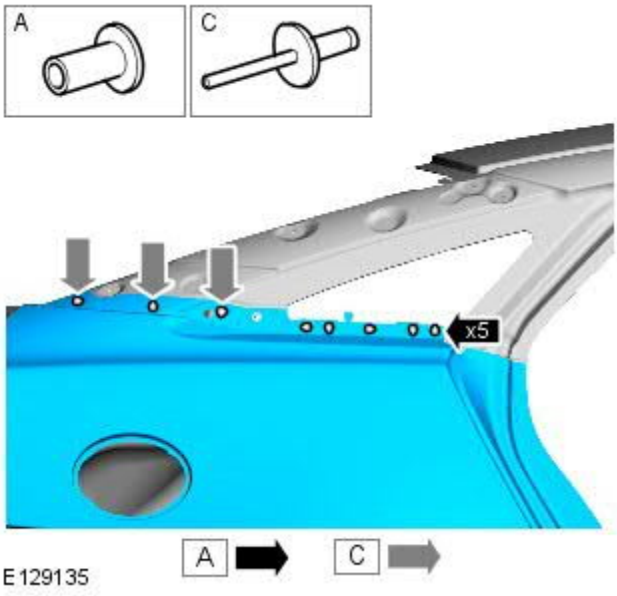
25. If the right-hand quarter panel is to be repaired remove the rear junction box (RJB).
For additional information, refer to: Rear Junction Box (RJB) (418-00 Module Communications Network, Removal and Installation).

26. If the right-hand quarter panel is to be repaired remove the fuel filler door assembly.

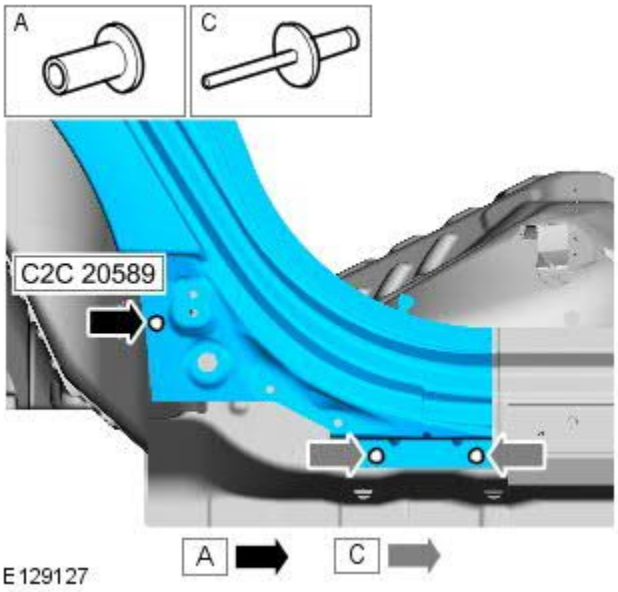
For additional information, refer to: Fuel Filler Door Assembly (501-03 Body Closures, Removal and Installation).

27. Remove any electrical components in the local area of repair to prevent damage.

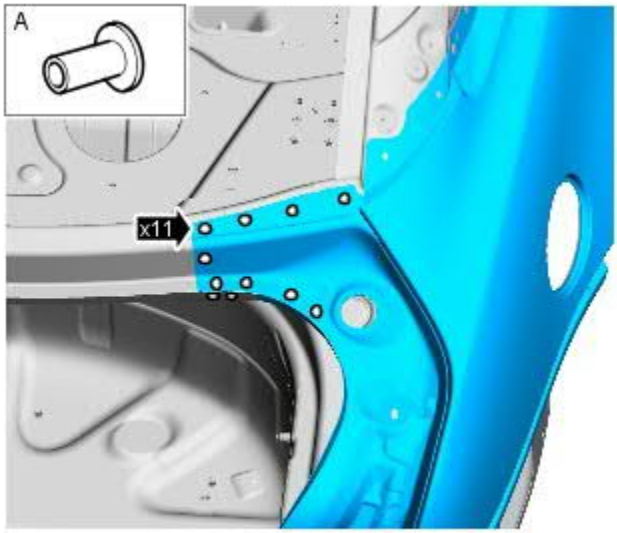
28. Release the back panel and loadspace wiring harness and position it to one side.



29. Remove the Monobolts from the quarter panel inner. Using the ESN50 remove the self piercing rivets from the quarter panel inner.

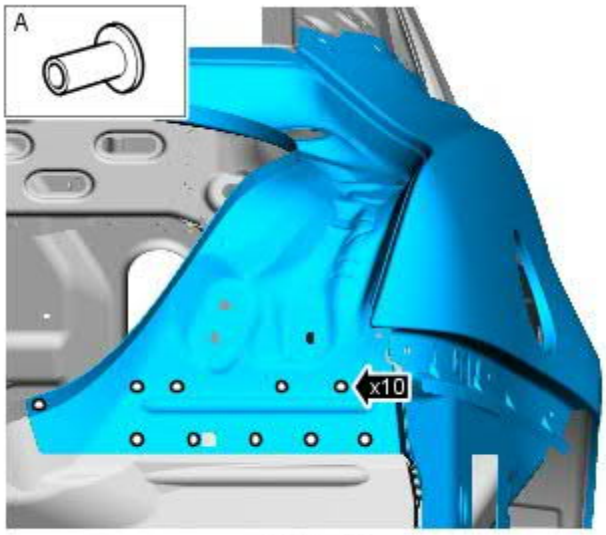


30. Remove the Monobolts from the rocker panel. Using the ESN50 remove the self piercing rivet from the rear wheelhouse outer.



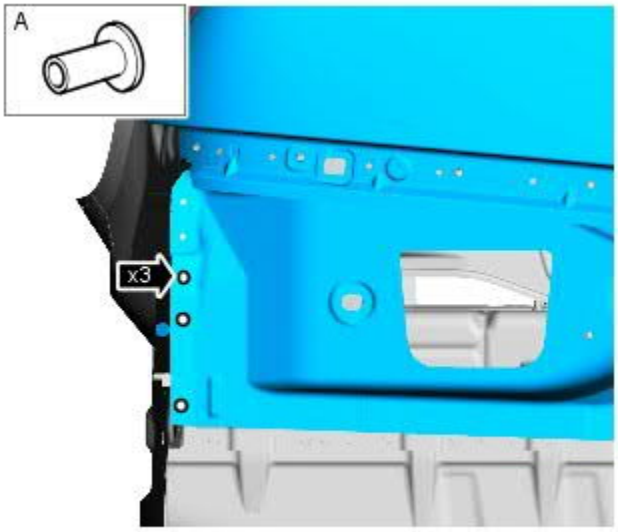
E129128

31. Using a combination of the ESN50 and a 6.5mm Cryobit drill bit, remove the self piercing rivets from the rear parcel shelf panel.



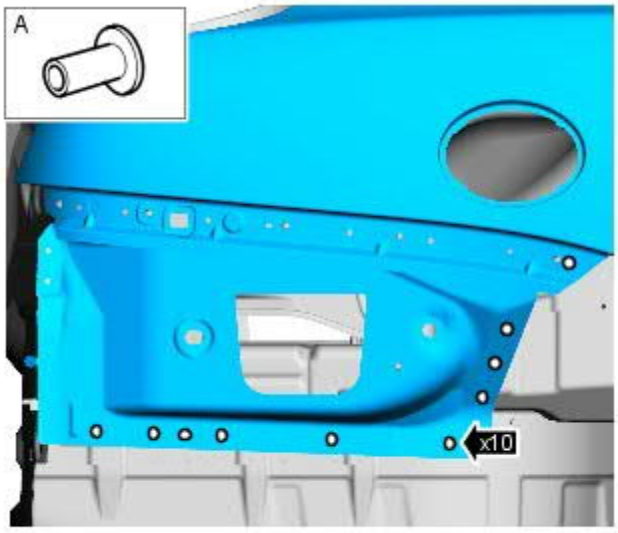
E129129

32. Using a combination of the ESN50 and a 6.5mm Cryobit drill bit, remove the self piercing rivets from the back panel.



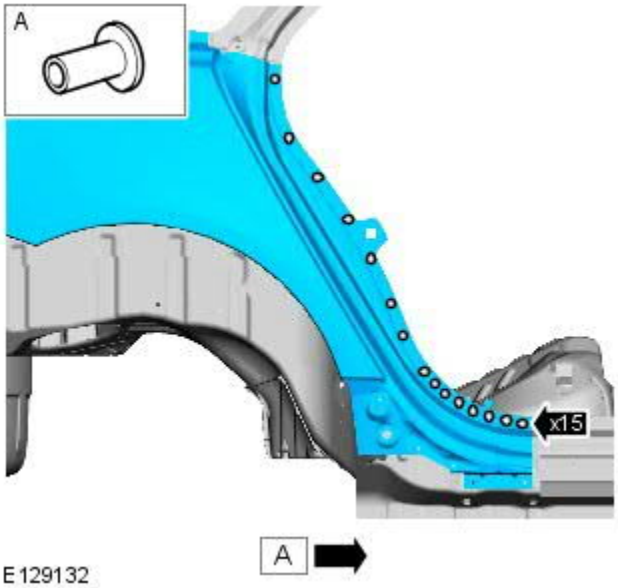
E129139

33. Using the ESN50, remove the self piercing rivets from the back panel.



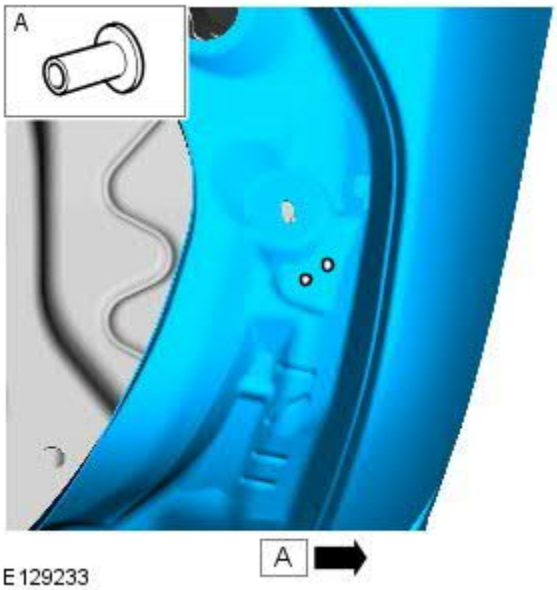
E129131

34. Using the ESN50, the self piercing rivets from the rear floor side extension and rear wheelhouse outer.



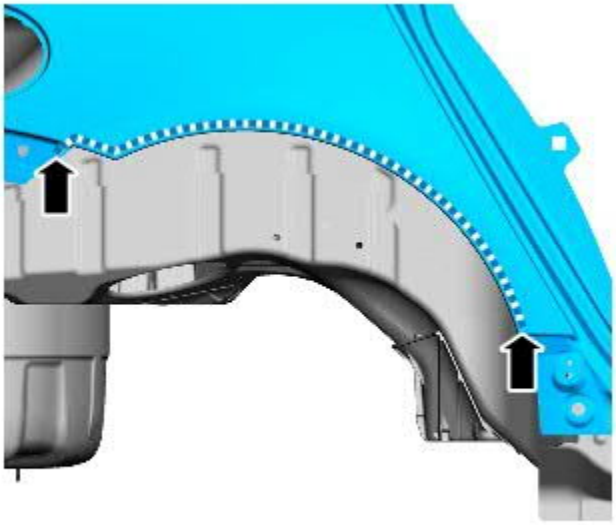
E129132

35. Using the ESN50, remove the self piercing rivets from the rear door aperture.



E129233

36. Using the ESN50, remove the self piercing rivets from the junction box and control module mounting panel.



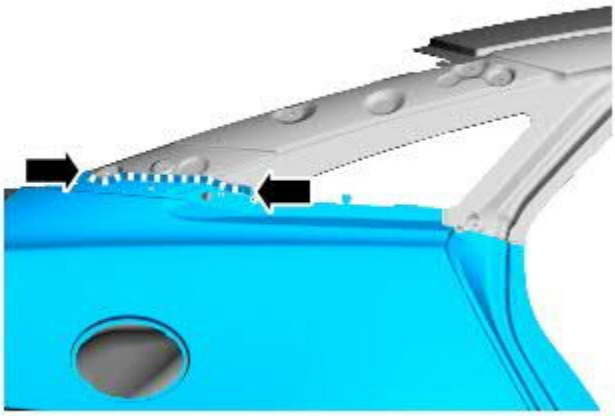
E129134

37. Carefully separate and release the adhesive from the wheelarch outer.

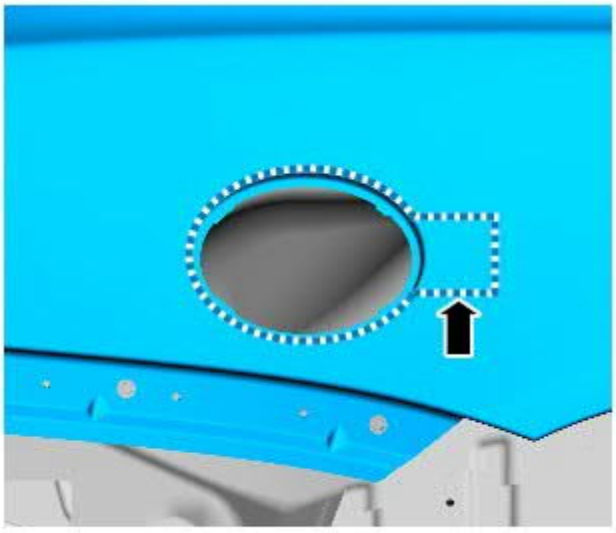
E129717

38. Carefully separate and release the adhesive from the rear parcel shelf panel.

39. Carefully separate and release the adhesive from the quarter panel inner.



E129743



E129133

40. If the right hand quarter panel is to be repaired, carefully separate and release the adhesive from the fuel filler door aperture.

41. Separate the joints and remove the old panel, also releasing the noise, vibration and harshness, (NVH), components.

Installation

1. If necessary, install the NVH components.

2. Remove rivet remnants.

3. Using a Roloc fine bristle disc, remove the adhesive residue.

4. Dress flanges where necessary.

5. Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before

proceeding.

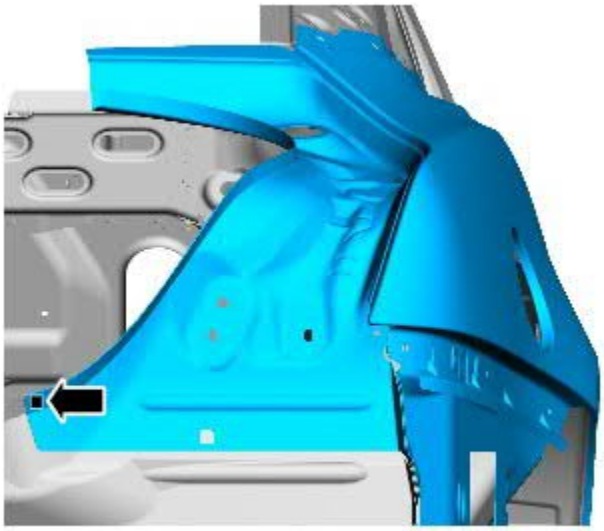
6. Using a 6.5mm Cryobit drill bit, drill holes through the old panels into the new panel at the points where Hemloks are to be installed. Where it is not possible to drill, scribe mark the hole locations on the new panel.

7. Remove the transit lug from the new panel.

8. Remove the new panel.

9. Using a 6.5mm Cryobit drill bit, drill holes in the new panel at the scribe marked locations.

10. Drill 1 10mm hole in the new quarter panel ready for MAG plug welding.



E129716

11. Deburr the drilled holes.

12. CAUTION: Use care not to damage the panel.

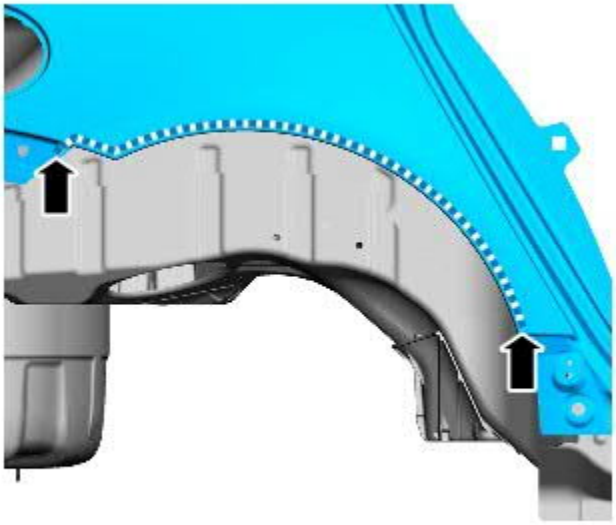
    Remove seam sealer where applicable.

13. Using a Roloc fine bristle disc, clean and prepare the panel surfaces.

14. Pyrosil the joints.

15. Apply the coupling agent and allow to dry.

16. Apply semi-rigid sealer to the body at the wheelarch outer.

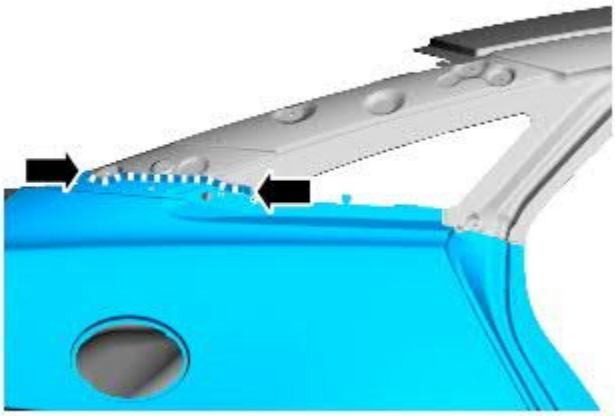


E129134

17. Apply semi-rigid sealer to the body at the rear parcel shelf panel.

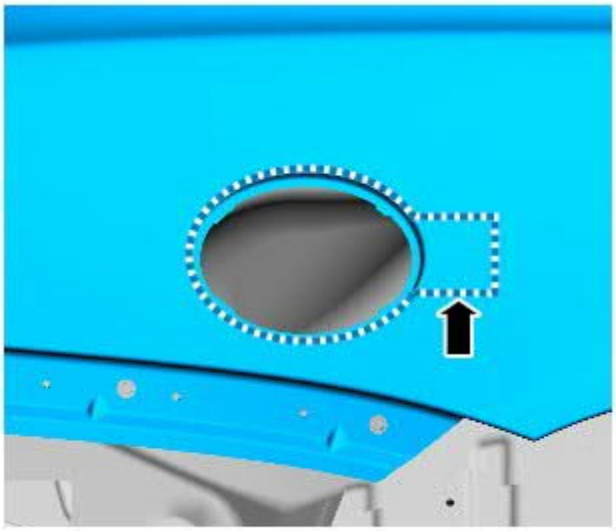
E129717

18. Apply semi-rigid sealer to the body at the quarter panel inner.



E129743

19. If the right hand quarter panel is to be repaired, apply semi-rigid sealer to the body at the fuel filler door aperture.



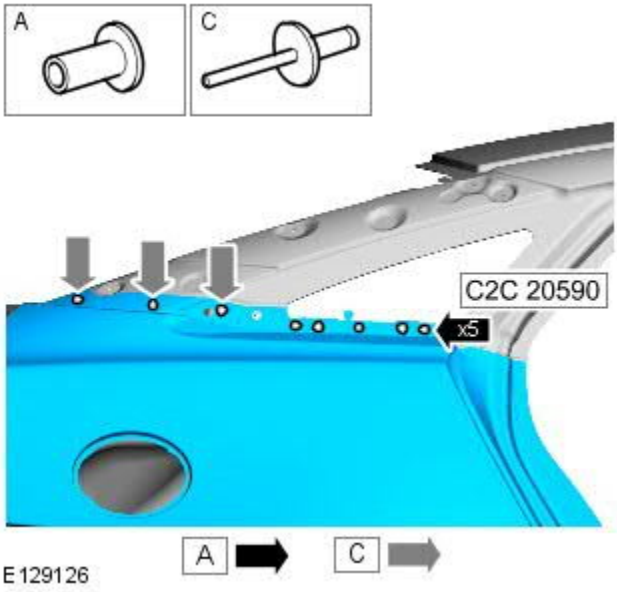
E129133

20. Apply semi-rigid sealer to the NVH components.

21. NOTE: make sure a continuous bead of adhesive surrounds the fixing holes. Do not apply adhesive in the vicinity of the MIG plug welds.

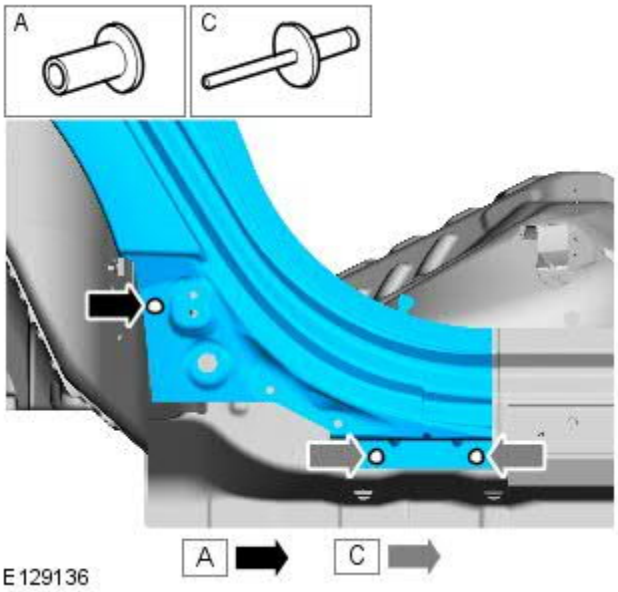
    Apply a 5mm zig zag bead of 3M 8115 adhesive to the body joints.

22. Offer up the new panel and clamp into position.



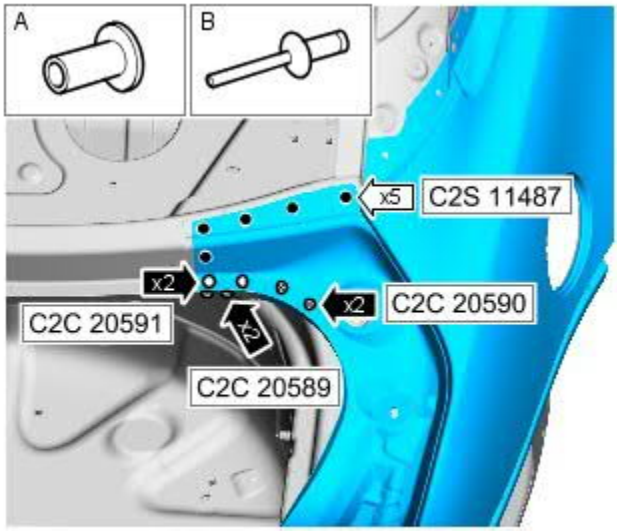
E129126

23. Using the Genesis G4, install the Monobolts into the quarter panel inner. Using the ESN50, install the self piercing rivets into the quarter panel inner.



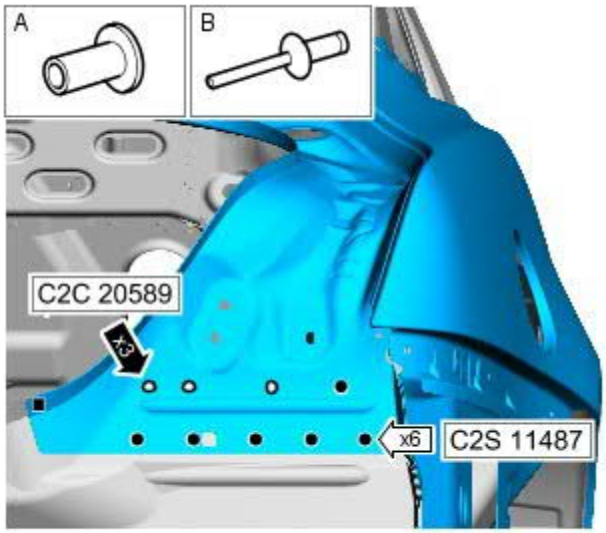
E129136

24. Using the Genesis G4, install the Monobolts into the rocker panel. Using the ESN50, install the self piercing rivet into the rear wheelhouse outer.



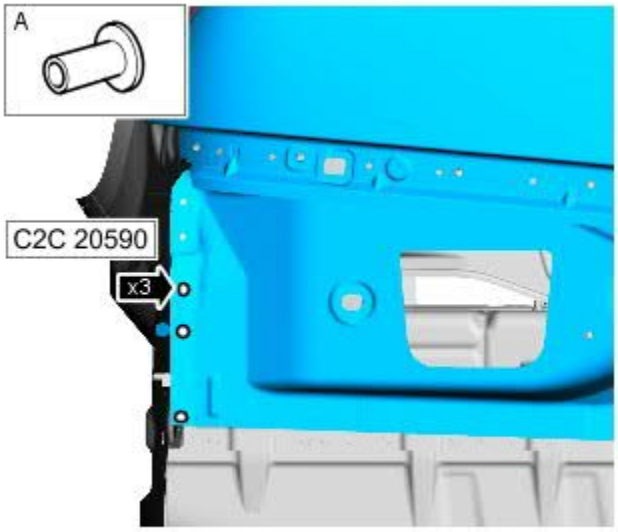
E129137

25. Using the Genesis G4, install the Hemloks into the rear parcel shelf panel. Using the ESN50, install the self piercing rivets into the rear parcel shelf panel.



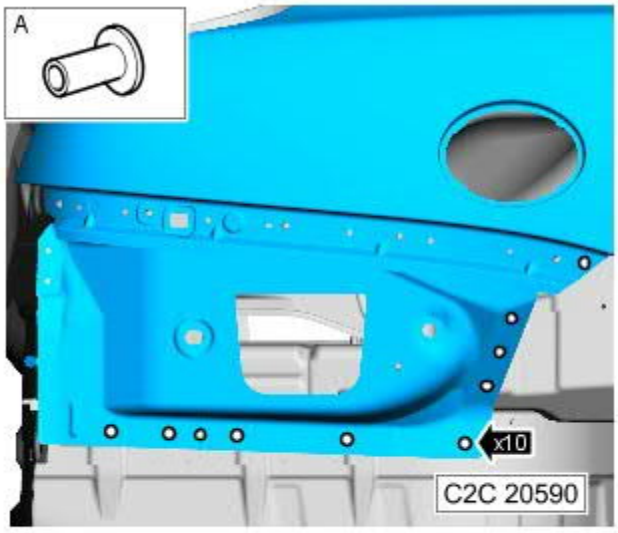
E129138

26. Using the Genesis G4, install the Hemloks into the back panel. Using the ESN50, install the self piercing rivets into the back panel.



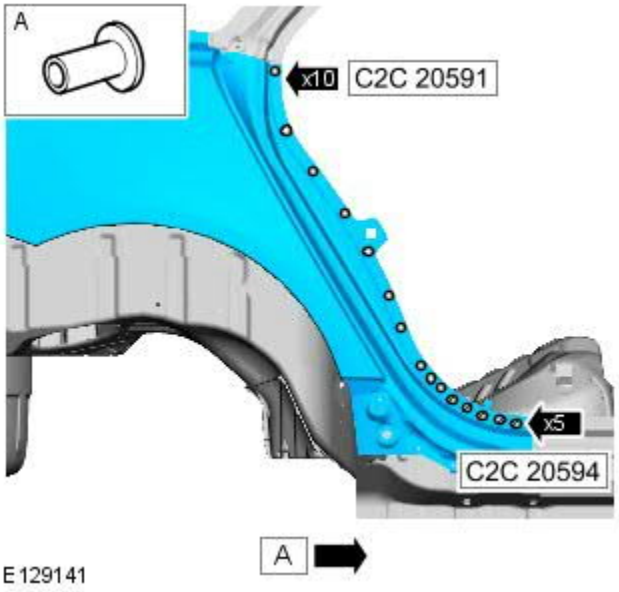
E129130

27. Using the ESN50, install the self piercing rivets into the back panel.



E129140

28. Using the ESN50, install the self piercing rivets into the rear floor side extension and rear wheelhouse outer.



E129141

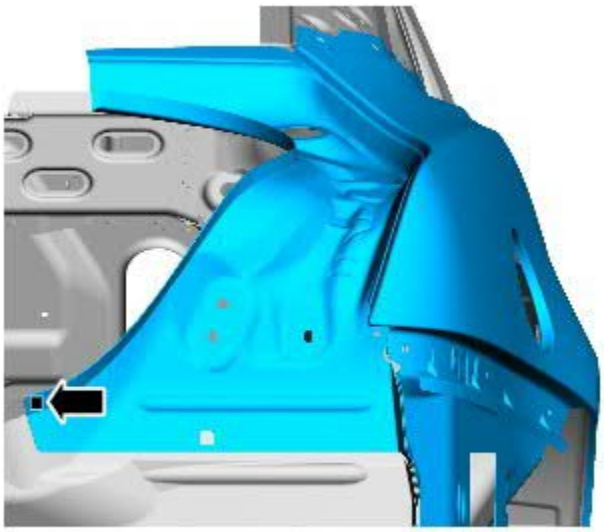
29. Using the ESN50, install the self piercing rivets into the rear door aperture.

E129232

30. Using the ESN50, install the self piercing rivets into the junction box and control module mounting panel.

31. Remove any excess adhesive.

32. Install the MIG plug weld into the back panel.



E129716

33. Install the NVH material as indicated.

E129533

34. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

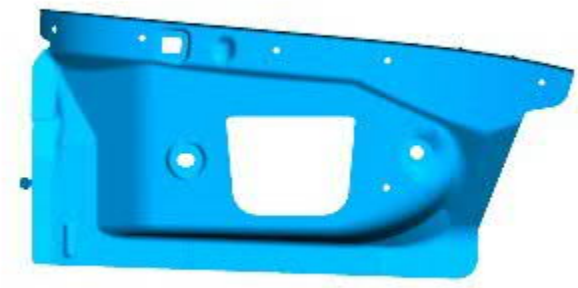
Rear End Sheet Metal Repairs - Quarter Panel Lower Extension

Removal and Installation

Removal

NOTE: The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being installed in isolation or is being installed in combination with panels other than those listed.

1. The quarter panel lower extension is a category A repair.



E129234

2. NOTE: The quarter panel lower extension is manufactured from aluminium alloy 5754-NG

   The quarter panel lower extension is serviced as a separate riveted and bonded panel, it is also serviced as part of the quarter panel.

3. The quarter panel lower extension is replaced in conjunction with:
   - Rear bumper cover
   - Rear bumper

4. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

5. Disconnect the battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

6. Remove the Rear Bumper.
   For additional information, refer to: Rear Bumper (501-19 Bumpers, Removal and Installation).

7. Remove the muffler and tailpipe.
   For additional information, refer to: Rear Muffler (309-00A Exhaust System - TDV6 3.0L Diesel, Removal and Installation) /
   Rear Muffler (309-00B Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

8. Remove the rear bumper cover side retainer.

9. Remove the rear wheel and tire.
   For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

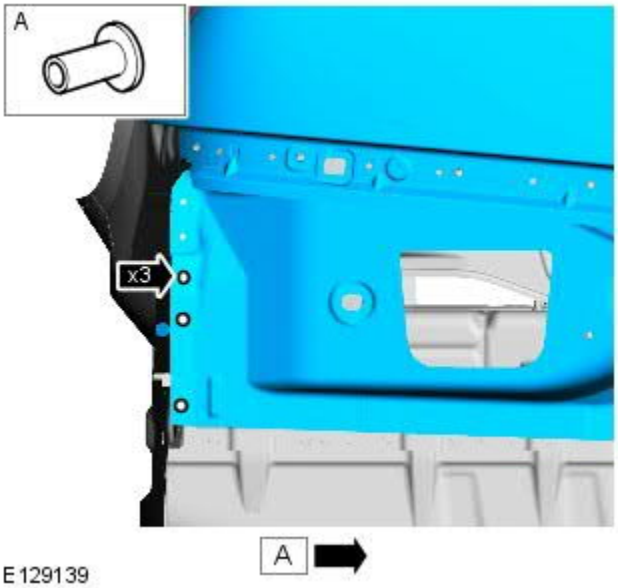
10. Remove the rear fender splash shield.

11. Remove the forced air extraction grille.

12. If the right-hand quarter panel is to be repaired remove the rear junction box (RJB).
For additional information, refer to: Rear Junction Box (RJB) (418-00 Module Communications Network, Removal and Installation).

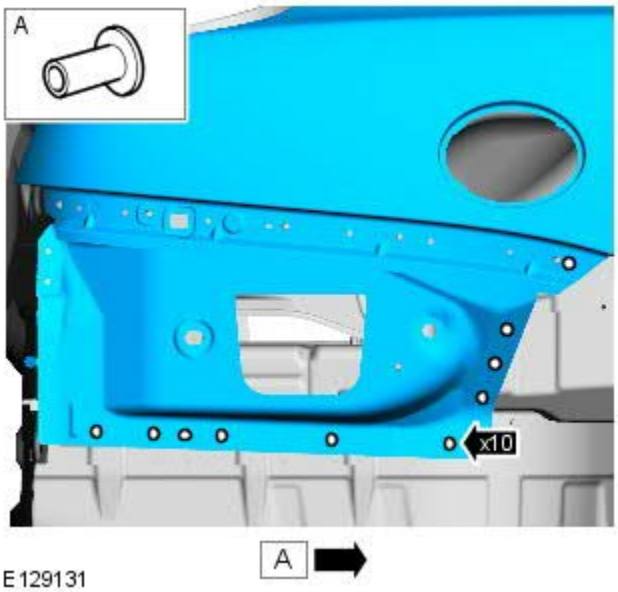
13. Release the back panel and loadspace wiring harness and position it to one side.

14. Remove any electrical components in the local area of repair to prevent damage.



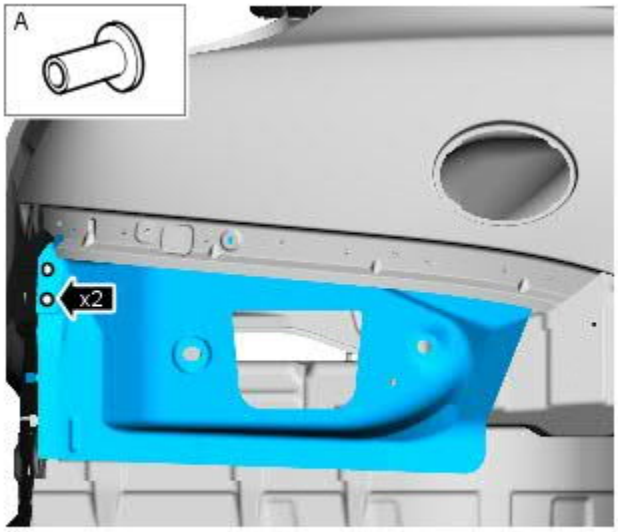
E129139

15. Using the ESN50, remove the self piercing rivets from the back panel.



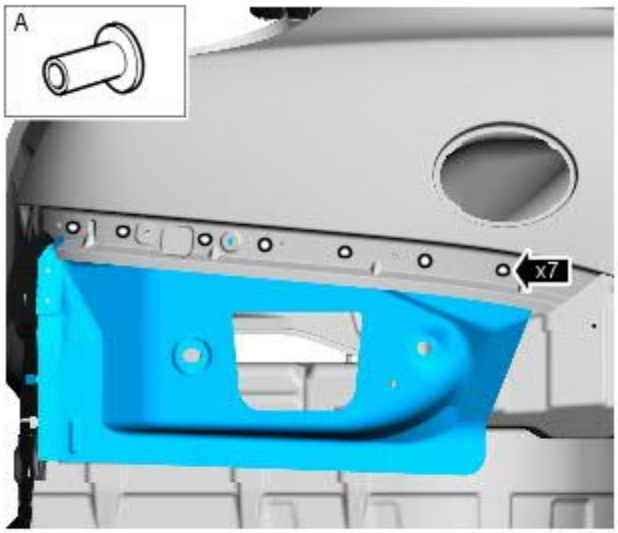
E129131

16. Using the ESN50, remove the self piercing rivets from the rear floor side extension and wheelhouse outer.



E130408

17. Using the ESN50, remove the self piercing rivets from the quarter panel.



E130407

18. CAUTION: Use care not to drill through into inner panels.

    Using a 6.5mm Cryobit drill bit, remove the self piercing rivets from the quarter panel.

19. CAUTION: Use care when separating the joints to avoid distorting adjacent panels.

    Separate the joints and remove the old panel, also releasing the noise, vibration and harshness, (NVH) component.

Installation

NOTES:

Self Piercing Rivets should be installed adjacent to their original positions and not into any holes made during removal.

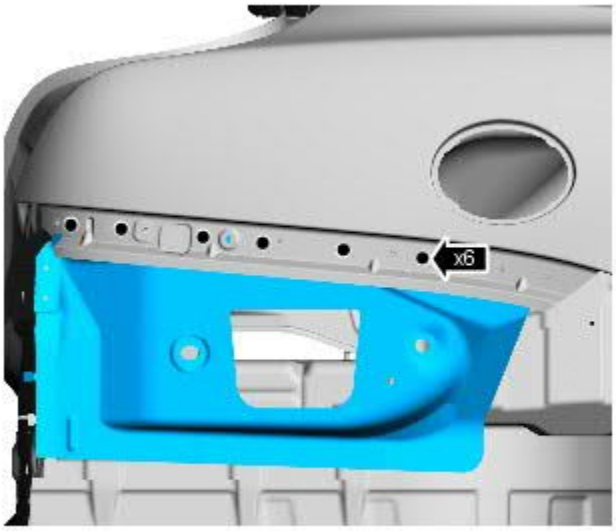
Self piercing rivets should be installed adjacent to their original positions and not into any holes made during removal.

1. Remove the rivet remnants.

2. Using a Roloc fine bristle disc, remove the adhesive residue.

3. Dress flanges where necessary.

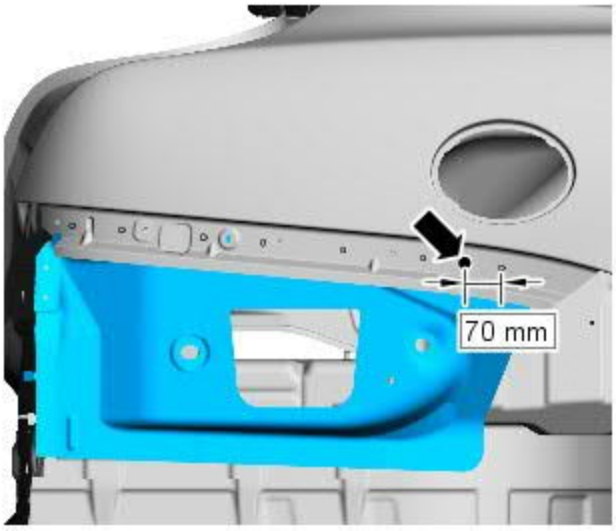
4. Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.



E130409

5. CAUTION: Use care not to drill through into inner panels.

   Using a 6.5mm Cryobit drill bit, drill holes through the old panels into the new panel, at the points where Hemloks are to be installed.



E130410

6. NOTE: Due to the proximity of inner panels, it is not possible to install a Hemlok in the same location as the original self piercing rivet. In this case the Hemlok is installed approximately 70mm rearward.

   Using a 6.5mm Cryobit drill bit, drill 1 hole as indicated.

7. Remove the new panel.

8. Debur the drilled holes.

9. Using a Roloc fine bristle disc, clean and prepare the panel surfaces.

10. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

11. Apply the coupling agent where 3M 8115 adhesive is to be applied and allow to dry.

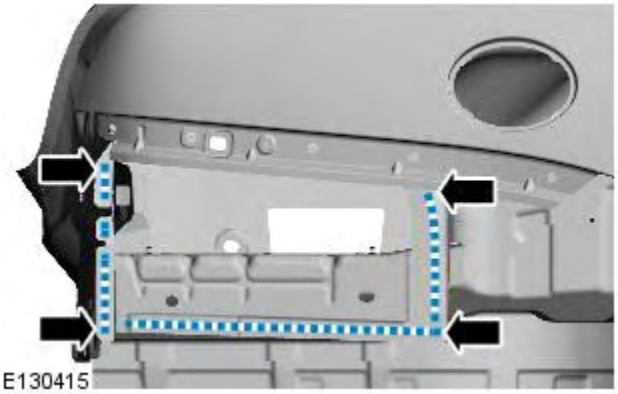
E130413

12. Apply semi-rigid sealer to the new panel as indicated.

E130414

13. NOTE: Make sure that a continuous bead of adhesive surrounds fixing holes.

    Apply a 5mm zig zag bead of 3M 8115 adhesive to the new panel as indicated.

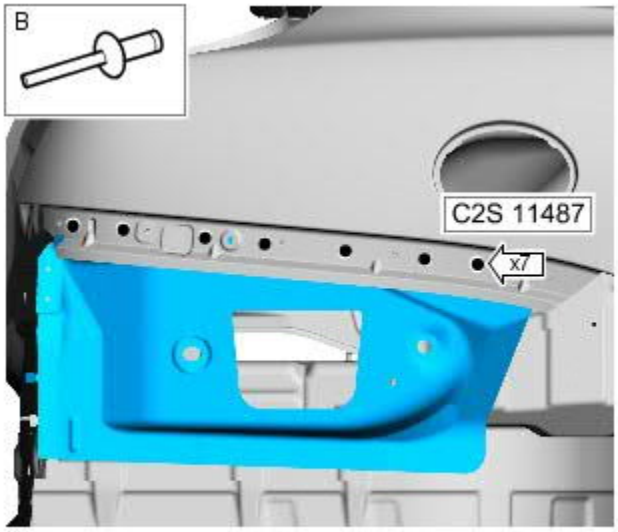


E130415

14. NOTE: Make sure that a continuous bead of adhesive surrounds fixing holes.

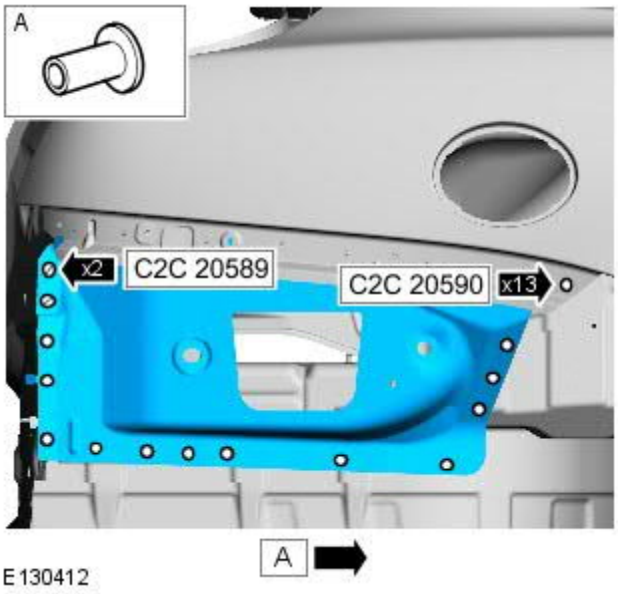
    Apply a 5mm zig zag bead of 3M 8115 adhesive to the body joints as indicated.

15. Offer up the new panel, align and clamp into position.



E130411

16. Using the Genesis G4, install the Hemloks.

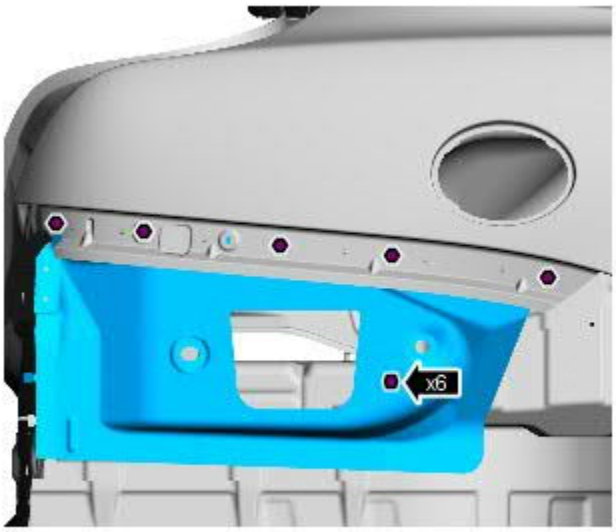


E130412

17. Using the ESN50, install the self piercing rivets.

18. Remove any excess adhesive.

19. Using the HES 412 Rivet Nut Tool, insert the rivet nuts.



E130416

20. Make sure that any open or exposed panel joints are suitably sealed following this procedure.

21. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

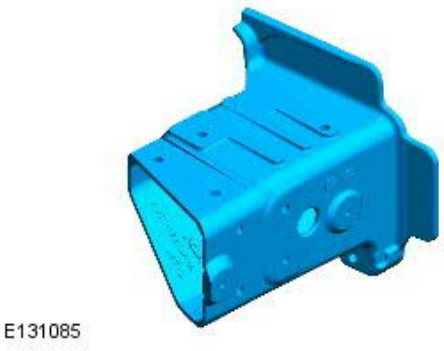
Rear End Sheet Metal Repairs - Rear Bumper Mounting

Removal and Installation

Removal

1. NOTE: The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being replaced in isolation, or, is being replaced in combination with panels other than those listed.

   The rear bumper mounting is a category A repair.


E131085

2. NOTE: The rear bumper mounting is manufactured from gravity die-cast aluminium (GDC).

   The rear bumper mounting is serviced as a separate riveted and bonded panel, it is also on the rear side member service panel.

3. In this procedure, to make sure that the vehicle is correctly aligned, it must be placed on an approved alignment jig.

4. The rear bumper mounting is replaced in conjunction with:
   - Rear bumper cover
   - Rear bumper
   - Back panel

   NOTE: A new rear side member closing panel service panel will be required

   - A section of the rear side member closing panel is required for access
   - The adjoining flanges of the spare wheel well and the rear floor side extension will need to be opened up to enable welding access

5. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

6. Disconnect the battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

7. Disconnect the generator electrical connectors.

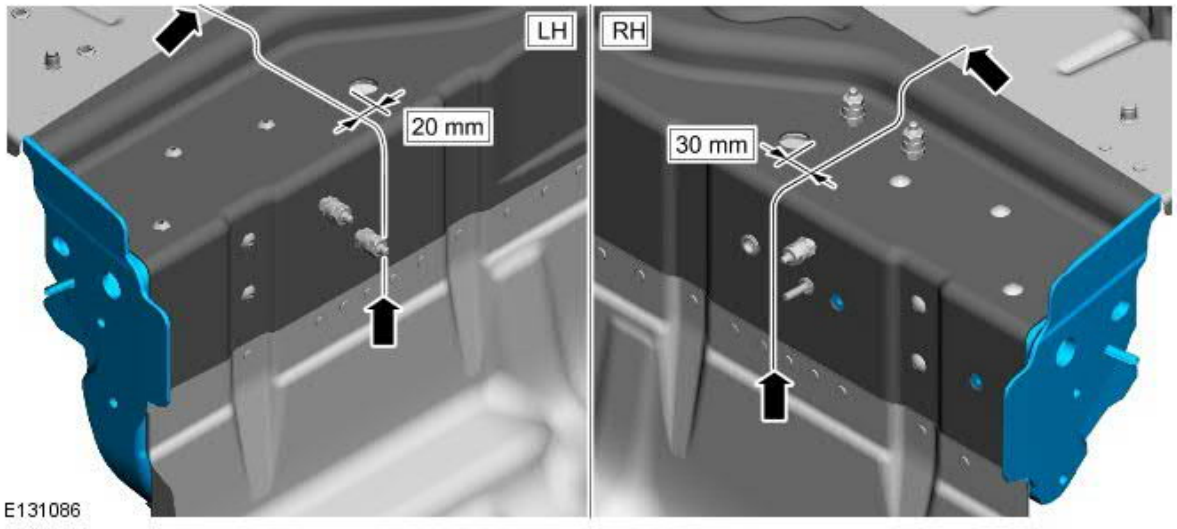
8. Remove the back panel.
   For additional information, refer to: Back Panel (501-30 Rear End Sheet Metal Repairs, Removal and Installation).

9. If the right-hand rear bumper mounting is to be replaced, remove the battery and battery tray.
   For additional information, refer to: Battery (414-01 Battery, Mounting and Cables, Removal and Installation).

10. If the right-hand rear bumper mounting is to be replaced, remove the insulating material from the luggage compartment floor.

11. Remove any electrical components in the local area of repair to prevent damage.

12. Release and position the back panel and loadspace wiring harness to one side.

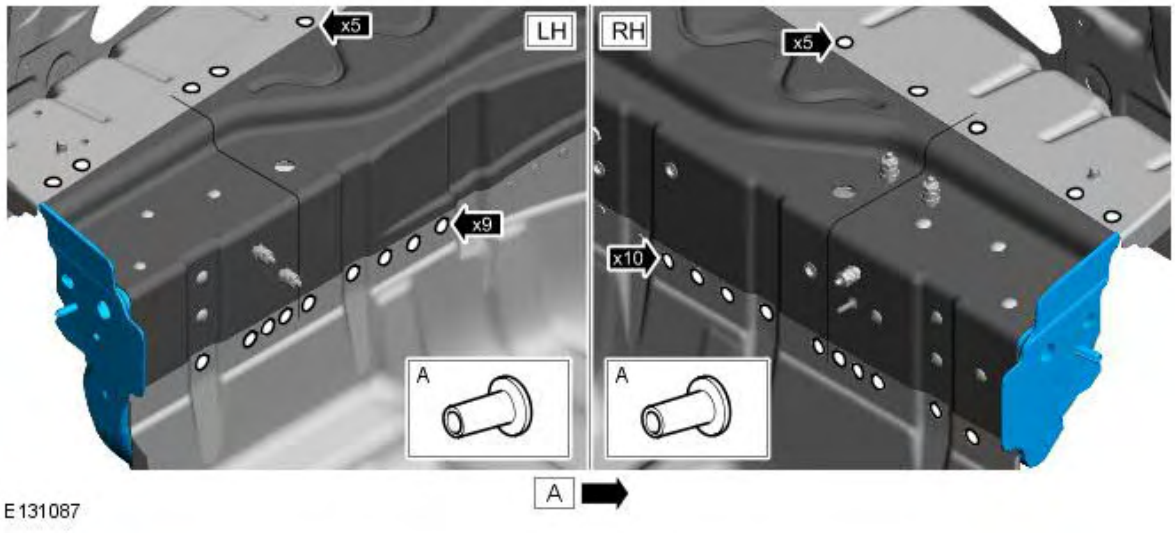


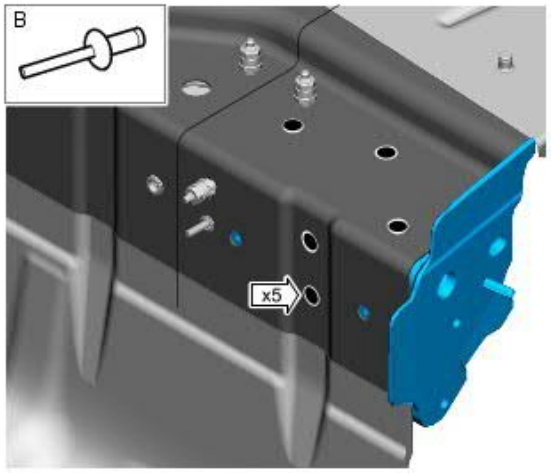
13. CAUTION: Consideration should be given to the location of holes, weld-studs and rivet-nuts.

    Mark out the position where the rear side member closing panel section MIG butt joint is to be made as indicated.

14. Remove sealer from the area of repair as required, to reveal the panel joints.

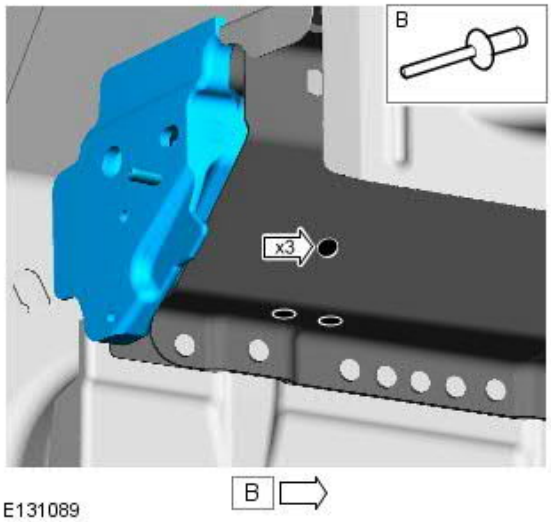
15. Using a 6.5mm Cryobit drill bit, remove the self piercing rivets from the spare wheel well and from the rear floor side extension.





E131088

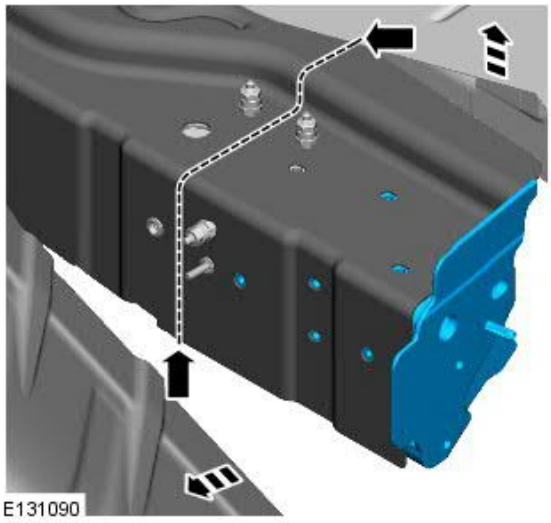
16. Remove the Hemloks from the rear side member closing panel.



E131089

17. Remove the Hemloks from the rear side member panel.

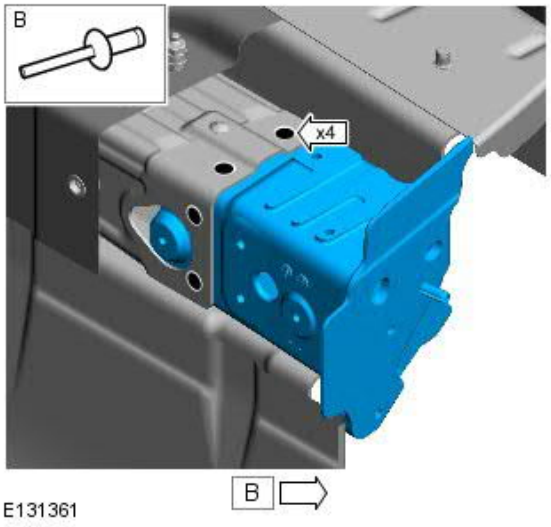
18. Carefully separate the flanges of the spare wheel well and the rear floor side extension to allow access to where the rear side member closing panel is to be sectioned.


E131090

19. CAUTION: Care should be taken not to cut through into the inner reinforcement.

    Cut through the rear side member closing panel as indicated.

20. Separate the joints and remove the rear side member closing panel section.



E131361

21. Using a 6.5mm Cryobit drill bit, remove the Hemloks from the rear bumper mounting.

22. Separate the joints and remove the rear bumper mounting.

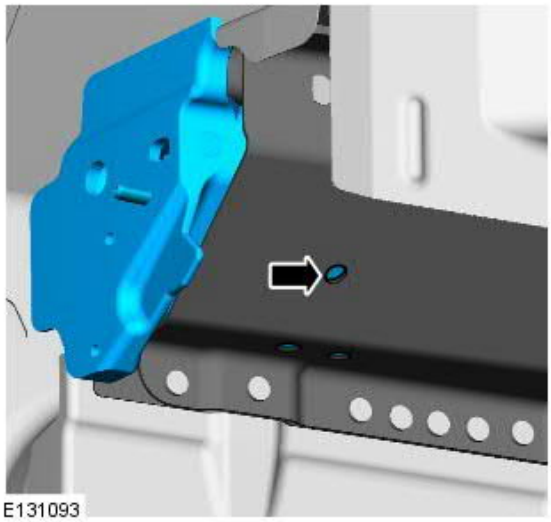
Installation

1. Remove rivet remnants.

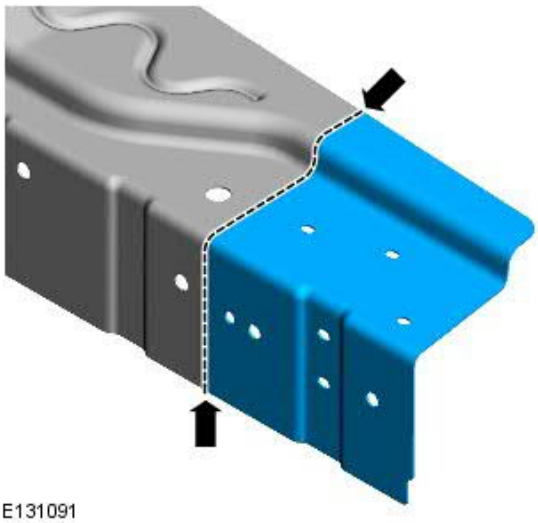
2. Using a Roloc fine bristle disc, clean and prepare the panel surfaces removing any sealer and adhesive residue.

3. Dress flanges where necessary.

4. Offer up the new rear bumper mounting and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.


E131093

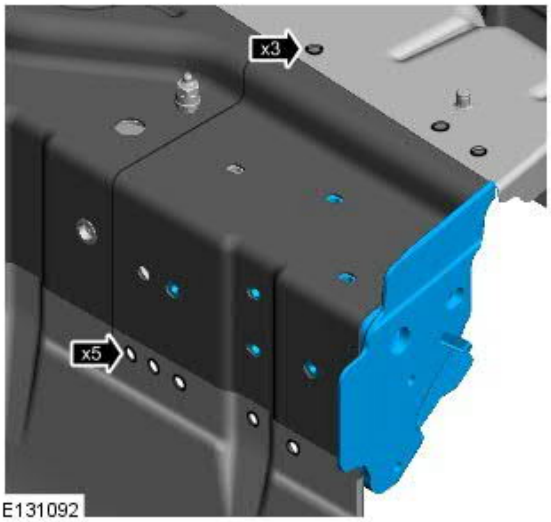
5. Using a 6.5mm Cryobit drill bit, drill a hole through the rear side member panel into the rear bumper mounting.



E131091

6. Mark out the position on the rear side member closing panel service panel, where the section MIG butt joint is to be made and cut the panel at this point as indicated.

7. Offer up the new rear side member closing panel section and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.



E131092

8. Using a 6.5mm Cryobit drill bit, drill holes at the points where Hemloks are to be installed.

9. Remove the new panel.

10. Deburr the drilled holes.

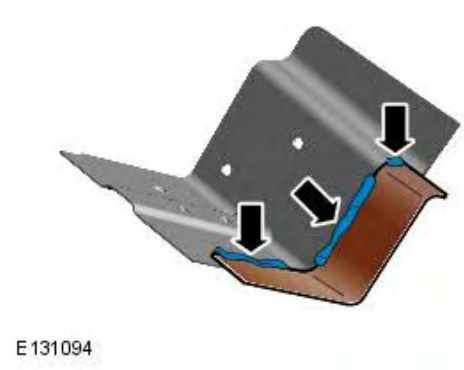
11. Using a Roloc fine bristle disc, clean and prepare the panel surfaces, including the inner panel surfaces where backing plates are to be welded.

12. NOTE: The backing plate may need to be trimmed to fit around holes and rivet-studs.

    Measure and cut a backing plate, approxinately 50mm wide (25mm each side of the MIG butt joint), from the unused part of the new rear side member closing panel or from similar material.

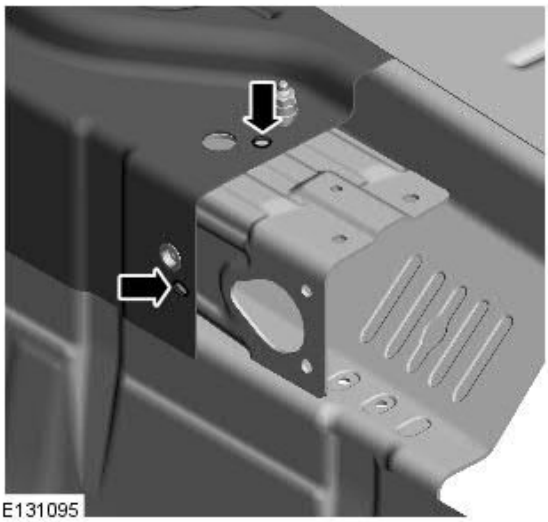
13. Cut a run on/run off tab from the unused part of the new rear side member closing panel, or from similar material.

14. Using a Roloc fine bristle disc, clean and prepare the backing plates and the run on/run off tab.



E131094

15. MIG weld the backing plate onto the new rear side member closing panel section.



E131095

16. Drill 2 10mm holes through the rear side member closing panel, where the backing plate is to be MIG plug welded.

17. Deburr drilled holes.

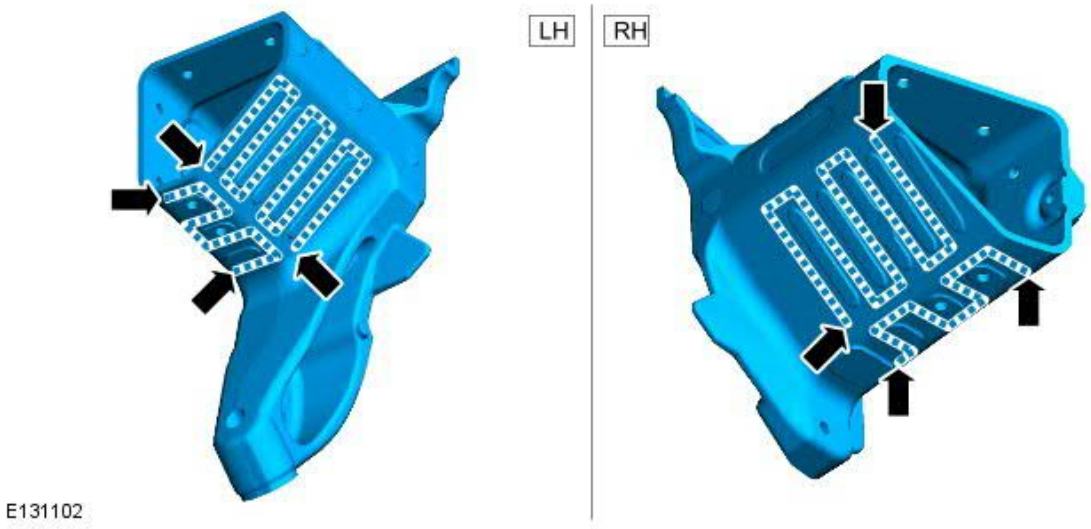
18. Using a Roloc fine bristle disc, clean and prepare the panel joints.

19. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

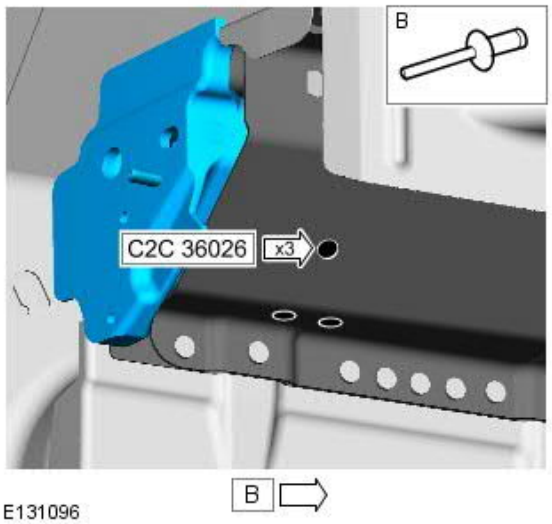
20. Apply the coupling agent where 3M 8115 adhesive is to be applied and allow to dry.

21. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes.

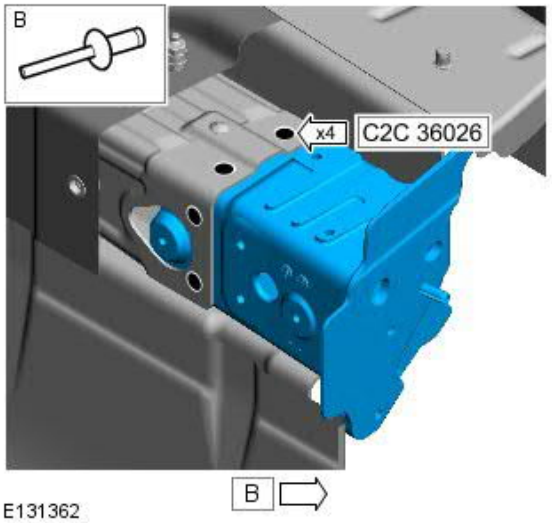
    Apply a 5mm zig zag bead of 3M 8115 adhesive to the rear bumper mounting.



22. Offer up the new rear bumper mounting, align and clamp into position.



23. Using the Genesis G4, install the Hemloks.



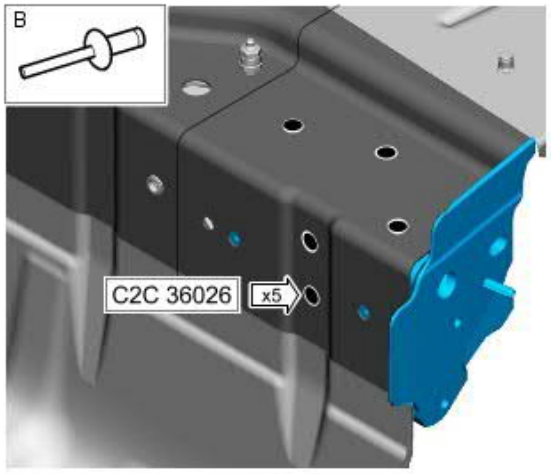
24. Using the Genesis G4, install the Hemloks.

25. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes. Do not

apply adhesive in the vicinity of the MIG weld.

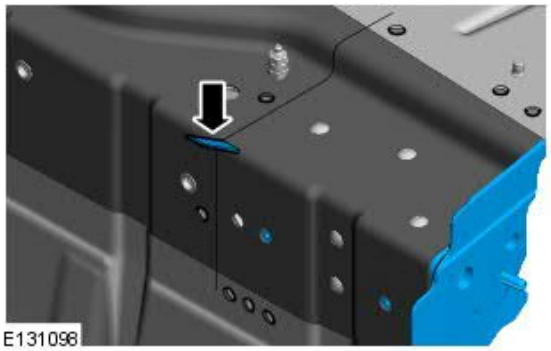
Apply a 5mm zig zag bead of 3M 8115 adhesive to the rear side member and the rear bumper mounting.

26. Offer up the new rear side member closing panel section, align and clamp into position.

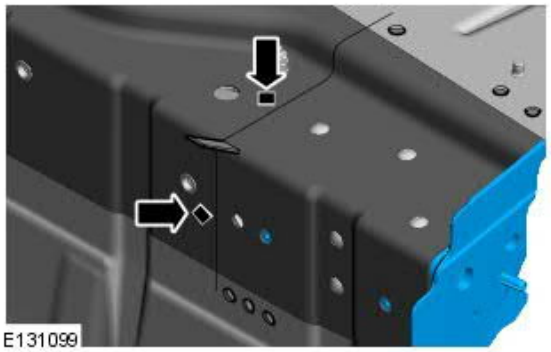


E131097

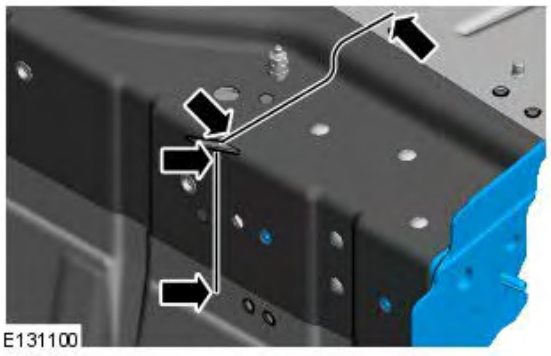
27. Using the Genesis G4, install the Hemloks.


E131098

28. Tack weld the run-on/run-off tab to the rear side member closing panel section.


E131099

29. Install 2 MIG plug welds.



30. MIG weld the rear side member section butt joint.

31. Cut off the run on/run off tab.

32. Dress the welded joints.

33. Pyrosil the flanges of the spare wheel well and rear floor side extension, at the points where 3M 8115 adhesive is to be applied.

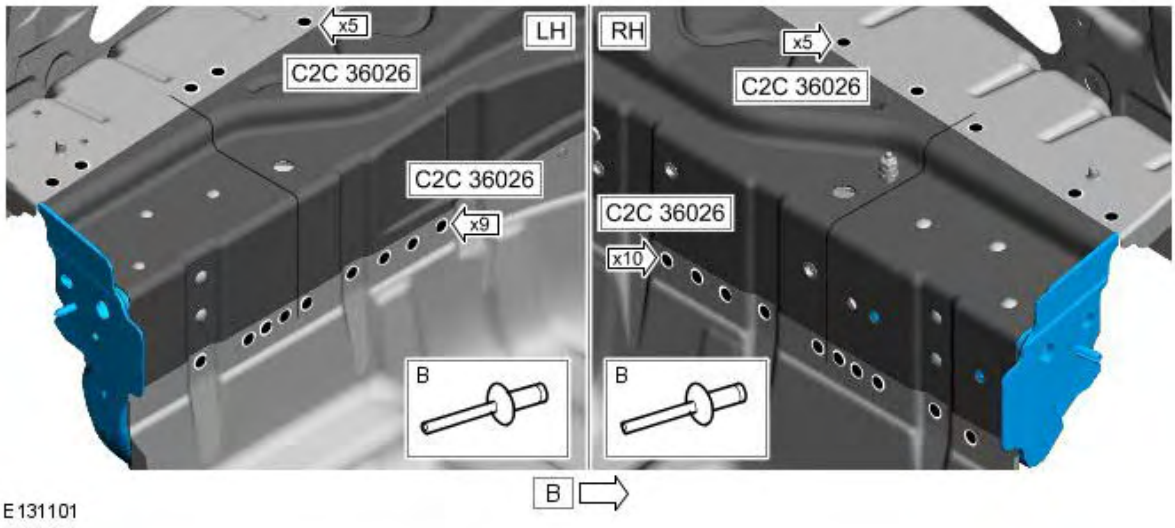
34. Apply the coupling agent to the flanges of the spare wheel well and rear floor side extension where 3M 8115 adhesive is to be applied and allow to dry.

35. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes.

    Apply a 5mm zig zag bead of 3M 8115 adhesive to the flanges of the spare wheel well and rear floor side extension.

36. Re-align the flanges of the spare wheel well and rear floor side extension and clamp into position.

37. Using the Genesis G4, install the Hemloks.



38. Remove any excess adhesive.

39. Using the old panel for reference, install the rivet-studs into the new rear side member closing panel section.

40. Make sure that any open or exposed panel joints are suitably sealed following this procedure.

41. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Rear End Sheet Metal Repairs - Rear Floor Side Extension

Removal and Installation

Removal

1. NOTE: The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being replaced in isolation, or, is being replaced in combination with panels other than those listed.

   The rear floor side extension is a category A repair.

2. NOTE: The rear floor side extension is manufactured from aluminium alloy 5754-NG.

   The rear floor side extension is serviced as a separate rivetted and bonded panel.

3. The rear floor side extension is replaced in conjunction with:
   - Rear bumper cover
   - Rear bumper
   - Back panel

4. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

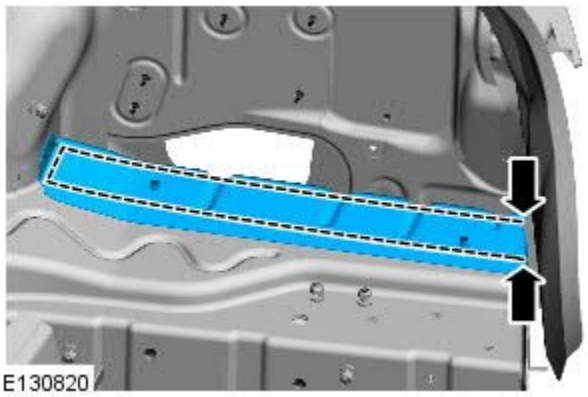
5. Disconnect the battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

6. Remove the back panel.
   For additional information, refer to: Back Panel (501-30 Rear End Sheet Metal Repairs, Removal and Installation).

7. If the right-hand rear floor side extension is to be replaced, remove the battery.
   For additional information, refer to: Battery (414-01 Battery, Mounting and Cables, Removal and Installation).

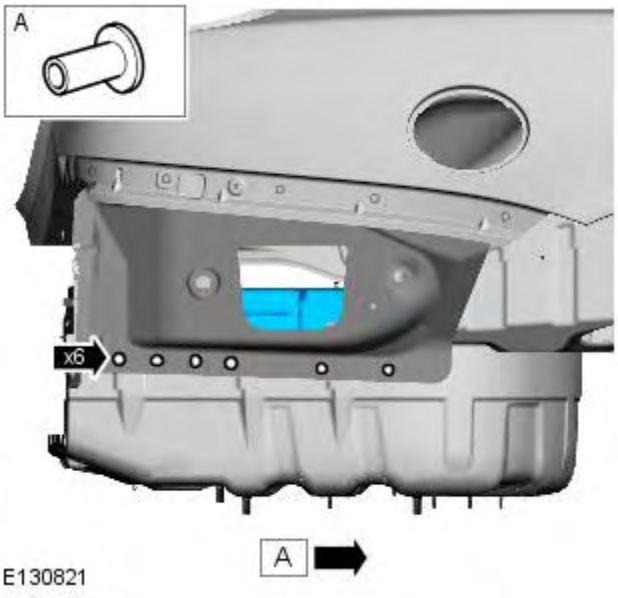
8. Remove sealer from the area of repair as required, to reveal the panel joints.

9. Prior to removal, mark the position of the rear floor side extension in relation to adjacent panels, for ease of alignment on installation.


E130820

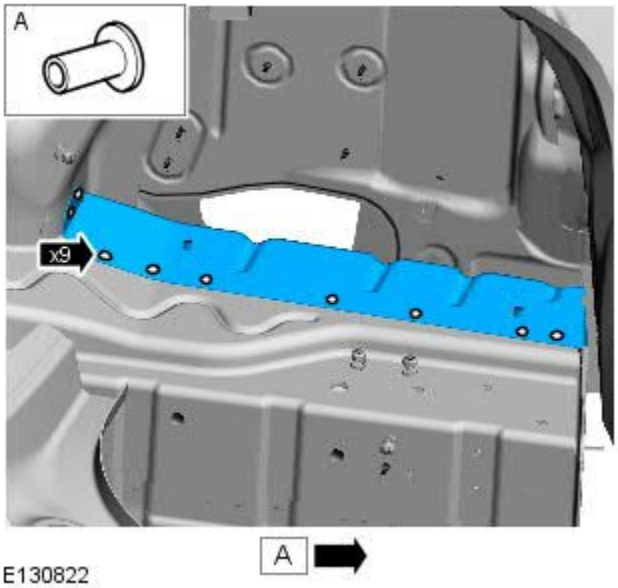
10. CAUTION: Use care not to damage adjacent panels.

    Saw cut to remove the panel bulk as indicated.



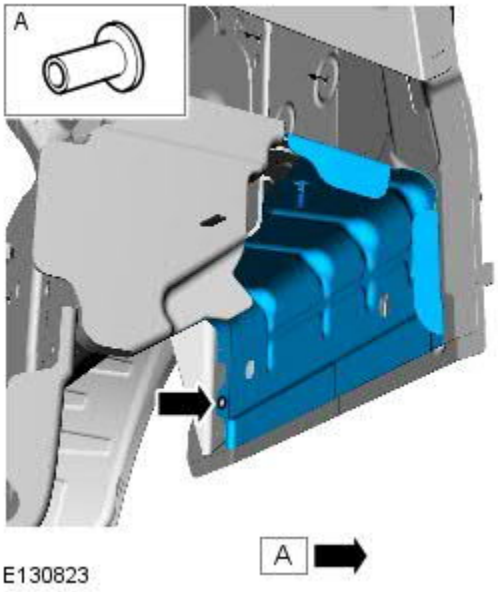
E130821

11. Using the ESN50, remove the self piercing rivets.



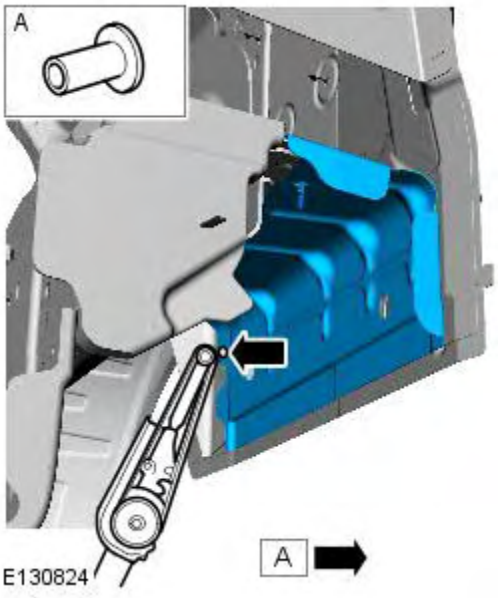
E130822

12. Using the ESN50, remove the self piercing rivets.



13. CAUTION: Use care not to drill through into inner panels.

    Using a 6.5mm Cryobit drill bit, remove the self piercing rivet from the wheelhouse.



14. NOTE: This fixing is not replaced on installation, due to restricted access.

    Using a belt sander, remove the self piercing rivet from the wheelhouse.

15. Separate the joints and remove the old panel remnant.

Installation

1. Remove rivet remnants.

2. Dress flanges where necessary.

3. NOTE: Use the marks made prior to removal to aid alignment.

   Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.

4. NOTE: The joint to the quarter panel lower extension uses self piercing rivets.

   Using a 6.5mm Cryobit drill bit, drill holes through the old panels into the new panel at the points where Hemloks are to be installed.

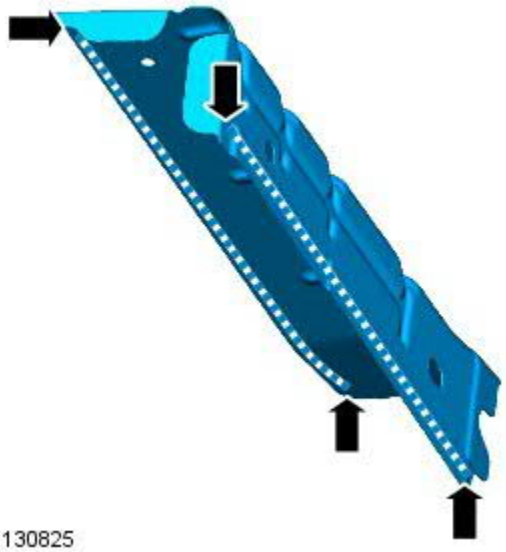
5. Remove the new panel.

6. Debur the drilled holes.

7. Using a Roloc fine bristle disc, clean and prepare the panel surfaces.

8. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

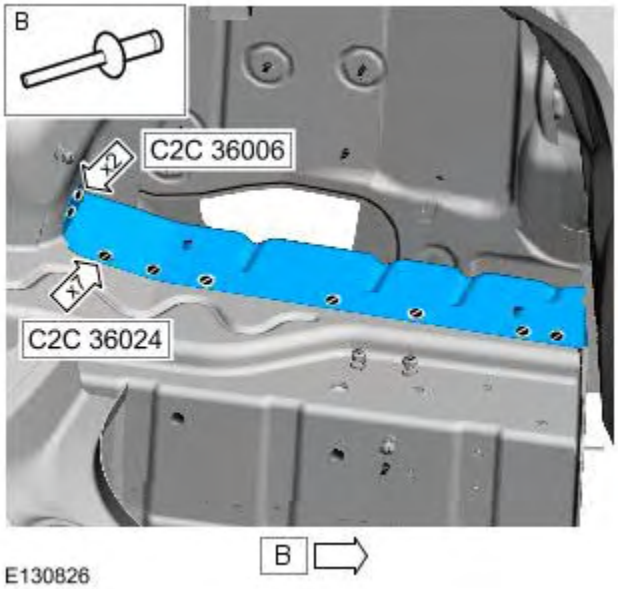
9. Apply the coupling agent where 3M 8115 adhesive is to be applied and allow to dry.


E130825

10. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes.

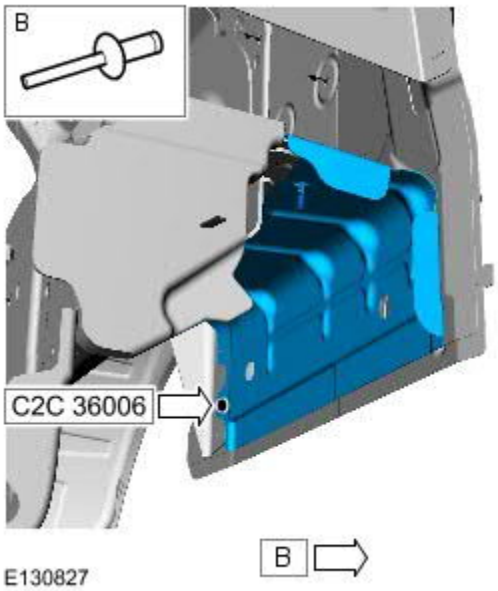
    Apply a 5mm zig zag bead of 3M 8115 adhesive to the body joints.

11. Offer up the new panel, align and clamp into position.



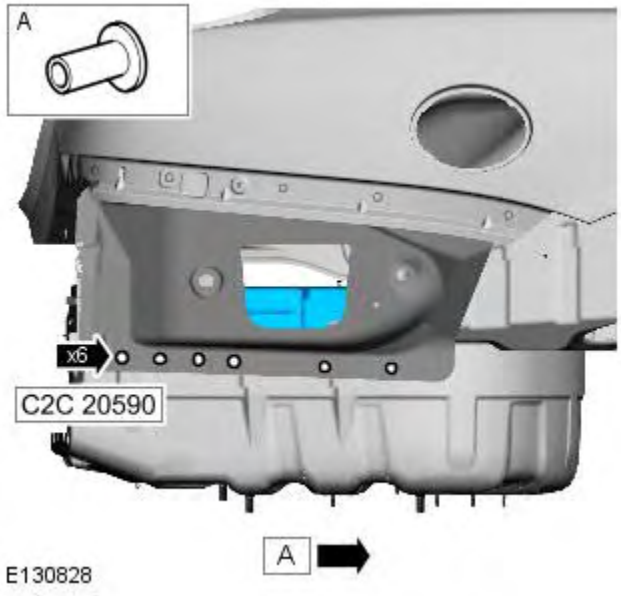
E130826

12. Using the Genesis G4, install the Hemloks.



E130827

13. Using the Genesis G4, install the Hemloks.



14. Using the ESN50, install the self piercing rivets into the quarter panel lower extension.

15. Remove any excess adhesive.

16. Make sure that any open or exposed panel joints are suitably sealed following this procedure.

17. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

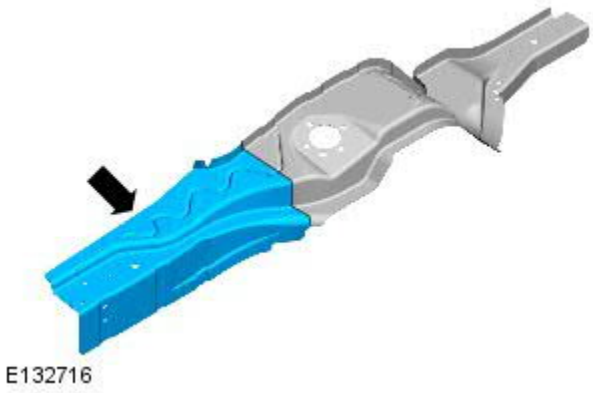
Rear End Sheet Metal Repairs - Rear Side Member Closing Panel Section

Removal and Installation

Removal

1. CAUTION: The rear side member closing panel must be sectioned at the point indicated so that the aluminium casting of the rear suspension mounting can be inspected for damage.

   The rear side member closing panel section is a category A repair.



2. NOTE: The rear side member closing panel section is manufactured from aluminium alloy 5754-NG.

   The rear side member closing panel section is cut from the rear side member closing panel service panel.

3. In this procedure, to make sure the vehicle is correctly aligned, it must be placed on an approved alignment jig.

4. The rear side member closing panel section is replaced in conjunction with:
   - Rear bumper cover
   - Rear bumper
   - Back panel
   - Spare wheel well
   - Rear floor side extension
   - Rear side member section
   - Rear side member inner reinforcement and noise, vibration and harshness (NVH) component (plastic)

5. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

6. NOTE: This procedure assumes that if the rear side member closing panel section is damaged, the rear side member section will also be damaged. Therefore the replacement procedure for the rear side member closing panel section is combined within the rear side member section procedure.

   Remove the rear side member section.
   For additional information, refer to: Rear Side Member Section (501-30 Rear End Sheet Metal Repairs, Removal and Installation).

Installation

1. The installation of associated panels and components is the reversal of removal procedure.

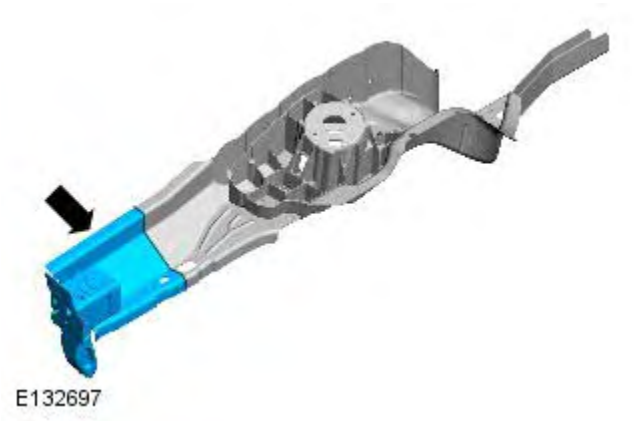
Published: 11-May-2011

Rear End Sheet Metal Repairs - Rear Side Member Section

Removal and Installation

Removal

1. The rear side member section is a category A repair.



2. NOTE: The rear side member section is manufactured from aluminium alloy 5754-NG.

   The rear side member section is cut from the rear side member service panel, it includes the rear bumper mounting.

3. In this procedure, to make sure the vehicle is correctly aligned, it must be placed on an approved alignment jig.

4. CAUTION: The rear side member closing panel must be sectioned at the point indicated so that the aluminium casting of the rear suspension mounting can be inspected for damage.

   NOTE: This procedure assumes that the rear side member closing panel section is damaged. Therefore, the procedure combines the repair of the rear side member section and the rear side member closing panel section.

   The rear side member section is replaced in conjunction with:
   - Rear bumper cover
   - Rear bumper
   - Back panel
   - Spare wheel well
   - Rear floor side extension
   - Rear side member closing panel section
   - Rear side member inner reinforcement and noise, vibration and harshness (NVH) component (plastic)

5. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

6. Remove the spare wheel well.
   For additional information, refer to: Spare Wheel Well (501-30 Rear End Sheet Metal Repairs, Removal and Installation).

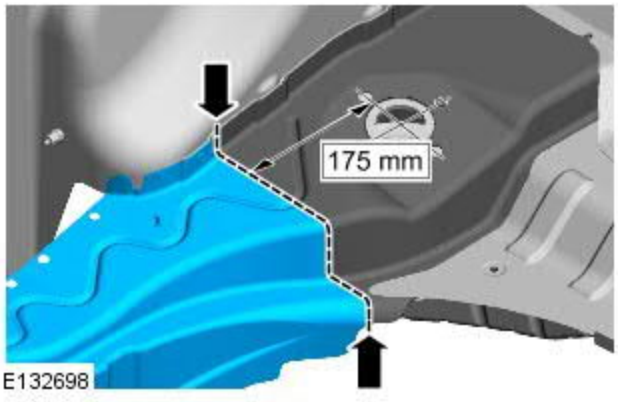
7. Remove the rear floor side extension.
   For additional information, refer to: Rear Floor Side Extension (501-30 Rear End Sheet Metal Repairs, Removal and Installation).

8. Disconnect the battery.
For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

9. Disconnect the generator electrical connectors.

10. Remove any remaining miscellaneous components from the repair area as necessary.

11. Release rear side member wiring harness and position it to one side.

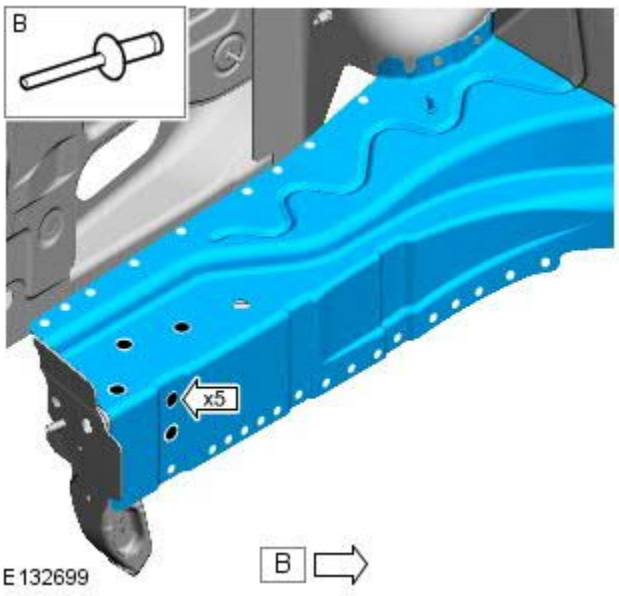


12. CAUTION: Care should be taken not to cut through into inner panels or reinforcements.

NOTE: If necessary, cut locations can be adjusted to avoid self piercing rivets.

Measure, mark and cut the old rear side member closing panel as indicated.

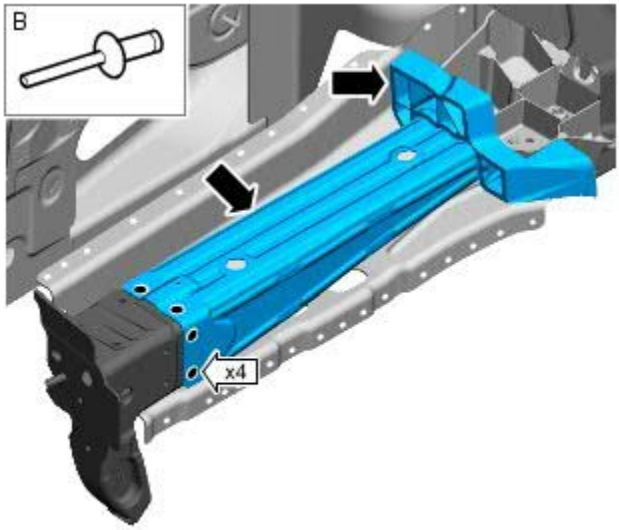
13. Using a combination of the ESN50 and a 6.5mm Cryobit drill bit, remove any remaining self piercing rivets to release the rear side member closing panel section.



14. Using a 6.5mm Cryobit drill bit, remove any remaining Hemloks to release the rear side member closing panel section.

15. NOTE: Retain the old panel remnant as it may be used as a template and to fabricate a backing strip.

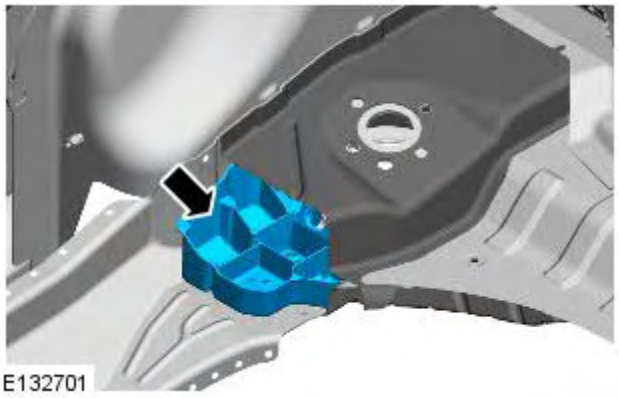
Separate the joints and carefully remove the old rear side member closing panel section.



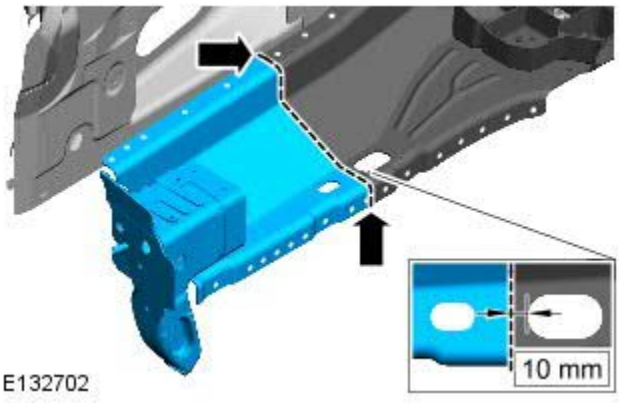
E132700

16. NOTE: Retain the rear side member inner reinforcement and its NVH component for reuse on installation. If damaged, a new component must be installed

    Using a 6.5mm Cryobit drill bit, remove the Hemloks from the rear side member inner reinforcement. Separate the joints and carefully remove the rear side member inner reinforcement, also releasing and removing the NVH component.


E132701

17. Remove any adhesive, clean and inspect the aluminium casting of the rear suspension mounting for damage. A non-destructive crack inspection must be carried out to identify any unseen damage. Only proceed to next step if no damage is identified.



E132702

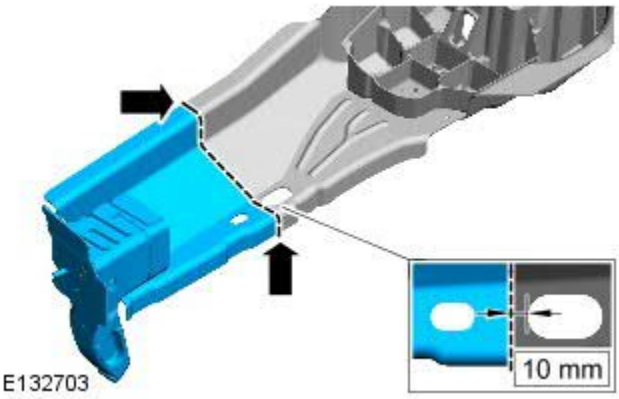
18. NOTE: Retain the old panel remnant as it may be used as a template and to fabricate a backing strip.

    Measure, mark and cut the old rear side member as indicated.

Installation

1. Remove rivet remnants.

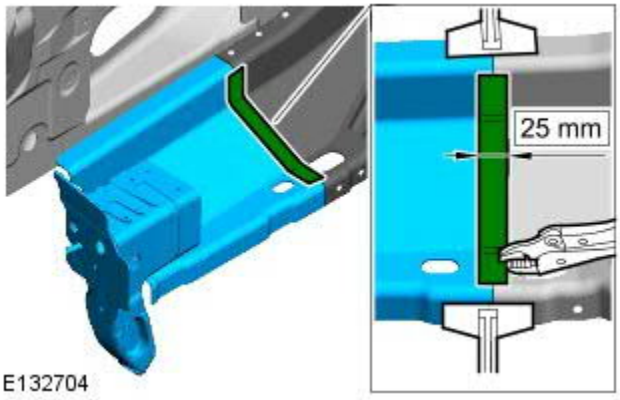
2. Dress flanges where necessary.



3. Mark out the position on the rear side member service panel, where the section MIG butt joint is to be made and cut the panel at this point as indicated.

4. Debur the new panel.

5. Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.



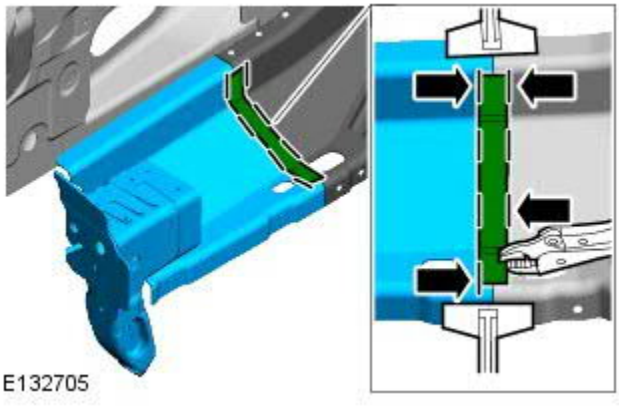
6. Fabricate a 25mm backing plate from the old/new rear side member remnant. Debur and offer up to the rear side member as indicated.

7. Cut a run on/run off tab from the unused part of the old/new rear side member remnant.

8. Remove the new rear side member section and its backing plate.

9. Using a Roloc fine bristle disc, clean and prepare the rear side member panel surfaces, the backing plate and the run on/run off tabs, including the inner panel surfaces where the backing plate is to be welded.

10. Offer up the new rear side member section with its backing plate, align and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

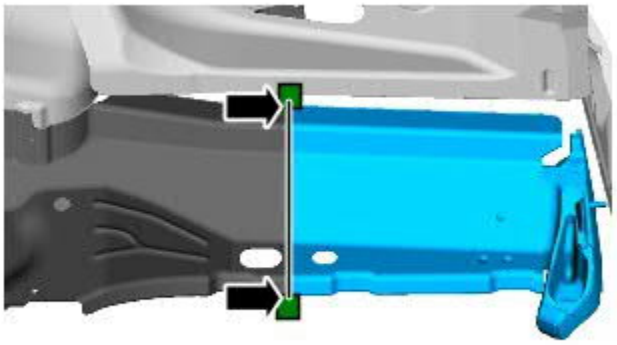

E132705

11. NOTE: MIG weld runs should avoid the hole in the rear side member.

    MIG weld the backing plate into the rear side member using 20mm runs as indicated.

12. Tack weld the run-on/run-off tabs to the rear side member section.

13. Clean the area of the MIG butt joint prior to welding.


E132706

14. MIG weld the rear side member section butt joint.

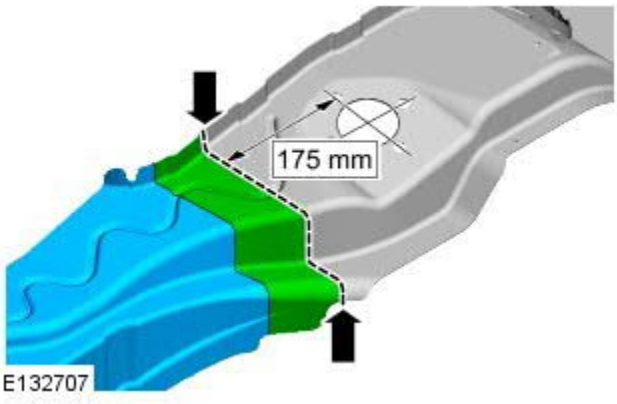
15. Cut off the run on/run off tabs.

16. Dress the mating panel flanges of the rear side member section MIG butt joint to ensure correct alignment with the rear side member closing panel.

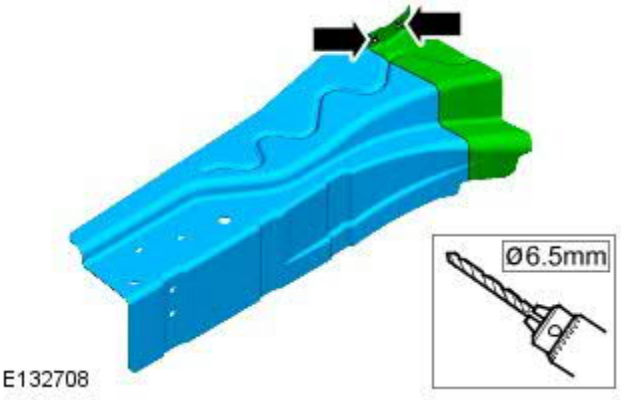
17. Carry out a non destructive crack inspection on the rear side member MIG butt joint. If correct proceed to next step, if not, rectify and recheck before proceeding.

18. Dress the rear side member MIG butt joint.

19. Cut a template from the old rear side member closing panel remnant, clean and dress the template.



20. Offer up, align and clamp the template in place on the rear side member closing panel service panel. Cut the rear side member closing panel service panel at the point indicated.



21. Using a 6.5mm Cryobit drill bit, drill through the template into the new side member closing panel section at the points indicated.

22. Remove the template.

23. Debur the new panel.

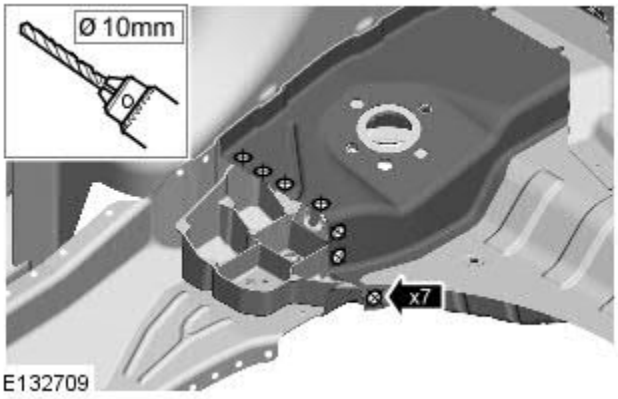
24. Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.

25. NOTE: The old rear side member and rear side member closing panel remnants can be used to identify where rivet locations are to be drilled.

    Using a 6.5mm Cryobit drill bit, drill holes through the rear side member and rear side member closing panel where the spare wheel well and rear floor side extension Hemloks are to be installed.

26. Remove the new panel.

27. Debur the drilled holes.



28. Using a 10mm drill bit, drill holes for MIG plug welds for the installation of the backing plate as indicated.

29. Debur the drilled holes.

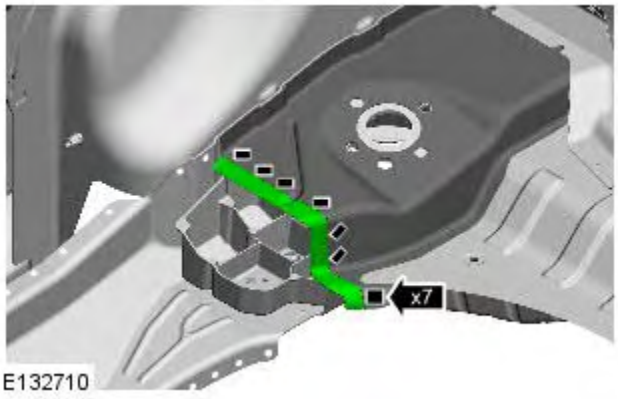
30. NOTE: It may be necessary to fabricate the backing plate from several pieces welded together. The backing plate should be wide enough to accommodate 10mm MIG plug welds.

    Fabricate a backing plate from the old/new rear side member closing panel remnant. Debur and offer up the backing plate to the rear side member closing panel and to the new rear side member closing panel section. If correct proceed to next step, if not, rectify and recheck before proceeding.

31. Remove the backing plate.

32. Using a Roloc fine bristle disc, clean the backing plate and the panel surfaces where the backing plate is to be welded.

33. Offer up the backing plate, align and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.



34. MIG plug weld the backing plate as indicated.

35. Clean and prepare the all remaining panel joint surfaces.

36. Pyrosil the joints of the rear side member and the rear side member closing panel, new and old.

37. Apply the coupling agent and allow to dry.

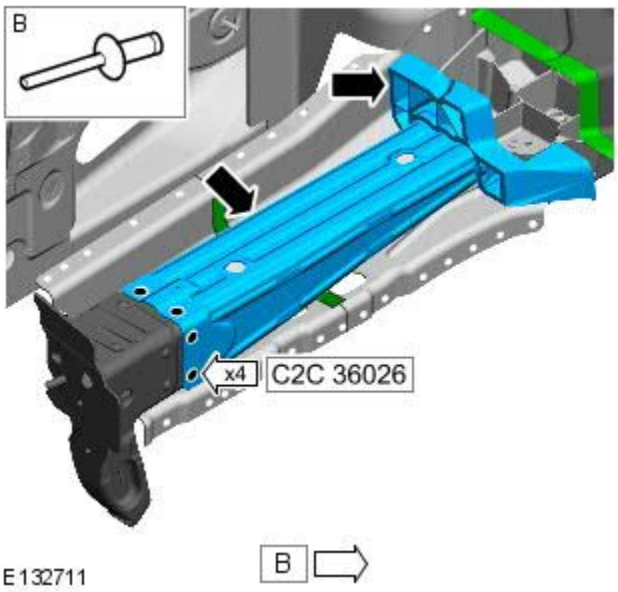
38. NOTES:

    An adhesive kit is supplied with the rear side member inner reinforcement service part.

    Do not apply adhesive in the areas where 3M 8115 adhesive is to be applied, or in the vicinity of the MIG welded butt joint.

    Apply adhesive to the rear side member and the rear side member inner reinforcement where the NVH component is to be installed.

39. Install the NVH component to the rear side member inner reinforcement and install the rear side member inner reinforcement to the rear side member.



E132711

40. Using the Genesis G4, install the Hemloks.

41. NOTES:

    An adhesive kit is supplied with the rear side member inner reinforcement service part.

    Do not apply adhesive in the areas where 3M 8115 adhesive is to be applied.

    Apply adhesive to the NVH component where it comes into contact with the rear side member closing panel section.

42. NOTE: Ensure a continuous bead of adhesive surrounds fixing holes. Do not apply adhesive in the vicinity of the MIG weld.

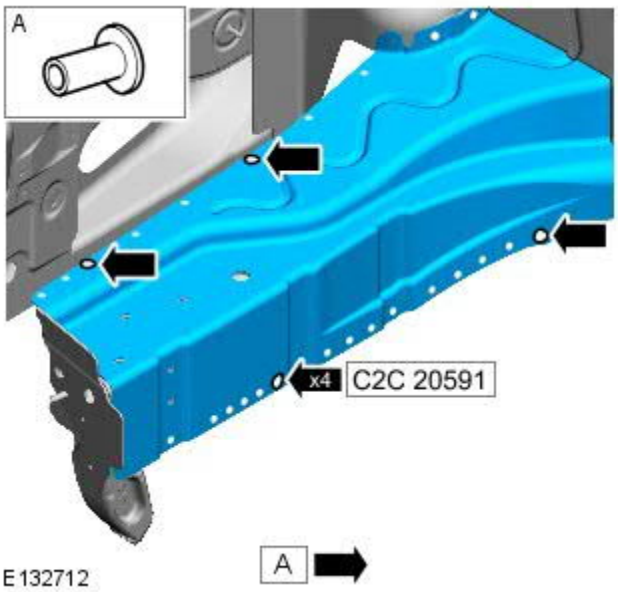
    Apply a 5mm zig zag bead of 3M 8115 adhesive to the rear side member.

43. CAUTION: Make sure any panel joints containing adhesive are fully clamped to avoid any separation prior to the installation of other panels. These joints must be left clamped until the adhesive has cured.

    NOTE: If necessary and to aid alignment, the unattached side of

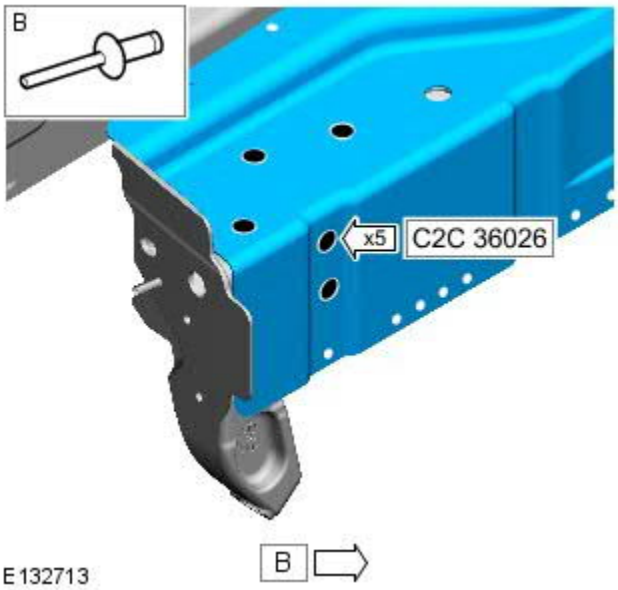
the backing plate can be secured with panel pin clamps.

Offer up the new rear side member closing panel section, align and clamp into position.



E132712

44. Using the ESN50, install the self piercing rivets as indicated.



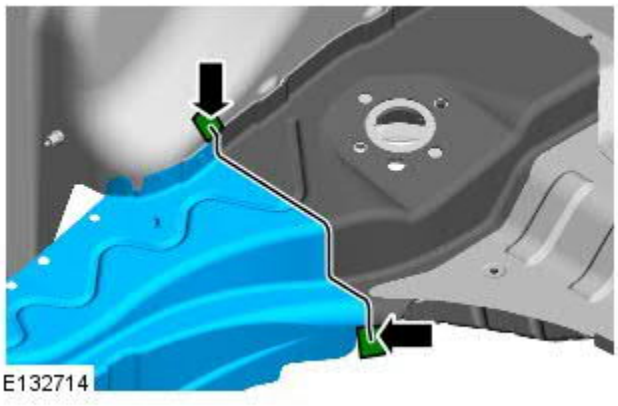
E132713

45. Using the Genesis G4, install the Hemloks.

46. Cut a run on/run off tab from the unused part of the old/new rear side member closing panel remnant.

47. Tack weld the run-on/run-off tabs to the rear side member closing panel section.

48. Clean the area of the MIG butt joint prior to welding.

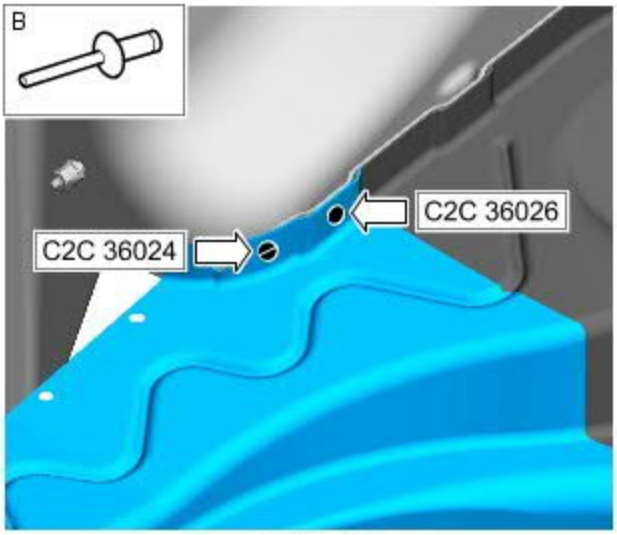

E132714

49. MIG weld the rear side member closing panel section butt joint.

50. Cut off the run on/run off tabs.

51. Carry out a non destructive crack inspection on the rear side member closing panel section MIG butt joint. If correct proceed to next step, if not, rectify and recheck before proceeding.

52. Dress the rear side member closing panel MIG butt joint and MIG plug welds.



E132715

53. Using the Genesis G4, install the Hemloks as indicated.

54. Remove any excess adhesive.

55. Make sure that any open or exposed panel joints are suitably sealed following this procedure.

56. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Rear End Sheet Metal Repairs - Rear Wheelhouse Outer

Removal and Installation

Removal

NOTE: The removal and installation steps shown within this procedure may differ depending on whether the panel in question is being replaced in isolation, or, is being replaced in combination with panels other than those listed.

1. The inner quarter panel rear section is a category A repair.

2. NOTES:

   The rear wheelhouse outer is manufactured from aluminium alloy 5754-NG.

   The illustration shows the left-hand service panel, the right-hand is similar but with the fuel filler aperture.

   The rear wheelhouse outer is serviced as a separate riveted and bonded panel.

3. The rear wheelhouse outer is replaced in conjunction with:
   - Rear bumper
   - Rear bumper cover
   - Quarter Panel
   - Luggage Compartment Lid
   - Luggage compartment lid hinge
   - Rear window glass
   - Headliner
   - Inner quarter panel rear section
   - Rear Door

4. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

5. Disconnect the battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

6. Disconnect the generator electrical connectors.

7. Remove the inner quarter panel rear section.
   For additional information, refer to: Inner Quarter Panel Rear Section (501-30 Rear End Sheet Metal Repairs, Removal and Installation).

8. If the right-hand rear wheelhouse outer is to be replaced, remove the DLM (Differential Locking Module).

9. If the right-hand rear wheelhouse outer is to be replaced, remove the

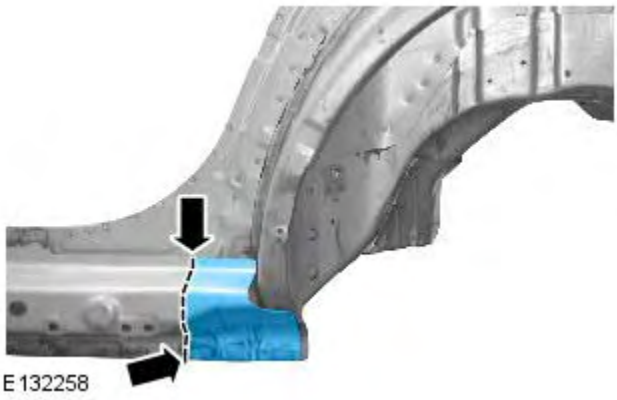
ADM (Adaptive Damping Module).
For additional information, refer to: Adaptive Damping Module (204-05 Vehicle Dynamic Suspension, Removal and Installation).

10. If the right-hand rear wheelhouse outer is to be replaced, remove the air suspension control module.
For additional information, refer to: Air Suspension Control Module (204-05 Vehicle Dynamic Suspension, Removal and Installation).

11. Remove any remaining miscellaneous components from the repair area as necessary.

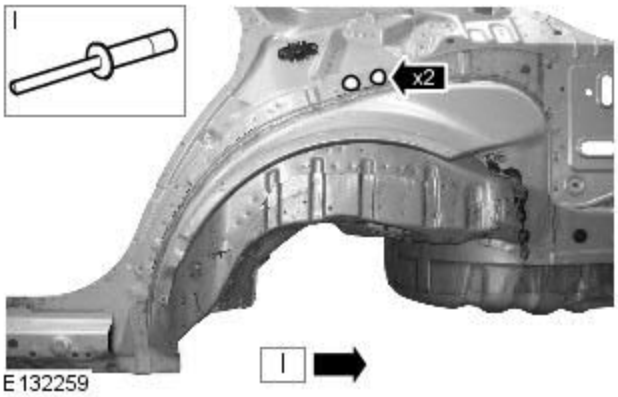
12. Release and lay aside the rear wheelhouse outer wiring harness.

13. Prior to removal, mark the position of the rear wheelhouse outer in relation to adjacent panels, for ease of alignment on installation.


E132258

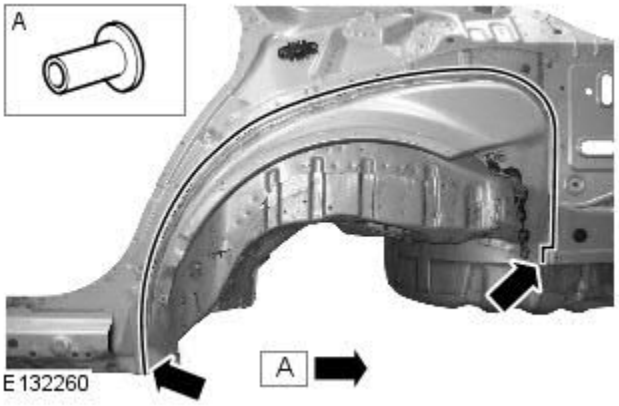
14. NOTE: Retain the rocker panel inner reinforcement section for installation.

    Saw cut and remove a minimal section from the rocker panel inner reinforcement to allow access to the self piercing rivets as indicated.



E132259

15. Remove the monobolts.



16. Using a combination of the ESN50 and a 6.5mm Cryobit drill bit, remove the self piercing rivets.

17. Carefully separate the joints and remove the old panel.

Installation

CAUTION: Installation of rivets should always be referenced against the stack size of the panel/s, access and the pitch between the original removed rivets locations, to make sure the correct type and size of rivet is installed.

NOTE: Hemloks should be installed in the hole created by the removed self piercing rivets.

1. Remove rivet remnants.

2. Dress flanges where necessary.

3. Using a Roloc fine bristle disc, clean and prepare the panel surfaces, removing any sealer and adhesive residue.

4. NOTE: Use the marks made prior to removal to aid alignment.

   Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.

5. Using a 6.5mm Cryobit drill bit, drill through the old panel holes into the new panel, at the points where Hemloks are to be installed.

6. Remove the new panel.

7. Debur the drilled holes.

8. Using a Roloc fine bristle disc, clean and prepare the panel surfaces.

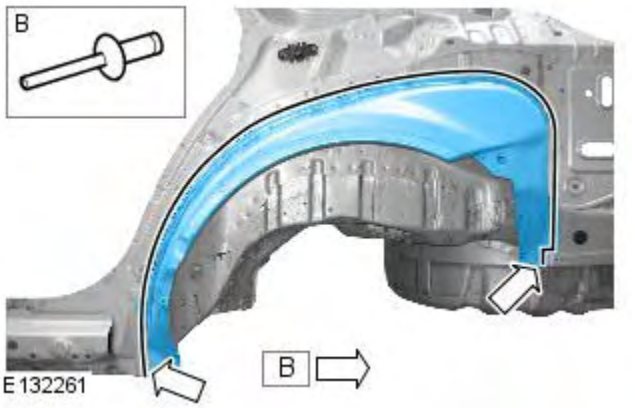
9. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

10. Apply the coupling agent where 3M 8115 adhesive is to be applied and allow to dry.

11. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes.

Apply a 5mm zig zag bead of 3M 8115 adhesive to the new panel and to the corresponding body joints.

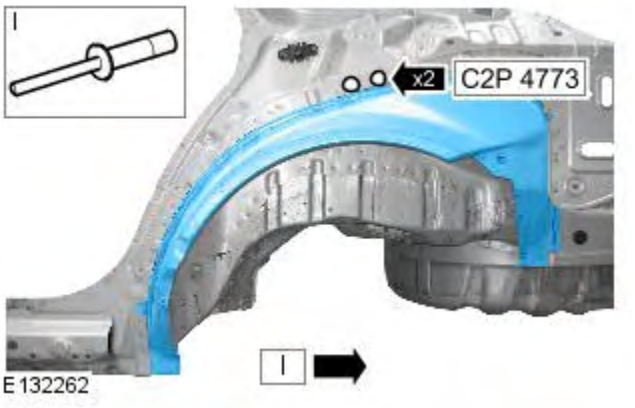
12. Offer up the new panel, align and clamp into position.



13. NOTE: It is important to identify and select the correct size fixing by referencing the following table prior to installation.

    Using the Genesis G4, install the Hemloks in the areas as indicated.

Hemlok Rivet Size	Material Stack	Jaguar Service Number
6.4mm x 13.7mm	1.5mm - 3.0mm	C2S 45252
6.4mm x 15.0mm	2.8mm - 4.8mm	C2C 36006
6.4mm x 17.0mm	4.8mm - 6.8mm	C2C 36026
6.4mm x 19.0mm	6.8mm - 8.8mm	C2C 36024
6.4mm x 20.0mm	7.5mm - 9.5mm	C2C 22613
6.4mm x 21.0mm	8.8mm - 10.8mm	C2C 36008



14. Using the Genesis G4, install the Monobolts.

15. Remove any excess adhesive.

16. Dress, clean and prepare the panel joint surfaces of the rocker panel inner reinforcement section.

17. Offer up the rocker panel inner reinforcement section and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.

18. NOTE: Hemloks for the rocker panel inner reinforcement section will be installed with the installation of outer panels.

    Using a 6.5mm Cryobit drill bit, drill holes through the old rocker panel inner reinforcement section, at the points where Hemloks are to be installed.

19. Remove the rocker panel inner reinforcement section.

20. Debur the drilled holes.

21. Using a Roloc fine bristle disc, clean and prepare the panel surfaces.

22. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

23. Apply the coupling agent where 3M 8115 adhesive is to be applied and allow to dry.

24. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes. Do not apply adhesive in the vicinity of the MIG weld.

    Apply a 5mm zig zag bead of 3M 8115 adhesive to the rocker panel inner reinforcement section.

25. CAUTION: Make sure any panel joints containing adhesive are fully clamped to avoid any separation prior to the installation of external panels. These joints must be left clamped until the adhesive has cured.

    Offer up the new panel, align and clamp into position.

26. NOTE: The run-on/run-off tabs should be fabricated from similar material.

    Tack weld the run-on/run-off tabs to all MIG butt joints.

E132263

27. MIG weld the MIG butt joint.

28. Remove the run-on/run-off tabs.

29. Carry out a non destructive crack inspection on the MIG butt joint. If correct proceed to next step, if not, rectify and recheck before proceeding.

30. Dress the welded joint.

31. Remove any excess adhesive.

32. Make sure that any open or exposed panel joints are suitably sealed following this procedure.

33. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Rear End Sheet Metal Repairs - Spare Wheel Well

Removal and Installation

Removal

1. The spare wheel well is a category A repair.

2. NOTE: The spare wheel well is manufactured from aluminium alloy 5754-NG.

   The spare wheel well is serviced as a separate riveted and bonded panel. It is not serviced with all its rivet-studs.

3. NOTE: The rear suspension and subframe assembly can remain in place, however, some aspects of the refinishing process will need to be carried out prior to the installataion of the new panel.

   The spare wheel well is replaced in conjunction with:
   - Rear bumper cover
   - Rear bumper
   - Back panel

4. For additional information relating to this repair procedure please see the following:
   For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation) /
   Body Repairs (501-25A Body Repairs - General Information, Description and Operation) /
   Corrosion Protection (501-25B Body Repairs - Corrosion Protection, Description and Operation) /
   Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

5. Remove the back panel.
   For additional information, refer to: Back Panel (501-30 Rear End Sheet Metal Repairs, Removal and Installation).

6. Disconnect the battery.
   For additional information, refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

7. Remove the fuel tank filler pipe.
   For additional information, refer to: Fuel Tank Filler Pipe (310-01A Fuel Tank and Lines - TDV6 3.0L Diesel, Removal and Installation).

8. Remove the battery.
   For additional information, refer to: Battery (414-01 Battery, Mounting and Cables, Removal and Installation).

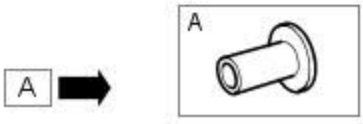
9. Remove sealer from the area of repair as required, to reveal the panel joints.

10. Prior to removal, mark the position of the spare wheel well in relation to adjacent panels, for ease of alignment on installation.

E130782

11. CAUTION: Use care not to damage adjacent panels.

    Saw cut to remove the panel bulk as indicated.



E130783

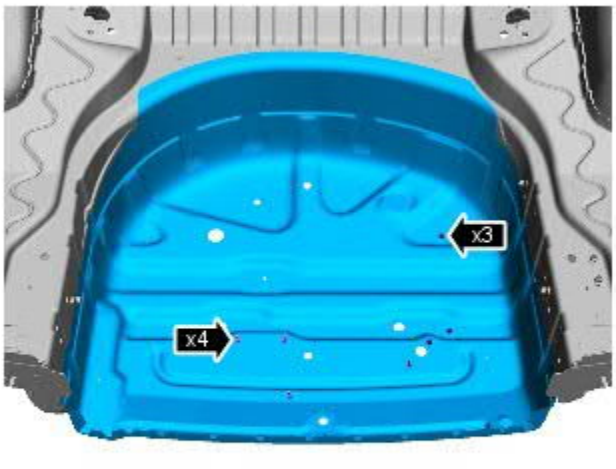
12. NOTE: Remove the sealer to expose the self piercing rivets.

    Using the ESN50, remove the self piercing rivets.

13. NOTE: Retain the remnant as it will be used as a template.

    Separate the joints and remove the old panel remnant.

Installation



E130786

1. Using the old panel for reference, install the rivet-studs into the new panel as indicated.

2. Remove rivet remnants.

3. Dress flanges where necessary.

4. Trim, clean and prepare the old panel remnant to be used as a template.

E130784

5. Clamp the template to the new panel and using a 6.5mm Cryobit drill bit. Drill holes through the template into the new panel, ready for Hemloks to be installed.

6. Remove the template from the new panel.

7. Debur the drilled holes in the new panel.

8. Using a Roloc fine bristle disc, clean and prepare the panel surfaces, removing any sealer and adhesive residue.

9. NOTE: Use the marks made prior to removal to aid alignment.

   Offer up the new panel and clamp into position. Check alignment, if correct proceed to next step, if not, rectify and recheck before proceeding.

10. Using a 6.5mm Cryobit drill bit. Drill holes through the old panels into the new panel, at the points where Hemloks are to be installed.

11. Remove the new panel.

12. Debur the drilled holes.

13. Using a Roloc fine bristle disc, clean and prepare the panel surfaces.

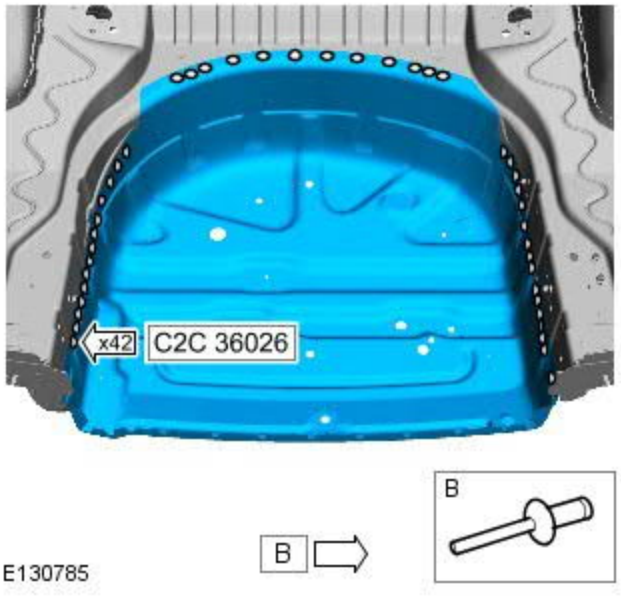
14. Pyrosil the joints at the points where 3M 8115 adhesive is to be applied.

15. Apply the coupling agent where 3M 8115 adhesive is to be applied and allow to dry.

16. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes.

    Apply a 5mm zig zag bead of 3M 8115 adhesive to the body joints.

17. Offer up the new panel, align and clamp into position.



18. Using the Genesis G4, install the Hemloks.

19. Remove any excess adhesive.

20. Make sure that any open or exposed panel joints are suitably sealed following this procedure.

21. The installation of associated panels and components is the reversal of removal procedure.

Published: 11-May-2011

Uni-Body, Subframe and Mounting System -

Torque Specifications

NOTE: * Make sure that new bolts are installed.

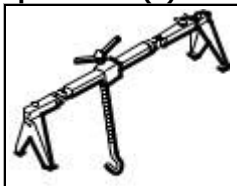
Description	Nm	lb-ft	lb-in
Front lower arm to front subframe retaining nut and bolt	175	129	-
Rear lower arm to front subframe retaining nut and bolt	175	129	-
Lower arm to rear subframe nuts and bolts	192	142	
Upper arm to rear subframe nuts and bolts	115	85	
Engine mount lower retaining nut	63	46	-
Steering gear retaining bolts	100	74	-
Front Shock absorber and spring assembly retaining bolt	175	129	-
* Front subframe to body front retaining bolts	Stage 1 - 80 Stage 2 - 270 degrees	Stage 1 - 59 Stage 2 - 270 degrees	-
* Front subframe to body rear retaining bolts	Stage 1 - 80 Stage 2 - 240 degrees	Stage 1 - 59 Stage 2 - 240 degrees	-
* Rear subframe to body mounting bolts	Stage 1 - 60 Stage 2 - 240 degrees	Stage 1 - 44 Stage 2 - 240 degrees	
Front Stabilizer bar link to stabilizer bar retaining nut	43	32	-
Front Stabilizer bar link to rear lower arm nut and bolt	70	52	-
Front Stabilizer bar link to subframe bolts	55	41	
Rear Stabilizer bar link to subframe bolts	55	41	
Rear Stabilizer bar link to rear Stabilizer bar	48	35	
Rear Shock absorber and spring assembly retaining bolt	133	98	-
Rear subframe reinforcement plate retaining bolts	35	26	-

Published: 29-Jul-2013

Uni-Body, Subframe and Mounting System - Front Subframe TDV6 3.0L Diesel

Removal and Installation

Special Tool(s)

 303-021	303-021 Engine support bracket
E54554	303-1129 Engine Lifting Brackets

General Equipment

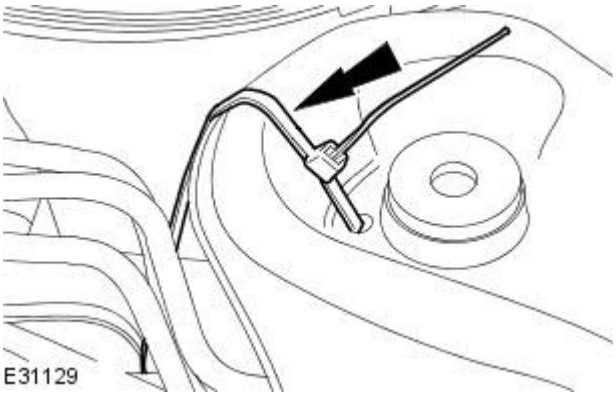
Powertrain Jack

Removal

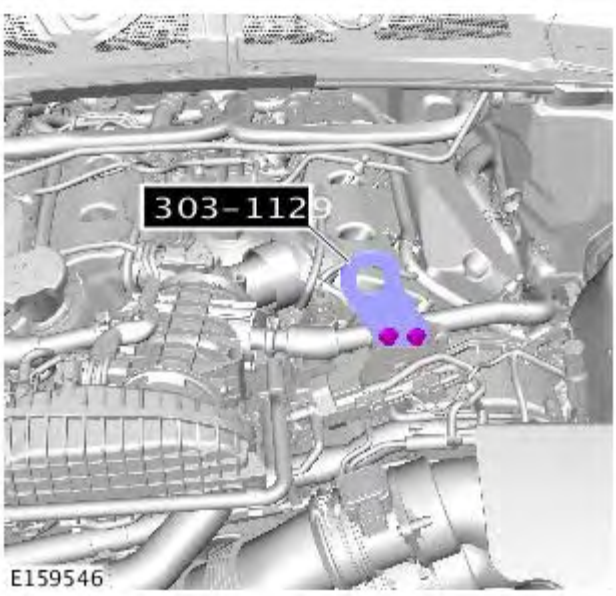
NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.
3. Refer to: Radiator Splash Shield (501-02 Front End Body Panels, Removal and Installation).
4. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).
5. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).



6. Secure the radiator assembly.

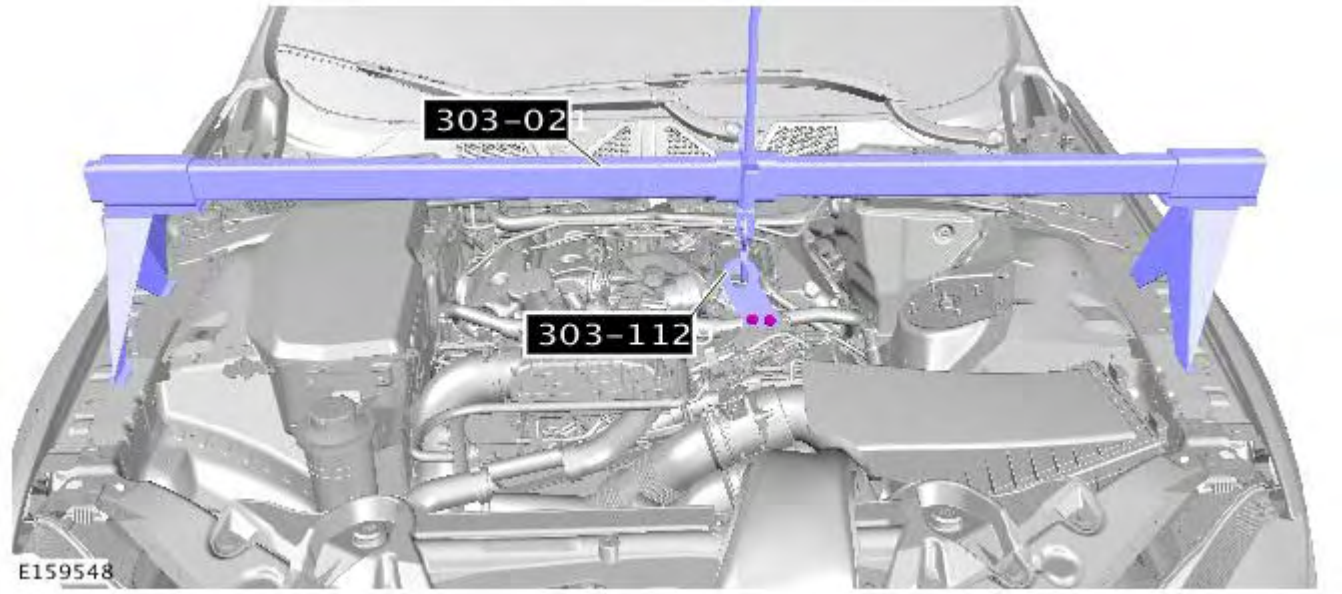


7.
- *Torque:* 22 Nm
- *Special Tool(s):* 303-1129

8. CAUTION: Make sure to protect the paintwork.

   Support the engine with the lifting equipment.

   Special Tool(s): 303-1129, 303-021



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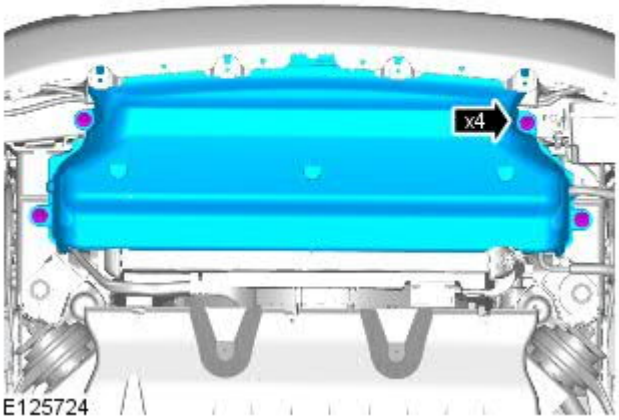

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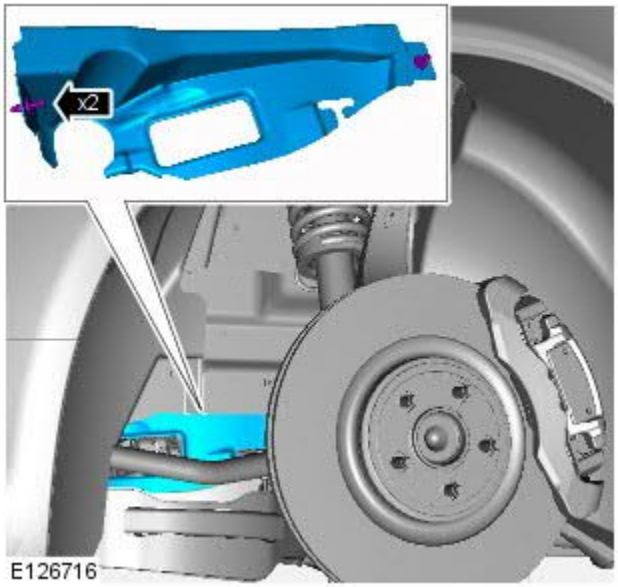

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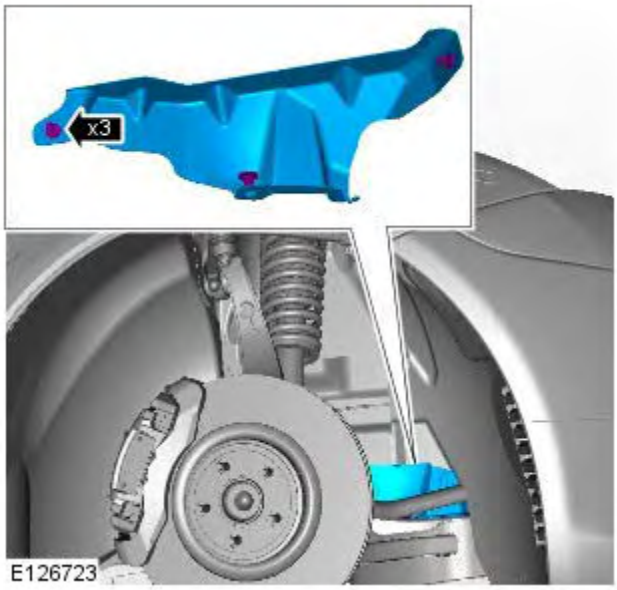

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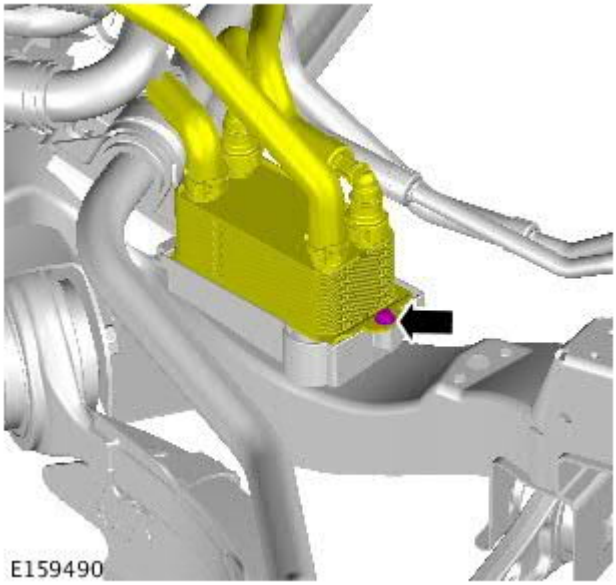
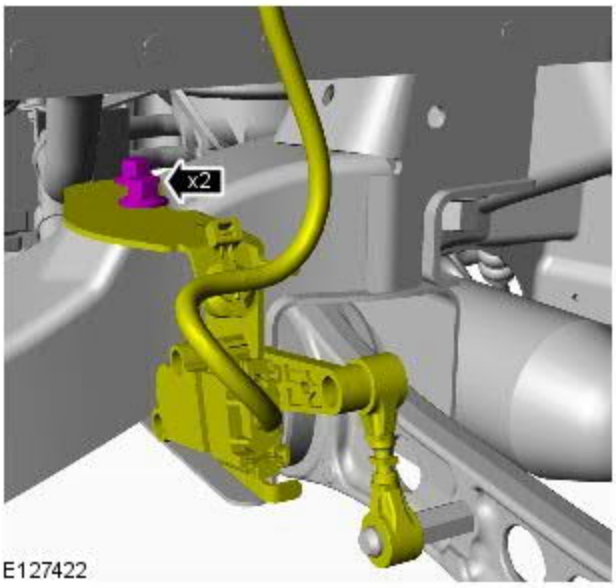
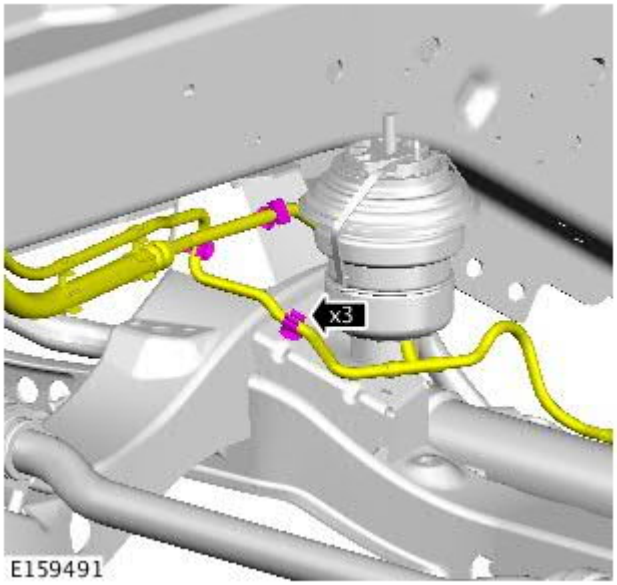




13. NOTE: Repeat the step for the other side.

14.



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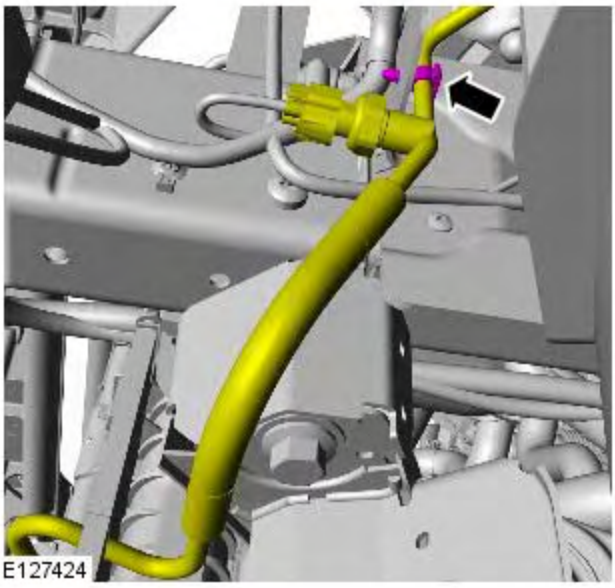
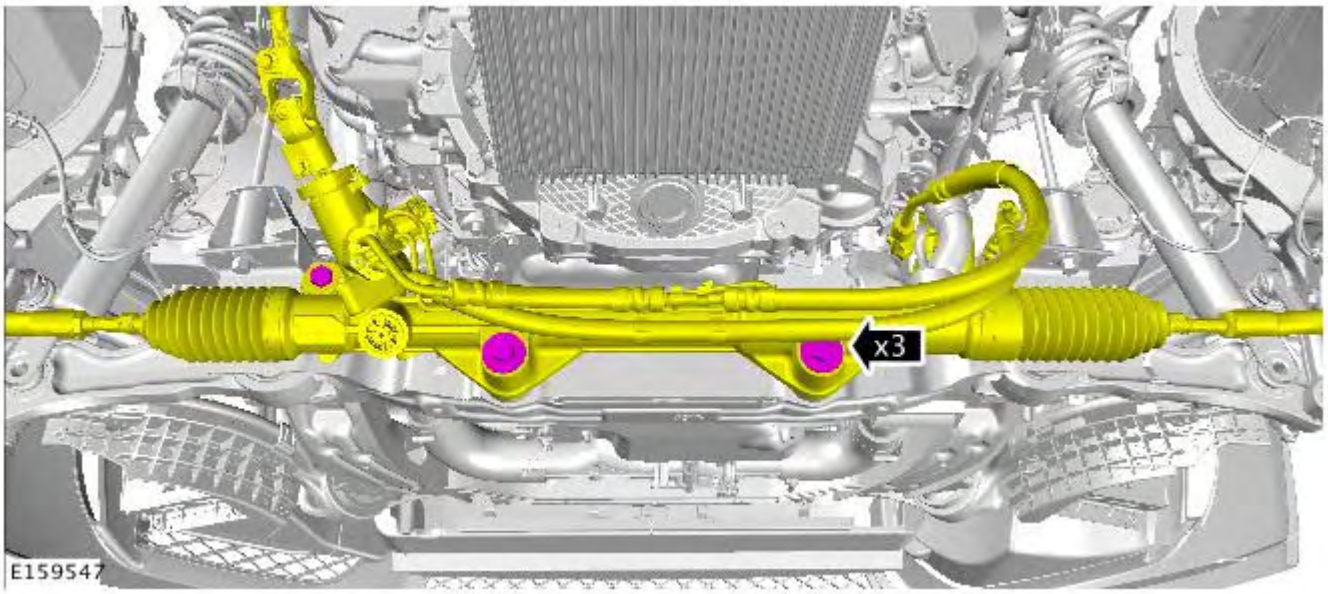


16. NOTES:

Make sure to support the steering gear.

LHD illustration shown, RHD is similar.



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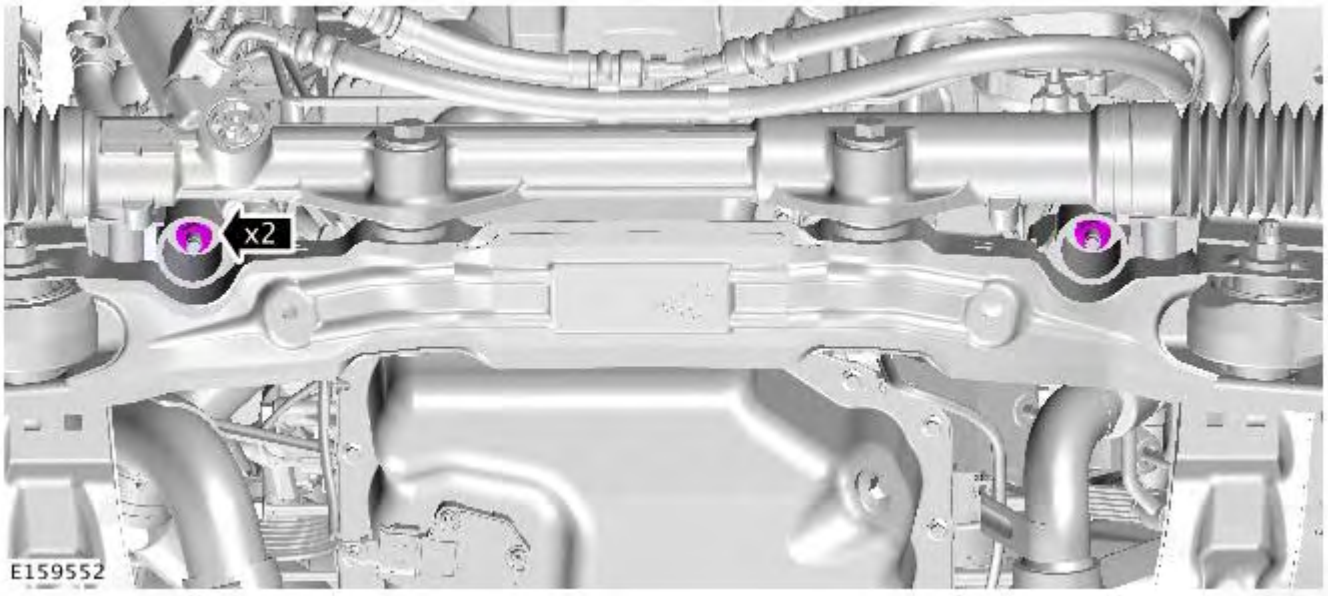

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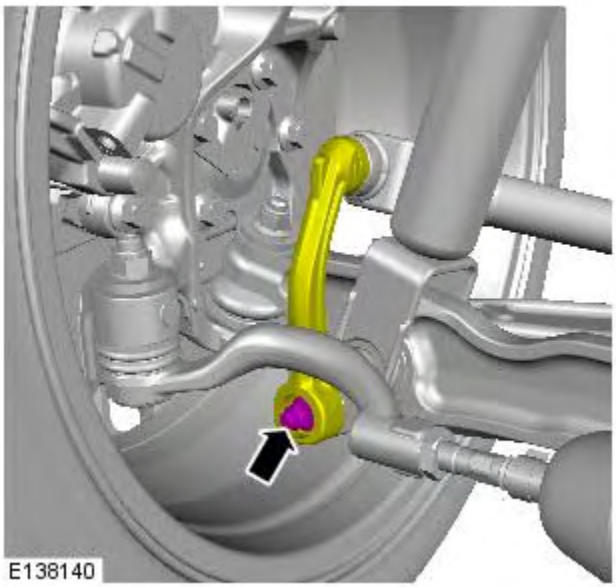

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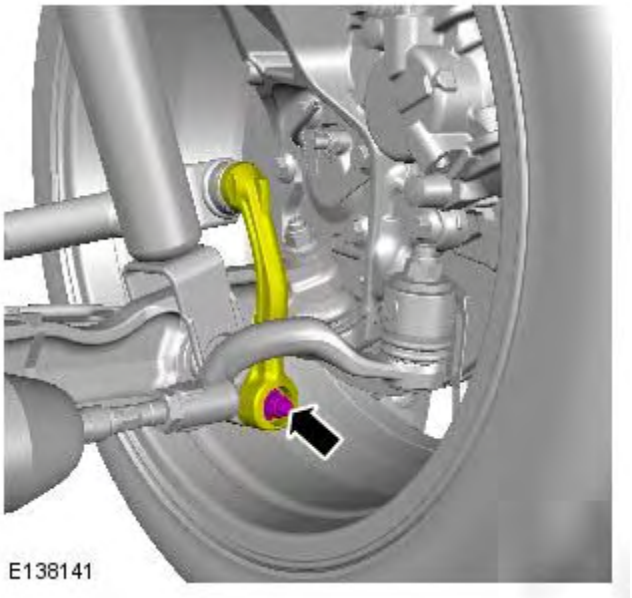
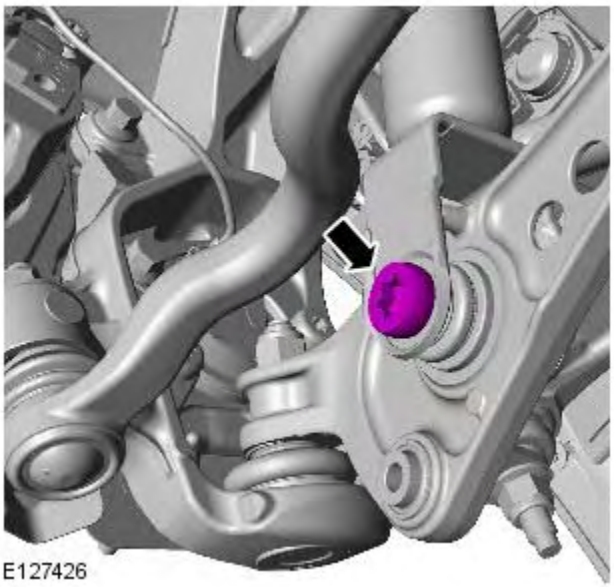
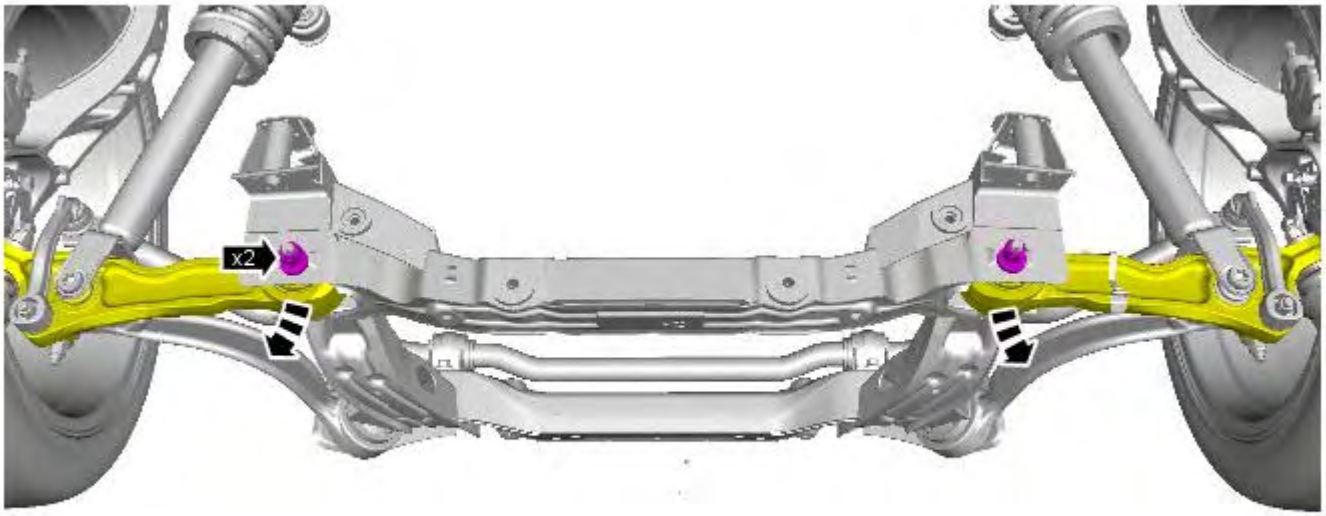




E127426

20. NOTE: Repeat the step for the other side.

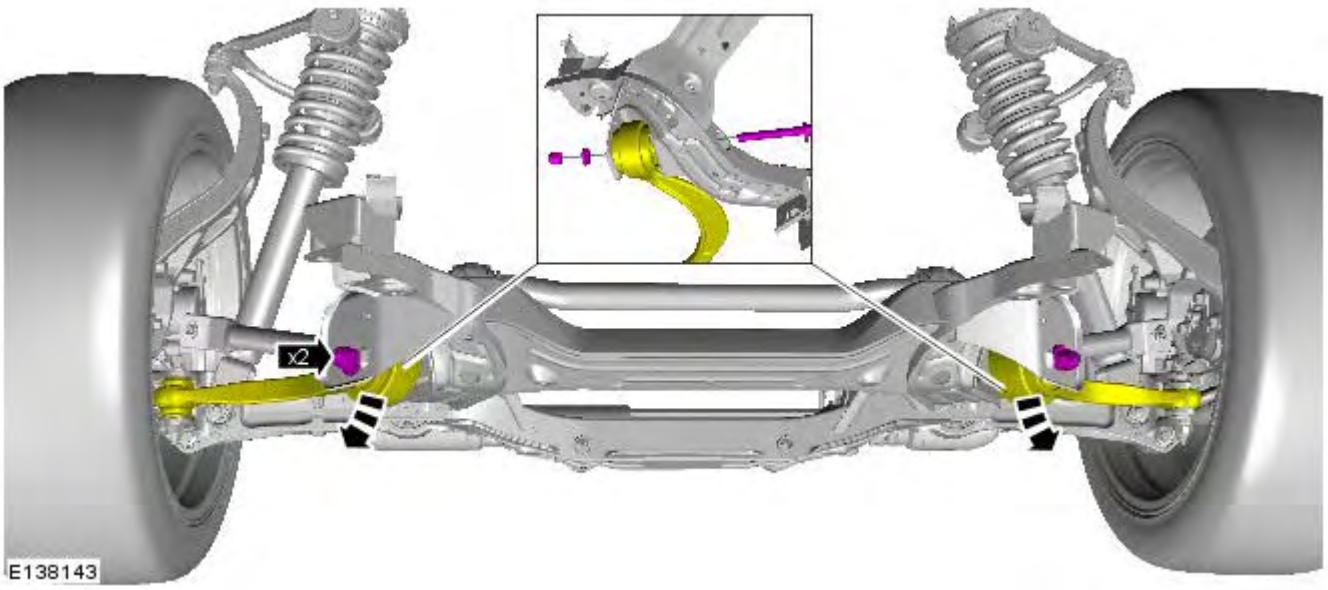
21. NOTE: Note the fitted position of each bolt, mark the washers and sub-frame before removal to aid assembly.



E138142

22. CAUTION: Make sure the wheel knuckle is supported. Failure to follow these instructions may result in damage to the vehicle.

NOTE: Note the fitted position of each bolt, mark the washers and sub-frame before removal to aid assembly.



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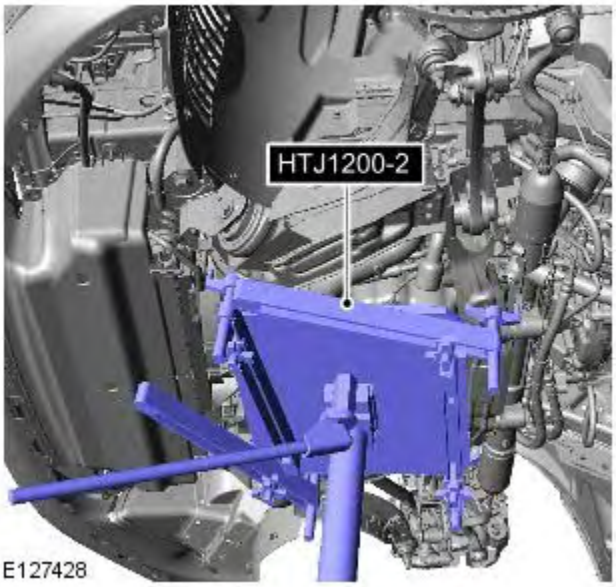


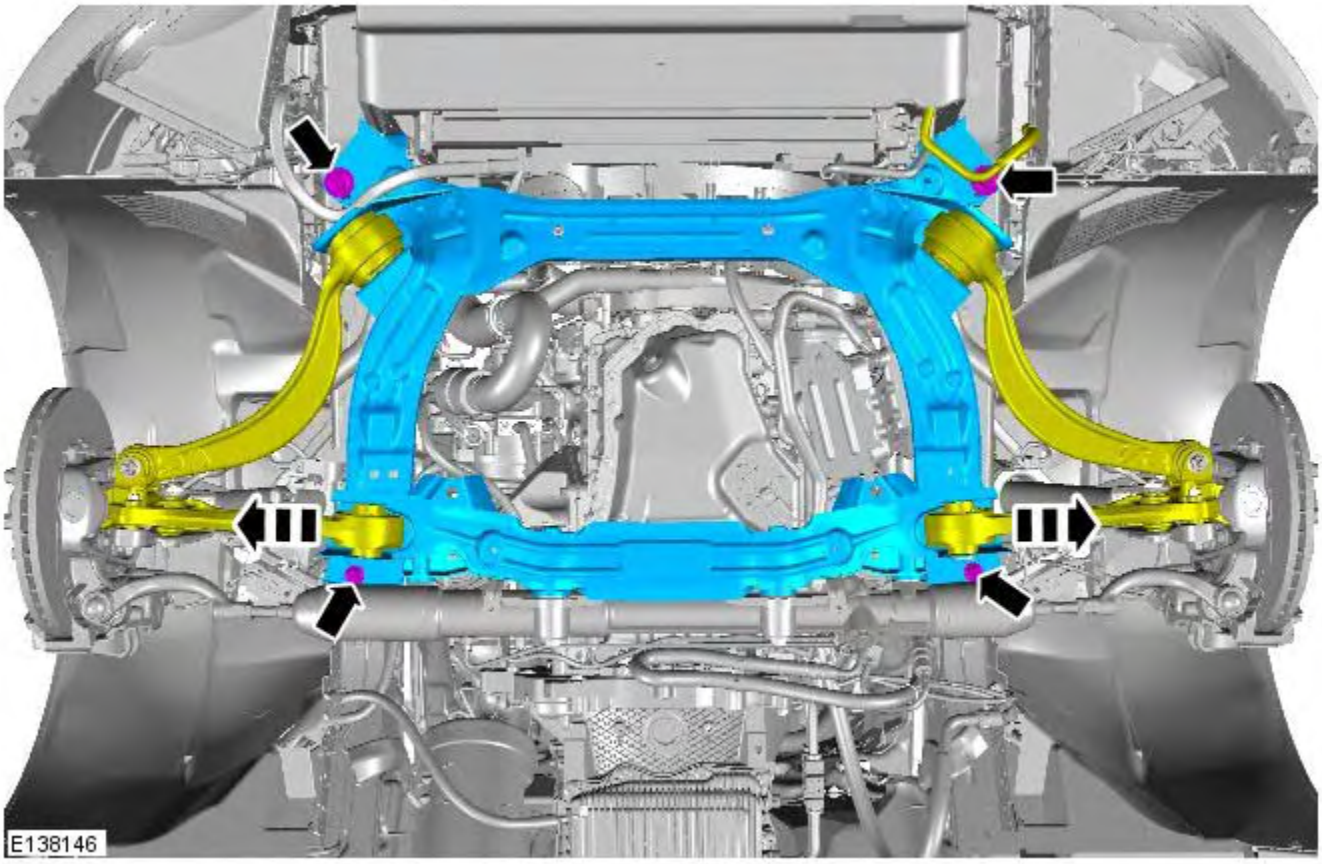
24. CAUTION: Take extra care not to damage the A/C pipes when lowering the component.

NOTES:

This step requires the aid of another technician.

Do not disassemble further if the component is removed for access only.

General Equipment: Powertrain Jack



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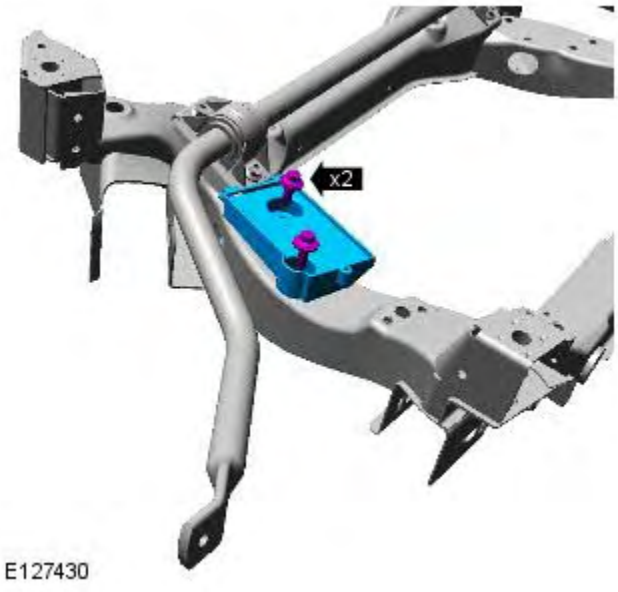
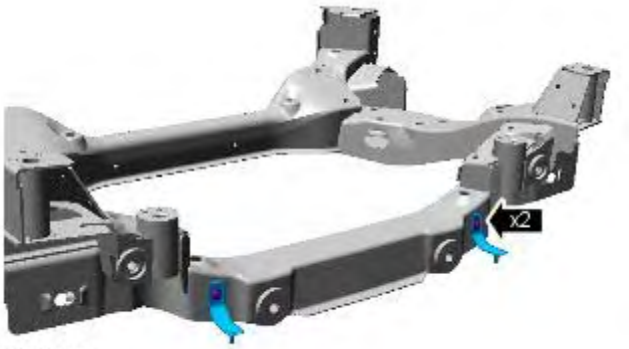


26.

E127431

27.



E127432

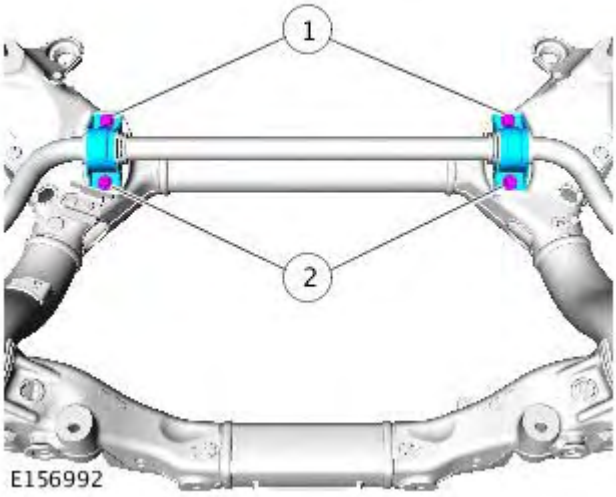
Installation

1. *Torque:* 8 Nm

E127432

E127431

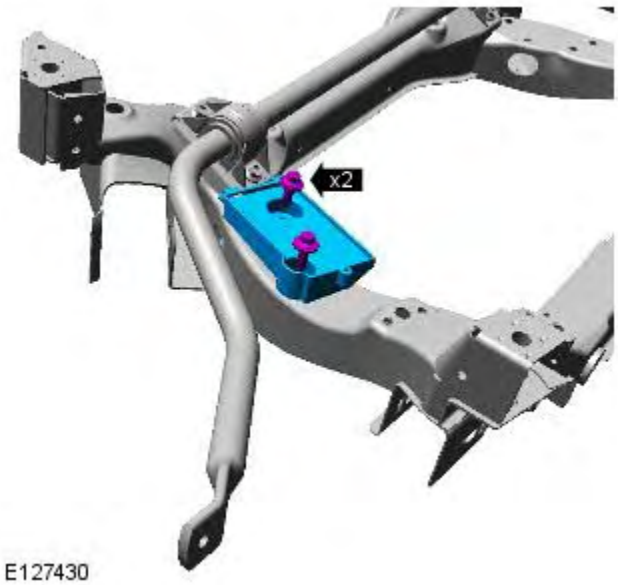
2. NOTE: Only tighten the bolts finger tight at this stage.



E156992

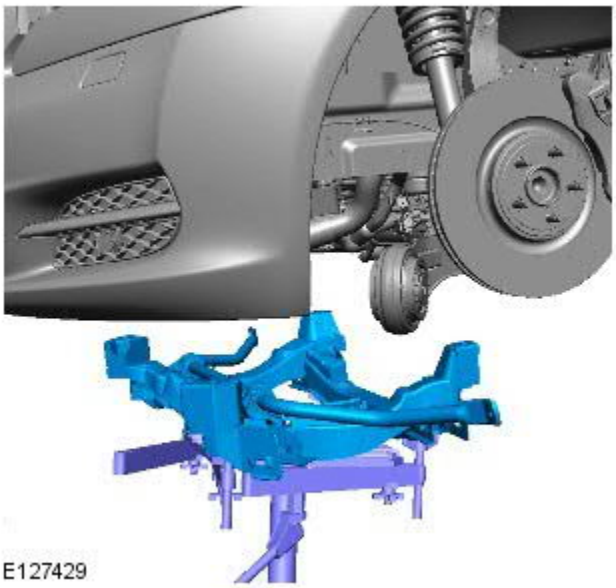
3. NOTE: Tighten the bolts in the sequence shown.

Torque:
Bolt 1 63 Nm
Bolt 2 63 Nm
Bolt 1 63 Nm



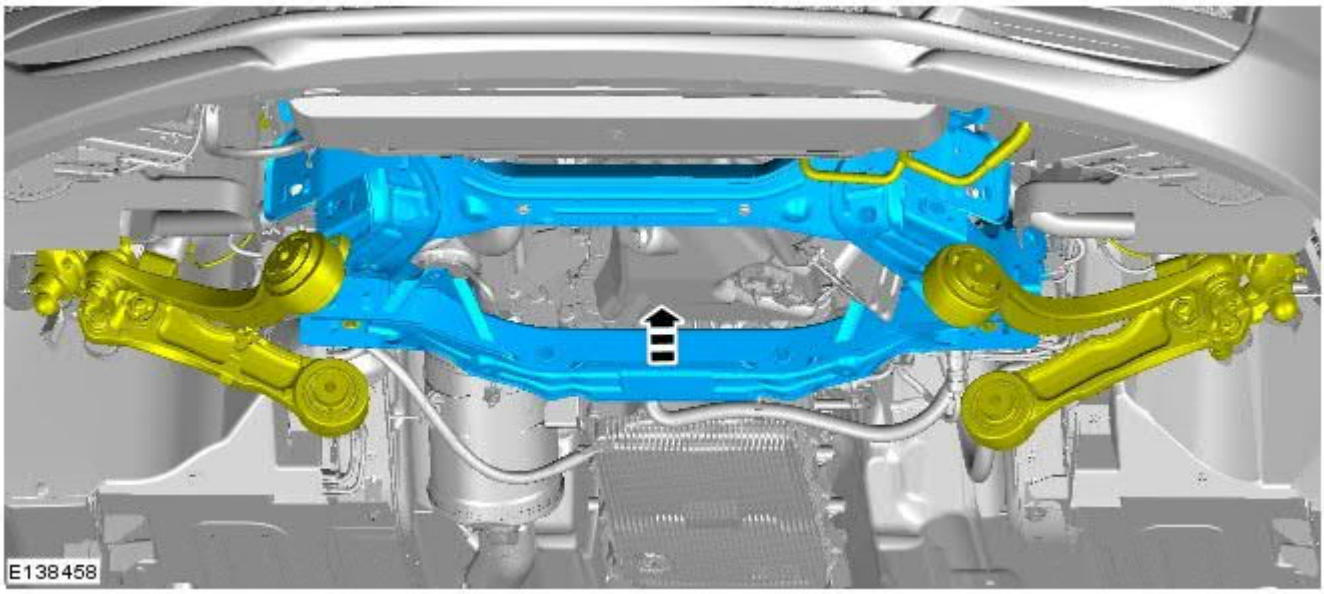
E127430

4. *Torque:* 12 Nm

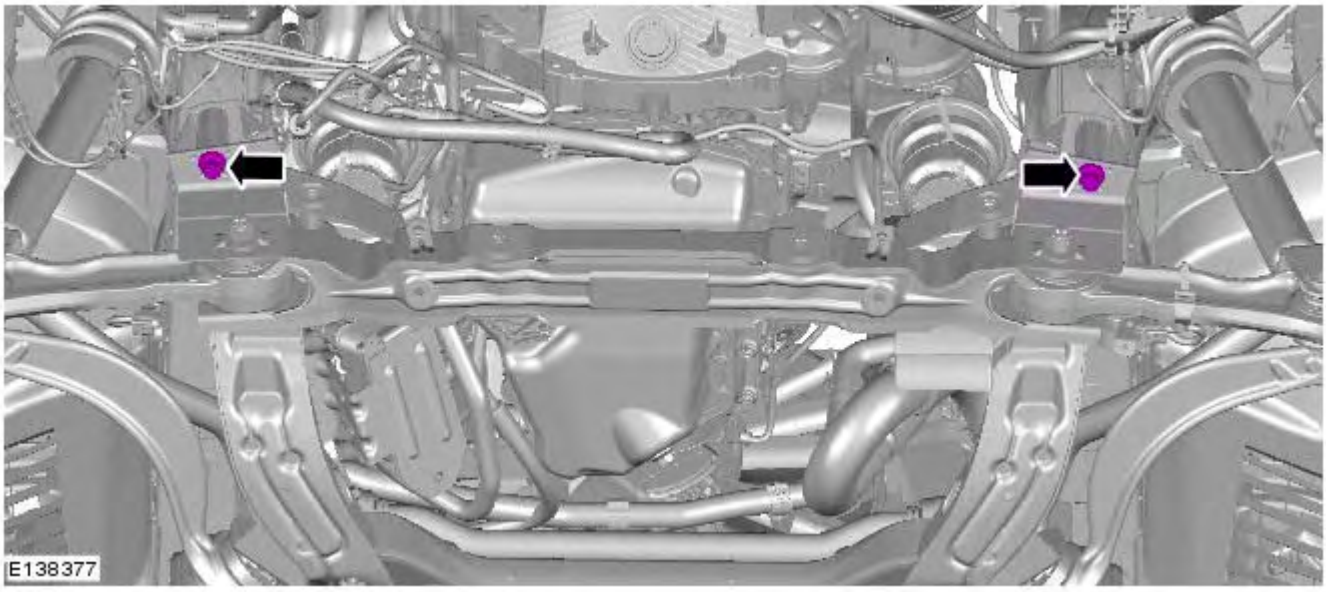


5. *General Equipment:* Powertrain Jack

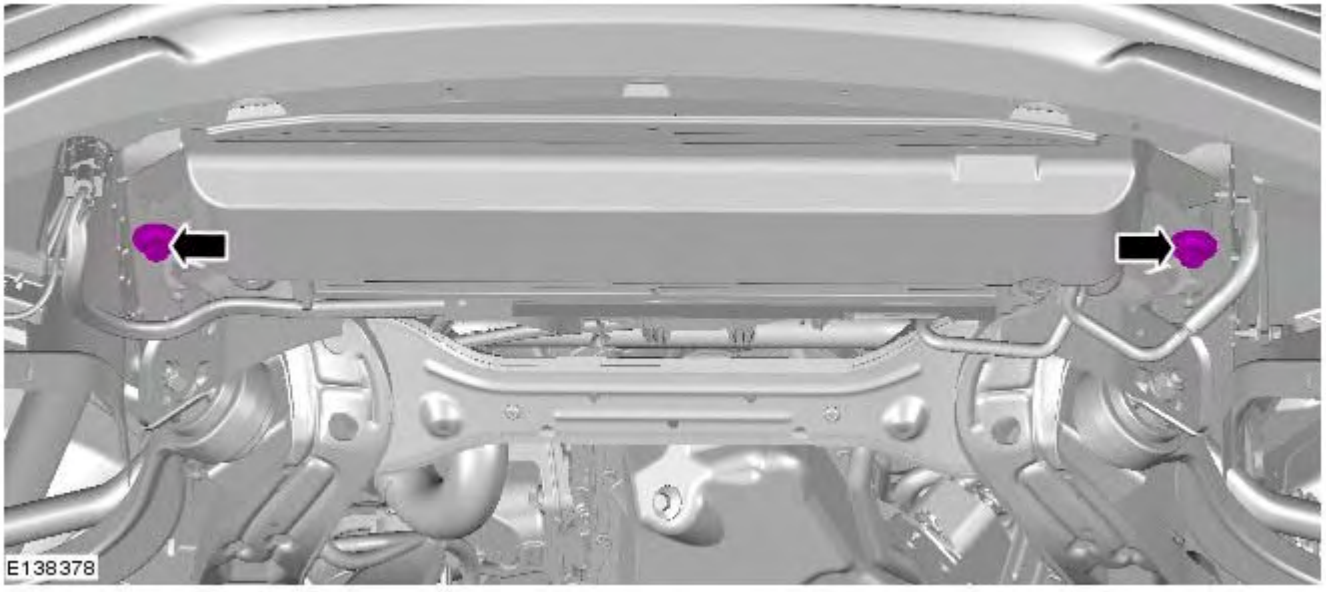
6. NOTE: This step requires the aid of another technician.



7. *Torque:*
   Stage 1:80 Nm
   Stage 2:240°

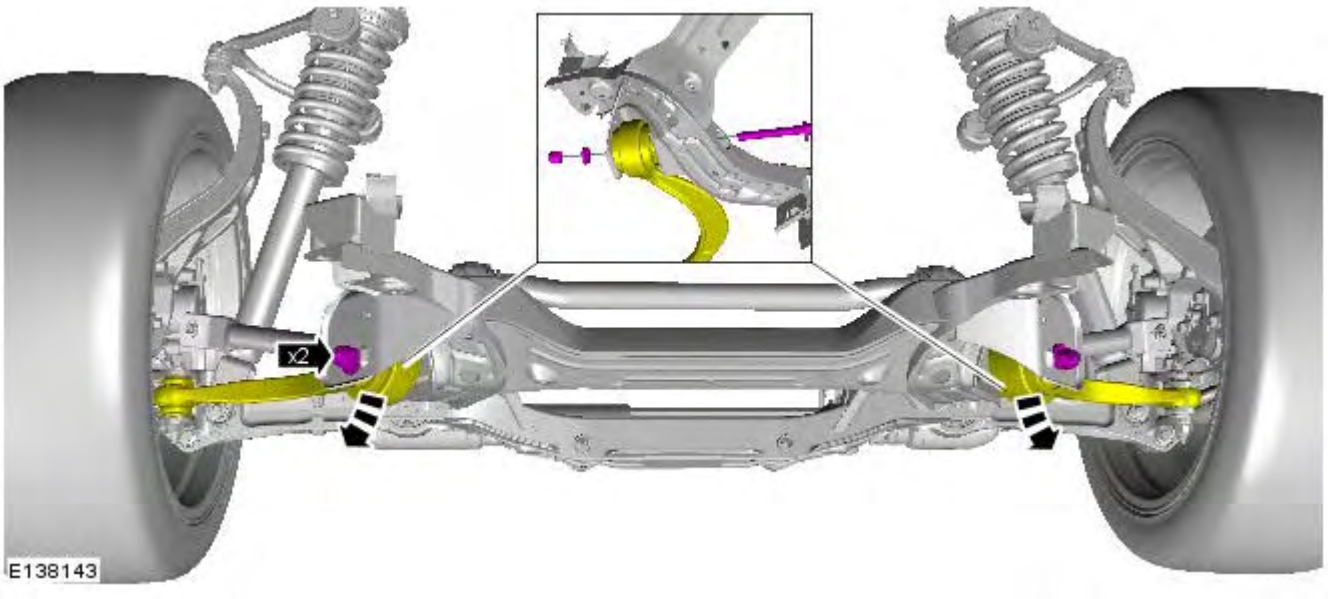


8. *Torque:*
   Stage 1:100 Nm
   Stage 2:270°



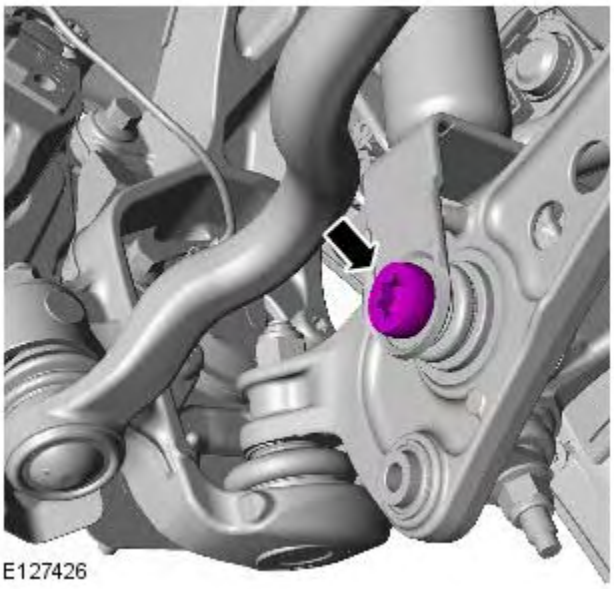
9. CAUTION: Make sure each bolt aligns with the removal markings.

Torque: 175 Nm



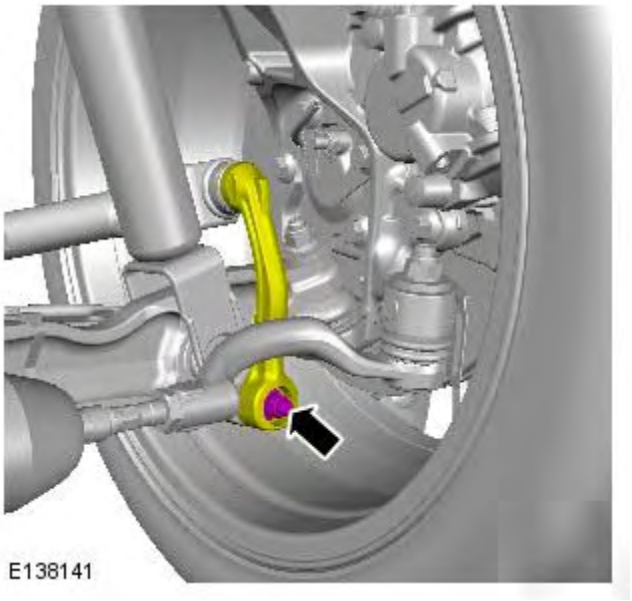
10. CAUTION: Make sure each bolt aligns with the removal markings.

Torque: 175 Nm


E127426

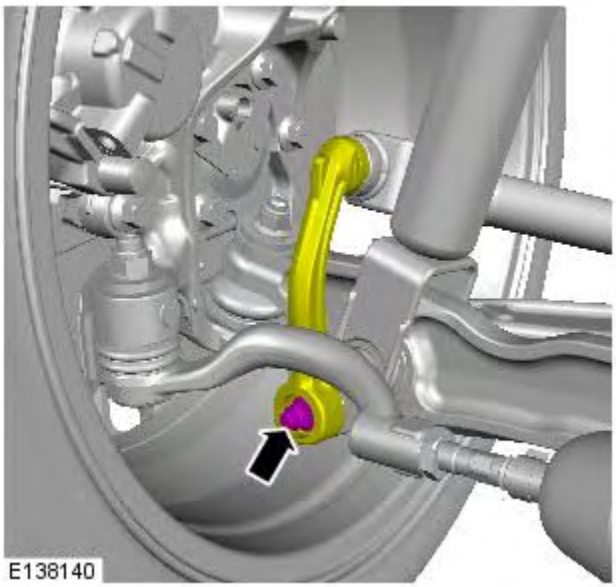
11. NOTE: Repeat the step for the other side.

    Torque: 175 Nm

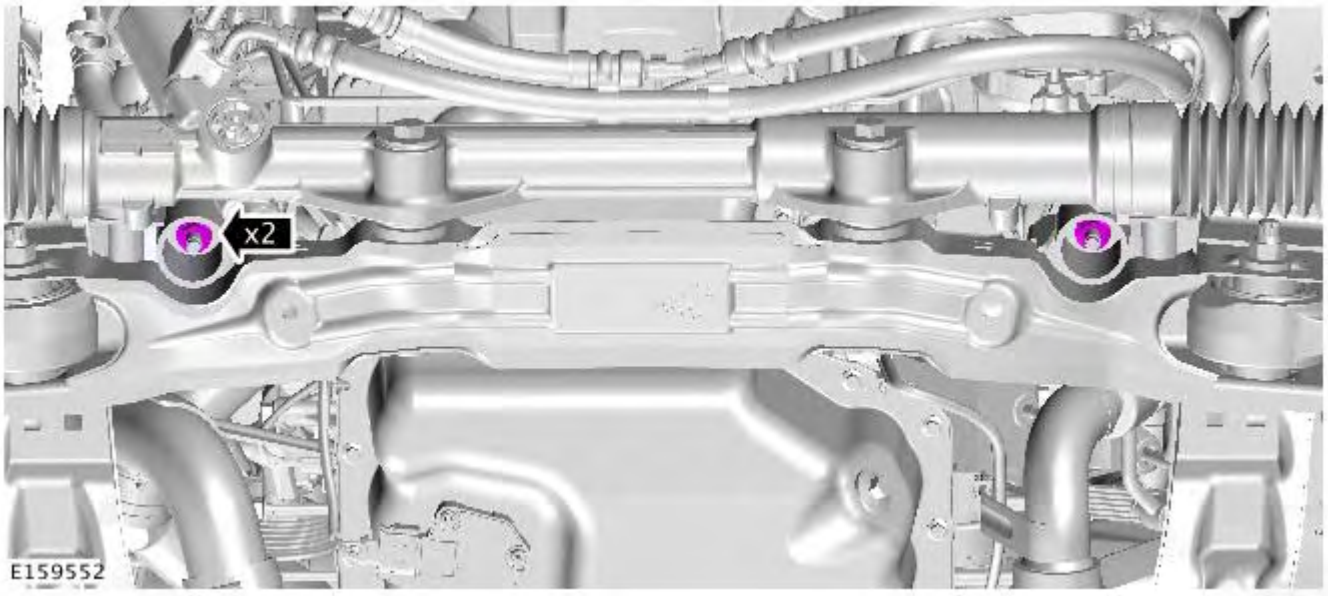

E138141

12. *Torque:* 43 Nm

13. *Torque:* 43 Nm

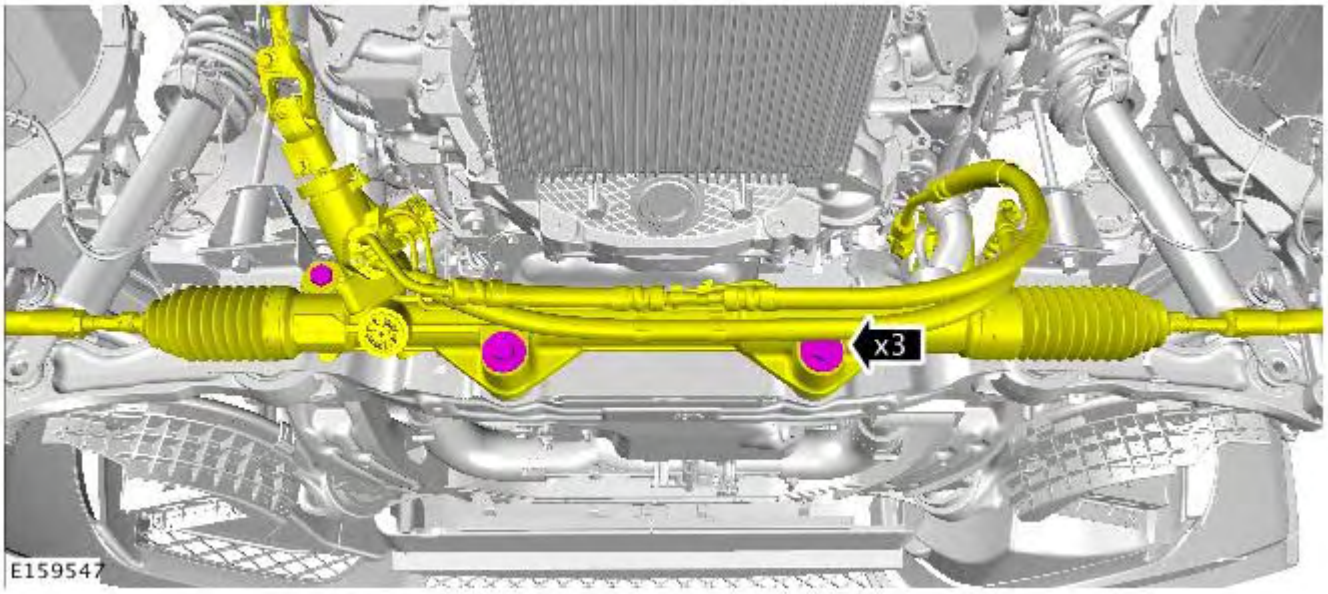


14. *Torque:* 63 Nm

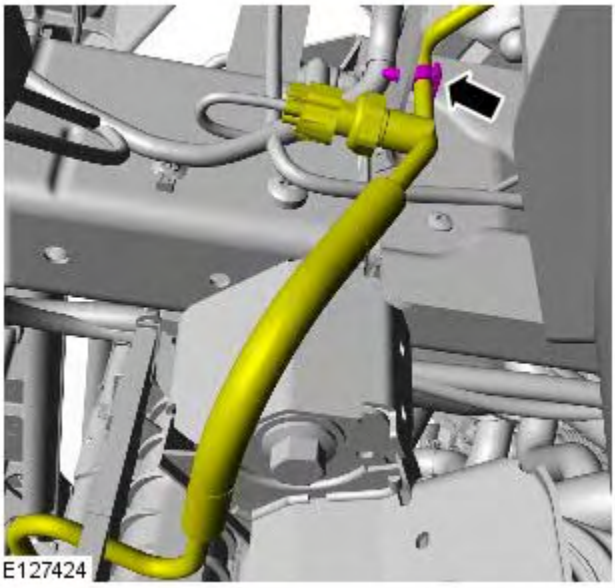


15. NOTE: LHD illustration shown, RHD is similar.

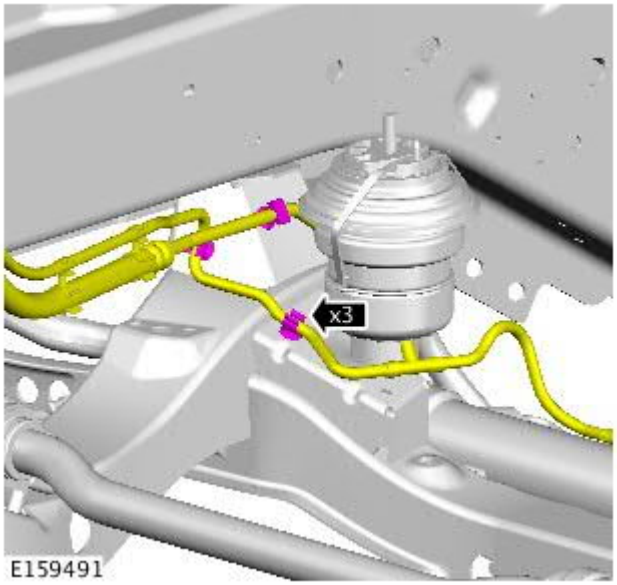
Torque: 100 Nm

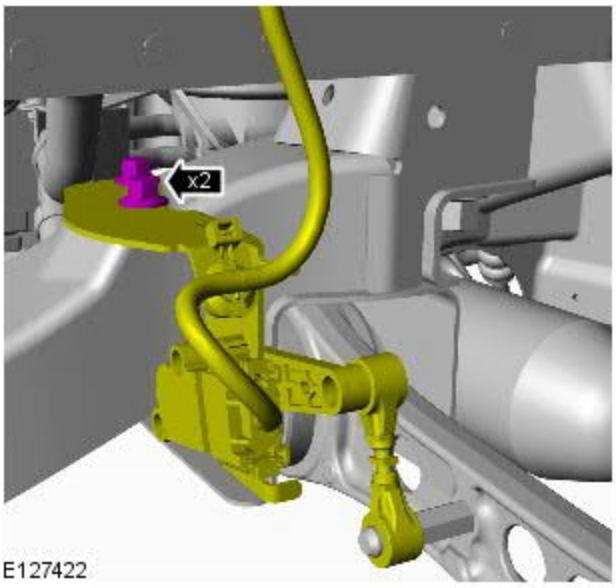


16.



17.

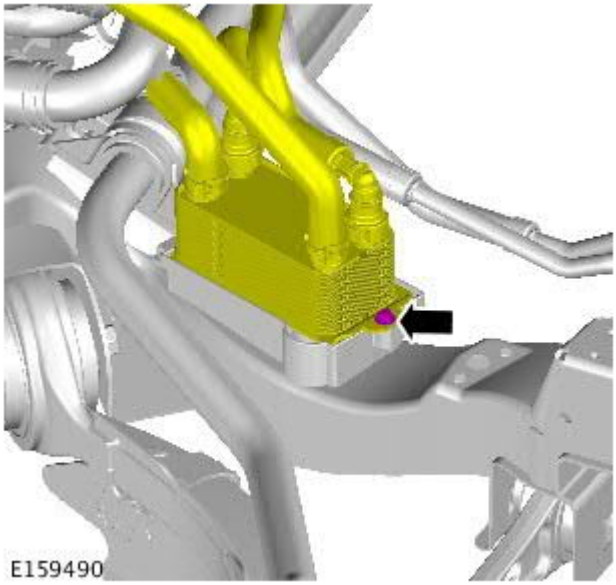




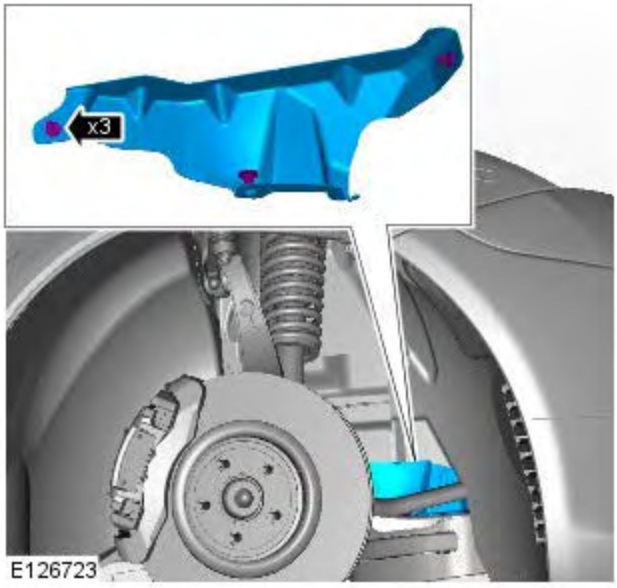
18. NOTE: Repeat the step for the other side.

Torque: 20 Nm

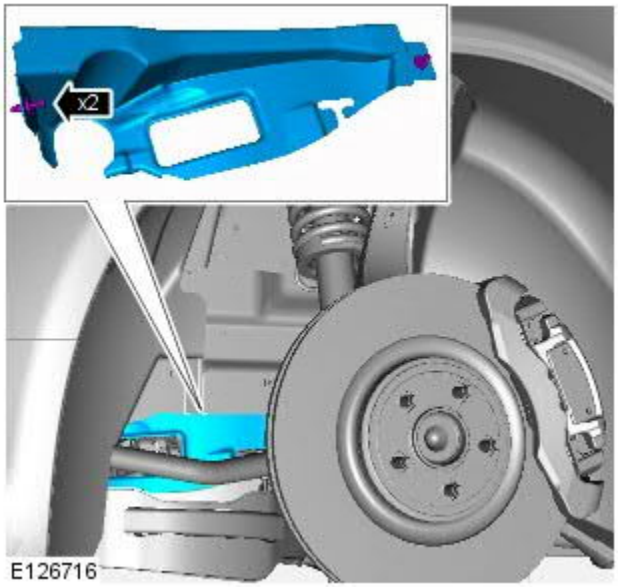
19. *Torque:* 7 Nm



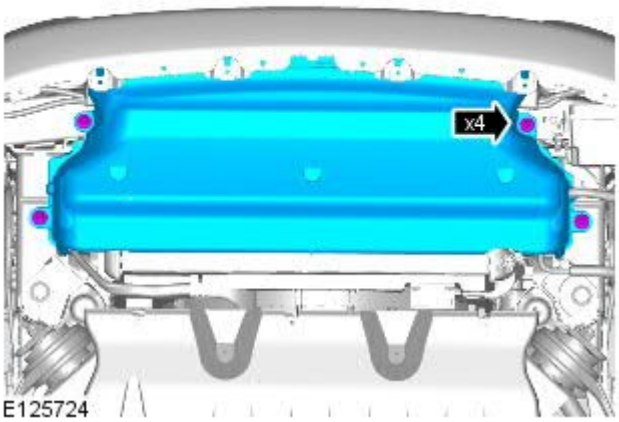
20.



21.

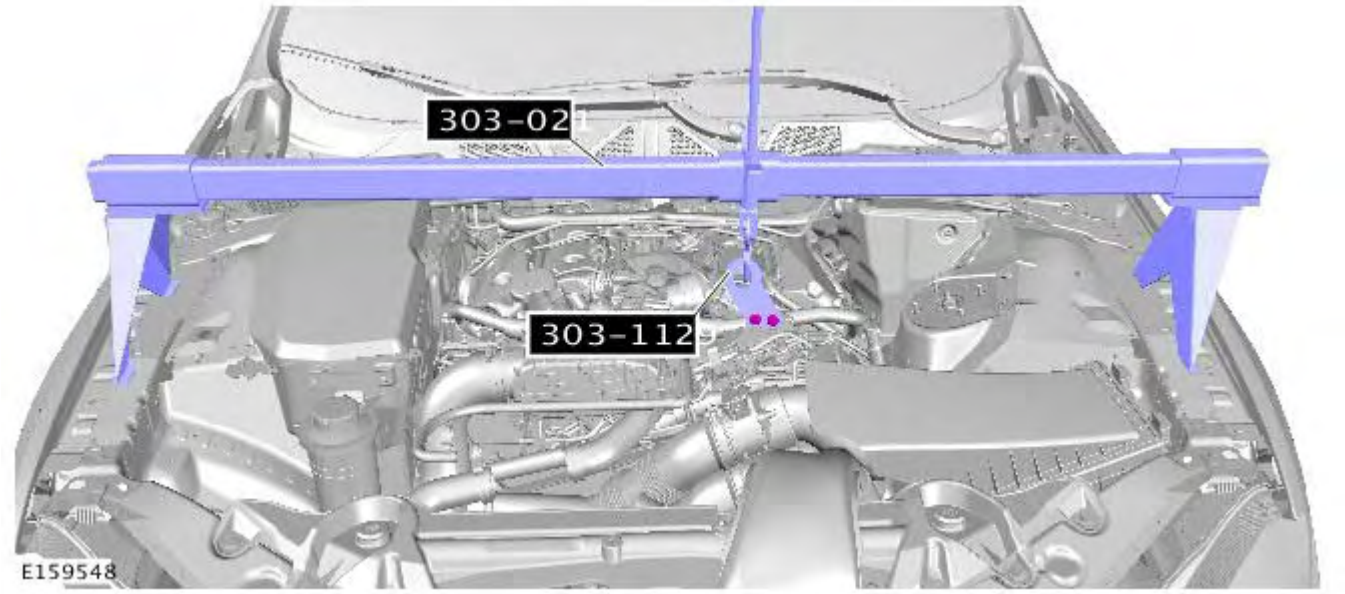


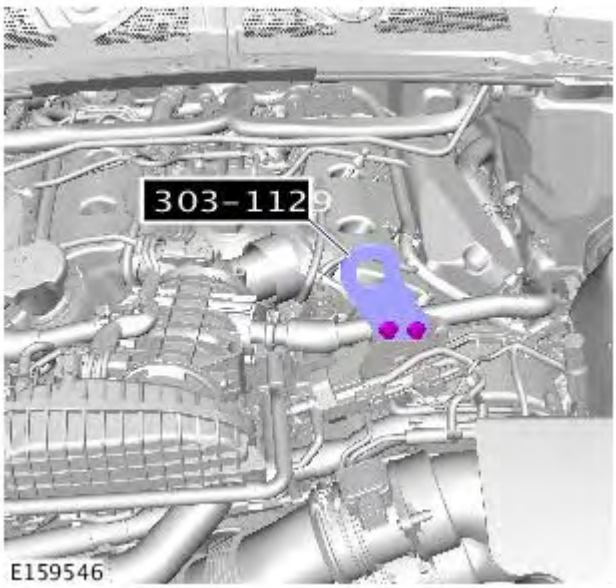
22.



23. CAUTION: Make sure to protect the paintwork.

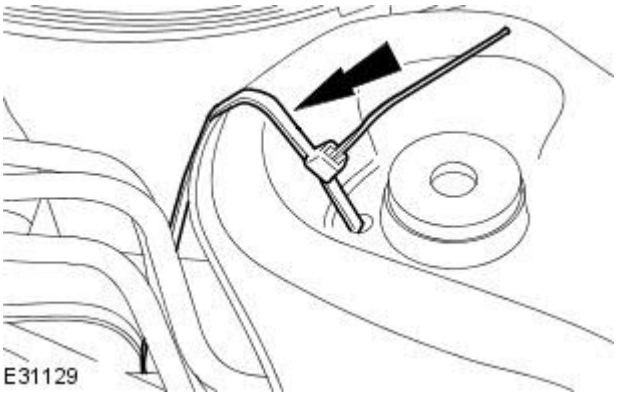
Special Tool(s): 303-021, 303-1129





24.

- *Special Tool(s):* 303-1129



25. Release the radiator assembly.

26. Refer to: Engine Cover - TDV6 3.0L Diesel (501-05 Interior Trim and Ornamentation, Removal and Installation).

27. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

28. Refer to: Radiator Splash Shield (501-02 Front End Body Panels, Removal and Installation).

29. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

30. Refer to: Four-Wheel Alignment (204-00 Suspension System - General Information, General Procedures).

Published: 11-May-2011

Uni-Body, Subframe and Mounting System - Rear Subframe TDV6 3.0L Diesel

Removal and Installation

Removal

CAUTION: The final tightening of the suspension components must be carried out with the vehicle on its wheels.

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

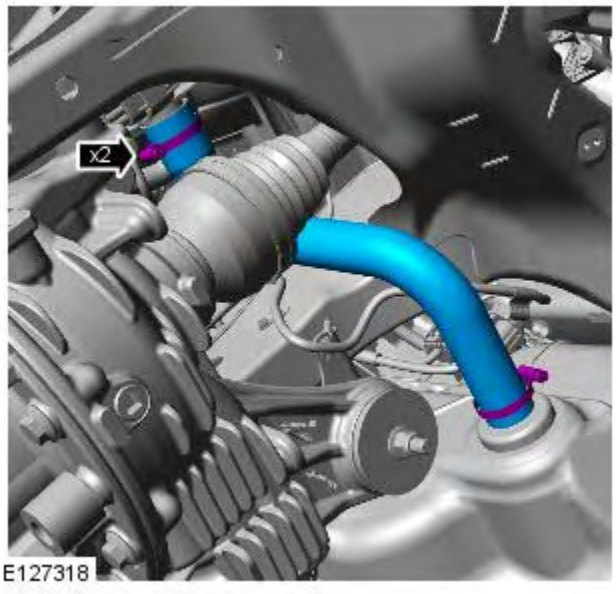
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Remove the rear wheels and tires

   Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

4. Refer to: Fuel Tank Draining - TDV6 3.0L Diesel (310-00 Fuel System - General Information, General Procedures).

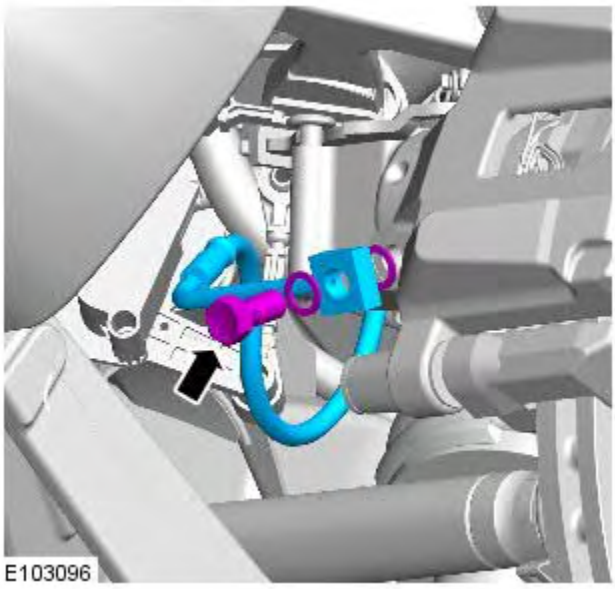


5. CAUTION: Be prepared to collect escaping fluids.

   NOTE: The fuel tank has a non-return valve in the filler stub pipe, only the fuel present in the filler hose will be spilt.

6. Refer to: Driveshaft - TDV6 3.0L Diesel (205-01 Driveshaft, Removal and Installation).

7. Refer to: Parking Brake Cable Tension Release (206-05 Parking Brake and Actuation, General Procedures).



8. CAUTIONS:

   Always plug any open connections to prevent contamination.

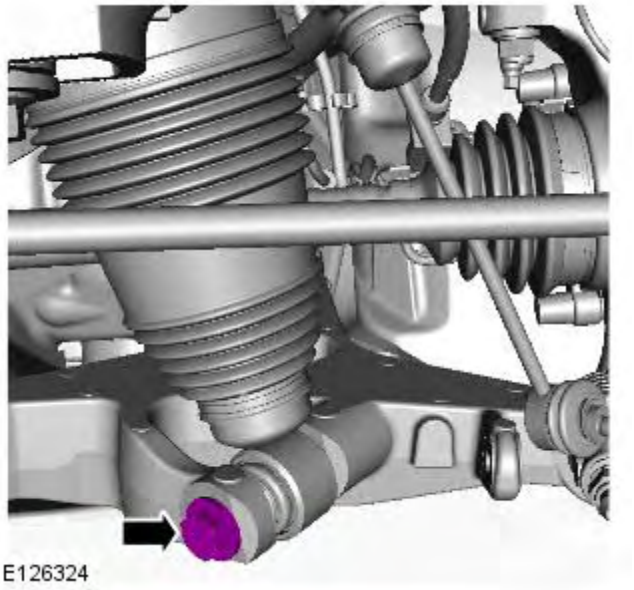
   If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

   NOTES:

   To prevent the loss of brake fluid, using the special tool apply the brake pedal and set to 40mm (1.6 in) below the rest position.

   LH illustration shown, RH is similar.

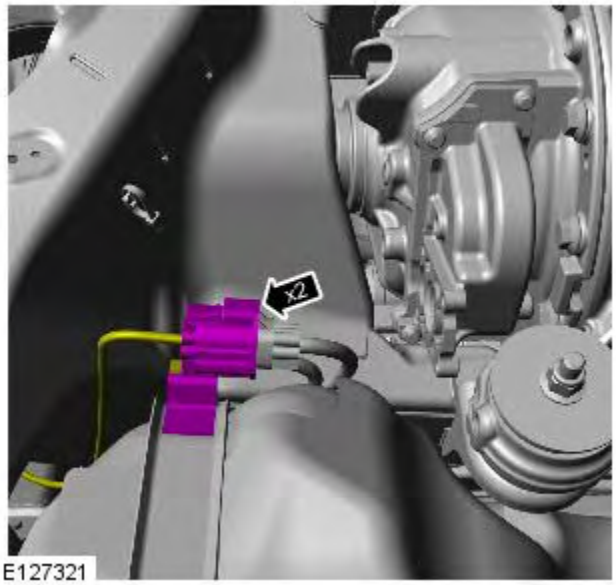
   - *Torque:* 38 Nm
   - Remove and discard the two sealing washers.
   - Repeat the above step for the other side.



9. NOTE: RH illustration shown, LH is similar.

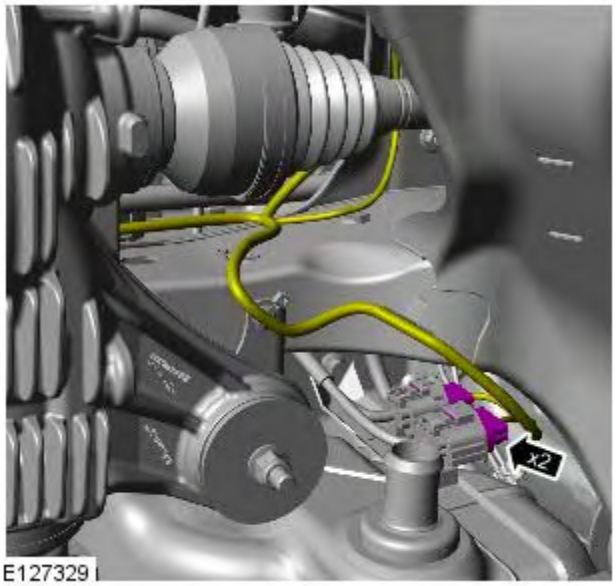
   - *Torque:* 133 Nm
   - Repeat the above step for the other side.

10.

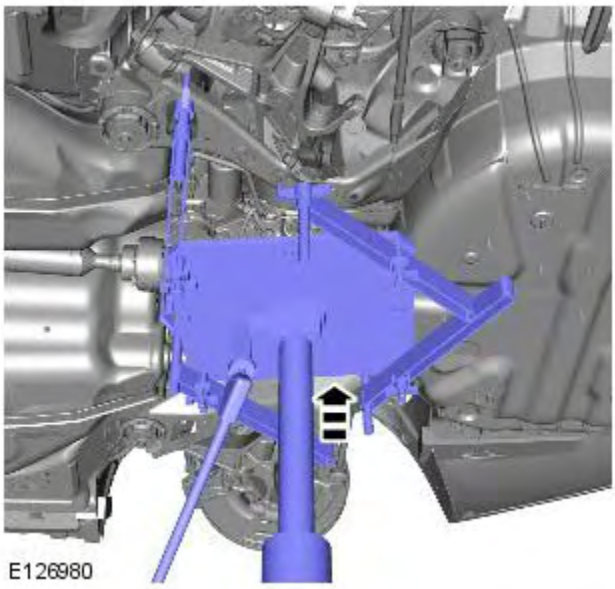


E127321

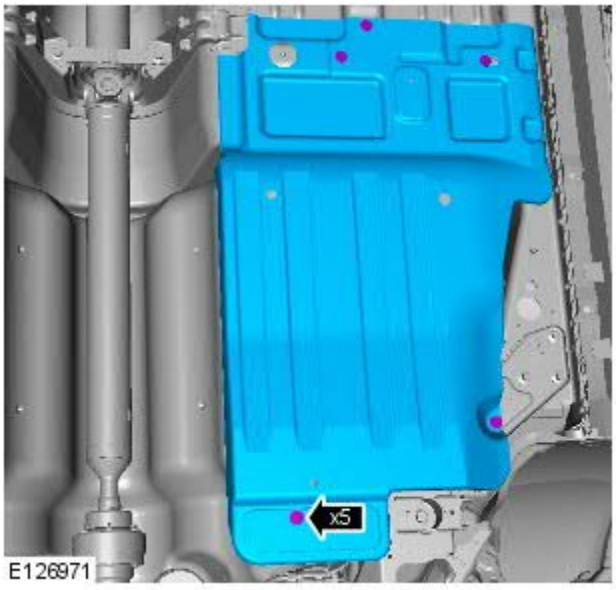
11.



E127329

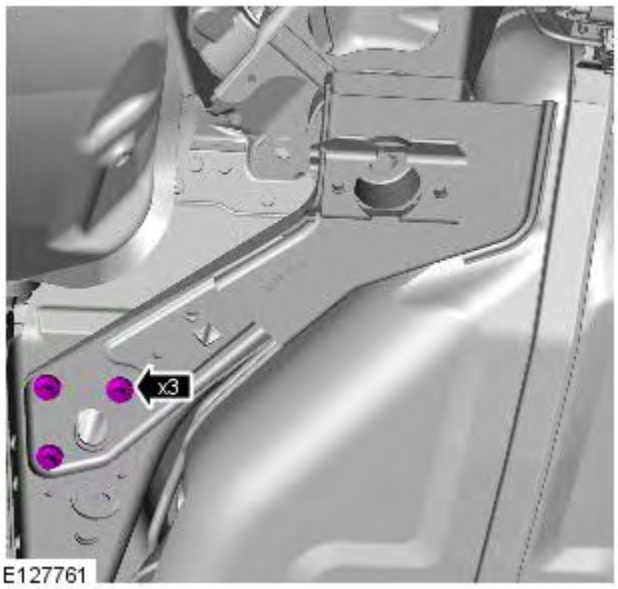


12.



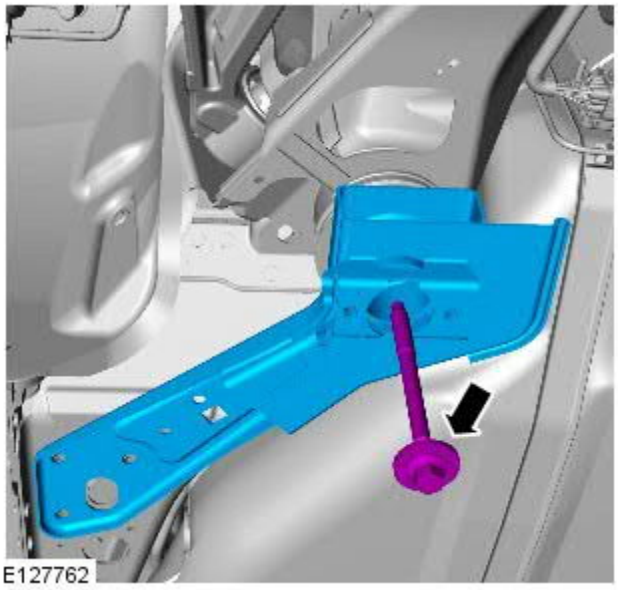
13. CAUTION: LH illustration shown, RH is similar.

- *Torque:* 10 Nm
- Repeat the above step for the other side.



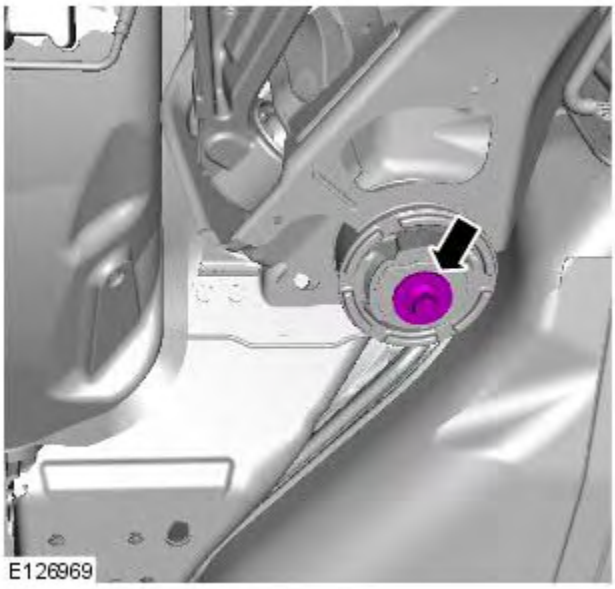
14. CAUTION: LH illustration shown, RH is similar.

- *Torque:* 35 Nm
- Repeat the above step for the other side.



15. CAUTION: LH illustration shown, RH is similar.

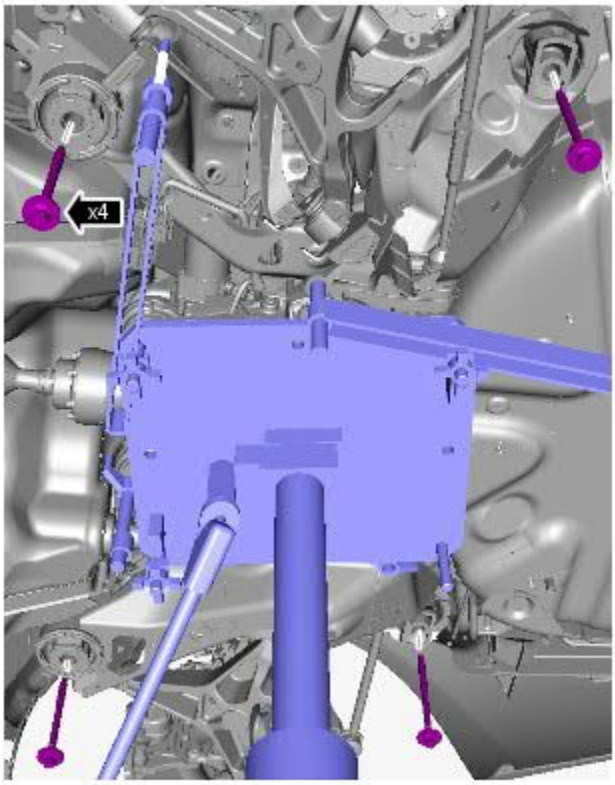
Repeat the above step for the other side.



16. CAUTION: LH illustration shown, RH is similar.

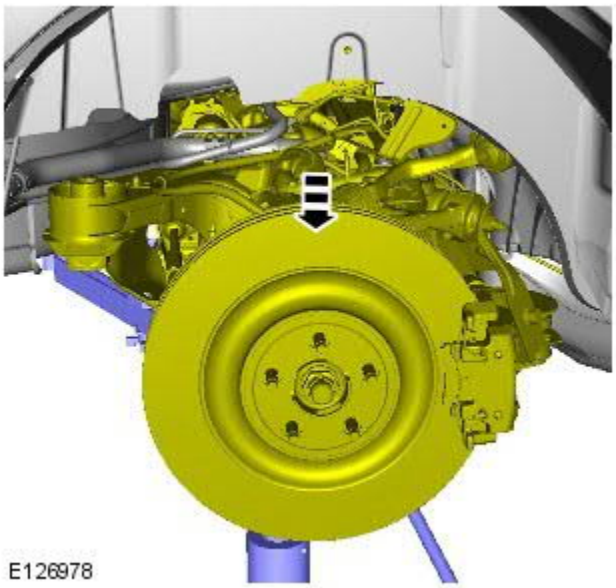
NOTE: Do not tighten at this stage.

Repeat the above step for the other side.



17. CAUTION: Make sure that new subframe bolts are installed.

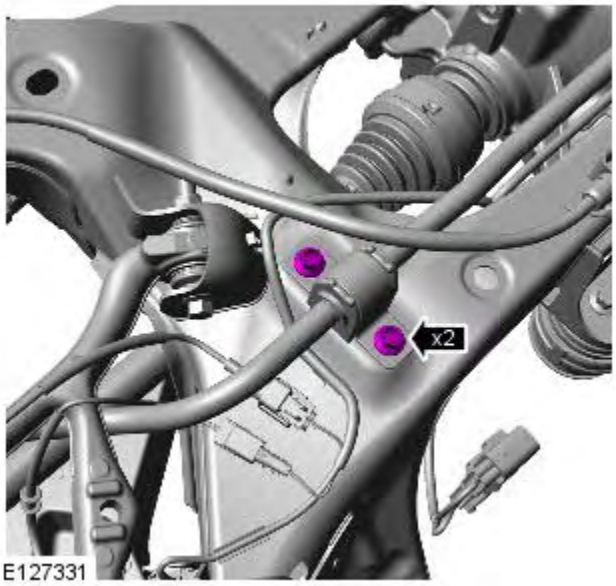
Torque:
Stage 1 60 Nm
Stage 2 240°


E126978

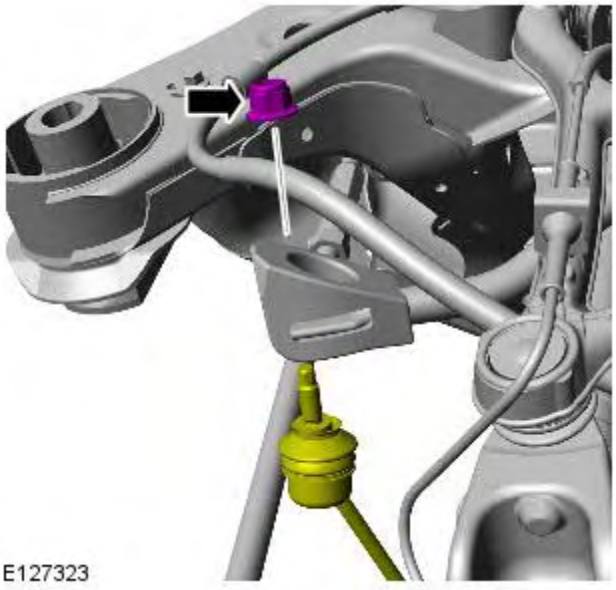
18. CAUTION: Make sure when lowering the rear subframe damage does not occur to the surrounding components. Failure to follow this instruction may result in damage to the vehicle.

E127317

19. NOTE: Do not disassemble further if the component is removed for access only.



20. NOTE: RH illustration shown, LH is similar.
    - *Torque:* 55 Nm
    - Repeat the above step for the other side.

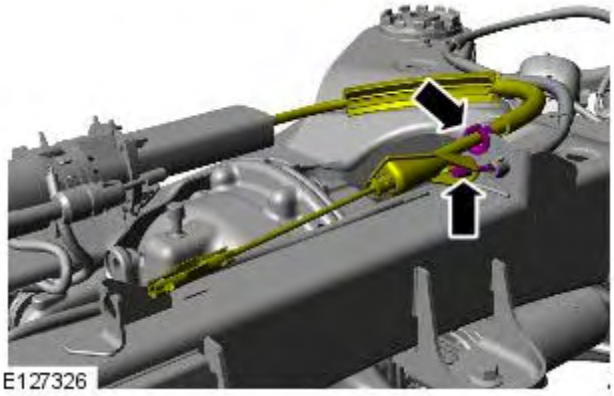


21. NOTE: RH illustration shown, LH is similar.
    - *Torque:* 48 Nm
    - Repeat the above step for the other side.

22.

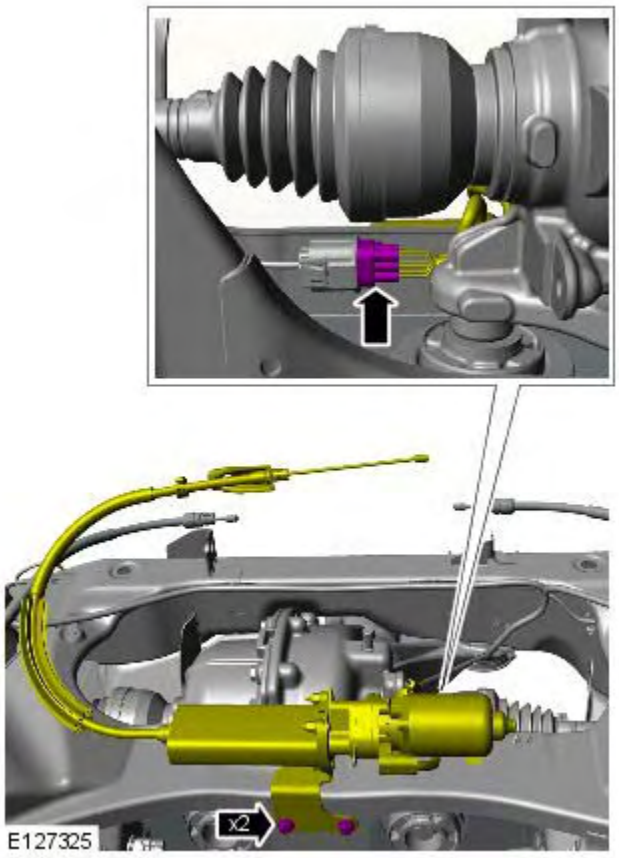
E127330

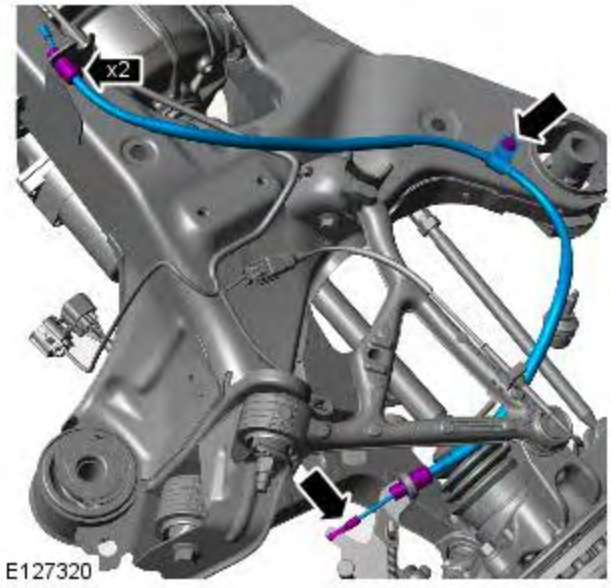
23.



E127326

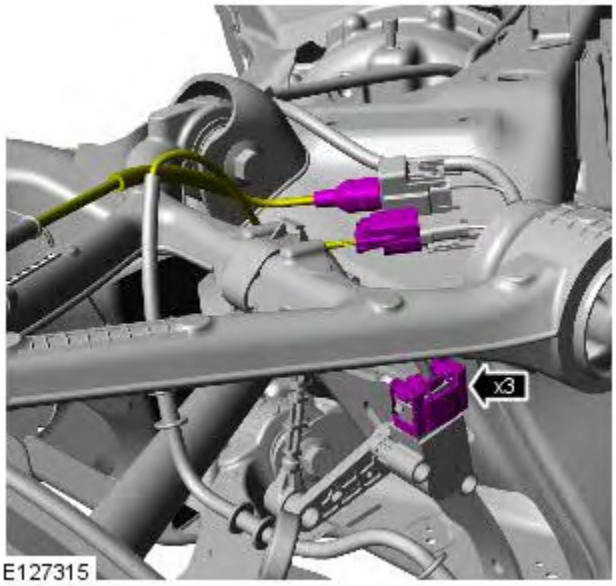
24. *Torque:* 20 Nm





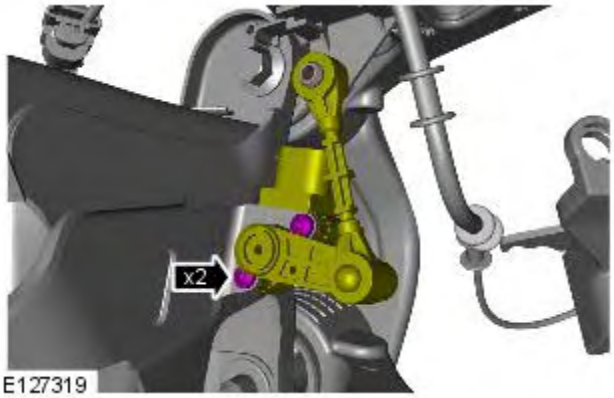
25. NOTE: LH illustration shown, RH is similar.

- *Torque:* 18 Nm
- Repeat the above step for the other side.



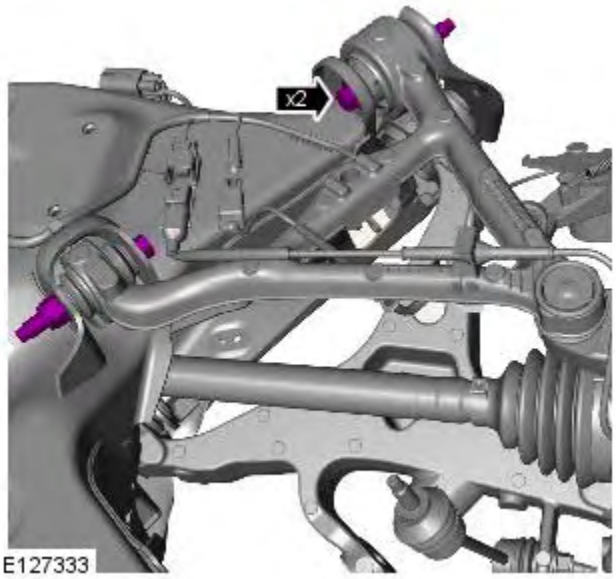
26. NOTE: RH illustration shown, LH is similar.

Repeat the above step for the other side.



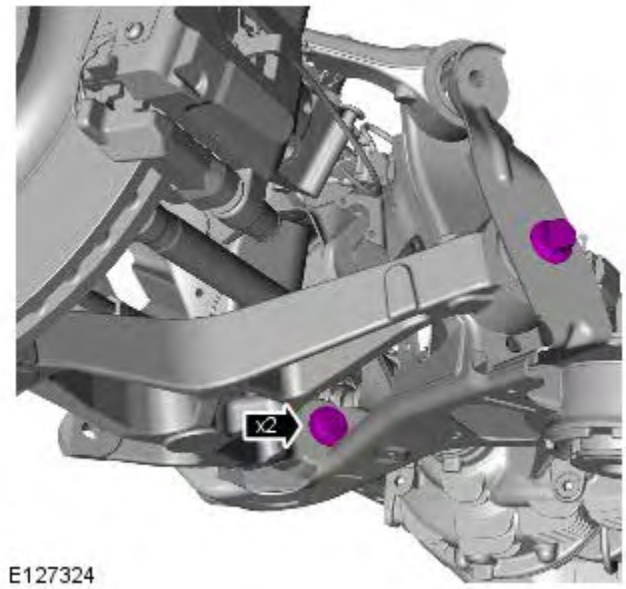
27. NOTE: RH illustration shown, LH is similar.

- *Torque:* 10 Nm
- Repeat the above step for the other side.



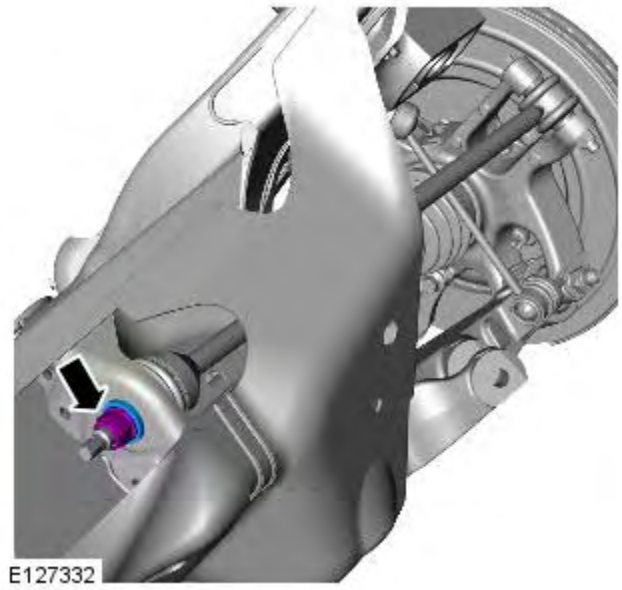
28. NOTE: RH illustration shown, LH is similar.

- *Torque:* 115 Nm
- Repeat the above step for the other side.

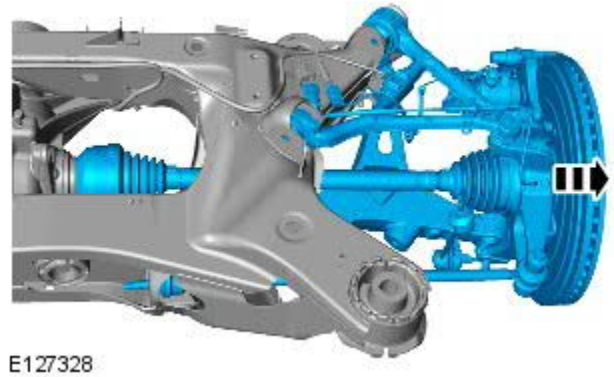


E127324

29. NOTE: RH illustration shown, LH is similar.
    - *Torque:* 192 Nm
    - Repeat the above step for the other side.

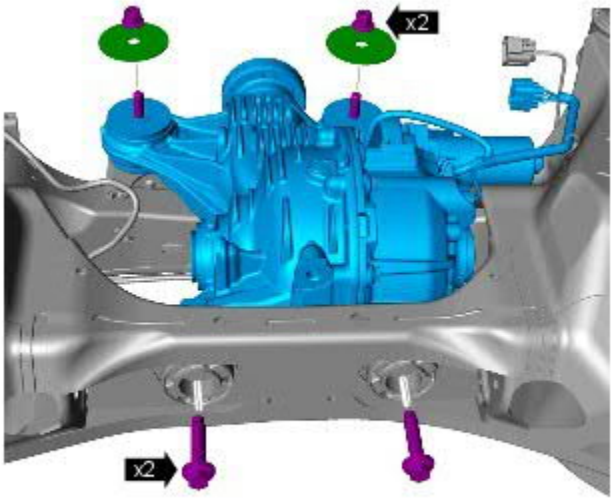

E127332

30. NOTE: RH illustration shown, LH is similar.
    - *Torque:* 90 Nm
    - Repeat the above step for the other side.


E127328

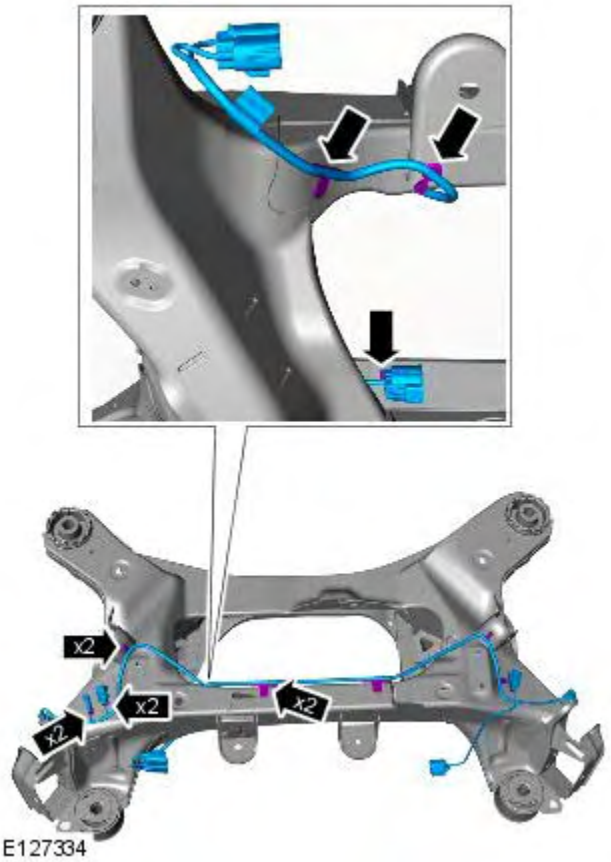
31. NOTE: RH illustration shown, LH is similar.

    Repeat the above step for the other side.



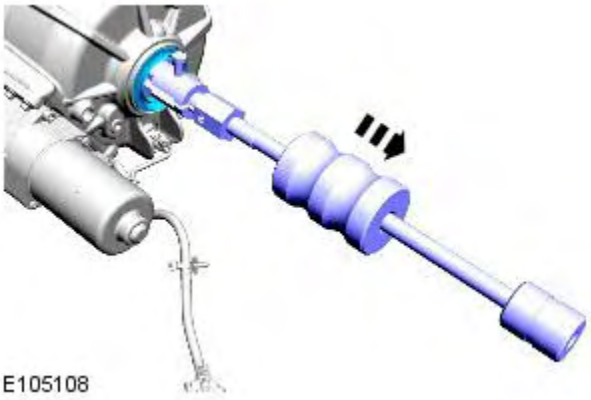
E127316

32. *Torque:*
M14 190 Nm
M12 90 Nm



E127334

33.

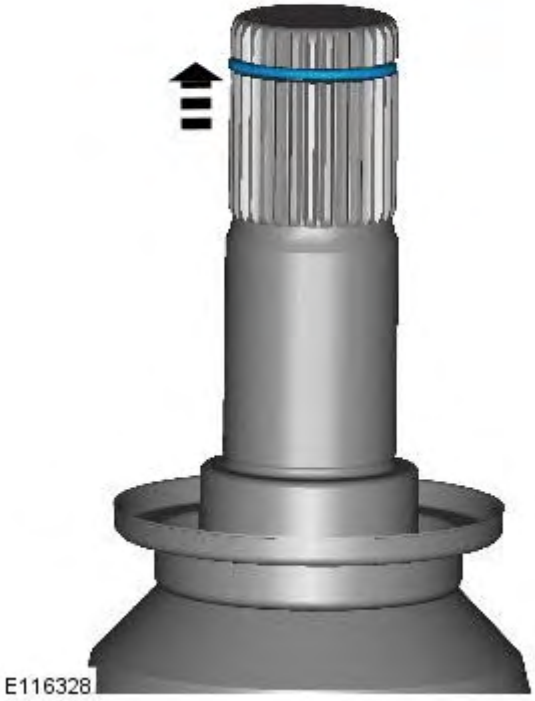


34. NOTE: LH illustration shown, RH is similar.

Repeat the above step for the other side.

35. NOTE: LH illustration shown, RH is similar.

Repeat the above step for the other side.

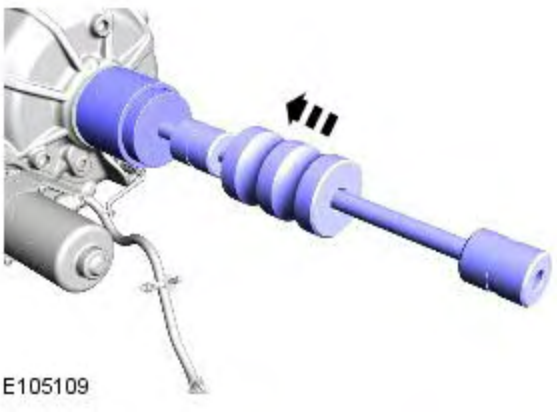


36.

Installation

1.

- Clean the components mating faces.
- Repeat the above step for the other side.

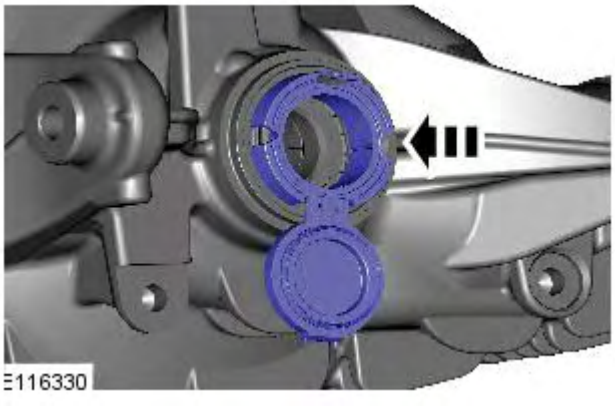


2. NOTE: LH illustration shown, RH is similar.

   Repeat the above step for the other side.

3. NOTE: LH illustration shown, RH is similar.

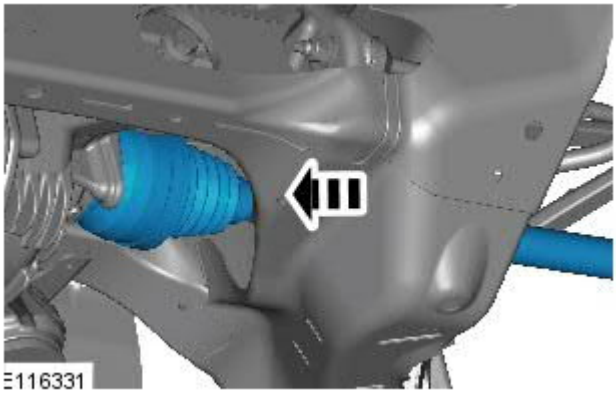
   Repeat the above step for the other side.



4. CAUTION: The halfshaft oil seal protector must be left in place, until the halfshaft is fully installed.

   NOTE: LH illustration shown, RH is similar.

   Repeat the above step for the other side.



5. CAUTIONS:

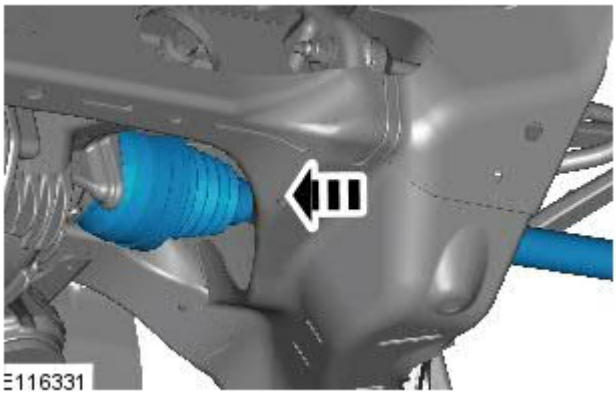
   Do not install the rear halfshaft fully at this stage.

   Only install the rear halfshaft until the halfshaft splines have past the halfshaft oil seal.

   NOTE: LH illustration shown, RH is similar.

   Repeat the above step for the other side.

6. NOTE: LH illustration shown, RH is similar.
   - Remove and discard the halfshaft oil seal plutector.
   - Repeat the above step for the other side.



7. CAUTION: Make sure that the rear halfshaft circlip is installed correctly by pulling the halfshaft gently to make sure it is engaged.

   NOTE: LH illustration shown, RH is similar.

   Repeat the above step for the other side.

8. To install, reverse the removal procedure.

9. Refer to: Brake System Bleeding (206-00 Brake System - General Information, General Procedures).

10. Install the rear wheels and tires

    Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and

Installation).

11. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

12. Refer to: Four-Wheel Alignment (204-00 Suspension System - General Information, General Procedures).

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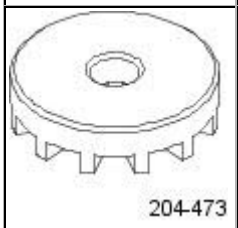
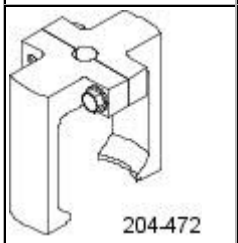
Uni-Body, Subframe and Mounting System - Rear Subframe Rear Bushing TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol

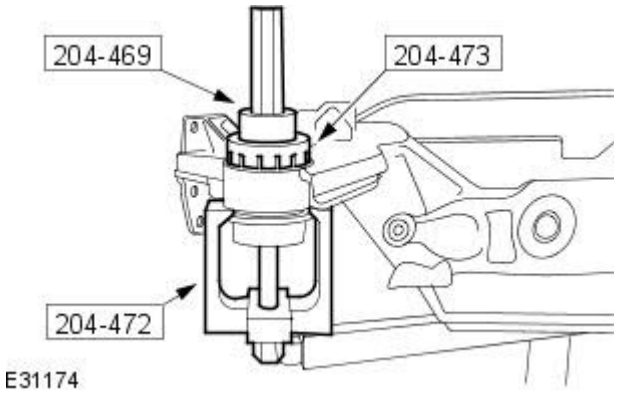
Removal and Installation

Special Tool(s)

	Forcing bolt 204-469
	Reciever-bush 204-475
	Replacer-bush 204-474
	Remover bush 204-473
	Remover support-bush 204-472

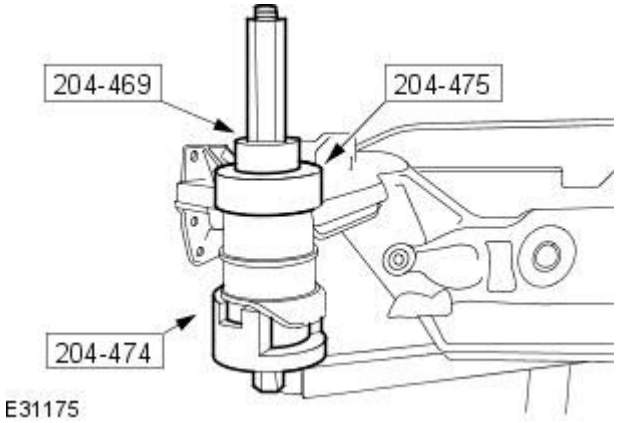
Removal

1. For additional information, refer to: Rear Subframe - TDV6 3.0L Diesel (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation) / Rear Subframe - V8 5.0L Petrol/V8 S/C 5.0L Petrol (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).



2.

Installation



1. NOTE: Make sure the bushing is correctly orientated.

2. For additional information, refer to: Rear Subframe - TDV6 3.0L Diesel (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation) / Rear Subframe - V8 5.0L Petrol/V8 S/C 5.0L Petrol (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).

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