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General Information - About This Manual

Description and Operation

Introduction

This manual has been written in a format that is designed to meet the needs of technicians worldwide. The objective is to use common formats and include similar content in each manual.

This manual provides general descriptions for accomplishing diagnosis and testing, service and repair work with tested and effective techniques. Following them will help to ensure reliability.

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) Removal and Installation Procedures

 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.

Items such as O-ring seals, gaskets, seals, self-locking nuts and bolts are to be discarded and new components installed unless otherwise stated within the procedure. Coated nuts or bolts are to be reused, unless damaged or otherwise stated within the procedure.

B1035-01	Left Rear Seat Heater Element - General electrical failure	 NOTE: This DTC will log with the engine running. When it is repaired, it will self-delete with age, or instantly using the manufacturer approved diagnostic system • Rear left heated seat cushion element circuit open circuit, high resistance • Rear left heated seat backrest element circuit open circuit, high resistance	• Refer to the electrical circuit diagrams and check the rear left heated seat cushion element circuit for open circuit, high resistance • Refer to the electrical circuit diagrams and check the rear left heated seat backrest element circuit for open circuit, high resistance
B1036-01	Right Front Seat Heater Element - General electrical failure	 NOTE: This DTC will log with the engine running. When it is repaired, it will self-delete with age, or instantly using the manufacturer approved diagnostic system • Front right heated seat cushion element circuit open circuit, high resistance • Front right heated seat backrest element circuit open circuit, high resistance	• Refer to the electrical circuit diagrams and check the front right heated seat cushion element circuit for open circuit, high resistance • Refer to the electrical circuit diagrams and check the front right heated seat backrest element circuit for open circuit, high resistance
B1037-01	Right Rear Seat Heater Element - General electrical failure	 NOTE: This DTC will log with the engine running. When it is repaired, it will self-delete with age, or instantly using the manufacturer approved diagnostic system • Rear right heated seat cushion element circuit open circuit, high resistance • Rear right heated seat backrest element circuit open circuit, high resistance	• Refer to the electrical circuit diagrams and check the rear right heated seat cushion element circuit for open circuit, high resistance • Refer to the electrical circuit diagrams and check the rear right heated seat backrest element circuit for open circuit, high resistance
B1038-01	Left Front Seat Heater Sensor - General electrical failure	 NOTE: This DTC will log with the engine running. When it is repaired, it will self-delete with age, or instantly using the manufacturer approved diagnostic system	• Using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new front left heated seat cushion element

P0AFC-49	Hybrid Battery Pack Sensor Module - Internal electronic failure	• Hybrid electric vehicle battery pack failure - Cell supervisor circuit 0 fault	• Using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new hybrid electric vehicle battery pack
P0AFC-71	Hybrid Battery Pack Sensor Module - Actuator stuck	• Hybrid electric vehicle battery pack failure - Cell balancing circuit stuck on or off	• Using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new hybrid electric vehicle battery pack
P0AFC-73	Hybrid Battery Pack Sensor Module - Actuator stuck closed	• Hybrid electric vehicle battery pack failure - Cell balancing deep discharge fault	• Using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new hybrid electric vehicle battery pack
P0AFC-92	Hybrid Battery Pack Sensor Module - Performance or incorrect operation	• Hybrid electric vehicle battery pack failure - Cell supervisor circuit 1 fault	• Using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new hybrid electric vehicle battery pack
P0AFC-93	Hybrid Battery Pack Sensor Module - No operation	• Hybrid electric vehicle battery pack failure - Cell supervisor circuit 2 fault	• Using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new hybrid electric vehicle battery pack
P0AFC-94	Hybrid Battery Pack Sensor Module - Unexpected operation	• Hybrid electric vehicle battery pack failure - Cell supervisor circuit 3 fault	• Using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new hybrid electric vehicle battery pack
P0AFC-96	Hybrid Battery Pack Sensor Module - Component internal failure	• Hybrid electric vehicle battery pack failure - Cell supervisor circuit 4 fault	• Using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new hybrid electric vehicle battery pack
P0AFC-9A	Hybrid Battery Pack Sensor Module - Component or system operating conditions	• Hybrid electric vehicle battery pack failure - Cell supervisor circuit 5 fault	• Using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new hybrid electric vehicle battery pack
P0AFD-9A	Hybrid Battery Pack Temperature Too Low - Component or system operating conditions	• Hybrid electric vehicle battery pack temperature below threshold	• Allow the vehicle to warm. Using the manufacturer approved diagnostic system, clear the DTCs and retest
P0B15-04	Hybrid Battery Pack Voltage Sense B Circuit Range / Performance - System internal failures	• Hybrid electric vehicle battery pack failure - Power supply voltage out of range for voltage sensor	• Using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new hybrid electric vehicle battery pack
P0B15-49	Hybrid Battery Pack Voltage Sense B Circuit Range / Performance - Internal electronic failure	• Hybrid electric vehicle battery pack failure - Hardware device reset or hardware diagnostics not completed for voltage sensor	• Using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new hybrid electric vehicle battery pack
	Hybrid Battery Pack Voltage Sense B Circuit Range /	• Hybrid electric vehicle battery pack failure	

B1166-15	or short to battery - Circuit short to battery or open	• Right side front approach lamp output circuit - Short circuit to power or open circuit, high resistance • Approach lamp - Internal failure	• If fault persists, refer to the electrical circuit diagrams and check the right side front approach lamp output circuit (pin 12) for short circuit to power or open circuit, high resistance. Repair circuit as required. Clear DTC and retest • If fault persists, check and install a new approach lamp as required. Clear DTC and retest
B117C-07	Rear Power Window Up - Mechanical Failures	• Set when window is reversed during window up due to mechanical problems, window channel restriction preventing window closure • Window mechanism fault	• Check for mechanical problems with the window operation. Check door window seals are fully seated in door, window channel seals are correctly fitted and window movement is not obstructed • Manually fully open and close windows 5 times ensuring window is driven fully into fully closed position before the window up switch is released • Clear DTCs and run "Learn Window Close Position" and "Window Test" diagnostic routines using the manufacturer approved diagnostic tool. Clear DTCs and retest • If fault persists, check and install new window seals as required
B117C-72	Rear Power Window Up - Actuator stuck open	NOTE: This DTC is set after 2 successive fault detections • Door module window up/window down motor control circuits - Short circuit to ground, short circuit to power, open circuit, high resistance • Door module - Internal relay sticking open	NOTE: Disconnect the battery prior to performing circuit checks • Refer to the electrical circuit diagrams and check the door module window up/window down motor control circuits (pins 12 & 1) for short circuit to ground, short circuit to power, open circuit, high resistance. Repair circuit as required. Reconnect battery, clear DTCs and fully open and close windows 5 times ensuring window is driven fully into fully closed position before the window up switch is released, then retest. • If fault persists, check and install a new door module as required
B117C-73	Rear Power Window Up - Actuator stuck closed	NOTE: This DTC is set after 2 successive fault detections • Door module window up/window down motor control circuits - Short circuit to ground, short circuit to power, open circuit, high resistance • Door module - Internal relay sticking closed	NOTE: Disconnect the battery prior to performing circuit checks • Refer to the electrical circuit diagrams and check the door module window up/window down motor control circuits (pins 12 & 1) for short circuit to ground, short circuit to power, open circuit, high resistance. Repair circuit as required. Reconnect battery, clear DTCs and fully open and close windows 5 times ensuring window is driven fully into fully closed position before the window up switch is released, then retest • If fault persists, check and install a new door module as required
B117C-92	Rear Power Window Up - Performance or incorrect operation	• Set when auto window up was interrupted (e.g. by pressing local switch)	• Check for mechanical problems with the window operation. Check door window seals are fully seated in door, window channel seals are correctly fitted and window movement is not obstructed • Manually fully open and close windows 5 times ensuring window is driven fully into fully closed position before the window up switch is released • Clear DTCs and run "Learn Window Close Position" and "Window Test" diagnostic routines using the manufacturer approved diagnostic tool. Clear DTCs and retest • If fault persists, check and install new window seals as required
		NOTES:	

	to battery	• Harness failure - Variable geometry turbine vane actuator control circuit short circuit to power	circuit for short circuit to power. Check both circuits for failures. Repair harness as required. Using the manufacturer approved diagnostic system clear all stored DTCs using the 'Diagnosis menu' tab and retest
P004C-77	Turbocharger/Supercharger Boost Control B Circuit Low - Commanded position not reachable	• The engine control module is unable to command a motor, solenoid or relay, to move a piece of equipment to the commanded position either due to a failure in the actuator or its mechanical environment • Harness failure - Variable geometry turbine vane actuator control circuit short circuit to ground, high resistance, open circuit • Harness failure - Variable geometry turbocharger sensor circuit, short circuit to ground, high resistance, open circuit • Mechanical failure on actuator mechanism • Variable geometry turbine vane actuator 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 turbine vane actuator control circuit for short circuit to ground, high resistance, open circuit. Repair harness as required. Using the manufacturer approved diagnostic system clear all stored DTCs using the 'Diagnosis menu' tab 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 • Check for mechanical failure on actuator mechanism • Check and install a new variable geometry turbine vane actuator control unit as required
P004D-00	Turbocharger/Supercharger Boost Control B Circuit High - No sub type information	• Harness failure - Variable geometry turbine vane actuator 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. Check both circuits for failures. Repair harness as required. Using the manufacturer approved diagnostic system clear all stored DTCs using the 'Diagnosis menu' tab and retest
P004D-77	Turbocharger/Supercharger Boost Control B Circuit High - Commanded Position Not Reachable	• The engine control module is unable to command a motor, solenoid or relay, to move a piece of equipment to the commanded position either due to a failure in the actuator or its mechanical environment • Harness failure - Variable geometry turbine vane actuator control circuit short circuit to power • Harness failure - Variable geometry turbocharger sensor circuit, short circuit to power • Mechanical failure on actuator mechanism • Variable geometry turbine vane actuator 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 turbine vane actuator control circuit for short circuit to power. Repair harness as required. Using the manufacturer approved diagnostic system clear all stored DTCs using the 'Diagnosis menu' tab and retest • Refer to the electrical circuit diagrams and check the variable geometry turbocharger sensor circuit for short circuit to power • Check for mechanical failure on actuator mechanism • Check and install a new variable geometry turbine vane actuator control unit as required

		• Engine control module failure	• Refer to the electrical circuit diagrams and check the engine control module ground supply for open circuit. Repair harness as required. Using the manufacturer approved diagnostic system clear all stored DTCs using the 'Diagnosis menu' tab and retest • Check and install a new engine control module as required
P062B-62	Internal Control Module Fuel Injector Control Performance - Signal compare failure	• The engine control module detected failure when comparing two or more input parameters for plausibility • Injector failure(s) • Corrupt engine control module software • Engine control module power supply failure • Engine control module ground supply failure • Engine control module failure	• Check for related injector DTCs and repair these first • Using the manufacturer approved diagnostic system, re-configure the engine control module with the latest level software • Refer to the electrical circuit diagrams and check the engine control module power supply for open circuit. Repair harness as required. Using the manufacturer approved diagnostic system clear all stored DTCs using the 'Diagnosis menu' tab and retest • Refer to the electrical circuit diagrams and check the engine control module ground supply for open circuit. Repair harness as required. Using the manufacturer approved diagnostic system clear all stored DTCs using the 'Diagnosis menu' tab and retest • Check and install a new engine control module as required
P062B-64	Internal Control Module Fuel Injector Control Performance - Signal plausibility failure	• The engine control module detected plausibility failures • Injector failure(s) • Corrupt engine control module software • Engine control module power supply failure • Engine control module ground supply failure • Engine control module failure	• Check for related injector DTCs and repair these first • Using the manufacturer approved diagnostic system, re-configure the engine control module with the latest level software • Refer to the electrical circuit diagrams and check the engine control module power supply for open circuit. Repair harness as required. Using the manufacturer approved diagnostic system clear all stored DTCs using the 'Diagnosis menu' tab and retest • Refer to the electrical circuit diagrams and check the engine control module ground supply for open circuit. Repair harness as required. Using the manufacturer approved diagnostic system clear all stored DTCs using the 'Diagnosis menu' tab and retest • Check and install a new engine control module as required
		• Injector failure(s)	• Check for related injector DTCs and repair these first • Using the manufacturer approved diagnostic system, re-configure the engine control module with the latest level software • Refer to the electrical circuit diagrams and check the engine control module power supply for open circuit. Repair harness as

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 installation.

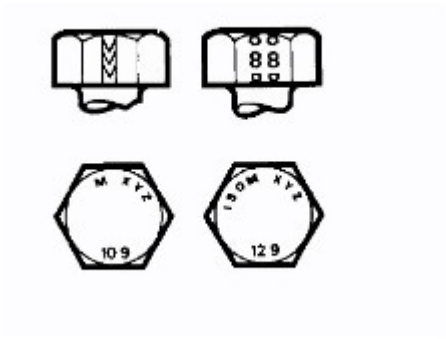
Where it is stated that bolts and screws may be re-used, the following procedures must be carried out:

- 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.

Bolt and Nut Identification



E48627

An ISO metric bolt or screw made of steel and larger than 6 mm in diameter can be identified by either of the symbols ISO M or M embossed or indented on top of the bolt head.

In addition to marks identifying the manufacturer, the top of the bolt head is also marked with symbols indicating the strength grade e.g. 8.8, 10.9, 12.9, 14.9. Alternatively, some bolts and screws have the M and strength grade symbol stamped on the flats of the hexagon.

Encapsulated ('Patched') bolts and screws

E48628

Encapsulated ('patched') bolts and screws have a thread locking agent applied to the threads during manufacture. Most thread locking agents are colored, the band of color extending for 360° around the thread. Some locking agents however, are neutral in color and may not be so easily identified apart from a slightly darker area of thread where the locking agent has been applied. The locking agent is released and activated by the tightening process and is then chemically cured to provide the locking action.

Self-locking bolts and screws

		• Air suspension air supply unit isolation relay stuck open	• Refer to the electrical circuit diagrams and check the integrity of the air suspension air supply unit isolation relay and associated wiring in the rear fuse box. Repair or replace as required, clear DTC and retest
C1A27-14	Compressor Circuit - Circuit short to ground or open	• Integrated suspension control module supply fusible link in battery junction box failed/not installed • Air suspension relay/air suspension air supply unit supply fusible link in battery junction box failed/not installed • Air suspension air supply unit power supply circuit - Short circuit to ground, open circuit, high resistance • Air suspension relay fault • Integrated suspension control module - Internal failure	• Refer to the electrical circuit diagrams and check the integrity of the air suspension relay/air suspension air supply unit supply fusible link and the integrated suspension control module supply fusible link in the battery junction box. Repair or replace as required, clear DTC and retest • If fault persists, refer to the electrical circuit diagrams and check the air suspension air supply unit power supply circuit for short circuit to ground, open circuit, high resistance. Repair circuit as required, clear DTC and retest • If fault persists, check and install a new air suspension relay as required. Clear DTC and retest • If fault persists, check and install a new integrated suspension control module as required. Clear DTC and retest
C1A27-15	Compressor Circuit - Circuit short to battery or open	• Air suspension air supply unit main fuse fault • Air suspension air supply unit main relay circuit - Open circuit, high resistance • Air suspension air supply unit main relay stuck open • Air suspension air supply unit motor supply circuit - Short circuit to ground	• Refer to the electrical circuit diagrams and check the integrity of the air suspension air supply unit main fuse and associated wiring in the rear fuse box. Repair or replace as required, clear DTC and retest • Refer to the electrical circuit diagrams and check the integrity of the air suspension air supply unit main relay and associated wiring in the rear fuse box. Repair or replace as required, clear DTC and retest • Refer to the electrical circuit diagrams and check the air suspension air supply unit motor power supply circuits for short circuit to ground. Repair circuit as required, clear DTC and retest
C1A27-29	Compressor Circuit - Signal invalid	• Air suspension relay control voltage signal invalid • Air suspension air supply unit main relay coil terminals - Short circuit to one another, open circuit, high resistance • Air suspension air supply unit main relay circuits - Short circuit to power, short circuit to ground, open circuit, high resistance	• Refer to the electrical circuit diagrams and check the integrity of the air suspension air supply unit main relay and associated wiring in the rear fuse box. Repair or replace as required, clear DTC and retest

		• Charge air temperature sensor failure	• Using the manufacturer approved diagnostic system clear all stored DTCs using the 'Diagnosis Menu' tab and retest
P007E-1F	Charge Air Cooler Temperature Sensor Circuit Intermittent/Erratic (Bank 1) - Circuit intermittent	• Charge air temperature sensor circuit, short circuit to ground, short circuit to power, open circuit, high resistance • Connector is disconnected, connector pin is backed out, connector pin corrosion • Charge air temperature sensor failure	• Refer to electrical circuit diagrams and check the charge air temperature sensor circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Inspect connectors for signs of water ingress, and pins for damage and/or corrosion • Check and install a new charge air temperature sensor as required • Using the manufacturer approved diagnostic system clear all stored DTCs using the 'Diagnosis Menu' tab and retest
P007E-2F	Charge Air Cooler Temperature Sensor Circuit Intermittent/Erratic (Bank 1) - Signal erratic	• Charge air temperature sensor circuit, short circuit to ground, short circuit to power, open circuit, high resistance • Connector is disconnected, connector pin is backed out, connector pin corrosion • Charge air temperature sensor failure	• Refer to electrical circuit diagrams and check the charge air temperature sensor circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Inspect connectors for signs of water ingress, and pins for damage and/or corrosion • Check and install a new charge air temperature sensor as required • Using the manufacturer approved diagnostic system clear all stored DTCs using the 'Diagnosis Menu' tab and retest
P0087-77	Fuel Rail/System Pressure - Too Low - Commanded position not reachable	NOTE: **Monitor description.** To detect under pressure in the fuel rail. The high pressure fuel pump signal is below a threshold • Fuel leaking outside of the fuel system • Fuel leaking into the low pressure system	• Check for fuel leaks external of the fuel rail • Check high pressure fuel pumps are not leaking from the high pressure system into the low pressure system
P0087-84	Fuel Rail/System Pressure - Too Low - Signal below allowable range	NOTE: **Monitor description.** The fuel rail pressure is below a threshold • Fuel rail pressure sensor circuit short circuit to ground • Fuel rail pressure sensor failure	• Refer to the electrical circuit diagrams and check fuel rail pressure sensor circuit for short circuit to ground • Using the manufacturer approved diagnostic system clear all stored DTCs using the 'Diagnosis Menu' tab and retest • Check and install new fuel rail pressure sensor as required
P0088-77	Fuel Rail/System Pressure - Too High - Commanded position not reachable	NOTE: **Monitor description.** To detect over pressure in the fuel rail. The high pressure fuel pump signal is above a threshold • Fuel leaking outside of the fuel system • Fuel leaking into the low pressure system	• Check for fuel leaks external of the fuel rail • Check high pressure fuel pumps are not leaking from the high pressure system into the low pressure system
			• Check fuel pressure relief valve for correct operation

P0366-00	Camshaft Position Sensor B Circuit Range/Performance (Bank 1) - No sub type information	NOTE: **Monitor description.** Disturbance detected on the camshaft input signal • Loose camshaft position sensor • Camshaft position sensor circuit short circuit to ground, short circuit to power, open circuit, high resistance • Camshaft position sensor reluctor ring air gap excessive	• Check camshaft position sensor is installed correctly • Refer to the electrical circuit diagrams and check camshaft position sensor circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Inspect connectors for signs of water ingress, and pins for damage and/or corrosion • Check reluctor ring to sensor run-out and air gap are within specification
P0367-00	Camshaft Position Sensor B Circuit Low (Bank 1) - No sub type information	NOTE: **Monitor description.** Missing input signal detected from the camshaft position sensor. No rise or falling edge detected from the camshaft position sensor. Input signal from the camshaft position sensor is low • Loose camshaft position sensor • Camshaft position sensor circuit short circuit to ground, short circuit to power, open circuit, high resistance • Camshaft position sensor reluctor ring air gap excessive	• Check camshaft position sensor is installed correctly • Refer to the electrical circuit diagrams and check camshaft position sensor circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Inspect connectors for signs of water ingress, and pins for damage and/or corrosion • Check reluctor ring to sensor run-out and air gap are within specification
P0368-00	Camshaft Position Sensor B Circuit High (Bank 1) - No sub type information	NOTE: **Monitor description.** Missing input signal detected from the camshaft position sensor. No rise or falling edge detected from the camshaft position sensor. Input signal from the camshaft position sensor is high • Loose camshaft position sensor • Camshaft position sensor circuit short circuit to ground, short circuit to power, open circuit, high resistance • Camshaft position sensor reluctor ring air gap excessive	• Check camshaft position sensor is installed correctly • Refer to the electrical circuit diagrams and check camshaft position sensor circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Inspect connectors for signs of water ingress, and pins for damage and/or corrosion • Check reluctor ring to sensor run-out and air gap are within specification
P0391-00	Camshaft Position Sensor B Circuit Range/Performance (Bank 2) - No sub type information	NOTE: **Monitor description.** Disturbance detected on the camshaft input signal • Loose camshaft position sensor • Camshaft position sensor circuit short circuit to ground, short circuit to power, open circuit, high resistance • Camshaft position sensor reluctor ring air gap excessive	• Check camshaft position sensor is installed correctly • Refer to the electrical circuit diagrams and check camshaft position sensor circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Inspect connectors for signs of water ingress, and pins for damage and/or corrosion • Check reluctor ring to sensor run-out and air gap are within specification
P0392-00	Camshaft Position Sensor B Circuit Low (Bank 2) - No sub type information	NOTE: **Monitor description.** Missing input signal detected from the camshaft position sensor. No rise or falling edge detected from the camshaft position sensor. Input signal from the camshaft position sensor is low • Loose camshaft position sensor • Camshaft position sensor circuit short circuit to ground, short circuit to power, open circuit, high resistance • Camshaft position sensor reluctor ring air gap excessive	• Check camshaft position sensor is installed correctly • Refer to the electrical circuit diagrams and check camshaft position sensor circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Inspect connectors for signs of water ingress, and pins for damage and/or corrosion • Check reluctor ring to sensor run-out and air gap are within specification

P2629-00	O2 Sensor Positive Current Trim Circuit / Open Bank 2 Sensor 1 - No sub type information	• Heated oxygen sensor circuit short circuit to ground, short circuit to power, open circuit, high resistance • Connector is disconnected, connector pin is backed out, connector pin corrosion • Heated oxygen sensor failure	sensor circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Inspect connectors for signs of water ingress, and pins for damage and/or corrosion • Using the manufacturer approved diagnostic system clear all stored DTCs using the 'Diagnosis Menu' tab and retest • Check and install new heated oxygen sensor as required
P2635-7B	Fuel Pump A Low Flow / Performance - Low fluid level	• Fuel level too low • Fuel low pressure sensor circuit, short circuit to ground, short circuit to power, open circuit, high resistance • Fuel pick up pipe is disconnected from the low pressure fuel pump within the fuel tank • Fuel pump driver module failure	• Check sufficient fuel is available • Refer to electrical circuit diagrams and check the fuel low pressure sensor circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Refer to the relevant sections of the workshop manual and check the fuel system pipework is correctly installed • Check and install a new fuel pump driver module as required
P2635-92	Fuel Pump A Low Flow / Performance - Performance or incorrect operation	• The powertrain control module has detected that the component performance is outside its expected range or operating in an incorrect way • Fuel level too low • Fuel low pressure sensor circuit, short circuit to ground, short circuit to power, open circuit, high resistance • Fuel pick up pipe is disconnected from the low pressure fuel pump within the fuel tank • Fuel pump driver module failure	• Check sufficient fuel is available • Refer to electrical circuit diagrams and check the fuel low pressure sensor circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Refer to the relevant sections of the workshop manual and check the fuel system pipework is correctly installed • Check and install a new fuel pump driver module as required
P2635-97	Fuel Pump A Low Flow / Performance - Component or system operation obstructed or blocked	• The powertrain control module has detected that the operation of a component is prevented by an obstruction • Fuel level too low • Fuel low pressure sensor circuit, short circuit to ground, short circuit to power, open circuit, high resistance • Fuel pick up pipe is disconnected from the low pressure fuel pump within the fuel tank • Fuel pump driver module failure	• Check sufficient fuel is available • Refer to electrical circuit diagrams and check the fuel low pressure sensor circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Refer to the relevant sections of the workshop manual and check the fuel system pipework is correctly installed • Check and install a new fuel pump driver module as required
U0001-87	High Speed CAN Communication Bus - Missing message	• High speed CAN bus failure • High speed CAN bus circuit, short circuit to ground, short circuit to power, open circuit • The powertrain control module has not received the expected CAN signal from the front audio control panel, button module within the specified time interval • CAN harness link between powertrain control module and front audio control panel, button module network malfunction	• Using the manufacturer approved diagnostic system complete a CAN network integrity test • Refer to the electrical circuit diagrams and check high speed CAN network for short circuit to ground, short circuit to power, open circuit • Using the manufacturer approved diagnostic system, check front audio control panel, button module for DTCs and refer to the relevant DTC index • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check front audio control panel, button module power and ground circuits for open circuit. Check CAN harness

CAUTION: Brake testing which includes heavy brake applications should not be carried out with new brake pads/discs until the components have bedded-in. New brake friction components will not reach full efficiency until the bedding-in process is complete. Note that when new parking brake shoes or rear brake discs have been installed, it is essential that the 'bedding-in' procedure given in Section 206-05 - Parking Brake Removal and Installation is carried out.

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 appreciably hotter than the others, could indicate that the pads on that disc are 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 etc., which might indicate over tightness or lack of lubrication.

Rolling Road Testing

Four-Wheel Rolling Road

CAUTION: When utilising a four-wheel rolling road for testing, ensure all relevant health and safety requirements are adhered to.

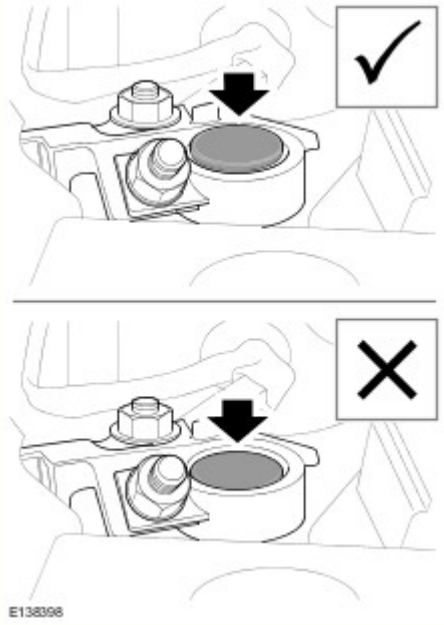
Provided that front and rear rollers are rotating at identical speeds and that normal workshop safety standards are applied, there is no speed restriction during testing except any that may apply to the tires.

Ensure that the parking brake is released prior to engaging roller driving mechanism.

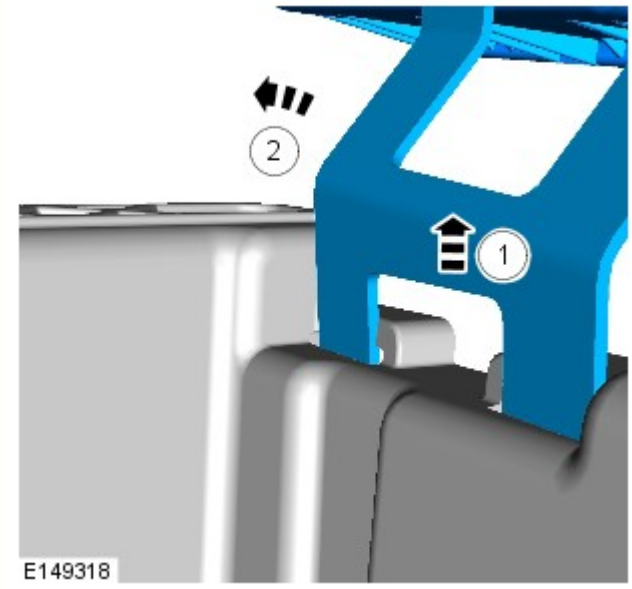
Two-Wheel Rolling Road

CAUTION: On no account should an attempt be made to carry out any form of testing on a two-wheel rolling road.

U0401-83	from ECM/PCM A - Value of signal protection calculation incorrect	engine control module	• Using the manufacturer approved diagnostic system, check the engine control module for related DTCs and refer to the relevant DTC index
U0401-87	Invalid Data Received from ECM/PCM A - Missing message	• Missing message from the powertrain control module	 NOTE: This DTC applies only to hybrid electric vehicles • Using the manufacturer approved diagnostic system, check the powertrain control module for related DTCs and refer to the relevant DTC index
U0403-81	Invalid Data Received From Transfer Case Control Module - Invalid serial data received	• Invalid data received from transfer case control module	 NOTE: This DTC applies only to hybrid electric vehicles • Using the manufacturer approved diagnostic system, check the transfer case control module for related DTCs and refer to the relevant DTC index
U0403-86	Invalid Data Received From Transfer Case Control Module - Signal invalid	• Invalid data received from transfer case control module	 NOTE: This DTC applies only to hybrid electric vehicles • Using the manufacturer approved diagnostic system, check the transfer case control module for related DTCs and refer to the relevant DTC index
U0415-82	Invalid Data Received From Anti-Lock Brake System (ABS) Control Module - Alive/sequence counter incorrect / not updated	• Missing/invalid data from the anti-lock brake system control module	• Using the manufacturer approved diagnostic system, check the anti-lock brake system control module for related DTCs and refer to the relevant DTC index
U0415-83	Invalid Data Received From Anti-Lock Brake System (ABS) Control Module - General checksum failure	• Missing/invalid data from the anti-lock brake system control module	• Using the manufacturer approved diagnostic system, check the anti-lock brake system control module for related DTCs and refer to the relevant DTC index
U0422-82	Invalid Data Received From Body Control Module - Alive/sequence counter incorrect/not updated	• Missing/invalid data from the central junction box	 NOTE: This DTC applies only to hybrid electric vehicles • Using the manufacturer approved diagnostic system, check the central junction box for related DTCs and refer to the relevant DTC index
U0422-83	Invalid Data Received From Body Control Module - Value of signal protection calculation incorrect	• Missing/invalid data from the central junction box	 NOTE: This DTC applies only to hybrid electric vehicles • Using the manufacturer approved diagnostic system, check the central junction box for related DTCs and refer to the relevant DTC index
U0447-82	Vehicle issue; check GWM - Alive/sequence counter incorrect/not updated	• Missing/invalid data from the gateway module	 NOTE: This DTC applies only to hybrid electric vehicles • Using the manufacturer approved diagnostic system, check the vehicle supervisory controller/electric power inverter for related DTCs and refer to the relevant DTC index
U0447-83	Invalid Data Received From Gateway "A" - Value of signal protection calculation incorrect	• Missing/invalid data from the gateway module	 NOTE: This DTC applies only to hybrid electric vehicles • Using the manufacturer approved diagnostic system, check the vehicle supervisory controller/electric power inverter for related DTCs and refer to the relevant DTC index
U0447-87	Invalid Data Received From Gateway "A" - Missing message	• Missing/invalid data from the gateway module	 NOTE: This DTC applies only to hybrid electric vehicles • Using the manufacturer approved diagnostic system, check the gateway module for related DTCs and refer to the relevant DTC index



Make sure that both the positive and negative battery terminals are correctly located when replaced after the transit relay has been removed as shown in the image above.



CAUTION: Make sure the component is correctly located on its mounting bracket. Lift the component by 10 mm before lowering into position.

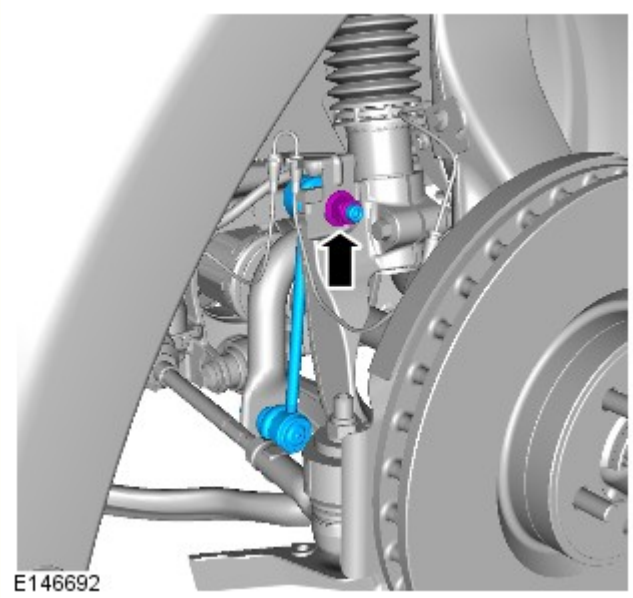
5.4. Refit the air compressor, spare wheel and loadspace floor panel. To refit the air compressor, first lift the compressor and return it to its correct position. Place the spare wheel lift assist tool in the spare wheel well.

5.5. The tailgate must be fully closed manually to calibrate each time the battery is disconnected. Test the tailgate operation after calibration.

6. Reconnect the approved Land Rover battery conditioner to the vehicle using the charging points under the bonnet.

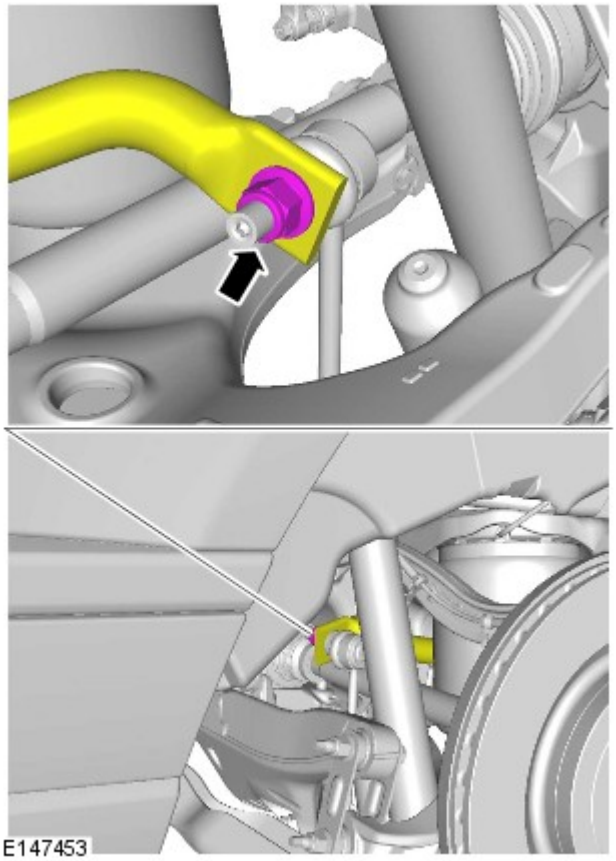
7. Connect SDD and run the SDD, PDI application:

- Make sure that both Smart Keys supplied with the vehicle are positioned on the centre console.
- Select the **'Recommendations'** tab.
- From the menu, select **'Pre-Delivery Inspection'** and click **'RUN'** .
- Follow the on-screen instructions. This will take the vehicle out of transit mode, disable the factory speed limiter and perform a full DTC clear.
- If the vehicle is equipped with telematics, confirm the market of the vehicle when prompted.
  - The system will now search for signal coverage.
  - If it detects a good signal coverage, confirm to activate the telematics module.
  - A message will state if activation was successful, a red light will illuminate the SOS call button.
  - If unsuccessful or SDD states a poor signal coverage, the vehicle must be moved to a area of good signal coverage.



Installation

1. To install, reverse the removal procedure.



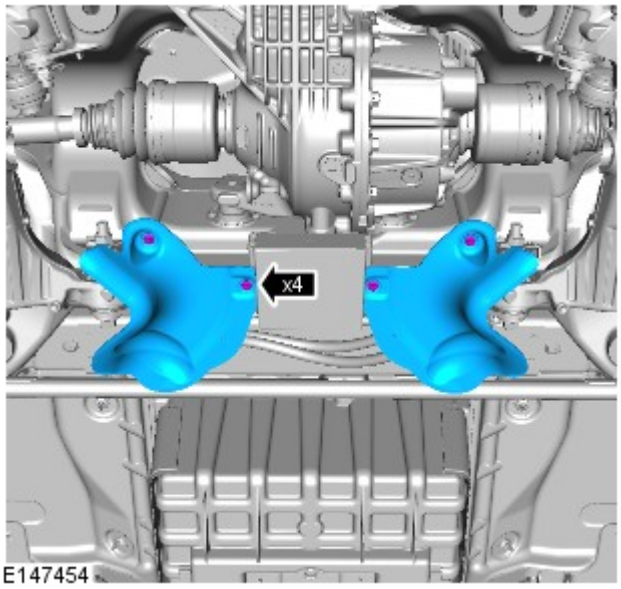
CAUTION: Use a wrench on the hexagon provided to prevent the ball joint rotating.

NOTES:

LH illustration shown, RH is similar.

The step must be carried out on both sides.

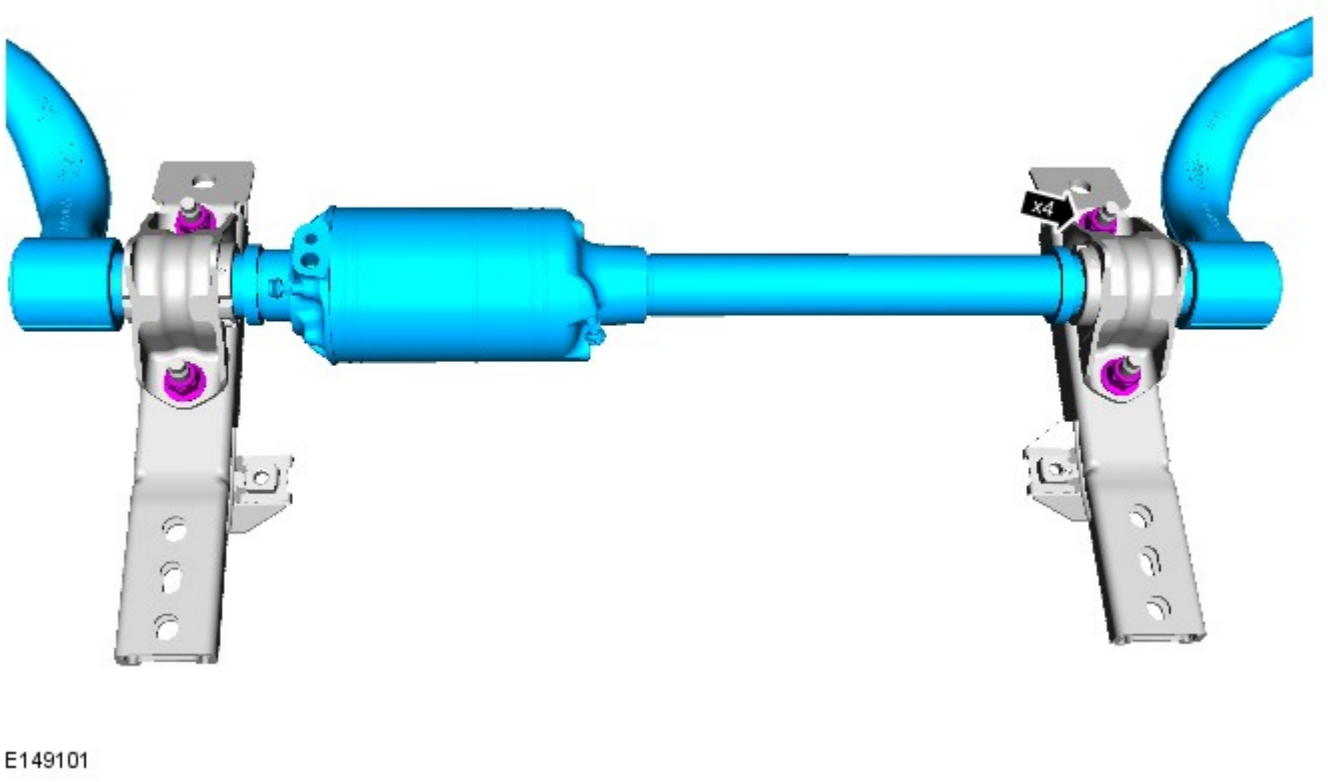
TORQUE: 185 Nm



9. TORQUE: 10 Nm

1. To install, reverse the removal procedure.

2. Refer to: Air Line Connector (204-05 Vehicle Dynamic Suspension, General Procedures).
Torque:
6 mm airline 3.5 Nm
8 mm airline 4.5 Nm



Installation

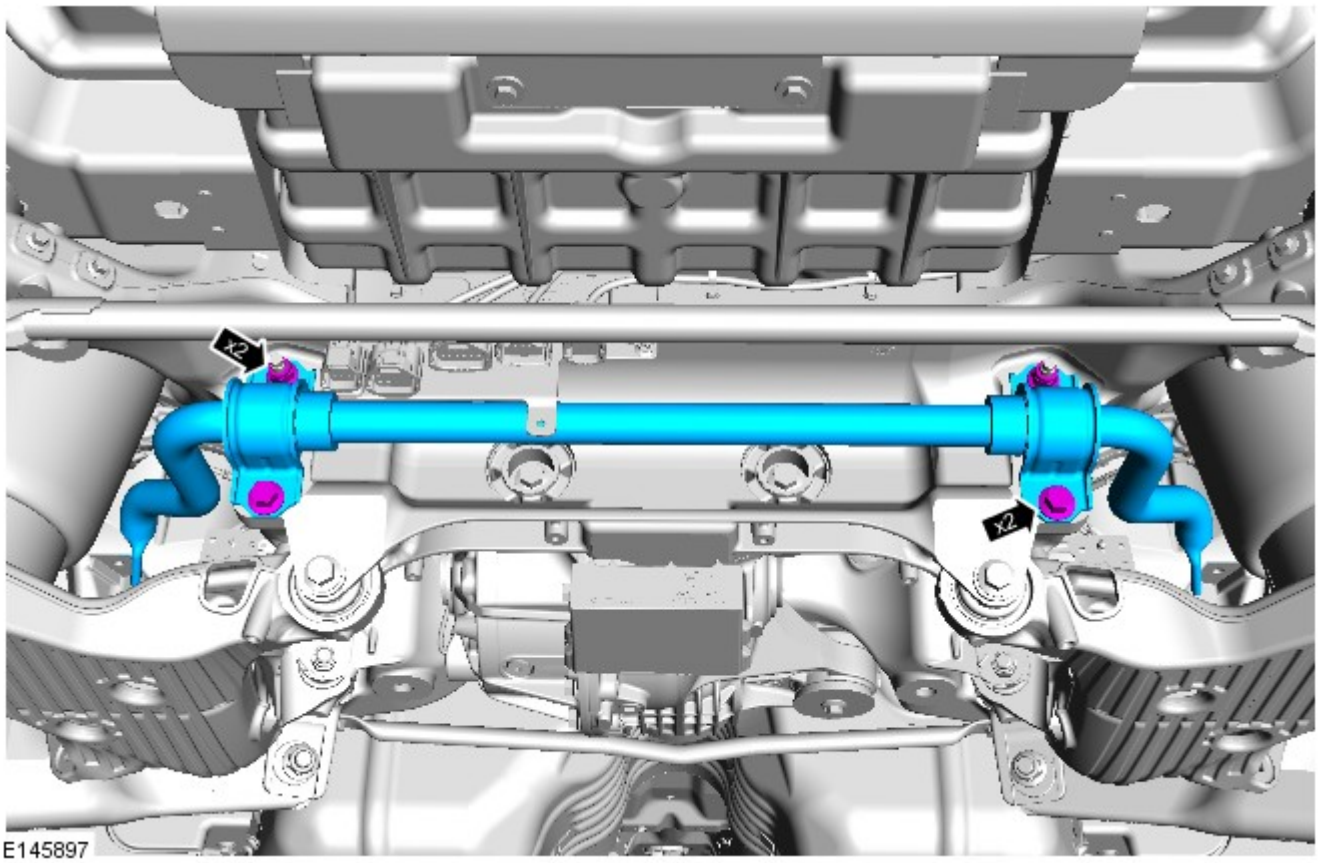
CAUTION: The bush must be installed without any additional lubricant. Failure to follow this instruction may cause damage to the component.

1. To install, reverse the removal procedure.

2. Refer to: Active Stabilization System Bleeding (204-06 Ride and Handling Optimization, General Procedures).

10. NOTE: If equipped.

Torque: 110 Nm



11. NOTE: If equipped.

Torque: 110 Nm

	TDV6 3.0L Diesel HEV	3.21	Rear - Electronic	EPLA 4A213FB
	TDV8 4.4L Diesel	2.73	Front	CPLA 3017 AF
			Rear - Electronic	DPLA 4A213 EC

Vehicle	Engine	Ratio	Part Description	Land Rover Part Number
L405	V6 S/C 3.0L Petrol	3.73	Front	DPLA 3017 EE
			Rear - Open	DPLA 4A213JB
	V8 5.0L Petrol	3.55	Front	CPLA 3017 DF
			Rear - Open	CPLA 4A213DB
	V8 5.0L S/C Petrol	3.31	Front	CPLA 3017 CF
			Rear - Open	CPLA 4A213CB
			Rear - Electronic (optional)	DPLA 4A213GB

Vehicle	Engine	Ratio	Part Description	Land Rover Part Number
L405	TDV6 3.0L Diesel HEV	3.21	Front	EPLA 3017 AD
			Rear - Open	EPLA 4A213BB
			Rear - Electronic (optional)	EPLA 4A213FB
	TDV8 4.4L Diesel	2.73	Front	CPLA 3017 AF
			Rear - Open	CPLA 4A213AC
			Rear - Electronic (optional)	DPLA 4A213 EC

If the part numbers of the front and/or rear differential units match those in the tables above, then follow the diagnostic steps outlined in the relevant DTC Index and elsewhere in TOPIx (if further technical support/advice is required, an additional TA should be raised)

If the part numbers of the front and/or rear differential units do not match those in the tables above, follow the steps outlined below:

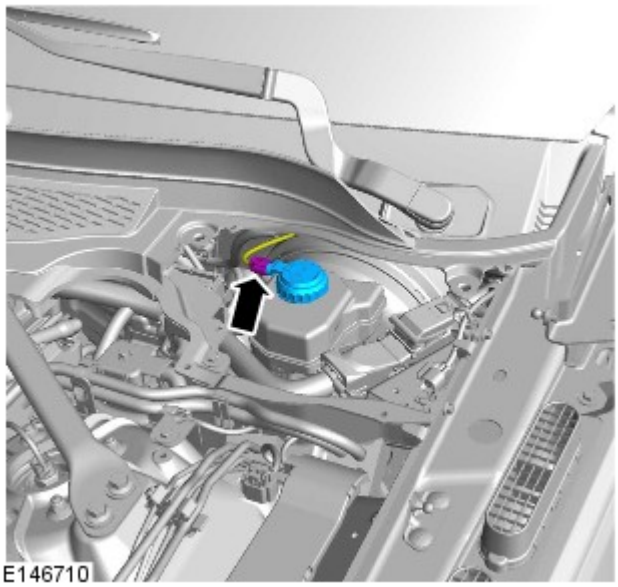
NOTE: Submit an EPQR (Electronic Product Quality Report) whenever an incorrect differential has been reported/discovered

1. Raise a TA/FRED (Technical Assistance Request/Fixed Right Enhanced Diagnostics) for pre-approval to replace the differential

2. Subject to TA/FRED approval, replace the incorrect axle(s). Clear all DTCs and perform a road test (ensure that the vehicle is driven at speeds in excess of 120 kph in order to trigger any potential re-occurrence of TCM DTCs)

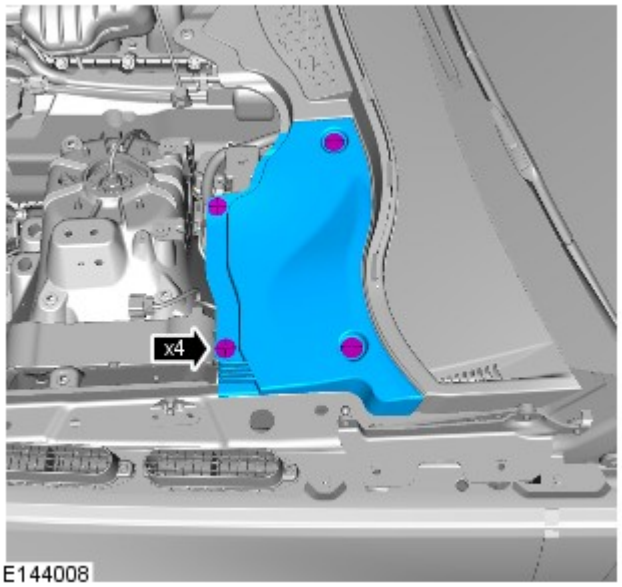
3. If no faults or symptoms are present, return the vehicle to the customer

4. If vibration is present or if DTCs P0721-62 or P0721-64 are flagged in the Transmission Control Module, then follow the diagnostic steps outlined in TOPIx (if further technical support/advice is required, an additional TA should be raised)



NOTE: LHD illustration shown, RHD is similar.

15.



NOTE: LHD illustration shown, RHD is similar.

Published: 06-Sep-2012

Parking Brake and Actuation - Electronic Parking Brake (EPB) Service Mode Activation and Deactivation

General Procedures

Activation

CAUTION: This procedure requires the vehicle in the Park or Neutral position, with the ignition turned ON (the engine must be OFF) and the parking brake system released.

NOTE: This procedure allows the parking brake to be released when removing and installing new rear brake pads or brake discs.

1. Press and hold the parking brake switch in the release position.
2. Wait 2 seconds.
3. Press and hold the accelerator pedal in the wide open throttle position.
4. Wait 2 seconds.
5. Turn the ignition Off and back On immediately.

NOTE: An audible noise will be heard to confirm that the parking brake has been released in Service Mode.

6. Release the accelerator pedal and release the parking brake switch to the neutral position.

Deactivation

CAUTIONS:

This procedure requires the vehicle in the Park or Neutral position, with the ignition turned ON (the engine must be OFF) and the parking brake system in Service Mode.

Once the rear brake pads or brake discs have been installed, the Service Mode must be cancelled.

1. Press and hold the parking brake switch in the apply position.
2. Wait 2 seconds.
3. Press and hold the accelerator pedal in the wide open throttle position.
4. Wait 2 seconds.
5. Turn the ignition Off and back On immediately.

NOTE: An audible noise will be heard to confirm that the parking brake has been released from the Service Mode.

6. Release the accelerator pedal and release the parking brake switch to the neutral position.

Published: 31-Jul-2012

Brake Controls - Braking Control System

Diagnosis and Testing

Principle of Operation

For additional information on the braking control system, refer to the relevant description and operation section in the workshop manual
REFER to: Braking Control System (206-11 Brake 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 mechanical or electrical faults

Visual Inspection

Mechanical	Electrical
• Tire size, condition and installation • Wheel speed sensor condition and installation • Steering angle sensor condition and installation • Yaw rate sensor and accelerometer condition and installation • Hydraulic control unit (with attached ABS control module) condition and installation	• Fuses • Harnesses and connectors • Warning lamp operation • Wheel speed sensors • Central junction box • Hill descent control switch • Dynamic stability control switch • Stop lamp switch • Yaw rate sensor and accelerometer • Steering angle sensor • ABS control module • 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 DTCs that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code Index: ABS Control Module - DTC: Anti-Lock Brake System Control Module (ABS) (100-00 General Information, Description and Operation).

Refer to: Driver Air Bag Module (501-20B Supplemental Restraint System, Removal and Installation).

10. Connect the battery ground cable.

Refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

11. If a new component is installed, the soft lock stop reset routine should be completed on the power steering system, using the approved diagnostic tool.

General Equipment: Land Rover diagnostic equipment

Published: 02-Mar-2015

Engine - TDV6 3.0L Diesel - Gen 2/TDV6 3.0L Diesel - Gen 1.5 -

Engine Data - Low Flow Fuel Injection System

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	190 kW at 4000 RPM	16.1:1 ± 0.5	84	90

Engine Data - Standard Flow Fuel Injection System

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	223 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 vehicles with Diesel Particulate Filter (DPF)	5W/30 – WSS–M2C934–B
Engine oil without (DPF)	5W/30 – WSS–M2C913–C
Sealant	WSE–M4G323–A5
Core plug and stub pipe retainer	WSK-M2G349-A7
Cooling system fluid	Havoline Extended Life Coolant (XLC)

Capacities

Description	Liters
Engine oil initial fill	6.66
Engine oil service fill with oil filter change	6.0

Cylinder Head and Valve Train

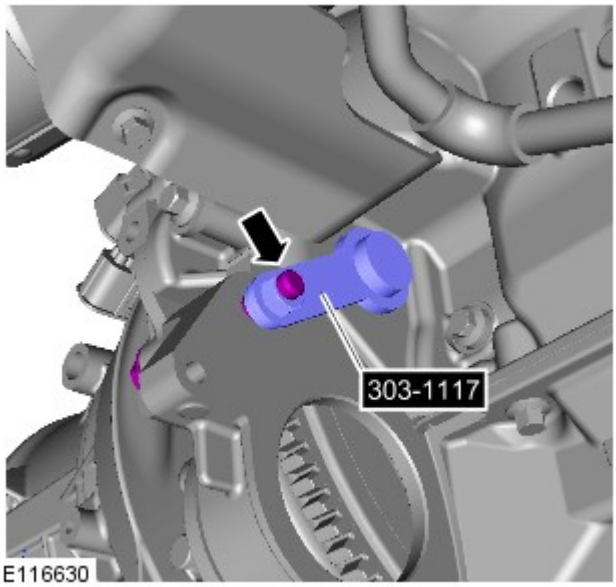
Item	Specification
Valve guide inner diameter (mm)	5.980 ± 0.010
Intake valve effective length (mm) (tip to gauge line)	94.99mm +/- 0.15
Exhaust valve effective length (mm) (tip to gauge line)	94.45mm +/-0.15
Valve stem to guide clearance intake diametrical (mm)	0.027 - 0.063
Valve stem to guide clearance 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	26.015±0.015
Bearing diameter - all positions	25.950±0.010
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 (mm) flatness specification	0.2mm (0.008 in)

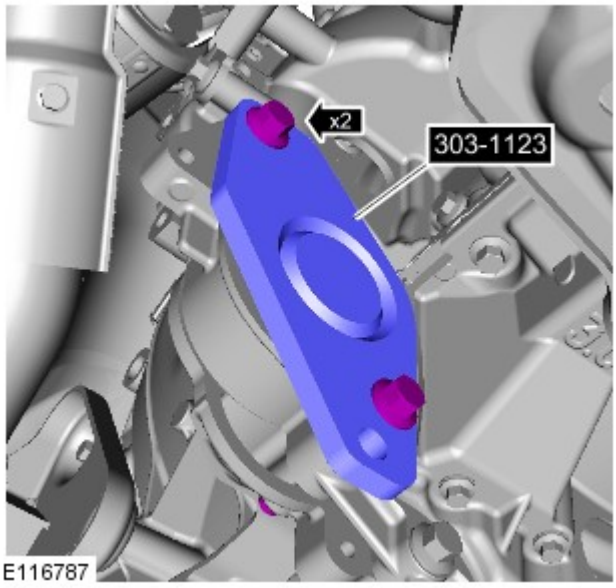
Cylinder Head Gasket

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

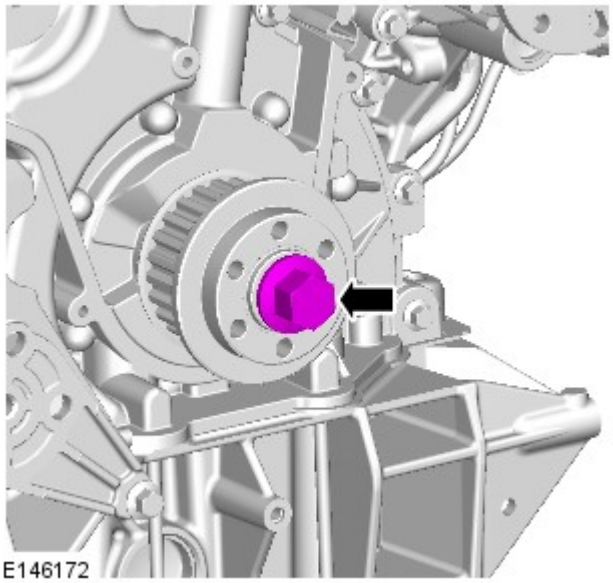
NOTE: A = refer to procedure for correct torque sequence



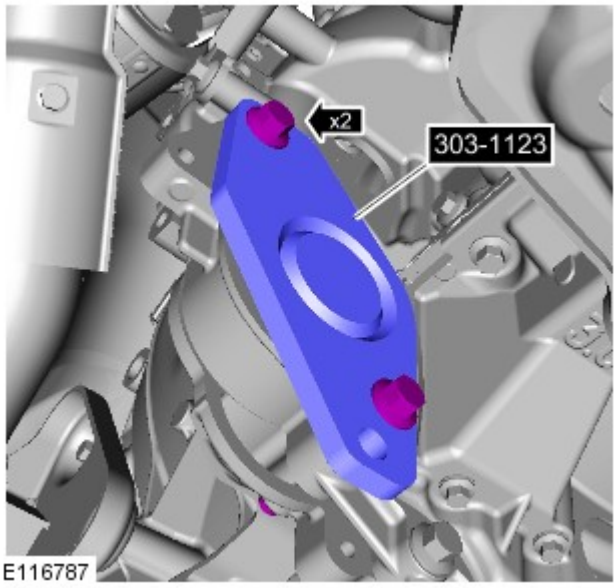


4.

- Install the special tool.
- *Special Tool(s):* 303-1123



5.

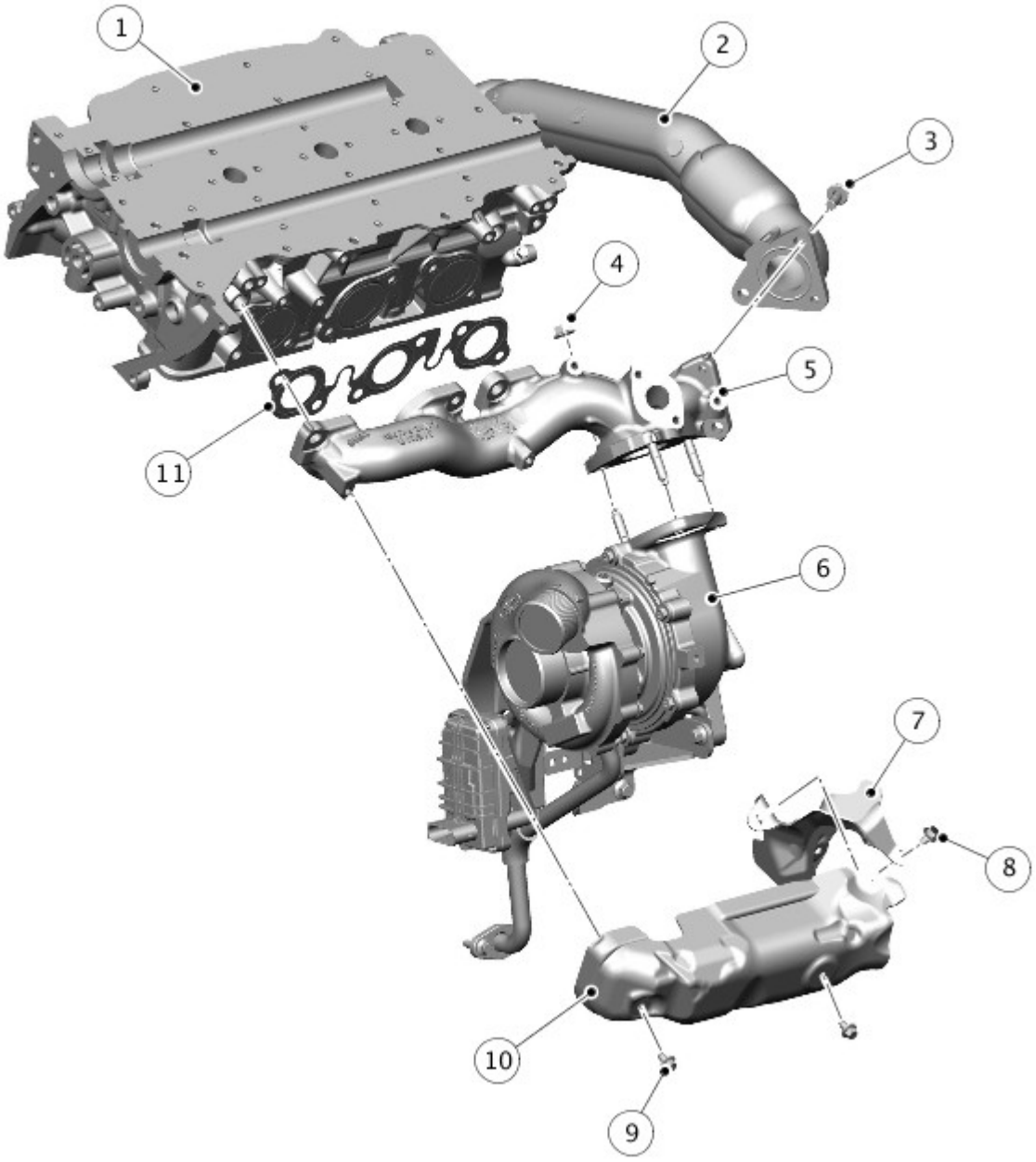


4. Refer to: Transmission - TDV6 3.0L Diesel - Gen 2/TDV6 3.0L Diesel - Gen 1.5 (307-01B Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, Installation).

5. Refer to: Starter Motor (303-06A Starting System - TDV6 3.0L Diesel - Gen 2/TDV6 3.0L Diesel - Gen 1.5, Removal and Installation).

6. Connect the battery ground cable.

Refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

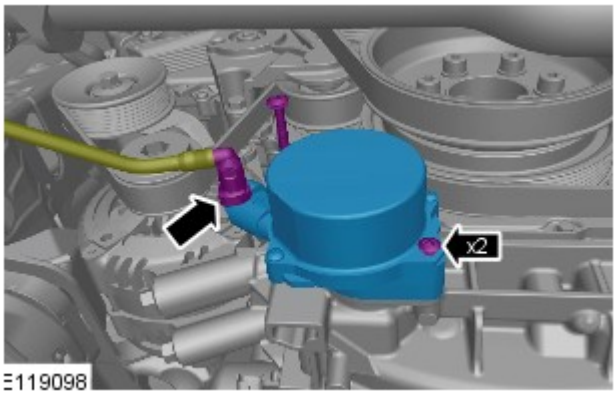


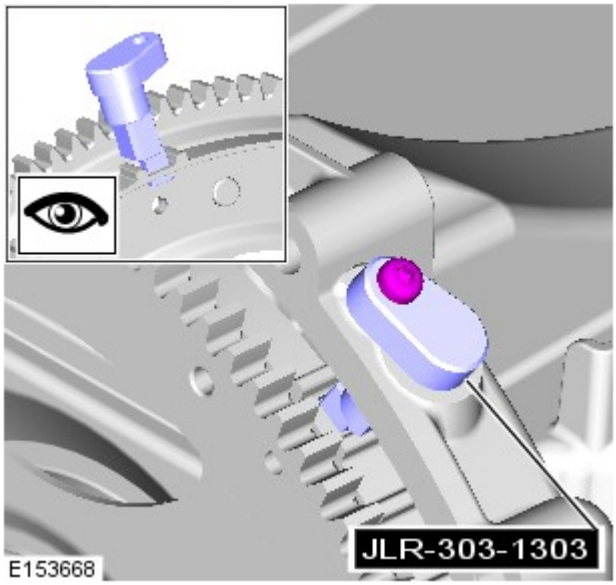
E169819

Item	Description
1	Cylinder head
2	Connecting pipe
3	Bolt (3 of)
4	Nut (3 of)
5	Exhaust manifold
6	Turbocharger (primary turbocharger shown)
7	Manifold rear heat shield
8	Bolt
9	Bolt (2 of)
10	Manifold heat shield
11	Gasket

The exhaust manifolds are sealed to the cylinder head by means of a gasket. Sacrificial 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 transfer pipe.

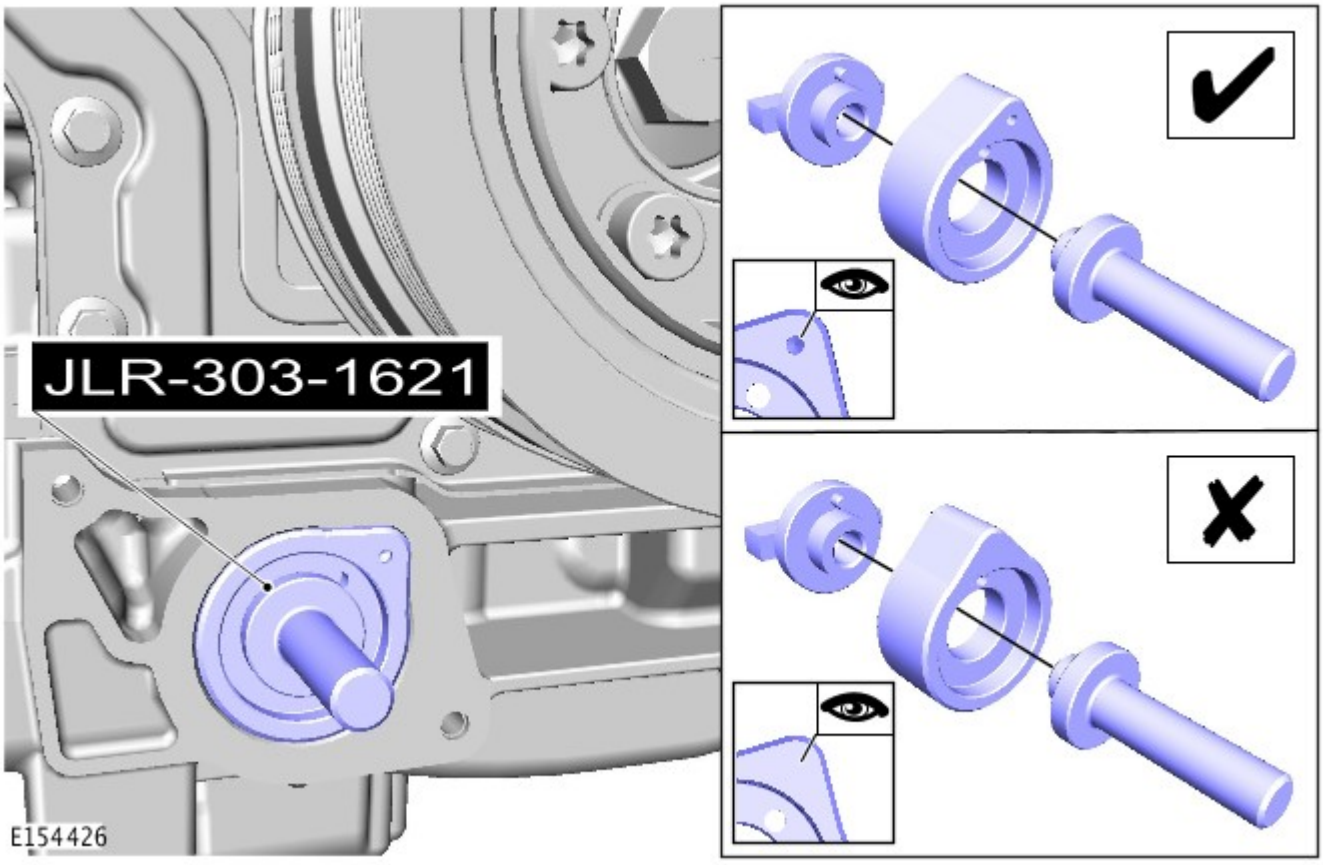


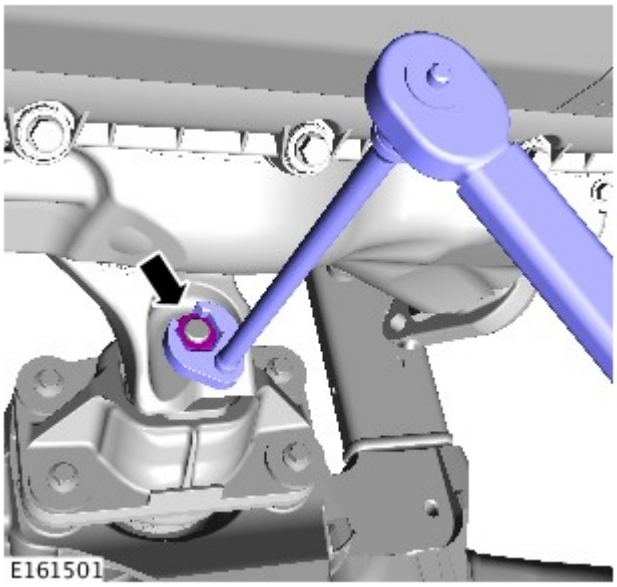


9.

- Remove the special tool.

  Special Tool(s): JLR-303-1303



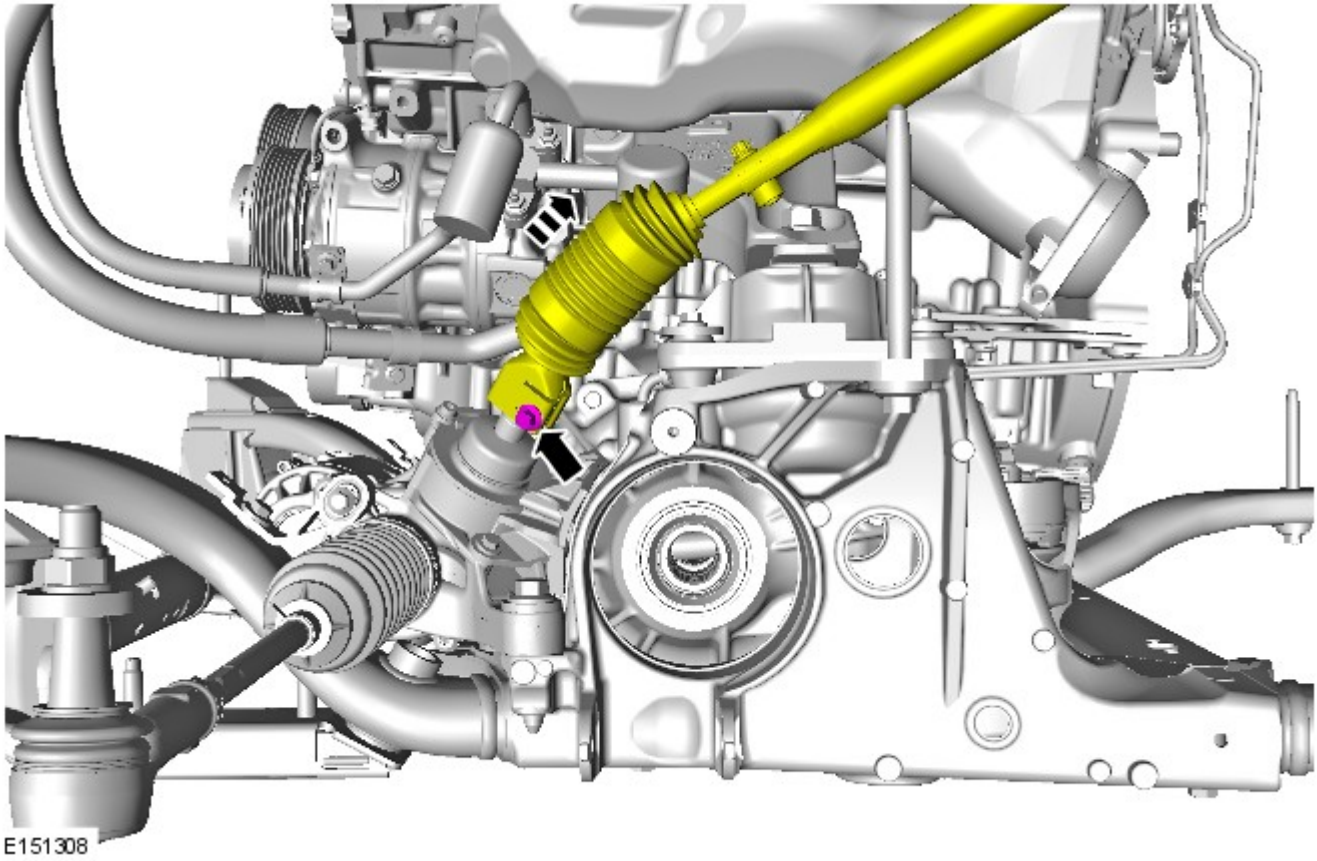


7. *Torque:* 110 Nm

Left-hand drive vehicles

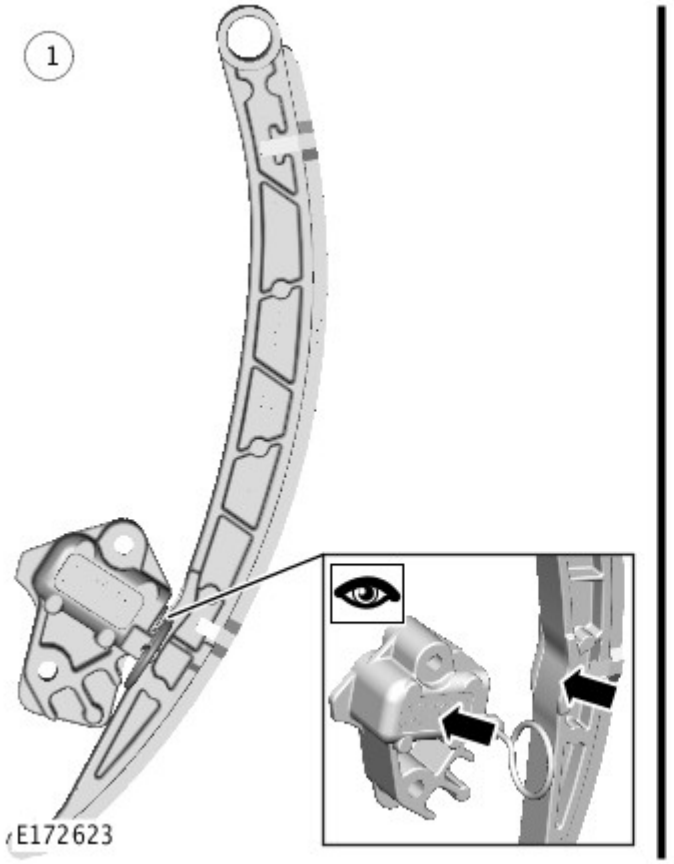
8. WARNING: Make sure that a new bolt is installed.

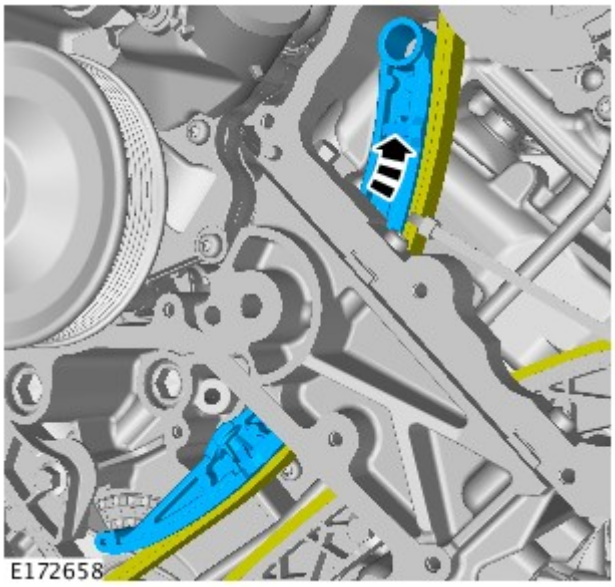
CAUTION: Discard the bolt.



All vehicles

9. Refer to: Front Driveshaft - GTDi 2.0L Petrol (205-01 Driveshaft, Removal and Installation).





11. CAUTION: Make sure that a new component is installed.

Install the timing chain guide.

12. Install the timing chain guide bolt.

Torque: 25 Nm

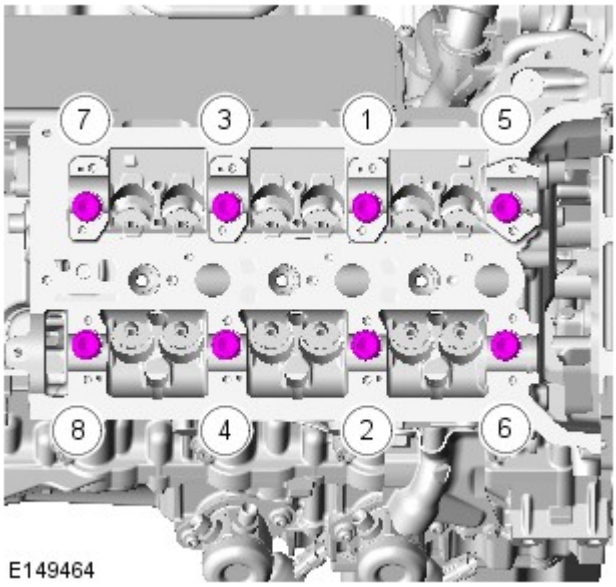
25.

- Press the left-hand directional button and select the Oil Level display.

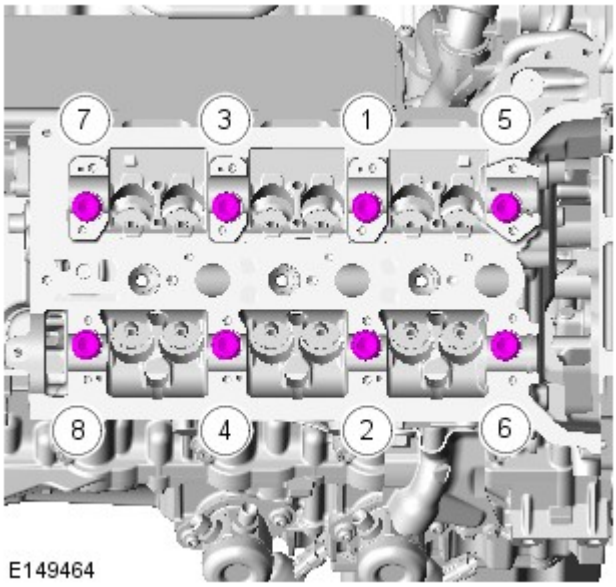
26.

- Press the left-hand OK button and follow the instructions.
- NOTE: If the message shows "Not available" wait for further 10 mins to allow the oil level to stabilize.

  Make sure that the average oil level value has now been updated.

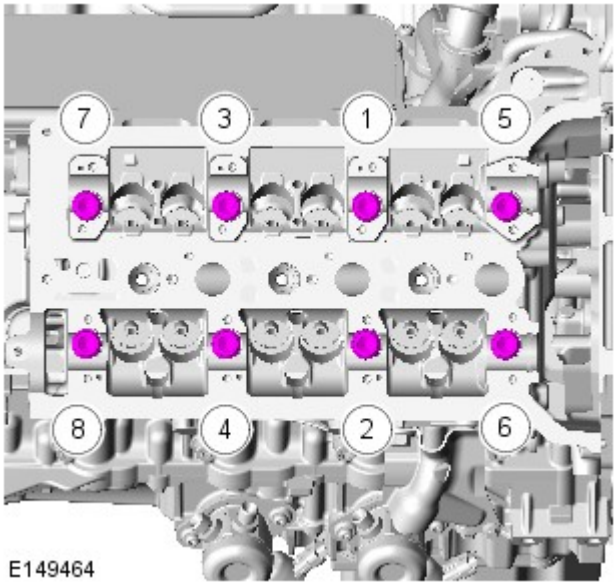


NOTE: Slacken the bolts in the sequence shown.



6. NOTE: Tighten the bolts in the indicated sequence.

Torque: 35 Nm



7. NOTE: Tighten the bolts in the indicated sequence.

Tighten the bolts 1 to 8, a further 90 degrees.

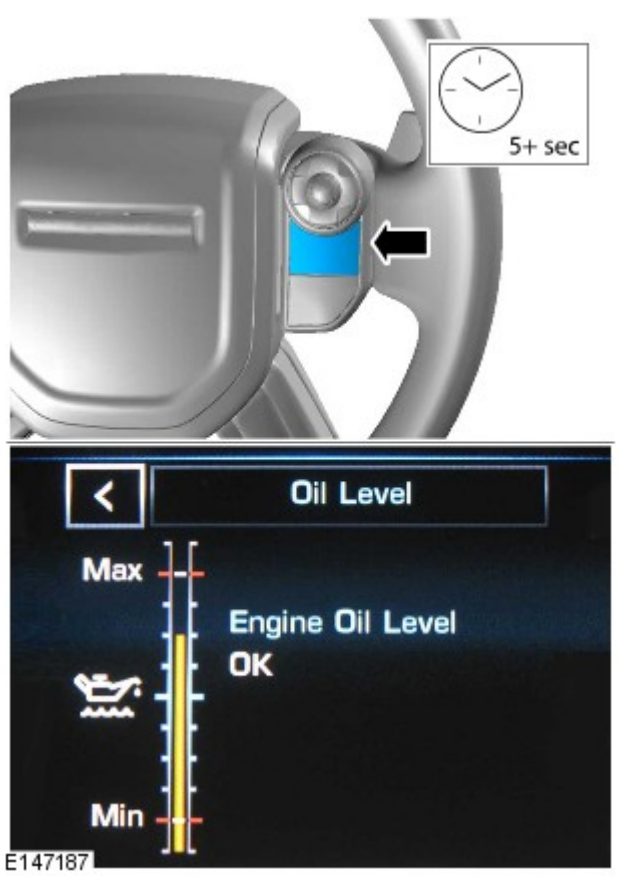
8.

21. Set the ignition to the OFF position.

22. Allow 10 minutes for the engine oil level to stabilize if there has been additional oil top up.

23. NOTE: The following steps are to update the average oil level value.

24. Repeat steps 13 to 19 to access the oil level display in service mode.



25. NOTE: The actual volume displayed on the bar graph will be written into the electronic control unit as a new value.

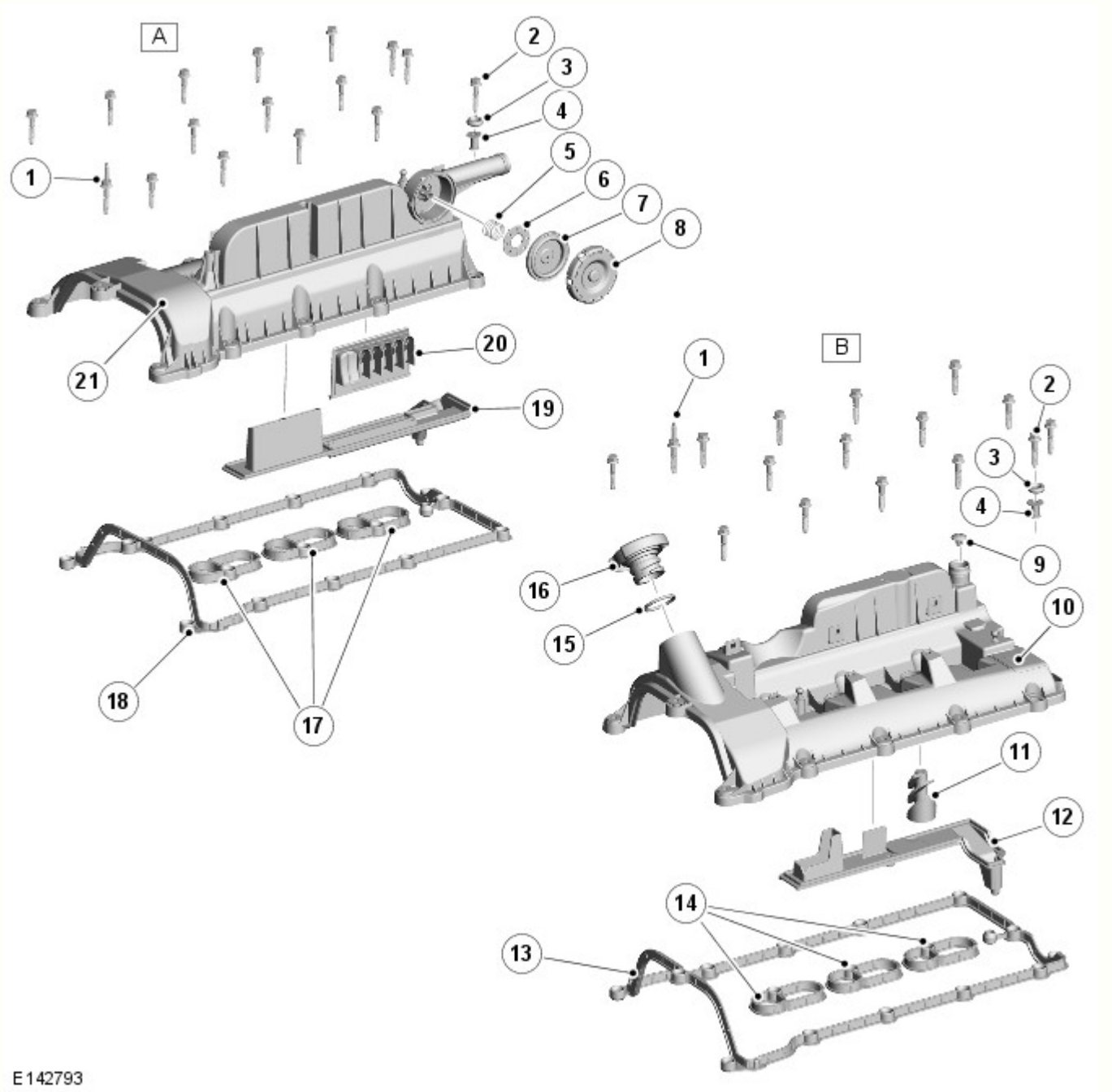
- Press and hold the speed control cancel button for more than 5 seconds.
- The message center displays the current oil level.

The threads for the spark plugs are machined at a precise start point to ensure that each spark plug is orientated in the cylinder correctly. The benefits of this are optimum spark plug intrusion into the combustion chamber to improve combustion, idle stability, dilution tolerance and spark plug durability. The spark plug must be tightened to the specified torque to ensure the correct orientation.

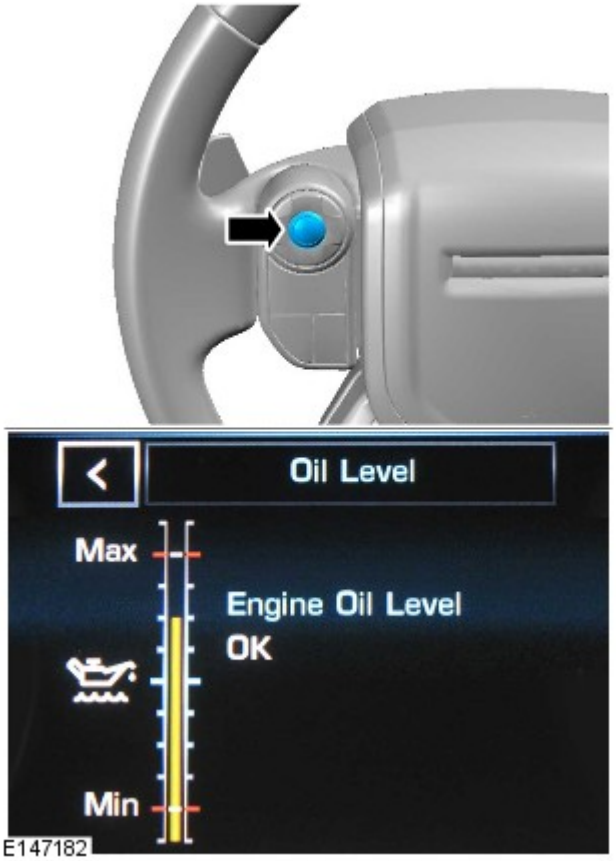
The camshafts run on line bored journals in the cylinder head and camshaft caps. Therefore it is very important that the camshaft caps are maintained with their respective journal and the orientation is as marked on the cap.

A camshaft cover is fitted and sealed with a rubber seal and 3 smaller rubber seals. The cover is retained in position with 15 bolts which are located through a sleeve and a grommet for sealing and a single stud and nut.

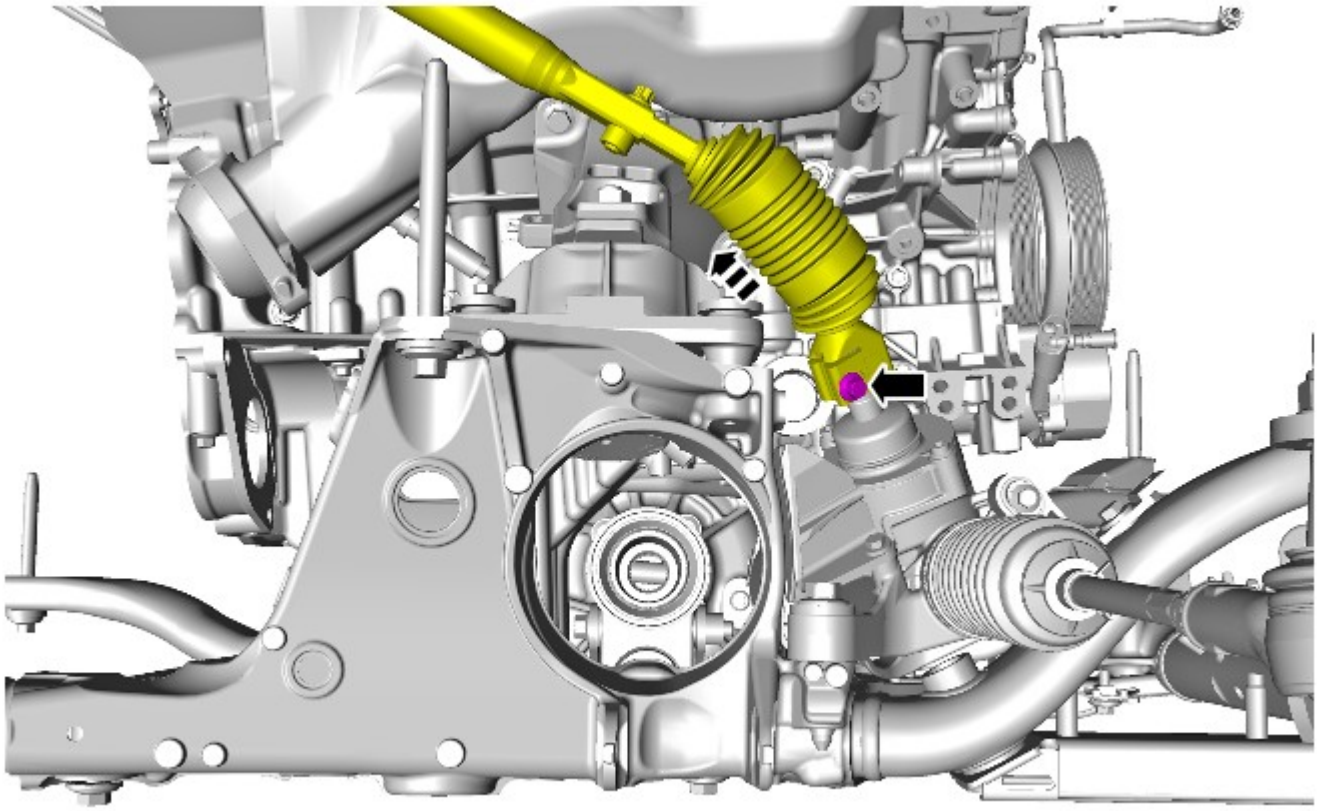
Camshaft Covers



Item	Description
A	Bank 1
B	Bank 2
1	Stud, nut, grommet and sleeve (1 of Bank 2, 2 of Bank 1)
2	Bolt (15 of per cover)
3	Grommet (15 of per cover)
4	Spacer (15 of per cover)
5	Pressure control valve spring



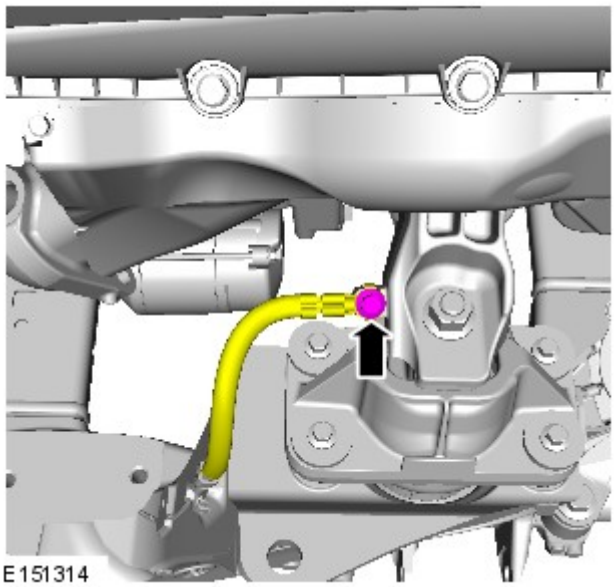
40. Refer to: Engine Cover - V6 S/C 3.0L Petrol /V8 5.0L Petrol/V8 S/C 5.0L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).



E151313

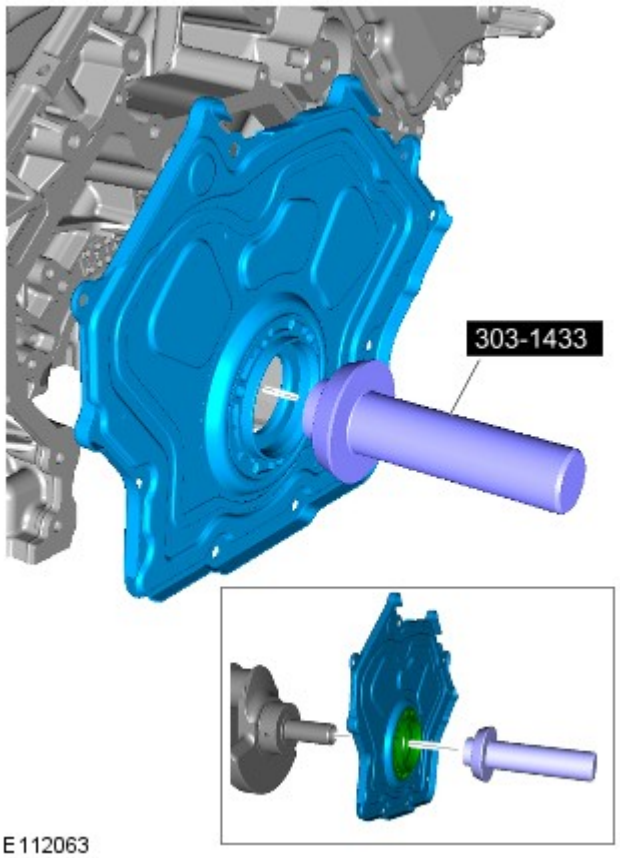
All vehicles

7.



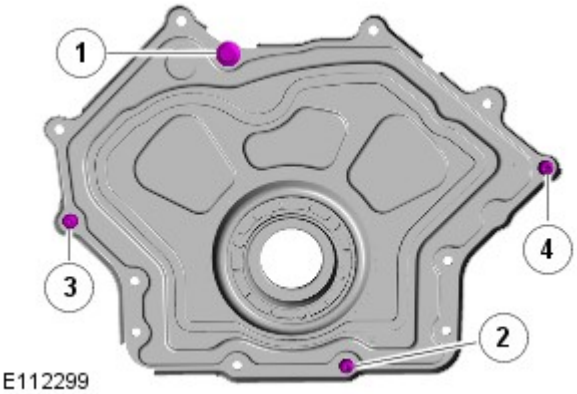
E151314

8.



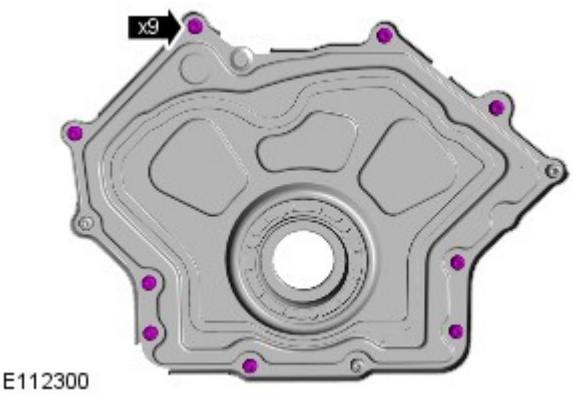
E112063

7. *Torque:*
   M6 12 Nm
   M8 20 Nm



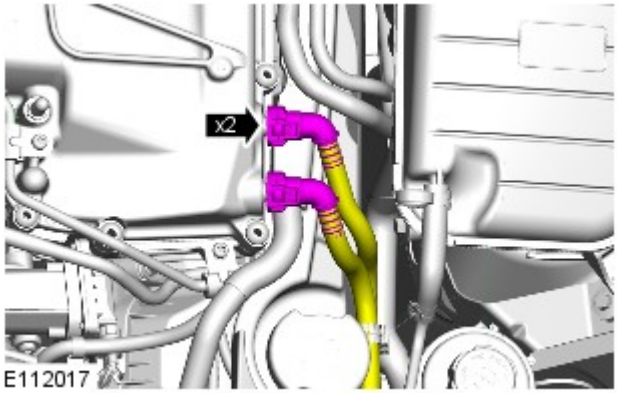
E112299

8. *Torque:* 12 Nm

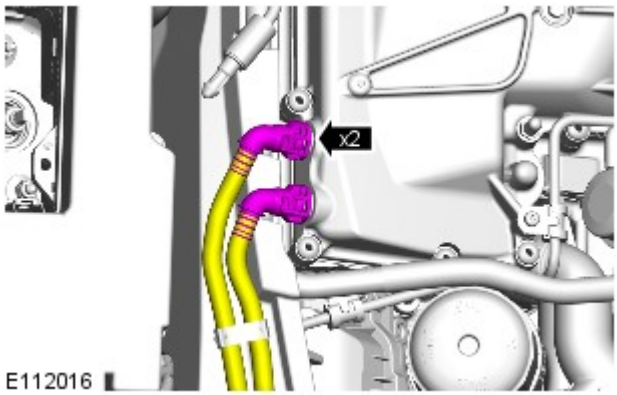


E112300

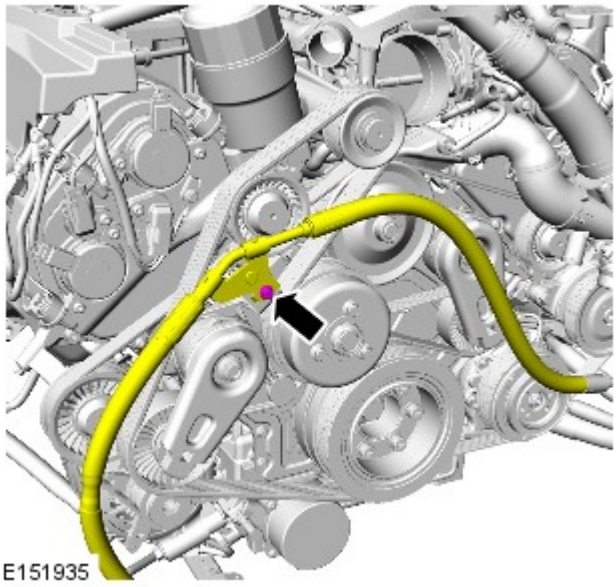
9. *Torque:* 12 Nm



14. WARNING: Be prepared to collect escaping fluids.

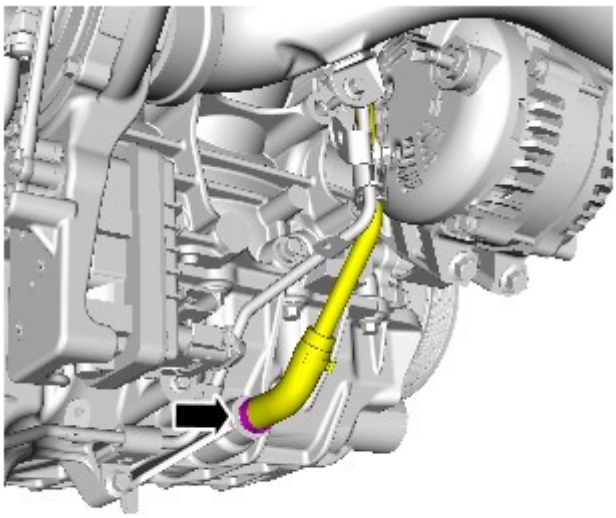


15. WARNING: Be prepared to collect escaping fluids.



16.

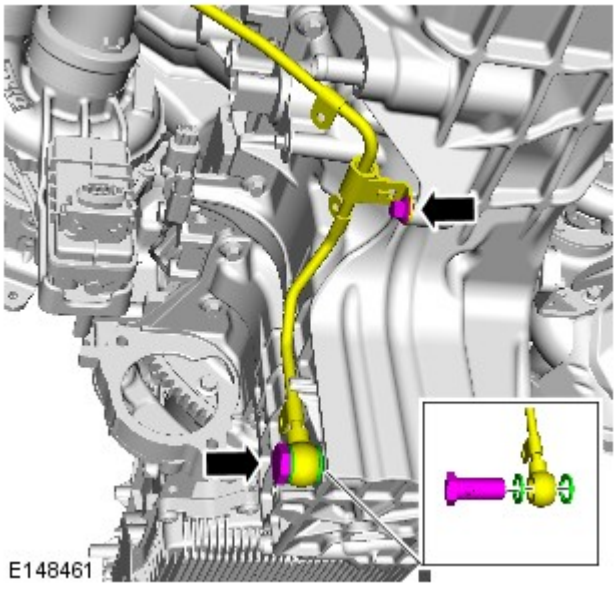
17. CAUTION: Be prepared to collect escaping coolant.



E148459

11. CAUTION: Be prepared to collect escaping oil.

NOTE: Discard the retaining clip.

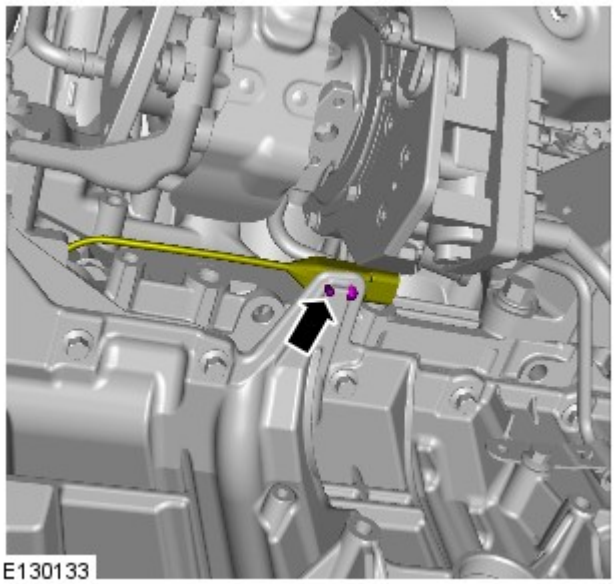


E148461

12. CAUTIONS:

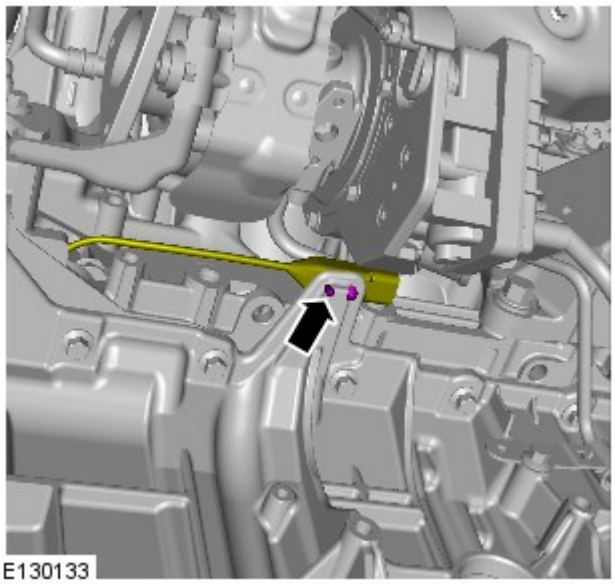
Be prepared to collect escaping oil.

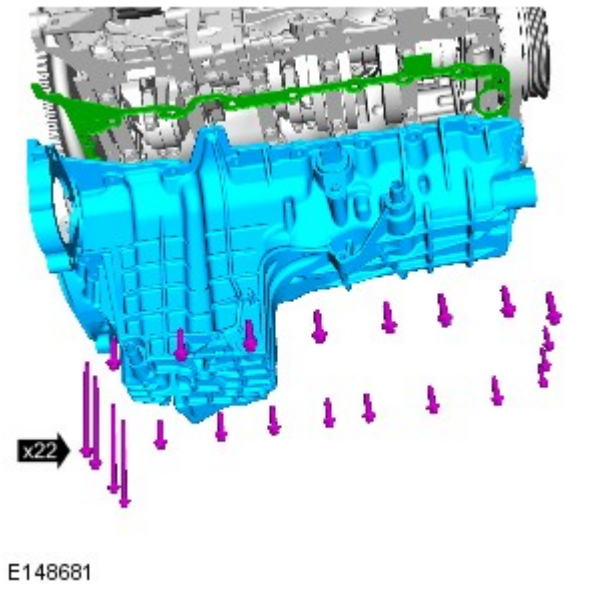
Inspect the seals, replace if damaged.



E130133

13.

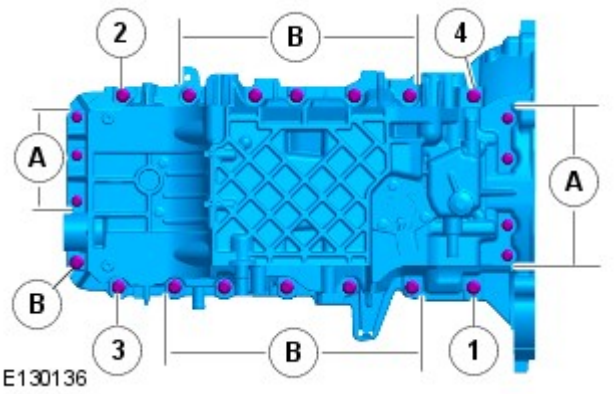




19. NOTE: Remove and discard the gasket.

Installation

All vehicles



1. CAUTIONS:

Make sure that the mating faces are clean and free of foreign material.

Install all the bolts finger tight before final tightening.

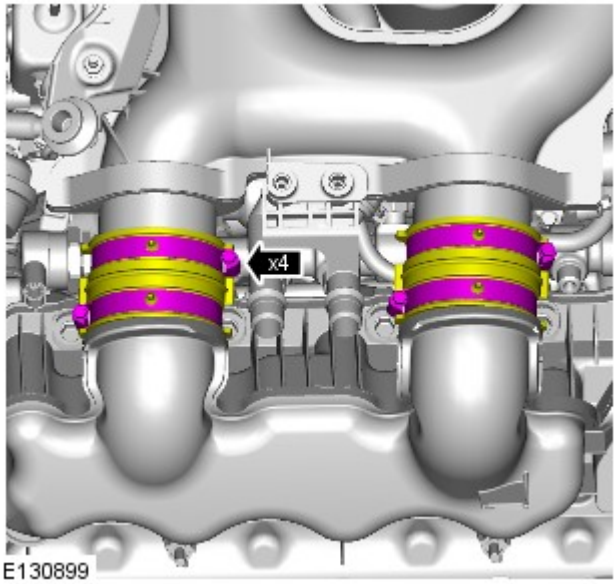
NOTES:

Install a new gasket.

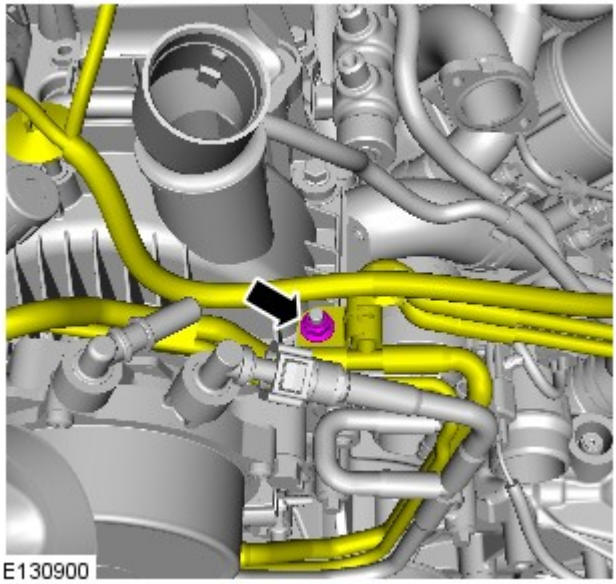
Tighten the bolts in the indicated sequence.

Torque:

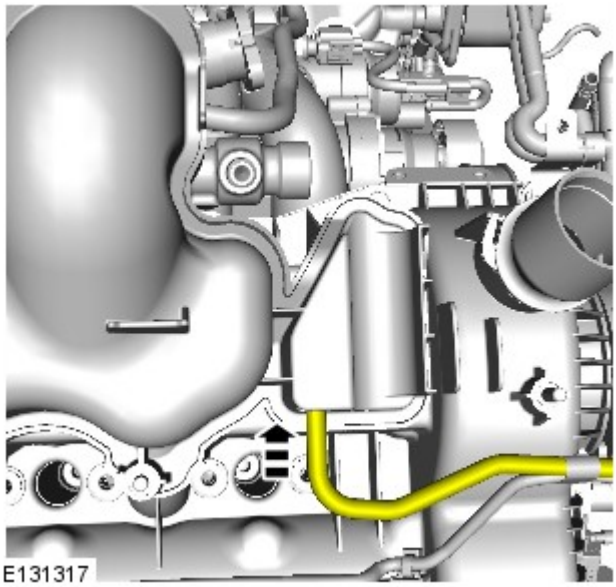
1-4 23 Nm
B 23 Nm
A 10 Nm

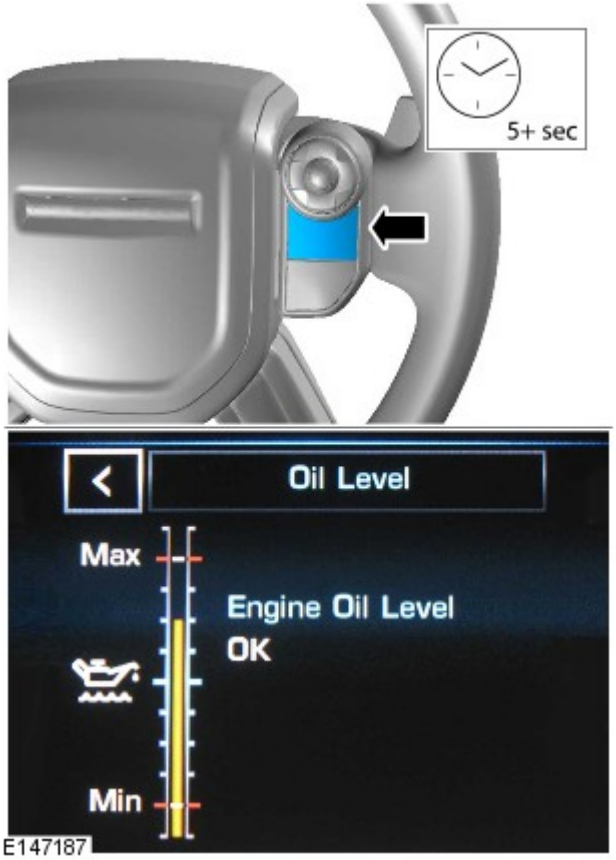


7. *Torque:* 10 Nm



8.





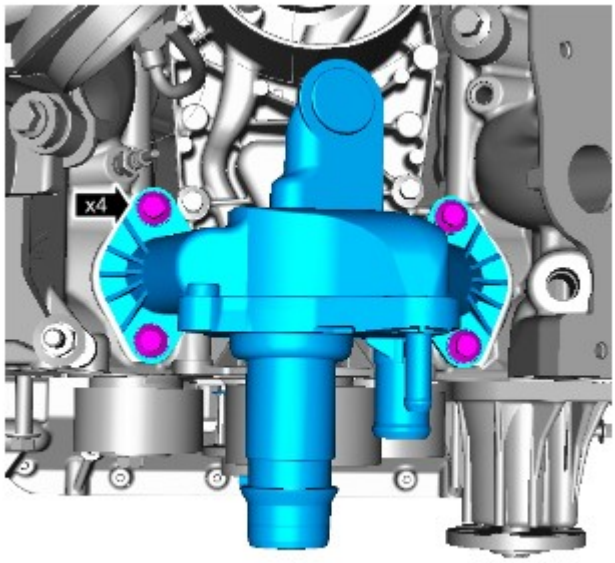
NOTE: Close the hood.

23. Set the ignition to the OFF position.

24. Set the ignition to the ON position.

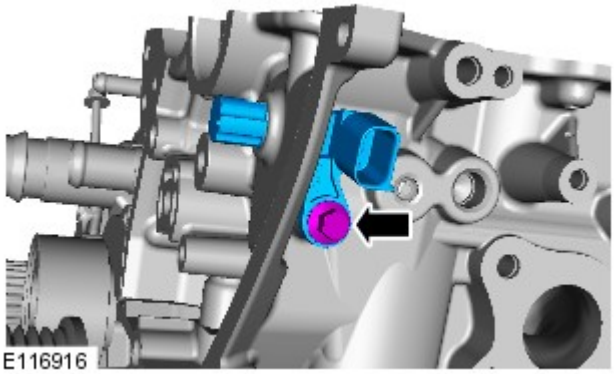
25. NOTE: The following steps are to check the current oil level in a customer mode.

- Press the left-hand OK button to access the Instrument Cluster (IC) Main Menu.

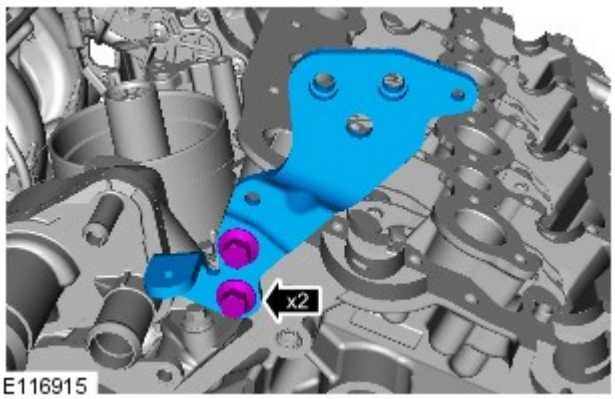


E116917

7. *Torque:* 10 Nm

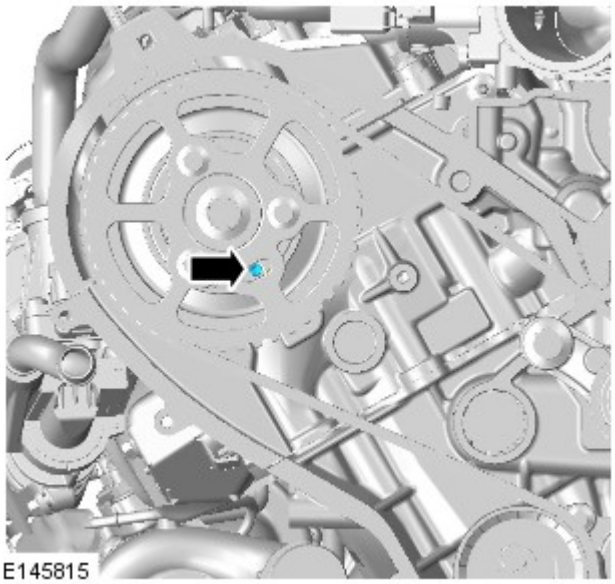

E116916

8. *Torque:* 24 Nm

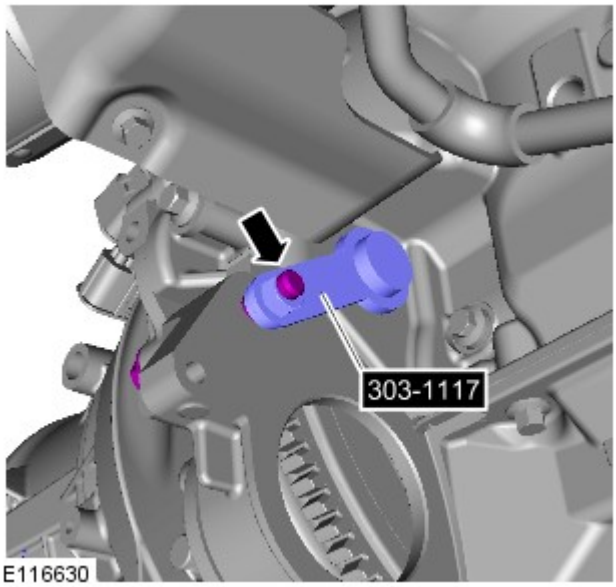


E116915

9. *Torque:* 14 Nm

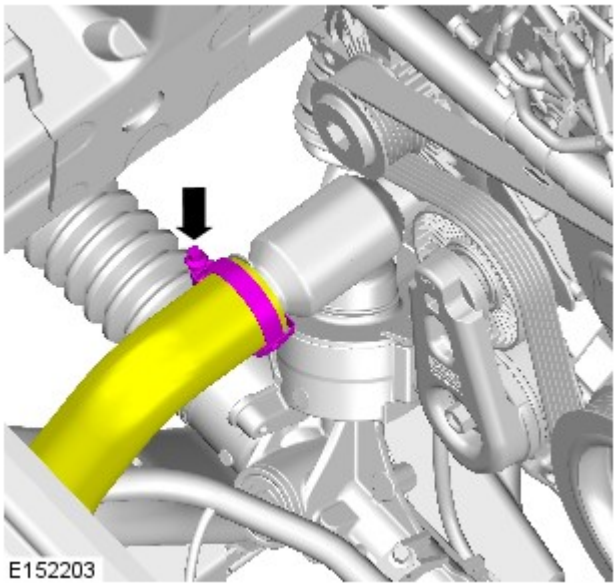

E145815

6. *Special Tool(s):* 303-1117



E116630

7. *Special Tool(s):* 303-1126



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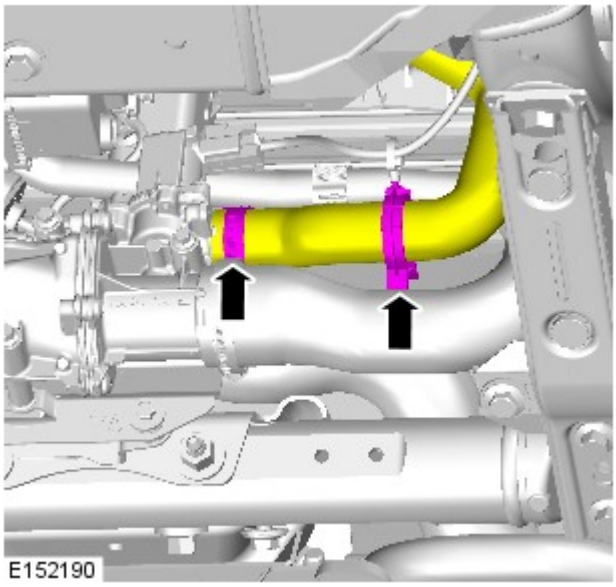
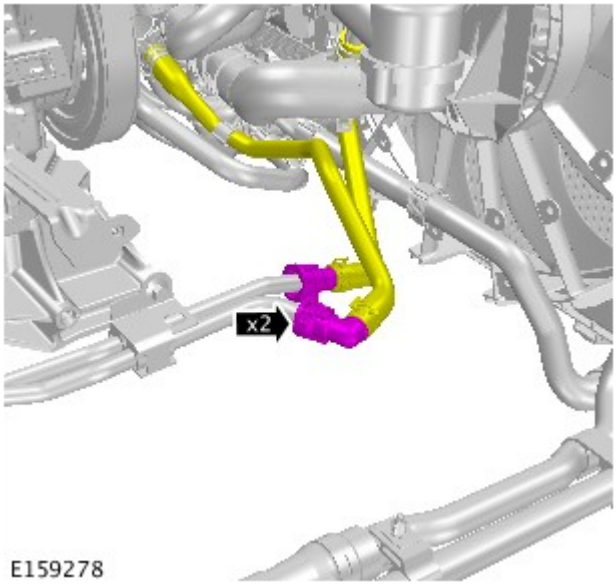
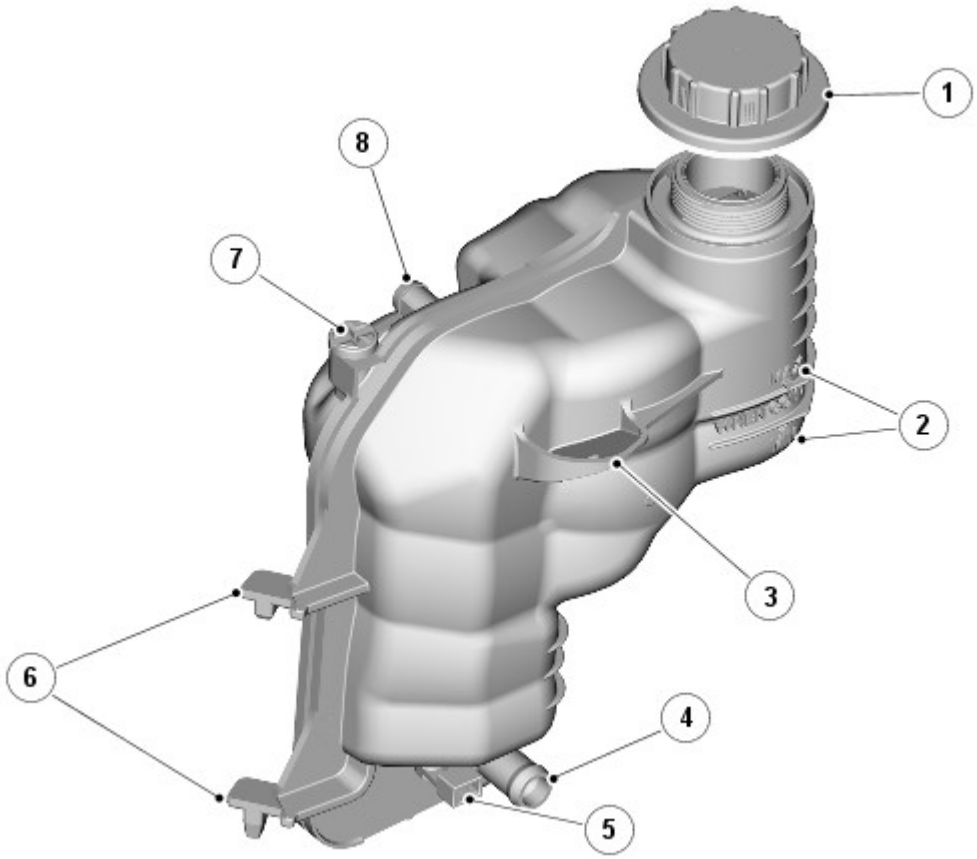


26. CAUTION: Be prepared to collect escaping coolant.



27.



Item	Description
1	Filler cap
2	MAX and MIN level markings
3	Mounting lug
4	Supply hose connection
5	Coolant level sensor
6	Mounting lugs
7	Bleed screw
8	Vent hose connection

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 thermostat. A continuous vent into the expansion tank, through a hose connected to the radiator, prevents air locks from forming in the cooling system.

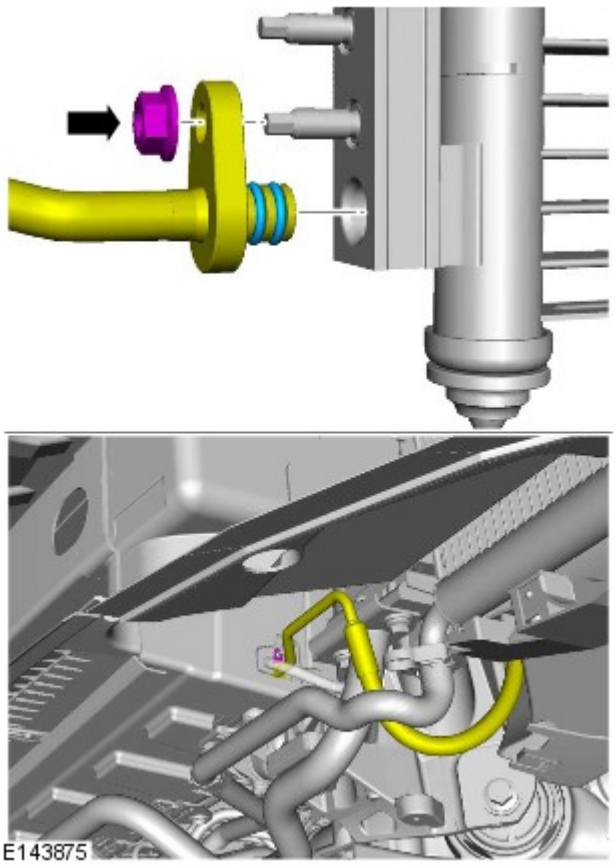
The expansion tank is attached to the front end carrier in the front left corner of the engine compartment. A filler cap, bleed screw and level sensor are incorporated into the expansion tank. MAX and MIN level markings are molded into the exterior of the tank.

The expansion tank provides the following functions:

- Service fill
- Coolant expansion during warm-up
- Air separation during operation
- System pressurization by the filler cap.

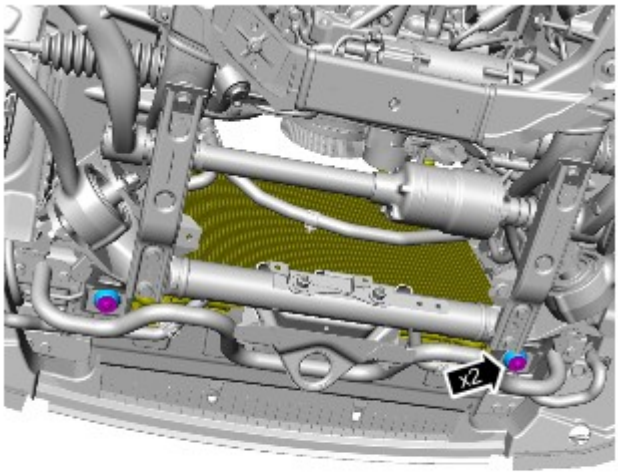
The expansion tank has an air space of approximately 0.5 to 1 liter (1.06 to 2,11 US pints), above the MAX level, to allow for coolant expansion.

Engine Cooling Fan(s)



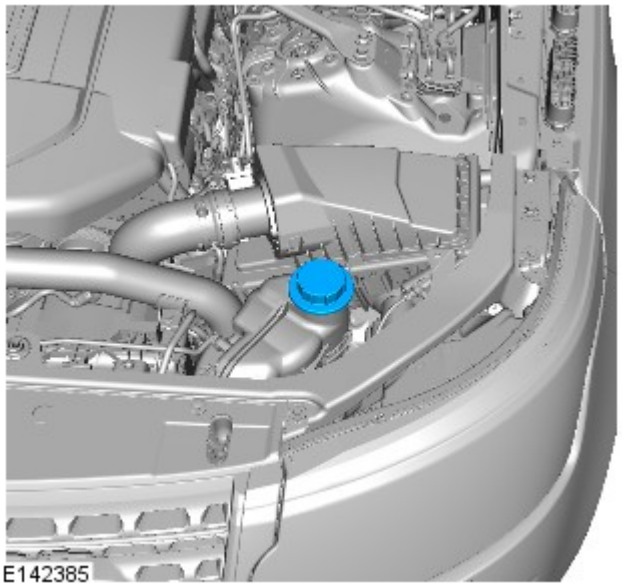
CAUTION: Remove and discard the O-ring seals.

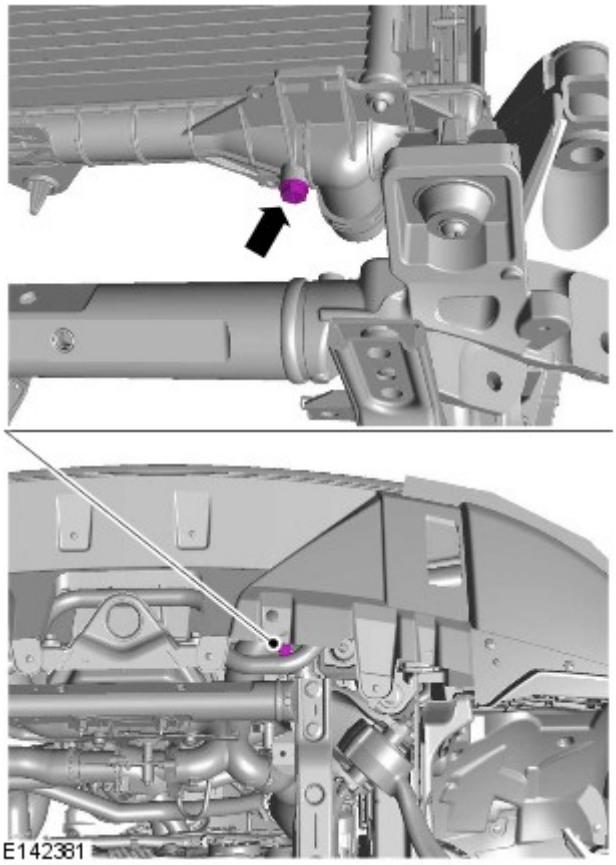
Torque: 8 Nm



26. *Torque:* 15 Nm

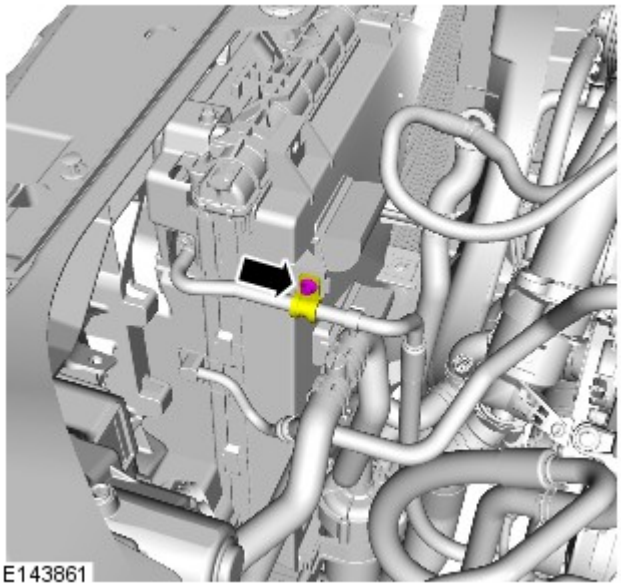
27.





6. CAUTION: Be prepared to collect escaping coolant.

7. CAUTION: Be prepared to collect escaping coolant.



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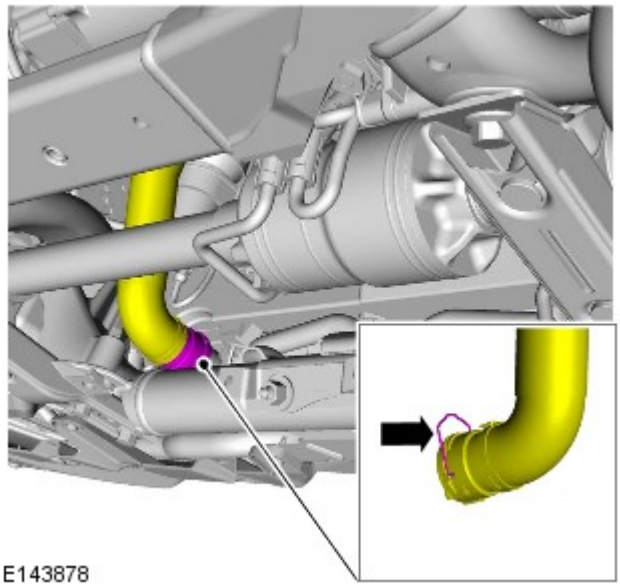
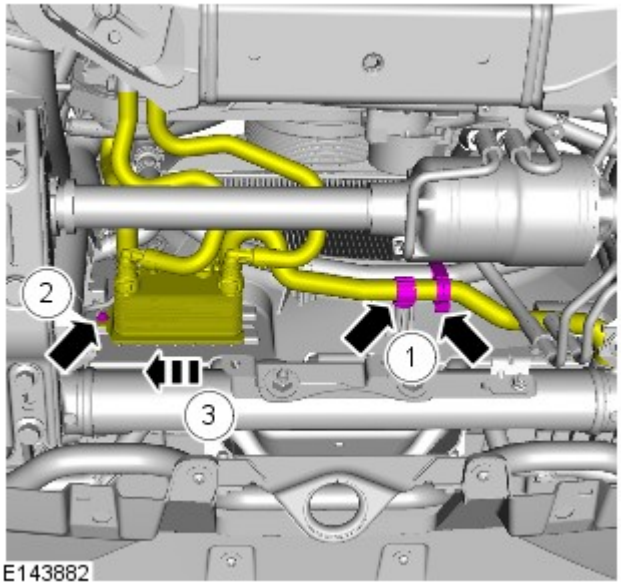


15. *Torque:* 7 Nm



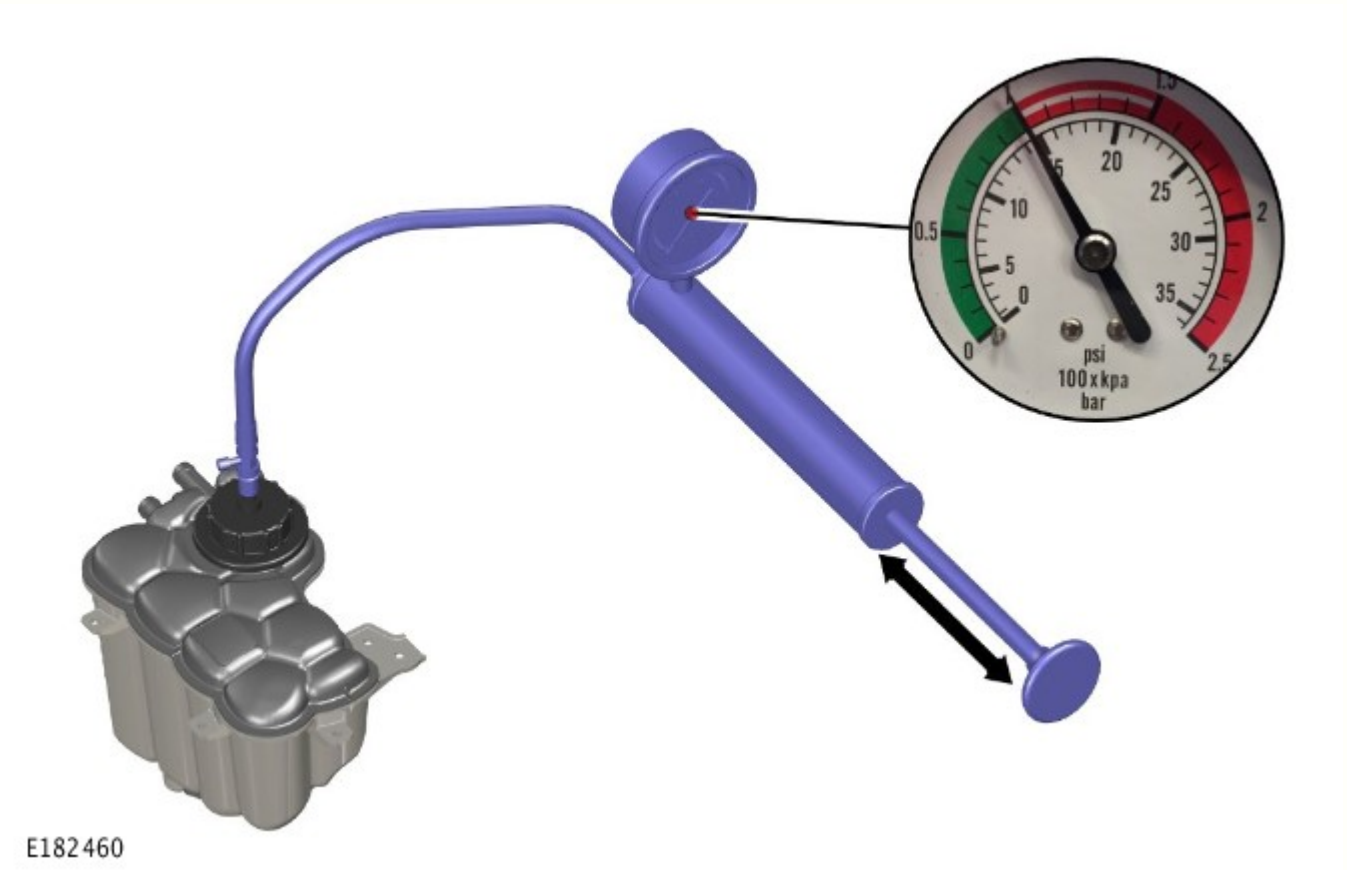
16.

Make sure that the mating faces are clean and free of foreign material.

Do not exceed 1.0 bar (15 psi) whilst pressurizing the cooling system.

NOTE: If the pressure continues to drop after the initial tolerance, there is a coolant leak.

- Using the correct adaptor connect the cooling system pressure test kit to the vehicle expansion tank.
- Slowly pressurize the cooling system until the pressure gauge reads 1.0 bar (15 psi).
- Make sure the cooling system holds pressure for 5 minutes, note that a small pressure decay of approximately 0.15 bar (1 psi) over the first minute is normal.



5. Depressurize and remove the cooling system pressure test kit.

Published: 23-Feb-2016

Engine Cooling - SDV6 3.0L Diesel - Hybrid Electric Vehicle - Cooling System Pressure Test

General Procedures

Activation

WARNING: Since injury such as scalding could be caused by escaping steam or coolant, allow the vehicle cooling system to cool prior to carrying out this procedure.

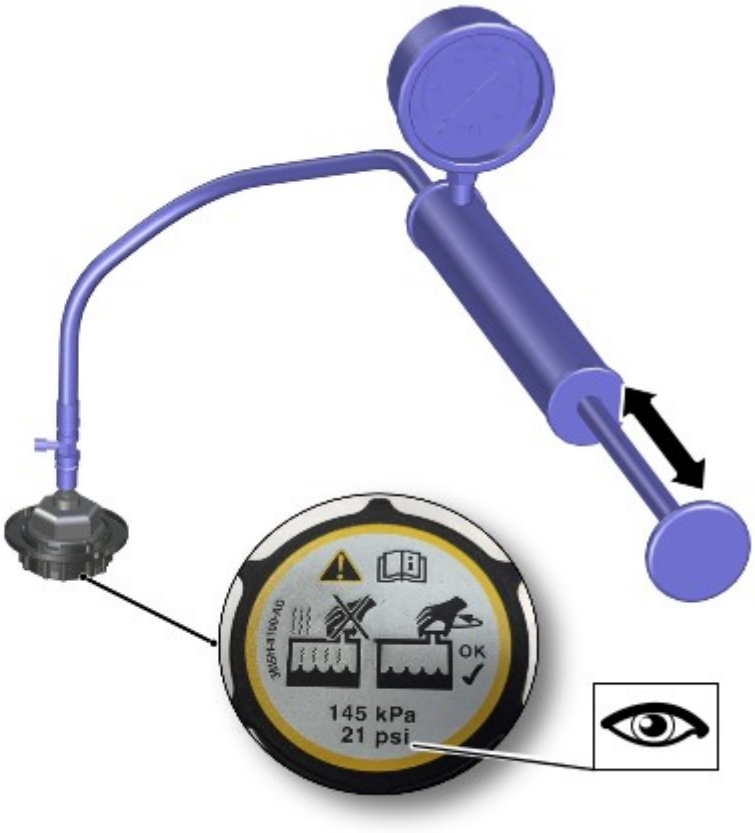
NOTE: The following procedure will enable the cooling system to be pressure tested for condition and leaks. Stage 1 will check the expansion tank cap register seal and the cap for leaks. Stage 2 will check the entire cooling system.

1. NOTE: If the coolant expansion tank cap is found to be leaking, replace the cap.

   Examine the coolant hoses for signs of cracking, distortion and security of the hose connections.

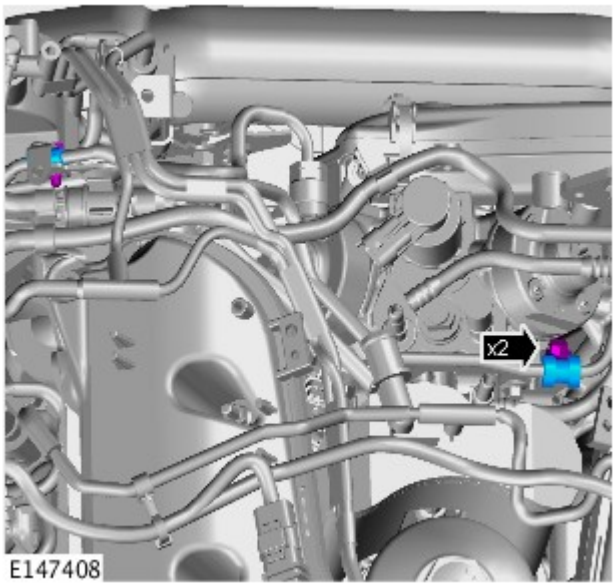
2.
   - Remove the expansion tank cap, using the correct adaptor connect the cooling system pressure test kit to the cap.
   - Note the release pressure displayed on the expansion tank cap before applying pressure.
   - Slowly pressurize the expansion tank cap checking for leaks. Once the noted cap pressure is reached the pressure will be released through the cap.

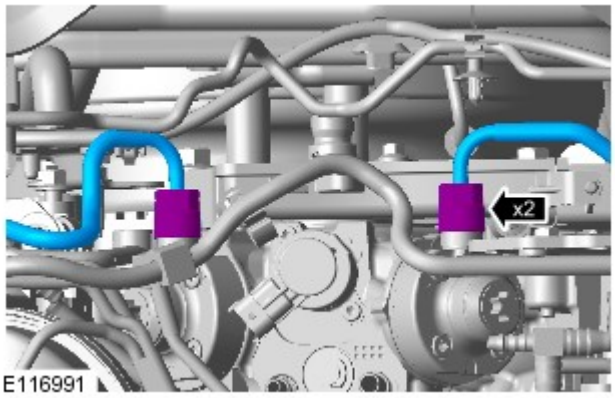
E182461



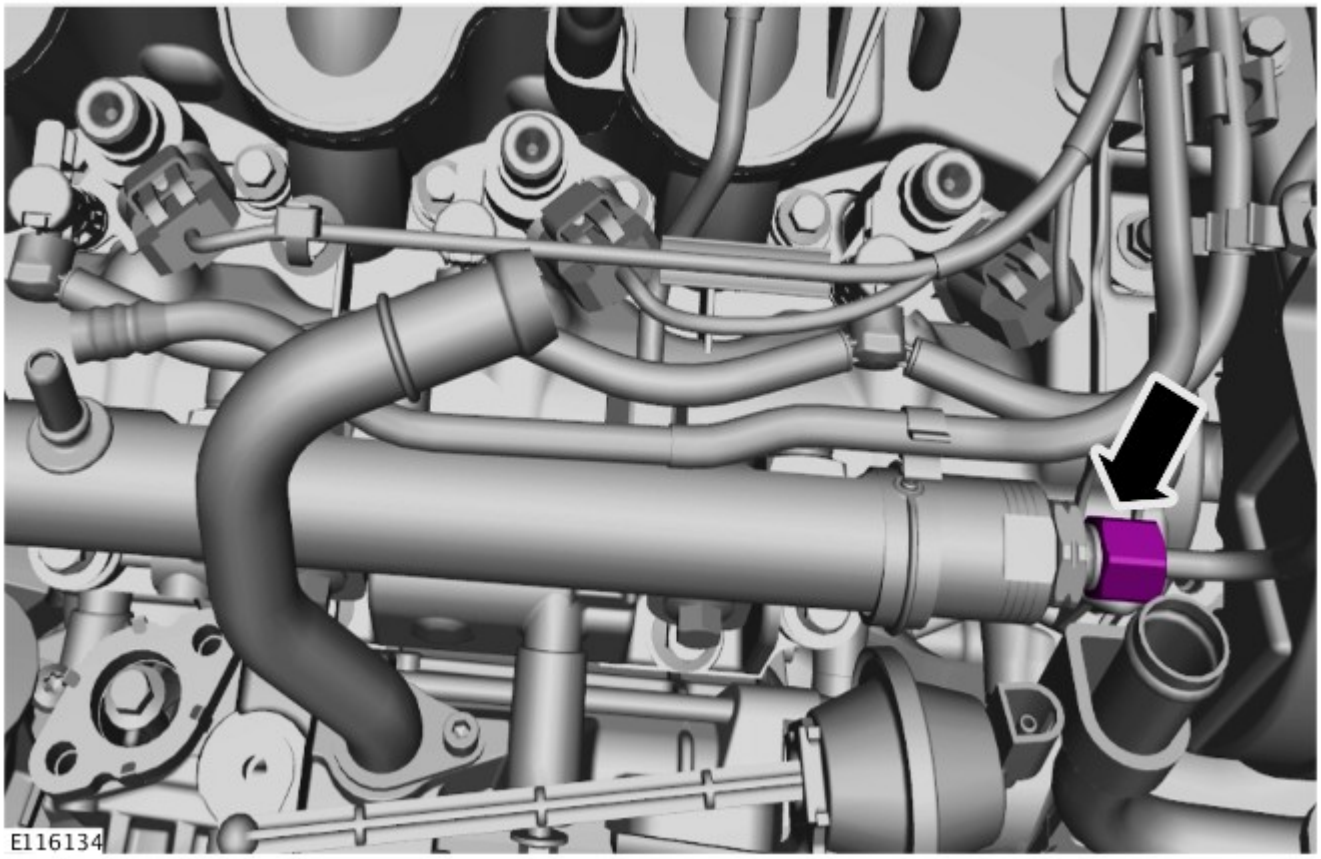
3. Depressurize and remove the cooling system pressure test kit.

4. CAUTIONS:

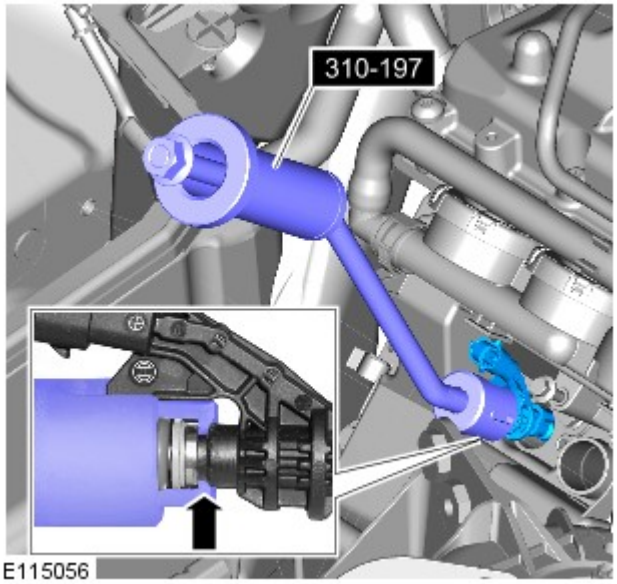




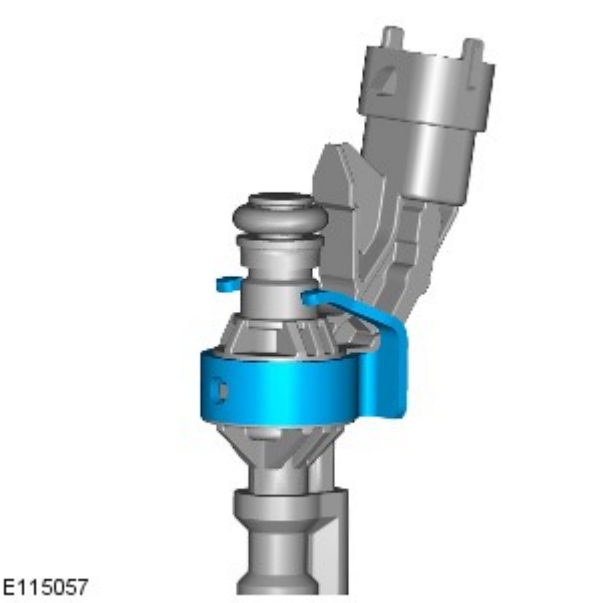
22. Tighten the high-pressure fuel lines union to 15Nm.



Special Tool(s): 310-197



E115056


E115057

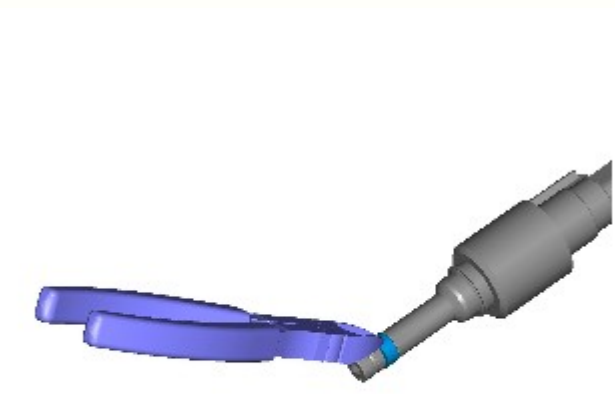
24. CAUTION: If the fuel injector is being removed without a new component being installed, the fuel injector clamp must remain with the fuel injector it is removed with.

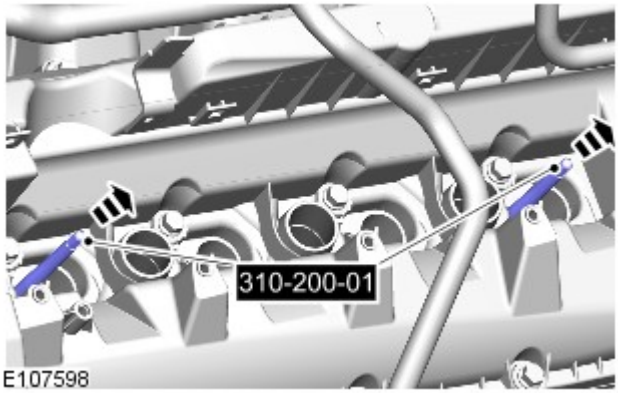
25. CAUTIONS:

Do not use a knife to remove the Teflon seal as damage could occur to the fuel injector.

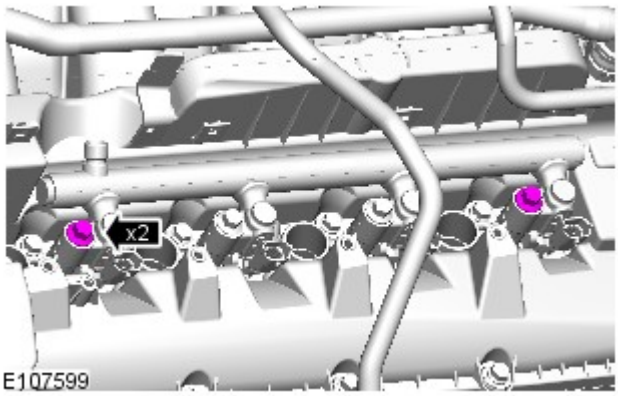
Do not cut the Teflon seal to deep as damage could occur to the fuel injector.

Pinch the Teflon seal to allow the tool to cut the Teflon seal without damaging the fuel injector.

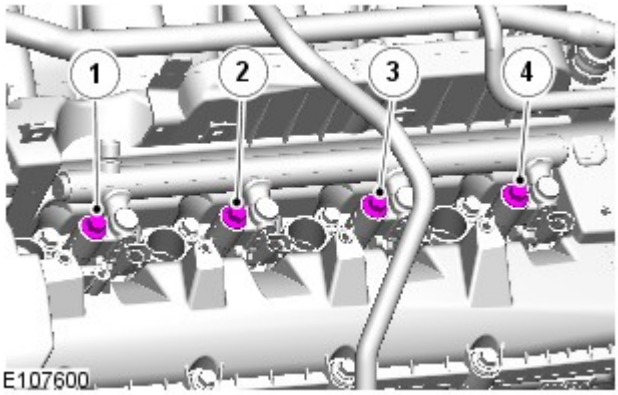

E115058



9. *Torque:* 20 Nm

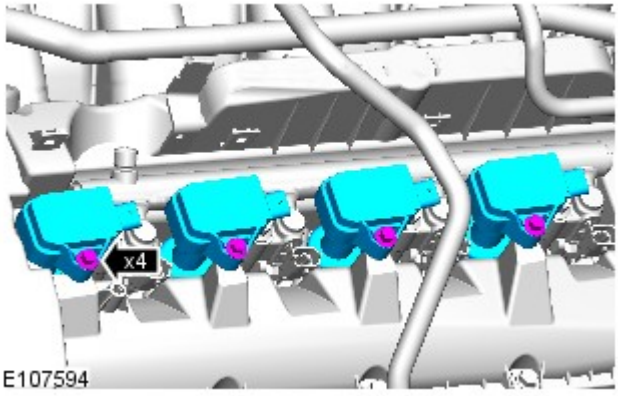


10. CAUTION: Tighten the bolts in the sequence shown.



Torque:
- Bolt 2 30 Nm
- Bolt 3 30 Nm
- Bolt 1 30 Nm
- Bolt 4 30 Nm

11. *Torque:* 8 Nm



12.

Published: 06-Mar-2013

Fuel Charging and Controls - V8 S/C 5.0L Petrol - 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 of the workshop manual. REFER to: Fuel Charging and Controls (303-04D Fuel Charging and Controls - V8 5.0L Petrol, 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

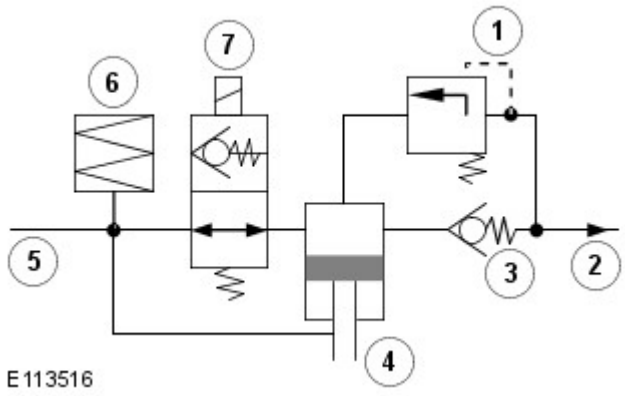
Mechanical	Electrical
• Fuel level • Fuel leaks • Damaged fuel lines • Damaged push connect fittings • Fuel contamination/grade/quality • Throttle body • Damaged fuel tank filler pipe cap • Damaged fuel tank filler pipe	• Fuses • Loose or corroded electrical connectors • Harnesses • Sensor(s) • Engine 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 Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Causes	Action
Engine cranks, but does not fire	• Engine breather system disconnected/restricted • Ignition system • Fuel system • Electronic engine control	Ensure the engine breather system is free from restriction and is correctly installed. Check for ignition system, fuel system and electronic engine control DTCs and refer to the relevant DTC Index
Engine cranks and fires, but will not start	• Evaporative emissions purge valve • Fuel pump • Spark plugs • HT short to ground (tracking) check rubber boots for cracks/damage • Ignition system	Check for evaporative emissions, fuel system and ignition system related DTCs and refer to the relevant DTC Index
Difficult cold start	• Engine coolant level/anti-freeze content • Battery • Electronic engine controls • Fuel pump • Purge valve	Check the engine coolant level and condition. Ensure the battery is in a fully charged and serviceable condition. Check for electronic engine controls, engine emissions, fuel system and evaporative emissions system related DTCs and refer to the relevant DTC Index



Item	Description
1	Pressure relief valve
2	To HP fuel lines
3	Check valve
4	Plunger
5	From LP fuel lines
6	Damper chamber
7	Fuel metering valve

In addition to the plunger, each HP fuel pump contains:

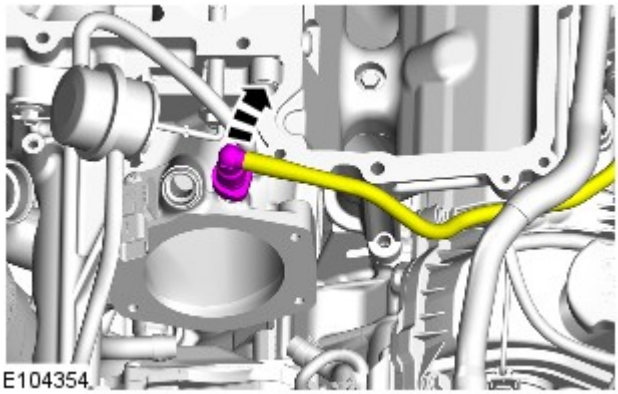
- A damper chamber
- A fuel metering valve
- A check valve
- A PRV (pressure relief valve).

The fuel metering valve regulates the output pressure from the HP fuel pump. The fuel metering valve is a normally open solenoid valve controlled by the ECM . During the inlet stroke of the plunger the fuel metering valve is de-energized, which allows LP fuel into the pumping chamber. The ECM energizes the fuel metering valve closed during the delivery stroke of the plunger, which forces the fuel in the pumping chamber through the check valve into the HP lines. By changing the closing point of the fuel metering valve, the ECM can determine the volume of fuel output during the delivery stroke, and thus the pressure in the HP side of the system.

The check valve prevents the return of HP fuel to the pumping chamber during the inlet stroke of the plunger.

The PRV protects the HP side of the system from excessive pressure if there is a failure of the fuel check valve. If the pump delivery pressure is excessive, the PRV opens and returns fuel to the inlet side of the plunger.

Fuel Rails and Crossover Tube



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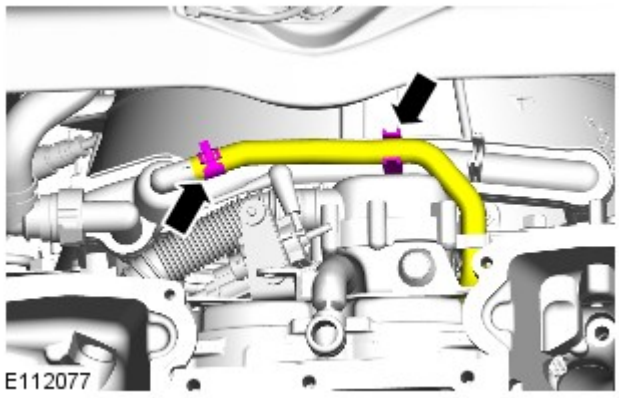

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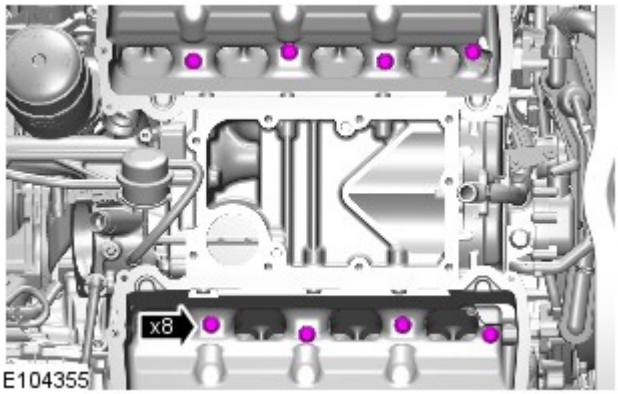
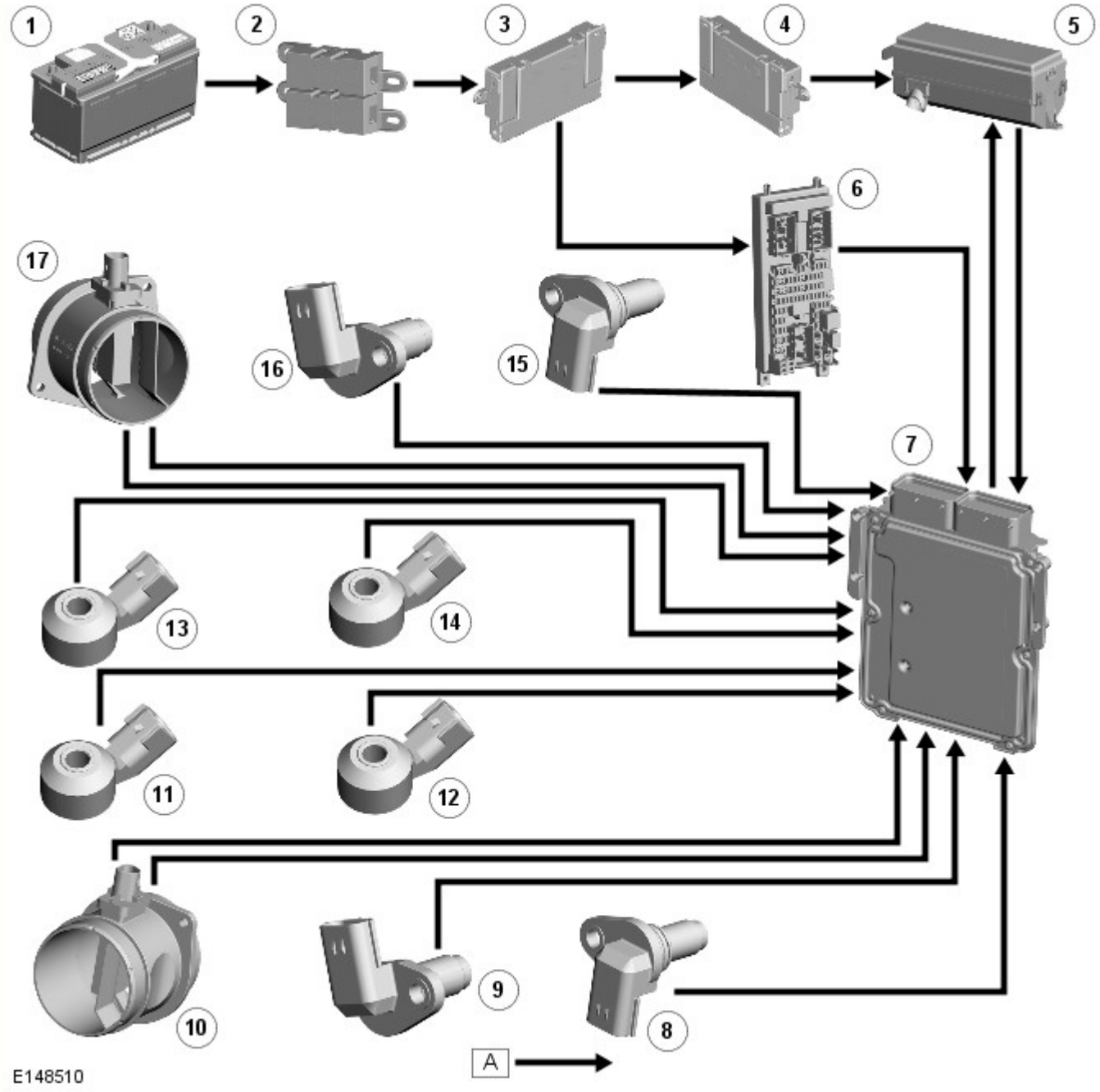


10.

- Discard the gaskets.

CONTROL DIAGRAM

Diagram 1 of 2



A = Hardwired.

Item	Description
1	Battery
2	Battery Junction Box 2 (BJB2)
3	Battery Junction Box (BJB)
4	Auxiliary Junction Box (AJB)
5	Engine Junction Box (EJB)
6	Central Junction Box (CJB)
7	Engine Control Module (ECM)
8	Left intake Camshaft Position (CMP) sensor
9	Left exhaust Camshaft Position (CMP) sensor
10	Left Mass Air Flow and Temperature (MAFT) sensor
11	Left front knock sensor
12	Left rear knock sensor

Published: 20-Oct-2016

Transfer Case - Vehicles With: Single Speed Transfer Case - Transfer Case

Diagnosis and Testing

Principles of Operation

For a detailed description of the Transfer Case - Single speed, refer to the relevant Description and Operation section in the workshop manual.
REFER to: Transfer Case (308-07B Transfer Case - Vehicles With: Single Speed Transfer Case, 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
• Transfer case • Driveshafts • Differentials • Halfshafts • Fluid 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

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
Warning message/gearbox fault displayed on instrument cluster	• Transfer case system fault	• Using the manufacturer approved diagnostic system, perform routine - Inline diagnostic unit 2 non-intrusive test -Transfer case • Pass - Recheck operation • Fail - Refer to the relevant DTC index
Whining noise	• Transfer case bearing/chain wear	• Using the manufacturer approved diagnostic system, perform routine - Noise, vibration and harshness sensor diagnostic test - Transfer case - Refer to the relevant section of the workshop manual and install a new transfer case chain - Refer to the relevant section of the workshop manual and install a new transfer case rear output shaft bearing

Vibration From Transfer Case

Published: 31-Jul-2012

Fuel System - General Information - High-Pressure Fuel System Bleeding

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 1650 bar (23,931 lb-sq-in). 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.

If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek immediate medical attention.

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:

Make sure that any protective clothing worn is clean and made from 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.

1. Set the ignition to the ON position.

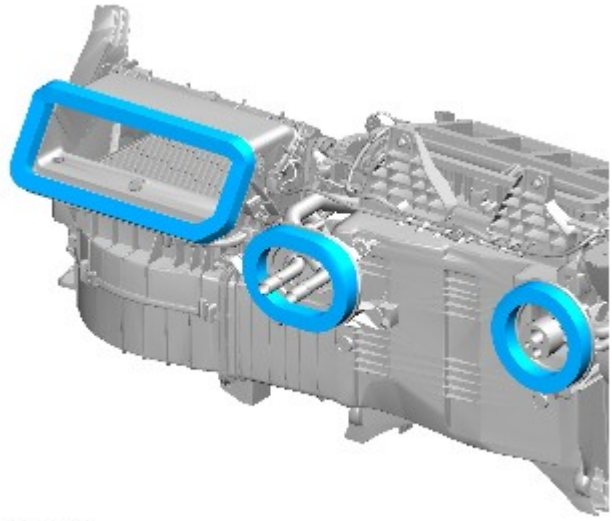
2. CAUTION: Do not crank the engine for more than 20 seconds.

   Start the engine.

3. NOTE: If the engine does not start, wait for 5 seconds and repeat step 2.

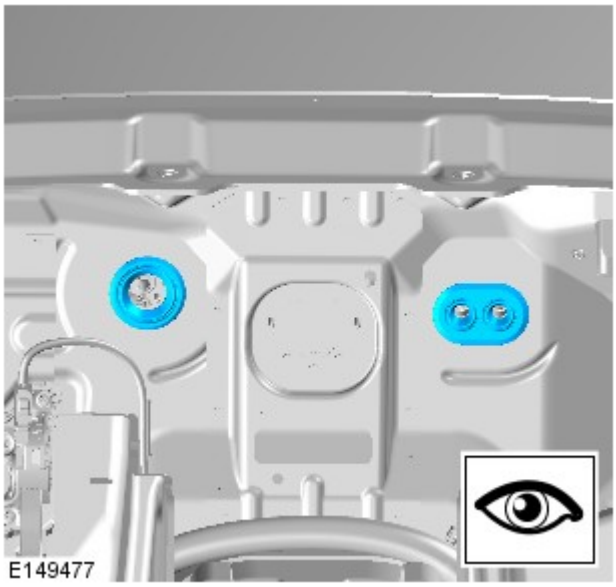
   Set the ignition to the OFF position.

	3	Turn A/C on and set to Hi/Hi
	4	Toggle left front distribution mode between face and foot
	Does air come out of the left face vents when in face mode and does air come out of the left foot vents when in foot mode? **Yes** Check the DTC's - has the DTC recurred? **A)** If the DTC has recurred go back to step 1 and repeat - if the DTC consistently recurring, check for obstruction/mechanical linkage problem/damage to recirculation door, if fault found repair. Clear the DTCs and retest. **B)** If the DTC has not recurred - no fault found **No** Check for obstruction/mechanical linkage problem/damage to recirculation door, if fault found repair. Clear the DTCs and retest. Check wiring - does left front face/feet distribution motor have power, ground and LIN connection to ECU? **A)** If wiring or LIN fault found - repair wiring. Clear the DTCs and retest. **B)** If no fault found, and there is sufficient power, ground and LIN connection is good, install a new left front face/feet distribution motor. Clear the DTCs and retest	
H12: RIGHT FRONT FACE/FEET DISTRIBUTION MOTOR OPERATION (B13F0-49, B13F0-87, B13F0-97)		
	1	Using the manufacturer approved diagnostic system, clear the DTCs
	2	Start the engine
	3	Turn A/C on and set to Hi/Hi
	4	Toggle right front distribution mode between face and foot
	Does air come out of the right face vents when in face mode and does air come out of the right foot vents when in foot mode? **Yes** Check the DTC's - has the DTC recurred? **A)** If the DTC has recurred go back to step 1 and repeat - if the DTC consistently recurring, check for obstruction/mechanical linkage problem/damage to recirculation door, if fault found repair. Clear the DTCs and retest. **B)** If the DTC has not recurred - no fault found **No** Check for obstruction/mechanical linkage problem/damage to recirculation door, if fault found repair. Clear the DTCs and retest. Check wiring - does right front face/feet distribution motor have power, ground and LIN connection to ECU? **A)** If wiring or LIN fault found - repair wiring. Clear the DTCs and retest. **B)** If no fault found, and there is sufficient power, ground and LIN connection is good, install a new right front face/feet distribution motor. Clear the DTCs and retest	
H13: REAR FACE/FEET DISTRIBUTION MOTOR OPERATION (B1B7D-49, B1B7D-87, B1B7D-97)		
	1	Using the manufacturer approved diagnostic system, clear the DTCs
	2	Start the engine
	3	Turn rear A/C on and set to Hi/Hi
	4	Toggle rear distribution mode between face and foot
	Does air come out of the rear face vents when in face mode and does air come out of the rear foot vents when in foot mode? **Yes** Check the DTC's - has the DTC recurred? **A)** If the DTC has recurred go back to step 1 and repeat - if the DTC consistently recurring, check for obstruction/mechanical linkage problem/damage to recirculation door, if fault found repair. Clear the DTCs and retest. **B)** If the DTC has not recurred - no fault found **No** Check for obstruction/mechanical linkage problem/damage to recirculation door, if fault found repair. Clear the DTCs and retest. Check wiring - does rear face/feet distribution motor have power, ground and LIN connection to ECU? **A)** If wiring or LIN fault found - repair wiring. Clear the DTCs and retest. **B)** If no fault found, and there is sufficient power, ground and LIN connection is good, install a new rear face/feet distribution motor. Clear the DTCs and retest	
H14: FRONT FACE/FEET DISTRIBUTION MOTOR OPERATION (B1434-49, B1434-87, B1434-97)		
	1	Using the manufacturer approved diagnostic system, clear the DTCs
	2	Start the engine
	3	Turn A/C on and set to Hi/Hi
	4	Toggle front distribution mode between face and foot
	Does air come out of the front face vents when in face mode and does air come out of the front foot vents when in foot mode? **Yes** Check the DTC's - has the DTC recurred? **A)** If the DTC has recurred go back to step 1 and repeat - if the DTC consistently recurring, check for obstruction/mechanical linkage problem/damage to recirculation door, if fault found repair. Clear the DTCs and retest. **B)** If the DTC has not recurred - no fault found **No** Check for obstruction/mechanical linkage problem/damage to recirculation door, if fault found repair. Clear the DTCs and retest. Check wiring - does front face/feet distribution motor have power, ground and LIN connection to ECU? **A)** If wiring or LIN fault found - repair wiring. Clear the DTCs and retest. **B)** If no fault found, and there is sufficient power, ground and LIN connection is good, install a new front face/feet distribution motor. Clear the DTCs and retest	
H15: AUXILIARY CLIMATE CONTROL FACE/FEET DISTRIBUTION MOTOR OPERATION (B13F1-49, B13F1-87, B13F1-97)		
	1	Using the manufacturer approved diagnostic system, clear the DTCs
	2	Start the engine
	3	Turn A/C on and set to Hi/Hi
	4	Toggle rear climate distribution mode between face and foot



E149476

NOTE: Install new seals.



E149477

2. NOTE: Make sure that the grommets are correctly seated.

E149095

3. NOTE: Install the trim retaining clips in the moulding prior to installing the components.

4. To install, reverse the removal procedure.

Published: 16-Mar-2013

Auxiliary Climate Control - Fuel Fired Booster Heater Control Module

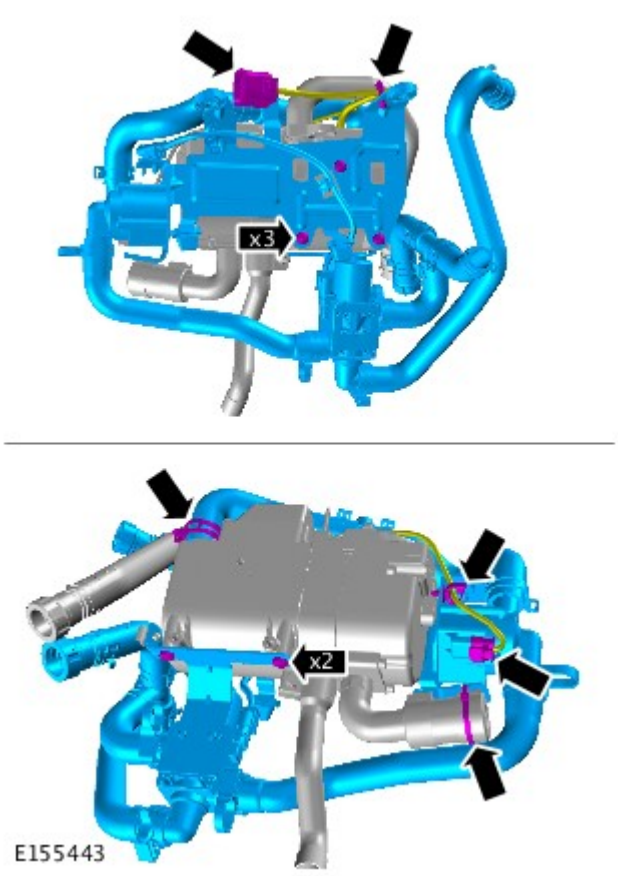
Removal and Installation

Removal

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

1. Refer to: Fuel Fired Booster Heater (412-02A Auxiliary Climate Control, Removal and Installation).

2.



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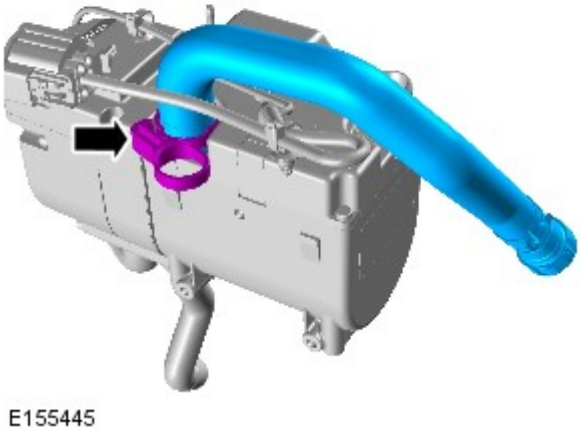


Published: 29-Oct-2013

Parking Aid -

Description	Nm	lb-ft	lb-in
Parking aid module retaining bolts	10	7	-
Parking aid camera module retaining bolts	10	7	-

The Hybrid Electric Vehicle (HEV) systems are controlled by software contained within the ECM (engine control module) . This software is sometimes referred to as the Vehicle Supervisory Controller (VSC).

The following components comprise the HEV system:

- Engine Control Module (ECM)
- HEV battery
- Electric Power Inverter Converter (EPIC)
- Motor Generator (MG)
- EPIC coolers
- EPIC coolant pump
- MG coolant pump
- High voltage cables
- Air Conditioning (A/C) for battery cooling.
  For additional information, refer to: Air Conditioning (412-01B Climate Control - SDV6 3.0L Diesel - Hybrid Electric Vehicle, Description and Operation).

The HEV battery pack comprises the HEV battery and the EPIC which are contained in an HEV battery pack cradle. The cradle is attached to the underside of the floorpan.

The HEV battery comprises 72 6.9 Ah Li-ion battery cells which are connected series with a total nominal battery voltage of 260 volts, and a capacity of 1.7 kWh. The HEV battery supplies power to operate the Motor Generator (MG) to propel the vehicle under electric power. The battery also supplies power to additional electrical components, for example electric Air Conditioning (A/C) compressor. The battery is cooled by its own dedicated cooling system and the vehicle A/C system.

The EPIC is located in the HEV battery pack cradle, forward of the HEV battery. The EPIC converts high voltage Direct Current (DC) to 12V DC to support the vehicle electrical loads.

The EPIC has two modes of operation:

- Motor mode - which applies 3 phase current from the HEV battery to the MG to propel the vehicle
- Generator mode - applies 3 phase current from the MG to charge the HEV battery and supply 12V DC to the vehicle electrical system.

The EPIC is cooled by coolant from the engine coolant circuit, but is a unique circuit from the engine cooling system. Coolant is circulated by a dedicated EPIC coolant pump and cooled by two EPIC coolers located forward of the radiator.

The MG is connected to the engine and the automatic transmission and is located on the transmission input shaft. When the vehicle engine is running the dual mass flywheel, attached to the MG, functions as conventional dual mass flywheel. The engine disconnect clutch within the MG is used to connect and disconnect the drive from the engine to the transmission. For further information on the dual mass flywheel and disconnect clutch, refer to the Transmission
For additional information, refer to: Transmission Description (307-01C Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed - Hybrid Electric Vehicle - Automatic Transmission – AWD, Description and Operation).

On vehicle deceleration the MG applies regenerative braking to apply a charging current to the HEV battery pack and assist the vehicle braking system. For details on regenerative braking refer to Braking Control System
For additional information, refer to: Braking Control System - SDV6 3.0L Diesel - Hybrid Electric Vehicle (206-11 Brake Controls, Description and Operation).
When the vehicle is operating under electrical power, the MG operates as an electric motor to provide drive through the automatic transmission using power from the HEV battery.

The MG is cooled by coolant from the engine coolant circuit. Coolant is circulated by a dedicated MG coolant pump.

The ECM HEV software can operate both the vehicle engine and HEV system simultaneously to provide the optimum and most efficient delivery of torque to the transmission.

OVERVIEW - DUAL BATTERY SYSTEM WITH STOP/START SYSTEM

Two batteries are fitted to support the stop/start system.
For additional information, refer to: Starting System (303-06A Starting System - TDV6 3.0L Diesel - Gen 2/TDV6 3.0L Diesel - Gen 1.5, Description and Operation).

A primary battery is located in the luggage compartment floor in a plastic molded tray and clamped in position by the air suspension air supply unit.

On stop/start system vehicles, a secondary battery is located in the right side of the luggage compartment on a battery support tray and secured with a strap bolted to the tray.

- The primary battery is a 90Ahr, 850CCA Absorbed Glass Mat (AGM) Valve Regulated Lead-Acid (VRLA) battery on all vehicles.
- The secondary battery is a 14Ahr, 200CCA AGM battery on all vehicles with stop/start.

A Battery Monitoring System (BMS) control module is mounted on the primary battery negative terminal. The BMS control module is integral with the battery negative cable and is controlled by the Gateway Module (GWM).

The secondary battery is not fitted with a BMS control module.

Published: 08-Jul-2013

Battery, Mounting and Cables - Electric Power Inverter Converter (EPIC)

Removal and Installation

Removal

WARNING: This procedure can only be carried out after the vehicle has been decommissioned, by an approved person.

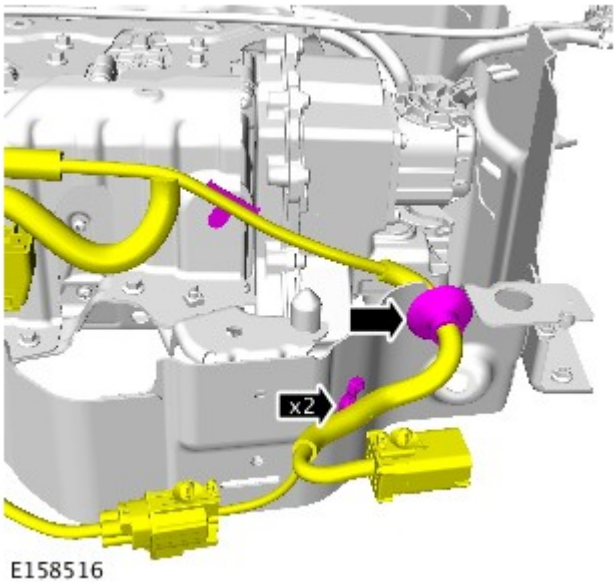
NOTES:

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: Hybrid Electric Vehicle (HEV) Battery Pack Cradle (414-01 Battery, Mounting and Cables, Removal and Installation).

2.



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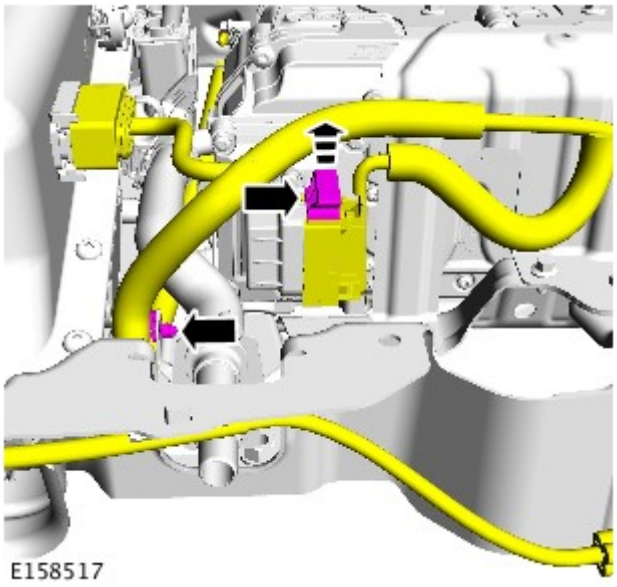


4. *Torque:* 10 Nm

Published: 18-Dec-2012

Generator and Regulator - GTDi 2.0L Petrol - Generator - Overview

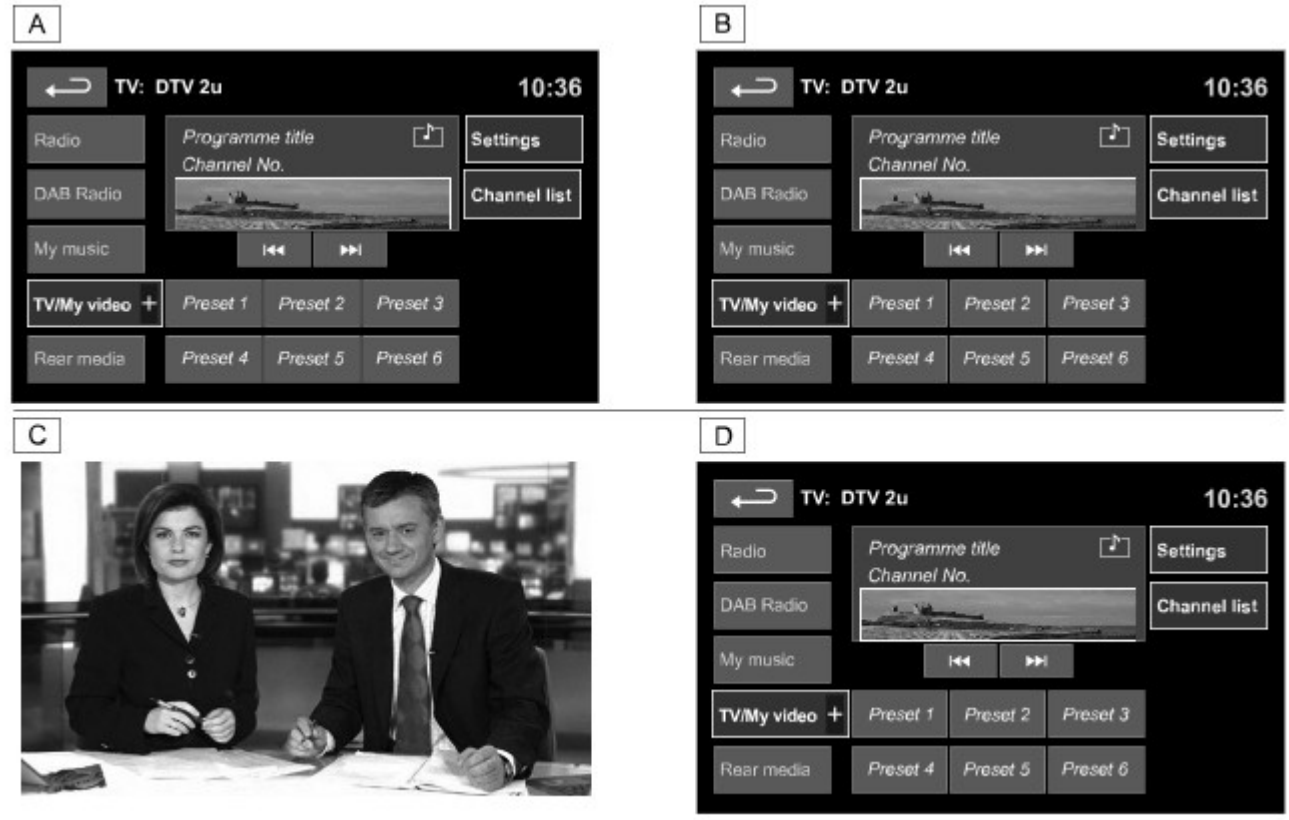
Description and Operation

OVERVIEW

On all engines, with the exception of GTDi 2.0L Petrol, the generator is mounted on the front right side of the engine and is driven at approximately three times engine speed by the accessory drive belt. The generator on GTDi 2.0L Petrol engines is mounted on the front left side of the engine.

The charging system consists of a generator and regulator assembly and a Gateway Module (GWM). The generator and regulator assembly generates electrical power for the vehicle electrical system and maintains the primary battery and the secondary battery (where fitted) in a charged state. The rate of charge for the primary battery and the secondary battery (where fitted) is controlled by the Gateway Module (GWM).

When the engine is running the generator produces an Alternating Current (AC), which is converted to a Direct Current (DC) internally. The output from the generator is controlled by the voltage regulator (located inside the generator) and then supplied to the primary battery through the Battery Junction Box (BJB) to the primary battery positive cable.



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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 the source on the TS.

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. The passenger's can choose to use headphones 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, for example, if reverse gear were to be selected, the rear view camera will be displayed automatically, overriding the currently displayed information.

CLOCK

The CJB (central junction box) contains the master clock functionality. Other vehicle infotainment system modules that require clock functionality use the time supplied from the CJB .

The clock is available to any control module that is connected to an interconnecting bus, for example, either of the CAN buses or the MOST ring.

The clock display is configurable to show in AM / PM or 24 hour format. Midnight is shown as 12:00AM or 00:00 respectively. The default condition, if not specified, after power on or delivery, should default to 12:00PM or 00:00. Depending upon the market set, the clock will default to either 12 or 24 hour format.

The time is adjusted from the TS. Under conditions when any bus system could be asleep or shut down, the TS does not allow clock adjustments.

Integrated Audio Module (IAM)

NOTE: IAM3 version shown, not all connectors are present on IAM versions 1 and 2

Published: 17-Dec-2013

Exterior Lighting - Front Fog Lamps

Diagnosis and Testing

Principle of Operation

For a detailed description of the exterior lighting system and operation, refer to the relevant description and operation section of the workshop manual. REFER to: Exterior Lighting (417-01 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 mechanical or electrical damage

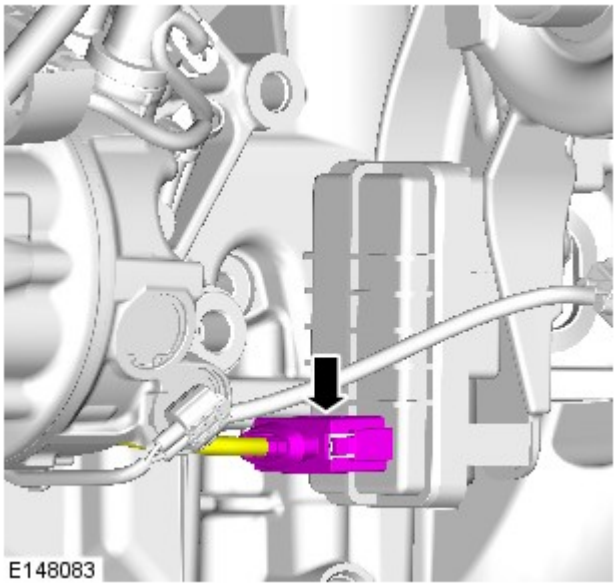
Visual Inspection

Mechanical	Electrical
• Front fog lamp condition and installation • Bulb and installation • Bulb holder and installation • Adjuster screw • Lighting control switch condition and installation	• Fuses • Wiring harness • Loose or corroded connector(s) • Front fog lamp relay • Front fog lamp warning indicator • Lighting control switch • Battery junction box • Central junction box

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	Possible Causes	Action
Front fog lamp inoperative	• Bulb failure • Fuse(s) blown • Circuit fault • Lighting control switch inoperative	Check the bulb condition. Check the fuse(s). Check the front fog lamp circuits. Check the lighting control switch function. Refer to the electrical guides
Front fog lamp dim	• Incorrect bulb rating • Circuit fault • Lighting control switch fault	Check the bulb condition and rating. Check the front fog lamp circuits. Check the lighting control switch function. Refer to the electrical guides
Front fog lamp lighting coverage poor	• Front fog lamp alignment incorrect	Check and adjust front fog lamp alignment
Front fog lamp warning indicator inoperative	• Fuse(s) blown • Lighting control switch inoperative • Circuit fault • Instrument cluster fault	Check the fuse(s). Check the lighting control switch function. Check the warning lamp circuits. Refer to the electrical guides. Check for DTCs indicating an instrument cluster fault



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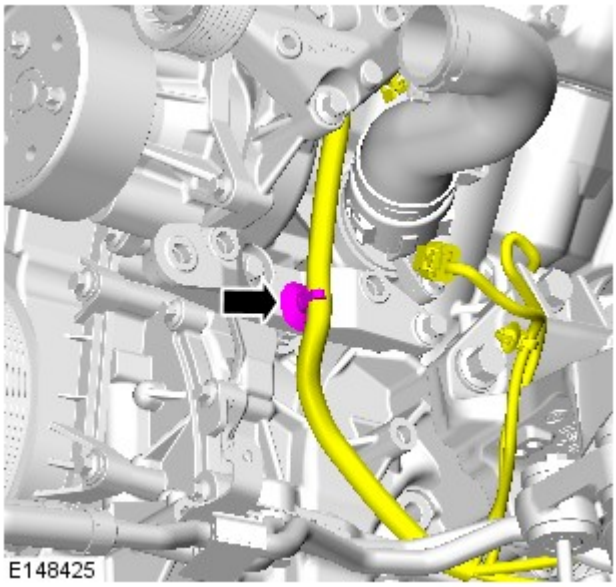

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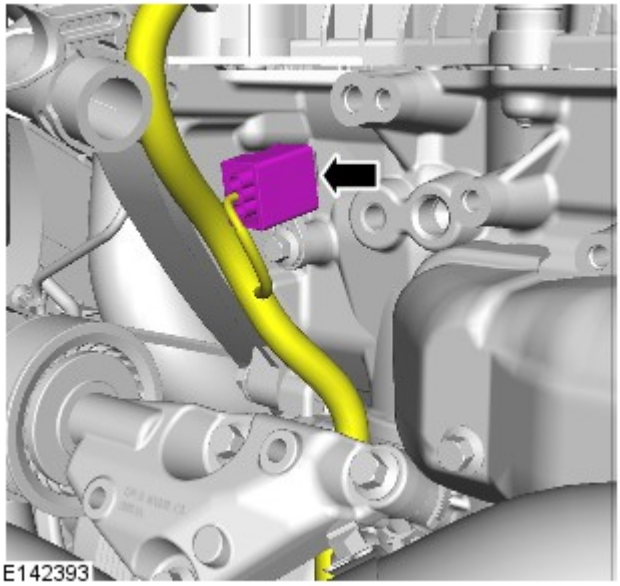
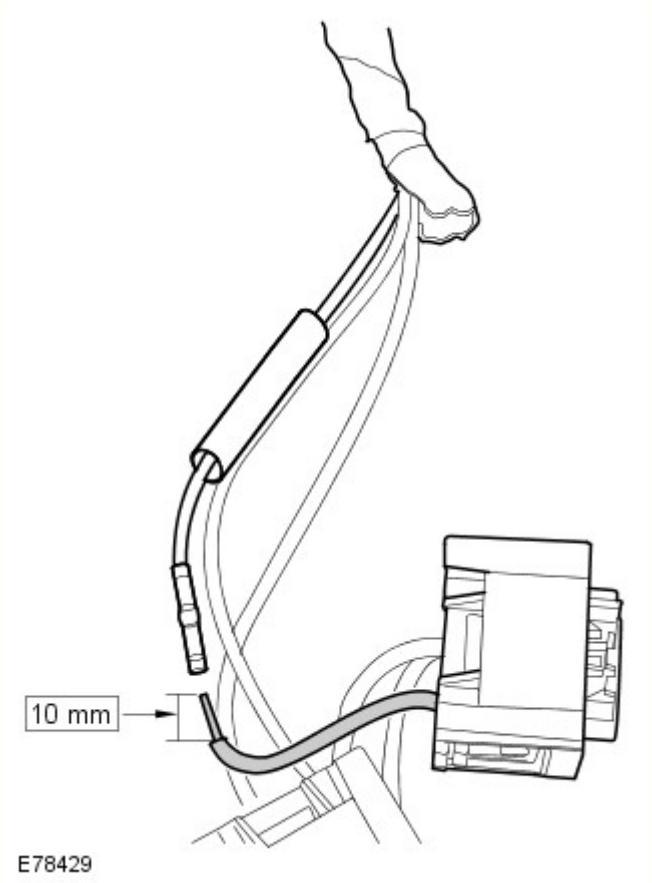


8. *Torque:* 9 Nm

8. Select the appropriate wire on the overlay harness that also goes to cavity 1 of the new connector, cut to the correct length and remove 10mm of insulation.



9. Insert the overlay wire into the connector and crimp in place.

CAUTION: Care must be taken when using the heat gun to avoid damage to surrounding areas.

10. Slide the heatshrink over the connector and using a hot air gun carefully apply the heat until the glue appears at both ends.

Published: 06-Aug-2012

Front End Body Panels - Cowl Panel Grille

Removal and Installation

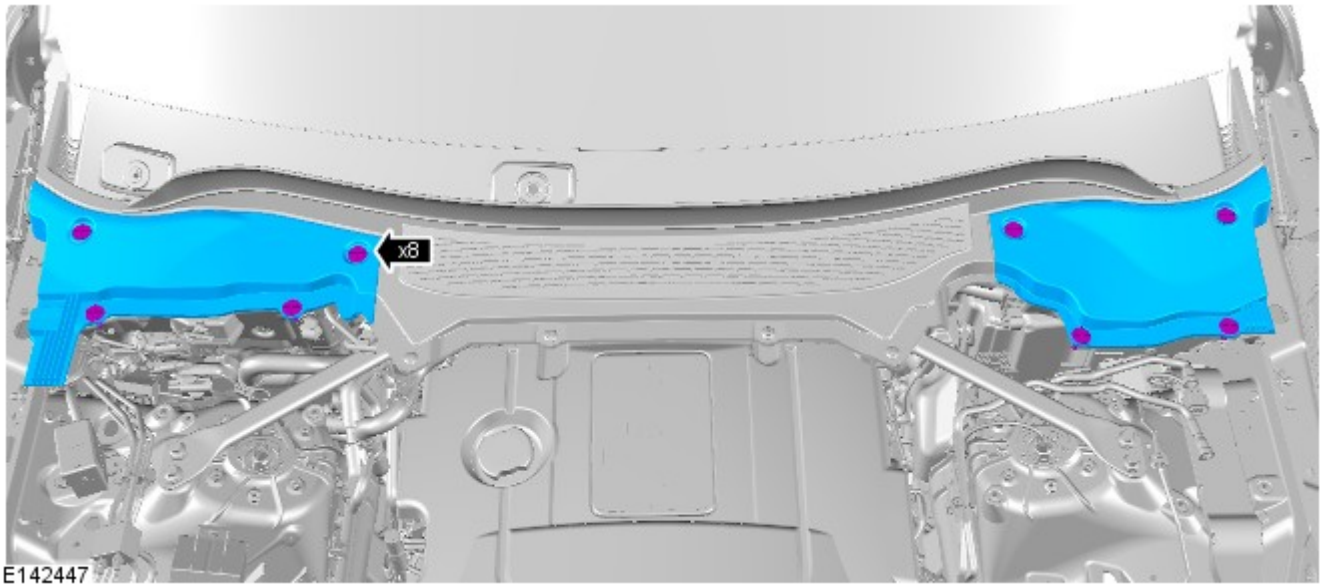
Removal

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

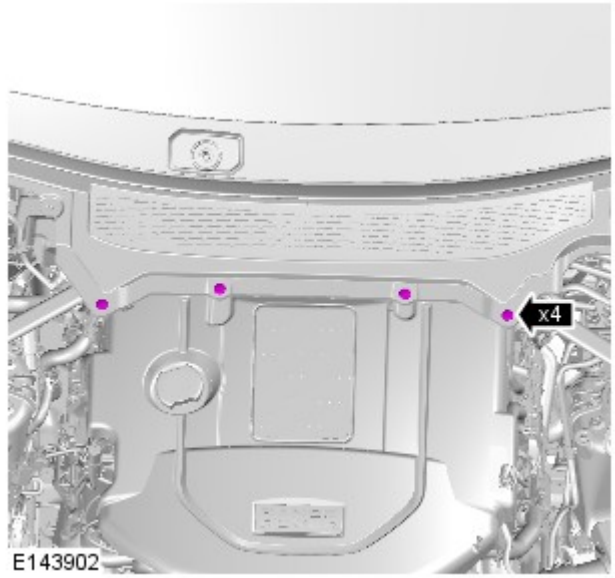
1. NOTE: Repeat the procedure for the other side.

   Refer to: Windshield Wiper Pivot Arm (501-16 Wipers and Washers, Removal and Installation).

2.



3.



4.

Published: 05-Dec-2013

Body Closures - Rear Door Long Wheelbase

Removal and Installation

Removal

NOTES:

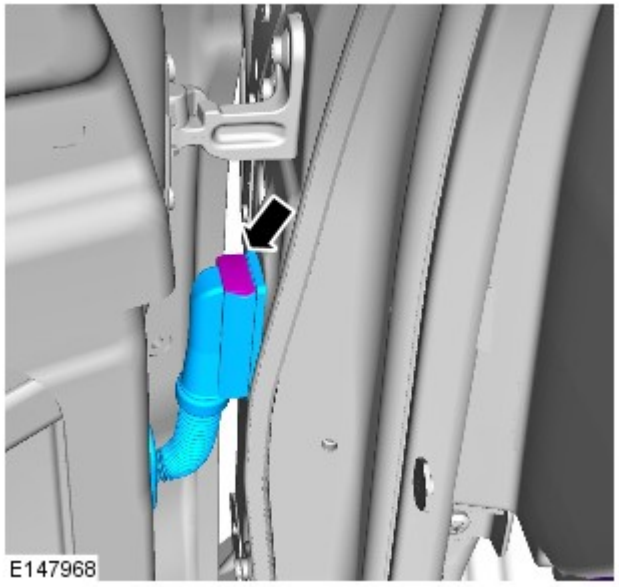
Some variation in the illustrations may occur, but the essential information is always correct.

Removal steps in this procedure may contain installation details.

1. Disconnect the battery ground cable.

Refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

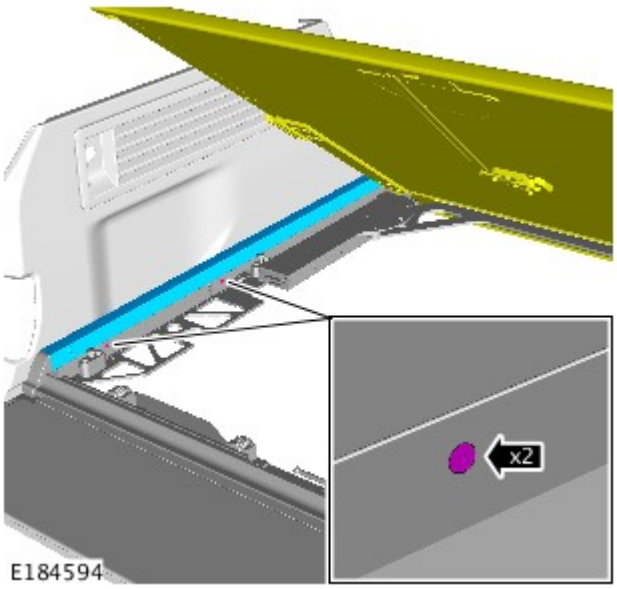
2.



3. NOTE: This step requires the aid of another technician.

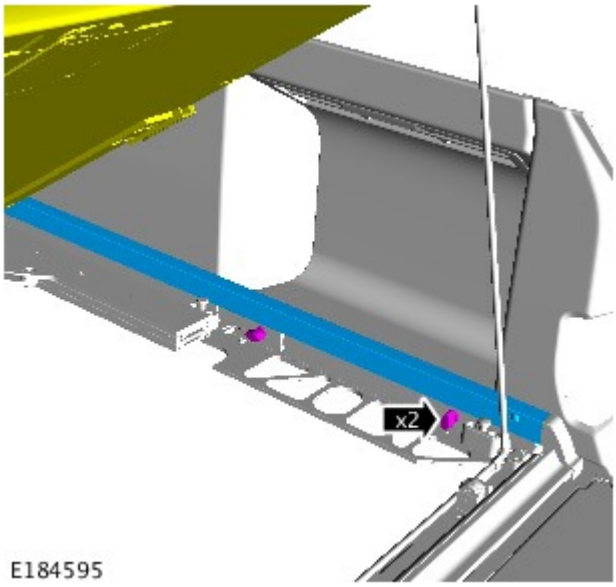
Torque:

M8 24 Nm
M7 13 Nm



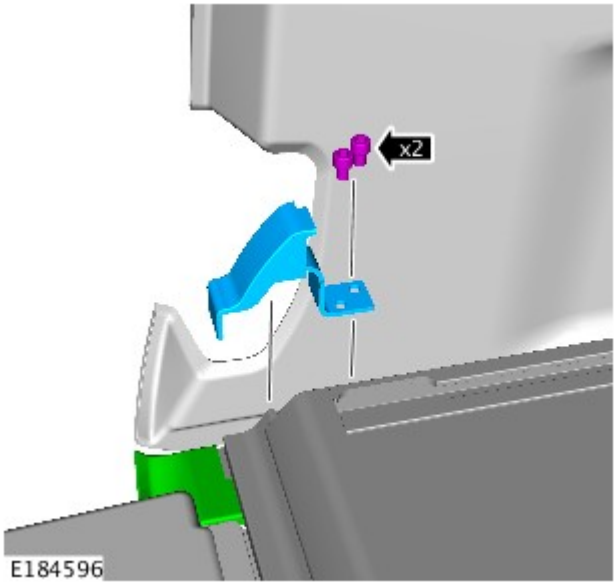
3. CAUTION: Protect the surrounding components.

General Equipment: Laminated card



4. CAUTION: Protect the surrounding components.

General Equipment: Laminated card

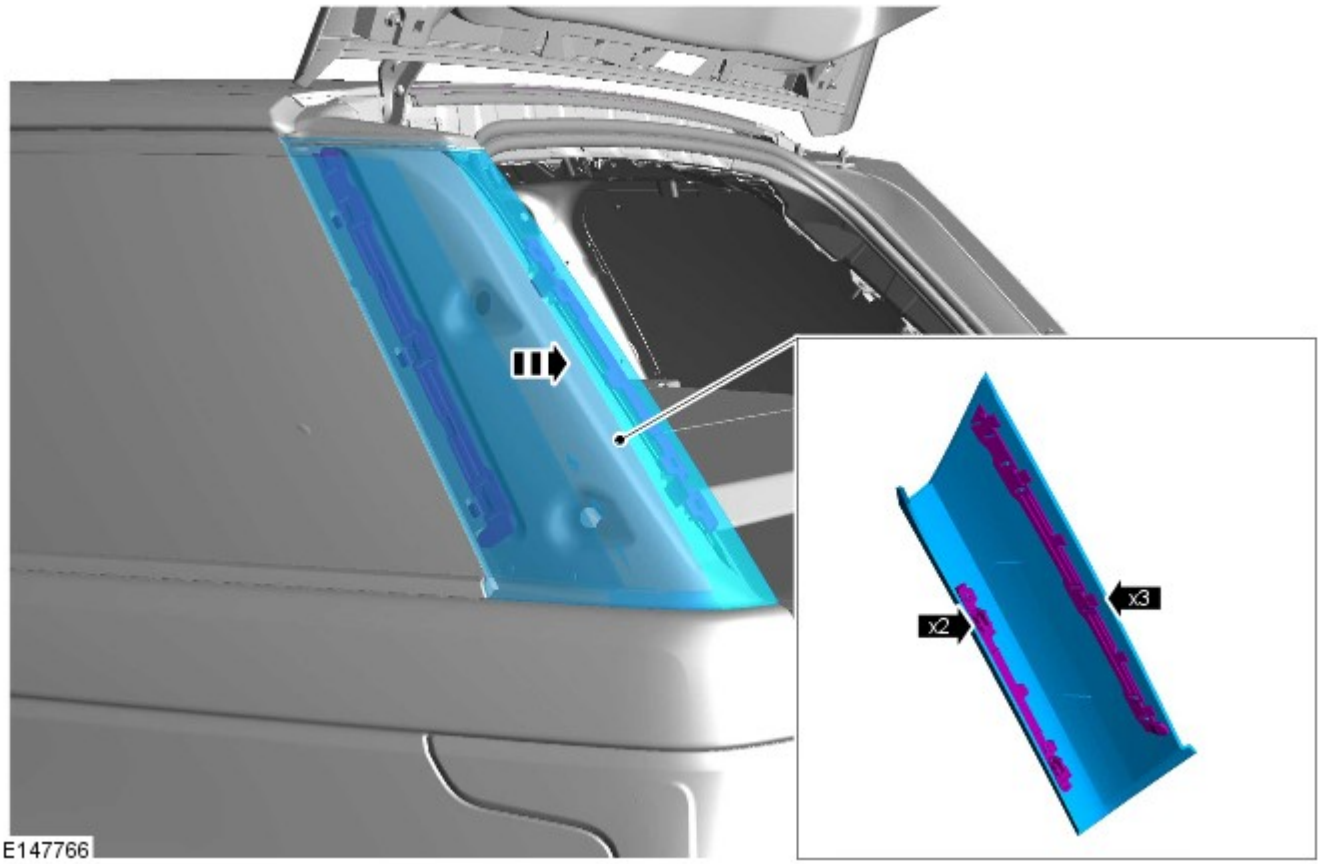


5. CAUTION: Protect the surrounding components.

Repeat procedure for the other side.

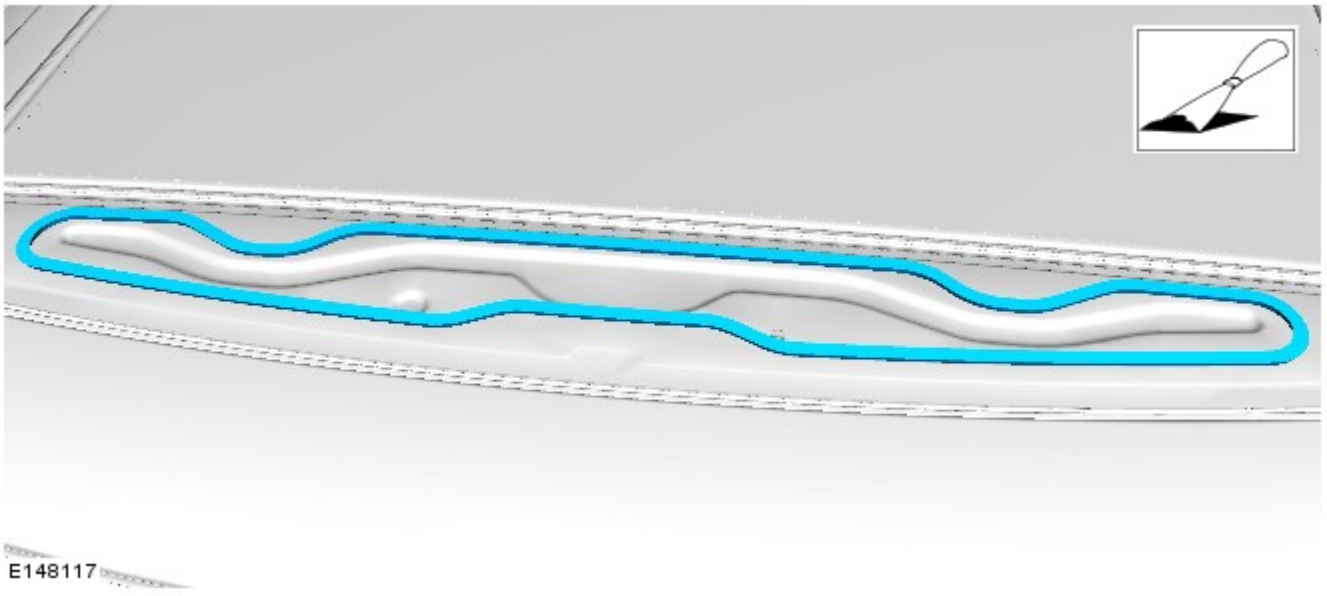
General Equipment: Laminated card

6.



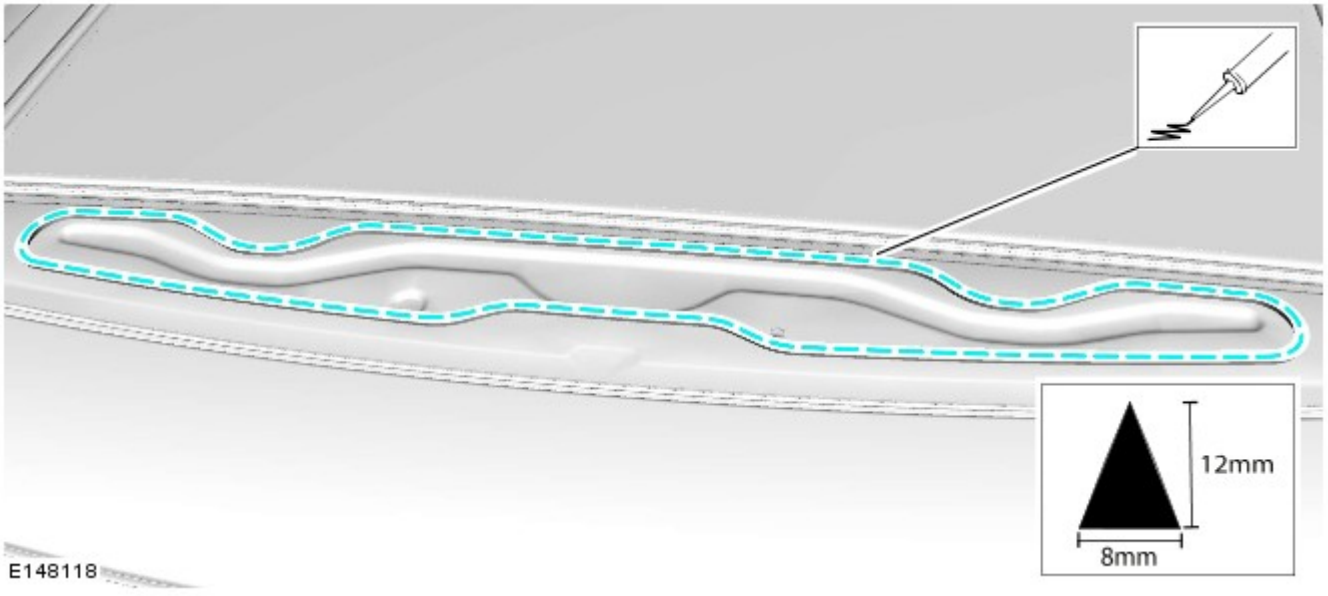
Installation

1. To install, reverse the removal procedure.



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.

Front Seats

Various options are available for the front seats with regard to temperature control and electrical adjustment. Seats are heated or heated and cooled (climate), with the following adjustment options:

- 8-way adjustment on the driver and passenger seats.
- 12-way adjustment on the driver and passenger seats.
- 18-way adjustment on the driver and passenger seats.
- 20-way adjustment on the driver and passenger seats.

8-way adjustments consist of seat slide, seat height, backrest recline and 2-way lumbar adjustment. 12-way adjustment adds cushion tilt and 4-way lumbar. 18-way adjustment adds cushion extension, front power head restraints and adjustable 2 way backrest seat bolsters. 20-way adjustment adds seat massage. The controls for seat adjustment are installed in the outboard side shield of the related seat cushion.

The driver seat on all variants 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 / 20-way adjustment also have a 3-channel memory. The controls for memory operation are in the related front door trim panel. Lumbar and backrest seat bolster settings are not included in the memory function.

20-way adjustment seats also incorporate 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 Touch Screen (TS).

Operation of the temperature settings for heated and climate seats is controlled from the Climate / Front Climate / Front Seats menu of the TS.

A storage pocket is installed on the rear of each front seat backrest.

Rear Seats

The following options are available for the two outer rear seats:

- Heated seats.
- Climate seats.
- Recline function.
- Front passenger seat away function.
- Massage seats - business seats only.
- Calf rest - business and autobiography seats only.
- Manual (trim level 3 and 4) or power fold (trim level 5 and 6).

Operation of the temperature settings for heated and climate seats is controlled from the rear climate control panel and/or the Climate / Rear Climate / Rear Seats menu of the TS.

ISOFIX fastening points are attached to the seat frame to provide secure fastening for compatible child seats in the rear seats.

Depending on the vehicle specification, two variants of the rear seats are available; a 60/40 split rear seat which allows for three occupants or a business class rear seat for two occupants with an extended rear floor console between the seats. The rear business class seats have a memory function, with a memory switchpack located in each door trim panel.

Some models have a seat away switch located on the inside of the passenger seat backrest. The switch allows the driver or rear seat passenger to move the passenger seat forward to allow additional legroom for the rear occupant. On vehicles with business rear seats, an additional seat away switch is located in the rear floor console.

The rear business seats have a 3-channel memory for easy recall of stored position settings for the seat. The controls for memory operation are in the related rear door trim panel. Lumbar and backrest seat bolster settings are not included in the memory function.

The business and autobiography rear passenger seats have a calf rest fitted. This is only fitted on one side of the rear passenger seats. For example; if the vehicle is RHD (right hand drive) the calf rest will be located on the left side of the rear passenger seat.

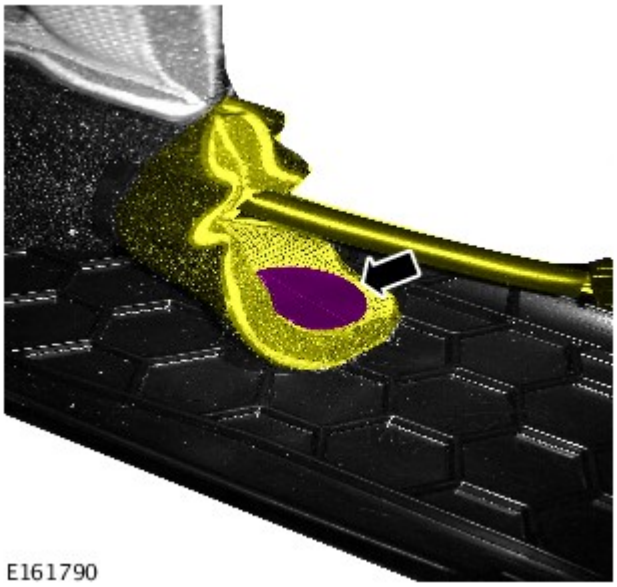
DESCRIPTION

Front Seat Adjustment

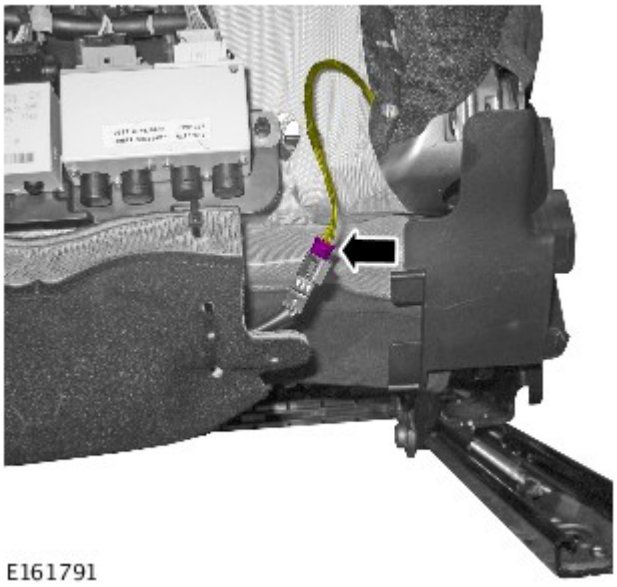
Electric motors are used to provide adjustment of seat slide, seat height, backrest recline and, where fitted, cushion tilt, head restraint, upper backrest adjustment and cushion extension. An air pump and inflatable cushions are used to provide adjustment of the lumbar support and the backrest seat 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 passenger seats, the control switches are connected directly to the adjustment motors. On memory seats, the switches are connected to the adjustment motors via driver and/or passenger seat control modules. The seat control module is located on the underside of each front seat. Memory seats also have a memory switchpack in the related door trim panel.

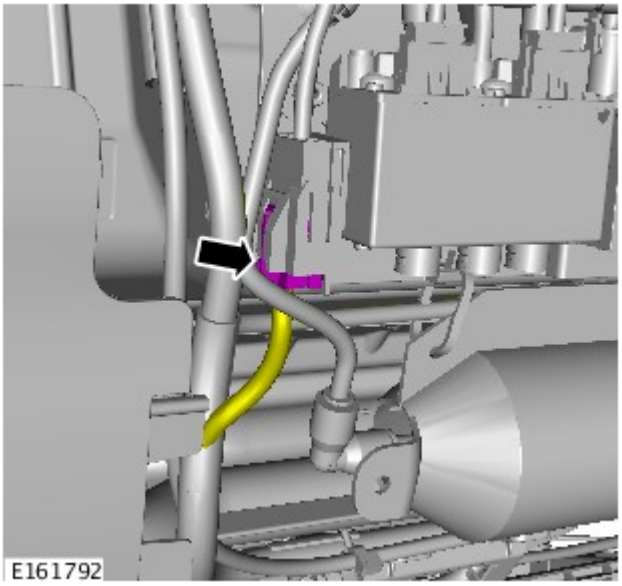
Adjustment Switches



15.



16.



17.

Published: 11-Dec-2013

Seating - Long Wheelbase - Front Seat Head Restraint

Removal and Installation

Removal

NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

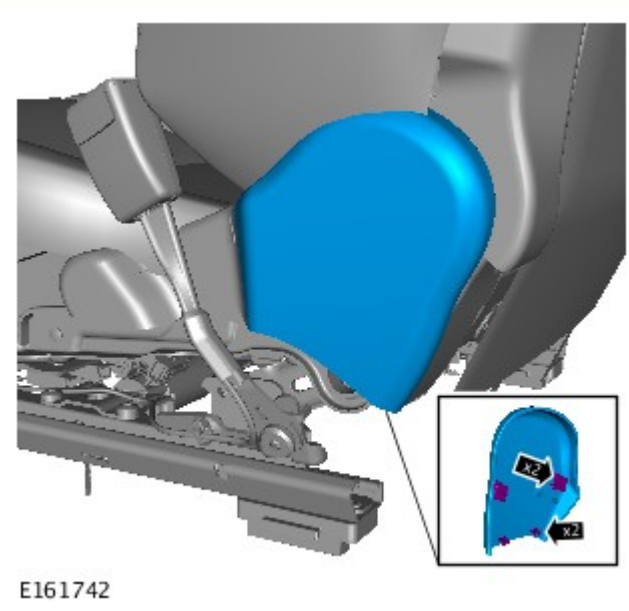
Removal steps in this procedure may contain installation details.

1. Refer to: Front Seat (501-10B Seating - Long Wheelbase, Removal and Installation).

2.

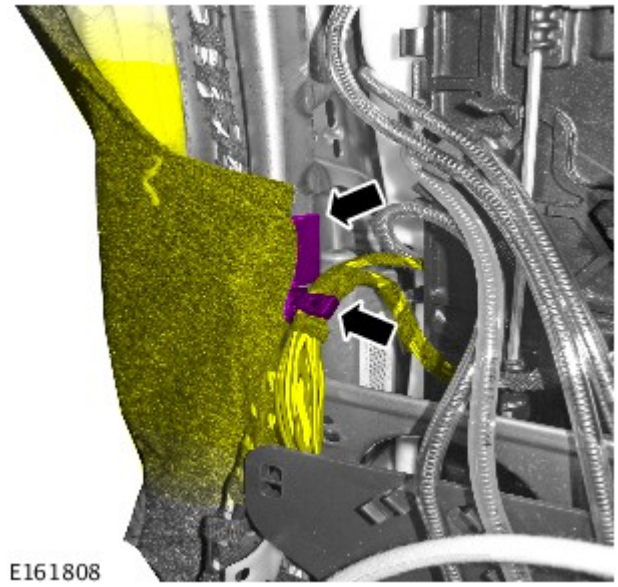
E143833

3.

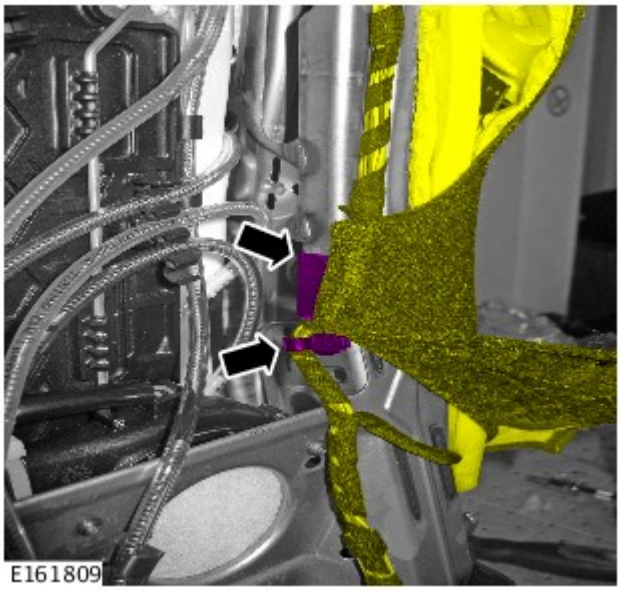


E161742

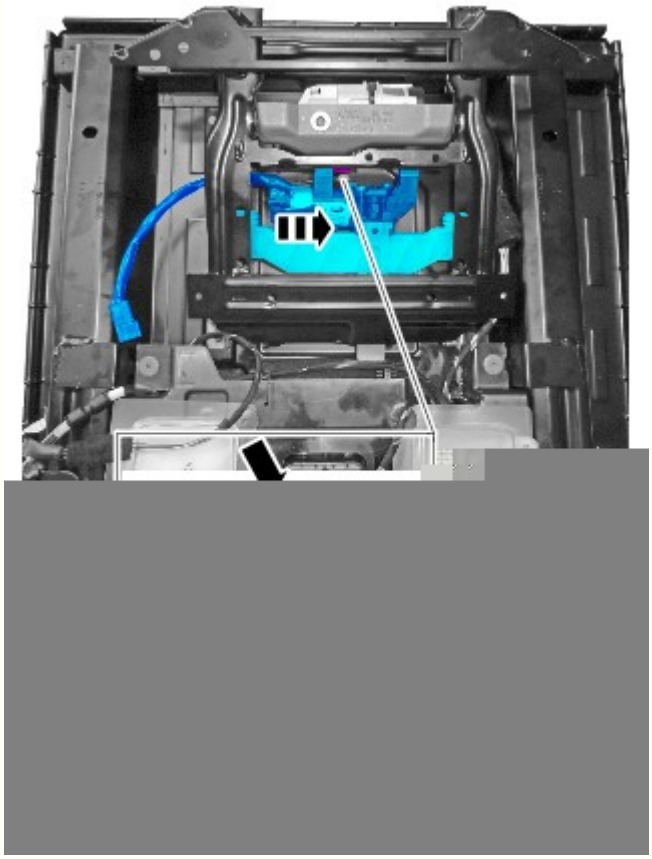
4.



44.

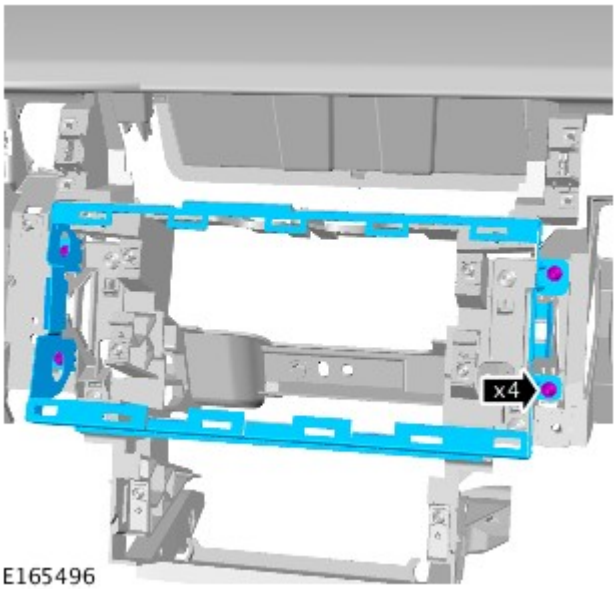


45.

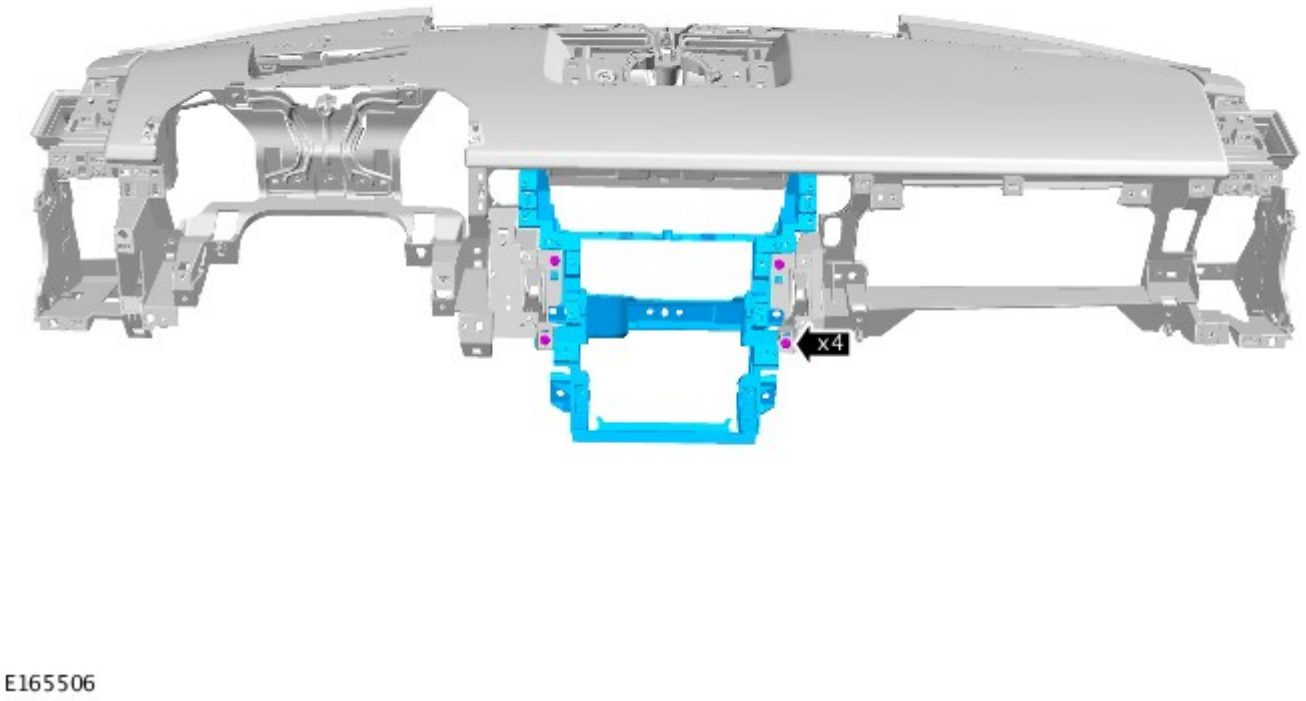


Installation

1. To install, reverse the removal procedure.

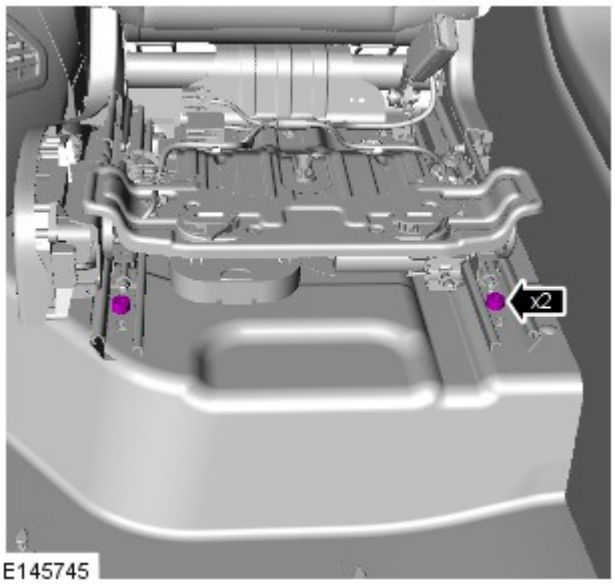


43. *Torque:* 9 Nm



Installation

1. NOTE: Install the trim retaining clips in the moulding prior to installing the components.



E145745


E145743

4. NOTE: Repeat the procedure for the other side.

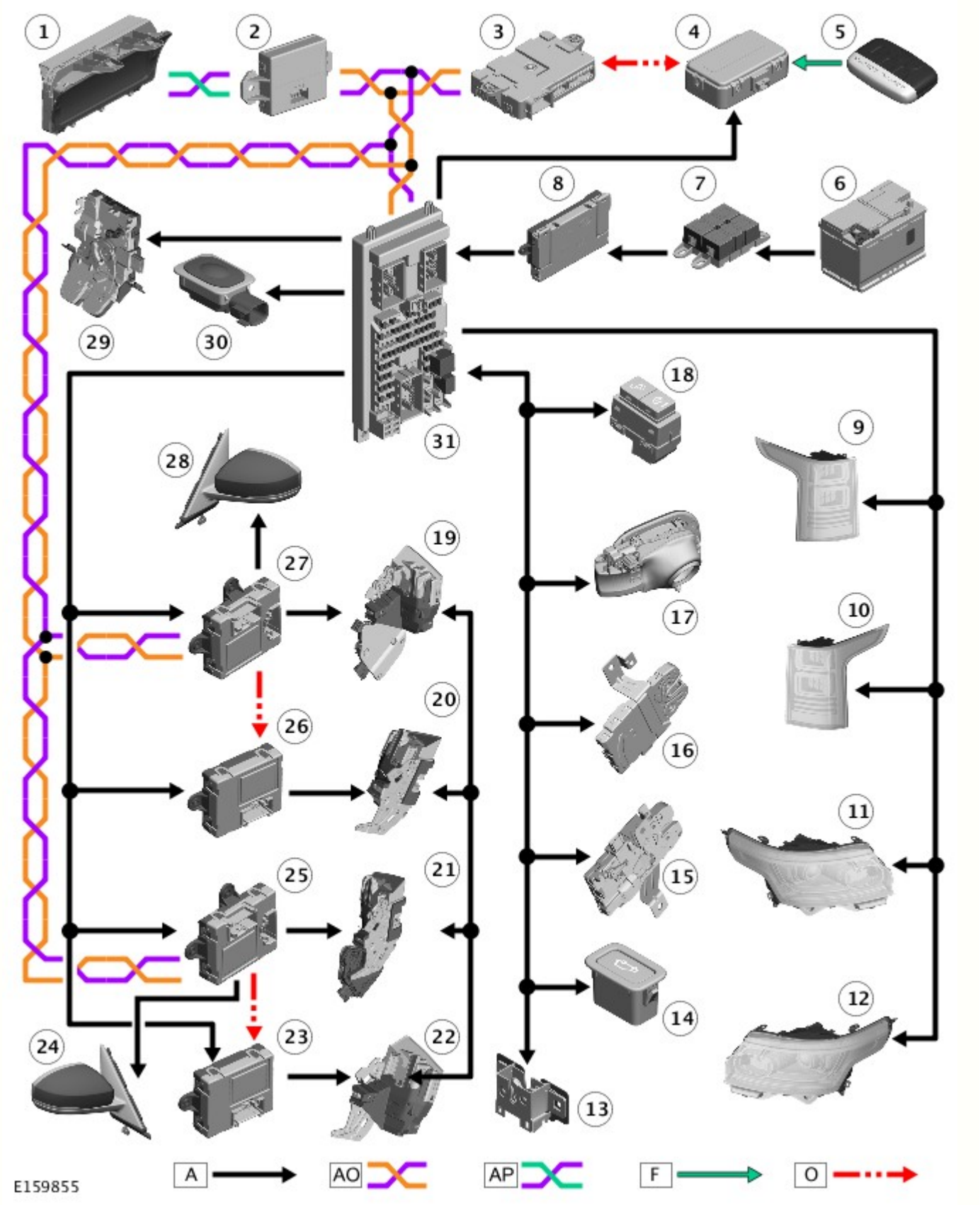
E146116

5. NOTE: Repeat the procedure for the other side.

Torque: 50 Nm

E149095

2. To install, reverse the removal procedure.



A = Hardwired; AO = Medium speed CAN (controller area network) body systems; AP = Medium speed CAN comfort and convenience systems; F = RF transmission; O = LIN (local interconnect network) bus.

Item	Description
1	Instrument Cluster (IC)
2	Gateway Module (GWM)
3	Keyless Vehicle Module (KVM)
4	Radio Frequency (RF) receiver
5	Smart key

Published: 23-Sep-2014

Wipers and Washers - Rear Window Wiper Motor

Removal and Installation

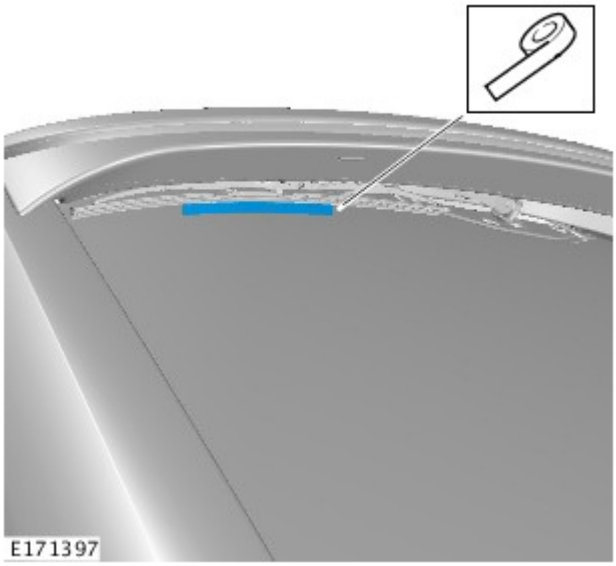
Removal

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

1. Remove the battery ground cable.

Refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Refer to: Rear Spoiler (501-08 Exterior Trim and Ornamentation, Removal and Installation).



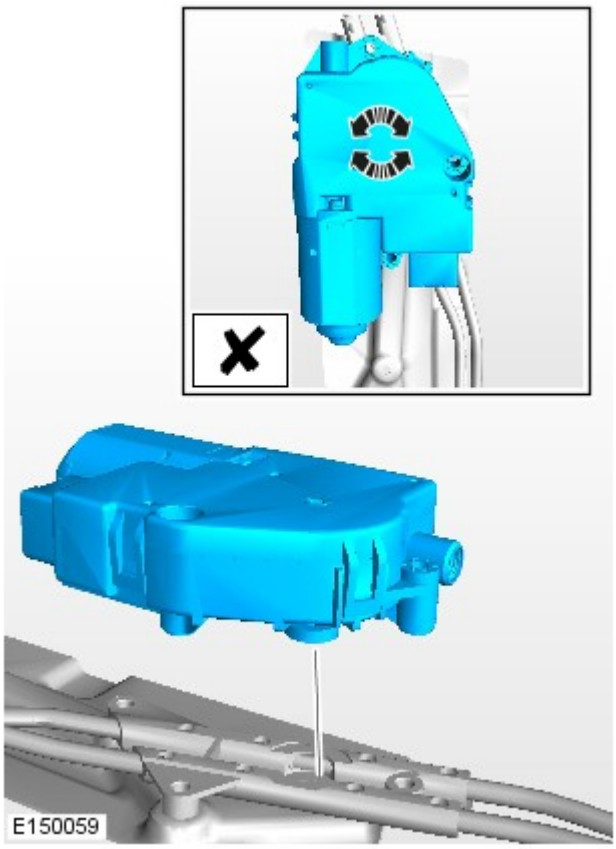
3. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Use a suitable piece of tape to mark the position of the rear wiper blade on the rear glass.

4. NOTE: Make sure that the rear wiper blade aligns with the tape that was installed in the removal procedure.

Torque: 14 Nm

5. *Torque:* 4.1 Nm



Refer to: Power Roof Opening Panel Initialization (501-17 Roof Opening Panel, General Procedures).

Published: 14-May-2013

Bumpers - Rear Bumper

Removal and Installation

Removal

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

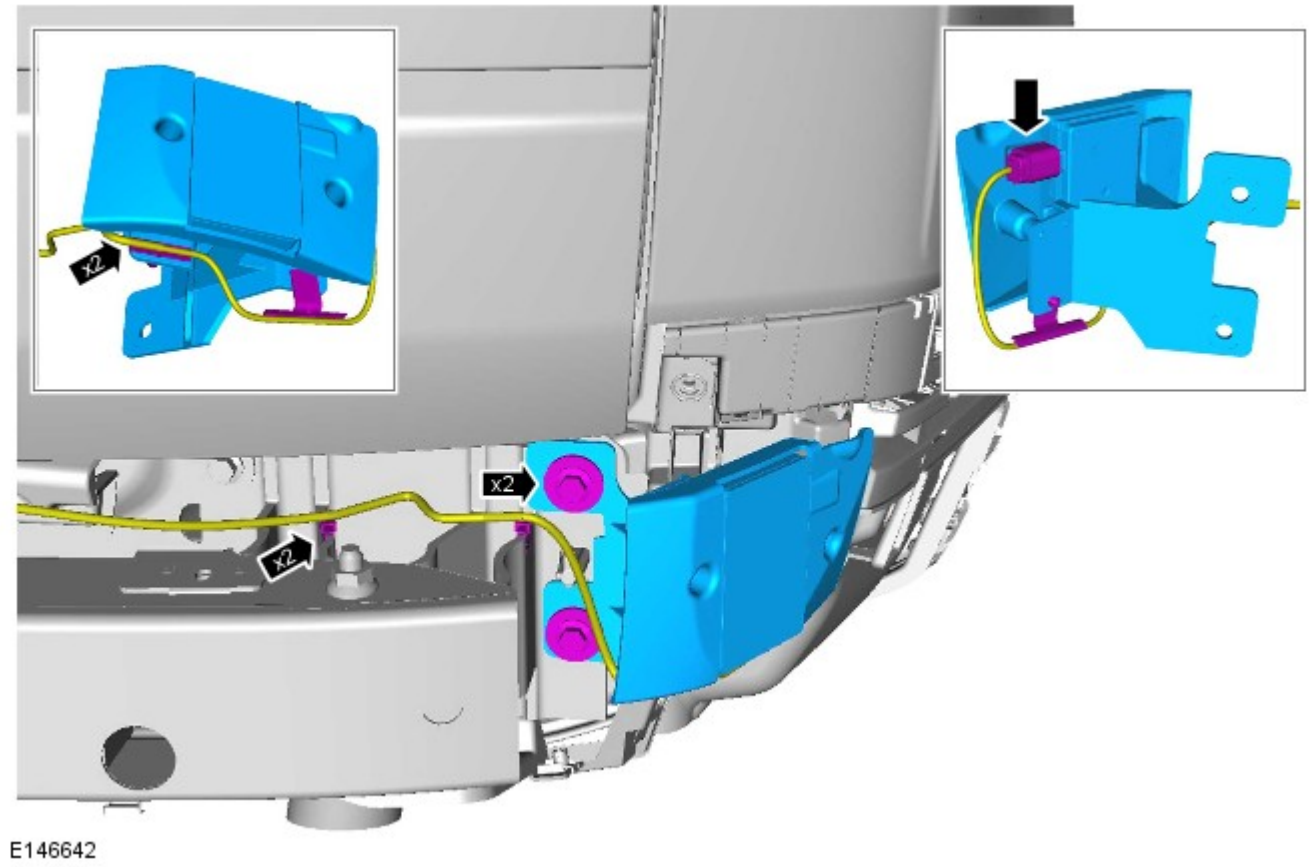
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

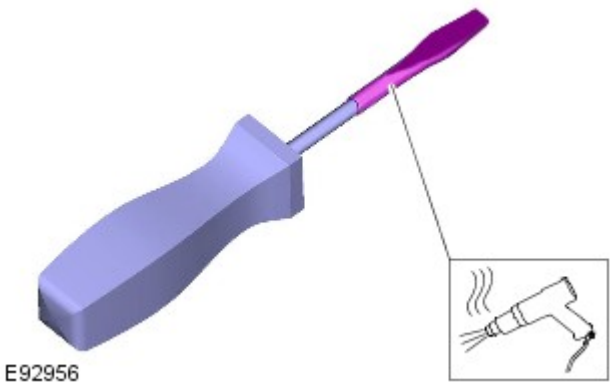
2. Refer to: Rear Bumper Cover (501-19 Bumpers, Removal and Installation).

3. NOTE: Repeat the step for the other side.

   Torque: 55 Nm



4. *Torque:* 55 Nm



CAUTION: Apply heatshrink or protective tape to the end of a suitable tool to protect the interior components.

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 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: D-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

9. NOTE: The procedure must be carried out on both sides.

Refer to: Sun Visor (501-05 Interior Trim and Ornamentation, Removal and Installation).

10. Refer to: Interior Rear View Mirror (501-09 Rear View Mirrors, Removal and Installation).

11. Refer to: Overhead Console (501-12A Instrument Panel and Console - Short Wheelbase, Removal and Installation).

12. WARNING: Be prepared to collect escaping fluid.

Published: 10-Nov-2016

Body Repairs - Vehicle Specific Information and Tolerance Checks - Front Door Alignment

General Procedures

Check

1. Check all trims are located and fitted correctly before performing this procedure.

2.

- NOTE: The rear quarter panel is a fixed point, all alignment checks must start from the rear quarter panel.

  Check all vehicle gaps and profiles.
- Vehicle specific and tolerance checks.

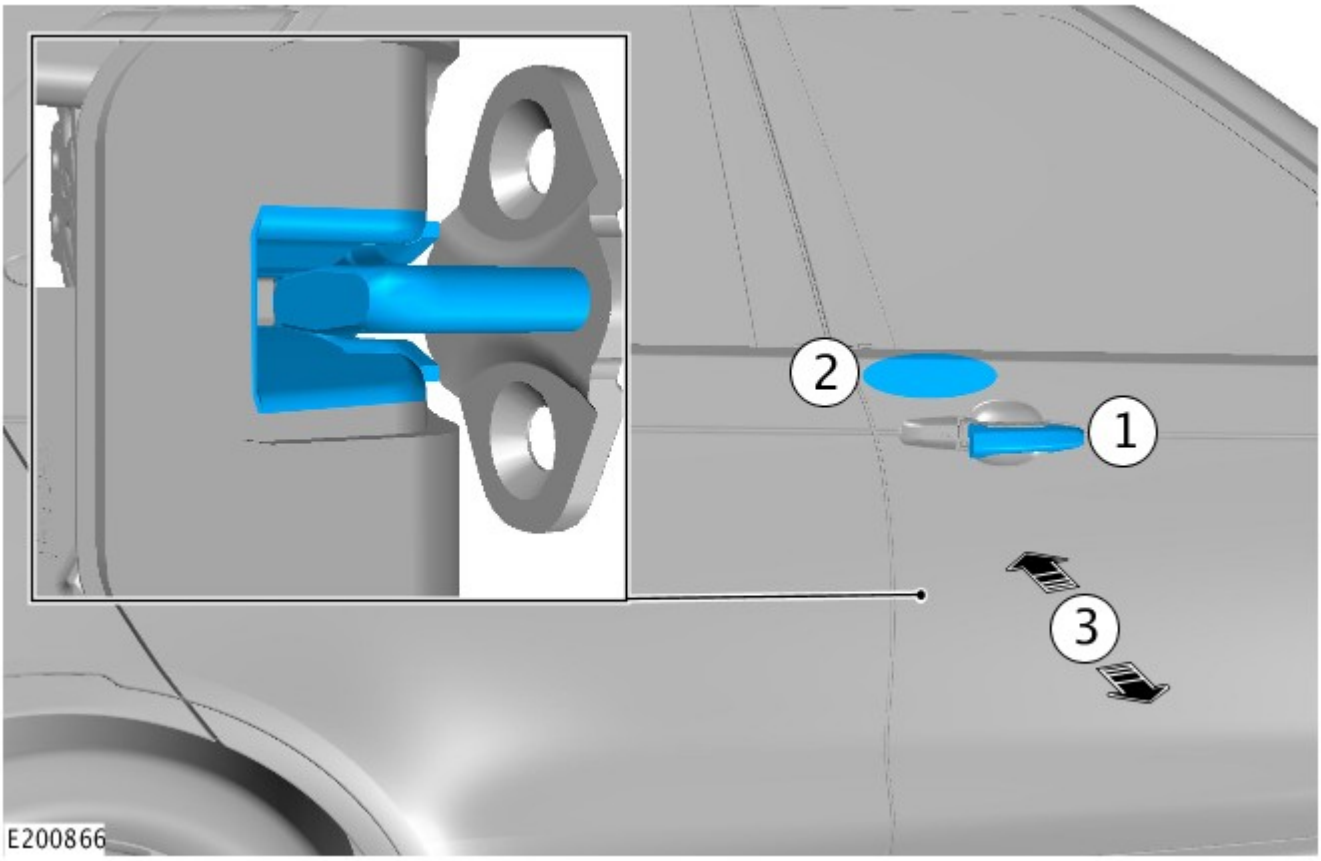
  Refer to: Body and Frame (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

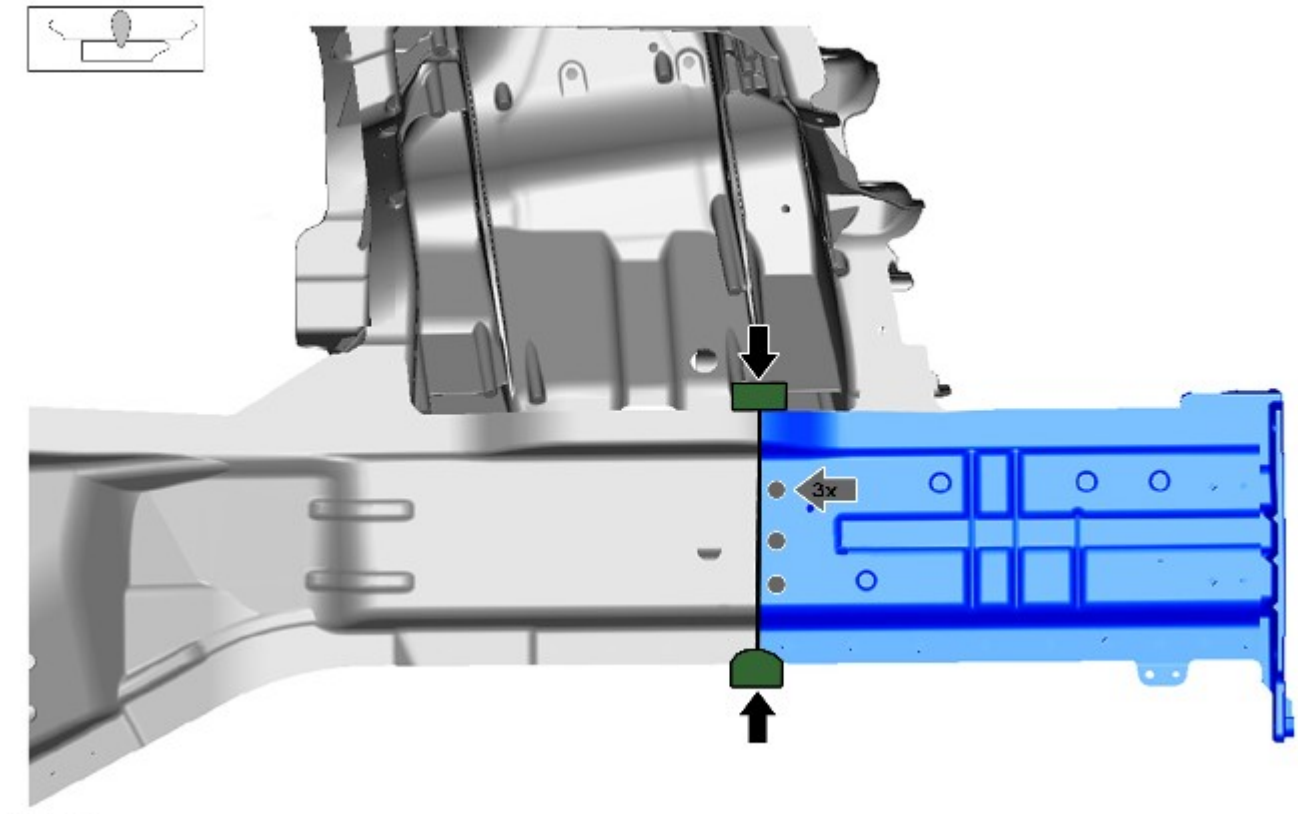
3. Remove the front fender to gain access to the front door hinge to A-pillar retaining bolts.

Refer to: Fender (501-02 Front End Body Panels, Removal and Installation).

4.

- **Front door striker initial check.**
- **(1)** - Keep the exterior door handle open.
- **(2)** - Place hand in position illustrated to allow feel of the door latch to striker.
- **(3)** - Move the front door in and out to feel the latch on striker.





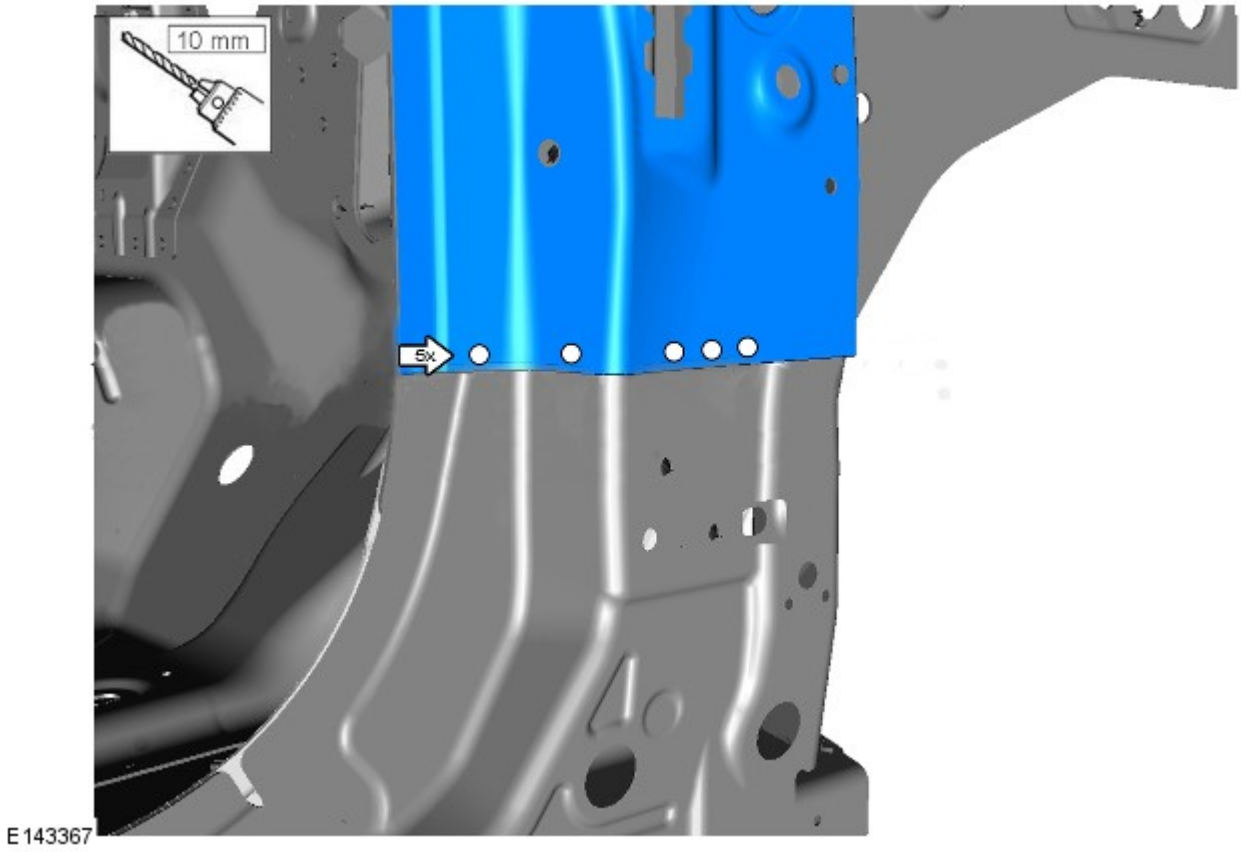
E143685

30. Cut off the run on/run off tabs.

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. Dress the welded joints.

33. Install the SPR's and the BSF's as indicated.



10. Deburr the drilled holes.

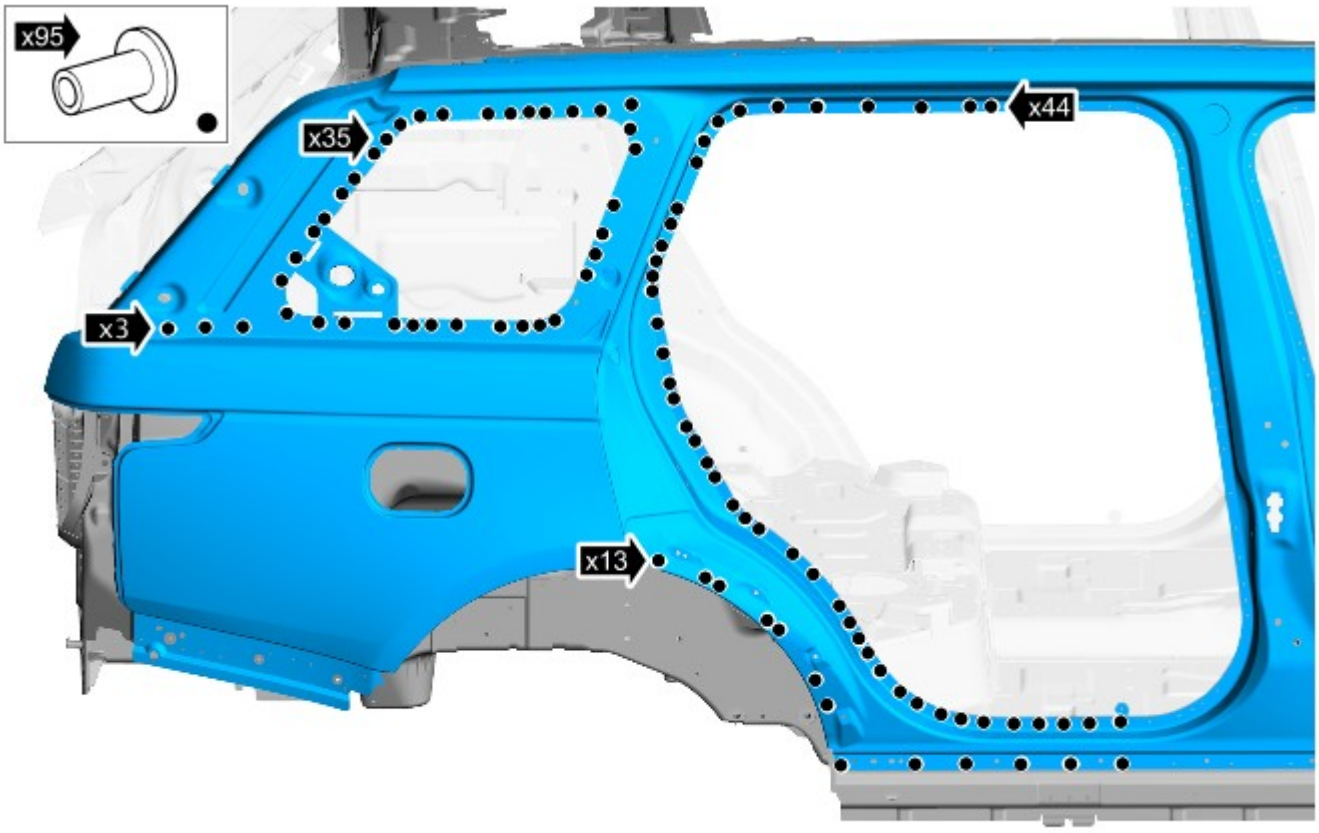
11. Measure and cut three 50mm wide backing plates, 25mm each side of the MIG butt joint, from the rocker panel remnant.

12. Cut six run on/run off tabs from the rocker panel remnant.

13. Using a fine bristle disc, clean and prepare the panel surfaces.

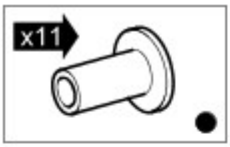
14. Install and MIG plug weld the backing plate as indicated.

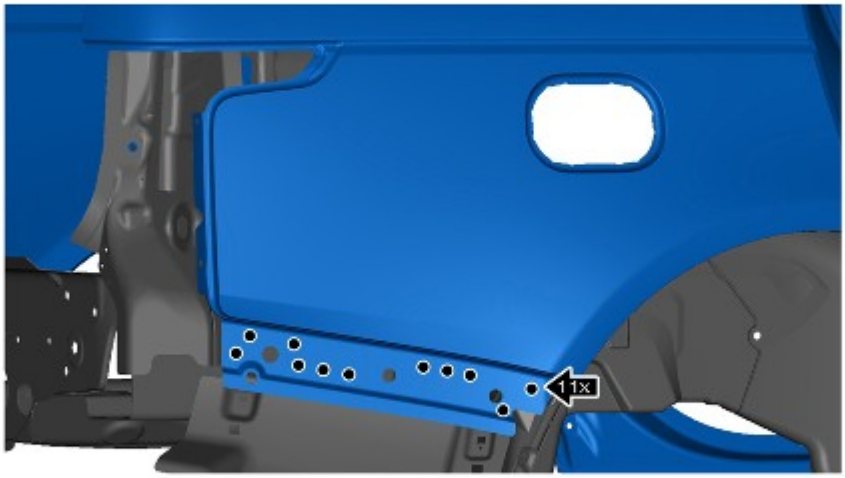
29. Remove the SPR's as indicated.



E161471

30. Remove the SPR's as indicated.

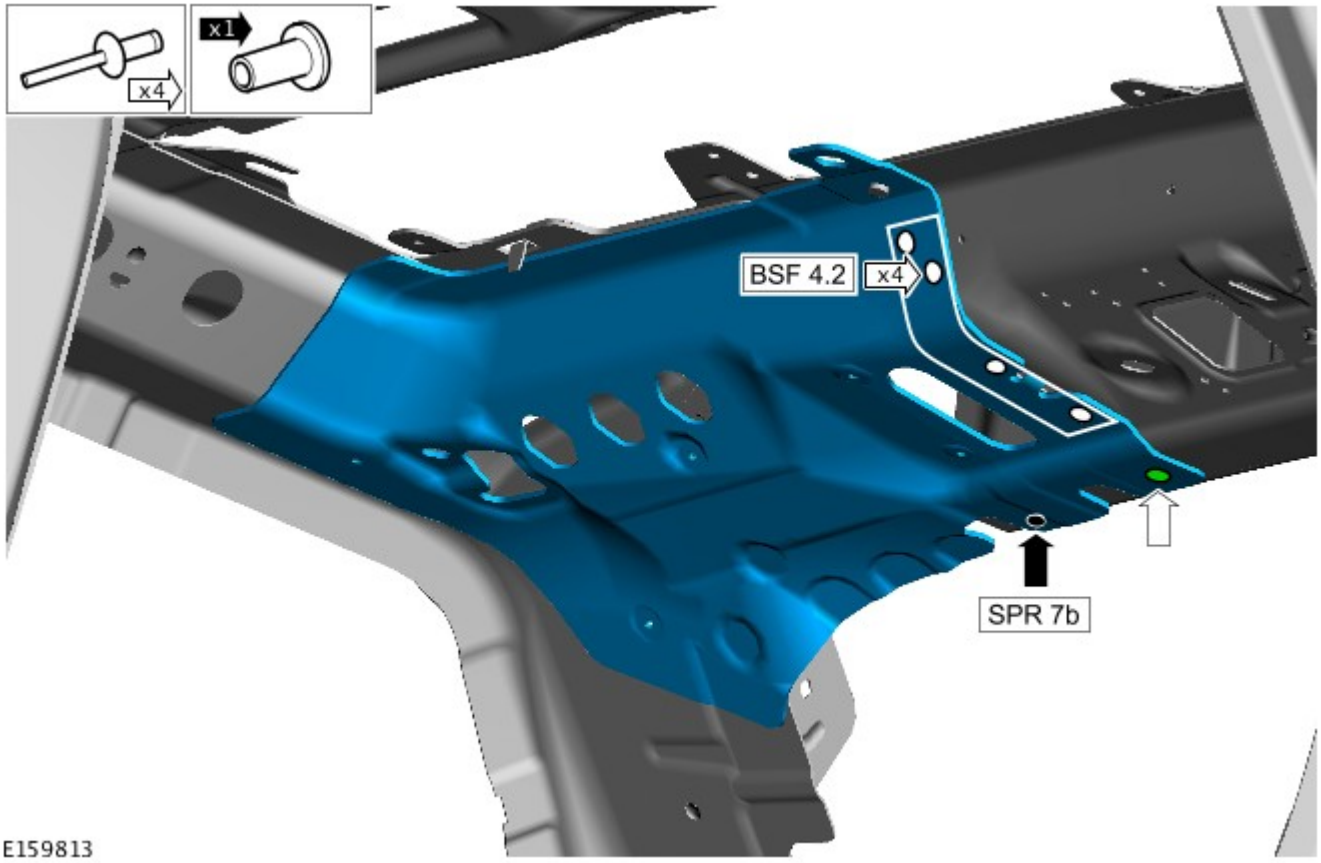




E143435

28. NOTE: Make sure that the BSF indicated by the **green** hole is **not installed** as this carried out in the roof installation.

Install the SPR's and the BSF's as indicated.

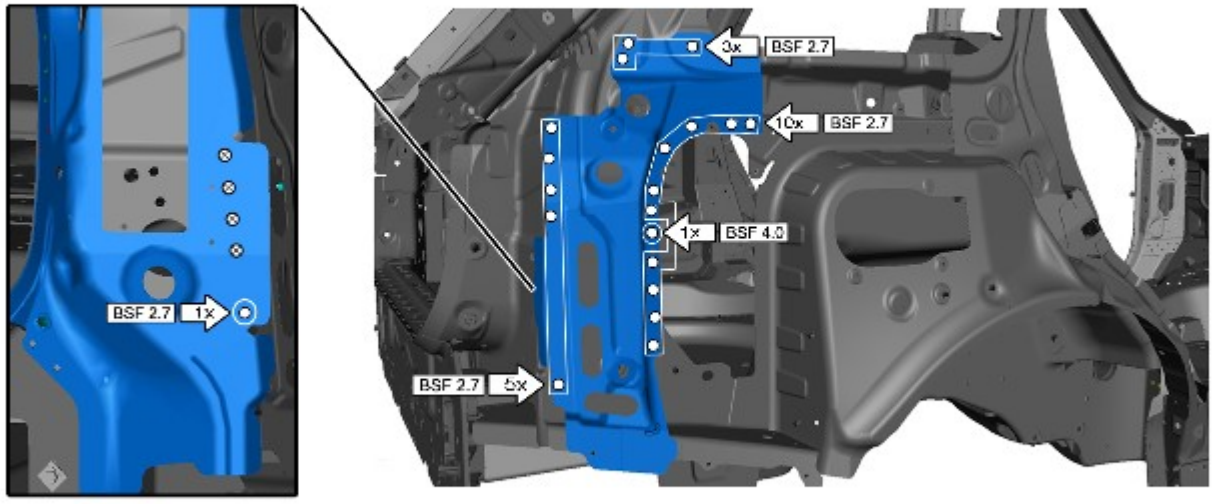


29. NOTES:

Make sure that the BSF highlighted in **red** is installed from the **outside** in.

Make sure that the **bolt** is **renewed** .

Install the BSF and the bolt and tighten to the new bolt to 40Nm as indicated.



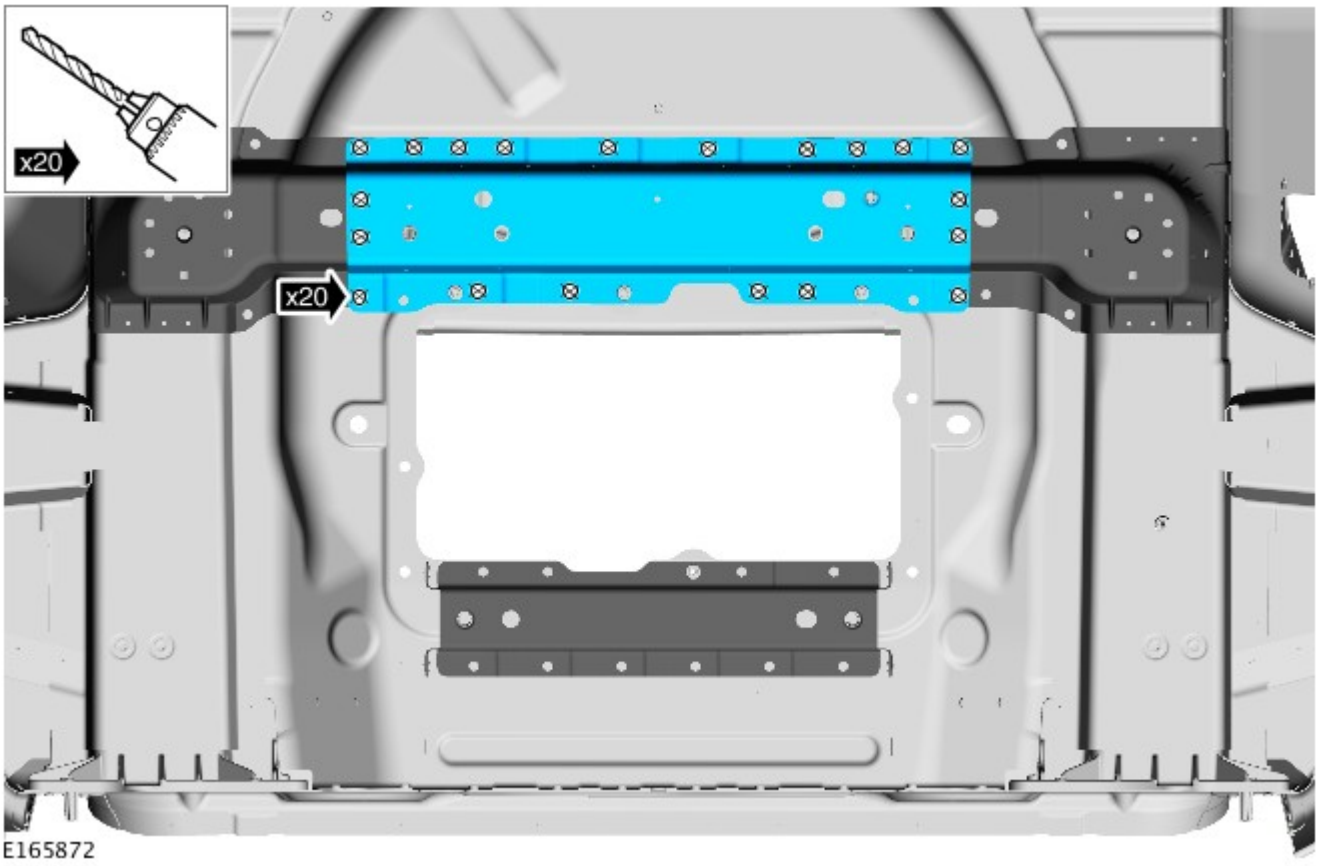
E143421

12. Remove any excess adhesive.

13. Make sure that any open or exposed panel joints are suitably sealed.

14. Make sure corrosion protection is applied to all areas affected by repair.

15. The installation of associated panels and components is the reversal of removal procedure.



31. Remove the panel.

32. Deburr the drilled holes.

33. Remove all drill remnants.

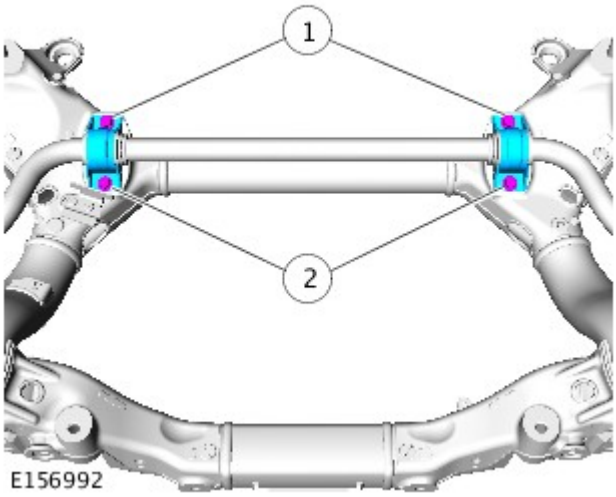
34. Using a fine bristle disc, clean and prepare the rear side member panel surfaces.

35. Apply the coupling agent where the Land Rover recommended bonding material is to be applied and allow to dry.

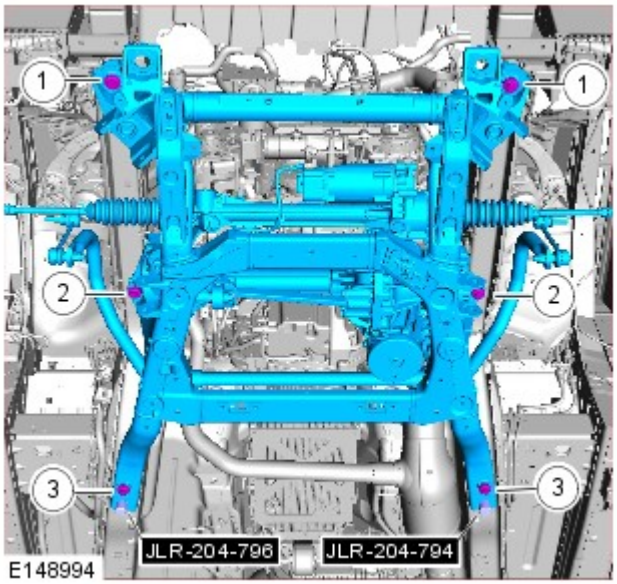
36. NOTE: Make sure a continuous bead of adhesive surrounds fixing holes.

Apply a 5mm bead of Land Rover recommended bonding material to the rear floor cross member as indicated.

During installation tighten the bolts in the following sequence.



Torque:
- Bolts 1 110 Nm
- Bolts 2 110 Nm
- Bolts 1 110 Nm

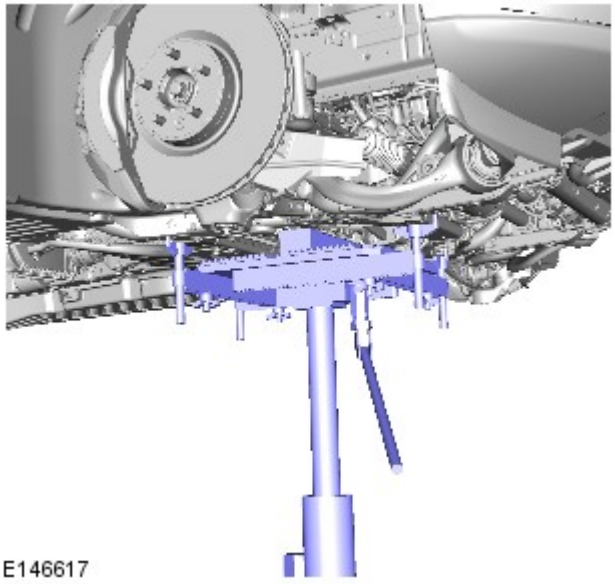


7. CAUTION: Make sure that 6 new bolts are installed.

With assistance, install the front subframe.

Special Tool(s): JLR-204-794 , JLR-204-796
Torque:
- 1
  - Stage 1:100 Nm
  - Stage 2:300°
- 2
  - Stage 1:100 Nm
  - Stage 2:240°
- 3
  - Stage 1:70 Nm
  - Stage 2:120°

8. Remove the special tools.



9.

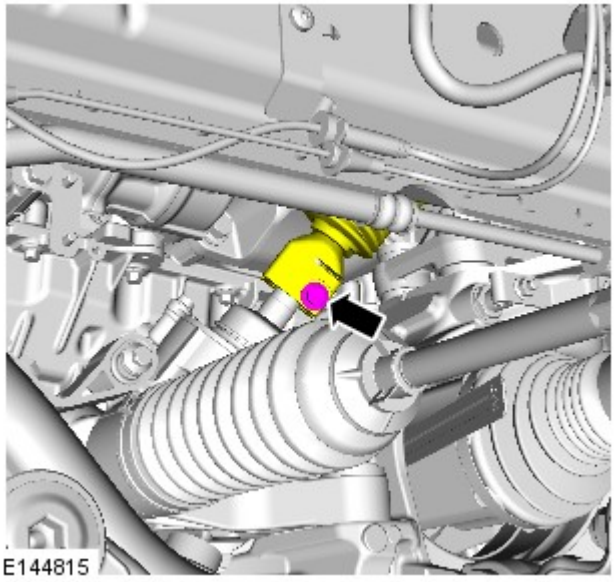
2. Disconnect the battery ground cable.

Refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

3. Refer to: Radiator (303-03B Engine Cooling - V6 S/C 3.0L Petrol, Removal and Installation).

4. NOTE: Repeat the procedure for the other side.

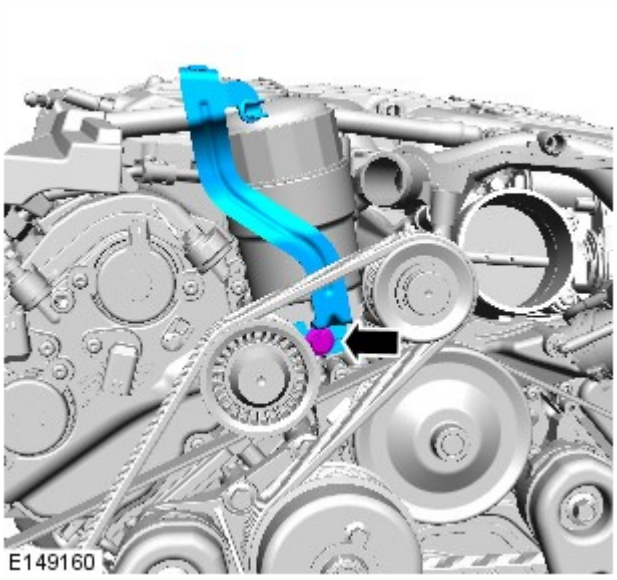
Refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).



5. CAUTION: Discard the bolt.

NOTE: LHD illustration shown, RHD is similar.

Align the steering wheel to straight ahead.



6.

7. *Special Tool(s):* 303-1436
Torque: 40 Nm