

Auxiliary Heating -

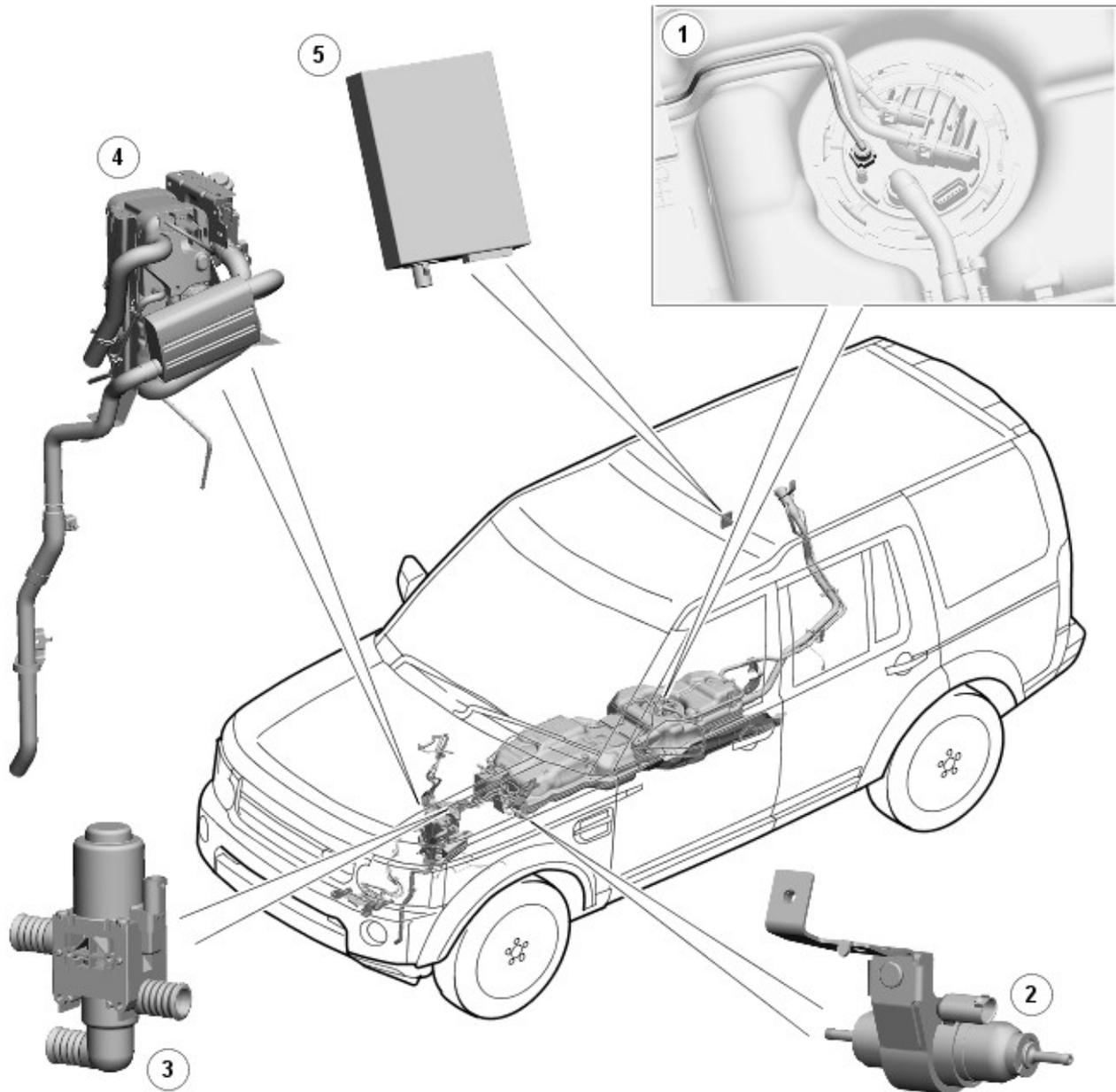
Torque Specifications

Description	Nm	lb-ft
Fuel fired booster heater exhaust bracket bolt	10	7
Fuel fired booster heater	10	7

Auxiliary Heating - Auxiliary Heater

Description and Operation

COMPONENT LOCATIONS



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E137283

Item	Part Number	Description
1	-	FFBH (fuel fired booster heater) fuel line connection to fuel tank
2	-	FFBH auxiliary fuel pump
3	-	FFBH changeover valve
4	-	FFBH
5	-	FFBH receiver

INTRODUCTION

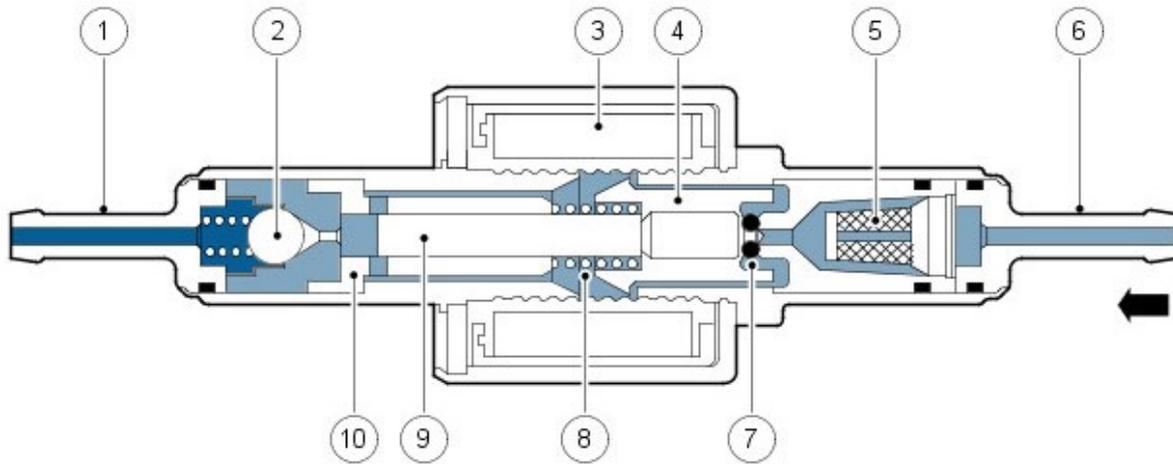
Auxiliary heating is provided by a FFBH (fuel fired booster heater), which boosts the temperature of the engine coolant. Fuel for the FFBH is taken from the vehicle fuel tank, through a fuel line attached to the fuel pump module. An auxiliary fuel pump supplies the fuel at low pressure to the FFBH. In the FFBH, the fuel is burned and the resultant heat output is used to heat the engine coolant.

For remote operation, the system includes a FFBH receiver and a remote handset.

AUXILIARY FUEL PUMP

The auxiliary fuel pump regulates the fuel supply to the FFBH. The pump is a self priming, solenoid operated plunger pump, controlled by a pulse width modulation (PWM) signal from the control module in the FFBH. When the pump is de-energized, it provides a positive shut-off of the fuel supply.

Sectioned View of Auxiliary Fuel Pump



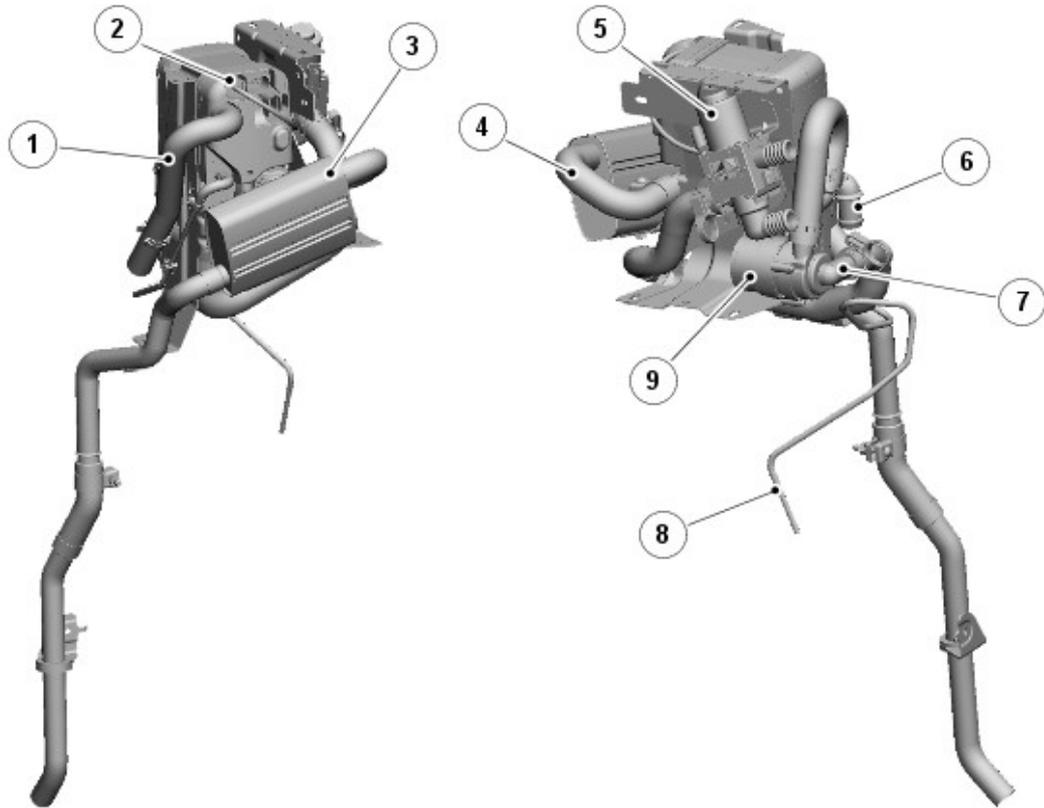
E43569

Item	Part Number	Description
1	-	Fuel line connector
2	-	Non return valve
3	-	Solenoid coil
4	-	Plunger
5	-	Filter insert
6	-	Fuel line connector
7	-	O-ring seal
8	-	Spring
9	-	Piston
10	-	Bush

The solenoid coil of the auxiliary fuel pump is installed around a housing which contains a plunger and piston. The piston locates in a bush, and a spring is installed on the piston between the bush and the plunger. A filter insert and a fuel line connector are installed in the inlet end of the housing. A non return valve and a fuel line connector are installed in the inlet end of the housing.

While the solenoid coil is de-energized, the spring holds the piston and plunger in the closed position at the inlet end of the housing. An O-ring seal on the plunger provides a fuel tight seal between the plunger and the filter insert, preventing any flow through the pump. When the solenoid coil is energized, the piston and plunger move towards the outlet end of the housing, until the plunger contacts the bush; fuel is then drawn in through the inlet connection and filter. The initial movement of the piston also closes transverse drillings in the bush and isolates the pumping chamber at the outlet end of the housing. Subsequent movement of the piston then forces fuel from the pumping chamber through the non return valve and into the line to the FFBH. When the solenoid de-energizes, the spring moves the piston and plunger back towards the closed position. As the piston and plunger move towards the closed position, fuel flows past the plunger and through the annular gaps and transverse holes in the bush to replenish the pumping chamber.

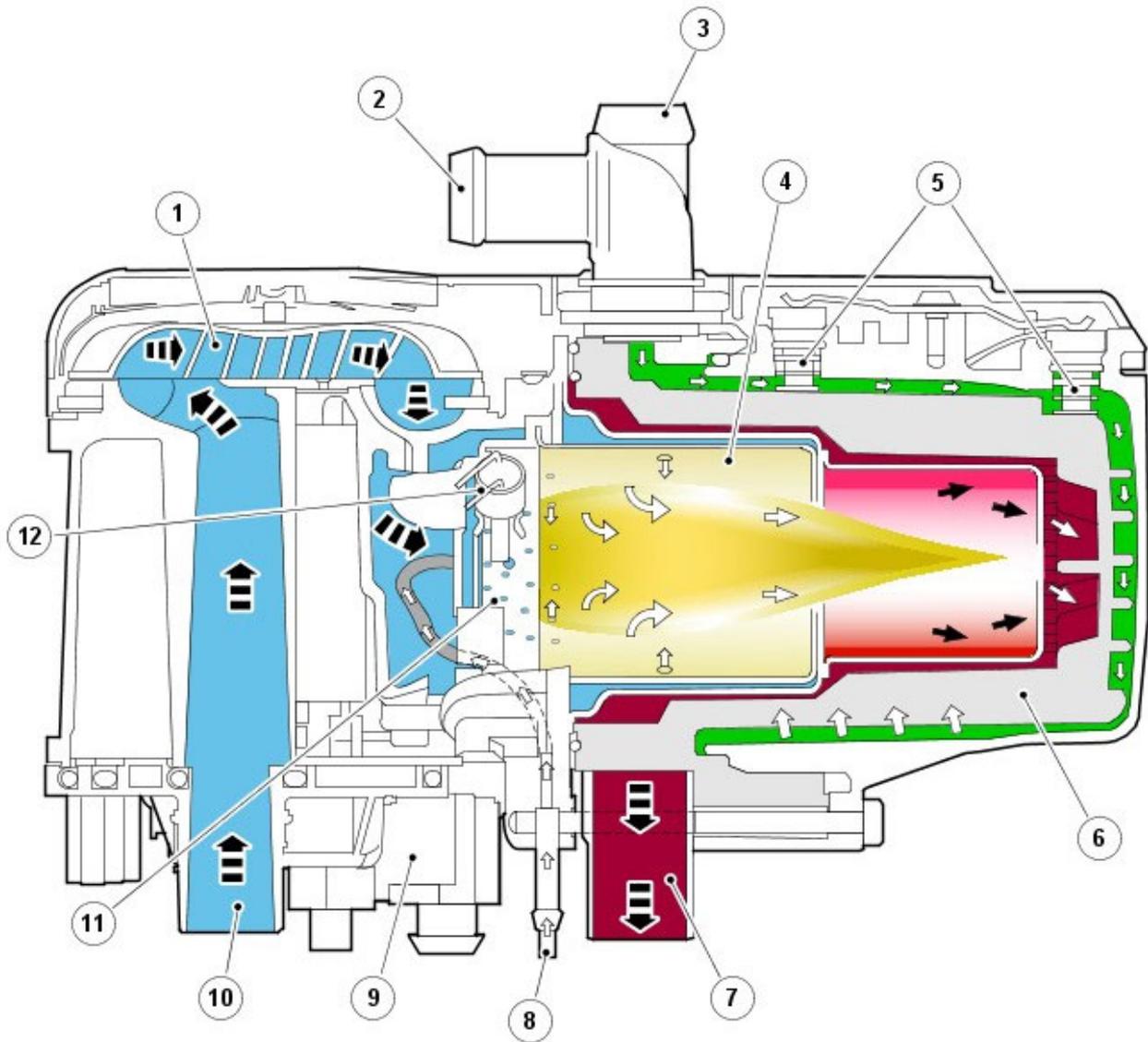
FFBH (Fuel Fired Booster Heater)



E137284

Item	Part Number	Description
1	-	Air inlet pipe
2	-	Electrical connectors
3	-	Exhaust muffler
4	-	Exhaust pipe
5	-	Changeover valve (if fitted)
6	-	Coolant outlet connection
7	-	Coolant inlet connection
8	-	Fuel supply line
9	-	Coolant circulation pump

Sectioned View of FFBH



E137285

Item	Part Number	Description
1	-	Combustion air fan
2	-	Coolant inlet
3	-	Coolant outlet
4	-	Burner insert
5	-	Coolant temperature sensors
6	-	Heat exchanger
7	-	Exhaust outlet
8	-	Fuel inlet
9	-	Control unit
10	-	Air inlet
11	-	Fuel evaporator
12	-	Glow plug / flame sensor

Coolant Circulation Pump

The coolant circulation pump is installed at the coolant inlet to the FFBH to assist the coolant flow through the FFBH and the vehicle heater core. The pump runs continuously while the FFBH is in standby or active operating modes. While the FFBH is inactive, coolant flow is reliant on the engine coolant pump. Operation of the FFBH coolant circulation pump is controlled by a power feed direct from the FFBH control module.

Combustion Air Fan

The combustion air fan regulates the flow of air into the FFBH to support combustion of the fuel supplied by the auxiliary fuel pump and to purge and cool the FFBH after operation.

Burner Housing

The burner housing contains the burner insert and also incorporates connections for the exhaust pipe, the coolant inlet from the coolant circulation pump and the coolant outlet to the vehicle heater core.

The burner insert incorporates the fuel combustion chamber, an evaporator and a glow pin and flame sensor. Fuel from the auxiliary fuel pump is supplied to an evaporator mat, where it evaporates and enters the combustion chamber to mix with air from the combustion air fan. The glow pin/flame sensor provides the ignition source of the fuel: air mixture and, once combustion is established, monitors the flame.

Heat Exchanger

The heat exchanger transfers heat generated by combustion to the coolant. Two sensors are installed in the heat exchanger casing to provide the control module with inputs of coolant temperature. The control module uses the temperature inputs to control system operation.

Air Inlet Pipe

The air inlet pipe delivers air to the combustion chamber for fuel ignition.

Exhaust Pipe and Muffler

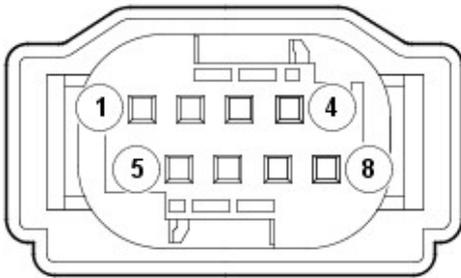
The exhaust pipe and muffler directs exhaust combustion gases to atmosphere. Exhaust vapor may be visible when the FFBH is running, depending on atmospheric conditions.

Control Module

The control module controls and monitors operation of the FFBH system. An internal flow of air from the combustion air fan ventilates the control module to prevent it overheating.

The control module communicates with other systems on the vehicle over the medium speed CAN (controller area network) bus.

FFBH Control Module Harness Connector C0925

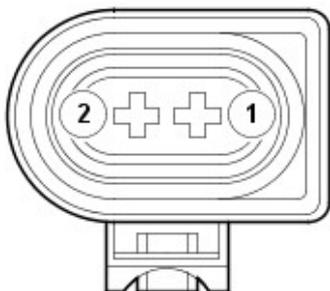


E50045

FFBH Control Module Harness Connector C0925 Pin Details

Pin No.	Description	Input/Output
1	Not used	-
2	WBUS diagnostic (Telestart signal)	Input/Output
3	Not used	-
4	Medium speed controller area network (CAN) bus low	Input/Output
5	Auxiliary fuel pump power feed	Output
6	Not used	-
7	Medium speed CAN bus high	Input/Output
8	Not used	-

FFBH Control Module Harness Connector C0926



E50046

FFBH Control Module Harness Connector C0926 Pin Details

Pin No.	Description	Input/Output
1	Permanent battery power supply	Input

2	Ground	Output
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Changeover Valve

The changeover valve is a normally open solenoid valve installed between the supply and return sides of the heater coolant circuit. When de-energized, the changeover valve connects the heater coolant circuit to the engine coolant circuit. When energized, the changeover valve isolates the heater coolant circuit from the engine coolant circuit.

The changeover valve is controlled by a power feed from the [ATC \(automatic temperature control\)](#) module.

FFBH Receiver

The FFBH receiver translates the FFBH request radio signals, relayed from the [TV \(television\)](#) antenna amplifier, into a voltage output to the FFBH unit. When a request for parked heating is received, the FFBH receiver outputs a battery power feed to the FFBH unit. When a request to switch off parked heating is received, the FFBH receiver disconnects the power feed.

The FFBH receiver has a permanent power feed from the [BJB \(battery junction box\)](#) and is connected to the [TV](#) antenna amplifier by a coaxial cable.

FFBH Remote Handset



E103416

Item	Description
1	On button
2	Off button
3	LED (light emitting diode)
4	Antenna

The FFBH remote handset allows parked heating to be remotely controlled up to a minimum of 100 m (328 ft) from the vehicle. 'On' and 'off' buttons activate and de-activate parked heating.

An [LED](#):

- Flashes green when parked heating is active.
- Flashes red after a start selection, if communication has not been established with the vehicle.
- Flashes orange when the remote handset battery needs replacing.

The FFBH remote handset is powered by a 3.3 V CR1/3N battery located under a cover on the rear of the handset.

Remote Handset Pairing:

Each remote handset must be 'paired' to the receiver to enable communications. Each handset has a unique identification number which is stored by the receiver. The receiver can store up to 3 handset identification numbers. If a fourth handset is paired to the receiver, the receiver will replace the first paired handset number with that for the fourth handset in the receiver memory. Subsequently, the first paired handset will no longer be paired and will not be recognized by the receiver.

The following procedure details the pairing process:



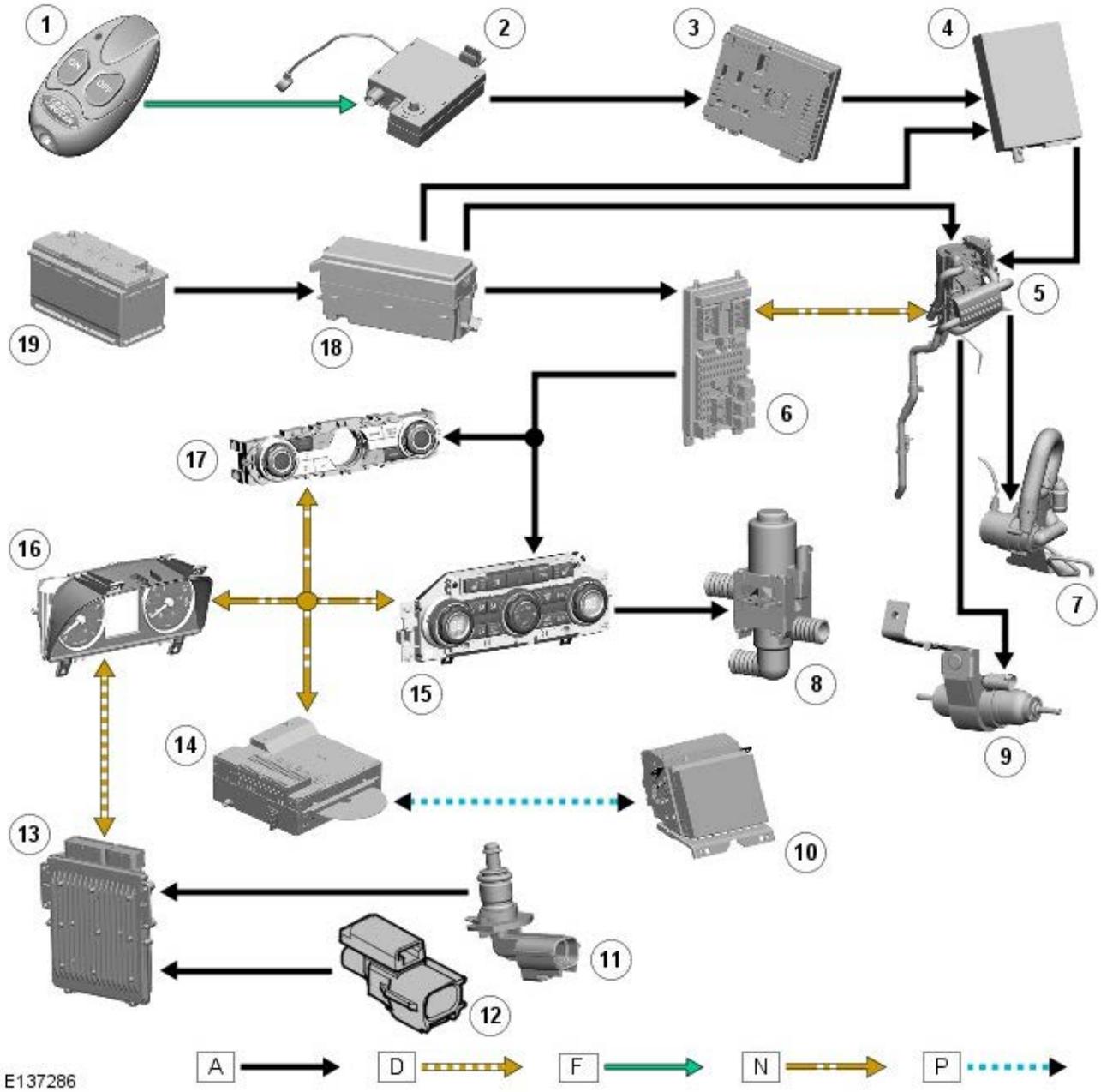
NOTE: The pairing process relies on the FFBH receiver having the power supply removed and then the power supply re-instated. The fuse method is the easiest method but it can also be achieved by battery disconnection or removal of the harness connector from the receiver unit.

- Remove mini-fuse F2 5A (telestart fuse) from the [BJB](#)
- Wait for a minimum of 5 seconds
- Replace fuse to position F2 5A in the [BJB](#)
- Within 5 seconds of replacing the fuse (and restoring the receiver power supply), press and hold the remote handset OFF button
- Confirmation of successful pairing is displayed by the remote handset [LED](#) illuminating in a red color for 2 seconds.

CONTROL DIAGRAM



NOTE: A = Hardwired connections; D = High speed CAN bus; F = RF transmission; N = Medium speed CAN bus; P = MOST bus



E137286

Item	Part Number	Description
1	-	FFBH remote handset
2	-	TV antenna
3	-	TV tuner module
4	-	FFBH receiver
5	-	FFBH
6	-	CJB (central junction box)
7	-	FFBH coolant circulation pump
8	-	Changeover valve (if fitted)
9	-	FFBH fuel pump
10	-	Touch screen display
11	-	ECT (engine coolant temperature) sensor
12	-	Ambient air temperature sensor
13	-	ECM (engine control module)
14	-	IAM (integrated audio module)
15	-	ATC module
16	-	Instrument cluster
17	-	Integrated control panel
18	-	BJB
19	-	Battery

OPERATION

The FFBH system operates in two modes:

- Provides additional heating by boosting heater performance while the engine is running.
- If fitted; parked heating heats the passenger compartment or engine while the vehicle is parked with the engine off.

The **ATC** module disables FFBH operation if battery voltage is too low, as determined from an ambient air temperature, dependent voltage-map. Where fitted, the battery monitoring system can also disable FFBH operation based on the battery charge state with the engine off.

Parked Heating/Ventilation

Parked heating works in conjunction with parked ventilation. When parked heating/ventilation is selected, the vehicle interior is either heated by parked heating or cooled by parked ventilation, depending on the ambient temperature. Parked heating occurs if the ambient temperature is less than 16 °C (61 °F); parked ventilation occurs if the ambient temperature is 16 °C (61 °F) or more.

Parked heating/ventilation is controlled by direct selection on the (TSD) Touch Screen Display. This is achieved by using the TSD to program one or two 'on/off' cycle start-times per day, and one 'on/off' cycle start-time further in the future.

The direct selection and programmed time modes of operation are selected when the engine is stopped and the smart key is in the vehicle. The key can then be removed and the vehicle locked. Any timed event will automatically run without the key inside the vehicle.

In all operating modes, to prevent excessive drain on the battery, parked heating/ventilation is automatically de-activated after:

- 20 minutes in moderate climate conditions, and
- after 30 minutes in climates where the ambient temperature regularly falls below minus 25 °C (minus 13 °F).

Parked ventilation is automatically de-activated when the ignition is switched on.

When programmed start times for parked heating/ventilation are entered on the TSD, the times are stored in the **CJB**.

If the engine is started while parked heating is on and:

- the engine coolant temperature is equal to or more than the heater coolant temperature, parked heating is switched off.
- the engine coolant temperature is less than the heater coolant temperature, parked heating remains on until the engine coolant temperature reaches the heater coolant temperature. The changeover valve also remains closed until the engine coolant temperature reaches the heater coolant temperature.

Parked heating/ventilation can also be operated by using the FFBH remote handset.

Programmed Parked Heating/Ventilation

At a programmed parked heating/ventilation start time, the **EJB (engine junction box)** sends a start signal to the **ATC** module on the medium speed **CAN**.

On receipt of the message:

- If the ambient temperature is less than 16 °C (61 °F) and more than -20 °C (-4 °F), the **ATC** module initiates parked heating and:
 - Energizes the changeover valve.
 - Sends a **CAN** bus message to activate the FFBH.
 - Operates the blower at 47% of the maximum speed.
 - Operates the distribution doors in the heater assembly to direct the air to the footwells for approximately 30 seconds, then to either only the windscreen, or to both the footwells and the windscreen, depending on the ambient air temperature.
 - Flashes the auto blower **LED** at 2 Hz.
 - If the ambient temperature is -20 °C (-4 °F) or below, the **ATC** module sends a **CAN** bus message to activate the FFBH, but leaves the changeover valve de-energized and does not operate the blower or distribution doors. Heated coolant is circulated around the engine and heater core(s) to heat the engine and improve engine starting.
 - Once the FFBH coolant temperature is above a suitable threshold the cabin blower is switched on and cabin heating commenced.
- If the ambient temperature is 16 °C (61 °F) or more, the **ATC** module initiates parked ventilation and:
 - Operates the blower at 47% of maximum speed.
 - Operates the distribution doors in the heater assembly to direct the air to the face level outlets.
 - Flashes the **A/C (air conditioning)** distribution LED at 2 Hz.

After 20 minutes in moderate climate conditions and after 30 minutes in climates where the ambient temperature regularly falls below minus 25 °C (minus 13 °F), the **ATC** module stops the parked heating/ventilation:

- If parked heating is active, the **ATC** module:
 - Sends a **CAN** bus message to de-activate the FFBH.
 - Switches off the blower.
 - Returns the distribution doors to the previous settings.
 - After 3 minutes, de-energizes the changeover valve.
- If parked ventilation is active, the **ATC** module:
 - Switches off the blower.
 - Returns the distribution doors to the previous settings.

Remotely Selected Parked Heating/Ventilation

When parked heating/ventilation is selected 'on' with the remote handset, the request is received by the FFBH receiver via the TV antenna and TV antenna amplifier. The FFBH receiver relays the request as a hardwired signal to the FFBH control module. On receipt of the request, the FFBH control module sends the request to the ATC module on the CAN bus. The ATC module then determines if parked heating or ventilation is required.

Operation of the FFBH is controlled by a status message from the automatic temperature control (ATC) module to the control module. A similar status message, from the control module to the ATC module, advises the ATC module of the current operating status of the FFBH.

While the engine is running, if the ambient air temperature is less than 9 °C (48 °F) and the engine coolant temperature (ECT) is less than 75 °C (167 °F) the ATC module changes the status message from 'heater off' to 'supplemental heat'. The control module then changes the status message it sends the ATC module to 'supplemental heat' and starts the FFBH. The control module will not start the FFBH, or will discontinue operation, if any of the following occur:

- The control module is in the error lockout mode (see Diagnostics, below).
- A crash message is received from the restraints control module (RCM).
For additional information, refer to: Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) (501-20B, Description and Operation).
- A low fuel level message is received from the instrument cluster.
For additional information, refer to: Information and Message Center (413-08, Description and Operation).
- The engine is not running, or stops running for approximately 4 seconds. The time delay is included for stall protection.

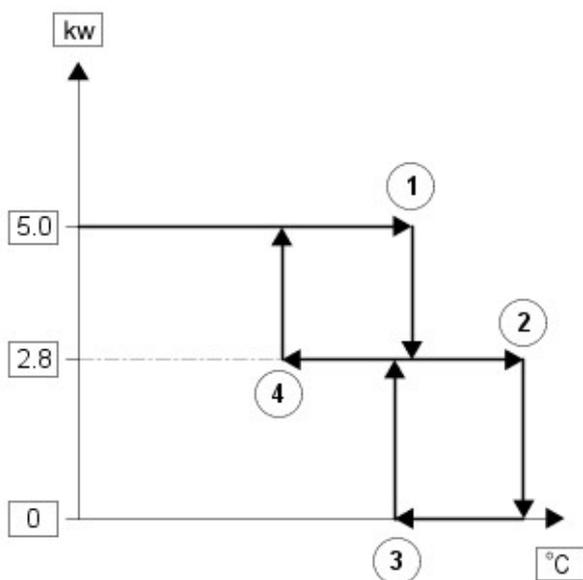
If the control module does not start the FFBH, or discontinues operation, the status message to the ATC module remains at, or changes to, 'heater off'. If the ambient air temperature increases to 9 °C (48 °F), or the ECT increases to 75 °C (167 °F), the ATC module cancels supplementary heating, by changing the status message to the control module back to 'heater off'. The control module then cancels FFBH operation and changes the status message to the ATC module to 'heater off'.

The FFBH is controlled at one of two heat output levels, 2.8 kW at part load combustion and 5 kW at full load combustion. The control module transmits the FFBH coolant temperature to the ATC module.

Start Sequence: At the beginning of a start sequence, the control module energizes the glow pin function of the glow pin and flame sensor, to pre heat the combustion chamber, starts the combustion air fan at slow speed and energizes the coolant circulation pump. After approximately 30 seconds, the control module energizes the auxiliary fuel pump at the starting sequence speed. The fuel delivered by the auxiliary fuel pump evaporates in the combustion chamber, mixes with air from the combustion air fan and is ignited by the glow pin and flame sensor. The control module then progressively increases the speed of the auxiliary fuel pump and the combustion air fan. Once combustion is established the control module switches the glow pin and flame sensor from the glow pin function to the flame sensing function to monitor combustion. From the beginning of the start sequence to stable combustion at full load takes approximately 240 seconds.

Coolant Temperature Control: While the FFBH is running, the control module cycles the FFBH between full load combustion, part load combustion and a control idle phase of operation, depending on the temperature of the coolant in the heat exchanger.

Switching Point Diagram



Switching Point		Temperature, °C (°F)
Figure Item No.	Description	
1	Full load to part load	84 (183)
2	Part load to control idle	88 (190)
3	Control idle to part load	78 (172)
4	Part load to full load	74 (165)

After the start sequence, the control module maintains full load combustion until the coolant temperature reaches switching point temperature 1. At this temperature, the control module decreases the speed of the auxiliary fuel pump and the combustion air fan to half speed, to produce part load combustion. The control module maintains part load combustion while the coolant temperature remains between switching point temperatures 2 and 4. At part load combustion the temperature of the coolant will increase or decrease depending on the amount of heat required to heat the vehicle interior. If the coolant temperature decreases to switching point temperature 4, the control module increases the speed of the auxiliary fuel pump and the combustion air fan to full speed, to return to full load combustion. If the coolant temperature increases to switching point temperature 2, the control module enters a control idle phase of operation.

On entering the control idle phase, the control module immediately switches the auxiliary fuel pump off, to stop combustion, and starts a timer for the combustion air fan. After a 2 minute cool down period, the control module switches the combustion air fan off and then remains in the control idle phase while the coolant temperature remains above switching point temperature 3. If the coolant temperature decreases to switching point temperature 3, the control module initiates a start to part load combustion. A start to part load combustion takes approximately 90 seconds.

In order to limit the build up of carbon deposits on the glow pin and flame sensor, the control module also enters the control idle phase if continuous combustion time exceeds 72 minutes (at part load, full load or a combination of both). After the cool down period, if the coolant is still in the temperature range that requires additional heat, the control module restarts the FFBH.

Shutdown: To stop the FFBH, the control module de-energizes the auxiliary fuel pump to stop combustion, but continues operation of the combustion air fan and the coolant circulation pump for a time, to cool down the FFBH. The cool down time is 100 seconds if the FFBH was operating at part load combustion and 175 seconds if the FFBH was operating at full load combustion.

DIAGNOSTICS

The control module monitors the FFBH system for faults. Any faults detected are stored in a volatile memory in the control module, which can be interrogated by approved diagnostic equipment via the medium speed CAN bus. A maximum of three faults and associated freeze frame data can be stored at any one time. If a further fault is detected, the oldest fault is overwritten by the new fault.

The control module also incorporates an error lockout mode of operation that inhibits operation to prevent serious faults from causing further damage to the system. In the error lockout mode, the control module immediately stops the auxiliary fuel pump, and stops the combustion air fan and coolant circulation pump after a cool down time of approximately 2 minutes. Error lockout occurs for start sequence failures, combustion flameouts, heat exchanger casing overheat and if battery voltage is out of limits. The error lockout mode can be cleared using approved diagnostic equipment.

Start Failure and Flameout: If a start sequence fails to establish combustion, or a flameout occurs after combustion is established, the control module immediately initiates another start sequence. The start failure or flameout is also recorded by an event timer in the control module. The event timer is increased by one after each start failure or flameout, and decreased by one if a subsequent start is successful. If the event timer increases to three (over any number of drive cycles), the control module enters the error lockout mode.

Heat Exchanger Casing Overheat: To protect the system from excessive temperatures, the control module enters the error lockout mode if the heat exchanger coolant temperature exceeds 125 °C (257 °F).

Battery Voltage Limits: 10.25 - 15.5 volts.

Auxiliary Heating - Fuel Fired Booster Heater

Diagnosis and Testing

Principles of Operation

For a detailed description of the fuel fired booster heater system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: Auxiliary Heater (412-02 Auxiliary Heating, 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
<ul style="list-style-type: none"> • Fuel fired booster heater assembly <ul style="list-style-type: none"> - Coolant inlet/outlet - Exhaust - Fuel inlet - Air inlet • Auxiliary fuel pump and lines • Auxiliary coolant pump 	<ul style="list-style-type: none"> • Fuses • Harnesses • Electrical connector(s) • Control module(s)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.

REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Fuel Fired Booster Heater Control Module (FFBH) (100-00, Description and Operation).

Auxiliary Heating - Fuel Fired Booster Heater TDV6 2.7L Diesel

Removal and Installation

Removal



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

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Charging System - General Information, Specifications).

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

Raise and support the vehicle.

3.  **NOTE:** Wheel shown removed for clarity.

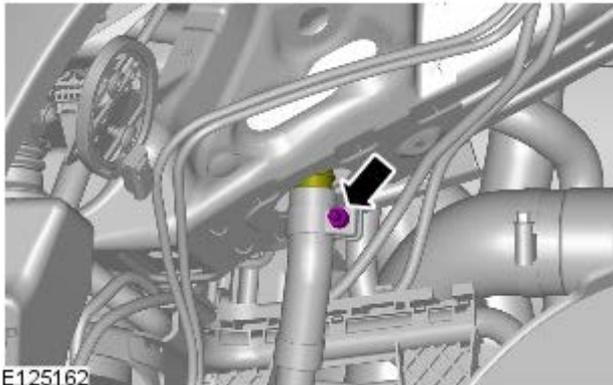
Carefully release the wheel arch liner, to allow access to the fuel fired burner heater (FFBH) exhaust clamp retaining bolt.



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4.  **NOTE:** Components removed for clarity.

Release the exhaust clamp.

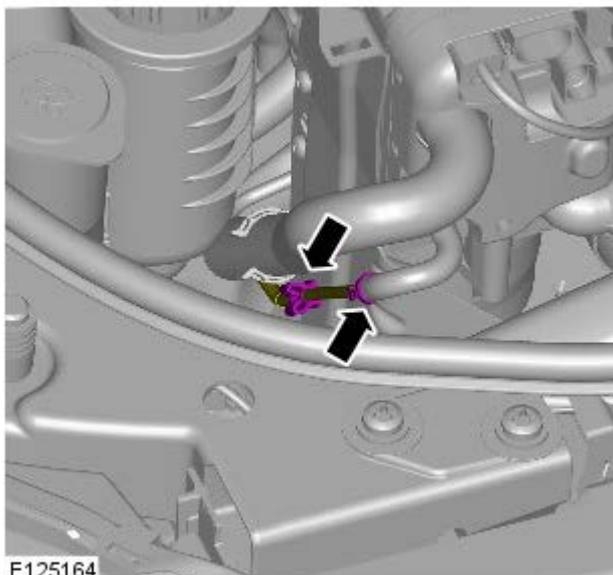


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5.  **CAUTION:** Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Disconnect the fuel fired booster heater fuel line.

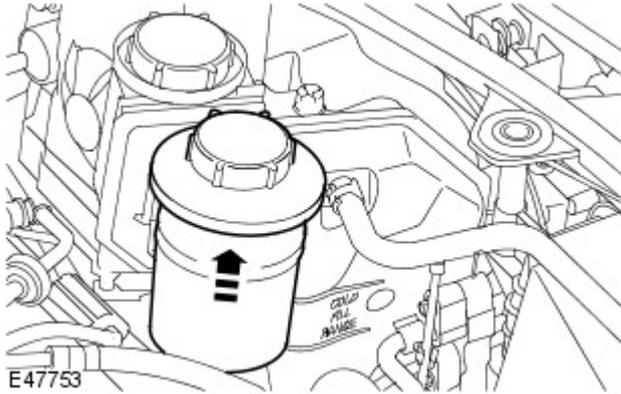
- Release the clip.



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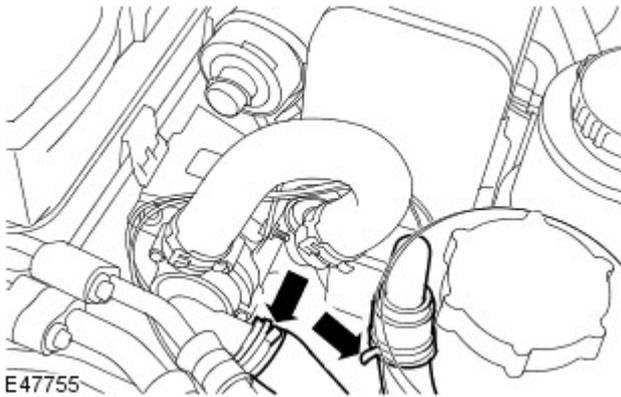
6. Lower the vehicle.

7. Release the power steering fluid reservoir.



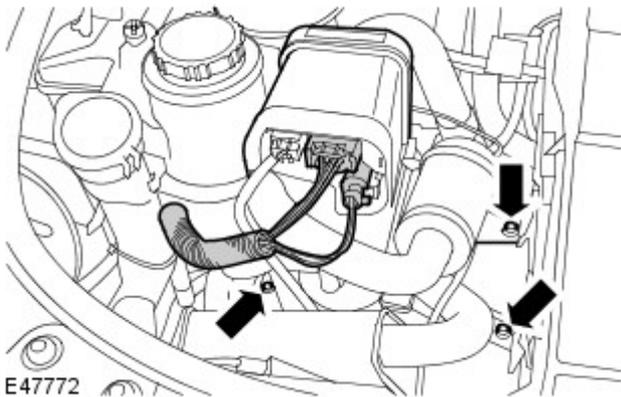
8. Disconnect the fuel fired booster heater inlet and outlet coolant hoses.

- Clamp the hoses to minimise coolant loss.
- Release the 2 clips.



9. Remove the fuel fired booster heater.

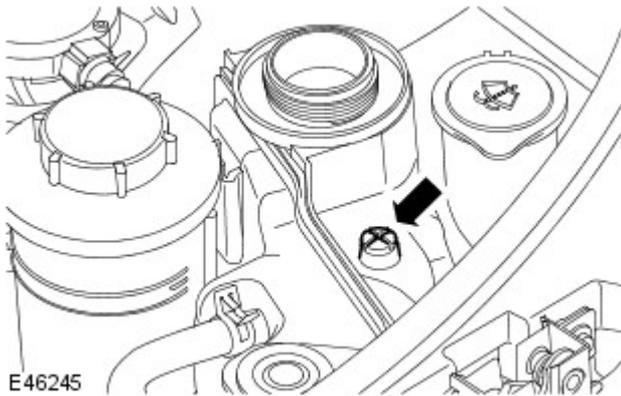
- Disconnect the 2 electrical connectors.
- Remove the 3 bolts.
- Release the fuel pipe from the clip.



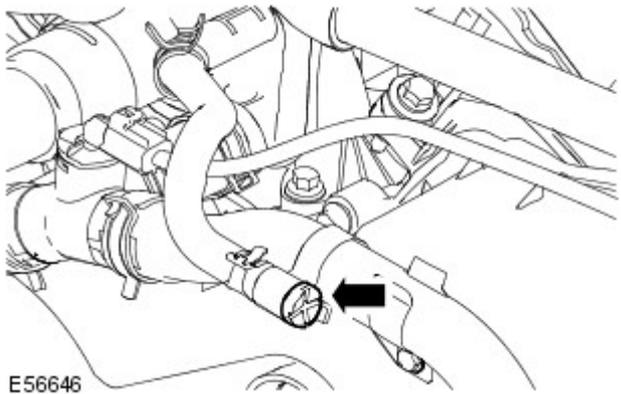
Installation

1. Install the fuel fired booster heater.
 - Tighten the bolts to 10 Nm (7 lb.ft).
 - Connect the electrical connectors.
 - Secure the fuel pipe in the clip.
2. Connect the fuel fired booster heater coolant hoses.
 - Secure with the clips.
 - Remove the clamps.
3. Connect the fuel fired booster heater fuel hose.
 - Secure with the clip.
4. Raise the vehicle.
5. Tighten the exhaust clamp.
 - Tighten to 10 Nm (7 lb.ft).
6. Secure the wheel arch liner.
 - Install the two retaining screws.
 - Install the clip.

7. Lower the vehicle.
8. Install the power steering fluid reservoir.
9. Connect the battery ground cable.
For additional information, refer to: Specifications (414-00 Charging System - General Information, Specifications).
10. Connect exhaust extraction hoses to the tail pipes.
11. Remove the engine cover.
For additional information, refer to: Engine Cover - 2.7L V6 - TdV6 (501-05 Interior Trim and Ornamentation, Removal and Installation).
12. Loosen the coolant expansion tank bleed screw.



13. Loosen the cylinder head bleed hose bleed screw.



14. Refill the cooling system.
15. Tighten the bleed screws to 14 Nm (10 lb.ft).
16. Fill the cooling system, keeping coolant to the upper level mark of the expansion tank, until a steady stream of coolant is seen returning to the tank.
17.  **NOTE:** When the coolant bleed is complete and prior to installing the expansion tank cap, top up the expansion tank to 30mm above the maximum level.

Install the coolant expansion tank cap.

18.  **WARNING:** Release the cooling system pressure by slowly turning the expansion tank cap a quarter of a turn. Cover the expansion tank cap with a thick cloth to prevent the possibility of scalding. Failure to follow this instruction may result in personal injury.

Start and run the engine.

- Hold the engine speed at 3,000 RPM for one minute.
- Return the engine to idle for five minutes.
- Hold the engine speed at 3,000 RPM for one minute.
- Run the engine until the thermostat opens.

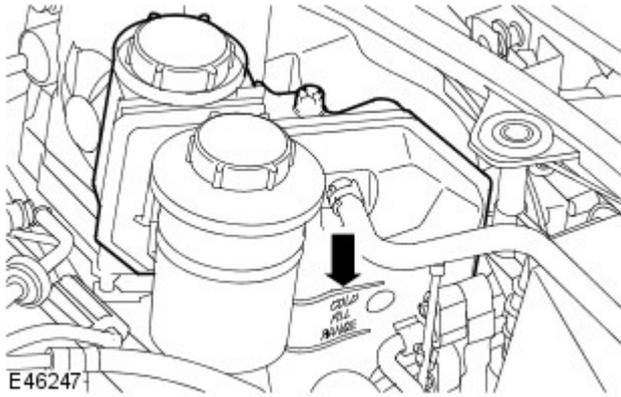
- Remove coolant expansion tank cap, allow float to settle and top-up coolant if required. Install cap.

19. Switch the engine off and allow to cool.

20. Install the engine cover.

For additional information, refer to: Engine Cover - 2.7L V6 - TdV6 (501-05 Interior Trim and Ornamentation, Removal and Installation).

21. Check and top-up the coolant if required.



Auxiliary Heating - Fuel Fired Booster Heater TDV6 3.0L Diesel

Removal and Installation

Removal

NOTES:



Removal steps in this procedure may contain installation details.



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

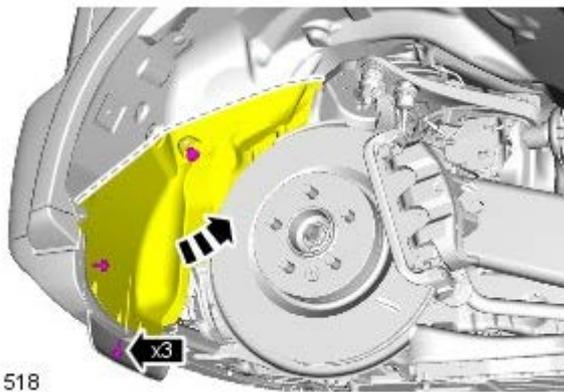
1. Refer to: Specifications (414-00, Specifications).

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

Raise and support the vehicle.

3.  **NOTE:** Wheel shown removed for clarity.

- Carefully release the wheel arch liner, to allow access to the fuel fired burner heater (FFBH) exhaust clamp retaining bolt.

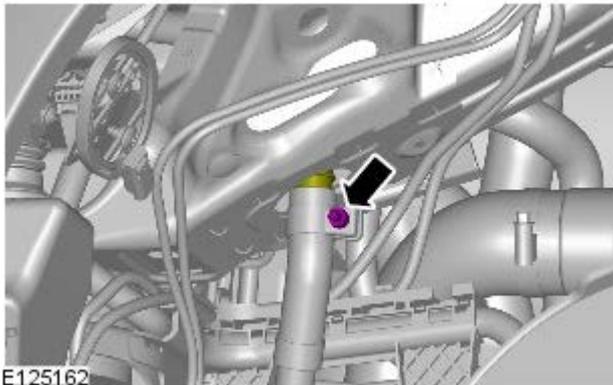


E131518

4.

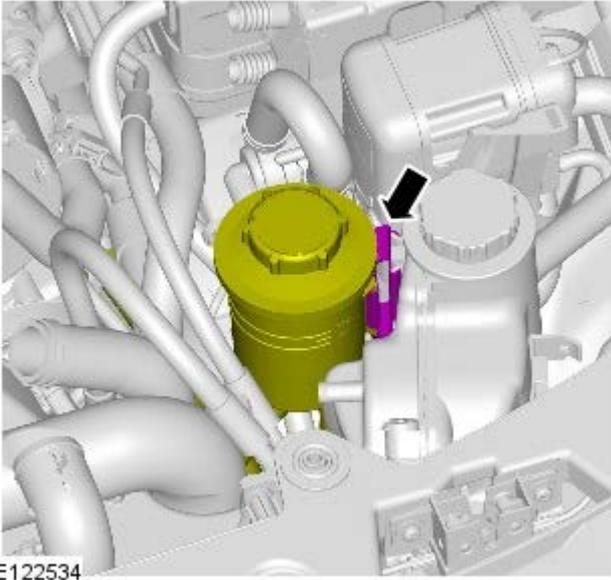
-  **NOTE:** Components removed for clarity.

Torque: 10 Nm

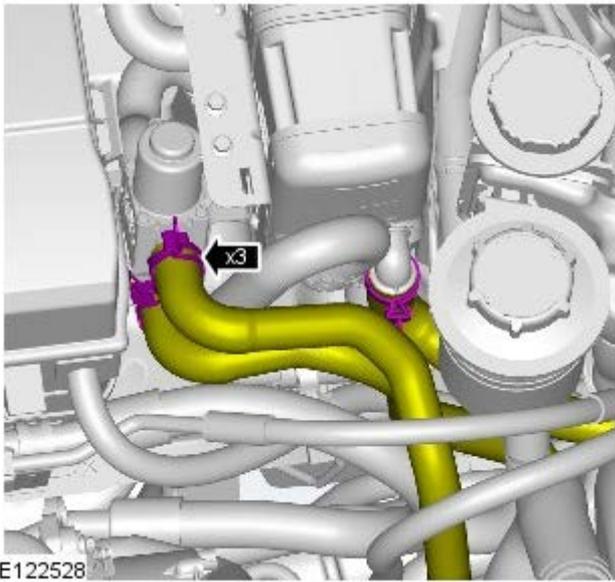


E125162

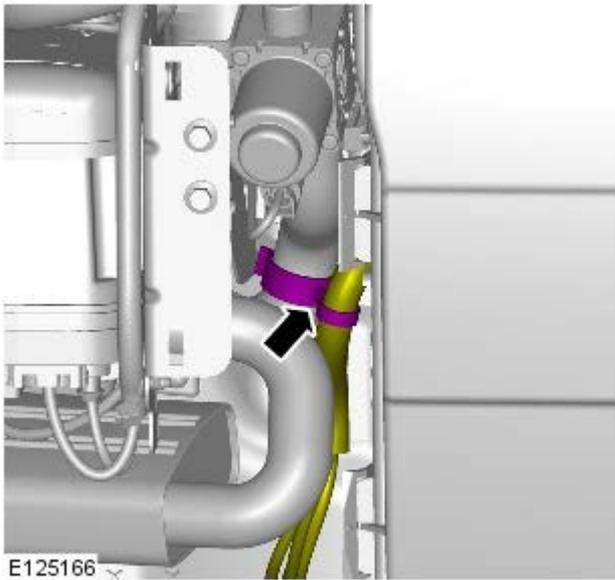
5.



E122534



E122528



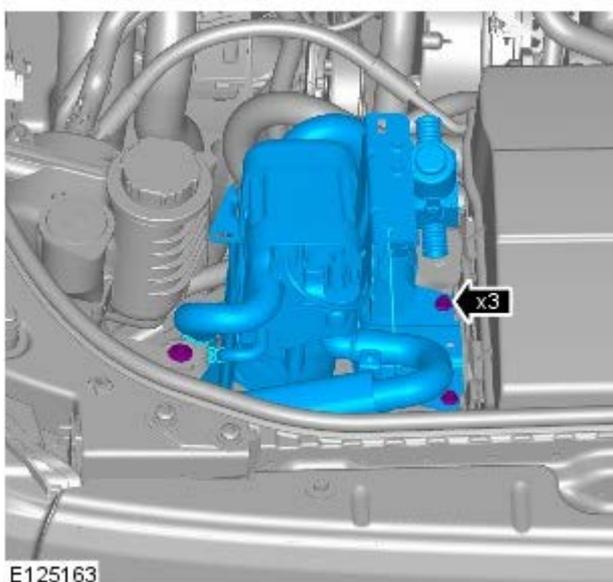
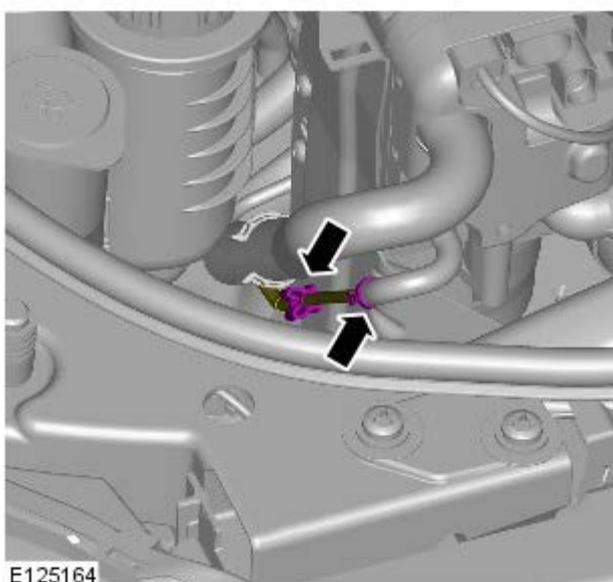
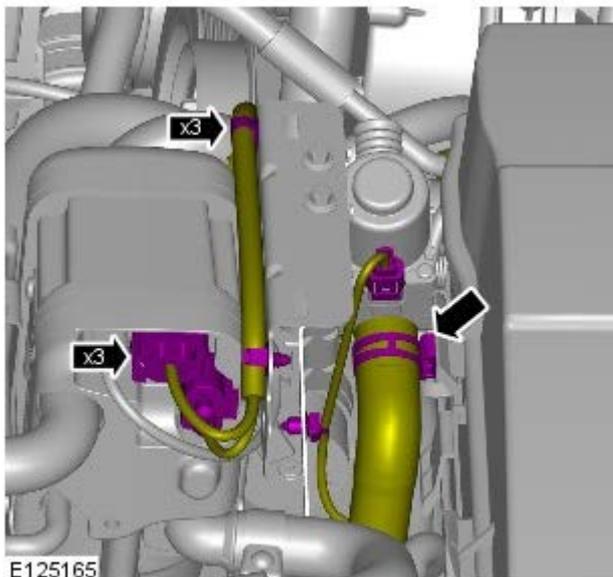
E125166

6.  CAUTION: Be prepared to collect escaping coolant.

- Clamp the hoses to minimize coolant loss.

7.

8.



9.  **CAUTION:** Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

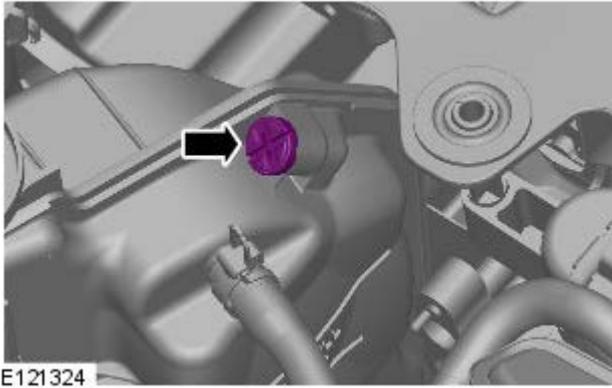
10. Torque: 10 Nm

Installation

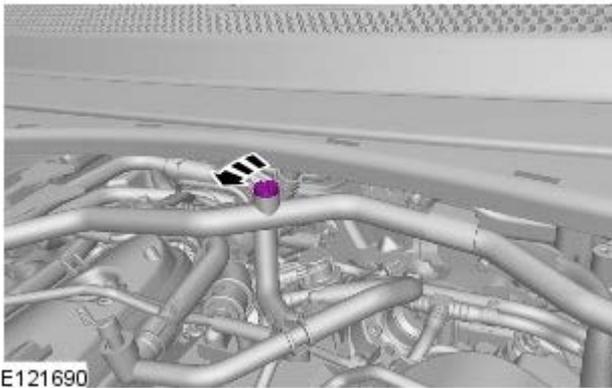
1. To install, reverse the removal procedure.

2. Refer to: Engine Cover - 3.0L V6 - TdV6 (501-05, Removal and Installation).

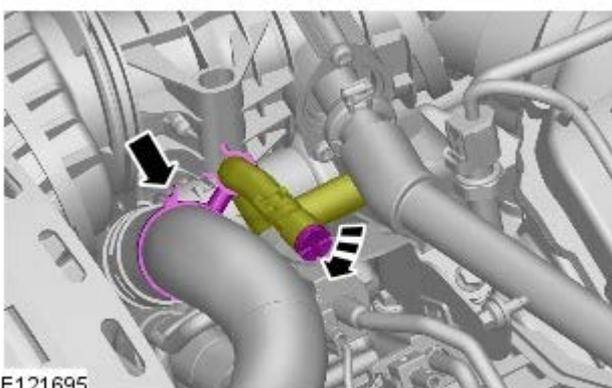
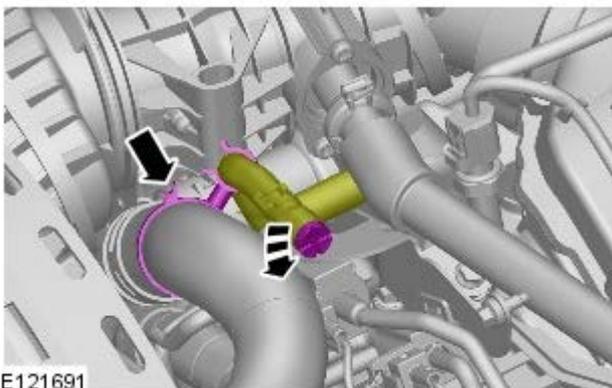
3.



4.



5.



6. CAUTIONS:

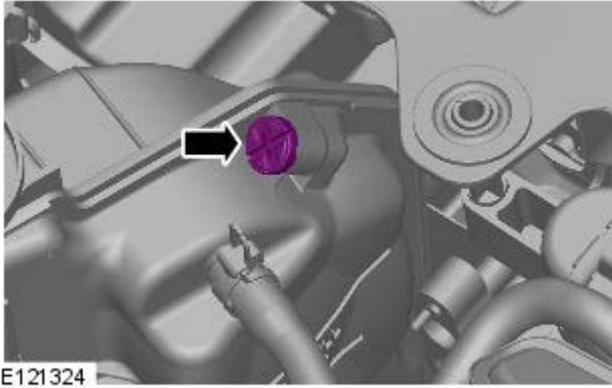
 Anti-freeze concentration must be maintained at 50%.

 Be prepared to collect escaping coolant.

Fill the coolant expansion tank until coolant appears through the bleed ports.

7.  CAUTION: Be prepared to collect escaping coolant.

Fill the coolant expansion tank until coolant appears through the bleed ports.



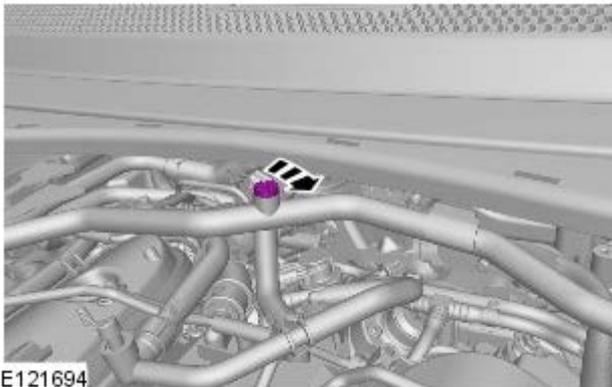
E121324

8.

- Set the heater controls to maximum.

9.

- Start the engine and continue to fill the coolant until the maximum level is reached.



E121694

10.  **CAUTION:** Be prepared to collect escaping coolant.

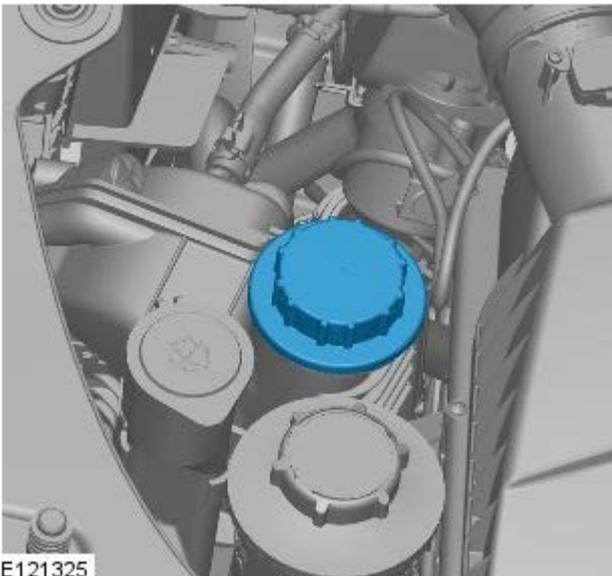
Fill the coolant expansion tank until coolant appears through the bleed ports.

11. Increase engine speed to 2500rpm and cycle between this and idle.

12.

- Continue to top-up with coolant with the engine at idle.

13.  **CAUTION:** Correct installation of the Coolant expansion tank cap can be obtained by tightening the cap until an audible click is heard.



E121325

14. Allow the engine to idle, until hot air is emitted at the face registers.

15. Once the front heater is warm, check if the rear heater is warm (if equipped). If no heat is felt, increase the engine

speed to 3000 rpm for 30 seconds and return to idle.

16.  CAUTION: Switch off the engine and allow the coolant temperature to go cold.
17. Visually check the engine and cooling system for signs of coolant leakage.

18.  WARNING: When releasing the cooling system pressure, cover the coolant expansion tank cap with a thick cloth.

CAUTIONS:

 Since injury such as scalding could be caused by escaping steam or coolant, make sure the vehicle cooling system is cool prior to carrying out this procedure

 Make sure the coolant level remains above the "COLD FILL RANGE" lower level mark.

 NOTE: When the cooling system is warm, the coolant will be approximately 10mm above the upper level mark on the expansion tank with the cap removed.

Check and top-up the coolant if required.

19. Refer to: Engine Cover - 3.0L V6 - TdV6 (501-05, Removal and Installation).

Auxiliary Heating - Fuel Fired Booster Heater Glow Plug And Burner Assembly TDV6 2.7L Diesel

Removal and Installation

Removal

NOTES:



Removal steps in this procedure may contain installation details.



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

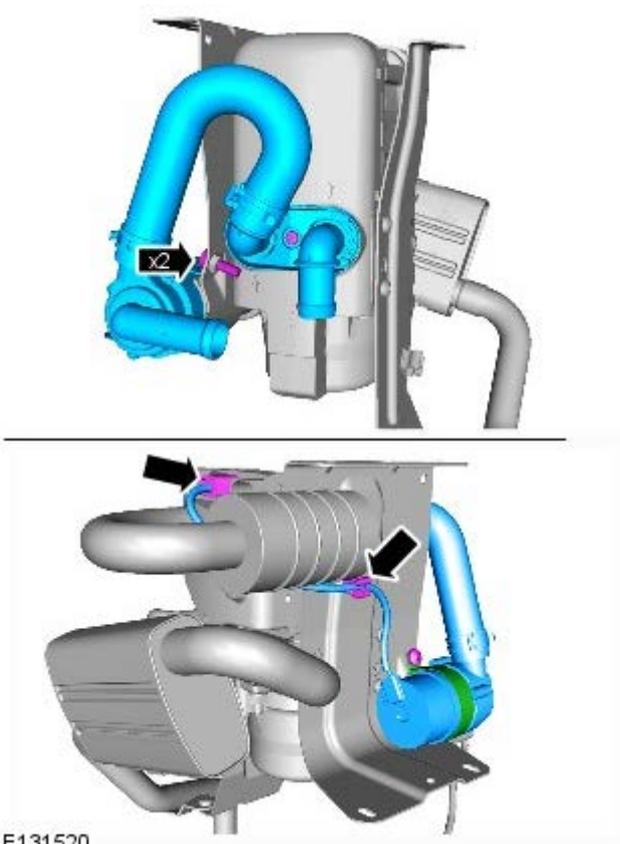
1. Refer to: Specifications (414-00, Specifications).

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

Raise and support the vehicle.

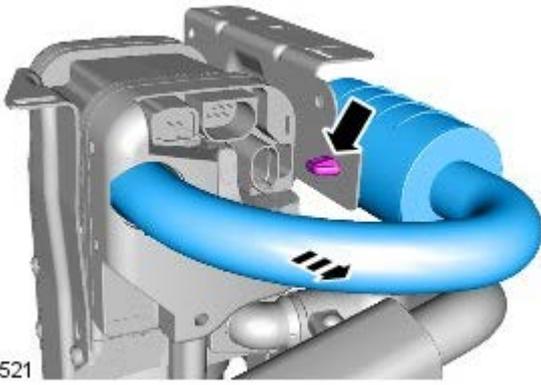
3. Refer to: Fuel Fired Booster Heater (412-02B, Removal and Installation).

4. 7.5 Nm



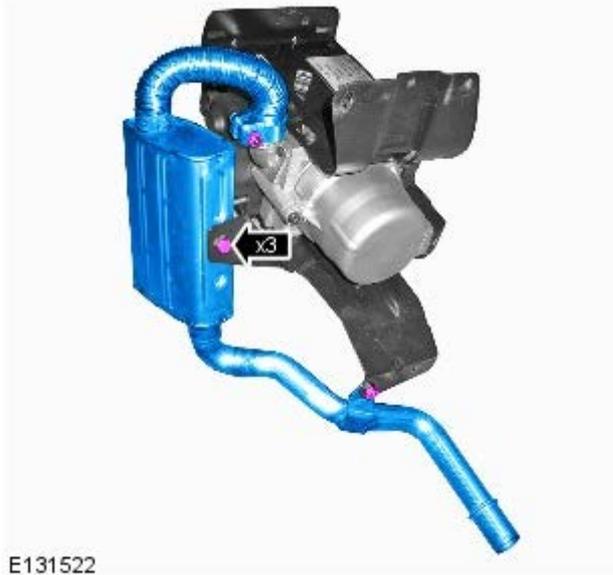
E131520

5.



E131521

6. 10 Nm



E131522

7. 10 Nm



E131523

8.



E131524

9.



E131525

10.



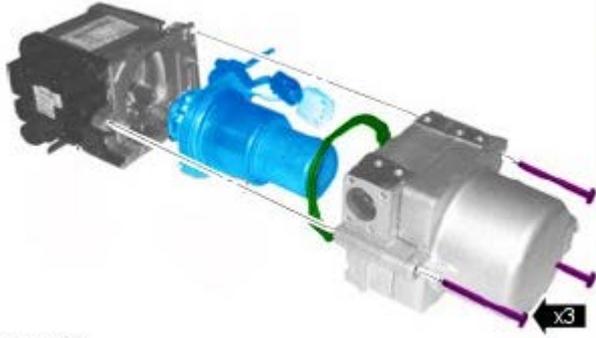
E131526

11.



E131527

12. 7 Nm



E131528

Installation

1. To install, reverse the removal procedure.
2. Refer to: Fuel Fired Booster Heater (412-02B, Removal and Installation).

Auxiliary Heating - Fuel Fired Booster Heater Glow Plug And Burner Assembly TDV6 3.0L Diesel

Removal and Installation

Removal

1. Refer to: Specifications (414-00, Specifications).

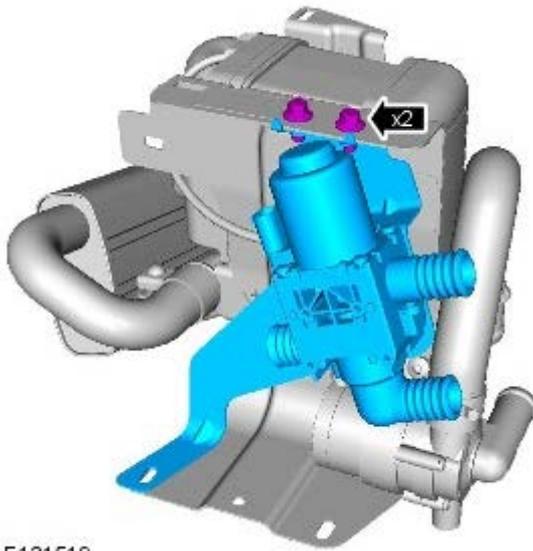
2.  **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

3. Refer to: Fuel Fired Booster Heater - 3.0L V6 - TdV6 (412-02B, Removal and Installation).

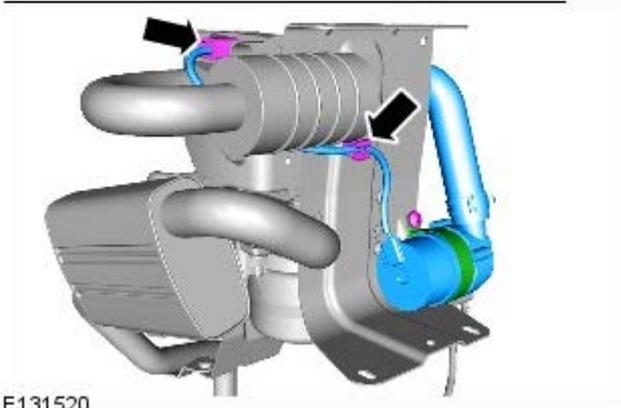
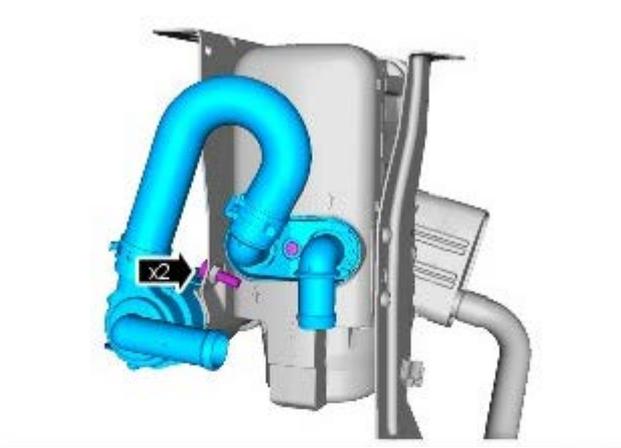
4.  **NOTE:** Where installed.

10 Nm



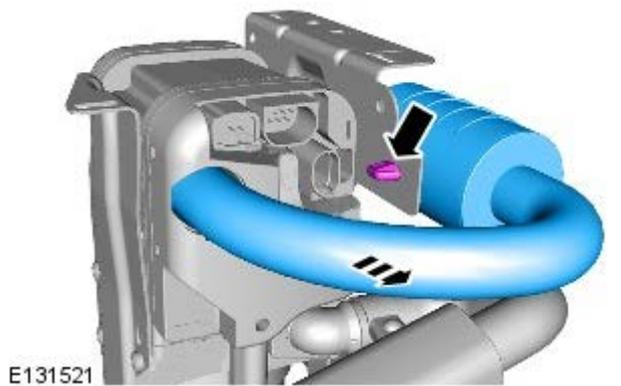
E131519

5. 7.5 Nm



E131520

6.



E131521

7. 10 Nm



E131522

8. 10 Nm



E131523

9.



E131524

10.



E131525

11.



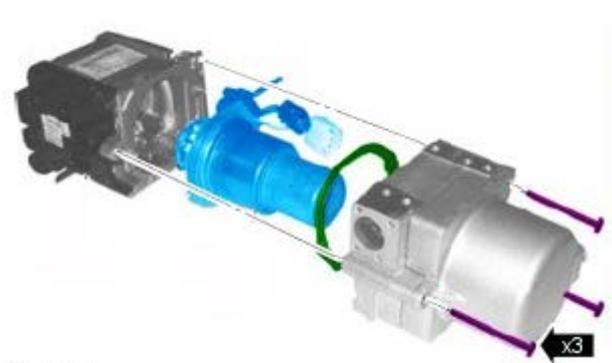
E131526

12.



E131527

13. 7 Nm



E131528

Installation

1. To install, reverse the removal procedure.
2. Refer to: Fuel Fired Booster Heater - 3.0L V6 - TdV6 (412-02B, Removal and Installation).

Auxiliary Heating - Fuel Fired Booster Heater Receiver Unit

Removal and Installation

Removal

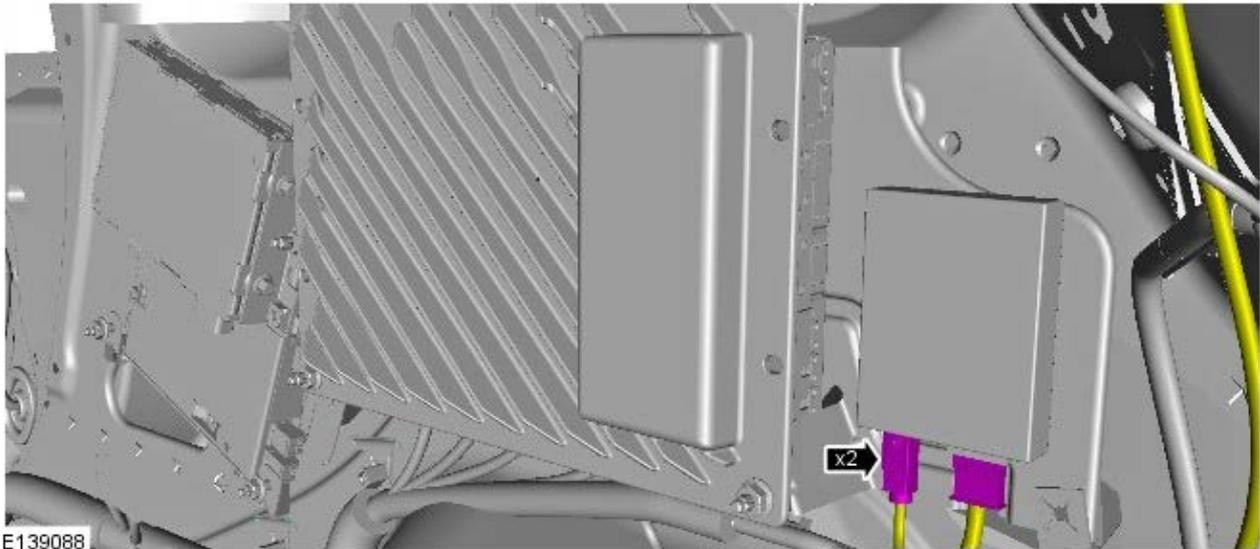


NOTE: Removal steps in this procedure may contain installation details.

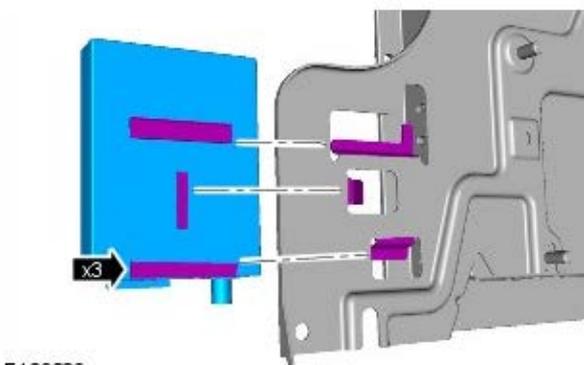
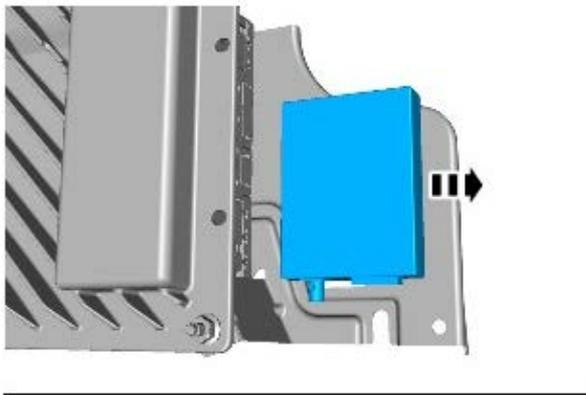
1. NOTE: RH side only.

Refer to: Rear Quarter Trim Panel (501-05, Removal and Installation).

- 2.



- 3.



Installation

1. To install, reverse the removal procedure.

2. Using the diagnostic tool, calibrate the component.