

Fuel Tank and Lines - TDV6 3.0L Diesel -**General Specifications**

Item	Specification
Fuel system	Mechanical - returnless
Fuel tank	Multi layer plastic
High pressure fuel pump	Located at rear of engine between the cylinder heads, belt driven from the camshafts
Low pressure fuel pump	Located in the fuel tank
Fuel filter	Remotely mounted on the inside of the longitudinal member - fitted with a renewable element
Fuel tank sender units	Two - Front and Rear - front sender is attached to the frame of the fuel pick up tube and the rear sender is attached to the fuel pump swirl pot
High pressure fuel pump maximum operating pressure	1650 bar - 23931.2 lbf/in ²
Low pressure fuel pump operating pressure	0.5 bar - 7.25 lbf/in ²

Capacities

	Liters
Fuel tank capacity	86.3 (total)

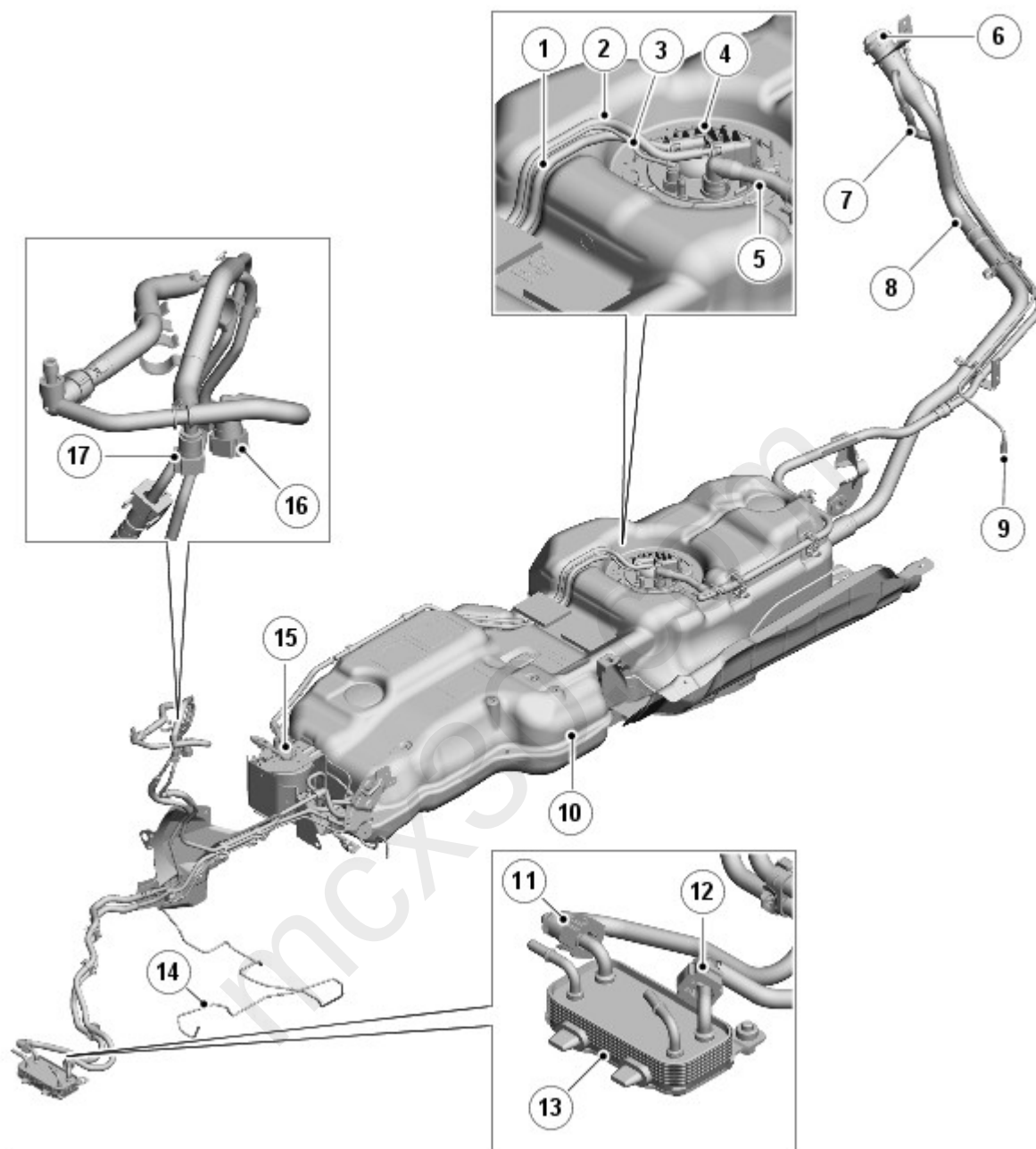
Torque Specifications

Description	Nm	lb-ft	lb-in
Fuel tank filler pipe retaining bolt	4	-	35
Fuel tank retaining bolts	45	33	-
Fuel tank heat shield retaining bolts	6	-	53
Fuel tank heat shield retaining nuts	3	-	27
Fuel filter heat shield retaining bolts	6	-	53
Transmission undershield retaining bolts	10	7	-
Fuel cooler retaining bolt	23	17	-

Fuel Tank and Lines - TDV6 3.0L Diesel - Fuel Tank and Lines

Description and Operation

3.0L V6 DIESEL FUEL TANK AND LINES COMPONENT LOCATION



E122445

Item	Part Number	Description
1	-	Pipe - Fuel pump to filter (fuel feed)
2	-	Pipe - Filter to pump module (fuel return)
3	-	Pipe - Fuel burning heater supply
4	-	Fuel pump module assembly
5	-	Fuel tank vent pipe
6	-	Filler cap and lanyard
7	-	Fuel tank vent pipe
8	-	Fuel filler pipe
9	-	Rear differential breather pipe (Ref only)
10	-	Cover
11	-	Pipe - Fuel cooler to filter (fuel return)
12	-	Pipe - HP pump to fuel cooler (fuel return)
13	-	Fuel cooler
14	-	Pipe - Fuel burning heater supply
15	-	Fuel filter
16	-	Pipe - HP pump to fuel cooler (fuel return)
17	-	Pipe - Filter to HP pump (fuel feed)

GENERAL

The major components of the 3.0L TdV6 fuel system comprises a fuel tank, a fuel pump module, a fuel filter, a fuel cooler, a fuel filler pipe and cap assembly and two fuel level sensors. The fuel system is a high pressure common rail system which uses an engine mounted and driven high pressure pump to deliver a uniform level of pressure to the common fuel rails which supply all 6 fuel injectors.

The fuel tank houses an internal fuel lift pump, located in the fuel pump module. The lift pump is employed to provide a low-pressure supply to the common rail high pressure fuel system.

Two fuel level sensors are installed in the front and rear of the fuel tank. The sensors are a MAGnetic PASSive Position Sensor (MAPPS) which provide a variable resistance to ground for the output from the fuel gauge.

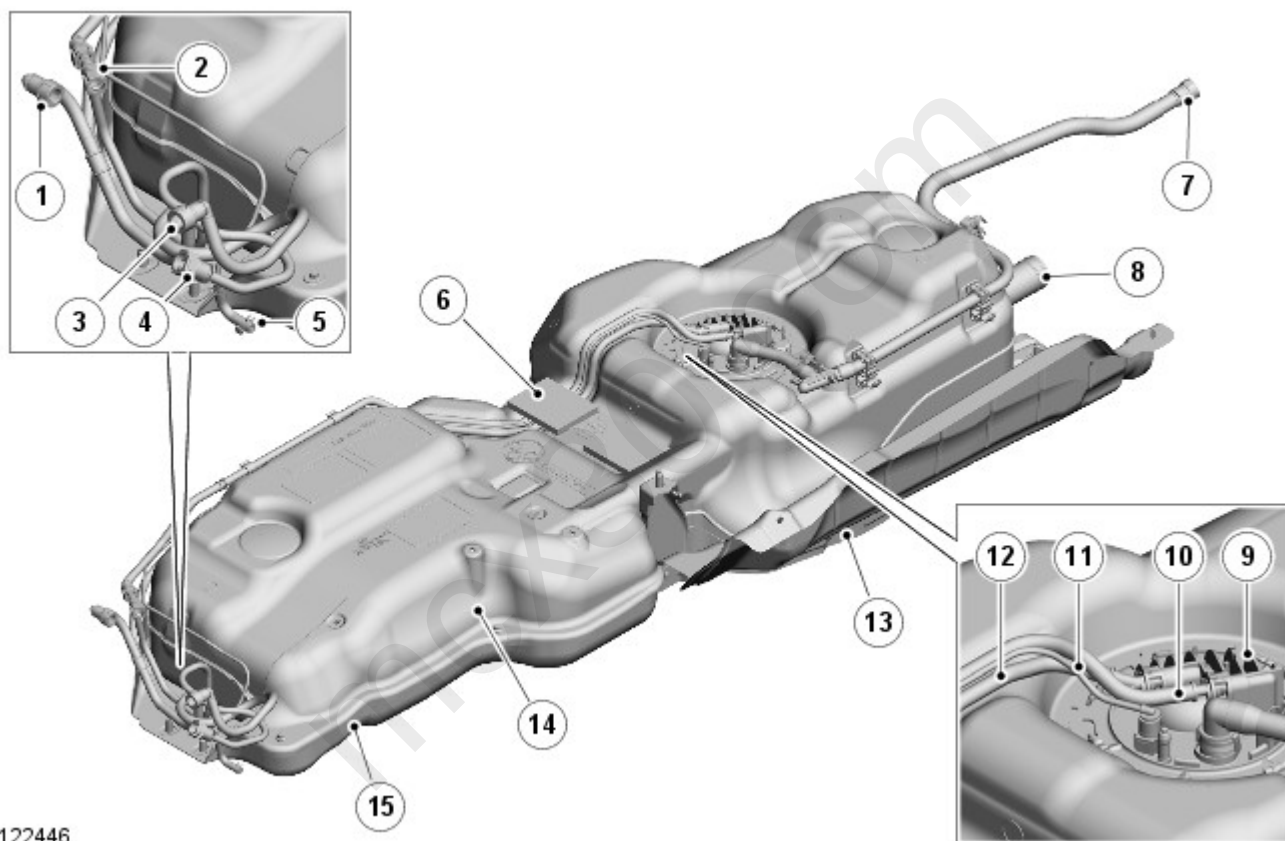
A fuel cooler is located in the low pressure side of the system in the fuel return line and is a fuel to water type cooler.

The fuel tank breather system consists of a fuel cut-off elbow. No Roll Over Valves (ROV's) are fitted.

The fuel filter is a disposable canister type and is located on a bracket at the front of the fuel tank.

DESCRIPTION

FUEL TANK ASSEMBLY



E122446

Item	Part Number	Description
1	-	Fuel return from filter to tank
2	-	Fuel supply from fuel pump to filter
3	-	Pipe - return from fuel cooler
4	-	Pipe - Fuel supply to HP pump
5	-	Pipe - Fuel burning heater supply
6	-	Pad (2 off)
7	-	Pipe - Fuel tank breather
8	-	Fuel tank filler inlet hose
9	-	Fuel pump module assembly
10	-	Pipe - Fuel return
11	-	Pipe - Fuel burning heater supply
12	-	Pipe - Fuel supply from pump
13	-	Heat shield
14	-	Cover
15	-	Cradle

The fuel tank is located on the right hand side of the vehicle, between the transmission and the right hand chassis longitudinal. The tank is located on a mounting cradle which secures the whole fuel tank assembly to the vehicle. The tank is blow moulded from HDPE (high density polyethylene) and has a useable capacity of 82.0 liters (18 gallons).

The cradle is attached to the chassis with six screws. When the cradle is attached to the chassis, the tank is positively secured via foam pads which bear against the central chassis cross beam. A protective cover is fitted to the front right

hand corner of the tank and provides additional protection.

The fuel tank is manufactured from moulded plastic which is a minimum of 3 mm thick. The tank is a sealed unit with the only internal access being via the pump module flange aperture on the top of the tank.

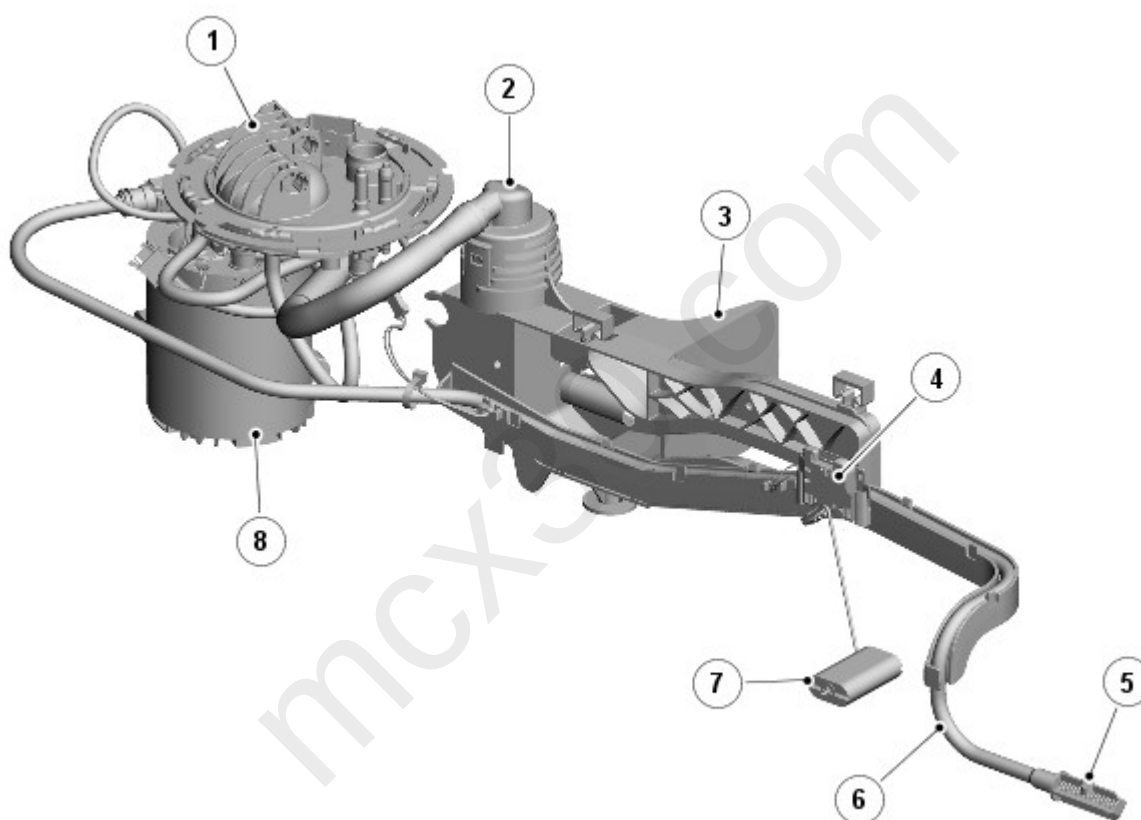
The flange is fitted with a locking ring and seal. The seal locates in a groove on the tank. The locking ring locates and clamps on the encapsulated ring that is moulded into the fuel tank. The flange has a tag which locates in the top of the tank to ensure correct orientation.

The flange has six pin internal and external connectors which provide for electrical connections for the level sensors and the fuel pump. Two quick release connectors provide for the connection of the fuel feed and return pipes and the vent pipes. The fuel return connection contains a non return valve which prevents fuel escaping from the connection in the event of a vehicle roll over and the pipe becoming detached. On vehicles with a fuel burning heater, a third connection provides the connection for the fuel feed supply to the fuel burning heater.

The fuel pump module is mounted on a bayonet lock ring which is welded inside the fuel tank. A carrier within the tank provides for the mounting of the fuel suction jet, front fuel sensor and the fuel cut-off elbow.

The fuel pump module contains a number of components. The module comprises the fuel pump, the rear fuel level sensor, the rear jet pump, the pump inlet filter and the fuel pressure regulator. Only the pump module assembly, the fuel level sensors and the flange are available as serviceable components, the individual assembly components are not available separately.

Fuel Tank Internal Components



E122447

Item	Part Number	Description
1	-	Fuel pump module assembly
2	-	Fuel cut-off elbow
3	-	Carrier
4	-	Forward fuel level sensor
5	-	Suction port filter
6	-	Suction port pipe
7	-	Level sensor float
8	-	Swirl pot

Fuel Pump Module

The low pressure fuel lift pump is located in the fuel pump module. The lift pump is employed to provide a low pressure supply at approximately 0.5 bar, to the common-rail high pressure fuel system and to allow the jet pump assemblies to maintain a full swirl pot.

The lift pump operation is controlled by the Engine Control Module (ECM), via the fuel pump relay located in the Engine Junction Box (EJB). When the ignition is switched on, the fuel pump operates for 25 seconds to build up fuel pressure. As engine cranking commences the fuel pump stops running until the engine starts. This function is employed to decrease load on the battery.

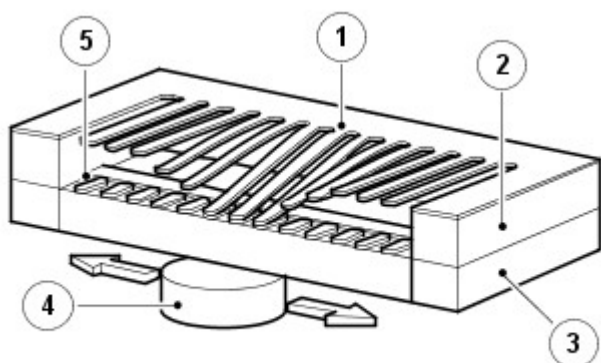
In cold conditions, 'waxing' of the fuel can occur. For this reason a coarse mesh filter is attached to the swirl pot inlet port at the bottom of the pump module.

A three way connection is located on the top of the module. Two outlets supply the jet pumps, the other outlet is the pressure feed through the pressure regulating valve to the fuel delivery line. The module incorporates a jet pump which draws fuel from the front of the tank and delivers it directly into the swirl pot.

Fuel Level Sensors

Two fuel level sensors are installed at either end of the tank. One is mounted on the fuel pump module, the other is mounted in a central position on the internal carrier within the tank. The sensors are a MAPPS (magnetic passive position sensor) which provide a variable resistance to ground for the output from the fuel gauge. The sensor is sealed from the fuel preventing contamination of the contacts, increasing reliability. The fuel level sensors are connected to an electrical connector on the underside of the fuel pump module flange.

The sensor comprises a series of 51 film resistors mounted in an arc on a ceramic surface. The resistors are wired in series with individual contacts. A soft magnetic foil with 51 flexible contacts is mounted a small distance above the film resistors. A magnet, located below the ceramic surface, is attached to the sender unit float arm. As the float arm moves, the magnet follows the same arc as the film resistors. The magnet pulls the flexible contacts onto the opposite film resistor contacts forming an electrical circuit.



E44504

Item	Part Number	Description
1	-	Magnetic foil
2	-	Spacer
3	-	Ceramic surface
4	-	Magnet
5	-	Resistance film

The film resistors are arranged in a linear arc with resistance ranging from 51.2 to 992.11 Ohms. The electrical output signal is proportional to the amount of fuel in the tank and the position of the float arm. The measured resistance is processed by the instrument cluster to implement an anti-slosh function. This monitors the signal and updates the fuel gauge pointer position at regular intervals, preventing constant pointer movement caused by fuel movement in the tank due to cornering or braking.

A warning lamp is incorporated in the instrument cluster and illuminates when the fuel level is low.

The fuel level sender signal is converted into a CAN (controller area network) message by the instrument cluster as a direct interpretation of the fuel tank contents in liters.

In the event that fuel is allowed to run too low, signals transmitted from the fuel level sensors initiate the fuel run-dry strategy. The driver will be notified before the tank is run critically low on fuel. Although this is a simulated run-dry procedure, it provides the symptoms of the vehicle running out of fuel and the driver will perceive it as such. The engine will stop when there is approximately 4 liters (0.87 gallons) of fuel remaining in the fuel tank.

Jet Pumps

The fuel system incorporates twin jet pumps which are integral with the fuel pump module. One jet pump collects fuel from the rear of the tank, and the other draws additional fuel from the front of the tank through a suction line that is mounted on the carrier. The jet pump operates on a venturi effect created by the fuel at pump output pressure passing through the jet pump.

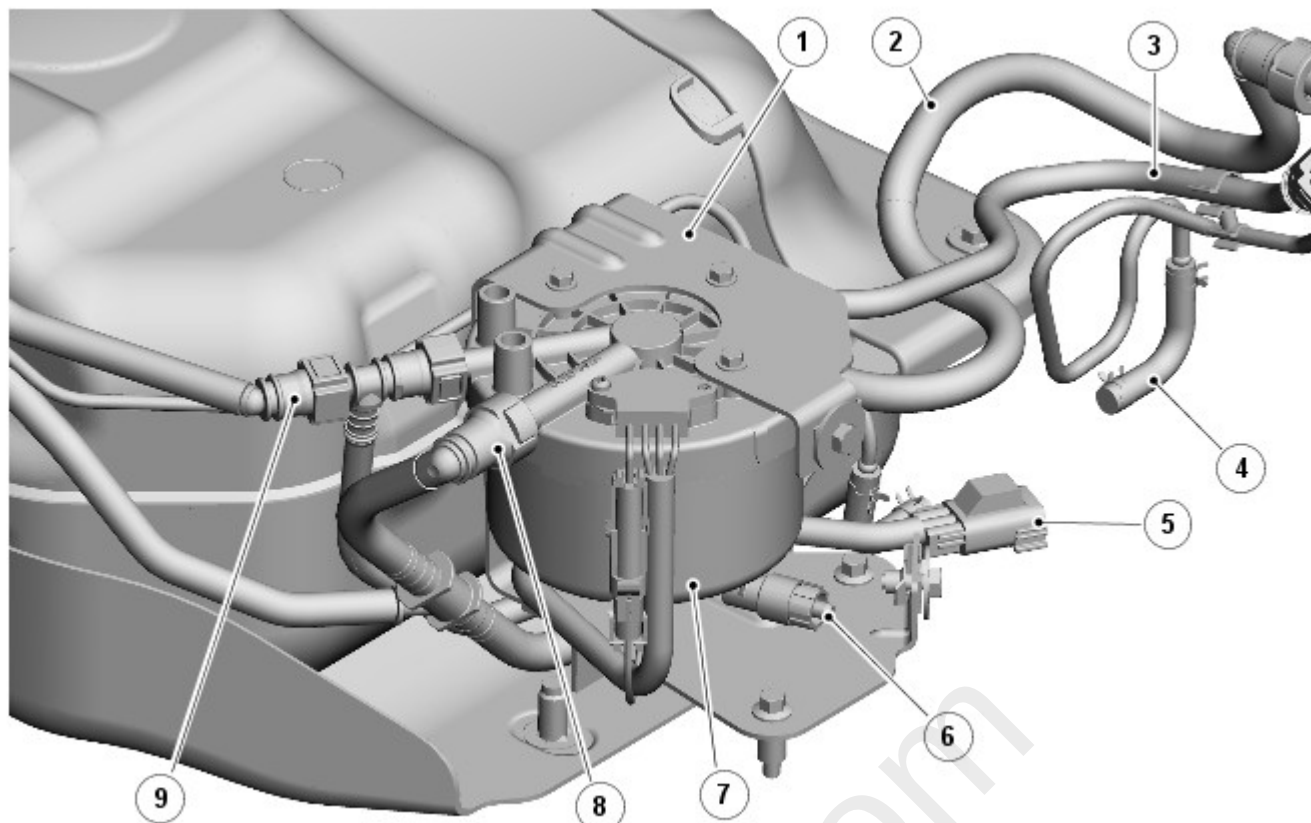
The prime function of the jet pump is to collect fuel from the front of the tank and transfer it into the fuel pump module swirl pot at the rear of the tank. The jet pump feature ensures that fuel is drained from the front of the tank before fuel run-out at the rear of the tank.

Fuel Cut-Off Elbow

The fuel cut-off elbow is located in the upper half of the tank on the carrier and is connected to the tank breather. The main purpose of the fuel cut-off elbow is to control the fill volume of the tank. During filling air, trapped inside the tank and a small amount of vapor is passed via the fuel cut-off elbow to the tank breather. The air and vapor mix then vents to atmosphere through the breather. During filling, when the tank reaches its full level, the fuel cut-off elbow closes and prevents air/vapor passing through to the tank breather. The resulting back pressure causes refueling to stop automatically.

The fuel cut-off elbow is always open when the fuel tank is below full, providing an unrestricted air/vapor outlet to the tank breather.

FUEL FILTER



E122448

Item	Part Number	Description
1	-	Mounting bracket
2	-	Pipe - Fuel return from fuel cooler
3	-	Pipe - Fuel supply to high pressure fuel pump
4	-	Pipe - Fuel supply to Fuel Burning Heater (FBH)
5	-	Electrical connector
6	-	Water drain
7	-	Fuel filter
8	-	Fuel return to tank connection
9	-	Fuel supply from tank connection

The fuel filter assembly is located in front of the fuel tank and is mounted on a bracket which is attached to the top face of the transfer box chassis cross member. The fuel filter assembly comprises a bracket, filter housing and the filtration element. The filter housing is secured to the bracket with 3 bolts. The bracket is secured to the cross member with 2 bolts which are screwed into threaded holes in the cross member.

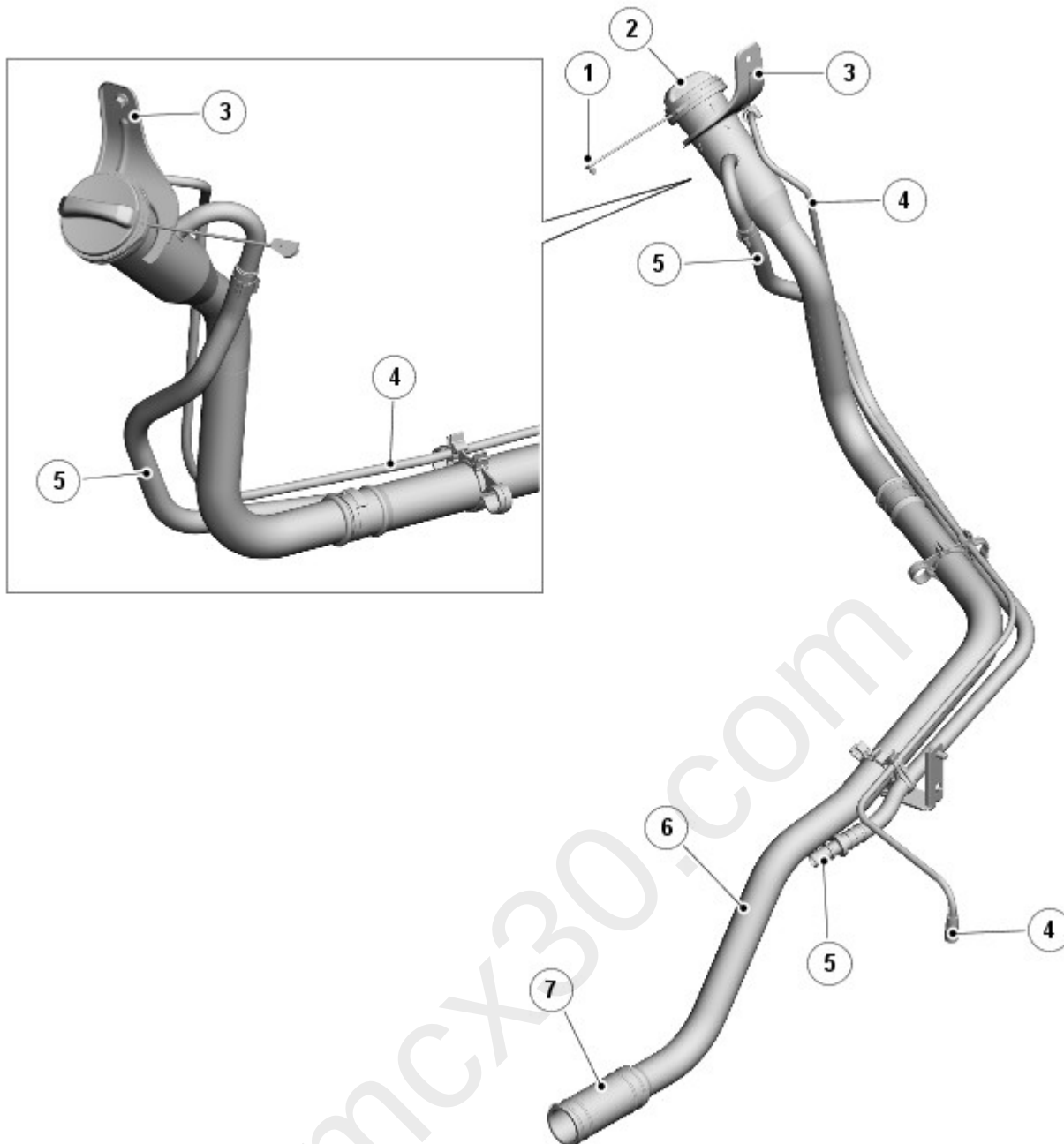
The filter housing has an inlet and outlet which allow for the attachment of hoses using quick release connectors. The filter element is located on the underside of the housing and can be removed by rotating one quarter turn to release from the housing.

The filter element has a capacity of 200 cm³ (12.2 in³). The filtration element can filter particulate matter larger than 15 microns. A water drain valve is located on the base of the filter. The filter can be purged of water by partially unscrewing the drain valve and allowing at least 84 cm³ (5.12 in³) of fuel to drain into a suitable container. The drain plug has a centre outlet which allows for the attachment of a drain hose.

The filter element also has a water sensor located in its base. The sensor is screwed into a threaded hole in the base of the element. When the filter is replaced at service, the sensor can be unscrewed from the element and installed in the new element. The sensor has an electrical connector located at the side of the element which can be disconnected to assist element removal.

The water sensor is connected to the Engine Control Module (ECM). When the water in the element reaches 64 cm³ (3.9 in³) the ECM issues a high speed Controller Area Network (CAN) bus message to the instrument cluster to display a 'WATER IN FUEL' message in the message center.

FUEL FILLER PIPE



E122449

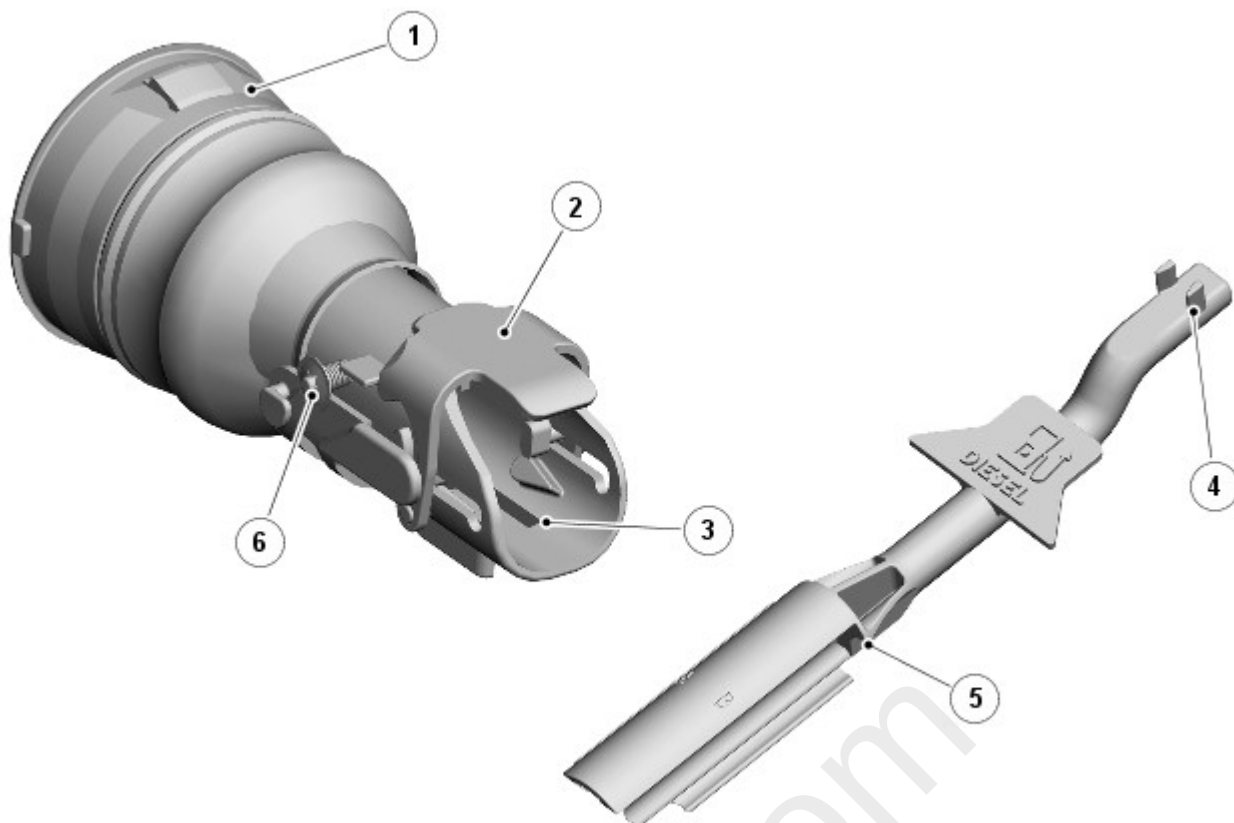
Item	Part Number	Description
1	-	Lanyard
2	-	Filler cap
3	-	Bracket
4	-	Pipe - Rear differential breather (Reference only)
5	-	Pipe - Fuel vapor vent
6	-	Fuel filler pipe
7	-	Hose - connection to fuel tank

The stainless steel filler neck has a wide bore neck specially designed to reduce diesel frothing while the fuel tank is being replenished. The filler pipe is connected at its lower end to the fuel tank by a hose which is secured to the pipe with a worm drive clamp. The opposite end of the hose is connected to the fuel tank inlet check valve and secured with another worm drive clamp.

A fuel vapor vent pipe is attached to the filler pipe and connects between the fuel level vent valve in the fuel tank and fuel filler pipe neck.

The filler head incorporates the Fuel Guard system to prevent accidental filling of the tank with petrol (gasoline).

Fuel Guard System



E117721

Item	Part Number	Description
1	-	Filler neck
2	-	Flap
3	-	Reset slots
4	-	Spigots
5	-	Reset tool
6	-	Spring

The fuel guard system comprises a mechanically operated flap which is triggered when the smaller diameter filler nozzle tube, used on petrol (gasoline) pumps, is inserted in the filler neck. The flap is actuated and blocks the sensor port on the fuel pump nozzle, causing it to automatically switch off. The flap is locked in this position by a latch mechanism.

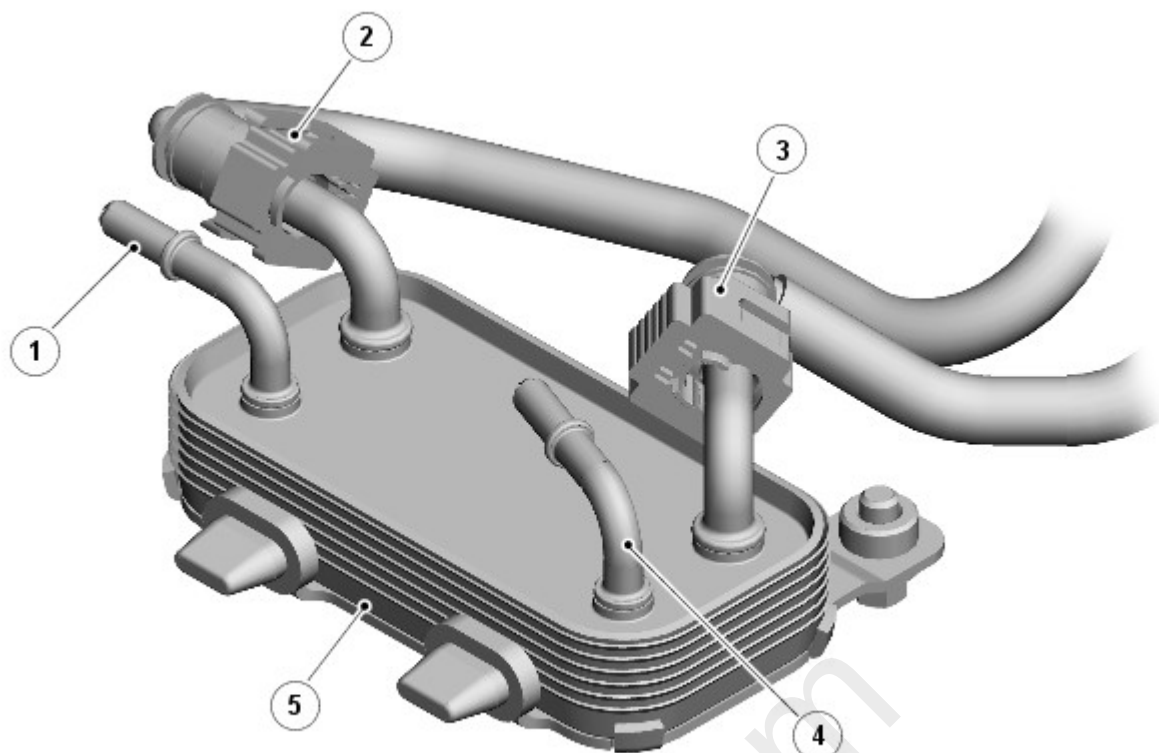
A reset tool is provided and stored in the luggage compartment. The tool is used to reset the fuel guard device if triggered and release the latch. Two spigots on the tool locate in slots in the filler neck which release a latch and the flap is opened by its own spring. The tool is located in the filler neck and once the two spigots on the tool are located in the slots it can be pulled outwards, releasing a latch and allowing the flap to be opened by its own spring pressure. The tool is stored on the battery mounting clamp.

The flap is colored yellow so that it is clearly visible when activated and has a 'Handbook' symbol on it.

A diesel fuel pump nozzle will not activate the fuel guard because the nozzle stops against two molded lugs. However, if an unleaded gasoline pump nozzle is inserted into the housing, its smaller diameter allows it to pass the two molded lugs. The nozzle strikes two pins on the inside of the filler housing which move forward. This movement rotates the shut-off flap which is then held in place when the nozzle is removed by the latch mechanism.

• **NOTE:** Russian markets do not use the fuel guard system and are fitted with a conventional filler neck.

FUEL COOLER



E122450

Item	Part Number	Description
1	-	Coolant outlet
2	-	Pipe - cooler to fuel filter
3	-	Pipe - HP pump to cooler
4	-	Coolant inlet
5	-	Fuel cooler

The fuel cooler uses engine coolant, direct from the lower part of the radiator, to cool fuel returning to the tank from the HP injection pump.

The fuel cooler is located on the right hand side of the chassis, at the rear of the engine, near to transmission cooler. A bracket, which is attached to the right hand chassis rail, provides for the attachment of the cooler. The bracket has two slots which accept two plastic pegs which are attached to the cooler. A bolt is inserted through a hole in the bracket and screws into a captive nut on the cooler to positively secure the cooler to the bracket.

The cooler has four quick fit connector pipes which provide for the attachment of the fuel inlet hose from the HP injection pump, the fuel outlet hose to the fuel filter, the coolant inlet hose from the radiator and the coolant outlet hose to the coolant thermostat housing. The coolant pipes can be identified by their smaller diameter.

OPERATION

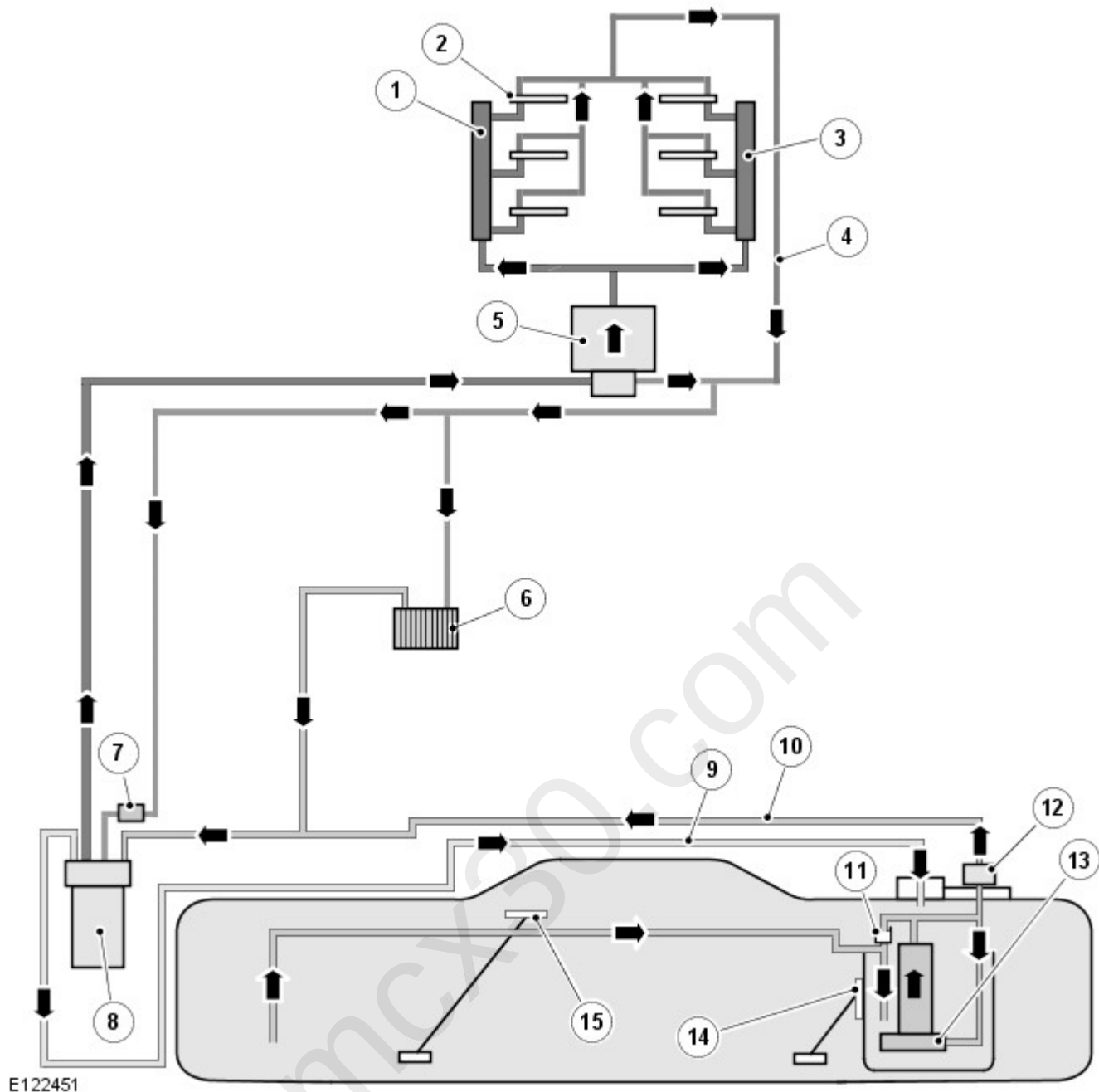
Diesel fuel is drawn from the tank by the internal electric lift pump. The fuel pressure regulator located in the fuel pump module assembly regulates the delivery pressure at approximately 0.5 bar to the transfer pump housed in the High Pressure (HP) pump. A VCV (volume control valve) governs the amount of fuel supplied to the HP pump.

The transfer and high pressure pump are driven directly by the engine. Due to the storage volume of the common rail, the injection pressure will remain practically constant over the complete duration of the injection process.

The HP pump has a return pipe circuit which is separate from the injector return pipes.

For additional information, refer to: [Fuel Charging and Controls](#) (303-04C Fuel Charging and Controls - TDV6 3.0L Diesel, Description and Operation).

Fuel Delivery Schematic Diagram



E122451

Item	Part Number	Description
1	-	Left Hand (LH) common rail
2	-	Fuel injector (6 off)
3	-	Right Hand (RH) common rail
4	-	Fuel rail and injector leak-off return line
5	-	High Pressure (HP) fuel pump
6	-	Fuel cooler
7	-	Thermostatic diverter valve
8	-	Fuel filter assembly
9	-	Fuel return/air bleed pipe
10	-	Low Pressure (LP) delivery pipe
11	-	Jet pump
12	-	Pressure regulator
13	-	Fuel pump module
14	-	Fuel level sensor - Rear
15	-	Fuel level sensor - Front

Fuel Tank and Lines - TDV6 3.0L Diesel - Fuel Tank and Lines

Diagnosis and Testing

Principle of Operation

For a detailed description of the fuel tank and lines system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to:

[Fuel Tank and Lines](#) (310-01A Fuel Tank and Lines - TDV6 2.7L Diesel, Description and Operation),
[Fuel Tank and Lines](#) (310-01B Fuel Tank and Lines - TDV6 3.0L Diesel, Description and Operation),
[Fuel Tank and Lines](#) (310-01B Fuel Tank and Lines - TDV6 3.0L Diesel, Description and Operation).

Inspection and Verification

• WARNINGS:

 Do **NOT** carry out any work on the fuel system with the engine running. The fuel pressure within the system can be as high as 2000 bar (29,008 lb/in²). Failure to follow this instruction may result in personal injury.

 Eye protection must be worn at all times when working on or near any fuel related components. Failure to follow this instruction may result in personal injury.

 This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow this instruction may result in personal injury.

 After carrying out repairs, the fuel system must be checked visually for leaks. This should be done after the engine has been run, but with the engine switched **OFF**. Failure to follow this instruction may result in personal injury.

 If taken internally, **DO NOT** induce vomiting. Seek immediate medical attention. Failure to follow this instruction may result in personal injury.

 If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek medical attention. Failure to follow this instruction may result in personal injury.

 Wash hands thoroughly after handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention. Failure to follow this instruction may result in personal injury.

• CAUTIONS:

 Before disconnecting any part of the system, it is imperative that all dust, dirt and debris is removed from around components to prevent ingress of foreign matter into the fuel system. Failure to follow this instruction may result in damage to the vehicle.

 The fuel pipes between the injectors and the rail must be discarded after each use, and new pipes installed. Failure to follow this instruction may result in damage to the vehicle.

 It is essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in damage to the vehicle.

 Make sure that the workshop area in which the vehicle is being worked on is as clean and dust-free as possible. Areas in which work on clutches, brakes or where welding or machining are carried out are not suitable in view of the risk of contamination to the fuel system. Failure to follow this instruction may result in damage to the vehicle.

 Make sure that any protective clothing worn is clean and made from lint-free non-flocking material. Failure to follow this instruction may result in damage to the vehicle.

 Make sure that any protective gloves worn are new and are of the non-powdered latex type. Failure to follow this instruction may result in damage to the vehicle.

 Make sure that clean, non-plated tools are used. Clean tools using a new brush that will not lose its bristles and fresh cleaning fluid prior to starting work on the vehicle. Failure to follow this instruction may result in damage to the vehicle.

 Use a steel-topped work bench and cover it with clean, lint-free, non-flocking material. Failure to follow this instruction may result in damage to the vehicle.



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

• **NOTE:** Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. **1.** Verify the customer concern.
2. **2.** Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
● Fuel level ● Contaminated fuel ● Fuel supply line(s) ● Fuel return line(s) ● High-pressure fuel supply line(s) ● Fuel tank filler pipe ● Fuel leak(s) ● Fuel tank ● Fuel filler cap ● Fuel filter ● Push connect fittings ● Fuel rail ● Fuel injection pump ● Exhaust Gas Recirculation (EGR) system	● Battery charge and condition ● Fuse(s) ● Inertia fuel shutoff (IFS) switch ● Fuel pump module relay ● Fuel pump module ● Electrical connector(s) ● Damaged or corroded wiring harness ● Fuel Volume Control Valve (FVCV) ● Fuel Pressure Control Valve (FPCV) ● Engine Control Module (ECM)

3. **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. **4.** If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Causes	Action
Engine cranks, but does not start	● Inertia fuel shutoff switch ● Low/Contaminated fuel ● Air leakage ● Low-pressure fuel system fault ● Fuel pump module (lift pump) fault ● Blocked fuel filter ● Fuel volume regulator blocked/contaminated ● Fuel pressure control valve blocked/contaminated ● Fuel pump fault ● Crankshaft position (CKP) sensor	Check that the inertia switch has not tripped. Check the fuel level and condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the intake air system for leaks. Check the lift pump operation, check the low-pressure fuel system for leaks/damage. Check the fuel filter, check for DTCs indicating a fuel volume or pressure control valve fault. Check the fuel pump. Check the CKP sensor circuits. Refer to the electrical guides.
Difficult to start	● Glow plug system fault (very cold conditions) ● Low/Contaminated fuel ● Air leakage ● Fuel pump module (lift pump) fault ● Low-pressure fuel system fault ● Blocked fuel filter ● Fuel volume control valve blocked/contaminated ● Fuel pressure control valve blocked/contaminated ● Exhaust gas recirculation (EGR) valve(s) fault	Check the glow plug circuits. Refer to the electrical guides. Check the fuel level/condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the intake air system for leaks. Check the lift pump operation, check the low-pressure fuel system for leaks/damage. Check the fuel filter, check for DTCs indicating a fuel volume or pressure control valve fault. Check the EGR system.
Rough idle	● Intake air system fault ● Low/Contaminated fuel ● Low-pressure fuel system fault ● Blocked fuel filter ● Fuel volume control valve blocked/contaminated ● Fuel pressure control valve	Check the intake air system for leaks. Check the fuel level/condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the low-pressure fuel system for leaks/damage. Check the fuel filter, check for DTCs indicating a fuel volume or pressure control valve fault. Check the EGR system.

Symptom	Possible Causes	Action
	blocked/contaminated Exhaust gas recirculation (EGR) valve(s) fault	
Lack of power when accelerating	- Intake air system fault - Restricted exhaust system - Low fuel pressure - Exhaust gas recirculation (EGR) valve(s) fault - Turbocharger actuator fault	Check the intake air system for leakage or restriction. Check for a blockage/restriction in the exhaust system, install new components as necessary. Check for DTCs indicating a fuel pressure fault. Check the EGR system. Check turbocharger actuator.
Engine stops/stalls	- Air leakage - Low/Contaminated fuel - Low-pressure fuel system fault - High pressure fuel leak - Fuel volume control valve blocked/contaminated - Fuel pressure control valve blocked/contaminated - Exhaust gas recirculation (EGR) valve fault	Check the intake air system for leaks. Check the fuel level/condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the fuel system for leaks/damage: Check for DTCs indicating a fuel volume or pressure control valve fault. Check the EGR system.
Engine judders	- Low/Contaminated fuel - Air ingress - Low-pressure fuel system fault - Fuel metering valve blocked/contaminated - Fuel volume control valve blocked/contaminated - Fuel pressure control valve blocked/contaminated - High pressure fuel leak - Fuel pump fault	Check the fuel level/condition. Draw off approximately 1 ltr (2.11 pints) of fuel and allow to stand for 1 minute. Check to make sure there is no separation of the fuel indicating water or other liquid in the fuel. Check the intake air system for leaks. Check the low-pressure fuel system for leaks/damage. Check the high pressure fuel system for leaks, check for DTCs indicating a fuel volume or pressure control valve fault. Check the fuel pump.
Excessive fuel consumption	- Low-pressure fuel system fault - Fuel volume control valve blocked/contaminated - Fuel pressure control valve blocked/contaminated - Fuel temperature sensor leak - High pressure fuel leak - Injector(s) fault - Exhaust gas recirculation (EGR) valve(s) fault	Check the low-pressure fuel system for leaks/damage. Check for DTCs indicating a fuel volume or pressure control valve fault. Check the fuel temperature sensor, fuel pump, etc for leaks. Check for injector DTCs. Check the EGR system.

Fuel Gauge Diagnosis

1. Using the manufacturer approved diagnostic system monitor, "active fuel level sensor(A)" and "passive fuel level sensor(B)" data logger signals located within the body control module subsection.

Customer Complaint	Possible Concern	Fuel Pressure	Active Fuel Level Sensor Voltage Reading A	Passive Fuel Level Sensor Voltage Reading B	Action
Fuel gauge switches on and off intermittently and / or fuel gauge indicates empty whilst there is fuel still available in the fuel tank	Open circuit	Yes	>3.6v	>3.6v	- Refer to the electrical circuit diagrams and check for backed out terminals and circuit faults between, - C0390-18 and C0114-1 - If no fault is evident then check C0376-18 to C0586R-8, - If no fault is evident with the above, remove the fuel pump module and two fuel senders from the fuel tank and check for backed out terminals and circuit faults. Refer to the warranty policy and procedures manual if a

Customer Complaint	Possible Concern	Fuel Pressure	Active Fuel Level Sensor Voltage Reading A	Passive Fuel Level Sensor Voltage Reading B	Action
					module/component is suspect
Fuel gauge switches on and off intermittently and / or fuel gauge indicates empty whilst there is fuel still available in the fuel tank	Open circuit	Yes	<3.0v	>3.6v	- Refer to the electrical circuit diagrams and check for backed out terminals and circuit faults between, - C0390-2 and C0114-6, - If no fault is evident then check C0376-2 to C0586R-20 - If no fault is evident with the above, remove the fuel sender B (front) from the fuel tank and check for backed out terminals and circuit faults
Fuel gauge switches on and off intermittently and / or fuel gauge indicates empty whilst there is fuel still available in the fuel tank	Open circuit	Yes	>3.6v	<3.0v	- Refer to the electrical circuit diagrams and check for backed out terminals and circuit faults between, - C0390-3 and C0114-2 - If no fault is evident then check C0376-3 to C0586R-21 - If no fault can be found with the above check then the active fuel sender A (rear) will need to be removed and the wiring carefully inspected
Fuel gauge switches on and off intermittently and / or fuel gauge indicates empty whilst there is fuel still available in the fuel tank	Electric parkbrake fault (EPB)	Yes	0.35v to 3.06v	0.35v to 3.06v	- NOTE: Check for correct EPB operation prior to carrying out the following checks. - NOTE: The EPB module is calibrated to allow fuel gauge correction for varying gradients (via CAN Bus). - Refer to the electrical circuit diagrams and check for backed out terminals and circuit faults at connectors, - C2178-31, C2178-32 - C2178-9, - C2178-10, - C2178-15 and C2178-16 - Check Earth Point (LH D Post) C2570S (Discovery 4/LR4) C2570T (Range Rover Sport)
Fuel gauge indicating fuel present	No fuel present inside tank	No	0.35v to 3.06v	0.35v	Check active sender A (rear) for potential hang up/fouling inside of the fuel tank
Fuel gauge indicating fuel present	No fuel present inside tank	No	0.35v	0.35v to 3.06v	Check passive sender B (front) for potential hang up/fouling inside of the fuel tank
Fuel gauge indicating fuel present	No fuel present inside tank	No	>1.0v	0.35v to 0.54v	Remove from the fuel tank and check all active sender A (rear) blue wires for backed out pin/defective wire
Fuel gauge indicating fuel present	No fuel present inside tank	No	0.35v to 0.44v	>1.0v	Remove from the fuel tank and check all passive sender B (front) blue circuit wires for backed out pin/defective wire
Fuel gauge indicating fuel present	No fuel present inside tank	No	>0.55v and within 0.6v of B	>0.55v and within 0.6v of A	Remove fuel pump module and both senders from the fuel tank and check all black wires on the circuit for backed out pin/defective wire
Fuel gauge indicating fuel present	No fuel present inside tank	No	>3.2v but <3.6v	0.35v to 0.54v	Active sender A (rear) internal fault. No repair possible, replace the sender. Refer to the warranty policy and procedures manual if a module/component is suspect
Fuel gauge indicating fuel present	No fuel present inside tank	No	0.35v to 0.44v	>3.2v but <3.6v	Passive sender B (front) internal fault. No repair possible, replace the sender. Refer to the warranty policy and procedures manual if a module/component is suspect
Fuel gauge indicating fuel present	Fuel present inside the fuel tank	No	0.35v to 3.06v	0.35v to 3.06v	Check the pressure relief valve inside fuel tank. Check Internal fuel feed pipe is connected to flange

Customer Complaint	Possible Concern	Fuel Pressure	Active Fuel Level Sensor Voltage Reading A	Passive Fuel Level Sensor Voltage Reading B	Action
Fuel gauge indicating fuel present	Fuel present inside the fuel tank	Yes	0.35v to 3.06v	0.35v to 3.06v	● Check terminals are correctly latched / installed to the fuel pump module
Fuel gauge indicating fuel present but reading an incorrect fuel level	Fuel present inside the fuel tank	Yes	0.35v to 3.06v	0.35v to 3.06v	● Check the bayonet fitting on the fuel pump module. Check both the active and passive fuel senders are securely located in their brackets
Fuel gauge indicating fuel present but reading an incorrect fuel level	Fuel tank - out of shape / sucking in (diesel only)	Yes	0.35v to 3.06v	0.35v to 3.06v	● Incorrect filler cap installed. Install the correct fuel filler cap (applies to diesel variants only). Refer to the warranty policy and procedures manual if a module/component is suspect

DTC Index

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

Fuel Tank and Lines - TDV6 3.0L Diesel - Fuel Cooler

Removal and Installation

Removal

• WARNINGS:

 Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install new blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

 This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

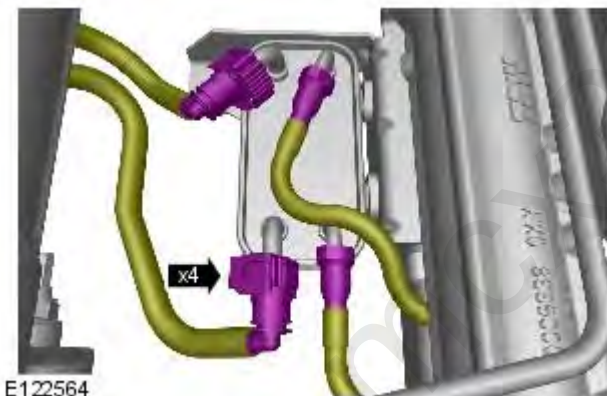
 CAUTION: Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

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

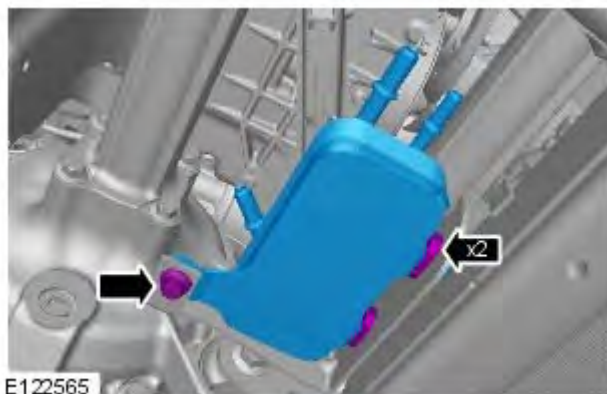
1.  WARNING: Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

2. Refer to: [Engine Undershield](#) (501-02 Front End Body Panels, Removal and Installation).



3.  WARNING: Fluid loss is unavoidable, use absorbent cloth or a container to collect the fluid.



4.  CAUTION: Always plug any open connections to prevent contamination.

Torque: 23 Nm

Installation

1.  CAUTION: Remove and discard all blanking caps.

To install, reverse the removal procedure.

2. Fill the cooling system, keeping coolant to the upper level mark of the expansion tank.

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Fuel Tank and Lines - TDV6 3.0L Diesel - Fuel Pump and Sender Unit

Removal and Installation

Special Tool(s)

	310-123 Locking Ring, Fuel Tank
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General Equipment

Transmission jack

Removal

• WARNINGS:



After carrying out repairs, the fuel system must be checked visually for leaks. Failure to follow this instruction may result in personal injury.



After the fuel tank drain is complete always fit the sealing covers over the drain ports. Failure to do so will mean that fuel vapor can escape.



This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.



CAUTION: Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

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

1. Disconnect the battery ground cable.

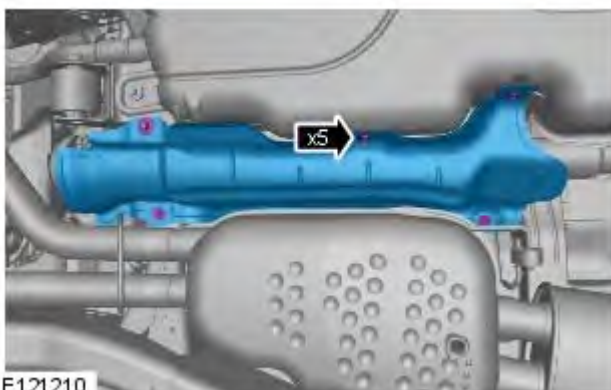
Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).

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

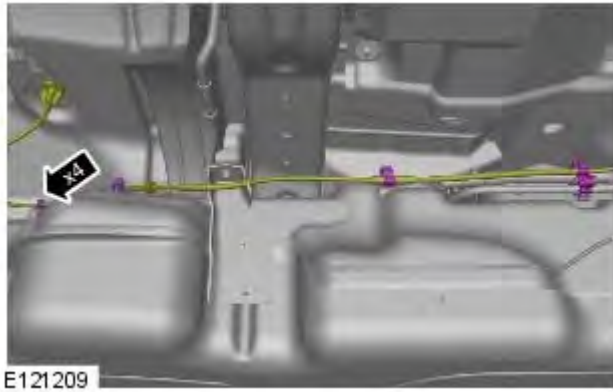
Raise and support the vehicle.

3. Refer to: [Fuel Tank Draining](#) (310-00 Fuel System - General Information, General Procedures).

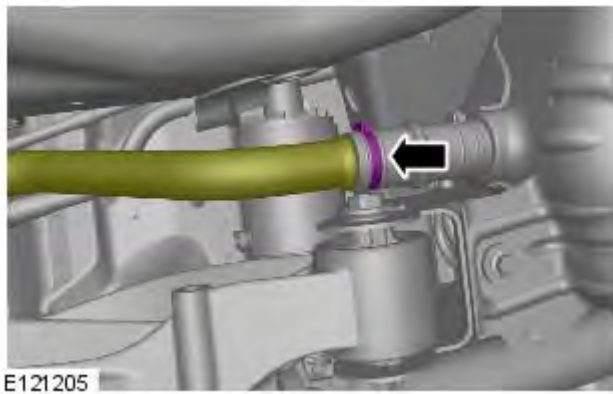
4. *Torque:*
Bolts 6 Nm
Nuts 3 Nm



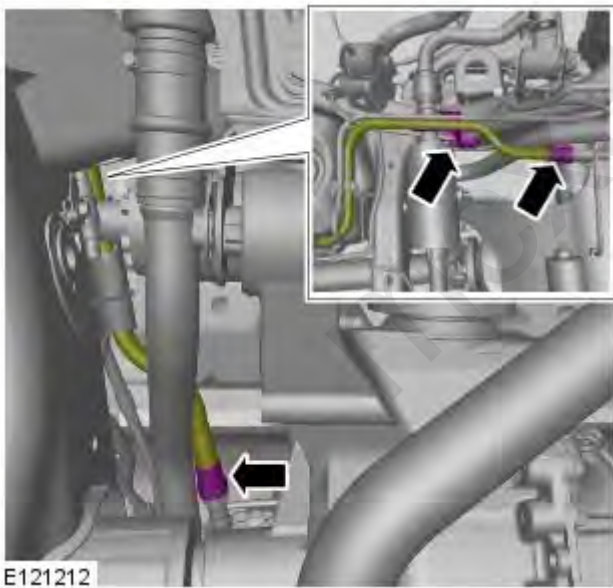
E121210



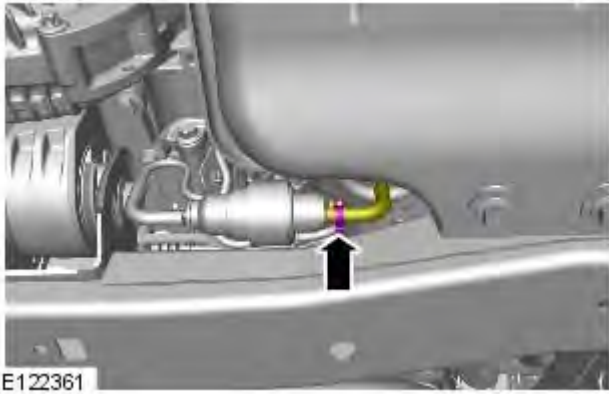
5.



6.  **CAUTION:** Discard the retaining clip.
Remove the tamper proof cover.

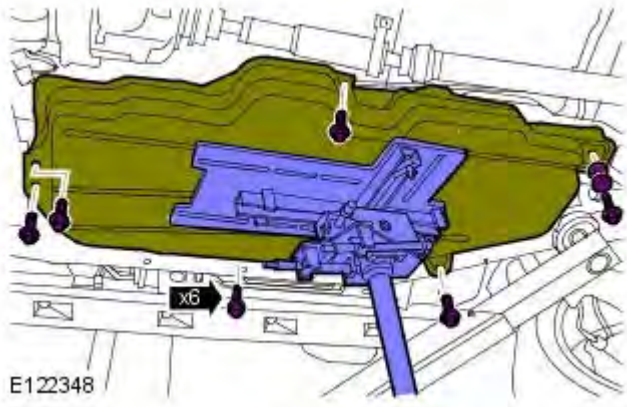


7.  **CAUTION:** Make sure that all openings are sealed. Use new blanking caps.



8.  **WARNING:** Be prepared to collect escaping fuel.

 **CAUTION:** Make sure that all openings are sealed. Use new blanking caps.



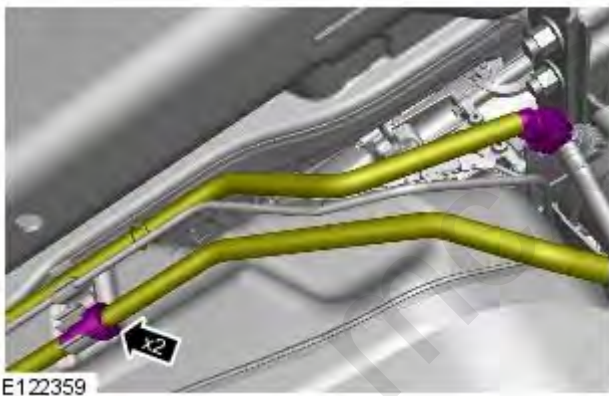
9.  **WARNING:** Secure the component to the transmission jack.

 **CAUTION:** Do not lower the fuel tank more than 250 mm.

• **NOTE:** Note the orientation of the two rear retaining bolts and washers.

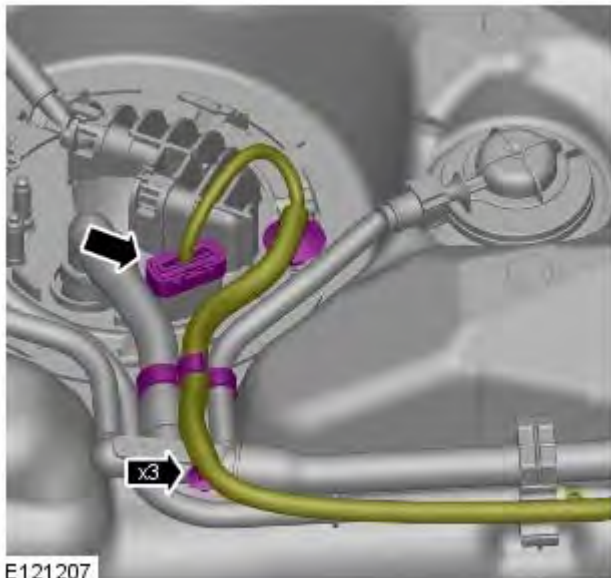
Using a suitable transmission jack, lower the fuel tank sufficiently only to access the top of the fuel tank.

General Equipment: [Transmission jack](#)
Torque: 45 Nm



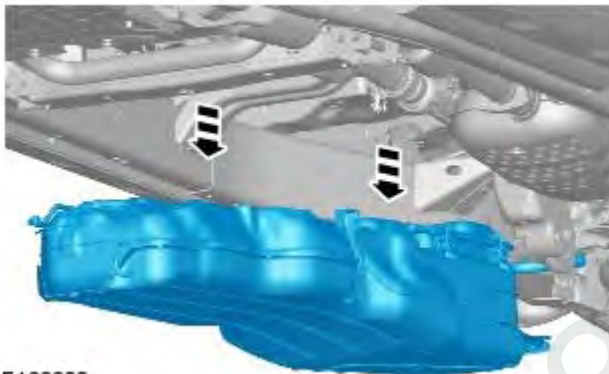
10.  **WARNING:** Be prepared to collect escaping fuel.

 **CAUTION:** Make sure that all openings are sealed. Use new blanking caps.



E121207

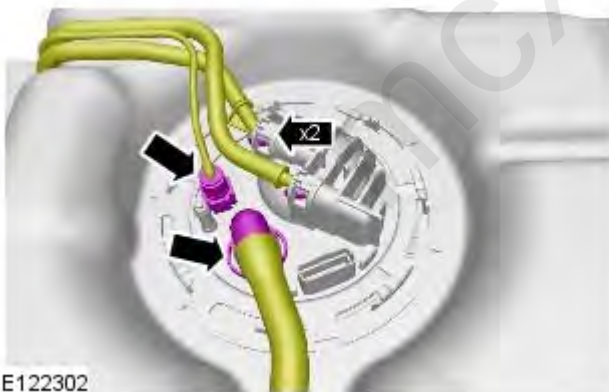
11. **11.** NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E122300

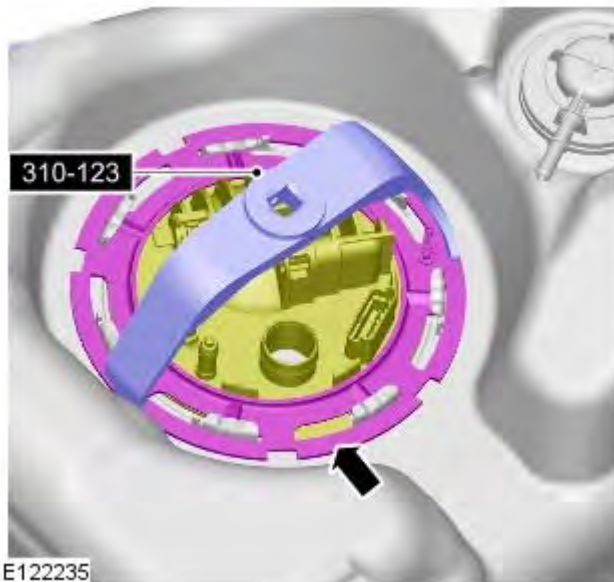
12. **12.** NOTE: Do not disassemble further if the component is removed for access only.

With assistance, remove the fuel tank.



E122302

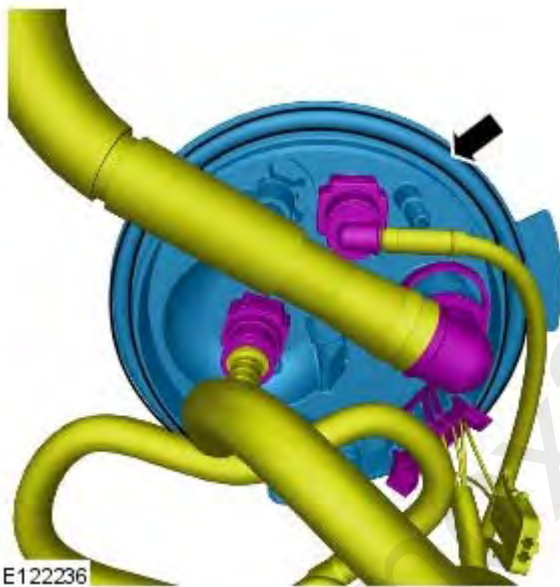
13. **13.**  CAUTION: Make sure that all openings are sealed. Use new blanking caps.



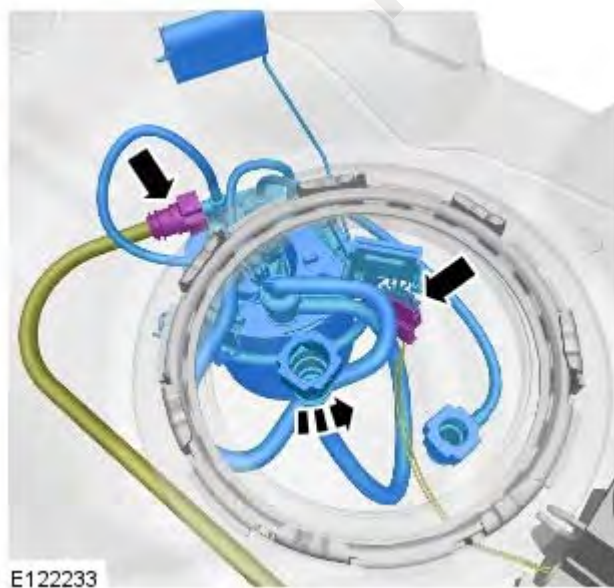
14. **14.** NOTE: Note the position of the locating tang.

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

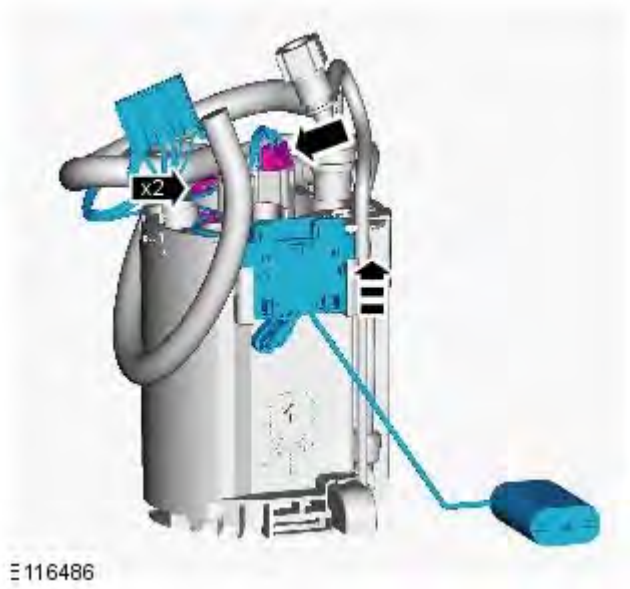
Special Tool(s): [310-123](#)



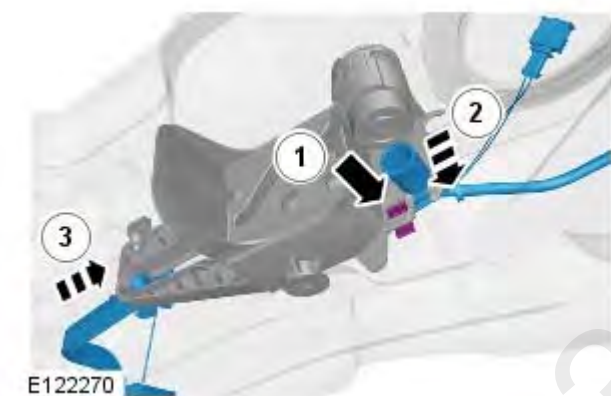
15. **15.** NOTE: Remove and discard the O-ring seal.



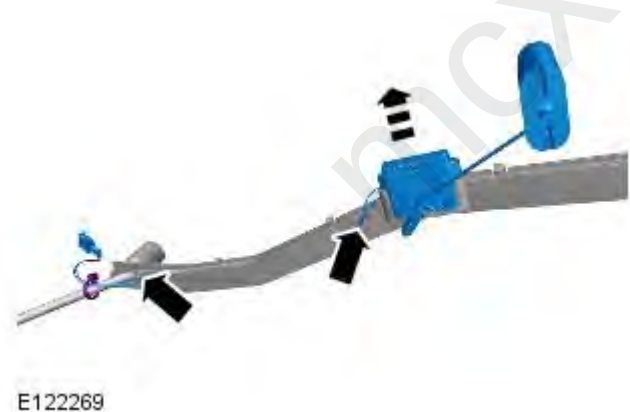
16. **16.**  CAUTION: Take extra care not to damage the fuel tank level sensor float and arm.



17. **17.**  **CAUTION:** Take extra care not to damage the fuel tank level sensor float and arm.
- **NOTE:** Do not disassemble further if the component is removed for access only.



18. **18.**  **CAUTION:** Take extra care not to damage the fuel tank level sensor float and arm.



19.

Installation

1. **1.** **NOTE:** Remove and discard all blanking caps.
- **NOTE:** Make sure the locating tang is installed in the position noted in the removal step.
- To install, reverse the removal procedure.

Fuel Tank and Lines - TDV6 3.0L Diesel - Fuel Tank

Removal and Installation

Special Tool(s)

 310-123 E80148	310-123 Locking Ring, Fuel Tank
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Removal

• WARNINGS:



After carrying out repairs, the fuel system must be checked visually for leaks. Failure to follow this instruction may result in personal injury.



After the fuel tank drain is complete always fit the sealing covers over the drain ports. Failure to do so will mean that fuel vapor can escape.



This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.



CAUTION: Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

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

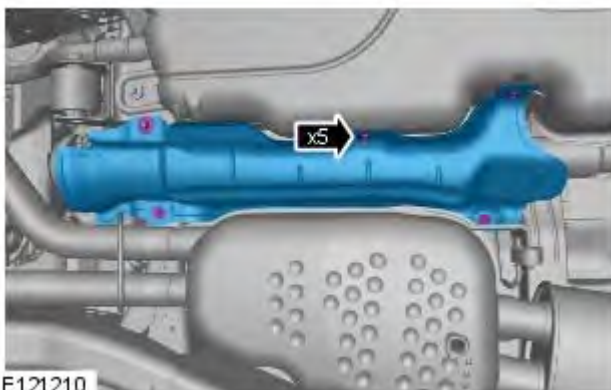
1. Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).

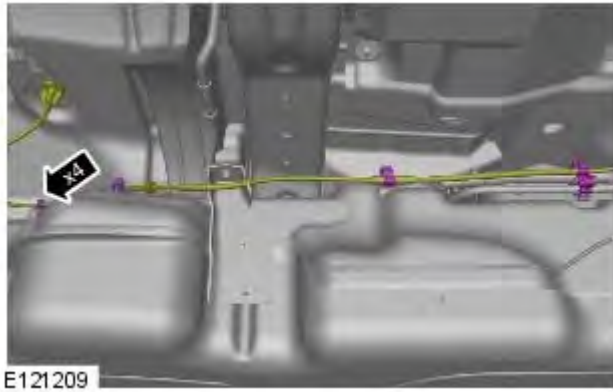
2.  **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

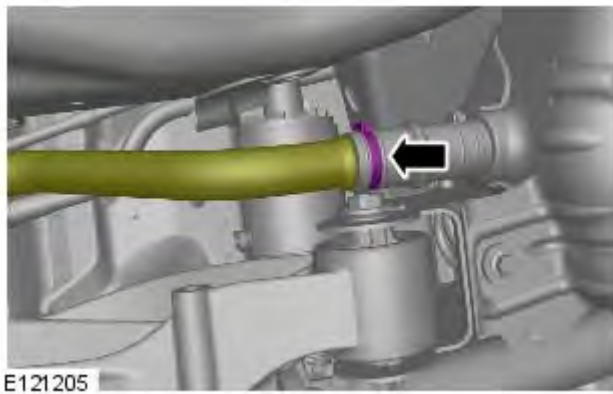
3. Refer to: [Fuel Tank Draining](#) (310-00 Fuel System - General Information, General Procedures).

4. *Torque:*
Bolts 6 Nm
Nuts 3 Nm



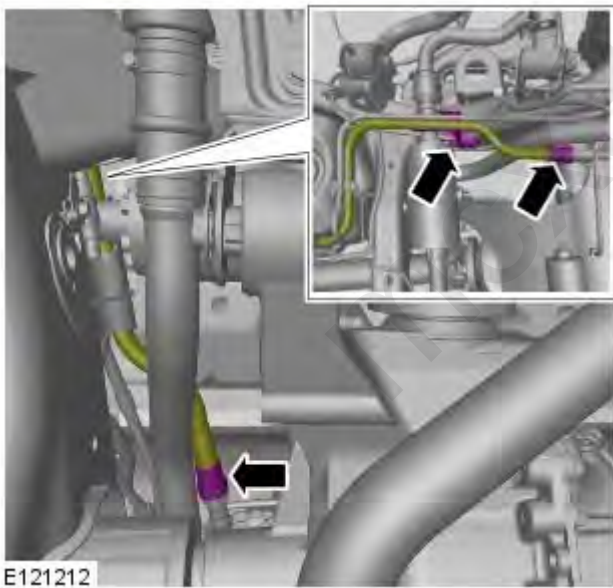


5.

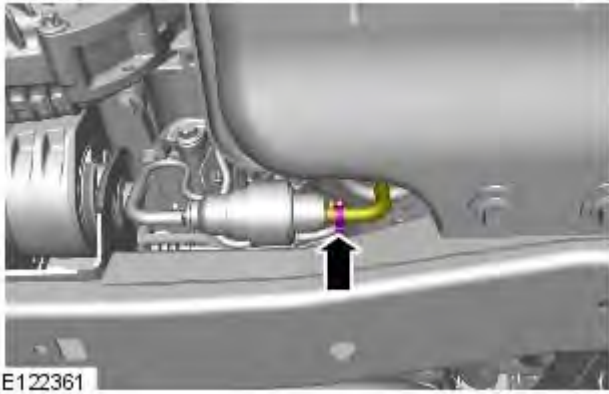


6. **NOTE:** Discard the retaining clip.

Remove the tamper proof cover.

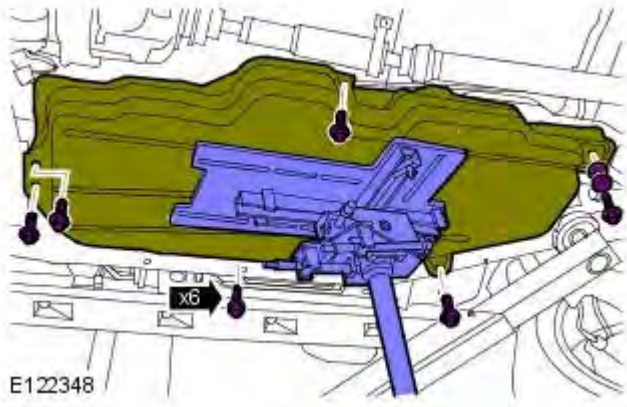


7. **CAUTION:** Make sure that all openings are sealed. Use new blanking caps.



8.  **WARNING:** Be prepared to collect escaping fuel.

 **CAUTION:** Make sure that all openings are sealed. Use new blanking caps.



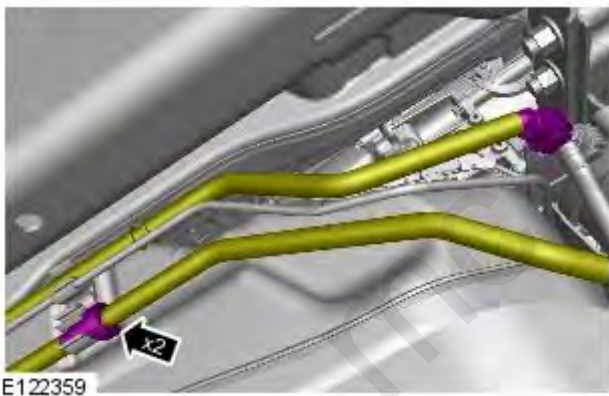
9.  **WARNING:** Secure the component to the transmission jack.

 **CAUTION:** Do not lower the fuel tank more than 250 mm (9.75 in)

- **NOTE:** Note the orientation of the two rear retaining bolts and washers.

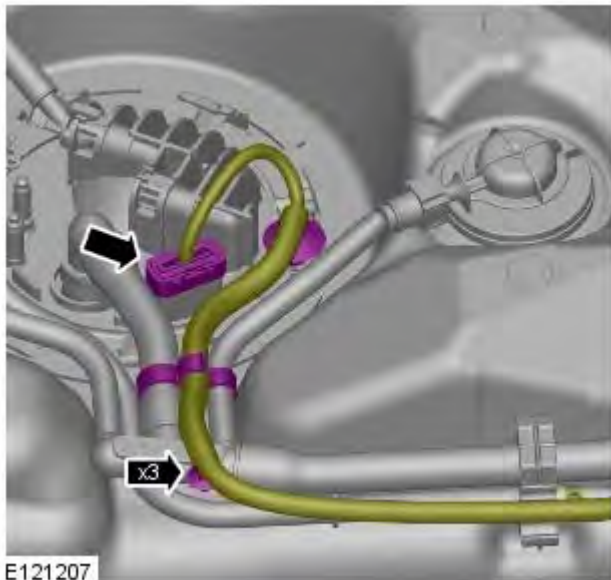
Using a transmission jack, lower the fuel tank sufficiently only to access the top of the fuel tank.

Torque: 45 Nm



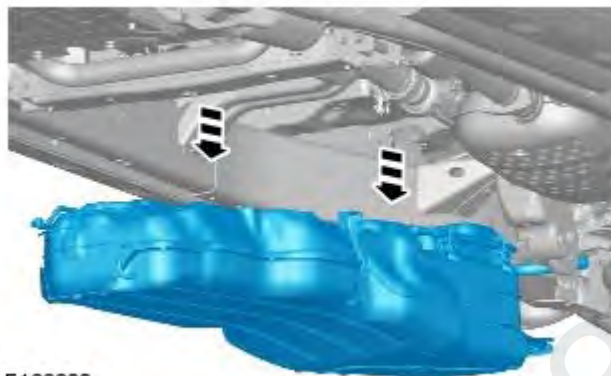
10.  **WARNING:** Be prepared to collect escaping fuel.

 **CAUTION:** Make sure that all openings are sealed. Use new blanking caps.



E121207

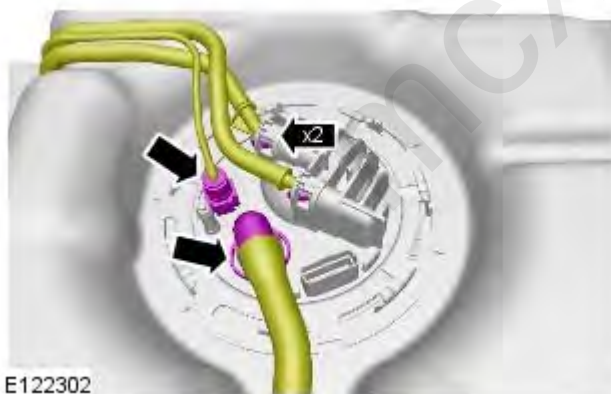
11. **11.** NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E122300

12. **12.** NOTE: Do not disassemble further if the component is removed for access only.

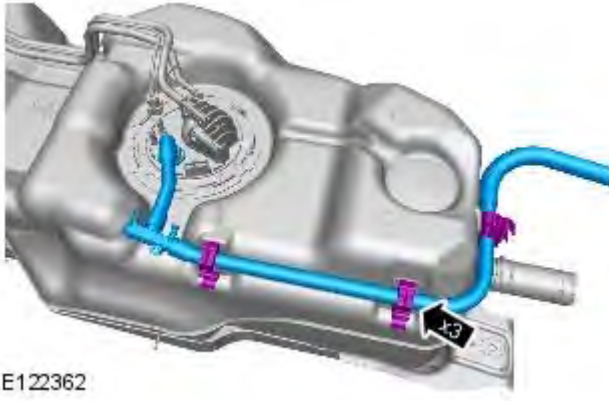
With assistance, remove the fuel tank.



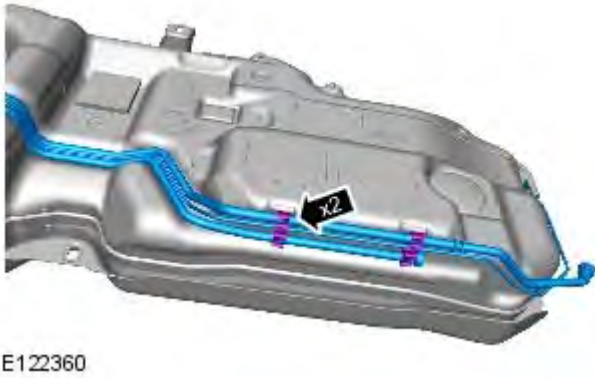
E122302

13. **13.**  CAUTION: Make sure that all openings are sealed. Use new blanking caps.

14.

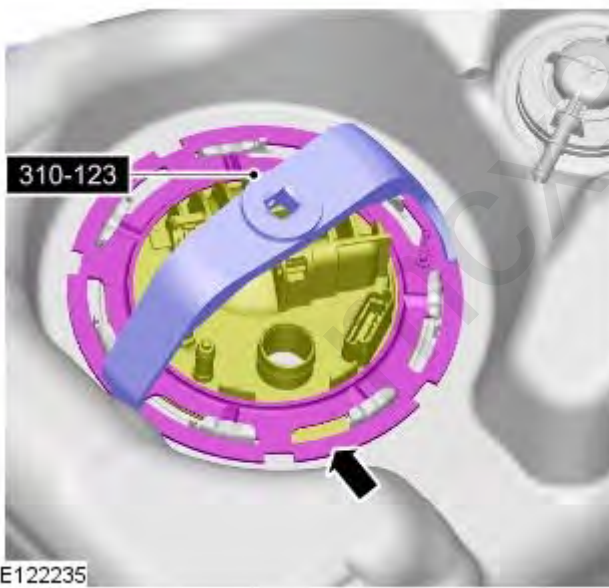


15.

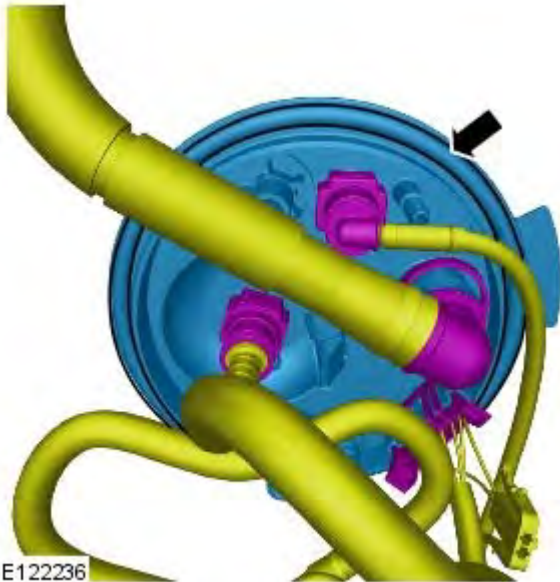


16. **16.** NOTE: Note the position of the locating tang.

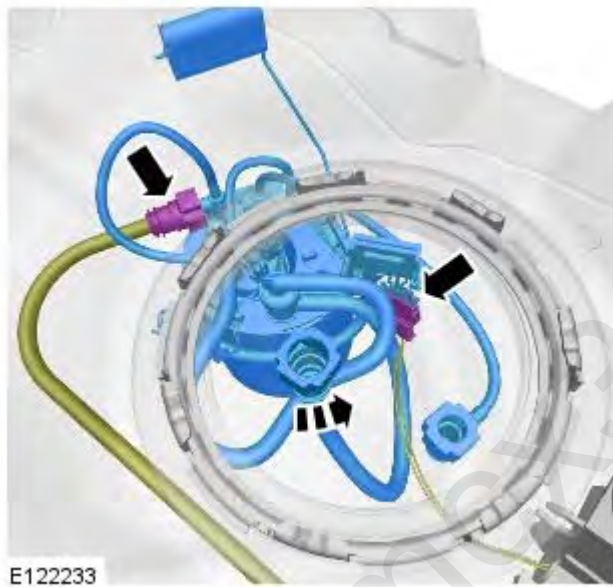
Special Tool(s): [310-123](#)



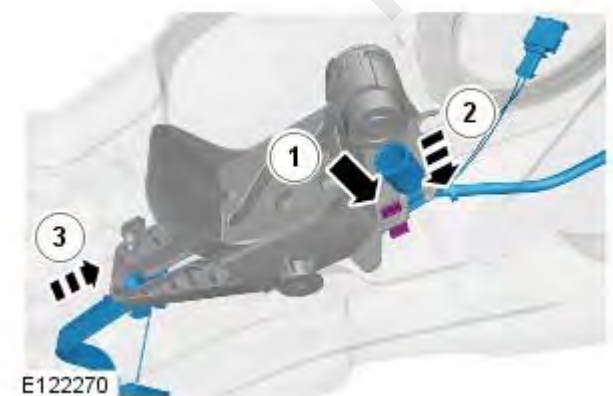
17. **17.** NOTE: Remove and discard the O-ring seal.



18. **18.**  CAUTION: Take extra care not to damage the fuel tank level sensor float and arm.



19. **19.**  CAUTION: Take extra care not to damage the fuel tank level sensor float and arm.



20.



Installation

1. **NOTE:** Remove and discard all blanking caps.
 - **NOTE:** Make sure the locating tang is installed in the position noted in the removal step.

To install, reverse the removal procedure.

Fuel Tank and Lines - TDV6 3.0L Diesel - Fuel Tank Filler Pipe

Removal and Installation

Removal

- WARNINGS:



The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.



After carrying out repairs, the fuel system must be checked visually for leaks. Failure to follow these instructions may result in personal injury.



This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

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

Raise and support the vehicle.

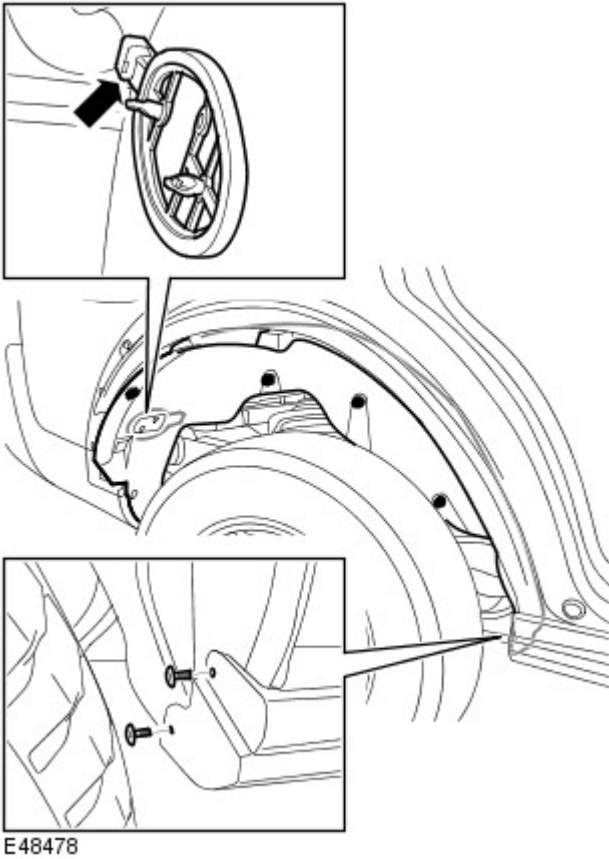
3. Refer to: [Fuel Tank Draining](#) (310-00 Fuel System - General Information, General Procedures).

4. Refer to: [Fuel Filler Door Assembly](#) (501-03 Body Closures, Removal and Installation).

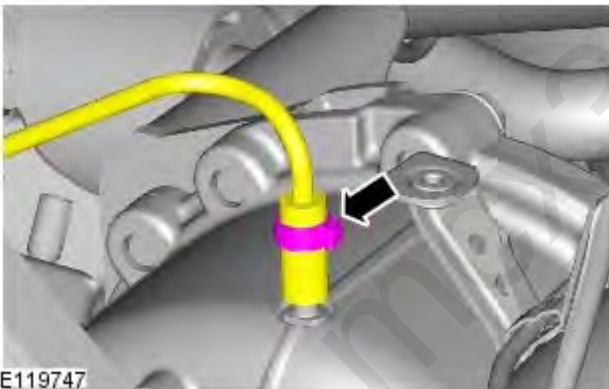
5. Remove the RH rear wheel and tire.

Torque: 140 Nm

6. Remove the fender splash shield.

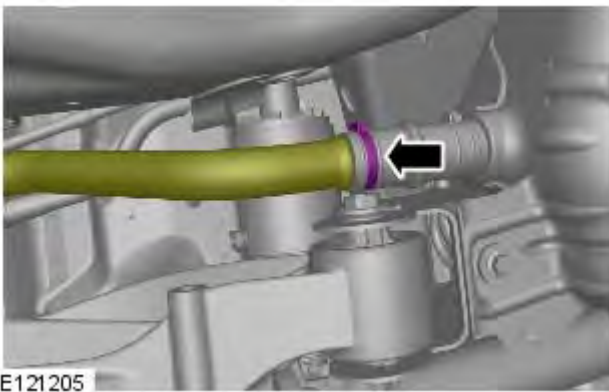


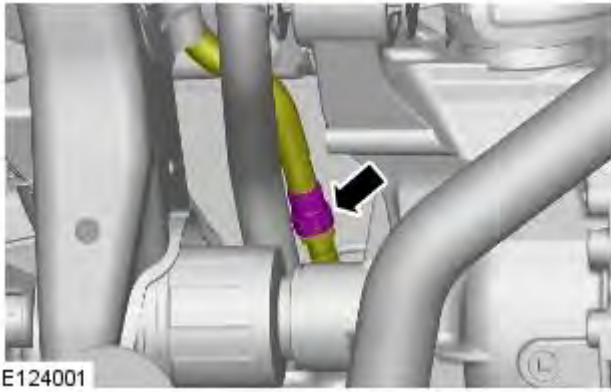
7.



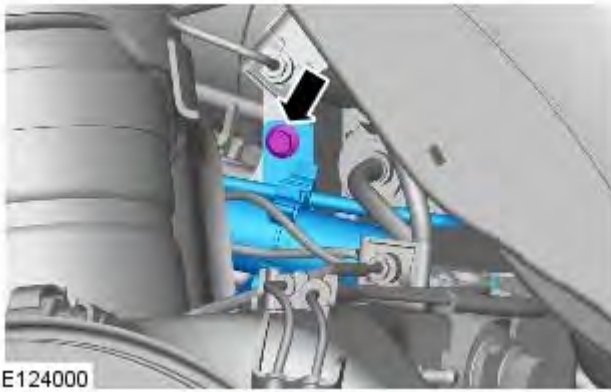
8. **8. NOTE: Discard the retaining clip.**

Remove the tamper proof cover from the fuel tank filler pipe hose clip.

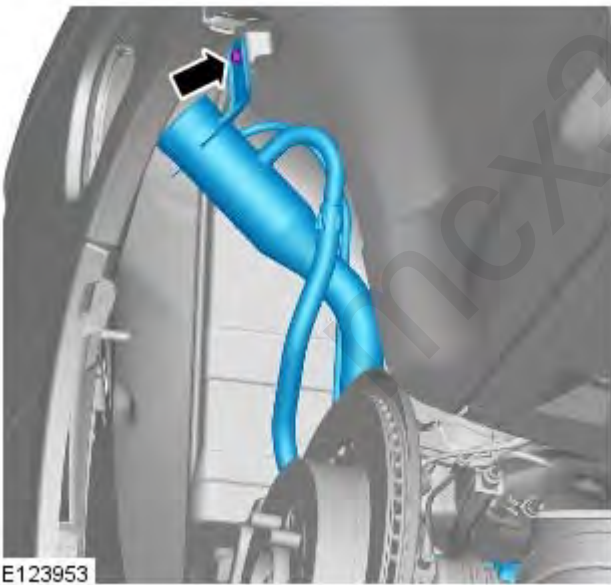




9.  **CAUTION:** Make sure that all openings are sealed. Use new blanking caps.



10. Torque: 4 Nm



11. Torque: 4 Nm

Installation

1. To install, reverse the removal procedure.

Fuel Tank and Lines - TDV6 3.0L Diesel - Fuel Filter Element

Removal and Installation

Removal

• WARNINGS:



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.



This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.



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.



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



If taken internally, do not induce vomiting, seek immediate medical attention. Failure to follow these instructions may result in personal injury.



Wash hands thoroughly after fuel handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.



The spilling of fuel is unavoidable during this operation. Make sure that all necessary precautions are taken to prevent fire and explosion.

• CAUTIONS:



Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.



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.

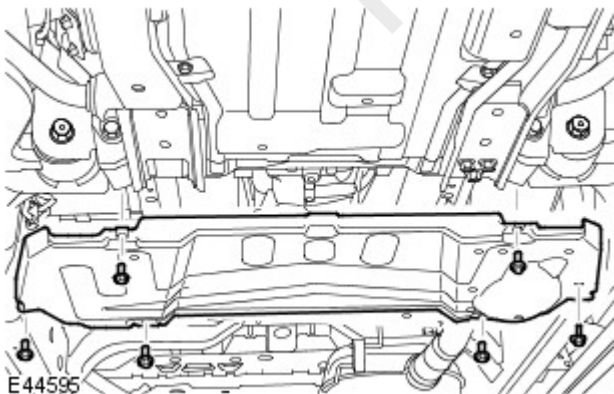


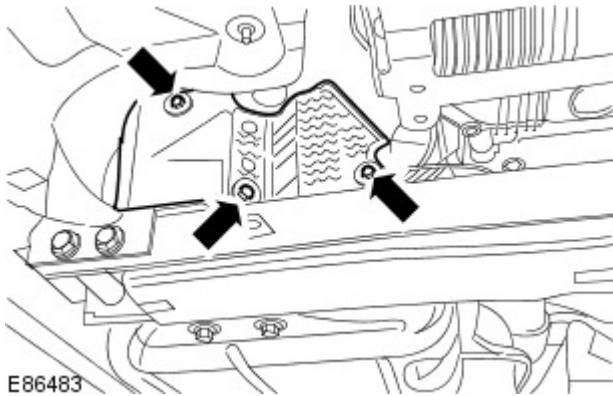
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the transmission undershield.

- Remove the 6 bolts.





3.  **WARNING:** Observe due care when working near a hot exhaust system.

Remove the fuel filter heat shield.

- Remove the 3 bolts.



4.  **CAUTION:** Make sure the water-in-fuel sensor remains in the aligned position.

Drain the fuel filter element.

- Position a container to collect the fluid spillage.
- Loosen the nut.
- Attach a suitable drain tube to the water-in-fuel sensor drain port.
- Remove the drain tube.
- Tighten the nut.



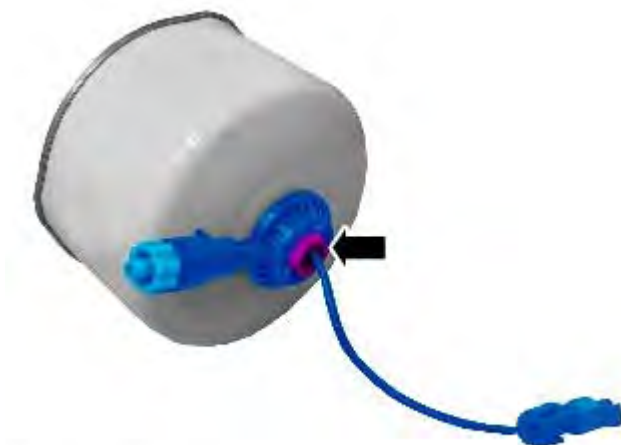
5.  **CAUTION:** Make sure that the area around the component is clean and free of foreign material.

Remove the fuel filter element.

- Disconnect the water-in-fuel sensor electrical connector.

6. Remove the water-in-fuel sensor.

- Discard the fuel filter element.



7. Remove and discard the O ring seals.



E138941

Installation

1. Install new O ring seals.



E138940



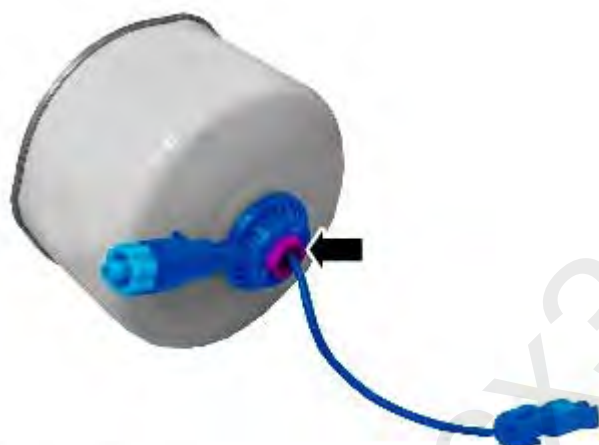
E138603

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

• NOTE: Make sure that the water-in-fuel sensor is aligned with the drain arrow.

Install the water-in-fuel sensor.

- Remove and discard the water-in-fuel drain plug from the new fuel filter element.



E138939

3.  CAUTION: Make sure the water-in-fuel sensor remains in the aligned position.

Tighten the plastic nut to 1.6 Nm.

4. NOTE: Make sure that the fuel filter element is correctly aligned. Failure to follow this instruction may result in damage to the vehicle.

Install the fuel filter element.

1. Insert the fuel filter with the the lock symbol arrow aligned with the inlet pipe on the fuel filter housing.



5. NOTE: Make sure that the fuel filter element is correctly aligned. Failure to follow this instruction may result in damage to the vehicle.

Rotate to tighten and seal the fuel filter element.

1. When tightened correctly, the lock symbol arrow should be aligned with the arrow symbol on the fuel filter housing.

- Connect the water-in-fuel sensor electrical connector.
- Remove the container.



6. Install the fuel filter heat shield.

- Tighten the bolts to 6 Nm.

7. Install the transmission undershield.

- Tighten the bolts to 10 Nm.

8. Carry out the low-pressure fuel system bleeding.