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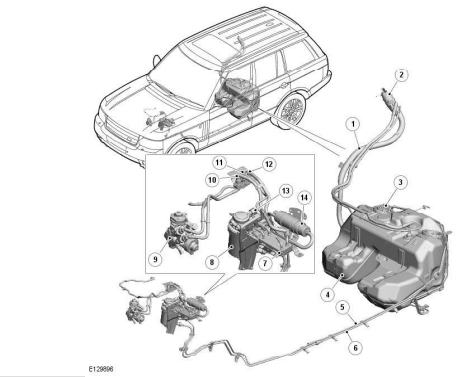
2011.0 RANGE ROVER (LM), 310-01B

FUEL TANK AND LINES - TDV8 4.4L DIESEL (G1311603)

4.4L TDV8 COMPONENT LOCATION



ITEM	DESCRIPTION
1	Fuel filler pipe
2	Fuel filler cap
3	Fuel pump delivery module
4	Fuel tank
5	Pressure feed pipe to filter and secondary fuel pump
6	Return pipe from fuel filter to tank
7	Fuel cooler
8	Fuel filter
9	High pressure fuel pump
10	Pressure feed from fuel filter to high pressure fuel pump
11	Fuel return from fuel rails
12	Fuel return from high pressure pump to fuel cooler
13	Fuel filter auxiliary heater
14	Secondary fuel pump

INTRODUCTION

The fuel system is divided into 2 sub systems:

- Low pressure system
- High pressure system.

The low pressure system features the following components:

- Fuel tank
- Fuel pump delivery module in tank
- Outlet protection valves
- Body mounted fuel to coolant cooler
- Fuel filter with water in fuel sensor and water drain plug
- Fuel heater
- Secondary fuel pump.

The low pressure system pressure is 0.5 bar up to the secondary fuel pump and 4.5 bar from the secondary fuel pump to the high pressure fuel pump. Return pressure is less than 0.5 bar.

The pressure in the high pressure system is up to 2000 bar. The high pressure system is described in Fuel and Charging Controls For additional information, refer to: Fuel Charging and Controls (303-04E Fuel Charging and Controls - TDV8 3.6L Diesel, Description and Operation).

FUEL TANK

The fuel tank is a saddle type tank and is constructed from moulded plastic. It is located towards the rear of the vehicle just in front of the rear suspension. The fuel tank has a 104.5 liter (27.6 US gallons) capacity and incorporates one roll over valve to prevent fuel leakage through the vent in the event of a vehicle roll over.

The tank has two apertures on the top of the tank. The right hand aperture provides for the location of the advance delivery fuel pump which is sealed in the aperture with a sealing ring and secured with a locking ring. The left hand aperture has a flange plate which is sealed in the aperture with a sealing ring and secured with a locking ring. The flange, when removed, allows access to the left-hand (LH) fuel level sensor and remote jet pump assembly.

The tank fuel level is monitored by two fuel level sensors which are connected to the instrument cluster. A fuel warning lamp in the instrument cluster is illuminated and a message is displayed when there is approximately 11 liters (2.91 US Gallons) of useable fuel remaining in the tank.

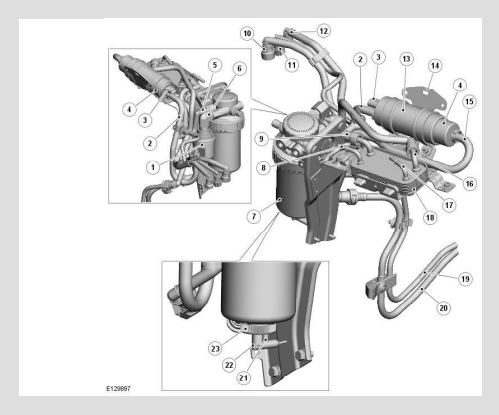
LOW FUEL STRATEGY

The engine control module (ECM) is programmed with a strategy which shuts the engine off before the fuel tank runs dry. This is to prevent fuel system damage by air being drawn into the high pressure fuel pump. For additional information, refer to: Electronic Engine Controls (303-14D Electronic Engine Controls - TDV8 3.6L Diesel, Description and Operation).

A misfire is induced when the fuel in the tank reaches approximately 0.25 liters (0.06 US Gallons) of useable fuel remaining to alert the driver to this condition. The engine is shut down when the fuel in the tank reaches 0.00 liters (0.00 US Gallons) of useable fuel remaining in the tank and 4.0 liters (1.05 US Gallons) of un-useable fuel remaining.

To reset the fuel strategy after engine shutdown, it is required that a minimum of 4 liters (1.05 US Gallons) of fuel is added to the fuel tank, when the vehicle is on level ground.

FUEL COOLER, SECONDARY FUEL PUMP AND FILTER ASSEMBLY



ITEM	DESCRIPTION
1	Fuel heater
2	Pipe - Secondary fuel pump to fuel heater
3	Secondary fuel pump electrical connector
4	Secondary fuel pump
5	Pipe - Fuel filter to high pressure fuel pump
6	Inlet connection from secondary fuel pump via fuel heater
7	Fuel filter housing
8	Pipe connection - Fuel cooler - engine coolant outlet
9	Pipe connection - Fuel cooler - Fuel return - fuel cooler to undefloor lines and system recirculation
10	Pipe connection - fuel feed - fuel filter to high pressure pump
11	Pipe connection - Fuel rails return to fuel heater/filter
12	Pipe connection - fuel return from filter from high-pressure pump to fuel cooler
13	Secondary fuel pump isolation mounting
14	Fuel filter and pump mounting bracket
15	Pipe - Fuel feed from in-tank fuel pump delivery module to secondary fuel pump

ITEM	DESCRIPTION
16	Pipe connection - fuel return - engine to fuel cooler
17	Pipe connection - Fuel cooler - engine coolant inlet
18	Fuel cooler
19	Pressure feed pipe to filter and secondary fuel pump
20	Return pipe from fuel filter to tank
21	Water drain outlet
22	Water sensor electrical connector
23	Water sensor

The fuel cooler, secondary fuel pump and filter assembly are located in the LH side of the engine compartment.

The fuel cooler, filter and pump are located on a bracket on top of the inner fender suspension turret. The fuel cooler is connected to the engine cooling system and cools the fuel by heat transfer through internal galleries within the cooler.

Two connections are located on the top face of the filter head. One connection is a quick release connector and is the outlet from the filter to the high pressure fuel pump. The second connection has a male/female threaded screwed into the filter head, a male/male union sealed with Dowty washers and a 90 degree elbow union to which the fuel heater is attached. Fuel from the secondary fuel pump is passed through the fuel heater to the filter housing and through the filter to the high-pressure fuel pump.

Fuel returning from the high pressure pump is passed through a combined engine coolant/fuel cooler located near the Left Hand (LH) suspension turret, adjacent to the filter. From the fuel cooler, excess fuel and air is sent back to the fuel tank via the return line, or recirculated back to the high pressure pump.

The engine coolant/fuel cooler receives cooled engine coolant from a dedicated cooler located in front of the radiator. This allows the engine coolant to be directly cooled before it passes through the fuel cooler improving the efficiency of the fuel cooling. For additional information, refer to: Engine Cooling (303-03D Engine Cooling - TDV8 3.6L Diesel, Description and Operation).

FUEL FILTER

The filter element is located on the underside of the filter head and is secured in position with a plastic locking ring. Rotation of this ring allows removal and fitment of the filter for servicing purposes. The filter can trap particulate matter of 5 microns or more and has a fuel capacity of 470 cm^3.

A Schraeder valve is located on the side of the filter housing and is used to bleed the air from the filter when a new filter element is fitted.

The filter is fitted with a removable water sensor which is secured in the base of the filter. The sensor can be unscrewed and fitted to the new filter. The water sensor housing also incorporates a water drain. A tube can be fitted

to the drain to collect the water/fuel mixture and, by rotating the sensor housing, the fuel can be drained to purge the filter of any water collected in it. This is performed at service intervals defined in the service schedule and differs between markets.

The maximum water capacity of the fuel filter is 116 cm ^{3}and this is the minimum amount required to drain from the filter at service to ensure all water has been removed.

The water sensor operates on the principle of differing resistance values to the transmission of current through water and fuel. When the volume of water in the fuel reaches 85 cm ^{3} or more, the sensor value is sensed by the ECM. The ECM transmits a message on the high speed controller area network (CAN) bus to the instrument cluster which displays a message 'WATER IN FUEL VISIT DEALER' in the message center.

FUEL HEATER MODULE

A fuel heater module is connected to the inlet port of the filter housing. The heater module is controlled by the ECM and is active when the ignition is on.

The heater module outputs a status signal to the ECM for fuel pressure and fuel temperature. If the temperature is at or below 2°C ±2°C (35.6°F ± 3.6°F) and the fuel pressure is at or more than 0.5 bar (7.25 lbf/in ^{2}) the fuel heater module will be activated. When the fuel temperature reaches or exceeds 7°C ± 2°C (44.6°F ± 3.6°F) or the fuel pressure is at or less than 5.5 bar (80 lbf/in ^{2}) the ECM will switch off the fuel heater module.

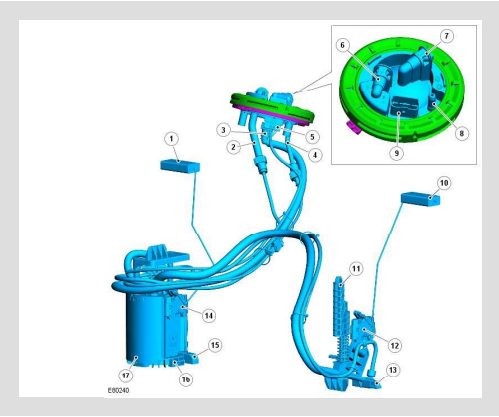
If, during the start of the heating process, the operating voltage is less than 7.5 Volts the heater module will be deactivated.

SECONDARY FUEL PUMP

The secondary fuel pump is attached to the filter bracket which is common with the filter and cooler assembly. The pump has a fuel inlet from the fuel tank mounted delivery pump module and a pressure outlet to the fuel heater and the filter assembly. A 2 pin electrical connector provides the connection starter relay in the Engine Junction Box (EJB). The pump is active at all time when the starter relay is energised.

The pump has a nominal flow rate of 180 l/hour at a pressure of 5.0 bar (72 lbf/in ^{2}), when supply voltage is 12 volts.

FUEL PUMP DELIVERY MODULE



ITEM	DESCRIPTION
1	right-hand (RH) fuel level sensor float
2	Fuel return pipe
3	Fuel feed pipe
4	Fuel fired heater feed pipe
5	Electrical connector
6	Fuel return connection
7	Fuel feed pressure connection
8	Fuel fired heater feed connection
9	Electrical connector
10	LH fuel level sensor float
11	Jet pump assembly
12	LH fuel level sensor
13	Jet pump coarse filter
14	RH fuel level sensor
15	Fuel pump coarse filter
16	Swirl pot
17	Fuel pump (inside swirl pot)

The electric fuel pump is mounted in the swirl pot which is located inside the fuel tank in the RH side of the tank.

The pump collects fuel from the fuel swirl pot at the base of the pump and passes it from the tank into the feed line to the engine mounted, high-pressure fuel pump, via the secondary in-line fuel pump.

The pump is connected via pipes to a jet pump located in the LH side of the tank. The jet pump delivers fuel to the fuel swirl pot in the RH side of the tank to ensure fuel is always in the RH side of the tank to supply the fuel pump.

Two fuel level sensors are located in the fuel tank. One is attached to the swirl pot and monitors the fuel level on the RH side of the tank. The second fuel level sensor is attached to the frame of the jet pump and monitors the fuel level in the LH side of the tank. Each sensor is connected on 2 wires to the instrument cluster. The instrument cluster calculates the total fuel tank contents using the two level values from the sensors.

The pump is controlled by the ECM via the fuel pump relay located in the battery junction box (BJB). Should the fuel pump electrical connection need to be disconnected, it is important that the ignition is switched off. If the ignition is on in positions I or II, the instrument cluster will store its last fuel gage needle position prior to power down. Once power is restored the gage will display the last stored position regardless of the actual level of fuel in the tank. This could result

in incorrect fuel gage readings if the fuel tank has been drained and not filled with exactly the same quantity of fuel that was removed.

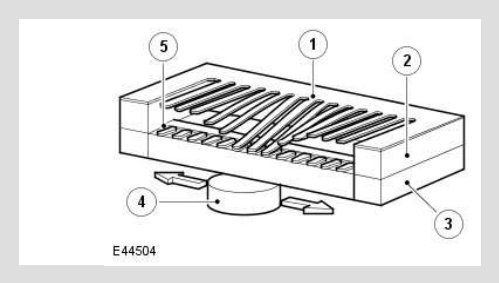
FUEL LEVEL SENSORS

The fuel level sensors are a MAgnetic Passive Position Sensor (MAPPS) which provides a variable resistance to ground for the output from the fuel gage. The sensor is sealed from the fuel preventing contamination of the contacts, increasing reliability. Both fuel level sensors are connected to the external electrical connector on the flange via the connectors on the underside of the fuel pump module flange.

The LH and RH sensors are attached to the fuel pump module and the remote jet pump assembly respectively and are accessible via the fuel pump flange apertures.

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.

SENSOR OPERATING PRINCIPLE



ITEM	DESCRIPTION
1	Magnetic foil
2	Spacer
3	Ceramic surface
4	Magnet
5	Resistance film

The film resistors are arranged in a linear arc with resistance ranging from 51.2 to 992.2 Ohms. The electrical output signal is output dependent on 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 gage 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 content in the tank is approximately 12 liters (3.17 US Gallons) of useable fuel remaining.

The fuel level sender signal is converted into a CANbus message by the instrument cluster as a direct interpretation of the fuel tank contents in liters. The ECM uses the CAN bus message to store additional on-board diagnostic (OBD) P Codes for misfire detection when the fuel level is below a predetermined capacity.

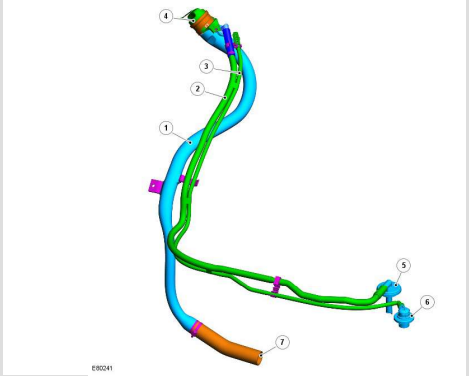
Fuel Level Sensors - Resistance/Fuel Gage Read out Table

NOTE:

These figures are with the vehicle on level ground. Sensor readings will differ with varying vehicle inclinations.

SENDER UNIT RESISTANCE, OHMS	NOMINAL GAGE READING
51.2	Empty
992	Full

FUEL FILLER PIPE AND TANK BREATHER ASSEMBLY



ITEM	DESCRIPTION
1	Filler pipe
2	Fuel tank breather pipe
3	Fuel tank vent pipe
4	Filler cap
5	Breather stub
6	Roll over valve
7	Filler pipe to tank connection (secured with a hose clip - not shown)

The fuel filler head is positioned at the rear of the vehicle, above the right hand rear wheel. The filler head and cap is covered by a moulded plastic cover which is electrically locked when the vehicle is locked.

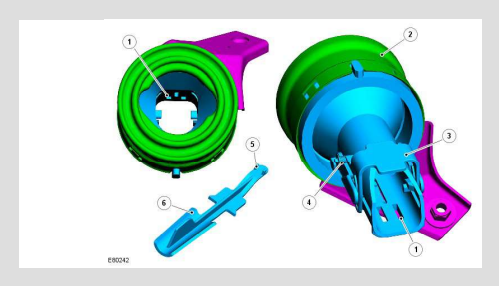
The filler cap is a quarter turn type which is secured to the vehicle with a lanyard. The filler cap must be securely fitted to ensure that the tank venting system is sealed. The cap has a locking mechanism which gives an audible click when the cap is correctly tightened.

The filler head is of moulded plastic construction with a metal top face. A bracket provides for the attachment of the filler head to the vehicle body. The filler head incorporates the Gasoline Fuel Guard system to prevent accidental filling of the tank with petrol.

A connection on the rear of the filler head allows for the connection of the fuel tank breather pipe from the breather stub.

The fuel filler pipe locates in the tank and incorporates a spitback flap in the tank end of the pipe. The flap is a spring loaded cover which acts as a one way valve, allowing the tank to be filled but preventing fuel leaving the tank into the filler pipe.

GASOLINE FUEL GUARD



ITEM	DESCRIPTION
1	Reset slots
2	Filler neck
3	Flap
4	Spring
5	Spigots
6	Reset tool

The gasoline fuel guard is a system developed by Land Rover to prevent the accidental filling of a diesel vehicle with gasoline.

The gasoline fuel guard comprises a mechanically operated flap which is triggered when the smaller diameter filler nozzle tube, used on 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.

A reset tool is provided and stored in the luggage compartment. The tool is used to reset the gasoline fuel guard device if triggered. 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 flap is colored yellow so that it is clearly visible when activated and has a 'Handbook' symbol on it.