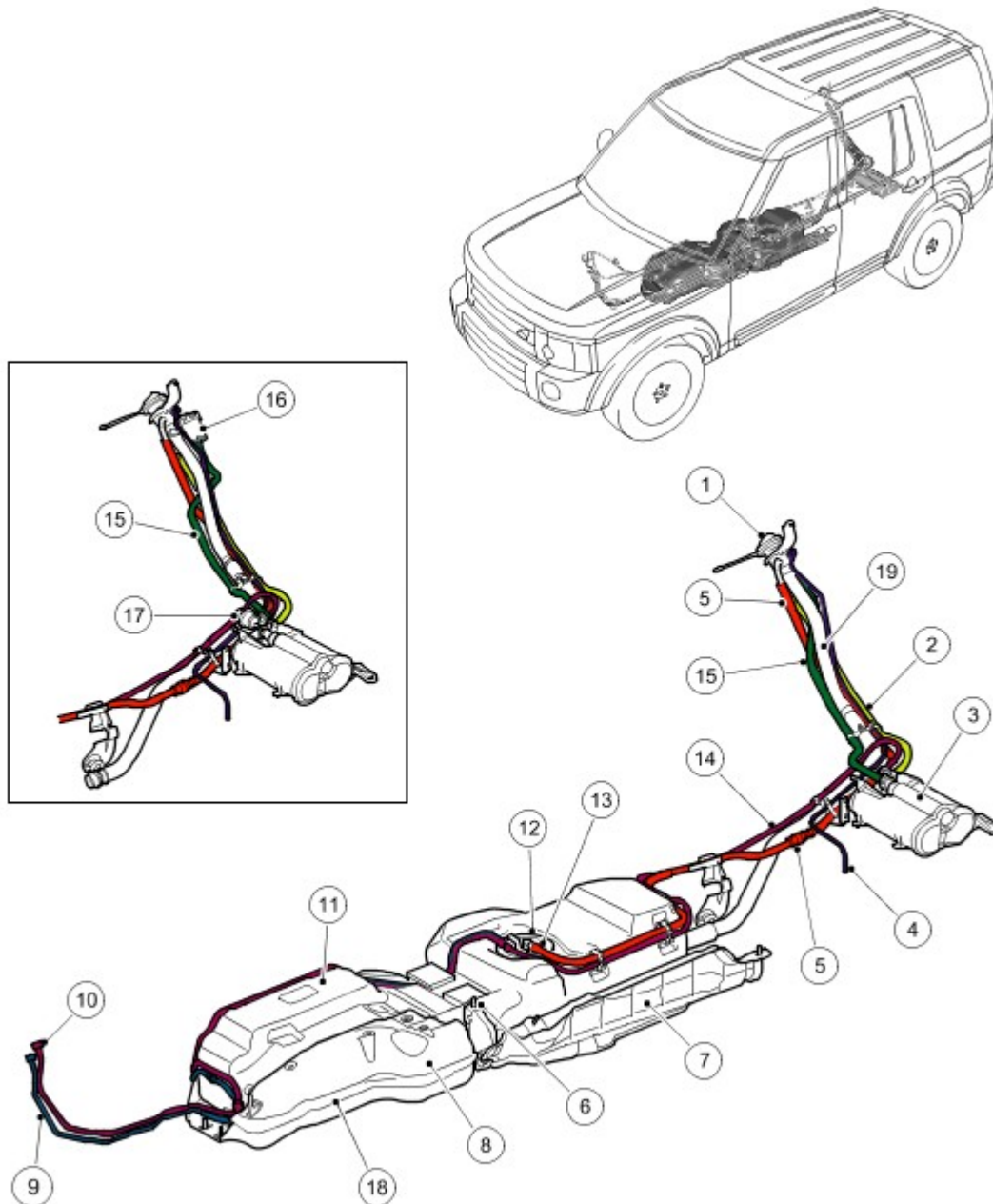




Fuel Tank and Lines

Fuel Delivery System Component Location



E44502

Item	Part Number	Description
1	-	Filler cap and lanyard
2	-	Breather line 'Y' piece to charcoal canister
3	-	Charcoal canister
4	-	Rear differential breather pipe

5	-	Tank breather pipe
6	-	Mounting screw (6 off)
7	-	Heat shield
8	-	Cover
9	-	Pipe - Fuel pump to engine (feed)
10	-	Charcoal canister purge line
11	-	Fuel tank
12	-	Fuel pump module assembly
13	-	Tank breather pipe connection
14	-	Pipe - purge valve to charcoal canister
15	-	Charcoal canister vent pipe
16	-	DMTL filter (NAS only)
17	-	DMTL pump (NAS only)
18	-	Cradle
19	-	Fuel filler pipe

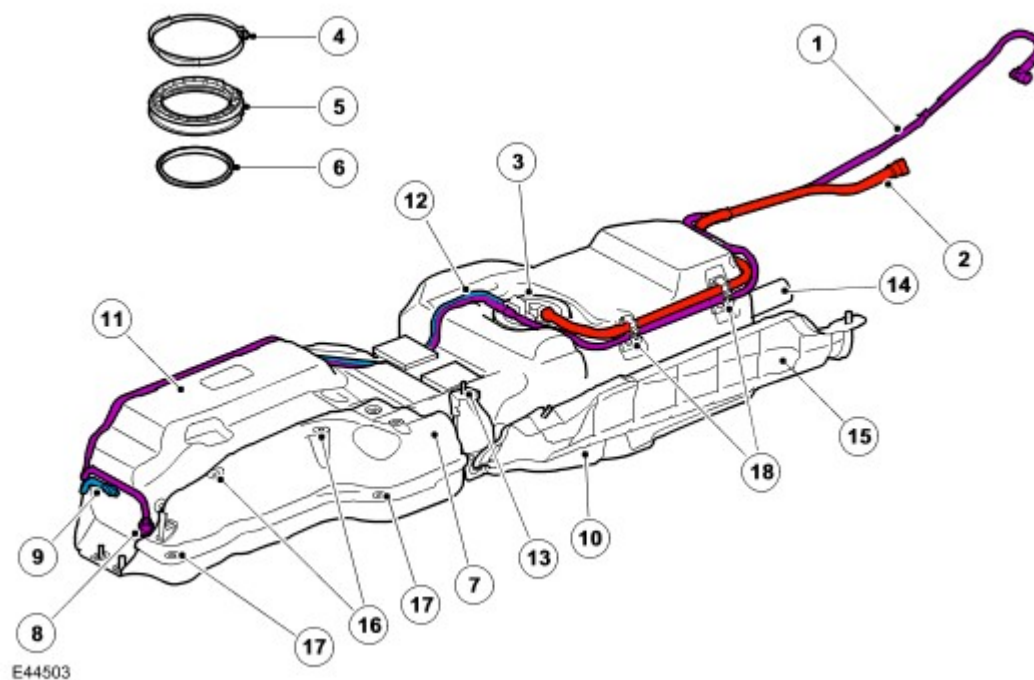
GENERAL

The major components of the 4.0L V6 fuel system comprise a fuel tank, a fuel pump module, a fuel filler assembly and two fuel level sensors.

The 4.0L V6 fuel system uses a fuel pump module mounted in the fuel tank to deliver a uniform level of pressure to the fuel rails which supply fuel to all fuel injectors. The fuel rails and the injectors are described in Fuel & Charging Controls – 4.0L V6. For additional information, refer to [Fuel Charging and Controls](#) (303-04A Fuel Charging and Controls - 4.0L)

Fuel system emission control is described in Engine Emission Control - 4.0L V6. For additional information, refer to [Engine Emission Control](#) (303-08A)

FUEL TANK ASSEMBLY



Item	Part Number	Description
1	-	Pipe - purge valve to charcoal canister
2	-	Tank breather pipe
3	-	Fuel pump module flange
4	-	Pump module clamp
5	-	Pump module collar
6	-	Pump module seal
7	-	Cover
8	-	Pipe connection - purge valve
9	-	Pipe connection - fuel feed
10	-	Cradle
11	-	Fuel tank
12	-	Pipe - fuel feed
13	-	Mounting screws (6 off)
14	-	Fuel filler hose
15	-	Heat shield
16	-	Scrivet
17	-	Screw M6
18	-	Clip cover

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 has a useable capacity of 86.3 litres (22.8 US 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 left 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.

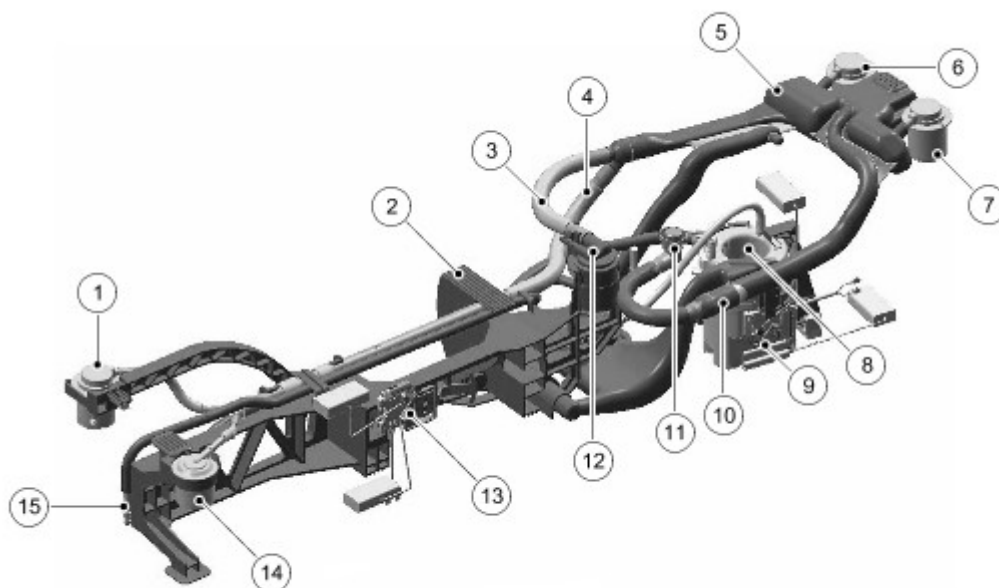
The flange assembly comprises a pump module flange which contains all external pipe and electrical connections for the tank internal components, a collar and a clamp. The flange is fitted with a seal which locates in the tank aperture. An arrow on the flange must be aligned between two moulded lines on the tank, adjacent to the pump module flange aperture, to obtain the correct orientation of the flange. The collar is located over the flange and is secured with the clamp. The flange, seal, collar and clamp arrangement meets the sealing requirements of LEV2 emissions.

The flange has a six pin external connector which provides for electrical connections for the level sensors and the fuel pump. This connector is wired to three push fit connectors on the underside of the flange. A quick release connector provides for the connection of the fuel feed pipe and breather.

A tank carrier assembly is attached inside the tank and is used to locate the internal tank components. The carrier provides location for the fuel pump module, the front level sensor, the Roll Over Valves (ROV's), the front jet pump and the Fuel Level Vent Valve (FLVV).

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, a second fine mesh filter and the fuel pressure regulator which is housed in a manifold that is mounted in the carrier. Only the pump module assembly and fuel level sensors are available as serviceable components, the individual assembly components are not available separately.

Fuel Tank Internal Components



E50099

Item	Part Number	Description
1	-	Front right hand Roll Over Valve (ROV)
2	-	Carrier assembly
3	-	Fuel Level Vent Valve (FLVV) breather corrugated tube
4	-	Front ROV corrugated tube
5	-	Liquid Vapor Separator (LVS)
6	-	Rear right hand ROV
7	-	Rear left hand ROV
8	-	Fuel pump module
9	-	Rear fuel level sensor
10	-	Tank breather tube
11	-	Connector
12	-	Fuel Level Vent Valve (FLVV)
13	-	Front fuel level sensor
14	-	Front left hand ROV
15	-	Front jet pump

The 4.0L V6 vent system is identical to the system used on the 4.4L V8 models. The vent system comprises:

- four Roll Over Valves (ROV)
- one Fuel Level Vent Valve (FLVV)
- one Liquid Vapor Separator (LVS)

The vent system is mounted on the fuel tank internal carrier which is assembled outside of the tank and inserted into the tank during the blow moulding process. None of the internal tank venting components are serviceable.

The two rear ROVs are mounted directly onto the LVS with a rubber grommet and secured with clips.

The two front ROVs are located in the front of the tank and are attached to the main beam of the carrier by a moulded clip. Both ROVs are connected to the LVS with a plastic corrugated tube.

The four ROVs vent directly into the LVS. Any liquid fuel is separated from the vapor in the LVS and drains back into the

tank via the FLVV. The LVS is connected by a corrugated tube to the fuel pump module flange. This allows fuel vapor to exit the tank during venting.

The main purpose of the FLVV is to control the fill volume of the tank. During filling, vapor is passed via the FLVV to the LVS. The vapor then passes from the LVS to the fuel pump module flange vent connection via a corrugated tube. The flange vent connection is connected to the charcoal canister which stores the fuel vapor. During filling, when the tank reaches its full level, the FLVV closes and prevents fuel vapor passing through to the LVS. This causes the pressure in the tank to rise which in turn causes the pump filling nozzle to turn off.

Fuel Pump Module

The fuel pump is attached to the carrier and is located in the bottom of the swirl pot. The pump and the fuel level sensors are connected to the external electrical connector via the connectors on the underside of the fuel pump module flange.

The pump module has a rated flow of 122 litres/hour (32.2 US gallons/hour) at a voltage of 12.3V and an output pressure of 4.5 bar (65.2 lbf/in²).

The fuel pump is energised by the fuel pump relay which is located in the battery junction box. The relay is controlled by the engine control module and energises the relay at all times when the ignition switch is in ignition position II.

A pump inlet filter is attached to pump inlet port at the bottom of the pump. The filter has a 'winged' section which is located vertically at the side of the pump to ensure that a portion of the filter is off the base of the swirl pot, to prevent premature blocking of the filter. The filter has a 31 micron fine mesh filter with a surface area of 70 cm² (10.8 in²).

A second fine mesh filter is located around the top of the fuel pump. This provides additional filtration to the fuel before it is passed into the manifold and onto the fuel rail. The filter has an electrical connection which is attached to ground. The ground is required to dissipate electrostatic charges that can build up on the fine filter.

The fuel filter incorporates a non-return valve which prevents fuel returning to the pump when the engine is not running. This ensures that system pressure is maintained in the fuel feed line to the fuel rail when the engine is not running.

Fuel Level Sensors

The sensor is a MAgnetic Passive Position Sensor (MAPPS) which provides a variable resistance to earth for the output from the fuel gauge. The sensor is sealed from the fuel preventing contamination of the contacts, increasing reliability. The front and rear 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.

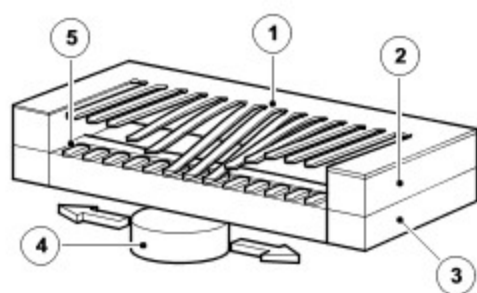
The front sensor is attached to the front of the carrier and is accessible via the fuel pump flange aperture. The rear sensor is attached to the side of the swirl pot and is also accessible via the flange aperture.

NOTE :

When a service replacement tank is ordered the tank is supplied with the front level sensor fitted.

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



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 output proportional to the amount of fuel in the tank and the position of the float arm. The measured resistance is processed by the instrument pack 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 at or below 10 litres (2.64 US gallons).

The fuel level sender signal is converted into a CAN message by the instrument pack as a direct interpretation of the fuel tank contents in litres. The ECM uses the CAN message to store additional OBD P Codes for misfire detection when the fuel level is below a predetermined capacity.

Front Fuel Level Sensor Resistance/Fuel Gauge 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 Gauge Reading
51	Empty
51	Low fuel level illumination
294	Half full
798	Full

Rear Fuel Level Sensor Resistance/Fuel Gauge 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 Gauge Reading
75.5	Empty
120	Low fuel level illumination
280	Half full
675	Full

Fuel Pressure Regulator

The fuel pressure regulator is located in the manifold inside the fuel tank. The regulator controls the fuel pressure in the feed pipe to the fuel rail by allowing some fuel to be diverted to the front jet pump.

The regulator is subject to pump output pressure and controls the pressure of the fuel delivered to the fuel rail to 4.5 bar (65.2 lbf/in²). At pressures above this figure, the regulator opens, decaying the pressure supplied to the fuel rail by allowing fuel to pass to the front jet pump. The regulator is required to maintain the fuel pressure at the optimum pressure for correct fuel injection.

Swirl Pot

The swirl pot is located at the rear of the fuel tank and provides for the attachment or location of most of the fuel pump assembly components.

The swirl pot acts as a fuel reserve, providing a constant supply of fuel to the fuel pump irrespective of fuel quantity or vehicle attitude. When the vehicle is level the swirl pot contains approximately 400 cm³ (24.4 in³) of fuel when the engine is running. The two jet pumps ensure that fuel is constantly supplied to the swirl pot to provide a sufficient fuel supply for the pump.

A one way valve is located in the base of the swirl pot. The valve allows fuel from the tank to enter the swirl pot, but prevents it from escaping.

Jet Pumps

The fuel system incorporates two jet pumps. The front jet pump is located on the carrier near the front of the fuel tank. The rear jet pump is located in the swirl pot below the fuel pump. Both jet pumps operate on a venturi effect created by fuel at pump output pressure passing through the jet pump. This draws additional fuel from the tank through ports in the jet pump body, delivering additional fuel to the swirl pot.

The front jet pump is mainly used when the vehicle is driving downhill. The jet pump is connected via a pipe from the fuel manifold and receives fuel diverted from the fuel feed pipe by the pressure regulator. The front jet pump collects fuel from the front of the tank and transfers it into the swirl pot, ensuring a constant supply of fuel to the pump. The jet pump has a jet nozzle of 2.1 mm diameter.

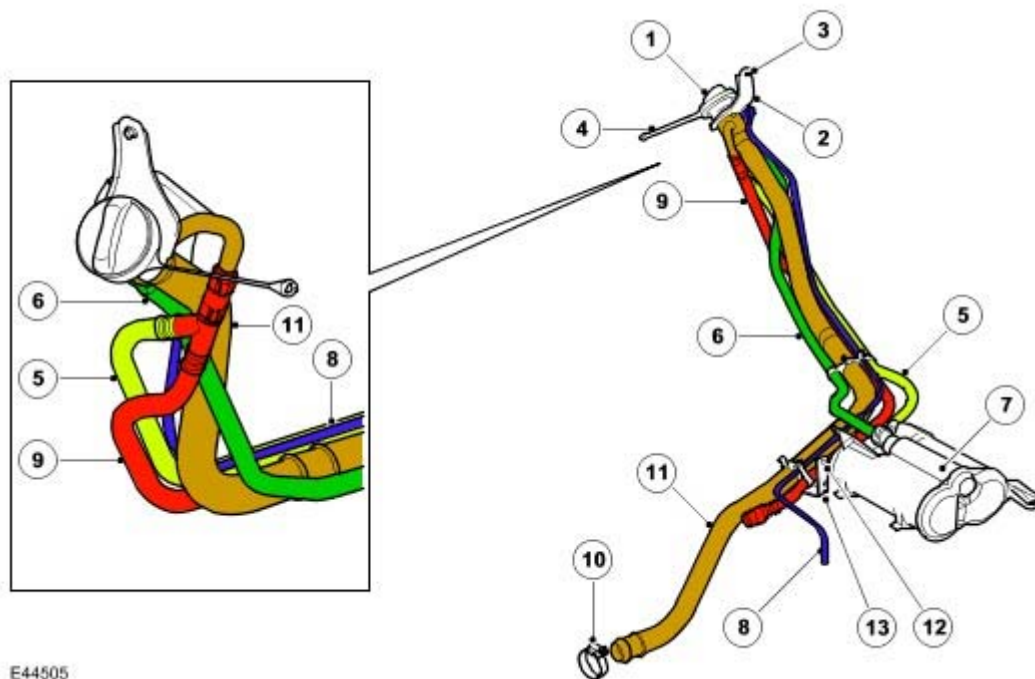
The rear jet pump operates at pump output pressure and delivers some of the fuel at pump pressure from the rear of the tank back into the swirl pot.

Roll Over Valves (ROVs)

Four ROVs are located on the carrier and are connected via pipes to a liquid vapour separator. The separator, which is also attached to the carrier, is connected via a pipe to the tank breather outlet in the pump module flange. The ROVs contain non-return valves which close in the event of the vehicle overturning, preventing liquid fuel escaping from the tank via the breather pipe.

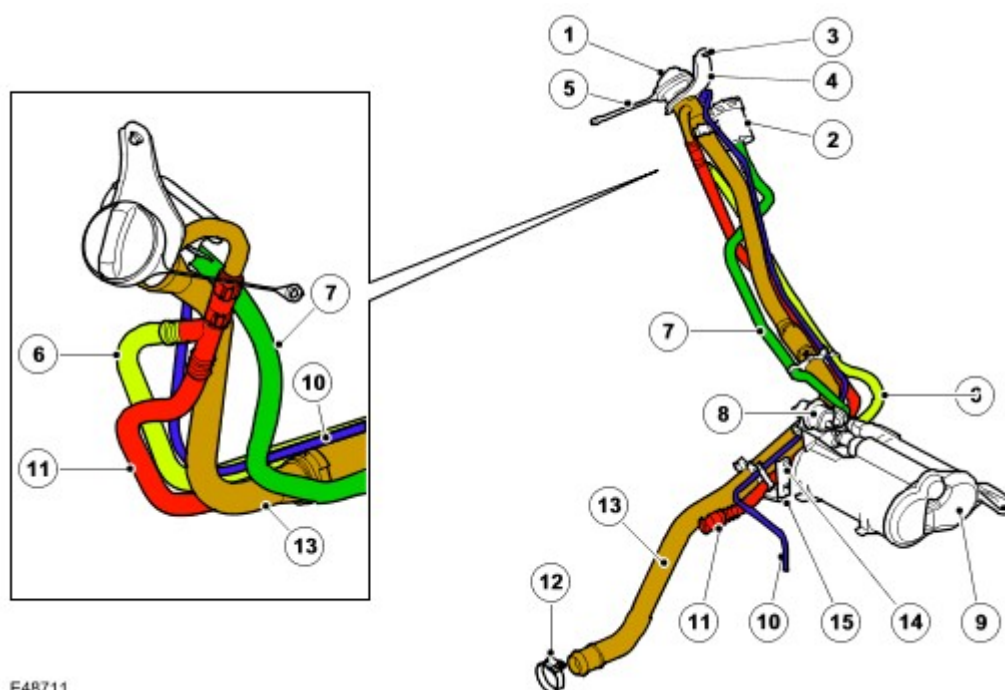
FUEL FILLER

Fuel Filler - ROW



Item	Part Number	Description
1	-	Filler cap
2	-	Bracket
3	-	Screw M6
4	-	Filler cap lanyard
5	-	Charcoal canister breather hose
6	-	Charcoal canister vent hose to atmosphere
7	-	Charcoal canister (ROW)
8	-	Rear differential breather pipe
9	-	Tank breather pipe
10	-	Clamp - filler hose
11	-	Fuel filler pipe
12	-	Screw M8
13	-	Lower mounting bracket to EPB bracket

Fuel Filler - NAS



E48711

Item	Part Number	Description
1	-	Filler cap
2	-	DMTL pump filter
3	-	Screw M6
4	-	Bracket
5	-	Filler cap lanyard
6	-	Charcoal canister breather hose
7	-	DMTL pump vent hose to filter
8	-	DMTL pump
9	-	Charcoal canister (NAS)
10	-	Rear differential breather pipe
11	-	Tank breather pipe
12	-	Clamp - filler hose
13	-	Fuel filler pipe
14	-	Screw M8
15	-	Lower mounting bracket to EPB bracket

The fuel filler head is positioned at the rear of the vehicle, above the right hand rear wheel. The filler head is covered by a moulded plastic cover which is electrically locked when the vehicle is locked. The filler cap is a conventional screw in type which is secured to the vehicle with a lanyard.

NOTE :

The fuel filler head plastic cover does not lock on NAS vehicles.

The filler head is a stainless steel fabrication. Two brackets provide for the attachment of the filler to the vehicle body and the chassis electronic park brake bracket.

Connections on the rear of the filler head allow for the connection of the fuel tank breather pipe from the fuel tank flange, the fuel filler pipe to the tank and the charcoal canister breather pipe.

The fuel tank breather pipe has a quick release fitting and connects to the breather pipe from the fuel tank flange.

The fuel filler pipe locates in a short flexible hose attached to the tank and is secured with worm drive clamps. The canister vent pipe is routed alongside the fuel filler pipe and attaches to the canister with a quick release coupling.

A charcoal canister to atmosphere pipe is also routed alongside the fuel filler pipe and provides air ventilation for the charcoal canister. On all petrol vehicles, except NAS vehicles, the pipe is connected to the air port on the charcoal canister with a quick release coupling and connects to an insect trap at the fuel filler head. On NAS vehicles fitted with a DMTL pump, the pipe connects to the pump vent port and is also connected to a filter which is attached to the filler head.

A smaller pipe, which is not associated with the fuel system, is attached to the side of the fuel filler pipe. This pipe connects to the rear differential and provides breathing for the differential case. The pipe terminates near the fuel filler head.