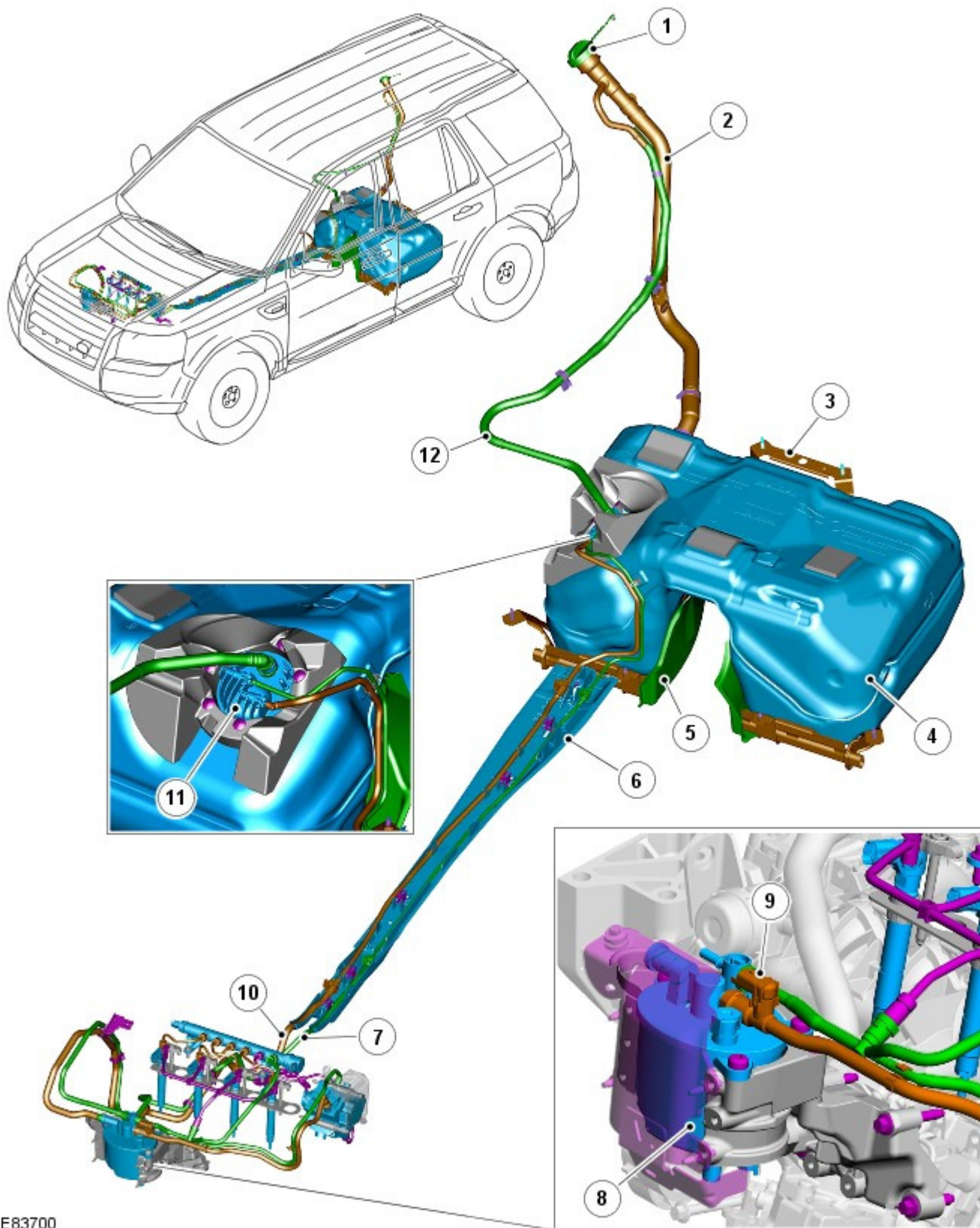


Fuel Tank and Lines - TD4 2.2L Diesel - Fuel Tank and Lines

Description and Operation

COMPONENT LOCATION



E83700

Item	Part Number	Description
1	-	Fuel tank filler cap and lanyard
2	-	Fuel tank filler pipe
3	-	Fuel tank support cradle
4	-	Fuel tank

5	-	Exhaust heat shield
6	-	Fuel line underfloor protection tray
7	-	Fuel return line
8	-	Fuel filter assembly
9	-	Fuel temperature sensor
10	-	Fuel supply line
11	-	Fuel delivery module
12	-	Hose - fuel tank breather

OVERVIEW

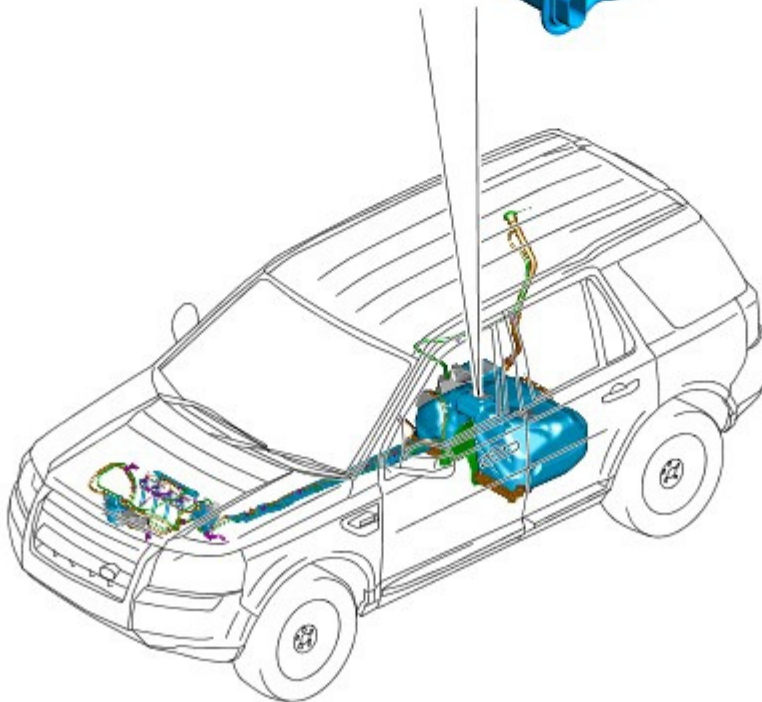
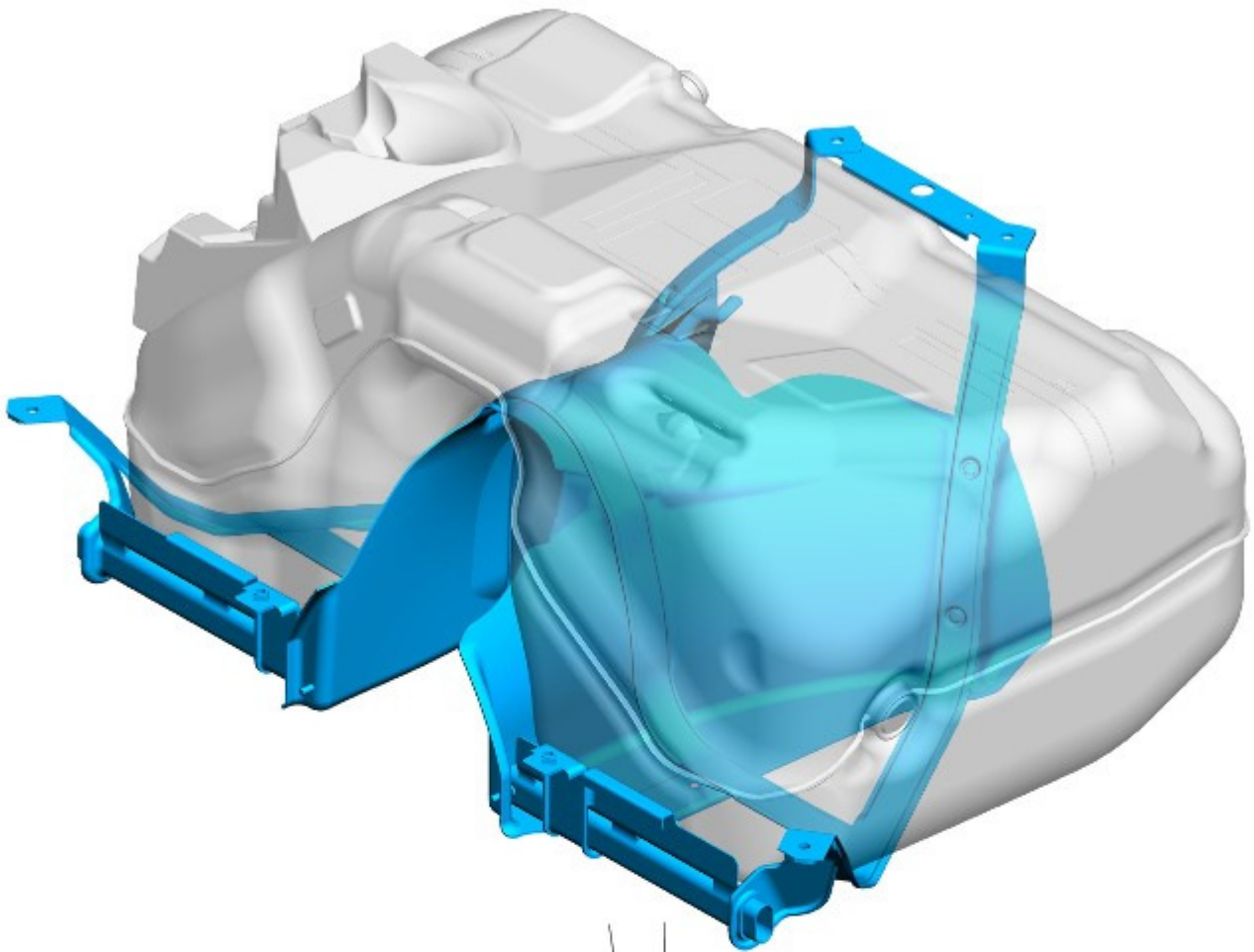
The TD4 diesel fuel system incorporates a low and high-pressure (HP) circuit to provide the engine with sufficient fuel for all operating conditions. The low-pressure (LP) system comprises:

- Molded plastic saddle-type fuel tank
 - Fuel delivery module (with integral in-tank pump)
 - Fuel level sensors
 - Fuel supply and return lines
 - Fuel filter assembly.
- **NOTE:** Fuel is drawn from the fuel tank by the engine mounted lift pump. The in-tank pump does not deliver fuel to the engine, and only delivers fuel through the 2 jet pumps to maintain fuel in the fuel delivery pot.

The HP system features a Bosch Generation 3 common rail injection system.

For additional information, refer to: [Fuel Charging and Controls](#) (303-04B Fuel Charging and Controls - TD4 2.2L Diesel, Description and Operation).

FUEL TANK CONSTRUCTION



E83022

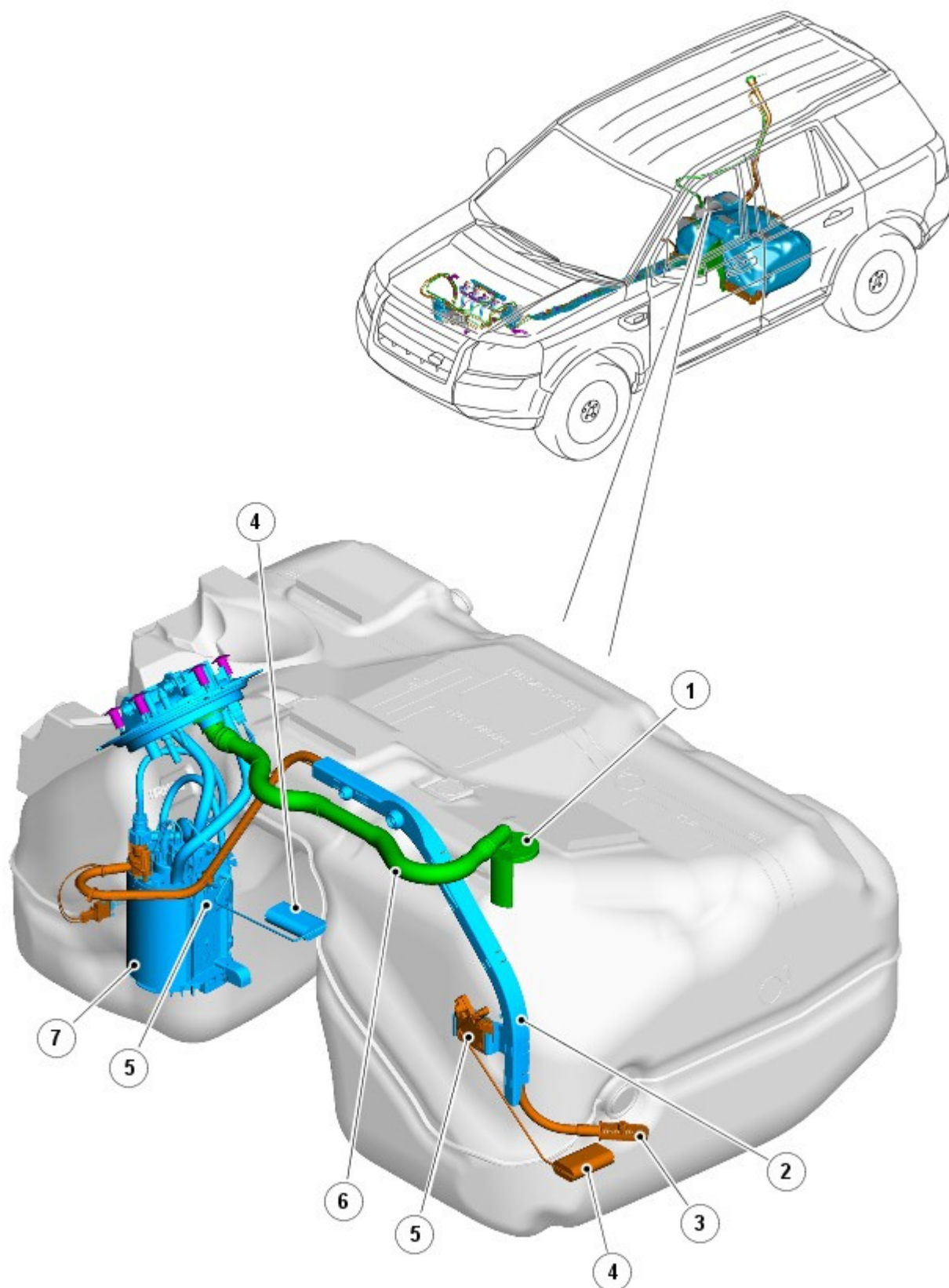
The fuel tank has a useable capacity of 68.0 liters (18.0 US gallons) and is designed with a run dry strategy to prevent air entering the HP fuel system. The tank is formed from a 6-layer laminated blow-molded plastic to provide high mechanical strength and complete emissions integrity. The tank is a sealed unit with internal access being via the fuel delivery module aperture located on the Right-Hand (RH) side of the tank.

The fuel tank is located centrally below the rear seat position and is formed to straddle the driveshaft and exhaust system.

A mounting cradle and 6 bolts secure the fuel tank to the vehicle. When the cradle is attached to the chassis, the tank is positively secured via foam pads that bear against the underfloor. The cradle is manufactured from steel and incorporates large diameter steel tubing to protect the fuel tank leading edge from underbody damage. The cradle also provides the location for the parking brake cable brackets.

A saddle shaped heat shield is attached to the cradle to protect the fuel tank from exhaust system temperature.

FUEL TANK INTERNAL COMPONENTS



E83023

Item	Part Number	Description
1	-	Fuel tank breather valve
2	-	Crossover tube
3	-	Coarse filter
4	-	Fuel sender unit float (2 off)
5	-	MAGnetic Passive Position Sensor (MAPPS) fuel sender unit (2 off)
6	-	Fuel tank breather hose
7	-	Fuel delivery module

The fuel tank comprises the following internal components:

- Internal mounting bracket
- Fuel delivery module and crossover tube
- 2 MAPPs type fuel sender units
- Breather valve.

Internal Mounting Bracket

The internal mounting bracket is molded into the tank casing and provides the location for the breather valve, and crossover tube assembly.

Fuel Delivery Module



E83024

Item	Part Number	Description
1	-	In-tank pump supply to jet pump
2	-	Fuel supply to engine fuel filter
3	-	In-tank pump
4	-	In-tank pump supply to jet pump
5	-	Jet pump (usable side of tank)
6	-	Inlet from usable side of tank
7	-	Return fuel from engine fuel filter
8	-	Crossover tube (from unusable side of tank)
9	-	Jet pump (unusable side of tank)

The fuel delivery module is located in the RH side of the tank, and is secured to the bottom of the tank with a welded bayonet-type lock ring. The top flange of the fuel delivery module assembly provides the internal and external interface for the tank electrical and fuel connections. The flange is formed with a 6-pin external electrical connector that is connected to the 2 MAPPs fuel level sensors, and the in-tank pump.

The fuel delivery module flange is sealed to the tank with an O-ring and secured with a locking ring.

The lower part of the fuel delivery module forms the fuel delivery pot, and provides the location for the in-tank pump and the 2 jet pumps. The delivery pot provides a constant reservoir of fuel for the engine drawn fuel supply. The engine fuel supply and return lines are immersed in the delivery pot.

The delivery pot is maintained full by the 2 jet pumps. The in-tank pump draws fuel from within the fuel delivery pot and forces the fuel through the 2 jet pumps. The flow of fuel through each jet pump creates a venturi effect that draws fuel from both sides of the fuel tank into the fuel delivery pot. Surplus fuel entering the fuel delivery pot overflows into the usable side of the fuel tank.

A valve is located in the lower (usable tank side) jet pump supply orifice. The valve is open when the in-tank pump is energized and the lower jet pump is supplying fuel into the fuel delivery pot. The valve will close when the in-tank pump is de-energized to prevent fuel draining from the fuel delivery pot.

The in-tank pump is energized by the fuel pump relay located in the Central Junction Box (CJB). The Engine Control Module (ECM) energizes the fuel pump relay at all times when the ignition is in power modes 4 (Accessory) to 9 (Engine crank). For additional information, refer to: Electronic Engine Controls - 2.2L Diesel (303-14 Electronic Engine Controls - 2.2L Diesel, Description and Operation).

A modified fuel delivery module is installed for cold climate market vehicles that feature a fuel fired booster heater and auxiliary fuel pump. The modified fuel delivery module incorporates a separate fuel supply line that connects to an auxiliary fuel pump, mounted on the exterior RH side of the tank. An additional fuel line connects the auxiliary fuel pump to the fuel fired booster heater.

For additional information, refer to: [Fuel Fired Booster Heater](#) (412-02B Auxiliary Climate Control, Description and Operation).

Fuel Sender Units

The 2 MAPPS fuel sender units are located on either side of the saddle shaped tank, and connect to the internal electrical connections on the fuel delivery module flange. Each sensor provides an electrical signal to the CJB that is proportionate to the fuel level in each side of the tank.

The actual fuel level in the tank is calculated by the CJB and transmitted via the medium speed Controller Area Network (CAN) bus to the instrument cluster.

A warning lamp is incorporated in the instrument cluster and will illuminate when the fuel level is at, or below a predetermined level. On vehicles with a high-line instrument cluster, a message is displayed and a chime is sounded to inform the driver to refuel.

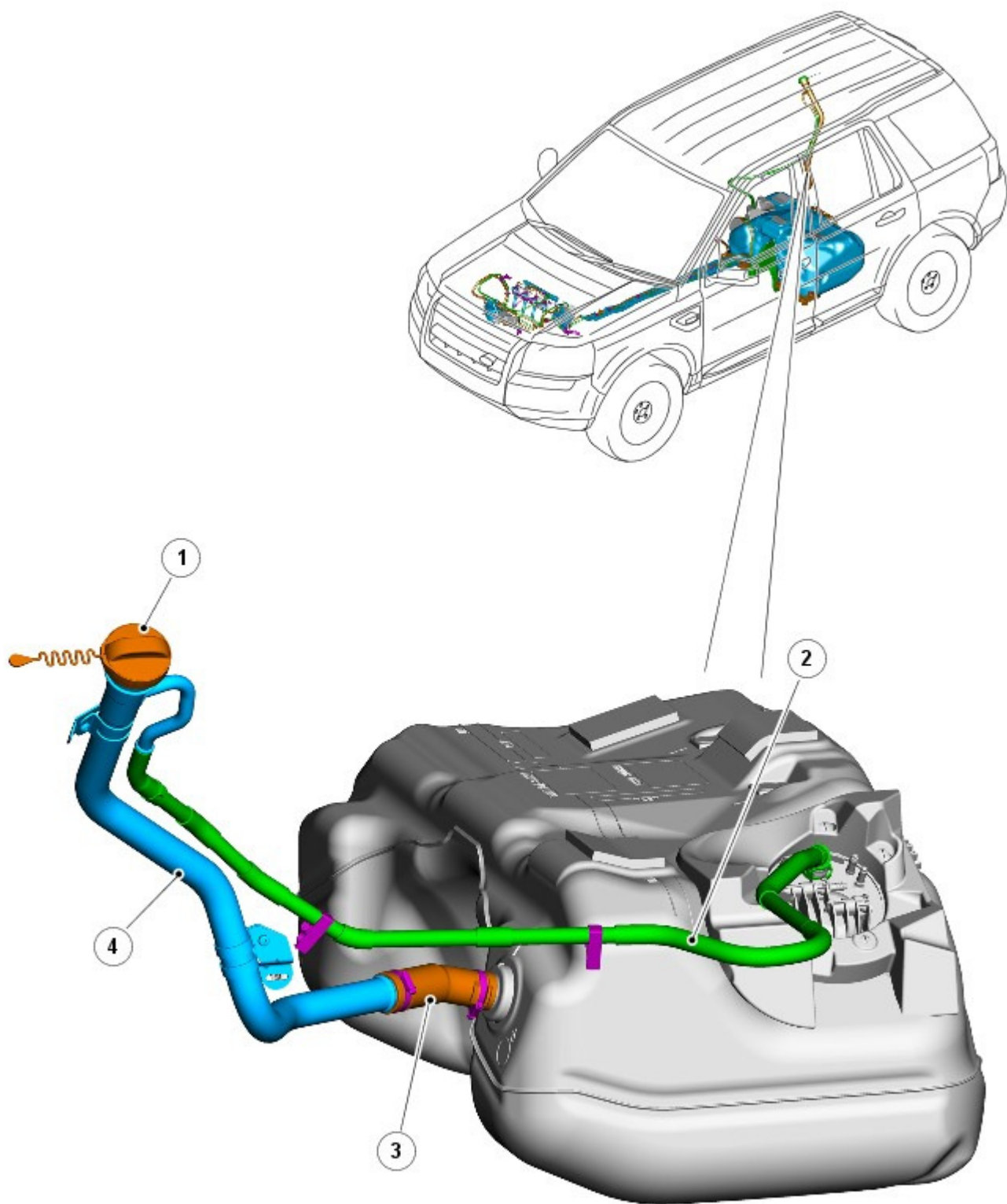
For additional information, refer to:

[Instrument Cluster](#) (413-01 Instrument Cluster, Description and Operation),
[Information and Message Center](#) (413-08 Information and Message Center, Description and Operation).

Fuel Tank Breather Valve

The breather valve is located in the fuel tank and is connected to the fuel delivery module flange via an internal breather hose. The breather valve allows air to escape and enter the fuel tank to compensate for the changing volume within the tank.

FUEL TANK FILLER



E83025

Item	Part Number	Description
1	-	Filler cap and lanyard
2	-	Tank external breather hose
3	-	Filler pipe stub hose
4	-	Filler pipe

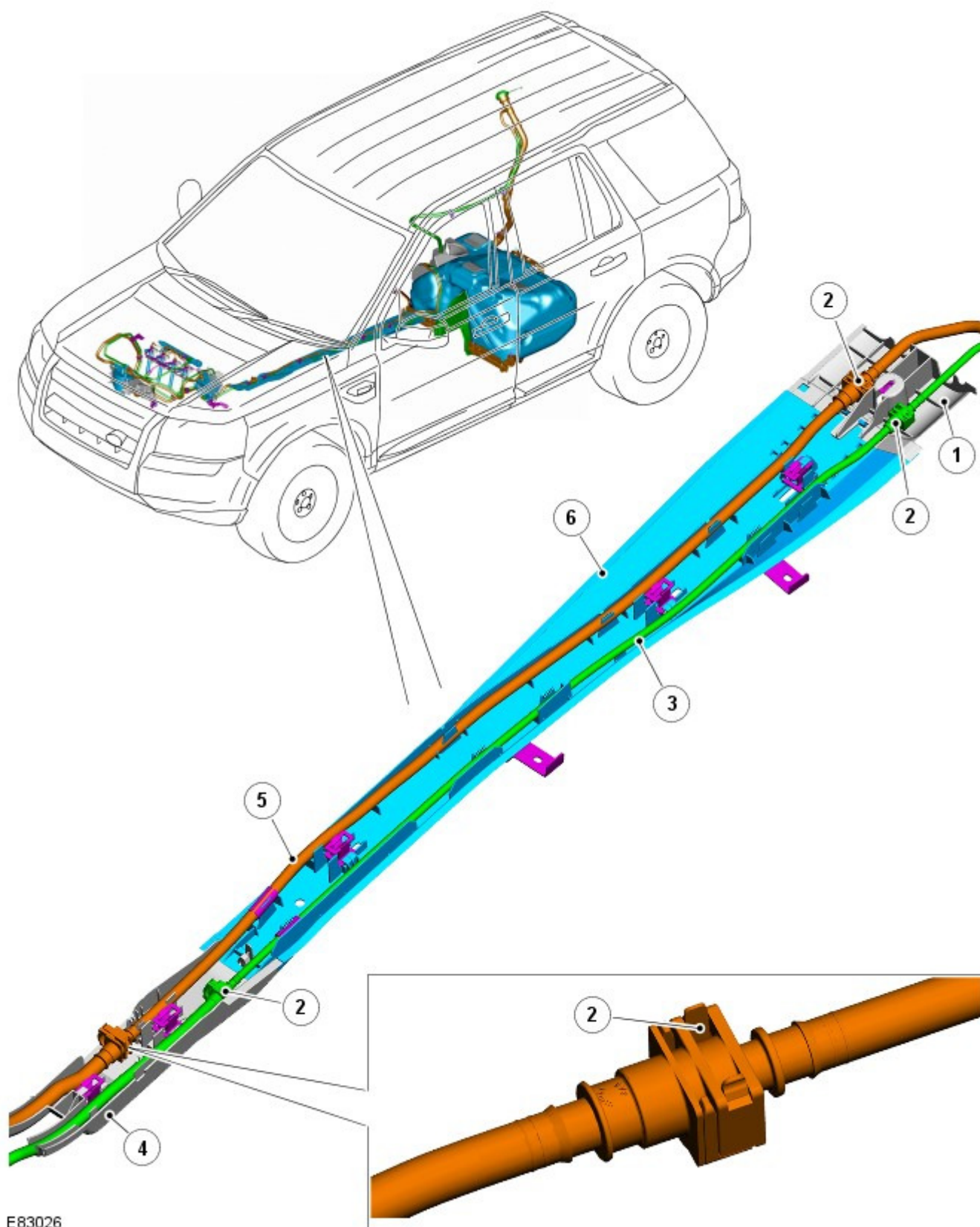
The fuel tank is filled through an aluminum filler pipe that is connected via a molded rubber stub hose to the rear RH side of the tank. A screw cap is installed to seal the filler pipe opening.

An inline check valve is mounted inside the filler pipe stub hose at the tank, and is retained in the closed position by a spring. The check valve is only opened when the vehicle is refueled. The check valve minimizes fuel spillage in the event that the filler pipe is damaged during an accident.

A breather hose is routed from the fuel filler pipe to the fuel delivery module flange. The breather hose connects to the

breather pipe on the fuel delivery module flange.

FUEL LINES



E83026

Item	Part Number	Description
1	-	Rear access cover
2	-	Quick-fit type connector (4 off)
3	-	Fuel return line
4	-	Front access cover
5	-	Fuel supply line
6	-	Underfloor protection tray

The fuel supply and return lines are routed along the vehicle underfloor, and housed within a plastic protection tray. The

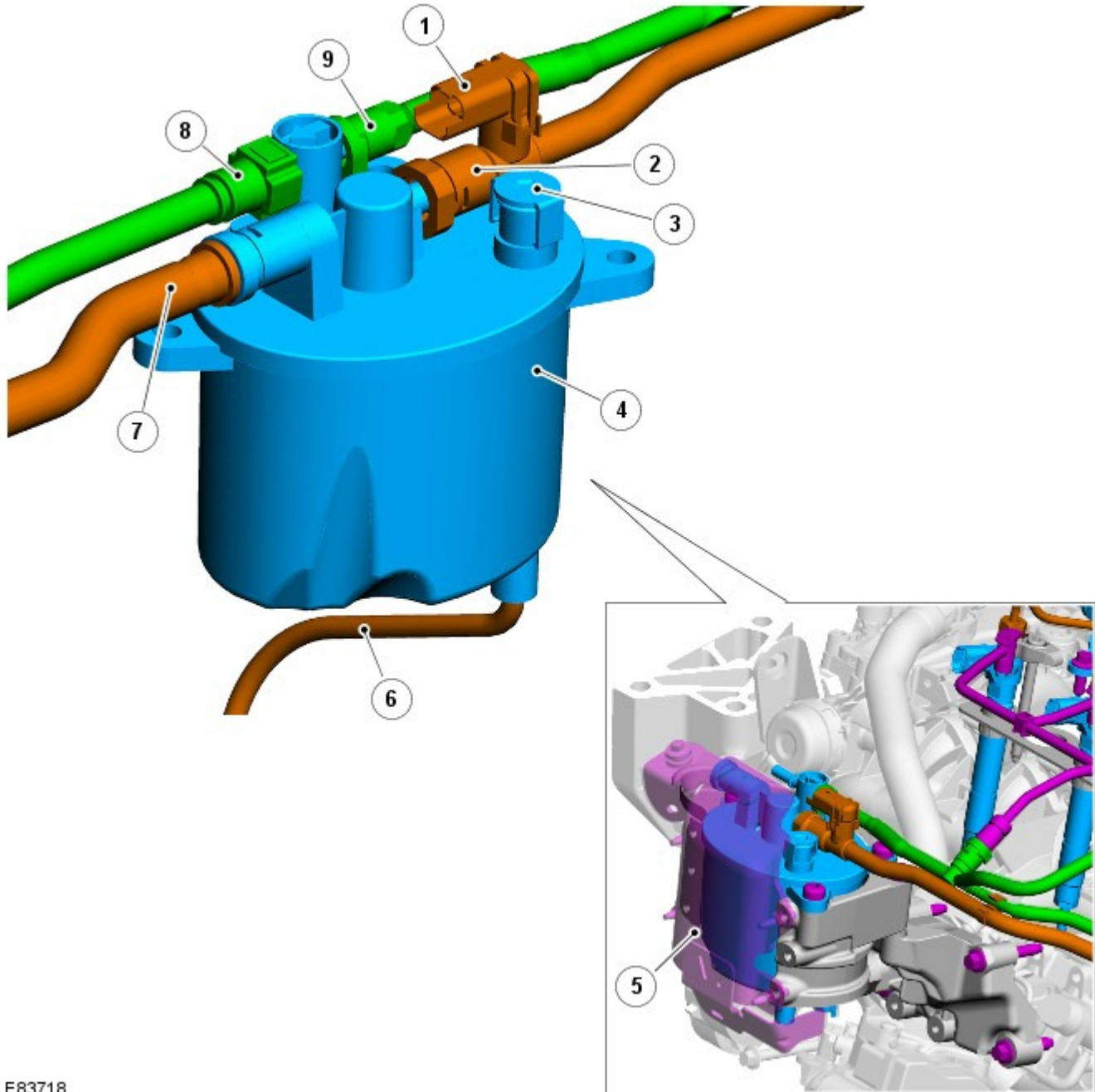
protection tray is secured with integral clips on the inside of the tray to studs along the underfloor.

⚠ CAUTION: The fuel line quick-fit type connector is a new design connector installed to the TD4 vehicle. During maintenance procedures the quick-fit type connector must be released and connected correctly to prevent fuel leakage. Use the correct method detailed in the relevant section of the Service Repair Manual (SRP) to release and connect the connector. Incorrect operation of the quick-fit type connector will result in damage to the connector and cause fuel leakage.

The quick-fit type fuel connector is not a self sealing connector, and will not prevent fuel flow when disconnected.

The fuel supply and return lines are connected at each end with a quick-fit type connector. The connector is not self-sealing and will not prevent fuel flow when the fuel line is separated.

FUEL FILTER ASSEMBLY



E83718

Item	Part Number	Description
1	-	Fuel temperature sensor
2	-	Fuel supply to HP pump
3	-	Water drain screw
4	-	Fuel filter canister
5	-	Fuel canister crash shield
6	-	Water drain point
7	-	Fuel supply from tank
8	-	Fuel return to tank
9	-	Fuel return from HP fuel system

The fuel filter canister is located at the front RH side of the engine compartment, and mounted within an engine support

bracket. A crash shield is installed to protect the filter canister in the event of a frontal impact. The filter canister is manufactured from heat resistant and flame-proof durable plastic, and contains a paper type filter element.

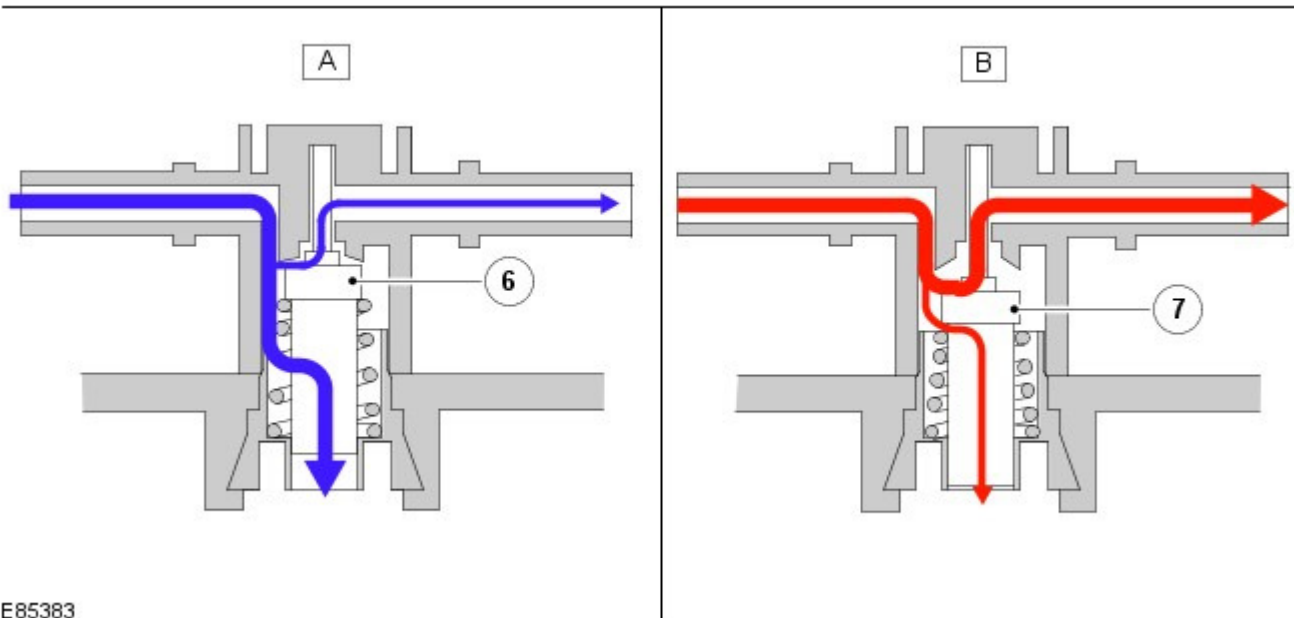
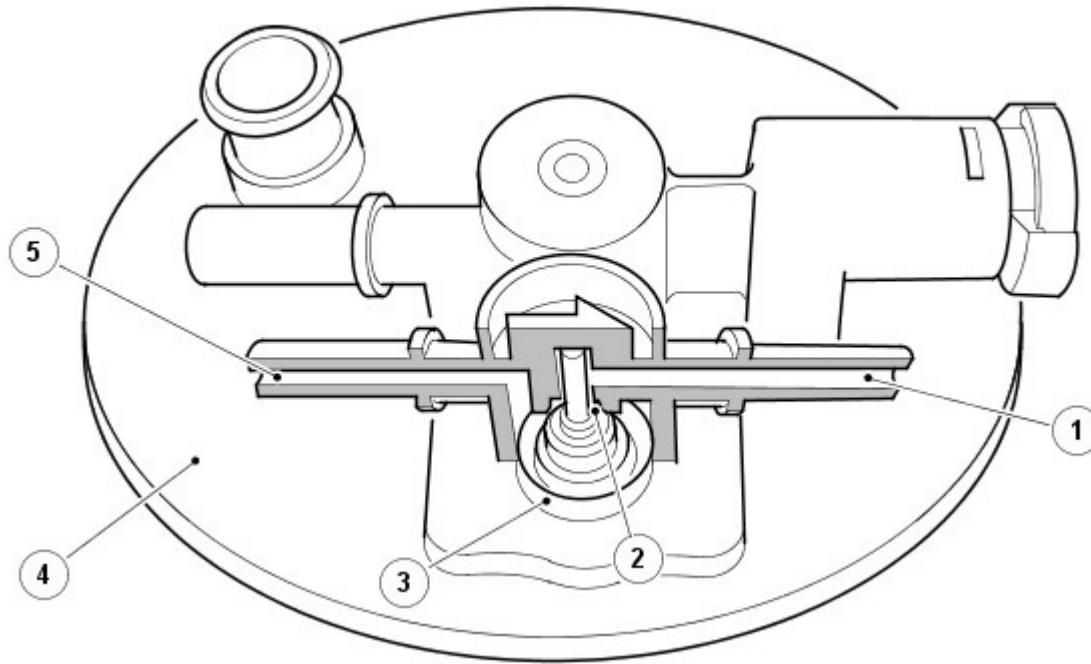
The fuel temperature sensor is incorporated within the fuel supply line connection on the fuel filter canister. The sensor provides the ECM with a signal voltage that is proportional to the actual fuel temperature. The signal is used by the ECM in conjunction with other vehicle sensors, to calculate the actual fuel pressure required in the HP fuel rail.

For additional information, refer to: Electronic Engine Controls - 2.2L Diesel (303-14 Electronic Engine Controls - 2.2L Diesel, Description and Operation).

A bleed screw and drain point are located on the filter canister. The bleed screw allows water content in the fuel to be drained off during service intervals.

Fuel Filter Pre-Heat Function

The fuel filter features a fuel pre-heat function that operates when the return fuel temperature is below 10°C (50°F). The pre-heat function recirculates a quantity of return fuel from the HP fuel system through the filter canister to prevent fuel waxing, and improve the engine performance during cold running.



E85383

Item	Part Number	Description
A	-	Return fuel temperature less than 10°C (50°F)
B	-	Return fuel temperature greater than 20°C (68°F)
1	-	Fuel return to tank
2	-	Fuel return passage outlet
3	-	Fuel return passage by-pass port
4	-	Fuel filter head
5	-	Fuel return from HP fuel system
6	-	Wax-type thermostatic valve (by-pass open)

7	-	Wax-type thermostatic valve (by-pass closed)
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The fuel filter canister head incorporates a wax-type thermostatic valve and spring, located in the fuel return passage between the HP fuel system and fuel tank return connections. The thermostatic valve is seated in a by-pass port that connects the fuel return passage to the fuel filter canister chamber.

The thermostatic valve is operated by the temperature of the fuel in the fuel return passage, felt at the upper side of the thermostatic valve; and the temperature of the supply fuel in the canister chamber, felt at the under side of the thermostatic valve.

The quantity of return fuel recirculated through the filter canister chamber is proportional to the temperature of the return fuel, and the position of the thermostatic valve.

Return Fuel Temperature	Percentage Return Fuel to Tank	Percentage Recirculated Fuel
Less than 10°C (50°F)	5 - 10%	90 - 95%
Greater than 20°C (68°F)	95 - 100%	0 - 5%

Fuel Temperature Less Than 10°C (50°F)

The thermostatic valve is in the contracted position and held off the by-pass port seat. The upper side of the thermostatic valve almost closes off the fuel return passage outlet due to the position of the thermostatic valve, and the light pressure applied by the spring.

A large proportion of returned fuel to the filter passes through the open by-pass port and is recirculated in the fuel filter canister chamber. A small proportion of the return fuel is allowed to pass across the thermostatic valve and is directed through the fuel return passage outlet to the fuel tank.

Fuel passing through the fuel return passage outlet also provides the lubrication for the thermostatic valve stem.

Fuel Temperature Greater Than 20°C (68°F)

The thermostatic valve expands against spring pressure to almost close off the fuel return passage by-pass port, and opens the fuel return passage outlet.

A small proportion of return fuel to the filter passes through the partially open by-pass port and is recirculated in the fuel filter canister chamber. A large proportion of the return fuel passes across the thermostatic valve and is directed through the open fuel return passage outlet to the fuel tank.