Evaporative Emissions - Evaporative Emissions

Description and Operation

To reduce the emission of fuel vapour, the fuel tank is vented to atmosphere through activated charcoal adsorption canister (s) which collects the fuel droplets. The charcoal is periodically purged of fuel when the EVAP Canister Purge Valve opens the vapour line between the canister(s) and the air intake induction elbow. This action allows manifold depression to draw air through the canister atmospheric vent, taking up the deposited fuel from the charcoal adsorber and burning the resulting fuel vapour in the engine.

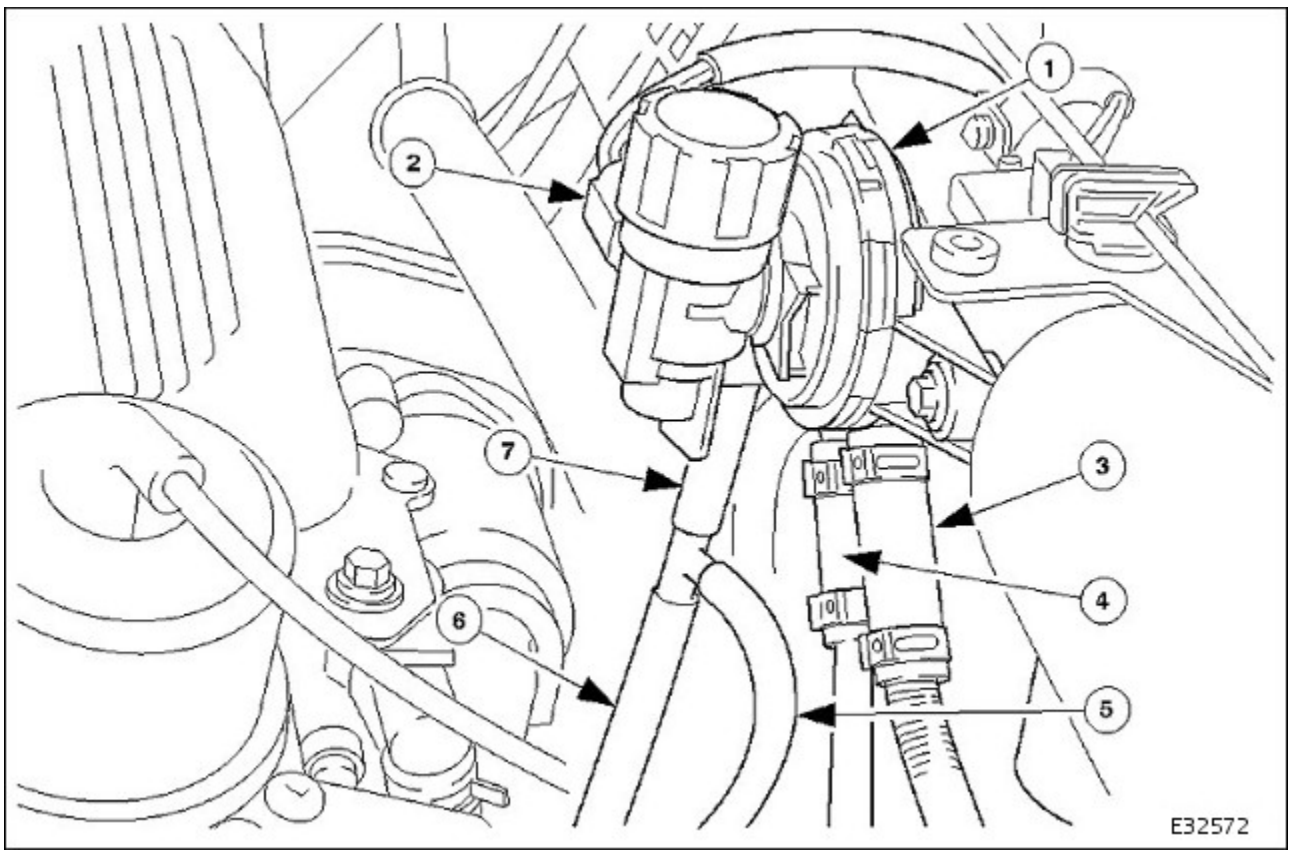
The EVAP Canister Purge Valve is controlled by the engine management system ECM. Purging is carried out in accordance with the engine management fueling strategy (see below).

The fuel tank vapour outlet is via a removeable flange assembly on the top surface of the tank. The vapour storage canister or canisters are fitted on the underside of the vehicle below the rear seats.

There are three variants of the evaporative system. All systems use the charcoal adsorber storage canisters and purge valve and operate as described above. The specific features of each system are described below. The evaporative systems are designated as :

- single canister system
- running loss system
- running loss with On-board Re-fueling Vapour Recovery (ORVR) system

EVAP Canister Purge Valve



Item	Part Number	Description
1	—	EVAP canister purge valve
2	—	Valve solenoid connector
3	—	Vapour outlet to induction elbow
4	—	Vapour inlet from canister(s)
5	—	Vacuum control pipe from induction elbow
6	—	Vacuum control pipe to vapour pressure control valve - applicable to single canister systems only
7	—	Vacuum control connection to EVAP valve

The EVAP canister purge valve controls the flow rate of fuel vapour drawn into the engine during the canister purge operation. The valve is opened by a vacuum feed from the induction elbow : the vacuum feed is controlled by the integral valve solenoid and is applied when the solenoid is energised. The solenoid is pulsed on (energised) and off by a fixed frequency (100Hz) variable pulse width control signal (pulse width modulation). By varying the pulse on to off time, the ECM controls the duty cycle of the valve (time that the valve is open to time closed) and thus the vapour flow rate to the engine.

With no ECM signal applied to the valve solenoid, the valve remains closed.

Canister Purge Operation

The following pre-conditions are necessary for purging to commence :

- after battery disconnection/reconnection, engine management adaptations must be re-instated.
- engine has run for at least 8 seconds.
- engine coolant temperature is not less than 70 °C.
- engine not running in the fuel cut off condition (eg overrun).
- the adaptive fuel correction function has not registered a rich or lean failure
- the evaporative emission leak test has not failed
- no faults have been diagnosted in the relevant sensor and valve circuits - Air Flow Meter (AFM), Engine Coolant Temperature sensor, Evaporative Canister Purge valve and Canister Close Valve (CCV).

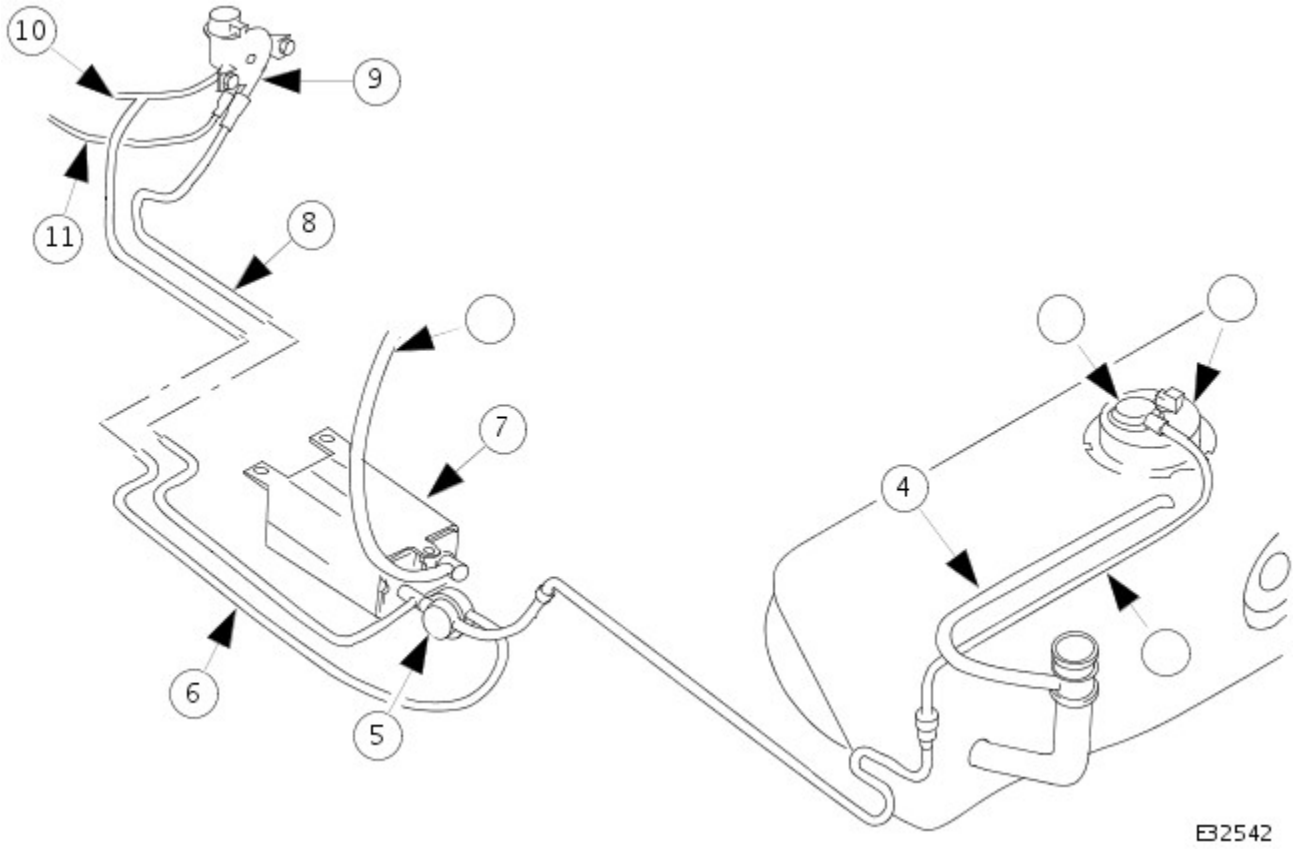
If these conditions have been satisfied, purging is started. If any failures are registered, purging is inhibited.

The canister(s) is purged during each drive cycle at various rates in accordance with the prevailing engine conditions. The engine management software stores a map of engine speed (RPM) against engine load (grams of air inducted / rev). For any given engine speed and load, a vapour purge rate is assigned (purge rate increases with engine speed and load).

The preset purge rates are based on the assumption of a vapour concentration of 100%. The actual amount of vapour is measured by the closed loop fueling system : the input of evaporative fuel into the engine causes the outputs from the upstream oxygen sensors to change, the amount of change providing a measure of the vapour concentration. This feedback causes the original purge rate to be adjusted and also reduces the amount of fuel input via the injectors to maintain the correct air to fuel ratio.

Engine speed/load mapping and the corresponding purge rates are different for single canister, running loss and ORVR evaporative systems.

Single Canister System



Item	Part Number	Description
1	—	Evaporative flange assembly
2	—	Vapour outlet rollover valve
3	—	Tank vapour outlet pipe
4	—	Breather pipe
5	—	Pressure control valve
6	—	Induction vacuum control pipe
7	—	Charcoal canister
8	—	Canister vapour outlet pipe
9	—	EVAP canister purge valve
10	—	Vacuum control signal from induction
11	—	EVAP canister purge valve outlet
12	—	Canister vent to atmosphere

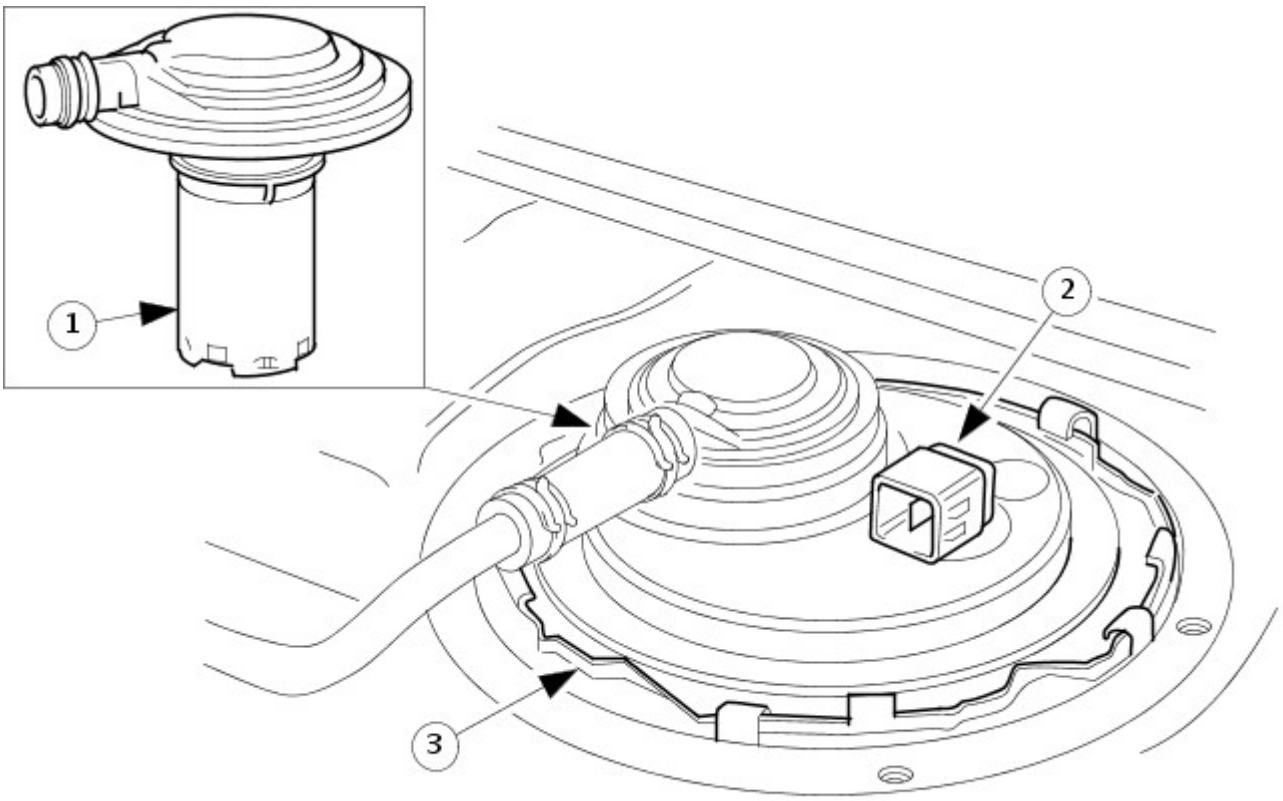
This system uses a single charcoal canister with a pressure control valve between the canister and the fuel tank vapour outlet. A vacuum control pipe is connected from the engine intake induction elbow to the pressure control valve. The vapour outlet from the fuel tank is taken via a safety rollover valve fitted to the removeable flange at the top of the tank.

With the engine stopped, the pressure control valve is closed, maintaining a slight positive pressure in the tank : any further increase in pressure causes the valve to open and release vapour to the canister.

When the engine is running, manifold depression (via the vacuum control pipe) holds the pressure control valve open. Air is drawn into the tank to maintain atmospheric pressure as fuel is used and vapourised fuel is deposited in the charcoal canister.

Canister purge operation is as described in Evaporative Emissions Control.

Evaporative Flange Assembly



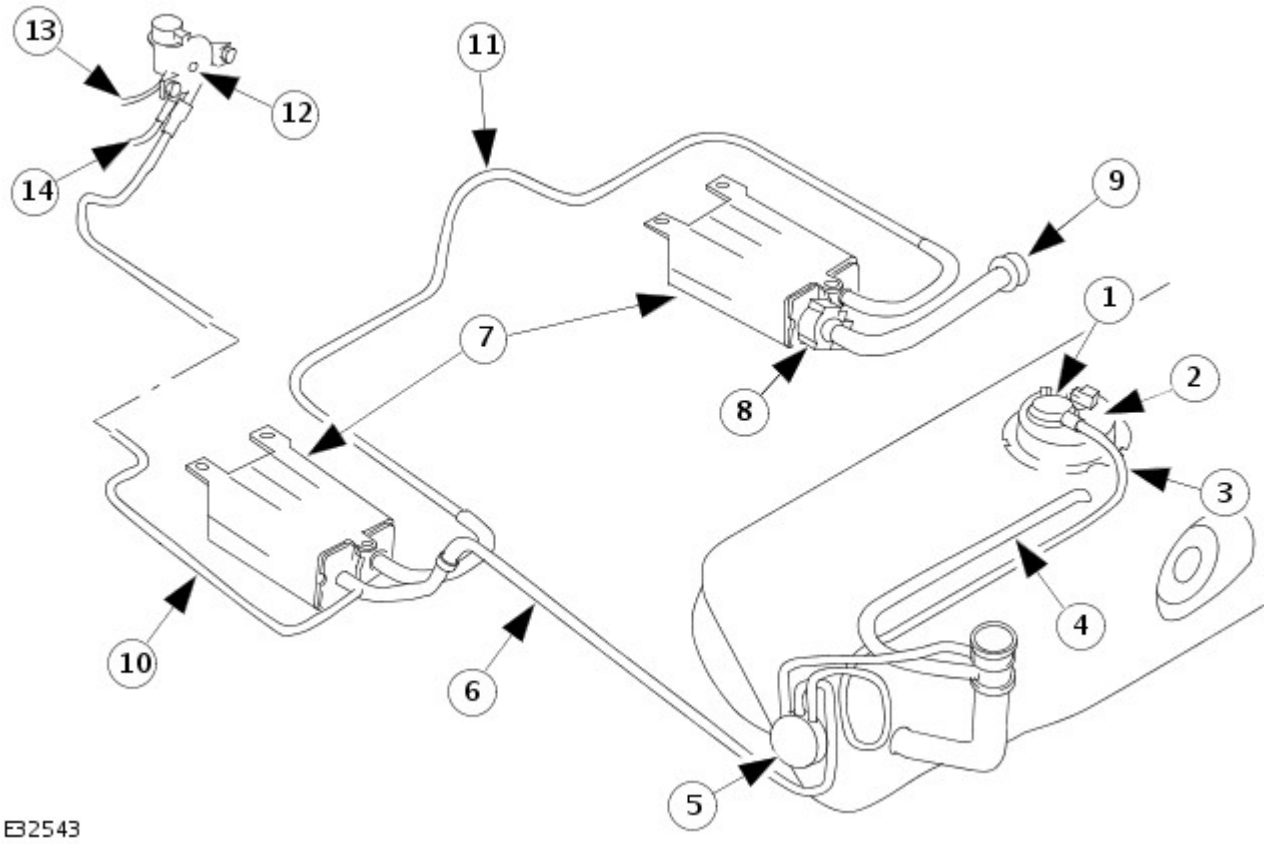
E32545

Item	Part Number	Description
1	—	Vapour vent / rollover protection valve
2	—	Fuel pump connector
3	—	Evaporative loss flange locking ring

The evaporative loss flange assembly is fitted to the top of the tank via a seal and locking ring. The assembly is removeable complete with the fitted components.

The vapour vent / rollover valve is a push fit via a sealing grommet. The fuel pump connector is push fitted and crimped into a location tube on the underside of the flange.

Running Loss System



E32543

Item	Part Number	Description
1	—	Vapour outlet rollover valve
2	—	Evaporative flange assembly
3	—	Tank vapour outlet pipe
4	—	Breather pipe
5	—	Pressure control valve
6	—	Vapour pipe to canister
7	—	Charcoal canisters
8	—	Canister close valve
9	—	Vent pipe air filter
10	—	Canister purge outlet pipe
11	—	Vapour pipe connecting canisters
12	—	EVAP canister purge valve
13	—	Vacuum control signal from induction elbow
14	—	EVAP purge valve outlet to induction elbow

The running loss system has the following features :

- a normally open pressure control valve is fitted at the lefthand side of the tank.
- two charcoal canisters are connected in series to reduce the concentration of fuel in vapour vented to atmosphere.
- a tank pressure sensor and canister close valve are fitted to allow the on-board diagnostic facility to test for leaks in the fuel and evaporative system.

The pressure control valve allows continuous venting of vapour to the charcoal canisters during normal running but prevents fuel entering the vent line during refueling. Fuel vapour from the tank passes through the valve to the lefthand canister and a third pipe connects the valve to the filler neck. When refueling, the difference in pressure between the tank interior and the open filler neck causes the valve to close, shutting off the vapour vent line. When the fuel cap is replaced, the pressures are equalised and the pressure control valve opens the vent line to the canisters.

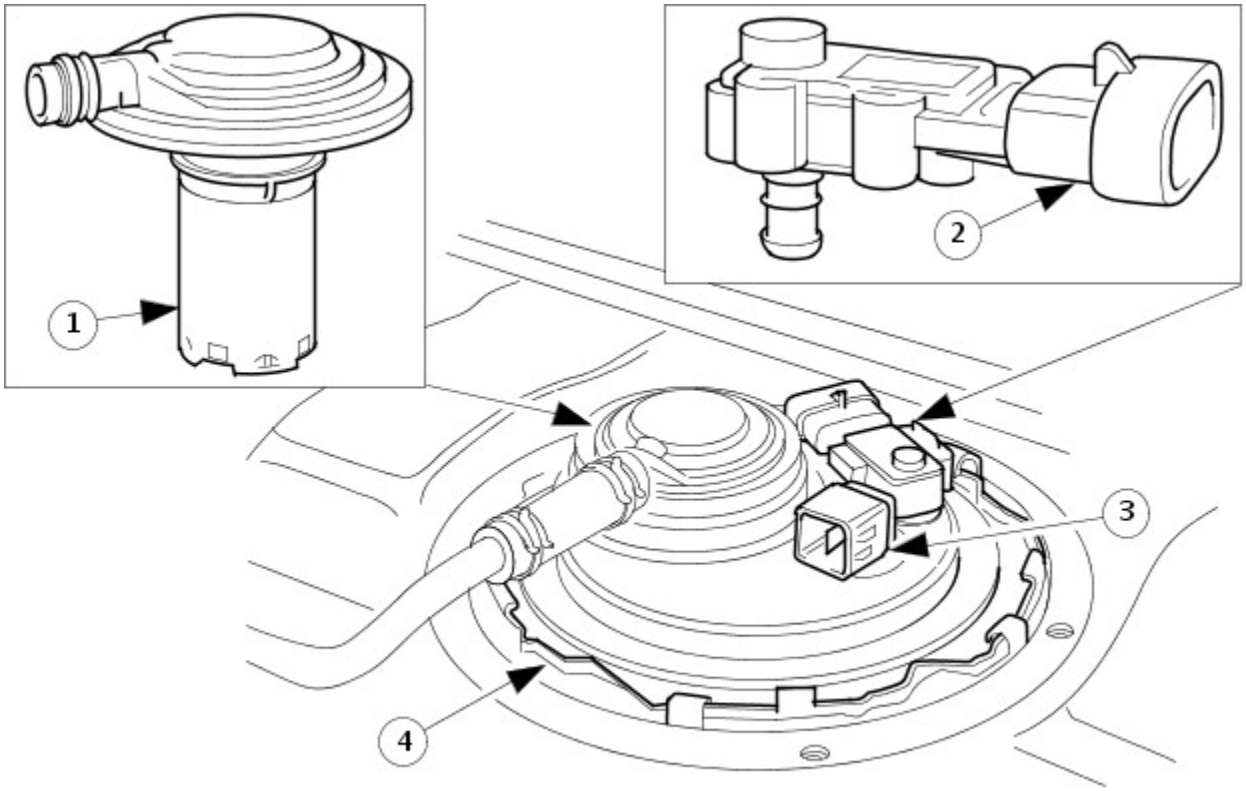
The canister close valve is a solenoid operated device controlled by the ECM. The valve is normally open and is closed only during the leak test sequence.

The fuel pressure sensor is fitted to the evaporative loss flange and provides a voltage to the ECM which is proportional to

tank vapour pressure.

Canister purge operation is as described in Evaporative Emissions Control.

Evaporative Flange Assembly

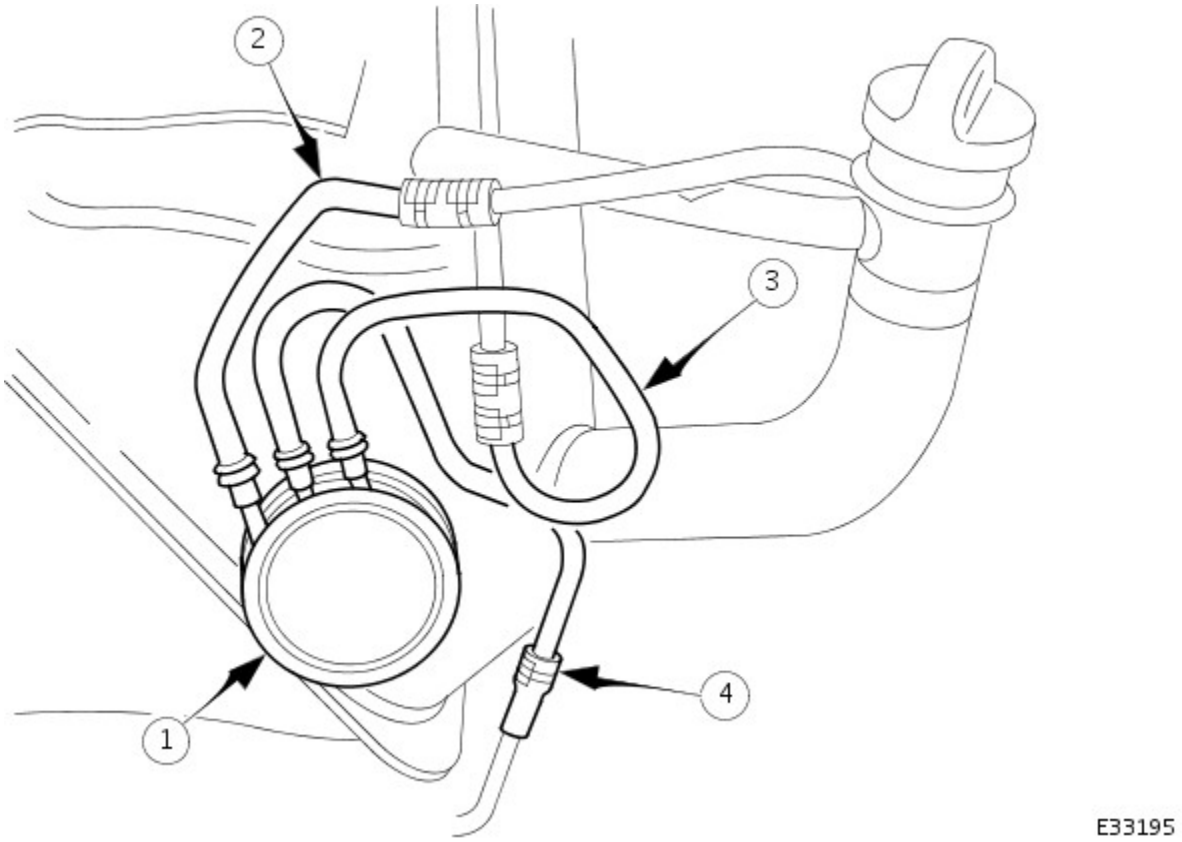


E32546

Item	Part Number	Description
1	—	Vapour vent / rollover protection valve
2	—	Pressure sensor
3	—	Fuel pump connector
4	—	Evaporative loss flange locking ring

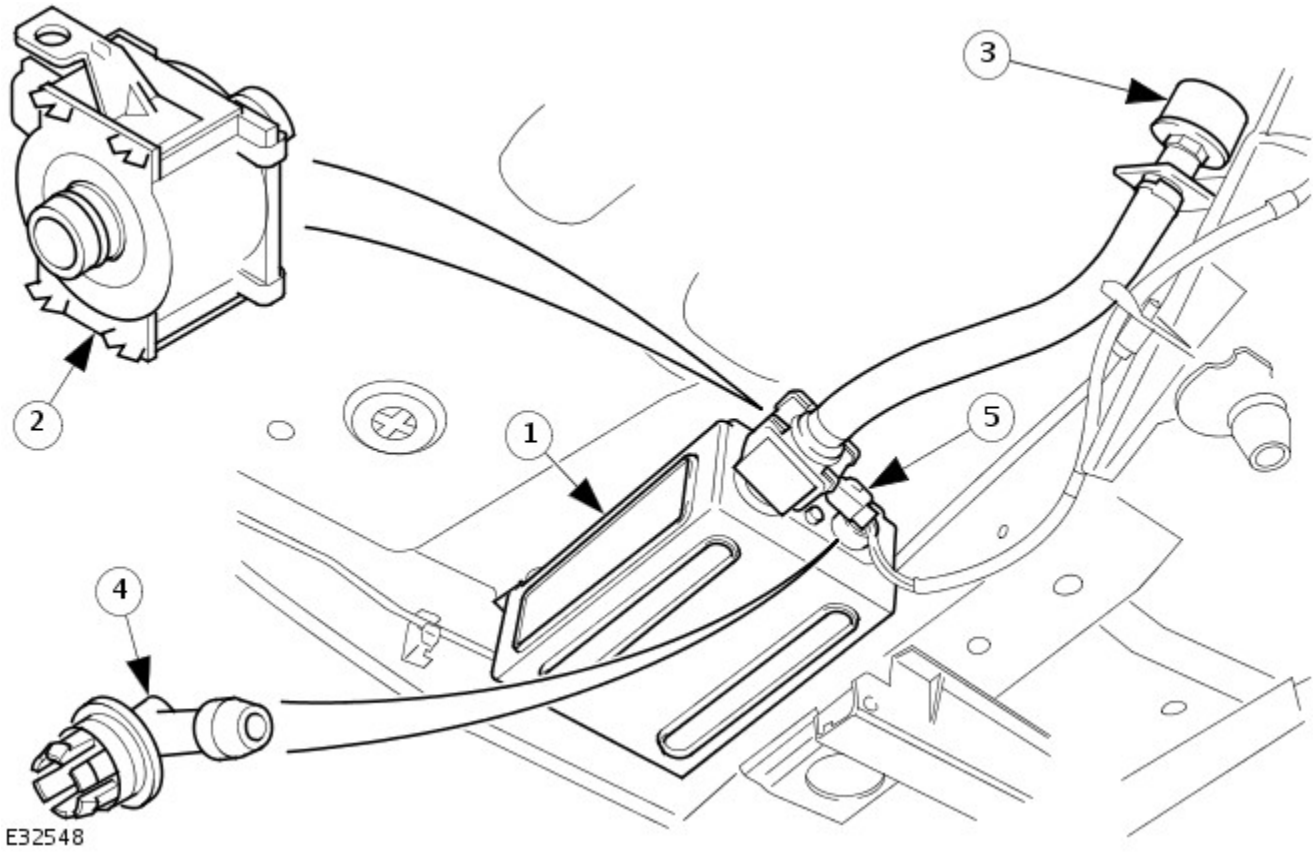
The evaporative loss flange assembly is fitted to the top of the tank via a seal and locking ring. The assembly is removeable complete with the fitted components.

The vapour vent / rollover valve and pressure sensor are a push fit via sealing grommets. The fuel pump connector is push fitted and crimped into a location tube on the underside of the flange.



Item	Part Number	Description
1	—	Pressure control valve
2	—	Filler neck pressure sensing pipe
3	—	Vapour pipe from tank
4	—	Vapour outlet pipe to underfloor canister

The pressure control valve is fastened by adhesive to the lefthand side of the tank. It is a non-serviceable component.



Item	Part Number	Description
1	—	Charcoal canister (righthand) in mounting bracket
2	—	Canister close valve (showing canister stub pipe)
3	—	Air filter
4	—	Quick-fit vapour inlet connector
5	—	Canister close valve electrical connector

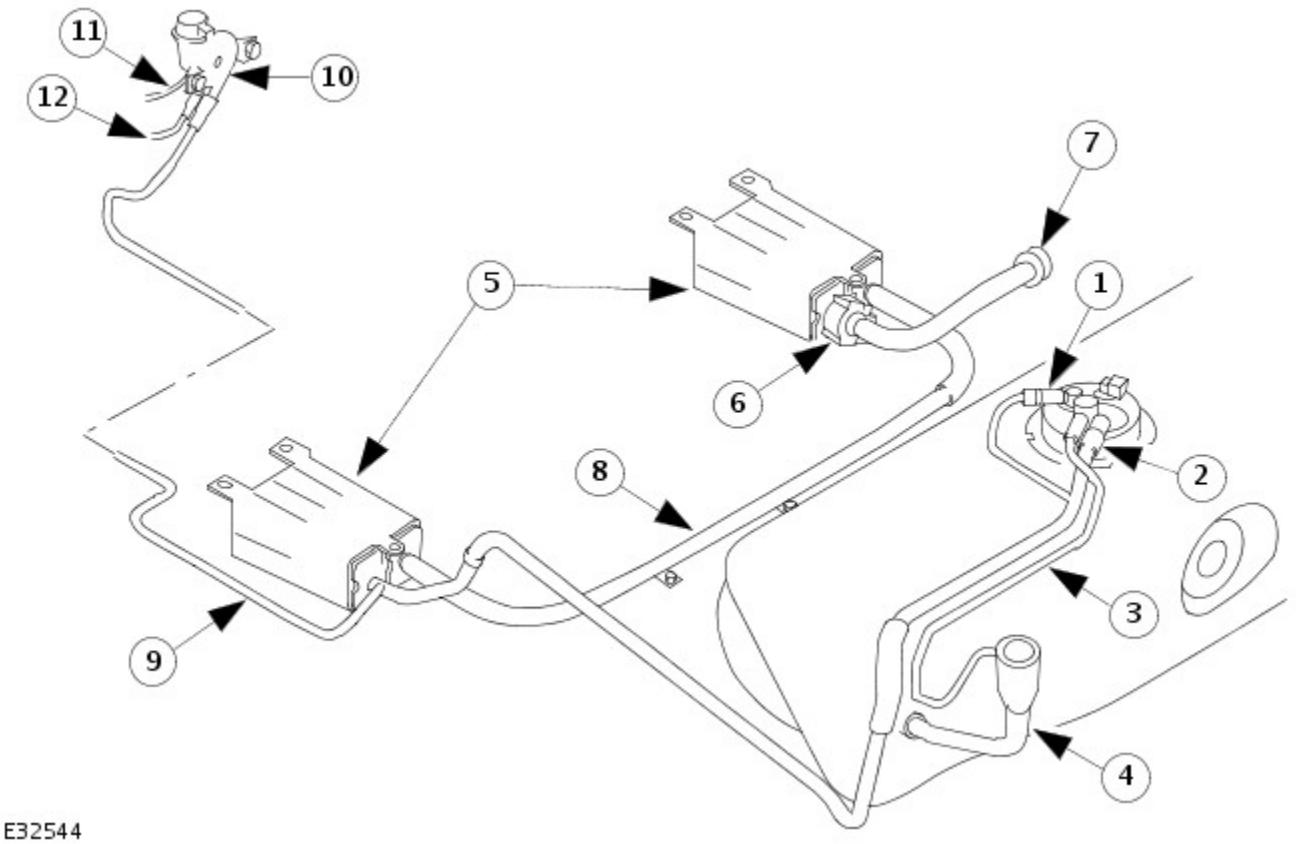
The canisters are fixed to the underside of the vehicle either directly or via semi-enclosed mounting brackets. Two fixing bolts are used at the front of the canister(or bracket) and a single rear bolt supports the canister and the canister close valve (CCV).

The vapour pipes to the canisters, other than the CCV, use multi-tang connectors which are push fitted and pulled out without the use of tools.

The canister close valve has a stub pipe with 'O' ring seal which is a simple push fit into the canister. A mounting bracket on the canister close valve enables it to be secured to the underbody via the canister rear mounting bolt.

A hose connects the CCV to the bracket mounted adaptor into which the vent system air filter is screwed.

Running Loss with On-board Refueling Vapour Recovery (ORVR) System



E32544

Item	Part Number	Description
1	—	Grade vent valve outlet
2	—	Vapour outlet from fill level vent valve (FLVV)
3	—	FLVV pressure relief valve outlet pipe
4	—	Narrow diameter fuel filler tube
5	—	Charcoal canisters
6	—	Canister close valve
7	—	Vent pipe air filter
8	—	Vapour pipe connecting canisters
9	—	Canister purge outlet pipe
10	—	EVAP canister purge valve (engine bay)
11	—	Vacuum control signal from induction elbow
12	—	EVAP purge valve outlet to induction elbow

The system has the following features :

- on-board refueling vapour recovery (ORVR) to reduce the fuel vapour vented directly to atmosphere from the filler nozzle when refueling.
- two charcoal canisters are connected in series to reduce the concentration of fuel in vapour vented to atmosphere.
- a tank pressure sensor and canister close valve are fitted to allow the on-board diagnostic facility to test for leaks in the fuel and evaporative system.

The canister close valve is a solenoid operated device controlled by the ECM. The valve is normally open and is closed only during the leak test sequence.

The fuel pressure sensor is fitted to the evaporative loss flange and provides a voltage to the ECM which is proportional to tank vapour pressure.

Operation of ORVR System

The ORVR system enables fuel vapour generated during re-fueling to be collected by the charcoal canisters. During normal running of the vehicle, the vapour is collected and purged in the same way as for non-ORVR systems.

The ORVR system features are :

- Narrow fuel filler pipe and tank check valve.
- Fuel level vent valve (FLVV) fitted to the evaporative flange and consisting of a two stage shut-off valve with rollover protection and a pressure relief valve.
- Grade vent valve with rollover protection, fitted to the evaporative flange and with an outlet pipe connected to the FLVV vapour outlet pipe.
- Large bore vapour vent pipes.

The fuel filler pipe has a reduced diameter between the nozzle guide and the tank, providing a liquid seal when re-fueling and preventing the fuel vapour venting directly to atmosphere. There is no breather tube fitted between the tank and the filler nozzle. To prevent spit back when re-fueling, a check valve is fitted at the lower end of the filler pipe inside the tank (see Figure).

During re-fueling, the tank is vented to atmosphere via the fuel level vent valve (FLVV), large bore vapour pipes and the charcoal canisters. The FLVV incorporates a float valve which is closed by the rising fuel level, creating a back pressure and causing the fuel delivery to stop. In the closed position, the FLVV also sets the fuel level.

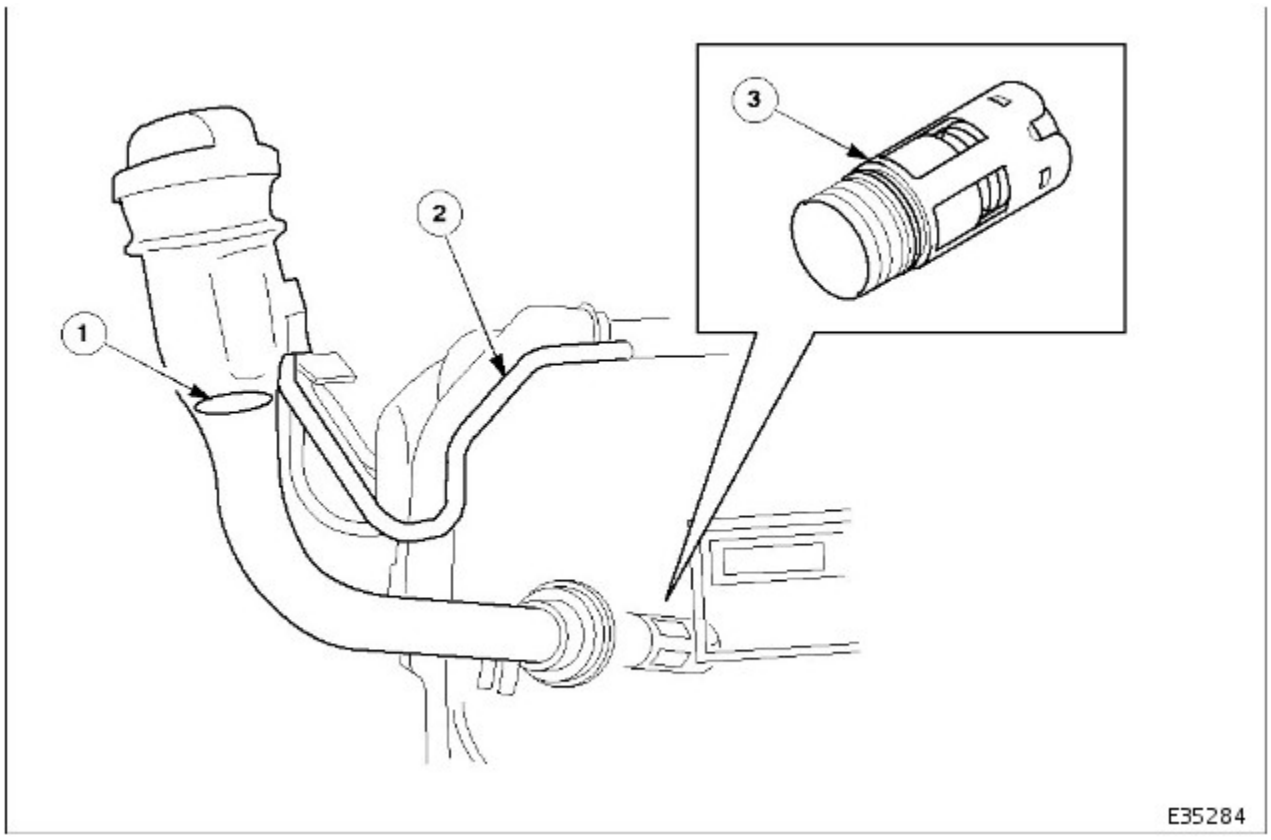
With the FLVV closed (tank full), any increase in pressure or overfilling is relieved by a separate rollover protected grade vent valve. The outlet from this valve feeds into the main FLVV vapour outlet pipe, bypassing the closed FLVV.

When the fuel level is below full, the FLVV opens to allow unrestricted venting via the canisters.

A pressure relief valve is incorporated into the FLVV assembly and has an outlet pipe to the filler nozzle,. If a blockage or other restriction (eg, canister close valve failing in the closed position) occurs in the vapour vent system, the pressure relief valve opens to allow venting to atmosphere via the filler nozzle guide and fuel filler cap.

Canister purge operation is as described in Evaporative Emissions Control.

Filler Tube and Check Valve

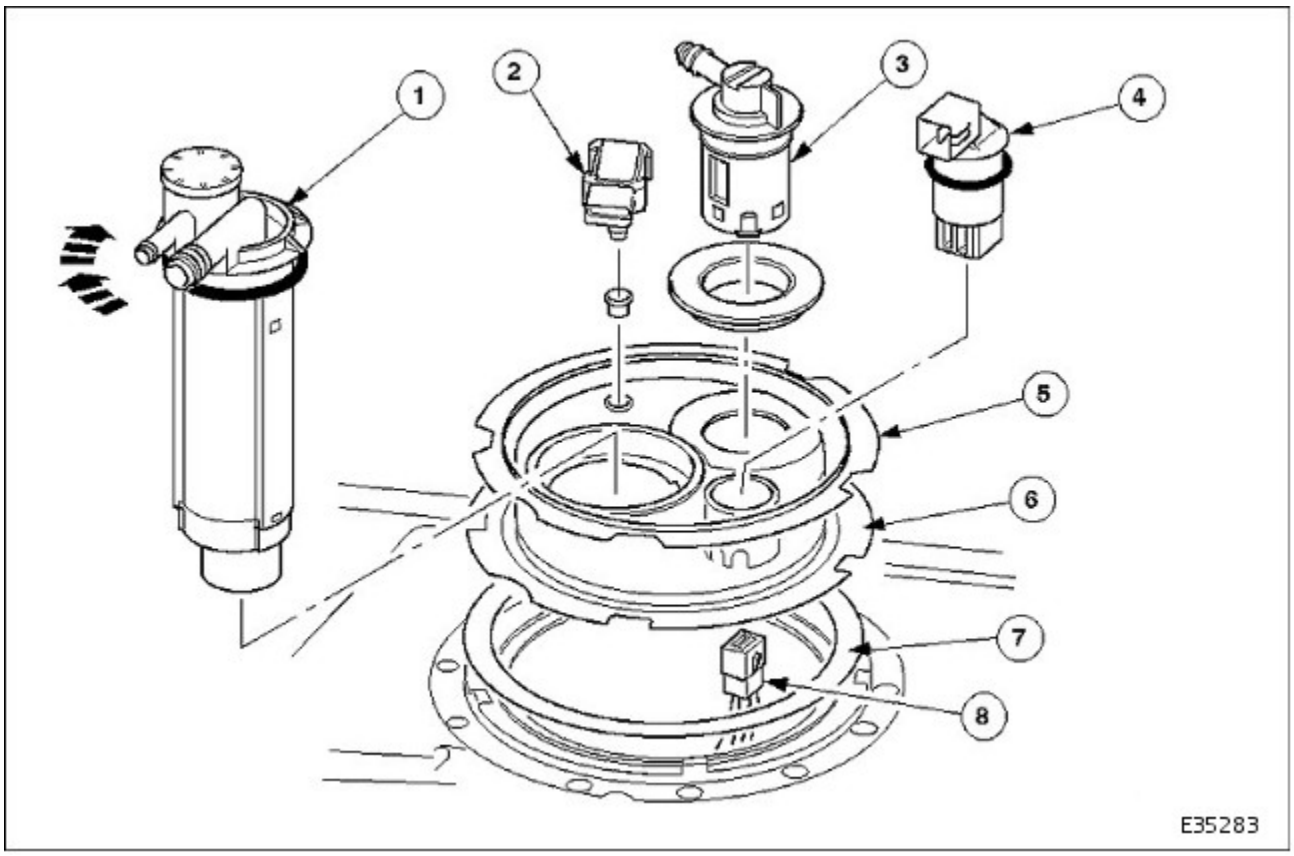


Item	Part Number	Description
1	—	Anti-surge valve
2	—	Pressure relief pipe
3	—	Check valve

The fuel filler cap is the same as that used on non-ORVR systems.

The check valve assembly is a push fit into the end of the fuel filler tube and is accessible with the evaporative flange removed. The valve has a light spring loading and opens under the inflow of fuel.

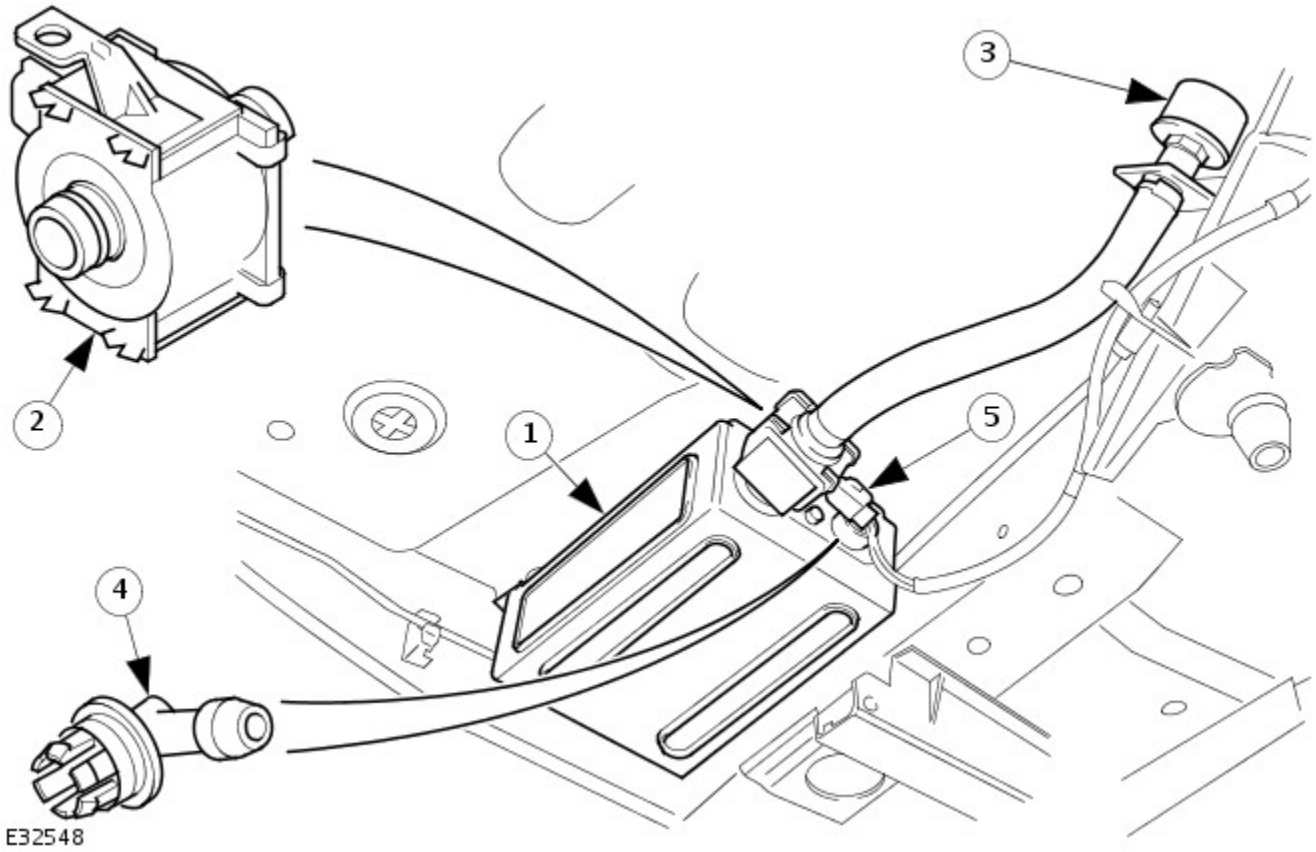
ORVR Evaporative Loss Flange Assembly



Item	Part Number	Description
1	—	Fill level vent valve (FLVV) / pressure relief valve assembly
2	—	Pressure sensor
3	—	Grade vent valve
4	—	Fuel pump connector
5	—	Locking ring
6	—	Evaporative loss flange (ELF)
7	—	Seal
8	—	Fuel pump link lead

The evaporative loss flange assembly is fitted to the top of the tank via a seal and locking ring arrangement identical to that used for non-ORVR systems. The assembly is removeable complete with the fitted components.

The fuel level vent valve (FLVV) is mounted in the ELF assembly via a bayonet fitting : it is turned approximately 90 ° clockwise to release. The grade vent valve and pressure sensor are push in fits via sealing grommets : note that, due to the tight fit, removal of these components may require cutting the grommets. The fuel pump connector is push fitted and crimped into a location tube on the underside of the flange.



Item	Part Number	Description
1	—	Charcoal canister (righthand) in mounting bracket
2	—	Canister close valve (showing canister stub pipe)
3	—	Air filter
4	—	Quick-fit vapour inlet connector
5	—	Canister close valve electrical connector

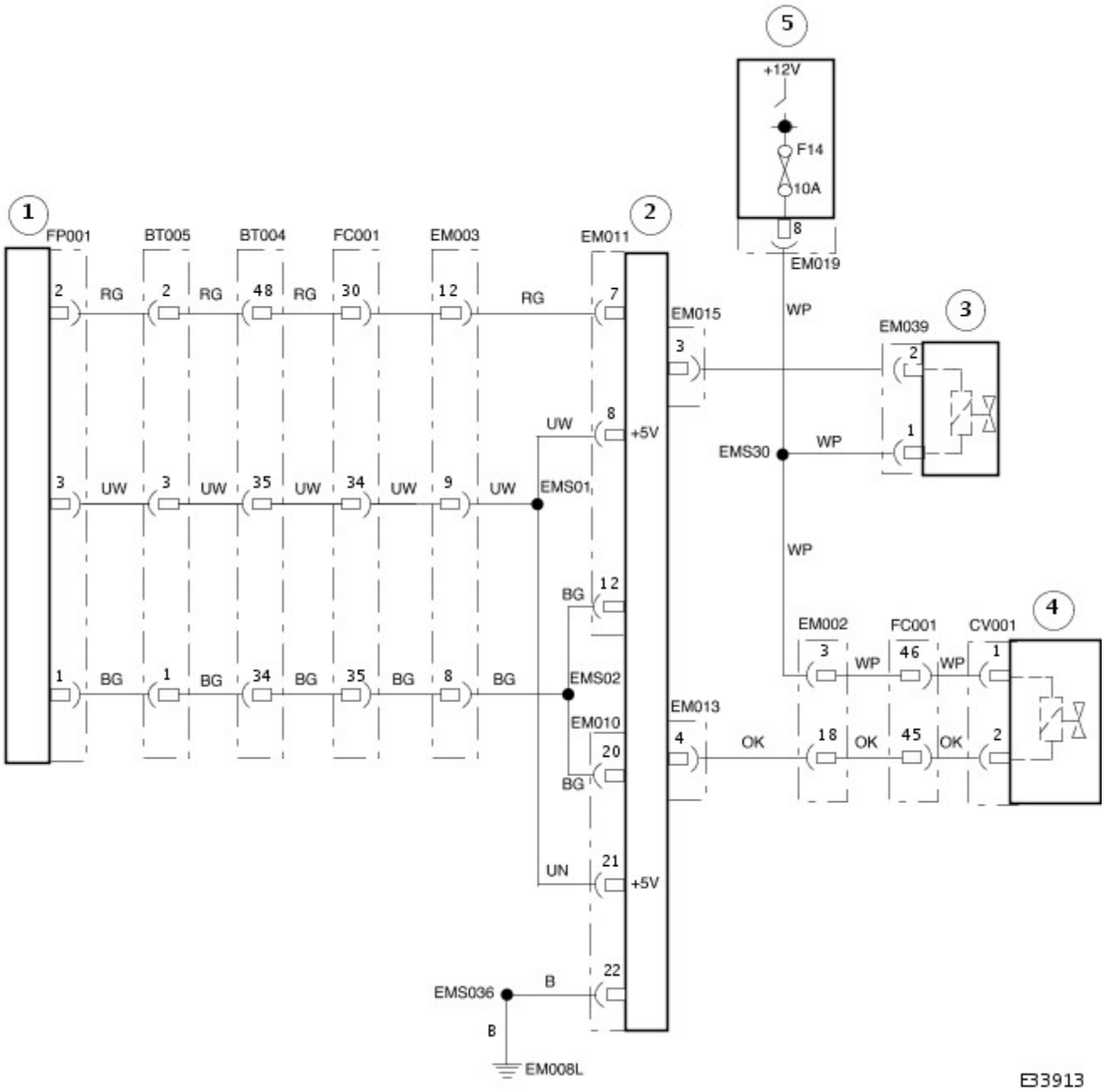
The canisters are fixed to the underside of the vehicle either directly or via semi-enclosed mounting brackets. Two fixing bolts are used at the front of the canister(or bracket) and a single rear bolt supports the canister and the canister close valve (CCV).

The vapour pipes to the canisters, other than the CCV, use multi-tang connectors which are push fitted and pulled out without the use of tools.

The canister close valve has a stub pipe with 'O' ring seal which is a simple push fit into the canister. A mounting bracket on the canister close valve enables it to be secured to the underbody via the canister rear mounting bolt.

A hose connects the CCV to the bracket mounted adaptor into which the vent system air filter is screwed.

Circuit diagram, evaporative emissions systems



Item	Part Number	Description
1	—	Fuel tank pressure sensor (if applicable)
2	—	Engine management ECU
3	—	EVAP canister purge valve
4	—	EVAP canister close valve (if applicable)
5	—	Engine management fusebox - IGN supply

Evaporative Emissions - Evaporative Emissions

Diagnosis and Testing

Preliminary Inspection

1. **1.** Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Engine oil level • Cooling system coolant level • Fuel level • Fuel contamination/grade/quality • Throttle body • Poly-vee belt	• Fuses • Wiring harness • Electrical connector(s) • Sensor(s) • Engine control module (ECM)

2. **2.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

3. **3.** If the concern is not visually evident, verify the symptom and proceed with diagnosis, using the Jaguar approved diagnostic system, where available.

4. **4.** Where K-Line or Vacutec equipment is available, it should be used as an aid to diagnosis. The equipment must be capable of testing to the 0.020 thou standard (2001 MY on).

Diagnostic Drive Cycles

Following the setting of a DTC, the appropriate repairs must be carried out, and the normal operation of the system checked. This will be done by performing a series of drive cycles which will enable the vehicle to operate the evaporative emissions system as a function check. For details of the drive cycles,
REFER to Section 303-14 Electronic Engine Controls.
ECM adaptations.

Diagnostic Trouble Code (DTC) index/Symptom Chart

1. **1.** Where the Jaguar approved diagnostic system is available, complete the S93 report before clearing any or all fault codes from the vehicle.

• NOTE: If a DTC cannot be cleared, then there is a permanent fault present that flags again as soon as it is cleared. (The exception to this is P1260, which will only clear following an ignition **OFF/ON** cycle after rectification).

2. **2.** If the cause is not visually evident and the Jaguar approved diagnostic system is not available, use a fault code reader to retrieve the fault codes before proceeding to the Diagnostic Trouble Code (DTC) Index Chart, or the Symptom Chart if no DTCs are set.

3. **3.** Using the Jaguar approved diagnostic system where available, and a scan tool where not, check the freeze frame data for information on the conditions applicable when the fault was flagged. The format of this will vary, depending on the tool used, but can provide information useful to the technician in diagnosing the fault.

 CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00.

• NOTE: When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to 3 decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

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

Symptom Chart

Symptom	Possible Source	Action
Difficulty in filling	• Restriction in the vapor line between the fuel tank and the carbon canister outlet/atmospheric port	Check for free flow of air.
Fuel smell	• Adaptations incomplete • Canister purge valve inoperative	Carry out the adaptations procedure, REFER to Section 303-14 Electronic Engine Controls. Check canister purge valve operation.
Message center display (see below)	• Fuel filler cap missing/not tightened after refuelling	Check fuel filler cap condition and fitment.

Driver Information

• NOTE: Use this table to identify DTCs associated with the message center display, then refer to the DTC index for possible sources and actions.

• NOTE: A trip is an ignition **OFF**, 30 seconds delay, ignition **ON** cycle, plus a minimum coolant temperature increase of 22° C (40°F) after which the coolant temperature should reach a minimum 71°C (160°F)

Warning Light	Message	Default Mode	DTC
Red	Check Engine (after two trips)	ECM default (canister purge inhibited, adaptive fuel metering inhibited)	P0442, P0444, P0445, P0447, P0448.
Red	Check Engine (after two trips)	None	P0452, P0453.

Diagnostic Trouble Code (DTC) index

Diagnostic Trouble Code	Description	Possible Source	Action
P0442	System leak detected	• Fuel tank filler cap seal defective • System leak (canister damage, pipework damage) • Canister close valve leaking • Fuel tank leak	Check filler cap, system pipework, fuel tank,GO to Pinpoint Test A. . For fuel tank information, REFER to Section 310-01 Fuel Tank and Lines.
P0444	Canister purge valve circuit open circuit	• Canister purge valve to ECM drive circuit; open circuit, high resistance • Canister purge valve failure	For purge valve circuit tests,GO to Pinpoint Test B. .
P0445	Canister purge valve circuit short circuit	• Canister purge valve to ECM drive circuit; short circuit to ground • Canister purge valve failure (stuck closed)	For purge valve circuit tests,GO to Pinpoint Test B. .
P0447	Canister close valve (CCV) circuit open circuit.	• CCV power supply circuit; open circuit, short circuit • CCV to ECM drive circuit; open circuit, high resistance, short circuit to B+ voltage • CCV failure	For CCV circuit tests,GO to Pinpoint Test C. .
P0448	Canister Close Valve (CCV) circuit short circuit	• Canister close valve to ECM drive circuit; short circuit to ground • Canister close valve failure	For CCV circuit tests,GO to Pinpoint Test C. .
P0452	Fuel tank Pressure (FTP) sensor circuit; low voltage (low pressure)	• FTP sensor disconnected • FTP sensor to ECM sense circuit; open circuit, short circuit to ground • FTP sensor to ECM power supply circuit open circuit, short circuit to ground • FTP sensor failure	For FTP sensor circuit tests,GO to Pinpoint Test D. .
P0453	Fuel tank Pressure (FTP) sensor circuit; high voltage (high pressure)	• FTP sensor to ECM signal ground circuit open circuit • FTP sensor to ECM wiring (supply, sense, signal ground), short circuit to each other • FTP sensor to ECM sense circuit short circuit to B+ voltage • FTP sensor failure	For FTP sensor circuit tests,GO to Pinpoint Test D. .

Pinpoint Tests

PINPOINT TEST A : P0442; SYSTEM LEAK DETECTED	
• NOTE: For K-Line or Vacutec equipment connection, see bulletin 05.1-29, or Vacutec operating instructions	
TEST CONDITIONS	**DETAILS / RESULTS / ACTIONS**
A1: CHECK PIPEWORK, ETC FOR LEAKS	
	1 Carry out a visual inspection of all accessible pipes, connectors and components. Rectify any faults noted.
	2 Using K-line or Vacutec equipment, check the joints/connections in the following order: • Filler cap • Canister purge valve • Underfloor purge line connectors • Carbon canister connections and vapor hoses • Canister close valve and it's atmospheric port (disconnect the air vent tube if necessary)
	Was a fault found? **Yes** Rectify the fault as necessary. Repeat the K-line or Vacutec test. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle. Recheck DTCs. For additional information, see "diagnostic drive cycles" above. **No** GO to A2.
A2: CHECK THE CANISTER PURGE VALVE FOR FLOW	
	1 Run the engine.
	2 Make sure the canister purge valve is operating.
	3 Using a flowmeter (or a small piece of paper) at the CCV inlet tube, confirm flow through the canister purge valve.
	Is there flow through the canister purge valve? **Yes** Possible intermittent fault with vapor hoses, O-ring seals. Carefully check condition of hoses and seals. Replace any suspect seals. Repeat the K-line or Vacutec test. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle. Recheck DTCs. For additional information, see "diagnostic drive cycles" above. **No** INSTALL a new canister purge valve. REFER to Evaporative Emission Canister Purge Valve - in this section. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle.

PINPOINT TEST B : P0444, P0445; PURGE VALVE CIRCUIT OPEN / SHORT CIRCUIT	
TEST CONDITIONS	**DETAILS / RESULTS / ACTIONS**
B1: CHECK THE PURGE VALVE DRIVE CIRCUIT FOR HIGH RESISTANCE	
	1 Turn the ignition switch to the **OFF** position.
	2 Disconnect the battery negative terminal. Vehicles with AJ26 engine: • Disconnect the ECM electrical connector, EM15 • Disconnect the purge valve electrical connector, EM39 • Measure the resistance between EM15, pin 03 (PN) and EM39, pin 02 (PN) Vehicles with AJ27 engine: • Disconnect the ECM electrical connector, EM80 • Disconnect the purge valve electrical connector, EM39 • Measure the resistance between EM80, pin 01 (UY) and EM39, pin 02 (UY)
	Is the resistance greater than 5 ohms? **Yes** REPAIR the high resistance circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle. For additional information, see

	"diagnostic drive cycles" above. **No** GO to B2.
B2: CHECK THE PURGE VALVE DRIVE CIRCUIT FOR SHORT TO GROUND	
	1 Reconnect the battery negative terminal.
	2 Measure the resistance between EM39, pin 02 (PN for vehicles with AJ26 engine, UY for vehicles with AJ27 engine), and GROUND.
	Is the resistance less than 10,000 ohms? **Yes** REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle. **No** INSTALL a new purge valve, REFER to Evaporative Emission Canister Purge Valve - in this section. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle. Recheck DTCs. For additional information, see "diagnostic drive cycles" above. If the DTC is repeated, contact dealer technical support for advice on possible ECM failure.

PINPOINT TEST C : P0447, P0448; CANISTER CLOSE VALVE CIRCUIT OPEN/SHORT CIRCUIT	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
C1: CHECK THE CCV DRIVE CIRCUIT FOR HIGH RESISTANCE	
	1 Turn the ignition switch to the **OFF** position.
	2 Disconnect the battery negative terminal. Vehicles with AJ26 engine: ● Disconnect the ECM electrical connector, EM13 ● Disconnect the CCV electrical connector, CV01 ● Measure the resistance between EM13, pin 04, (OK) and CV1, pin 02 (OK) Vehicles with AJ27 engine: ● Disconnect the ECM electrical connector, EM80 ● Disconnect the CCV electrical connector, CV01 ● Measure the resistance between EM80, pin 02 (GU) and CV1, pin 02 (GU)
	Is the resistance greater than 5 ohms? **Yes** REPAIR the high resistance circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle. For additional information, see "diagnostic drive cycles" above. **No** GO to C2.
C2: CHECK THE CCV DRIVE CIRCUIT FOR SHORT CIRCUIT TO GROUND	
	1 Reconnect the battery negative terminal.
	2 Measure the resistance between CV01, pin 02 (OK for vehicles with AJ26 engine, GU for vehicles with AJ27 engine), and GROUND.
	Is the resistance less than 10,000 ohms? **Yes** REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle. **No** INSTALL a new CCV. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle. Recheck DTCs. For additional information, see "diagnostic drive cycles" above. If the DTC is repeated, contact dealer technical support for advice on possible ECM failure.

PINPOINT TEST D : P0452, P0453; FUEL TANK PRESSURE (FTP) SENSOR LOW/HIGH VOLTAGE	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
D1: CHECK THE FTP SENSOR SENSE CIRCUIT FOR HIGH RESISTANCE	
	1 Turn the ignition switch to the **OFF** position.
	2 Disconnect the battery negative terminal.

	Vehicles with AJ26 engine: • Disconnect the ECM electrical connector, EM11 • Disconnect the FTP sensor electrical connector, FP01 • Measure the resistance between EM11, pin 07 (RG) and FP01, pin 02 (RG) Vehicles with AJ27 engine: • Disconnect the ECM electrical connector, EM81 • Disconnect the FTP sensor electrical connector, FP01 • Measure the resistance between EM81, pin 16 (RG) and FP01, pin 02 (RG)
	Is the resistance greater than 5 ohms? **Yes** REPAIR the high resistance circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle. For additional information, see "diagnostic drive cycles" above. **No** GO to D2.
D2: CHECK THE FTP SENSOR SENSE CIRCUIT FOR SHORT CIRCUIT TO GROUND	
	1 Reconnect the battery negative terminal.
	2 Measure the resistance between FP01, pin 07 (RG) and GROUND.
	Is the resistance less than 10,000 ohms? **Yes** REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle. **No** GO to D4.
D3: CHECK THE FTP SENSOR SENSE CIRCUIT FOR SHORT CIRCUIT TO HIGH VOLTAGE	
	1 Turn the ignition switch to the **ON** position.
	2 Measure the voltage between FP01, pin 02 (RG) and GROUND.
	Is the voltage greater than 3 volts? **Yes** REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle. **No** GO to D4.
D4: CHECK THE FTP SENSOR SIGNAL GROUND CIRCUIT FOR HIGH RESISTANCE	
	1 Disconnect the battery negative terminal. Vehicles with AJ26 engine: • Disconnect the ECM electrical connector, EM10 • Measure the resistance between EM11, pin 12 (BG) and FP01, pin 01 (BG) • Measure the resistance between EM10, pin 20 (BG) and FP01, pin 01 (BG) Vehicles with AJ27 engine: • Reconnect the ECM electrical connector, EM81 • Disconnect the ECM electrical connector, EM82 • Disconnect the ECM electrical connector, EM83 • Measure the resistance between EM82, pin 07 (BG) and FP01, pin 01 (BG) • Measure the resistance between EM83, pin 13 (BG) and FP01, pin 01 (BG)
	Is either resistance greater than 5 ohms? **Yes** REPAIR the high resistance circuit. This circuit includes harness splice, EMS02. For additional information, refer to the wiring diagrams. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle. For additional information, see "diagnostic drive cycles" above. **No** GO to D5.
D5: CHECK THE FTP SENSOR SIGNAL GROUND CIRCUIT FOR SHORT CIRCUIT TO GROUND	
	1 Reconnect the battery negative terminal.
	2 Measure the resistance between FP01, pin 01 (BG) and GROUND.
	Is the resistance less than 10,000 ohms?

	Yes REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle. **No** GO to D6.
D6: CHECK THE FTP SENSOR POWER SUPPLY CIRCUIT FOR HIGH RESISTANCE	
	1 Disconnect the battery negative terminal. Vehicles with AJ26 engine: • Measure the resistance between EM11, pin 08 (UW) and FP01, pin 03 (UW) • Measure the resistance between EM10, pin 21 (UW) and FP01, pin 03 (UW) Vehicles with AJ27 engine: • Measure the resistance between EM82, pin 01 (OY) and FP01, pin 03 (OY) • Measure the resistance between EM83, pin 05 (OY) and FP01, pin 03 (OY)
	Is either resistance greater than 5 ohms? **Yes** REPAIR the high resistance circuit. This circuit includes harness splice, EMS01. For additional information, refer to the wiring diagrams. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle. For additional information, see "diagnostic drive cycles" above. **No** GO to D7.
D7: CHECK THE FTP SENSOR WIRING FOR SHORT CIRCUIT TO EACH OTHER	
	1 Measure the resistance between FP01, pins 01 (BG) and 02 (RG).
	2 Measure the resistance between FP01, pins 02 (RG) and 03 (UW).
	Is either resistance less than 10,000 ohms? **Yes** REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle. **No** INSTALL a new FTP sensor. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle. For additional information, see "diagnostic drive cycles" above.

Evaporative Emissions - Evaporative Emission Canister

Removal and Installation

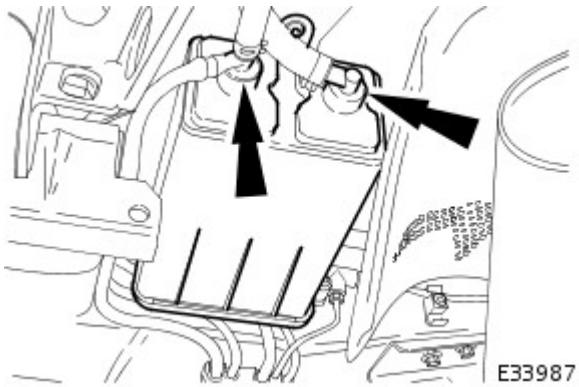
Removal

1. Disconnect battery ground cable (IMPORTANT, see SRO 86.15.19 for further information).

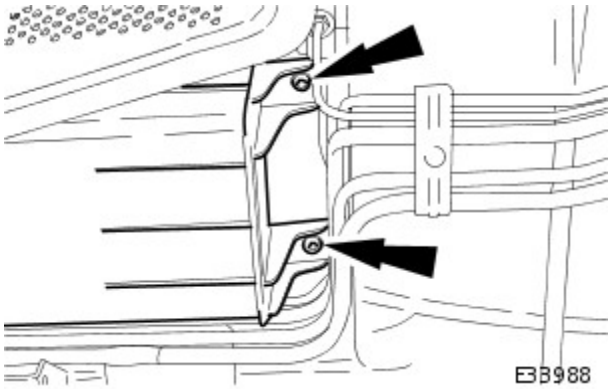
WARNING: BEFORE PROCEEDING, IT IS ESSENTIAL THAT THE WARNING NOTES GIVEN IN SECTION 100-00 (UNDER THE HEADING 'SAFETY PRECAUTIONS') ARE READ AND UNDERSTOOD.

2. Raise vehicle on four post ramp.
3. NOTE: Discard O-ring seals from adapter elbows.

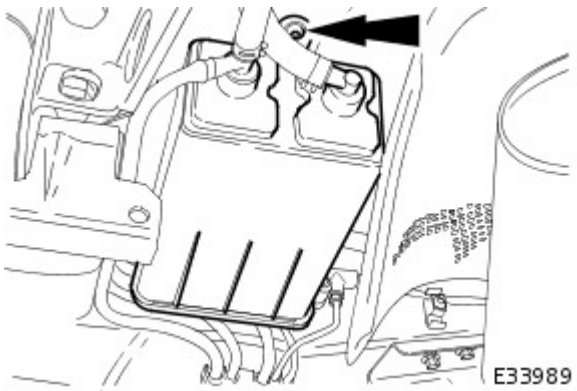
Disconnect inlet and outlet pipe adapter elbow.



4. Remove EVAP canister assembly from body.
   - Remove front mounting bolts.



5. Remove rear mounting bolt.
   - Remove EVAP canister.

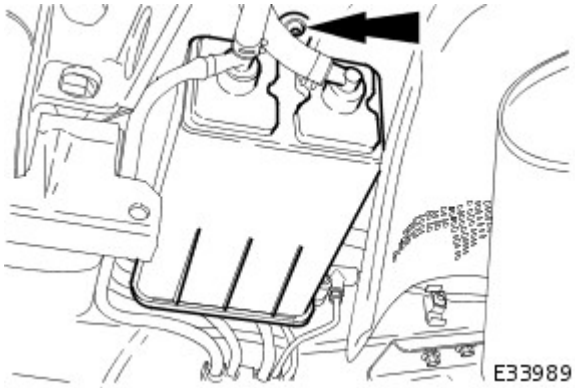


Installation

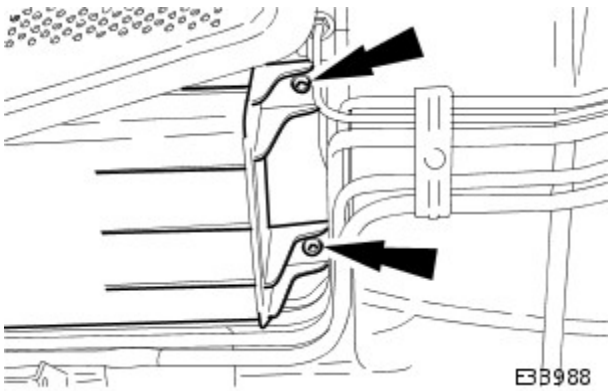
1. NOTE: Install new O-ring seals to adapter elbows and apply suitable lubrication.

Installation is the reverse of the removal procedure.

2. Tighten to specification.



- 9-12 Nm.



3. Tighten to specification.

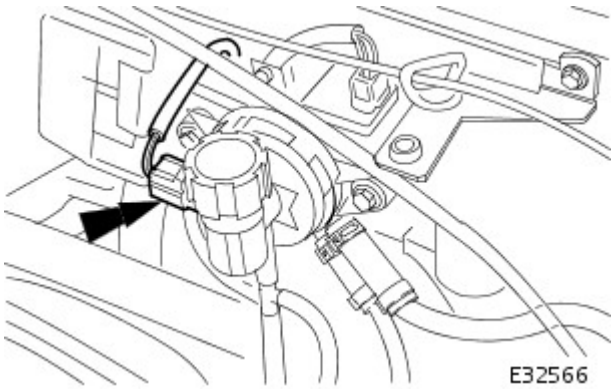
- 9-12 Nm.

Evaporative Emissions - Evaporative Emission Canister Purge Valve

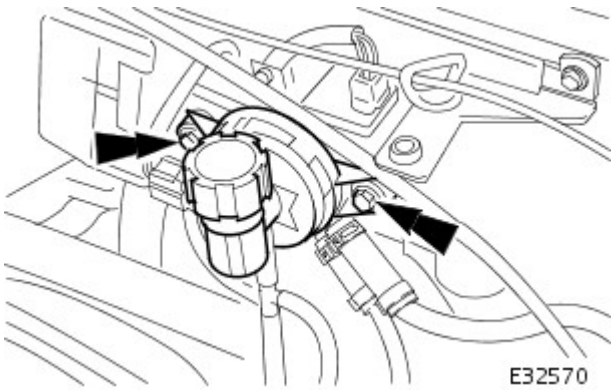
Removal and Installation

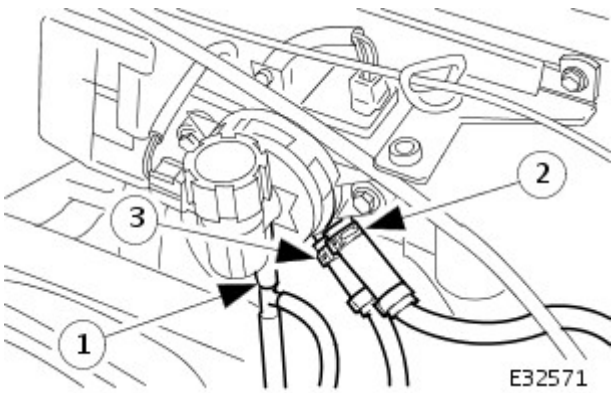
Removal

1. Open the engine compartment and fit paintwork protection sheets.
2. Disconnect the battery.
   - Remove the battery cover.
   - Disconnect the battery ground (negative) cable.
3. Disconnect the purge valve harness connector.



4. Remove the two securing nuts.





5. WARNING: BEFORE PROCEEDING, IT IS ESSENTIAL THAT THE WARNING NOTES GIVEN IN SECTION 100-00 (UNDER THE HEADING 'SAFETY PRECAUTIONS') ARE READ AND UNDERSTOOD.

   Disconnect the three valve hoses.

   1. Pull off the vacuum pipe.
   2. Release the clip and disconnect the upper vapour hose.
   3. Release the clip and disconnect the lower vapour hose. Plug the hose (note the warning above).

Installation

1. Remove the two mounting rubbers from the old valve and fit to the new valve.
2. Fitting a new purge valve assembly is the reverse of the removal procedure.

3. Connect the battery and fit the battery cover.

- Refer to the Battery Reconnection Procedure (86.15.15).

4. Carry out a leak test of the evaporative emissions system.

Evaporative Emissions - Fuel Tank Pressure Sensor

Removal and Installation

Removal

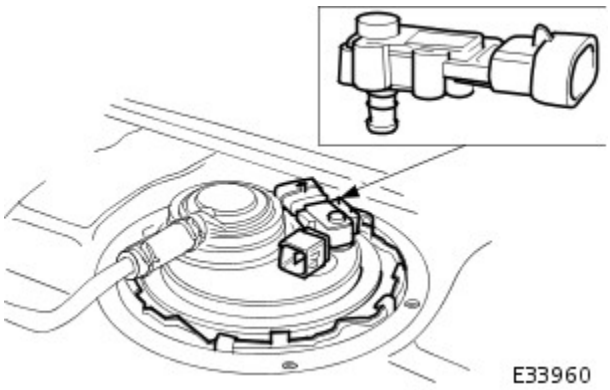
1. Disconnect battery ground cable (IMPORTANT, see SRO 86.15.19 for further information).

2. WARNING: BEFORE PROCEEDING, IT IS ESSENTIAL THAT THE WARNING NOTES GIVEN IN SECTION 100-00 (UNDER THE HEADING 'SAFETY PRECAUTIONS') ARE READ AND UNDERSTOOD.

   Drain the fuel tank using a suitable suction pump/tanker. If the On-board Refueling Vapor Recovery (ORVR) system is fitted, refer to General Procedures Section 310-01.

3. Remove the fuel tank; refer to operation 19.55.01.

4. Remove pressure sensor from evaporative loss flange.



Installation

1. Installation is the reverse of the removal procedure.

Evaporative Emissions - Fuel Vapor Vent Valve Housing

Removal and Installation

Removal

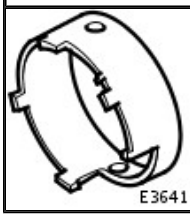
1. Refer to 19.55.25.

Installation

1. Installation is a reversal of the removal procedure.

Evaporative Emissions - Fuel Vapor Vent Valve Housing Seal

Removal and Installation

Special Tool(s)	
 E36415	Lock Ring Wrench - Fuel Tank Flange 412-070 (JD 174)

Removal

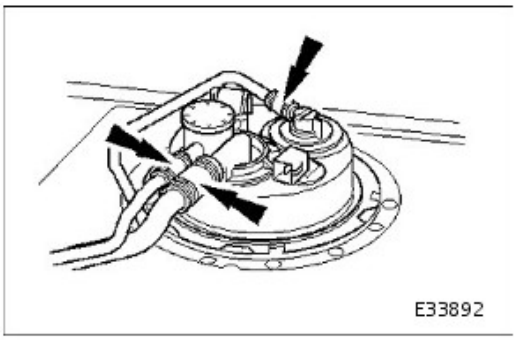
• NOTE: The Removal and Installation procedures below show one type of flange but are applicable to the other evaporative loss systems described.

1. Remove battery. Refer to 86.15.01.

2. WARNING: BEFORE PROCEEDING, IT IS ESSENTIAL THAT THE WARNING NOTES GIVEN IN SECTION 100-00 (UNDER THE HEADING 'SAFETY PRECAUTIONS') ARE READ AND UNDERSTOOD.

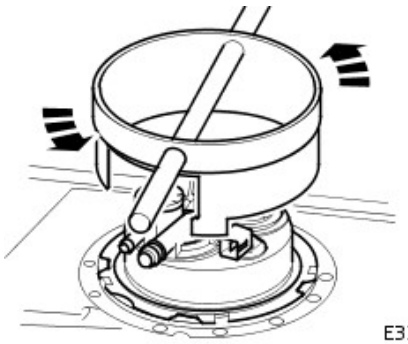
Remove fuel tank assembly for access. Refer to operation 19.55.01.

3. Disconnect vapor hose(s) from flange assembly.

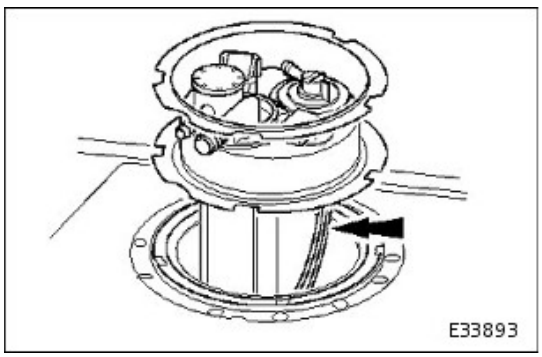

E33892

4. Remove locking ring using special tool 412-070 (JD 174).

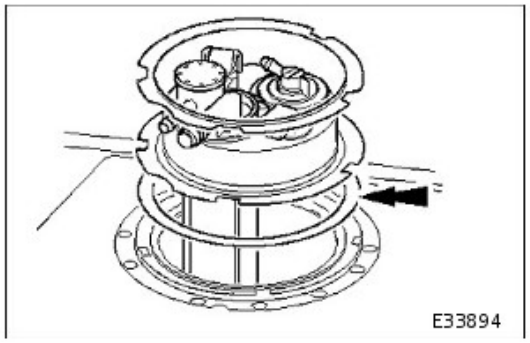
- Install special tool to locking ring.
- Using a suitable bar, turn special tool anti-clockwise to release locking ring from the five tank tabs.


E33895

5. Lift flange assembly slightly and disconnect fuel pump link lead from the underside of flange connector. Secure connector to tank aperture.

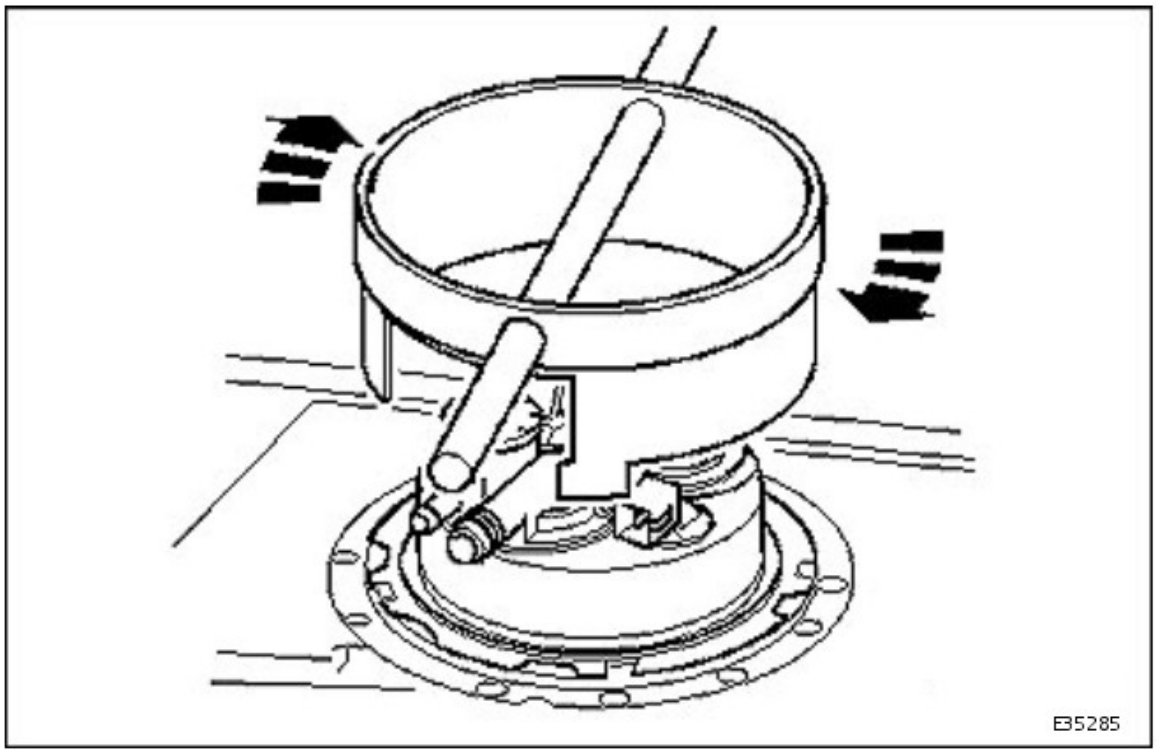

E33893

6. Discard sealing ring.



Installation

1. Install new sealing ring. Make sure it is seated correctly.
2. Connect fuel pump link lead to flange connector.
3. Align and install evaporative loss flange. Make sure sealing ring remains correctly seated.



4. Install and fully seat locking ring using the special tool.
   - Install special tool with bar to locking ring.
   - Turn clockwise until raised tabs on locking ring locate against the fixed tabs on the tank.
5. Connect vapor hose(s).
6. Install fuel tank. Refer to operation 19.55.01.
7. Install battery. Refer to 86.15.01 and 86.15.15.
8. Carry out a leak test of the evaporative emissions system.