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.

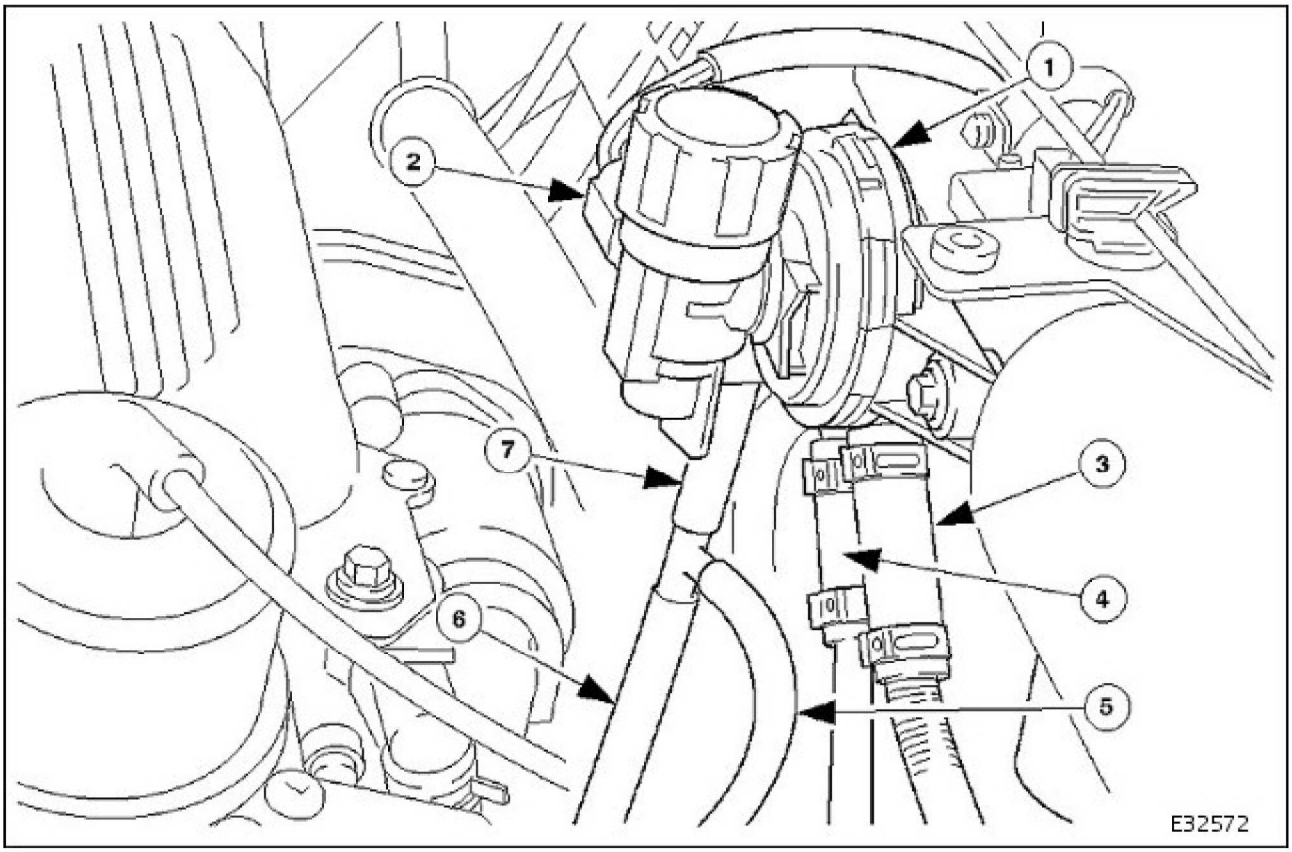
The EVAP Canister Purge Valve is controlled by the engine management system ECM. Purging is carried out in accordance with the engine management fueling strategy (see below).

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).

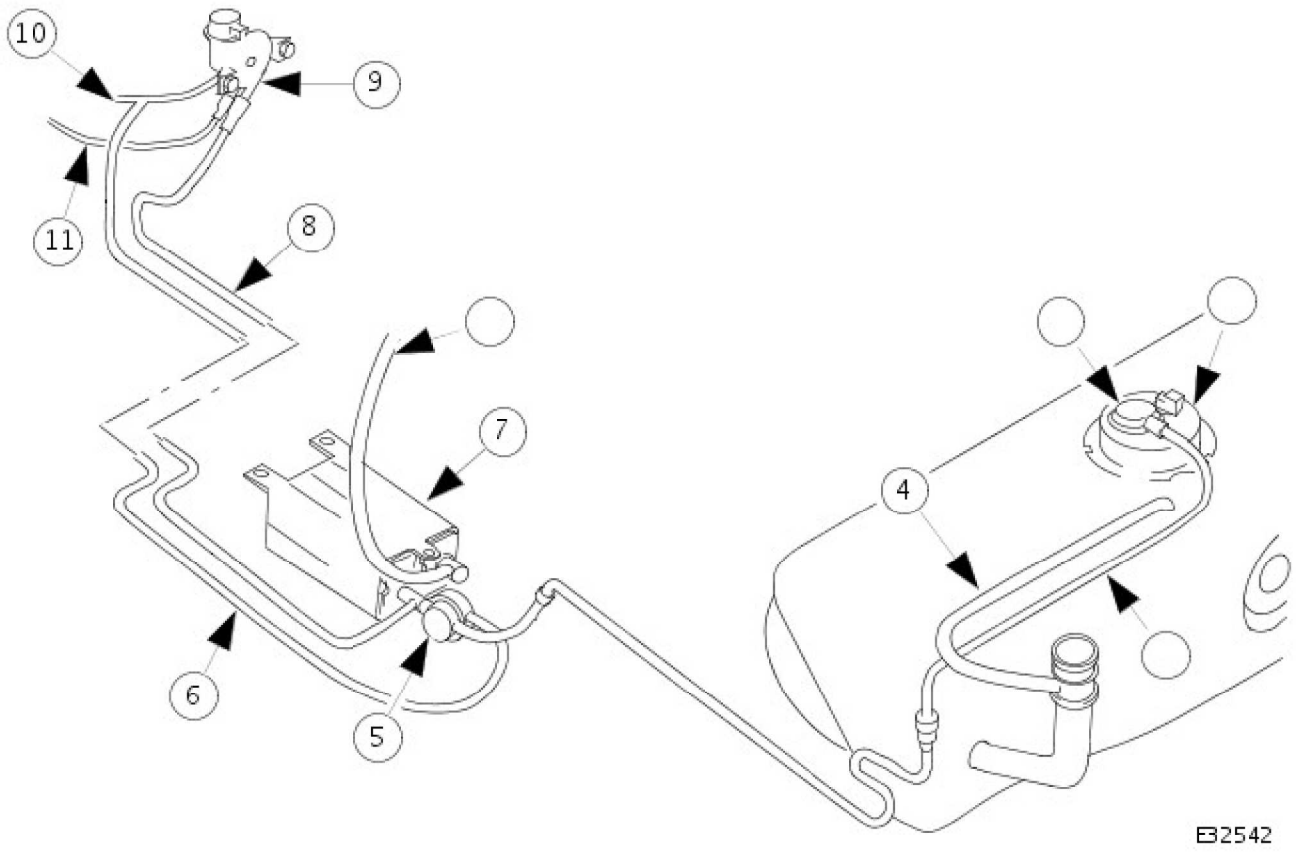
If these conditions have been satisfied, purging is started. If any failures are registered, purging is inhibited.

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

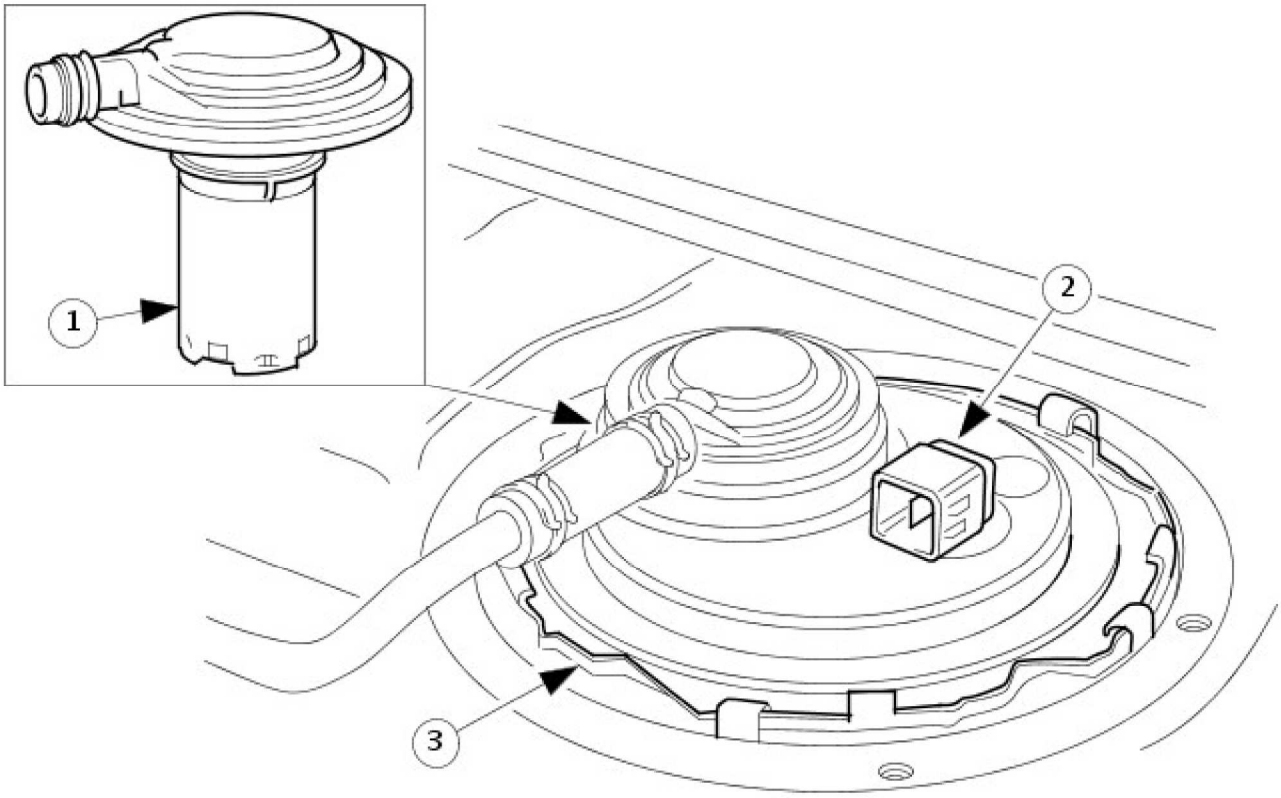
This system uses a single charcoal canister with a pressure control valve between the canister and the fuel tank vapour outlet. A vacuum control pipe is connected from the engine intake induction elbow to the pressure control valve. The vapour outlet from the fuel tank is taken via a safety rollover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



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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.