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Evaporative Emissions -

Torque Specifications

Description	Nm	lb-ft	lb-in
Evaporative emission canister retaining bolts	6	-	53
Evaporative emission canister vent solenoid retaining nut	6	-	53

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Evaporative Emissions - Evaporative Emissions

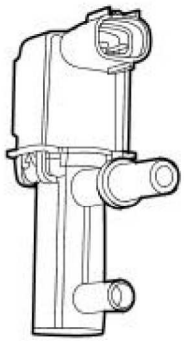
Description and Operation

To reduce the emission of fuel vapour, the fuel tank is vented to atmosphere through activated evaporative emission canisters which collect the fuel vapor. The evaporative emission canister is periodically purged of fuel vapor when the evaporative emission canister purge valve opens the vapor line between the evaporative emission canister and the air intake induction elbow. This action allows manifold depression to draw air through the evaporative emission canister atmospheric vent, taking up the deposited fuel vapor from the charcoal adsorber inside the evaporative emission canister and burning the resulting fuel vapor in the engine.

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

- Vehicles with on-board refueling vapor recovery
- Vehicles without on-board refueling vapor recovery

Evaporative Emissions Canister Purge Valve



E38187

The evaporative emission canister purge valve controls the flow rate of fuel vapor drawn into the engine during the canister purge operation. The valve is operated via inputs from the engine control module (ECM).

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 diagnosed in the relevant sensor and valve circuits - mass air flow (MAF) sensor, engine coolant temperature (ECT) sensor, evaporative canister purge valve and evaporative emission canister vent solenoid.

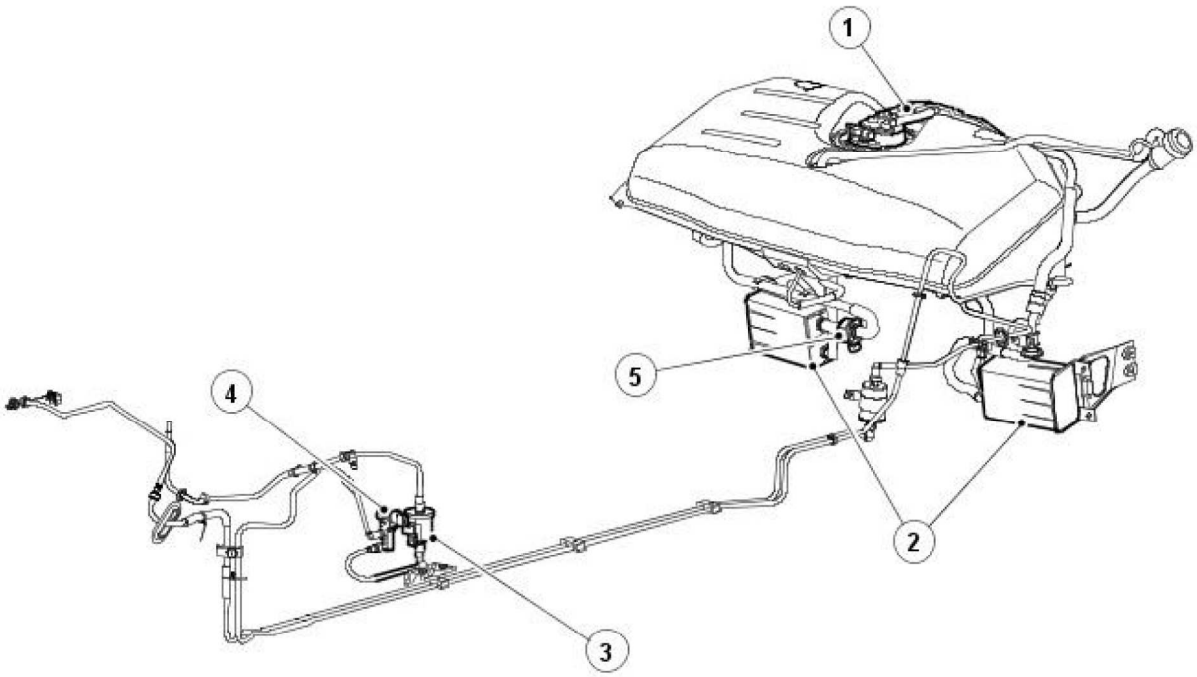
If these conditions have been satisfied, purging is started. If any failures are registered, purging is inhibited.

The canisters are 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 vapor purge rate is assigned (purge rate increases with engine speed and load).

The preset purge rates are based on the assumption of a vapor concentration of 100%. The actual amount of vapor 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 vapor 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 vehicles with on-board refueling vapor recovery and vehicles without on-board refueling vapor recovery .

Vehicles With On-board Refueling Vapor Recovery.



E38190

Item	Part Number	Description
1	—	Fuel level vent valve housing
2	—	Evaporative emission canisters
3	—	Evaporative emission canister purge valve resonator
4	—	Evaporative emission canister purge valve
5	-	Evaporative emission canister vent solenoid

The system has the following features :

- on-board refueling vapor recovery to reduce the fuel vapor vented directly to atmosphere from the filler nozzle when refueling.
- a fuel tank pressure sensor and an evaporative emission canister vent solenoid are fitted to allow the on-board diagnostic facility to test for leaks in the fuel and evaporative system.

The evaporative emission canister vent solenoid 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 tank pressure sensor is fitted to the fuel vapor vent valve housing and provides a voltage to the ECM which is proportional to tank vapor pressure.

Operation Of On-board Refueling Vapor Recovery

The on-board refueling vapor recovery system enables fuel vapor generated during refueling to be collected by the charcoal canisters. During normal running of the vehicle, the vapor is collected and purged in the same way as for vehicles without on-board refueling vapor recovery.

The on-board refueling vapor recovery system features are:

- Narrow fuel filler pipe and tank check valve.
- Fuel level vent valve fitted to the fuel vapor vent valve housing 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 fuel vapor vent valve housing and with an outlet pipe connected to the fuel level vent valve vapor outlet pipe.
- Large bore vapor vent pipes.

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

During refueling, the tank is vented via the fuel level vent valve, large bore vapor pipes and the charcoal canisters. The fuel level vent valve 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 fuel level vent valve also sets the fuel level.

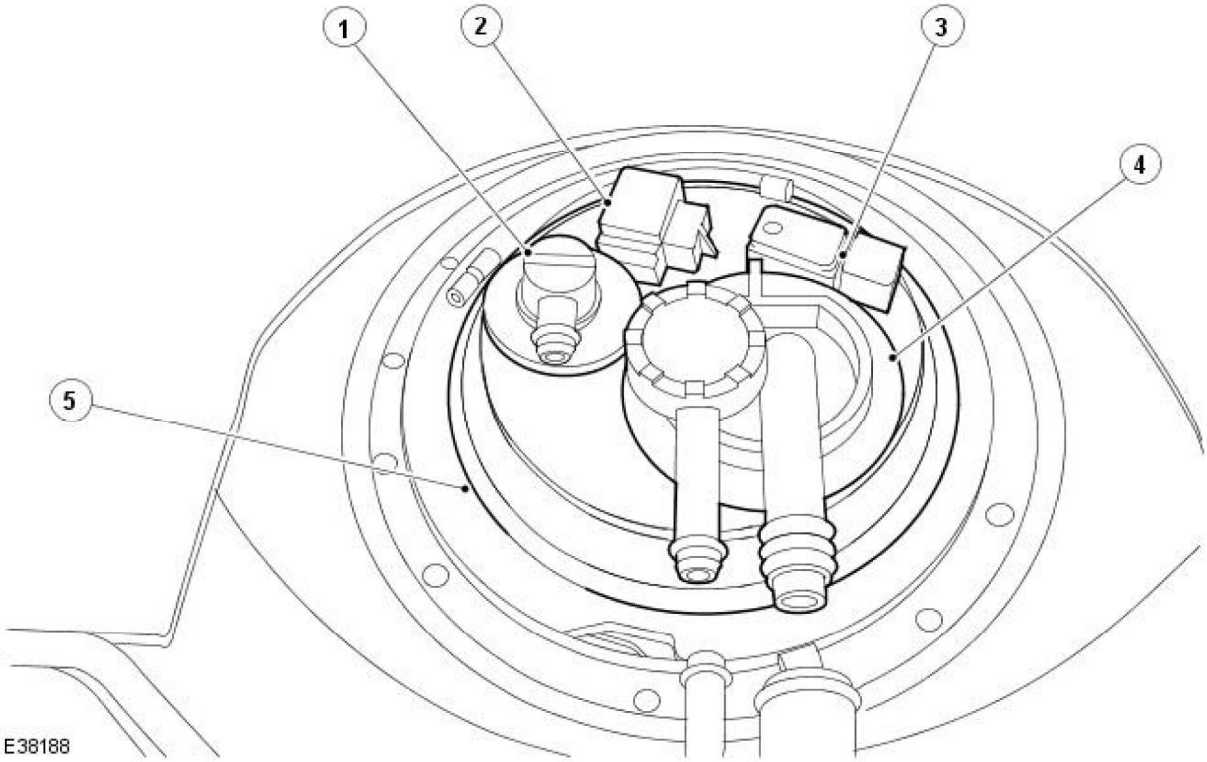
With the fuel level vent valve closed (tank full), any increase in pressure or overfilling is relieved by a separate rollover protected grade vent valve. The outlet from this valve feeds into the main fuel level vent valve vapor outlet pipe, by-passing the closed fuel level vent valve.

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

A pressure relief valve is incorporated into the fuel level vent valve assembly and has an outlet pipe to the filler nozzle. If a blockage or other restriction (eg, evaporative emission canister vent solenoid in the closed position) occurs in the vapor 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.

Fuel Vapor Vent Valve Housing - Vehicles With On-Board Refueling Vapor Recovery



Item	Part Number	Description
1	—	Grade vent valve
2	—	Fuel pump module electrical connector
3	—	Fuel tank pressure sensor
4	—	Fuel level vent valve
5	—	Fuel vapor vent valve housing locking ring

The fuel vapor vent valve housing is fitted to the top of the tank via a seal and locking ring arrangement identical to that used for vehicles without on-board refueling vapor recovery. The fuel vapor vent valve housing is removable complete with the fitted components.

The fuel level vent valve is mounted in the fuel vapor vent valve housing 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/sender electrical connector is push fitted and crimped into a location tube on the underside of the flange.

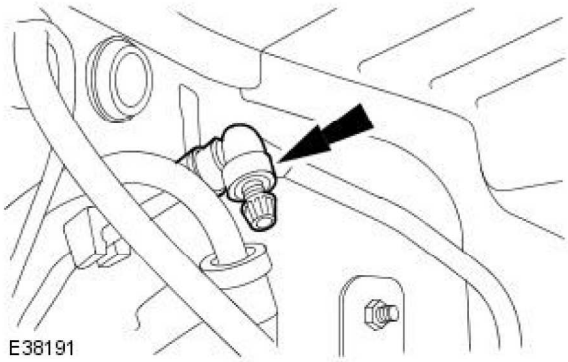
Evaporative Emission Canister, Evaporative Emission Canister Vent Solenoid and Fittings

The evaporative emission canisters are fixed to the underside of the vehicle either via semi-enclosed mounting brackets. Two fixing bolts are used at the front of the bracket and a single rear bolt supports the evaporative emission canister and the evaporative emission canister vent solenoid.

The vapor pipes to the canisters, other than the evaporative emission canister vent solenoid, use multi-tang connectors which are push fitted and pulled out without the use of tools.

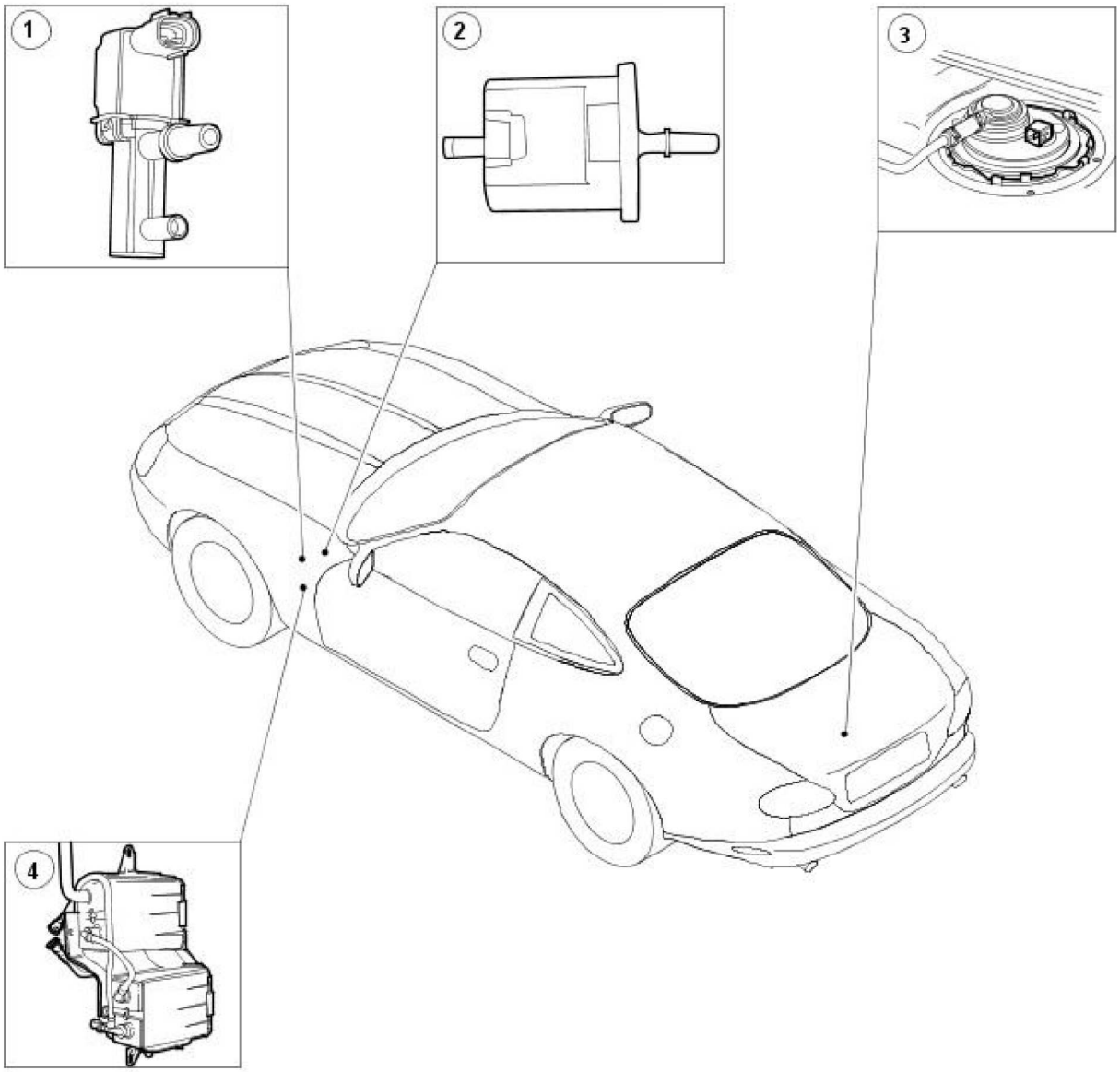
The evaporative emission canister vent solenoid has a stub pipe with 'O' ring seal which is a simple push fit into the canister. A mounting bracket on the evaporative emission canister vent solenoid enables it to be secured to the underbody via the canister rear mounting bolt.

Standard Federal Testing Procedures (SFTP) Test Port



To comply with Standard Federal Testing Procedures (SFTP) a test port is provided in the evaporative emission canisters to purge valve resonator line to enable leak test diagnosis of the fuel system.

Vehicles Without On-board Refueling Vapor Recovery.



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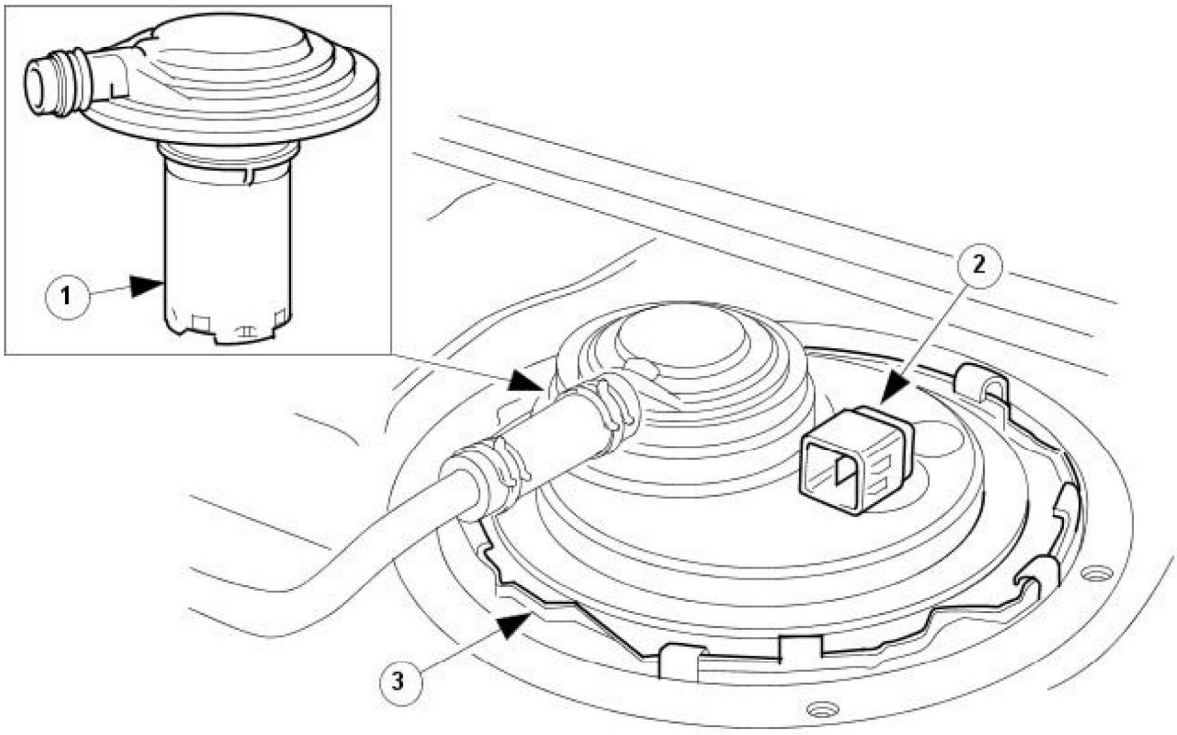
Item	Part Number	Description
1	-	Evaporative emission canister purge valve
2	-	Evaporative emission canister purge valve resonator
3	-	Fuel vapor vent valve housing
4	-	Evaporative emission canisters

This system uses two evaporative emission canisters. The vapor outlet from the fuel tank is taken via a rollover valve fitted to the removable flange at the top of the tank.

Canister purge operation is as described in Evaporative Emissions.

Fuel Vapor Vent Valve Housing - Vehicles Without On-board Refueling Vapor Recovery



E32545

Item	Part Number	Description
1	—	Fuel vapor vent valve
2	—	Fuel pump module electrical connector connector
3	—	Fuel vapor vent valve housing locking ring

The fuel vapor vent valve housing is fitted to the top of the tank via a seal and locking ring. The assembly is removable complete with the fitted components.

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

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Evaporative Emissions - Evaporative Emissions

Diagnosis and Testing

Preliminary Inspection

1. **1.** Visually inspect for obvious signs of mechanical or electrical damage, blown fuses, etc.
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.

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. The following drive cycles cover the use of the Jaguar approved diagnostic system, GDS510 instrument, and a test with no additional equipment, where possible.

Flow check monitor drive cycle conditions (non-Federal)

• NOTE: These conditions must be satisfied before the test is commenced.

This drive cycle should be performed following rectification work on the system.

- Make sure the fuel tank is between one third and three quarters full. (Adding fuel will increase vapor generation; the diagnostic will not run if the vapor concentration is too great).
- Make sure the ambient air temperature is above -5°C (23°F).

Flow check monitor drive cycle (non-Federal)

- Drive the vehicle for a minimum of 15 minutes, avoiding severe or excessive fuel movement.
- Avoiding excessive fuel movement, gently bring the vehicle to rest. (Coast to a stop).
- Allow the vehicle to idle for two minutes.

Full Evaporative system monitor drive cycle conditions

• NOTE: These conditions must be satisfied before the test is commenced.

- Make sure the fuel filler cap is correctly fitted.
- Clear the DTCs. (Perform a code clear, even if no codes are present. This will reset TIDs).
- Make sure the fuel tank is between one third and three quarters full. (Adding fuel will increase vapor generation; the diagnostic will not run if the vapor concentration is too great).
- Drive the vehicle for a minimum of two minutes, and until fully warm. (Temperature gauge just below mid-point).
- Make sure that the purge valve is operating, either by touch, sound, or using datalogger. (Purge vapor management valve-duty cycle).
  - If the purge is not active, perform the "Drive cycle for green ECM" in this section.

Full Evaporative system monitor drive cycle

- Drive the vehicle to a suitable road where the test can be carried out, switch off the ignition.
- Leave the ignition switched off for 30 seconds.
- Restart the engine, accelerate briskly to 80 Kilometres per hour (50 miles per hour), making sure that the engine speed reaches at least 3500 RPM for a minimum of five seconds.

40 thou test, using the Jaguar approved diagnostic system

- Avoiding high engine loads, drive the vehicle steadily between 64 and 97 Kilometres per hour. (40 and 60 miles per hour). Using the Jaguar approved diagnostic system, monitor the Evaporative valve duty cycle (Purge vapor management valve-duty cycle), CCV status (Canister close valve-vapor recovery system), and the FTPS (Fuel tank pressure-vapor recovery system). The Jaguar approved diagnostic system will give an indication when the test is active. Dependant on the level of vapor concentration, it may take up to 30 minutes for the test to initialise. (Vapor concentration cannot be measured using the Jaguar approved diagnostic equipment). When the test has initialised (CCV closed), it will take up to 90 seconds to complete. Avoid excessive fuel movement while the test is active.

20 thou test, using the Jaguar approved diagnostic system

- Continue driving the vehicle steadily between 64 and 97 Kilometres per hour. (40 and 60 miles per hour). avoiding high engine loads for a further 10 minutes.
- Avoiding excessive fuel movement, gently bring the vehicle to rest. (Coast to a stop).
- Allow the vehicle to idle for 2 minutes.
- Use the Jaguar approved diagnostic system to monitor the Evaporative valve duty cycle (Purge vapor management valve-duty cycle), CCV status (Canister close valve-vapor recovery system), and the FTPS (Fuel tank pressure-vapor recovery system). The Jaguar approved diagnostic system will give an indication when the test is active. When the test has initialised (CCV closed), it will take up to 90 seconds to complete.

If the 20 thou test has not run, it is likely that the vapor concentration in the purge system is too great. In this case, carry out the following -

- Drive the vehicle steadily for a further 30 minutes, avoiding excessive fuel movement.
- Avoiding excessive fuel movement, gently bring the vehicle to rest. (Coast to a stop).
- Allow the vehicle to idle for 2 minutes.
- Use the Jaguar approved diagnostic system to monitor the Evaporative valve duty cycle (Purge vapor management valve-duty cycle), CCV status (Canister close valve-vapor recovery system), and the FTPS (Fuel tank pressure-vapor recovery system). The Jaguar approved diagnostic system will give an indication when the test is active. When the test has initialised (CCV closed), it will take up

to 90 seconds to complete.

If the 20 thou test fails to run a second time, repeat the entire test.

- Check for DTCs. Rectify as indicated.

40 thou test, using GDS510

- Avoiding high engine loads, drive the vehicle steadily between 64 and 97 Kilometres per hour. (40 and 60 miles per hour)
- When the test has initialised, using the GDS510, monitor the Evaporative valve duty cycle, CCV status, and the FTPS. (The GDS510 will give an indication when the test is active).
- When the test has initialised (CCV closed), it will take up to 90 seconds to complete.
- To make sure that the test has completed, TID 08 in mode 6 must be checked. (If the test has not completed, this TID will display 0. Any other value indicates test completion).
- If the test did not complete, repeat the test.

20 thou test, using GDS510

- Continue driving the vehicle steadily between 64 and 97 Kilometres per hour. (40 and 60 miles per hour) avoiding high engine loads for a further 10 minutes.
- Avoiding excessive fuel movement, gently bring the vehicle to rest. (Coast to a stop).
- Allow the vehicle to idle for 2 minutes.
- When the test has initialised, using the GDS510, monitor the Evaporative valve duty cycle, CCV status, and the FTPS. (The GDS510 will give an indication when the test is active).
- When the test has initialised (CCV closed), it will take up to 90 seconds to complete.
- To make sure that the test has completed, TID 06 in mode 6 must be checked. (If the test has not completed, this TID will display 0. Any other value indicates test completion).
- If the test did not complete, repeat the test.
- If the 20 thou test has not run, it is likely that the vapor concentration in the purge system is too great. In this case, drive the vehicle steadily for a further 30 minutes, avoiding excessive fuel movement, then repeat the test.
- Check for DTCs. Rectify as indicated.

40 thou and 20 thou tests using no additional equipment

The test procedure and conditions are as for the Jaguar approved diagnostic system or GDS510, but no confirmation of the test having run is possible without the use of one of these instruments. The DTC will be set if the fault still exists, but the possibility exists that the conditions for the test to run may not have been met, in which case, the DTC may not be set until the owner reproduces the conditions in which the fault originally occurred.

Drive cycle for "green" ECM

- To enable the ECM to re-learn fuelling adaptions.

• NOTE: This procedure should be performed whenever the vehicle battery has been disconnected.

Due to component tolerance and wear during the normal running of a vehicle, fuelling and air requirements for an engine will vary over time. The ECM has the ability to adjust for this variation by "learning" the level of compensation that is required. (These compensation values are referred to as adaptions)

If the vehicle battery is disconnected, all adaptions held within the ECM will be lost (ie, set to Zero) The ECM is then referred to as "green". To enable the vehicle to function correctly, the ECM must "relearn" these adaptions.

There are four areas or sites that need to be relearnt.

- Allow the vehicle to idle until fully warm. (Temperature gauge just below mid-point).
- Allow to idle for a further three minutes, minimum.
- Drive the vehicle with the air conditioning OFF on a level road using a constant throttle, or speed control if fitted, for at least one minute in the following gears, at the stated engine speeds for each of the sites below.

"Green" ECM drive cycle chart. Site 1

• NOTE: The vehicle speed is for guidance only. DO NOT use the vehicle speed as the target to set adaptions.

Monitor condition	Vehicles without supercharger	Vehicles with supercharger
GEAR	P	P
ENGINE SPEED	Idle	Idle
VEHICLE SPEED (GUIDE ONLY)	0MPH	0MPH

"Green" ECM drive cycle chart. Site 2

• NOTE: The vehicle speed is for guidance only. DO NOT use the vehicle speed as the target to set adaptions.

Monitor condition	Vehicles without supercharger	Vehicles with supercharger
GEAR	2	2
ENGINE SPEED	1337	1337
VEHICLE SPEED (GUIDE ONLY)	17.6 kph (11.0 mph)	17.6 kph (11.0 mph)

"Green" ECM drive cycle chart. Site 3

• NOTE: The vehicle speed is for guidance only. DO NOT use the vehicle speed as the target to set adaptions.

Monitor condition	Vehicles without supercharger	Vehicles with supercharger
GEAR	2	2
ENGINE SPEED	1853	1853
VEHICLE SPEED (GUIDE ONLY)	30.4 kph (19.0 mph)	30.4 kph (19.0 mph)

"Green" ECM drive cycle chart. Site 4

• NOTE: The vehicle speed is for guidance only. DO NOT use the vehicle speed as the target to set adaptions.

Monitor condition	Vehicles without supercharger	Vehicles with supercharger

Monitor condition	Vehicles without supercharger	Vehicles with supercharger
GEAR	3	3
ENGINE SPEED	2013	2013
VEHICLE SPEED (GUIDE ONLY)	52.8 kph (33.0 mph)	52.8 kph (33.0 mph

"Green" ECM drive cycle chart. Site 5

• NOTE: The vehicle speed is for guidance only. DO NOT use the vehicle speed as the target to set adaptions.

Monitor condition	Vehicles without supercharger	Vehicles with supercharger
GEAR	3	3
ENGINE SPEED	2492	2492
VEHICLE SPEED (GUIDE ONLY)	65.6 kph (41.0 mph)	65.6 kph (41.0 mph)

Bring the vehicle to rest, allow to idle for one minute.

WARNING: The following tests may involve parts which are hot.

If sufficient adaptions have occurred, the Evaporative valve should now be operating. This can be verified manually by either touching or listening to the valve. By touching the Evaporative valve, it should be possible to feel the valve switching. Listening to the Evaporative valve is best done using a workshop stethoscope, through which it should be possible to hear the valve operating.

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	Refer to Action for DTC P0446
Fuel smell	• Adaptions incomplete • Purge valve inoperative	Carry out adaptions procedure, check purge valve operation
Message centre display (see below)	• Fuel filler cap missing/not tightened after refuelling	Check fuel filler cap, refer to Action for DTC P0455,

Driver Information

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

• NOTE: For definitions of Default Modes, see the foot of this table.

• 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 minmum 71°C (160°F)

Warning Light	Message	Default Mode	DTC
Check Engine (after two trips)	None	ECM default. (canister purge inhibited, adaptive fuel metering inhibited)	P0441, P0442, P0443, P0444, P0445, P0446, P0447, P0448, P0455, P0456
Check Engine (after two trips)	None	None	P0450, P0452, P0453
Red	Check fuel filler cap	ECM default. (canister purge inhibited, adaptive fuel metering inhibited)	P0455

Diagnostic Trouble Code (DTC) index

Diagnostic Trouble Code	Description	Possible Source	Action
P0441 (Euro only)	Incorrect purge flow	• Evaporative canister purge pipe restricted, leaking, disconnected • Evaporative canister vent restricted • Evaporative canister purge valve to engine pipe(s) restricted, leaking, disconnected • Evaporative canister purge valve failure.	GO to Pinpoint Test A.
P0442	Leak detected. 40 thou.	• 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 tankGO to Pinpoint Test B. For fuel tank information, REFER to Section 310-01 Fuel Tank and Lines. Where K-Line or Vacutec equipment is available, carry out the appropriate test. See bulletin 05.1-29, or Vacutec operating instructions

Diagnostic Trouble Code	Description	Possible Source	Action
P0443	Canister purge valve malfunction (leaking)	• Canister purge valve failure.	Carry out system pressure check (K-Line or Vacutec equipment. See bulletin 05.1-29, or Vacutec operating instructions)
P0444	Canister purge valve circuit open circuit	• Canister purge valve disconnected • Canister purge valve to ECM drive circuit; open circuit, high resistance • Canister purge valve failure.	Check purge valve connections, 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.	GO to Pinpoint Test B.
P0446	Canister close valve malfunction (CCV stuck closed)	• Restricted flow through; air vent, filter, CCV or canister • Canister close valve failure	Inspect the components listed, and interconnecting pipework for blockage, kinks or flattened areas
P0447	Canister close valve circuit open circuit.	• Canister close valve power supply circuit; open circuit, short circuit • Canister close valve to ECM drive circuit; open circuit, high resistance, short circuit to B+ voltage • Canister close valve failure	GO to Pinpoint Test C.
P0448	Canister close valve circuit short circuit	• Canister close valve to ECM drive circuit; short circuit to ground • Canister close valve failure	GO to Pinpoint Test C.
P0450	Fuel tank Pressure (FTP) sensor malfunction (output stuck/not changing)	• FTP sensor disconnected • FTP sensor failure	Check FTP sensor connections. GO to Pinpoint Test D.
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 splice in sensor supply circuit; open circuit, high resistance • FTP sensor failure	For FTP sensor supply tests, REFER to Section 303-14 Electronic Engine Controls. GO to Pinpoint Test D.
P0453	Fuel tank Pressure (FTP) sensor circuit; high voltage (high pressure)	• FTP sensor to splice in sensor ground circuit; open circuit, high resistance • FTP sensor to ECM sense circuit; open circuit, short circuit to high voltage • FTP sensor failure	Check fuel filler cap and seal, pipework, etc, GO to Pinpoint Test B. For fuel tank information, REFER to Section 310-01 Fuel Tank and Lines.
P0455	Leak detected-large	• Fuel filler cap missing • Fuel filler cap seal defective • System leak (canister damage, pipework damage) • CCV stuck open • Canister purge valve to engine purge pipe; restricted, leaking, disconnected • Canister purge valve stuck closed • Fuel tank leak	Check fuel filler cap and seal, pipework, etc, GO to Pinpoint Test B. For fuel tank information, REFER to Section 310-01 Fuel Tank and Lines.
P0456	Leak detected - 20 thou.	• Fuel filler cap seal defective • System leak (canister damage, pipework damage) • CCV leaking • Fuel tank leak	Check fuel filler cap and seal, pipework, etc, GO to Pinpoint Test B. For fuel tank information, REFER to Section 310-01 Fuel Tank and Lines.

Pinpoint Tests

PINPOINT TEST A : DTC P0441; EVAPORATIVE SYSTEM INCORRECT PURGE FLOW	
• NOTE: European specification vehicles only.	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
A1: CHECK FUEL FILLER CAP FITMENT AND CONDITION OF CANISTER, PIPES AND CONNECTORS	
	1 Make sure that the fuel filler cap is correctly installed and tightened.
	2 Check the condition of the carbon canister.
	3 Check the condition of all accessible pipes and connectors in the vapor line.
	Are the canister and all pipes and connectors in good condition? **Yes** GO to A2. **No** REPAIR as necessary. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle. Recheck DTCs. For additional information, see "diagnostic drive cycles" above.
A2: CHECK EVAPORATIVE PURGE VALVE IS OPERATING	
	1 Disconnect the Vapor pipe from the inlet port of the Evaporative purge valve (ie, from fuel tank).
	2 RUN the engine for 2 minutes, making sure that the engine reaches normal operating temperature.
	3 Check that the Evaporative purge valve is operating, by touch or by sound. (Using a stethoscope, it will be possible to hear the valve operating).
	Is the valve operating? **Yes** Recheck DTCs. Carry out a flow check monitor drive cycle. For additional information, see "diagnostic drive cycles" above.

	No CHECK for DTC P0444, P0445. Conduct "green" ECM drive cycle. For additional information, see "diagnostic drive cycles" above.

PINPOINT TEST B : DTC P0442, P0444, P0445, P0455, P0456; LEAK DETECTED:LARGE/20 THOU/40 THOU, PURGE VALVE CIRCUIT MALFUNCTION, OPEN/SHORT CIRCUIT,	
• NOTE: Where K-Line or Vacutec equipment is available, the apppropriate test should be carried out, see bulletin 05.1-29, and Vacutec operating instructions.	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
B1: CHECK FUEL FILLER CAP FITMENT AND CONDITION OF CANISTER, PIPES AND CONNECTORS	
	1 Make sure that the fuel filler cap is correctly installed and tightened.
	2 Check the condition of the carbon canister.
	3 Check the condition of all accessible pipes and connectors in the vapor line.
	Are the canister and all pipes and connectors in good condition? **Yes** GO to B2. **No** REPAIR as necessary. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle. Recheck DTCs. For additional information, see "diagnostic drive cycles" above.
B2: CHECK THE CANISTER PURGE VALVE DRIVE CIRCUIT FOR HIGH RESISTANCE	
	1 Disconnect the battery negative terminal.
	2 Disconnect the canister purge valve electrical connector, LF99.
	3 Disconnect the ECM electrical connector, EM80.
	4 Measure the resistance between LF99, pin 02 (UY) and EM80, pin 66 (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. **No** GO to B3.
B3: CHECK THE CANISTER PURGE VALVE DRIVE CIRCUIT FOR SHORT TO HIGH VOLTAGE	
	1 Reconnect the battery negative terminal.
	2 Turn the ignition switch to the ON position.
	3 Measure the voltage between LF99, pin 02 (UY) 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 B4.
B4: CHECK THE CANISTER PURGE VALVE DRIVE CIRCUIT FOR SHORT TO GROUND	
	1 Turn the ignition switch to the OFF position.
	2 Measure the resistance between LF99, pin 02 (UY) 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 B5.
B5: CHECK THE CANISTER PURGE VALVE POWER SUPPLY	
	1 Turn the ignition switch to the ON position. • Make sure the EMS relay is energised.
	2 Measure the voltage between LF99, pin 01 (WU) and GROUND.
	Is the voltage less than 10 volts? **Yes** REPAIR the circuit between the canister purge valve and battery. This circuit includes the EMS fuse box, fuse 14, the EMS relay, and the high power protection module. For additional information, refer to the wiring diagrams. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle. **No** INSTALL a new canister purge valve. REFER to Evaporative Emission Canister Purge Valve - in this section. Carry out a full Evap system monitor drive cycle. Recheck DTCs. For additional information, see "diagnostic drive cycles" above.

PINPOINT TEST C : DTC P0447, P0448; CANISTER CLOSE VALVE (CCV) CIRCUIT MALFUNCTION, OPEN /SHORT CIRCUIT	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
C1: CHECK THE CANISTER CLOSE VALVE POWER SUPPLY	
	1 Disconnect the CCV electrical connector, BT14.
	2 Turn the ignition switch to the ON position. • Make sure the EMS relay is energised.
	3 Measure the voltage between BT14, pin 02 (WU) and GROUND.
	Is the voltage greater than 10 volts? **Yes** GO to C2. **No** REPAIR the circuit between the CCV and battery. This circuit includes the EMS fuse box, fuse 14, the EMS relay and the high power protection module. For additional information, refer to the wiring diagrams. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle.
C2: CHECK THE CANISTER CLOSE VALVE POWER SUPPLY CIRCUIT FOR SHORT CIRCUIT	
	1 Turn the ignition switch to the OFF position.

	2 Measure the voltage between BT14, pin 02 (WU) 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 C3.
C3: CHECK THE CANISTER CLOSE VALVE DRIVE CIRCUIT FOR HIGH RESISTANCE	
	1 Disconnect the battery negative terminal. 2 Disconnect the ECM electrical connector, EM80. 3 Measure the resistance between BT14, pin 01 (O) and EM80, pin 67 (O).
	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. **No** GO to C4.
C4: CHECK THE CANISTER CLOSE VALVE DRIVE CIRCUIT FOR SHORT TO HIGH VOLTAGE	
	1 Reconnect the battery negative terminal. 2 Measure the voltage between BT14, pin 01 (O) 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 C5.
C5: CHECK THE CANISTER CLOSE VALVE DRIVE CIRCUIT FOR SHORT TO GROUND	
	1 Measure the resistance between BT14, pin 01 (O) 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. REFER to Fuel Vapor Vent Valve - in this section. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle.

PINPOINT TEST D : DTC P0450, P0452, P0453; FUEL TANK PRESSURE (FTP) SENSOR CIRCUIT MALFUNCTION, LOW/HIGH VOLTAGE

• NOTE: For FTP sensor supply and ground circuit tests, REFER to Section 303-14 Electronic Engine Controls.

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: CHECK THE FTP SENSOR SENSE CIRCUIT FOR HIGH RESISTANCE	
	1 Disconnect the battery negative terminal. 2 Disconnect the FTP sensor electrical connector, FT02. 3 Disconnect the ECM electrical connector, EM80. 4 Measure the resistance between FT02, pin 02 (RG) and EM80, pin 104 (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. **No** GO to D2.
D2: CHECK THE FTP SENSOR SENSE CIRCUIT FOR SHORT TO HIGH VOLTAGE	
	1 Reconnect the battery negative terminal. 2 Turn the ignition switch to the ON position. 3 Measure the voltage between FT02, 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 D3.
D3: CHECK THE FTP SENSOR SENSE CIRCUIT FOR SHORT TO GROUND	
	1 Measure the resistance between FT02, pin 02 (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** INSTALL a new FTP sensor. REFER to Section 310-01 Fuel Tank and Lines. CLEAR the DTC. Carry out a full Evaporative system monitor drive cycle.