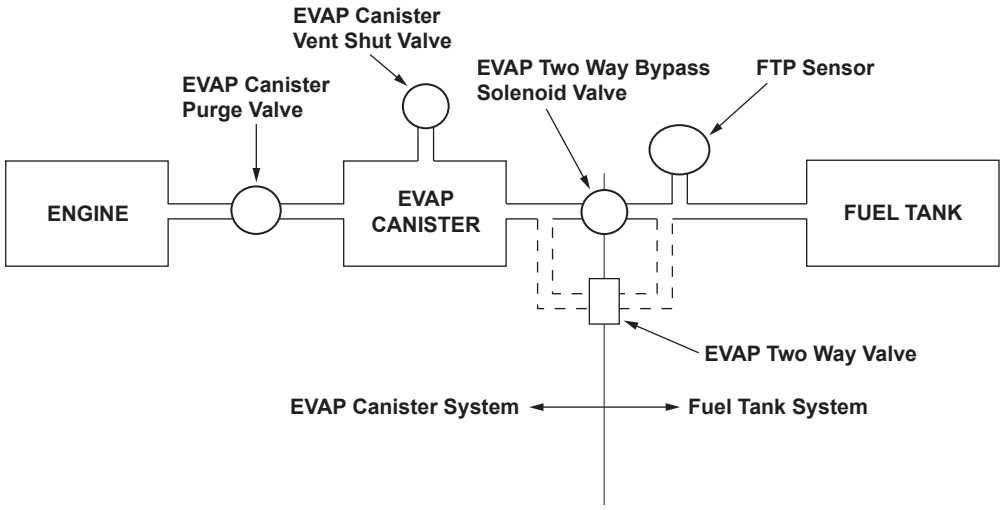
DTC P1457: Evaporative Emission (EVAP) Control System Leakage (EVAP Canister System)

Evaporative Emission (EVAP) System



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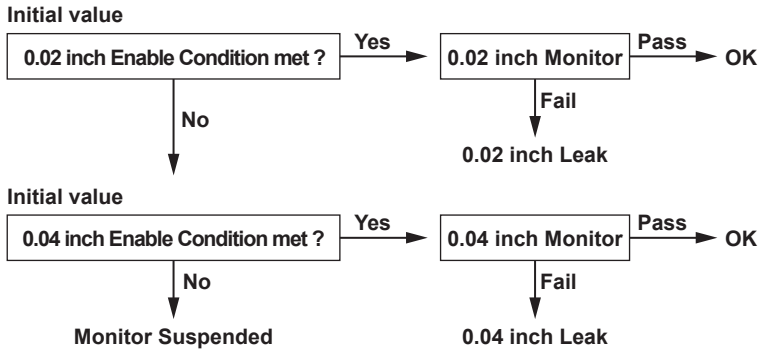

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General Description

The evaporative emission (EVAP) control system stores fuel vapor from the fuel tank in the EVAP canister temporarily to prevent it from escaping to the atmosphere and to enable it to be drawn into the engine by intake manifold vacuum and burned. The EVAP control system leak detection method improves the accuracy and frequency of the detection by determining faulty components and vapor leakage for each part. The EVAP control system (from the purge valve to the fuel tank) is divided into two parts. One is the "EVAP Canister Side" (from the EVAP two way valve to the purge valve) and the other is the "Tank Side" (from the EVAP two way valve to the fuel tank). Each side uses different detection principles and methods.

Step 1: If the fuel tank pressure (FTP) sensor indicates a significantly negative pressure value when the fuel tank and the EVAP canister are exposed to atmosphere, a malfunction when the canister vent shut valve (which is fully closed) is detected, and a DTC is stored. The detection is complete.
Step 2: If no malfunction is detected in step 1, and if the FTP sensor output is a specified pressure value or less, or it changes toward negative pressure when exposed to atmosphere, a malfunction when the purge control solenoid valve (which is fully open) is detected, and a DTC is stored. The detection is complete.
Step 3: Draw negative pressure into the canister if no malfunction is detected in Steps 1 and 2. At that time, if the FTP sensor output value is a set value or less, it is interpreted as leakage. A DTC is stored and the detection is complete.
Step 4: If no malfunction is detected in Steps 1 through 3, wait until the fuel tank pressure stabilizes. If there is leakage in the EVAP canister side, negative pressure in the EVAP canister has leaked and become equal to atmospheric pressure. If there is no leak, a certain level of negative pressure remains in the EVAP canister.
Step 5: Draw the negative pressure remaining in the canister into the tank side after performing Step 4. Monitor the FTP sensor output value. If the FTP sensor output changes toward negative pressure considerably, it is interpreted as no leakage in the canister side, and the detection is complete. On the other hand, if the FTP sensor output value does not change, it is interpreted as leakage in the EVAP canister side. Then, go to Step 6.
Step 6: After returning pressure in the EVAP control system to atmospheric level, shift to normal control, then the detection is complete.

Monitor Execution, Sequence, Duration, DTC Type

0.04 inch Leak Detection

Execution	Once per driving cycle
Sequence	None
Duration	45 seconds or less
DTC Type	Two drive cycles, MIL ON

0.02 inch Leak Detection

Execution	Once per driving cycle
Sequence	None
Duration	67 seconds or less
DTC Type	Two drive cycles, MIL ON

Enable Conditions

0.04 inch Leak Detection

Condition		Minimum	Maximum
Initial engine coolant temperature		—	94ºF (35ºC)
Engine coolant temperature		158ºF (70ºC)	212ºF (100ºC)
Intake air temperature		20ºF (-7ºC)	140ºF (60ºC)
Engine speed		1,300 rpm	3,500 rpm
		1,500 rpm*1	
MAP value	1,500 rpm	75 kPa (559 mmHg, 22.0 in.Hg)	91 kPa (684 mmHg, 27.0 in.Hg)
	2,400 rpm	30 kPa (220 mmHg, 8.7 in.Hg)	
Vehicle speed		32 mph (50 km/h)	82 mph (132 km/h)
Fuel tank pressure before starting monitoring		-2 kPa (-15 mmHg, -0.5 in.Hg)	—
Throttle position		1.0º	40.0º
Battery voltage		10.5 V	—
Fuel trim		0.65	1.40
Fuel feedback		Closed loop	
No active DTCs		ECM, A/F Sensor, A/F Sensor Heater, MAP, ECT, TP*1, BARO, IAT, VSS, EVAP, FTP, A/T System*1, ECM Back-up	
Others		Other than when there is excessive vapor generation (fuel level is 40 - 80%)	
		Test-drive on a flat road to avoid misdetection	
		Avoid abrupt acceleration, deceleration and turns	

*1: CVT

Enable Conditions (cont'd)

0.02 inch Leak Detection

Condition		Minimum	Maximum
Initial condition A*		—	7ºF (4ºC)
Initial condition B**		15ºF (8ºC)	—
Initial condition C***		6ºF (3ºC)	—
Initial engine coolant temperature		32ºF (0ºC)	94ºF (34ºC)
Initial intake air temperature		32ºF (0ºC)	94ºF (34ºC)
Engine coolant temperature		158ºF (70ºC)	212ºF (100ºC)
Intake air temperature		20ºF (-7ºC)	140ºF (60ºC)
Engine speed		1,300 rpm	3,500 rpm
		1,500 rpm*1	
MAP value	1,500 rpm	75 kPa (559 mmHg, 22.0 in.Hg)	91 kPa (684 mmHg, 27.0 in.Hg)
	2,400 rpm	30 kPa (220 mmHg, 8.7 in.Hg)	
Vehicle speed		32 mph (50 km/h)	82 mph (132km/h)
Fuel tank pressure before starting monitoring		-2 kPa (-15 mmHg, -0.5 in.Hg)	—
Throttle position		1.0º	40.0º
Battery voltage		10.5 V	—
Fuel trim		0.65	1.40
Fuel feedback		Closed loop	
No active DTCs		ECM, A/F Sensor, A/F Sensor Heater, MAP, ECT, TP*1, BARO, IAT, VSS, EVAP, FTP, A/T System*1, ECM Back-up*1	
Others		Other than when there is excessive vapor generation (fuel level is 40 - 80%)	
		Test-drive on a flat road to avoid misdetection	
		Avoid abrupt acceleration, deceleration and turns	

* : The difference between initial engine coolant temperature and initial intake air temperature when atmospheric temperature is about 32°F (0°C).

** : The difference between initial intake air temperature and the temperature right after start-up when atmospheric temperature is about 32°F (0°C).

***: The difference between intake air temperature right after start-up and initial intake air temperature when atmospheric temperature is about 32°F (0°C).

Malfunction Threshold

Any of these conditions must be met.
Step 1: Fuel tank pressure is -2 kPa (-20 mmHg, -0.7 in.Hg) or less.
Step 2: Fuel tank pressure changes by -6 kPa (-49 mmHg, -1.9 in.Hg) or more with the canister purge control solenoid valve closed (PCS OPEN failure 1). Or fuel tank pressure changes by 3 kPa (20 mmHg, 0.8 in.Hg) or more and fuel tank pressure is -0.6 kPa (-4 mmHg, -0.1 in.Hg) or less (PCS OPEN failure 2).
Step 3: Fuel tank pressure is -4 kPa (-25 mmHg, -1.0 in.Hg) or more.
Step 5: Fuel tank pressure changes by 0.5 kPa (3 mmHg, 0.1 in.Hg) or less.

Driving Pattern

0.04 inch Leak Detection:
1. Start the engine at an engine coolant temperature as specified under Enable Conditions, and let it idle until the radiator fan comes on.
2. Drive the vehicle immediately at a speed between 35 - 75 mph (56 - 120 km/h) for at least 2 minutes and 6 miles (10 km).

0.02 inch Leak Detection:
1. Start the engine using the conditions specified in the enable criteria for engine coolant temperature and intake air temperatures let it idle until the radiator fan comes on.
2. Drive the vehicle immediately at a speed between 35 - 75 mph (56 - 120 km/h) for at least 20 minutes and 6 miles (10 km).

- If you have difficulty duplicating the DTC, retest after turning off electrical components such as the audio system and A/C, and try a different gear position.
- Drive the vehicle in this manner only if the traffic regulations and ambient conditions allow.

Diagnosis Details

Conditions for illuminating the MIL
When a malfunction is detected during the first drive cycle with the ECT at engine start-up within the specified temperature range, a Temporary DTC is stored in the ECM memory. If the malfunction recurs during the next (second) drive cycle with the ECT at engine start-up within the specified temperature range, the MIL comes on and the DTC and the freeze frame data are stored.

Conditions for clearing the MIL
The MIL will be cleared if the malfunction does not recur during three consecutive trips in which the diagnostic runs.
The MIL, the DTC, the Temporary DTC, and the freeze frame data can be cleared by using the scan tool Clear command or by disconnecting the battery.