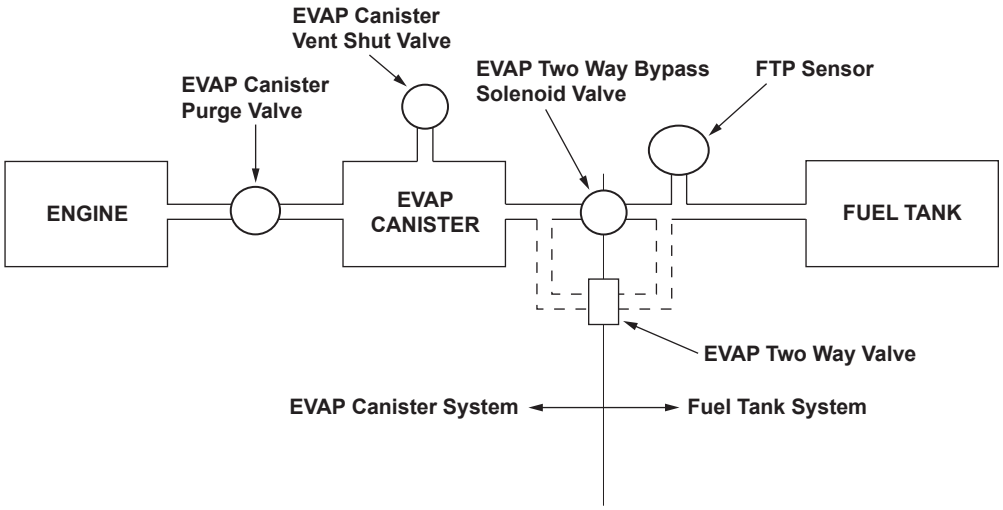
DTC P1456: Evaporative Emission (EVAP) Control System Leakage (Fuel Tank System)

Evaporative Emission (EVAP) System



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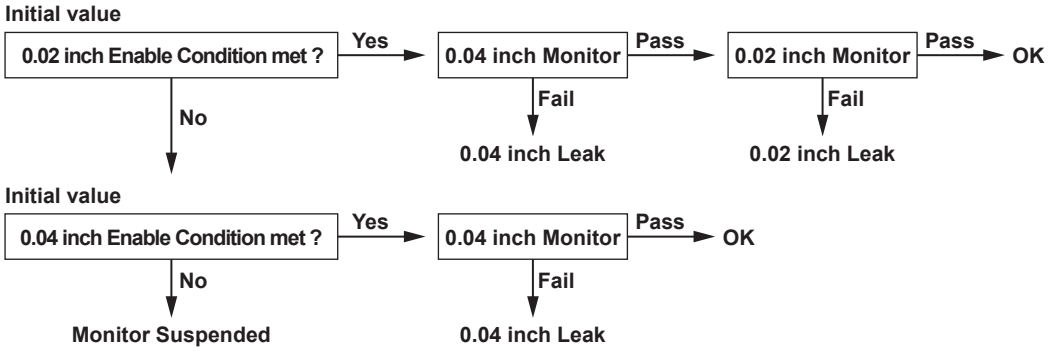

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General Description

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. In addition, the onboard refueling vapor recovery system (ORVR) stores fuel vapor generated when refueling in the EVAP canister.

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). There is 0.04 inch leak detection and 0.02 inch leak detection. If the 0.04 inch leak detection results are OK, the 0.02 inch leak detection runs.

• Each step is performed for leak detection during a valid drive cycle in which no Temporary DTC is stored.

Step 1: Common to both the 0.02 and 0.04 inch leak detections

Start the engine from the specified engine coolant and intake air temperature. Compare the output value from the fuel tank pressure (FTP) sensor right after start-up with the one after 20 seconds have elapsed. If there is a change between them (different thresholds are applied to the 0.02 inch leak detection and 0.04 inch leak detection), the tank side is considered that free of leaks. The detection is complete and the normal operation is started. If it is considered that there may be a 0.04 inch leak at that time, go to Step 2a or Step 2b. If there may be a 0.02 inch leak, go to Step 2a.

Step 2a: Common to both the 0.02 and 0.04 inch leak detections

Monitor the changes of absolute pressure in the fuel tank for a set time period after starting the engine. If it changes by a specified value (different thresholds are applied to the 0.02 inch leak detection and 0.04 inch leak detection) toward negative pressure, it is interpreted as no leakage in the tank side, detection is complete, and the normal operation starts.

Step 2b: 0.04 inch leak detection

Monitor the changes of absolute pressure in the fuel tank for a set time period after starting the engine. If it changes by a certain value, it is interpreted as no leakage in the tank side, detection is complete, and the normal operation starts.

If there may be a 0.04 inch leak in Step 2a or 2b, go to Step 3.

If there may be a 0.02 inch leak in Step 2a, go to Step 4.

Step 3: 0.04 inch leak detection

If the change of pressure in the fuel tank at the point of a set time period has elapsed after starting the engine is small, it is interpreted as leakage. Then, the detection is complete, and the normal operation starts.

Step 4a: 0.02 inch leak detection

When the monitoring conditions for the 0.02 inch leak detection in the "Tank Side" are met after the leak detection in the "EVAP Canister Side", the change of FTP sensor output is evaluated. If the change is a set value or more, it is interpreted as leakage in the "Tank Side" and a DTC is stored.

Step 4b: Common to both the 0.02 and 0.04 inch leak detections

If the change of fuel tank pressure is small while drawing intake manifold vacuum into the fuel tank, or if the fuel tank pressure does not become negative, it is interpreted as leakage (filler cap off, pipe disconnected, etc.) and a DTC is stored.

Step 5: Allowing the EVAP system to return atmospheric pressure, the normal operation starts, and the detection is complete.

Monitor Execution, Sequence, Duration, DTC Type

0.04 inch Leak Detection

Execution	Once per driving cycle
Sequence	None
Duration	1,223 seconds or more
DTC Type	Two drive cycles, MIL ON

0.02 inch Leak Detection

Execution	Once per driving cycle
Sequence	None
Duration	116 seconds or less
DTC Type	Two drive cycles, MIL ON

Enable Conditions

0.04 inch Leak Detection

Condition	Minimum	Maximum
Initial condition A*	—	18ºF (10ºC)
Initial condition B**	9ºF (5ºC)	—
Initial engine coolant temperature	20ºF (-6ºC)	94ºF (34ºC)
Initial intake air temperature	20ºF (-6ºC)	94ºF (34ºC)
Mileage after starting the engine	6 miles (10 km)	—
Battery voltage	10.6 V	—
No active DTCs	ECM, ECT, IAT, VSS, EVAP, FTP, A/T System*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 ambient temperature is about 32°F (0°C).

** : The difference between initial intake air temperature and intake air temperature right after starting the engine when ambient temperature is about 32°F (0°C).

*1: CVT

Enable Conditions (cont'd)

0.02 inch Leak Detection

Condition	Minimum	Maximum
Initial condition A*	—	7ºF (4ºC)
Initial condition B**	—	5ºF (3ºC)
Initial engine coolant temperature	32ºF (0ºC)	94ºF (34ºC)
Initial intake air temperature	32ºF (0ºC)	94ºF (34ºC)
Mileage after starting the engine	6 miles (10 km)	—
Battery voltage	10.5 V	—
No active DTCs	ECM, A/F Sensor, A/F Sensor Heater, MAP, ECT, TP, IAT, BARO, 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	

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

** : The difference between initial intake air temperature and intake air temperature right after starting the engine when ambient temperature is about 32°F (0°C).

Enable Conditions (cont'd)

0.02 inch Leak (Step 4) Detection

Condition		Minimum	Maximum
Initial condition A**		—	7ºF (4ºC)
Initial condition B***		—	5ºF (3ºC)
Initial engine coolant temperature		32ºF (0ºC)	94ºF (34ºC)
Initial intake air temperature		32ºF (0ºC)	94ºF (34ºC)
Mileage after starting the engine		6 miles (10 km)	—
Engine coolant temperature		150ºF (66ºC)	—
Engine speed		1,300 rpm*1	2,900 rpm
		1,500 rpm*2	—
MAP value	1,300 rpm	30 kPa (220 mmHg, 8.7 in.Hg)	95 kPa (714 mmHg, 28.2 in.Hg)
	2,400 rpm		
Vehicle speed		45 mph (72 km/h)	82 mph (132 km/h)
Throttle position		1º	40º *1
			50º *2
Fuel trim		0.65	1.40
Fuel feedback		Closed loop	
Monitoring priority		EVAP	
No active DTCs		ECM, A/F Sensor, A/F Sensor Heater, MAP, ECT, TP, IAT, BARO, VSS, EVAP, FTP, A/T System*1, ECM Back-up	
Others		A certain time period (equivalent to monitoring time for 0.04 inch leak) has elapsed	
		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 ambient temperature is about 32°F (0°C).

** : The difference between initial intake air temperature and intake air temperature right after starting the engine when ambient temperature is about 32°F (0°C).

*2: M/T

Malfunction Threshold

• 0.04 inch leak detection

These conditions must all be met:

Step 1: The change of fuel tank pressure is 0.3 kPa (2 mmHg, 0.1 in.Hg) or less.

Step 2a: The change of fuel tank pressure is 0.3 kPa (2 mmHg, 0.1 in.Hg) or less.

Step 2b: The difference between maximum and minimum fuel tank pressure is not 0.4 kPa (3 mmHg, 0.2 in.Hg) - 1 kPa (8 mmHg, 0.3 in.Hg)***,*2.

Step 3: The change of fuel tank pressure is not 0.2 kPa (1 mmHg, 0.03 in.Hg) - 0.2 kPa (1.4 mmHg, 0.05 in.Hg)****,*2.

*** : Depending on initial engine coolant temperature and fuel consumption.

**** : Depending on initial engine coolant temperature.

• 0.02 inch leak detection

These conditions must all be met:

Step 1: The change of fuel tank pressure is 0.6 kPa (4 mmHg, 0.2 in.Hg) or less.

Step 2a: The change of fuel tank pressure is 0.7 kPa (5 mmHg, 0.2 in.Hg) or less.

Step 4a: The change ratio of fuel tank pressure is 00DB (HEX) or more.

Step 4b: If the change of fuel tank pressure is 2 kPa (10 mmHg, 0.4 in.Hg) or less, or fuel tank pressure is -0.6 kPa (-4 mmHg, -0.2 in.Hg) or more, it is considered to be a large leak (filler cap coming off etc.).

Driving Pattern

• 0.04 inch leak detection

1. Start the engine at an engine coolant temperature and intake air 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 20 minutes and 6 miles (10 km).

• 0.02 inch leak detection

1. Complete the Driving Pattern for the 0.04 inch leak detection.
2. Then, drive the vehicle at a speed between 40 - 75 mph (64 - 120 km/h) for at least 2 minutes.

- 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.