

DTC	P043E	Evaporative Emission System Reference Orifice Clog Up
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DTC	P043F	Evaporative Emission System Reference Orifice High Flow
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DTC SUMMARY

DTCs	Monitoring Items	Malfunction Detection Conditions	Trouble Areas	Detection Timings	Detection Logic
P043E	Reference orifice clogged	P043E, P043F, P2401, P2402 and P2419 present when one of following conditions met during key-off EVAP monitor: - EVAP pressure just after reference pressure measurement greater than -1 kPa-g (-7.5 mmHg-g) - Reference pressure less than -4.85 kPa-g (-36.4 mmHg-g)	- Canister pump module (Reference orifice, leak detection pump, vent valve) - Connector/wire harness (Canister pump module - ECM) - EVAP system hose (pipe from air inlet port to canister pump module, canister filter, fuel tank vent hose) - ECM	While ignition switch OFF	2 trip
P043F	Reference orifice high-flow	- Reference pressure greater than -1.057 kPa-g (-7.93 mmHg-g) - Reference pressure not saturated - Reference pressure difference between first and second 0.7 kPa-g (5.25 mmHg-g) or more HINT: Typical example values	- Canister pump module (Reference orifice, leak detection pump, vent valve) - Connector/wire harness (Canister pump module - ECM) - EVAP system hose (pipe from air inlet port to canister pump module, canister filter, fuel tank vent hose) - ECM	While ignition switch OFF	2 trip

HINT:

The reference orifice is located inside the canister pump module.

DESCRIPTION

The circuit description can be found in the EVAP (Evaporative Emission) System (See page [ES-341](#)).

INSPECTION PROCEDURE

Refer to the EVAP System (See page [ES-346](#)).

MONITOR DESCRIPTION

5 hours* after the ignition switch is turned to OFF, the leak detection pump creates negative pressure (vacuum) in the EVAP system. The ECM monitors for leaks and actuator malfunctions based on the EVAP pressure.

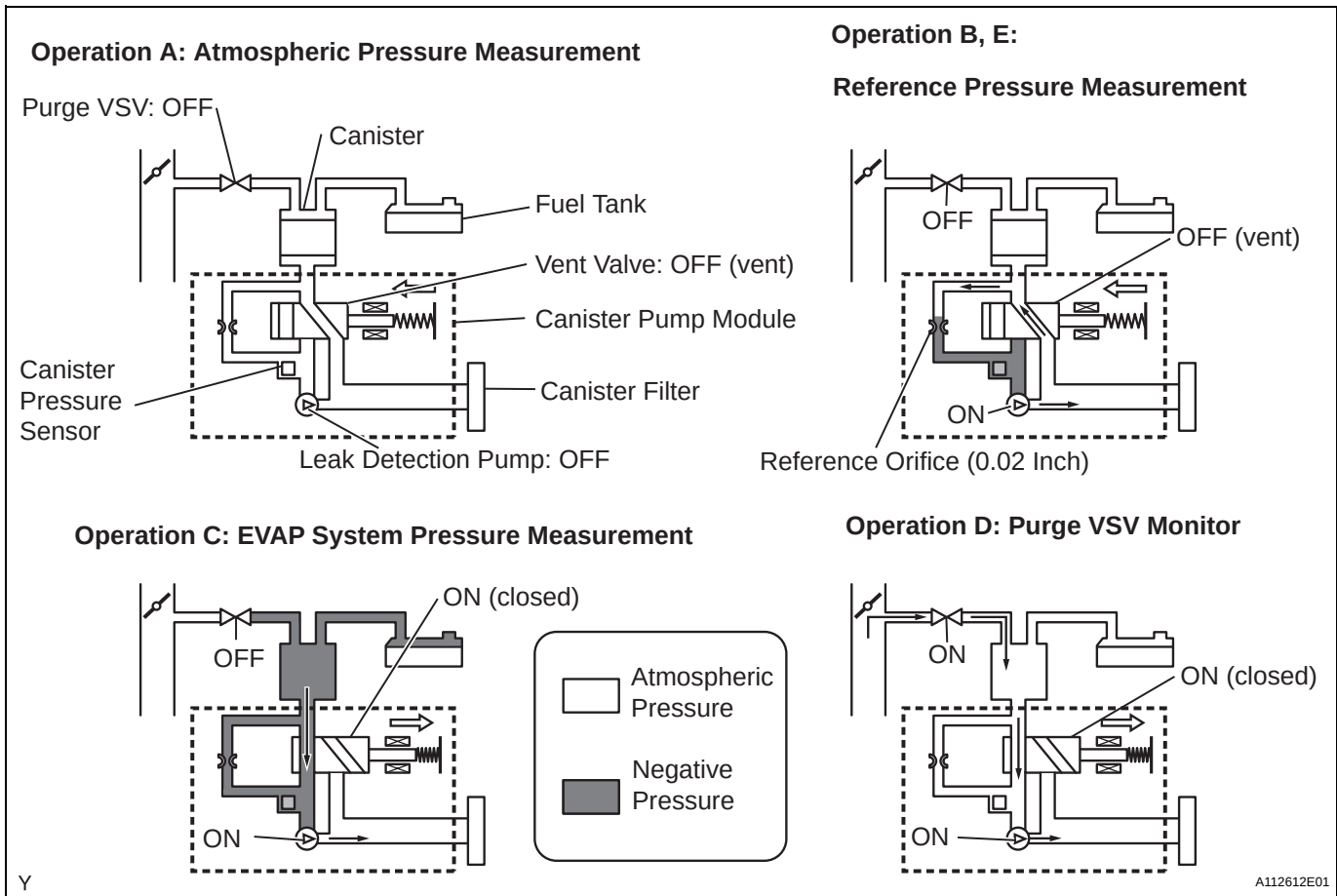
HINT:

*: If the engine coolant temperature is not below 35°C (95°F) 5 hours after the ignition switch is turned to OFF, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the ignition switch is turned to OFF, the monitor check starts 2.5 hours later.

Sequence	Operations	Descriptions	Duration
-	ECM activation	Activated by soak timer, 5 hours (7 or 9.5 hours) after ignition switch turned to OFF.	-

Sequence	Operations	Descriptions	Duration
A	Atmospheric pressure measurement	Vent valve turned OFF (vent) and EVAP system pressure measured by ECM in order to register atmospheric pressure. If pressure in EVAP system not between 76 kPa-a and 110 kPa-a (570 mmHg-a and 825 mmHg-a), ECM cancels EVAP system monitor.	10 seconds
B	First reference pressure measurement	In order to determine reference pressure, leak detection pump creates negative pressure (vacuum) through reference orifice and then ECM checks if leak detection pump and vent valve operate normally.	60 seconds
C	EVAP system pressure measurement	Vent valve turned ON (closed) to shut EVAP system. Negative pressure (vacuum) created in EVAP system, and EVAP system pressure then measured. Write down measured value as will be used in leak check. If EVAP pressure does not stabilize within 15 minutes, ECM cancels EVAP system monitor.	15 minutes*
D	Purge VSV monitor	Purge VSV opened and then EVAP system pressure measured by ECM. Large increase indicates normality.	10 seconds
E	Second reference pressure measurement	After second reference pressure measurement, leak check performed by comparing first and second reference pressure. If stabilized system pressure higher than second reference pressure, ECM determines that EVAP system leaking.	60 seconds
F	Final check	Atmospheric pressure measured and then monitoring result recorded by ECM.	-

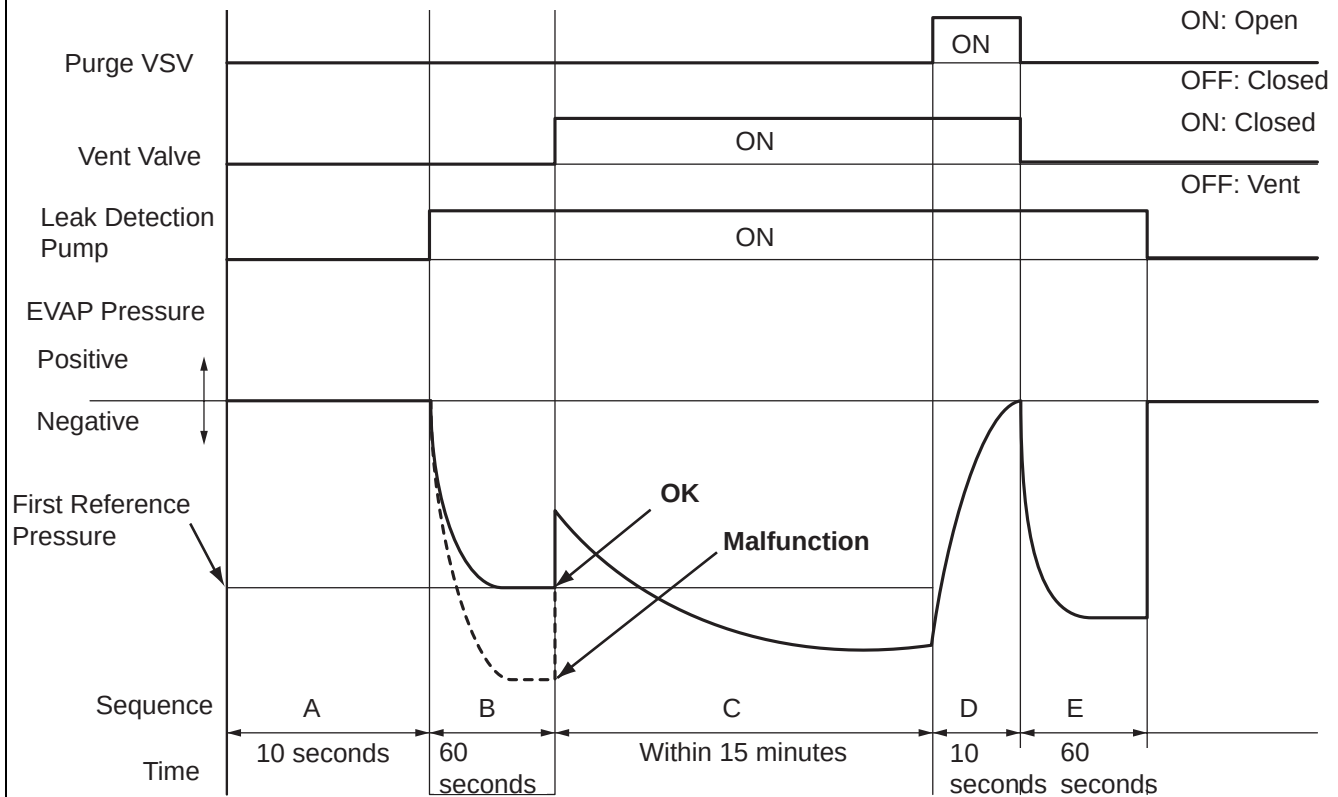
* If only a small amount of fuel is in the fuel tank, it takes longer for the EVAP pressure to stabilize.



(a) P043E: Reference orifice clogged

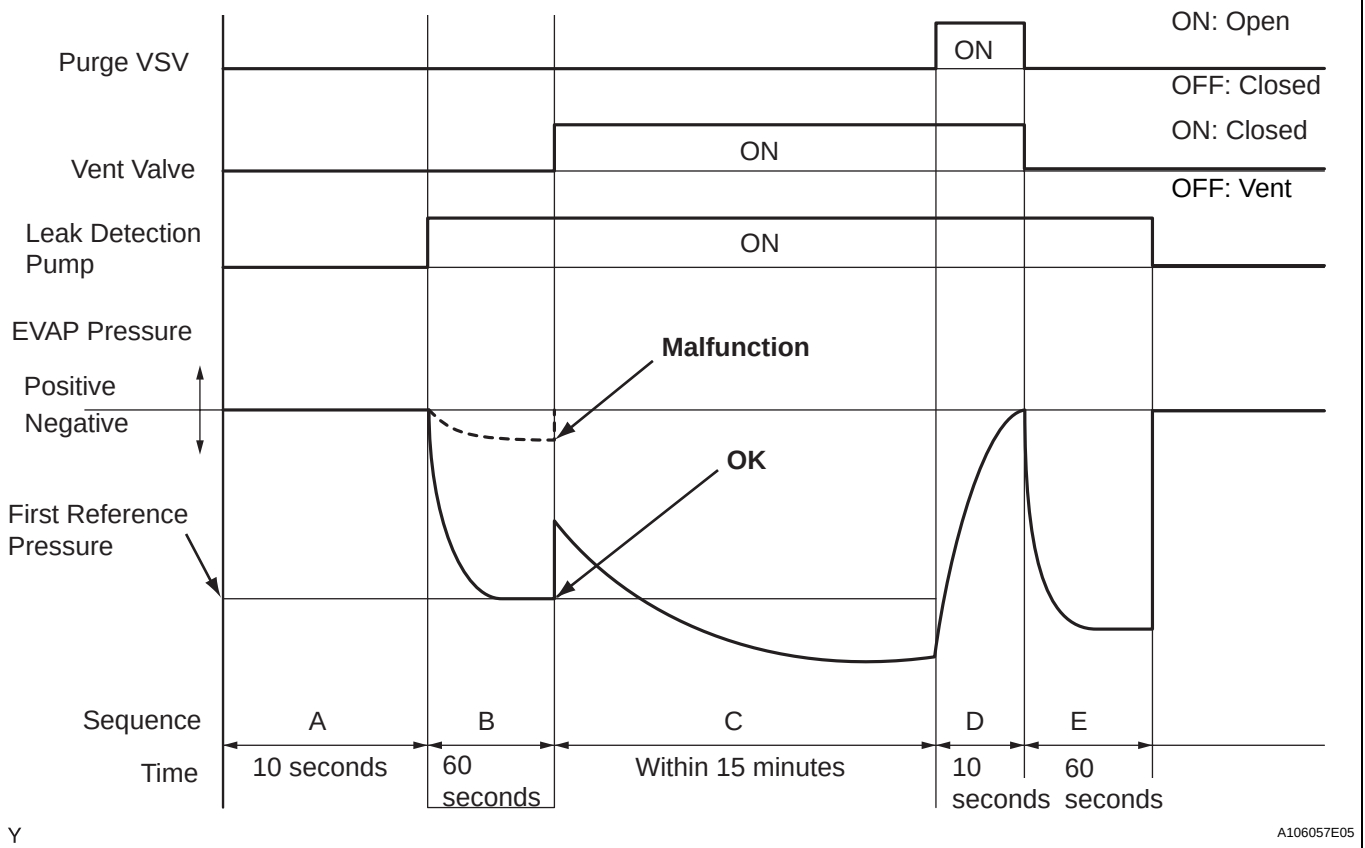
In operation B, the leak detection pump creates negative pressure (vacuum) through the reference orifice. The EVAP system pressure is then measured by the ECM, using the canister pressure sensor, to determine the reference pressure. If the pressure is lower than -4.85 kPa-g (-36.4 mmHg-g), the ECM interprets this as a clog malfunction in the reference orifice, and stops the EVAP system monitor. The ECM then illuminates the MIL and sets the DTC (2 trip detection logic).

EVAP Pressure when Reference Orifice Clogged:



(b) P043F: Reference orifice high-flow

In operation B, the leak detection pump creates negative pressure (vacuum) through the reference orifice. The EVAP system pressure is then measured by the ECM using the canister pressure sensor to determine the reference pressure. If the pressure is higher than -1.057 kPa-g (-7.93 mmHg-g), the ECM interprets this as a high-flow malfunction in the reference orifice, and stops the EVAP system monitor. The ECM then illuminates the MIL and sets the DTC (2 trip detection logic).

EVAP Pressure when Reference Orifice High-flow Malfunction:**OBD II MONITOR SPECIFICATIONS****MONITOR STRATEGY**

Related DTCs	P043E: 0.02 inch reference orifice (low flow) P043F: 0.02 inch reference orifice (high flow)
Required Sensors/Components	Pump module
Frequency of Operation	Once per driving cycle
Duration	Within 2 minutes (varies with amount of fuel in tank)
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS**All:**

The monitor will run whenever the following DTCs are not present	None
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Enable conditions of EVAP key-off monitor

Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg) [absolute pressure]
Battery voltage	10.5 V or higher
Vehicle speed	2.5 mph (4 km/h) or less
Ignition switch	OFF
Time after key off	15 hours
EVAP pressure sensor malfunction (P0450, P0452, P0453)	Not detected
EVAP canister purge valve	Not operated by scan tool

EVAP canister vent valve	Not operated by scan tool
EVAP leak detection pump	Not operated by scan tool
Both of the following conditions set before key off	Conditions 1 and 2
1. Duration that vehicle has been driven	5 minutes or more
2. EVAP purge operation	Performed
ECT	4.4 to 35°C (40 to 95°F)
IAT	4.4 to 35°C (40 to 95°F)

EVAP Key-off monitor sequence 1 to 8**1. Atmospheric pressure measurement**

Next sequence is run if the following condition is met:	-
Atmospheric pressure change for 10 seconds	Within 0.3 kPa (2.25 mmHg) in 1 second

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2. Reference pressure measurement

Next sequence is run if the following conditions are set:	-
EVAP pressure just after reference pressure measurement start	Within 0.3 kPa (2.25 mmHg) in 1 second
Reference pressure	-1 kPa (-7.5 mmHg) or lower
Reference pressure	Saturated within 60 seconds

3. EVAP canister vent valve close stuck check

Next sequence is run if the following condition is set:	-
EVAP pressure change after vent valve is ON	0.3 kPa (2.25 mmHg) or more

4. Vacuum introduction and EVAP leak check

Next sequence is run if the following condition is set:	-
EVAP pressure	Saturated within 12 minutes

5. EVAP canister purge valve close stuck check

Next sequence is run if the following condition is set:	-
EVAP pressure change after purge valve is open	0.3 kPa (2.25 mmHg) or more

6. Second reference pressure measurement

Next sequence run if all of following conditions set:	Condition 1, 2, 3 and 4
1. EVAP pressure just after reference pressure	-1 kPa-g (-7.5 mmHg-g) or less
2. Reference pressure	-4.85 to -1.057 kPa-g (-36.4 to -7.93 mmHg-g)
3. Reference pressure	Saturated within 60 seconds
4. Reference pressure difference between first and second	Less than 0.7 kPa-g (5.25 mmHg-g)

7. Leak check

Next sequence run if following condition set:	-
EVAP pressure when vacuum introduction complete	Second reference pressure or less

8. Atmospheric pressure measurement

EVAP monitor complete if following condition set:	-
Atmospheric pressure difference between sequence 1 and 8	Within 0.3 kPa-g (2.25 mmHg-g)

TYPICAL MALFUNCTION THRESHOLDS

One of following conditions is met	-
EVAP pressure when reference pressure measurement started	-1 kPa (-7.5 mmHg) or higher
Reference pressure (0.02 inch leak pressure)	Less than -4.3 kPa (-32 mmHg)
Reference pressure (0.02 inch leak pressure)	-1.2 kPa (-9 mmHg) or higher

Reference pressure (0.02 inch leak pressure)	Not saturated for 60 seconds
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MONITOR RESULT

Refer to EVAP System (See page [ES-339](#))

DTC	P0441	Evaporative Emission Control System Incorrect Purge Flow
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DTC SUMMARY

DTC	Monitoring Items	Malfunction Detection Conditions	Trouble Areas	Detection Timings	Detection Logic
P0441	Purge VSV (Vacuum Switching Valve) stuck open	Leak detection pump creates negative pressure (vacuum) in EVAP system and EVAP system pressure measured. Reference pressure measured at start and at end of leak check. If stabilized pressure higher than [second reference pressure x 0.2], ECM determines that purge VSV stuck open	- Purge VSV - Connector/wire harness (Purge VSV - ECM) - ECM - Canister pump module - Leakage from EVAP system	While ignition switch OFF	2 trip
	Purge VSV stuck closed	After EVAP leak check performed, purge VSV turned ON (open), and atmospheric air introduced into EVAP system. Reference pressure measured at start and at end of check. If pressure does not return to near atmospheric pressure, ECM determines that purge VSV stuck closed	- Purge VSV - Connector/wire harness (Purge VSV - ECM) - ECM - Canister pump module - Leakage from EVAP system	While ignition switch OFF	2 trip
	Purge flow	While engine running, following conditions successively met: - Negative pressure not created in EVAP system when purge VSV turned ON (open) - EVAP system pressure change less than 0.5 kPa-g (3.75 mmHg-g) when vent valve turned ON (closed) - Atmospheric pressure change before and after purge flow monitor less than 0.1 kPa-g (0.75 mmHg-g)	- Purge VSV - Connector/wire harness (Purge VSV - ECM) - Leakage from EVAP line (Purge VSV - Intake manifold) - ECM	While engine running	2 trip

DESCRIPTION

The circuit description can be found in the EVAP (Evaporative Emission) System (See page [ES-341](#)).

INSPECTION PROCEDURE

Refer to the EVAP System (See page [ES-346](#)).

MONITOR DESCRIPTION

The two monitors, Key-Off and Purge Flow, are used to detect malfunctions relating to DTC P0441. The Key-Off monitor is initiated by the ECM internal timer, known as the soak timer, 5 hours* after the ignition switch is turned to OFF. The purge flow monitor runs while the engine is running.

1. KEY-OFF MONITOR

5 hours* after the ignition switch is turned to OFF, the leak detection pump creates negative pressure (vacuum) in the EVAP system. The ECM monitors for leaks and actuator malfunctions based on the EVAP pressure.

HINT:

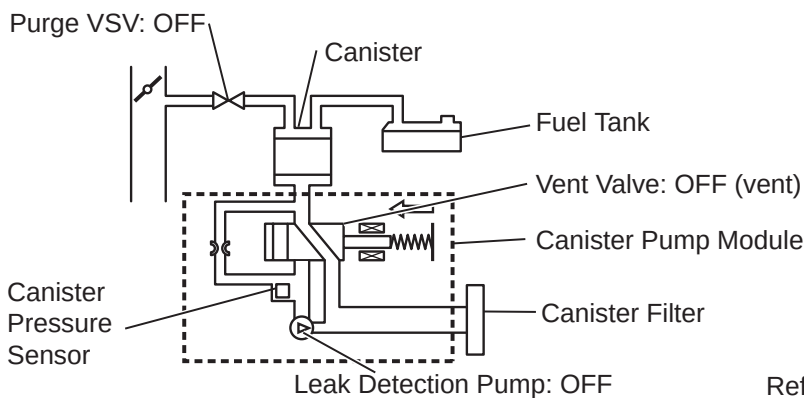
*: If the engine coolant temperature is not below 35°C (95°F) 5 hours after the ignition switch is turned to OFF, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the ignition switch is turned to OFF, the monitor check starts 2.5 hours later.

Sequence	Operations	Descriptions	Duration
-	ECM activation	Activated by soak timer, 5 hours (7 or 9.5 hours) after ignition switch turned to OFF.	-

Sequence	Operations	Descriptions	Duration
A	Atmospheric pressure measurement	Vent valve turned OFF (vent) and EVAP system pressure measured by ECM in order to register atmospheric pressure. If pressure in EVAP system not between 76 kPa-a and 110 kPa-a (570 mmHg-a and 825 mmHg-a), ECM cancels EVAP system monitor.	10 seconds
B	First reference pressure measurement	In order to determine reference pressure, leak detection pump creates negative pressure (vacuum) through reference orifice and then ECM checks if leak detection pump and vent valve operate normally.	60 seconds
C	EVAP system pressure measurement	Vent valve turned ON (closed) to shut EVAP system. Negative pressure (vacuum) created in EVAP system, and EVAP system pressure then measured. Write down measured value as will be used in leak check. If EVAP pressure does not stabilize within 15 minutes, ECM cancels EVAP system monitor.	15 minutes*
D	Purge VSV monitor	Purge VSV opened and then EVAP system pressure measured by ECM. Large increase indicates normality.	10 seconds
E	Second reference pressure measurement	After second reference pressure measurement, leak check performed by comparing first and second reference pressure. If stabilized system pressure higher than second reference pressure, ECM determines that EVAP system leaking.	60 seconds
F	Final check	Atmospheric pressure measured and then monitoring result recorded by ECM.	-

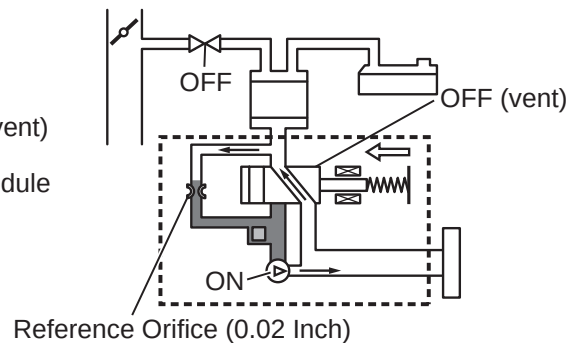
* If only a small amount of fuel is in the fuel tank, it takes longer for the EVAP pressure to stabilize.

Operation A: Atmospheric Pressure Measurement

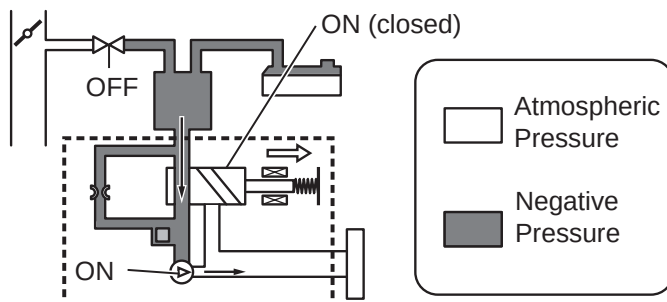


Operation B, E:

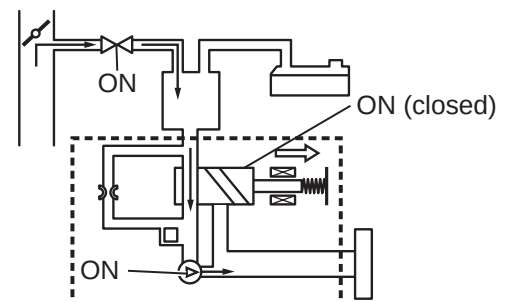
Reference Pressure Measurement



Operation C: EVAP System Pressure Measurement



Operation D: Purge VSV Monitor



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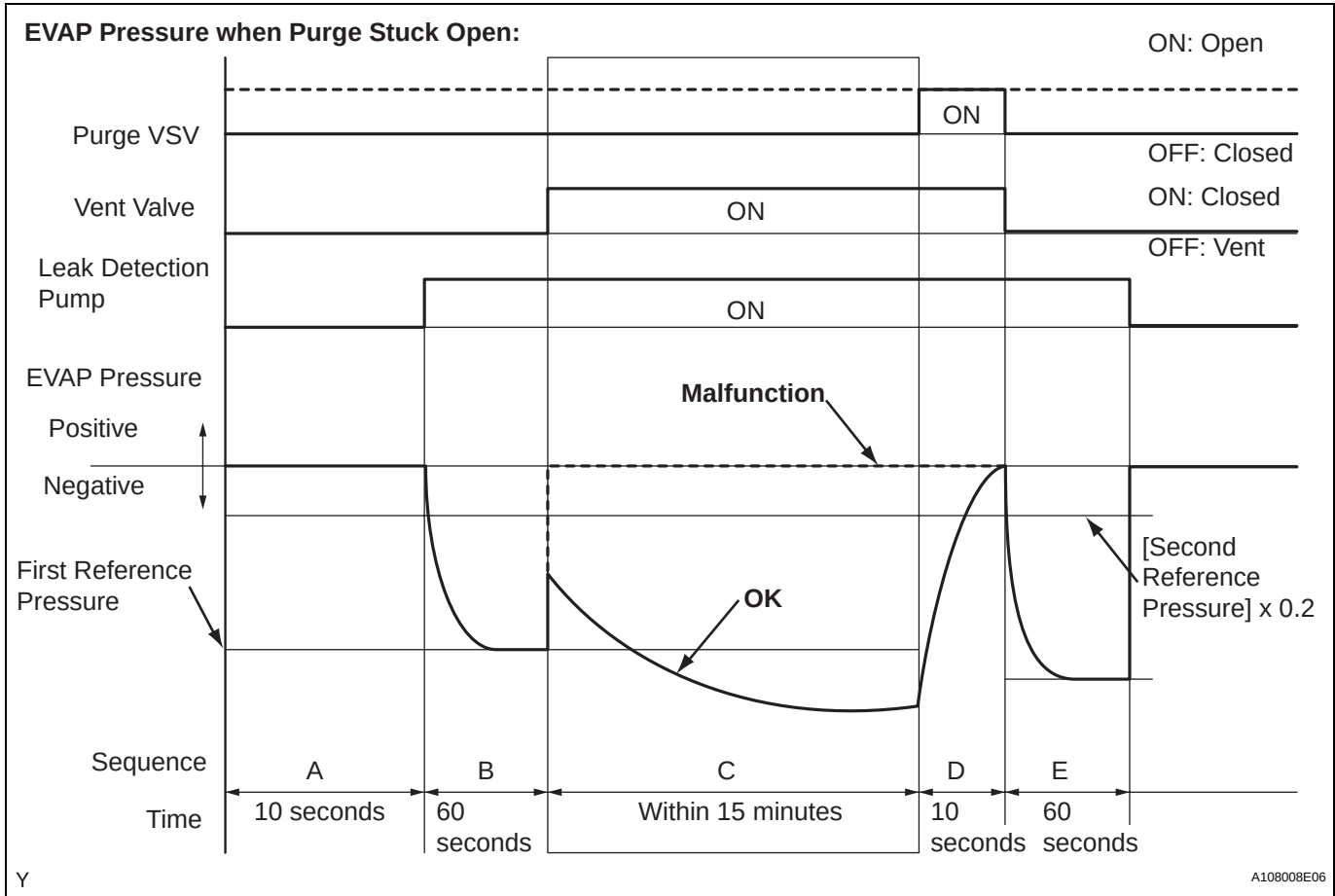
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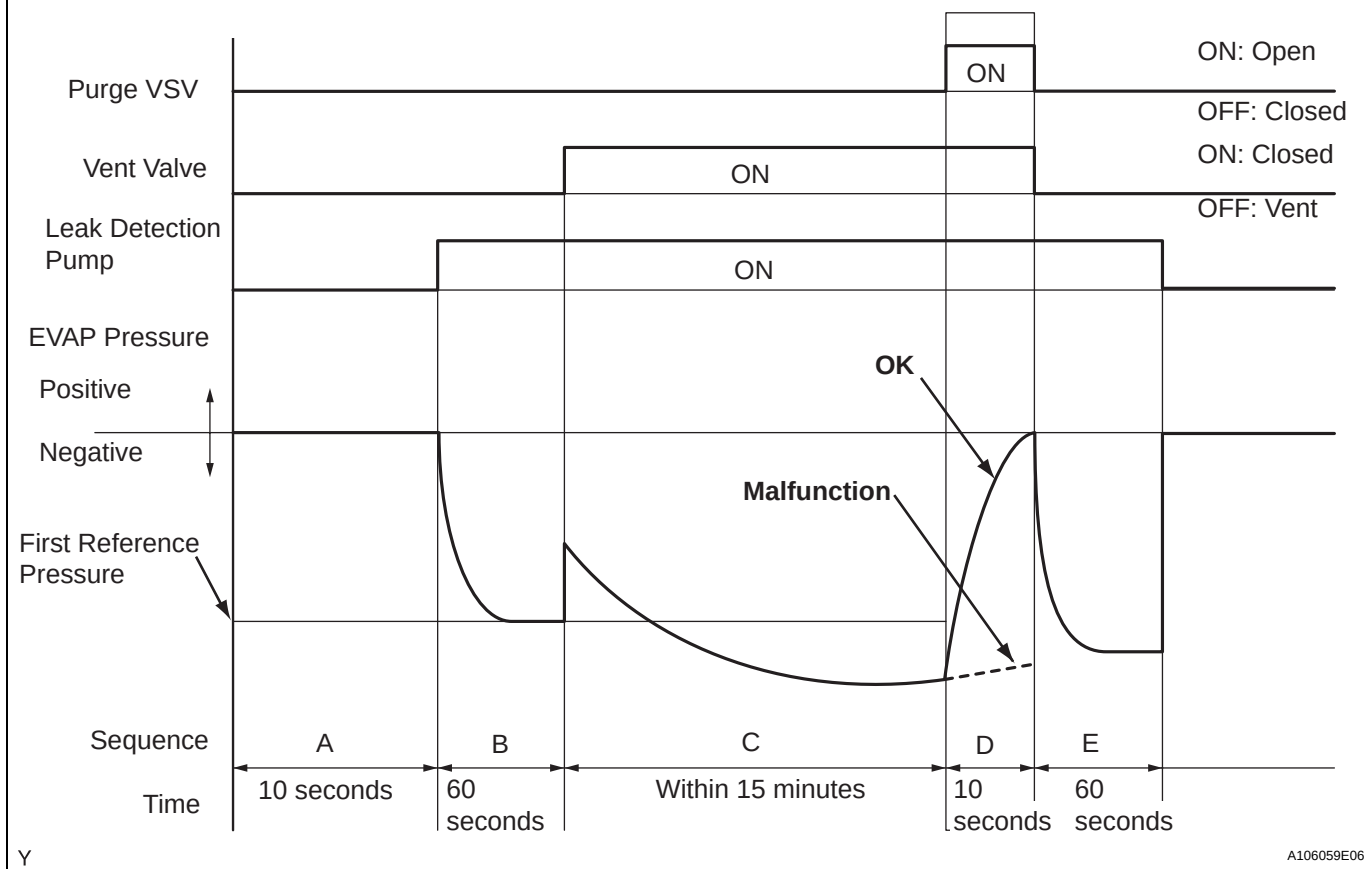
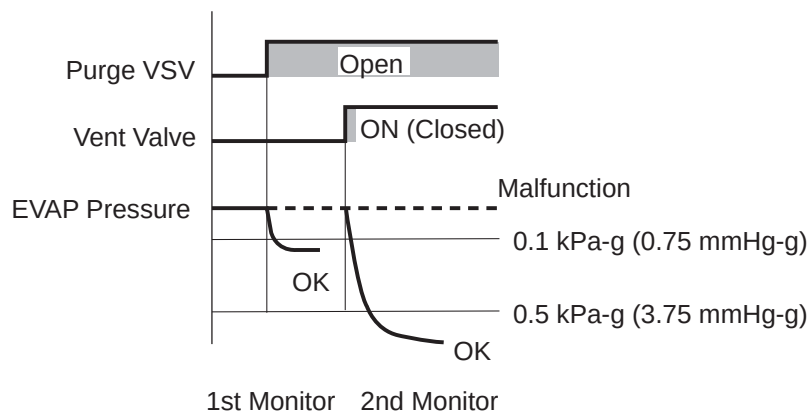
(a)Purge VSV stuck open

In operation C, the leak detection pump creates negative pressure (vacuum) in the EVAP system. The EVAP system pressure is then measured by the ECM using the canister pressure sensor. If the stabilized system pressure is higher than [second reference pressure x 0.2], the ECM interprets this as the purge VSV (Vacuum Switching Valve) being stuck open. The ECM illuminates the MIL and sets the DTC (2 trip detection logic).



(b) Purge VSV stuck closed

In operation D, the canister pressure sensor measures the EVAP system pressure. The pressure measurement for purge VSV monitor is begun when the purge VSV is turned ON (open) after the EVAP leak check. When the measured pressure indicates an increase of 0.3 kPa-g (2.25 mmHg-g) or more, the purge VSV is functioning normally. If the pressure does not increase, the ECM interprets this as the purge VSV being stuck closed. The ECM illuminates the MIL and sets the DTC (2 trip detection logic).

EVAP Pressure when Purge VSV Stuck Closed:**2. PURGE FLOW MONITOR****EVAP Pressure During Purge Flow Monitor:**

The purge flow monitor consists of the two step monitors. The 1st monitor is conducted every time and the 2nd monitor is activated if necessary.

- The 1st monitor
While the engine is running and the purge VSV is ON (open), the ECM monitors the purge flow by measuring the EVAP pressure change. If negative pressure is not created, the ECM begins the 2nd monitor.
- The 2nd monitor
The vent valve is turned ON (closed) and the EVAP pressure is then measured. If the variation in the pressure is less than 0.5 kPa-g (3.75 mmHg-g), the ECM interprets this as the purge VSV being stuck closed, and illuminates the MIL and sets DTC P0441 (2 trip detection logic).

Atmospheric pressure check:

In order to ensure reliable malfunction detection, the variation between the atmospheric pressures, before and after conduction of the purge flow monitor, is measured by the ECM.

OBD II MONITOR SPECIFICATIONS

Key-off Monitor

MONITOR STRATEGY

Related DTCs	P0441: Purge VSV stuck closed P0441: Purge VSV stuck open
Required Sensors/Components	Purge VSV and pump module
Frequency of Operation	Once per driving cycle
Duration	Within 2 minutes (varies with fuel in tank)
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All:

The monitor will run whenever the following DTCs are not present	P0011, P0012 (VVT system-Advance, Retard), P0100-P0103 (MAF sensor), P0110, P0112, P0113 (IAT sensor), P0115, P0117, P0118 (ECT sensor), P0120, P0122, P0123, P0220, P0222, P0223, P2135 (TP sensor), P0125 (Insufficient ECT for closed loop), P0171, P0172 (Fuel system), P0300, P0301, P0302, P0303, P0304 (Misfire), P0335 (CKP sensor), P0340, P0341 (CMP sensor), P0351, P0352, P0353, P0354 (Igniter), P0450, P0451, P0542, P0453 (EVAP pressure sensor), P0500 (VSS)
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Enable conditions of EVAP key-off monitor

Atmospheric pressure:	70 to 110 kPa (525 to 825 mmHg) [absolute pressure]
Battery voltage	10.5 V or higher
Vehicle speed	2.5 mph (4 km/h) or less
Ignition switch	OFF
Time after key off	5 hours
EVAP pressure sensor malfunction (P0450, P0452, P0453)	Not detected
EVAP canister purge valve	Not operated by scan tool
EVAP canister vent valve	Not operated by scan tool
EVAP leak detection pump	Not operated by scan tool
Both of the following conditions set before key off	Conditions 1 and 2
1. Duration that vehicle has been driven	5 minutes or more
2. EVAP purge operation	Performed
ECT	4.4 to 35°C (40 to 95°F)
IAT	4.4 to 35°C (40 to 95°F)

EVAP key-off monitor sequence 1 to 8

1. Atmospheric pressure measurement

Next sequence is run if the following condition is set:	-
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Atmospheric pressure change for 10 seconds	Within 0.3 kPa (2.25 mmHg) in 1 second
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2. Reference pressure measurement

Next sequence is run if the following conditions are set:	-
EVAP pressure just after reference pressure measurement start	-1 kPa (-7.5 mmHg) or less
Reference pressure	-4.5 to -1 kPa (-33.75 to -7.5 mmHg)
Reference pressure	Saturated within 60 seconds

3. EVAP canister vent valve close stuck check

Next sequence is run if the following condition is set:	-
EVAP pressure change after vent valve is ON	0.3 kPa (2.25 mmHg) or more

4. Vacuum introduction and EVAP leak check

Next sequence is run if the following condition is set:	-
EVAP pressure	Saturated within 12 minutes

5. EVAP canister purge valve close stuck check

Next sequence is run if the following condition is set:	-
EVAP pressure change after purge valve is open	0.3 kPa (2.25 mmHg) or more

6. Second reference pressure measurement

Next sequence run if all of following conditions set:	Condition 1, 2, 3 and 4
1. EVAP pressure just after reference pressure	-1 kPa-g (-7.5 mmHg-g) or less
2. Reference pressure	-4.85 to -1.057 kPa-g (-36.4 to -7.93 mmHg-g)
3. Reference pressure	Saturated within 60 seconds
4. Reference pressure difference between first and second	Less than 0.7 kPa-g (5.25 mmHg-g)

7. Leak check

Next sequence run if following condition set:	-
EVAP pressure when vacuum introduction complete	Second reference pressure or less

8. Atmospheric pressure measurement

EVAP monitor complete if following condition set:	-
Atmospheric pressure difference between sequence 1 and 8	Within 0.3 kPa-g (2.25 mmHg-g)

TYPICAL MALFUNCTION THRESHOLDS

1. Purge VSV stuck open

EVAP pressure when vacuum introduction is complete	Higher than reference pressure x 0.2
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2. Purge VSV stuck closed

EVAP pressure change after EVAP canister purge valve is open	Less than 0.3 kPa (2.25 mmHg)
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OBD II MONITOR SPECIFICATIONS

Purge Flow Monitor

MONITOR STRATEGY

Related DTC	P0441: Purge flow
Required Sensors/Components	Purge VSV and pump module
Frequency of Operation	Continuous
Duration	20 to 25 seconds

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MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	P0011, P0012 (VVT system-Advance, Retard), P0100, P0102, P0103 (MAF sensor), P0110, P0112, P0113 (IAT sensor), P0115, P0117, P0118 (ECT sensor), P0120, P0122, P0123, P0220, P0222, P0223, P2135 (TP sensor), P0125 (Insufficient ECT for closed loop), P0171, P0172 (Fuel system), P0300, P0301, P0302, P0303, P0304 (Misfire), P0335 (CKP sensor), P0340, P0341 (CMP sensor), P0351, P0352, P0353, P0354 (Igniter), P0450, P0451, P0452, P0453 (EVAP pressure sensor), P0500 (VSS)
Engine	Running
ECT	4.4°C (40°F) or more
IAT	4.4°C (40°F) or more
EVAP pressure malfunction	Not detected
EVAP canister purge valve	Not operated by scan tool
EVAP system check	Not operated by scan tool
Battery voltage	10 V or more
Purge duty cycle	8 % or more

TYPICAL MALFUNCTION THRESHOLDS

Both of the following conditions are met:	Conditions 1 and 2
1. EVAP pressure change when purge flow is started	Less than 0.1 kPa (0.75 mmHg)
2. EVAP pressure change during purge flow when EVAP pressure switching valve is ON (closed)	Less than 0.5 kPa (3.75 mmHg)

MONITOR RESULT

Refer to EVAP System (See page [ES-339](#)).