

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

DTC SUMMARY

DTCs	Monitoring Items	Malfunction Detection Conditions	Trouble Areas	Detection Timings	Detection Logic
P043E	Reference orifice clogged	Leak detection pump creates negative pressure through reference orifice, and EVAP system pressure measured to determine leak pressure standard. 0.02 inch leak criterion measured at start and at end of leak check. If system pressure lower than -4.85 kPa (-36.38 mmHg)*, ECM determines that reference orifice has clogging malfunction.	<ul style="list-style-type: none"> • Canister pump module • Connector/wire harness (Canister pump module - ECM) • ECM • Leakage from EVAP system 	While ignition switch OFF	2 trip
P043F	Reference orifice high-flow	Leak detection pump creates negative pressure through reference orifice, and EVAP system pressure measured to determine leak pressure standard. 0.02 inch leak criterion measured at start and at end of leak check. If system pressure higher than -1.06 kPa (-7.95 mmHg)*, ECM determines that reference orifice has high-flow malfunction.	<ul style="list-style-type: none"> • Canister pump module • Connector/wire harness (Canister pump module - ECM) • ECM • Leakage from EVAP system 	While ignition switch OFF	2 trip

*: The threshold values vary according to the atmospheric pressure measured at the beginning of the EVAP system monitor. The values described in the table above are based on an atmospheric pressure of 100 kPa (750.1 mmHg) (absolute pressure).

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-392](#)).

Refer to the EVAP System (see page [ES-397](#)).

MONITOR DESCRIPTION

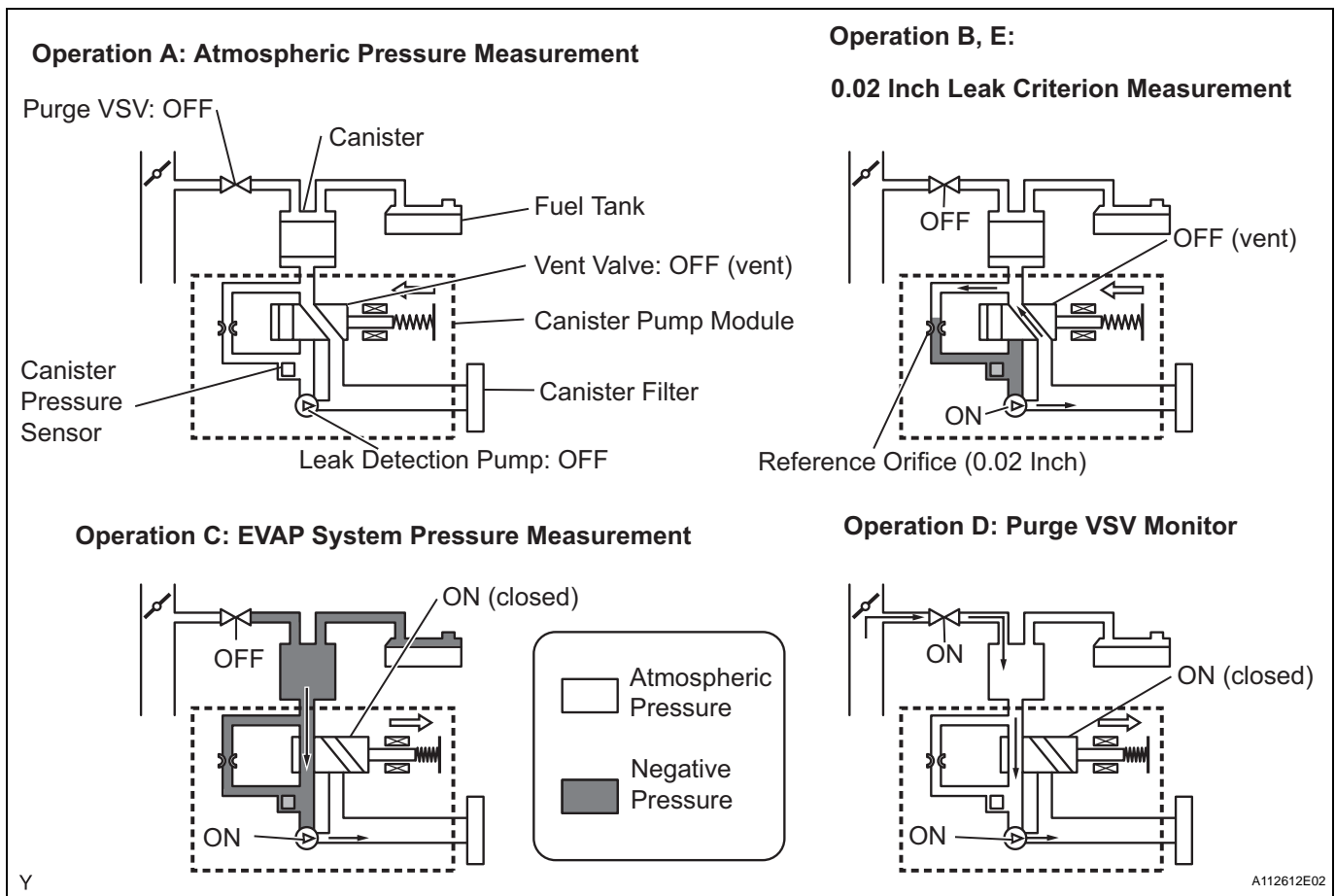
5 hours* after the ignition switch is turned to OFF, the electric leak detection pump creates negative pressure (vacuum) in the EVAP (Evaporative Emission) system. The ECM monitors for leaks and actuator malfunctions based on the EVAP pressure.

HINT:

*: If the engine coolant temperature is not below 35°C (95°F) 5 hours after the ignition switch is turned 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 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.	-
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 70 kPa and 110 kPa (525 mmHg and 825 mmHg), ECM cancels EVAP system monitor.	10 seconds
B	First 0.02 inch leak criterion (reference pressure) measurement	In order to determine 0.02 inch leak criterion, 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 they 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 normal.	10 seconds
E	Second 0.02 inch leak criterion (reference pressure) measurement	After second 0.02 inch leak pressure measurement, leak check performed by comparing first and second 0.02 inch leak criterion. If stabilized system pressure higher than second 0.02 inch leak criterion, ECM determines that EVAP system leaking.	60 seconds
F	Final check	Atmospheric pressure measured and then monitoring result recorded by ECM.	-

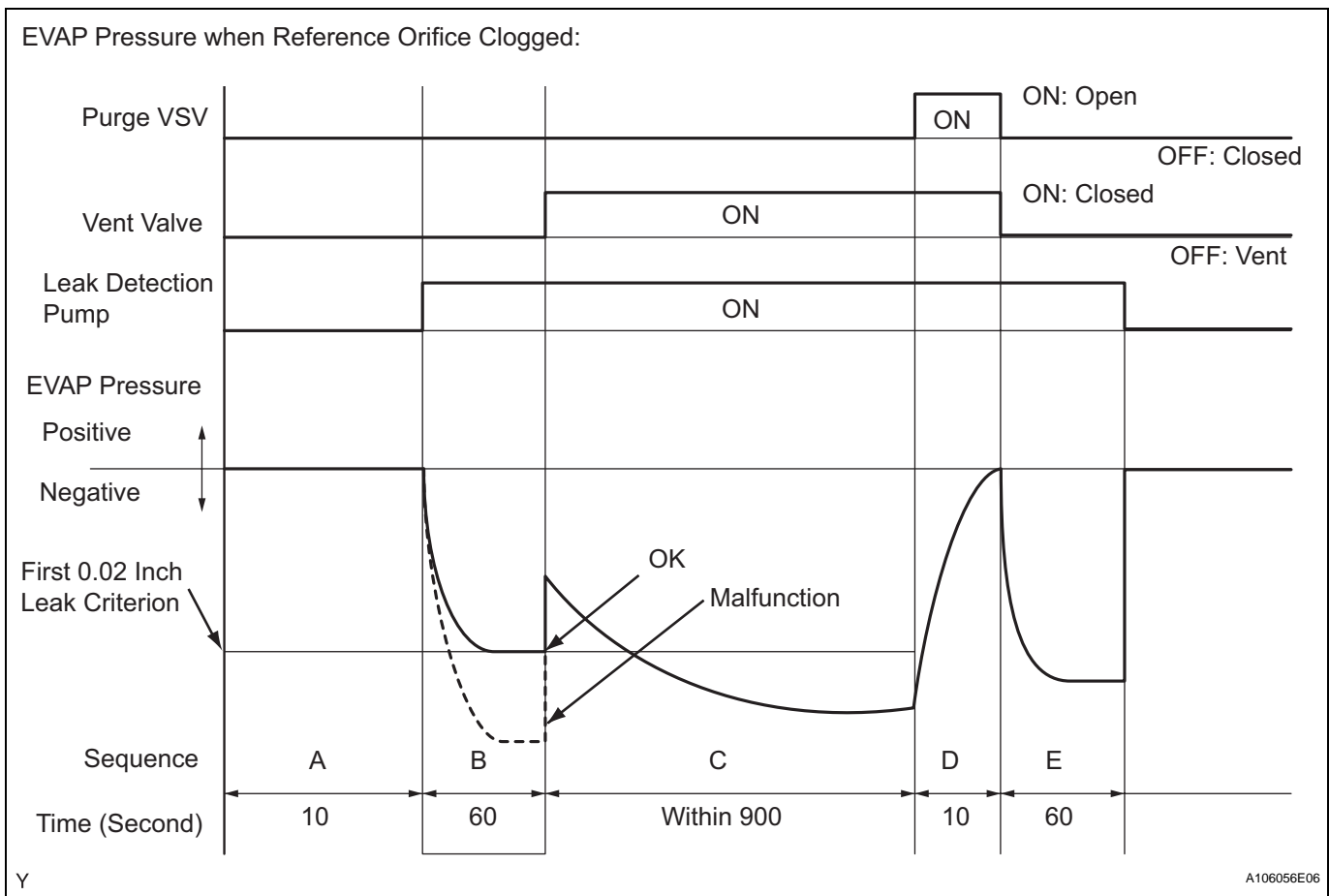
* If only a small amount of fuel is in the fuel tank, it takes longer for the EVAP pressure to stabilize.



(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 pressure sensor, to determine the 0.02 inch leak criterion. If the pressure is lower than -4.85 kPa (-36.38 mmHg)*, the ECM interprets this as a clog malfunction in the reference orifice, and stops the EVAP (Evaporative Emission) system monitor. The ECM then illuminates the MIL and sets the DTC (2 trip detection logic).

*: The threshold varies according to the atmospheric pressure measured in operation A. The value described above is based on an atmospheric pressure of 100 kPa (750.1 mmHg): absolute pressure.



(b) P043F: Reference orifice high-flow

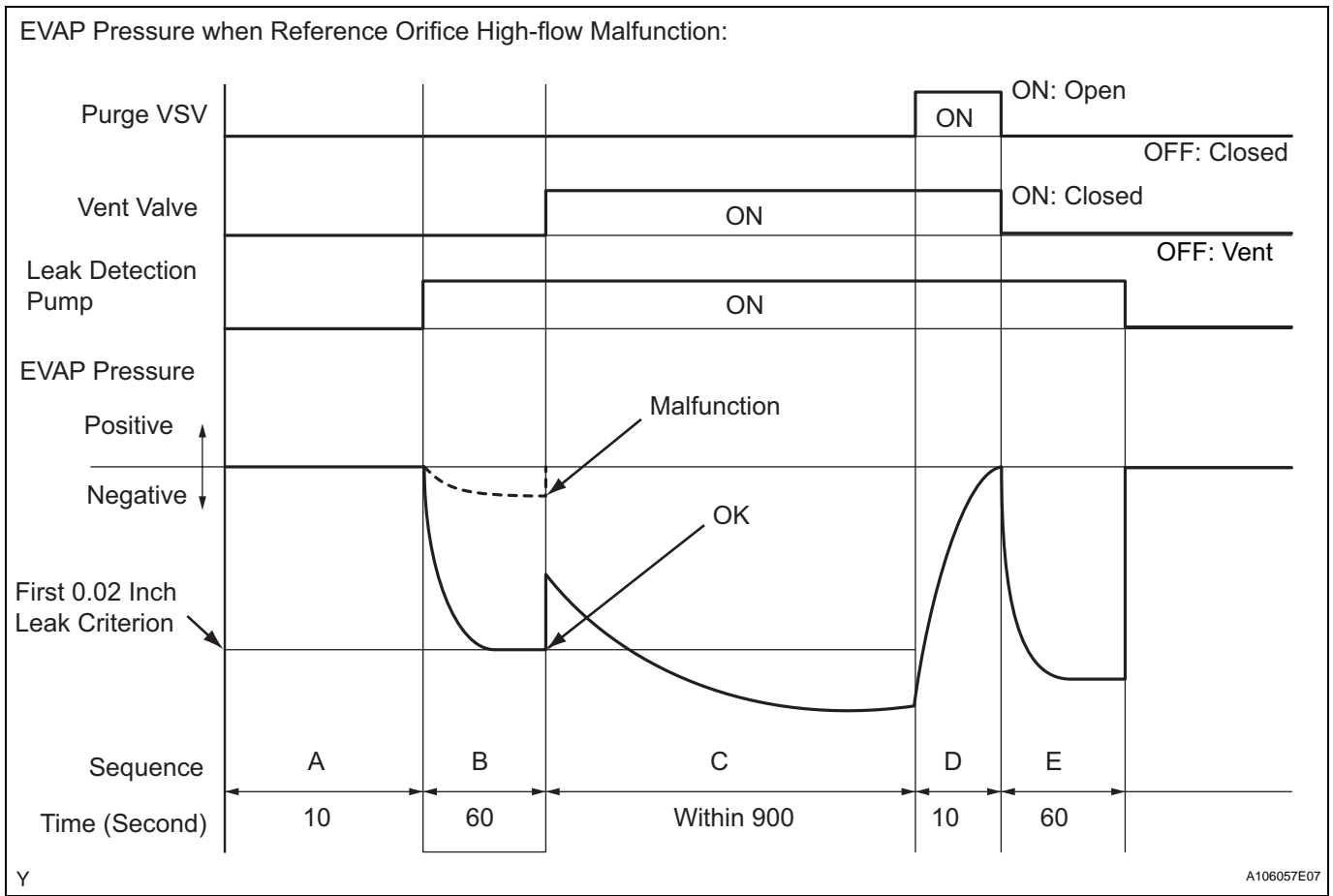
In operation B, the leak detection pump creates negative pressure (vacuum) through the reference orifice. The EVAP system pressure is then measured by the ECM using the canister pressure sensor to determine the 0.02 inch leak criterion. If the pressure is higher than -1.06 kPa (-7.95 mmHg)*, the ECM 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).

*: The threshold varies according to the atmospheric pressure measured in operation A. The value described above is based on a atmospheric pressure of 100 kPa (750.1 mmHg): absolute pressure.

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OBD II MONITOR SPECIFICATIONS

MONITOR STRATEGY

Required Sensors/Components	Canister pump module
Frequency of Operation	Once per driving cycle
Duration	Within 15 minutes (varies with amount of fuel in tank)
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not present	None
EVAP key-off monitor runs when all of following conditions met	-
Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg)
Battery voltage	10.5 V or more
Vehicle speed	Below 2.5 mph (4 km/h)
Ignition switch	OFF
FTP sensor malfunction (P0450, P0451, P0452 and P0453)	Not detected
Purge VSV	Not operated by scan tool
Vent valve	Not operated by scan tool
Leak detection pump	Not operated by scan tool
Both of following conditions met before IG switch OFF	Conditions 1 and 2
1. Duration that vehicle driven	5 minutes or more
2. Purge flow	Executed

ECT	4.4° to 35°C (40° to 95°F)
IAT	4.4° to 35°C (40° to 95°F)
Time after engine stopped	5 hours

Example of restart time

First time	7 hours
Second time	9 hours and 30 minutes

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

Next sequence is run if following condition set	-
Atmospheric pressure change for 10 second	Less than 0.3 kPa (2.25 mmHg) for 1 second

2. First reference pressure

Next sequence is run if all of following conditions set	Condition 1, 2 and 3
1. FTP when 4 seconds after reference pressure measurement	-1 kPa (-7.5 mmHg) or less
2. Reference pressure	-4.85 to -1.057 kPa (-33.38 to -7.93 mmHg)
3. Reference pressure	Saturated within 60 seconds

3. Vent valve stuck closed check

Next sequence is run if following condition set	-
FTP change for 10 seconds after vent valve ON (closed)	0.3 kPa (2.25 mmHg) or more

4. Vacuum introduction and leak

Next sequence is run if both of following conditions set	Condition 1 and 2
1. Vacuum introduction time	12 minutes or less
2. FTP	Saturated within 12 minutes

5. Purge VSV stuck closed check

Next sequence is run if following condition set	-
FTP change for 10 seconds after purge VSV ON (open)	0.3 kPa (2.25 mmHg) or more

6. Second reference pressure measurement

Next sequence is run if all of following conditions set	Condition 1, 2, 3 and 4
1. FTP when 4 seconds after reference pressure measurement	-1 kPa (-7.5 mmHg) or less
2. Reference pressure	-4.85 to -1.057 kPa (-36.4 to -7.92 mmHg)
3. Reference pressure	Saturated within 60 seconds
4. Reference pressure difference between first and second	0.7 kPa (5.25 mmHg) or less

7. Leak check

Next sequence is run if following condition set	-
FTP when vacuum introduction was complete	Second reference pressure or less

8. Atmospheric pressure

Monitor is complete if following condition set	-
Atmospheric pressure difference between sequence 1 and 8	0.3 kPa (2.25 mmHg) or less

TYPICAL MALFUNCTION THRESHOLDS

"Saturated" indicates that the EVAP pressure change is less than 0.1 kPa (0.75 mmHg) in 30 seconds.

One of following conditions met	-
EVAP pressure just after reference pressure measurement start	More than -1 kPa (-7.5 mmHg)
Reference pressure	Less than -4.85 kPa (-36.4 mmHg)
Reference pressure	-1.057 kPa (-7.9 mmHg) or more
Reference pressure	Not saturated within 60 seconds

Difference between first and second reference pressure	0.7 kPa (5.3 mmHg) or more
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MONITOR RESULT

Refer to Checking Monitor Status (See page [ES-21](#)) or (See page [ES-422](#)).

DTC

P0441

Evaporative Emission Control System Incorrect Purge Flow

DTC SUMMARY

DTCs.	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. 0.02 inch leak criterion measured at start and at end of leak check. If stabilized pressure higher than [second 0.02 inch leak criterion x 0.2], ECM determines that purge VSV stuck open	<ul style="list-style-type: none"> Purge VSV Connector/wire harness (Purge VSV - ECM) ECM Canister pump module Leakage from EVAP system 	While ignition switch OFF	2 trip
P0441	Purge VSV stuck closed	After EVAP leak check performed, purge VSV turned ON (open), and atmospheric air introduced into EVAP system. 0.02 inch leak criterion measured at start and at end of the check. If pressure does not return to near atmospheric pressure, ECM determines that purge VSV stuck closed	<ul style="list-style-type: none"> Purge VSV Connector/wire harness (Purge VSV - ECM) ECM Canister pump module Leakage from EVAP system 	While ignition switch OFF	2 trip
P0441	Purge flow	While engine running, following conditions successively met: <ul style="list-style-type: none"> Negative pressure not created in EVAP system when purge VSV turned ON (open) EVAP system pressure change less than 0.5 kPa (3.75 mmHg) when vent valve turned ON (closed) Atmospheric pressure change before and after purge flow monitor less than 0.1 kPa (0.75 mmHg) 	<ul style="list-style-type: none"> Purge VSV Connector/wire harness (Purge VSV - ECM) Leakage from EVAP line (Purge VSV - Intake manifold) ECM 	While engine running	2 trip

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DESCRIPTION

The circuit description can be found in the EVAP (Evaporative Emission) System (see page [ES-392](#)).

Refer to the EVAP System (see page [ES-397](#)).

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 electric leak detection pump creates negative pressure (vacuum) in the EVAP (Evaporative Emission) 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 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 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.	-
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 70 kPa and 110 kPa (525 mmHg and 825 mmHg), ECM cancels EVAP system monitor.	10 seconds
B	First 0.02 inch leak criterion (reference pressure) measurement	In order to determine 0.02 inch leak criterion, 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 they 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 normal.	10 seconds

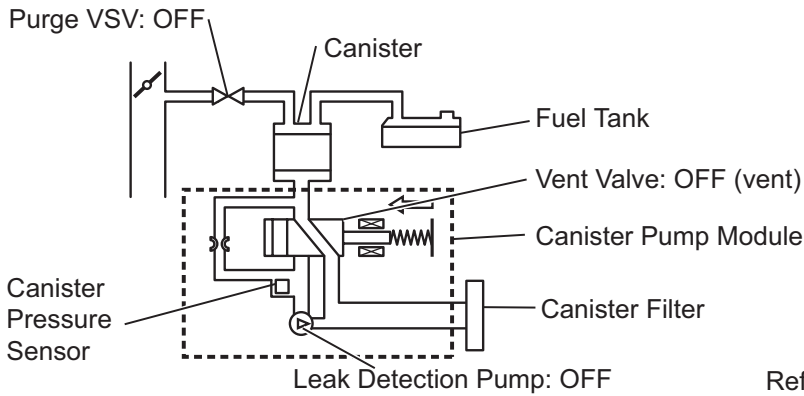
Sequence	Operations	Descriptions	Duration
E	Second 0.02 inch leak criterion (reference pressure) measurement	After second 0.02 inch leak criterion measurement, leak check performed by comparing first and second 0.02 inch leak criterion. If stabilized system pressure higher than second 0.02 inch leak criterion, ECM determines that EVAP system leaking.	60 seconds
F	Final check	Atmospheric pressure measured and then monitoring result recorded by ECM.	-

HINT:

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

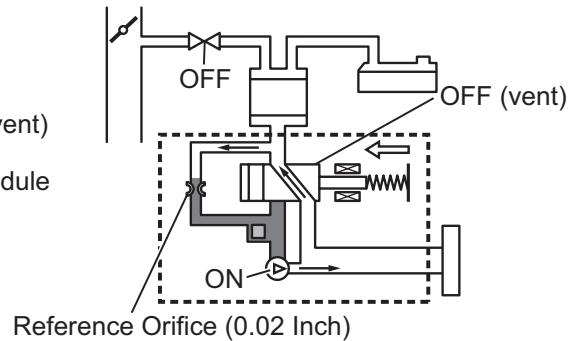
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Operation A: Atmospheric Pressure Measurement

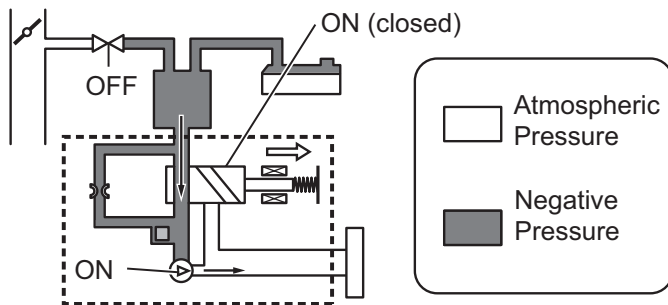


Operation B, E:

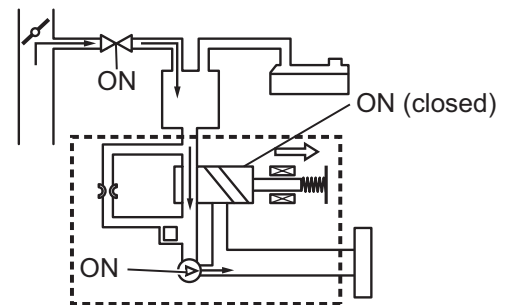
0.02 Inch Leak Criterion Measurement



Operation C: EVAP System Pressure Measurement



Operation D: Purge VSV Monitor

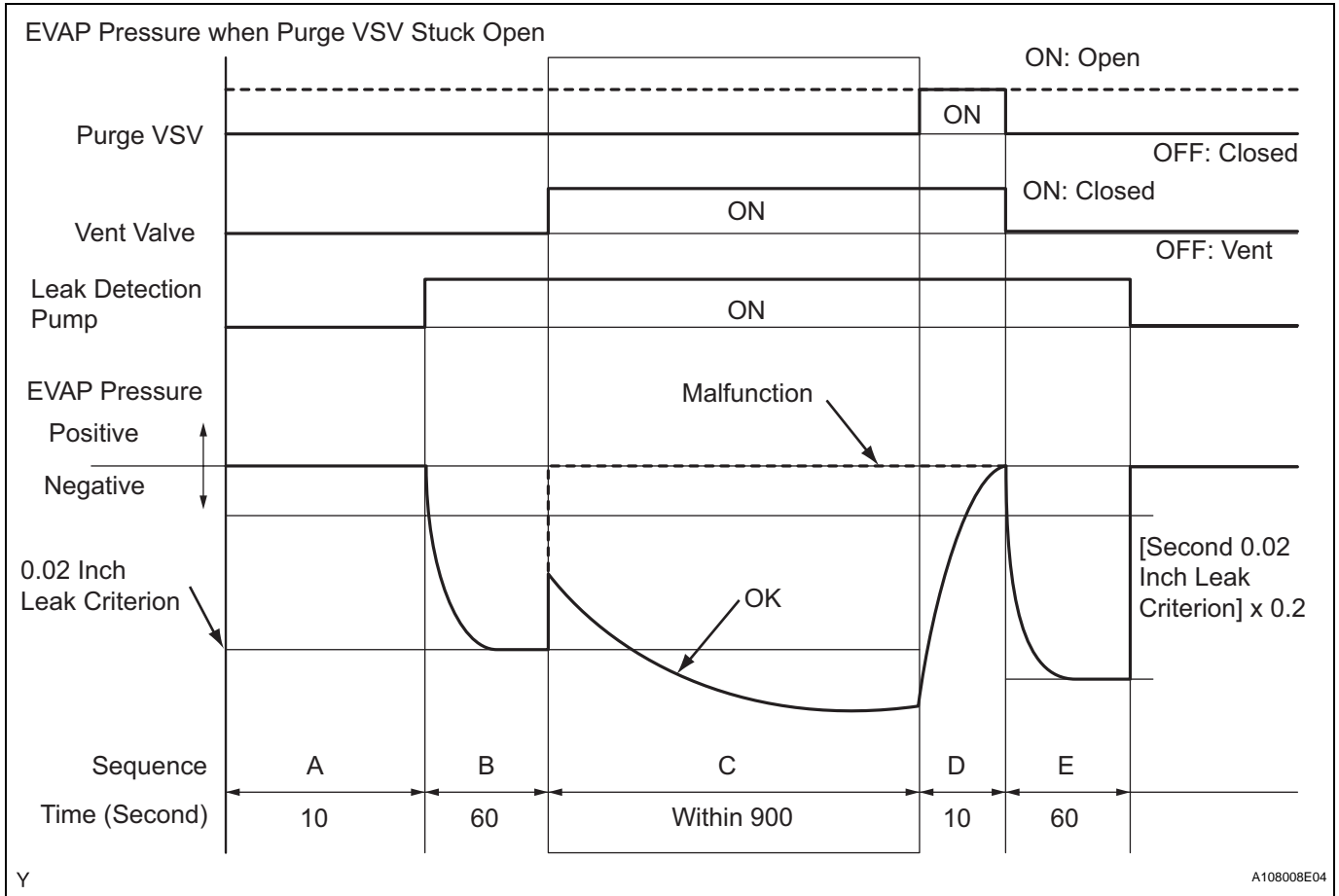


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(a) Purge VSV stuck open

In operation C, the leak detection pump creates negative pressure (vacuum) in the EVAP (Evaporative Emission) 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 0.02 inch leak criterion 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).



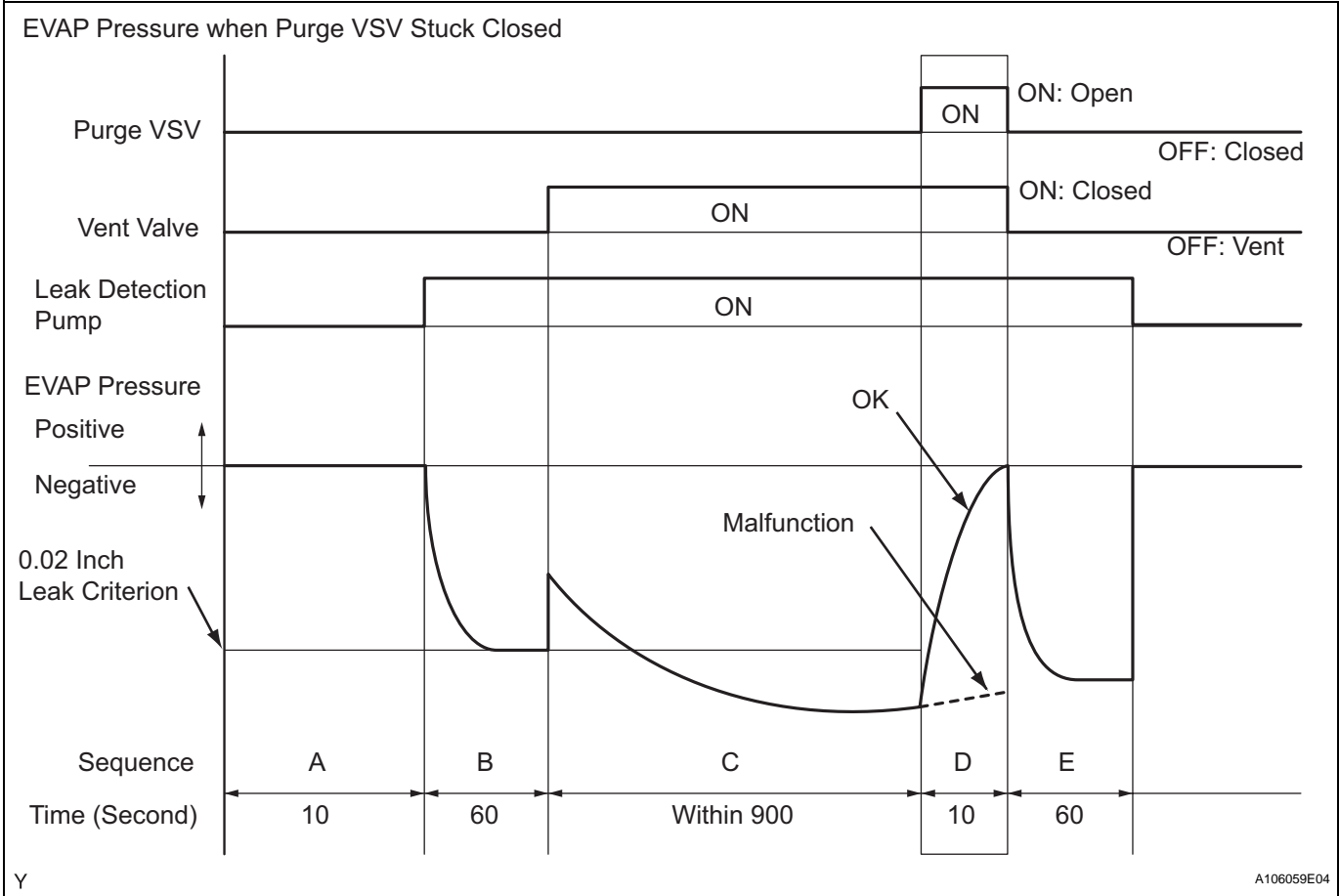
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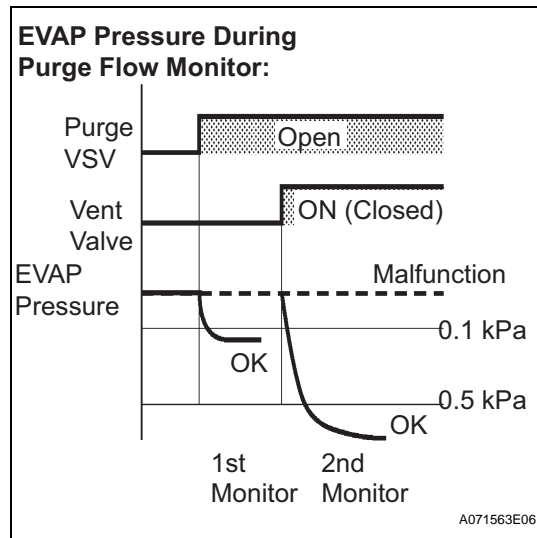
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(b) Purge VSV stuck closed

In operation D, the canister pressure sensor measures the EVAP (Evaporative Emission) 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 (2.25 mmHg) 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).



2. 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 (Vacuum Switching Valve) 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 (3.75 mmHg), 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

1. Key-off Monitor

Monitor Strategy

Required Sensors/Components	Purge VSV and Canister pump module
Frequency of Operation	Once per driving cycle
Duration	Within 15 minutes (varies with fuel in tank)
MIL Operation	2 driving cycles
Sequence of Operation	None

Typical Enabling Conditions

Monitor runs whenever following DTCs not present	None
EVAP key-off monitor runs when all of following conditions met	-
Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg)
Battery voltage	10.5 V or more
Vehicle speed	Below 2.5 mph (4 km/h)
Ignition switch	OFF
FTP sensor malfunction (P0450, P0451, P0452 and P0453)	Not detected
Purge VSV	Not operated by scan tool
Vent valve	Not operated by scan tool
Leak detection pump	Not operated by scan tool
Both of following conditions met before IG switch OFF	Conditions 1 and 2
1. Duration that vehicle driven	5 minutes or more
2. Purge flow	Executed
ECT	4.4° to 35°C (40° to 95°F)
IAT	4.4° to 35°C (40° to 95°F)
Time after engine stopped	5 hours

Example of restart time

First time	7 hours
Second time	9 hours and 30 minutes

2. Key-off monitor sequence 1 to 8

1. Atmospheric pressure

Next sequence is run if following condition set	-
Atmospheric pressure change for 10 second	Less than 0.3 kPa (2.25 mmHg) for 1 second

2. First reference pressure

Next sequence is run if all of following conditions set	Condition 1, 2 and 3
1. FTP when 4 seconds after reference pressure measurement	-1 kPa (-7.5 mmHg) or less
2. Reference pressure	-4.85 to -1.057 kPa (-33.38 to -7.93 mmHg)
3. Reference pressure	Saturated within 60 seconds

3. Vent valve stuck closed check

Next sequence is run if following condition set	-
FTP change for 10 seconds after vent valve ON (closed)	0.3 kPa (2.25 mmHg) or more

4. Vacuum introduction and leak

Next sequence is run if both of following conditions set	Condition 1 and 2
1. Vacuum introduction time	12 minutes or less
2. FTP	Saturated within 12 minutes

5. Purge VSV stuck closed check

Next sequence is run if following condition set	-
FTP change for 10 seconds after purge VSV ON (open)	0.3 kPa (2.25 mmHg) or more

6. Second reference pressure measurement

Next sequence is run if all of following conditions set	Condition 1, 2, 3 and 4
1. FTP when 4 seconds after reference pressure measurement	-1 kPa (-7.5 mmHg) or less
2. Reference pressure	-4.85 to -1.057 kPa (-36.4 to -7.92 mmHg)
3. Reference pressure	Saturated within 60 seconds
4. Reference pressure difference between first and second	0.7 kPa (5.25 mmHg) or less

7. Leak check

Next sequence is run if following condition set	-
FTP when vacuum introduction was complete	Second reference pressure or less

8. Atmospheric pressure

Monitor is complete if following condition set	-
Atmospheric pressure difference between sequence 1 and 8	0.3 kPa (2.25 mmHg) or less

Typical Malfunction Thresholds

Purge VSV stuck open	-
FTP when vacuum introduction complete	Higher than reference pressure x 0.2
Purge VSV stuck closed	-
FTP change for 10 seconds after purge VSV ON (open)	Less than 0.3 kPa (2.25 mmHg)

"Saturated" indicates that the EVAP pressure change is less than 0.1 kPa (0.75 mmHg) in 30 seconds.

OBD II MONITOR SPECIFICATIONS**1. Purge Flow Monitor****Monitor Strategy**

Required Sensors/Components	Purge VSV and canister pump module
Frequency of Operation	Once per driving cycle
Duration	Within 30 seconds
MIL Operation	2 driving cycles
Sequence of Operation	None

Typical Enabling Conditions

Monitor runs whenever following DTCs not present	None
Engine	Running
ECT	4.4°C (40°F) or more
IAT	4.4°C (40°F) or more
FTP sensor malfunction	Not detected
Purge VSV	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
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Typical Malfunction Thresholds

Both of following conditions are met	Conditions 1 or 2
1. FTP change when purge operation started	Less than 0.1 kPa (0.75 mmHg)
2. FTP change during purge operation when vent valve closed	Less than 0.5 kPa (3.75 mmHg)

MONITOR RESULT

Refer to Checking Monitor Status (See page [ES-422](#)) or (See page [ES-21](#)).