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 Logics
P043E	Reference orifice clogged	Leak detection pump creates negative pressure through reference orifice, and EVAP system pressure measured to determine 0.02 inch leak criterion. 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.	• Canister pump module • Connector/wire harness (Canister pump module - ECM) • ECM • Leakage from EVAP system	While ignition switch OFF	2 trips
P043F	Reference orifice high-flow	Leak detection pump creates negative pressure through reference orifice, and EVAP system pressure measured to determine 0.02 inch leak criterion. 0.02 inch leak criterion generated 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.			

*: 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 System (See page ES-351).

Refer to the EVAP System (See page ES-351).

MONITOR DESCRIPTION

5 hours* after the ignition switch is turned 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 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

Sequence	Operations	Descriptions	Duration
B	First 0.02 inch leak criterion 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 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.	-

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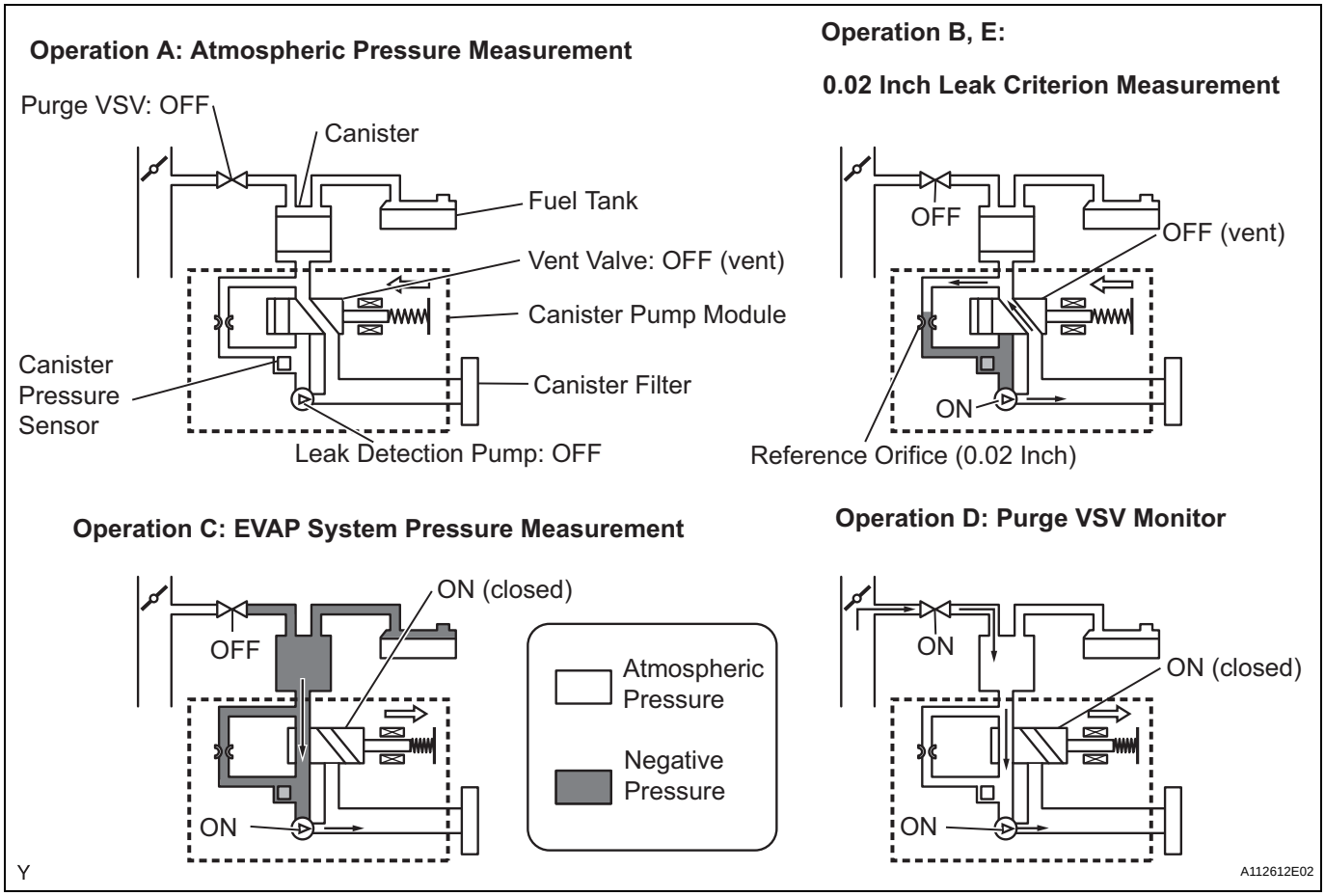
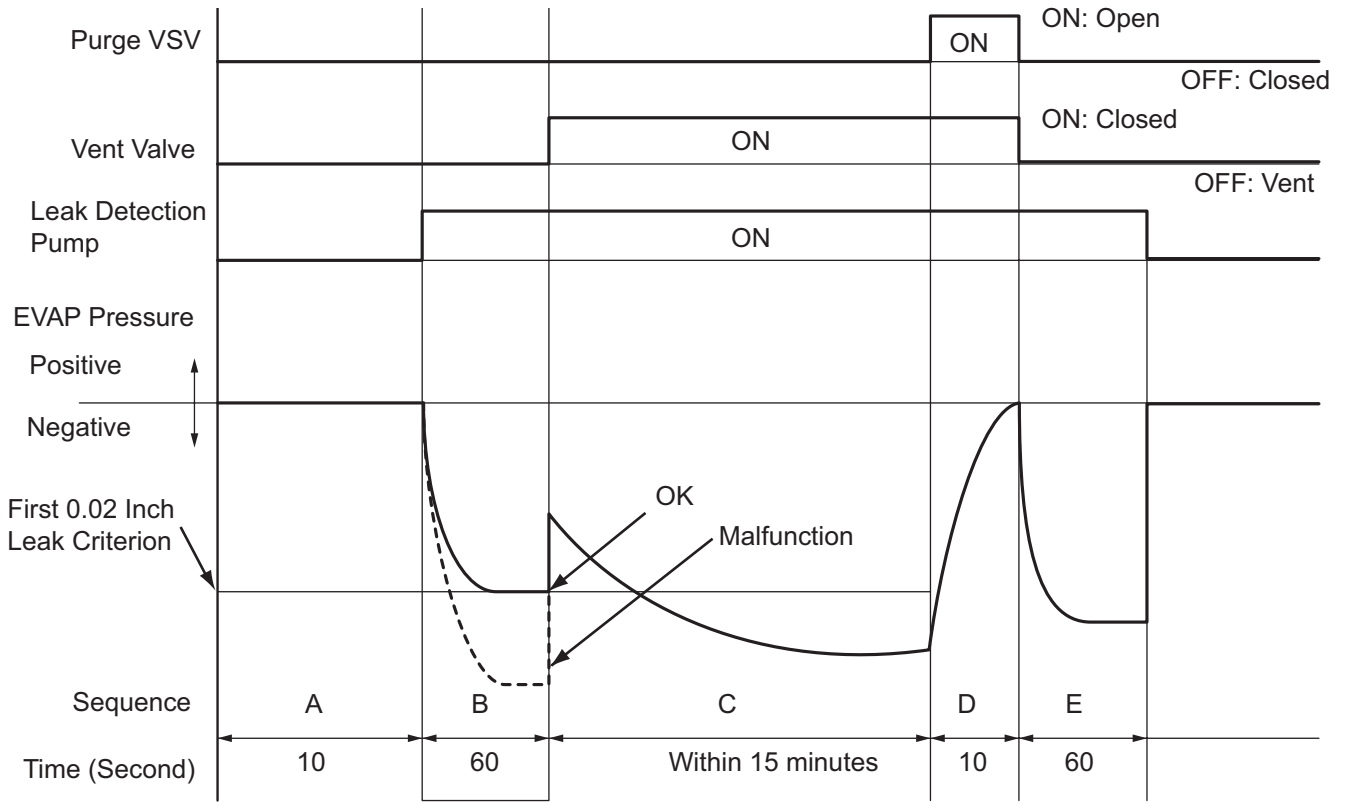
* If only a small amount of fuel is in the fuel tank, it takes longer for the EVAP pressure to stabilize.



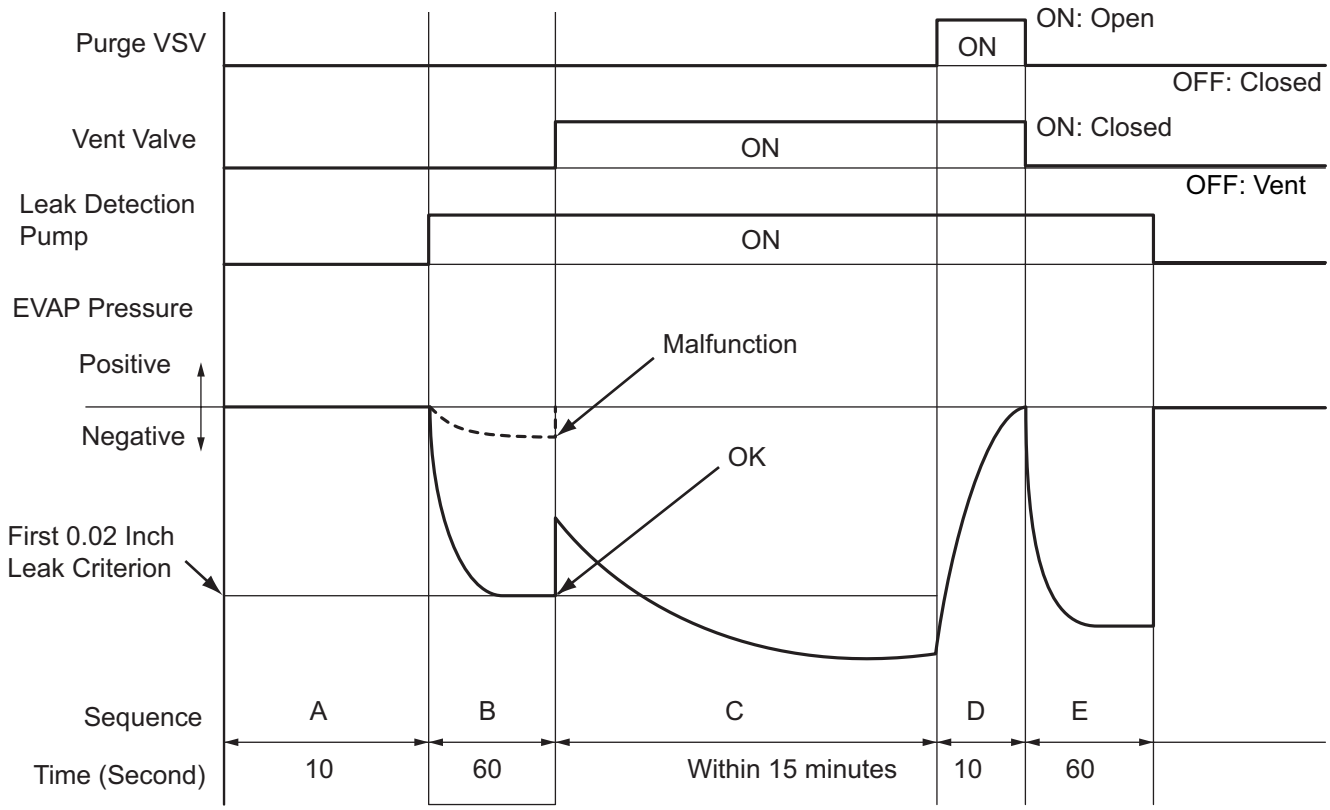
1. P043E: Reference orifice clogged
   In operation B, the leak detection pump creates negative pressure (vacuum) through the reference orifice. The EVAP system pressure is then measured by the ECM, using the canister pressure sensor, to determine the 0.02 inch leak criterion. If the pressure is lower 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.

EVAP Pressure when Reference Orifice Clogged:



2. 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.

EVAP Pressure when Reference Orifice High-flow Malfunction:



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 these DTCs not present	None
EVAP key-off monitor runs when all of following conditions met	-
Atmospheric pressure	525 to 825 mmHg (70 to 110 kPa)
Battery voltage	10.5 V or more
Vehicle speed	Below 2.5 mph (4 km/h)
Ignition switch	OFF
Engine condition	Not running

Fuel tank pressure sensor malfunction (P0450, P0452 and/or 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)

Example of restart time

First time	7 hours
Second time	9 hours and 30 minutes

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1. Key-off monitor sequence is 1 to 8

1. Atmospheric pressure

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

2. First 0.02 inch leak criterion

Next sequence is run if all of following conditions set	Conditions 1, 2 and 3
1. Fuel tank pressure when 4 seconds after 0.02 inch leak criterion measurement began	-7.5 mmHg (-1 kPa) or less
2. 0.02 inch leak criterion	-33.38 to -7.93 mmHg (-4.85 to -1.057 kPa)
3. 0.02 inch leak criterion	Saturated within 55 seconds

3. Vent valve stuck closed check

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

4. Vacuum introduction

Next sequence is run if both of following condition set	-
1. Vacuum introduction time	12 minutes or less
2. Fuel tank pressure	Fuel tank pressure was standard

5. Purge VSV stuck closed check

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

6. Second 0.02 inch leak criterion measurement

Next sequence is run if all of following conditions set	Conditions 1, 2, 3 and 4
1. Fuel tank pressure when 4 seconds after 0.02 inch leak criterion measurement began	-7.5 mmHg (-1 kPa) or less
2. 0.02 inch leak criterion	-36.4 to -7.92 mmHg (-4.85 to -1.057 kPa)
3. 0.02 inch leak criterion	Saturated within 55 seconds
4. 0.02 inch leak criterion difference between first and second	5.25 mmHg (0.7 kPa) or less

7. Leak check

Next sequence is run if following condition set	-
Arrival pressure when vacuum introduced for EVAP system	Leak detection criteria or less

8. Atmospheric pressure

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

TYPICAL MALFUNCTION THRESHOLDS

One of following conditions met	-
Fuel tank pressure when 4 seconds after 0.02 inch leak criterion measurement began	More than -7.5 mmHg (-1 kPa)
0.02 inch leak criterion	Less than -36.4 mmHg (-4.85 kPa)
0.02 inch leak criterion	-7.9 mmHg (-1.057 kPa) or more
0.02 inch leak criterion	Not saturated
0.02 inch leak criterion difference between first and second	5.3 mmHg (0.7 kPa) or more

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

MONITOR RESULT

Detailed information on Checking Monitor Status (See page ES-19).

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	• 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. 0.02 inch leak criterion measured at start and at end of leak 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 (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)	• 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 System (See page ES-351).

Refer to the EVAP System (See page ES-351).

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 OFF. The purge flow monitor runs while the engine is running.

1. KEY-OFF MONITOR

5 hours* after the ignition switch is turned 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.

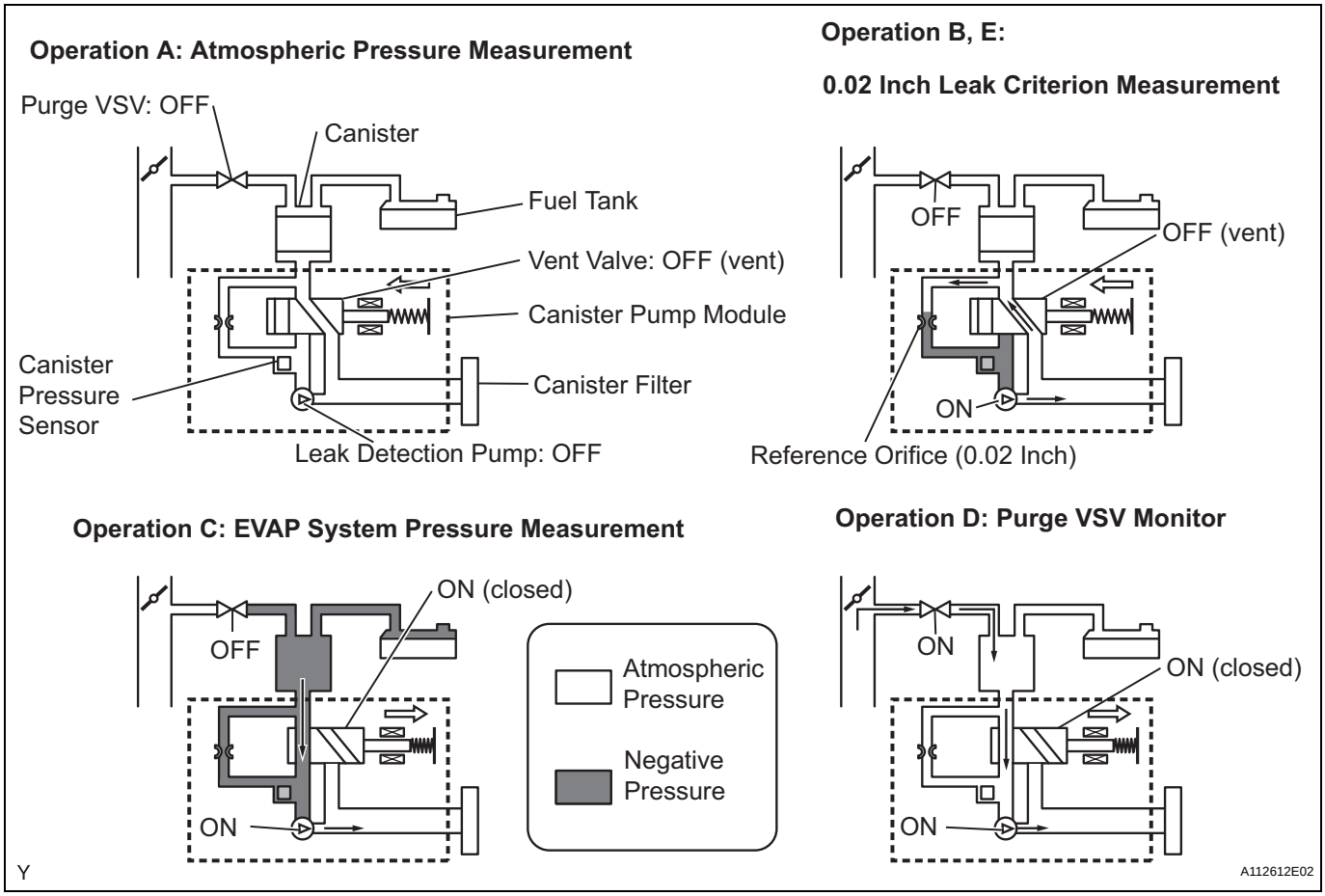
HINT:

*: 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.

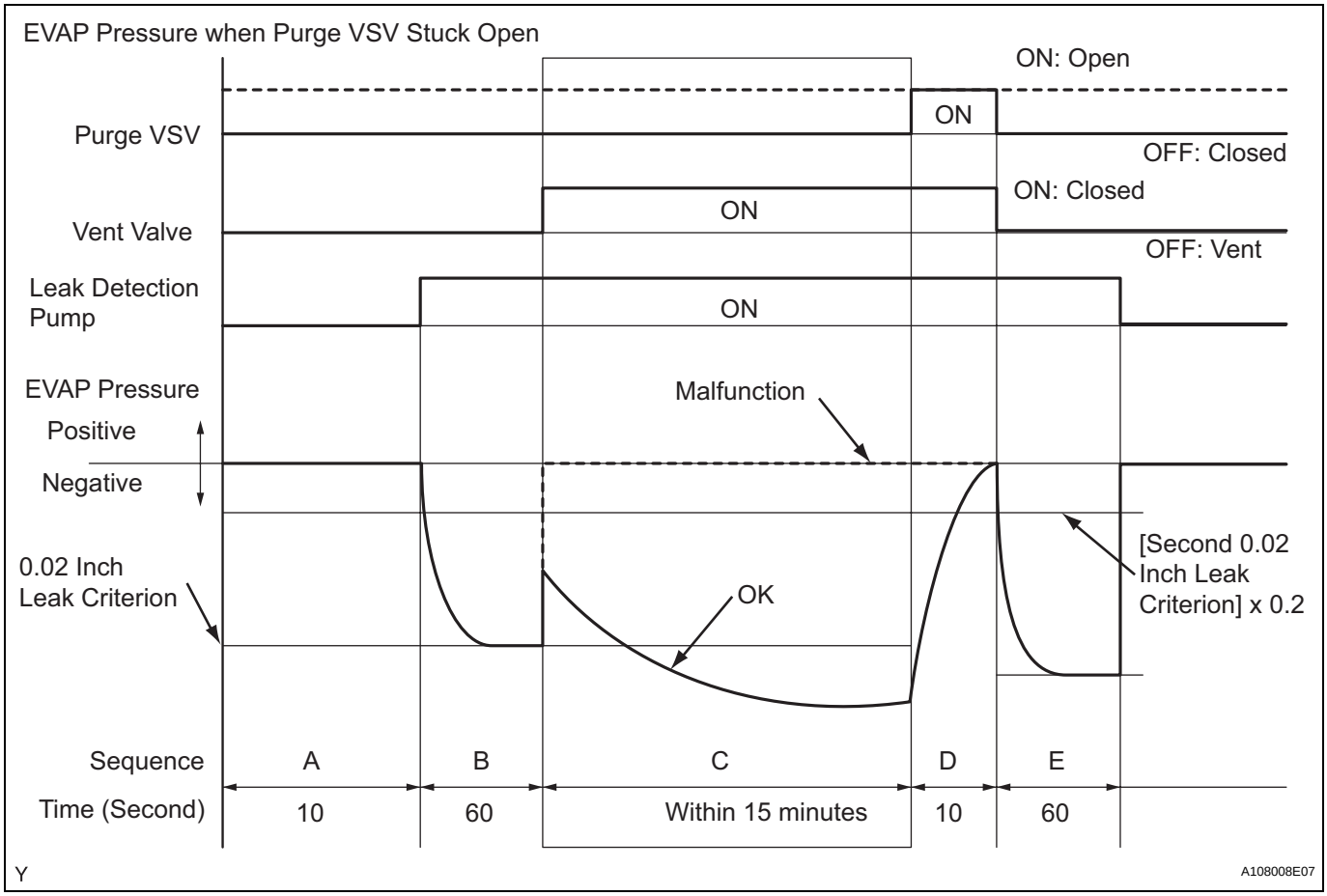
Sequence	Operation	Descriptions	Duration
-	ECM activation	Activated by soak timer, 5 hours (7 or 9.5 hours) after ignition switch turned OFF.	-

Sequence	Operation	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 70 kPa and 110 kPa (525 mmHg and 825 mmHg), ECM cancels EVAP system monitor.	10 seconds
B	First 0.02 inch leak criterion 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 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.	-

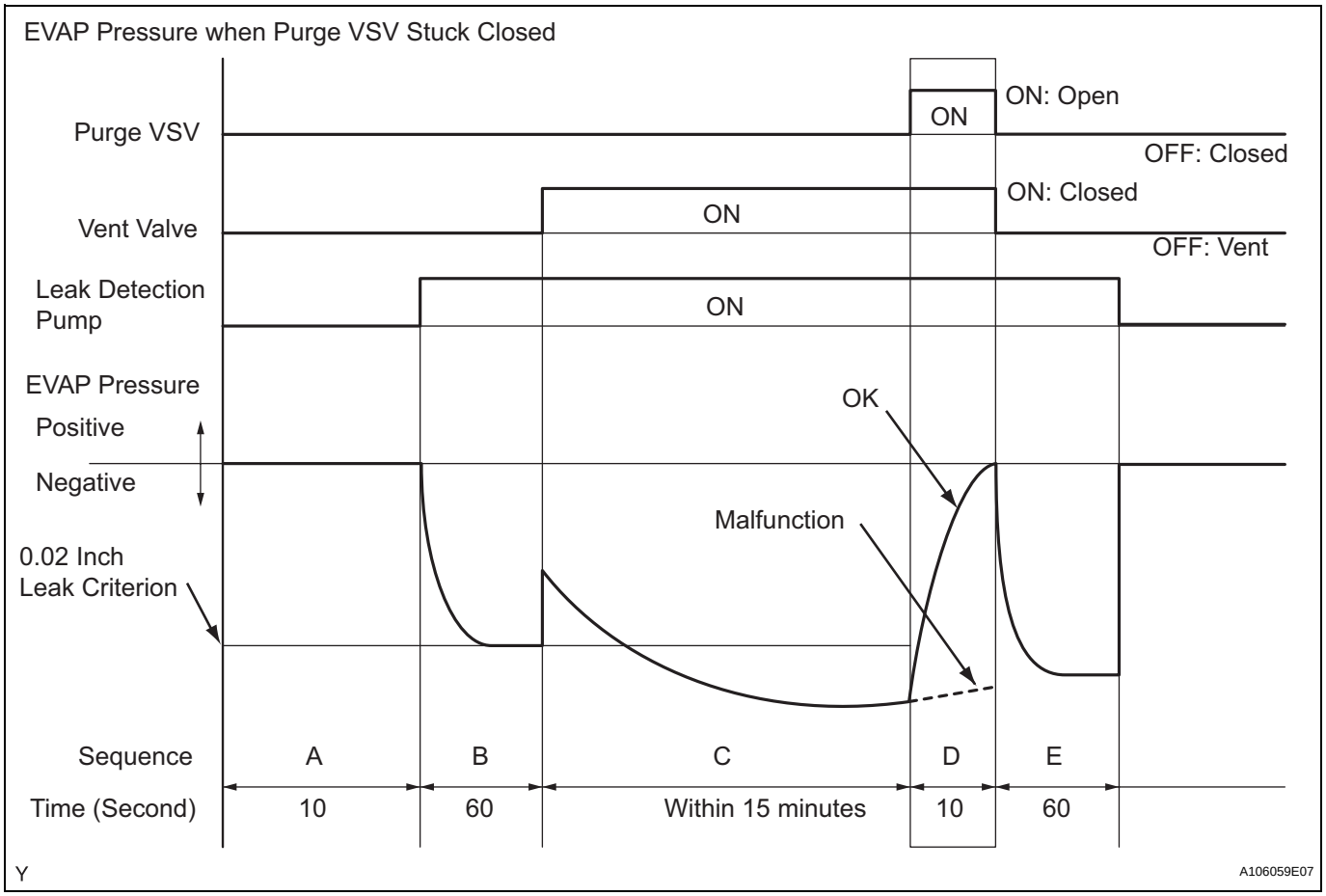
* If only a small amount of fuel is in the fuel tank, it takes longer for the EVAP pressure to stabilize.

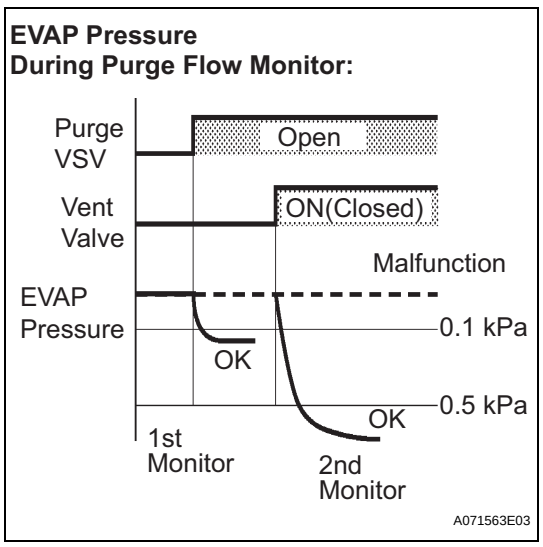


1. Purge VSV stuck open
   In operation C, the leak detection pump creates negative pressure (vacuum) in the EVAP (Evaporative Emission) system. The EVAP system pressure is then measured by the ECM using the canister pressure sensor. If the stabilized system pressure is higher than [second 0.02 inch 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).



2. Purge VSV stuck closed
In operation D, the canister pressure sensor measures the EVAP (Evaporative Emission) system pressure. Pressure measurement for the 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 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

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 higher
Vehicle speed	4 km/h (2.5 mph) or less
Ignition switch	OFF
EVAP control system pressure sensor	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 the following conditions 1 and 2 are met before key off	-
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)

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 measurement

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

2. First 0.02 inch leak criterion measurement

Next sequence is run if the following conditions set	Conditions 1, 2 and 3
1. EVAP pressure just after 0.02 inch leak criterion measurement start	-7.5 mmHg (-1 kPa) or less
2. 0.02 inch leak criterion	-33.38 to -7.93 mmHg (-4.85 to 1.057 kPa)
3. 0.02 inch leak criterion	Saturated within 55 seconds

3. Vent valve stuck closed check

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

4. Vacuum introduction

Next sequence is run if the following condition set	-
Vacuum introduction time	12 minutes or less

5. Purge VSV stuck closed check

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

6. Second 0.02 inch leak criterion measurement

Next sequence is run if the following conditions set	Conditions 1, 2, 3 and 4
1. EVAP pressure just after 0.02 inch leak criterion measurement	-7.5 mmHg (-1 kPa) or less
2. 0.02 inch leak criterion	-36.4 to -7.92 mmHg (-4.85 to -1.057 kPa)
3. 0.02 inch leak criterion	Saturated within 55 seconds
4. 0.02 inch leak criterion difference between first and second	5.25 mmHg (0.7 kPa) or less

7. Leak check

Next sequence is run if the following condition set	-
EVAP pressure when vacuum introduction is complete	Leak detection criteria or less

8. Atmospheric pressure measurement

EVAP monitor is complete if the following condition set	-
Atmospheric pressure difference between sequences 1 and 8	2.25 mmHg (0.3 kPa) 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 10 minutes (varies with fuel in tank)
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTC not present	None
Engine	Running
ECT	4.4°C (40°F) or more
IAT	4.4°C (40°F) or more
EVAP control system pressure sensor	Not detected
Purge VSV	Not detected by scan tool
EVAP system check	Not detected by scan tool
Battery voltage	10 V or higher
Purge duty cycle	8% or more

2. TYPICAL MALFUNCTION THRESHOLDS

Purge Flow Monitor:

Both of the 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

Detailed information on Checking Monitor Status (See page ES-19).