

DTC	P0441	EVAPORATIVE EMISSION CONTROL SYSTEM INCORRECT PURGE FLOW
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DTC SUMMARY

DTCs	Monitoring Items	Malfunction Detection Conditions	Trouble Areas	Detection Timings	Detection Logic
P0441	Purge VSV (Vacuum Switching Valve) stuck open	Vacuum pump creates negative pressure (vacuum) in EVAP system and EVAP system pressure measured. 0.02 inch leak pressure standard is measured at the start and at the end of the leak check. If stabilized pressure higher than [second 0.02 inch leak pressure standard 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 • 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 pressure standard is measured at the start and at the end of the leak check. If pressure does not return to near atmospheric pressure, ECM determines that purge valve stuck closed	<ul style="list-style-type: none"> • Purge VSV • Connector/wire harness (Purge VSV - ECM) • ECM • 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

CIRCUIT DESCRIPTION

The circuit description can be found in the EVAP (Evaporative Emission) Inspection Procedure (see page [05-317](#)).

INSPECTION PROCEDURE

Refer to the EVAP Inspection Procedure (see page [05-317](#)).

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

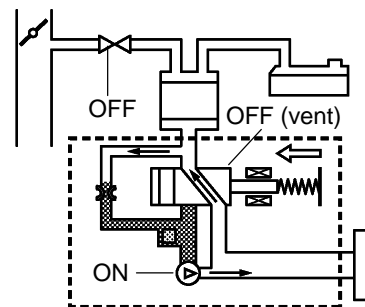
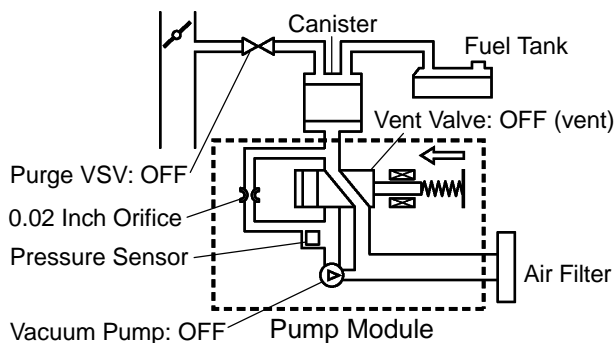
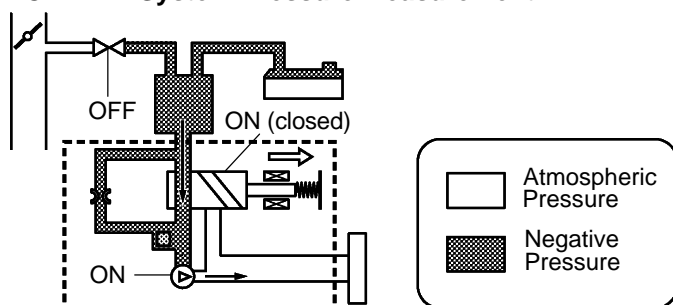
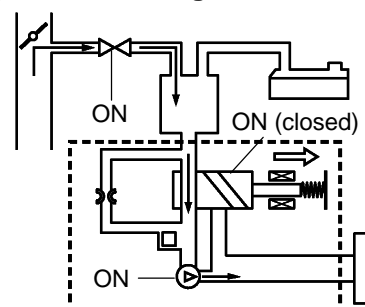
5 hours* after the ignition switch is turned OFF, the electric vacuum pump creates negative pressure (vacuum) in the EVAP (Evaporative Emission) system. The ECM monitors for leaks and actuator malfunctions based on the EVAP pressure.

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 EVAP pressure is 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 pressure measurement	In order to determine 0.02 inch leak pressure standard, vacuum pump creates negative pressure (vacuum) through 0.02 inch orifice and then ECM checks if vacuum 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 the measured value as it will be used in the 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 pressure measurement	Leak check is performed after second 0.02 inch leak pressure standard is measured. If stabilized system pressure higher than second 0.02 inch leak pressure standard, 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.

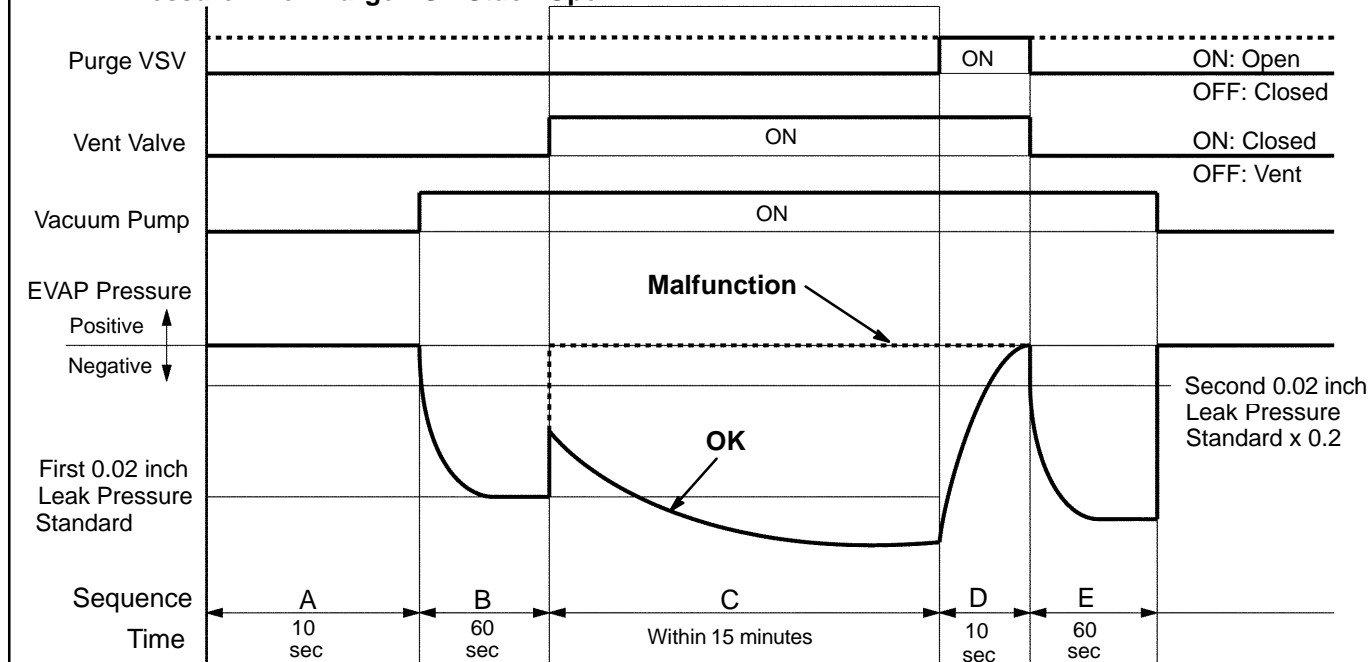
Operation A: Atmospheric Pressure Measurement Operation B, E: 0.02 Inch Leak Pressure Measurement

Operation C: EVAP System Pressure Measurement

Operation D: Purge VSV monitor


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(a) Purge VSV stuck open

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

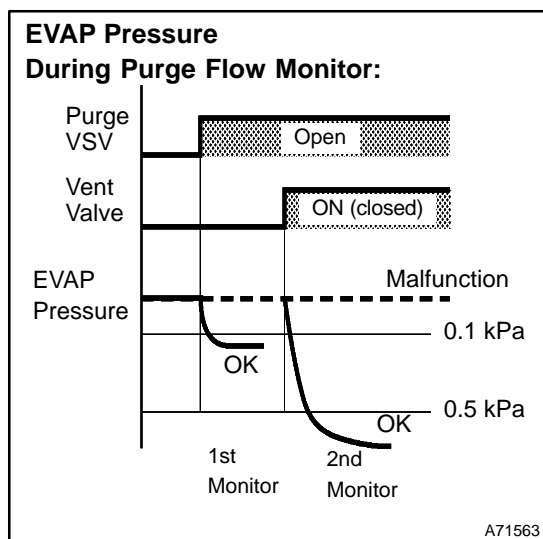
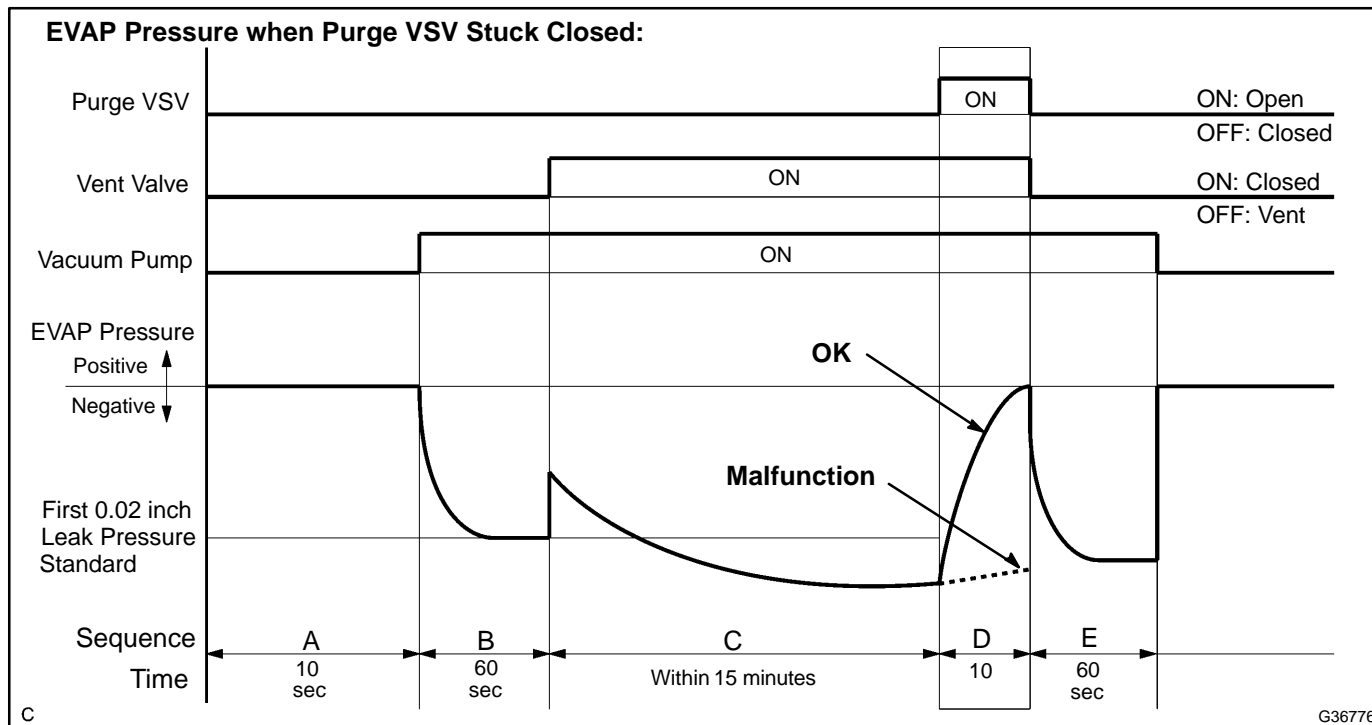
EVAP Pressure when Purge VSV Stuck Open:


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(b) Purge VSV stuck closed

In operation D, the 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 (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 (Key-off Monitor)

Monitor Strategy

Required Sensors/Components	Purge VSV and 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

The monitor will run whenever these DTCs are not present	See page 05-16
EVAP key-off monitor runs when all of the following conditions met	-
Atmospheric pressure	525 to 825 mmHg (70 to 110 kPa)
Battery voltage	10.5 V or more
Vehicle speed	Below 4 km/h (2.5 mph)
Ignition switch	OFF
Engine condition	Not running
Time after engine stopped	5 hours
FTP sensor malfunction (P0450, P0452, 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 the following conditions are met before IG switch OFF:	Condition 1 and 2
1. Duration that vehicle is driven	5 min. 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 re-start time

First time	7 hours
Second time	9 hours and 30 min.

Key-off monitor sequence: 1 to 8

1. Atmospheric pressure

Next sequence is run if following condition met	-
Atmospheric pressure change for 10 sec.	Within 2.25 mmHg (0.3 kPa) for 1 sec.

2. First reference pressure

Next sequence is run if all of following conditions met	Condition 1, 2 and 3
1. FTP when 4 sec. after reference pressure measurement	-7.5 mmHg (-1 kPa) or less
2. Reference pressure	-36.47 to -7.93 mmHg (-4.85 to -1.057 kPa)
3. Reference pressure	Saturated

3. Vent valve stuck closed check

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

4. Vacuum introduction and leak

Next sequence is run if both of following conditions met	Condition 1 and 2
1. Vacuum introduction time	Within 15 min.
2. FTP	FTP was saturated

5. Purge VSV stuck closed check

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

6. Second reference pressure measurement

Next sequence is run if all of following conditions met	Condition 1, 2, 3 and 4
1. FTP when 4 sec. after reference pressure measurement	-7.5 mmHg (-1 kPa) or less
2. Reference pressure	-36.47 to -7.93 mmHg (-4.85 to -1.057 kPa)
3. Reference pressure	Saturated
4. Reference pressure difference between first and second	Less than 5.25 mmHg (0.7 kPa)

7. Leak check

Next sequence is run if following condition met	-
FTP when vacuum introduction was complete	Lower than second reference pressure

8. Atmospheric pressure

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

Typical Malfunction Thresholds**Purge VSV stuck open**

FTP when vacuum introduction was complete	Higher than reference pressure x 0.2
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Purge VSV stuck closed

FTP change for 10 seconds after purge VSV ON (open)	Less than 2.25 mmHg (0.3 kPa)
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OBD II MONITOR SPECIFICATIONS (Purge Flow Monitor)**Monitor Strategy**

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

Typical Enabling Conditions

The monitor will run whenever these DTCs are not present	See page 05-16
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

Typical Malfunction Thresholds

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

MONITOR RESULT (MODE 06)

Refer to page [05-317](#) for detailed information on Monitor Result.