

## EVAP (Evaporative Emission) Inspection Procedure

### DTCS RELATING TO EVAP SYSTEM

DTCs	Monitoring Items	See Page
P043E	0.02 inch orifice clogged (built into pump module)	DI-353
P043F	0.02 inch orifice high-flow (built into pump module)	DI-353
P0441	<ul style="list-style-type: none"> <li>•Purge VSV (Vacuum Switching Valve) stuck closed</li> <li>•Purge VSV stuck open</li> <li>•Purge flow</li> </ul>	DI-236
P0450	Pressure sensor (built into pump module) voltage abnormal fluctuation	DI-243
P0451	<ul style="list-style-type: none"> <li>•Pressure sensor (built into pump module) noise</li> <li>•Pressure sensor (built into pump module) signal becomes fixed/flat</li> </ul>	DI-243
P0452	Pressure sensor (built into pump module) voltage low	DI-243
P0453	Pressure sensor (built into pump module) voltage high	DI-243
P0455	EVAP gross leak	DI-252
P0456	EVAP small leak	DI-252
P2401	Vacuum pump stuck OFF (built into pump module)	DI-339
P2402	Vacuum pump stuck ON (built into pump module)	DI-339
P2419	Vent valve stuck open (vent) (built into pump module)	DI-345
P2420	Vent valve stuck closed (built into pump module)	DI-345
P2610	Soak timer (built into ECM)	DI-351

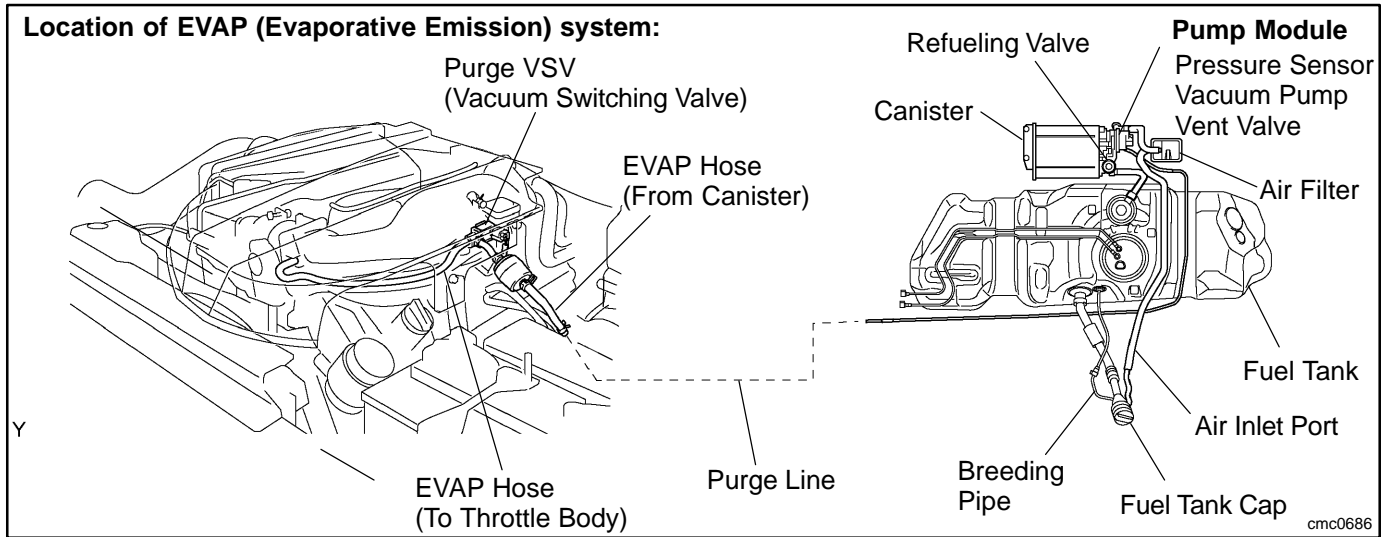
If any EVAP system DTCs are set, the malfunctioning area can be determined using the table below.

DTCs	P043E P043F	P0441	P0450	P0451	P0452	P0453	P0455	P0456	P2401 P2402	P2419	P2420
Malfunctioning Areas											
0.02 inch orifice clogged	●								●	●	
0.02 inch orifice high-flow	●								●	●	
Purge VSV stuck open		●					●				
Purge VSV stuck closed		●									
Pressure sensor stuck				●							
Pressure sensor noise				●							
Pressure sensor low output			●		●						
Pressure sensor high output			●			●					
Gross leak		●					●				
Small leak								●			
Vacuum pump stuck OFF	●								●	●	
Vacuum pump stuck ON	●								●	●	
Vent valve stuck open (vent)	●								●	●	
Vent valve stuck closed											●

#### NOTICE:

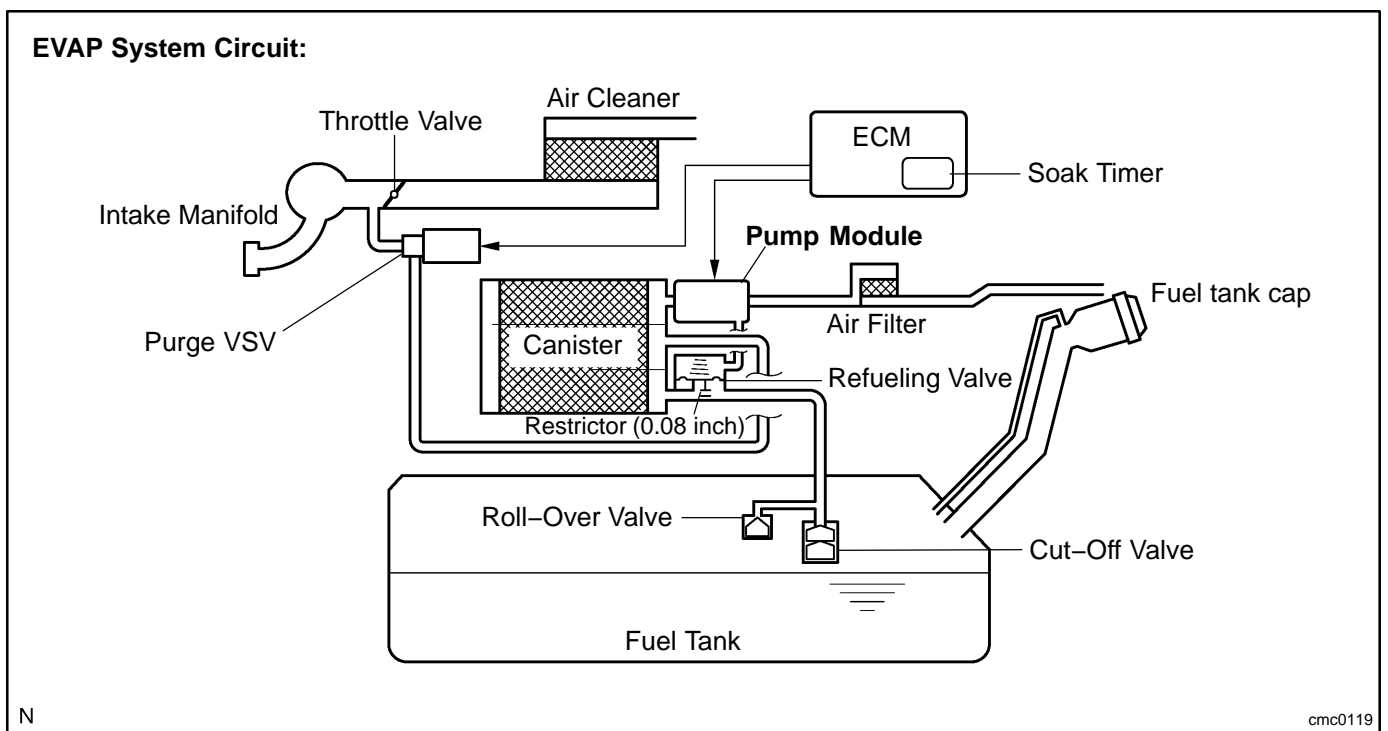
If the 0.02 inch reference pressure difference between the first and second checks is greater than the specification, the DTCs corresponding to the reference pressure (P043E, P043F, P0441, P0455, P0456, P2401, P2420) will be all stored.

## CIRCUIT DESCRIPTION



### HINT:

The canister is located near the fuel tank, underneath the body.



While the engine is running, if a predetermined condition (closed-loop, etc.) is met, the purge VSV is opened by the ECM and stored fuel vapors in the canister are purged to the intake manifold. The ECM changes the duty cycle ratio of the purge VSV to control purge flow volume.

The purge flow volume is also determined by the intake manifold pressure. Atmospheric pressure is allowed into the canister through the vent valve to ensure that the purge flow is maintained when the negative pressure (vacuum) is applied to the canister.

The following two monitors run to confirm appropriate EVAP system operation.

### Key-off monitor

This monitor checks for EVAP (Evaporative Emission) system leaks and pump module malfunctions. The monitor starts 5 hours\* after the ignition switch is turned OFF. More than 5 hours are required to allow enough time for the fuel to cool down to stabilize the Fuel Tank Pressure (FTP), thus making the EVAP system monitor more accurate.

The electric vacuum pump creates negative pressure (vacuum) in the EVAP system and the pressure is measured. Finally, the ECM monitors for leaks from the EVAP system, and malfunctions in both the pump module and purge VSV, based on the EVAP pressure.

#### HINT:

\*:If the engine coolant temperature is not below 35°C 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.

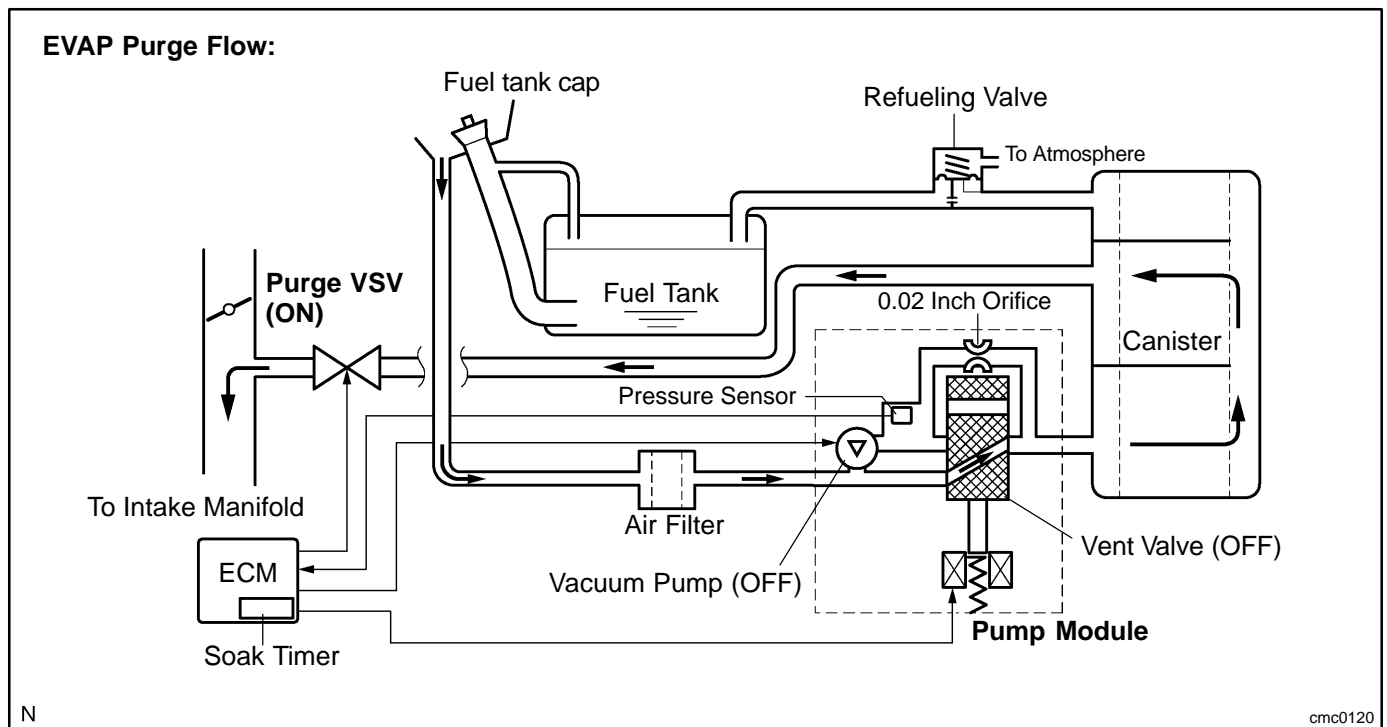
### Purge flow monitor

The purge flow monitor consists of the two monitors. The 1st monitor is always 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.

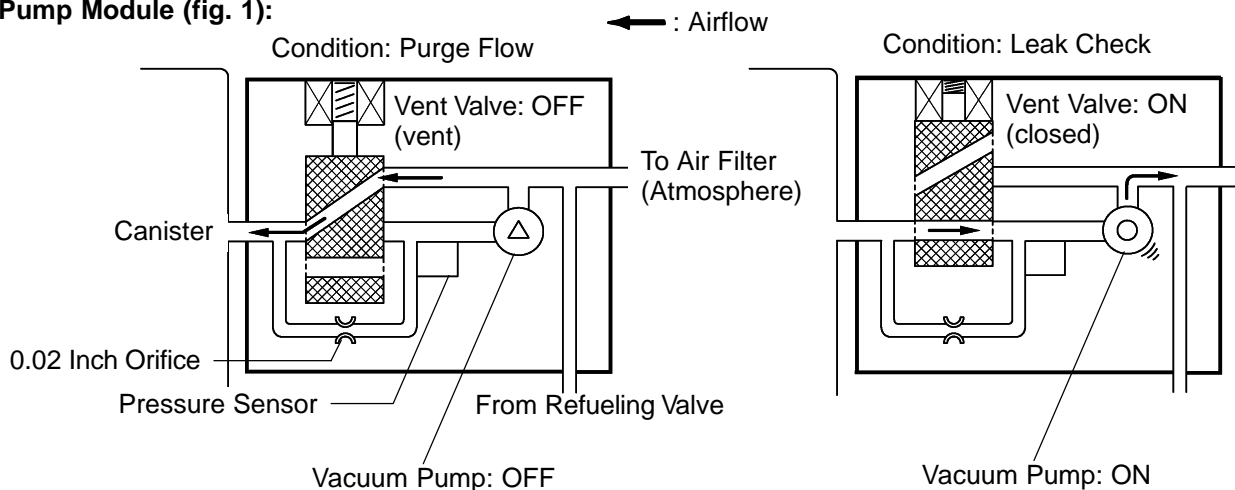


## DIAGNOSTICS – ENGINE (1GR-FE)

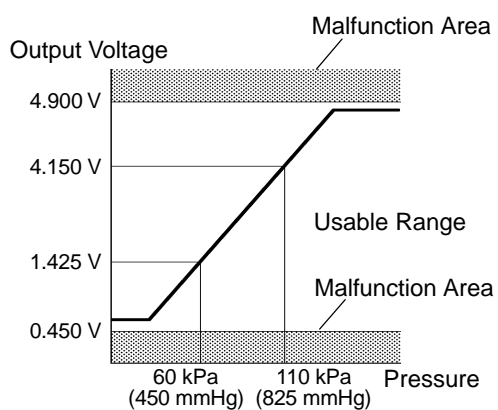
Components	Operations
Canister	Contains activated charcoal to absorb EVAP (Evaporative Emissions) generated in fuel tank.
Cut-off valve	Located in fuel tank. Valve floats and closes when fuel tank is 100 % full.
Purge VSV (Vacuum Switching Valve)	Opens or closes line between canister and intake manifold. ECM uses purge VSV to control EVAP purge flow. In order to discharge EVAP absorbed by canister to intake manifold, ECM opens purge VSV. EVAP discharge volume to intake manifold controlled by purge VSV duty cycle ratio (current-carrying time). (Open: ON, Close: OFF)
Refueling valve	Controls EVAP pressure from fuel tank to canister. Valve consists of diaphragm, spring and restrictor (diameter: 0.08 inch). When fuel vapor and pressure inside fuel tank increase, valve opens. While EVAP purged, valve closes and restrictor prevents large amount of vacuum from affecting pressure in fuel tank. Valve opened while refueling. When valve open, adding fuel into fuel tank possible.
Roll-over valve	Located in fuel tank. Valve closes by its own weight when vehicle overturns to prevent fuel from spilling out.
Service port	Used for connecting vacuum gauge for inspecting EVAP system.
Soak timer	Built into ECM. To ensure accurate EVAP monitor, measures 5 hours* after ignition switch turned to OFF. This allows fuel to cool down, stabilizing Fuel Tank Pressure (FTP). When approx. 5 hours* elapsed, ECM activates.
Pump module	Consists of (a) to (d) below. Pump module cannot be disassembled.
(a) Vent valve	Vents and closes EVAP system. When ECM turns valve ON, EVAP system closed. When, ECM turns valve OFF, EVAP system vented. Negative pressure (vacuum) created in EVAP system to check for EVAP leaks by closing purge VSV, turning on vent valve (closed) and operating vacuum pump (refer to fig. 1).
(b) Pressure sensor	Indicates pressure as voltages. ECM supplies regulated 5 V to pressure sensor, and uses feedback from sensor to monitor EVAP system pressure (refer to fig 2).
(c) Vacuum pump	Creates negative pressure (vacuum) in EVAP system for leak check.
(d) 0.02 inch orifice	Has opening with 0.02 inch diameter. Vacuum produced through orifice by closing purge VSV, turning off vent valve and operating vacuum pump, to monitor 0.02 inch leak pressure. 0.02 inch leak pressure indicates small leak of EVAP.

**HINT:**

\*:If the engine coolant temperature is not below 35°C after 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.

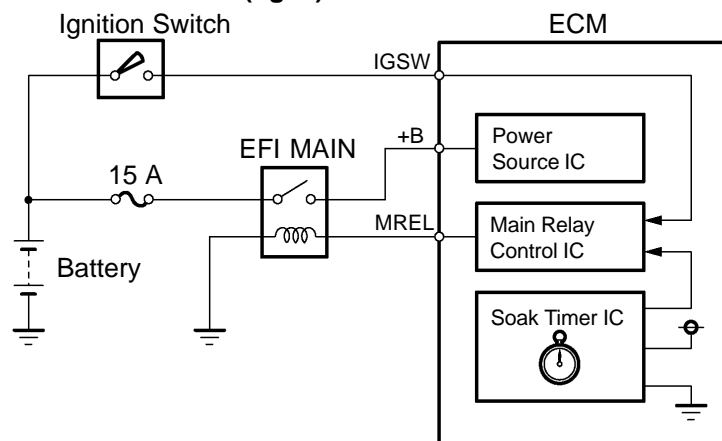
**Pump Module (fig. 1):**

A23494

**Pressure Sensor Specification (fig. 2)**

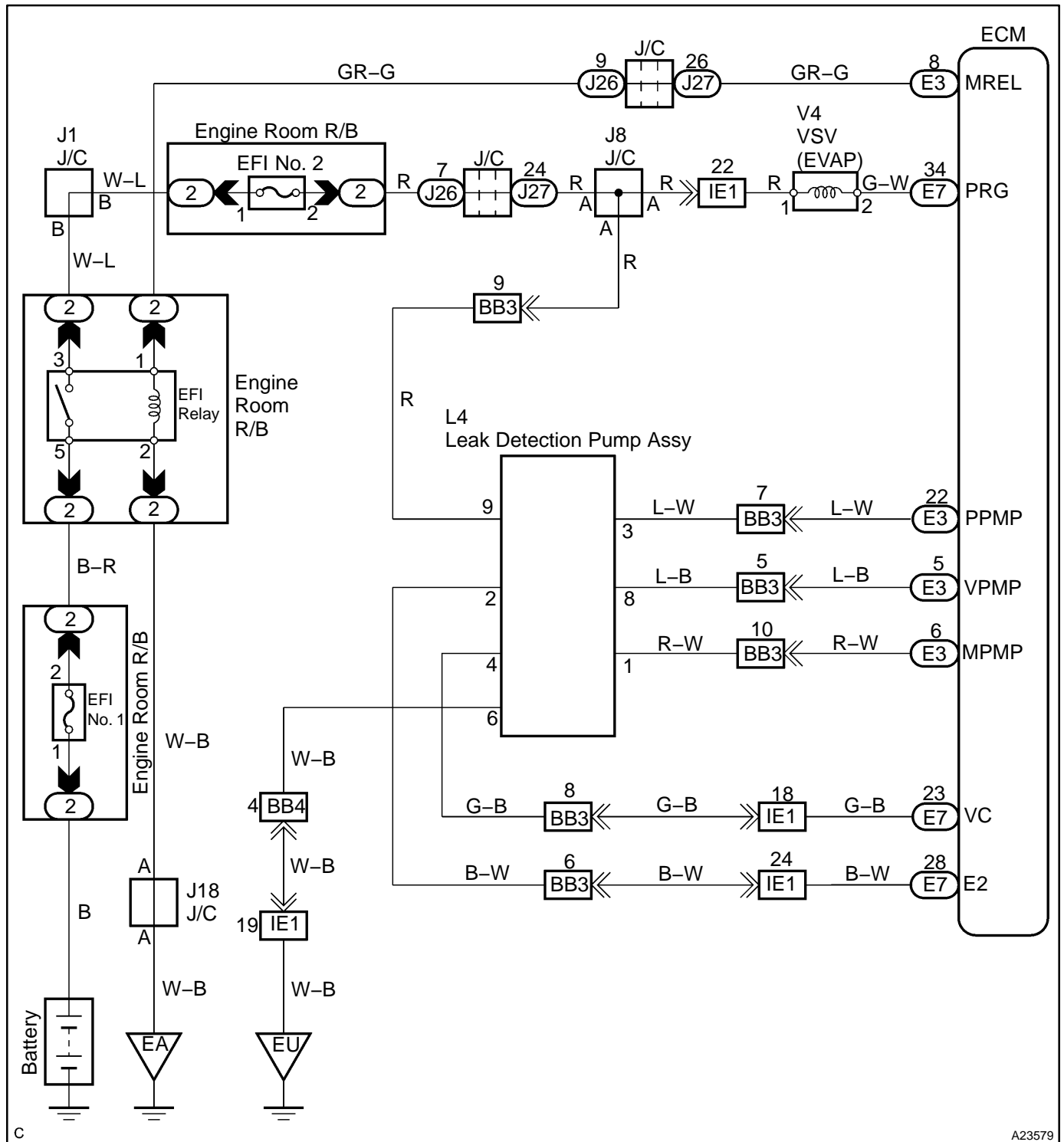
HINT:  
Standard atmospheric pressure is  
101.3 kPa (760 mmHg)

A23495

**Soak Timer Circuit (fig. 3)**

A23496

## WIRING DIAGRAM



C

A23579

## INSPECTION PROCEDURE

### NOTICE:

A hand-held tester is required to conduct the following diagnostic troubleshooting procedure.

### HINT:

- Using hand-held tester monitor results enables the EVAP (Evaporative Emission) system to be confirmed.
- Read freeze frame data using a hand-held tester Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data, from the time the malfunction occurred.

1	<b>Confirm DTC.</b>
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- Turn the ignition switch to OFF and wait for 10 seconds.
- Turn the ignition switch to ON.
- Turn the ignition switch to OFF and wait for 10 seconds.
- Connect a hand-held tester to the DLC3.
- Turn the ignition switch to ON and turn the tester ON.
- Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- Confirm DTCs and freeze frame data.

If any EVAP system DTCs are set, the malfunctioning area can be determined using the table below.

DTCs	P043E P043F	P0441	P0450	P0451	P0452	P0453	P0455	P0456	P2401 P2402	P2419	P2420
Malfunctioning Areas											
0.02 inch orifice clogged	●								●	●	
0.02 inch orifice high-flow	●								●	●	
Purge VSV stuck open		●					●				
Purge VSV stuck closed		●									
Pressure sensor signal becomes fixed/flat				●							
Pressure sensor noise				●							
Pressure sensor voltage low			●		●						
Pressure sensor voltage high			●			●					
Gross leak		●					●				
Small leak								●			
Vacuum pump stuck OFF	●								●	●	
Vacuum pump stuck ON	●								●	●	
Vent valve stuck ON (closed)	●								●	●	
Vent valve stuck OFF (vent)											●

### NOTICE:

If the 0.02 inch reference pressure difference between the first and second checks is greater than the specification, the DTCs corresponding to the reference pressure (P043E, P043F, P0441, P0455, P0456, P2401, P2420) will be all stored.

NEXT

2	Perform EVAP system check.
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**NOTICE:**

- In the EVAP SYSTEM CHECK (AUTO OPERATION), the series of 5 EVAP SYSTEM CHECK steps is performed automatically by the hand-held tester. It takes a maximum of approximately 18 minutes.
  - Do not perform the EVAP SYSTEM CHECK when the fuel tank is more than 90% full because the cut-off valve may be closed and making the leak check of the fuel tank unavailable.
  - Do not run the engine in this step.
  - When the temperature of the fuel is 35°C (95°F) or more, a large amount of vapor forms and any check results become inaccurate. When performing the EVAP SYSTEM CHECK, keep the temperature below 35°C (95°F).
- (a) Clear DTC (See page [DI-42](#)).
- (b) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / AUTO OPERATION.
- (c) After the EVAP SYSTEM CHECK is completed, check for pending DTCs by selecting the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.

**HINT:**

If no pending DTC is displayed, perform the Monitor Confirmation after this repair is completed. After this confirmation, check for pending DTCs. If no DTC is displayed, the EVAP system is normal.

**NEXT**



### EVAP SYSTEM CHECK

The diagram illustrates the sequence of operations for an EVAP system check. It shows the states of the Purge VSV, Vent Valve, and Vacuum Pump, and the resulting EVAP pressure response over five steps.

**Legend:**

- ON: Open
- OFF: Closed
- ON: Closed
- OFF: Vent

**Steps and Time:**

- Step 1/5:** 10 sec (Reference)
- Step 2/5:** 60 sec
- Step 3/5:** Within 15 minutes
- Step 4/5:** 10 sec
- Step 5/5:** 60 sec

**Pressure Response:**

- Gross Leak:** Pressure remains high (positive) throughout the test.
- Small Leak:** Pressure drops slightly during the vacuum phase (Steps 2/5 and 3/5) but returns to normal pressure during the vent phase (Steps 4/5 and 5/5).
- No Leak:** Pressure drops significantly during the vacuum phase (Steps 2/5 and 3/5) and returns to normal pressure during the vent phase (Steps 4/5 and 5/5).
- Normal Pressure:** The pressure level during the vent phase (Steps 4/5 and 5/5).

**First 0.02 inch Leak Pressure Standard**

**Second 0.02 inch Leak Pressure Standard x 0.2**

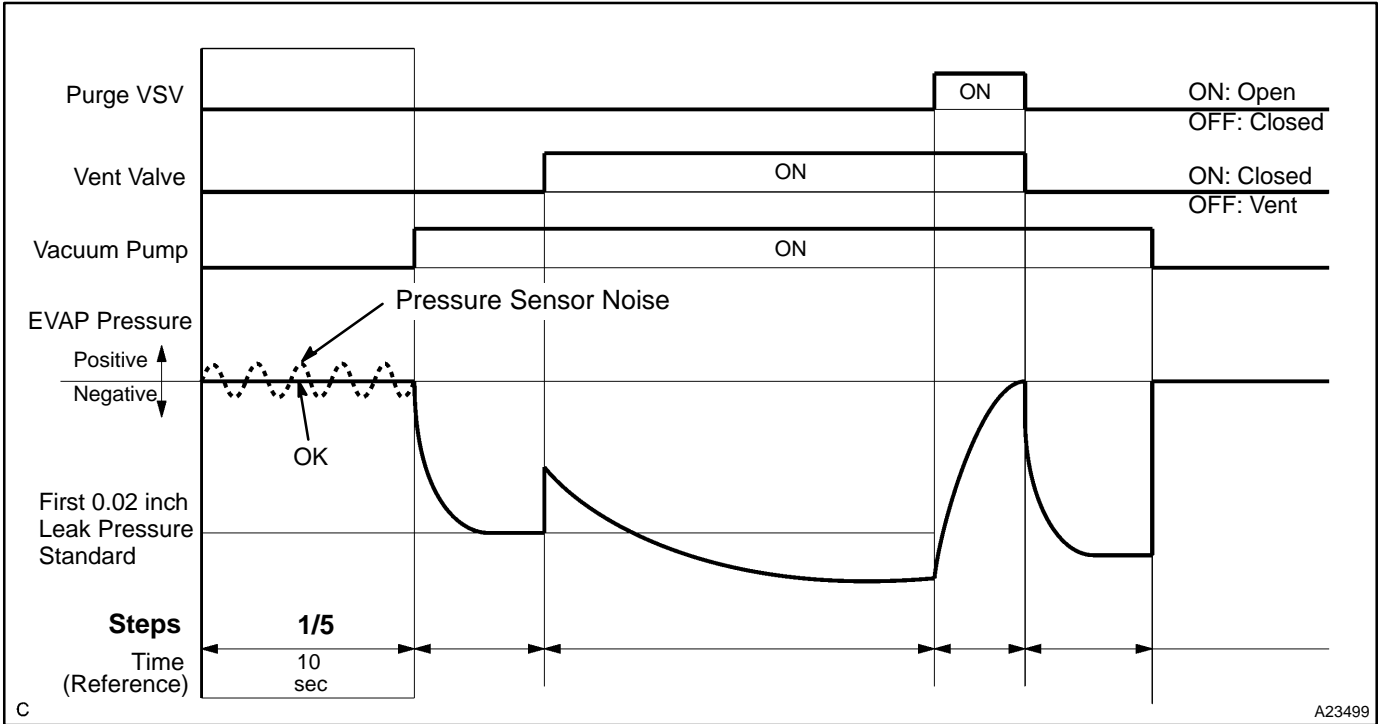
- In the EVAP SYSTEM CHECK (MANUAL OPERATION), the series of 5 EVAP SYSTEM CHECK steps is performed manually by the hand-held tester.
- Do not perform the EVAP SYSTEM CHECK when the fuel tank is more than 90% full because the cut-off valve may be closed and making the leak check of the fuel tank unavailable.
- Do not run the engine in this step.
- When the temperature of the fuel is 35°C (95°F) or more, a large amount of vapor forms and any check results become inaccurate. When performing the EVAP SYSTEM CHECK, keep the temperature below 35°C (95°F).

(a) Clear DTC (See page [DI-42](#)).

(b) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / MANUAL OPERATION.

## NEXT

**4 Perform EVAP system step 1/5 check.**



(a) Check the EVAP pressure in step 1/5.

**Result:**

DTCs*	Test Results	Suspected Trouble Areas	Proceed To
—	Virtually no variation in EVAP pressure	Not yet determined	A
P0451	EVAP pressure fluctuates by $\pm 0.3$ kPa (2.25 mmHg) or more	Pressure sensor noising	B

\*: The DTCs relating to the EVAP system displayed on a hand-held tester when checking.

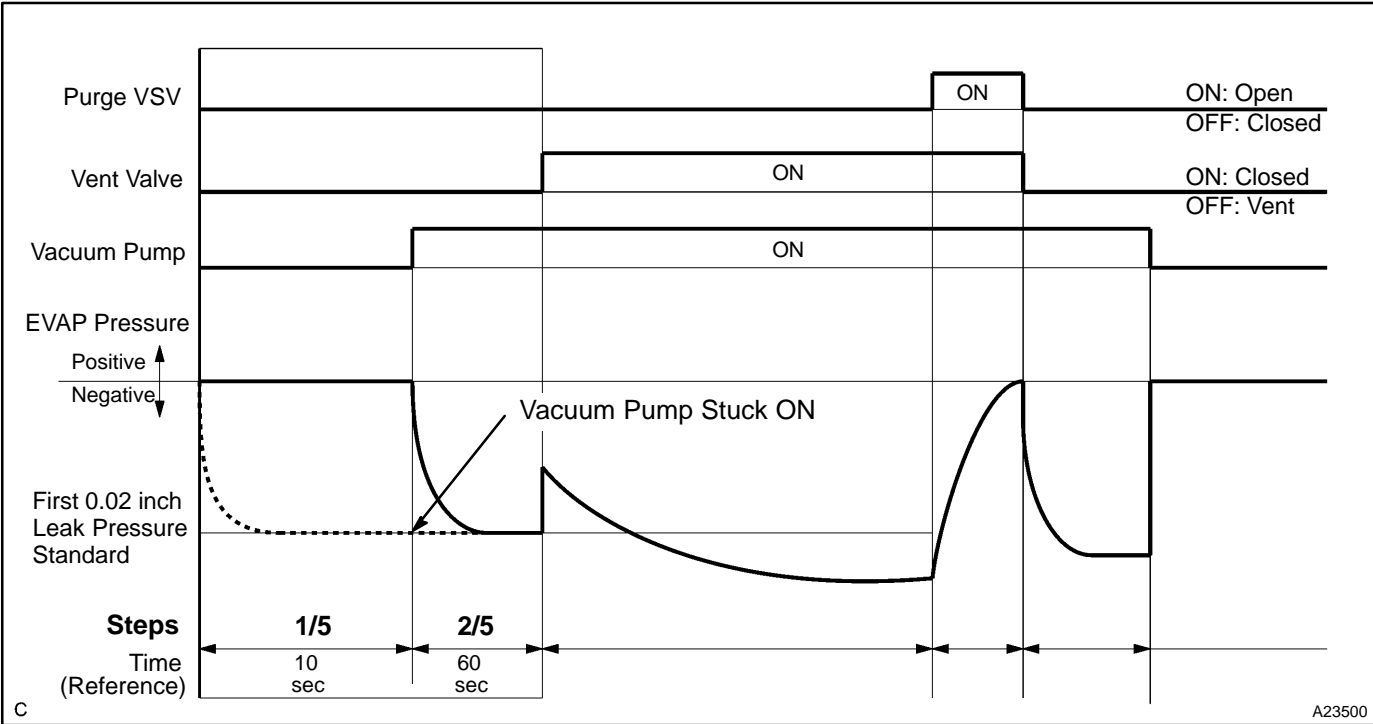
**B**

**Go to step 30**

**A**

5

Perform EVAP system step 1/5 to 2/5 check.



- (a) Check the EVAP pressure in step 1/5 and 2/5.
- Result:**

DTCs*	Test Results	Suspected Trouble Areas	Proceed To
—	Virtually no variation in EVAP pressure during step 1/5. Then decreases to 0.02 inch leak pressure standard*	Not yet determined	A
P2402	Small difference between EVAP pressures during steps 1/5 and 2/5	Vacuum pump stuck ON	B

\*: The DTCs relating to the EVAP system displayed on a hand-held tester when checking.

HINT:

The 0.02 inch leak pressure standard is the value determined in step 2/5.

B

Go to step 23.

A

The diagram illustrates the timing of EVAP system components during a leak test. The components and their states are as follows:

- Purge VSV:** ON (Open) during Step 2/5 and Step 3/5.
- Vent Valve:** ON (Closed) during Step 2/5 and Step 3/5.
- Vacuum Pump:** ON during Step 2/5 and Step 3/5.

The EVAP Pressure and Leak Pressure are shown on the left y-axis. The EVAP Pressure is Positive (up) and Negative (down). The Leak Pressure is Positive (up) and Negative (down). The Leak Pressure is shown as a solid line and a dotted line.

The test is divided into two steps:

- Step 2/5 (60 sec):** The Vacuum Pump is ON. The EVAP Pressure is Negative. The Leak Pressure is Positive. The Vent Valve is Stuck closed. The 0.02 inch Orifice is High-flow.
- Step 3/5 (Within 15 minutes):** The Vacuum Pump is ON. The EVAP Pressure is Negative. The Leak Pressure is Positive. The Vent Valve is Stuck closed. The 0.02 inch Orifice is Clogged.

The diagram also includes a legend for the components:

- ON: Open
- OFF: Closed
- ON: Closed
- OFF: Vent

Make a note of the pressures checked in steps (a) and (b) below.

- \*: The vacuum pump begins to operate as step 1/5 is proceeded to step 2/5.

**Result:**

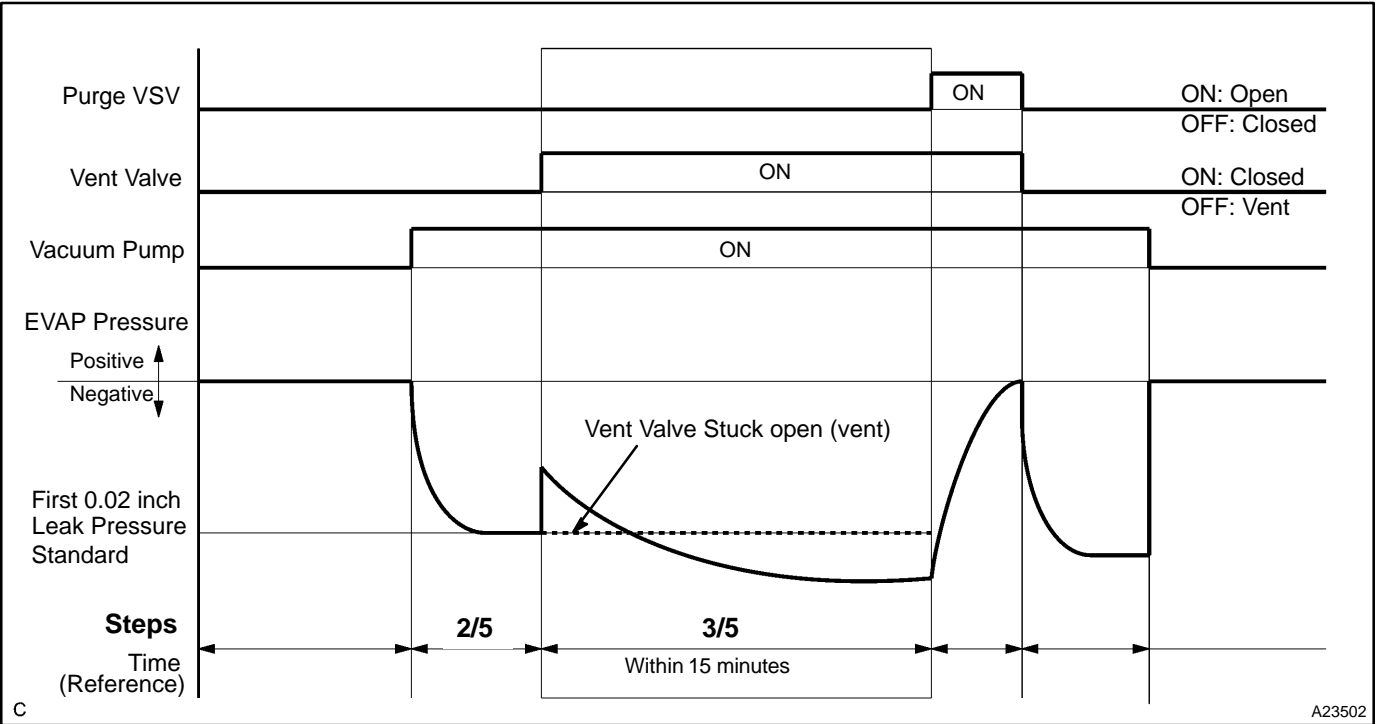
DTCs*	Test Results	Suspected Trouble Areas	Proceed To
—	EVAP pressure in step (b) between –4.85 kPa and –1.06 kPa (–36.38 mmHg and –7.95 mmHg)	Not yet determined	A
P043F and P2401	EVAP pressure in step (b) –1.06 kPa (–7.95 mmHg) or more	<ul style="list-style-type: none"> <li>• 0.02 inch orifice high–flow</li> <li>• Vacuum pump stuck OFF</li> </ul>	B
P043E	EVAP pressure in step (b) below –4.85 kPa (–36.38 mmHg)	0.02 inch orifice clogged	C
P2419	EVAP pressure in step (a) more than –1.06 kPa (–7.95 mmHg)	Vent valve stuck closed	D

<b>B</b>	Go to step 11
<b>C</b>	Go to step 30
<b>D</b>	Go to step 19

A

7

Perform EVAP system step 2/5 to 3/5 check.



- (a) Check the EVAP pressure increase in step 3/5.
- Result:**

DTCs*	Test Results	Suspected Trouble Areas	Proceed To
—	EVAP pressure increases by 0.3 kPa (2.25 mmHg) or more within 10 seconds of proceeding from step 2/5 to step 3/5	Not yet determined	A
P2420	No variation in EVAP pressure despite proceeding from step 2/5 to step 3/5	Vent valve stuck open (vent)	B
P0451	No variation in EVAP pressure during steps 1/5 through 3/5	Pressure sensor malfunction stuck	C

\*: The DTCs relating to the EVAP system displayed on a hand-held tester when checking.

B

Go to step 19.

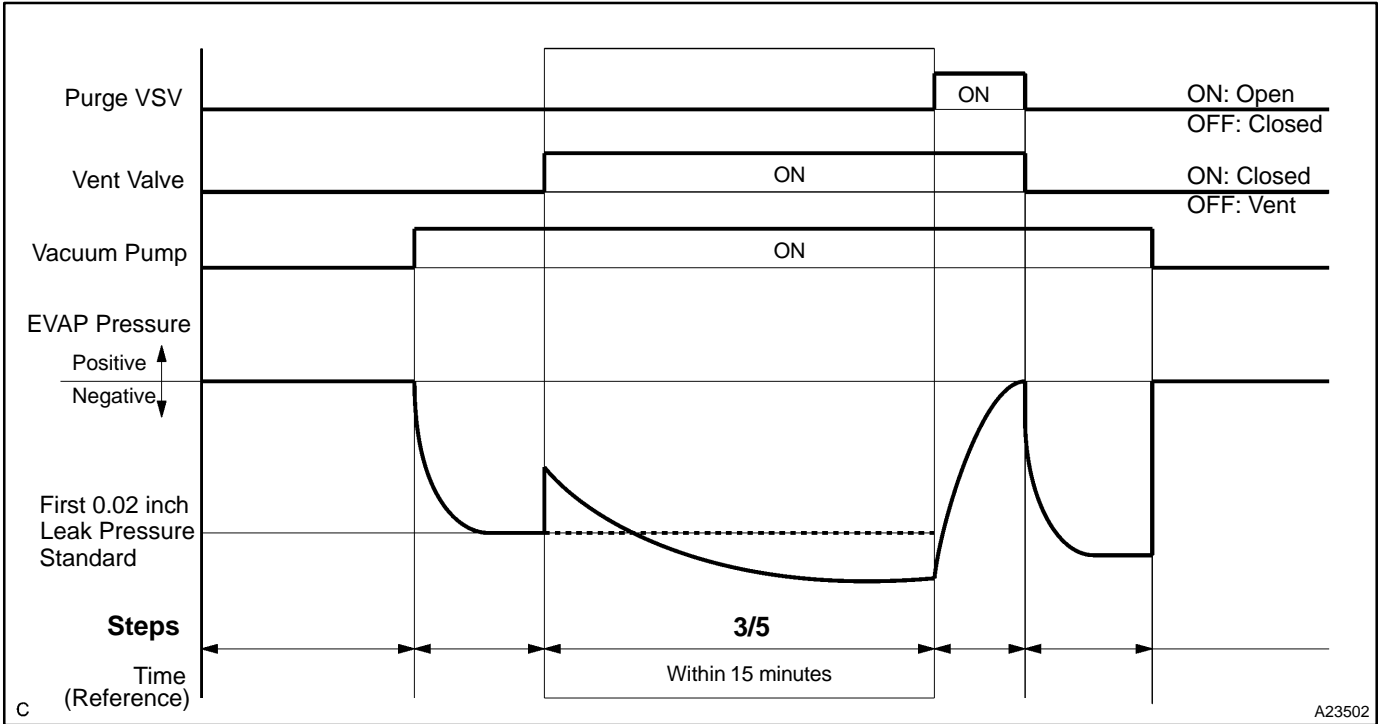
C

Go to step 30.

A

8

Perform EVAP system step 3/5 check.

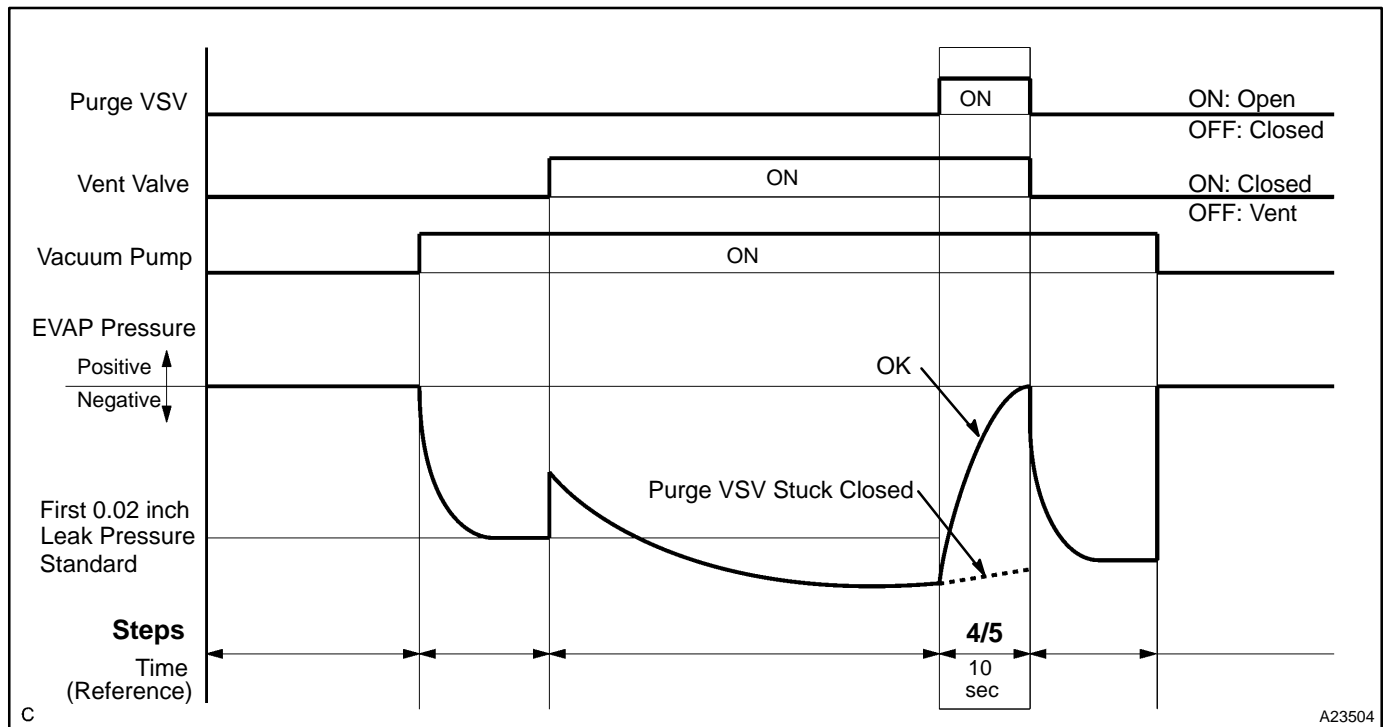


- Wait until the EVAP pressure change is less than 0.1 kPa (0.75 mmHg) for 30 seconds.
- Measure the EVAP pressure and record it.

HINT:

A few minutes are required for the EVAP pressure to become saturated. When there is little fuel in the fuel tank, it takes up to 12 minutes.

**NEXT**

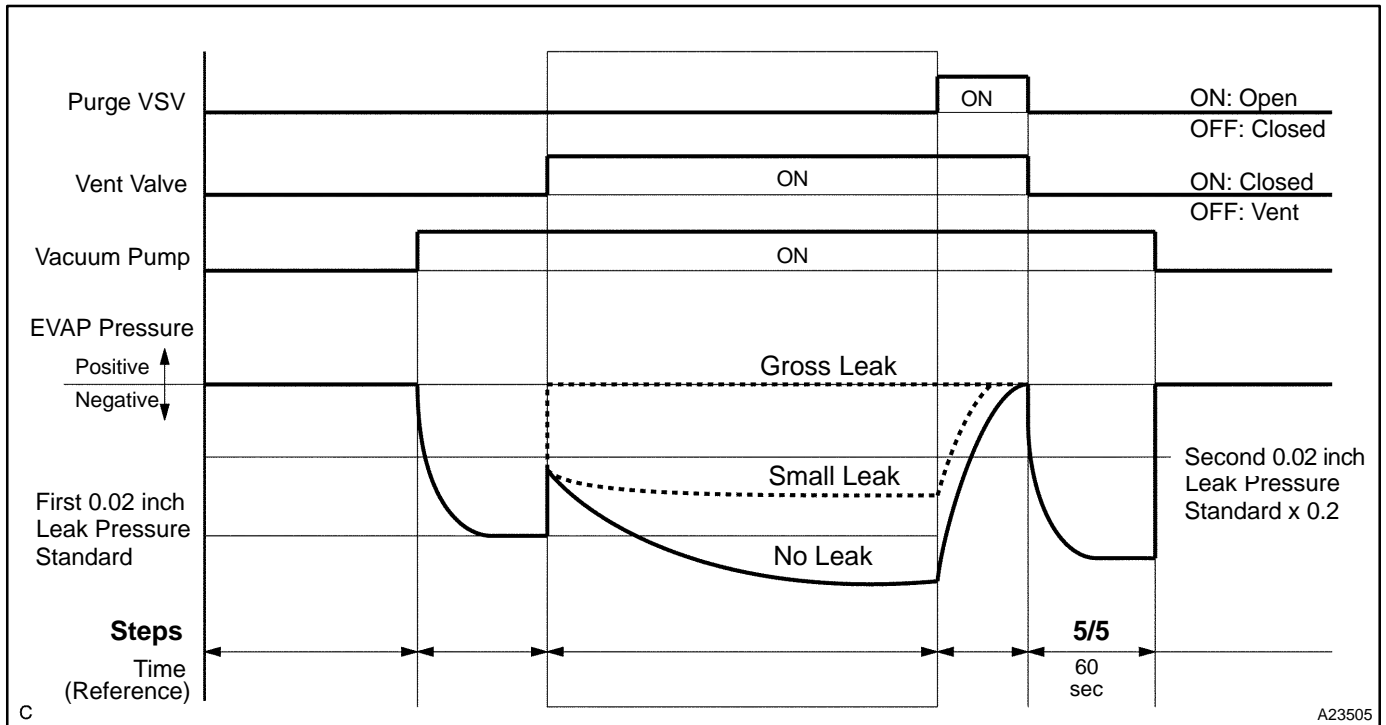
**9 Perform EVAP system step 4/5 check.**

(a) Check the EVAP pressure in step 4/5.

DTCs*	Test Results	Suspected Trouble Areas	Proceed To
—	EVAP pressure increases by 0.3 kPa (2.25 mmHg) or more within 10 seconds of proceeding from step 3/5 to step 4/5	Not yet determined	A
P0441	EVAP pressure increases by 0.3 kPa (2.25 mmHg) or more within 10 seconds of proceeding from step 3/5 to step 4/5	Problems in EVAP hose between pure VSV and throttle body	B
P0441	Variation in EVAP pressure is less than 0.3 kPa (2.25 mmHg) for 10 seconds, after proceeding from step 3/5 to step 4/5	Purge VSV stuck closed	C

\*: The DTCs relating to the EVAP system displayed on a hand-held tester when checking.

**B****Go to step 15.****C****Go to step 12.****A**

**10 Perform EVAP system step 5/5 check.**

- (a) Check the EVAP pressure in step 5/5.  
 (b) Compare the EVAP pressure in step 3/5 and the second 0.02 inch leak pressure standard (step 5/5).

**Result:**

DTCs*	Test Results	Suspected Trouble Areas	Proceed To
—	EVAP pressure (step 3/5) lower than the second 0.02 inch leak pressure standard (step 5/5)	Not yet determined (no leakage from EVAP system)	A
P0441 and P0455	EVAP pressure (step 3/5) higher than [second 0.02 inch leak pressure standard (step 5/5) x 0.2]	<ul style="list-style-type: none"> <li>• Purge VSV stuck open</li> <li>• EVAP gross leak</li> </ul>	B
P0456	EVAP pressure (step 3/5) higher than second 0.02 inch leak pressure standard (step 5/5)	EVAP small leak	B

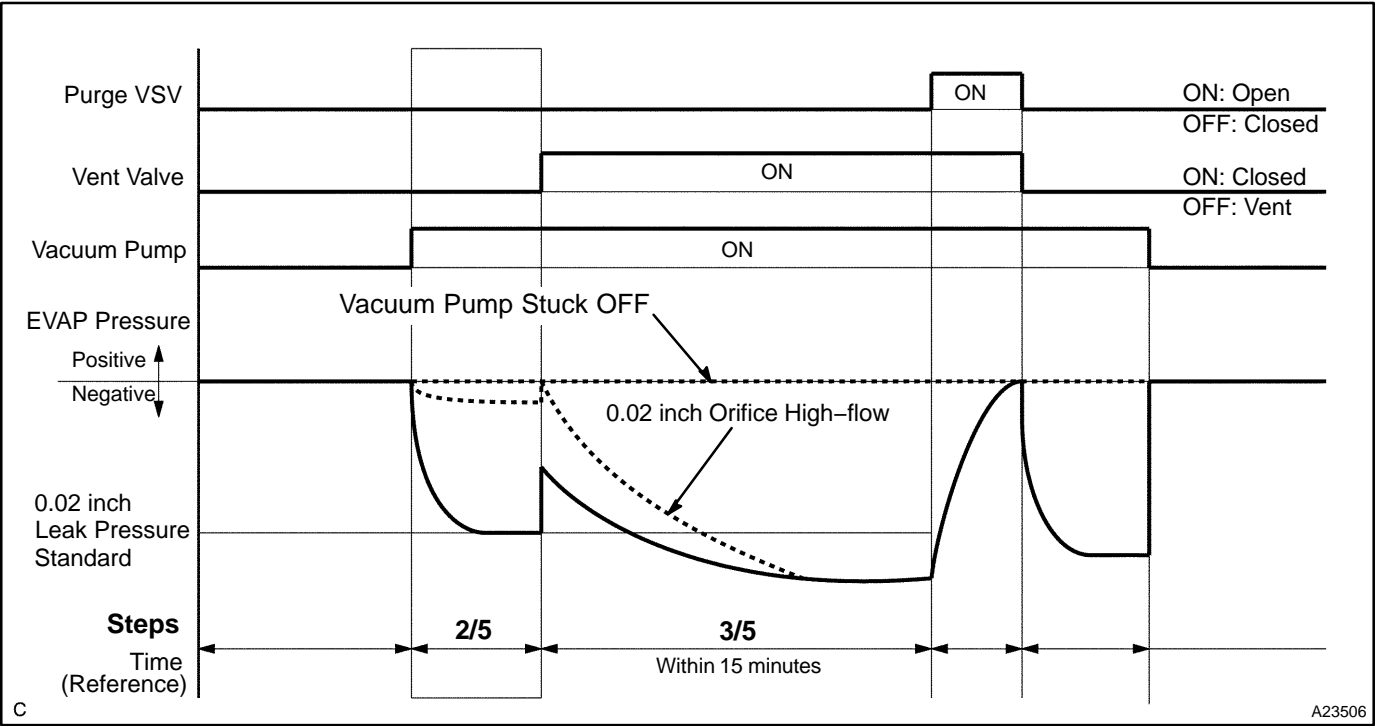
\*: The DTCs relating to the EVAP system displayed on a hand-held tester when checking.

**A****Go to step 36.****B****Go to step 12.**



11

Perform EVAP system step 3/5 check.



(a) Check the EVAP pressure in step 3/5.

Result:

DTCs*	Test Results	Suspected Trouble Areas	Proceed To
—	EVAP pressure less than [0.02 inch leak pressure standard x 0.2]	0.02 inch orifice high-flow	A
—	EVAP pressure more than [0.02 inch leak pressure standard x 0.2]	Vacuum pump stuck OFF	B

\*: The DTCs relating to the EVAP system displayed on a hand-held tester when checking.

HINT:

The 0.02 inch leak pressure standard is the value determined in step 2/5.

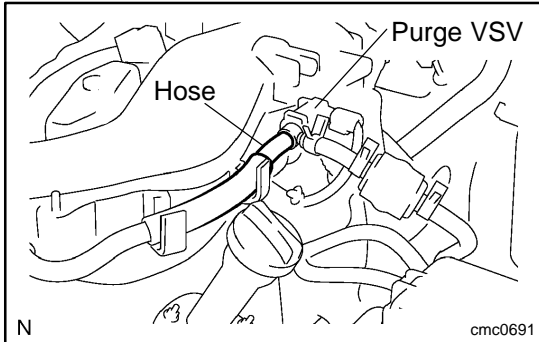
A

Go to step 30.

B

Go to step 23.

## 12 Perform active test of purge VSV.



### PREPARATION:

- On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II/ ACTIVE TEST / EVAP VSV.
- Disconnect the hose (connected to the canister) from the purge VSV.
- Start the engine.

### CHECK:

- On the tester, turn off the purge VSV (EVAP VSV: OFF).
- Use your finger to confirm that the purge VSV has no suction.
- Using the tester, turn on the purge VSV (EVAP VSV: ON).
- Use your finger to confirm that the purge VSV has suction.

### RESULT:

Test Results	Suspected Trouble Areas	Proceed To
No suction when purge VSV turned OFF, and suction applied when turned ON	Purge VSV normal	A
Suction applied when purge VSV turned OFF	Purge VSV stuck open	B
No suction when purge VSV turned ON	<ul style="list-style-type: none"> <li>Purge VSV stuck closed</li> <li>Problems with EVAP hose between purge VSV and throttle body</li> </ul>	C

**B**

**Go to step 14.**

**C**

**Go to step 15.**

**A**

<b>13</b>	<b>Check fuel tank cap.</b>
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**CHECK:**

- (a) Check that the fuel tank cap is correctly installed and confirm the fuel tank cap meets OEM specification.

**HINT:**

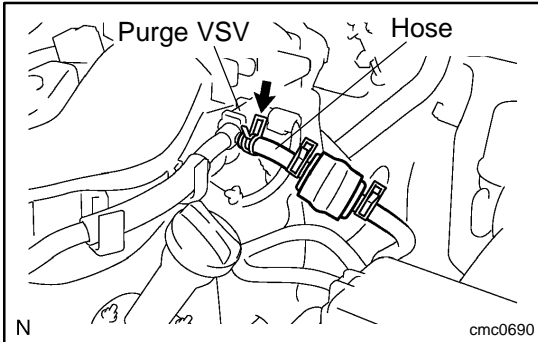
If an EVAP tester is available, check the fuel tank cap using the tester.

- (1) Tighten the fuel tank cap.
- (2) Remove the fuel tank cap and install it onto a fuel tank cap adaptor.
- (3) Connect an EVAP tester pump hose to the adaptor, and pressurize to 3.2 to 3.7 kPa (24 to 28 mmHg) using an EVAP tester pump.
- (4) Seal the adaptor and wait for 2 minutes.
- (5) Check the pressure. If the pressure is 2 kPa (15 mmHg) or more, the fuel tank cap is normal.

**PREPARATION:**

Test Results	Suspected Trouble Areas	Proceed To
Fuel tank cap correctly installed	—	A
Fuel tank cap loose	<ul style="list-style-type: none"> <li>Fuel tank cap improperly installed</li> <li>Defective fuel tank cap</li> <li>Fuel tank cap does not meet OEM specifications</li> </ul>	B
No fuel tank cap	—	C

<b>A</b>	<b>Go to step 29.</b>
<b>B</b>	<b>Go to step 27.</b>
<b>C</b>	<b>Go to step 28.</b>

**14 Inspect EVAP VSV.****PREPARATION:**

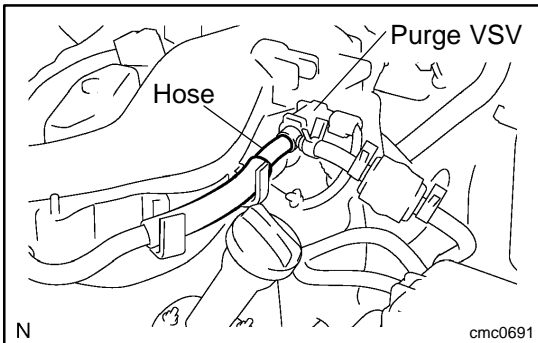
- Turn the ignition switch to OFF.
- Disconnect the V4 purge VSV connector.
- Disconnect the hose (connected to the canister) from the purge VSV.
- Start the engine.

**CHECK:**

Use your finger to confirm that the purge VSV has no suction.

**RESULT:**

Test Results	Suspected Trouble Areas	Proceed To
No suction	ECM	A
Suction applied	Purge VSV	B

**A****Go to step 34.****B****Go to step 30.****15 Check EVAP hose between purge VSV and throttle body.****PREPARATION:**

- Disconnect the hose (connected to the throttle body) from the purge VSV.
- Start the engine.

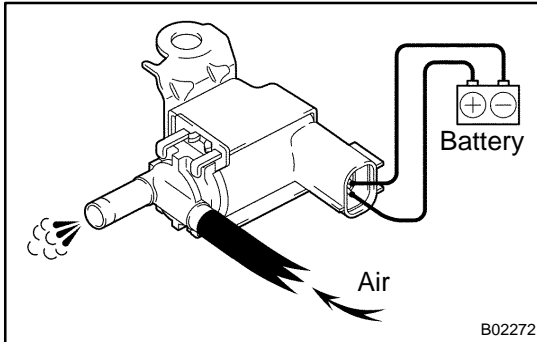
**CHECK:**

- Use your finger to confirm that the hose has suction.

**RESULT:**

Test Results	Suspected Trouble Areas	Proceed To
Suction applied	EVAP hose between purge VSV and throttle body normal	A
No suction	<ul style="list-style-type: none"> <li>Throttle body</li> <li>EVAP hose between purge VSV and throttle body</li> </ul>	B

**B****Go to step 26.****A**

**16 Inspect EVAP VSV.****PREPARATION:**

- Remove the purge VSV.
- Apply battery voltage to the terminals of the purge VSV.

**CHECK:**

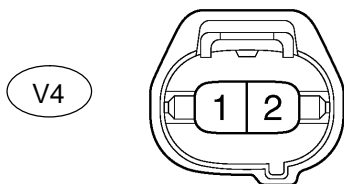
Using an air gun, confirm that air flows from port A to port B.

**RESULT:**

Test Results	Suspected Trouble Areas	Proceed To
Suction applied	EVAP hose between purge VSV and throttle body normal	A
No suction	<ul style="list-style-type: none"> <li>Throttle body</li> <li>EVAP hose between purge VSV and throttle body</li> </ul>	B

**B****Go to step 31.****A****17 Measure purge VSV terminal voltage.****Wire Harness Side:**

Purge VSV Connector



Front View

N

B17440

**PREPARATION:**

- Disconnect the V4 purge VSV connector.
- Turn the ignition switch to ON.

**CHECK:**

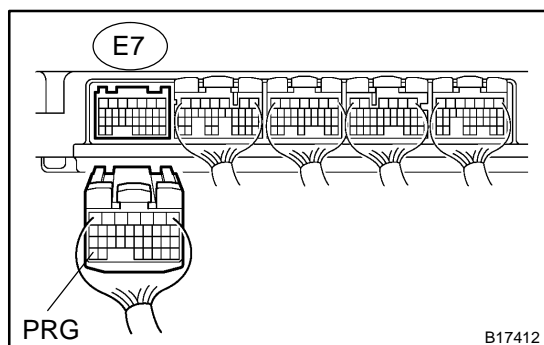
- Measure the voltage between terminal 1 of the purge VSV connector and the body ground.

**RESULT:**

Test Results	Suspected Trouble Areas	Proceed To
Between 11 V and 14 V	Normal	A
Other than result above	Wire harness or connectors between purge VSV and ECM	B

**B****Go to step 32.****A**

# 18 Check for open and short circuit in harness and connector between purge VSV and ECM.



B17412

## PREPARATION:

Disconnect the E7 ECM connector and the V4 purge VSV connector.

## CHECK:

Check the resistance.

## OK:

## Standard:

Tester Connections	Specified Conditions
E7-34 (PRG) – V4-1	Below 1 $\Omega$
E7-34 (PRG) – Body ground	10 k $\Omega$ or higher
V4-1 – Body ground	10 k $\Omega$ or higher

OK

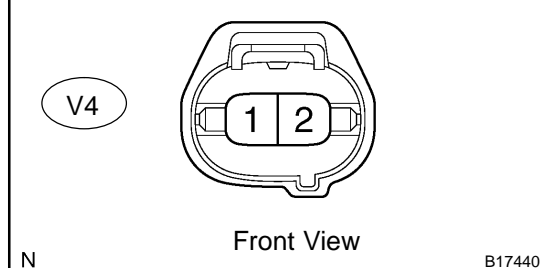
Go to step 35.

NG

Go to step 32.

## Wire Harness Side:

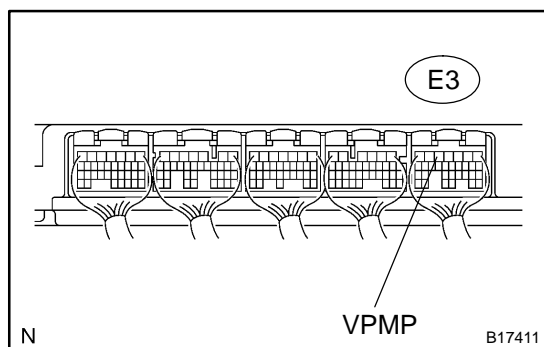
Purge VSV Connector



Front View

B17440

# 19 Perform active test for vent valve.



B17411

## PREPARATION:

- Turn the ignition switch to ON.
- On the hand-held tester, select the following menu items: DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ VENT VALVE (ALONE).

## CHECK:

Measure the voltage between terminal VPMP of the ECM connector and the body ground when the vent valve is turned ON (close) and OFF (vent) using the tester.

## RESULT:

Test Results	Suspected Trouble Areas	Proceed To
Between 9 V and 14 V when OFF Below 3 V when ON	Vent valve	A
Below 3 V when OFF and ON	ECM	B

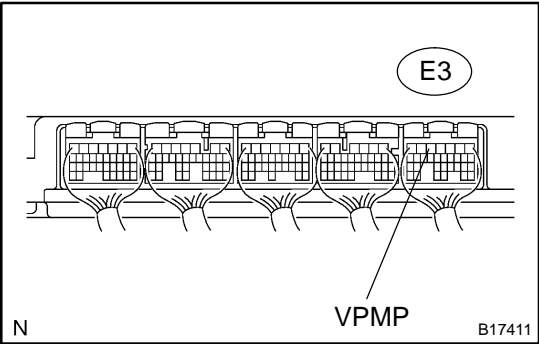
A

Go to step 22.

B

Go to step 35.

20	Perform active test for vent valve.
----	-------------------------------------



**PREPARATION:**

- (a) Turn the ignition switch to ON.
- (b) On the hand-held tester, select the following menu items:  
DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ VENT VALVE (ALONE).

**CHECK:**

Measure the voltage between terminal VPMP of the ECM connector and the body ground when the vent valve is turned ON (close) and OFF (vent) using the tester.

**RESULT:**

Test Results	Suspected Trouble Areas	Proceed To
Below 3 V when OFF and ON	Power source of vent valve	A
Between 9 V and 14 V when OFF Below 3 V when ON	Vent valve	B
Between 9 V and 14 V when OFF and ON	ECM	C

A

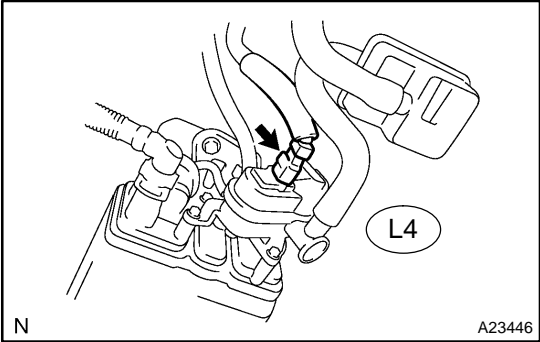
B

Go to step 24.

C

Go to step 35.

21 Inspect pump module power source circuit.

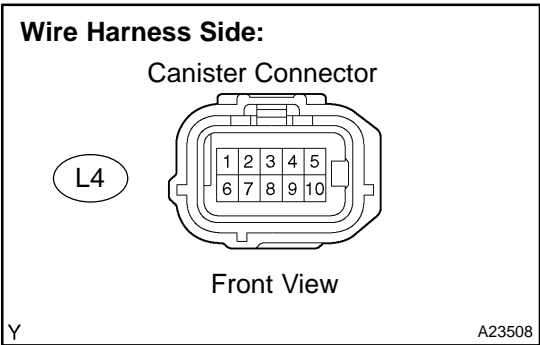


**PREPARATION:**

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the L4 canister connector.
- (c) Turn the ignition switch to ON.

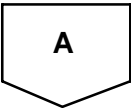
**CHECK:**

Measure the voltage between terminal 9 of the canister connector and the body ground.



**RESULT:**

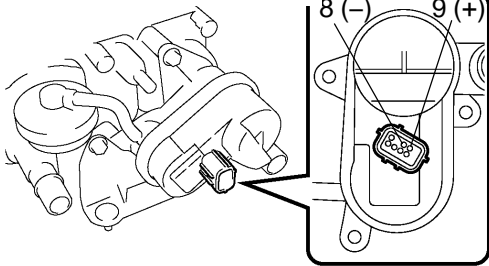
Test Results	Suspected Trouble Areas	Proceed To
Between 9 V and 14 V	Normal	A
Between 0 V and 3 V	Power source wire harness of vent valve	B





## 22 Inspect vent valve operation of pump module.

Charcoal Canister Assy:



N

B17423

**PREPARATION:**

- Disconnect the L4 canister connector.
- Turn the ignition switch to OFF.
- Apply the battery voltage to terminals 9 and 8 of the pump module.

**CHECK:**

Touch the pump module to confirm the vent valve operation.

**RESULT:**

Test Results	Suspected Trouble Areas	Proceed To
Operating	Wire harness between vent valve and ECM	A
Not operating	Vent valve	B

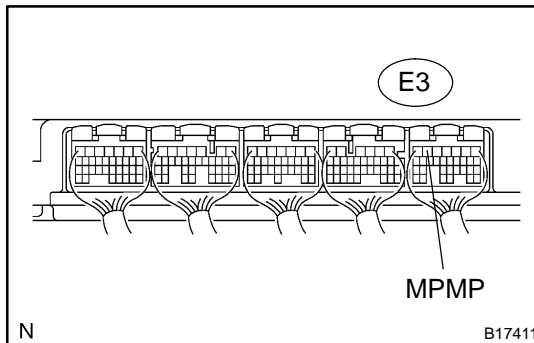
A

Go to step 32.

B

Go to step 30.

## 23 Perform active test for vacuum pump.



N

B17411

**PREPARATION:**

On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VACUUM PUMP (ALONE).

**CHECK:**

Measure the voltage between terminal MPMP of the ECM connector and the body ground when the vacuum pump is turned ON and OFF using the tester.

**Result:**

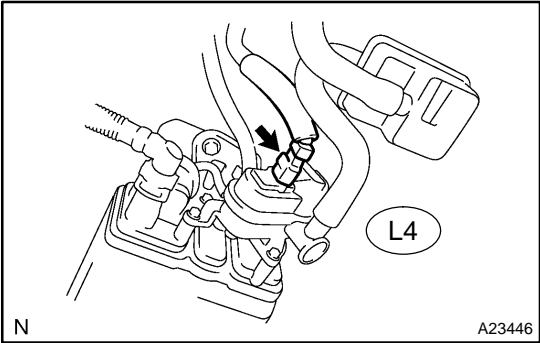
Tests Results	Suspected Trouble Areas	Proceed To
Between 0 V and 3 V when OFF Between 9 V and 14 V when ON	ECM normal	A
Between 9 V and 14 V when OFF Between 0 V and 3 V when ON	ECM	B

B

Go to step 35.

A

**24 Check for open and short circuit in harness and connector between pump module and ECM.**

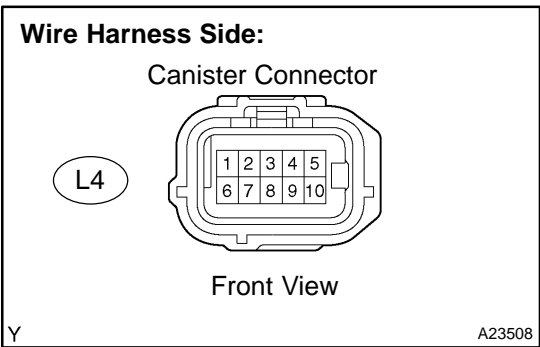


**PREPARATION:**

- (a) Turn the ignition switch to OFF.
- (b) Disconnect the L4 canister connector.
- (c) Turn the ignition switch to ON.
- (d) On the hand-held tester, select the following menu items:DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VACUUM PUMP (ALONE).
- (e) Turn the vacuum pump ON.

**CHECK:**

Measure the voltage between terminal 1 of the canister connector and the body ground.



**RESULT:**

Test Results	Suspected Trouble Areas	Proceed To
Between 9 V and 14 V	Normal	A
Between 0 V and 3 V	Wire harness between ECM and vacuum pump	B

**B**

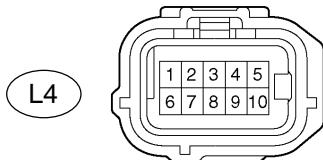
**Go to step 32.**

**A**

<b>25</b>	<b>Check for open and short in harness and connector between pump module and ECM.</b>
-----------	---

**Wire Harness Side:**

Canister Connector



Front View

Y

A23508

**PREPARATION:**

- (a) Disconnect the L4 canister connector.
- (b) Turn the ignition switch to OFF.

**CHECK:**

Check the resistance between terminal 6 of the canister connector and the body ground.

**RESULT:**

Test Results	Suspected Trouble Areas	Proceed To
Below 1 $\Omega$	Vacuum pump	A
10 k $\Omega$ or more	Wire harness between vacuum pump and body ground	B

**A****Go to step 30.****B****Go to step 32.**

<b>26</b>	<b>Inspect throttle body.</b>
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**PREPARATION:**

- (a) Stop the engine.
- (b) Disconnect the EVAP hose from the throttle body.
- (c) Start the engine.

**CHECK:**

- (a) Use your finger to confirm that the port of the throttle body has suction.

**RESULT:**

Test Results	Suspected Trouble Areas	Proceed To
Suction applied	EVAP hose between throttle body and purge VSV	A
No suction	Throttle body	B

**A****Go to step 33.****B****Go to step 34.**

**27 Correctly reinstall or replace fuel tank cap.****HINT:**

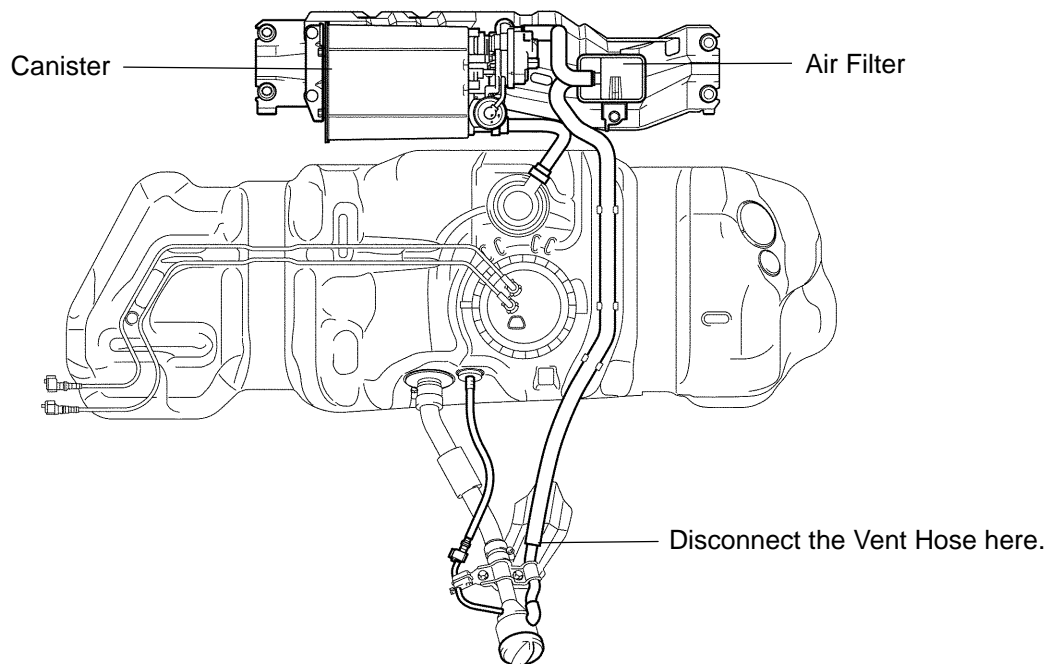
- When reinstalling the fuel tank cap, tighten it until a few click sounds are heard.
- When replacing the fuel tank cap, use a fuel tank cap that meets OEM specifications, and install it until a few click sounds are heard.

**NEXT****Go to step 37.****28 Replace fuel tank cap.****HINT:**

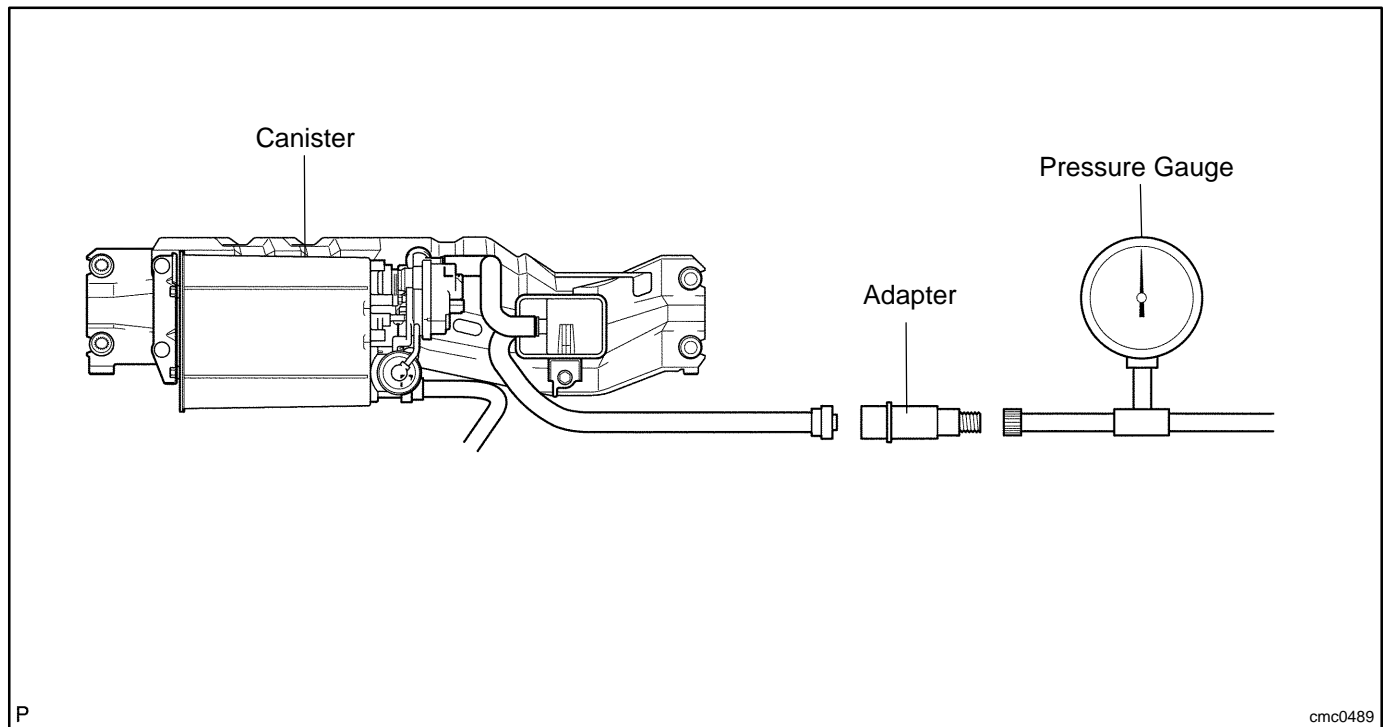
When installing the fuel tank cap, tighten it until a few click sounds are heard.

**NEXT****Go to step 37.****29 Locate EVAP leak.**

(a) Disconnect the vent hose.



- (b) Connect the EVAP pressure tester tool to the canister with the adapter.



- (c) Pressurize the EVAP system by 3.2 to 3.7 kPa (24 to 28 mmHg).  
(d) Apply soapy water to the piping and the connecting parts of the EVAP system.  
(e) Look for areas where bubbles appear. This indicates leak point.  
(f) Repair or replace the leak point.

**NEXT****Go to step 37.****30****Replace charcoal canister.****NEXT****Go to step 37.****31****Replace EVAP VSV.**

- (a) Disconnect the connector and the hoses from the purge VSV.  
(b) Remove the purge VSV.  
(c) Install a new purge VSV.  
(d) Reconnect the connector and hoses.

**NEXT****Go to step 37.****32****Repair or replace wire harness or connector.****NEXT****Go to step 37.**

<b>33</b>	<b>Replace EVAP hose between EVAP VSV and throttle body.</b>
-----------	--


**NEXT**

Go to step 37.

<b>34</b>	<b>Inspect throttle body.</b>
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- (a) Remove the throttle body (see page [SF-40](#)).
- (b) Check that the EVAP purge port of the throttle body is not clogged. If necessary, replace the throttle body.


**NEXT**

Go to step 37.

<b>35</b>	<b>Replace ECM (See page <a href="#">SF-66</a>)</b>
-----------	---


**NEXT**

Go to step 37.

<b>36</b>	<b>Repair or replace parts and components indicated by output DTCs.</b>
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- (a) Repair the malfunctioning areas indicated by the DTCs that had been confirmed when the vehicle was brought in.


**NEXT**

Go to step 37.

<b>37</b>	<b>Perform EVAP system auto operation check.</b>
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**NOTICE:**

- In the EVAP SYSTEM CHECK (AUTO OPERATION), the series of 4 EVAP SYSTEM CHECK steps is performed automatically by the hand-held tester. It takes a maximum of approximately 15 minutes.
  - Do not perform the EVAP SYSTEM CHECK when the fuel tank is more than 90 % full because the cut-off valve may be closed and making the leak check of the fuel tank unavailable.
  - Do not run the engine in this step.
  - When the temperature of the fuel is 35°C (95°F) or more, a large amount of vapor forms and any check results become inaccurate. When performing an EVAP SYSTEM CHECK, keep the temperature below 35°C (95°F).
- (a) Clear DTCs (see page [DI-42](#)).
  - (b) On the hand-held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / AUTO OPERATION.
  - (c) After the SYSTEM CHECK is completed, check for pending DTCs by selecting the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.

**HINT:**

If no pending DTC is found, the repair has been successfully completed.

**NEXT****Completed**

## Monitor Confirmation

### HINT:

After a repair, check Monitor Status by performing the Key–Off Monitor Confirmation and Purge Flow Monitor Confirmation described below.

### 1. KEY–OFF MONITOR CONFIRMATION

#### (a) Preconditions

The monitor will not run unless:

- The vehicle has been driven for 10 minutes or more (in a city area or on a free way)
- The fuel tank is less than 90 % full
- The altitude is less than 8,000 ft (2,400 m)
- The Engine Coolant Temperature (ECT) is between 4.4°C and 35°C (40°F and 95°F)
- The Intake Air Temperature (IAT) is between 4.4°C and 35°C (40°F and 95°F)
- The vehicle remains stationary (the vehicle speed is 0 mph [0 km/h])

#### (b) Monitor Conditions

- (1) Allow the engine to idle for at least 5 minutes.
- (2) Turn the ignition switch to OFF and wait for 6 hours (8 or 10.5 hours).

### HINT:

Do not start the engine until checking MONITOR STATUS. If the engine is started, the steps described above must be repeated.

#### (c) Monitor Status

- (1) Connect a hand–held tester to the DLC3.
- (2) Turn the ignition switch to ON and turn the tester ON.
- (3) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / MONITOR STATUS.
- (4) Check the Monitor Status displayed on the tester.

### HINT:

If INCMP is displayed, the monitor is not completed. Make sure that the preconditions have been met, and perform the Monitor Conditions again.

### 2. PURGE FLOW MONITOR CONFIRMATION (P0441)

### HINT:

Perform this monitor confirmation after the Key–Off Monitor Confirmation shows COMPL (complete).

#### (a) Preconditions

The monitor will not run unless:

- The vehicle has been driven for 10 minutes or more (in a city area or on a free way)
- The ECT is between 4.4°C and 35°C (40°F and 95°F)
- The IAT is between 4.4°C and 35°C (40°F and 95°F)

#### (b) Monitor Conditions

- (1) Release the pressure from the fuel tank by removing and reinstalling the fuel tank cap.
- (2) Warm the engine up until the ECT reaches more than 75°C (167°F).
- (3) Increase the engine speed to 3,000 rpm once.
- (4) Allow the engine to idle and turn A/C ON for 1 minute.

## (c) Monitor Status

- (1) Turn the ignition switch to OFF (where ON or the engine is running).
- (2) Connect a hand-held tester to the DLC3.
- (3) Turn the ignition switch to ON and turn the tester ON.
- (4) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / MONITOR STATUS.
- (5) Check the Monitor Status displayed on the tester.

## HINT:

If INCMP is displayed, the monitor is not completed. Make sure that the preconditions have been met, and perform the Monitor Conditions again.

**MONITOR RESULT**

Refer to page [DI-26](#) for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor drive pattern (refer to "Confirmation Monitor").

- MID (Monitor Identification Data) is assigned to each emissions-related component.
- TID (Test Identification Data) is assigned to each test value.
- Scaling is used to calculate the test value indicated on generic OBD II scan tools.

**EVAP-Key-off monitor**

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
\$3D	\$C9	Multiply by 0.01 (kPa)	Test value for small leak (P0456): Refer to pressure D*.	Minimum test limit for small leak	Maximum test limit for small leak
\$3D	\$CA	Multiply by 0.01 (kPa)	Test value for gross leak (P0455): Refer to pressure E*.	Minimum test limit for gross leak	Maximum test limit for gross leak
\$3D	\$CB	Multiply by 0.01 (kPa)	Test value for vacuum pump stuck OFF (P2401): Refer to pressure A*.	Minimum test limit for vacuum pump stuck OFF	Maximum test limit for vacuum pump stuck OFF
\$3D	\$CD	Multiply by 0.01 (kPa)	Test value for vacuum pump stuck ON (P2402): Refer to pressure A*.	Minimum test limit for vacuum pump stuck ON	Maximum test limit for vacuum pump stuck ON
\$3D	\$CE	Multiply by 0.01 (kPa)	Test value for vent valve stuck OFF (vent) (P2420): Refer to pressure C*.	Minimum test limit for vent valve stuck ON	Maximum test limit for vent valve stuck ON
\$3D	\$CF	Multiply by 0.01 (kPa)	Test value for vent valve stuck ON (closed) (P2419): Refer to pressure A*.	Minimum test limit for vent valve stuck OFF	Maximum test limit for vent valve stuck OFF
\$3D	\$D0	Multiply by 0.01 (kPa)	Test value for 0.02 inch orifice low flow (P043E): Refer to pressure B*.	Minimum test limit for 0.02 inch orifice low flow	Maximum test limit for 0.02 inch orifice low flow
\$3D	\$D1	Multiply by 0.01 (kPa)	Test value for 0.02 inch orifice high flow (P043F): Refer to pressure A*.	Minimum test limit for 0.02 inch orifice high flow	Maximum test limit for 0.02 inch orifice high flow
\$3D	\$D4	Multiply by 0.01 (kPa)	Test value for purge VSV stuck close (P0441): Refer to pressure F*.	Minimum test limit for purge VSV stuck close	Maximum test limit for purge VSV stuck close
\$3D	\$D5	Multiply by 0.01 (kPa)	Test value for purge VSV stuck open (P0441): Refer to pressure E*.	Minimum test limit for purge VSV stuck open	Maximum test limit for purge VSV stuck open
\$3D	\$D7	Multiply by 0.01 (kPa)	Test value for purge flow (P0441): Refer to pressure G*.	Minimum test limit for purge flow	Maximum test limit for purge flow

\* Pressure A to G are indicated as shown in the diagram below.



