EVAP INSPECTION PROCEDURE

DTCS RELATING TO EVAP SYSTEM

<table>
<thead>
<tr>
<th>DTCs</th>
<th>Monitoring Items</th>
<th>See Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>P043E</td>
<td>0.02 inch orifice clogged (built into pump module)</td>
<td>05-248</td>
</tr>
<tr>
<td>P043F</td>
<td>0.02 inch orifice high-flow (built into pump module)</td>
<td>05-248</td>
</tr>
<tr>
<td>P0441</td>
<td>• Purge VSV (Vacuum Switching Valve) stuck closed</td>
<td>05-255</td>
</tr>
<tr>
<td></td>
<td>• Purge VSV stuck open</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Purge flow</td>
<td></td>
</tr>
<tr>
<td>P0450</td>
<td>Pressure sensor (built into pump module) voltage abnormal fluctuation</td>
<td>05-261</td>
</tr>
<tr>
<td>P0451</td>
<td>• Pressure sensor (built into pump module) abnormal voltage fluctuation</td>
<td>05-261</td>
</tr>
<tr>
<td></td>
<td>• Pressure sensor constant voltage (built into pump module)</td>
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<tr>
<td>P0452</td>
<td>Pressure sensor (built into pump module) voltage low</td>
<td>05-261</td>
</tr>
<tr>
<td>P0453</td>
<td>Pressure sensor (built into pump module) voltage high</td>
<td>05-261</td>
</tr>
<tr>
<td>P0455</td>
<td>EVAP gross leak</td>
<td>05-271</td>
</tr>
<tr>
<td>P0456</td>
<td>EVAP small leak</td>
<td>05-271</td>
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<tr>
<td>P2401</td>
<td>Vacuum pump stuck OFF (built into pump module)</td>
<td>05-352</td>
</tr>
<tr>
<td>P2402</td>
<td>Vacuum pump stuck ON (built into pump module)</td>
<td>05-352</td>
</tr>
<tr>
<td>P2419</td>
<td>Vent valve stuck ON (closed) (built into pump module)</td>
<td>05-359</td>
</tr>
<tr>
<td>P2420</td>
<td>Vent valve stuck OFF (vent) (built into pump module)</td>
<td>05-359</td>
</tr>
<tr>
<td>P2610</td>
<td>Soak timer (built into ECM)</td>
<td>05-365</td>
</tr>
</tbody>
</table>

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

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

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 and P2420) will be all stored.
CIRCUIT DESCRIPTION

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 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 (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.

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 OFF (open) 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.
**A97610**

**EVAP Purge Flow:**

- **Fuel Tank Cap**
- **Refueling Valve**
- **To Intake Manifold**
- **Canister**
- **Vent Valve (OFF)**
- **0.02 Inch Orifice**
- **Pump Module**

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**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 is 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 is purged, valve closes and restrictor prevents a large amount of vacuum from affecting pressure in fuel tank. Valve is opened while refueling. When valve is open, adding fuel into fuel tank is 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 (± 15 min.) after ignition switch turned 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 is vented. Negative pressure (vacuum) is created in EVAP system to check for EVAP leaks by closing purge VSV, vent valve (closed) and operating vacuum pump are turned on (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 an opening with 0.02 inch diameter. Vacuum is 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 a small leak of EVAP.
**Pump Module (fig. 1):**
- Condition: Purge Flow
- Condition: Leak Check

- Vent Valve: OFF (vent)
- To Air Filter (Atmosphere)
- Vacuum Pump: OFF

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

<table>
<thead>
<tr>
<th>Output Voltage</th>
<th>Malfunction Area</th>
<th>Usable Range</th>
<th>Malfunction Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.900 V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.150 V</td>
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<td></td>
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<tr>
<td>1.425 V</td>
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<td></td>
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<tr>
<td>0.450 V</td>
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</tbody>
</table>

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

- Ignition Switch (IGSW)
- Engine Room Junction Block +B
- MREL
- 25 A Source IC
- Soak Timer IC
- ECM

**HINT:**
Standard atmospheric pressure is 101.3 kPa

2005 AVALON REPAIR MANUAL  (RM1169U)
WIRING DIAGRAM
Refer to DTC P0450 on page 05-261.

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 the 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 CONFIRM DTC

(a) Turn the ignition switch off and wait for 10 seconds.
(b) Turn the ignition switch on (IG).
(c) Turn the ignition switch off and wait for 10 seconds.
(d) Connect the hand-held tester to the DLC3.
(e) Turn the ignition switch on (IG) and turn the tester on.
(f) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(g) Confirm DTCs and freeze frame data.

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

<table>
<thead>
<tr>
<th>Malfunctioning Areas</th>
<th>DTCs</th>
<th>P043E</th>
<th>P043F</th>
<th>P0441</th>
<th>P0450</th>
<th>P0451</th>
<th>P0452</th>
<th>P0453</th>
<th>P0455</th>
<th>P0456</th>
<th>P2401</th>
<th>P2402</th>
<th>P2419</th>
<th>P2420</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.02 inch orifice clogged</td>
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<td>⬤</td>
<td>⬤</td>
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<tr>
<td>0.02 inch orifice high-flow</td>
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<tr>
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<tr>
<td>Purge VSV stuck closed</td>
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<td>Pressure sensor stuck</td>
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<td>Pressure sensor noise</td>
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<td>Pressure sensor voltage low</td>
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<tr>
<td>Pressure sensor voltage high</td>
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<td></td>
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<tr>
<td>Gross leak</td>
<td>⬤</td>
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<td>⬤</td>
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<td>Small leak</td>
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<td>⬤</td>
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<tr>
<td>Vacuum pump stuck OFF</td>
<td>⬤</td>
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<td>⬤</td>
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<tr>
<td>Vacuum pump stuck ON</td>
<td>⬤</td>
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<tr>
<td>Vent valve stuck ON (closed)</td>
<td>⬤</td>
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<tr>
<td>Vent valve stuck OFF (vent)</td>
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</tbody>
</table>

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 and P2420) will be all stored.

NEXT
2 PERFORM EVAP SYSTEM CHECK (AUTO OPERATION)

NOTICE:
- In the EVAP SYSTEM CHECK (AUTO OPERATION), the series of 5 EVAP SYSTEM CHECK steps is performed automatically. 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) Connect the hand-held tester to the DLC3.
(b) Clear DTCs (see page 05-54).
(c) Select the following menu items on the tester: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / AUTO OPERATION.
(d) 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.
PERFORM EVAP SYSTEM CHECK (MANUAL OPERATION)

**NOTICE:**
- In the EVAP SYSTEM CHECK (MANUAL OPERATION), the series of 5 EVAP SYSTEM CHECK steps is performed manually.
- 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) Connect the hand-held tester to the DLC3.
(b) Clear DTCs (see page 05-54).
(c) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYSTEM CHECK / MANUAL OPERATION.

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

**Result:**

<table>
<thead>
<tr>
<th>DTCs*</th>
<th>Test Results</th>
<th>Suspected Trouble Areas</th>
<th>Proceed To</th>
</tr>
</thead>
<tbody>
<tr>
<td>—</td>
<td>Virtually no variation in EVAP pressure</td>
<td>Not yet determined</td>
<td>A</td>
</tr>
<tr>
<td>P0451</td>
<td>EVAP pressure fluctuates by ±0.3 kPa (2.25 mmHg) or more</td>
<td>Pressure sensor noising</td>
<td>B</td>
</tr>
</tbody>
</table>

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

B > Go to step 30
(a) Check the EVAP pressure in steps 1/5 and 2/5.

**Result:**

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

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

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

B > Go to step 23

A
HINT:
Make a note of the pressures checked in steps (a) and (b) below.
(a) Check the EVAP pressure 4 seconds after the vacuum pump is activated*1.
(b) Check the EVAP pressure again when it has stabilized. This pressure is the 0.02 inch leak pressure standard.

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

Result:

<table>
<thead>
<tr>
<th>DTCs</th>
<th>Test Results</th>
<th>Suspected Trouble Areas</th>
<th>Proceed To</th>
</tr>
</thead>
<tbody>
<tr>
<td>—</td>
<td>EVAP pressure in step (b) is between -4.85 kPa and -1.06 kPa (-36.38 mmHg and -7.95 mmHg)</td>
<td>Not yet determined</td>
<td>A</td>
</tr>
<tr>
<td>P043F and P2401</td>
<td>EVAP pressure in step (b) is -1.06 kPa (-7.95 mmHg) or more</td>
<td>• 0.02 inch orifice high-flow • Vacuum pump stuck OFF</td>
<td>B</td>
</tr>
<tr>
<td>P043E</td>
<td>EVAP pressure in step (b) is less than -4.85 kPa (-36.38 mmHg)</td>
<td>0.02 inch orifice clogged</td>
<td>C</td>
</tr>
<tr>
<td>P2419</td>
<td>EVAP pressure in step (a) is more than -1.06 kPa (-7.95 mmHg)</td>
<td>Vent valve stuck closed</td>
<td>D</td>
</tr>
</tbody>
</table>

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

- Go to step 11
- Go to step 30
- Go to step 19

A
## 7 PERFORM EVAP SYSTEM CHECK (STEP 2/5 TO 3/5)

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

#### Result:

<table>
<thead>
<tr>
<th>DTCs*</th>
<th>Test Results</th>
<th>Suspected Trouble Areas</th>
<th>Proceed To</th>
</tr>
</thead>
<tbody>
<tr>
<td>—</td>
<td>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</td>
<td>Not yet determined</td>
<td>A</td>
</tr>
<tr>
<td>P2420</td>
<td>No variation in EVAP pressure even after proceeding from step 2/5 to step 3/5</td>
<td>Vent valve stuck open (vent)</td>
<td>B</td>
</tr>
<tr>
<td>P0451</td>
<td>No variation in EVAP pressure during steps 1/5 through 3/5</td>
<td>Pressure sensor malfunction</td>
<td>C</td>
</tr>
</tbody>
</table>

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

- **B** Go to step 20
- **C** Go to step 30

---

2005 AVALON REPAIR MANUAL (RM1169U)
(a) Wait until the EVAP pressure change is less than 0.1 kPa (0.75 mmHg) for 30 seconds.
(b) 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 15 minutes.
PERFORM EVAP SYSTEM CHECK (STEP 4/5)

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

<table>
<thead>
<tr>
<th>DTCs*</th>
<th>Test Results</th>
<th>Suspected Trouble Areas</th>
<th>Proceed To</th>
</tr>
</thead>
<tbody>
<tr>
<td>—</td>
<td>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</td>
<td>Not yet determined</td>
<td>A</td>
</tr>
<tr>
<td>P0441</td>
<td>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</td>
<td>Problems in EVAP hose between pure VSV and intake manifold</td>
<td>B</td>
</tr>
<tr>
<td>P0441</td>
<td>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</td>
<td>Purge VSV stuck closed</td>
<td>C</td>
</tr>
</tbody>
</table>

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

**Go to step 15**

**Go to step 12**
(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:**

<table>
<thead>
<tr>
<th>DTCs*</th>
<th>Test Results</th>
<th>Suspected Trouble Areas</th>
<th>Proceed To</th>
</tr>
</thead>
<tbody>
<tr>
<td>—</td>
<td>EVAP pressure (step 3/5) is lower than second 0.02 inch leak pressure standard (step 5/5)</td>
<td>Not yet determined (no leakage from EVAP system)</td>
<td>A</td>
</tr>
</tbody>
</table>
| P0441 and P0455 | EVAP pressure (step 3/5) is higher than [second 0.02 inch leak pressure standard (step 5/5) x 0.2] | • Purge VSV stuck open  
• EVAP gross leak | B |
| P0456 | EVAP pressure (step 3/5) is 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 the hand-held tester when checking.

A ➤ Go to step 36

B ➤ Go to step 12
(a) Check the EVAP pressure in step 3/5.

Result:

<table>
<thead>
<tr>
<th>DTCs*</th>
<th>Test Results</th>
<th>Suspected Trouble Areas</th>
<th>Proceed To</th>
</tr>
</thead>
<tbody>
<tr>
<td>P043F</td>
<td>EVAP pressure is less than [0.02 inch leak pressure standard] measured in step 2/5</td>
<td>0.02 inch orifice high-flow</td>
<td>A</td>
</tr>
<tr>
<td>P2401</td>
<td>EVAP pressure is almost the same as [0.02 inch leak pressure standard] measured in step 2/5</td>
<td>Vacuum pump stuck OFF</td>
<td>B</td>
</tr>
</tbody>
</table>

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

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

A ➔ Go to step 30

B ➔ Go to step 23
### PERFORM ACTIVE TEST USING HAND-HELD TESTER (PURGE VSV)

(a) Select the following menu items on the tester: DIAGNOSIS / ENHANCED OBD II/ ACTIVE TEST / EVAP VSV (ALONE).

(b) Disconnect the hose (connected to the canister) from the purge VSV.

(c) Start the engine.

(d) Using the tester, turn off the purge VSV (EVAP VSV: OFF).

(e) Confirm that the purge VSV has no suction with your fingers.

(f) Using the tester, turn on the purge VSV (EVAP VSV: ON).

(g) Confirm that the purge VSV has suction with your fingers.

**Result:**

<table>
<thead>
<tr>
<th>Test Results</th>
<th>Suspected Trouble Areas</th>
<th>Proceed To</th>
</tr>
</thead>
<tbody>
<tr>
<td>No suction when purge VSV turned OFF, and suction applied when turned ON</td>
<td>-</td>
<td>A</td>
</tr>
<tr>
<td>Suction applied when purge VSV turned OFF</td>
<td>Purge VSV stuck open</td>
<td>B</td>
</tr>
<tr>
<td>No suction when purge VSV turned ON</td>
<td>• Purge VSV stuck closed</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>• Problems with EVAP hose between purge VSV and throttle body</td>
<td></td>
</tr>
</tbody>
</table>

(h) Reconnect the hose.

- **B** Go to step 14
- **C** Go to step 15

![Diagram of Purge VSV and Hose](G41038.png)
13 CHECK FUEL TANK CAP ASSY

(a) Check that the fuel tank cap is correctly installed.
(b) Confirm that the fuel tank cap is tightened until a few click sounds are heard.

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

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

Result:

<table>
<thead>
<tr>
<th>Test Results</th>
<th>Suspected Trouble Areas</th>
<th>Proceed To</th>
</tr>
</thead>
</table>
| Fuel tank cap correctly installed | • Fuel tank cap improperly installed  
• Defective fuel tank cap  
• Fuel tank cap does not meet OEM specifications | A          |
| Fuel tank cap loose           |                                                                                        | B          |
| No fuel tank cap              |                                                                                        | C          |

A ➤ Go to step 29
B ➤ Go to step 27
C ➤ Go to step 28

14 INSPECT VACUUM SWITCHING VALVE NO.1

(a) Turn the ignition switch off.
(b) Disconnect the B31 purge VSV connector.
(c) Disconnect the hose (connected to the canister) from the purge VSV.
(d) Start the engine.
(e) Confirm that the purge VSV has no suction with your fingers.

Result:

<table>
<thead>
<tr>
<th>Test Results</th>
<th>Suspected Trouble Areas</th>
<th>Proceed To</th>
</tr>
</thead>
<tbody>
<tr>
<td>No suction</td>
<td>ECM</td>
<td>A</td>
</tr>
<tr>
<td>Suction applied</td>
<td>Purge VSV</td>
<td>B</td>
</tr>
</tbody>
</table>

(f) Reconnect the purge VSV connector.
(g) Reconnect the hose.

A ➤ Go to step 35
B ➤ Go to step 31
15 **CHECK EVAP HOSE (PURGE VSV - THROTTLE BODY)**

(a) Disconnect the hose (connected to the throttle body) from the purge VSV.
(b) Start the engine.
(c) Confirm that the hose has suction with your fingers.

<table>
<thead>
<tr>
<th>Test Results</th>
<th>Suspected Trouble Areas</th>
<th>Proceed To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suction applied</td>
<td>-</td>
<td>A</td>
</tr>
<tr>
<td>No suction</td>
<td>• Throttle body&lt;br&gt;• EVAP hose between purge VSV and throttle body</td>
<td>B</td>
</tr>
</tbody>
</table>

(d) Reconnect the hose.

B  Go to step 26

16 **INSPECT VACUUM SWITCHING VALVE NO.1 (PURGE VSV)**

(a) Remove the purge VSV.
(b) Apply battery voltage to the terminals of the purge VSV.
(c) Using compressed air, confirm that air flows from port A to port B.

<table>
<thead>
<tr>
<th>Test Results</th>
<th>Suspected Trouble Areas</th>
<th>Proceed To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air flows</td>
<td>-</td>
<td>A</td>
</tr>
<tr>
<td>No air flow</td>
<td>Purge VSV</td>
<td>B</td>
</tr>
</tbody>
</table>

(d) Install the purge VSV.

B  Go to step 31
17 CHECK WIRE HARNESS AND CONNECTOR (POWER SOURCE OF PURGE VSV)

(a) Disconnect the B31 purge VSV connector.  
(b) Turn the ignition switch on (IG).  
(c) Measure the voltage between terminal 1 of the purge VSV connector and the body ground.

Result:

<table>
<thead>
<tr>
<th>Test Results</th>
<th>Suspected Trouble Areas</th>
<th>Proceed To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between 11 V and 14 V</td>
<td>Wire harness or connectors between purge VSV and ECM</td>
<td>A</td>
</tr>
<tr>
<td>Other than result above</td>
<td></td>
<td>B</td>
</tr>
</tbody>
</table>

(d) Reconnect the purge VSV connector.

A ➔ Go to step 32

18 CHECK WIRE HARNESS AND CONNECTOR (PURGE VSV - ECM)

(a) Disconnect the B45 ECM connector and the B31 purge VSV connector.  
(b) Measure the resistance between the terminals of the purge VSV connector and ECM connector.

Standard:

<table>
<thead>
<tr>
<th>Tester Connections</th>
<th>Specified Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>B45-34 (PRG) - B31-1</td>
<td>Below 1 Ω</td>
</tr>
<tr>
<td>B45-34 (PRG) - Body ground</td>
<td>10 kΩ or higher</td>
</tr>
<tr>
<td>B31-1 - Body ground</td>
<td>10 kΩ or higher</td>
</tr>
</tbody>
</table>

(c) Reconnect the purge VSV connector.  
(d) Reconnect the ECM connector.

OK ➔ Go to step 35

NG ➔ Go to step 32
19 PERFORM ACTIVE TEST USING HAND-HELD TESTER (FOR VENT VALVE)

(a) Turn the ignition switch on (IG).
(b) Select the following menu items on the tester: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VENT VALVE.
(c) 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:

<table>
<thead>
<tr>
<th>Test Results</th>
<th>Suspected Trouble Areas</th>
<th>Proceed To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between 9 V and 14 V when OFF</td>
<td>Vent valve</td>
<td>A</td>
</tr>
<tr>
<td>Below 3 V when ON</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 3 V when OFF and ON</td>
<td>ECM</td>
<td>B</td>
</tr>
</tbody>
</table>

A ➔ Go to step 22
B ➔ Go to step 35

20 PERFORM ACTIVE TEST USING HAND-HELD TESTER (FOR VENT VALVE)

(a) Turn the ignition switch on (IG).
(b) Select the following menu items on the tester: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VENT VALVE (ALONE).
(c) 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:

<table>
<thead>
<tr>
<th>Test Results</th>
<th>Suspected Trouble Areas</th>
<th>Proceed To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 3 V when OFF and ON</td>
<td>Power source of vent valve</td>
<td>A</td>
</tr>
<tr>
<td>Between 9 V and 14 V when OFF</td>
<td>Vent valve</td>
<td>B</td>
</tr>
<tr>
<td>Below 3 V when ON</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between 9 V and 14 V when OFF and ON</td>
<td>ECM</td>
<td>C</td>
</tr>
</tbody>
</table>

B ➔ Go to step 22
C ➔ Go to step 35

A ➔
21 INSPECT PUMP MODULE (POWER SOURCE FOR VENT VALVE)

(a) Turn the ignition switch off.
(b) Disconnect the L12 canister connector.
(c) Turn the ignition switch on (IG).
(d) Measure the voltage between terminal 9 of the canister connector and the body ground.

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

(e) Reconnect the canister connector.

B Go to step 32
22

INSPECT PUMP MODULE (VENT VALVE OPERATION)

Charcoal Canister Assy:

(a) Turn the ignition switch off.
(b) Disconnect the L12 canister connector.
(c) Apply the battery voltage to terminals 9 and 8 of the pump module.
(d) Touch the pump module to confirm the vent valve operation.

Result:

<table>
<thead>
<tr>
<th>Test Results</th>
<th>Suspected Trouble Areas</th>
<th>Proceed To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating</td>
<td>Wire harness between vent valve and ECM</td>
<td>A</td>
</tr>
<tr>
<td>Not operating</td>
<td>Vent valve</td>
<td>B</td>
</tr>
</tbody>
</table>

(e) Reconnect the canister connector.

A Go to step 32

B Go to step 30

23

PERFORM ACTIVE TEST USING HAND-HELD TESTER (FOR PUMP MODULE(VACUUM PUMP))

ECM:

(a) Select the following menu items on the tester: DIAGNOSTIC / ENHANCED OBD II / ACTIVE TEST / VACUUM PUMP.
(b) 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:

<table>
<thead>
<tr>
<th>Tests Results</th>
<th>Suspected Trouble Areas</th>
<th>Proceed To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between 0 V and 3 V when OFF</td>
<td>ECM</td>
<td>A</td>
</tr>
<tr>
<td>Between 9 V and 14 V when ON</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between 9 V and 14 V when OFF</td>
<td>ECM</td>
<td>B</td>
</tr>
<tr>
<td>Between 0 V and 3 V when ON</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B Go to step 35

A
24 CHECK WIRE HARNESS AND CONNECTOR (PUMP MODULE - ECM)

(a) Turn the ignition switch off.
(b) Disconnect the L12 canister connector.
(c) Turn the ignition switch on (IG).
(d) Select the following menu items on the tester: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VACUUM PUMP.
(e) Turn the vacuum pump ON.
(f) Measure the voltage between terminal 1 of the canister connector and the body ground.

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

(g) Reconnect the canister connector.

B Go to step 32
25 CHECK WIRE HARNESS AND CONNECTOR (PUMP MODULE - GROUND)

(a) Disconnect the L12 canister connector.
(b) Turn the ignition switch off.
(c) Measure the resistance between terminal 6 of the canister connector and the body ground.

Result:

<table>
<thead>
<tr>
<th>Test Results</th>
<th>Suspected Trouble Areas</th>
<th>Proceed To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 1 Ω</td>
<td>Vacuum pump</td>
<td>A</td>
</tr>
<tr>
<td>10 kΩ or more</td>
<td>Wire harness between vacuum pump and body ground</td>
<td>B</td>
</tr>
</tbody>
</table>

(d) Reconnect the canister connector.

A > Go to step 30
B > Go to step 32

26 INSPECT THROTTLE W/MOTOR BODY ASSY

(a) Stop the engine.
(b) Disconnect the EVAP hose from the throttle body.
(c) Start the engine.
(d) Confirm that the port of the throttle body has suction with your fingers.

Result:

<table>
<thead>
<tr>
<th>Test Results</th>
<th>Suspected Trouble Areas</th>
<th>Proceed To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suction applied</td>
<td>EVAP hose between throttle body and purge VSV</td>
<td>A</td>
</tr>
<tr>
<td>No suction</td>
<td>Throttle body</td>
<td>B</td>
</tr>
</tbody>
</table>

(e) Reconnect the EVAP hose.

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 ASSY

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

NEXT Go to step 37

29 REPAIR EVAP LEAK PART

(a) Prepare a rubber hose with a 15 to 18.5 mm inside diameter.
(b) Reinstall the fuel tank cap.
(c) Using SST, pinch the rubber tube to close the canister passage.
SST 00002-6872A
(d) Connect a pressure gauge to the service port (green cap near the air cleaner box).
(e) Pressurize the EVAP system to 3.2 to 3.7 kPa (24 to 28 mmHg).
(f) Apply soapy water to the piping and connecting parts of the EVAP system. Check for areas where bubbles appear. This indicates leaking points.
(g) Repair or replace leaking points.

HINT:
• If the system has leaks, a whistling sound will be heard.
• Disconnect the hose between the canister and the fuel tank from the canister. Close the canister hose connected to the fuel tank, and conduct an inspection. In this way, the fuel tank can be excluded as an area suspected of causing fuel leaks.

NEXT Go to step 37

30 REPLACE CHARCOAL CANISTER ASSY

NEXT Go to step 37

31 REPLACE VACUUM SWITCHING VALVE NO.1 (PURGE VSV)

(a) Disconnect the connector and 2 hoses from the purge VSV.
(b) Remove the purge VSV.
(c) Install a new purge VSV.
(d) Reconnect the connector and 2 hoses.

NEXT Go to step 37
### 32 REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR
- **NEXT** Go to step 37

### 33 REPLACE EVAP HOSE (THROTTLE BODY - PURGE VSV)
- **NEXT** Go to step 37

### 34 INSPECT THROTTLE W/MOTOR BODY ASSY
(a) Remove the throttle body (see page 10-15).
(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

### 35 REPLACE ECM (SEE PAGE 10-20)
- **NEXT** Go to step 37

### 36 REPAIR OR REPLACE PARTS AND COMPONENTS INDICATED BY OUTPUT DTCS
(a) Repair the malfunctioning areas indicated by the DTCs that had been confirmed when the vehicle was brought in.
- **NEXT** Go to step 37

### 37 PERFORM EVAP SYSTEM CHECK (AUTO OPERATION)
- **NEXT**

**NOTICE:**
- In the EVAP SYSTEM CHECK (AUTO OPERATION), the series of 5 EVAP SYSTEM CHECK steps is performed automatically. 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 an EVAP SYSTEM CHECK, keep the temperature below 35°C (95°F).
(a) Clear DTCs (see page 05-54).
(b) Select the following menu items on the tester: 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.
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 freeway)
      - 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 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 the hand-held tester to the DLC3.
      (2) Turn the ignition switch on (IG) and turn the tester on.
      (3) 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 freeway)
      - 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 the A/C ON for 1 minute.
   (c) Monitor Status
      (1) Turn the ignition switch off.
      (2) Connect the hand-held tester to the DLC3.
      (3) Turn the ignition switch on (IG) and turn the tester on.
      (4) 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 05-34 for detailed information.

The test value and test limit information are described as shown in the following table. This information is included under MONITOR RESULT in the emissions-related DTC sections:

- 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.

### Thermostat

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

* Pressures A to G are indicated as shown in the diagram on the next page.
Key-off Monitor

- Monitor Start
- Purge VSV
- ON (Open)
- ON (Close)
- Vent Valve
- Pump
- Atmosphere (0 kPa)
- Criterion 1 (-1.2 kPa)
- Criterion 5 (-4.3 kPa)
- Elapsed Time (Seconds)
- Criterion 2 (Criterion 4 x 0.2)
- Criterion 3 (0.3 kPa)
- Criterion 4
- Criterion 6 (0.3 kPa)
- Within 900
- criterion 7 (0.1 kPa)
- EVAP Pressure (Reference)
- Criterion 8 (1 kPa)

Purge Flow Monitor

- Sequence
- 1 ON (Open)
- 2 ON (Close)
- Purge VSV
- Vent Valve
- EVAP Pressure (Reference)
- Criterion 7 (0.1 kPa)
- Criterion 8 (1 kPa)

If pressure change in sequence 1 is greater than criterion 7, purge flow monitor is completed (functioning normally).

If pressure change in sequence 1 is smaller than criterion 7, sequence 2 is run.

If pressure change in sequence 2 is smaller than criterion 8, purge flow is insufficient.