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<b>Model Year:</b> 2007	<b>Model:</b> ES350	<b>Doc ID:</b> RM000000SWF01EX
<b>Title:</b> 2GR-FE ENGINE CONTROL SYSTEM: SFI SYSTEM: P0441: Evaporative Emission Control System Incorrect Purge Flow (2007 ES350)<!--DTC SUMMARY-->		

<b>DTC</b>	<b>P0441</b>	<b>Evaporative Emission Control System Incorrect Purge Flow</b>
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## DTC SUMMARY

DTC NO.	MONITORING ITEM	DTC DETECTION CONDITION	TROUBLE AREA	DETECTION TIMING	DETECTION LOGIC
P0441	EVAP VSV (Vacuum Switching Valve) stuck open	Vacuum pump creates negative pressure (vacuum) in EVAP system and EVAP system pressure is measured. 0.02 inch leak pressure standard is measured at start and at end of leak check. If stabilized pressure is higher than [second 0.02 inch leak pressure standard x 0.2], ECM determines that EVAP VSV is stuck open	<ul style="list-style-type: none"> <li>● EVAP VSV</li> <li>● Connector/wire harness (EVAP VSV - ECM)</li> <li>● ECM</li> <li>● Pump module</li> <li>● Leakage from EVAP system</li> </ul>	While engine switch off	2 trip
P0441	EVAP VSV stuck closed	After EVAP leak check is performed, EVAP VSV is turned ON (open), and atmospheric air is introduced into EVAP system. 0.02 inch leak pressure standard is measured at start and at end of the check. If pressure does not return to near atmospheric pressure, ECM determines that purge valve is stuck closed	<ul style="list-style-type: none"> <li>● EVAP VSV</li> <li>● Connector/wire harness (EVAP VSV - ECM)</li> <li>● ECM</li> <li>● Pump module</li> <li>● Leakage from EVAP system</li> </ul>	While engine switch off	2 trip
P0441	Purge flow	While engine is running, following conditions are successively met: <ul style="list-style-type: none"> <li>● Negative pressure is not created in EVAP system when EVAP VSV is turned ON (open)</li> <li>● EVAP system pressure change is less than 0.5 kPa (3.75 mmHg) when vent valve is turned ON (closed)</li> <li>● Atmospheric pressure change before and after purge flow monitor is less than 0.1 kPa (0.75 mmHg)</li> </ul>	<ul style="list-style-type: none"> <li>● EVAP VSV</li> <li>● Connector/wire harness (EVAP VSV - ECM)</li> <li>● Leakage from EVAP line (EVAP VSV - Intake manifold)</li> <li>● ECM</li> </ul>	While engine running	2 trip

## DESCRIPTION

The circuit description can be found in the EVAP (Evaporative Emission) system [INFO](#) .

## INSPECTION PROCEDURE

Refer to the EVAP system [INFO](#) .

## 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 engine switch is turned off. The purge flow monitor runs while the engine is running.

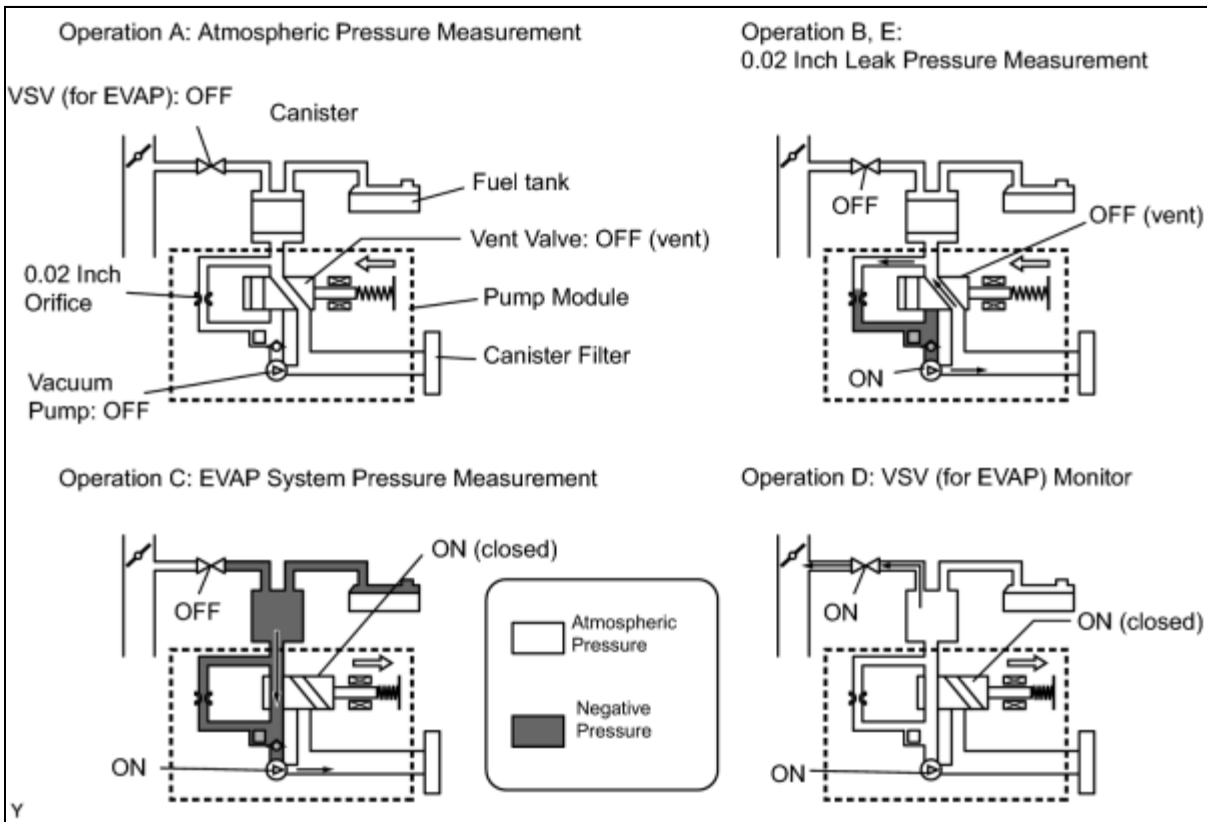
## 1. KEY-OFF MONITOR

5 hours\* after the engine 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.

**\*: If the engine coolant temperature is not below 35°C (95°F) 5 hours after the engine 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 engine switch is turned off, the monitor check starts 2.5 hours later.**

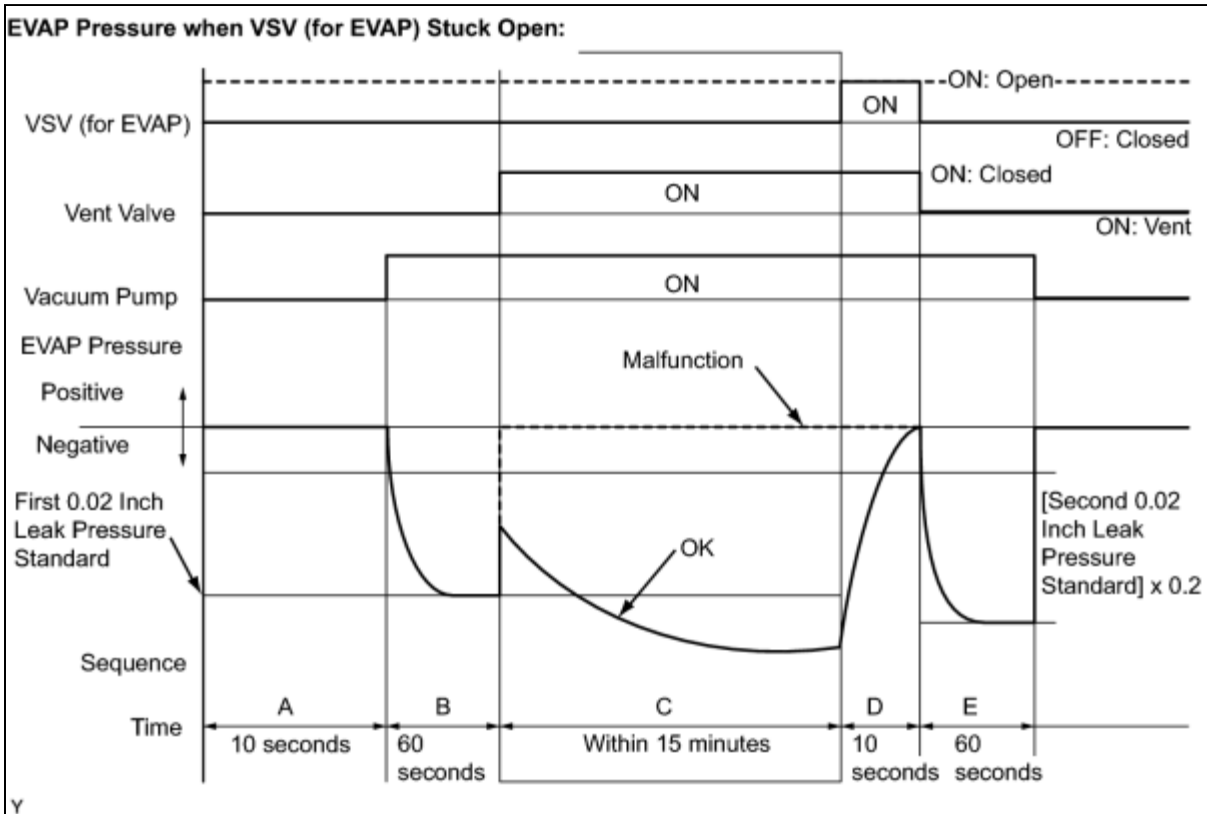
SEQUENCE	OPERATION	DESCRIPTION	DURATION
-	ECM activation	Activated by soak timer, 5 hours (7 or 9.5 hours) after engine switch turned is off.	-
A	Atmospheric pressure measurement	Vent valve is turned OFF (vent) and EVAP system pressure is measured by ECM in order to register atmospheric pressure. If pressure in EVAP system 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 is turned ON (closed) to shut EVAP system. Negative pressure (vacuum) is created in EVAP system, and EVAP system pressure is then measured. Write down measured value as they will be used in leak check. If EVAP pressure does not stabilize within 15 minutes, ECM cancels EVAP system monitor.	15 seconds*
D	EVAP VSV monitor	EVAP VSV is opened and then EVAP system pressure is measured by ECM. Large increase indicates normal.	10 seconds
E	Second 0.02 inch leak pressure measurement	After second 0.02 inch leak pressure measurement, leak check is performed by comparing first and second 0.02 inch leak pressure standards. If stabilized system pressure is higher than second 0.02 inch leak pressure standard, ECM determines that there is a leak in EVAP system.	60 seconds
F	Final check	Atmospheric pressure is measured and then monitoring result is recorded by ECM.	-

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



(a) EVAP VSV stuck open

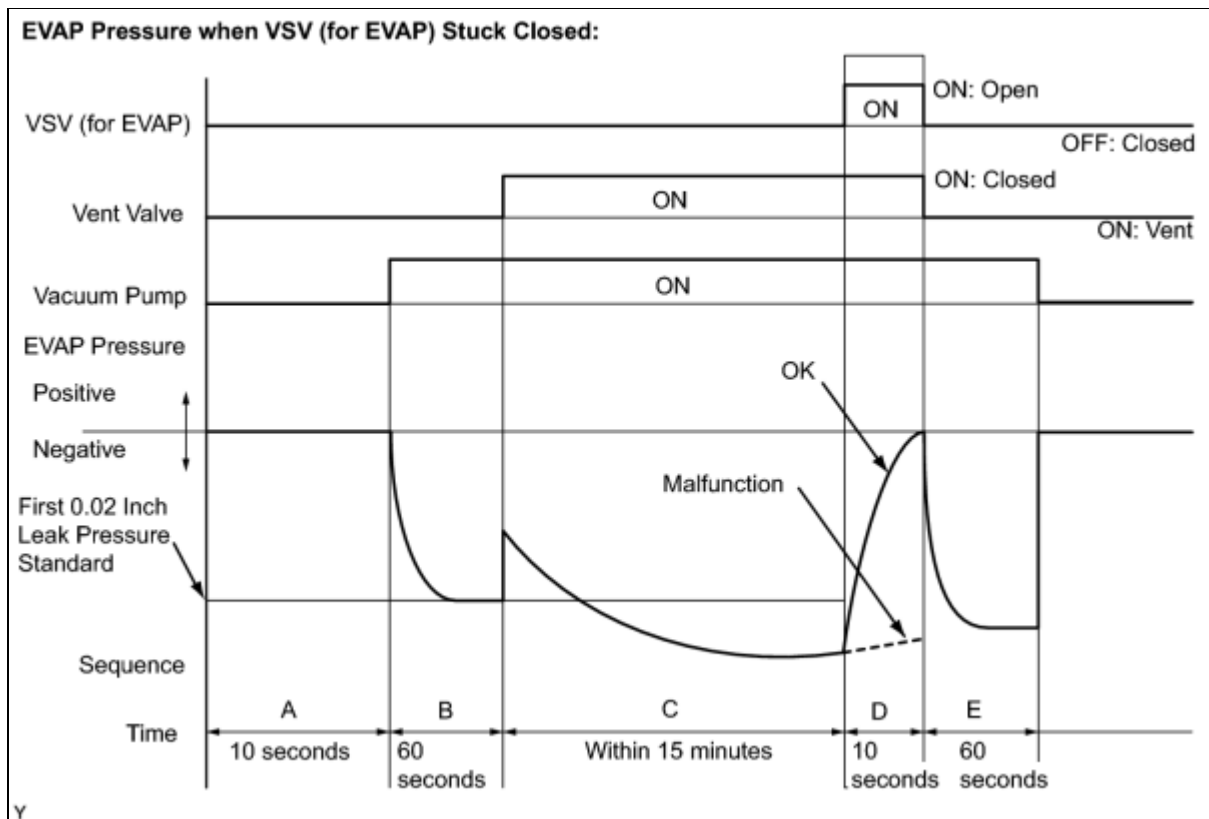
In operation C, the vacuum pump creates negative pressure (vacuum) in the EVAP (Evaporative Emission) system. The EVAP system pressure is then measured by the ECM using the pressure sensor. If the stabilized system pressure is higher than [second 0.02 inch leak pressure standard x 0.2], the ECM interprets this as the EVAP VSV (Vacuum Switching Valve) being stuck open. The ECM illuminates the MIL and sets the DTC (2 trip detection logic).



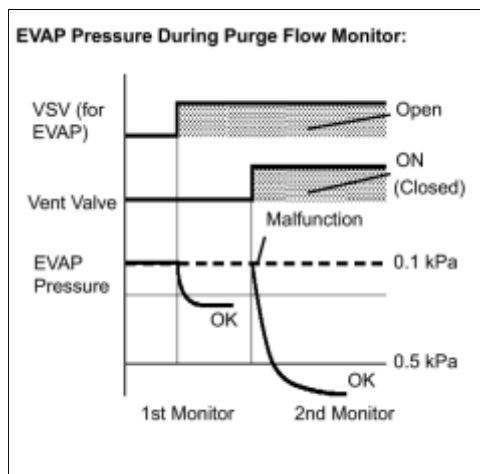
(b) EVAP VSV stuck closed

In operation D, the pressure sensor measures the EVAP (Evaporative Emission) system pressure. The pressure measurement for EVAP VSV monitor

is begun when the EVAP 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 EVAP VSV is functioning normally. If the pressure does not increase, the ECM interprets this as the EVAP 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 EVAP 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 EVAP 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 pressure, before and after conduction of the purge flow monitor, is measured by the ECM.

## OBD II MONITOR SPECIFICATIONS

### 1. Key-off Monitor

Monitor Strategy:

Required Sensors/Components	EVAP VSV and pump module
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Frequency of Operation	Once per driving cycle
Duration	Within 15 minutes
MIL Operation	2 driving cycles
Sequence of Operation	None

**Typical Enabling Conditions:**

EVAP key-off monitor runs when all of following conditions are met:	-
Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg)
Battery voltage	10.5 V or more
Vehicle speed	Below 2.5 mph (4 km/h)
Engine switch	OFF
Time after key off	5, 7 or 9.5 hours
EVAP pressure sensor malfunction (P0450, P0451, P0452 and/or P0453)	Not detected
EVAP VSV	Not operated by scan tool
Vent valve	Not operated by scan tool
Leak detection pump	Not operated by scan tool
Both of following conditions are met before key off:	Conditions 1 and 2
1. Duration that vehicle is being driven	5 minutes or more
2. EVAP purge operation	Performed
ECT	4.4 to 35°C (40 to 95°F)
IAT	4.4 to 35°C (40 to 95°F)

(a) Key-off monitor sequence 1 to 8

**1. Atmospheric pressure**

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

**2. First reference pressure**

Next sequence is run if all of following conditions are met:	Conditions 1, 2 and 3
1. EVAP pressure 4 seconds after reference pressure measurement	-1 kPa (-7.5 mmHg) or less
2. Reference pressure	-4.85 to -1.05 kPa (-36.38 to -7.87 mmHg)
3. Reference pressure	Saturated within 1 minute

**3. Vent valve stuck closed check**

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

**4. Vacuum introduction and leak**

Next sequence is run if both of following condition is met:	-
Vacuum introduction time	15 minutes or less

### 5. EVAP VSV stuck closed check

Next sequence is run if following condition is met:	-
EVAP pressure change after purge VSV is turned ON	0.3 kPa (2.25 mmHg) or more

### 6. Second reference pressure measurement

Next sequence is run if all of following conditions are met:	Conditions 1, 2, 3 and 4
1. EVAP pressure just after reference pressure measurement	-1 kPa (-7.5 mmHg) or less
2. Reference pressure	-4.85 to -1.05 kPa (-36.38 to -7.87 mmHg)
3. Reference pressure	Saturated within 1 minute
4. Reference pressure difference between first and second	Less than 0.7 kPa (5.25 mmHg)

### 7. Leak check

Next sequence is run if following condition is met:	-
EVAP pressure when vacuum introduction was complete	Less than second reference pressure

### 8. Atmospheric pressure

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

### Typical Malfunction Thresholds:

One of the following conditions is met:	-
(a) EVAP VSV stuck open	-
EVAP pressure when vacuum introduction is complete	Higher than reference pressure x 0.2
(b) EVAP VSV stuck closed	-
EVAP pressure change after EVAP canister purge valve is opened	Less than 0.3 kPa (2.25 mmHg)

### 2. Purge Flow Monitor

#### Monitor Strategy:

Required Sensors/Components	EVAP VSV and pump module
Frequency of Operation	Once per driving cycle
Duration	Within 10 minutes
MIL Operation	2 driving cycles
Sequence of Operation	None

#### Typical Enabling Conditions:

Monitor runs whenever these DTCs are not present	-
Engine	Running
ECT	4.4°C (40°F) or more
IAT	4.4°C (40°F) or more
EVAP pressure sensor malfunction	Not detected

EVAP VSV	Not operated by scan tool
EVAP system check	Not detected by scan tool
Battery voltage	10 V or more
Purge duty cycle	8 % or more

**Typical Malfunction Thresholds:**

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

## **MONITOR RESULT**

Refer to CHECKING MONITOR STATUS  .

