EVAP System

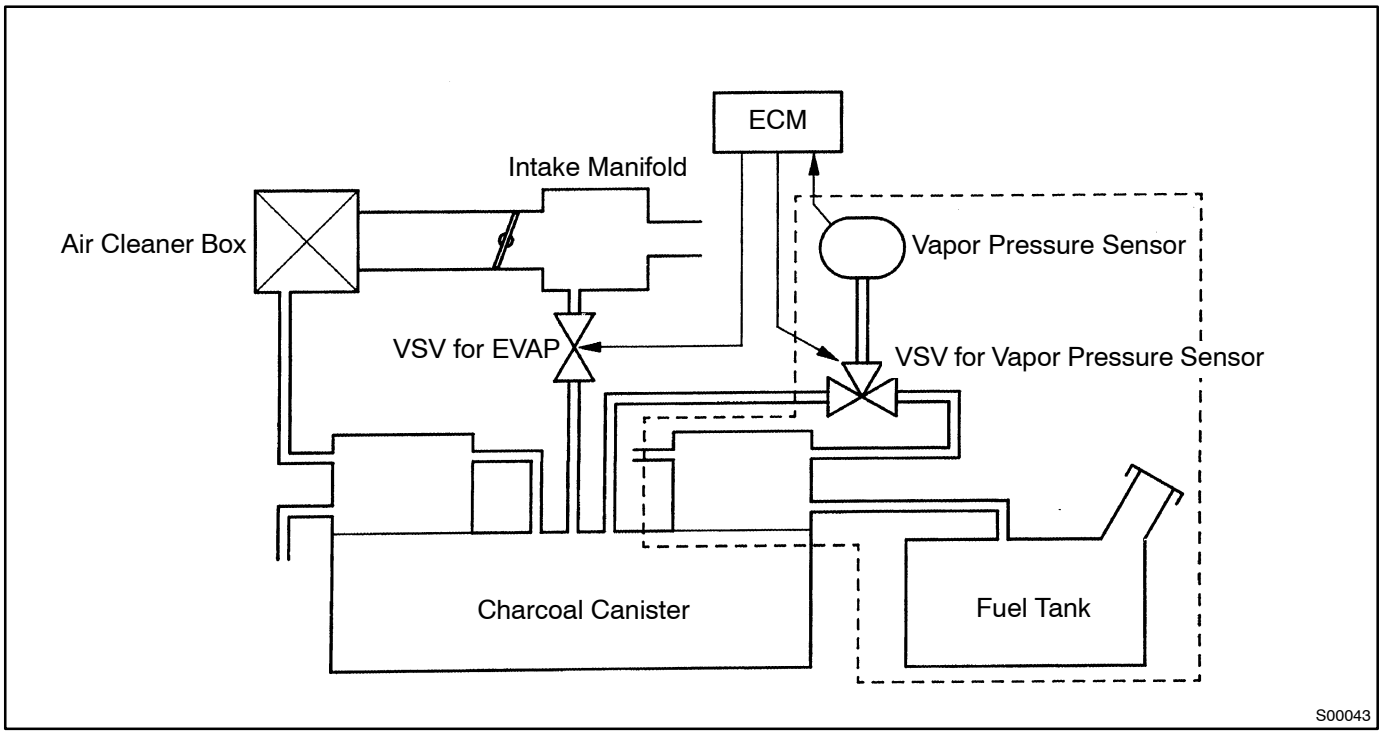
EVAP Monitor Introduction

Two EVAP systems have been used since 1998.

1. Fuel tank pressure monitor (1998 and 1999 model)

The EVAP control system is a system which utilizes the intake manifold vacuum to draw the evaporative emissions into the intake manifold and mix then in with the intake air. The ECM controls a duty−cycle type VSV (vacuum switching valve) to purge the evaporative emissions from the charcoal canister.

The ECM uses the vapor pressure sensor to detect malfunctions in the evaporative emissions (EVAP) system. This diagnostic checks the function of the VSV for EVAP and VSV for vapor pressure sensor, and the integrity of these components and the fuel tank from the standpoint of fuel vapor emissions. When the VSV for vapor pressure sensor is closed, the ECM monitors the vapor pressure in the fuel tank. When it is open, the ECM monitors the vapor pressure in the charcoal canister.



(a) EVAP Leak Monitor (DTC P0440 and P0442)

In this diagnostic, the ECM switches the VSV for vapor pressure sensor closed so that it will monitor the vapor pressure in the fuel tank. It is normal for the vapor pressure in the tank to change over a period time. If the ECM detects very small change of the vapor pressures in a 20 minute interval, it interprets this as a malfunction (leak) in the EVAP system. The ECM will illuminate the MIL (2−trip detection logic) and set a DTC.

(b) VSV for EVAP Monitor (DTC P0441)

In one part of this diagnostic, the ECM switches the VSV for EVAP open to apply manifold vacuum to the EVAP system. The ECM then monitors the vapor pressure in the charcoal canister.

It is normal for the vapor pressure decrease when the VSV for EVAP is opened. If the ECM detects no reduction of the vapor pressures it interprets this as a “stuck closed” malfunction in the VSV for EVAP.

In a second part of this diagnostic, the ECM checks the vapor pressure in the charcoal canister with the VSV for EVAP off. In this case there should be some vapor pressure in the canister. If the vapor pressure in the canister is low and remains low, the ECM interprets this as a “stuck open” malfunction in the VSV for EVAP.

In either case, the ECM will illuminate the MIL and set a DTC.

(c) VSV for Vapor Pressure Sensor Monitor (DTC P0446)
In one part of this diagnostic, the ECM closes the VSV for EVAP. This should allow for a gradual increase in canister pressure. The ECM monitors the vapor pressure in the charcoal canister. If the ECM detects no increase in the vapor pressures it interprets this as a leak in the charcoal canister or vapor lines.
In a second part of this diagnostic, the ECM checks the VSV for vapor pressure sensor. When the VSV for vapor pressure sensor is switched from the charcoal canister to the fuel tank, the vapor pressure sensor should indicate a different pressure level. If there is little or no change in the indicated vapor pressure, the ECM interprets this as a malfunction in the VSV for vapor pressure sensor.
In either case, the ECM will illuminate the MIL (2–trip detection logic) and set a DTC.

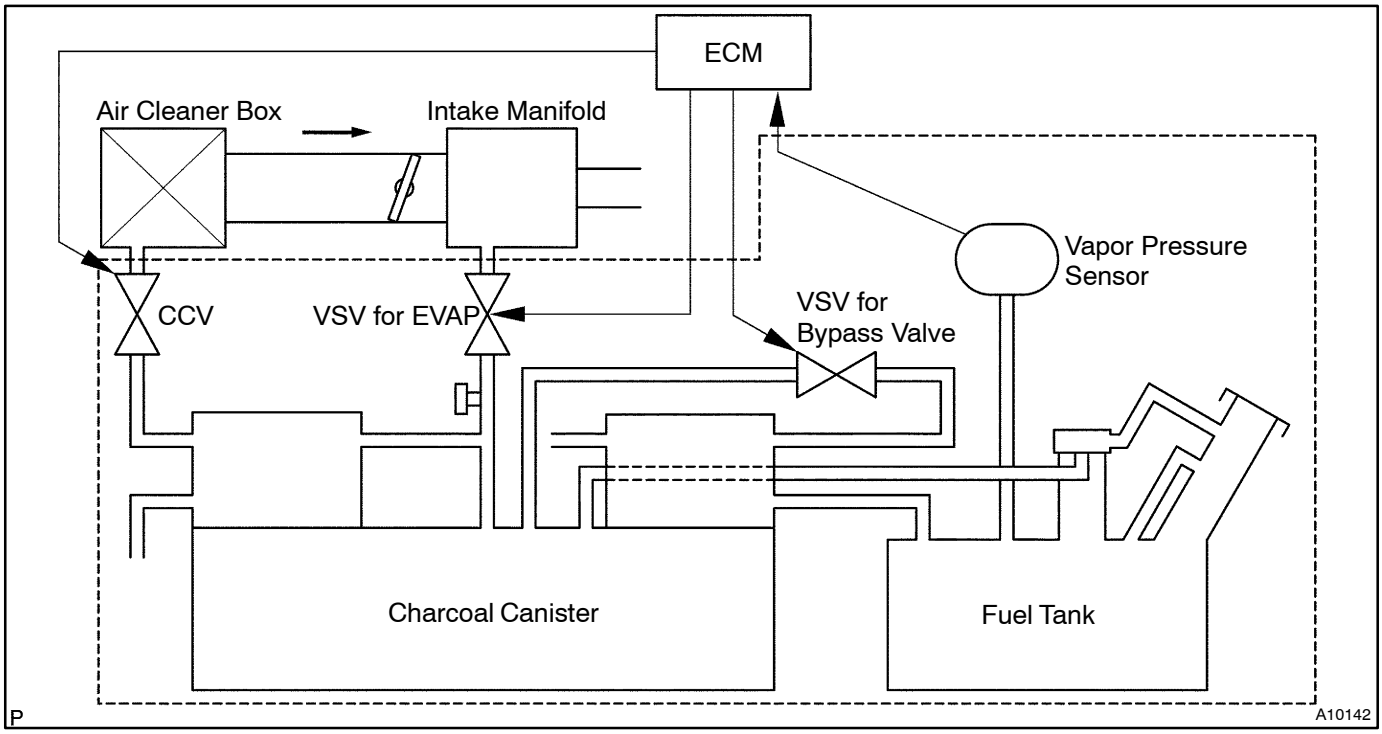
MONITOR DTC TABLE

DTC	Document Title	See Page
P0440	EVAP leak	Ev–6
P0441	VSV for EVAP	Ev–8
P0446	VSV for Vapor Pressure Sensor	Ev–10
P0450	Vapor pressure sensor	Ev–17
P0451	Vapor pressure sensor Range/Performance	Ev–18

2. Vacuum monitor (2000 to 2003 model)

As in the 2000 and later models, the vacuum type has been adopted to detect leaks in the EVAP system. This vacuum type detects leaks by forcefully introducing the purge vacuum into the entire system and monitoring the changes in the pressure. It consists of the following main components:

- A canister closed valve (CCV) that closes the fresh air line from the air cleaner to the charcoal canister has been adopted.
- A VSV for bypass valve that opens the evaporator line between the fuel tank and the charcoal canister has been adopted.
- Function to close the purge line from the air intake manifold to the charcoal canister for this system is added to the original functions of VSV for EVAP.
- A vapor pressure sensor that measures the pressure in the fuel tank while checking for EVAP leaks and sends signals to the ECM has been adopted.



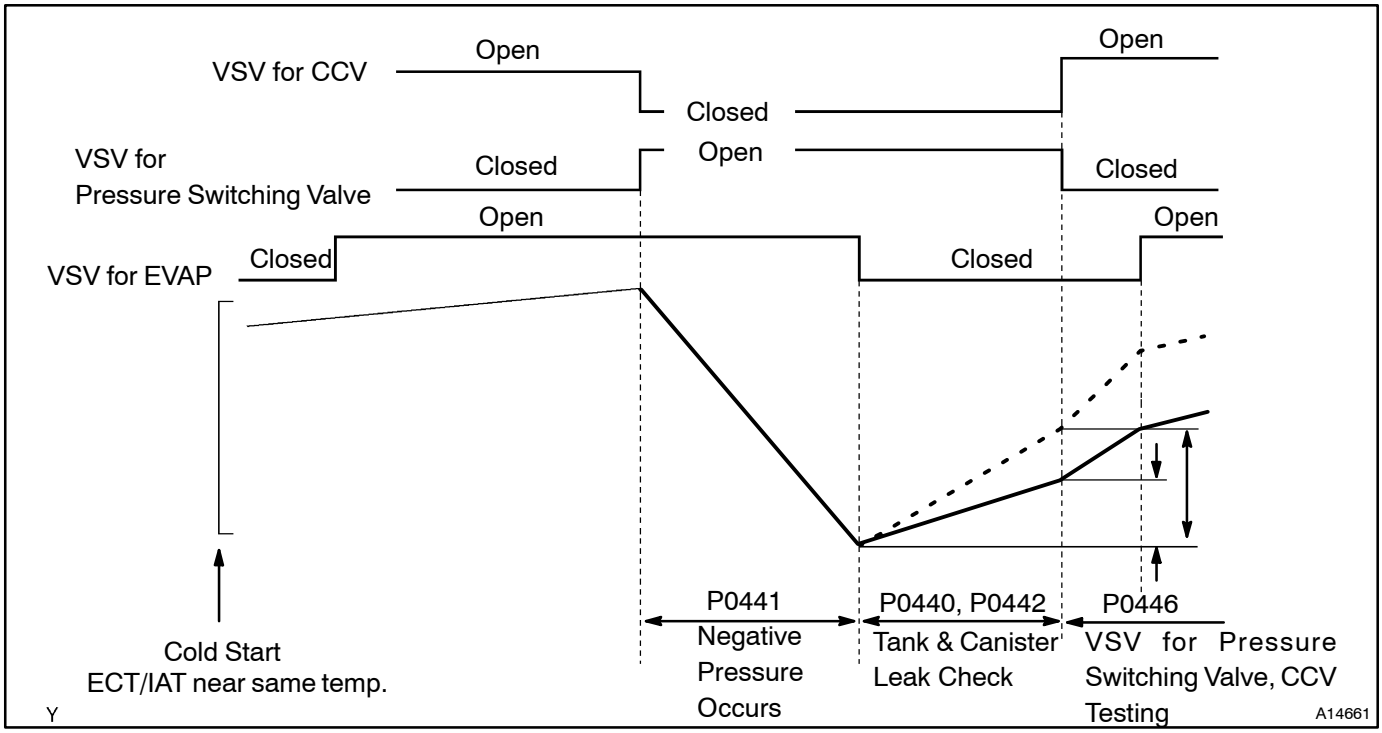
SUMMARY OF SYSTEM OPERATION

(a) Purge Flow

When the engine has reached predetermined parameters (Closed Loop, ECT above 75°C [167°F], etc.), stored fuel vapors are purged from the charcoal canister whenever the purge valve is opened by the ECM. At the appropriate time, the ECM will turn on the VSV for EVAP.

The ECM will change the duty ratio cycle of the VSV for EVAP thus controlling purge flow volume. Purge flow volume is determined by manifold pressure and the duty ratio cycle of the VSV for EVAP. Atmospheric pressure is allowed into the canister to ensure that purge flow is constantly maintained whenever purge vacuum is applied to the canister.

(b) EVAP Monitor
The monitor sequence begins with a cold engine start. The IAT and ECT sensors must have approximately the same temperature reading. The ECM is constantly monitoring fuel tank pressure. As the temperature of the fuel increases, pressure slowly rises. The ECM will purge the charcoal canister at the appropriate time. With VSV for bypass valve closed, pressure will continue to rise in fuel tank.



(c) EVAP Leak Monitor (DTC P0440 and P0442)
Initially, when the canister closed valve is closed, the VSV for bypass valve and the purge valve are opened, a vacuum is applied to the purge line from the air intake to the charcoal canister and to the evaporator line from the charcoal canister to the fuel tank. Next, the purge valve is closed in order to maintain a vacuum from VSV for EVAP to the inside of the fuel tank. Then, any subsequent changes in the pressure are monitored by the vapor pressure sensor in order to check for EVAP leaks. If a leak is detected, the MIL illuminates.

(d) VSV for EVAP Monitor (DTC P0441)
At a predetermined point, the ECM closed the canister closed valve and opens the VSV for bypass valve causing a pressure drop in the entire EVAP system. The ECM continues to operate the VSV for EVAP until the pressure is lowered to a specified point at which time the ECM closed the purge valve. If the pressure did not drop, or if the drop in pressure increased beyond the specified limit, the ECM judges the VSV for EVAP and related components to be faulty and MIL illuminates.

(e) Canister Closed Valve Monitor (DTC P0446)
This stage checks the canister closed valve and vent (air inlet side) operation. When the vapor pressure rises to a specified pint, the ECM opens the canister closed valve. Pressure will increase rapidly because of the air allowed into the system. No increase or an increase below specified rate of pressure increase indicates a restriction on the air inlet side. If a malfunction is detected, the MIL illuminates.

(f) VSV for Bypass Valve Malfunction (DTC P0446)
The ECM closes the VSV for bypass valve. This action blocks air entering the tank side of the system. The pressure rise is no longer as great. If there was no change in pressure, the ECM will conclude the

VSV for bypass valve did not close. If a malfunction is detected, the MIL illuminates.

MONITOR DTC TABLE

DTC	Document Title	See Page
P0440	EVAP leak (0.040 in.)	Ev–12
P0441	VSV for EVAP	Ev–14
P0442	EVAP leak (0.020 in.)	Ev–12
P0446	CCV or VSV for Bypass Valve	Ev–15
P0450	Vapor pressure sensor	Ev–17
P0451	Vapor pressure sensor Range/Performance	Ev–18

Fuel Tank Pressure Monitor

EVAP Leak

MONITOR DESCRIPTION

The ECM uses the vapor pressure sensor to detect malfunctions in the evaporative emissions (EVAP) system. This diagnostic checks the function of the VSV for EVAP and VSV for vapor pressure sensor, and the integrity of these components and the fuel tank from the standpoint of fuel vapor emissions. When the VSV for vapor pressure sensor is closed, the ECM monitors the vapor pressure in the fuel tank. When it is open, the ECM monitors the vapor pressure in the charcoal canister.
In this diagnostic, the ECM switches the VSV for vapor pressure sensor closed so that it will monitor the vapor pressure in the fuel tank. It is normal for the vapor pressure in the tank to change over a period time. If the ECM detects very small change of the vapor pressures in a 20 minute interval, it interprets this as a malfunction (leak) in the EVAP system. The ECM will illuminate the MIL (2–trip detection logic) and set a DTC.

MONITOR STRATEGY

Related DTCs	P0440	EVAP leak
Required sensors/Components	Main	Vapor pressure sensor
	Sub	VSV for EVAP, VSV for vapor pressure sensor, IAT senor, ECT sensor
Frequency of operation	Once per driving cycle	
Duration	10 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever the following DTCs are not present	See page In–4	
Altitude	–	2,400 m (7,870 ft.)
Battery voltage	11 V	–
IAT	–10˚C (14˚F)	–
(a) ECT at engine start	10˚C (50˚F)	35˚C (95˚F)
(b) IAT at engine start	10˚C (50˚F)	35˚C (95˚F)
Difference between (a) and (b)	–	7˚C (45˚F)
Fuel tank level	–	90 %
Time that vehicle has run (both accelerated and decelerated)	20 min.	–
Both of the following conditions were met at the previous drive		
ECT	70˚C (158˚F)	–
Time that vehicle has run (both accelerated and decelerated)	20 min.	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Fuel tank pressure at engine start	Between –1.8 mmHg (–0.24 kPa) and 1.8 mmHg (0.24 kPa)
Positive fuel tank pressure	1.8 mmHg (0.24 kPa) or less
Difference of maximum fuel tank pressure and minimum fuel tank pressure	2.6 mmHg (0.35 kPa) or less

MODE 06 DATA (MONITOR RESULT)

(a) Checking monitor status (See page In–6)
(b) Decoding mode 06 data (See page In–7)

READINESS MONITOR DRIVING PATTERN

See page In–9

VSV for EVAP

MONITOR DESCRIPTION

The ECM uses the vapor pressure sensor to detect malfunctions in the evaporative emissions (EVAP) system. This diagnostic checks the function of the VSV for EVAP and VSV for vapor pressure sensor, and the integrity of these components and the fuel tank from the standpoint of fuel vapor emissions. When the VSV for vapor pressure sensor is closed, the ECM monitors the vapor pressure in the fuel tank. When it is open, the ECM monitors the vapor pressure in the charcoal canister.
In one part of this diagnostic, the ECM switches the VSV for EVAP open to apply manifold vacuum to the EVAP system. The ECM then monitors the vapor pressure in the charcoal canister.
It is normal for the vapor pressure decrease when the VSV for EVAP is opened. If the ECM detects no reduction of the vapor pressures it interprets this as a “stuck closed” malfunction in the VSV for EVAP.
In a second part of this diagnostic, the ECM checks the vapor pressure in the charcoal canister with the VSV for EVAP off. In this case there should be some vapor pressure in the canister. If the vapor pressure in the canister is low and remains low, the ECM interprets this as a “stuck open” malfunction in the VSV for EVAP.
In either case, the ECM will illuminate the MIL and set a DTC.

MONITOR STRATEGY

Related DTCs	P0441	• VSV for EVAP stuck open • VSV for EVAP stuck closed
Required sensors/Components	Main	Vapor pressure sensor
	Sub	VSV for EVAP, VSV for vapor pressure sensor, IAT senor, ECT sensor and MAP sensor
Frequency of operation	Once per driving cycle	
Duration	10 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever the following DTCs are not present	See page In–4	
IAT	–10˚C (14˚F)	–
(a) ECT at engine start	10˚C (50˚F)	35˚C (95˚F)
(b) IAT at engine start	10˚C (50˚F)	35˚C (95˚F)
Difference between (a) and (b)	–	7˚C (45˚F)
Running (7km/h [4 mph] or more) and stopped (3 km/h [2 mph] or less)	Once	
Case 1: VSV for EVAP stuck open		
Time after engine start	6 sec.	6.5 sec.
EVAP purge	Cut	
Case 2: VSV for EVAP stuck closed		
Time after engine start	300 sec.	–
Intake air amount (MAF sensor equipped)	–	0.6 g/rev.
Intake manifold vacuum (MAP sensor equipped)	–	–200 mmHg (–26.7 kPa)
VSV for EVAP duty signal	20 %	–

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1: VSV for EVAP stuck open	
Canister pressure	Less than −20 mmHg (−2.67 kPa)
Decrease in canister pressure after engine start	15 mmHg (2.00 kPa) or more
Case 2: VSV for EVAP stuck closed	
Canister pressure	−16 mmHg (−2.13 kPa) or more
Pulsation in canister pressure	Less than 1.1 mmHg (0.15 kPa)

MODE 06 DATA (MONITOR RESULT)

(a) Checking monitor status (See page In−6)
(b) Decoding mode 06 data (See page In−7)

READINESS MONITOR DRIVING PATTERN

See page In−9

VSV for Vapor Pressure Sensor

MONITOR DESCRIPTION

The ECM uses the vapor pressure sensor to detect malfunctions in the evaporative emissions (EVAP) system. This diagnostics check the function of the VSV for EVAP and VSV for vapor pressure sensor, and the integrity of these components and the fuel tank from the standpoint of fuel vapor emissions. When the VSV for vapor pressure sensor is closed, the ECM monitors the vapor pressure in the fuel tank. When it is open, the ECM monitors the vapor pressure in the charcoal canister.
In one part of this diagnostic, the ECM closes the VSV for EVAP. This should allow for a gradual increase in canister pressure. The ECM monitors the vapor pressure in the charcoal canister. If the ECM detects no increase in the vapor pressures it interprets this as a leak in the charcoal canister or vapor lines.
In a second part of this diagnostic, the ECM checks the VSV for vapor pressure sensor. When the VSV for vapor pressure sensor is switched from the charcoal canister to the fuel tank, the vapor pressure sensor should indicate a different pressure level. If there is little or no change in the indicated vapor pressure, the ECM interprets this as a malfunction in the VSV for vapor pressure sensor.
In either case, the ECM will illuminate the MIL (2–trip detection logic) and set a DTC.

MONITOR STRATEGY

Related DTCs	P0446	• VSV for vapor pressure sensor malfunction • Purge line leak
Required sensors/Components	Main	Vapor pressure sensor
	Sub	VSV for EVAP, VSV for vapor pressure sensor, IAT senor, ECT sensor and MAP sensor
Frequency of operation	Once per driving cycle	
Duration	Within 20 sec.	Purge line leak
	Within 10 sec.	VSV for vapor pressure sensor malfunction
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever the following DTCs are not present	See page	
IAT	–10˚C (14˚F)	–
(a) ECT at engine start	10˚C (50˚F)	35˚C (95˚F)
(b) IAT at engine start	10˚C (50˚F)	35˚C (95˚F)
Difference between (a) and (b)	–	7˚C (45˚F)
Time after engine start	300 sec.	–
Intake air amount (MAF sensor equipped)	–	0.6 g/rev.
Intake manifold vacuum (MAP sensor equipped)	–	–200 mmHg (–26.7 kPa)
VSV for EVAP duty signal	20 %	–
“Run” (7 km/h [4 mph] or more) and “stop” (3 km/h [2 mph] or less)	Once	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1: Purge line leak	
Increase of canister pressure at 0.5 to 1.5 sec. after purge cut	3 mmHg (0.4 kPa) or more
Canister pressure at 0.5 sec. after purge cut	• –5.5 mmHg (–0.73 kPa) or more • Less than –26 mmHg (–3.5 kPa)
Canister pressure at 7 to 12 sec. after purge cut	• Between –2 mmHg (–0.27 kPa) and 2 mmHg (0.27 kPa) • Less than –26 mmHg (–3.5 kPa)
Increase of canister pressure at 7 to 12 sec. after purge cut	Less than 0.5 mmHg (0.07 kPa)
Case 2: VSV for vapor pressure sensor malfunction	
Difference between canister pressure and fuel tank pressure at engine start	Less than 0.73 mmHg (0.10 kPa)
Difference between canister pressure and fuel tank pressure at engine start before/after purge start with (a) or (b) below	Less than 2.93 mmHg (0.39 kPa)
(a) Pulsation in fuel tank pressure	1.1 mmHg (0.15 kPa) or more
(b) Pulsation in canister pressure	Less than 1.1 mmHg (0.15 kPa)

MODE 06 DATA (MONITOR RESULT)

(a) Checking monitor status (See page In–6)

(b) Decoding mode 06 data (See page In–7)

READINESS MONITOR DRIVING PATTERN

See page In–9

Vacuum Monitor

EVAP Leak

MONITOR DESCRIPTION

The ECM uses the vapor pressure sensor to detect malfunctions in the evaporative emissions (EVAP) system. This diagnostics check the function of the VSV for EVAP, canister closed valve (CCV) and VSV for bypass valve, and the integrity of these components and the fuel tank from the standpoint of fuel vapor emissions.

This test will run once per driving cycle provided the ECM detects relatively stable vapor pressure in the fuel tank. While the vehicle is being operated on rough or winding roads, the movement of the fuel in the tank will cause unstable fuel tank vapor pressures and the diagnostic test will not executed.

The ECM performs the following steps;

(a) The canister closed valve (CCV) is closed.

(b) The fuel tank pressure stability is checked. The diagnostic is disabled if the pressure change is more than specified value.

(c) The VSV for EVAP is opened. This introduces a negative pressure (vacuum) from the intake manifold to the tank.

(d) The VSV for EVAP is closed and the negative pressure (vacuum) is sealed in the fuel tank.

(e) The ECM monitors the increase in fuel tank pressure for:

(1) Rapid increase in the internal pressure (loss of vacuum) i.e. a large leak: 0.040” or more.

(2) Higher than excepted increase internal pressure (loss of vacuum) i.e. a small leak: 0.020”.

If the ECM detects either of these conditions, it will interpret this a a leak in the EVAP system.

The ECM will illuminate the MIL (2–trip detection logic) and set a DTC.

MONITOR STRATEGY

Related DTCs	P0440	0.040” EVAP leak
	P0442	0.020” EVAP leak
Required sensors/Components	Main	Vapor pressure sensor
	Sub	VSV for EVAP, CCV, VSV for bypass valve, ECT sensor, IAT sensor, Vehicle speed sensor, MAF sensor
Frequency of operation	Once per driving cycle	
Duration	Within 60 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever the following DTCs are not present	See page In–4	
Altitude	–	2,400 m (7,870 ft.)
Battery voltage	11 V	–
(a) IAT at engine start	10˚C (50˚F)	35˚C (95˚F)
(b) ECT at engine start	10˚C (50˚F)	35˚C (95˚F)
Difference between (a) and (b)	–	7˚C (45˚F)
IAT	10˚C (50˚F)	–
Time after engine start	–	50 min.
Vehicle speed	–	130 km/h (80 mph)
Time that vehicle speed is fixed at 64 km/h (40 mph) or more	15 sec.	–
Time that vehicle speed is fixed at less than 64 km/h (40 mph)	60 sec.	–
Fuel level	–	90 %
Fuel slosh	No slosh	
Change value of fuel tank pressure	Little	
Time after vehicle stop	110 sec.	–
Time after vehicle start	20 sec.	–
Number of vacuum introduction	–	8 times

TYPICAL MALFUNCTION THRESHOLDS

Delta P (–15) indicates the change amount of the fuel tank pressure for 5 sec. after the fuel tank pressure is –15 mmHg (–2.00 kPa)

Delta P (–20) indicates the change amount of the fuel tank pressure for 5 sec. after the fuel tank pressure is –20 mmHg (–2.67 kPa)

2000 MY:

Detection Criteria	Threshold
0.040” leak:	
Delta P (–15) Delta P (–20)	1.8 mmHg (0.24 kPa) or more

2001 – 2003 MY:

Detection Criteria	Threshold
0.020” leak:	
Delta P (–15) Delta P (–20)	0.5 mmHg (0.07 kPa) or more
0.040” leak:	
Delta P (–15) Delta P (–20)	1.8 mmHg (0.24 kPa) or more

MODE 06 DATA (MONITOR RESULT)

(a) Checking monitor status (See page In–6)

(b) Decoding mode 06 data (See page In–7)

READINESS MONITOR DRIVING PATTERN

See page In–9

VSV for EVAP

MONITOR DESCRIPTION

The ECM checks for a VSV for EVAP “stuck closed” fault by commanding the VSV for EVAP open when the canister closed valve (CCV) is closed. The fuel tank should develop a high negative pressure (vacuum), but does not. The ECM determines that the despite an OPEN command, the VSV for EVAP remained closed. The ECM turns on the MIL and a DTC is set.
The ECM checks for VSV for EVAP “stuck open” fault by commanding both valves (VSV for EVAP and CCV) closed at a time when the fuel tank is at atmospheric pressure. If the fuel tank develops a high negative pressure (vacuum) at this early stage of the test, the ECM determines that the VSV for EVAP is stuck OPEN. The ECM will turn on the MIL and a DTC is set.

MONITOR STRATEGY

Related DTCs	P0441	VSV for EVAP malfunction
Required sensors/Components	Main	Vapor pressure sensor, VSV for EVAP, CCV and VSV for bypass valve
	Sub	ECT sensor, IAT sensor, Vehicle speed sensor and MAF meter
Frequency of operation	Once per driving cycle	
Duration	Within 90 sec.	
MIL operation	2 driving cycle	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page In–4
The same as that for DTC P0440	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
• Fuel tank pressure when vacuum introduction starts • Difference between fuel tank pressure when vacuum introduction starts and fuel tank pressure when it stops	–12 mmHg (–1.60 kPa) or more Less than 7 mmHg (0.93 kPa)
Difference between minimum fuel tank pressure and fuel tank pressure at 14 sec. after leak check	3.5 mmHg (0.47 kPa) or more
Fuel tank pressure at 14 sec. after leak check	Less than –28 mmHg (–3.73 kPa)

MODE 06 DATA (MONITOR RESULT)

(a) Checking monitor status (See page In–6)
(b) Decoding mode 06 data (See page In–7)

READINESS MONITOR DRIVING PATTERN

See page In–9

CCV and VSV for Bypass Valve

MONITOR DESCRIPTION

If there is a malfunction detected in the vacuum switching valve (VSV) for evaporative emission (EVAP), the canister closed valve (CCV) and the VSV for bypass valve; the engine control module (ECM) will illuminate the malfunction indicator lamp (MIL) and set a DTC.

This portion of the EVAP diagnostic checks the following EVAP system functions:

(a) CCV stuck closed.
The ECM checks for a CCV “stuck closed” malfunction by commanding the CCV open after an EVAP leak test. If the fuel tank pressure does not rise (lose vacuum), the ECM determines that the CCV is stuck CLOSED. The ECM will turn on the MIL and a DTC is set.

(b) VSV for bypass valve stuck closed.
The ECM checks for a VSV for bypass valve “stuck closed” malfunction by commanding the VSV for bypass valve closed after an EVAP leak test. If the fuel tank pressure does not change, the ECM determines that the VSV for bypass valve is malfunctioning. The ECM will turn on the MIL and a DTC is set.

(c) VSV for EVAP (Purge line to intake manifold) stuck closed.
The ECM checks for a VSV for EVAP “stuck closed” fault by commanding the VSV for EVAP open with the CCV closed. The fuel tank should develop a high negative pressure (vacuum), but does not. The ECM determines that the despite an OPEN command, the VSV for EVAP remained closed. The ECM turns on the MIL and a DTC is set.

MONITOR STRATEGY

Related DTCs	P0446	• CCV stuck closed • VSV for bypass valve malfunction • VSV for EVAP stuck closed
Required sensors/Components	Main	Vapor pressure sensor
	Sub	VSV for EVAP, CCV and VSV for bypass valve, ECT sensor, IAT sensor, Vehicle speed sensor and MAF meter
Frequency of operation	Once per driving cycle	
Duration	Within 10 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	See page In–4
The same as that for DTC P0440	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1: CCV stuck closed	
Fuel tank pressure when the CCV is opened after an EVAP leak check	Not changing
Case 2: VSV for bypass valve malfunction	
Fuel tank pressure when the VSV for bypass valve is closed after an EVAP leak check.	Not changing
Case 3: VSV for EVAP stuck closed	
Fuel tank pressure after the VSV for EVAP is opened and manifold vacuum is introduced to the fuel tank.	Not changing

MODE 06 DATA (MONITOR RESULT)

(a) Checking monitor status (See page In–6)
(b) Decoding mode 06 data (See page In–7)

READINESS MONITOR DRIVING PATTERN

See page In–9

Vapor Pressure Sensor

Vapor Pressure Sensor

MONITOR DESCRIPTION

The ECM senses pressure in the fuel tank using the vapor pressure sensor. The ECM supplies the sensor with a regulated 5 V reference−voltage and the sensor returns a signal voltage between 0.5 V and 4.5 V according to the pressure level in the fuel tank.
When the pressure in the fuel tank is low, the output voltage of the vapor pressure sensor is low. When it is high, the output voltage is high.
If the output voltage of the vapor pressure sensor is out of the normal range, the ECM will determine that there is a malfunction in the sensor or sensor circuit. The ECM will illuminate the MIL (2−trip detection logic) and set a DTC.

MONITOR STRATEGY

Related DTCs	P0450	Vapor pressure sensor circuit is open/shorted
Required sensors/Components	Main	Vapor pressure sensor
	Sub	ECT sensor and IAT sensor
Frequency of operation	Continuous	
Duration	Within 10 sec.	
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever the following DTCs are not present	See page In−4	
(a) IAT at engine start	10°C (50°F)	35°C (95°F)
(b) ECT at engine start	10°C (50°F)	35°C (95°F)
Difference between (a) and (b)	−	7°C (45°F)

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1: Sensor is open/shorted	
Vapor pressure sensor voltage	Less than 0.1 V or More than 4.9 V
Fuel tank pressure	Less than −4.0 kPa or 2.0 kPa or more

COMPONENT OPERATING RANGE

Parameter	Standard Value
Vapor pressure sensor voltage	Between 0.5 and 4.5 V
Fuel tank pressure	Between −3.5 and 1.5 kPa

Vapor Pressure Sensor Range/Performance Problem

MONITOR DESCRIPTION

The ECM senses pressure in the fuel tank using the vapor pressure sensor. The ECM supplies the sensor with a regulated 5 V reference−voltage and the sensor returns a signal voltage between 0.5 V and 4.5 V according to the pressure level in the fuel tank.
When the pressure in the fuel tank is low, the output voltage of the vapor pressure sensor is low. When it is high, the output voltage is high.
For this DTC P0451, the ECM checks for a “noisy” sensor or a “stuck” sensor.
The ECM checks for a “noisy” sensor by monitoring the fuel tank pressures when the vehicle is stationary and there should be little variation in the tank pressure. If the indicated pressure varies beyond specified limits, the ECM will illuminate the MIL (2−trip detection logic) and a DTC is set.
The ECM checks for a “stuck” sensor by monitoring the fuel tank pressure for an extended time period. If the indicated pressure does not change over this period, the ECM will conclude that the fuel tank pressure sensor is malfunctioning. The ECM will illuminate the MIL (2−trip detection logic) and a DTC is set.

MONITOR STRATEGY

Related DTCs	P0451	Vapor pressure sensor malfunction
Required sensors/Components	Main	Vapor pressure sensor
	Sub	ECT sensor and IAT sensor
Frequency of operation	Once per driving cycle	
Duration	10 sec.	Noisy sensor
	20 min.	Stuck sensor
MIL operation	2 driving cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Specification	
	Minimum	Maximum
The monitor will run whenever the following DTCs are not present	See page In−4	
Altitude	−	2,400 m (7,870 ft.)
Battery voltage	11 V	−
IAT at engine start	4.4°C (40°F)	35°C (95°F)
ECT at engine start	4.4°C (40°F)	35°C (95°F)
Difference between IAT at engine start and ECT at engine start	−7°C (19°F)	11.1°C (52°F)

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
Case 1: Noisy sensor	
Both of the following conditions occur 7 times from 5 to 15 sec. after idling start:	
Change amount of vapor pressure sensor voltage at idle	1 V or more
Change amount of fuel tank pressure at idle	5 mmHg (0.67 kPa) or more
Case 2–1: Stuck sensor	
Time that vapor pressure sensor voltages is constant	20 min. or more

COMPONENT OPERATING RANGE

Parameter	Standard Value
Vapor pressure sensor voltage	Between 0.5 and 4.5 V
Fuel tank pressure	Between –3.5 and 1.5 kPa