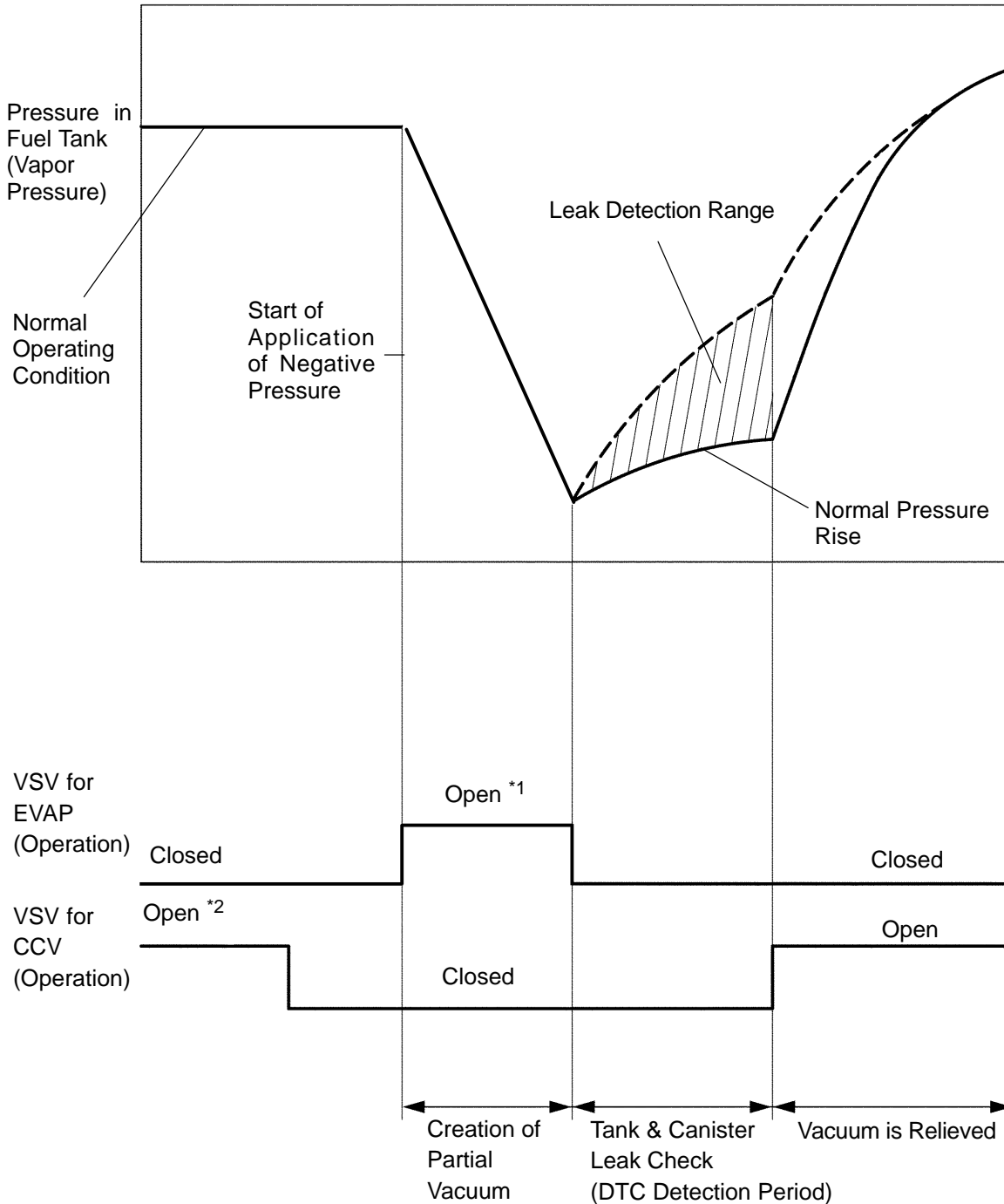


Leak Check

Initial Condition

- Cold Start
- Engine Coolant Temp./Intake Air Temp. Nearly Same



*1: VSV for EVAP is Open: ON

*2: VSV for CCV is Open: OFF

P

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MONITOR DESCRIPTION

The ECM tests the evaporative emissions (EVAP) system using the fuel tank pressure sensor, the canister close valve (CCV), and the VSV for EVAP. The ECM closes the EVAP system and introduces a negative pressure (vacuum) into it. The ECM then monitors the internal pressure using the fuel tank pressure sensor. (Refer to figure 1)

A leak in the evaporative emission system prompts the ECM to set DTC P0442, P0456.

The ECM checks for leaks in the system by introducing a high negative pressure from the intake manifold by commanding the VSV for EVAP to open while the VSV for CCV (vent) is closed. After sufficient time has elapsed the fuel tank should have developed a high negative pressure and the VSV for EVAP is closed. The ECM then monitors the pressure–rise (loss of vacuum) in the fuel tank. If the pressure rises too rapidly, the ECM concludes that there is a leak in the system. The ECM will turn on the MIL and a DTC is set. The ECM has separate DTCs for small and large leaks.

- (a) Large increase of the internal pressure
- (b) Slight increase of the internal pressure

Condition (a) represents leakage somewhere in the evaporative emission system and DTC P0442 is set, and condition (b) indicates a very small leak and DTC P0456 is set.

MONITOR STRATEGY

DTCs	P0442	Small leak (0.040 inch or more hole) detected
	P0456	Very small leak (0.020 inch hole) detected
Required sensors/components	Main	Vapor pressure sensor, VSV for EVAP (purge VSV), VSV for CCV
	Sub	Mass air flow sensor, engine coolant temperature sensor
Frequency of operation	Once per drive cycle	
Duration	60 sec	
MIL operation	2 drive cycles	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

Item	Criteria	
	Minimum	Maximum
The monitor will run whenever the following DTCs are not present	See "List of Disable a Monitor" table (On page 05–24)	
Common pre-conditions for 0.020 and 0.040 inch:		
Altitude	–	2,400 m (7,872 ft.)
Battery voltage	11 V	–
Throttle position learning	Completed	
Vapor pressure sensor	No malfunction	
Different between intake air temperature and engine coolant temperature at engine start	–7°C (19.4°F)	11.1°C (52°F)
Vehicle speed	45 km/h (28 mph) (at vacuum introduction) and 29 km/h (18 mph) (during monitoring)	–
0.020 inch malfunction detection:		
Engine coolant temperature at engine start	10°C (50°F)	32°C (89.6°F)
Intake air temperature at engine start	10°C (50°F)	32°C (89.6°F)
Intake air temperature	10°C (50°F)	–
Fuel level condition in fuel tank during leak check	Fuel slosh is small (must not drive on road with bat conditions)	
Time after engine start	–	60min

DIAGNOSTICS – SFI SYSTEM

Fuel tank pressure condition before leak check (Fuel tank condition before closed negative pressure introduction)	Tank inside pressure change is small before negative pressure introduction. (Reference: If fuel in tank is high temperature, vapor volume increase and tank inside pressure changes also increase)	
Vehicle speed and intake air amount condition before and after negative pressure introduction	Steady speed and not change greatly of intake air amount	
Fuel level	–	90%
VSV for CCV malfunction	Not detected	
Vehicle speed	–	130 km/h (81 mph)
VSV for EVAP (Evap purge VSV) malfunction	Not detected	
0.040 inch malfunction:		
Engine coolant temperature at engine start	10°C (50°F)	35°C (95°F)
Intake air temperature at engine start	10°C (50°F)	35°C (95°F)
Intake air temperature	10°C (50°F)	–
Fuel level condition in fuel tank during leak check	Fuel slosh is small (must not drive on road with bat conditions)	
Time after engine start	–	60min
Fuel tank pressure condition before leak check (Fuel tank condition before closed negative pressure introduction)	Tank inside pressure change is small before negative pressure introduction. (Reference: If fuel in tank is high temperature, vapor volume increase and tank inside pressure changes also increase)	
Vehicle speed and intake air amount condition before and after negative pressure introduction	Steady speed and not change greatly of intake air amount	
Fuel level	–	90%
0.040 inch leak detection	Not detected	
Fuel tank pressure at vacuum introduction completed	–2.4 kPa (–18 mmHg)	–
P0446 VSV check	No executed	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
0.020 inch malfunction detection:	
Fuel tank pressure changing value for 5 sec from –2.3 kPa (–17 mmHg) point	Increase more than 0.1 kPa (0.7 mmHg)
Fuel tank pressure changing value for 5 sec from –2.5 kPa (–19 mmHg) point	Increase more than 0.1 kPa (0.7 mmHg)
0.040 inch malfunction detection:	
Fuel tank pressure changing value for 5 sec from –2.0 kPa (–15 mmHg) point	Increase more than 0.3 kPa (2.0 mmHg)
Fuel tank pressure changing value for 5 sec from –2.7 kPa (–20 mmHg) point	Increase more than 0.3 kPa (2.0 mmHg)

MONITOR RESULT (MODE06)

Test ID	Comp ID	Description of Test Data	Description of Test Limit	Unit	Conversion Factor
\$02	\$81	VSV for EVAP closed malfunction: Tank pressure change value during vacuum introduction of the EVAP. System by VSV for EVAP when EVAP system is closed. VSV for EVAP open malfunction: Tank pressure change value when enclosing EVAP system (when closing canister close valve) while VSV for EVAP is not operated.	Malfunction criteria for the VSV for EVAP	mmHg	Multiply by 0.0916
	\$82	Tank pressure change value at switching over the VSV for EVAP (closed → open).	Malfunction criteria for canister close valve	mmHg	Multiply by 0.0458 minus 2.930
	\$03	Fuel tank pressure changes 5 seconds after the end the vacuum introduction cycle. Conditions: VSV for EVAP: Closed VSV for CCV: Closed	Malfunction criteria for vapor leak from the 0.040 inch hole	mmHg	Multiply by 0.0458
	\$04	Fuel tank pressure change 5 seconds after the end the vacuum introduction cycle. Conditions: VSV for EVAP: Closed VSV for CCV : Closed	Malfunction criteria for vapor leak from the 0.020 inch hole	mmHg	Multiply by 0.0458

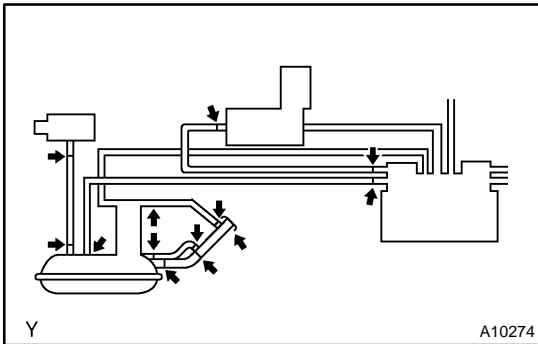
Refer to page 05–26 for detailed information on CHECKING MONITOR STATUS.

WIRING DIAGRAM

Refer to DTC P0441 and P0446 on page 05–180.

INSPECTION PROCEDURE**HINT:**

- If DTC P0441 (Purge Flow), P0446 (VSV for CCV) or P0451 (Evaporative Pressure Sensor) is output with DTC P0442 or P0456, first troubleshoot DTC P0441, P0446 or P0451. If no malfunction is detected, troubleshoot DTC P0442 or P0456 next.
- Ask the customer whether, after the MIL came on, the customer found the fuel tank cap loose and tightened it. Also ask the customer whether the fuel tank cap was loose when refuelling. If the fuel tank cap was loose, it was the cause of the DTC. If the fuel tank cap was not loose or if the customer was not sure if it was loose, troubleshoot according to the following procedure.
- Read freeze frame data using hand-held tester or OBD II scan tool. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air-fuel ratio was lean or rich, etc. at the time of the malfunction.
- When the ENGINE RUN TIME in the freeze frame data is less than 200 seconds, carefully check the vapor pressure sensor.

1 CHECK FOR EVAPORATIVE EMISSIONS LEAK

(a) Check if any hoses close to the fuel tank have been modified, and check if there are signs of any accident damage near the fuel tank or the charcoal canister.

- (1) Check the following parts for cracks, deformation or loose connections:
- Fuel tank
 - Charcoal canister
 - Fuel tank filler pipe
 - Hoses and tubes around fuel tank and charcoal canister

NG REPAIR OR REPLACE

OK

2 INSPECT FUEL TANK CAP ASSY(CHECK THAT FUEL TANK IS GENUINE PARTS)

NG REPLACE TO GENUINE PARTS

OK

3 CHECK THAT FUEL TANK CAP IS CORRECTLY INSTALLED

NG CORRECTLY INSTALL FUEL TANK CAP

OK

4 INSPECT FUEL TANK CAP ASSY (See page 12-8)

NG REPLACE FUEL TANK CAP ASSY

OK

5 CHECK FILLER NECK FOR DAMAGE

NG REPLACE FUEL TANK INLET PIPE SUB-ASSY

OK

6 CHECK HOSES AND TUBES(VAPOR PRESSURE SENSOR - FUEL TANK)

- (a) Check that the vacuum hoses are connected correctly.
 (b) Check that the vacuum hoses are not loose and disconnected.
 (c) Check the vacuum hoses and tubes for cracks, holes, damage, or blockage.

NG REPAIR OR REPLACE HOSES AND TUBES

OK

7 CHECK HOSES AND TUBES(FUEL TANK - CHARCOAL CANISTER)

- (a) Check the connection between the fuel tank and fuel EVAP pipe, fuel EVAP pipe and under-floor fuel tube, and under-floor fuel tube and charcoal canister.
- (b) Check the hose and tube for cracks, hole and damage.

NG REPAIR OR REPLACE HOSES AND TUBES

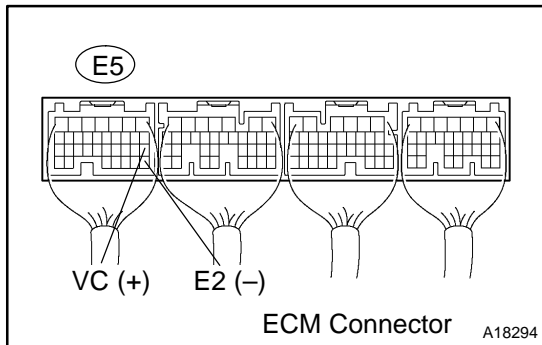
OK

8 INSPECT CHARCOAL CANISTER ASSY(CRACKS AND DAMAGE)

NG REPLACE CHARCOAL CANISTER ASSY

OK

9 INSPECT ECM(VC VOLTAGE)



- (a) Turn the ignition switch ON.
- (b) Measure the voltage between the specified terminals of the E5 ECM connector.

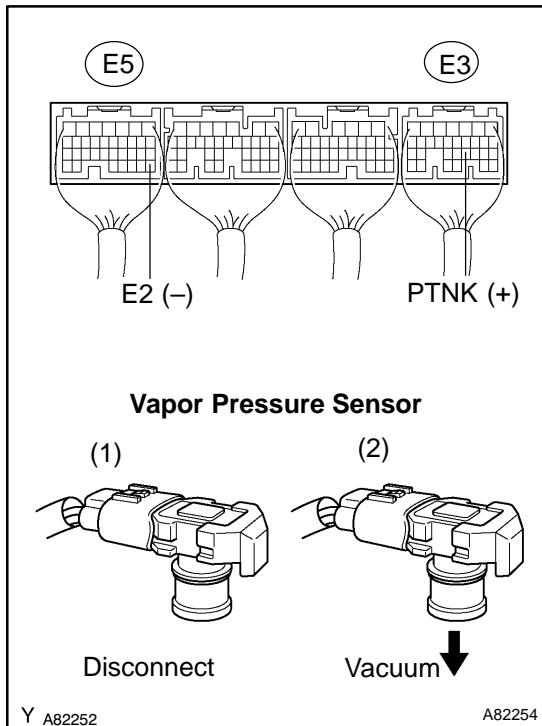
Standard:

Tester Connection	Specified Condition
VC (E5-18) - E2 (E5-28)	4.5 to 5.5 V

NG REPLACE ECM (See page 10-17)

OK

10 INSPECT ECM(PTNK VOLTAGE)



- (a) Turn the ignition switch ON.
- (b) Measure the voltage between the specified terminals of the E3 and E5 ECM connectors.

(1) Remove the vapor pressure sensor.

Standard (1):

Tester Connection	Specified Condition
PTNK (E3-21) - E2 (E5-28)	2.9 to 3.7 V

(2) Using the MITYVAC (Hand-Held Vacuum Pump), apply a vacuum of 4.0 kPa (30 mmHg, 1.18 in.Hg) to the vapor pressure sensor.

NOTICE:

The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

Standard (2):

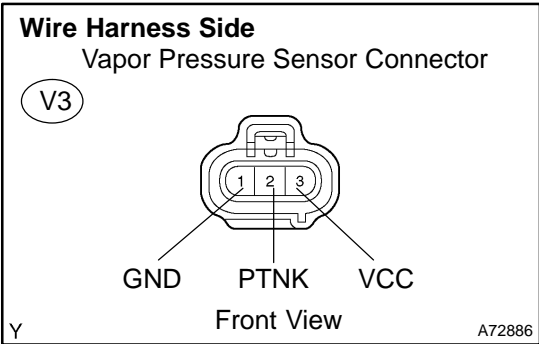
Tester Connection	Specified Condition
PTNK (E3-21) - E2 (E5-28)	0.5 V or less

(3) Reinstall the vapor pressure sensor.

OK → Go to step 12

NG

11 CHECK HARNESS AND CONNECTOR(VAPOR PRESSURE SENSOR – ECM)



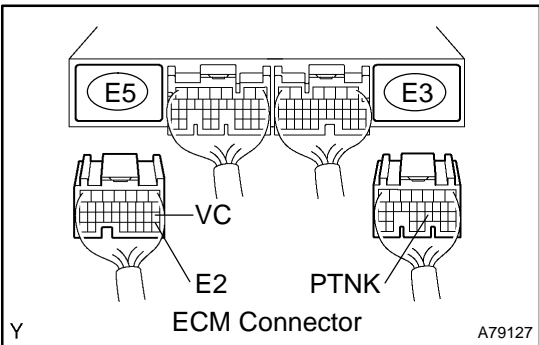
- (a) Disconnect the V3 vapor pressure sensor connector.
- (b) Disconnect the E3 and E5 ECM connectors.
- (c) Measure the resistance between the wire harness side connectors.

Standard (Check for open):

Tester Connection	Specified Condition
PTNK (V3-2) – PTNK (E3-21)	Below 1 Ω
GND (V3-1) – E2 (E5-28)	
VCC (V3-3) – VC (E5-18)	

Standard (Check for short):

Tester Connection	Specified Condition
PTNK (V3-2) or PTNK (E3-21) – Body ground	10 kΩ or higher
VCC (V3-3) or VC (E5-18) – Body ground	



- (d) Reconnect the vapor pressure sensor connector.
- (e) Reconnect the ECM connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE VAPOR PRESSURE SENSOR ASSY

12 CHECK FUEL TANK OVER FILL CHECK VALVE

NG → **REPLACE FUEL TANK OVER FILL CHECK VALVE OR FUEL TANK**

OK

IT IS LIKELY THAT FUEL TANK CAP WAS NOT CLOSED PROPERLY