

DTC	P0442	Evaporative Emission Control System Leak Detected (Small Leak)
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DTC	P0455	Evaporative Emission Control System Leak Detected (Gross Leak)
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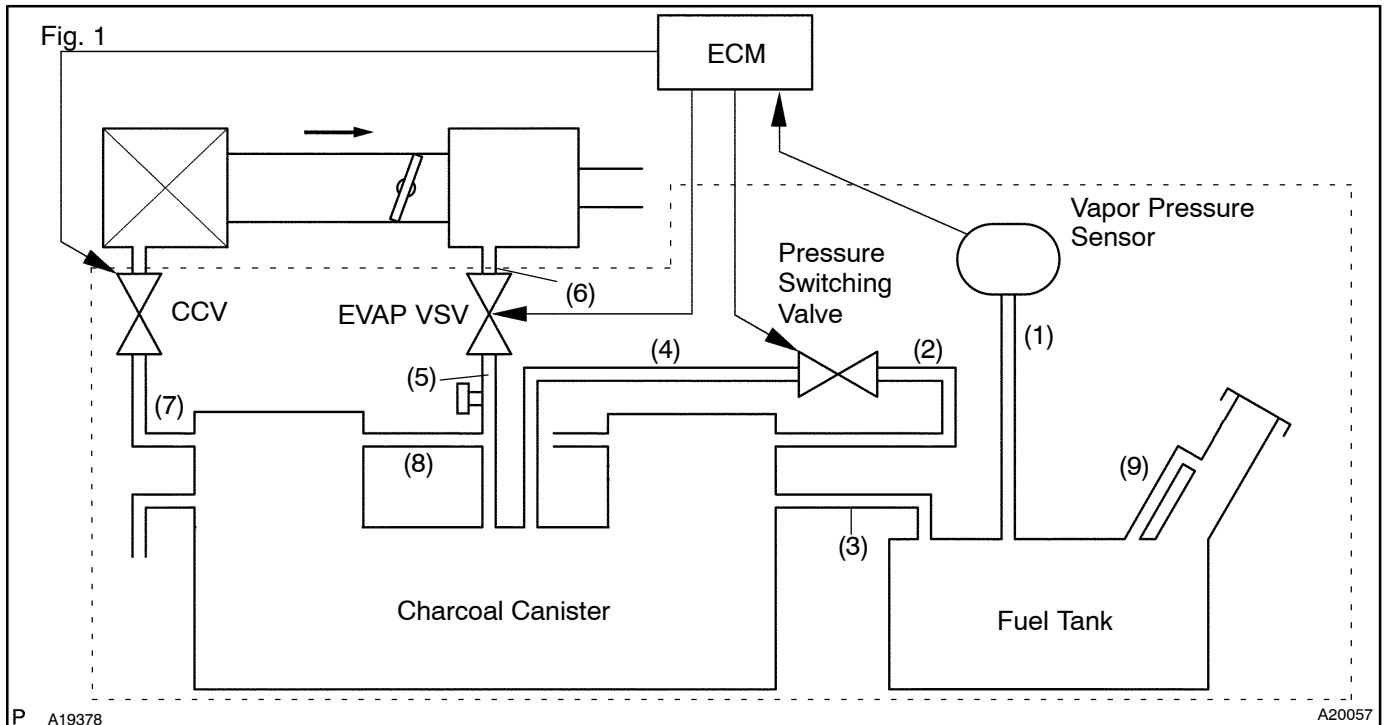
DTC	P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)
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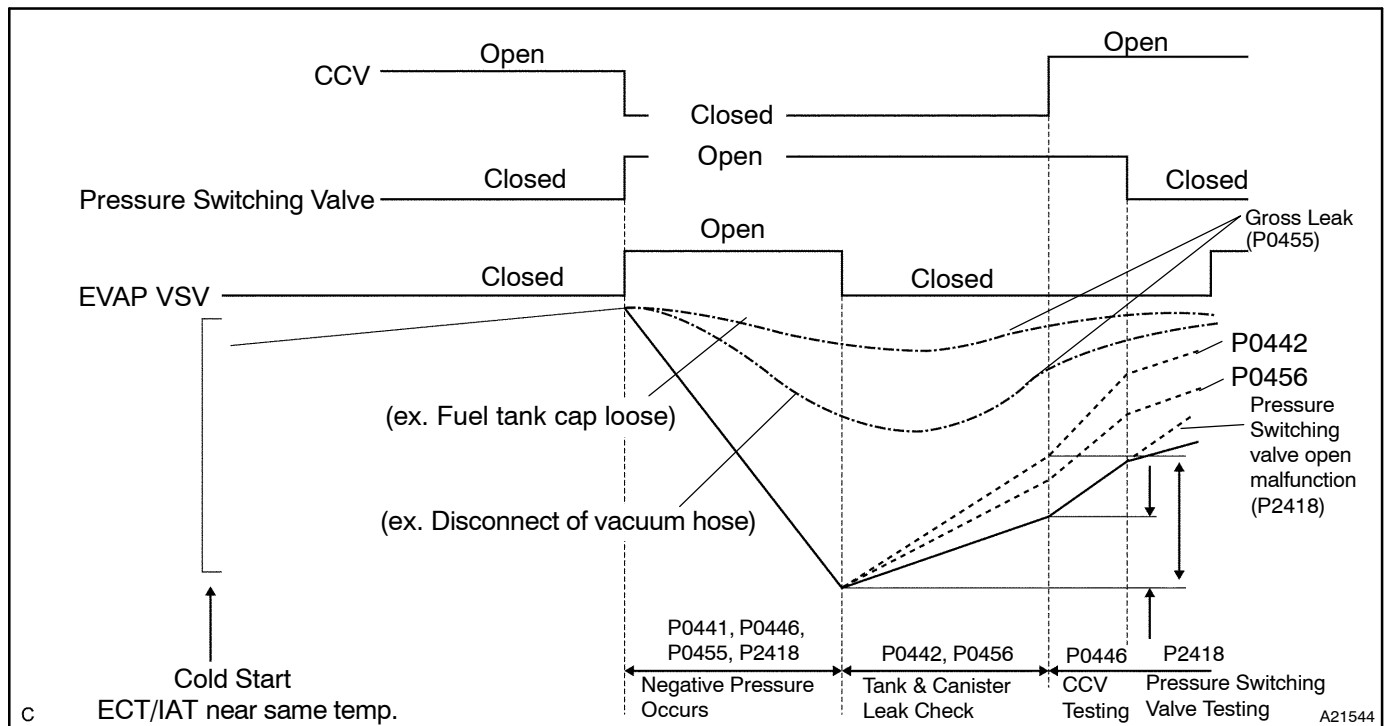
CIRCUIT DESCRIPTION

The vapor pressure sensor, canister closed valve (CCV) and pressure switching valve are used to detect abnormalities in the evaporative emission control system.

The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.

DTC P0442, P0455 or P0456 is recorded by the ECM when evaporative emissions leak from the components within the dotted line in Fig. 1 below, or when the vapor pressure sensor malfunctions.





MONITOR DESCRIPTION

A leak in the evaporative emission system prompts the ECM to set DTC P0442, P0455 or P0456.

The ECM checks for leaks in the system by introducing a high negative pressure (vacuum) from the intake manifold by commanding the EVAP VSV open while the CCV (vent) is closed and the pressure switching valve is open. After sufficient time has elapsed the fuel tank should have developed a high negative pressure (vacuum) and the EVAP VSV 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 set a DTC.

The ECM has separate DTCs for small and large leaks:

- (1) DTC P0442 is set when the internal fuel tank pressure has a large increase and the EVAP system has a small leak.
- (2) DTC P0455 is set when the EVAP system has various large leaks. Even though the ECM sends a signal to the EVAP VSV (when CCV is closed) to create a vacuum, the internal fuel tank pressure does not decrease beyond a specified level.
- (3) DTC P0456 is set when the internal fuel tank pressure increase slightly and the EVAP system has a small leak.

HINT:

Refer to DTCs P0441, P0446 and P2418

DTC No.	DTC Detecting Condition	Trouble Area
P0442	After the negative pressure introduction has been completed, if the pressure in the EVAP system sharply increases.	After the negative pressure introduction has been completed, if the pressure in the EVAP system sharply increases. • Hose or tube cracked, holed, damaged or loose seal ((3) in Fig. 1)
P0455	If the vacuum is not strong enough, the ECM assumes the EVAP system has a large hole.	• Fuel tank cap incorrectly installed • Fuel tank cap cracked or damaged • Vacuum hose cracked, holed, blocked, damaged or disconnected ((1), (2), (4), (5), (6), (7), (8) and (9) in Fig. 1)
P0456	If the pressure in the EVAP system slightly increase while the ECM performs a leak check.	• Fuel tank cracked, holed or damaged • Charcoal canister cracked, holed or damaged • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM

HINT:

Typical DTC output of each trouble part

Trouble part		Typical DTC output (*1)
Small Leak		P0442 and/or P0456
Medium Leak (ex: Vacuum hose loose)		P0455
Large Leak (ex: Fuel tank cap loose)		P0441, P0446, P0455 and P2418
EVAP VSV	Open Malfunction	P0441
	Close Malfunction	P0441, P0446, P0455 and P2418
CCV	Open Malfunction	P0441, P0446, P0455 and P2418
	Close Malfunction	P0446
Pressure Switching Valve	Open Malfunction	P2418
	Close Malfunction	P0441, P0446, P0455 and P2418

*1: ECM may output some other DTC combination.

MONITOR STRATEGY

Related DTCs	P0442	Small leak (0.040 inch or more large hole) is detected
	P0455	Gross leak detected
	P0456	Very small leak (0.020 inch hole) is detected
Required sensors/components	Main sensors/components	Vapor pressure sensor
	Related sensors/components	Mass air flow sensor, Engine coolant temperature sensor EVAP VSV (purge VSV), CCV
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" (on page DI-3)	
Common pre-conditions for 0.020, 0.040 inch and gross:		
Altitude	–	2,400 m (7,872 ft.)
Throttle position learning	Completed	
Vapor pressure sensor	No malfunction	
Difference between intake air temperature and engine coolant temperature at engine start	–7°C (–13°F)	11.1°C (20°F)
Vehicle speed condition	A or B	
A. Time after vehicle stopped (Less than 10 km/h (6 mph))	90 sec.	–
B. Time after vehicle started (7 km/h (4 mph) or more)	20 sec.	–
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 in bad conditions)	
Time after engine start	–	50 min.
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%
0.020 inch leak detection	Not completed	
0.040 inch leak detection	Not detected	
CCV malfunction, bypass VSV malfunction	Not detected	
Vehicle speed	–	130 km/h (81 mph)
EVAP VSV (Evap purge VSV) malfunction	Not detected	
0.040 inch and gross 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 in bad conditions)	
Time after engine start	–	50 min.
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)	

DIAGNOSTICS – ENGINE

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 completed	
Fuel tank pressure at vacuum introduction completed	–2.4 kPa (–18 mmHg, –0.71 in.Hg)	–
P0446 VSV check	Not executed	

TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
0.020 inch malfunction detection:	
Fuel tank pressure changing value for 5 sec. from –2.0 kPa (–15 mmHg, –0.59 in.Hg) point	Increase 0.067 kPa (0.5 mmHg, 0.02 in.Hg) or more
Fuel tank pressure changing value for 5 sec. from –2.7 kPa (–20 mmHg, –0.79 in.Hg) point	Increase 0.067 kPa (0.5 mmHg, 0.02 in.Hg) or more
0.040 inch malfunction detection:	
Fuel tank pressure changing value for 5 sec. from –2.0 kPa (–15 mmHg, –0.59 in.Hg) point	Increase 0.16 kPa (1.2 mmHg, 0.05 in.Hg) or more
Fuel tank pressure changing value for 5 sec. from –2.7 kPa (–20 mmHg, –0.79 in.Hg) point	Increase 0.16 kPa (1.2 mmHg, 0.05 in.Hg) or more
Gross leak detection:	
Fuel tank pressure min. value at vacuum introduction	–2.4 kPa (–18 mmHg, –0.71 in.Hg) or more

MONITOR RESULT

The detailed information is described in “CHECKING MONITOR STATUS” (see page [DI-3](#)).

- TID (Test Identification) is assigned to each emission-related component.
- TLT (Test Limit Type):
If TLT is 0, the component is malfunctioning when the test value is higher than the test limit.
If TLT is 1, the component is malfunctioning when the test value is lower than the test limit.
- CID (Component Identification) is assigned to each test value.
- Unit Conversion is used to calculate the test value indicated on generic OBD scan tools.

TID \$02: EVAP – Vacuum Monitor

TLT	CID	Unit Conversion	Description of Test Value	Description of Test Limit
1	\$01	Multiply by 0.0916 (mmHg)	Test value of EVAP VSV: Determined by fuel tank pressure change during vacuum introduction	Malfunction criterion
1	\$02	Multiply by 0.0458 and subtract 2.93 (mmHg)	Test value of bypass VSV (pressure switching valve): Determined by fuel tank pressure change at switching over bypass VSV	Malfunction criterion
0	\$03	Multiply by 0.0458 (mmHg)	Test value of 0.04 inch leak: Determined by fuel tank pressure change	Malfunction criterion
0	\$04	Multiply by 0.0458 (mmHg)	Test value of 0.02 inch leak: Determined by fuel tank pressure change	Malfunction criterion
1	\$05	Multiply by 0.0458 and subtract 2.93 (mmHg)	Test value of CCV: Determined by fuel tank pressure change at switching over CCV	Malfunction criterion

WIRING DIAGRAM

Refer to DTC P0441, P0446 and P2418 on page [DI-222](#).

Hand-held tester:

1	Check that fuel tank cap meets OEM specifications.
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NG

Replace with a cap that meets OEM specifications.

OK

2	Check that fuel tank cap is correctly installed.
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NG

Correctly install fuel tank cap.

OK

3	Check fuel tank cap (See page EC-5).
---	---

NG

Replace fuel tank cap.

OK

4	Check filler neck for damage.
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PREPARATION:

Remove the fuel tank cap.

CHECK:

Visually inspect the filler neck for damage.

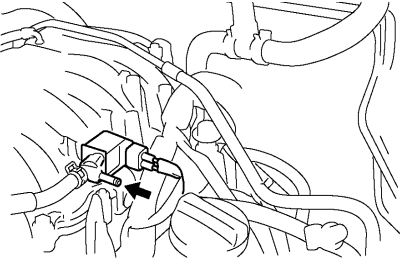
NG

Replace filler pipe.

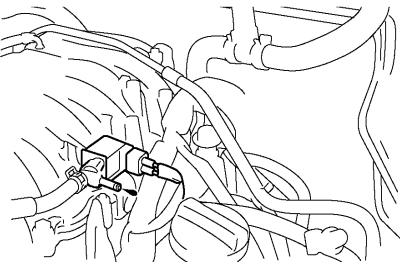
OK

5 Check purge flow.

VSV is ON



VSV is OFF



Y

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PREPARATION:

- Connect the hand-held tester to the DLC3.
- Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand-held tester.
- Disconnect the vacuum hose for the EVAP VSV from the charcoal canister.
- Start the engine.
- Select the item "EVAP (ALON) / ALL" in the ACTIVE TEST and operate EVAP VSV.

CHECK:

When the EVAP VSV is operated by the hand-held tester, check whether the disconnected hose applies suction to your finger.

OK:

VSV is ON:

Disconnected hose applies suction to your finger.

VSV is OFF:

Disconnected hose applies no suction to your finger.

OK

Go to step 9.

NG

6 Check vacuum hose between intake manifold and EVAP VSV, and EVAP VSV and charcoal canister.

CHECK:

- Check that the vacuum hose is connected correctly.
- Check the vacuum hose for looseness and disconnection.
- Check the vacuum hose for cracks, hole, damage and blockage.

NG

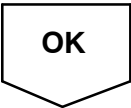
Repair or replace vacuum hose.

OK

7	Check operation of EVAP VSV (See page SF-44).
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NG

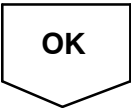
Replace EVAP VSV.

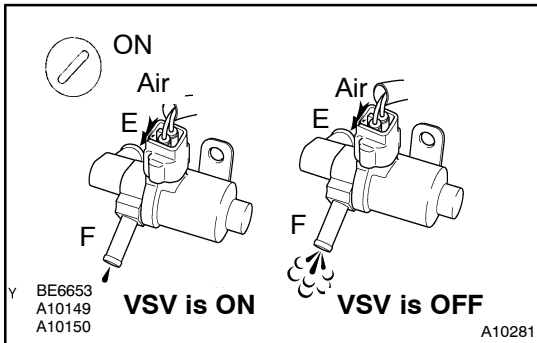
OK

8	Check for open and short in harness and connector between EFI or ECD relay and EVAP VSV, and EVAP VSV and ECM (See page IN-36).
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NG

Repair or replace harness or connector.

OKReplace ECM (See page [SF-60](#)).

9**Check CCV.****PREPARATION:**

- Disconnect the vacuum hose for the CCV from the charcoal canister.
- Turn the ignition switch ON and push the hand-held tester main switch ON.
- Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand-held tester.
- Select the item "CAN CTRL VSV / ALL" in the ACTIVE TEST and operate CAN CTRL VSV (Press the right or left button).

CHECK:

Check the VSV operation when it is operated by the hand-held tester.

OK:

VSV is ON:

Air does not flow from port E to port F.

VSV is OFF:

Air from port E flows out through port F.

OK**Go to step 13.****NG****10****Check vacuum hose between CCV and charcoal canister.****CHECK:**

- Check that the vacuum hose is connected correctly.
- Check the vacuum hose for looseness and disconnection.
- Check the vacuum hose for cracks, hole damage, and blockage.

NG**Repair or replace vacuum hose.****OK**

11 Check operation of CCV (See page [SF-48](#)).

NG

Replace CCV.

OK

12 Check for open and short in harness and connector between EFI or ECD relay and CCV, and CCV and ECM (See page [IN-36](#)).

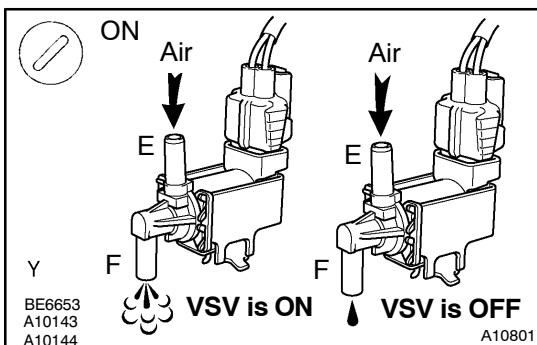
NG

Repair or replace harness or connector.

OK

Replace ECM (See page [SF-60](#)).

13 Check pressure switching valve.



PREPARATION:

- Turn the ignition switch ON and push the hand-held tester main switch ON.
- Select the "ENHANCED OBD II / ACTIVE TEST" mode on the hand-held tester.
- Select the item "TANK BYPASS VSV / ALL" in the ACTIVE TEST and operate TANK BYPASS VSV (press the right or left button).

CHECK:

Check the VSV operation when it is operated by the hand-held tester.

OK:

VSV is ON:

Air from port E flows out through port F.

VSV is OFF:

Air does not flow from port E to port F.

OK

Go to step 16.

NG

14 Check operation of pressure switching valve (See page [SF-46](#)).

NG

Replace pressure switching valve.

OK

15 Check for open and short in harness and connector between EFI or ECD relay and pressure switching valve, and pressure switching valve and ECM (See page [IN-36](#)).

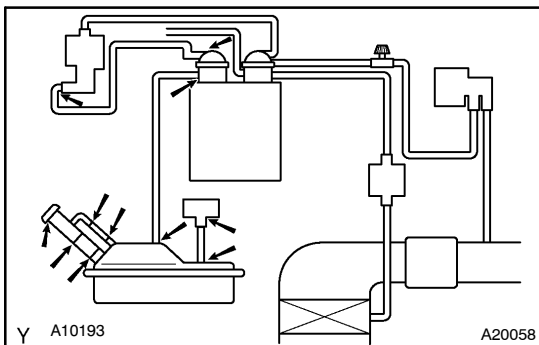
NG

Repair or replace harness or connector.

OK

Replace ECM (See page [SF-60](#)).

16 Check whether hose close to fuel tank has been modified, and check whether there are signs of any accident near fuel tank or charcoal canister.



CHECK:

Check for cracks, deformation and loose connection of the following parts:

- Fuel tank
- Charcoal canister
- Fuel tank filler pipe
- Hoses and tubes around fuel tank and charcoal canister

NG

Repair or replace evaporative emissions leak part.

OK

- 17 Check vacuum hoses between vapor pressure sensor and fuel tank, and charcoal canister and pressure switching valve.**

CHECK:

- (a) Check that the vacuum hose is connected correctly.
- (b) Check the vacuum hose for looseness and disconnection.
- (c) Check the vacuum hose for cracks, hole and damage.

NG**Repair or replace vacuum hose and tube.****OK**

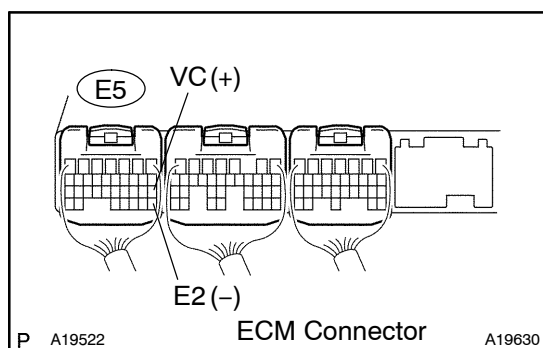
- 18 Check hose and tube between fuel tank and charcoal canister.**

CHECK:

- (a) Check for proper connection of the fuel tank and fuel evap pipe (See page [EC-2](#)), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.
- (b) Check the hose and tube for cracks, hole and damage.

NG**Repair or replace hose and tube.****OK**

- 19 Check voltage between terminals VC and E2 of ECM connector.**

**CHECK:**

Turn the ignition switch ON.

CHECK:

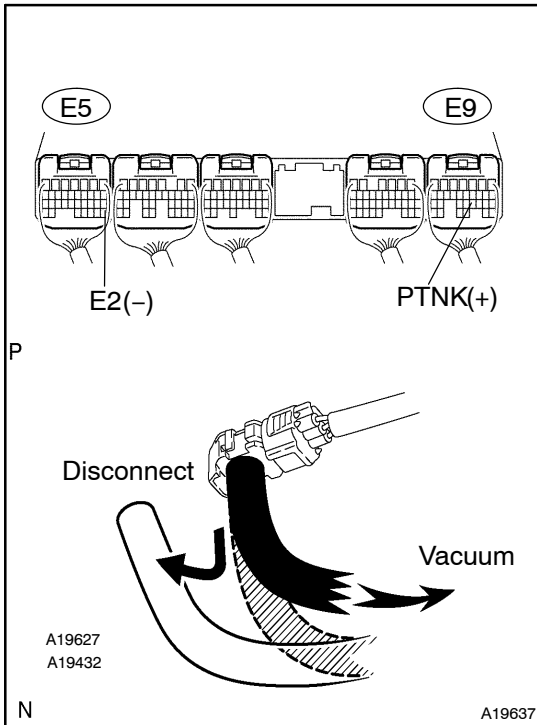
Measure the voltage between terminals of the E5 ECM connector.

OK:

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

NG**Replace ECM (See page [SF-60](#)).****OK**

20 Check voltage between terminals PTNK and E2 of ECM connectors.



PREPARATION:

- Remove the glove compartment door (See page [SF-60](#)).
- Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connectors at following condition (1) and (2).

- Disconnect the vacuum hose from the vapor pressure sensor.
- 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).

OK:

Condition (1) Voltage: 2.9 to 3.7 V

Condition (2) Voltage: 0.5 V or less

OK

Go to step 22.

NG

21 Check for open and short in harness and connector between vapor pressure sensor and ECM (See page [IN-36](#)).

NG

Repair or replace harness or connector.

OK

Replace ECM (See page [SF-60](#)).

22 Check fuel tank inlet valve.

NG

Replace fuel tank inlet valve.

OK

23	Check fuel tank.
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NG	Replace fuel tank.
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OK

24	Check charcoal canister for cracks, hole and damage.
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NG	Replace charcoal canister.
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OK

Replace ECM (See page SF-60).
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OBD II scan tool (excluding hand-held tester):

1	Check that fuel tank cap meets OEM specifications.
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NG

Replace with a cap that meets OEM specifications.

OK

2	Check that fuel tank cap is correctly installed.
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NG

Correctly install fuel tank cap.

OK

3	Check fuel tank cap (See page EC-5).
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NG

Replace fuel tank cap.

OK

4	Check filler neck for damage.
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PREPARATION:

Remove the fuel tank cap.

CHECK:

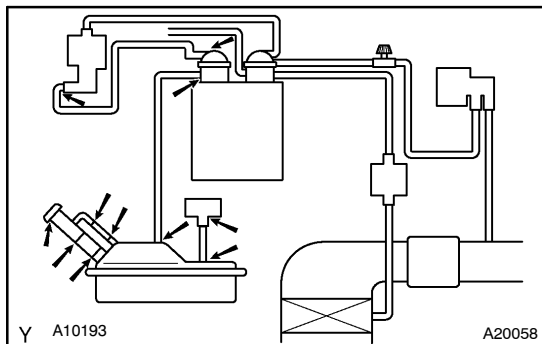
Visually inspect the filler neck for damage.

NG

Replace filler pipe.

OK

- 5 Check whether hose close to fuel tank has been modified, and check whether there are signs of any accident near fuel tank or charcoal canister.**

**CHECK:**

Check for cracks, deformation and loose connection of the following parts:

- Fuel tank
- Charcoal canister
- Fuel tank filler pipe
- Hoses and tubes around fuel tank and charcoal canister

NG

Repair or replace evaporative emission leak part.

OK

- 6 Check vacuum hoses between vapor pressure sensor and fuel tank, charcoal canister and pressure switching valve, and pressure switching valve and charcoal canister.**

CHECK:

- Check that the vacuum hose is connected correctly.
- Check the vacuum hose for looseness and disconnection.
- Check the vacuum hose for cracks, hole and damage.

NG

Repair or replace vacuum hose.

OK

- 7 Check hose and tube between fuel tank and charcoal canister.**

CHECK:

- Check for proper connection of the fuel tank and fuel evap pipe (See page [EC-2](#)), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.
- Check the hose and tube for cracks, hole and damage.

NG

Repair or replace hose and tube.

OK

8	Check vacuum hoses ((5), (6), (7), (8) and (9) in Fig. 1 in circuit description).
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CHECK:

- (a) Check that the vacuum hose is connected correctly.
- (b) Check the vacuum hose for looseness and disconnection.
- (c) Check the vacuum hose for cracks, hole damage, and blockage.

NG**Repair or replace vacuum hose.****OK**

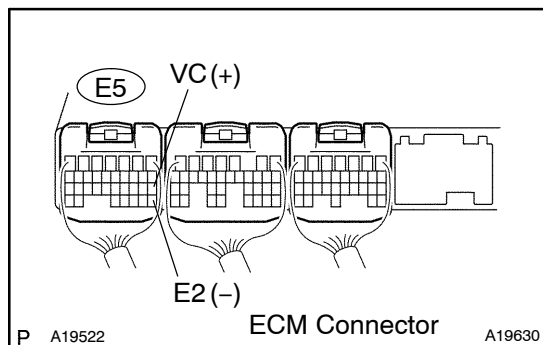
9	Check VSV connector for EVAP, VSV connector for CCV, VSV connector for pressure switching valve and vapor pressure sensor connector for looseness and disconnection.
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NG**Repair or connect VSV or sensor connector.****OK**

10	Check charcoal canister for cracks, hole and damage.
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NG**Replace charcoal canister.****OK**

11 Check voltage between terminals VC and E2 of ECM connector.

**CHECK:**

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals of the E5 ECM connector.

OK:

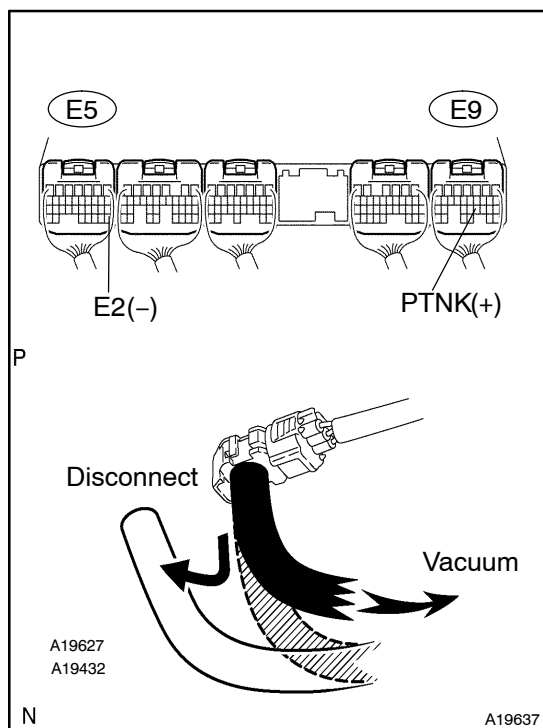
Tester Connection	Specified Condition
VC (E5-18) - E2 (E5-28)	4.5 to 5.5 V

NG

Replace ECM (See page [SF-60](#)).

OK

12 Check voltage between terminals PTNK and E2 of ECM connectors.

**PREPARATION:**

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals PTNK and E2 of the ECM connectors at following condition (1) and (2).

- (1) Disconnect the vacuum hose from the vapor pressure sensor.
- (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).

OK:

Condition (1) Voltage: 2.9 to 3.7 V

Condition (2) Voltage: 0.5 V or less

OK

Go to step 14.

NG

- 13** Check for open and short in harness and connector between vapor pressure sensor and ECM (See page [IN-36](#)).

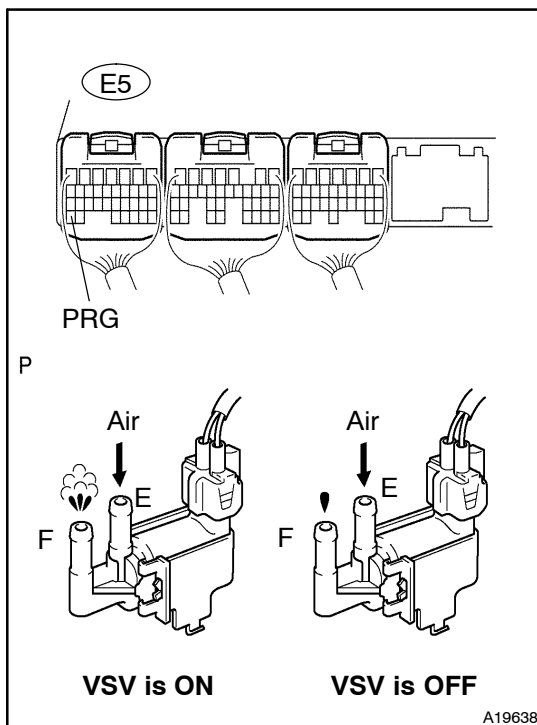
NG

Repair or replace harness or connector.

OK

Replace ECM (See page [SF-60](#)).

- 14** Check EVAP VSV.

**PREPARATION:**

Turn the ignition switch ON.

CHECK:

Check the VSV function.

- (1) Connect between terminal EVP1 of the ECM connector and body ground (ON).
- (2) Disconnect between terminal EVP1 of the ECM connector and body ground (OFF).

OK:

- (1) **VSV is ON:**
Air from port E flows out through port F.
- (2) **VSV is OFF:**
Air does not flow from port E to port F.

OK

Go to step 17.

NG

15 Check operation of EVAP VSV (See page [SF-44](#)).

NG

Replace EVAP VSV.

OK

16 Check for open and short in harness and connector between EFI or ECD relay and EVAP VSV, and EVAP VSV and ECM (See page [IN-36](#)).

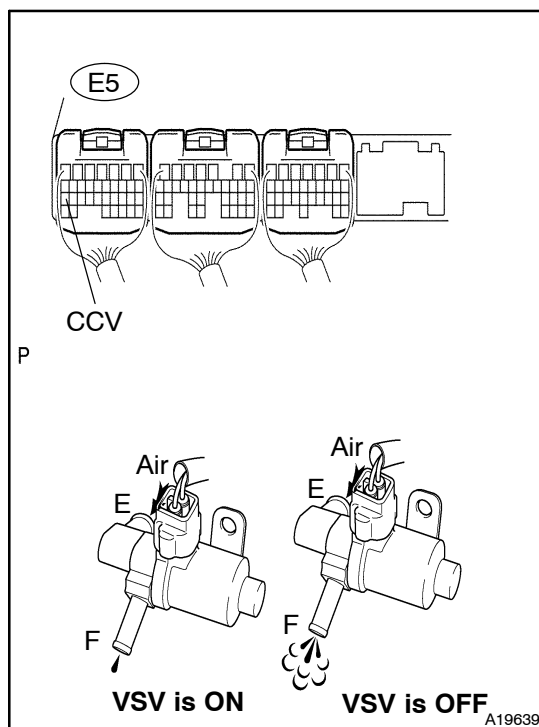
NG

Repair or replace harness or connector.

OK

Replace ECM (See page [SF-60](#)).

17 Check CCV.



PREPARATION:

Turn the ignition switch ON.

CHECK:

Check the VSV function.

- (1) Connect between terminal CCV of the ECM connector and body ground (ON).
- (2) Disconnect between terminal CCV of the ECM connector and body ground (OFF).

OK:

- (1) VSV is ON:
Air does not flow from port E to port F.
- (2) VSV is OFF:
Air from port E flows out through port F.

OK

Go to step 20.

NG

18	Check operation of CCV (See page SF-48).
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NG	Replace CCV.
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OK

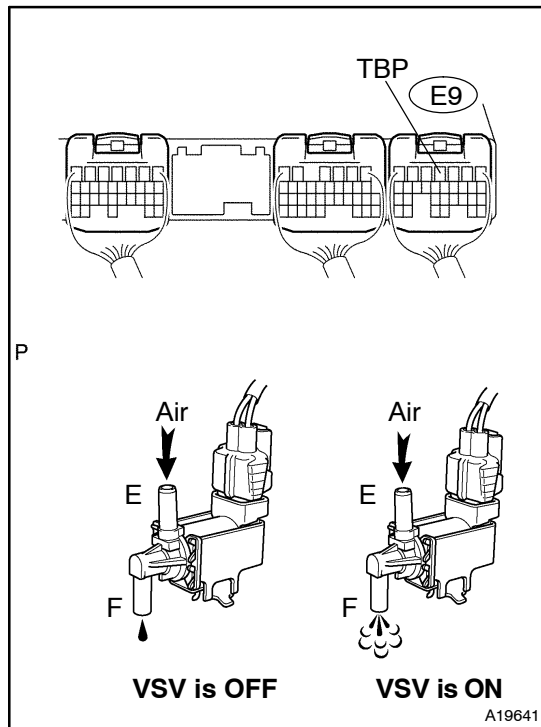
19	Check for open and short in harness and connector between EFI or ECD relay and CCV, and CCV and ECM (See page IN-36).
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NG	Repair or replace harness or connector.
----	---

OK

Replace ECM (See page SF-60).
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20 Check pressure switching valve.



PREPARATION:

Turn the ignition switch ON.

CHECK:

Check the VSV function.

- (1) Connect between terminal TBP of the ECM connector and body ground (ON).
- (2) Disconnect between terminal TBP of the ECM connector and body ground (OFF).

OK:

- (1) VSV is ON:
Air from port E flows out through port F.
- (2) VSV is OFF:
Air does not flow from port E to port F.

OK

Go to step 23.

NG

21 Check operation of pressure switching valve (See page [SF-46](#)).

NG

Replace pressure switching valve.

OK

22	Check for open and short in harness and connector between EFI or ECD relay and pressure switching valve, and pressure switching valve and ECM (See page IN-36).
----	--

NG

Repair or replace harness or connector.

OK

Replace ECM (See page [SF-60](#)).

23	Check fuel tank inlet valve.
----	------------------------------

NG

Replace fuel tank inlet valve.

OK

24	Check fuel tank.
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NG

Replace fuel tank.

OK

It is likely that vehicle user did not properly close fuel tank cap.