

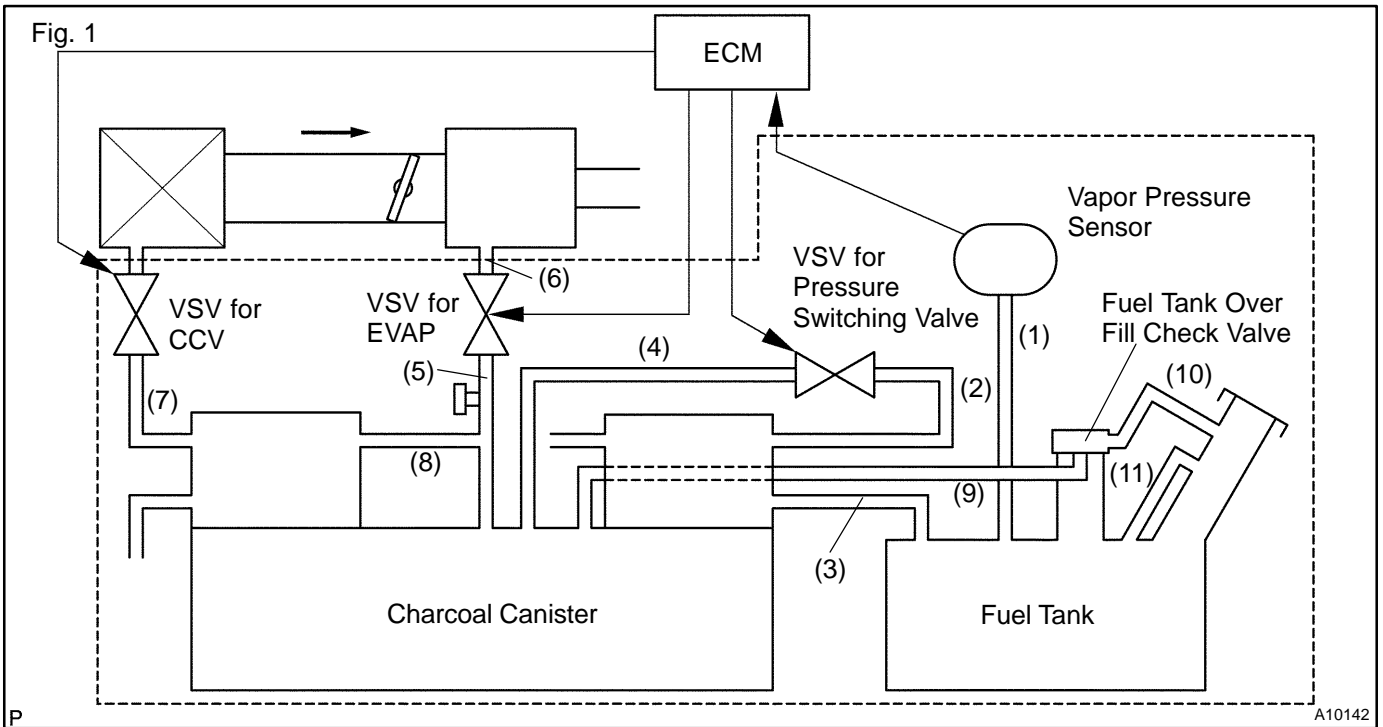
DTC	P0442	Evaporative Emission Control System Leak Detected (Small Leak)
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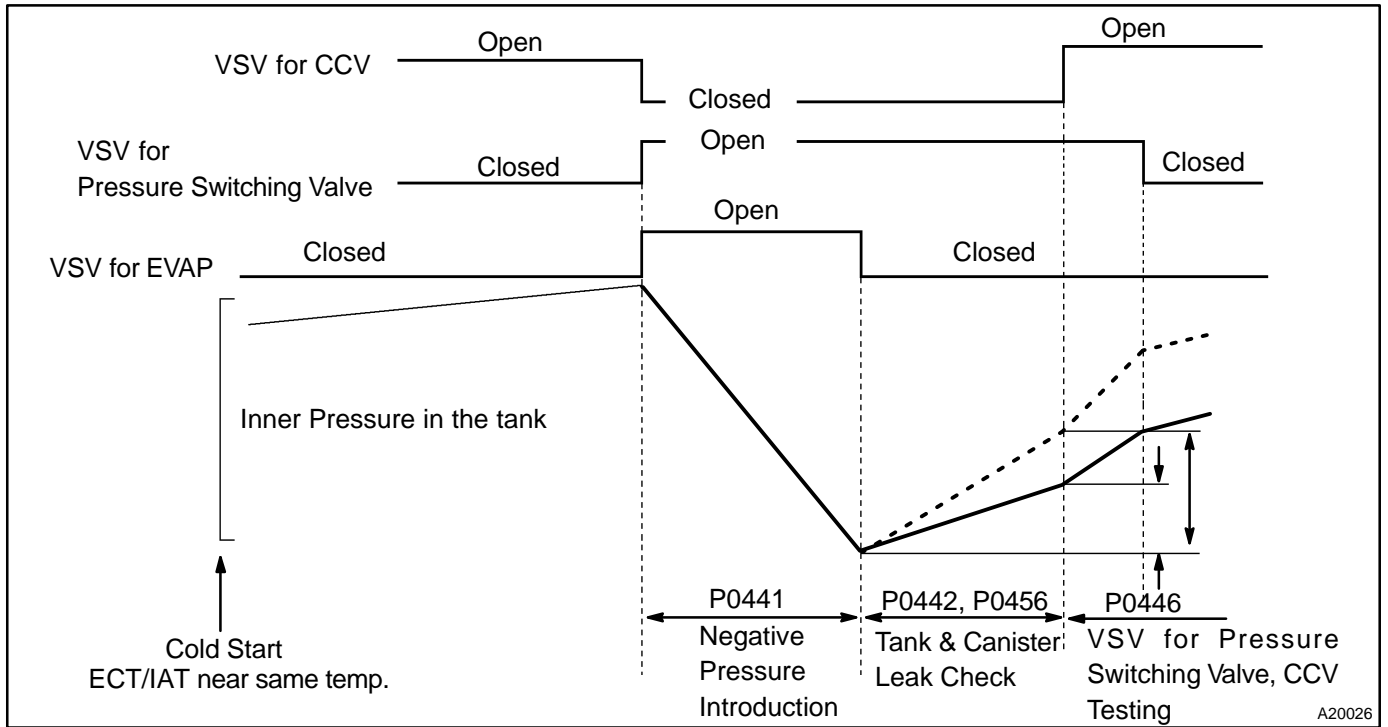
DTC	P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)
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CIRCUIT DESCRIPTION

The vapor pressure sensor, VSV for EVAP, VSV for canister closed valve (CCV) and VSV for 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 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.





After purge operation, the VSV for EVAP is turned off sealing the vacuum in the system and the ECM begins to monitor the pressure increase. It is normal if the increase in pressure is lower than the predict level. A very rapid, sharp increase in pressure indicates a leak in the EVAP system and sets the DTC P0442. A pressure rise just above normal indicates a very small hole and will set the DTC P0456.

DTC No.	DTC Detecting Condition	Trouble Area
P0442 P0456	<p>After cold engine start.</p> <p>After VSV for EVAP operation, the VSV for EVAP is turned off sealing the vacuum in the system and the ECM begins to monitor the pressure increase.</p> <p>Some increase is normal. A very rapid, sharp increase in pressure indicates a leak in the EVAP system and sets the DTC P0442.</p> <p>This monitoring method is also able to distinguish what is called the small leak detection.(DTC P0456)</p> <p>A pressure rise just above normal indicates a very small hole.</p>	<ul style="list-style-type: none"> • Fuel tank cap incorrectly installed • Fuel tank cap cracked or damaged • Hose or tube cracked, hole, damaged or loose seal ((3) or (9) in Fig. 1) • Vacuum hose cracked, holed, blocked, damaged or disconnected ((1), (2), (4), (5), (6), (7), (8), (10)and (11) in Fig. 1) • Fuel tank cracked, holed or damaged • Charcoal canister cracked, holed or damaged • Open or short in vapor pressure sensor circuit • VSV for CCV • VSV for EVAP • VSV for pressure switching valve • Vapor pressure sensor • Fuel tank over fill check valve cracked or damaged • 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)		P0442
Large Leak (ex: Fuel tank cap loose)		P0441 and P0442 and P0446
VSV for EVAP	Open Malfunction	P0441
	Close Malfunction	P0441 and P0442 and P0446
VSV for CCV	Open Malfunction	P0441 and P0442 and P0446
	Close Malfunction	P0446
VSV for Pressure Switching	Open Malfunction	P0446
	Close Malfunction	P0441 and P0442 and P0446

*1: ECM may output some other DTC combination.

WIRING DIAGRAM

Refer to DTC P0441 and P0446 on page [DI-328](#).

CONFIRMATION READINESS TEST

First Trip Procedure

- (a) Vehicle must be cold, ambient temperature approximately between 50°F – 95°F.
- (b) Intake Air Temp. (IAT) and Engine Coolant Temp. (ECT) sensor almost same value.

READINESS TESTS	
MISFIRE MON	AVAIL
FUEL SYS MON	AVAIL
COMP MON	AVAIL
CAT EVAL	INCMPL
HTD CAT EVAL	N/A
EVAP EVAL	INCMPL
2nd AIR EVAL	N/A
A/C EVAL	N/A
O2S EVAL	INCMPL
O2S HTR EVAL	INCMPL
EGR EVAL	N/A

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- (c) Clear DTC's.
 - Disconnecting the battery terminals or EFI fuse and ETCS fuse.
 - Readiness tests will show INCMPL (incomplete).
- (d) Drive the vehicle according to LA#4 drive cycle. Note the state of Readiness Tests. They will change to COMPL as the evaluation monitors operate and if the system passes. This procedure may take approximately 20 minutes or more.

NOTICE:

Do not shut off the engine – the results will be invalid.

READINESS TESTS	
MISFIRE MON	AVAIL
FUEL SYS MON	AVAIL
COMP MON	AVAIL
CAT EVAL	COMPL
HTD CAT EVAL	N/A
EVAP EVAL	COMPL
2nd AIR EVAL	N/A
A/C EVAL	N/A
O2S EVAL	COMPL
O2S HTR EVAL	COMPL
EGR EVAL	N/A

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Pass Condition – No Problem Found by the ECM

If the EVAP evaluation monitor shows COMPL, go to the Non-Continuous Test screen.

NOTICE:

Do not shut off the engine – the results will be invalid.

NON-CONTINUOUS TESTS	
Time\$01 CID\$01	Pass
Time\$01 CID\$02	Pass
Time\$02 CID\$01	Pass
Time\$02 CID\$02	Pass
Time\$02 CID\$03	Pass
Time\$02 CID\$04	Pass
Time\$04 CID\$01	Pass
Time\$04 CID\$02	Pass
Time\$04 CID\$10	Pass
Time\$04 CID\$20	Pass
Time\$08 CID\$01	Pass

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- To get there, go to Advanced OBD II, Onboard Tests, Non-continuous Tests.
- If all of the tests in the time \$02 category Tests show Pass, the evaluation monitor has operated and no problem was detected.

READINESS TESTS	
MISFIRE MON	AVAIL
FUEL SYS MON	AVAIL
COMP MON	AVAIL
CAT EVAL	COMPL
HTD CAT EVAL	N/A
EVAP EVAL	INCMPL
2nd AIR EVAL	N/A
A/C EVAL	N/A
O2S EVAL	COMPL
O2S HTR EVAL	COMPL
EGR EVAL	N/A

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Fail Condition – Problem Detected by the ECM

If the EVAP evaluation monitor shows INCMPL, go to the Non-Continuous Test screen.

NON-CONTINUOUS TESTS	
Time\$01 CID\$01	Pass
Time\$01 CID\$02	Pass
Time\$02 CID\$01	Fail
Time\$02 CID\$02	Fail
Time\$02 CID\$03	Fail
Time\$02 CID\$04	Fail
Time\$04 CID\$01	Pass
Time\$04 CID\$02	Pass
Time\$04 CID\$10	Pass
Time\$04 CID\$20	Pass
Time\$08 CID\$01	Pass

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- (1) If all Tests show Pass, the following may have occurred.
 - The EVAP evaluation monitor did not operate.
 - The EVAP evaluation monitor did not finish.
 - The ECM withheld judgement.
- (2) If one or more of the tests in the time \$02 category show Fail, the EVAP evaluation monitor did operate and the ECM detected a problem.

CONTINUOUS TESTS	
ECU: \$10 (Engine)	
Number of Tests: 3	
P0441	
EVAP Control System Incorrect Purge Flow	
P0442	
EVAP Control System Leak Detected	
P0446	
EVAP Control System Vent Control Circuit Malfunction	

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- (3) Go to Continuous Tests screen. This is the only place DTC's are listed for the first trip.

NOTICE:

The DTC listed may not be valid. A second trip is needed to confirm the DTC.

READINESS TESTS	
MISFIRE MON	AVAIL
FUEL SYS MON	AVAIL
COMP MON	AVAIL
CAT EVAL	COMPL
HTD CAT EVAL	N/A
EVAP EVAL	COMPL
2nd AIR EVAL	N/A
A/C EVAL	N/A
O2S EVAL	COMPL
O2S HTR EVAL	COMPL
EGR EVAL	N/A

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Second Trip Procedure

- (a) Vehicle must be cold, ambient temperature approximately between 50°F – 95°F.
- (b) Go to Readiness Tests screen.
- (c) Drive the vehicle according to LA#4 drive cycle. Note the state of EVAP evaluation monitor. This procedure may take approximately 20 minutes or more.

NOTICE:

Do not shut off the engine – the results will be invalid.

CONTINUOUS TESTS	
ECU: \$10 (Engine)	
Number of Tests: 3	
P0441	EVAP Control System Incorrect Purge Flow
P0442	EVAP Control System Leak Detected
P0446	EVAP Control System Vent Control Circuit Malfunction

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If Readiness Tests changes to COMPL, the EVAP evaluation monitor has operated. Check for any stored DTC's.

- If a DTC has stored, the problem has been detected and confirmed by the ECM.
- If no DTC was found, the EVAP monitor operated but no problem was detected.

INSPECTION PROCEDURE

HINT:

- If DTC P0441 (Purge Flow), P0446 (VSV for CCV or VSV for Pressure switching valve), P0451 P0452 or P0453 (Evaporative Pressure Sensor) is output with DTC P0442 or P0456, first troubleshoot DTC P0441, P0446, P0451. P0452 or P0453. 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 OBD II scan tool or hand-held tester. Because freeze frame records the engine conditions when the 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.

Hand-held tester:

1	Perform EVAP leak test.
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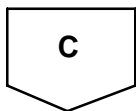
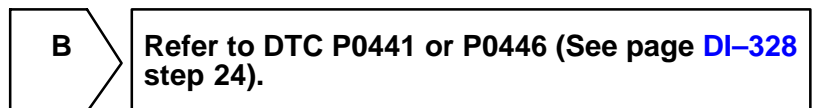
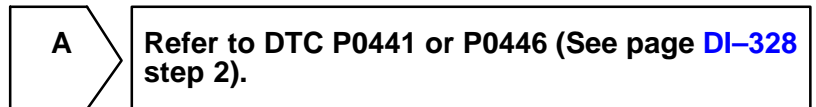
PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Select the item "DIAGNOSIS/ENHANCED OBD II/SYSTEM CHECK/EVAP SYS CHECK (or EVAP LEAK TEST)" mode on the hand-held tester.
- (c) Perform "EVAP SYS CHECK (or EVAP LEAK TEST)".

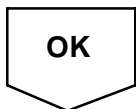
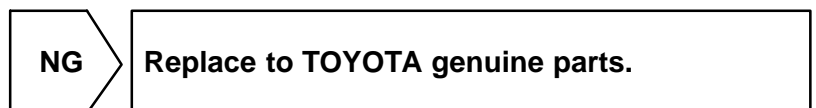
CHECK:

Display on the Hand-held tester	Proceed to
Scan tool detects a leak on the fuel tank side.	A
Scan tool detects a leak on the canister side.	B
Scan tool doesn't detect a leak on the EVAP system.	C

If any changes do not occur within 1 minute after pressing "EVAP LEAK TEST", once remove the fuel tank cap, then set the fuel tank cap again. Then perform the "EVAP LEAK TEST".



2	Check that fuel tank cap is TOYOTA genuine parts.
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3	Check that fuel tank cap is correctly installed.
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4 Check fuel tank cap (See page EC-6).

NG Replace fuel tank cap.

OK

5 Check filler neck for damage.

PREPARATION:

Remove the fuel tank cap.

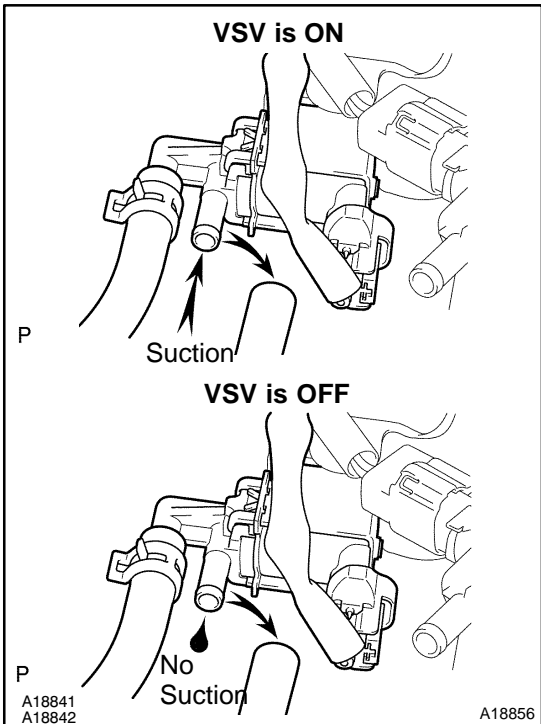
CHECK:

Visually inspect the filler neck for damage.

NG Replace filler pipe.

OK

6 Check purge flow.



PREPARATION:

- (a) Connect the hand-held tester to the DLC3.
- (b) Select the item "DIAGNOSIS/ENHANCED OBD II/ACTIVE TEST" mode on the hand-held tester.
- (c) Disconnect the vacuum hose for the VSV for the EVAP from the charcoal canister.
- (d) Start the engine.
- (e) Select the item "EVAP VSV (ALON)/ALL" in the ACTIVE TEST and operate EVAP VSV (Press the ← or → button).

CHECK:

When the VSV for the EVAP 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 10.

NG

7	Check vacuum hose between intake manifold and VSV for EVAP, and VSV for EVAP and charcoal canister.
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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.
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OK

8	Check operation of VSV for EVAP (See page SF-49).
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NG	Replace VSV for EVAP.
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OK

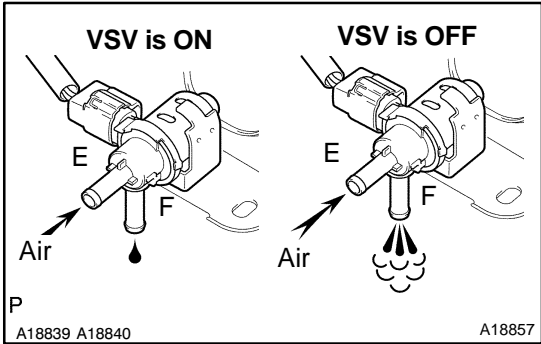
9	Check for open and short in harness and connector between EFI main relay (Marking: EFI) and VSV for EVAP, and VSV for EVAP and ECM (See page IN-28).
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NG	Repair or replace harness or connector.
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OK

Check and replace ECM (See page IN-28).
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10 Check VSV for CCV.



PREPARATION:

- (a) Disconnect the vacuum hose for the VSV for the CCV from the charcoal canister.
- (b) Turn the ignition switch ON and push the hand-held tester main switch ON.
- (c) Select the item "DIAGNOSIS/ENHANCED OBD II/ACTIVE TEST" mode on the hand-held tester.
- (d) Select the item "INTAKE CTL VSV/ALL" in the ACTIVE TEST and operate INTAKE CTL VSV (Press the ← or → 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 14.

NG

11 Check vacuum hose between VSV for CCV and charcoal canister.

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.

OK

12 Check operation of VSV for CCV (See page SF-50).

NG → Replace VSV for CCV.

OK

- 13** Check for open and short in harness and connector between EFI main relay (Marking: EFI) and VSV for CCV, and VSV for CCV and ECM (See page [IN-28](#)).

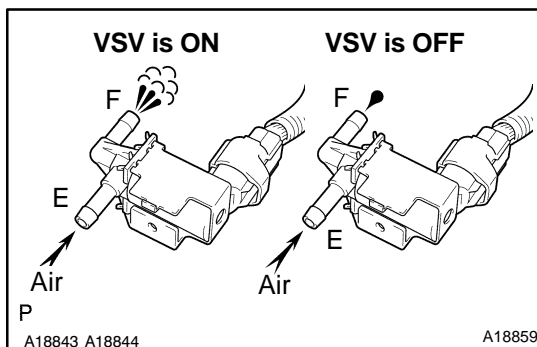
NG

Repair or replace harness or connector.

OK

Check and replace ECM (See page [IN-28](#)).

- 14** Check VSV for pressure switching valve.



PREPARATION:

- Turn the ignition switch ON and push the hand-held tester main switch ON.
- Select the item "DIAGNOSIS/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 ← or → 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 17.

NG

- 15** Check operation of VSV for pressure switching valve (See page [SF-52](#)).

NG

Replace VSV for pressure switching valve.

OK

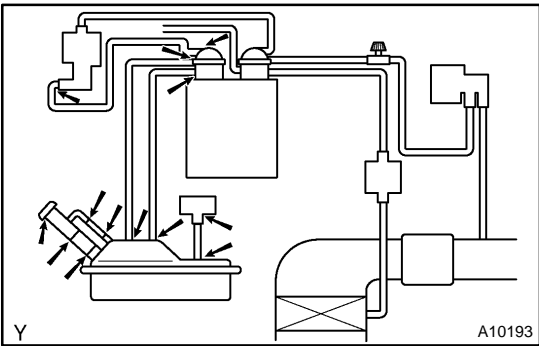
16 Check for open and short in harness and connector between EFI main relay (Marking: EFI) and VSV for pressure switching valve, and VSV for pressure switching valve and ECM (See page IN-28).

NG Repair or replace harness or connector.

OK

Check and replace ECM (See page IN-28).

17 Check whether hose close to fuel tank have 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.

OK

18 Check vacuum hoses between vapor pressure sensor and fuel tank, and charcoal canister and VSV for pressure switching valve.

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.

OK

19 Check vacuum hoses ((4), (5), (7) and (8) in Fig. 1 in description).

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.

OK

20 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-6](#)), 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.

OK

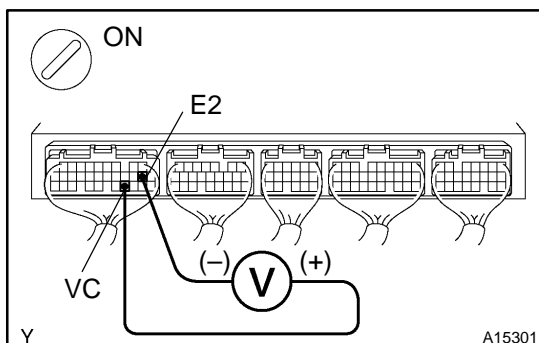
21 Check charcoal canister for cracks, hole and damage (See page [EC-6](#)).

NG

Repair or replace.

OK

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

**CHECK:**

- Remove the groove compartment (See page [SF-63](#)).
- Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals VC and E2 of the ECM connector.

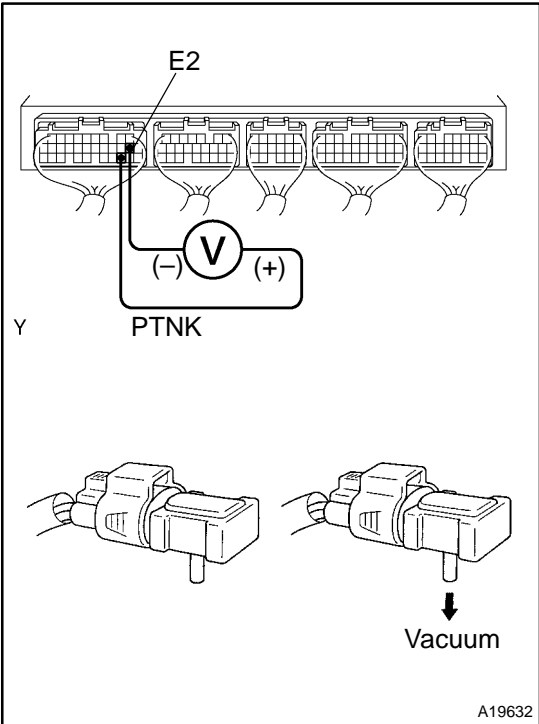
OK:

Voltage: 4.5 – 5.5 V

NG Check and replace ECM (See page [IN-28](#)).

OK

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



PREPARATION:
 (a) Remove the groove compartment (See page [SF-63](#)).
 (b) Turn the ignition switch ON.

CHECK:
 Measure the voltage between terminals PTNK and E2 of the ECM connectors.
 (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:
 (1) Voltage: 2.9 – 3.7 V
 (2) Voltage: 0.5 V or less

OK Go to step 25.

NG

24 Check for open and short in harness and connector between vapor pressure sensor and ECM (See page [IN-28](#)).

NG Repair or replace harness or connector.

OK

Replace vapor pressure sensor.

25	Check fuel tank and fuel tank over fill check valve for cracks and damage.
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NG	Replace fuel tank or fuel tank over fill check valve.
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It is likely that vehicle user did not properly close fuel tank cap. Please explain to customer how to properly install fuel tank cap.

OBD II scan tool (excluding hand-held tester):

HINT:

Refer to DTC P0441 or P0446 on page [DI-328](#).