

DTC	P0441	Evaporative Emission Control System Incorrect Purge Flow
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DTC SUMMARY

DTC No.	Monitoring Items	Malfunction Detection Conditions	Trouble Areas	Detection Timing	Detection Logic
P0441	Purge Vacuum Switching Valve (VSV) stuck open	Leak detection pump creates negative pressure (vacuum) in EVAP system and EVAP system pressure measured. 0.02 inch leak criterion measured at start and at end of leak check. If stabilized pressure higher than [second 0.02 inch leak criterion x 0.15], ECM determines that purge VSV stuck open.	<ul style="list-style-type: none"> • Purge VSV • Connector/wire harness (purge VSV - ECM) • ECM • Canister pump module • Leakage from EVAP system 	While power switch OFF	2 trip
P0441	Purge VSV stuck closed	After EVAP leak check performed, purge VSV turned ON (open), and atmospheric air introduced into EVAP system. 0.02 inch leak criterion measured at start and at end of leak check. If pressure does not return to near atmospheric pressure, ECM determines that purge VSV stuck closed.	<ul style="list-style-type: none"> • Purge VSV • Connector/wire harness (purge VSV - ECM) • ECM • Canister pump module • Leakage from EVAP system 	While power switch OFF	2 trip
P0441	Purge flow	While engine running, following conditions are met: <ul style="list-style-type: none"> • Negative pressure not created in EVAP system when purge VSV turned ON (open) • Atmospheric pressure change before and after purge flow monitor less than 0.93 kPa (7 mmHg) 	<ul style="list-style-type: none"> • Purge VSV • Connector/wire harness (purge VSV - ECM) • Leakage from EVAP line (purge VSV - Intake manifold) • ECM 	While engine running	2 trip

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DESCRIPTION

NOTICE:

In this vehicle's EVAP system, turning ON the vent valve does not seal off the EVAP system. To check for leaks in the EVAP system, disconnect the air inlet vent hose and apply pressure from the atmosphere side of the canister.

While the engine is running, if a predetermined condition (closed loop, etc.) is met, the purge VSV is opened by the ECM and stored fuel vapors in the canister are purged to the intake manifold. The ECM changes the duty cycle ratio of the purge VSV to control purge flow volume.

The purge flow volume is also determined by the intake manifold pressure. Atmospheric pressure is allowed into the canister through the vent valve to ensure that the purge flow is maintained when the negative pressure (vacuum) is applied to the canister.

Key-off monitor

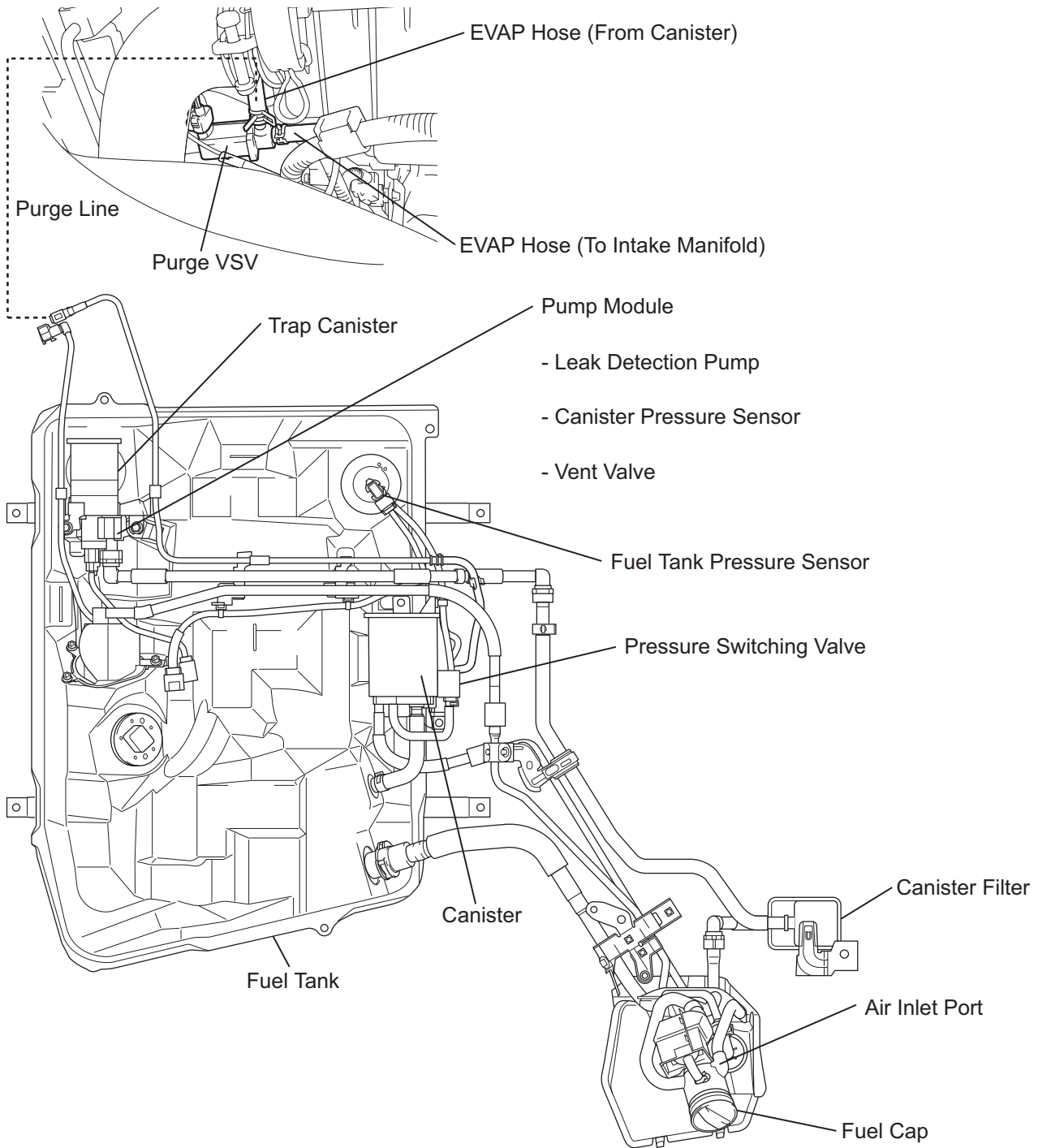
This monitor checks for Evaporative Emission (EVAP) system leaks and canister pump module malfunctions. The monitor starts 5 hours* after the power switch is turned OFF. More than 5 hours are required to allow the fuel to cool down to stabilize the Fuel Tank Pressure (FTP), thus making the EVAP system monitor more accurate.

The leak detection pump creates negative pressure (vacuum) in the EVAP system and the pressure is measured. Finally, the ECM monitors for leaks from the EVAP system and malfunctions in both the canister pump module and purge VSV, based on the EVAP pressure.

HINT:

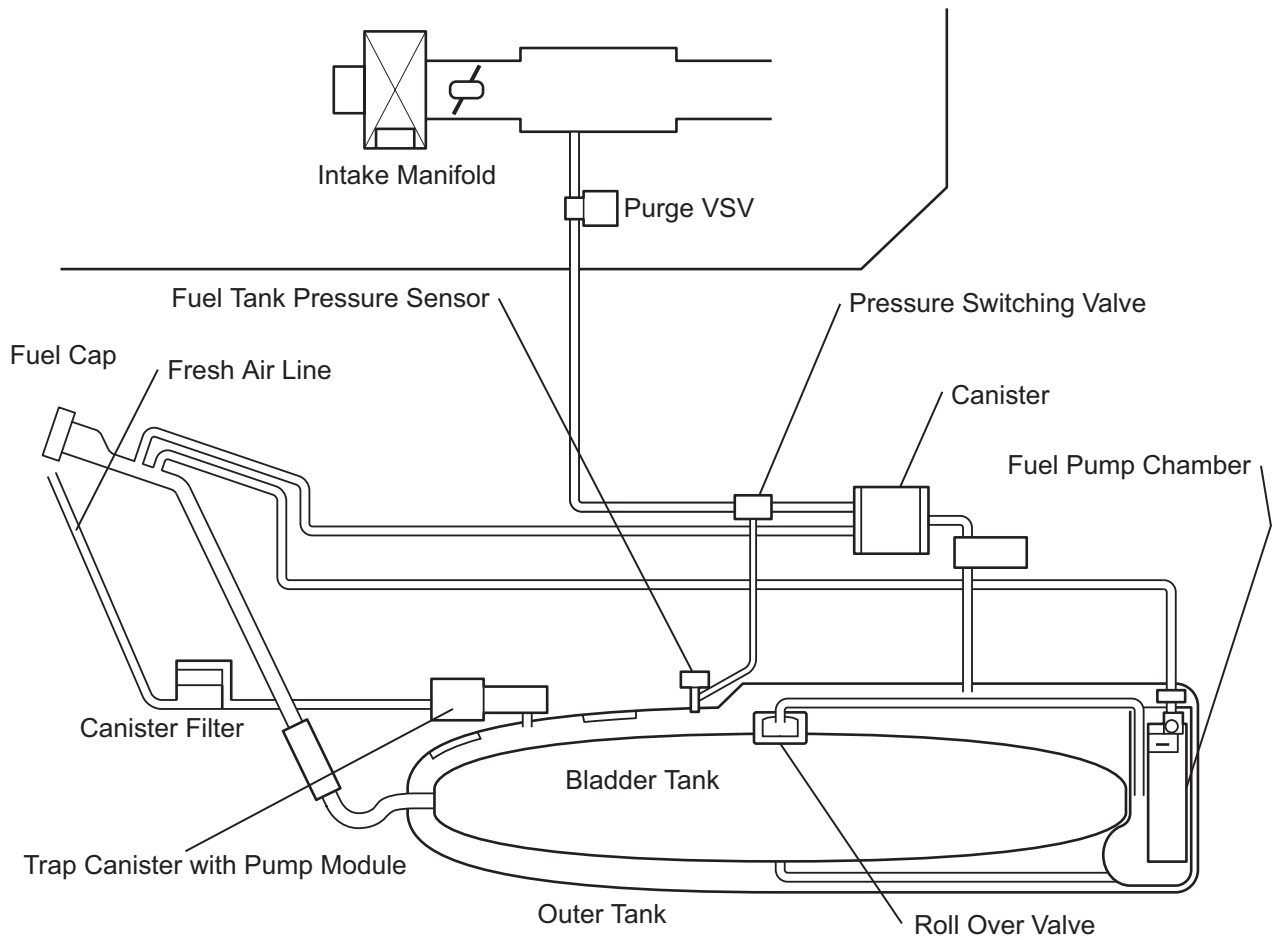
*: If the engine coolant temperature is not below 35°C (95°F) 5 hours after the power switch is turned OFF, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the power switch is turned OFF, the monitor check starts 2.5 hours later.

Location



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Diagram

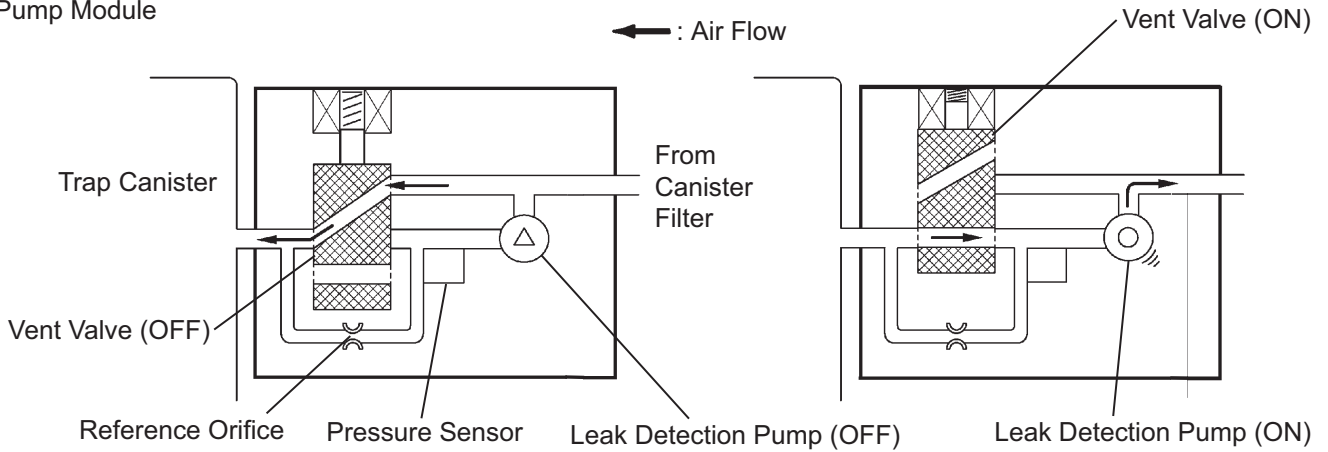


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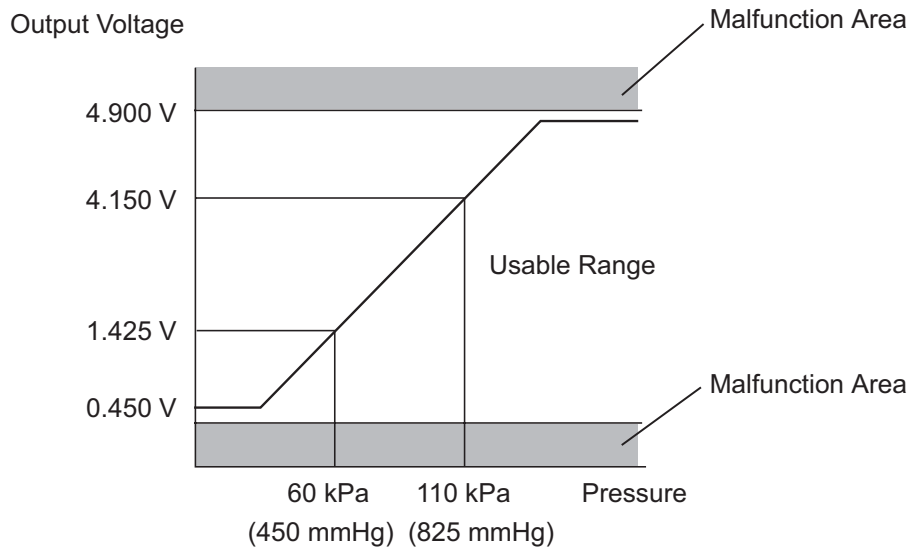
A130305E01

Pump Module



A131438E01

Canister Pressure Sensor Specification



HINT:

Standard atmospheric pressure is 101.3 kPa (760mmHg)

A115543E09

Components	Operations
Canister, Trap canister	Contains activated charcoal to absorb EVAP generated in fuel tank.
Cut-off valve	Located in fuel tank. Valve floats and closes when fuel tank 100% full.
Purge Vacuum Switching Valve (VSV)	Opens or closes line between canister and intake manifold. ECM uses purge VSV to control EVAP purge flow. In order to discharge EVAP absorbed by canister to intake manifold, ECM opens purge VSV. EVAP discharge volume to intake manifold controlled by purge VSV duty cycle ratio (current-carrying time) (open: ON; closed: OFF).
Roll-over valve	Located in fuel tank. Valve closes by its own weight when vehicle overturns to prevent fuel from spilling out.
Soak timer	Built into ECM. To ensure accurate EVAP monitor, measures 5 hours (+-15 min) after power switch OFF. This allows fuel to cool down, stabilizing Fuel Tank Pressure (FTP). When approximately 5 hours elapsed, ECM activates.
Pressure switching valve	The pressure switching valve located on the canister is used to detect leakage from the bladder tank into the fuel tank. The valve opens during the bladder tank leak check. Then, the fuel tank's fuel vapor flows to the intake manifold without passing the canister.
Pump module	Consists of (a) to (d) below. Pump module cannot be disassembled.
(a) Vent valve	Vents and closes EVAP system. When ECM turns valve ON, EVAP system closed. When ECM turns valve OFF, EVAP system vented. Negative pressure (vacuum) created in EVAP system to check for EVAP leaks by closing purge VSV, turning vent valve ON (closed) and operating leak detection pump (refer to fig. 1).
(b) Canister pressure sensor	Indicates pressure as voltage. ECM supplies regulated 5 V to canister pressure sensor, and uses feedback from sensor to monitor EVAP system pressure (refer to fig. 2).
(c) Leak detection pump	Creates negative pressure (vacuum) in EVAP system for leak check.

Components	Operations
(d) Reference orifice	Has opening with 0.02 inch diameter. Vacuum produced through orifice by closing purge VSV, turning vent valve OFF and operating leak detection pump to monitor 0.02 inch leak criterion. 0.02 inch leak criterion indicates small leak of EVAP.

MONITOR DESCRIPTION

1. Key-off monitor

5 hours* after the power switch is turned OFF, the leak detection pump creates negative pressure (vacuum) in the EVAP system. The ECM monitors for leaks and actuator malfunctions based on the EVAP pressure.

HINT:

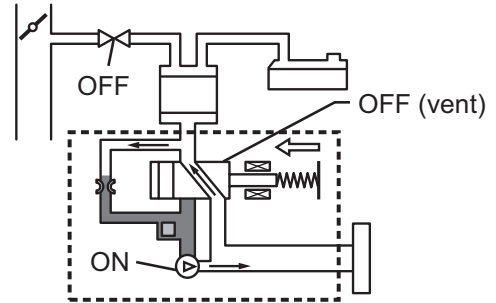
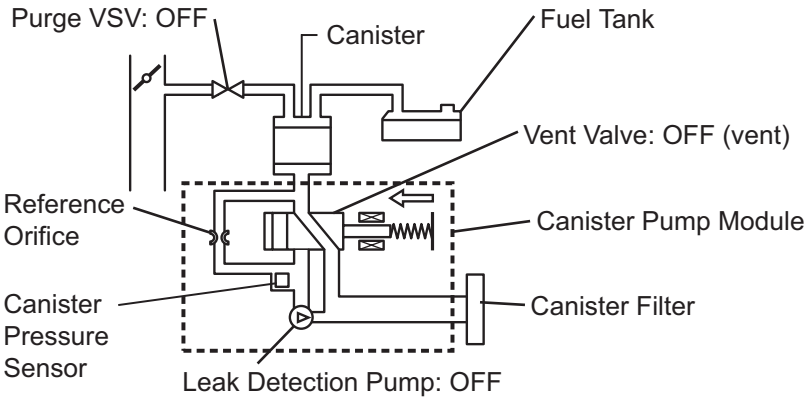
*: If the engine coolant temperature is not below 35°C (95°F) 5 hours after the power switch is turned OFF, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the power switch is turned OFF, the monitor check starts 2.5 hours later.

Sequence	Operations	Descriptions	Duration
-	ECM activation	Activated by soak timer 5, 7 or 9.5 hours after power switch OFF.	-
A	Atmospheric pressure measurement	Vent valve turned OFF (vent) and EVAP system pressure measured by ECM in order to register atmospheric pressure. If pressure in EVAP system 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 criterion measurement	In order to determine 0.02 inch leak criterion, leak detection pump creates negative pressure (vacuum) through reference orifice and then ECM checks if leak detection pump and vent valve operate normally.	60 seconds
C	EVAP system pressure measurement	Vent valve turned ON (closed) to shut EVAP system. Negative pressure (vacuum) created in EVAP system, and EVAP system pressure then measured. Write down measured value as it will be used in leak check. If EVAP pressure does not stabilize within 900 seconds, ECM cancels EVAP system monitor.	900 seconds*
D	Purge VSV monitor	Purge VSV opened and then EVAP system pressure measured by ECM. Large increase indicates normal.	10 seconds
E	Second 0.02 inch leak criterion measurement	After second 0.02 inch leak criterion measurement, leak check performed by comparing first and second 0.02 inch leak criterion. If stabilized system pressure higher than second 0.02 inch leak criterion, ECM determines that EVAP system leaking.	60 seconds
-	Final check	Atmospheric pressure measured and then monitoring result recorded by ECM.	-

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

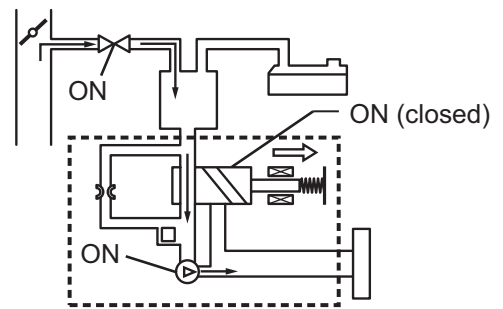
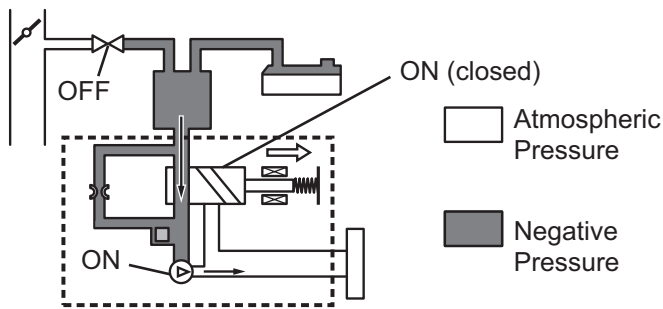
Operation A: Atmospheric Pressure Measurement

Operation B, E: 0.02 Inch Leak Criterion Measurement



Operation C: EVAP System Pressure Measurement

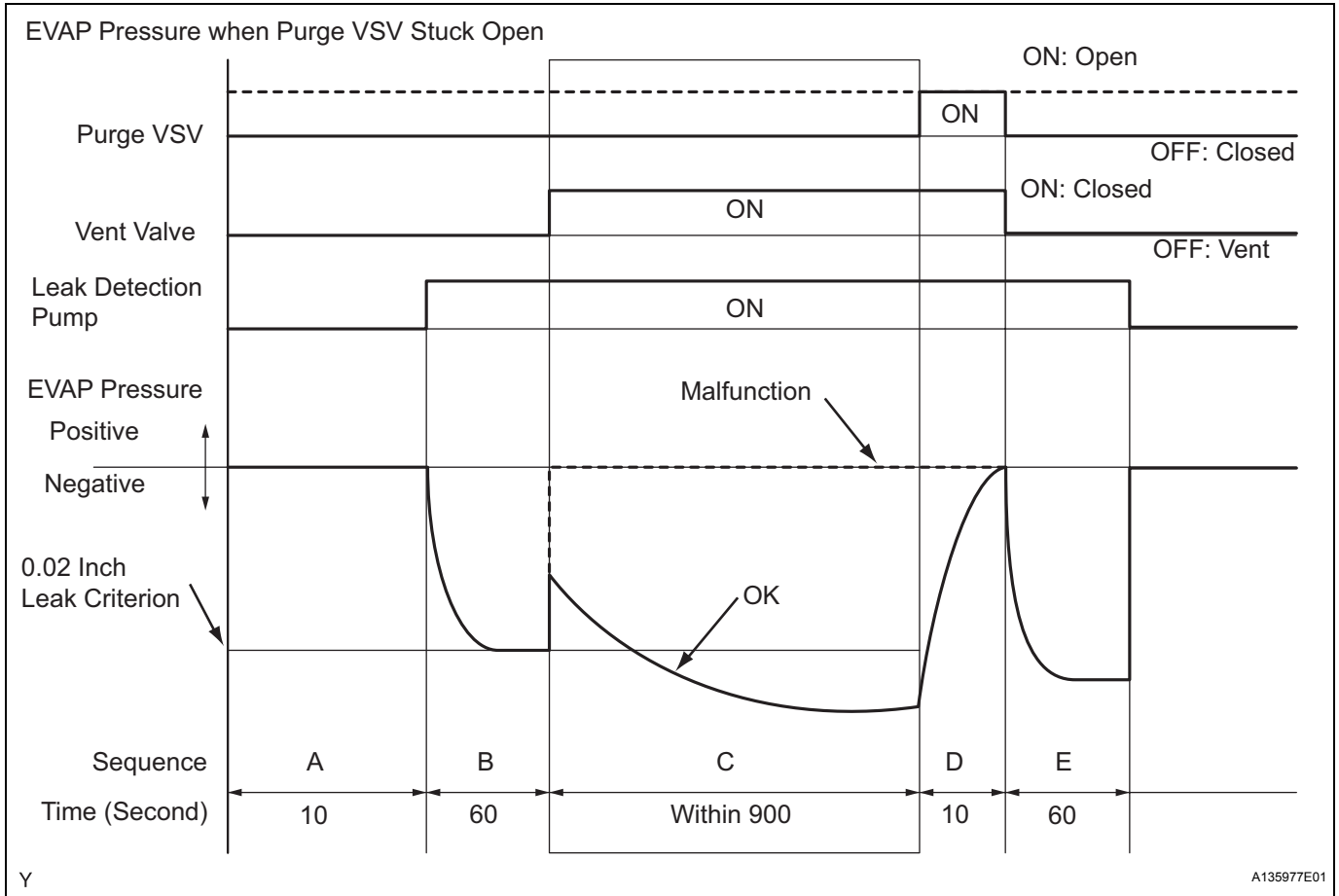
Operation D: Purge VSV Monitor



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(a) Purge VSV stuck open

In operation C, the leak detection pump creates negative pressure (vacuum) in the EVAP system. The EVAP system pressure is then measured by the ECM using the canister pressure sensor. If the stabilized system pressure is higher than [second 0.02 inch leak criterion x 0.15], the ECM interprets this as the purge Vacuum Switching Valve (VSV) being stuck open. The ECM illuminates the MIL and sets the DTC (2 trip detection logic).

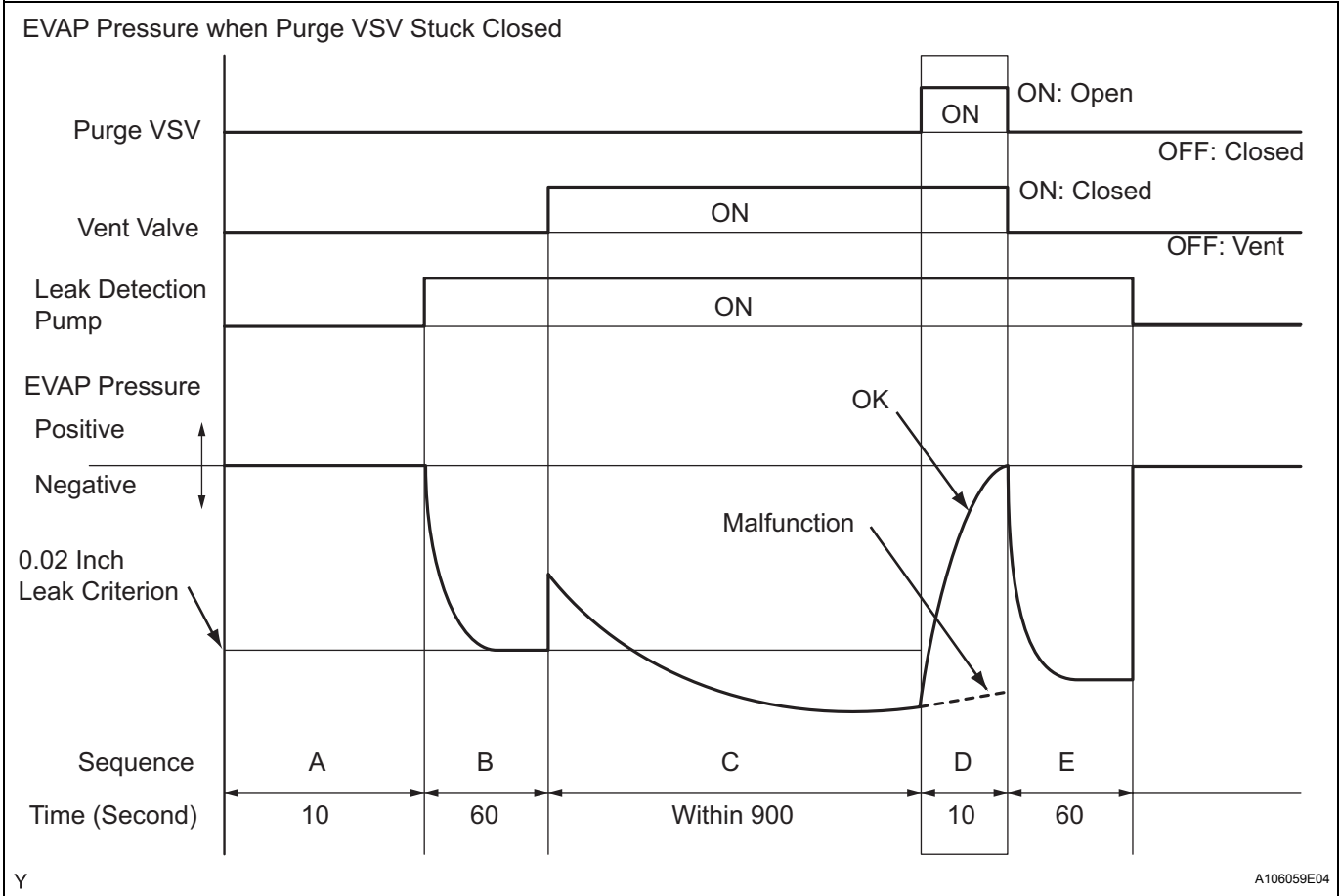


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(b)Purge VSV stuck closed

In operation D, the canister pressure sensor measures the EVAP system pressure. The pressure measurement for the purge VSV monitor begins when the purge 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 purge VSV is functioning normally. If the pressure does not increase, the ECM interprets this as the purge VSV being stuck closed. The ECM illuminates the MIL and sets the DTC (2 trip detection logic).

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(c)Purge flow

While the engine running, the purge VSV opens to purge the fuel vapor according to the engine condition. The ECM check the EVAP pressure when the purge VSV opens. If the pressure dose not change, the ECM interprets this as a malfunction. The ECM illuminates the MIL and sets DTC (2 trip detection logic).

MONITOR STRATEGY

Related DTCs	P0441: Purge VSV stuck open P0441: Purge VSV stuck closed P0441: Purge flow
Required Sensors/Components	Purge VSV and canister pump module
Frequency of Operation	Once per driving cycle
Duration	Maximum 15 seconds
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Purge Flow Monitor:

Monitor runs whenever following DTC not present	-
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Engine	Running
ECT	4.4°C (40°F) or more
IAT	4.4°C (40°F) or more
EVAP control system pressure sensor malfunction	Not detected
Purge VSV	Not detected by scan tool
EVAP system check	Not detected by scan tool
Battery voltage	11 V or higher
Purge duty cycle	15% or more

Purge VSV Stuck:

The monitor will run whenever these DTCs are not present	P0011, P0012, P0021, P0022 (VVT system-Advance, Retard) P0100, P0101, P0102, P0103 (MAF sensor) P0110, P0112, P0113 (IAT sensor) P0115, P0116, P0117, P0118 (ECT sensor) P0120, P0122, P0123, P0220, P0222, P0223, P2135,(TP sensor) P0125 (Insufficient ECT for closed loop) P0171, P0172, P0174, P0175 (Fuel system) P0300, P0301, P0302, P0303, P0304 (Misfire) P0335 (CKP sensor) P0340, P0341 (CMP sensor) P0351, P0352, P0353, P0354 (Igniter) P0450, P0452, P0453 (EVAP press sensor) P0500 (VSS)
Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg)
Battery voltage	10.5 V or higher
Vehicle speed	Less than 4 km/h (2.5 mph)
Power switch	OFF
Time after key off	5 or 7 or 9.5 hours
Purge VSV	Not operated by scan tool
Vent valve	Not operated by scan tool
Leak detection pump	Not operated by scan tool
Both of the following conditions 1 and 2 are met before key off	-
1. Duration that vehicle has been 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)

1. Key-off monitor sequence 1 to 8**1. Atmospheric pressure measurement**

Next sequence is run if the following condition is met	-
Atmospheric pressure change	Within 0.3 kPa (2.25 mmHg) in 1 second

2. First reference pressure measurement

Next sequence is run if the following conditions are met	-
EVAP pressure just after reference pressure measurement start	-1 kPa (-7.5 mmHg) or lower
Reference pressure	-4.85 to -1.05 kPa (726 to 754 mmHg)
Reference pressure	Saturated within 60 seconds

3. Vent valve stuck closed check

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

4. Vacuum introduction

Next sequence is run if the following condition is met	-
EVAP pressure	Saturated within 900 seconds

5. Purge VSV stuck closed check

Next sequence is run if the following condition is met	-
EVAP pressure change after purge valve is open	0.3 kPa (2.25 mmHg) or more

6. Second reference pressure measurement

Next sequence is run if the following conditions are met	-
EVAP pressure just after reference pressure measurement	-1 kPa (-7.5 mmHg) or lower
Reference pressure	-4.85 to -1.05 kPa (726 to 754 mmHg)
Reference pressure	Saturated within 60 seconds
Reference pressure difference between first and second	Less than 0.7 kPa (5.25 mmHg)

7. Leak check

Next sequence is run if the following condition is met	-
EVAP pressure when vacuum introduction is complete	Lower than second reference pressure

8. Atmospheric pressure measurement

EVAP monitor is complete if the following condition is met	-
Atmospheric pressure difference between sequence 1 and 8	Within 0.3 kPa (2.25 mmHg)

TYPICAL MALFUNCTION THRESHOLDS

"Saturated" indicates that the EVAP pressure change is less than 0.1 kPa (0.75 mmHg) in 30 seconds.

Purge Flow Monitor:

EVAP pressure change when purge flow is started	Lower than 0.93 kPa (7 mmHg)
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Key-off Monitor: Purge VSV stuck open

FTP when vacuum introduction complete	Higher than reference pressure x 0.15
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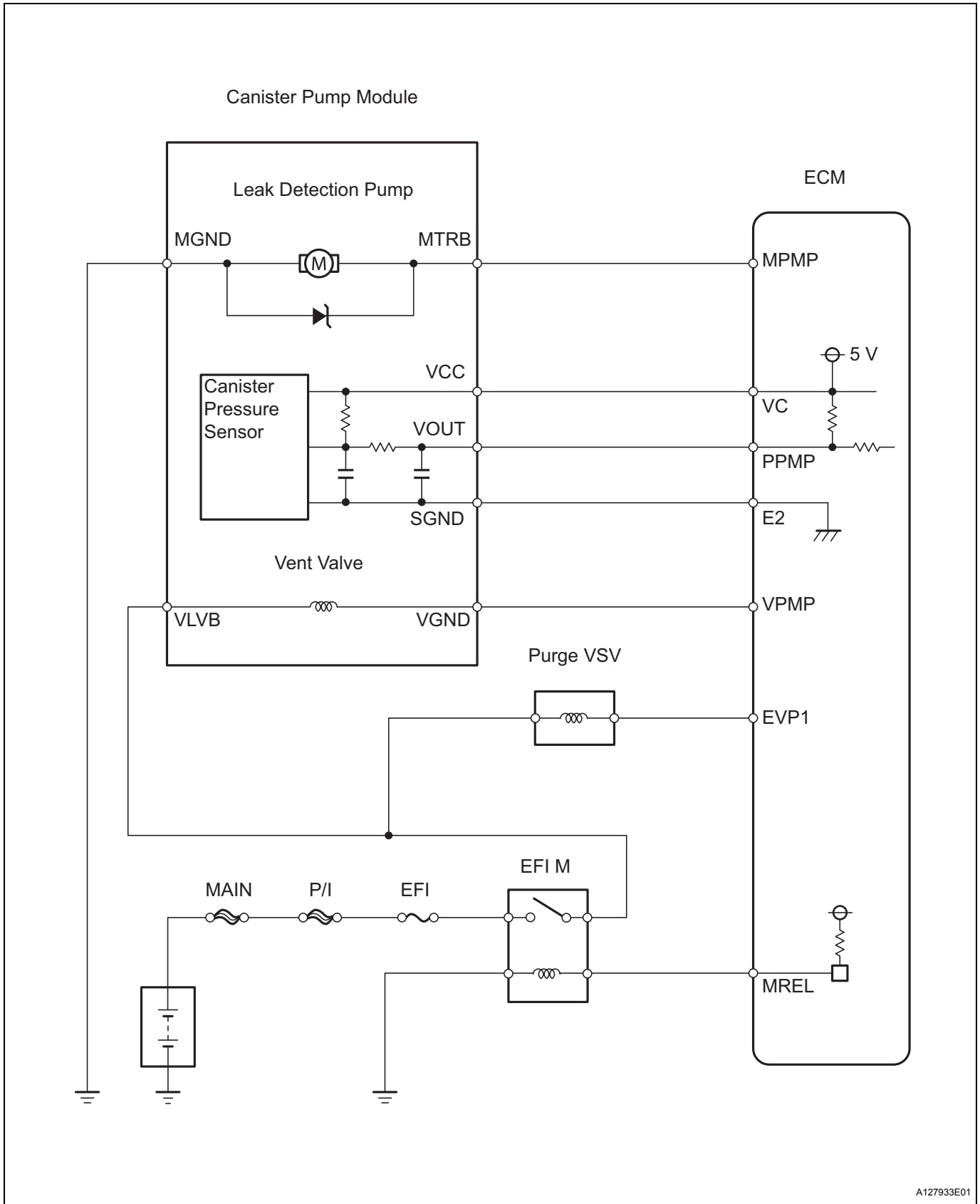
Key-off Monitor: Purge VSV stuck closed

FTP change after purge VSV ON (open)	Less than 0.3 kPa (2.25 mmHg)
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MONITOR RESULT

Refer to CHECKING MONITOR STATUS (see page [ES-15](#)).

WIRING DIAGRAM



ES

A127933E01

INSPECTION PROCEDURE

NOTICE:

The intelligent tester is required to conduct the following diagnostic troubleshooting procedure.

HINT:

- Using the intelligent tester monitor results enable the EVAP system to be confirmed.
- Read freeze frame data using the intelligent tester. Freeze frame data records the engine conditions when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 CONFIRM DTC

- Turn the power switch OFF and wait for 10 seconds.
- Turn the power switch ON (IG).
- Turn the power switch OFF and wait for 10 seconds.
- Connect the intelligent tester to the DLC3.
- Turn the power switch ON (IG).
- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- Check if DTC P0446 is output.

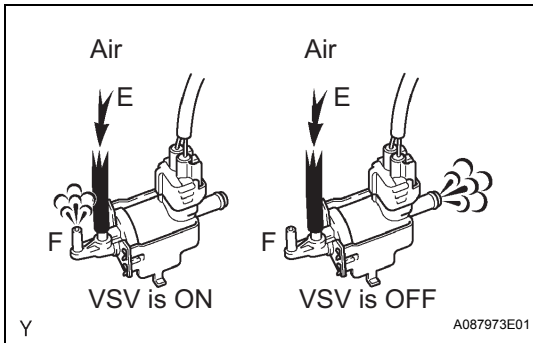
NO**Go to step 5****YES****2 PERFORM EVAP SYSTEM CHECK**

- Note the freeze frame data and DTCs.
- Clear DTCs.
- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / AUTO OPERATION.
- After the system check is finished, check for pending DTCs.

OK:**No DTC is present.****NG****Go to step 6****OK****3 CHECK OPERATION FOR PRESSURE SWITCHING VALVE**

- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / TANK BYPASS VSV.
- Touch the pressure switching valve (TANK BYPASS VSV) to feel the operating vibration.

OK:**The pressure switching valve is operated by the ACTIVE TEST.****NG****Go to step 18****OK**

4 CHECK PRESSURE SWITCHING VALVE

- Turn the power switch OFF.
- Remove the pressure switching valve (see page EC-31).
- Reconnect the pressure switching valve connector.
- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / TANK BYPASS VSV.
- Check the airflow for the pressure switching valve.

OK:**The pressure switching valve operates normally.****NG****Go to step 19****OK****Go to step 33****5 PERFORM EVAP SYSTEM CHECK**

- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / AUTO OPERATION.
- After the system check is finished, check for pending DTCs.

OK:**DTCs are present.****NG****CHECK INTERMITTENT PROBLEMS****OK****6 CHECK DTC**

- Check the DTCs that were present at the EVAP system check.

OK:**P043E, P043F, P2401, P2402 and P2419 are present.****NG****Go to step 10****OK****7 CHECK VENT VALVE CLOSE STUCK**

- Allow the engine to idle.
- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / EVAP VSV.
- Turn the EVAP VSV ON (purge VSV open) and check the VAPOR PRESS (EVAP pressure) for 10 seconds.

OK:**EVAP pressure is higher than 755 mmHg.****NG****Go to step 20****ES**

OK

8 CHECK LEAK DETECTION PUMP OPERATION

- (a) Turn the power switch OFF.
- (b) Turn the power switch ON (IG).
- (c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VACUUM PUMP.
- (d) Touch the pump module to feel the operating vibration.

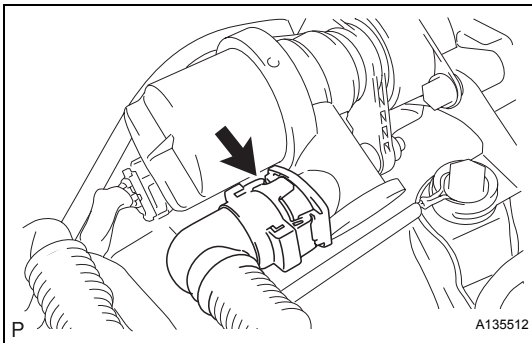
OK:

The leak detection pump is operated by the ACTIVE TEST.

NG

Go to step 21

OK

9 CHECK TRAP CANISTER

- (a) Disconnect the vent hose from the pump module.
- (b) Check that no moisture is in the pump module or the vent hose.

OK:

No moisture.

OK

Go to step 22

NG

Go to step 23

10 CHECK DTC

- (a) Check the DTCs that were present at the EVAP system check.

OK:

P0441, P0455 and/or P0456 are present.

NG

Go to step 16

OK

11 CHECK INSTALLATION FOR FUEL CAP

- (a) Remove the fuel cap.
- (b) Reinstall the fuel cap.
- (c) Clear DTCs.
- (d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / AUTO OPERATION.
- (e) After the system check is finished, check for pending DTCs.

HINT:

If no DTC is present, this indicates that the fuel cap is loosened.

OK:

No DTC is present.

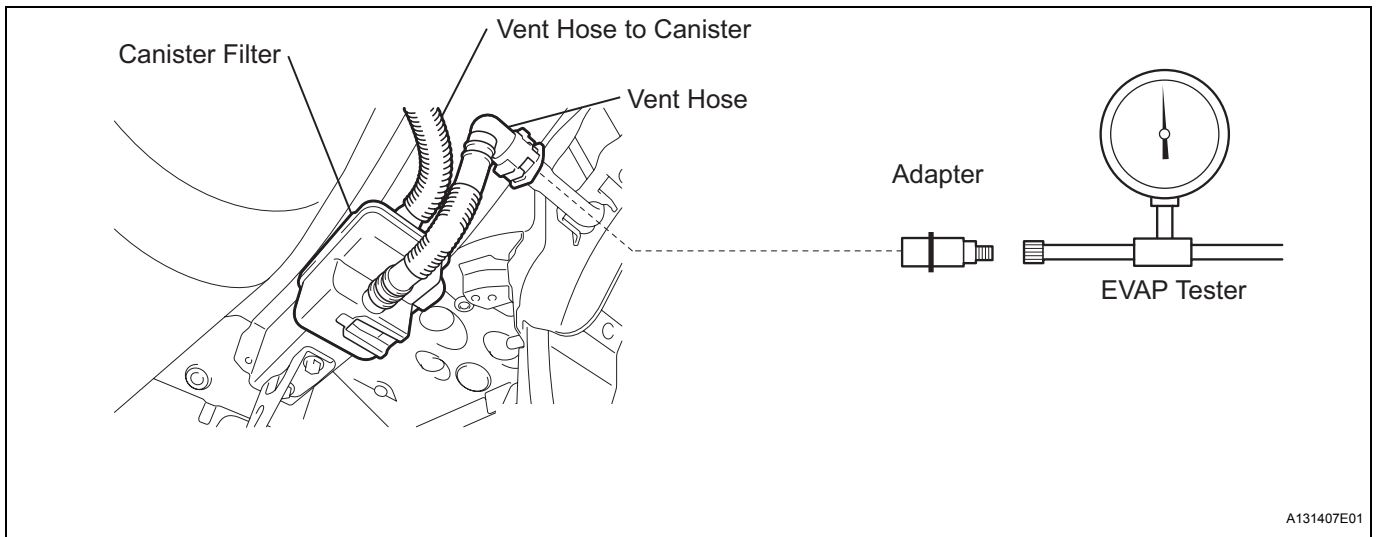
OK

REPAIR COMPLETED

NG

12 LOCATE LEAK POINT

- (a) Disconnect the vent hose (fresh air line) as shown in the illustration.



- (b) Connect the pressure gauge and air pump as shown in the illustration.
 (c) Pressurize the EVAP system until 24 to 28 mmHg.
 (d) Locate the leak point.

HINT:

If the EVAP system has leakage, a whistling sound may be heard.

OK:

The leak point is found.

OK

Go to step 24

NG

13 CHECK FUEL CAP

Check that the fuel cap meets OEM specifications.

HINT:

If an EVAP tester is available, perform the fuel cap test according to the tester's instructions.

OK:

Fuel cap meets OEM specifications.

NG

Go to step 25

ES

OK

14 CHECK OPERATION FOR PURGE VSV

- (a) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / EVAP VSV.
- (b) Touch the purge VSV to feel the operating vibration.

OK:

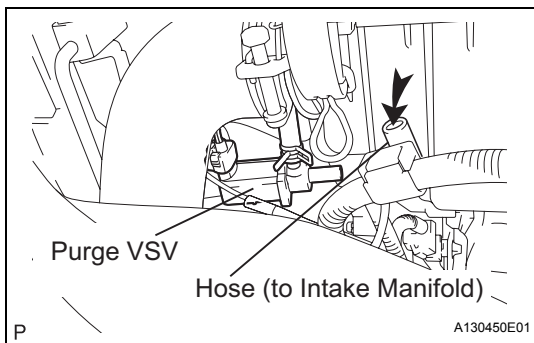
The purge VSV (EVAP VSV) is operated by the ACTIVE TEST.

NG

Go to step 26

ES

OK

15 CHECK INTAKE MANIFOLD PRESSURE

- (a) Disconnect the purge VSV hose that is connected to the throttle body.
- (b) Allow the engine to idle.
- (c) Check that the hose has suction using your finger.

OK:

The hose has suction.

NG

Go to step 27

OK

Go to step 28

16 CHECK DTC

- (a) Check the DTCs that were present at the EVAP system check.

OK:

P0451 is not present.

NG

Go to step 9

OK

17 CHECK OPERATION FOR VENT VALVE

- (a) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VENT VALVE.
- (b) Touch the pump module to feel the operating vibration.

OK:

The vent valve is operated by the ACTIVE TEST.

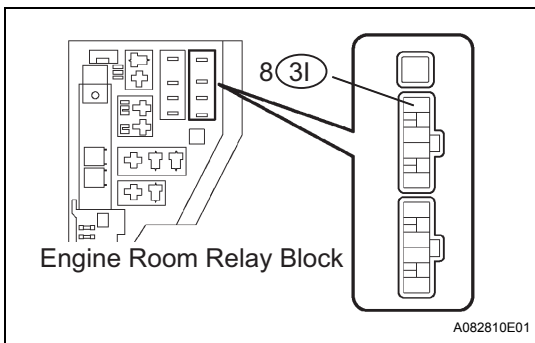
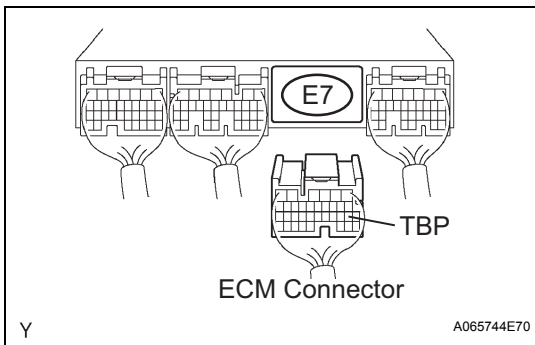
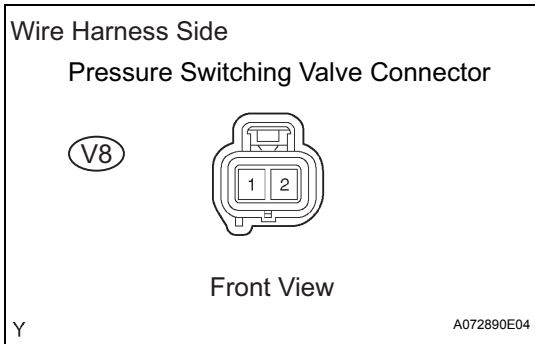
OK

Go to step 9

NG

Go to step 29

18 CHECK HARNESS AND CONNECTOR (PRESSURE SWITCHING VALVE - ECM AND EFI M RELAY)



(a) Check the harness and the connectors between the pressure switching valve and the ECM.

- (1) Disconnect the V8 pressure switching valve connector.

- (2) Disconnect the E7 ECM connector.
- (3) Measure the resistance between the wire harness side connectors.

Standard resistance (Check for open)

Tester Connection	Specified Condition
V8-1 (Pressure switching valve) - E7-18 (TBP)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V8-1 (Pressure switching valve) or E7-18 (TBP) - Body ground	10 kΩ higher

- (4) Reconnect the pressure switching valve connector.
 - (5) Reconnect the ECM connector.
- (b) Check the harness and the connectors between the pressure switching valve and the EFI M relay.

- (1) Disconnect the V8 pressure switching valve connector.
- (2) Remove the integration relay from the engine room relay block.
- (3) Measure the resistance between the wire harness side connector.

Standard resistance (Check for open)

Tester Connection	Specified Condition
V8-2 (Pressure switching valve) - 31-8 (EFI M relay)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V8-2 (Pressure switching valve) or 31-8 (EFI M relay) - Body ground	10 kΩ or higher

- (4) Reconnect the pressure switching valve connector.
- (5) Reinstall the integration relay.

NG	Go to step 30
OK	Go to step 31

19 REPLACE PRESSURE SWITCHING VALVE

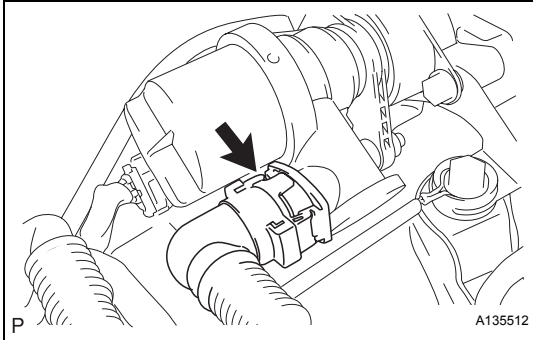
Replace the pressure switching valve (see page EC-31).

NEXT

Go to step 34

20 CHECK FOR VENT HOSE CLOG

ES



- (a) Turn the power switch OFF.
- (b) Disconnect the vent hose (fresh air line) as shown in the illustration.
- (c) Allow the engine to idle.
- (d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / EVAP VSV.
- (e) Turn the purge VSV (EVAP VSV) ON and check the EVAP pressure (VAPOR PRESS) for 10 seconds.

OK:

EVAP pressure is higher than 755 mmHg.

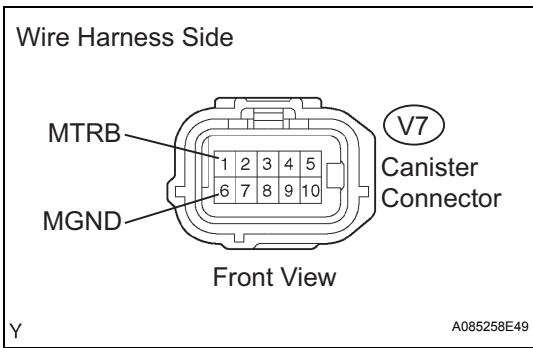
NG

Go to step 22

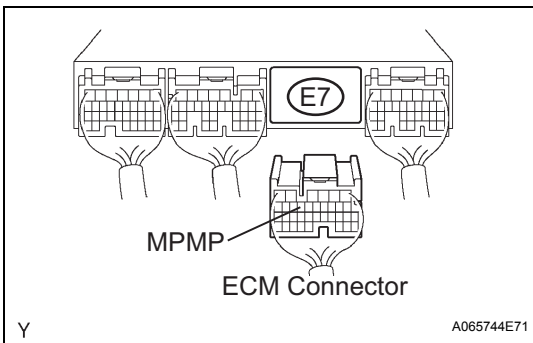
OK

Go to step 32

21 CHECK HARNESS AND CONNECTOR (LEAK DETECTION PUMP - ECM)



- (a) Disconnect the V7 canister connector



- (b) Disconnect the E7 ECM connector.
- (c) Measure the resistance between the wire harness side connector.

Standard resistance (Check for open)

Tester Connection	Specified Condition
V7-1 (MTRB) - E7-13 (MPMP)	Below 1 Ω
V7-6 (MGND) - Body ground	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V7-1 (MTRB) or E7-13 (MPMP) - Body ground	10 kΩ higher

- (d) Reconnect the canister connector.
- (e) Reconnect the ECM connector.

NG

Go to step 30

OK

Go to step 31

22 REPLACE TRAP CANISTER WITH PUMP MODULE

Replace the trap canister with pump module (see page EC-17).

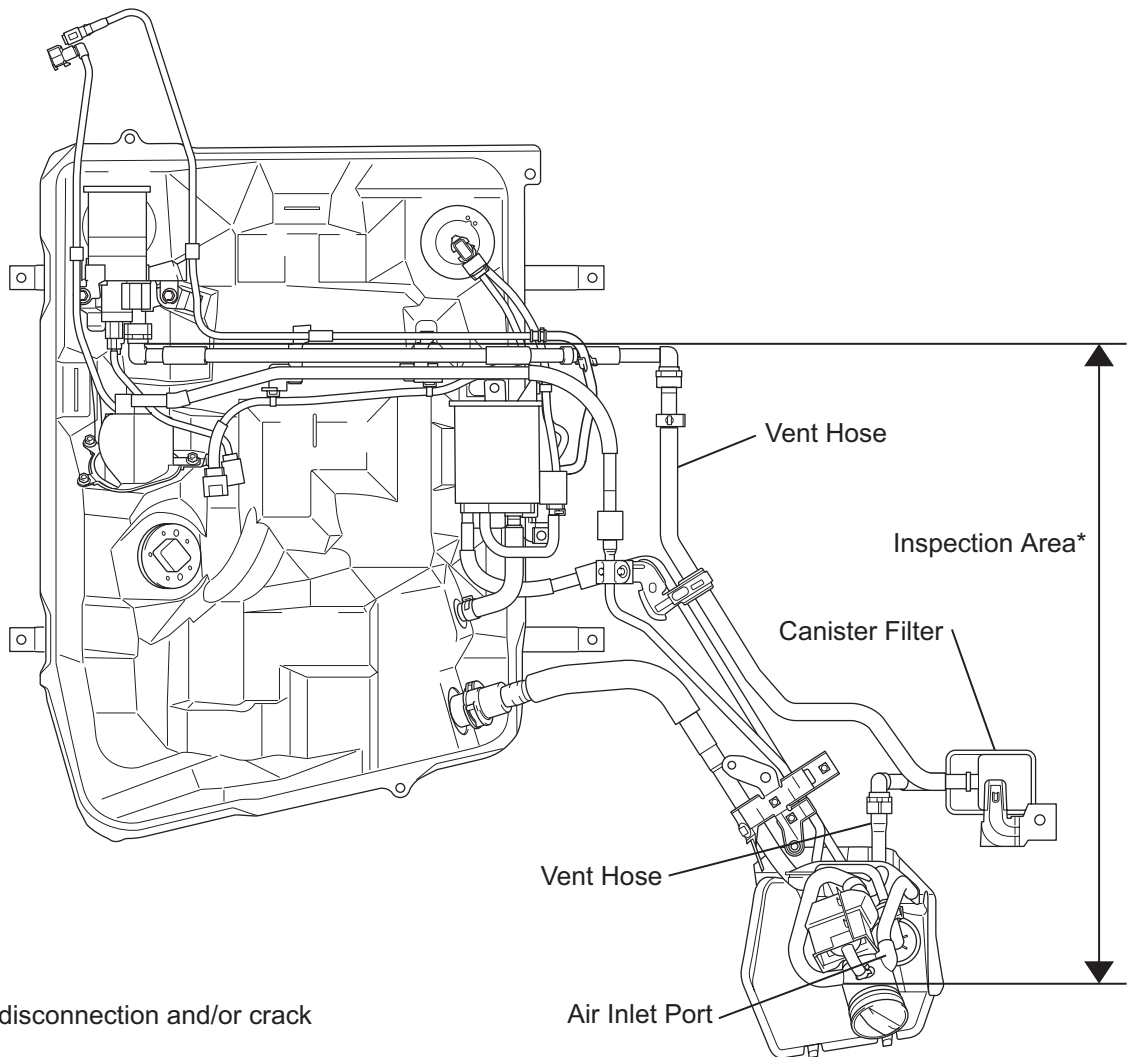
NEXT

Go to step 34

23 CHECK FOR VENT HOSE DAMAGE

Check for hose damage as shown in the illustration. If necessary, replace the vent hose.

ES



*: Check for disconnection and/or crack

P

A130304E01

NEXT

Go to step 22

24 REPAIR OR REPLACE LEAK POINT

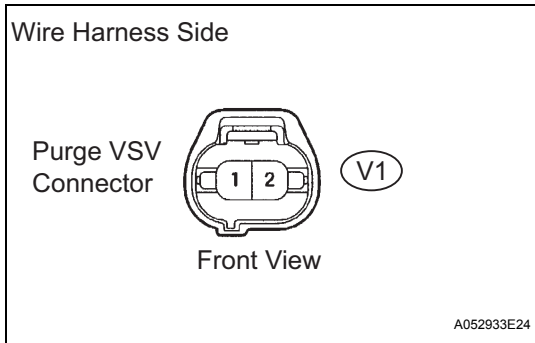
NEXT Go to step 34

25 REPLACE FUEL CAP

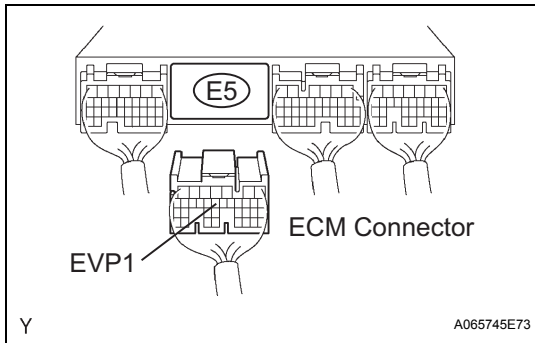
NEXT Go to step 34

ES

26 CHECK HARNESS AND CONNECTOR (PURGE VSV - ECM)



(a) Disconnect the V1 purge VSV connector.



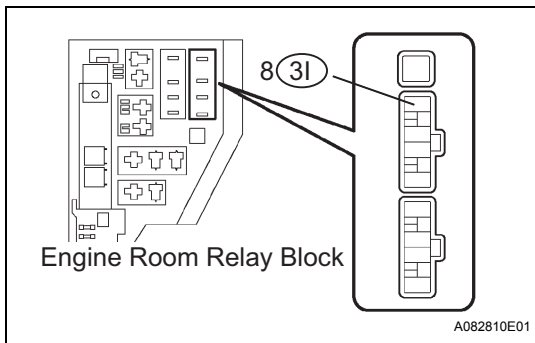
- (b) Disconnect the E5 ECM connector.
- (c) Check the harness and the connectors between the ECM and the purge VSV connectors.
 - (1) Measure the resistance between the wire harness side connector.

Standard resistance (Check for open)

Tester Connection	Specified Condition
V1-1 - E5-14 (EVP1)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V1-1 or E5-14 (EVP1) - Body ground	10 kΩ higher



- (d) Remove the integration relay from the engine room relay block.
- (e) Check the harness and connectors between the purge VSV connector and the EFI M relay.
 - (1) Measure the resistance between the wire harness side connectors.

Standard resistance (Check for open)

Tester Connection	Specified Condition
V1-2 - 3I-8 (EFI M relay)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V1-2 or 3I-8 (EFI M relay) - Body ground	10 kΩ higher

- (f) Reconnect the purge VSV connector.
- (g) Reconnect the ECM connector.

(h) Reinstall the integration relay.

NG	Go to step 30
OK	Go to step 31

27 REPLACE HOSE (PURGE VSV - THROTTLE BODY)

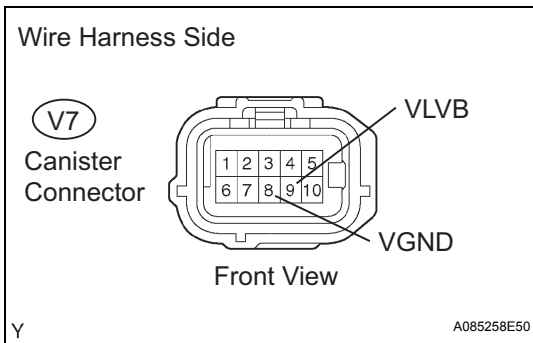
NEXT Go to step 34

28 REPLACE PURGE VSV

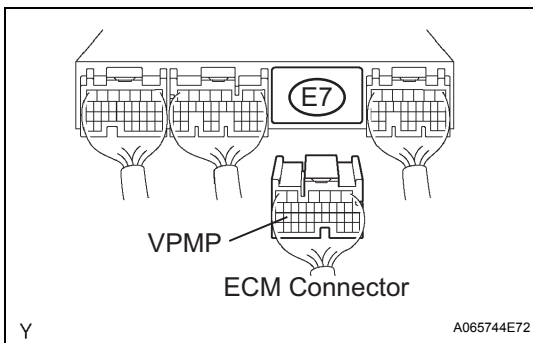
Replace the purge VSV (see page [EC-23](#)).

NEXT Go to step 34

29 CHECK HARNESS AND CONNECTOR (VENT VALVE - ECM)



(a) Disconnect the V7 canister connector.



(b) Disconnect the E7 ECM connector.

(c) Check the harness and the connectors between the ECM and the canister connectors.

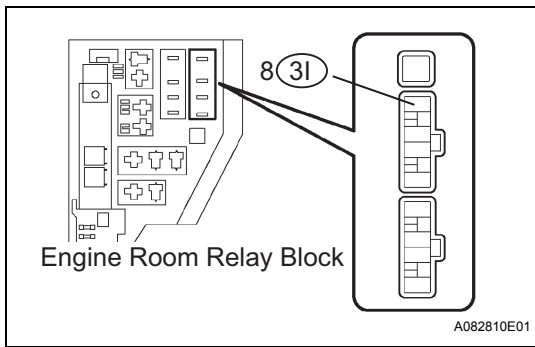
(1) Measure the resistance between the wire harness side connector.

Standard resistance (Check for open)

Tester Connection	Specified Condition
V7-8 (VGND) - E7-26 (VPMP)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V7-8 (VGND) or E7-26 (VPMP) - Body ground	10 kΩ higher



- (d) Remove the integration relay from the engine room relay block.
- (e) Check the harness and connectors between the canister connector and the EFI M relay.
 - (1) Measure the resistance between the wire harness side connectors.

Standard resistance (Check for open)

Tester Connection	Specified Condition
V7-9 (VLVB) - 31-8 (EFI M relay)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V7-9 (VLVB) or 31-8 (EFI M relay) - Body ground	10 kΩ higher

- (f) Reconnect the canister connector.
- (g) Reconnect the ECM connector.
- (h) Reinstall the integration relay.

NG	Go to step 30
OK	Go to step 31

30 REPAIR OR REPLACE HARNESS AND CONNECTOR

NEXT → Go to step 34

31 REPLACE ECM

Replace the ECM (see page [ES-469](#)).

NEXT → Go to step 34

32 CHECK AND REPLACE VENT HOSE OR CANISTER FILTER

NEXT → Go to step 34

33 REPLACE HOSE (PRESSURE SWITCHING VALVE AND FUEL TANK)

NEXT

34 PERFORM EVAP SYSTEM CHECK

- (a) Turn the power switch ON (IG).
- (b) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / AUTO OPERATION.
- (c) After the system check is finished, check for pending DTCs.

OK:
No DTC is present.

NG

Go to step 6

OK

35 **PERFORM EVAP MONITOR DRIVE PATTERN**

- (a) Check that the following conditions are met:
- Fuel level is 1/8 to 7/8.
 - Engine coolant temperature (ECT) is 4.4 to 35°C (40 to 95°F).
 - Intake air temperature (IAT) is 4.4 to 35°C (40 to 95°F).
 - Difference of ECT and IAT is less than 7°C (13°F).
- (b) Enter the check mode. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / CHECK MODE.
- (c) Allow the engine to idle until the ECT is 75°C (167°F).
- (d) Drive the vehicle at 50 km/h (30 mph) or faster and maintain that speed for 60 seconds or more.
- (e) Stop the vehicle. Do not turn the power switch OFF.
- (f) Check that the EVAP monitor status is complete. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / MONITOR STATUS.
- (g) If the EVAP monitor is incomplete, drive the vehicle at 50 km/h (30 mph) or faster and maintain that speed for 120 seconds or more. After that, recheck the EVAP monitor status.
- (h) Check for pending DTCs.

OK:
No DTC is present.

NG

Go to step 2

OK

REPAIR COMPLETED

ES

DTC	P0446	Evaporative Emission Control System Vent Control Circuit
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DESCRIPTION

DTC	DTC Detection Condition	Trouble Area
P0446	One of the following condition is met while vehicle is driving (2 trip detection logic): <ul style="list-style-type: none"> • No change in fuel tank pressure when purge VSV and pressure switching valve are opened • No change in fuel tank pressure when fuel tank is depressurized until 740 mmHg and purge VSV is closed 	<ul style="list-style-type: none"> • Leak from EVAP system • Pressure switching valve • Purge VSV • Vent valve • Fuel tank pressure sensor

ES

This DTC is designed to detect the pressure switching valve (3-way VSV) malfunction. If the malfunction is detected while the vehicle is running, the ECM illuminates the MIL and sets a DTC (2 detection logic). The pressure switching valve located on the canister is used to detect leakage from the bladder tank into the fuel tank. The valve opens during the bladder tank leak check. Then, the fuel tank's fuel vapor flows to the intake manifold without passing the canister.

MONITOR DESCRIPTION

Pressure switching valve is stuck OFF (Closed)

The pressure switching valve opens when the purge VSV opens while the vehicle is running. Then, the fuel tank pressure drops 2 mmHg or more when the pressure switching valve is normal. If the pressure does not change, the ECM interprets this as a malfunction. The ECM illuminates the MIL and sets a DTC (2 trip detection logic).

Pressure switching valve is stuck ON (Open)

In order to depressurize the fuel tank, the pump module's vent valve is turned ON (close) when the purge VSV opens while the vehicle is running. After the fuel tank pressure drops 20 mmHg, the purge VSV closes. Then, the fuel tank pressure rises slightly when the pressure switching valve is normal. If the pressure rises quickly, the ECM interprets this as a malfunction. The ECM illuminates the MIL and sets a DTC (2 trip detection logic).

MONITOR STRATEGY

Related DTCs	P0466: Pressure switching valve fixed
Required Sensors/Components	Pressure switching valve
Frequency of Operation	Once per driving cycle
Duration	Within 10 seconds
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

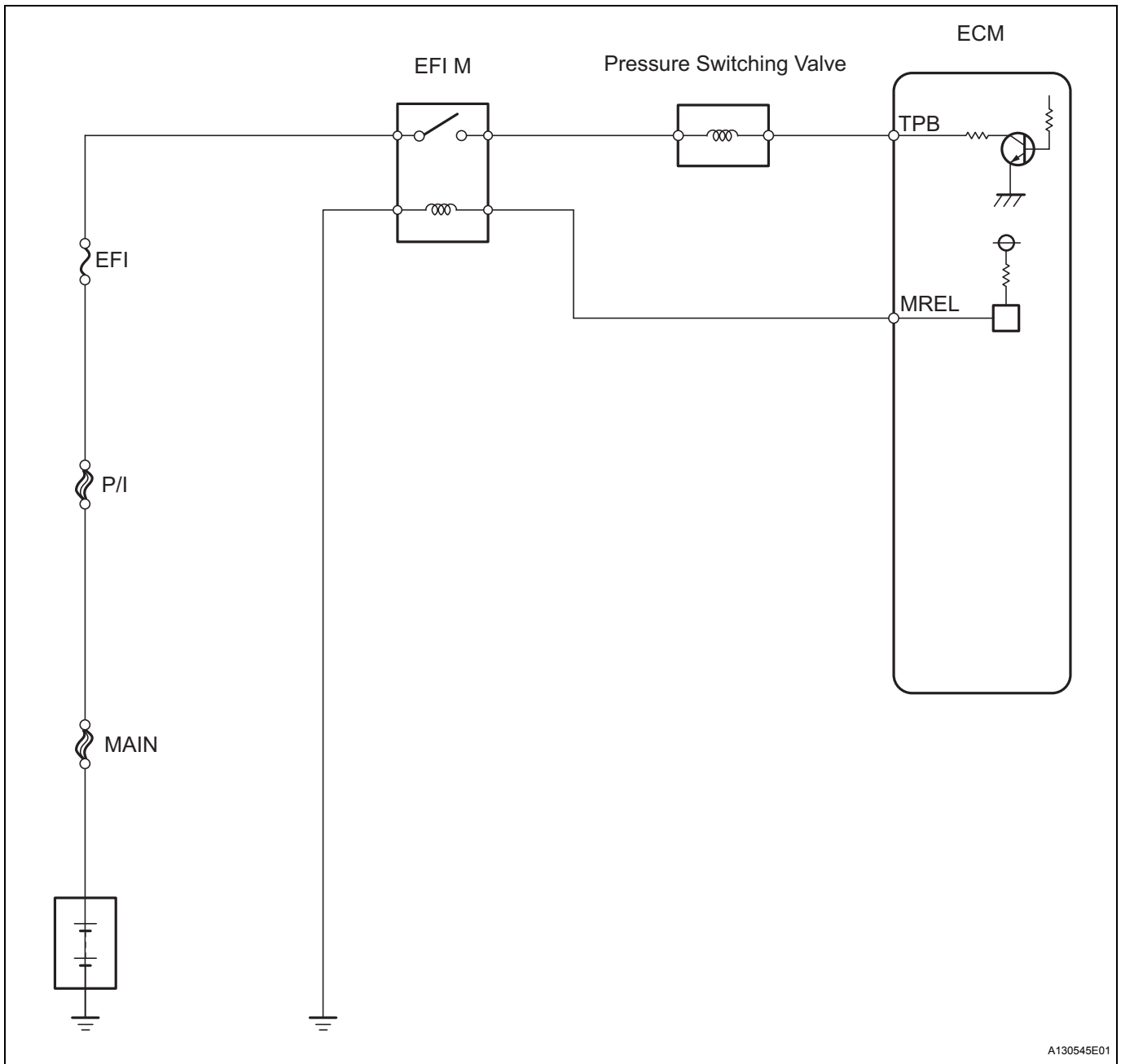
Monitor runs whenever following DTC not present	P0441: Purge VSV P1450 - P1453: FTP sensor
Altitude	Less than 2,400 m (8,000 ft.)
Battery voltage	11 V or more
IAT at engine start - ECT at engine start	-7 to 11°C (-12.6 to 20°F)
ECT at engine start	4.4 to 35°C (40 to 95°F)
IAT at engine start	4.4 to 35°C (40 to 95°F)
Vehicle speed	Constant between 45 and 130 km/h (28 and 80 mph)
Time after engine start	Less than 30 minutes
HV ECU	OK

Fail-safe via HV ECU	Not executed
Purge flow volume	0.08 g/sec. or more

TYPICAL MALFUNCTION THRESHOLDS

Either of following condition 1 or 2 is met	-
1. Following conditions are met	-
FTP change when pressure switching valve is ON	0.267 kPa (2 mmHg) or more
FTP	-2.667 kPa (740 mmHg) or higher
FTP increase after 20 mmHg vacuum is applied to fuel tank	1.333 kPa (10 mmHg) or more

WIRING DIAGRAM



ES

INSPECTION PROCEDURE

1 CONFIRM DTC

- (a) Turn the power switch OFF and wait for 10 seconds.
- (b) Turn the power switch ON (IG).
- (c) Turn the power switch OFF and wait for 10 seconds.
- (d) Connect the intelligent tester to the DLC3.
- (e) Turn the power switch ON (IG).
- (f) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (g) Check if DTC P0446 is output.

NO

Go to step 5

YES

2 PERFORM EVAP SYSTEM CHECK

- (a) Note the freeze frame data and DTCs.
- (b) Clear DTCs.
- (c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / AUTO OPERATION.
- (d) After the system check is finished, check for pending DTCs.

OK:

No DTC is present.

NG

Go to step 6

OK

3 CHECK OPERATION FOR PRESSURE SWITCHING VALVE

- (a) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / TANK BYPASS VSV.
- (b) Touch the pressure switching valve (TANK BYPASS VSV) to feel the operating vibration.

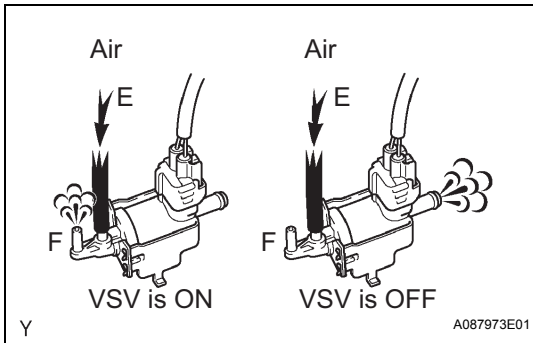
OK:

The pressure switching valve is operated by the ACTIVE TEST.

NG

Go to step 18

OK

4 CHECK PRESSURE SWITCHING VALVE

- Turn the power switch OFF.
- Remove the pressure switching valve (see page EC-31).
- Reconnect the pressure switching valve connector.
- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / TANK BYPASS VSV.
- Check the airflow for the pressure switching valve.

OK:

The pressure switching valve operates normally.

NG

Go to step 19

OK

Go to step 33

ES**5 PERFORM EVAP SYSTEM CHECK**

- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / AUTO OPERATION.
- After the system check is finished, check for pending DTCs.

OK:

DTCs are present.

NG

CHECK INTERMITTENT PROBLEMS

OK**6 CHECK DTC**

- Check the DTCs that were present at the EVAP system check.

OK:

P043E, P043F, P2401, P2402 and P2419 are present.

NG

Go to step 10

OK**7 CHECK VENT VALVE CLOSE STUCK**

- Allow the engine to idle.
- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / EVAP VSV.
- Turn the EVAP VSV ON (purge VSV open) and check the VAPOR PRESS (EVAP pressure) for 10 seconds.

OK:

EVAP pressure is higher than 755 mmHg.

NG

Go to step 20

OK

8 CHECK LEAK DETECTION PUMP OPERATION

- Turn the power switch OFF.
- Turn the power switch ON (IG).
- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VACUUM PUMP.
- Touch the pump module to feel the operating vibration.

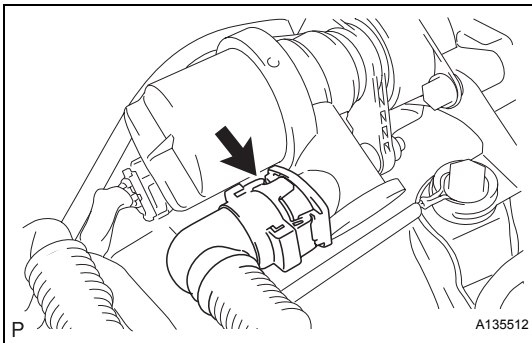
OK:

The leak detection pump is operated by the ACTIVE TEST.

NG

Go to step 21

OK

9 CHECK TRAP CANISTER

- Disconnect the vent hose from the pump module.
- Check that no moisture is in the pump module or the vent hose.

OK:

No moisture.

OK

Go to step 22

NG

Go to step 23

10 CHECK DTC

- Check the DTCs that were present at the EVAP system check.

OK:

P0441, P0455 and/or P0456 are present.

NG

Go to step 16

NG

11 CHECK INSTALLATION FOR FUEL CAP

- Remove the fuel cap.
- Reinstall the fuel cap.
- Clear DTCs.
- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / AUTO OPERATION.
- After the system check is finished, check for pending DTCs.

HINT:

If no DTC is present, this indicates that the fuel cap is loosened.

OK:

No DTC is present.

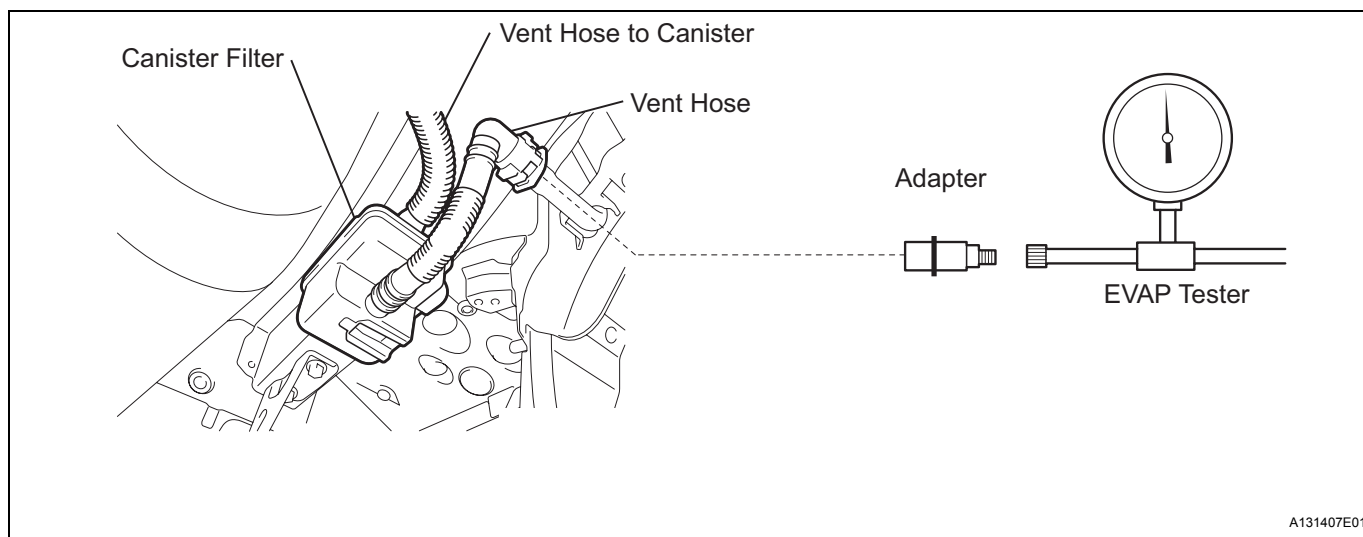
OK

REPAIR COMPLETED

NG

12 LOCATE LEAK POINT

- (a) Disconnect the vent hose (fresh air line) as shown in the illustration.



- (b) Connect the pressure gauge and air pump as shown in the illustration.
 (c) Pressurize the EVAP system until 24 to 28 mmHg.
 (d) Locate the leak point.

HINT:

If the EVAP system has leakage, a whistling sound may be heard.

OK:

The leak point is found.

OK

Go to step 24

NG

13 CHECK FUEL CAP

Check that the fuel cap meets OEM specifications.

HINT:

If an EVAP tester is available, perform the fuel cap test according to the tester's instructions.

OK:

Fuel cap meets OEM specifications.

NG

Go to step 25

ES

OK

14 CHECK OPERATION FOR PURGE VSV

- (a) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / EVAP VSV.
- (b) Touch the purge VSV to feel the operating vibration.

OK:

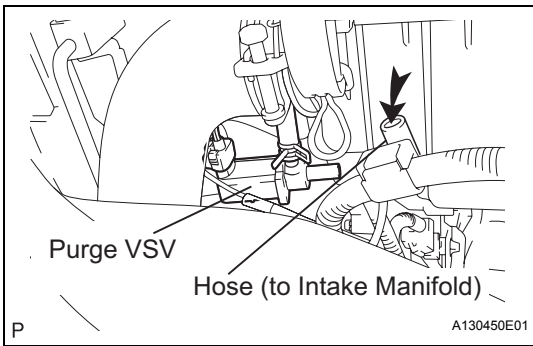
The purge VSV (EVAP VSV) is operated by the ACTIVE TEST.

NG → Go to step 26

ES

OK

15 CHECK INTAKE MANIFOLD PRESSURE



- (a) Disconnect the purge VSV hose that is connected to the throttle body.
- (b) Allow the engine to idle.
- (c) Check that the hose has suction using your finger.

OK:

The hose has suction.

NG → Go to step 27

OK → Go to step 28

16 CHECK DTC

- (a) Check the DTCs that were present at the EVAP system check.

OK:

P0451 is not present.

NG → Go to step 9

OK

17 CHECK OPERATION FOR VENT VALVE

- (a) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VENT VALVE.
- (b) Touch the pump module to feel the operating vibration.

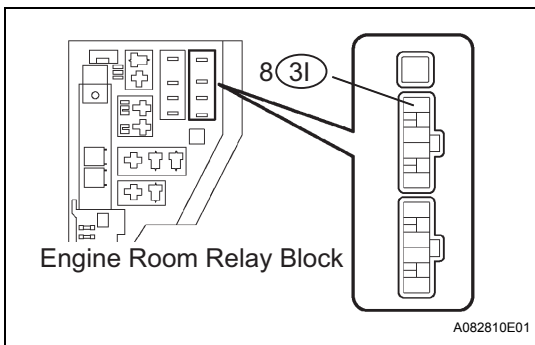
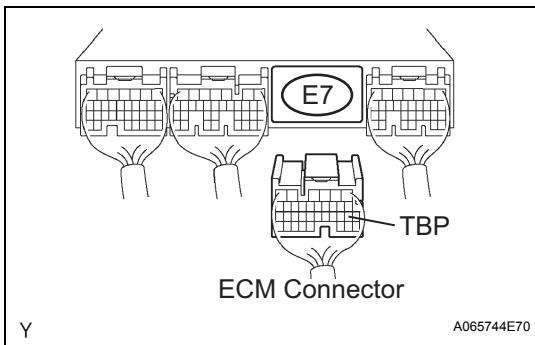
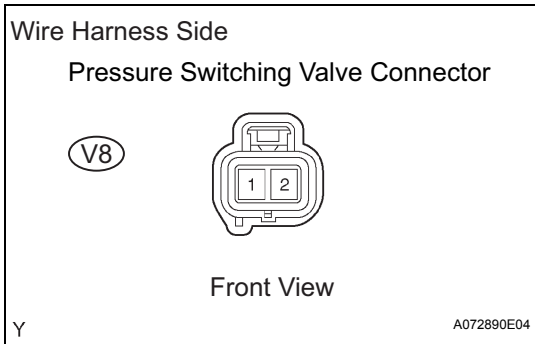
OK:

The vent valve is operated by the ACTIVE TEST.

OK → Go to step 9

NG → Go to step 29

18 CHECK HARNESS AND CONNECTOR (PRESSURE SWITCHING VALVE - ECM AND EFI M RELAY)



(a) Check the harness and the connectors between the pressure switching valve and the ECM.

- (1) Disconnect the V8 pressure switching valve connector.

- (2) Disconnect the E7 ECM connector.
- (3) Measure the resistance between the wire harness side connectors.

Standard resistance Check for open)

Tester Connection	Specified Condition
V8-1 (Pressure switching valve) - E7-18 (TBP)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V8-1 (Pressure switching valve) or E7-18 (TBP) - Body ground	10 kΩ higher

- (4) Reconnect the pressure switching valve connector.
 - (5) Reconnect the ECM connector.
- (b) Check the harness and the connectors between the pressure switching valve and the EFI M relay.

- (1) Disconnect the V8 pressure switching valve connector.
- (2) Remove the integration relay from the engine room relay block.
- (3) Measure the resistance between the wire harness side connector.

Standard resistance (Check for open)

Tester Connection	Specified Condition
V8-2 (Pressure switching valve) - 31-8 (EFI M relay)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V8-2 (Pressure switching valve) or 31-8 (EFI M relay) - Body ground	10 kΩ or higher

- (4) Reconnect the pressure switching valve connector.
- (5) Reinstall the integration relay.

NG	Go to step 30
OK	Go to step 31

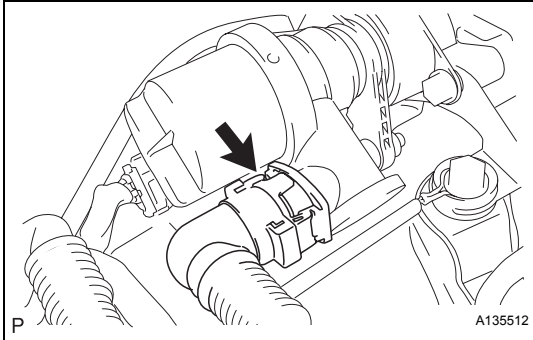
19 REPLACE PRESSURE SWITCHING VALVE

Replace the pressure switching valve (see page EC-31).

NEXT **Go to step 34**

20 CHECK FOR VENT HOSE CLOG

ES



- (a) Turn the power switch OFF.
- (b) Disconnect the vent hose (fresh air line) as shown in the illustration.
- (c) Allow the engine to idle.
- (d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / EVAP VSV.
- (e) Turn the purge VSV (EVAP VSV) ON and check the EVAP pressure (VAPOR PRESS) for 10 seconds.

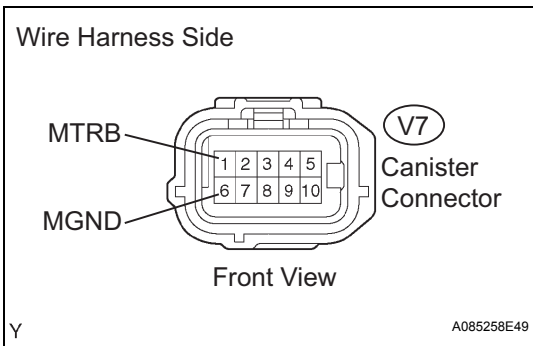
OK:

EVAP pressure is higher than 755 mmHg.

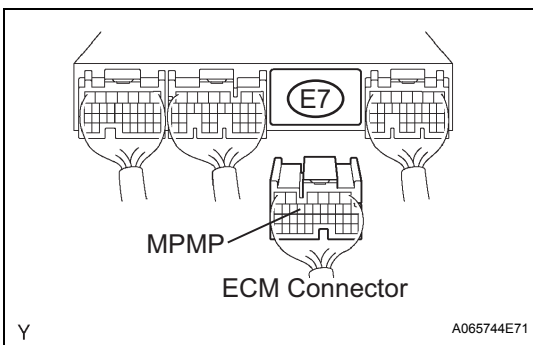
NG **Go to step 22**

OK **Go to step 32**

21 CHECK HARNESS AND CONNECTOR (LEAK DETECTION PUMP - ECM)



- (a) Disconnect the V7 canister connector



- (b) Disconnect the E7 ECM connector.
- (c) Measure the resistance between the wire harness side connector.

Standard resistance (Check for open)

Tester Connection	Specified Condition
V7-1 (MTRB) - E7-13 (MPMP)	Below 1 Ω
V7-6 (MGND) - Body ground	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V7-1 (MTRB) or E7-13 (MPMP) - Body ground	10 kΩ higher

- (d) Reconnect the canister connector.
- (e) Reconnect the ECM connector.

NG

Go to step 30

OK

Go to step 31

22 REPLACE TRAP CANISTER WITH PUMP MODULE

Replace the trap canister with pump module (see page [EC-17](#)).

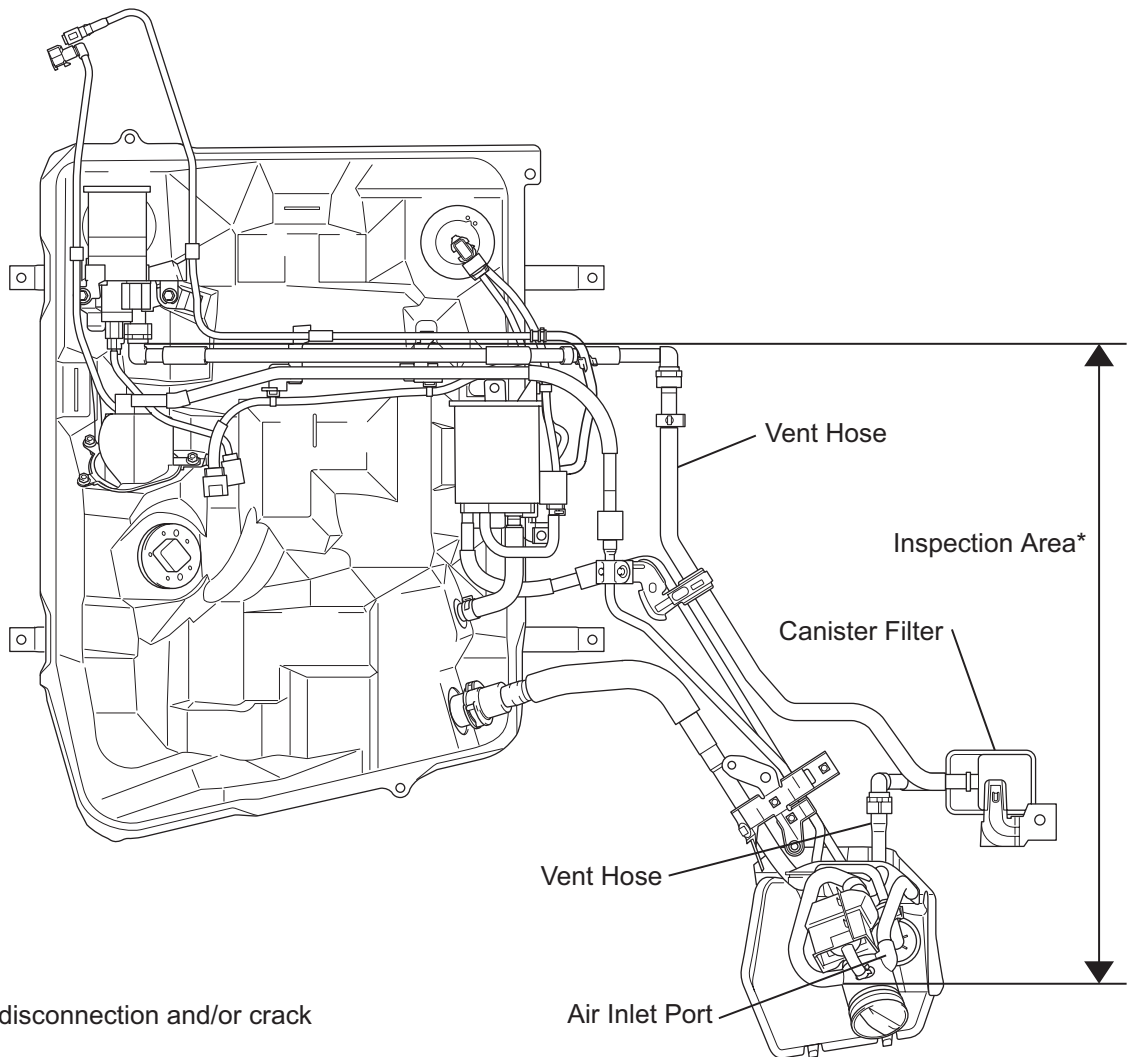
NEXT

Go to step 34

23 CHECK FOR VENT HOSE DAMAGE

Check for hose damage as shown in the illustration. If necessary, replace the vent hose.

ES



*: Check for disconnection and/or crack

P

A130304E01

NEXT

Go to step 22

24 REPAIR OR REPLACE LEAK POINT

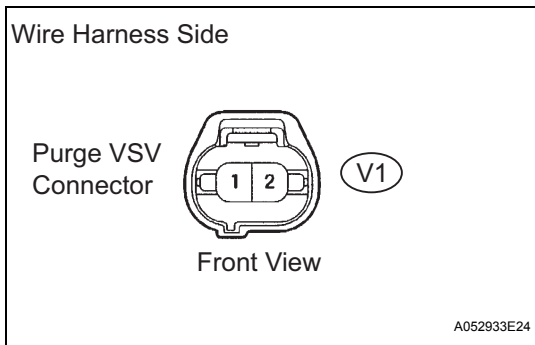
NEXT Go to step 34

25 REPLACE FUEL CAP

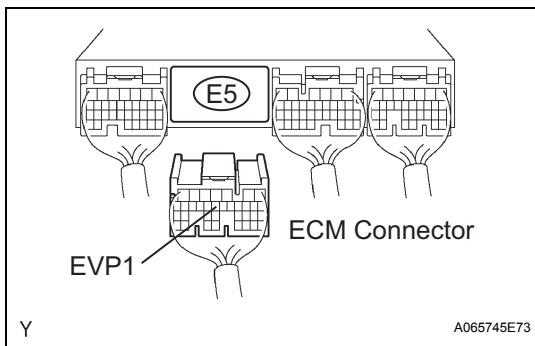
NEXT Go to step 34

ES

26 CHECK HARNESS AND CONNECTOR (PURGE VSV - ECM)



(a) Disconnect the V1 purge VSV connector.



(b) Disconnect the E5 ECM connector.

(c) Check the harness and the connectors between the ECM and the purge VSV connectors.

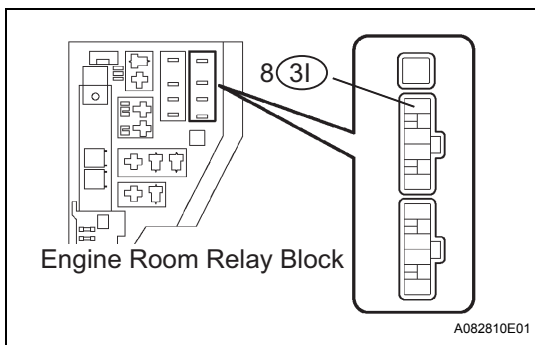
(1) Measure the resistance between the wire harness side connector.

Standard resistance (Check for open)

Tester Connection	Specified Condition
V1-1 - E5-14 (EVP1)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V1-1 or E5-14 (EVP1) - Body ground	10 kΩ higher



(d) Remove the integration relay from the engine room relay block.

(e) Check the harness and connectors between the purge VSV connector and the EFI M relay.

(1) Measure the resistance between the wire harness side connectors.

Standard resistance (Check for open)

Tester Connection	Specified Condition
V1-2 - 3I-8 (EFI M relay)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V1-2 or 3I-8 (EFI M relay) - Body ground	10 kΩ higher

(f) Reconnect the purge VSV connector.

(g) Reconnect the ECM connector.

(h) Reinstall the integration relay.

NG	Go to step 30
OK	Go to step 31

27 REPLACE HOSE (PURGE VSV - THROTTLE BODY)

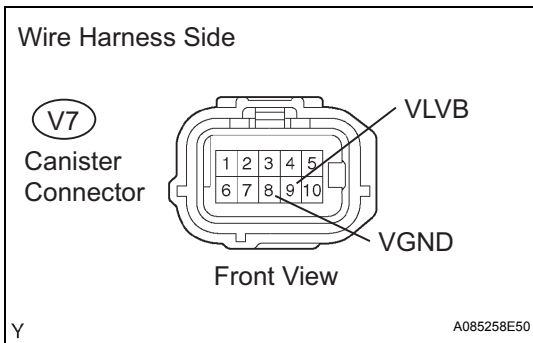
NEXT Go to step 34

28 REPLACE PURGE VSV

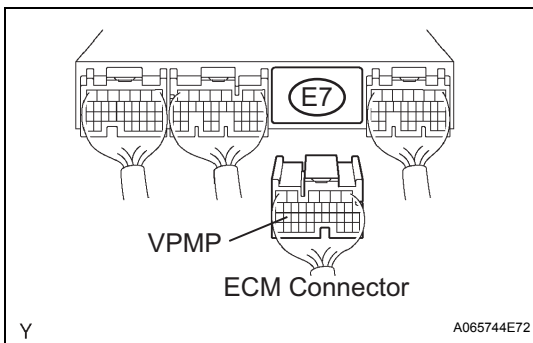
Replace the purge VSV (see page [EC-23](#)).

NEXT Go to step 34

29 CHECK HARNESS AND CONNECTOR (VENT VALVE - ECM)



(a) Disconnect the V7 canister connector.



(b) Disconnect the E7 ECM connector.

(c) Check the harness and the connectors between the ECM and the canister connectors.

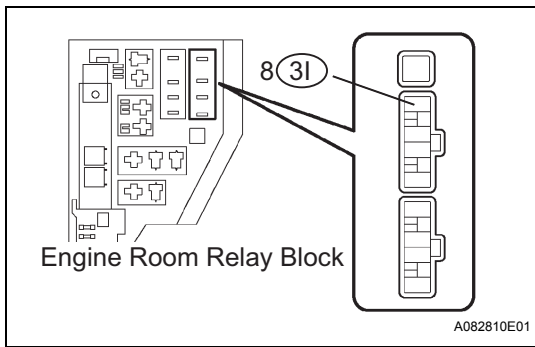
(1) Measure the resistance between the wire harness side connector.

Standard resistance (Check for open)

Tester Connection	Specified Condition
V7-8 (VGND) - E7-26 (VPMP)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V7-8 (VGND) or E7-26 (VPMP) - Body ground	10 kΩ higher



- (d) Remove the integration relay from the engine room relay block.
- (e) Check the harness and connectors between the canister connector and the EFI M relay.
 - (1) Measure the resistance between the wire harness side connectors.

Standard resistance (Check for open)

Tester Connection	Specified Condition
V7-9 (VLVB) - 31-8 (EFI M relay)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V7-9 (VLVB) or 31-8 (EFI M relay) - Body ground	10 kΩ higher

- (f) Reconnect the canister connector.
- (g) Reconnect the ECM connector.
- (h) Reinstall the integration relay.

NG	Go to step 30
OK	Go to step 31

30 REPAIR OR REPLACE HARNESS AND CONNECTOR

NEXT → Go to step 34

31 REPLACE ECM

Replace the ECM (see page [ES-469](#)).

NEXT → Go to step 34

32 CHECK AND REPLACE VENT HOSE OR CANISTER FILTER

NEXT → Go to step 34

33 REPLACE HOSE (PRESSURE SWITCHING VALVE AND FUEL TANK)

NEXT

34 PERFORM EVAP SYSTEM CHECK

- (a) Turn the power switch ON (IG).
- (b) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / AUTO OPERATION.
- (c) After the system check is finished, check for pending DTCs.

OK:
No DTC is present.

NG

Go to step 6

OK

35 **PERFORM EVAP MONITOR DRIVE PATTERN**

- (a) Check that the following conditions are met:
- Fuel level is 1/8 to 7/8.
 - Engine coolant temperature (ECT) is 4.4 to 35°C (40 to 95°F).
 - Intake air temperature (IAT) is 4.4 to 35°C (40 to 95°F).
 - Difference of ECT and IAT is less than 7°C (13°F).
- (b) Enter the check mode. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / CHECK MODE.
- (c) Allow the engine to idle until the ECT is 75°C (167°F).
- (d) Drive the vehicle at 50 km/h (30 mph) or faster and maintain that speed for 60 seconds or more.
- (e) Stop the vehicle. Do not turn the power switch OFF.
- (f) Check that the EVAP monitor status is complete. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / MONITOR STATUS.
- (g) If the EVAP monitor is incomplete, drive the vehicle at 50 km/h (30 mph) or faster and maintain that speed for 120 seconds or more. After that, recheck the EVAP monitor status.
- (h) Check for pending DTCs.

OK:
No DTC is present.

NG

Go to step 2

OK

REPAIR COMPLETED

ES

DTC	P0450	Evaporative Emission Control System Pressure Sensor Malfunction
DTC	P0451	Evaporative Emission Control System Pressure Sensor Range / Performance
DTC	P0452	Evaporative Emission Control System Pressure Sensor / Switch Low Input
DTC	P0453	Evaporative Emission Control System Pressure Sensor / Switch High Input

ES

DTC SUMMARY

DTC No.	Monitoring Items	Malfunction Detection Conditions	Trouble Area	Detection Timing	Detection logic
P0450	Canister pressure sensor voltage abnormal fluctuation	Sensor output voltage rapidly fluctuates beyond upper and lower malfunction thresholds for 0.5 seconds.	<ul style="list-style-type: none"> • Canister pump module • ECM 	<ul style="list-style-type: none"> • EVAP monitoring (power switch OFF) • Power switch ON (IG) 	1 trip
P0451	Canister pressure sensor noisy	Sensor output voltage fluctuates frequently in certain time period.	<ul style="list-style-type: none"> • Canister pump module • EVAP system hose (pipe from air inlet port to canister pump module, canister filter, fuel tank vent hose) • ECM 	<ul style="list-style-type: none"> • EVAP monitoring (power switch OFF) • Engine running 	2 trip
P0451	Canister pressure sensor stuck	Sensor output voltage does not vary in certain time period.	<ul style="list-style-type: none"> • Canister pump module • EVAP system hose (pipe from air inlet port to canister pump module, canister filter, fuel tank vent hose) • ECM 	<ul style="list-style-type: none"> • EVAP monitoring (power switch OFF) 	2 trip
P0452	Canister pressure sensor voltage low	Sensor output voltage less than 0.45 V for 0.5 seconds.	<ul style="list-style-type: none"> • Canister pump module • Connector/wire harness (canister pump module - ECM) • ECM 	<ul style="list-style-type: none"> • EVAP monitoring (power switch OFF) • Power switch ON (IG) 	1 trip
P0453	Canister pressure sensor voltage high	Sensor output voltage more than 4.9 V for 0.5 seconds.	<ul style="list-style-type: none"> • Canister pump module • Connector/wire harness (canister pump module - ECM) • ECM 	<ul style="list-style-type: none"> • EVAP monitoring (power switch OFF) • Power switch ON (IG) 	1 trip

HINT:

The canister pressure sensor is built into the canister pump module.

DESCRIPTION**NOTICE:**

In this vehicle's EVAP system, turning ON the vent valve does not seal off the EVAP system. To check for leaks in the EVAP system, disconnect the air inlet vent hose and apply pressure from the atmosphere side of the canister.

While the engine is running, if a predetermined condition (closed loop, etc.) is met, the purge VSV is opened by the ECM and stored fuel vapors in the canister are purged to the intake manifold. The ECM changes the duty cycle ratio of the purge VSV to control purge flow volume.

The purge flow volume is also determined by the intake manifold pressure. Atmospheric pressure is allowed into the canister through the vent valve to ensure that the purge flow is maintained when the negative pressure (vacuum) is applied to the canister.

Key-off monitor

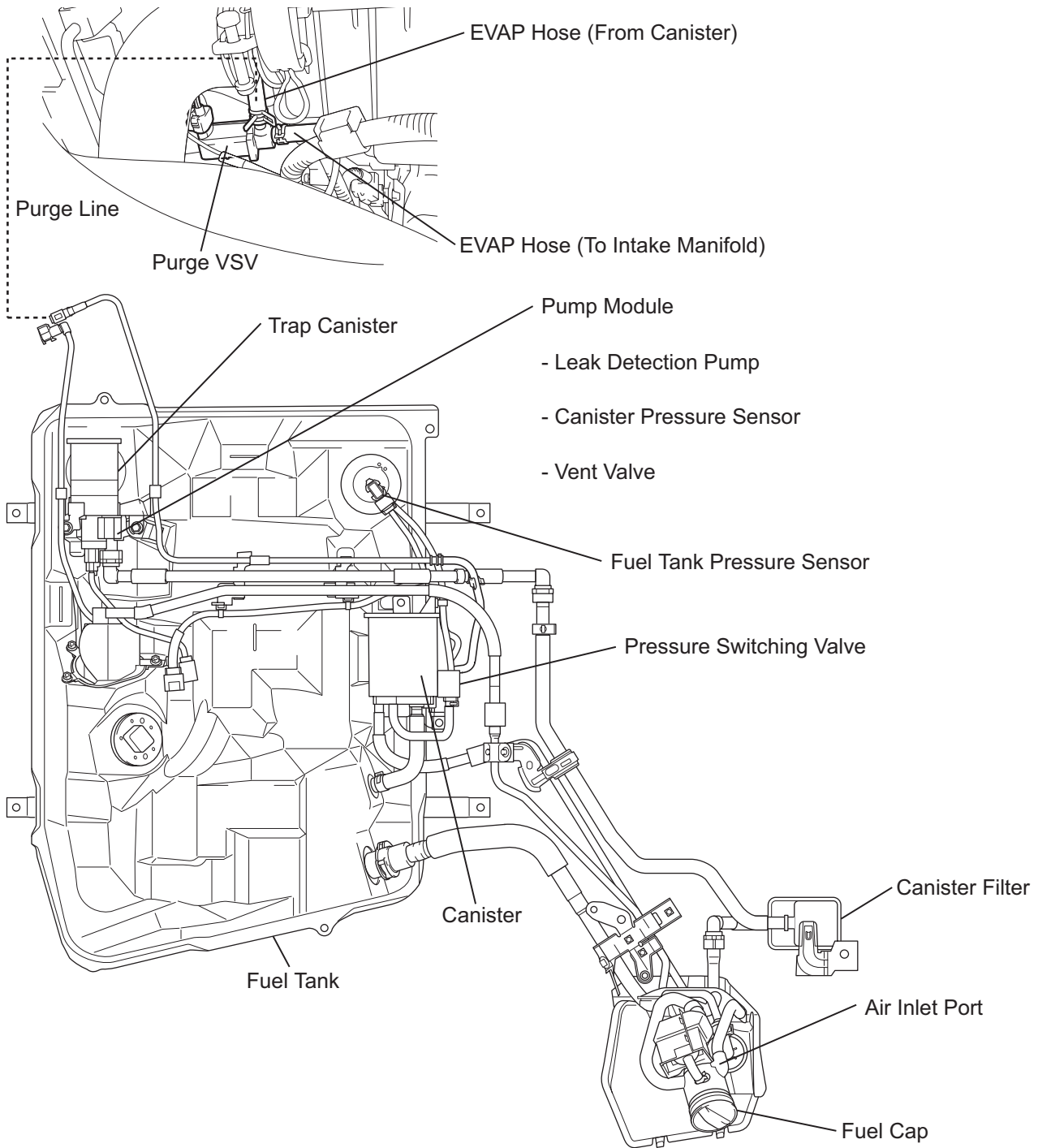
This monitor checks for Evaporative Emission (EVAP) system leaks and canister pump module malfunctions. The monitor starts 5 hours* after the power switch is turned OFF. More than 5 hours are required to allow the fuel to cool down to stabilize the Fuel Tank Pressure (FTP), thus making the EVAP system monitor more accurate.

The leak detection pump creates negative pressure (vacuum) in the EVAP system and the pressure is measured. Finally, the ECM monitors for leaks from the EVAP system and malfunctions in both the canister pump module and purge VSV, based on the EVAP pressure.

HINT:

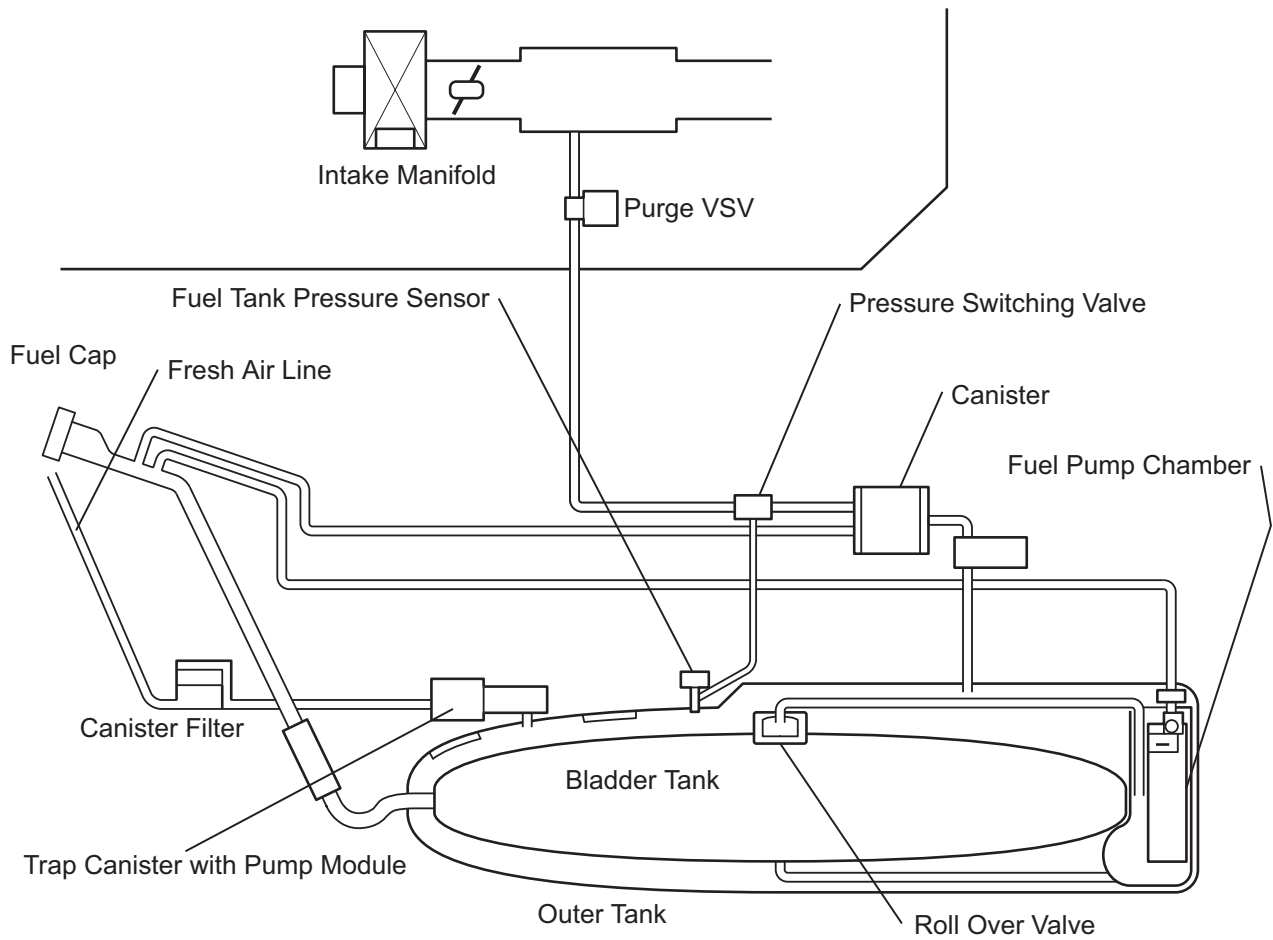
*: If the engine coolant temperature is not below 35°C (95°F) 5 hours after the power switch is turned OFF, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the power switch is turned OFF, the monitor check starts 2.5 hours later.

Location



ES

Diagram

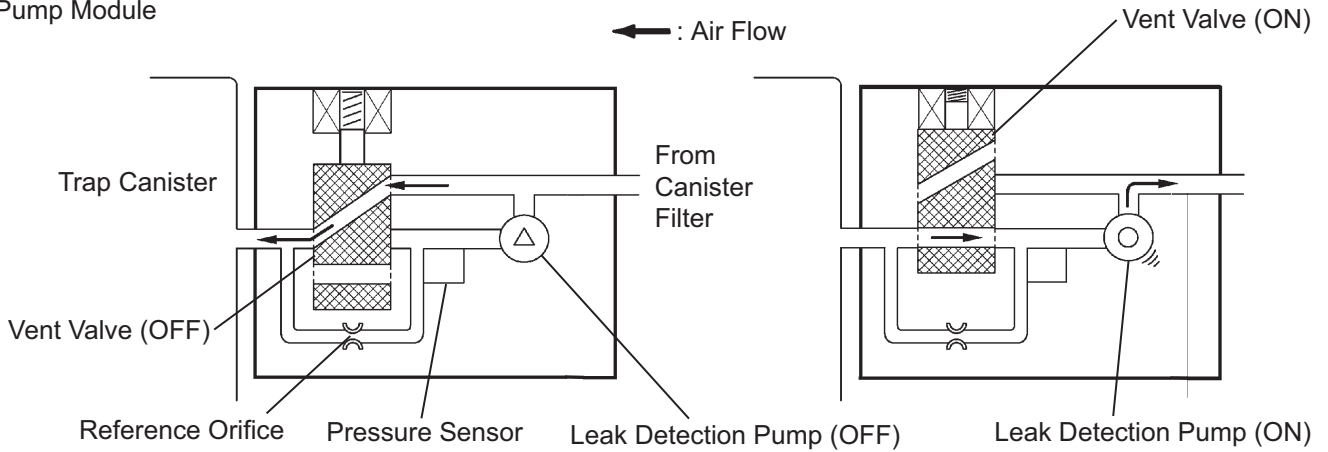


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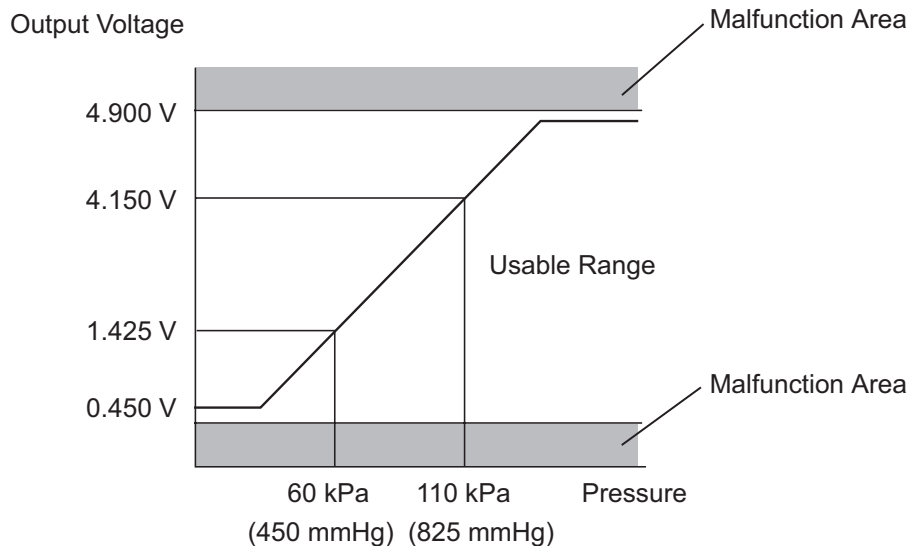
A130305E01

Pump Module



A131438E01

Canister Pressure Sensor Specification



HINT:

Standard atmospheric pressure is 101.3 kPa (760mmHg)

A115543E09

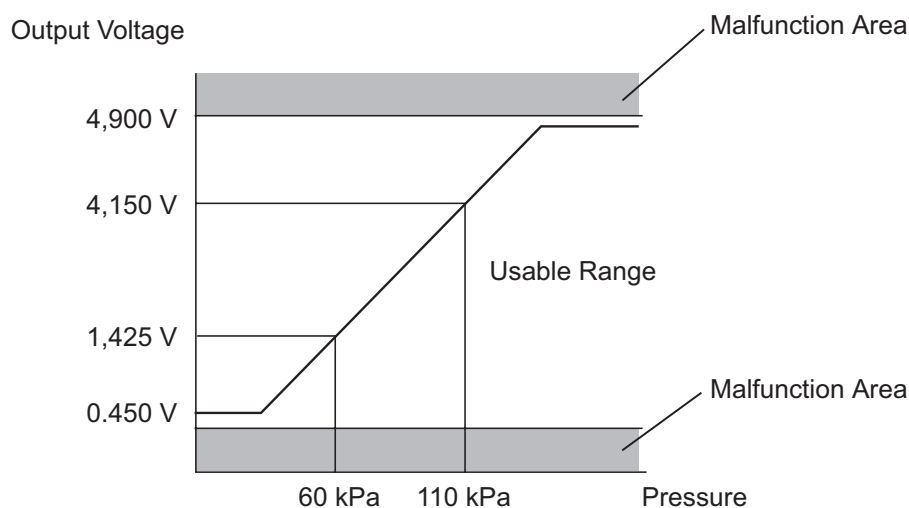
ES

Components	Operations
Canister, Trap canister	Contains activated charcoal to absorb EVAP generated in fuel tank.
Cut-off valve	Located in fuel tank. Valve floats and closes when fuel tank 100% full.
Purge Vacuum Switching Valve (VSV)	Opens or closes line between canister and intake manifold. ECM uses purge VSV to control EVAP purge flow. In order to discharge EVAP absorbed by canister to intake manifold, ECM opens purge VSV. EVAP discharge volume to intake manifold controlled by purge VSV duty cycle ratio (current-carrying time) (open: ON; closed: OFF).
Roll-over valve	Located in fuel tank. Valve closes by its own weight when vehicle overturns to prevent fuel from spilling out.
Soak timer	Built into ECM. To ensure accurate EVAP monitor, measures 5 hours (+-15 min) after power switch OFF. This allows fuel to cool down, stabilizing Fuel Tank Pressure (FTP). When approximately 5 hours elapsed, ECM activates.
Pressure switching valve	The pressure switching valve located on the canister is used to detect leakage from the bladder tank into the fuel tank. The valve opens during the bladder tank leak check. Then, the fuel tank's fuel vapor flows to the intake manifold without passing the canister.
Pump module	Consists of (a) to (d) below. pump module cannot be disassembled.
(a) Vent valve	Vents and closes EVAP system. When ECM turns valve ON, EVAP system closed. When ECM turns valve OFF, EVAP system vented. Negative pressure (vacuum) created in EVAP system to check for EVAP leaks by closing purge VSV, turning vent valve ON (closed) and operating leak detection pump.
(b) Canister pressure sensor	Indicates pressure as voltage. ECM supplies regulated 5 V to canister pressure sensor, and uses feedback from sensor to monitor EVAP system pressure.
(c) Leak detection pump	Creates negative pressure (vacuum) in EVAP system for leak check.

Components	Operations
(d) Reference orifice	Has opening with 0.02 inch diameter. Vacuum produced through orifice by closing purge VSV, turning vent valve OFF and operating leak detection pump to monitor 0.02 inch leak criterion. 0.02 inch leak criterion indicates small leak of EVAP.

MONITOR DESCRIPTION

Canister Pressure Sensor Specification



HINT:

Standard atmospheric pressure is 101.3 kPa

A115543E03

- (a) DTC P0450: Canister pressure sensor voltage abnormal fluctuation
If the canister pressure sensor voltage output rapidly fluctuates between less than 0.45 V and more than 4.9 V, the ECM interprets this as an open or short circuit malfunction in the canister pressure sensor or its circuit, and stops the EVAP system monitor. The ECM then illuminates the MIL and sets the DTC (1 trip detection logic).
- (b) DTC P0451: Canister pressure sensor noisy or stuck
If the canister pressure sensor voltage output fluctuates rapidly for 10 seconds, the ECM stops the EVAP system monitor. The ECM interprets this as noise from the canister pressure sensor, and stops the EVAP system monitor. The ECM then illuminates the MIL and sets the DTC.
Alternatively, if the sensor voltage output does not change for 10 seconds, the ECM interprets this as the sensor being stuck, and stops the monitor. The ECM then illuminates the MIL and sets the DTC. (Both of the malfunctions are detected by 2 trip detection logic).
- (c) DTC P0452: Canister pressure sensor voltage low
If the canister pressure sensor voltage output is below 0.45 V, the ECM interprets this as an open or short circuit malfunction in the canister pressure sensor or its circuit, and stops the EVAP system monitor. The ECM then illuminates the MIL and sets the DTC (1 trip detection logic).
- (d) DTC P0453: Canister pressure sensor voltage high
If the canister pressure sensor voltage output is 4.9 V or more, the ECM interprets this as an open or short circuit malfunction in the canister pressure sensor or its circuit, and stops the EVAP system monitor. The ECM then illuminates the MIL and sets the DTC (1 trip detection logic).

MONITOR STRATEGY

Required Sensors/Components	Canister pump module
Frequency of Operation	Continuous
Duration	Within 15 minutes
MIL Operation	Immediate: P0450, P0452, P0453 2 driving cycles: P0451
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

P0451 (Noise Monitor):

Monitor runs whenever following DTCs are not present	None
Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg) [absolute pressure]
Battery voltage	10.5 V or more
Intake air temperature	4.4 to 35 °C (40 to 95°F)
EVAP canister pressure sensor malfunction (P0450, P0452, P0453)	Not detected
Either of following conditions is met	A or B
A. Engine	Running
B. Soak time (power switch OFF time)	5 hours

Example of restart time

First time	7 hours
Second time	9 hours and 30 minutes

P0451 (Stuck Monitor):

Monitor runs whenever following DTCs are not present	None
Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg)
Battery voltage	10.5 V or more
Intake air temperature	4.4 to 35°C (40 to 95°F)
EVAP pressure sensor malfunction	Not detected
Soak time (power switch OFF time)	5 hours

Example of restart time

First time	7 hours
Second time	9 hours and 30 minutes

P0450, P0452 and P0453:

Monitor runs whenever following DTCs are not present	None
When either of following condition is met	(a) or (b)
(a) Power switch	ON
(b) Soak timer	ON

TYPICAL MALFUNCTION THRESHOLDS

1. P0450: Canister pressure sensor chattering

EVAP pressure	Less than 42.1 kPa (315.9 mmHg) or more than 123.8 kPa (928.4 mmHg)
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2. P0451: Canister pressure sensor noise

Pressure variation indicated by canister pressure sensor in 10 seconds	More than +0.3 kPa (+2.25 mmHg) 10 times
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3. P0451: Canister pressure sensor stuck

EVAP pressure change during reference pressure in 10 seconds	Less than 1 kPa (7.5 mmHg)
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4. P0452: Canister pressure sensor low voltage

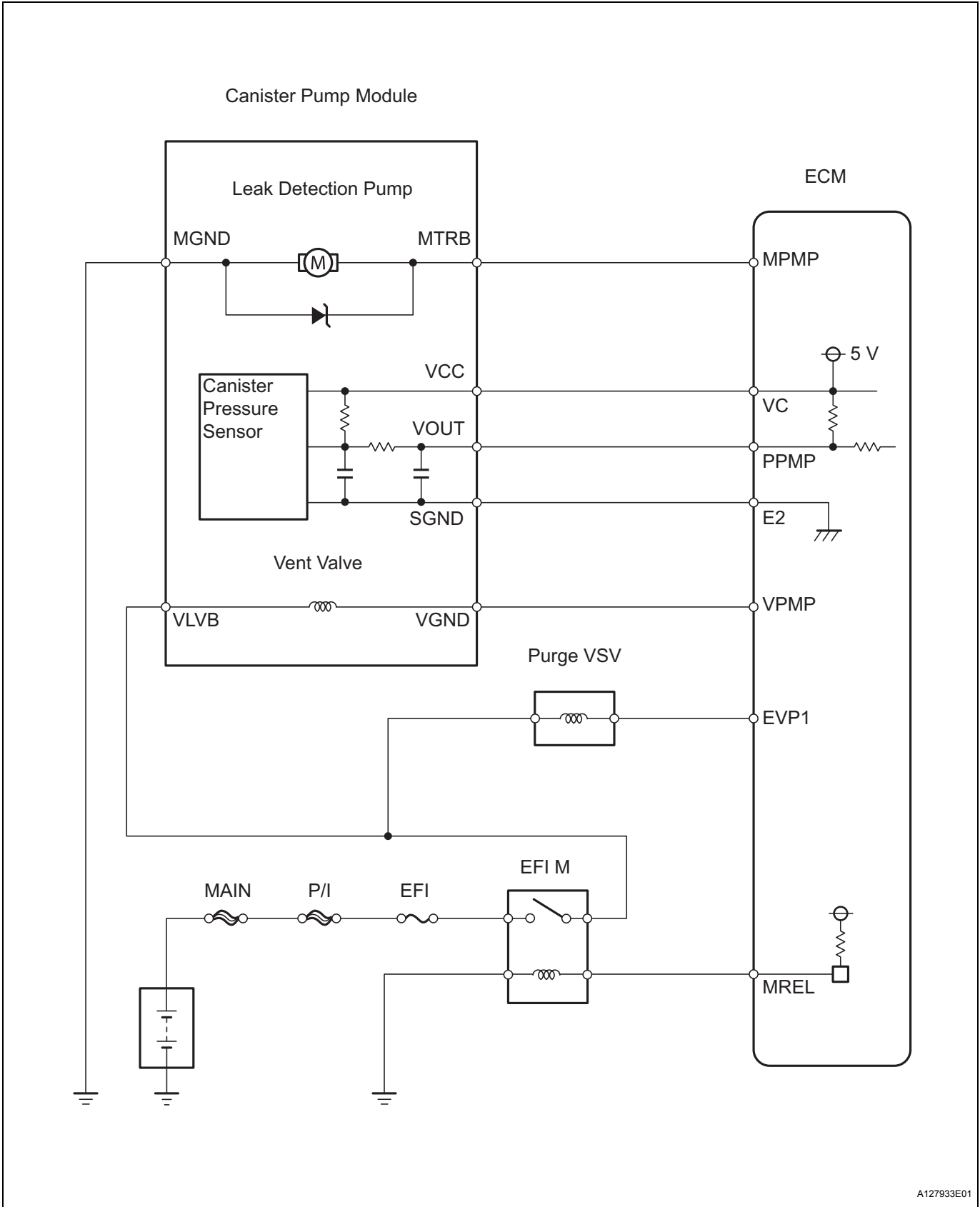
EVAP pressure	Less than 42.1 kPa (315.9 mmHg)
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5. P0453: Canister pressure sensor high voltage

EVAP pressure	More than 123.8 kPa (928.4 mmHg)
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WIRING DIAGRAM

ES



INSPECTION PROCEDURE

NOTICE:

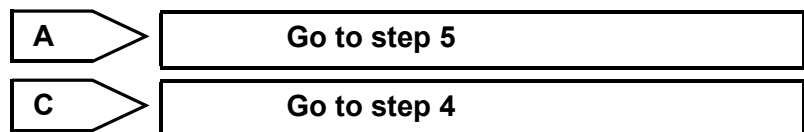
- When a vehicle is brought into the workshop, leave it as it is. Do not change the vehicle condition. For example, do not tighten the fuel cap.
- Do not disassemble the canister pump module.
- The intelligent tester is required to conduct the following diagnostic troubleshooting procedure.

1 CONFIRM DTC AND EVAP PRESSURE

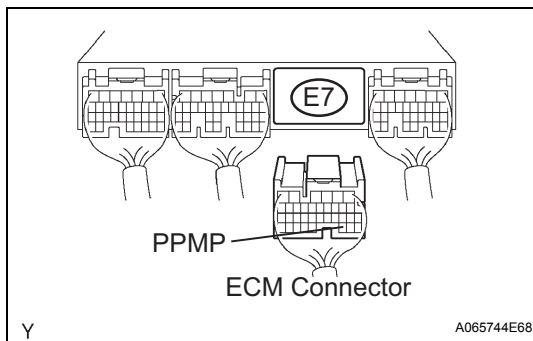
- Connect the intelligent tester to the DLC3.
- Turn the power switch ON (IG) and turn the intelligent tester ON.
- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- Read the values.
- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / EVAP / VAPOR PRESS.
- Read the EVAP pressure displayed on the intelligent tester.

Result

Display (DTC Output)	Test Result	Suspected Trouble Areas	Proceed to
P0451	-	• Canister pressure sensor	A
P0452	Less than 45 kPa (430 mmHg)	• Wire harness/connector (ECM - canister pressure sensor) • Canister pressure sensor • Short in ECM circuit	B
P0453	More than 120 kPa (900 mmHg)	• Wire harness/connector (ECM - canister pressure sensor) • Canister pressure sensor • Open in ECM circuit	C



2 CHECK HARNESS AND CONNECTOR (CANISTER PUMP MODULE - ECM)



- Turn the power switch OFF.
- Disconnect the E7 ECM connector.
- Measure the resistance between the PPMP (E7-30) terminal of the ECM connector and the body ground.

Result

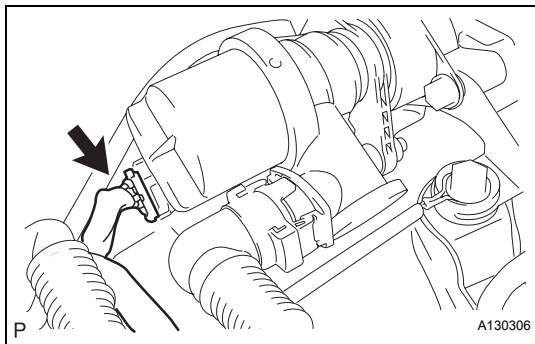
Test Results	Suspected Trouble Areas	Proceed to
10 Ω or less	<ul style="list-style-type: none"> • Wire harness/connector (ECM - canister pressure sensor) • Short in canister pressure sensor circuit 	A
10 kΩ or more	<ul style="list-style-type: none"> • Wire harness/connector (ECM - canister pressure sensor) • Short in ECM circuit 	B

B
Go to step 7

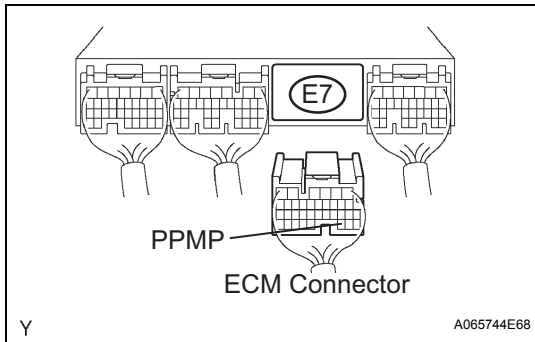
A

ES

3 CHECK HARNESS AND CONNECTOR (CANISTER PUMP MODULE - ECM)



- (a) Disconnect the V7 canister connector.
- (b) Disconnect the E7 ECM connector.



- (c) Measure the resistance between the PPMP (E7-30) terminal of the ECM connector and the body ground.

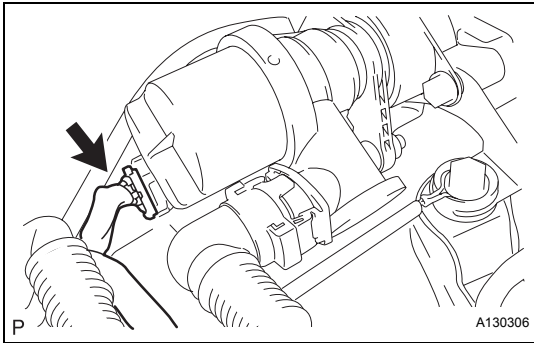
Result

Test Results	Suspected Trouble Areas	Proceed to
10 kΩ or more	<ul style="list-style-type: none"> • Short in canister pressure sensor circuit 	A
10 kΩ or less	<ul style="list-style-type: none"> • Short in wire harness/connector (ECM - canister pressure sensor) 	B

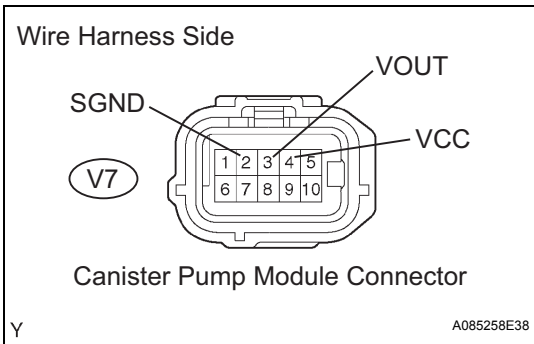
B
Go to step 6

A

4 CHECK HARNESS AND CONNECTOR (CANISTER PUMP MODULE - ECM)



(a) Disconnect the V7 canister connector.



(b) Turn the power switch ON (IG).
 (c) Measure the voltage and resistance of the canister pump module connector.

Standard voltage

Tester Connection	Specified Condition
V7-4 (VCC) - Body ground	4.5 to 5.0 V
V7-3 (VOUT) - Body ground	4.5 to 5.0 V

Standard resistance

Tester Connection	Specified Condition
V7-2 (SGND) - Body ground	100 Ω or less

Result

Test Results	Suspected Trouble Areas	Proceed to
Voltage and resistance within standard ranges	<ul style="list-style-type: none"> Open in canister pressure sensor circuit 	A
Voltage and resistance outside standard ranges	<ul style="list-style-type: none"> Open in wire harness/connector (ECM - canister pressure sensor) 	B



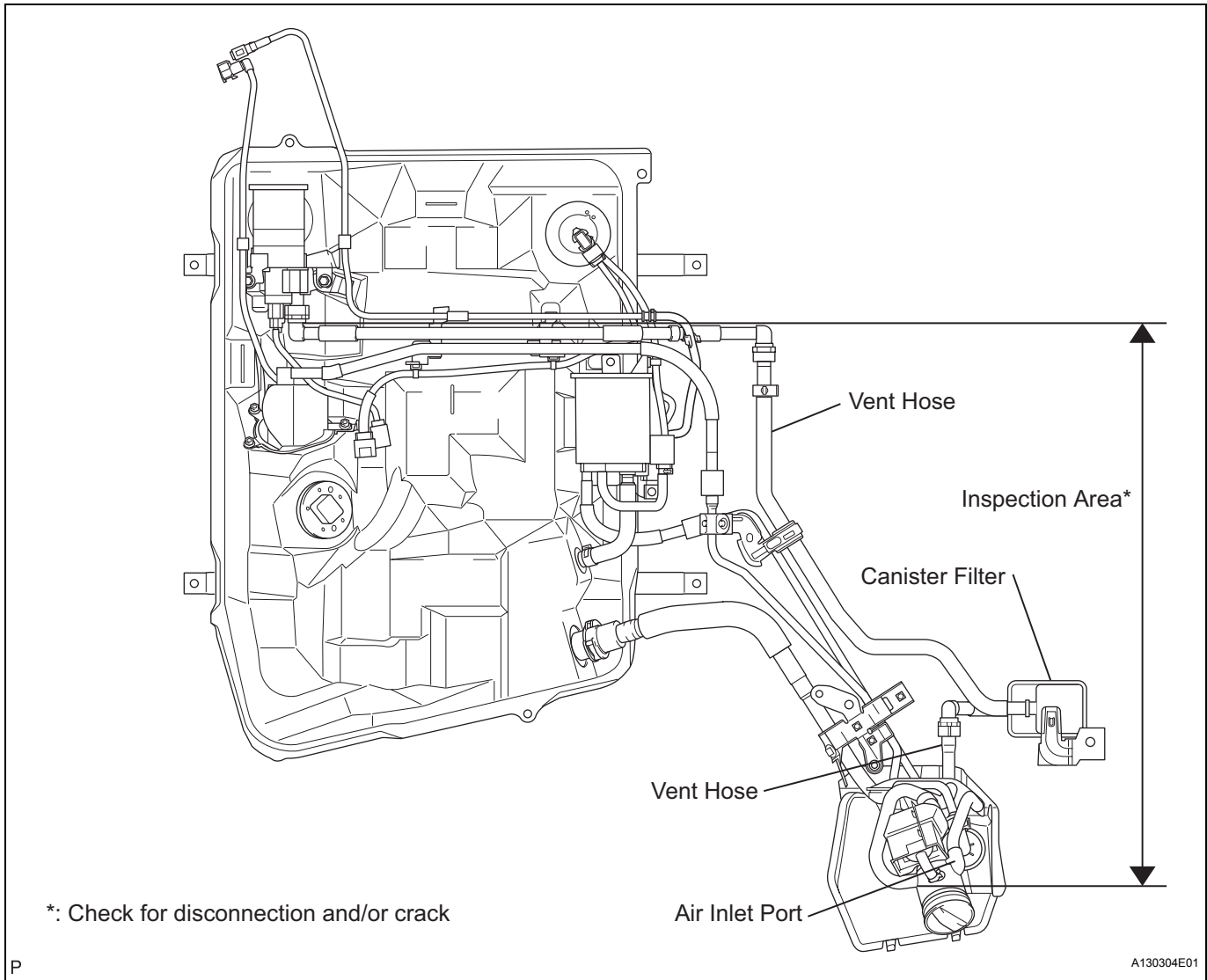
5 REPLACE CANISTER ASSEMBLY

(a) Replace the canister assembly (see page EC-9).

NOTICE:

When replacing the canister, check the canister pump module interior and related pipes for water, fuel or other liquids. If liquids are present, check for disconnections and/or cracks in the following: 1) the pipe from the air inlet port to the canister pump module; 2) the canister filter; and 3) the fuel tank vent hose.

ES



NEXT **Go to step 8**

6 REPAIR OR REPLACE HARNESS OR CONNECTOR

HINT:
If the exhaust tailpipe has been removed, go to the next step before reinstalling it.

NEXT **Go to step 8**

7 REPLACE ECM

(a) Replace the ECM (see page [ES-469](#)).

NEXT **Go to step 8**

8 CHECK WHETHER DTC OUTPUT RECURS (AFTER REPAIR)

(a) Connect the intelligent tester to the DLC3.

- (b) Turn the power switch ON (IG) and turn the intelligent tester ON.
- (c) Wait for at least 60 seconds.
- (d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.

HINT:

If no pending DTC is displayed on the intelligent tester, the repair has been successfully completed.

NEXT

COMPLETED

ES

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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DTC SUMMARY

DTC No.	Monitoring Items	Malfunction Detection Conditions	Trouble Area	Detection Timing	Detection Logic
P0455	EVAP gross leak	Leak detection pump creates negative pressure (vacuum) in EVAP system and EVAP system pressure measured. 0.02 inch leak criterion measured at start and at end of leak check. If stabilized pressure higher than [second 0.02 inch leak criterion x 0.15], ECM determines that EVAP system has large leakage.	<ul style="list-style-type: none"> • Fuel cap (loose) • Leakage from EVAP line (canister - fuel tank) • Leakage from EVAP line (purge VSV - canister) • Canister pump module • Leakage from fuel tank • Leakage from canister 	While power switch OFF	2 trip
P0456	EVAP small leak	Leak detection pump creates negative pressure (vacuum) in EVAP system and EVAP system pressure measured. 0.02 inch leak criterion measured at start and at end of leak check. If stabilized pressure higher than second 0.02 inch leak criterion, ECM determines that EVAP system has small leakage.	Same as above	While power switch OFF	2 trip

DESCRIPTION**NOTICE:**

In this vehicle's EVAP system, turning ON the vent valve does not seal off the EVAP system. To check for leaks in the EVAP system, disconnect the air inlet vent hose and apply pressure from the atmosphere side of the canister.

While the engine is running, if a predetermined condition (closed loop, etc.) is met, the purge VSV is opened by the ECM and stored fuel vapors in the canister are purged to the intake manifold. The ECM changes the duty cycle ratio of the purge VSV to control purge flow volume.

The purge flow volume is also determined by the intake manifold pressure. Atmospheric pressure is allowed into the canister through the vent valve to ensure that the purge flow is maintained when the negative pressure (vacuum) is applied to the canister.

Key-off monitor

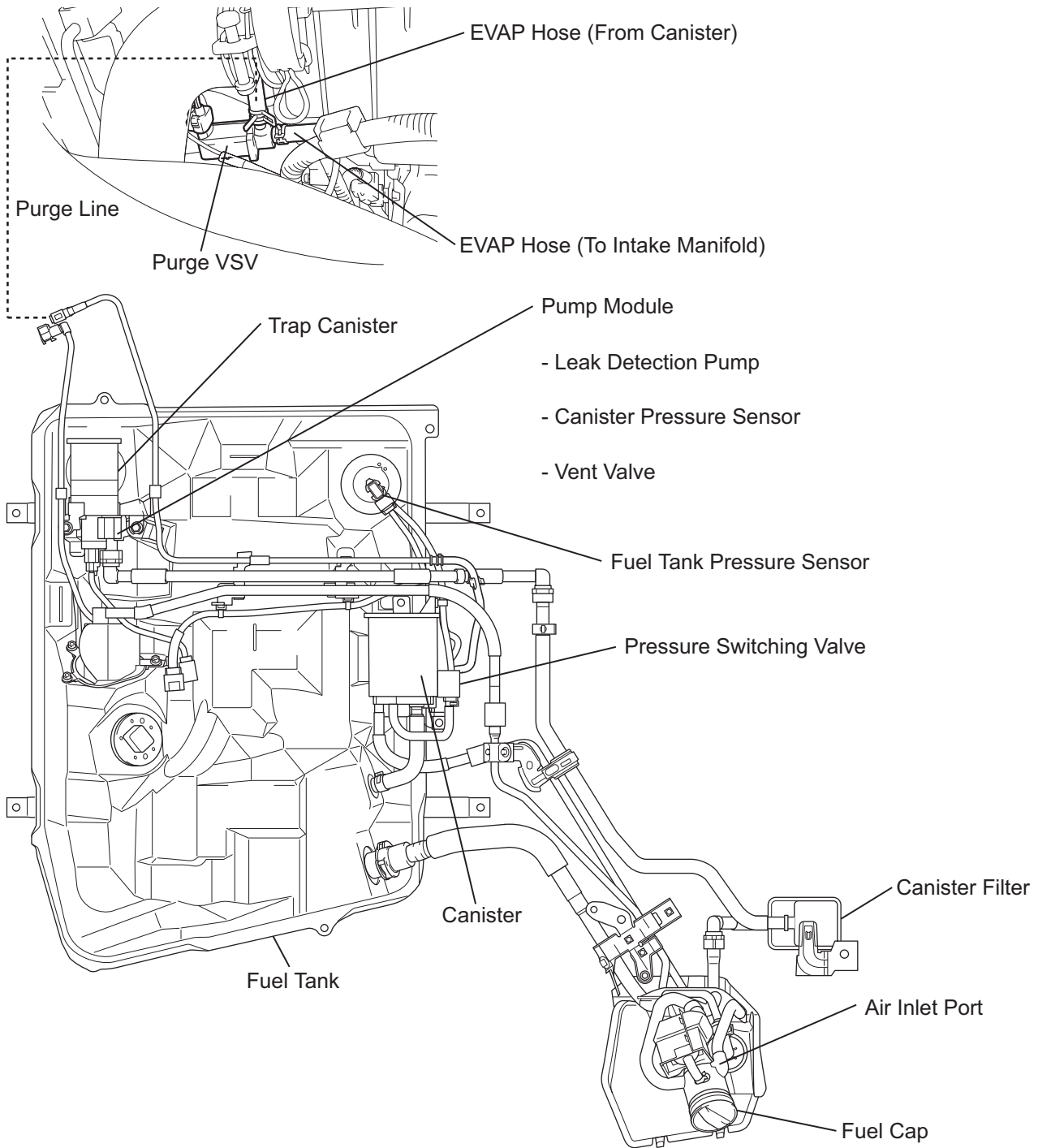
This monitor checks for Evaporative Emission (EVAP) system leaks and canister pump module malfunctions. The monitor starts 5 hours* after the power switch is turned OFF. More than 5 hours are required to allow the fuel to cool down to stabilize the Fuel Tank Pressure (FTP), thus making the EVAP system monitor more accurate.

The leak detection pump creates negative pressure (vacuum) in the EVAP system and the pressure is measured. Finally, the ECM monitors for leaks from the EVAP system and malfunctions in both the canister pump module and purge VSV, based on the EVAP pressure.

HINT:

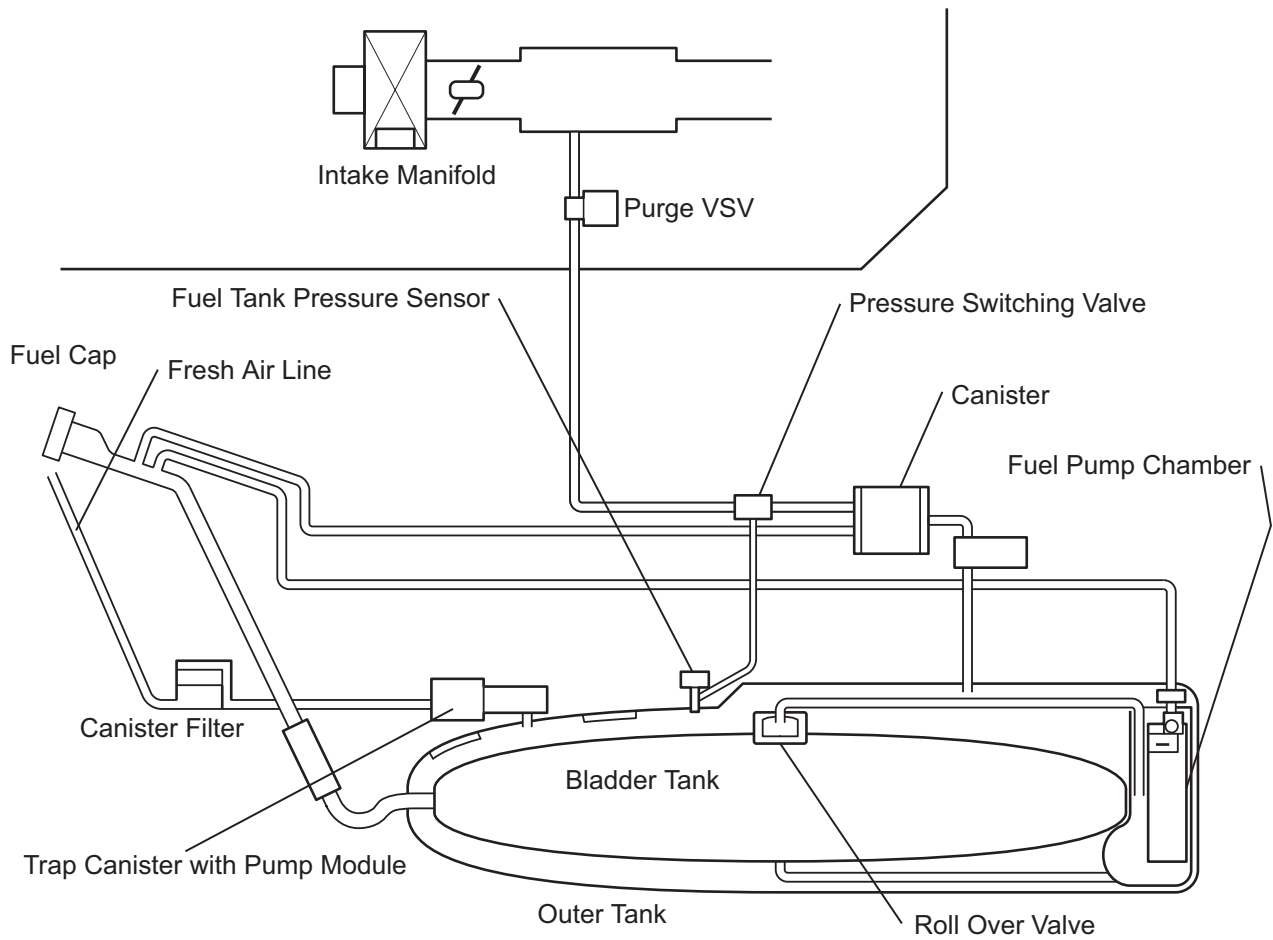
*: If the engine coolant temperature is not below 35°C (95°F) 5 hours after the power switch is turned OFF, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the power switch is turned OFF, the monitor check starts 2.5 hours later.

Location



ES

Diagram

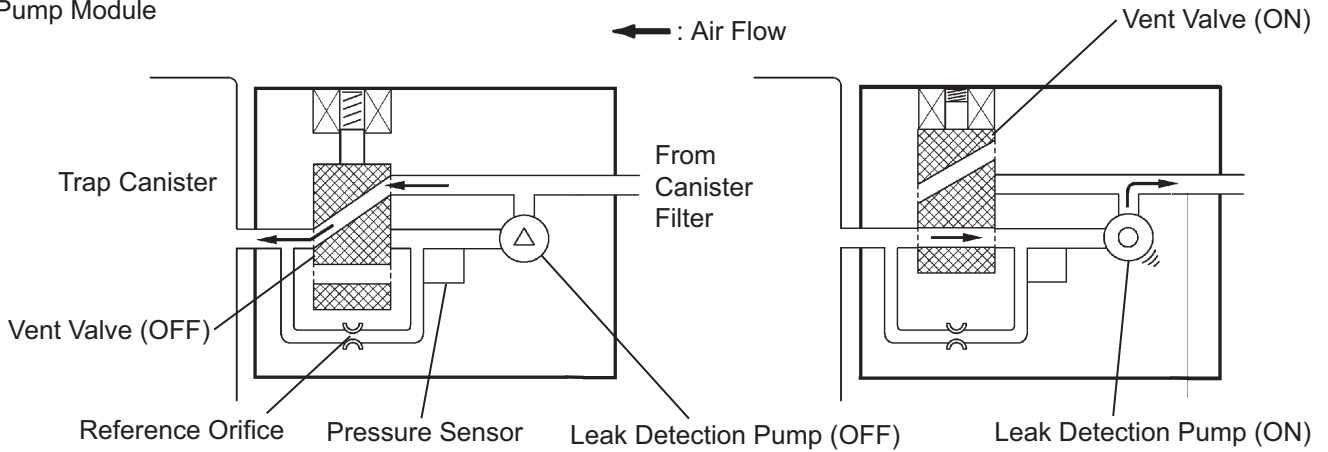


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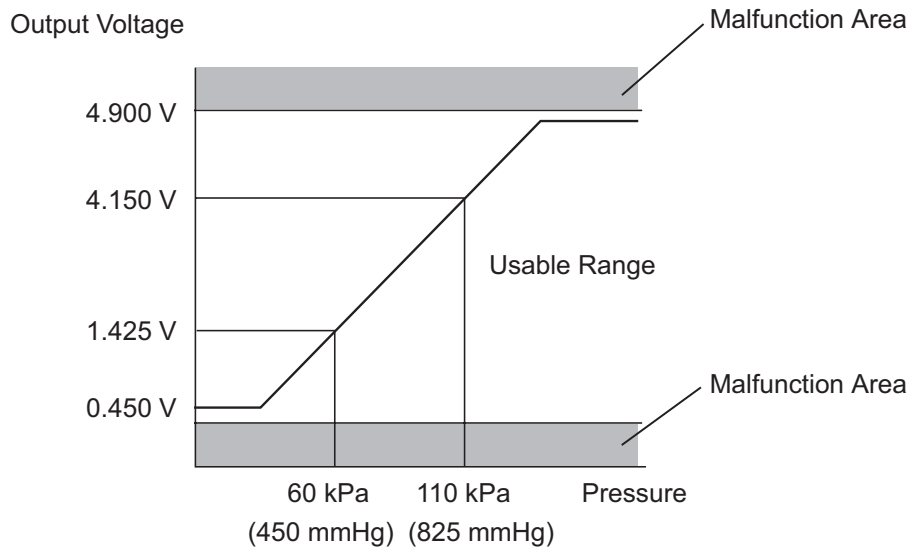
A130305E01

Pump Module



A131438E01

Canister Pressure Sensor Specification



HINT:

Standard atmospheric pressure is 101.3 kPa (760mmHg)

A115543E09

Components	Operations
Canister, Trap canister	Contains activated charcoal to absorb EVAP generated in fuel tank.
Cut-off valve	Located in fuel tank. Valve floats and closes when fuel tank 100% full.
Purge Vacuum Switching Valve (VSV)	Opens or closes line between canister and intake manifold. ECM uses purge VSV to control EVAP purge flow. In order to discharge EVAP absorbed by canister to intake manifold, ECM opens purge VSV. EVAP discharge volume to intake manifold controlled by purge VSV duty cycle ratio (current-carrying time) (open: ON; closed: OFF).
Roll-over valve	Located in fuel tank. Valve closes by its own weight when vehicle overturns to prevent fuel from spilling out.
Soak timer	Built into ECM. To ensure accurate EVAP monitor, measures 5 hours (+-15 min) after power switch OFF. This allows fuel to cool down, stabilizing Fuel Tank Pressure (FTP). When approximately 5 hours elapsed, ECM activates.
Pressure switching valve	The pressure switching valve located on the canister is used to detect leakage from the bladder tank into the fuel tank. The valve opens during the bladder tank leak check. Then, the fuel tank's fuel vapor flows to the intake manifold without passing the canister.
Pump module	Consists of (a) to (d) below. Pump module cannot be disassembled.
(a) Vent valve	Vents and closes EVAP system. When ECM turns valve ON, EVAP system closed. When ECM turns valve OFF, EVAP system vented. Negative pressure (vacuum) created in EVAP system to check for EVAP leaks by closing purge VSV, turning vent valve ON (closed) and operating leak detection pump (refer to fig. 1).
(b) Canister pressure sensor	Indicates pressure as voltage. ECM supplies regulated 5 V to canister pressure sensor, and uses feedback from sensor to monitor EVAP system pressure (refer to fig. 2).
(c) Leak detection pump	Creates negative pressure (vacuum) in EVAP system for leak check.

Components	Operations
(d) Reference orifice	Has opening with 0.02 inch diameter. Vacuum produced through orifice by closing purge VSV, turning vent valve OFF and operating leak detection pump to monitor 0.02 inch leak criterion. 0.02 inch leak criterion indicates small leak of EVAP.

MONITOR DESCRIPTION

5 hours* after the power switch is turned OFF, the leak detection pump creates negative pressure (vacuum) in the EVAP system. The ECM monitors for leaks and actuator malfunctions based on the EVAP pressure.

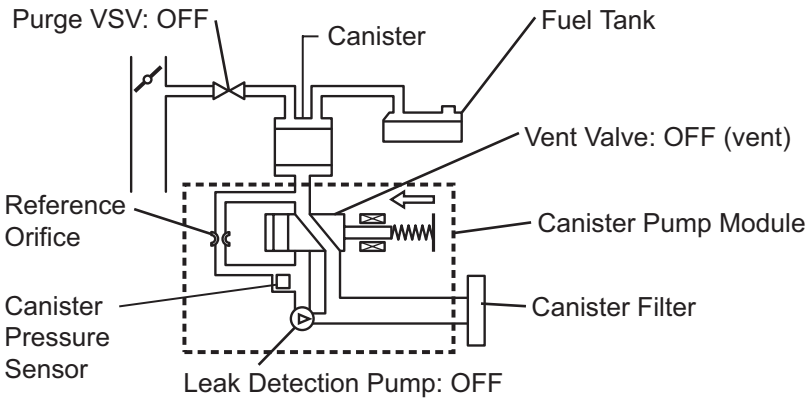
HINT:

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

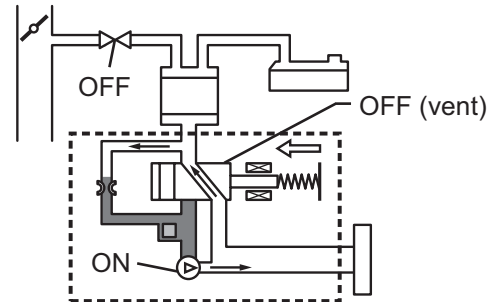
Sequence	Operations	Descriptions	Duration
-	ECM activation	Activated by soak timer 5, 7 or 9.5 hours after power switch OFF.	-
A	Atmospheric pressure measurement	Vent valve turned OFF (vent) and EVAP system pressure measured by ECM in order to register atmospheric pressure. If pressure in EVAP system 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 criterion measurement	In order to determine 0.02 inch leak criterion, leak detection pump creates negative pressure (vacuum) through reference orifice and then ECM checks if leak detection pump and vent valve operate normally.	60 seconds
C	EVAP system pressure measurement	Vent valve turned ON (closed) to shut EVAP system. Negative pressure (vacuum) created in EVAP system, and EVAP system pressure then measured. Write down measured value as it will be used in leak check. If EVAP pressure does not stabilize within 900 seconds, ECM cancels EVAP system monitor.	900 seconds*
D	Purge VSV monitor	Purge VSV opened and then EVAP system pressure measured by ECM. Large increase indicates normal.	10 seconds
E	Second 0.02 inch leak criterion measurement	After second 0.02 inch leak criterion measurement, leak check performed by comparing first and second 0.02 inch leak criterion. If stabilized system pressure higher than second 0.02 inch leak criterion, ECM determines that EVAP system leaking.	60 seconds
-	Final check	Atmospheric pressure measured and then monitoring result recorded by ECM.	-

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

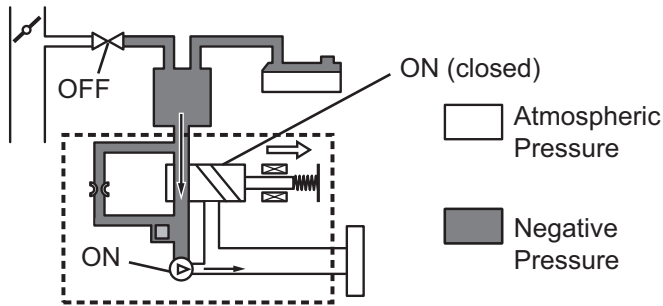
Operation A: Atmospheric Pressure Measurement



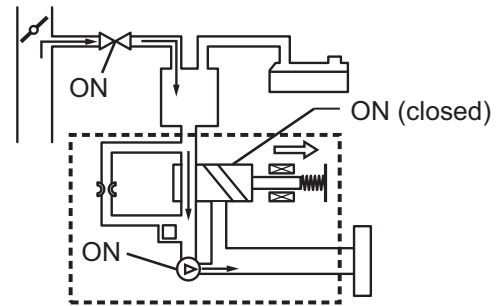
Operation B, E: 0.02 Inch Leak Criterion Measurement



Operation C: EVAP System Pressure Measurement



Operation D: Purge VSV Monitor



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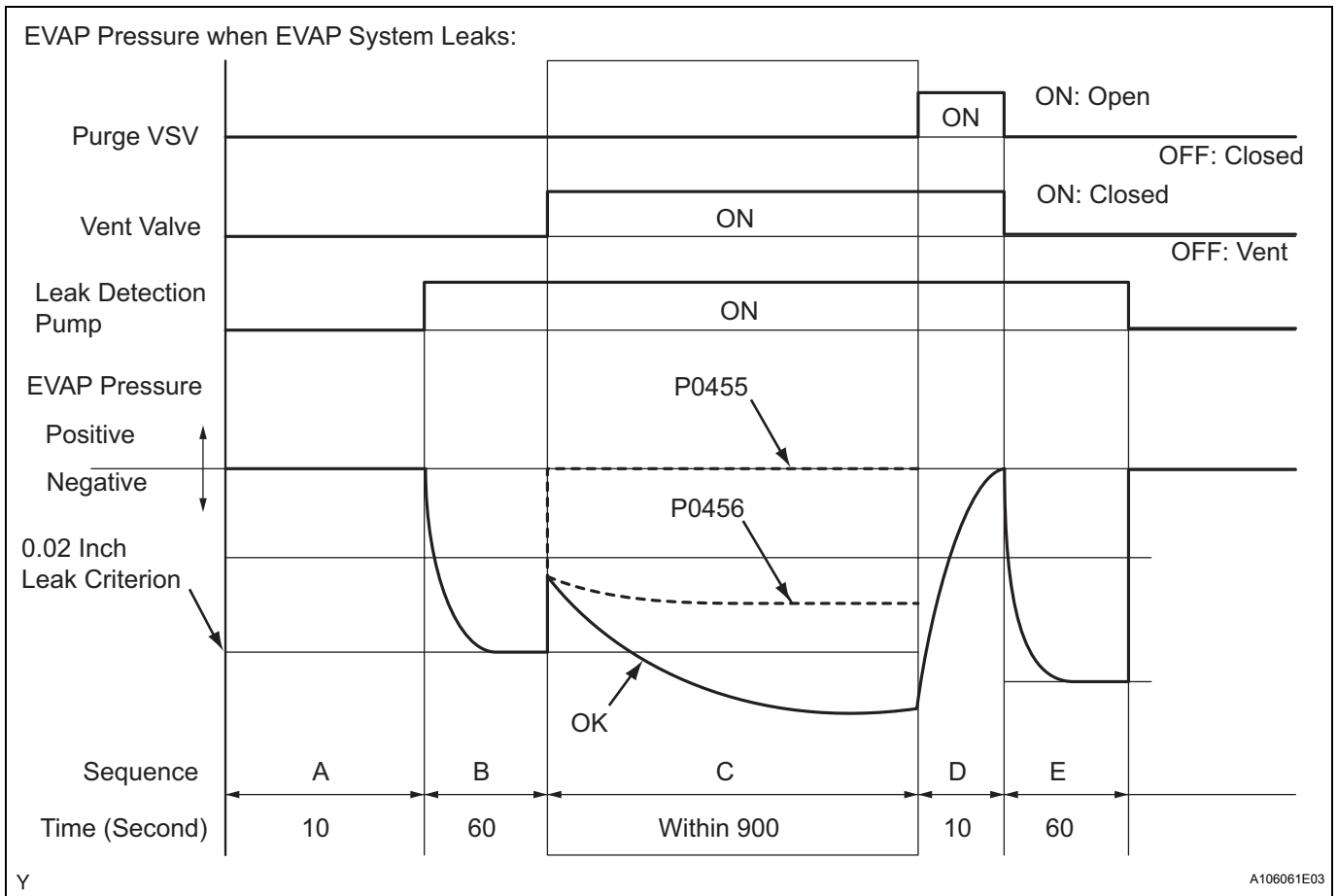
1. P0455: EVAP gross leak

In operation C, the leak detection pump creates negative pressure (vacuum) in the EVAP system and the EVAP system pressure is measured. If the stabilized system pressure is higher than [second 0.02 inch leak criterion x 0.15] (near atmospheric pressure), the ECM determines that the EVAP system has a large leakage, illuminates the MIL and sets the DTC (2 trip detection logic).

ES

2. P0456: EVAP very small leak

In operation C, the leak detection pump creates negative pressure (vacuum) in the EVAP system and the EVAP system pressure is measured. If the stabilized system pressure is higher than the second 0.02 inch leak criterion, the ECM determines that the EVAP system has a small leakage, illuminates the MIL and sets the DTC (2 trip detection logic).



ES

MONITOR STRATEGY

Required Sensors/Components	Purge VSV and canister pump module
Frequency of Operation	Once per driving cycle
Duration	Maximum 15 seconds
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	P0011, P0012, P0021, P0022 (VVT system-Advance, Retard) P0100, P0101, P0102, P0103 (MAF sensor) P0110, P0112, P0113 (IAT sensor) P0115, P0116, P0117, P0118 (ECT sensor) P0120, P0122, P0123, P0220, P0222, P0223, P2135,(TP sensor) P0125 (Insufficient ECT for closed loop) P0171, P0172, P0174, P0175 (Fuel system) P0300, P0301, P0302, P0303, P0304 (Misfire) P0335 (CKP sensor) P0340, P0341 (CMP sensor) P0351, P0352, P0353, P0354 (Igniter) P0450, P0452, P0453 (EVAP press sensor) P0500 (VSS)
Atmospheric pressure	70 to 110 kPa (525 to 825 mmHg)

Battery voltage	10.5 V or higher
Vehicle speed	Less than 4 km/h (2.5 mph)
Power switch	OFF
Time after key off	5 or 7 or 9.5 hours
Purge VSV	Not operated by scan tool
Vent valve	Not operated by scan tool
Leak detection pump	Not operated by scan tool
Both of the following conditions 1 and 2 are met before key off	-
1. Duration that vehicle has been 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)

ES

1. Key-off monitor sequence 1 to 8**1. Atmospheric pressure measurement**

Next sequence is run if the following condition is met	-
Atmospheric pressure change	Within 0.3 kPa (2.25 mmHg) in 1 second

2. First reference pressure measurement

Next sequence is run if the following conditions are met	-
EVAP pressure just after reference pressure measurement start	-1 kPa (-7.5 mmHg) or lower
Reference pressure	-4.85 to -1.05 kPa (726 to 754 mmHg)
Reference pressure	Saturated within 60 seconds

3. Vent valve stuck closed check

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

4. Vacuum introduction

Next sequence is run if the following condition is met	-
EVAP pressure	Saturated within 900 seconds

5. Purge VSV stuck closed check

Next sequence is run if the following condition is met	-
EVAP pressure change after purge valve is open	0.3 kPa (2.25 mmHg) or more

6. Second reference pressure measurement

Next sequence is run if the following conditions are met	-
EVAP pressure just after reference pressure measurement	-1 kPa (-7.5 mmHg) or lower
Reference pressure	-4.85 to -1.05 kPa (726 to 754 mmHg)
Reference pressure	Saturated within 60 seconds
Reference pressure difference between first and second	Less than 0.7 kPa (5.25 mmHg)

7. Leak check

Next sequence is run if the following condition is met	-
EVAP pressure when vacuum introduction is complete	Lower than second reference pressure

8. Atmospheric pressure measurement

EVAP monitor is complete if the following condition is met	-
Atmospheric pressure difference between sequence 1 and 8	Within 0.3 kPa (2.25 mmHg)

TYPICAL MALFUNCTION THRESHOLDS

"Saturated" indicates that the EVAP pressure change is less than 0.1 kPa (0.75 mmHg) in 30 seconds.

P0455: EVAP gross leak

FTP when vacuum introduction complete	Higher than reference pressure x 0.15
---------------------------------------	---------------------------------------

P0456: EVAP small leak

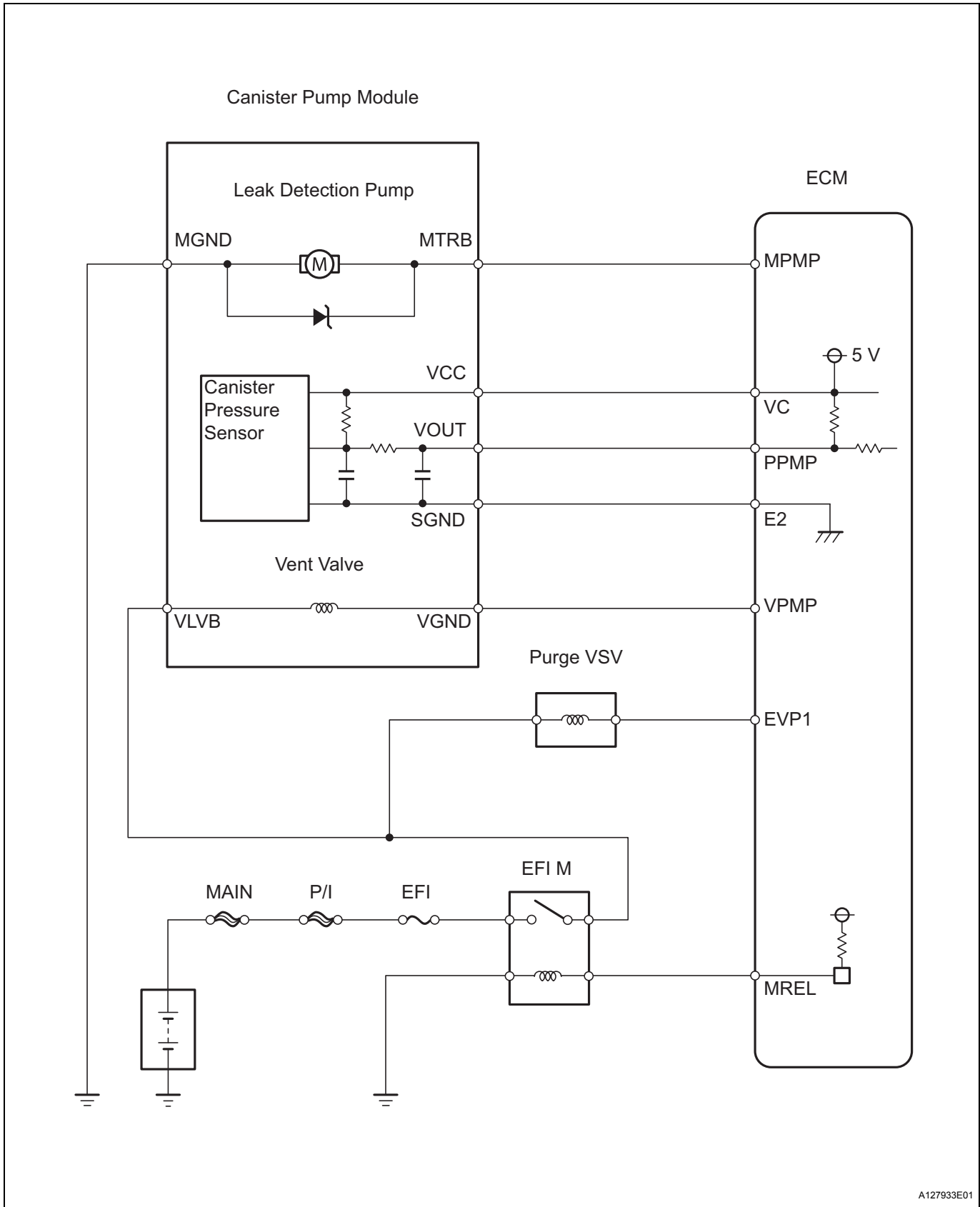
FTP when vacuum introduction complete	Between "reference pressure" and "reference pressure x 0.15"
---------------------------------------	--

MONITOR RESULT

Refer to CHECKING MONITOR STATUS (see page [ES-15](#)).

WIRING DIAGRAM

ES



A127933E01

INSPECTION PROCEDURE

NOTICE:

The intelligent tester is required to conduct the following diagnostic troubleshooting procedure.

HINT:

- Using the intelligent tester monitor results enable the EVAP system to be confirmed.
- Read freeze frame data using the intelligent tester. Freeze frame data records the engine conditions when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

1 CONFIRM DTC

- Turn the power switch OFF and wait for 10 seconds.
- Turn the power switch ON (IG).
- Turn the power switch OFF and wait for 10 seconds.
- Connect the intelligent tester to the DLC3.
- Turn the power switch ON (IG).
- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- Check if DTC P0446 is output.

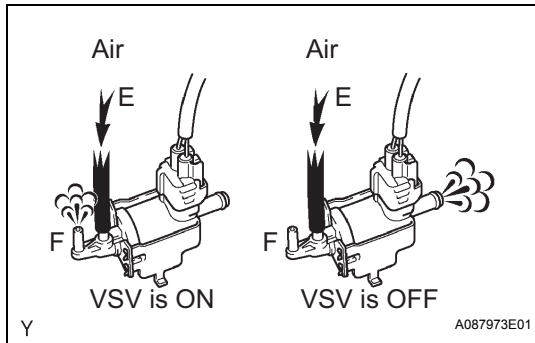
NO**Go to step 5****YES****2 PERFORM EVAP SYSTEM CHECK**

- Note the freeze frame data and DTCs.
- Clear DTCs.
- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / AUTO OPERATION.
- After the system check is finished, check for pending DTCs.

OK:**No DTC is present.****NG****Go to step 6****OK****3 CHECK OPERATION FOR PRESSURE SWITCHING VALVE**

- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / TANK BYPASS VSV.
- Touch the pressure switching valve (TANK BYPASS VSV) to feel the operating vibration.

OK:**The pressure switching valve is operated by the ACTIVE TEST.****NG****Go to step 18****OK****ES**

4 CHECK PRESSURE SWITCHING VALVE

- Turn the power switch OFF.
- Remove the pressure switching valve (see page EC-31).
- Reconnect the pressure switching valve connector.
- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / TANK BYPASS VSV.
- Check the airflow for the pressure switching valve.

OK:

The pressure switching valve operates normally.

NG

Go to step 19

OK

Go to step 33

5 PERFORM EVAP SYSTEM CHECK

- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / AUTO OPERATION.
- After the system check is finished, check for pending DTCs.

OK:

DTCs are present.

NG

CHECK INTERMITTENT PROBLEMS

OK**6 CHECK DTC**

- Check the DTCs that were present at the EVAP system check.

OK:

P043E, P043F, P2401, P2402 and P2419 are present.

NG

Go to step 10

OK**7 CHECK VENT VALVE CLOSE STUCK**

- Allow the engine to idle.
- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / EVAP VSV.
- Turn the EVAP VSV ON (purge VSV open) and check the VAPOR PRESS (EVAP pressure) for 10 seconds.

OK:

EVAP pressure is higher than 755 mmHg.

NG

Go to step 20

OK

8 CHECK LEAK DETECTION PUMP OPERATION

- (a) Turn the power switch OFF.
- (b) Turn the power switch ON (IG).
- (c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VACUUM PUMP.
- (d) Touch the pump module to feel the operating vibration.

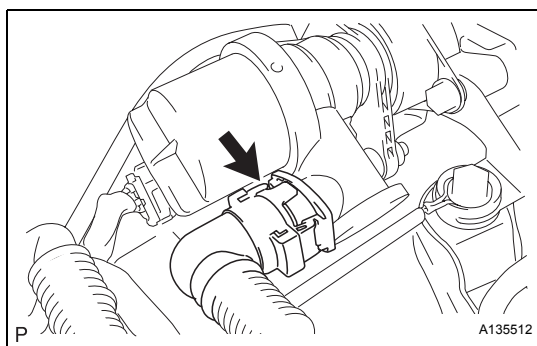
OK:

The leak detection pump is operated by the ACTIVE TEST.

NG

Go to step 21

OK

9 CHECK TRAP CANISTER

- (a) Disconnect the vent hose from the pump module.
- (b) Check that no moisture is in the pump module or the vent hose.

OK:

No moisture.

OK

Go to step 22

NG

Go to step 23

10 CHECK DTC

- (a) Check the DTCs that were present at the EVAP system check.

OK:

P0441, P0455 and/or P0456 are present.

NG

Go to step 16

OK

11 CHECK INSTALLATION FOR FUEL CAP

- (a) Remove the fuel cap.
- (b) Reinstall the fuel cap.
- (c) Clear DTCs.
- (d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / AUTO OPERATION.
- (e) After the system check is finished, check for pending DTCs.

ES

HINT:

If no DTC is present, this indicates that the fuel cap is loosened.

OK:

No DTC is present.

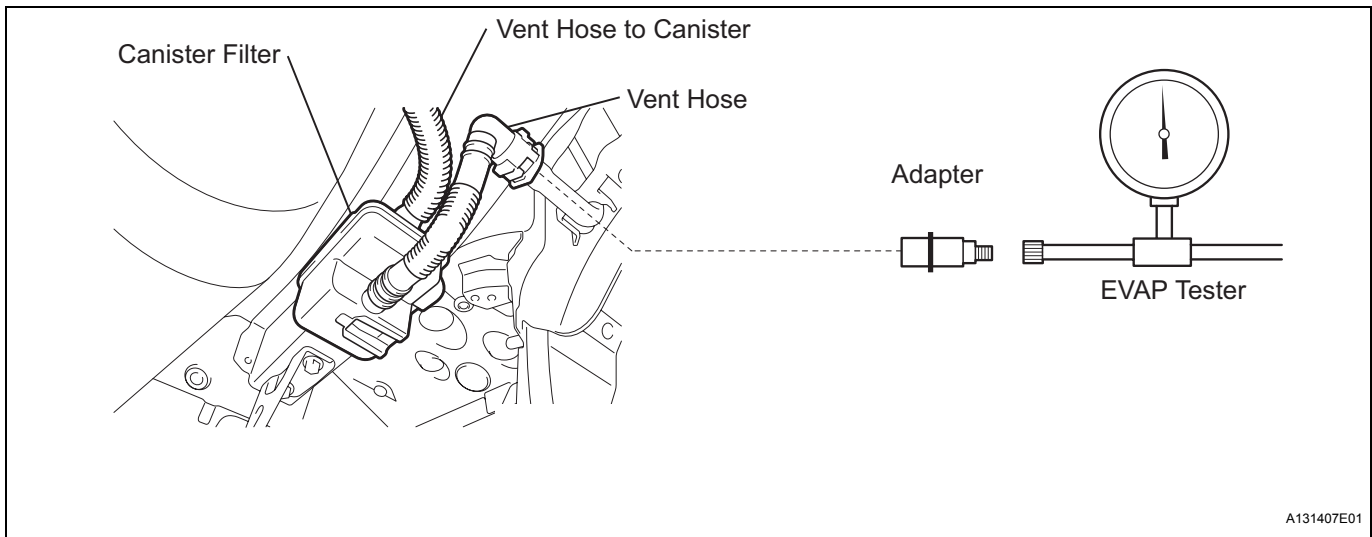
OK → REPAIR COMPLETED

NG

12 LOCATE LEAK POINT

ES

(a) Disconnect the vent hose (fresh air line) as shown in the illustration.



(b) Connect the pressure gauge and air pump as shown in the illustration.

(c) Pressurize the EVAP system until 24 to 28 mmHg.

(d) Locate the leak point.

HINT:

If the EVAP system has leakage, a whistling sound may be heard.

OK:

The leak point is found.

OK → Go to step 24

NG

13 CHECK FUEL CAP

Check that the fuel cap meets OEM specifications.

HINT:

If an EVAP tester is available, perform the fuel cap test according to the tester's instructions.

OK:

Fuel cap meets OEM specifications.

NG → Go to step 25

OK

14 CHECK OPERATION FOR PURGE VSV

- (a) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / EVAP VSV.
- (b) Touch the purge VSV to feel the operating vibration.

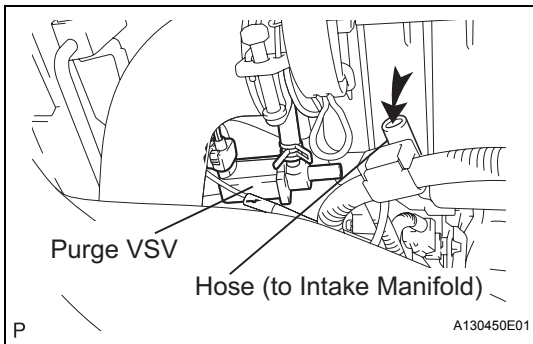
OK:

The purge VSV (EVAP VSV) is operated by the ACTIVE TEST.

NG

Go to step 26

OK

15 CHECK INTAKE MANIFOLD PRESSURE

- (a) Disconnect the purge VSV hose that is connected to the throttle body.
- (b) Allow the engine to idle.
- (c) Check that the hose has suction using your finger.

OK:

The hose has suction.

NG

Go to step 27

OK

Go to step 28

16 CHECK DTC

- (a) Check the DTCs that were present at the EVAP system check.

OK:

P0451 is not present.

NG

Go to step 9

OK

17 CHECK OPERATION FOR VENT VALVE

- (a) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / VENT VALVE.
- (b) Touch the pump module to feel the operating vibration.

OK:

The vent valve is operated by the ACTIVE TEST.

OK

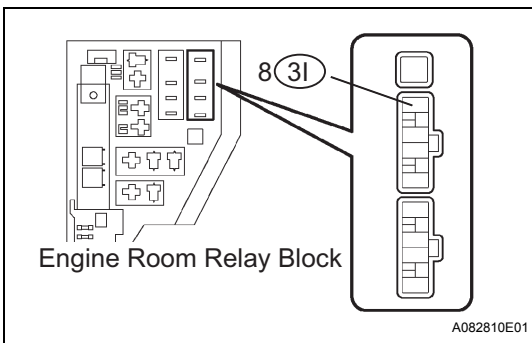
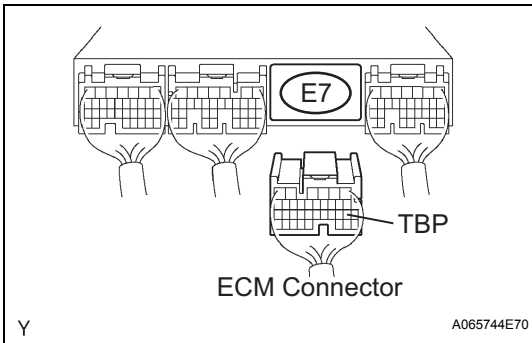
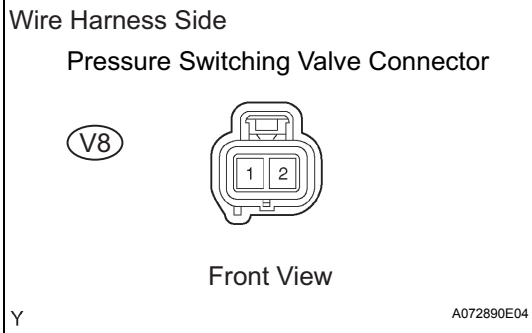
Go to step 9

NG

Go to step 29

ES

18 CHECK HARNESS AND CONNECTOR (PRESSURE SWITCHING VALVE - ECM AND EFI M RELAY)



(a) Check the harness and the connectors between the pressure switching valve and the ECM.

(1) Disconnect the V8 pressure switching valve connector.

(2) Disconnect the E7 ECM connector.

(3) Measure the resistance between the wire harness side connectors.

Standard resistance (Check for open)

Tester Connection	Specified Condition
V8-1 (Pressure switching valve) - E7-18 (TBP)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V8-1 (Pressure switching valve) or E7-18 (TBP) - Body ground	10 kΩ higher

(4) Reconnect the pressure switching valve connector.

(5) Reconnect the ECM connector.

(b) Check the harness and the connectors between the pressure switching valve and the EFI M relay.

(1) Disconnect the V8 pressure switching valve connector.

(2) Remove the integration relay from the engine room relay block.

(3) Measure the resistance between the wire harness side connector.

Standard resistance (Check for open)

Tester Connection	Specified Condition
V8-2 (Pressure switching valve) - 3I-8 (EFI M relay)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V8-2 (Pressure switching valve) or 3I-8 (EFI M relay) - Body ground	10 kΩ or higher

(4) Reconnect the pressure switching valve connector.

(5) Reinstall the integration relay.

NG

Go to step 30

OK

Go to step 31

ES

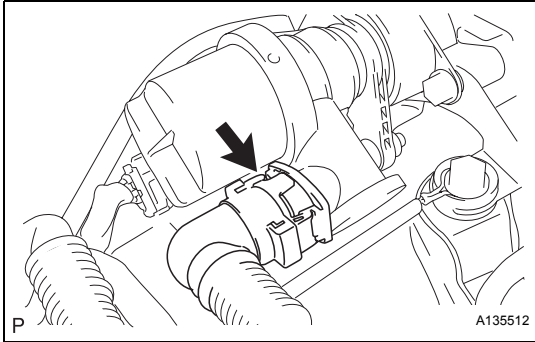
19 REPLACE PRESSURE SWITCHING VALVE

Replace the pressure switching valve (see page EC-31).

NEXT

Go to step 34

20 CHECK FOR VENT HOSE CLOG



- (a) Turn the power switch OFF.
- (b) Disconnect the vent hose (fresh air line) as shown in the illustration.
- (c) Allow the engine to idle.
- (d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / EVAP VSV.
- (e) Turn the purge VSV (EVAP VSV) ON and check the EVAP pressure (VAPOR PRESS) for 10 seconds.

ES

OK:

EVAP pressure is higher than 755 mmHg.

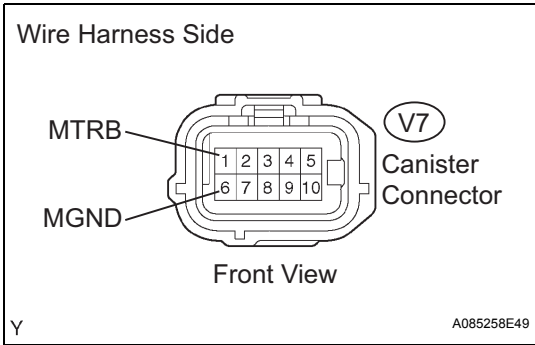
NG

Go to step 22

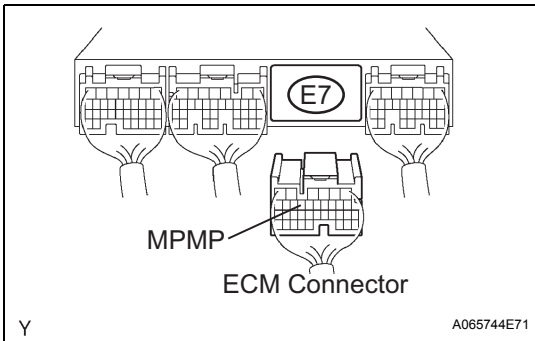
OK

Go to step 32

21 CHECK HARNESS AND CONNECTOR (LEAK DETECTION PUMP - ECM)



- (a) Disconnect the V7 canister connector



- (b) Disconnect the E7 ECM connector.
- (c) Measure the resistance between the wire harness side connector.

Standard resistance (Check for open)

Tester Connection	Specified Condition
V7-1 (MTRB) - E7-13 (MPMP)	Below 1 Ω
V7-6 (MGND) - Body ground	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V7-1 (MTRB) or E7-13 (MPMP) - Body ground	10 kΩ higher

- (d) Reconnect the canister connector.
- (e) Reconnect the ECM connector.

- NG** → **Go to step 30**
- OK** → **Go to step 31**

22 REPLACE TRAP CANISTER WITH PUMP MODULE

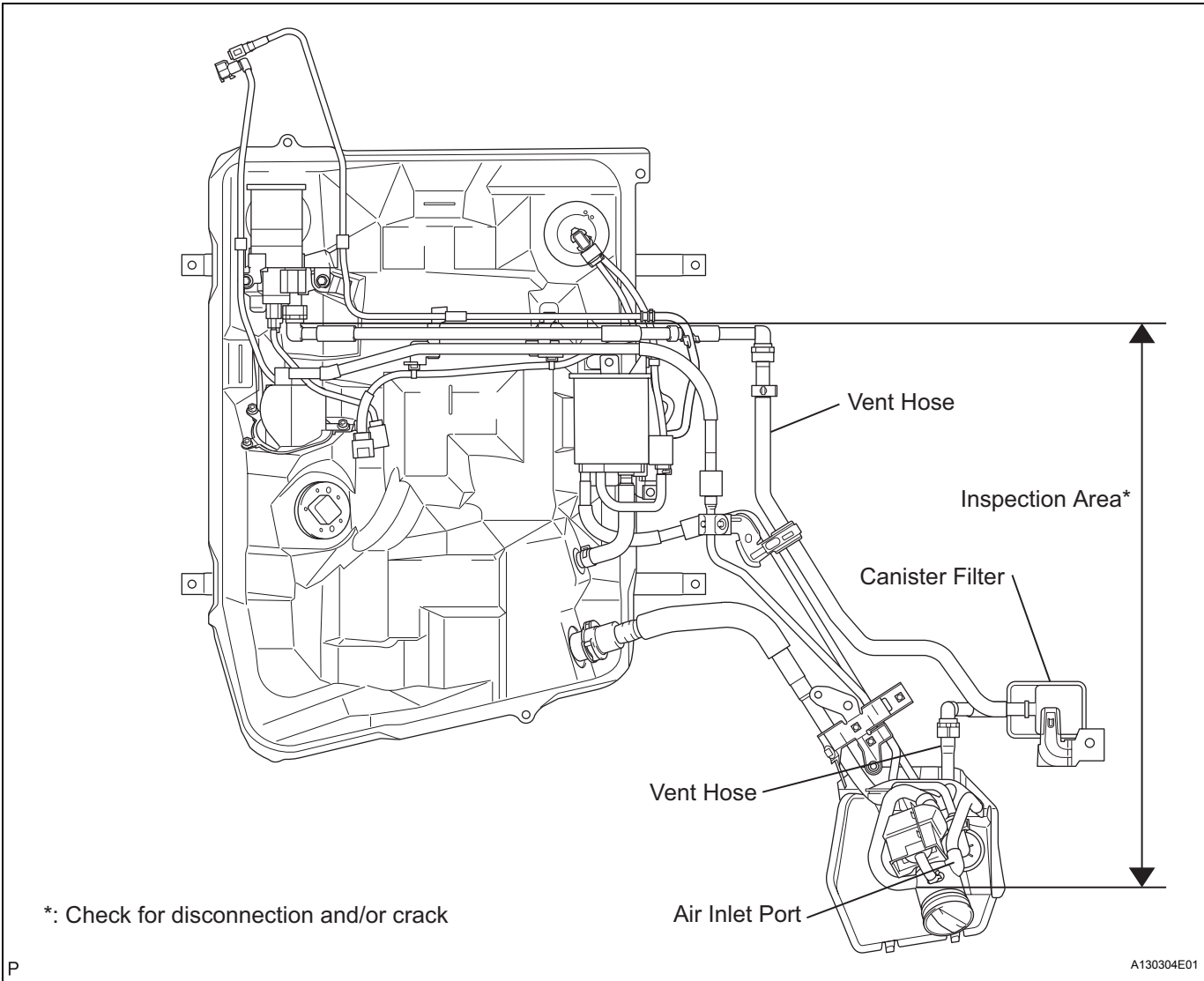
Replace the trap canister with pump module (see page EC-17).

- NEXT** → **Go to step 34**

ES

23 CHECK FOR VENT HOSE DAMAGE

Check for hose damage as shown in the illustration. If necessary, replace the vent hose.



- NEXT** → **Go to step 22**

24 REPAIR OR REPLACE LEAK POINT

NEXT 

Go to step 34

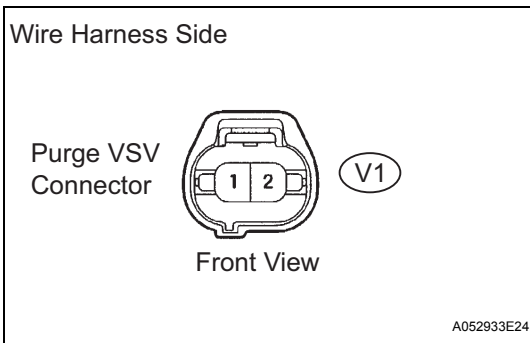
25 REPLACE FUEL CAP

NEXT 

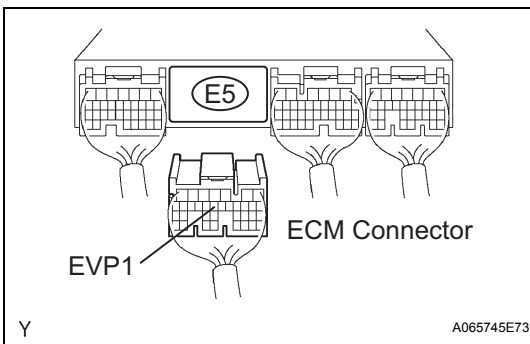
Go to step 34

26 CHECK HARNESS AND CONNECTOR (PURGE VSV - ECM)

ES



(a) Disconnect the V1 purge VSV connector.



(b) Disconnect the E5 ECM connector.

(c) Check the harness and the connectors between the ECM and the purge VSV connectors.

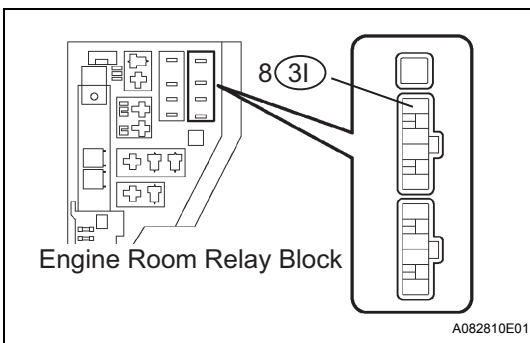
(1) Measure the resistance between the wire harness side connector.

Standard resistance (Check for open)

Tester Connection	Specified Condition
V1-1 - E5-14 (EVP1)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V1-1 or E5-14 (EVP1) - Body ground	10 kΩ higher



(d) Remove the integration relay from the engine room relay block.

(e) Check the harness and connectors between the purge VSV connector and the EFI M relay.

(1) Measure the resistance between the wire harness side connectors.

Standard resistance (Check for open)

Tester Connection	Specified Condition
V1-2 - 3I-8 (EFI M relay)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V1-2 or 3I-8 (EFI M relay) - Body ground	10 kΩ higher

(f) Reconnect the purge VSV connector.

(g) Reconnect the ECM connector.

(h) Reinstall the integration relay.

NG	Go to step 30
OK	Go to step 31

27 REPLACE HOSE (PURGE VSV - THROTTLE BODY)

NEXT Go to step 34

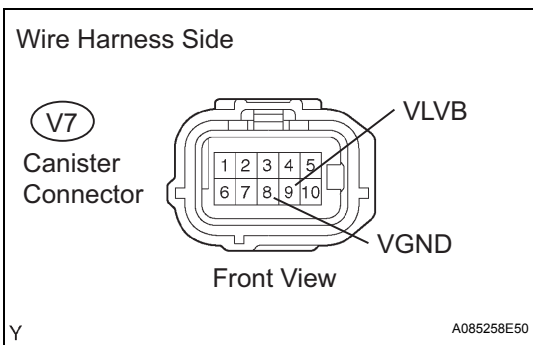
ES

28 REPLACE PURGE VSV

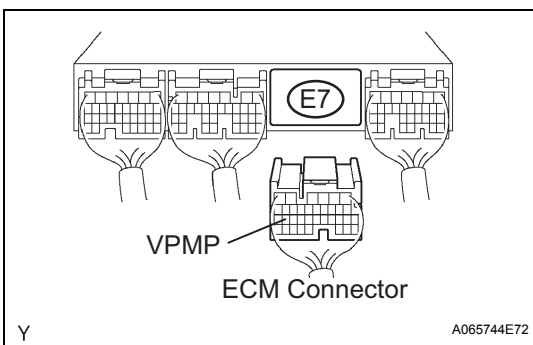
Replace the purge VSV (see page [EC-23](#)).

NEXT Go to step 34

29 CHECK HARNESS AND CONNECTOR (VENT VALVE - ECM)



(a) Disconnect the V7 canister connector.



(b) Disconnect the E7 ECM connector.

(c) Check the harness and the connectors between the ECM and the canister connectors.

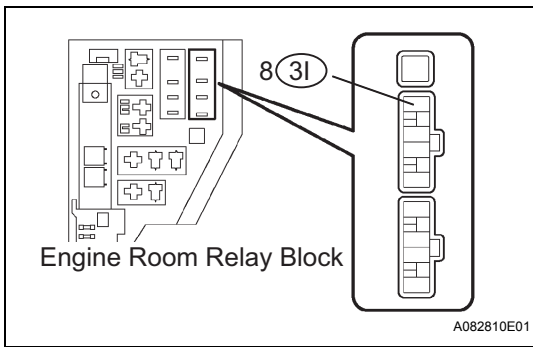
(1) Measure the resistance between the wire harness side connector.

Standard resistance (Check for open)

Tester Connection	Specified Condition
V7-8 (VGND) - E7-26 (VPMP)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V7-8 (VGND) or E7-26 (VPMP) - Body ground	10 kΩ higher



- (d) Remove the integration relay from the engine room relay block.
- (e) Check the harness and connectors between the canister connector and the EFI M relay.
 - (1) Measure the resistance between the wire harness side connectors.

Standard resistance (Check for open)

Tester Connection	Specified Condition
V7-9 (VLVB) - 31-8 (EFI M relay)	Below 1 Ω

Standard resistance (Check for short)

Tester Connection	Specified Condition
V7-9 (VLVB) or 31-8 (EFI M relay) - Body ground	10 kΩ higher

ES

- (f) Reconnect the canister connector.
- (g) Reconnect the ECM connector.
- (h) Reinstall the integration relay.

NG	Go to step 30
OK	Go to step 31

30 REPAIR OR REPLACE HARNESS AND CONNECTOR

NEXT	Go to step 34
-------------	----------------------

31 REPLACE ECM

Replace the ECM (see page [ES-469](#)).

NEXT	Go to step 34
-------------	----------------------

32 CHECK AND REPLACE VENT HOSE OR CANISTER FILTER

NEXT	Go to step 34
-------------	----------------------

33 REPLACE HOSE (PRESSURE SWITCHING VALVE AND FUEL TANK)

NEXT

34 PERFORM EVAP SYSTEM CHECK

- (a) Turn the power switch ON (IG).
- (b) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / SYSTEM CHECK / EVAP SYS CHECK / AUTO OPERATION.
- (c) After the system check is finished, check for pending DTCs.

OK:
No DTC is present.

NG

Go to step 6

OK

35 **PERFORM EVAP MONITOR DRIVE PATTERN**

- (a) Check that the following conditions are met:
- Fuel level is 1/8 to 7/8.
 - Engine coolant temperature (ECT) is 4.4 to 35°C (40 to 95°F).
 - Intake air temperature (IAT) is 4.4 to 35°C (40 to 95°F).
 - Difference of ECT and IAT is less than 7°C (13°F).
- (b) Enter the check mode. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / CHECK MODE.
- (c) Allow the engine to idle until the ECT is 75°C (167°F).
- (d) Drive the vehicle at 50 km/h (30 mph) or faster and maintain that speed for 60 seconds or more.
- (e) Stop the vehicle. Do not turn the power switch OFF.
- (f) Check that the EVAP monitor status is complete. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / MONITOR STATUS.
- (g) If the EVAP monitor is incomplete, drive the vehicle at 50 km/h (30 mph) or faster and maintain that speed for 120 seconds or more. After that, recheck the EVAP monitor status.
- (h) Check for pending DTCs.

OK:
No DTC is present.

NG

Go to step 2

OK

REPAIR COMPLETED

ES