Ev01I–01

Vacuum Monitor (LEV II) General Description

MONITOR DTC TABLE

DTC	Document Title	See Page
P0441	EVAP VSV Monitor Description	Ev–88
P0442	EVAP leak Monitor Description (0.040 in.)	Ev–85
P0446	CCV Monitor Description	Ev–91
P0456	EVAP leak Monitor Description (0.020 in.)	Ev–85
P0451	Vapor pressure sensor Range/Performance Monitor Description	Ev–96
P0452	Vapor pressure sensor Monitor Description (Sensor voltage is low)	Ev–94
P0453	Vapor pressure sensor Monitor Description (Sensor voltage is high)	

NOTE:

Some DTCs may have different meanings from those listed above depending upon the EVAP Monitoring strategy. To identify which strategy is used on each model, refer to EVAP Monitor Summary (See page Ev–1).

MONITOR INTRODUCTION

This EVAP monitor design was introduced in 2003 to comply with more stringent LEV II standards. There are number of differences between this system and earlier systems.

Listed below are the construction differences between this system and the conventional vacuum type:

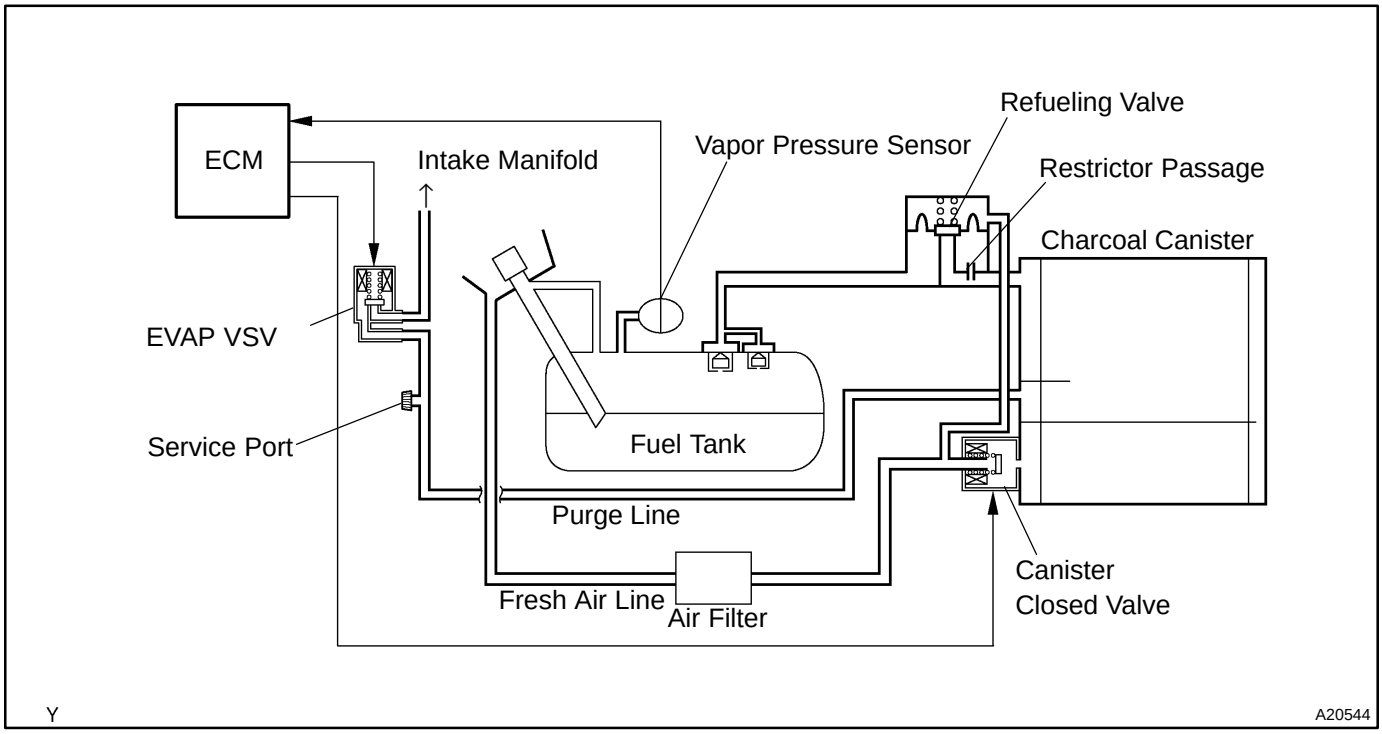
(a) The air drain valve has been eliminated. The air that has been cleaned through the charcoal canister is discharged through the fresh air line. Accordingly, the fresh air inlet has been moved from the air cleaner to a location near the fuel inlet. Furthermore, the pipe diameter of the fresh air line and the flow rate of the canister closed valve have been increased.

(b) A restrictor passage has been provided in the refueling valve to prevent a large amount of vacuum during purge operation or system monitoring operation from affecting the pressure in the fuel tank. And the VSV for bypass valve has been eliminated.

(c) An air filter has been added to the fresh air line.

A more detailed description of system components and operation is listed below.

Components

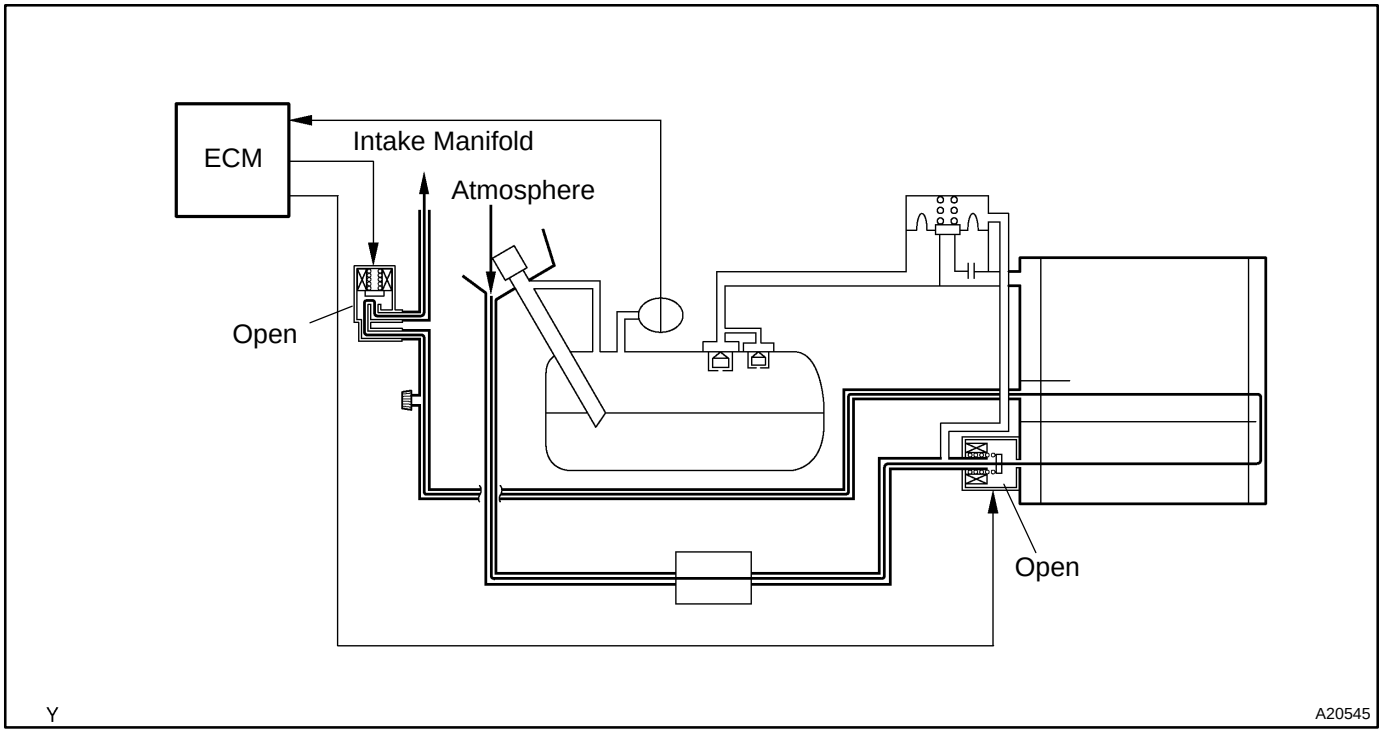


Components	Function
Canister Closed Valve	Opens and closes the fresh air line in accordance with the signals from the ECM in order to introduce fresh air and control the pressure relief if the internal pressure in the fuel tank increases.
EVAP VSV	Opens in accordance with the signals from the ECM when the system is purging in order to send the vapor gas that was absorbed by the charcoal canister into the intake manifold. During the system monitoring mode, this VSV controls the introduction of the vacuum into the fuel tank.
Charcoal Canister	Contains activated charcoal to absorb the vapor gas that is created in the fuel tank.
Vapor Pressure Sensor	Detects the pressure in the fuel tank and sends the signals to the ECM.
Refueling Valve	Controls the flow rate of the vapor gas from the fuel tank to the charcoal canister when the system is purging or during refueling.
Air Filter	Prevents dust and debris in the fresh air from entering the system.
Service Port	This port is used for connecting a vacuum gauge for inspecting the system.
ECM	Controls the canister closed valve and the EVAP VSV in accordance with the signals from various sensors, in order to achieve a purge volume that suits the driving conditions. In addition, the ECM monitors the system for any leakage and outputs a DTC if a malfunction is found.

SUMMARY OF SYSTEM OPERATION

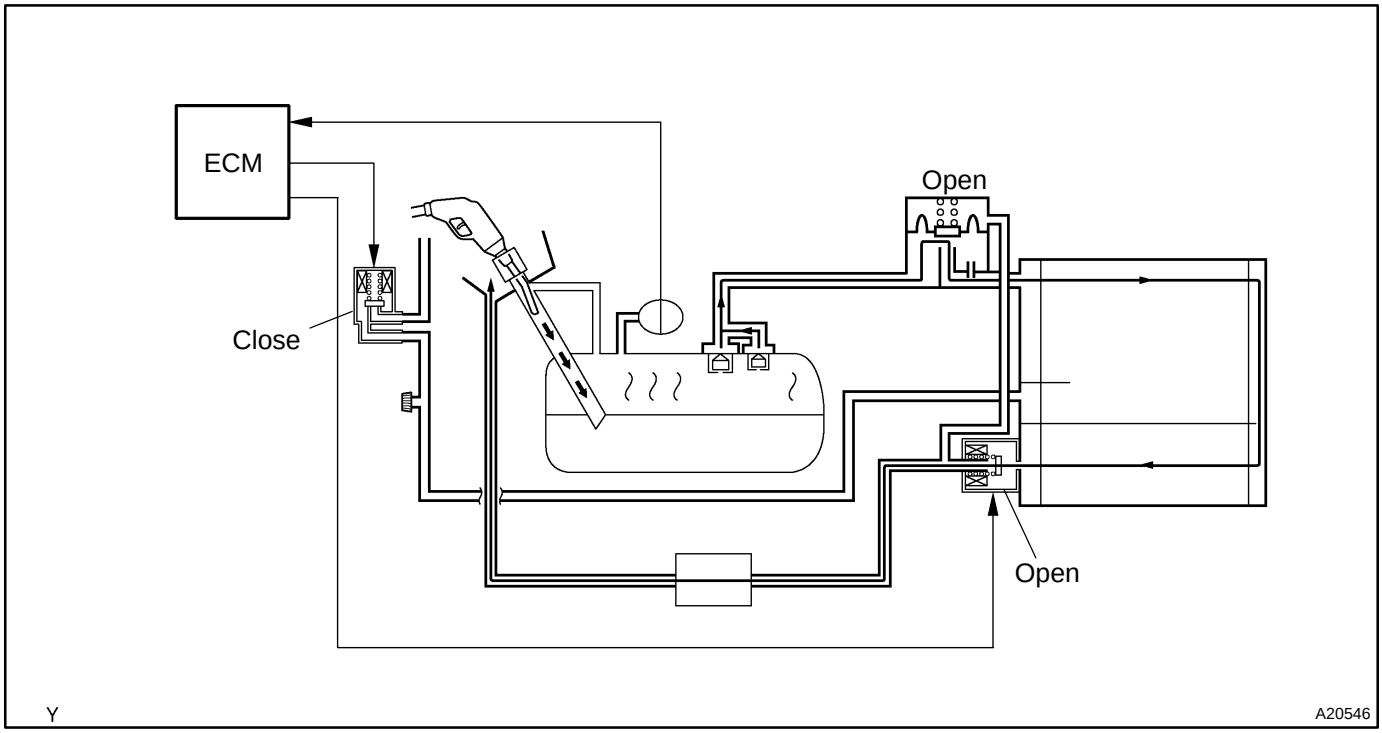
1. Purge Flow Control

When the engine has reached predetermined parameters (closed loop, ECT above 75˚C/167˚F, etc.), stored fuel vapors are purged from the charcoal canister whenever the EVAP VSV is opened by the ECM. The ECM will charge the duty ratio cycle of the EVAP VSV thus controlling purge flow volume. Purge flow volume is determined by intake manifold pressure and the duty ratio cycle of the EVAP VSV. Atmospheric pressure is allowed into the charcoal canister to ensure that purge flow is constantly maintained whenever purge vacuum is applied to the charcoal canister.



2. ORVR (On–Board Refueling Vapor Recovery)

When the internal pressure of the fuel tank increases during refueling, this pressure causes the diaphragm in the refueling valve to lift up, allowing the fuel vapors to enter the charcoal canister. Because the canister closed valve is always open (even when the engine is stopped) when the system is in a mode other than the monitoring mode, the air that has been cleaned through the charcoal canister is discharged outside of the vehicle via the flesh air line. If the vehicle is refueled during the system monitoring mode, the ECM will recognize the refueling by way of the vapor pressure sensor which detects the sudden pressure increase in the fuel tank and will open the canister closed valve.

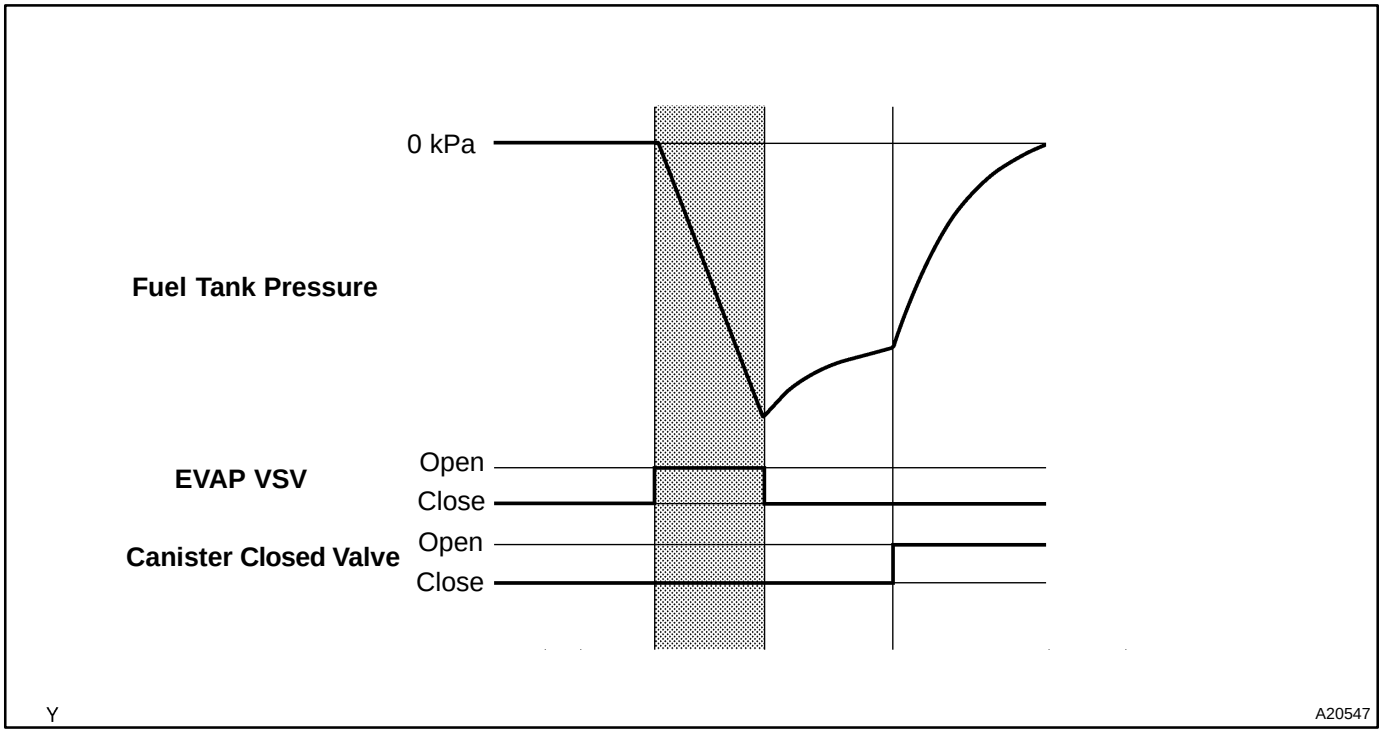


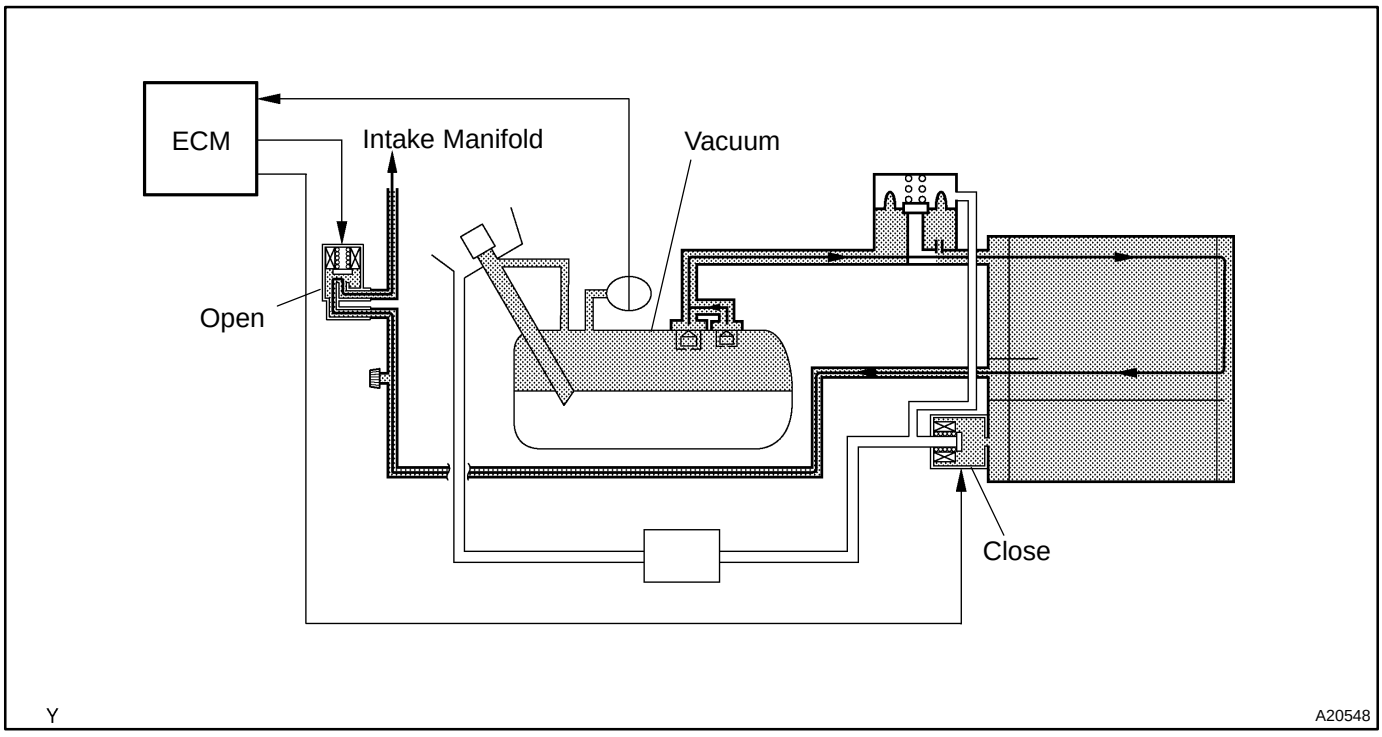
3. EVAP System Monitor

When the initial conditions {low engine temperature (low ECT and, ECT and IAT being nearly the same) at the engine starting, constant vehicle speed (or idling), etc. are met, the ECM introduces a vacuum into the system and monitors the amount of pressure increase in the fuel tank in order to determine if there is any leakage in the system. At the same time , the ECM determines if there is any malfunction in the canister closed valve and the EVAP VSV.

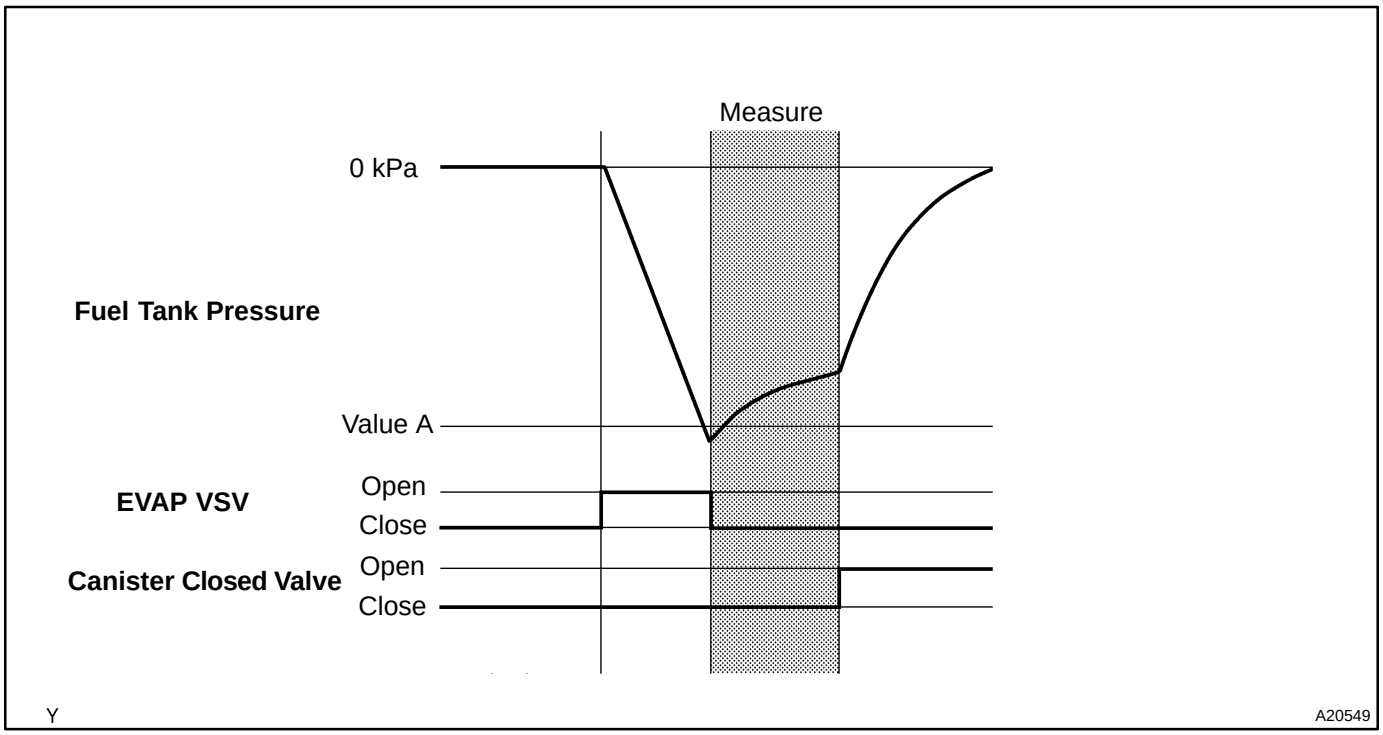
(a) Step 1

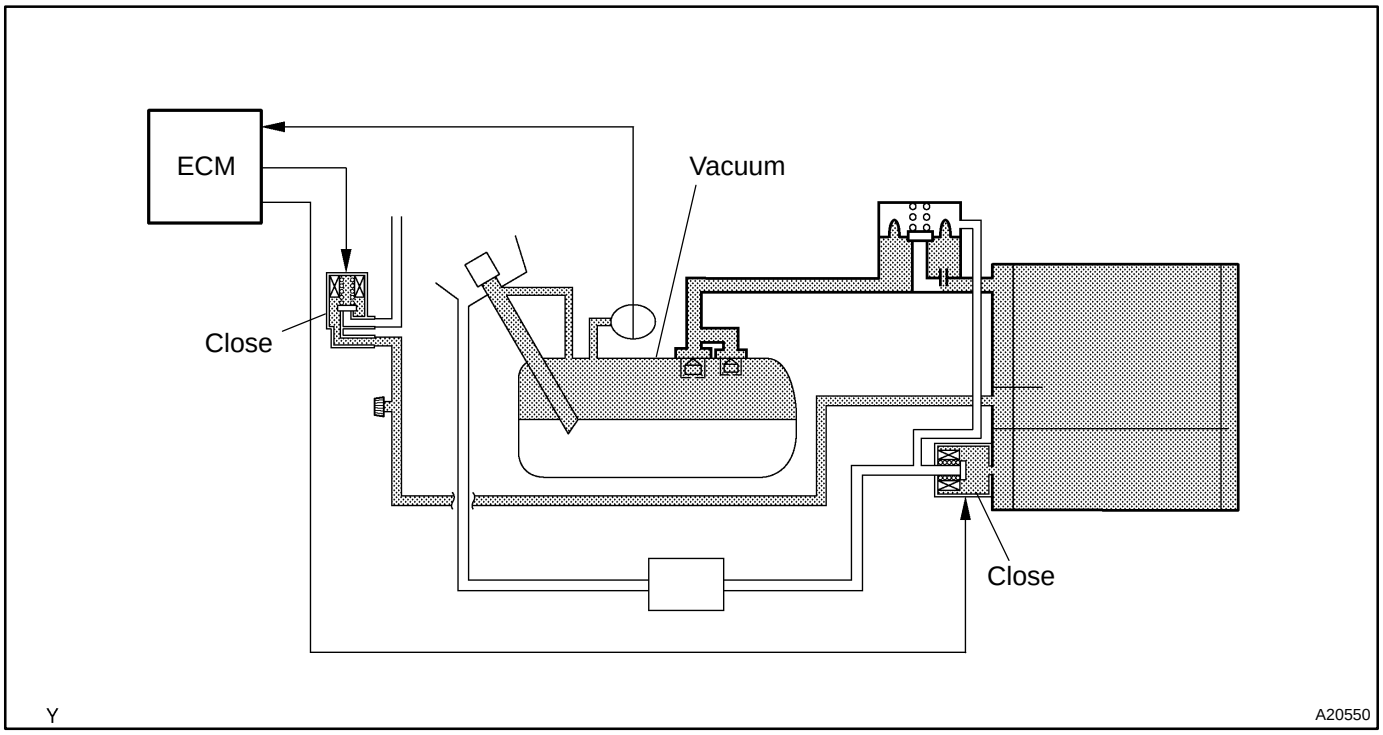
The ECM opens the EVAP VSV and introduces a vacuum into the fuel tank.





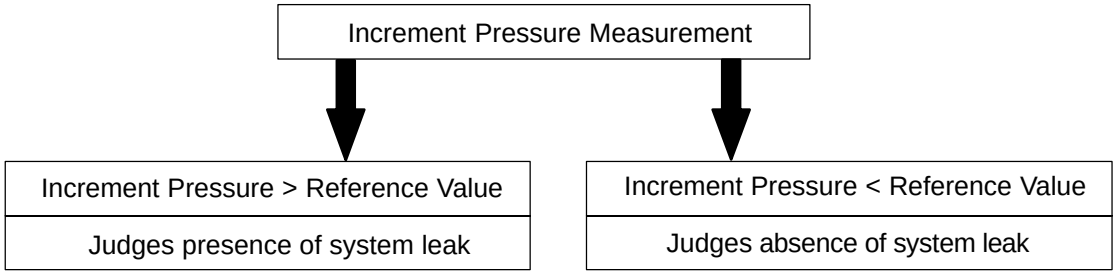
(b) Step 2
When the pressure in the fuel tank decreases below value A, the ECM closes the EVAP VSV. The ECM measures the amount of pressure increase in the fuel tank.





(c) EVAP Leak Judgement

The ECM determines whether there is a leakage in the system by the increment amount of fuel tank pressure at Step 2 on the previous page. If the increment amount of the fuel tank pressure is greater than the reference value, the ECM judges that there is a system leak.



- If the ECM judges that there is no system leak, it ends the system monitoring mode and transfers to the normal system control. (Canister closed valve is opened.)
- If the ECM determines that there is a system leak, it will illuminate the MIL and set following DTCs.

Level of Leak	DTC
Small or medium	P0456
Large	P0441, P0442, P0446

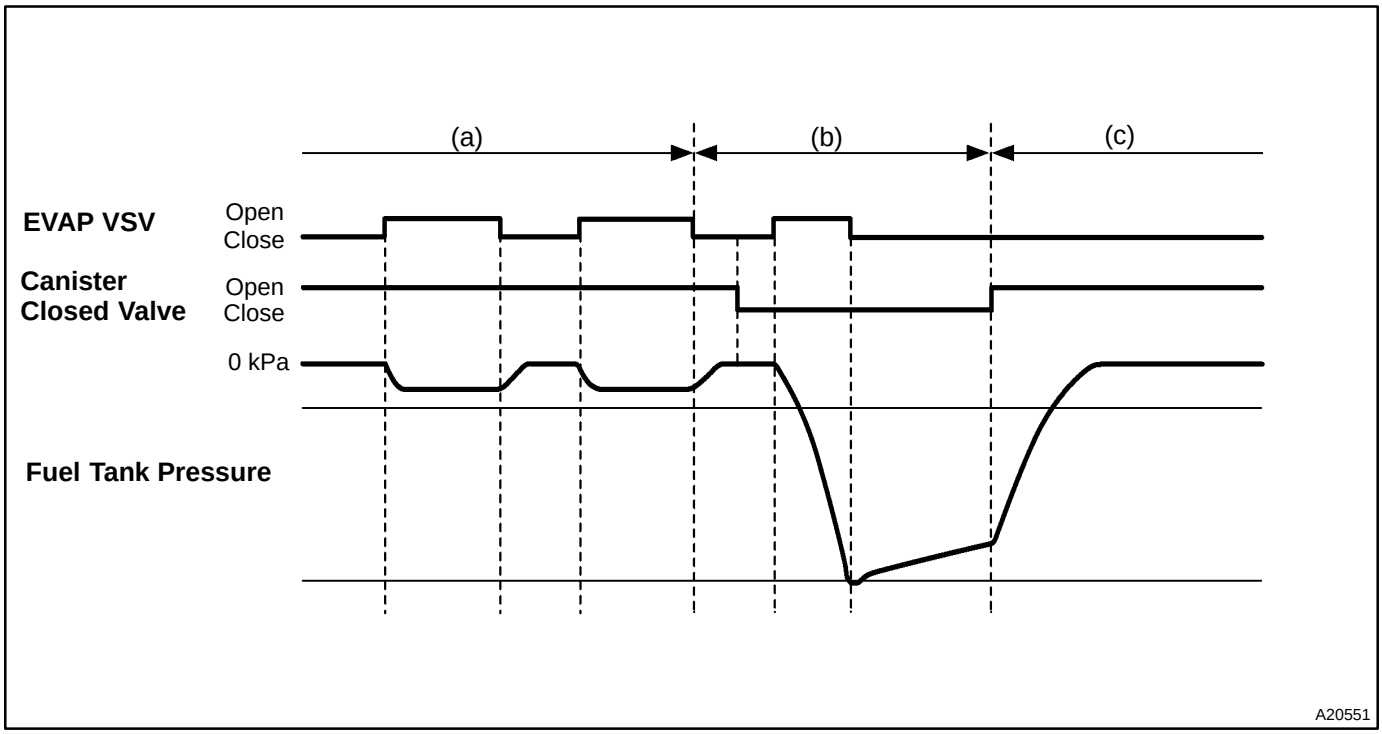
4. Vacuum Switching Valve (VSV) Monitor

(a) Normal Condition

(1) During purging, the ECM opens the EVAP VSV and this creates a slight vacuum in the fuel tank.

(2) During the system monitoring mode, the ECM opens EVAP VSV and closes the canister closed valve to introduce a vacuum into the fuel tank.

(3) After the ECM has performed a system leak judgement, it opens the canister closed valve to introduce fresh air into the system. As a result, the atmospheric pressure is reinstated rapidly in the fuel tank.

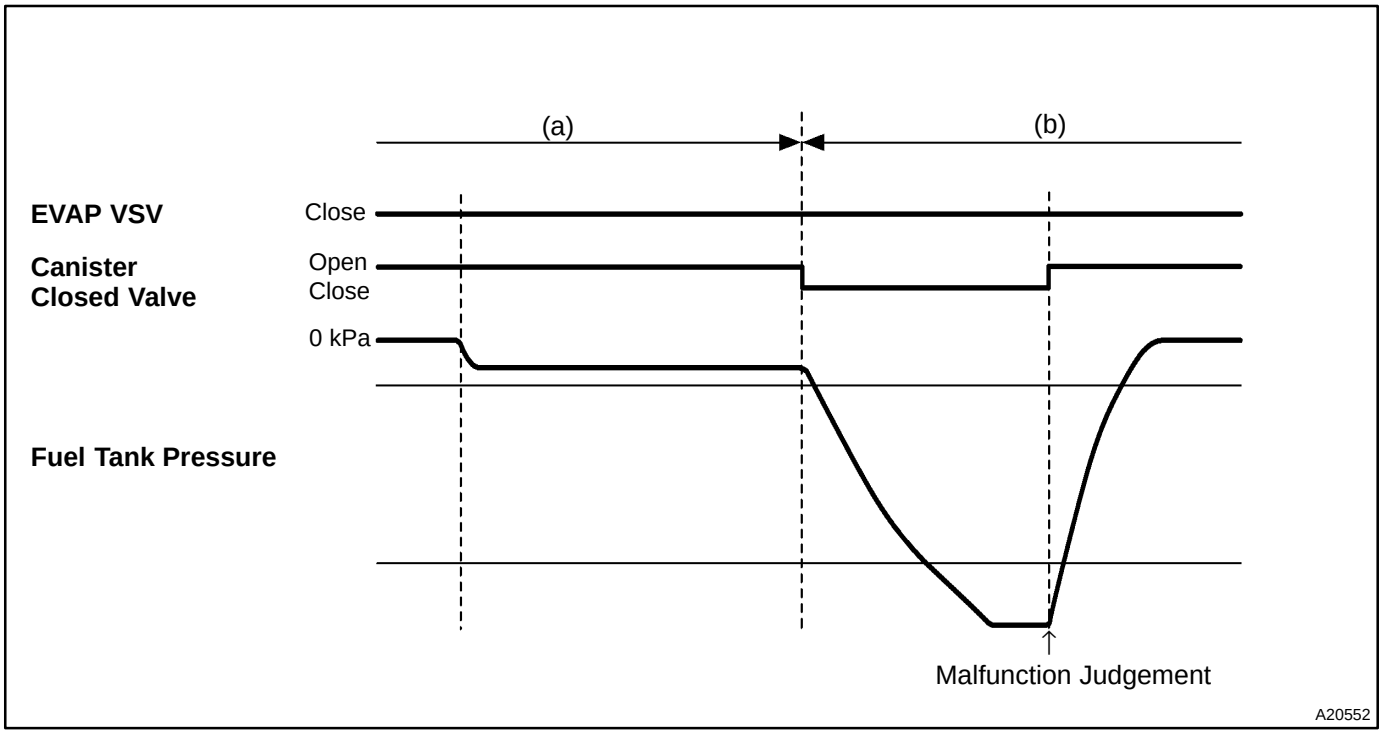


(b) EVAP VSV Open Malfunction

(1) The fuel tank remains in a constant, slight vacuum state regardless of whether the ECM sends an open or close signal to the EVAP VSV.

(2) The pressure in the fuel tank drops rapidly regardless of the close signal that the ECM is sending to the EVAP VSV.

When the ECM detects an open malfunction of the EVAP VSV, it will illuminate the MIL and set DTC P0441.

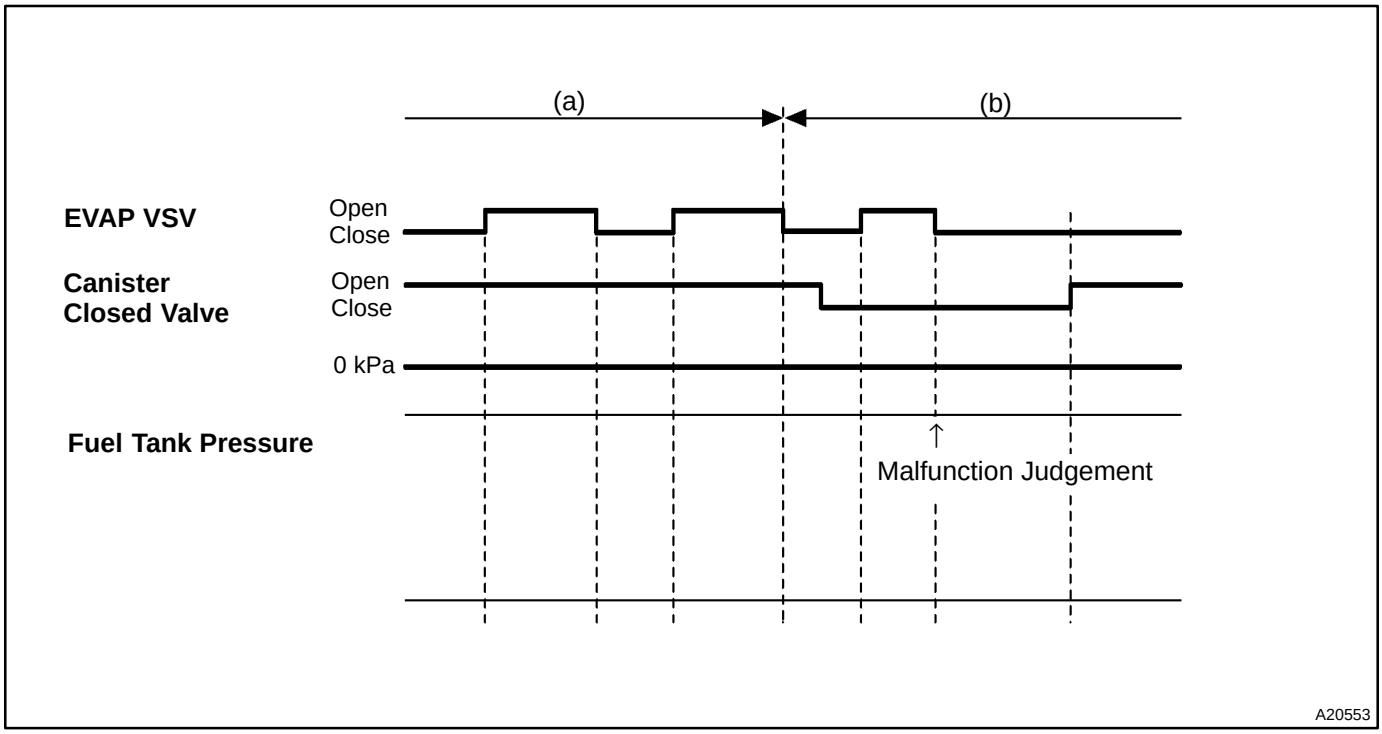


(c) EVAP VSV Close Malfunction

(1) The pressure in the fuel tank does not change regardless of whether the ECM sends an open or closed signal to the EVAP VSV.

(2) Even if the ECM closes the canister closed valve in order to transfer to system monitoring mode, no vacuum is introduced into the fuel tank.

When the ECM detects a close malfunction of the EVAP VSV, it will illuminate the MIL and set DTCs P0441, P0442 and P0446.

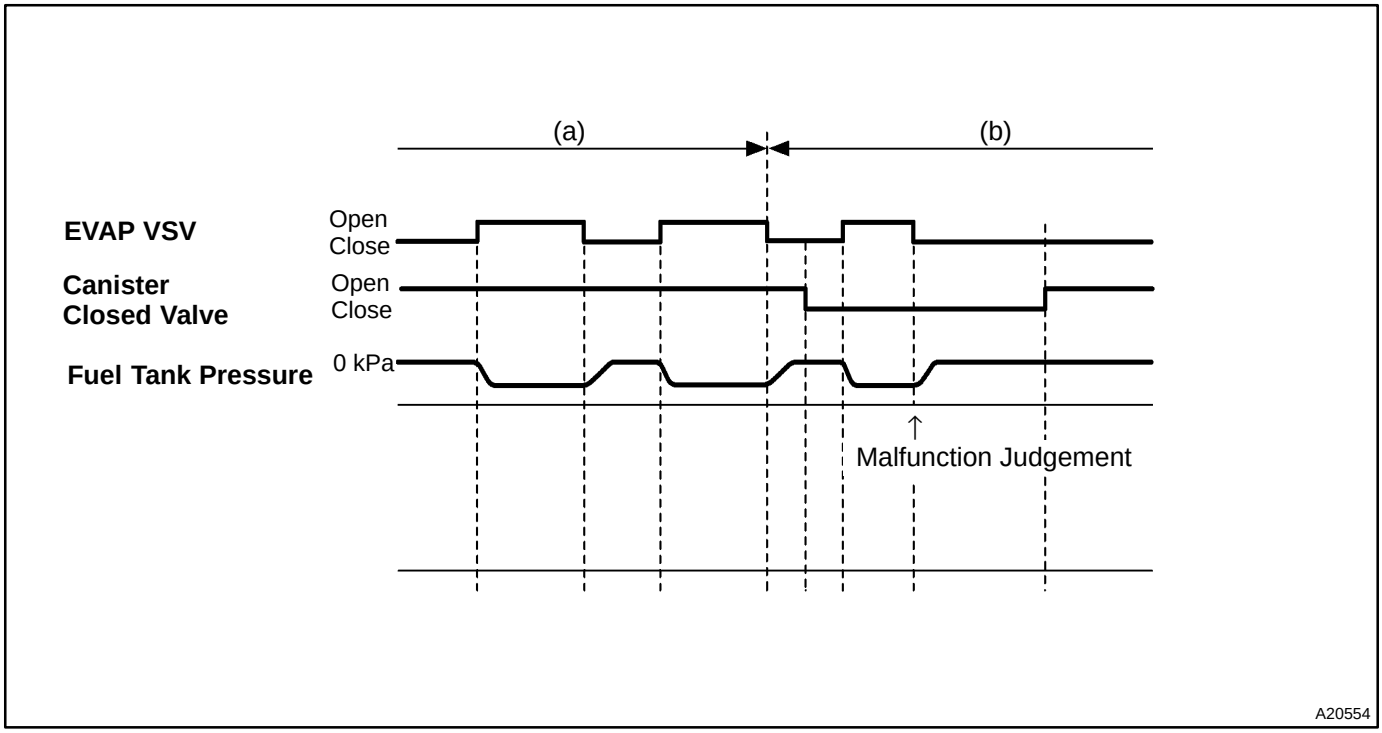


(d) Canister Closed Valve (CCV) Open Malfunction

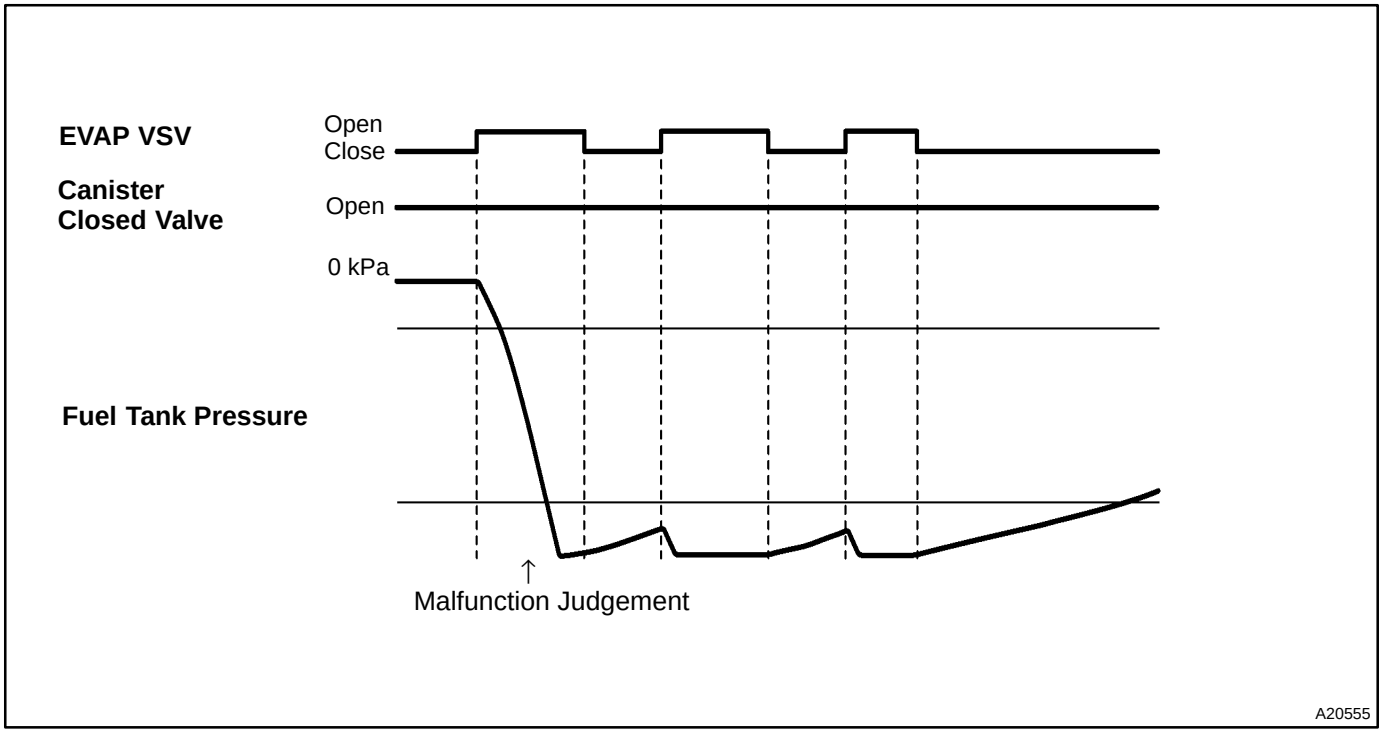
(1) As the ECM opens the EVAP VSV, a slight vacuum is created in the fuel tank.

(2) Even if the ECM sends a close signal to the canister closed valve in order to transfer to system monitoring mode, it is not possible to introduce a complete vacuum into the fuel tank.

When the ECM detects an open malfunction of the canister closed valve, it will illuminate the MIL and set DTCs P0441, P0442 and P0446.



(e) Canister Closed Valve (CCV) Close Malfunction
During purging, a large amount of vacuum is introduced into the fuel tank regardless of the open signal that the ECM sends to the canister closed valve. Even if the EVAP VSV closes, the atmospheric pressure is not reinstated in the fuel tank.
When the ECM detects a close malfunction of the canister closed valve, it will illuminate the MIL and set DTC P0446.



5. Vapor Pressure Sensor Monitor (Previous DTC: P0450) (Extended DTC: P0452/P0453)
If the output voltage of the vapor pressure sensor is out of the normal range, the ECM will determine that there is a malfunction in the sensor or sensor circuit. The ECM will illuminate the MIL (2–trip detection logic) and set a DTC.

6. Vapor Pressure Sensor Range/Performance Monitor (DTC P0451)
The ECM checks for a “noisy” sensor or a “stuck” sensor.
The ECM checks for a “noisy” sensor by monitoring the fuel tank pressure when there should be little variation in the tank pressure due to the vehicle being stationary. If the indicated pressure varies beyond the specified limits, the ECM will illuminate the MIL (2–trip detection logic) and set a DTC.
The ECM checks for a “stuck” sensor by monitoring the fuel tank pressure for an extended time period. If the indicated pressure does not change over this period, the ECM will conclude that the fuel tank pressure sensor is malfunctioning. The ECM will illuminate the MIL (2–trip detection logic) and set a DTC.