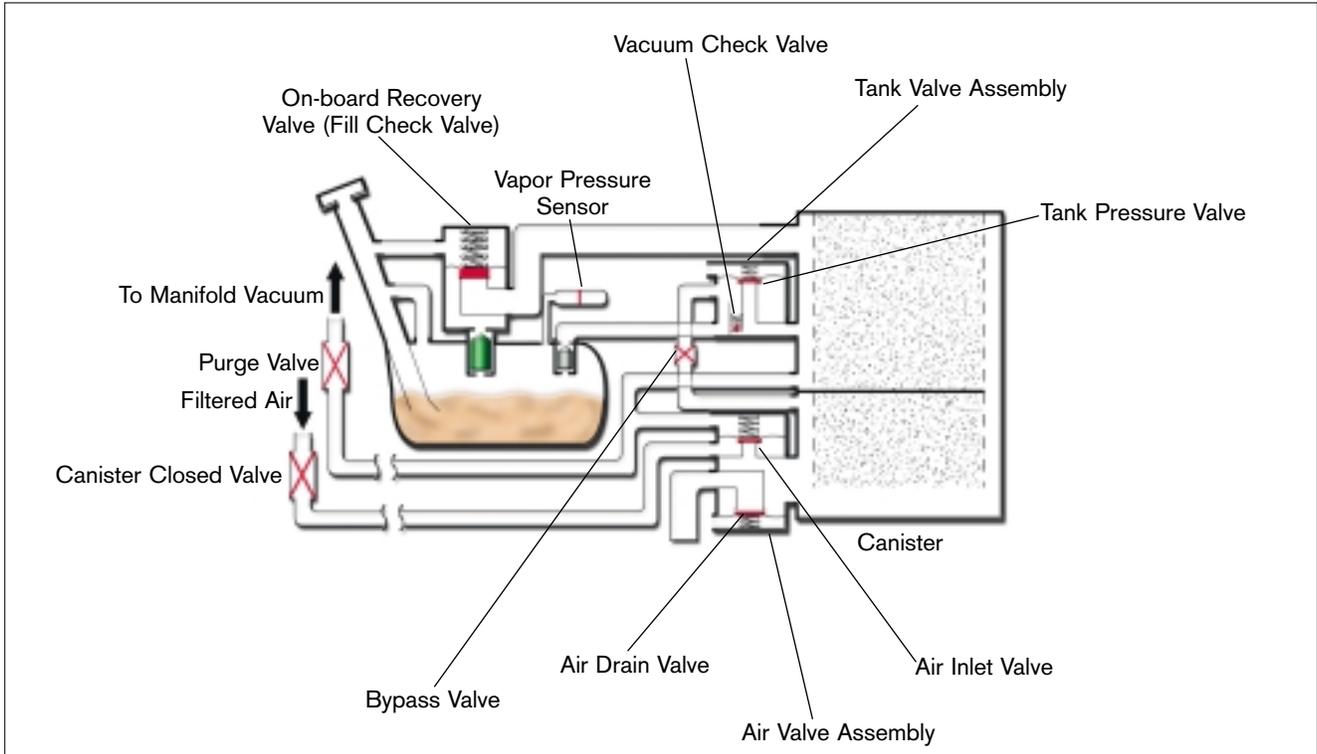


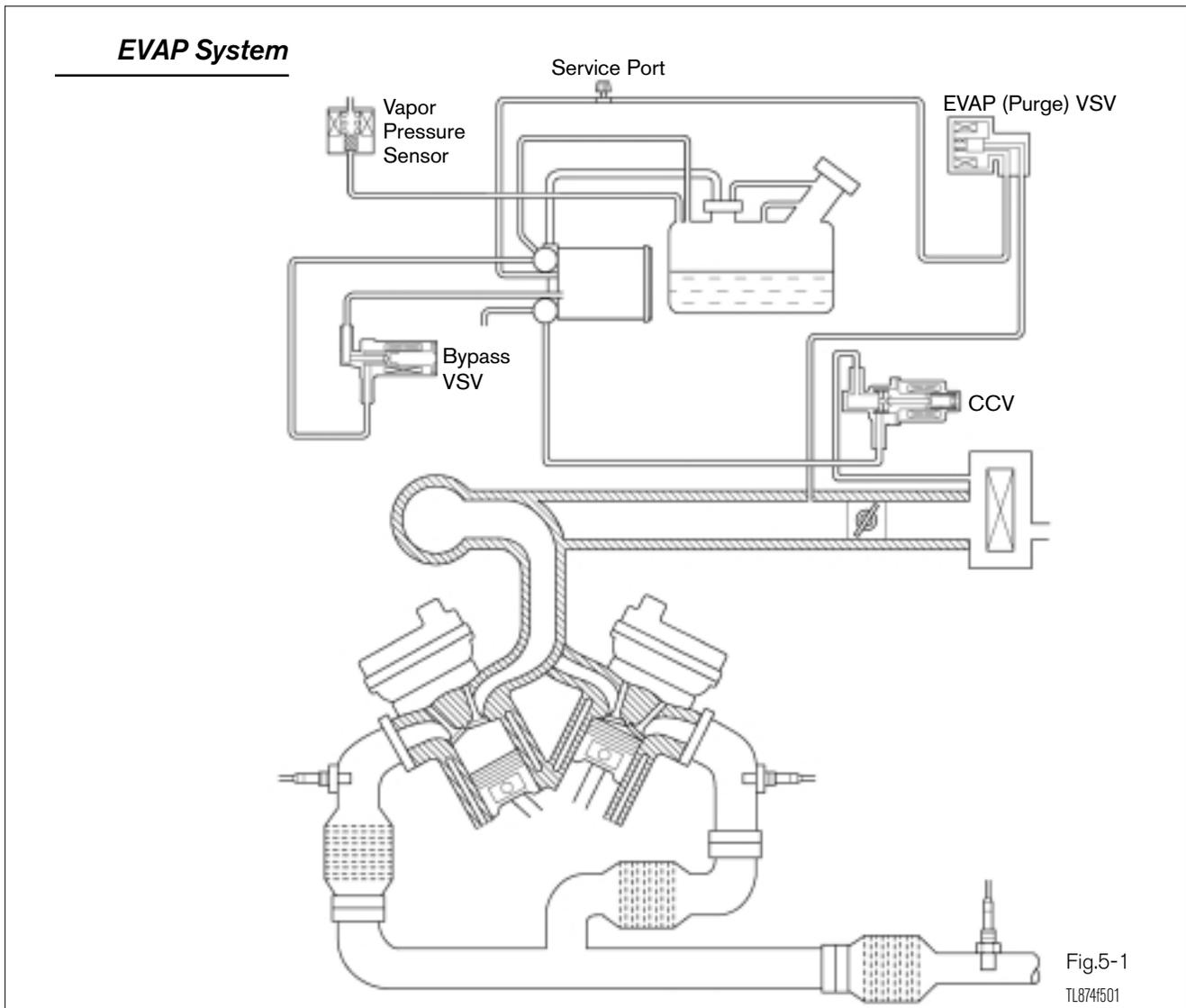
Evaporative Systems Diagnosis



Learning Objectives:

1. Determine the condition of the EVAP system operation based on engine data and the EVAP pressure tester.
2. Determine the condition of the vapor pressure sensor.
3. Determine EVAP monitor status using Readiness Tests and CARB modes.

Evaporative System Diagnosis

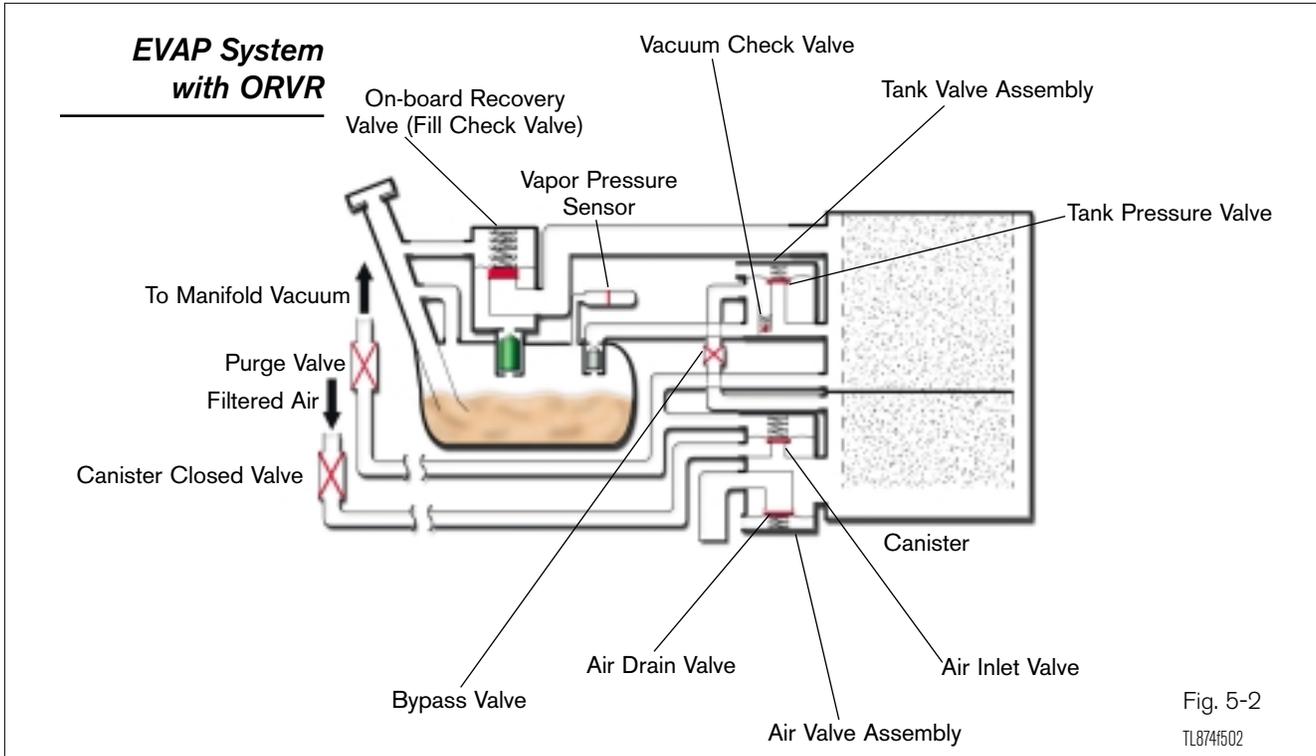


Overview There are a variety of EVAP systems in use with different monitoring strategies. It is essential that the EVAP system be correctly identified before beginning diagnosis (the Repair Manual is the best source). The following information covers the different systems.

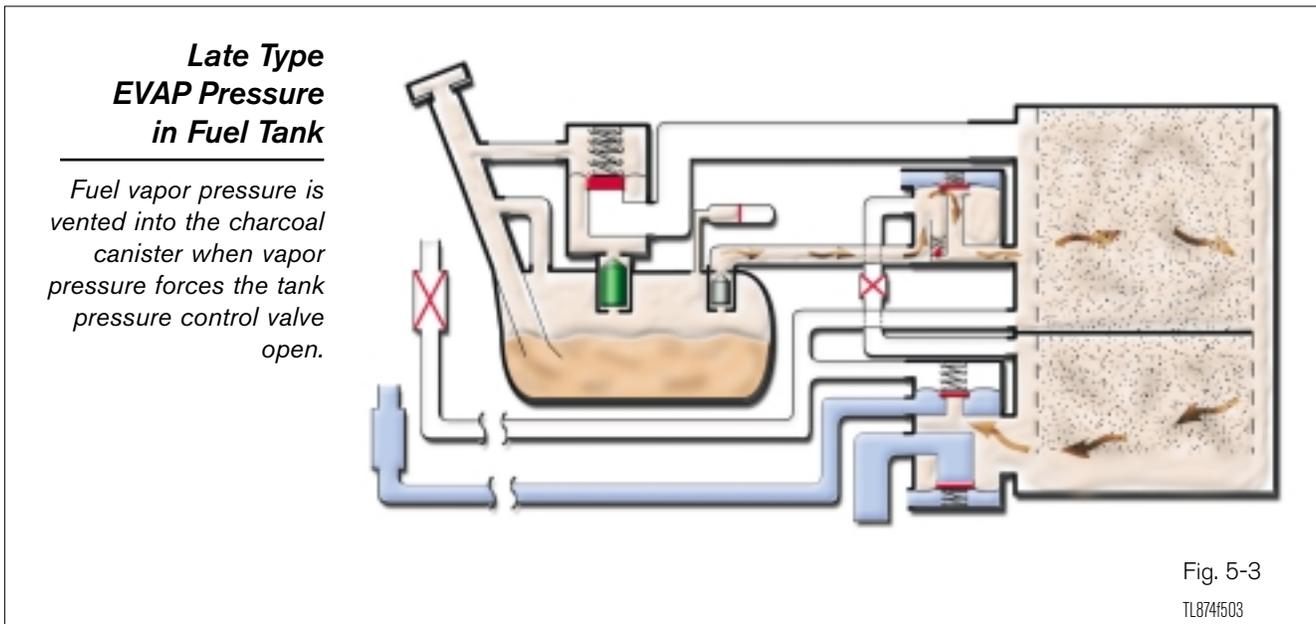
Usually, the customer is unaware of an EVAP system problem until the MIL illuminates. The customer needs to be aware that they must correctly install the fuel cap after refueling.

Check mode does not work for EVAP codes. Use the Readiness Test Confirmation procedure.

A common failure is a leak in the system, but restrictions will also set EVAP related DTCs.



Condition	Purge Port	Air Inlet Port	Tank Vacuum Ball Check	Tank Pressure Valve	ORVR Valve	Air Drain
VSV Purge Valve ON	OPEN (V)	OPEN (V)	CLOSED	CLOSED	CLOSED	CLOSED
VSV Purge Valve OFF	CLOSED (NV)	CLOSED (NV)	CLOSED	CLOSED	CLOSED	CLOSED
Pressure in Tank	CLOSED	CLOSED	CLOSED	OPEN	CLOSED	CLOSED
Vacuum in Tank			OPEN	CLOSED	CLOSED	CLOSED
Refill			CLOSED	CLOSED	OPEN	OPEN



**Late Type
EVAP Vacuum
in Fuel Tank**

Vacuum in the tank can be relieved by allowing air to enter through the charcoal canister or fuel tank cap.

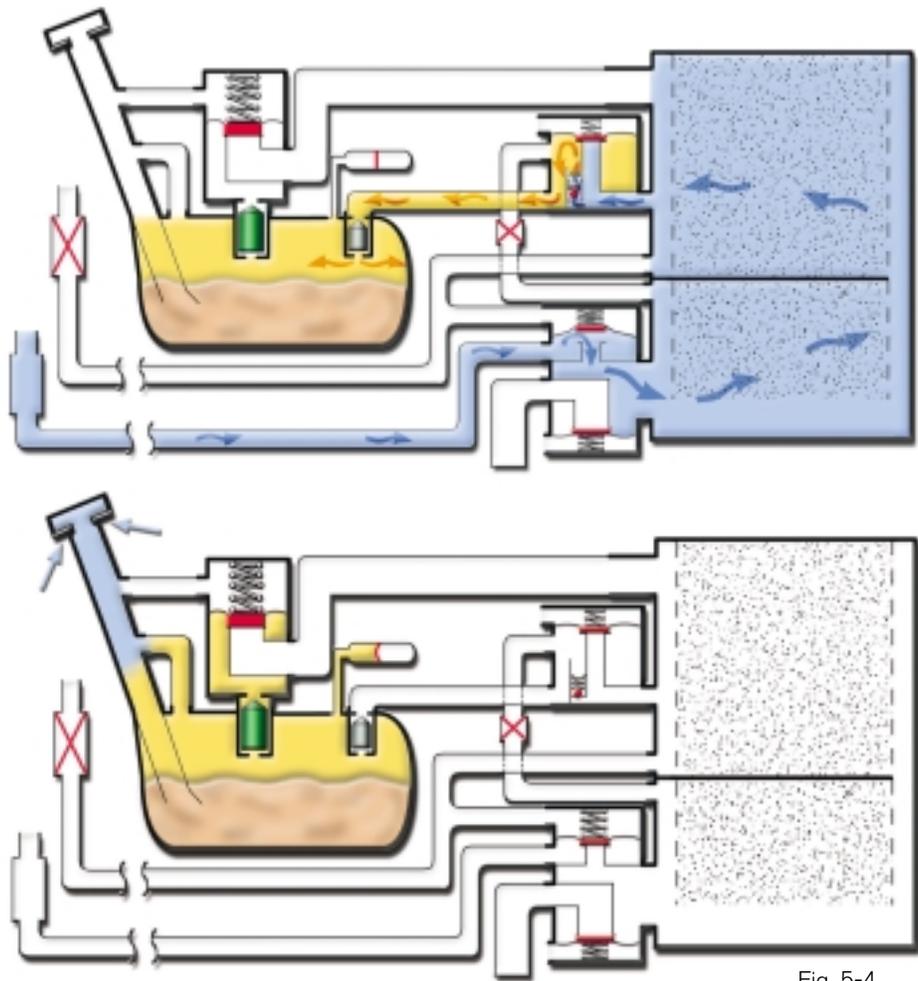


Fig. 5-4
TL874f504

**Late Type
EVAP Purge Mode**

During purge, vapors are drawn out of the canister and burned in the engine.

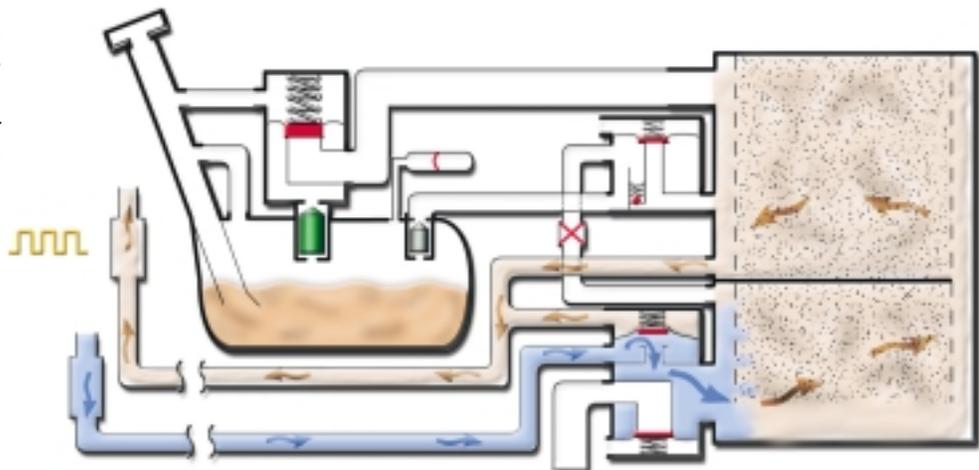


Fig. 5-5
TL874f505

Late Type EVAP ORVR Operation

During refueling, the differential pressure valve and air drain valve are open. Fuel vapors are absorbed by the charcoal canister and excess air is vented to the atmosphere.

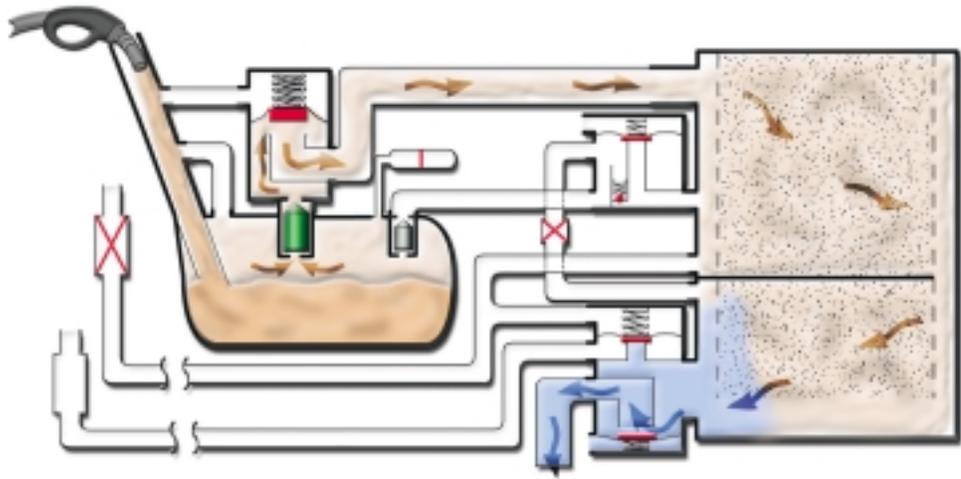


Fig. 5-6
TL874f506

Evaporative Systems Monitoring

Regulations require that the EVAP system be monitored for system performance and leak detection. Leaks, restrictions, and many components are checked by measuring the pressure of the EVAP system at various stages.

Early EVAP systems had to detect a 1mm (0.040 in.) hole and greater. It is often called the early type or non-intrusive system.

Beginning with 2000 model year, a new EVAP monitor system was implemented to meet the new, mandated standard of detecting a hole down to .5mm (0.020 in.). This new system is referred to as the Late Type or Intrusive Type. The intrusive system is being phased in.

In addition, the EVAP monitor has to monitor vapor purge and component performance. All EVAP monitor DTCs require two trips.

Early-Type (Non-Intrusive) Pressure Detection

The ECM relies on the VP sensor signal to accurately measure pressure in the EVAP system and the purge side of the charcoal canister. The changes in the pressures being measured are very small, often 15.5 mmHg (0.3 psi) or less. For the VP sensor to measure tank pressure and canister pressure, a three-way VSV is connected to the VP sensor, fuel tank and lines, and charcoal canister. When there is no power to the three-way VSV VP sensor, the VP sensor measures canister purge pressure. When the ECM turns on the VSV, the VP sensor measures fuel tank pressure.

Early Type EVAP Components

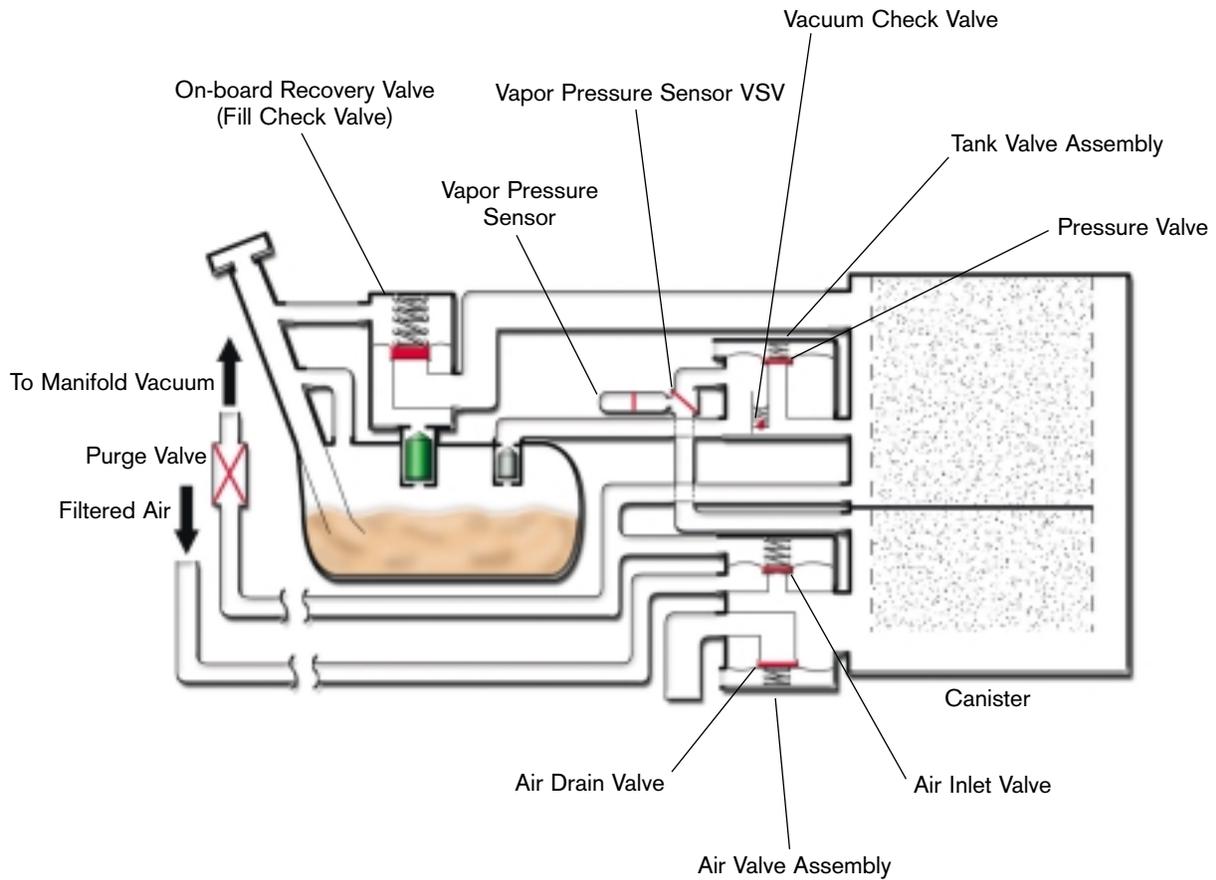


Fig. 5-7
TL874f507

EVAP Pressure Monitoring

The ECM tests for leaks by measuring EVAP system pressure in the lines, charcoal canister, and fuel tank. When the EVAP pressure is higher or lower than atmospheric pressure, the ECM concludes that no leaks are present. EVAP pressure is measured by the VP sensor. If either the tank or canister purge side is at atmospheric pressure under specific conditions, the ECM determines there is a leak.

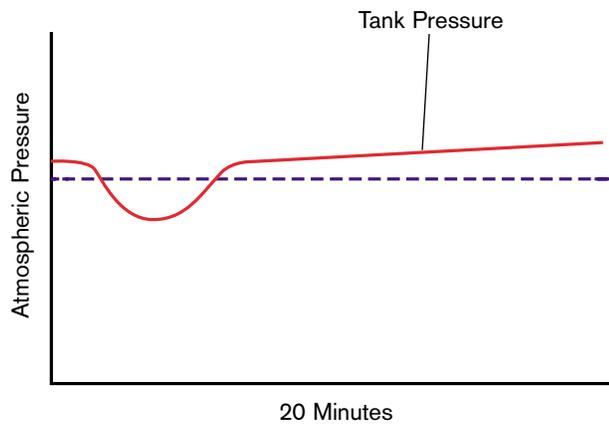


Fig. 5-8
TL874f508

HC Leak Detection - P0440, P0441, P0446

A leak can generate multiple DTCs depending on component and location. Refer to the Repair Manual for the proper sequence for diagnosing these DTCs.

The ECM tests for leaks by measuring EVAP system pressure in the lines, charcoal canister, and fuel tank. When the EVAP pressure is higher or lower than atmospheric pressure, the ECM concludes that no leaks are present. EVAP pressure is measured by the VP sensor. If either the tank or canister purge side is at atmospheric pressure under specific conditions, the ECM determines there is a leak.

The leak could be a filler cap not properly tightened, a hole in the lines, charcoal canister, or fuel tank. A visual inspection of the EVAP is performed for most EVAP diagnostic procedures. Inspection begins with the filler cap, hoses and tank.

The number of times the leak detection test is performed is determined by the regulations for that model year and test conditions. The monitor runs depending on engine temperature and vehicle operating conditions. If a leak is detected on two consecutive trips (providing the monitor ran and completed on each trip), the MIL is illuminated and a DTC is stored. **(For details for DTC(s) see P0440, P0441, & P0446)**

P0440: Evaporative Emission System Malfunction

If DTC P0440 is present, the leak is on the fuel tank side of the EVAP system. This also includes the lines between the fuel tank and part of the canister. When the VP sensor is measuring tank pressure, the ECM is observing changes in pressure and comparing tank pressure to atmospheric pressure. No difference in pressure indicates a leak. The ECM may take 20 minutes or more to complete testing the fuel tank side.

Evaporative Monitor P0440

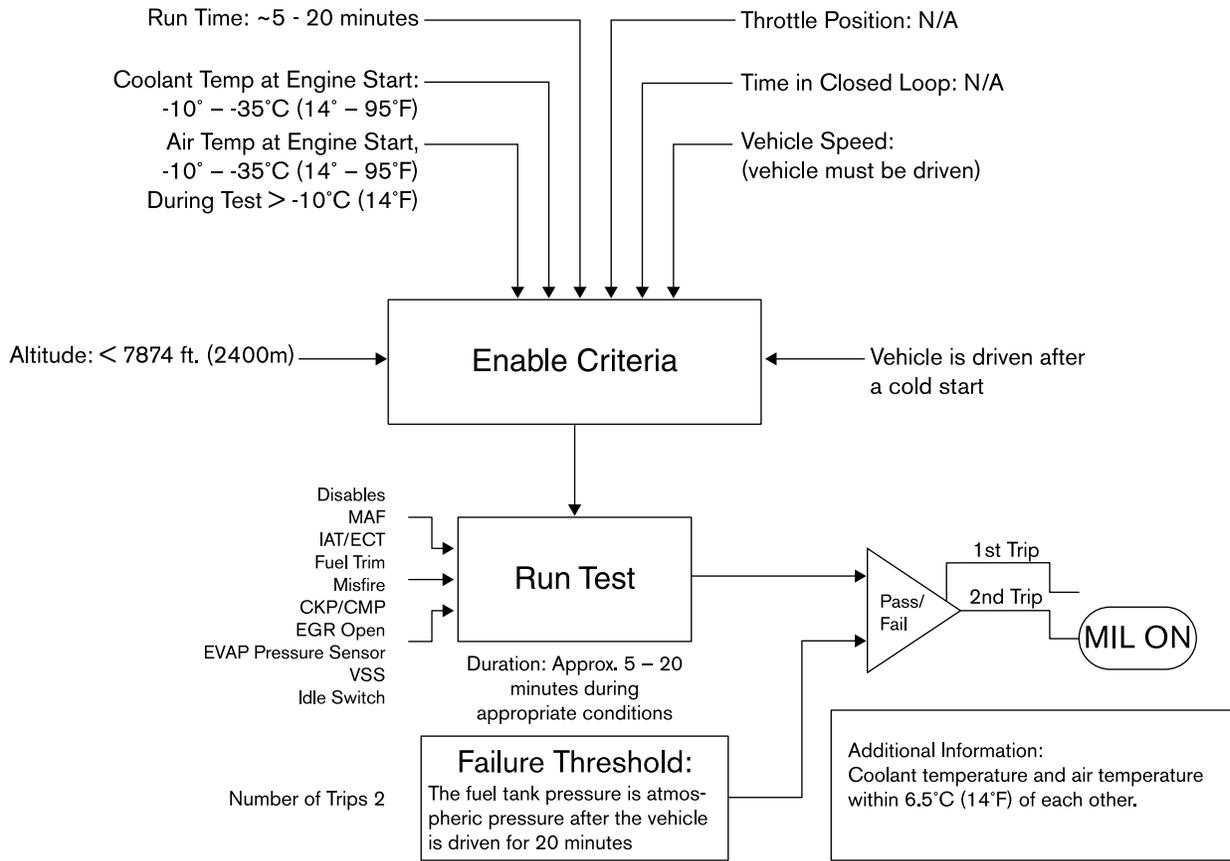


Fig. 5-9
TL874f509

Early Type EVAP Tank Side

If a leak is suspected, the shaded areas should be checked.

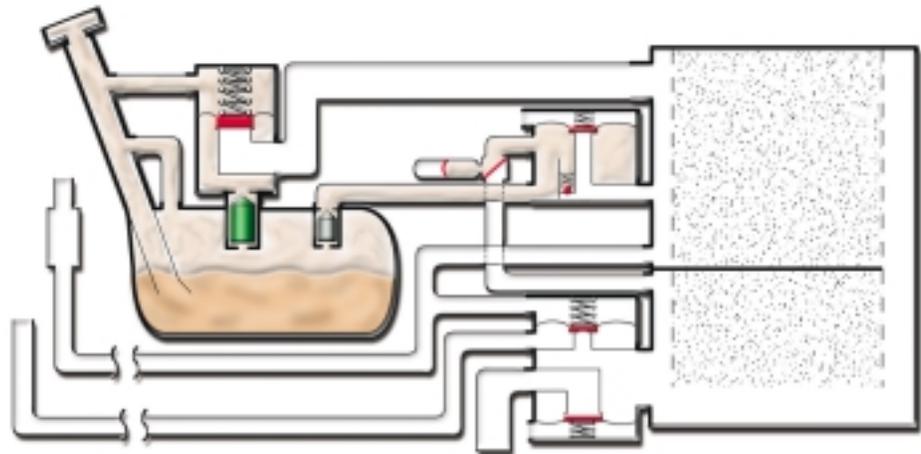


Fig. 5-10
TL874f510

P0441: Vapor Purge Flow Detection

- restricted vapor purge flow when the purge VSV is open
- inappropriate vapor purge flow when the purge VSV is closed
- under normal purge conditions, pressure pulsations generated by the cycling of the purge VSV are present in the canister and detected by the VP sensor

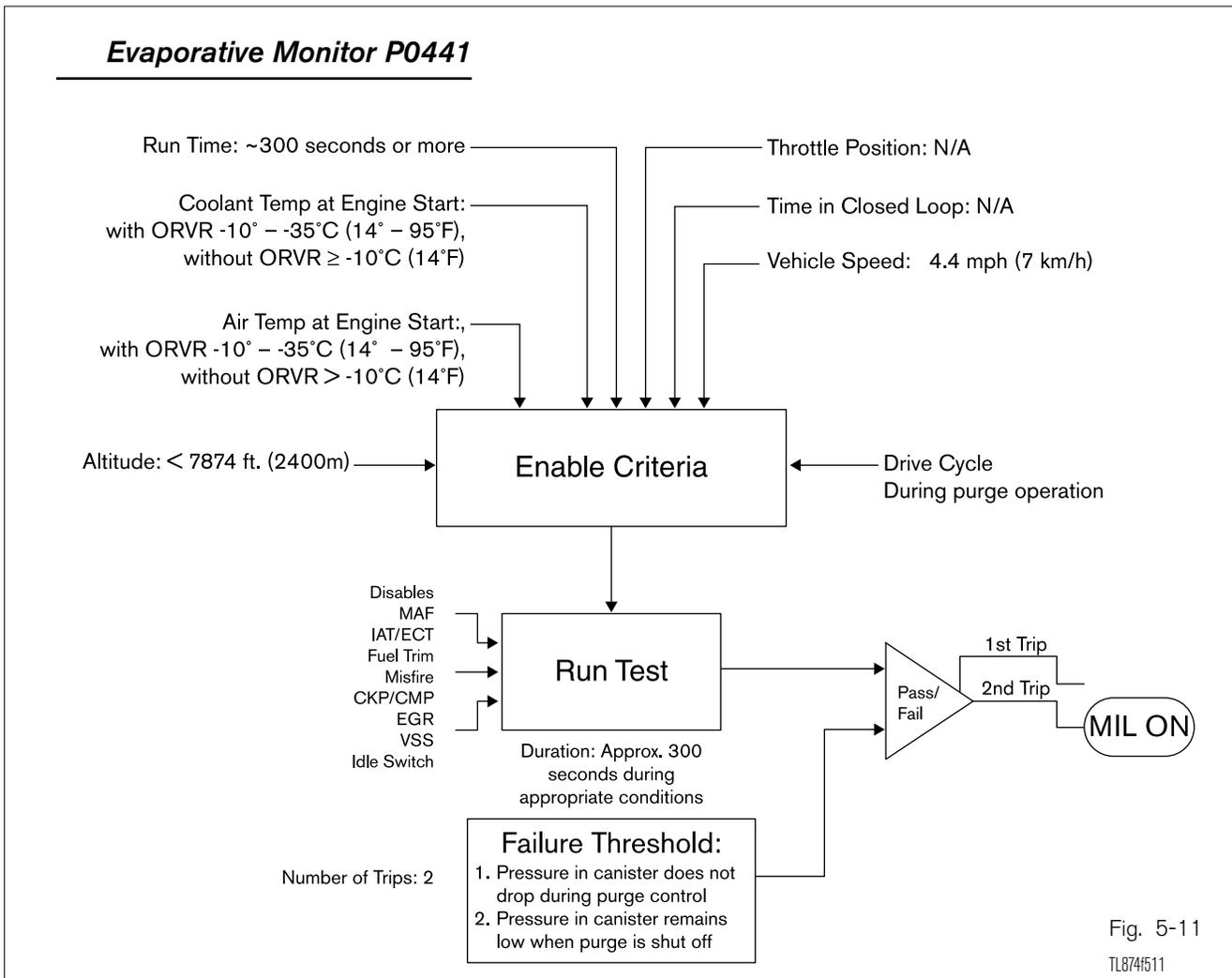


Fig. 5-11
TL874511

Restricted Vapor Purge Flow During purging under normal conditions, pressure pulsations are generated by the cycling of the purge VSV and canister pressure drops. If the VP sensor does NOT detect these pulsations and pressure drop in the canister, the ECM determines the EVAP system is not working. Possible causes are, the purge VSV is stuck closed, a restricted purge line, a hole or disconnected purge line.

Inappropriate Vapor Purge Flow If during starting the canister internal pressure is at atmospheric pressure, and immediately after starting the canister internal pressure drops to nearly intake manifold pressure (vacuum), the purge VSV is open when it should be closed.

Both vapor purge flow conditions set DTC P0441 and the technician must diagnose the system to find which condition is present.

NOTE DTC P0441 may indicate a leak. If the VP sensor does NOT detect a pressure drop when the purge control is turned on, a leak may be a possible cause; for example, a disconnected purge hose.

Early Type EVAP Vapor Purge Flow Detection

If a purge flow problem is suspected, check the shaded areas. The purge VSV should also be checked.

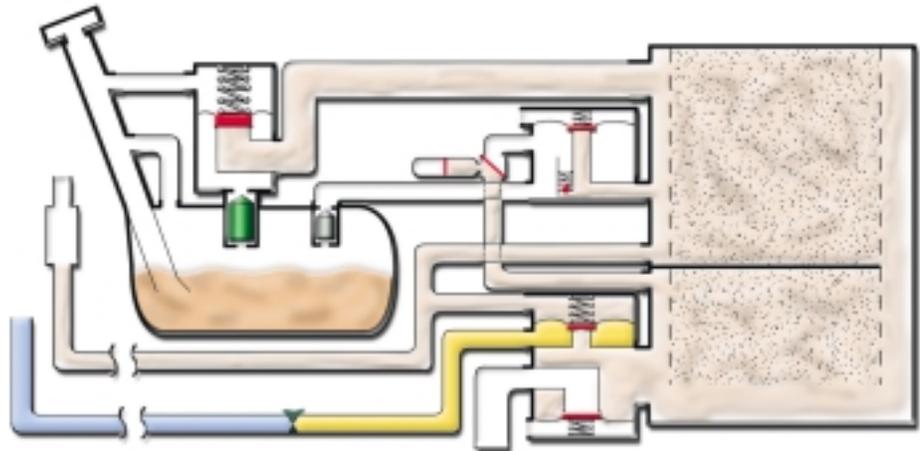


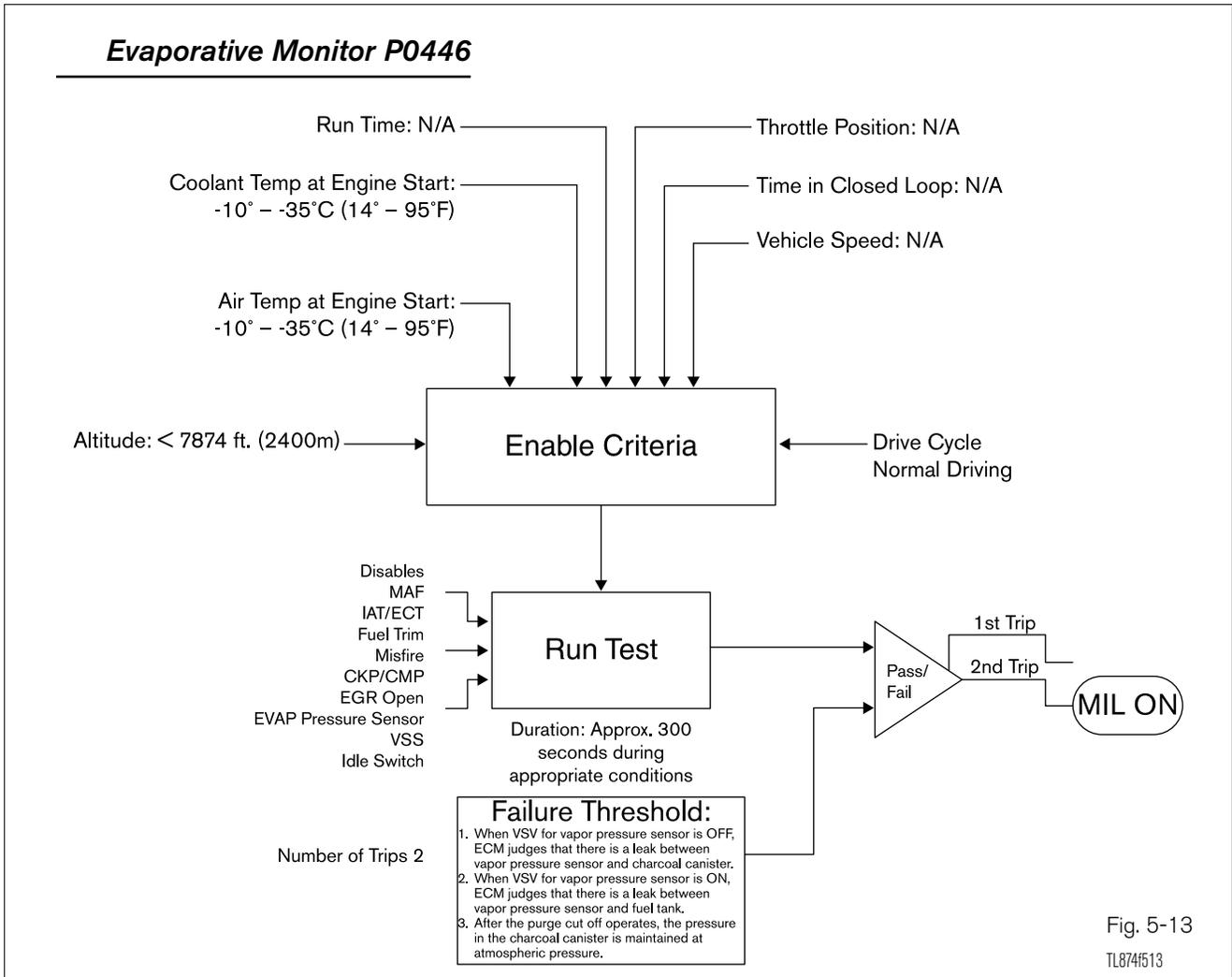
Fig. 5-12

TL874f512

P0446: Three-Way VSV If DTC P0446 is present, a leak present on the canister purge side may set this code.

NOTE

This code can also be set by a malfunctioning three-way VSV. If there is atmospheric pressure in the canister after the purge VSV is shut off, the ECM concludes there is a problem with the system.



Early Type EVAP Canister Leak Detection

If a leak is suspected in the canister, check the shaded areas.

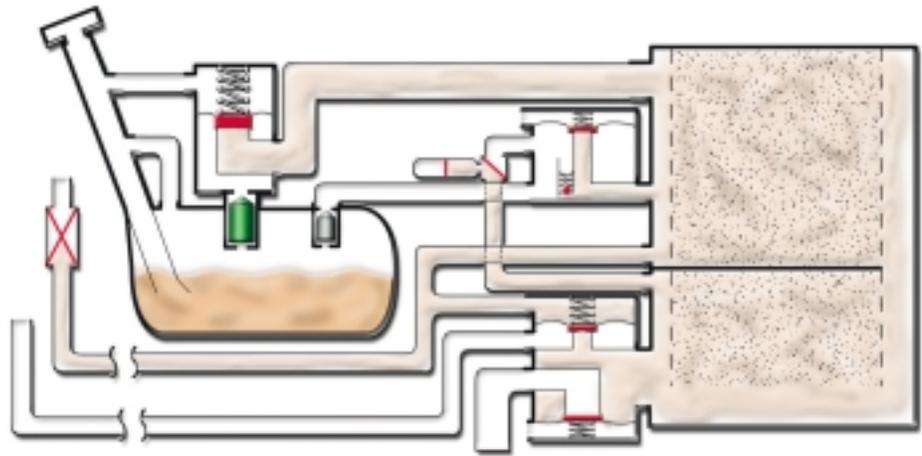


Fig. 5-14
TL874f514

The three-way VSV is connected to the VP sensor, canister, and fuel tank. This VSV allows the VP sensor to detect either canister or tank pressure.

There are two modes the ECM can use to determine if the three-way VSV is malfunctioning. The three-way VSV is judged to be normal if there is pressure difference between the tank and canister when the three-way VSV is switched.

If there isn't any pressure difference between the tank and canister, the ECM looks for the following conditions:

During purging, if pressure pulsations generated by the purge VSV are not present in the canister as detected by the VP sensor, the three-way VSV is judged to be defective.

If there are pressure pulsations detected by the VP sensor present in the fuel tank, the three-way VSV is judged to be defective.

The logic is that during purging, the VP sensor is supposed to be monitoring pressure pulsations in the canister. Because the VP sensor did not see pulsations in the canister but, in the tank during purging, the ECM concludes the three-way VSV did not switch.

Summary of Early Type Evaporative System DTC(s)

P0440: The fuel tank pressure is atmospheric pressure after the vehicle is driven for 20 minutes. (two trip detection logic)
Evaporative
Emission
Control System
Malfunction

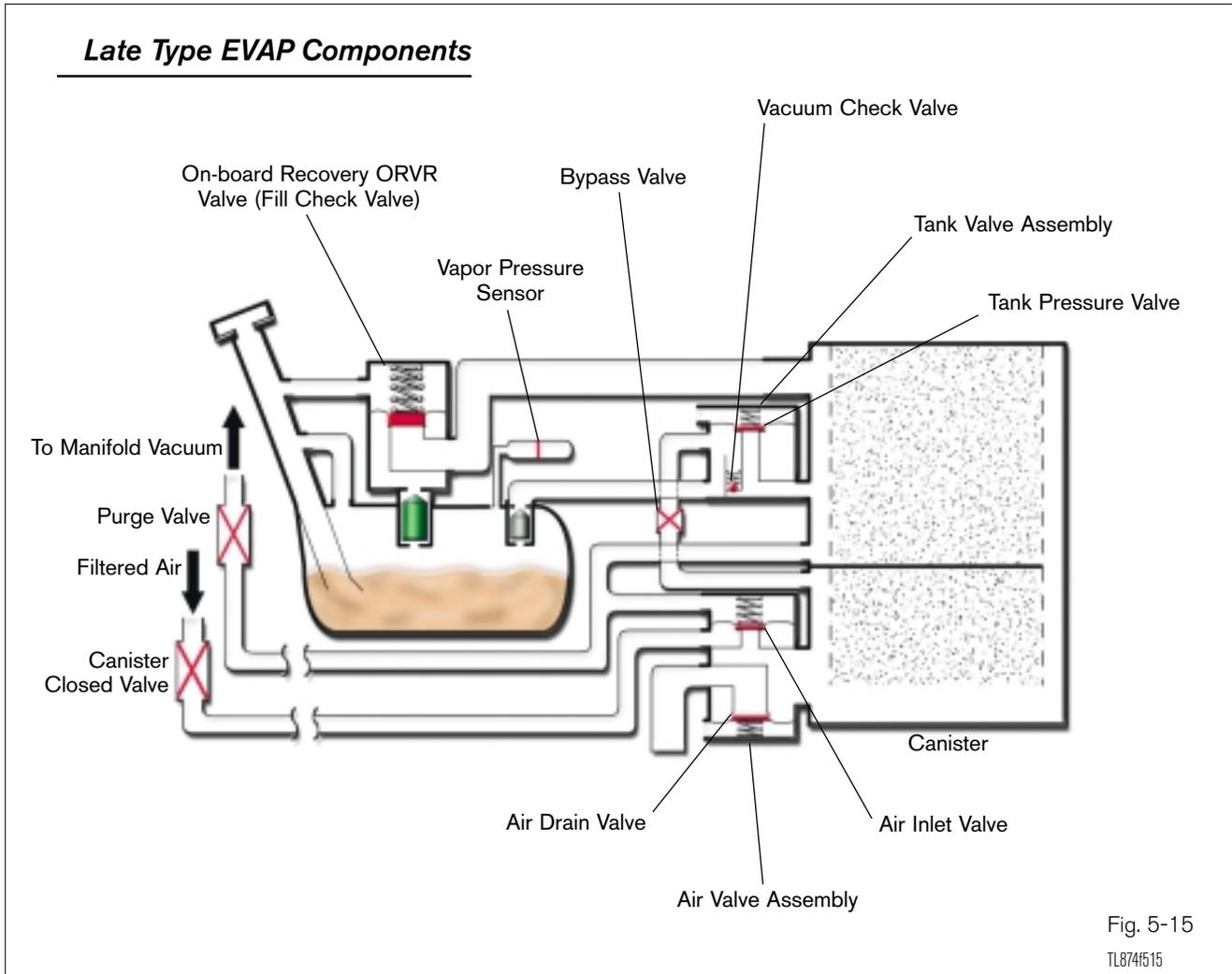
P0441: The pressure in the charcoal canister does not drop during purge control. (two trip detection logic)
Evaporative
Emission
Control System
Incorrect Purge
Flow
During purge cut-off, the pressure in the charcoal canister is very low compared with atmospheric pressure. (two trip detection logic)

P0446: When VSV for vapor pressure sensor is OFF, the ECM judges that there is a leak between the vapor pressure sensor and charcoal canister. (two trip detection logic)
Evaporative
Emission
Control System
Vent Control
Malfunction
When VSV for vapor pressure sensor is ON, ECM judges that there is a leak between the pressure sensor and fuel tank. (two trip detection logic)

After the purge cut off operates, the pressure in the charcoal canister is maintained at atmospheric pressure. (two trip detection logic)

NOTE

When diagnosing a P0446 DTC, check the Freeze Frame data. If the DTC sets at 0 mph, check for a hole in the canister. If a vehicle speed is recorded, check the 3-way VSV.



Late Type (Intrusive) Monitor System

The late type, also known as intrusive type, was developed to meet the very stringent, mandated standard of detecting a hole 5mm (0.020"). This system uses many of the same components as the early type. Purge, vacuum relief, pressure relief, and ORVR operations are identical to the early type. However, the following items have been changed:

The vapor pressure sensor is connected to the tank and is not switched to the canister.

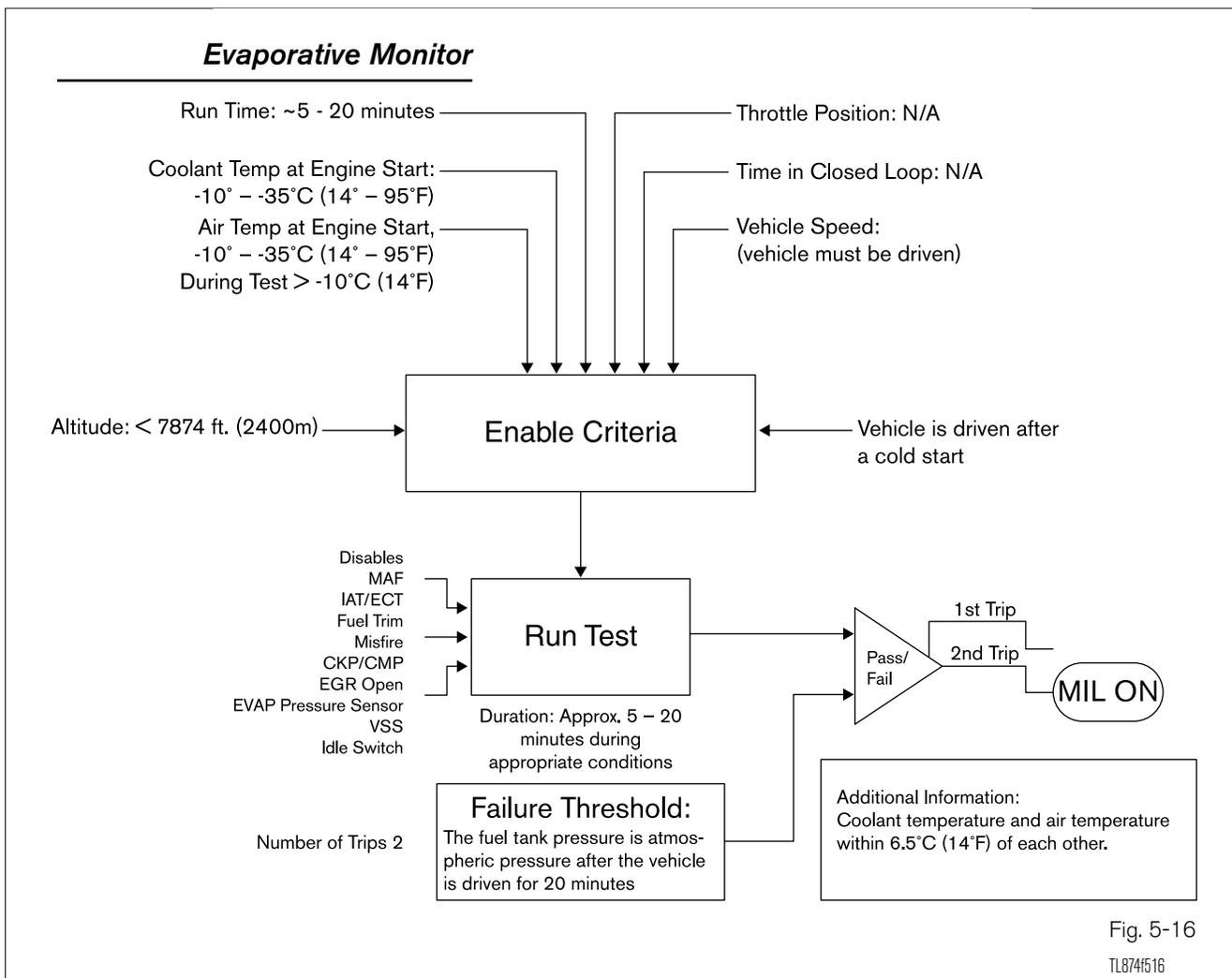
The three-way VSV has been replaced with a bypass VSV which connects the canister and tank during monitor operation.

A closed canister valve (CCV) has been added on the air inlet line allowing the system to be sealed.

The monitoring for leak detection is different. This system applies a very small vacuum to the EVAP system. The ECM determines if there is a problem in the system based on the vapor pressure sensor signal. All EVAP DTCs require two trips.

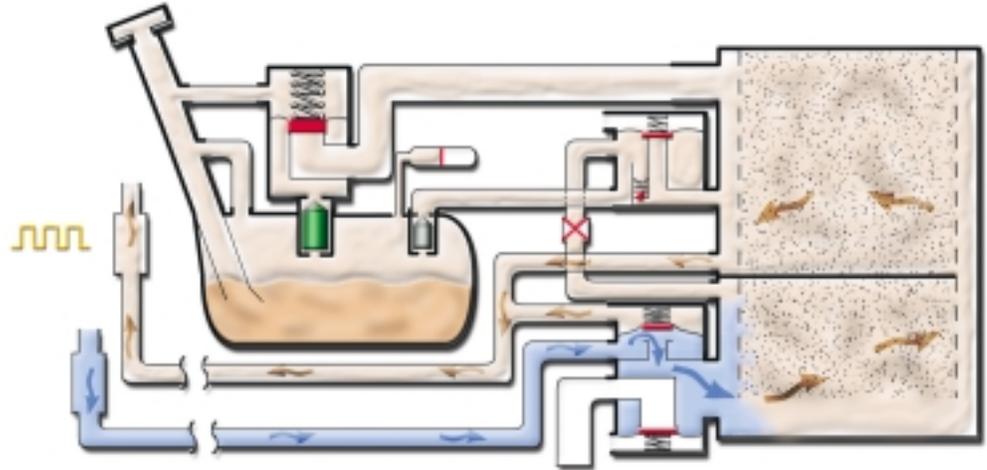
The following is a general overview of this monitoring system operation:

- The monitor sequence begins with a cold engine start. The IAT and ECT sensors must have approximately the same temperature reading.
- The ECM is constantly monitoring fuel tank pressure. As the temperature of the fuel increases, pressure slowly rises.
- The ECM will purge the charcoal canister at the appropriate time. With the bypass VSV closed, pressure will continue to rise in fuel tank.

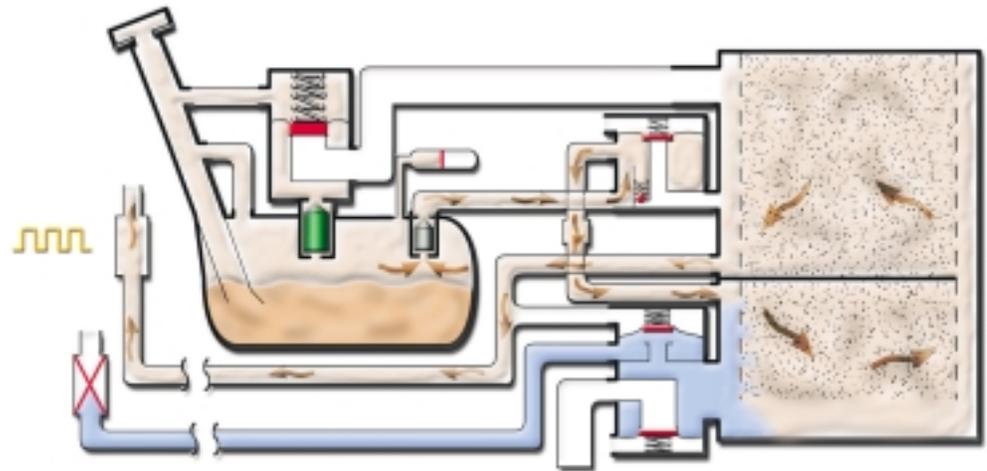


**Late Type
EVAP Monitor
Beginning Stages**

After a period of driving, 5-20 minutes, the ECM cycles the purge VSV.



Next, the ECM will close the CCV and open the bypass VSV while continuing to operate the purge VSV. This will lower the pressure in the EVAP system.



When the pressure reaches a predetermined point, the purge VSV is turned off and the valve is closed. At this point the ECM will begin to monitor for a leak by measuring the rate of pressure increase.

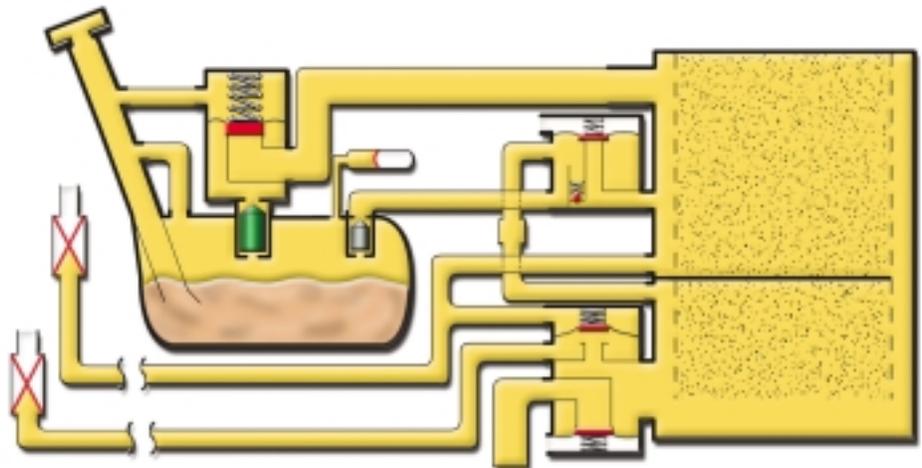


Fig. 5-17

TL8741517

P0441: Purge VSV Operation At a predetermined point, the ECM closes the CCV and opens the bypass VSV causing a pressure drop in the entire EVAP system.

The ECM continues to operate the purge valve until the pressure is lowered to a specified point at which time the ECM closes the purge valve.

If the pressure did not drop, or if the drop in pressure decreased beyond the specified limit, the ECM judges the purge VSV and related components to be faulty.

P0440 & P0442: HC Leak Detection The rate of pressure increase, as detected by the vapor pressure signal, indicates if there is a leak and if it is a large or small leak.

After purge valve operation, the purge VSV is turned off sealing the vacuum in the system and the ECM begins to monitor the pressure increase. Some increase in pressure is normal. A very rapid, sharp increase in pressure indicates a leak in the EVAP system and sets the DTC P0440.

This monitoring method is also able to distinguish what is called the small leak detection. A pressure rise just above normal indicates a very small hole.

CCV Operation

The CCV is commanded open by the ECM. The vapor pressure sensor will measure a rapid pressure increase.

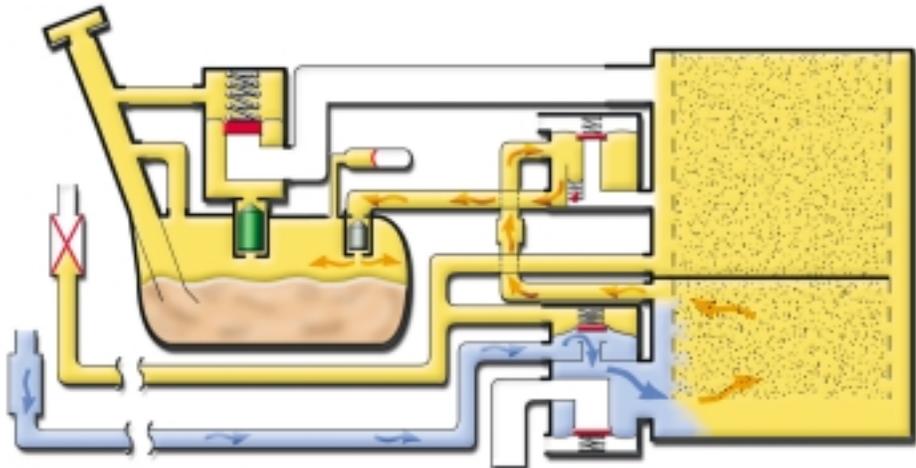
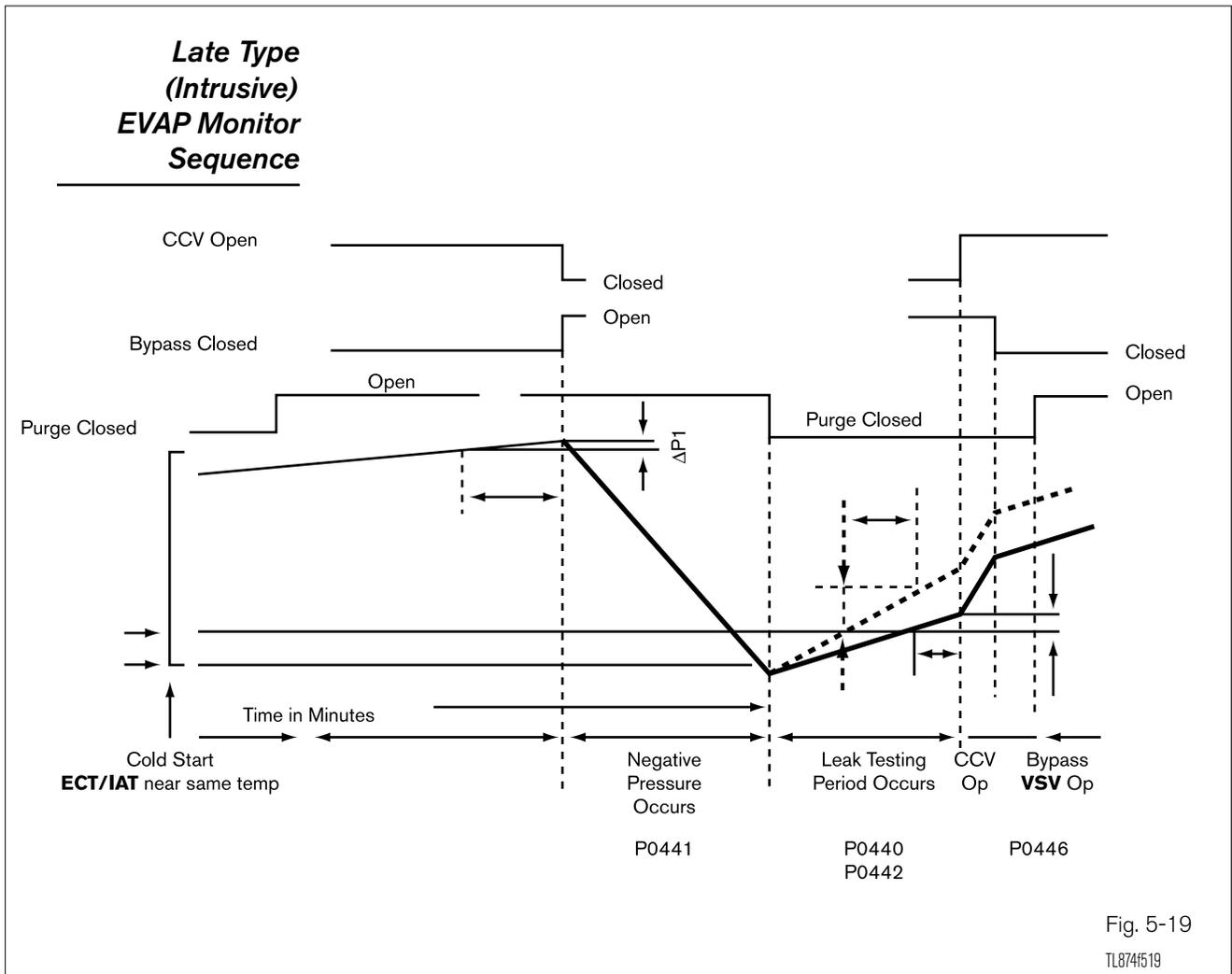


Fig. 5-18
TL874f518

P0446: This stage checks the CCV and vent (air inlet side) operation. When the Vent Control, CCV Operation and Bypass VSV Operation Pressure will increase rapidly because of the air allowed into the system. No increase or an increase below specified rate of pressure increase indicates a restriction on the air inlet side.

In the next stage, the ECM closes the bypass VSV. This action blocks air entering the tank side of the system. The pressure rise is no longer as great. If there was no change in pressure, the ECM will conclude the bypass VSV did not close.



P0450 & P0451: These two DTCs indicate a faulty VP sensor or circuit on Early and Late type EVAP systems. These DTCs are not set instantly, for the ECM measures VP sensor signal under a variety of conditions and may require the EVAP monitor to complete. Both DTCs require two trips.

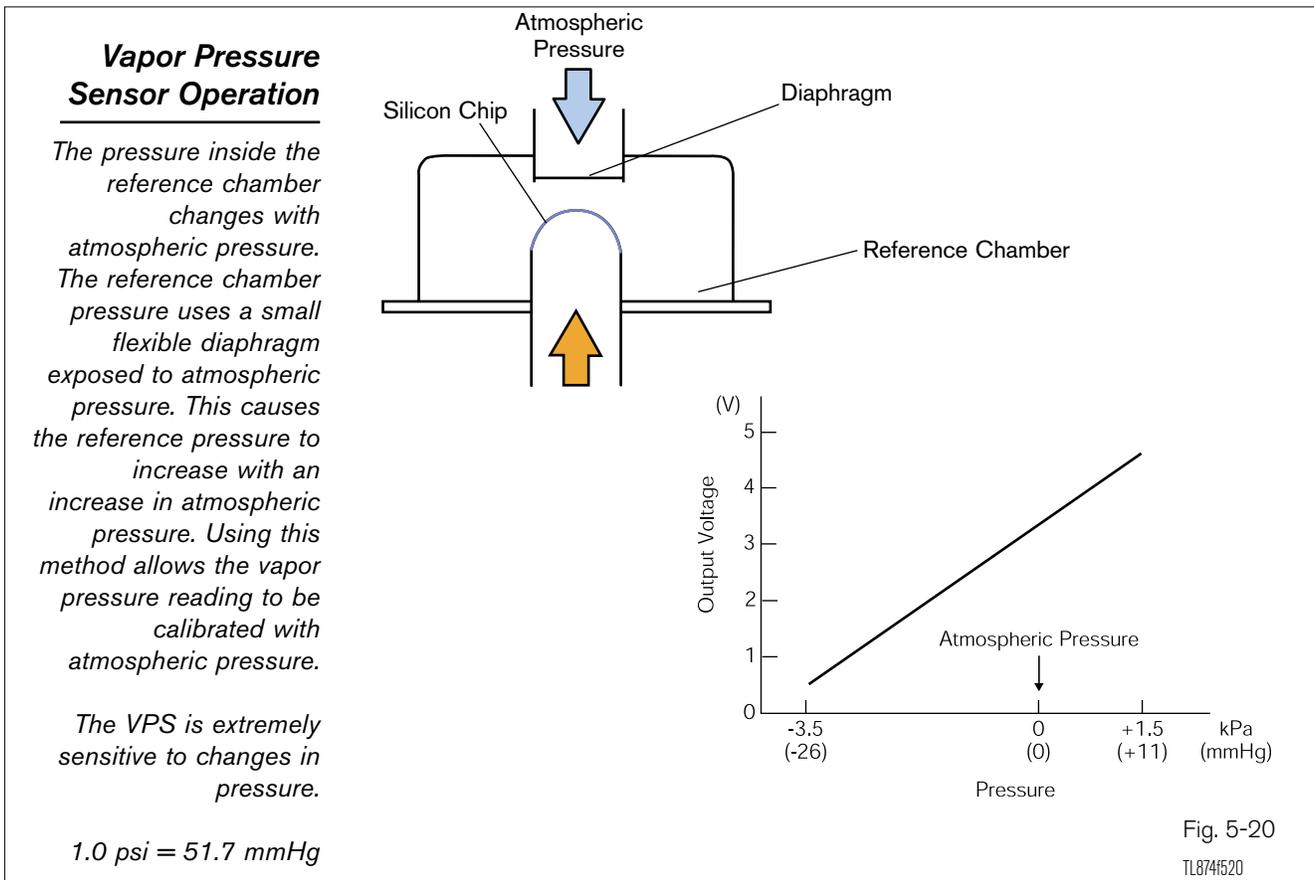
To set DTC P0450, after starting, the ECM monitors the VP sensor for 10 seconds. If the VP sensor measures over 4.5V or under 0.5V for at least 7 seconds of the 10 seconds after starting in both the canister and tank, the VP sensor is judged to have failed.

For DTC P0451, after 10 seconds, the voltage criteria is 4.9V and 0.10V. If the VP sensor exceeds these specifications for over 7 seconds, the VP sensor is judged as faulty. Within a 10 seconds period, between 5 to 15 seconds after stopping the vehicle, the tank pressure is monitored. If the VP sensor output fluctuates beyond the programmed specifications, the VP sensor is judged to have failed. For example, 3.83V (+5 mmHg) and 2.77V (-5 mmHg) have occurred more than 7 times within the 10 seconds period.

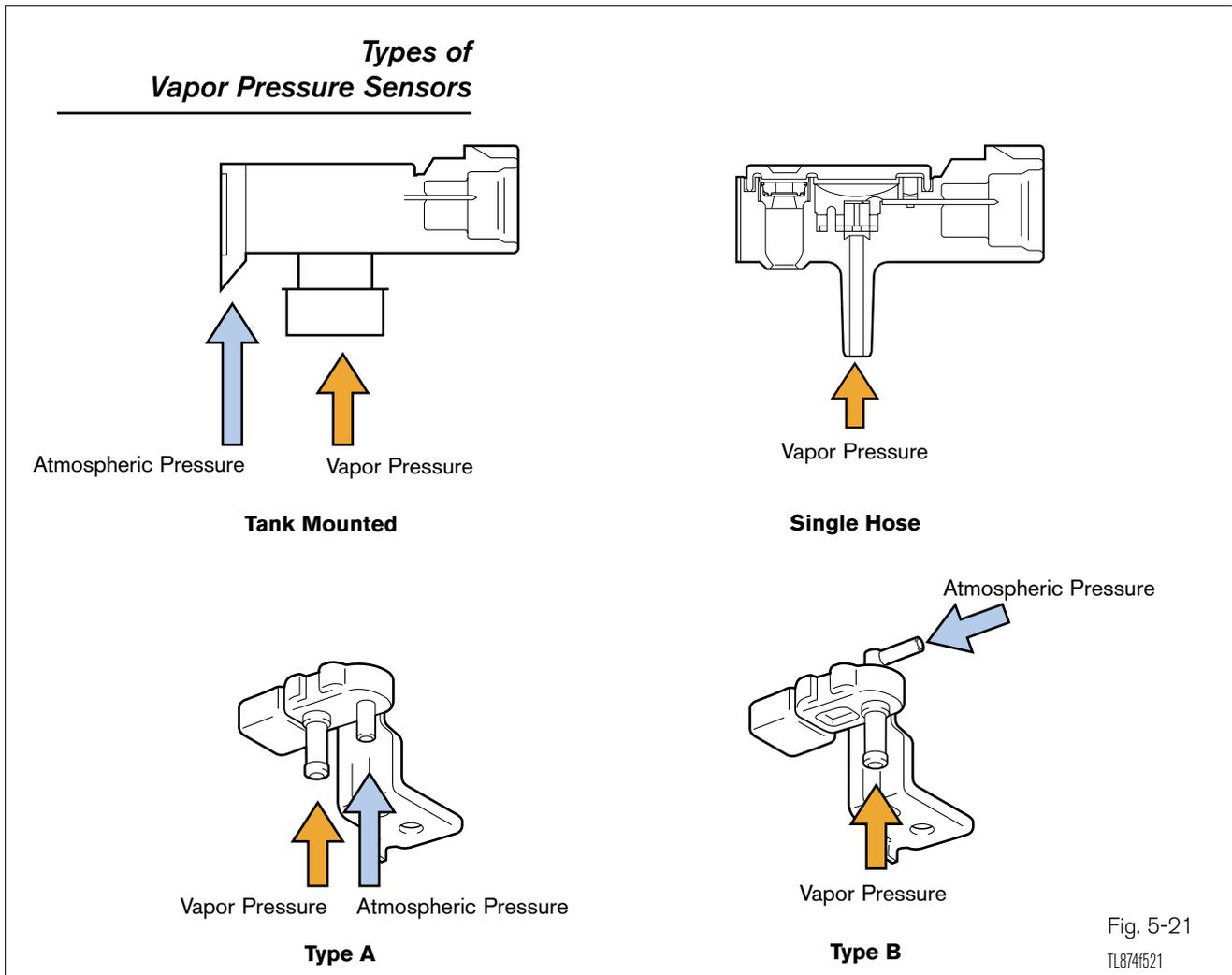
Vapor Pressure Sensor Circuit

Though there are different styles of vapor pressure sensors, they use the same style circuit.

The Vapor Pressure Sensor (VPS) measures the vapor pressure in the evaporative emission control system. The vapor pressure sensor may be located on the fuel tank, near the charcoal canister assembly or in a remote location.



This sensor uses a silicon chip with a calibrated reference pressure on one side of the chip. The other side of the chip is exposed to vapor pressure. Changes in vapor pressure cause the chip to flex and vary the voltage signal to the ECM. The voltage signal out depends on the difference between atmospheric pressure and vapor pressure. As vapor pressure increases, the voltage signal increases. This sensor is sensitive to very small pressure changes (1.0 psi = 51.7 mmHg).



Vapor Pressure Sensors come in a variety of configurations. When the VPS is mounted directly on the fuel pump assembly, no hoses are required. For remote locations, there may be one or two hoses connected to the VPS. If the VPS uses one hose, the hose is connected to vapor pressure. In the two hose configuration, one hose is connected to vapor pressure, the other hose to atmospheric pressure. It is important that these hoses are connected to the proper port. If they are reversed, DTCs will set.

VPS
Electrical Circuit

The ECM receives this voltage signal at the PTNK terminal. This sensor receives 5 volts from the ECM on the VC line. The ground for the sensor is through a ground wire to the ECM (usually terminal E2).

The PTNK signal will be 5 volts if the PTNK wire is disconnected.

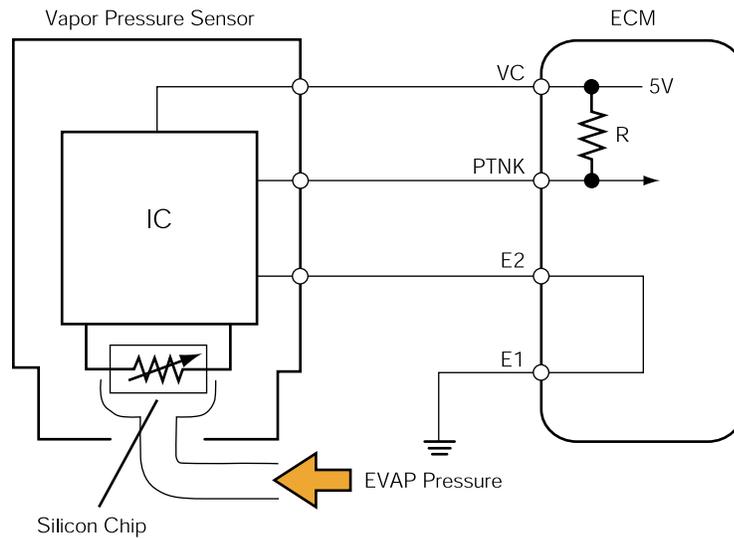


Fig. 5-22
TL8741502

VPS Diagnosis

Check all hoses for proper connection, restrictions, and leaks. Check the VC and E2 voltages. Apply the specified pressure and read sensor voltage output. The vapor pressure sensor is calibrated for the pressures found in the EVAP system, so apply only the specified amount to prevent damaging the sensor.

NOTE

Check the Freeze Frame data. Typically, when ENGINE RUN TIME is less than 200 seconds, carefully check the Vapor Pressure Sensor.

P0450 Evaporative Emission Control System Pressure Sensor Malfunction

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Up to 10 sec. after engine has started	Vapor Pressure Sensor > -3.5kPa (-26 mmHg, -1.0 in. Hg) for 7 sec. or more OR Vapor Pressure Sensor ≥ 2.0kPa (15 mmHg, 0.6 in. Hg) for 7 sec. or more	2	

P0451 Evaporative Emission Control System Pressure Sensor Range Performance

ENABLING STRATEGY	DETECTING CONDITION	TRIP(S)	ECM STRATEGY
Vehicle Speed 0 mph (0 km/h) Engine Speed Idling VSV for Vapor Pressure Sensor is ON	Vapor Pressure Sensor output changes extremely	2	
10 sec. or more after the engine has started	Vapor Pressure Sensor > -4.0kPa (-30 mmHg, -1.2 in. Hg) for 7 sec. or more OR Vapor Pressure Sensor ≥ 2.0kPa (15 mmHg, 0.6 in. Hg) for 7 sec. or more	2	

EVAP Diagnostic Tools and Procedures

The common tools for diagnosis are the Diagnostic Tester and Pressure tool. Procedures will vary with application. The worksheet attached to this section will provide you with a general procedure.

The nature of the EVAP system makes it difficult to confirm the repair. Please refer to the Readiness Confirmation Test.

It is recommended that during a visual inspection, do not wiggle hoses or tighten fittings and caps until the system has been pressurized.

NOTE

When the Intrusive EVAP system is pressurized through the service port, the EVAP system is pressurized EXCEPT for the fresh air intake line between the CCV and canister. The CCV and intake line must be pressurized separately to check for a leak.



Notes



WORKSHEET 5-1

EVAP Leak Test Confirmation - Intrusive Test

Vehicle	Year/Prod. Date	Engine	Transmission

Worksheet Objectives

This worksheet will guide you in testing and confirming if there is a leak in the Intrusive EVAP system. It will also show you how to isolate the canister side from the tank side.

Tools and Equipment

- Vehicle
- Vehicle Repair Manual, EWD, & NCF
- Diagnostic Tester
- Hand Tools, Fender Covers, Floor Mats, and Shop Towels
- DVOM
- Test leads

Section 1: Setup and Test

1. On a vehicle selected by the instructor, connect the Diagnostic Tester to the vehicle.
2. DIAGNOSTIC TESTER SETUP: Go to setup menu on the tester and select UNIT CONVERSION.
3. Under VAPOR PRESSURE, select ABS for absolute pressure, and mmHg for millimeters of mercury. This is to match RM specs.
4. Go back to FUNCTION SELECT and select ENHANCED OBD II.
5. Turn the ignition key to ON.
6. Using a test lead, ground the Closed Canister Valve (CCV) at the ECM and listen for a clicking sound at the CCV.

Did the CCV "click"?

DO NOT REMOVE the test lead.

7. Using a test lead, ground the Bypass (Pressure Switching Valve) VSV (TBP) at the ECM and listen for a clicking sound at Bypass VSV.

Did the Bypass VSV "click"?

DO NOT REMOVE the test lead.

8. What will grounding the CCV and Bypass VSV do to these valves and what does it verify?
-
-

9. Connect the + lead of a DVOM to the Vapor Pressure Sensor pin at the ECM, the - lead to ground E2.

10. Start the engine, activate the EVAP (Purge) VSV. Observe the vapor pressure reading and DVOM. Pressure should drop to approximately 740mmHg or 1.2 volts (this will vary with altitude and condition of system). Turn OFF or disconnect EVAP (Purge) VSV.

11. Observe the Vapor Pressure Sensor and DVOM. How long should the EVAP system maintain a vacuum?
-

12. What is the condition of the system?
-

13. Create a small leak by opening the gas cap, or at another point as directed by the instructor. Observe DT and DVOM.

14. What happened to the DT Vapor Pressure Sensor reading and DVOM readings? Which reacted faster?
-

15. Is the vacuum test more useful for locating a leak or verifying a leak exists?
-

16. What DTC(s) are likely to be reported if there is a leak?
-

17. Restore vehicle to normal condition.

EVAP Leak Test Confirmation - Intrusive Test

Name: _____ Date: _____

Review this sheet as you are doing the worksheet. Check each category after completing the worksheet and instructor presentation. Ask the instructor if you have questions. The comments section is for you to write where to find the information, questions, etc.

I have questions

I know I can

Topic			Comment
Locate components using the EWD and RM			
Find wire colors, pin numbers using the EWD and RM			
Set the conditions for the test			
Determine if the EVAP system is leaking			



Notes



WORKSHEET 5-2 EVAP System Test - Intrusive Type

Vehicle	Year/Prod. Date	Engine	Transmission
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Worksheet Objectives

In this worksheet, you will use the Diagnostic Tester and EVAP Pressure Tester (Miller) to test system integrity and determine the condition of the EVAP system and components. When finished, you will know how to diagnose the EVAP system and components.

Tools and Equipment

- Repair Manual
- Vehicle EWD
- EVAP Pressure Tester
- Diagnostic Tester
- DVOM
- Hand Tool Set

Note: Fuel Level should be 1/4 to 3/4 of the tank.

SECTION 1: DIAGNOSTIC TESTER SETUP

1. Go to setup menu on the Diagnostic Tester and select UNIT CONVERSION.
2. Under VAPOR PRESSURE, select ABS for absolute pressure, and mmHg for millimeters of mercury. This is to match RM specs.
3. Go back to FUNCTION SELECT and select ENHANCED OBD II.

SECTION 2: EVAP SYSTEM

1. Setup the Diagnostic Tester as outlined above.
2. With the **key on and engine off**, record Tank Vapor Pressure reading _____mmHg. What does a reading above or below atmospheric pressure (**762 mmHg**) indicate?

Note: DO NOT TIGHTEN or REMOVE the FUEL CAP!

Test EVAP Purge Line/Check Purge VSV

This procedure tests for purge flow restrictions, and checks the purge VSV and EVAP purge line connections. This is done to confirm the operation of these components.

1. Connect EVAP System Pressure Pump to EVAP service port.
 - Set pump hold switch to CLOSE.
 - Set vent switch to CLOSE.
2. Using the Diagnostic Tester, go to ACTIVE TEST, EVAP (Purge) VSV test.
3. Start the engine. With engine warm @ idle, activate EVAP VSV.
4. Pump gauge should read between - 9 mmHg to - 499 mmHg (-5" H2O to -268" H2O) with the needle fluctuating. Name two causes for the needle not to fluctuate.

5. What DTC(s) are possible if the Purge VSV does not operate correctly? (HINT: See monitor sequence)

6. From air cleaner side, temporarily plug the air inlet line. Pressure should decrease by -10mmHg (- 5" H2O) or more.

7. If pressure did not decrease, list two causes.

Note: When both gauge valves are in the CLOSE position, the pump cannot pressurize the system. The gauge measures the pressure in the EVAP system.

Pressurize System (System Integrity Check)

This test checks for leaks in the canister and fuel tank sides by pressurizing the system. When the system is pressurized, it allows you to locate the source of a leak. The CCV and Air Inlet Line are checked separately.

Proceduce	Resultls
<p>1. Clamp air drain hose with supplied hose pliers.</p> <p style="text-align: center;">↓</p> <p>2. Locate the Vapor Pressure Sensor. If the sensor has two hoses connected to it, disconnect the hose between the air drain and the sensor and plug the air drain hose. See Figure 1.</p> <p style="text-align: center;">↓</p> <p>3. Pressurize EVAP system. Turn off the pump and seal system (see pump directions).</p> <p style="text-align: center;">↓</p> <p>4. Note pump pressure reading and Vapor Pressure Sensor reading.</p> <p style="text-align: center;">↓</p> <p>5. Compare your readings to one of the four results listed in the right column. Your vehicle had result number _____.</p> <p>6. Next, in the right column, list a probable reason or area that can cause each result.</p>	<p>Condition 1. Pump gauge and vapor pressure above atmospheric pressure. This indicates:</p> <p>2. Pump pressure gauge zero, vapor pressure above atmospheric pressure (above 762 mmHg). This indicates:</p> <p>3. Pump pressure gauge is above atmospheric pressure (above zero), vapor pressure is at 762 mmHg. This indicates:</p> <p>4. Pump pressure gauge at zero, vapor pressure is at 762 mmHg. This indicates:</p>

What DTC(s) are likely to set if there is a leak?

After completing the steps above proceed to checking the CCV and air inlet line. This must be done because this section is not pressurized when the pump pressurizes the system through the service port.

Check CCV and Air Inlet Line

This test checks for leaks and restrictions between the canister and CCV; tests CCV operation.

1. Disconnect the air inlet line at the canister.
 2. Connect pump to line.
 3. Go to ACTIVE TEST, turn on the CCV.
 4. Pressurize line, turn pump off. Pressure should hold. If not, check line and CCV.
 5. Turn off the CCV, pressure should decrease.
 6. Reconnect line.
 7. What DTC(s) are possible if the CCV fails?
-

Check Bypass (Pressure Switching Valve) VSV Operation

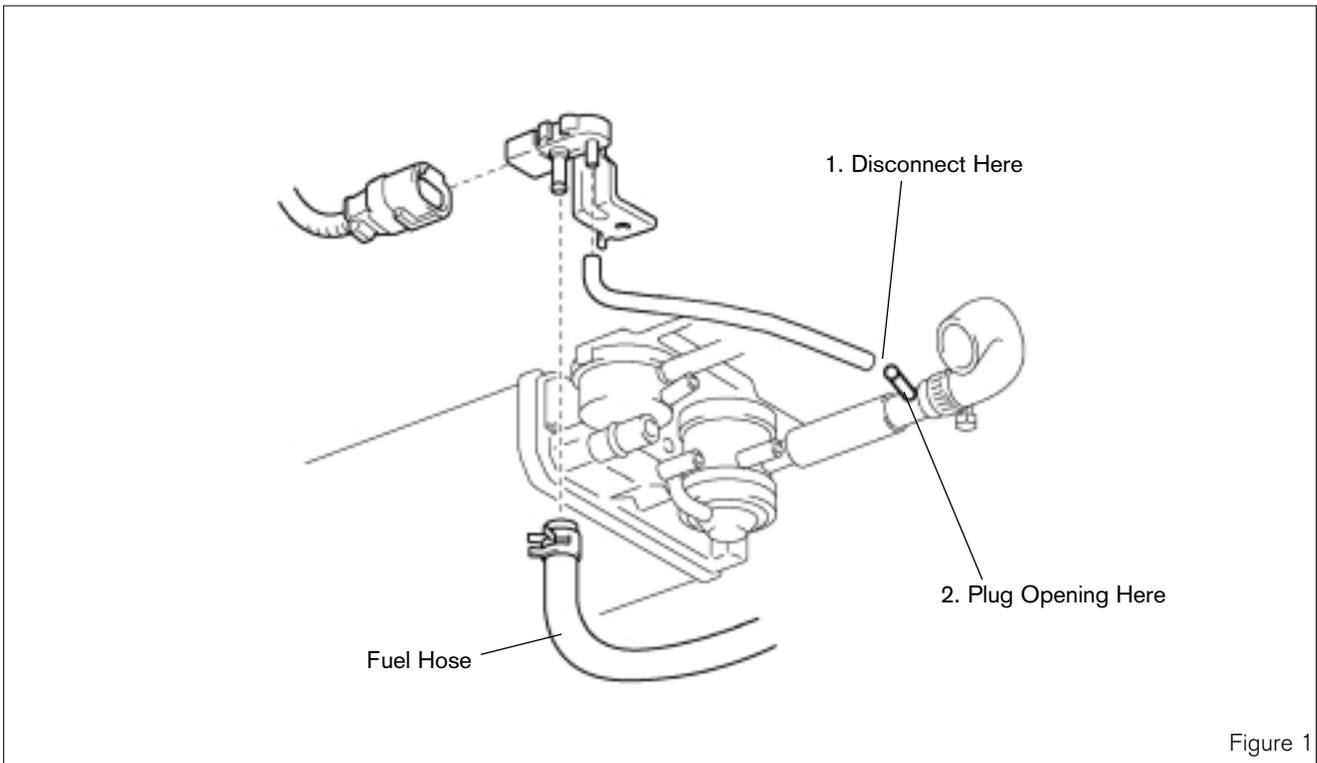
This tests the Bypass VSV for operation and restrictions.

1. Disconnect Bypass VSV lines from canister.
 2. Connect pump to one Bypass VSV line.
 3. Go to ACTIVE TEST BYPASS VSV.
 4. Pressurize Bypass VSV, Turn Pump off.
 5. Pressure should hold at this point. If not, what needs to be checked?
-
6. Turn Bypass VSV on, pressure should drop. If not, what component should be checked first?
-
7. Reconnect lines.
 8. What DTC(s) are possible if the Bypass VSV fails?
-

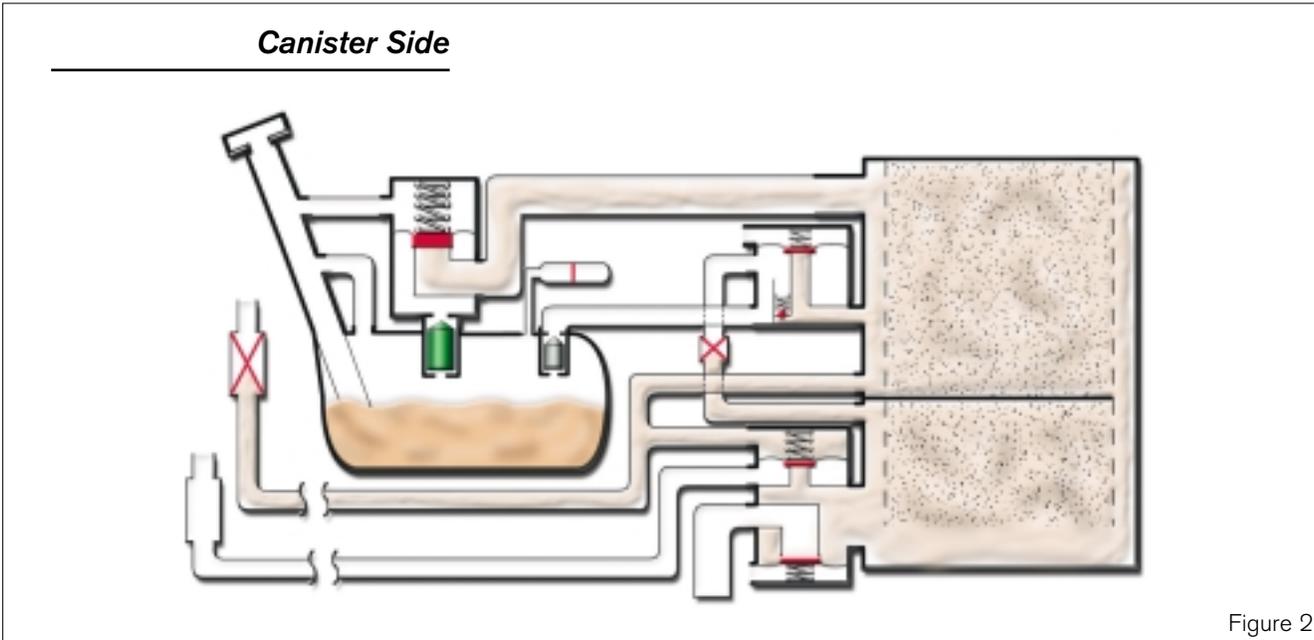
Return Vehicle to Service

1. After repairs, pressurize the EVAP system to be sure the system does not leak.
2. Remove clamp from air drain. Remove the plug and connect the Vapor Pressure Sensor hose.
3. Enable EVAP monitor according to Readiness Test Confirmation procedure.

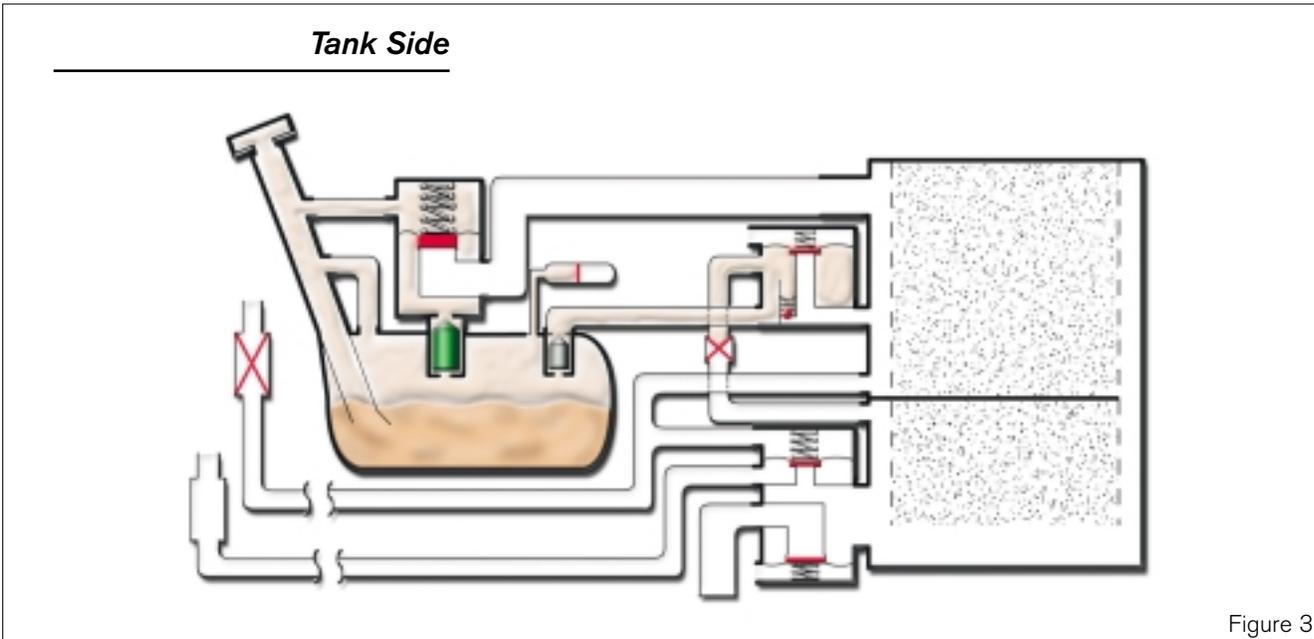
Vapor pressure sensor with two hoses - preparation for leak testing



Areas to Check for Leaks



1. Check shaded areas for leaks (soapy water detection).



1. Disconnect the EVAP hose from the charcoal canister side and then pressurize the fuel tank to 30 mmHg (4 kPa/0.58psi).
2. Check that the internal pressure of the tank can hold for 1 minute. Check shaded areas for leaks (soapy water detection). If it does, check the canister side.
3. With system pressurized, check shaded areas for leaks (soapy water detection). Inspect fuel tank cap for leaks and if it is OEM.

EVAP System Test - Intrusive Type

Name: _____ Date: _____

Review this sheet as you are doing the worksheet. Check each category after completing the worksheet and instructor presentation. Ask the instructor if you have questions. The comments section is for you to write where to find the information, questions, etc.

I have questions

I know I can

Topic			Comment
Locate components using the EWD and RM			
Find wire colors, pin numbers using the EWD and RM			
Set the conditions for the test			
Determine if the EVAP system is leaking			
Set the conditions for the test and operate the EVAP pressure tester			
Determine if EVAP system purge operation is normal			
Locate the source of the leak and determine the cause			
Visually inspect tank, fuel cap, lines, canister			
Activate purge VSV with Active Test			
Test purge VSV and compare to specs. to determine condition			
Test Vapor Pressure Sensor			



Notes



WORKSHEET 5-3 EVAP System Test - Non-Intrusive Type

Vehicle	Year/Prod. Date	Engine	Transmission
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Worksheet Objectives

In this worksheet, you will use the Diagnostic Tester and EVAP Pressure Tester (Miller) to test system integrity and determine the condition of the EVAP system and components.

Tools and Equipment

- Repair Manual
- Vehicle EWD
- EVAP Pressure Tester
- Diagnostic Tester
- DVOM
- Hand Tool Set

Note: Fuel Level should be 1/4 to 3/4 of the tank.

SECTION 1: DIAGNOSTIC TESTER SETUP

1. Go to setup menu on the Diagnostic Tester and select UNIT CONVERSION.
2. Under VAPOR PRESSURE, select ABS for absolute pressure, and mmHg for millimeters of mercury. This is to match RM specs.
3. Go back to FUNCTION SELECT and select ENHANCED OBD II.

SECTION 2: EVAP SYSTEM

The following procedures are designed to test the operation of the EVAP system with a service port.

1. Setup the Diagnostic Tester as outlined above.
2. With the key on and engine off, record Tank Vapor Pressure reading _____mmHg. What does a reading above or below atmospheric pressure indicate?

Note: DO NOT TIGHTEN or REMOVE the FUEL CAP!

Test EVAP Purge Line/Check Purge VSV

This procedure tests for purge flow restrictions, and checks the purge VSV and EVAP purge line connections. This is done to confirm the operation of these components.

1. Connect EVAP System Pressure Pump to EVAP service port
 - Set pump hold switch to CLOSE
 - Set vent switch to CLOSE
2. Using the Diagnostic Tester, go to ACTIVE TEST, EVAP (Purge) VSV test
3. Start the engine. With engine warm @ idle, activate EVAP VSV
4. Pump gauge should read between - 9 mmHg to - 499 mmHg (-5" H2O to -268" H2O) with the needle fluctuating. Name two causes for the needle not to fluctuate.

5. What DTC(s) are possible if the Purge VSV does not operate correctly? (HINT: See monitor sequence)

6. From air cleaner side, temporarily plug the air inlet line. Pressure should decrease by -10mmHg (- 5" H2O) or more.

7. If pressure did not decrease, list two causes.

Note: When both gauge valves are in the CLOSE position, the pump cannot pressurize the system. The gauge measures the pressure in the EVAP system.

Pressurize System (System Integrity Check)

This test checks for leaks in the canister and fuel tank sides by pressurizing the system. When the system is pressurized, it allows you to locate the source of a leak.

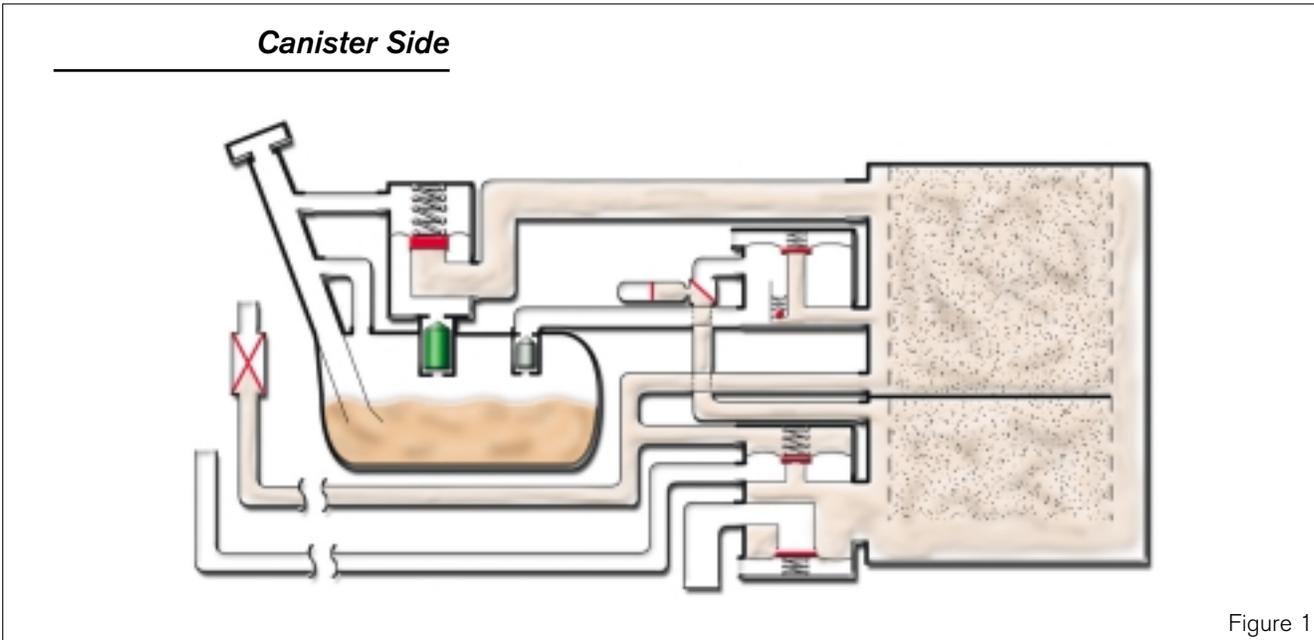
Proceduce	Resultls
1. Clamp air drain line with supplied hose pliers. <div style="text-align: center;">↓</div>	Condition 1. Pump gauge and vapor pressure above atmospheric pressure. This indicates:
2. Pressurize EVAP system. Turn off the pump and seal system (see pump directions). <div style="text-align: center;">↓</div>	2. Pump pressure gauge zero, vapor pressure above atmospheric pressure (above 762 mmHg). This indicates:
3. Note pump pressure reading and Vapor Pressure Sensor reading for the fuel tank. <div style="text-align: center;">↓</div>	3. Pump pressure gauge is above atmospheric pressure (above zero), vapor pressure is at 762 mmHg. This indicates:
4. Note pump pressure reading and Vapor Pressure Sensor reading. <div style="text-align: center;">↓</div>	4. Pump pressure gauge at zero, vapor pressure is at 762 mmHg. This indicates:
5. Compare your readings to one of the four results listed in the right column. Your vehicle had result number _____.	
6. Next, in the right column, list a probable reason or area that can cause each result.	

What DTC(s) are likely to set if there is a leak?

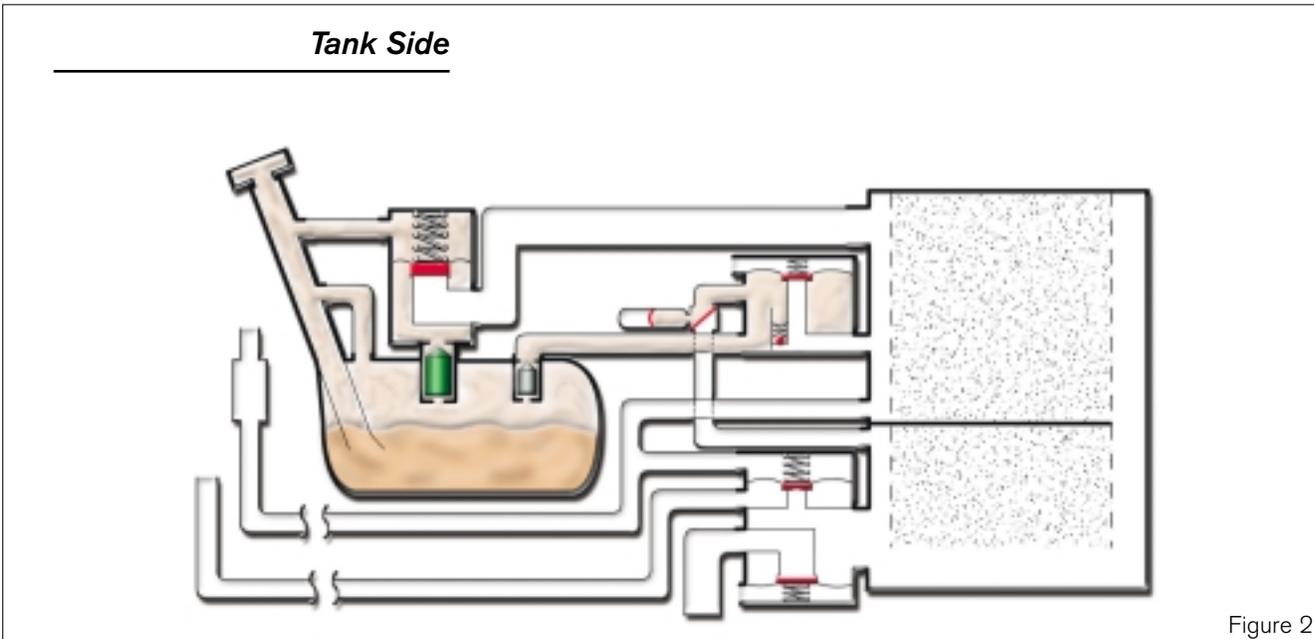
Return Vehicle to Service

1. After repairs, pressurize the EVAP system to be sure the system does not leak.
2. Remove clamp from air drain. Remove the plug and connect the Vapor Pressure Sensor hose.
3. Enable EVAP monitor according to Readiness Test Confirmation procedure.

Areas to Check for Leaks



1. With the system pressurized, check shaded areas for leaks (soapy water detection).



1. Inspect fuel tank cap for leaks and see if it is OEM.
2. Check shaded areas for leaks (soapy water detection).

EVAP System Test - Non-Intrusive Type

Name: _____ Date: _____

Review this sheet as you are doing the worksheet. Check each category after completing the worksheet and instructor presentation. Ask the instructor if you have questions. The comments section is for you to write where to find the information, questions, etc.

I have questions

I know I can

Topic			Comment
Locate components using the EWD and RM			
Find wire colors, pin numbers using the EWD and RM			
Set the conditions for the test			
Determine if the EVAP system is leaking			
Set the conditions for the test and operate the EVAP pressure tester			
Determine if EVAP system purge operation is normal			
Locate the source of the leak and determine the cause			
Visually inspect tank, fuel cap, lines, and canister			
Activate purge VSV with Active Test			
Test purge VSV and compare to specs. to determine condition			
Test Vapor Pressure Sensor			