LEXUS

Technical Service Information Bulletin

April 27, 2001

Title:

EVAP SYSTEM OPERATION INFORMATION

Models:

All ’96 – ’01 Models

TSIB

Introduction

This service bulletin provides supplemental information regarding the system design, operation, and diagnostics of the Early Type (Non–Intrusive) and Late Type (Intrusive) EVAP Systems found on 1996 model year and later OBD II equipped vehicles.

Applicable Vehicles

MODEL	1996	1997	1998	1999	2000	2001
ES 300	Early	Early	Early	Early	Late	Late
GS 300	N/A	N/A	Early	Early	Early	Late
GS 400	N/A	N/A	Early	Early	Early	N/A
GS 430	N/A	N/A	N/A	N/A	N/A	Late
IS 300	N/A	N/A	N/A	N/A	N/A	Late
LS 400	N/A	N/A	Early	Early	Late	N/A
LS 430	N/A	N/A	N/A	N/A	N/A	Late
LX 470	N/A	N/A	Early	Early	Early	Early
RX 300	N/A	N/A	N/A	Early	Late	Late
SC 300	N/A	N/A	Early	Early	Late	N/A
SC 400	N/A	Early	Early	Early	Late	N/A

Contents

This bulletin is divided into the following sections:

Warranty Information

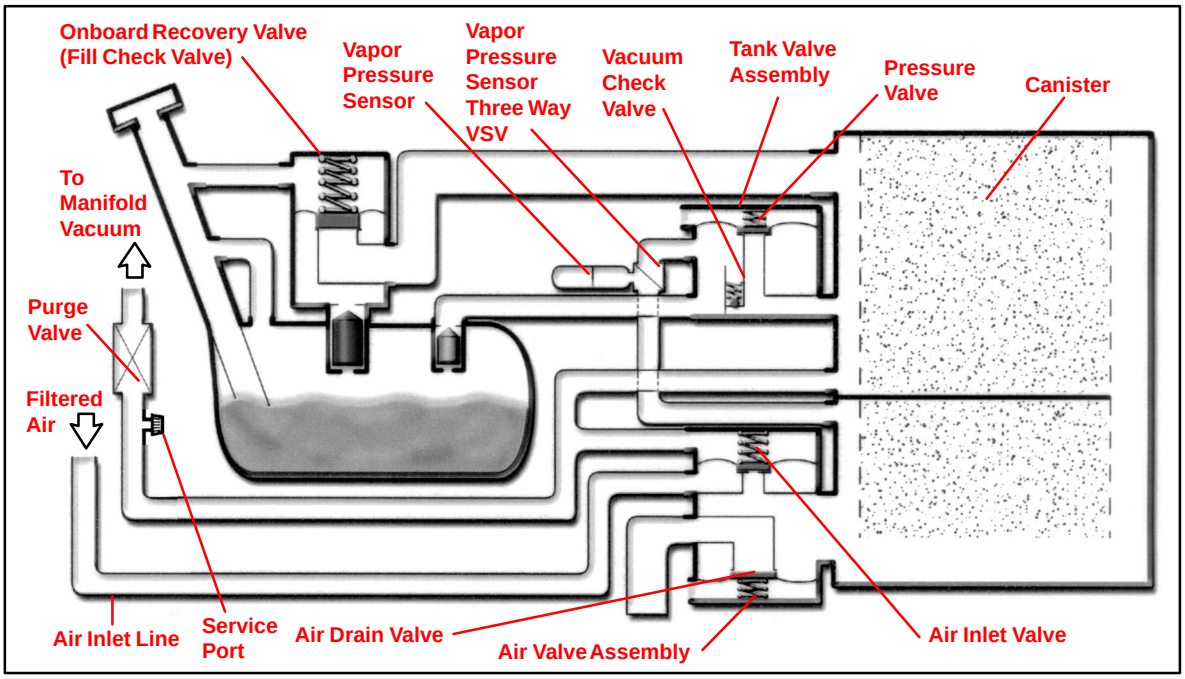
OP CODE	DESCRIPTION	TIME	OPN	T1	T2
N/A	Not Applicable to Warranty	–	–	–	–

Early Type System Description

Early Type (Non–Intrusive) EVAP System 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 for this information. The following information covers the different systems.

The first system described is the Early Type (Non–Intrusive) EVAP System. Refer to the Applicable Vehicles chart for applicability information.



Purge Operation

When the engine has reached predetermined parameters (closed loop, engine temp. above 125°F, etc.), stored fuel vapors are purged from the canister whenever the purge VSV is opened by the ECM. At the appropriate time, the ECM will turn on the purge VSV.

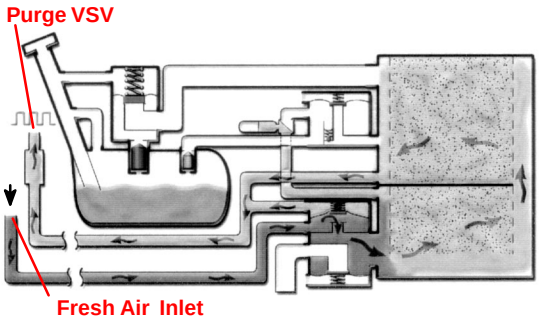


Figure 1. Purge Operation

The ECM will change the duty ratio cycle of the purge VSV thus controlling purge flow volume. Purge flow volume is determined by manifold pressure and the duty ratio cycle of the purge VSV. Atmospheric pressure is allowed into the canister to ensure that purge flow is constantly maintained whenever purge vacuum is applied to the canister (see Figure 1).

Early Type System Description (Continued)

ORVR Operation

During refueling, low pressure above the diaphragm in the onboard recovery valve lifts allowing fuel vapors into the charcoal canister. At the same time, the air drain valve opens and the charcoal absorbs the fuel vapors (see Figure 2).

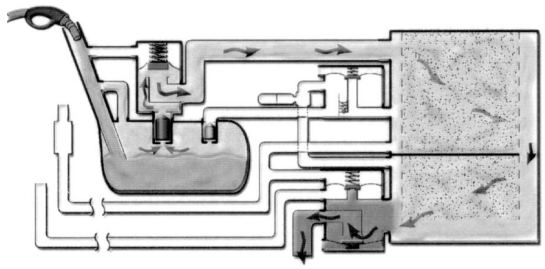


Figure 2. ORVR Operation

Early Type (Non–Intrusive) EVAP System DTCs

EVAP Monitor Leak Operation P0440

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 vapor pressure sensor. If either the tank or canister purge side is at atmospheric pressure under specific conditions, the ECM determines there is a leak.

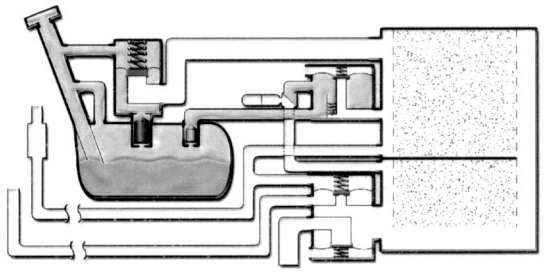


Figure 3. Fuel Tank Side of System

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 Vapor Pressure 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 (see Figure 3).

Canister Leak Detection P0446

When the ECM switches the vapor pressure VSV to canister side, the ECM measures canister pressure. A leak on the canister side can set multiple DTCs (see Figure 4).

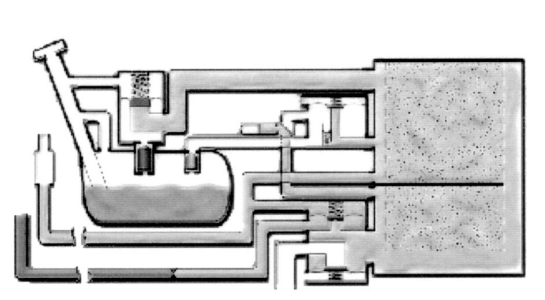


Figure 4. Canister Side of System

Early Type System Description (Continued)

Vapor Purge Flow P0441

The EVAP monitor is designed to detect:

- Restricted vapor purge flow when the purge VSV is open
- Inappropriate vapor purge flow when the purge VSV is closed

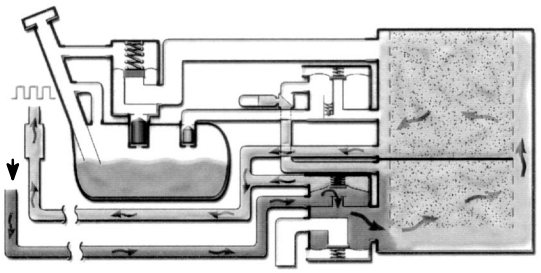


Figure 5. Flow During Purge Operation

Under normal purge conditions, pressure pulsations generated by the cycling of the purge VSV are present in the canister and detected by the Vapor Pressure sensor.

Three–Way VSV P0446

The three–way VSV is connected to the Vapor Pressure sensor, canister, and fuel tank. This VSV allows the Vapor Pressure 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 to look at the charcoal canister and fuel tank side of system.

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

- During purging, pressure pulsations generated by the purge VSV are not present in the canister as detected by Vapor Pressure sensor, the three–way VSV is judged to be defective.
- If there are pressure pulsations detected by the Vapor Pressure sensor present in the fuel tank, the three–way VSV is judged to be defective.

Late Type System Description

Late Type (Intrusive) EVAP System Overview

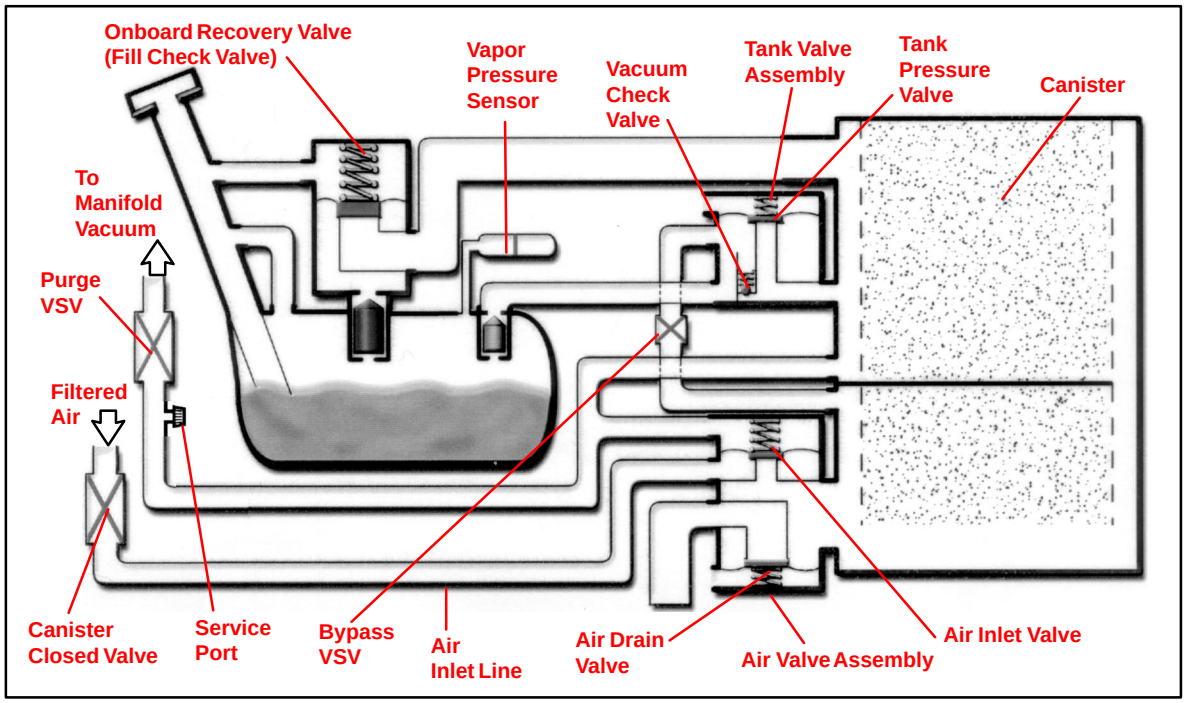
The Late Type EVAP System, also known as the Intrusive type, was developed to meet the very stringent, mandated standard of detecting a hole 0.020 inch (0.5 mm). This system uses many of the same components as the early type EVAP system. Purge, vacuum relief, pressure relief, and ORVR operations are identical to the early type. Refer to the Applicable Vehicles chart for applicability information.

The following changes were made to the Late Type EVAP System:

- Vapor pressure sensor connected to the fuel tank.
- Bypass VSV in the place of the three way VSV.
- Canister Closed Valve (CCV) on the air inlet line.

Late Type System Description (Continued)

Late Type (Intrusive EVAP System)



Tank Side

The bypass VSV and the fill check valve assembly isolates the tank pressure side from the canister side (see Figure 1).

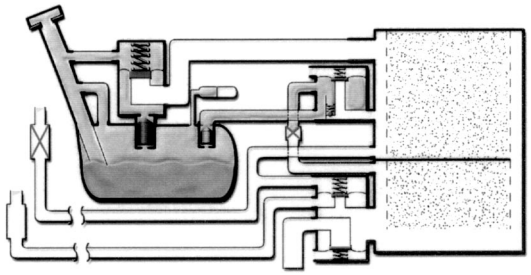


Figure 1. Fuel Tank Side of System

Canister Side

The bypass VSV and the Fill Check valve also isolate the canister side from the tank side (see Figure 2).

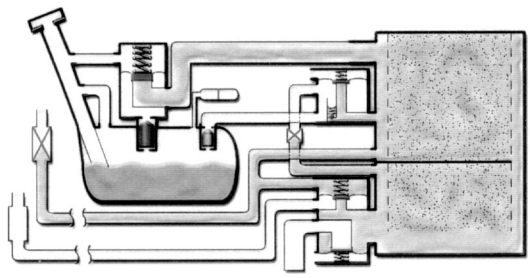


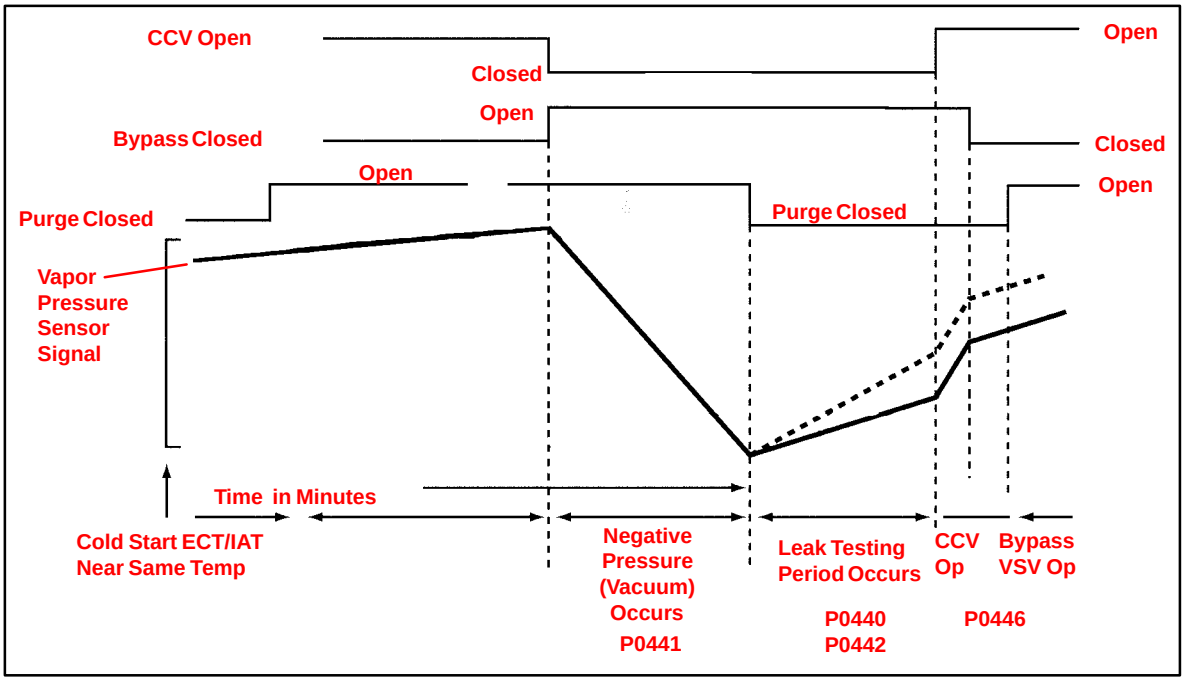
Figure 2. Canister Side of System

Late Type System Monitor Sequence

Late Type (Intrusive) EVAP System Monitor Sequence

The monitoring sequence for leak detection is different from that of the Early Type EVAP System. The Late Type applies a very small vacuum to the EVAP system. The ECM then determines if there is a problem in the system based on the vapor pressure sensor signal.

Monitor Sequence



Monitor 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 (see Figure 1). With bypass VSV closed, pressure will continue to rise in fuel tank.

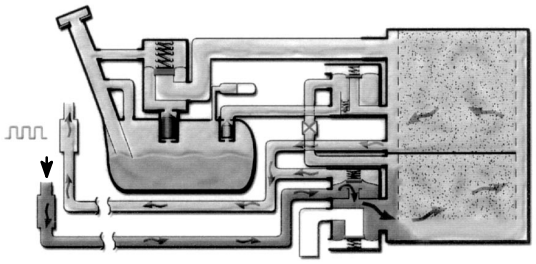


Figure 1. Canister Purge

Late Type System Monitor Sequence (Continued)

Purge VSV Operation – P0441

At a predetermined point, the ECM closes the CCV and opens the Bypass VSV causing vacuum to increase in the entire EVAP system.

The ECM continues to operate the purge VSV until the vacuum is increased to a specified point at which time the ECM closes the purge VSV (see Figure 2).

If the vacuum did not increase, or if the vacuum increased beyond the specified limit, the ECM judges the purge VSV and related components to be faulty.

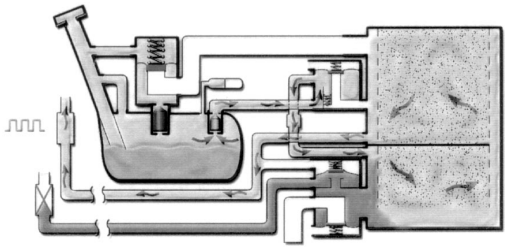


Figure 2. Vacuum Application

Hole Detection P0440 and P0442

The rate of pressure increase as detected by the vapor pressure signal indicates the 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 (see Figure 3). Some increase 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 and will set the DTC P0442.

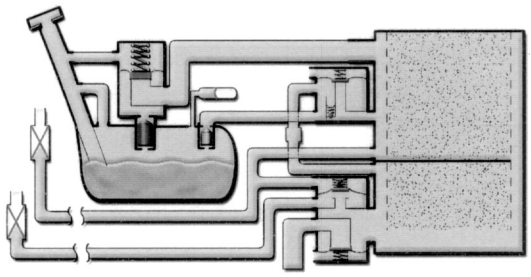


Figure 3. System Sealed

Vent Control, CCV Operation P0446

This stage checks the CCV and vent (air inlet side) operation. When the vapor pressure rises to a specified point, the ECM opens the CCV. 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.

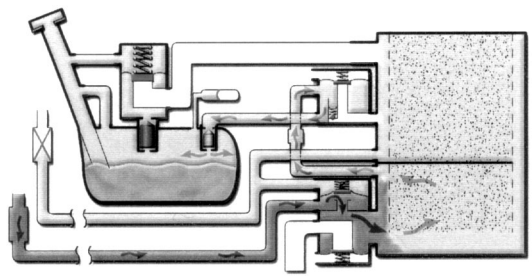


Figure 4. CCV Opens

Late Type System Monitor Sequence (Continued)

Bypass VSV Operation P0446

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

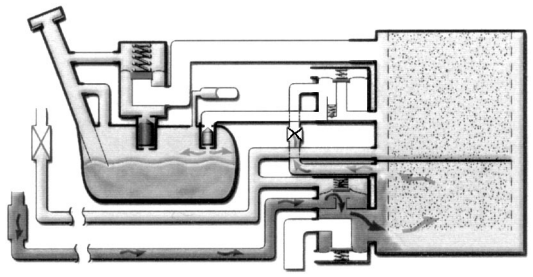


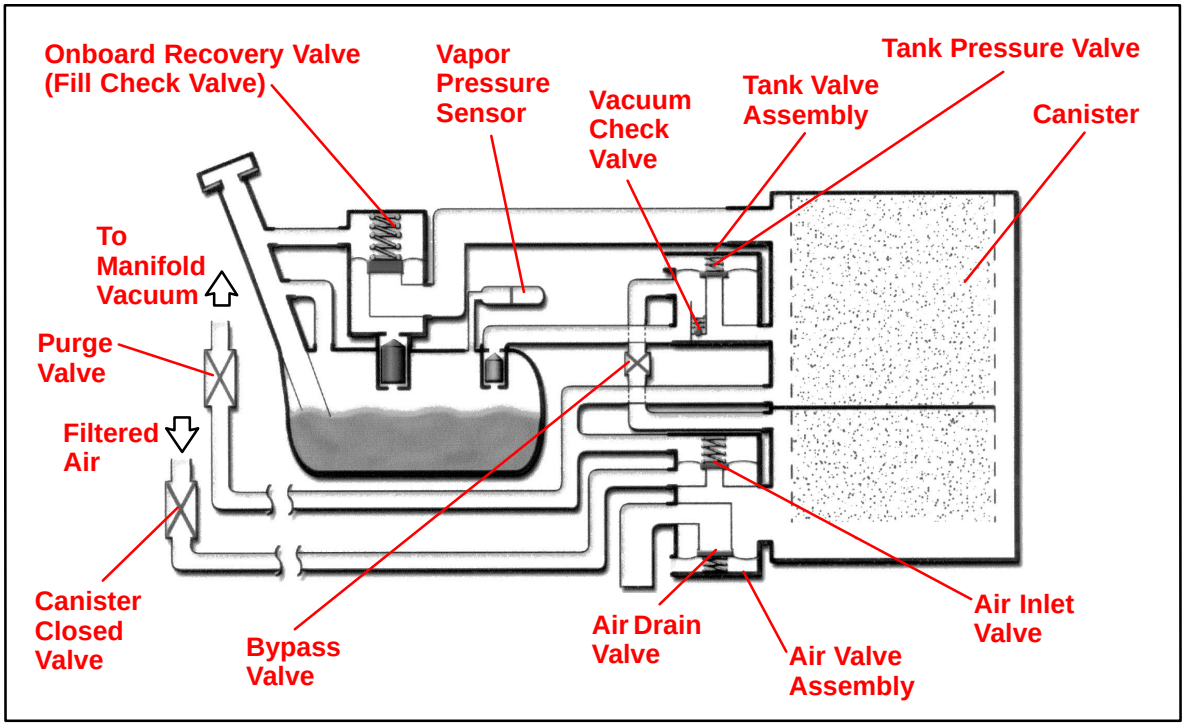
Figure 5. Bypass VSV Closes

Diagnostic Tips for Late Type EVAP System

This diagnostic process tests the EVAP System. The following diagnostic tips may be used in conjunction with the Diagnostic Procedures for EVAP DTCs listed in the Repair Manual. They may be used for all Late Type (Intrusive) EVAP Systems and for all EVAP DTCs. Refer to the Applicable Vehicles chart for applicability information.

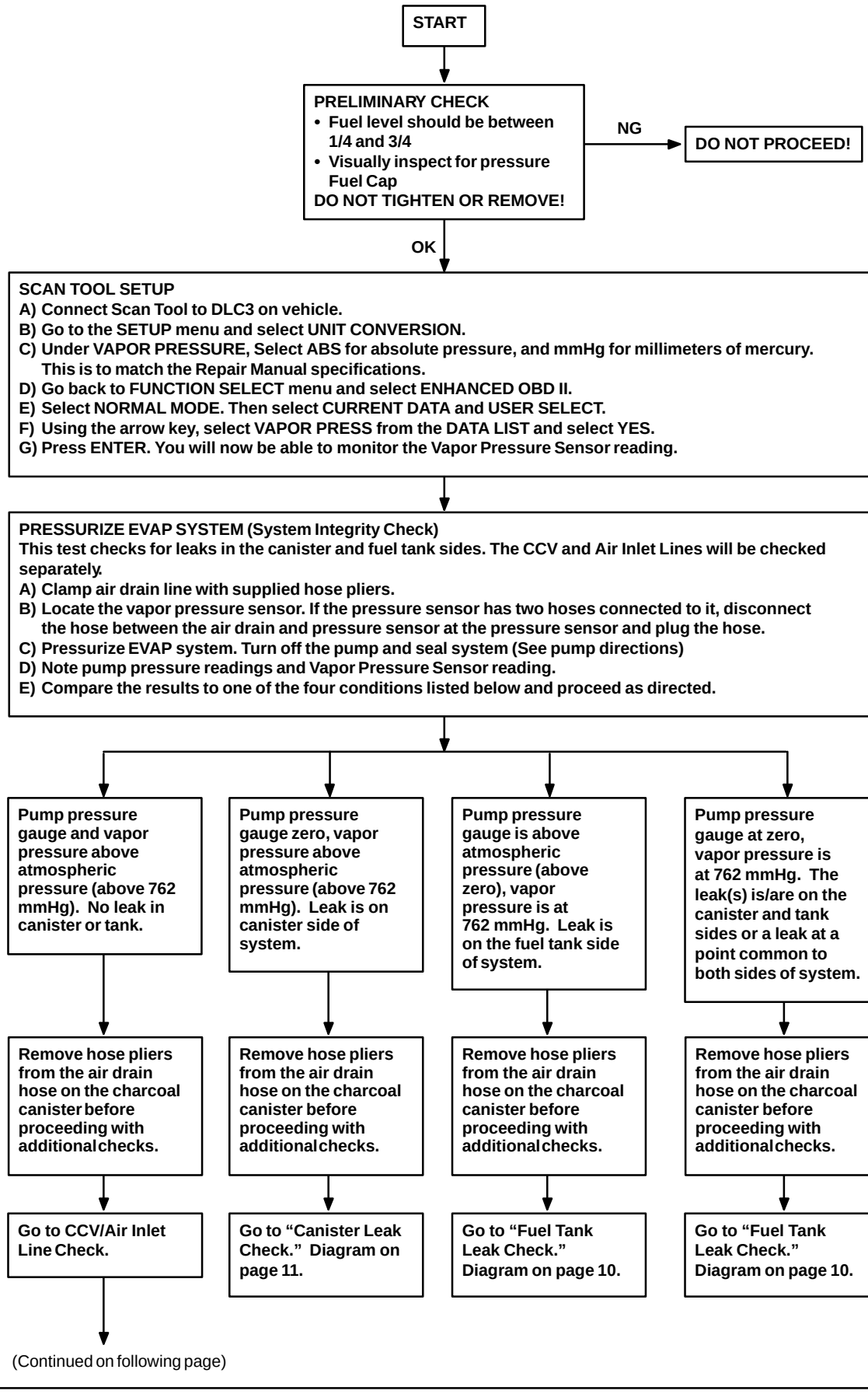
The EVAP System Pressure Test Kit (P/N 00002–6872A) and the Scan Tool can be used to diagnose the EVAP System. Measuring EVAP System pressures using the EVAP System Pressure Tester Gauge and the Scan Tool can aid in the identification of leaks in the system.

System Outline



Diagnostic Tips for Late Type EVAP System (Continued)

Diagnostic Process Flow Chart



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Diagnostic Tips for Late Type EVAP System (Continued)

Diagnostic Process Flow Chart (Continued)

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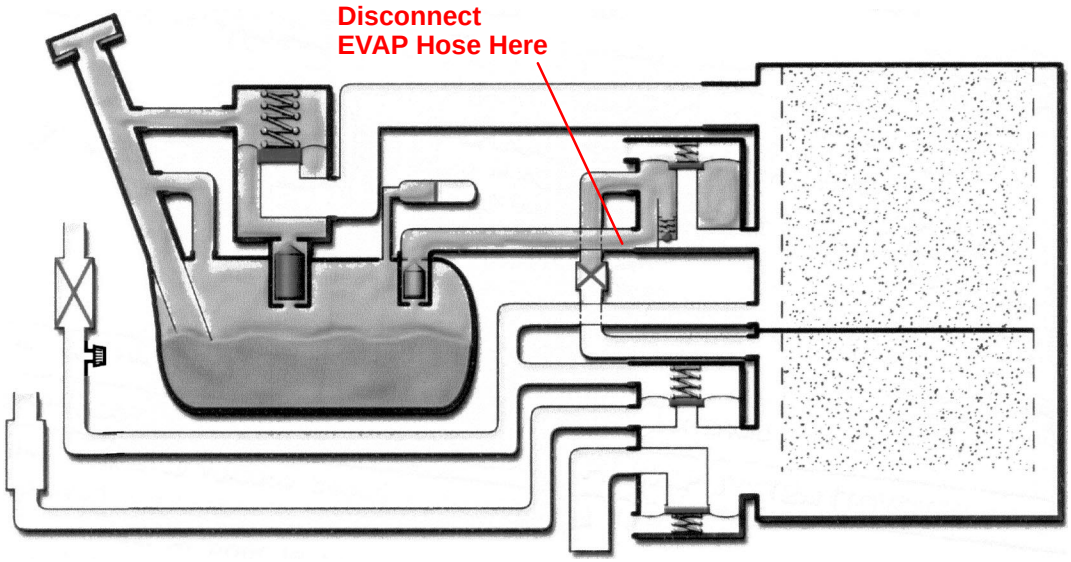
CCV and Air Inlet Line Check.

A) Disconnect the air inlet line from the charcoal canister.
B) Using the supplied step–down brass adapter (or equivalent) connect the Pressure Supply Hose to the air inlet line.
C) Using the Scan Tool Active Test, turn on the CCV. This will close the CCV.
D) Pressurize the line. Once pressurized, turn off the pump and seal the line (Pressure Hold Switch to "Closed" and Vent Switch to "Closed"). Pressure should hold. If not, check CCV and connections.
E) Next, using the Scan Tool, turn off the CCV. This will open the CCV. The pressure should decrease. If not, check the CCV and connections.
F) After completing the test, reconnect air inlet line to charcoal canister.

Go to "Return Vehicle to Service" on page 11.

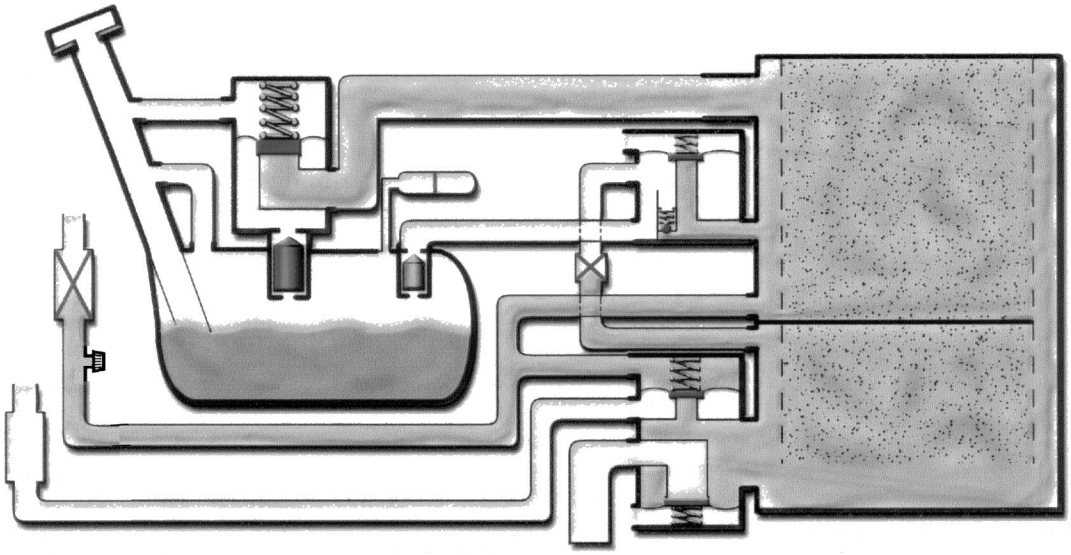
Fuel Tank Leak Check



A. Using the supplied brass step–down adapter, disconnect the EVAP hose from the charcoal canister side as indicated above. Connect Pressure Supply hose from Pressure Test Kit to the EVAP hose and pressurize the fuel tank to 30 mmHg (4 kPa / 0.58 psi).
B. Check that the internal pressure of the tank will hold for 1 minute. Check shaded areas for leaks (soapy water can be used for leak detection). If pressure holds, then perform the Canister Leak Check.
C. When done, reconnect the EVAP line hose to the charcoal canister.

Diagnostic Tips for Late Type EVAP System (Continued)

Canister Leak Check



A. Connect the Pressure Supply hose from the Pressure Test Kit to the Green EVAP System Service Port located on the EVAP Purge VSV line in the engine compartment.
B. Using the directions on the inside of the EVAP System Pressure Test Kit lid, pressurize the EVAP system. Once pressurized, turn off the pump and seal the system (Pressure Hold Switch to "Closed" and Vent Switch to "Closed")
C. With system pressurized at EVAP Service Port, check shaded areas for leaks (soapy water can be used for leak detection).

Return Vehicle to Service

A. After performing above checks, be sure to reconnect all lines and verify that all plugs and hose pliers used for diagnosis have been removed.
B. For additional diagnostic procedures and information, refer to the appropriate Repair Manual.