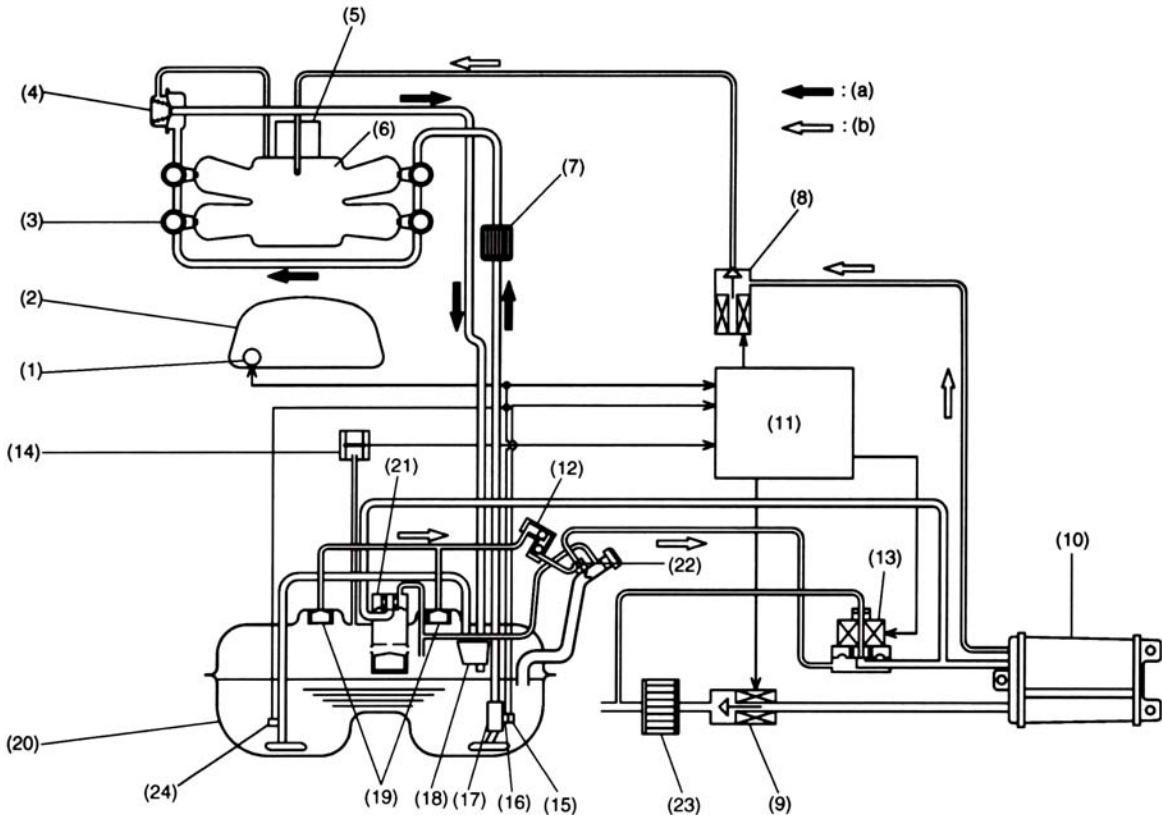


Evaporative Emissions Testing



- | | | | |
|------------------------|--------------------------------------|--------------------------------|----------------------------|
| (1) Fuel Gauge | (8) Purge control solenoid valve | (14) Fuel tank pressure sensor | (21) Vent valve |
| (2) Combination meter | (9) Drain valve | (15) Fuel temperature sensor | (22) Shut valve |
| (3) Fuel injector | (10) Canister | (16) Fuel level sensor | (23) Drain filter |
| (4) Pressure regulator | (11) ECM | (17) Fuel pump | (24) Fuel sub level sensor |
| (5) Throttle body | (12) Roll over valve | (18) Jet pump | |
| (6) Intake manifold | (13) Pressure control solenoid valve | (19) Fuel cut valve | (a) Fuel line |
| (7) Fuel filter | | (20) Fuel tank | (b) Evaporation line |

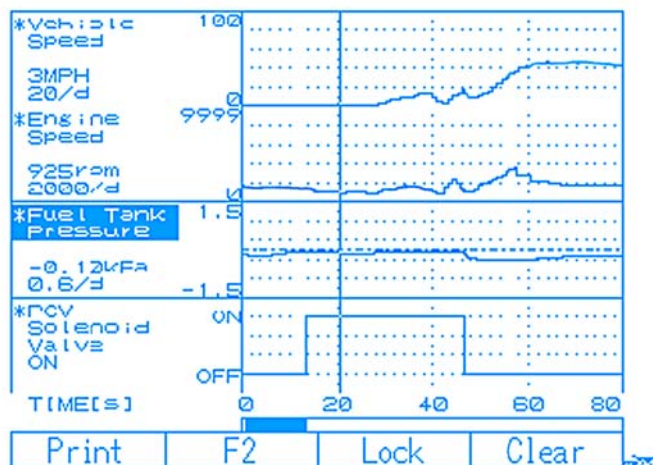
A major component of the Subaru OBD-II system is the system's ability to monitor the evaporative emissions system.

Today's vehicles are producing very low emissions from the tailpipe, so it has become increasingly important to monitor and contain emissions from other vehicle sources. A potentially large source of emissions is the vehicle's fuel system. If not properly contained, vapors escaping from the fuel tank could produce a larger quantity of harmful emissions while the vehicle was standing still than what would be emitted via the tailpipe when the engine was running and the vehicle was driving down the road.

The Subaru OBD-II system monitors the evaporative emissions system by drawing the system to a negative pressure. If the system holds vacuum, it passes the test. If the system fails to hold vacuum for the prescribed period, it fails and a diagnostic trouble code (DTC) P0440 is stored in the ECM memory. The malfunction indicator light (MIL) also comes on in the dash to alert the driver to the problem.

The charts that follow were collected through the data link connector using the New Select Monitor (NSM), during the diagnosis of a DTC P0440 on a 1997 Subaru Legacy 2.5 liter. We'll begin with a description of system operation under normal operating conditions.

Evaporative Emissions Testing

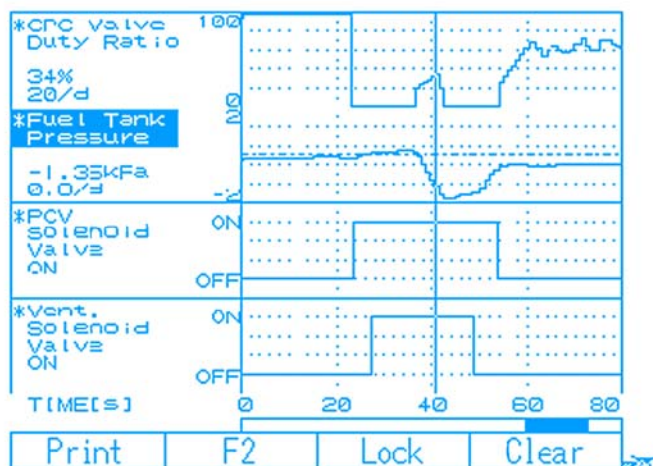


Enhanced Evaporative Emissions Test Part One

When the car is first started and you begin to drive, the pressure control solenoid is turned ON after a few seconds. At this time, the ECM is looking for some pressure change in the fuel tank to indicate that the system has been sealed and can be purged.

If the ECM sees a change in pressure, the pressure control solenoid will turn OFF in about 40 seconds, and the vehicle will pass the first part of the Enhanced Evaporative Emission System Test.

If the ECM doesn't see any pressure change, the pressure control solenoid will remain ON for the remainder of the drive cycle.



Enhanced Evaporative Emissions Test Part Two

If the first part of the test passes, the ECM will wait until the vehicle reaches cruising speed to perform the next three steps of the test. If the vehicle is cruising over 45 mph but under 80 mph and has less than a half a tank of fuel, the next part of the test will begin.

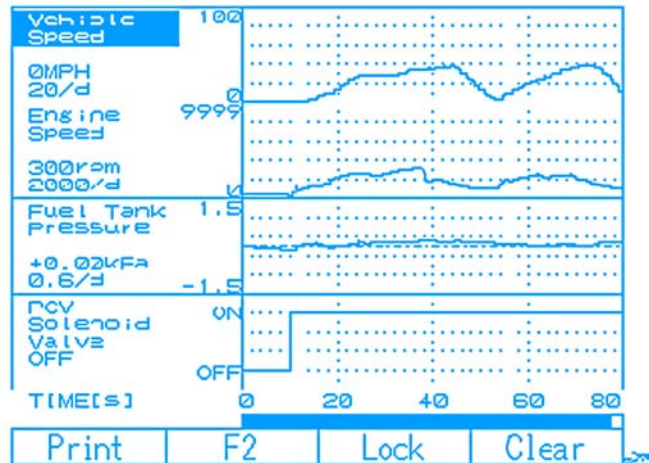
The second part of the test is the only time when the pressure control solenoid and vent solenoid will turn on at the same time. When the pressure control solenoid turns ON, the ECM is looking for a pressure change in the tank. If it sees one, the second part of the test will pass.

The vent solenoid then turns ON to shut off the vent to outside air. Since the canister purge valve is also open at this time, the entire evaporative system is drawn to a low pressure. If the pressure in the tank can be lowered

Evaporative Emissions Testing

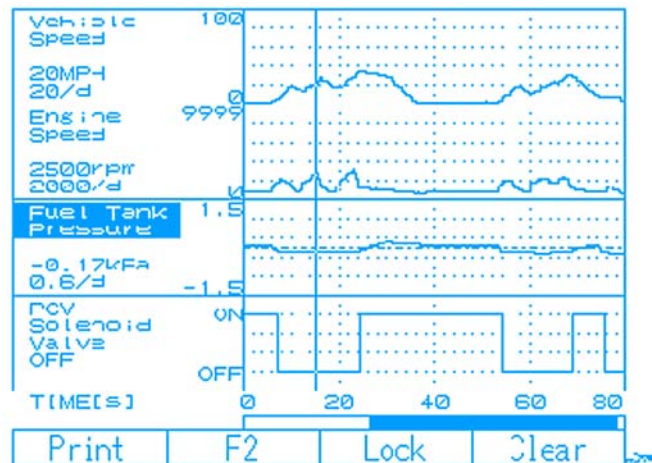
below -1.338 kPa, the third part of the test will pass and the vent solenoid shuts off to reopen the vent to outside air.

The low pressure in the tank should begin to recover toward atmospheric pressure at this time. If the pressure rise in the tank is sufficient to satisfy the DTC formula, the fourth part of the test will pass, the pressure control solenoid shuts OFF and the vehicle emissions system is judged to be functioning normally.



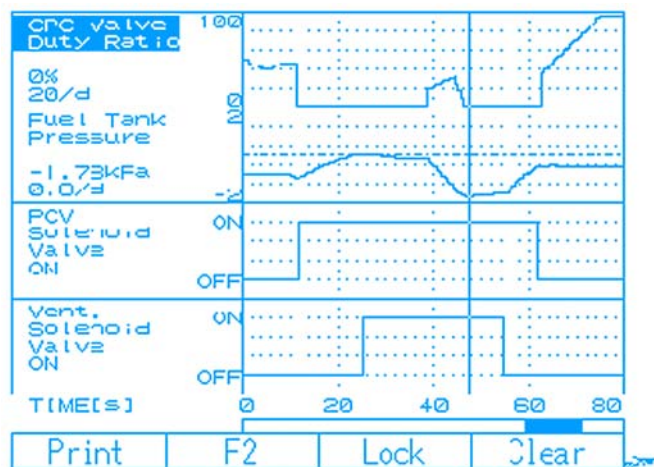
The graph representing fuel tank pressure for this vehicle indicates the fuel tank could not be drawn to a negative pressure. This problem was caused by a pressure control solenoid valve that was sticking open, which prevented the fuel tank from developing negative pressure.

The pressure control solenoid valve remains ON during this first part of the Evaporative Emissions Test. This indicates a leak in the evaporative emissions system, and the first part of the test has failed.



The results were quite different after the defective pressure control solenoid valve was replaced and the Enhanced Evaporative Emissions Test was repeated. When the pressure control solenoid valve was turned OFF, the fuel tank pressure reached -0.17 kPa. This indicates the system has been sealed and can be purged. The ECM recognizes the change in fuel tank pressure, and turns OFF the pressure control solenoid valve. The first part of the Enhanced Evaporative Emissions Test has passed.

Evaporative Emissions Testing



To continue the Enhanced Evaporative Emissions Test, the vehicle was driven at a cruising speed between 45 and 80 mph. When the pressure control solenoid valve turned ON, the ECM recognized a fuel tank pressure change from negative to positive pressure, and the second part of the Enhanced Evaporative Emissions Test passed.

When the pressure control solenoid valve and vent solenoid valve are ON at the same time, the fuel tank pressure must drop to at least -1.333 kPa. The reading indicates -1.78 kPa, and the vehicle passes the third part of the Enhanced Evaporative Emissions Test.

The vent solenoid valve turns OFF and the low pressure in the fuel tank begins to rise toward atmospheric pressure. The fourth part of the Enhanced Evaporative Emissions Test has passed and the vehicle is successfully repaired.

The vehicle's OBD-II monitors can be used as a final verification that replacing the pressure control solenoid valve has successfully repaired the vehicle's evaporative emissions problem and resulting P0440 DTC.

OBD-II monitors are scheduled to run under very precise conditions. If these conditions are not met for any reason, the monitor simply will not run to completion.

The Subaru evaporative emissions system monitor is a 'leak up' system. This means the evaporative system is put under a slight vacuum, and the ECM measures how much the system pressure rises over time.

Before the evaporative systems monitor will run, the ECM must see a pressure change in the fuel tank when the vehicle is first started and you begin to drive. The fuel tank must be less than half full. The vehicle must be cruising over 45 mph, but below 80 mph.

A notation of *Complete* after a particular monitor indicates that all enabling criteria have been met, the monitor has run, and the monitored system has passed the test.

OBD-II MONITORS TEST 1997 SUBARU LEGACY 2.5L

Number of Diag. Code:	0
MI (MIL)	OFF
Misfire monitoring	complete
Fuel system monitoring	complete
Component monitoring	complete
Catalyst Diagnosis	complete
Heated catalyst	no support
Evaporative purge system	complete
Secondary a:r system	no support
A/C system refrigerant	no support
Oxygen sensor	complete
O2 Heater Diagnosis	complete

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