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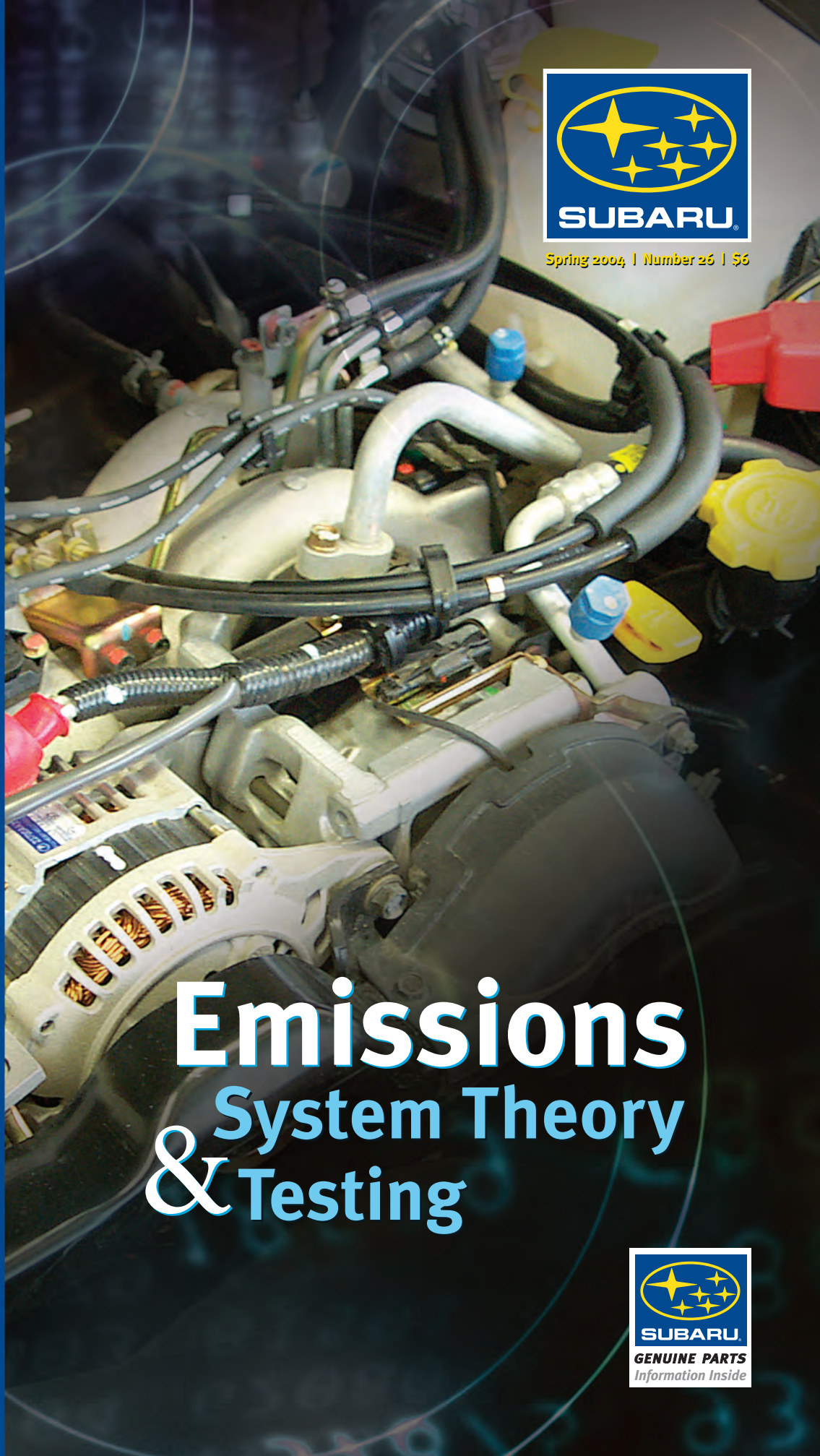

SUBARU

Spring 2004 | Number 26 | $6

Emissions & System Theory Testing

SUBARU
GENUINE PARTS
Information Inside

Install Genuine Subaru Mufflers

Unlike aftermarket mufflers that are "cross-fitted" to multiple makes with adapters, Genuine Subaru Replacement Mufflers are specifically designed for each Subaru vehicle. So they fit better and last longer. Fully aluminized steel construction resists corrosion; sound absorbing materials help subdue sound without hampering performance. And they're backed by the Genuine Subaru Parts Limited Warranty—protection for you and your customers. Find your nearest Subaru N.E.W. Horizons wholesaling dealer at **www.endwrench.com**

SUBARU
GENUINE PARTS

A Perfect Fit at a Perfect Price

What could be better than offering your customers mufflers that are specifically built to their cars' specifications at prices that are affordable? Each Genuine Subaru Replacement Muffler Assembly is a complete, all-welded, one-piece unit that ensures easy and precise installation.

You'll find Subaru replacement mufflers for a wide variety of applications, too. Everything fits just the way it should. There are no strange sounds from improvised parts or loud engine growls from "bargain" replacement mufflers without properly engineered baffles to efficiently suppress exhaust noise.

Subaru performance mufflers offer the same high quality as our regular replacement mufflers plus a high-flow-capacity core for improved performance and a deeper sound when accelerating.

SPT
SUBARU PERFORMANCE TUNING

Finally, every Subaru muffler is competitively priced so there's nothing but satisfaction all around – for you and your customer. Like we said, perfect!

Genuine Subaru Mufflers Mean Business

Replacement Mufflers	Includes associated hangers, gaskets, bolts, nuts, etc.
Performance Mufflers	Applications for Impreza 2.5 RS, WRX and Legacy GT models

IMPORTANT NOTE: Federal and California law prohibits use of these parts in making repairs covered under emissions-related warranties extended on the vehicle at the time of its original purchase. No claims made under those warranties will be honored unless OEM parts are used.

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Subaru Consultants:
Bruce Barker
Norm Hunsinger
Joseph Kuter

Editorial and Circulation Offices:
598 Pine Point Drive
Akron, Ohio 44333
Phone: 330.666.9886

inside

Evaporative System Diagnosis

One of the last remaining sources of air pollution produced by vehicles occurs during refueling. As fuel is pumped into the tank, fuel vapors are displaced. Unless these vapors are trapped, they will escape into the atmosphere via the fuel filler neck.

Many jurisdictions now require the use of special gas pump filler nozzles, which capture the vapors as they escape. Many late model vehicles also incorporate an onboard refueling vapor recovery system, which captures the vapors before they have a chance to reach the filler neck. Subaru first added this capability to its vehicles during the 2000 model year.

Operation of the evaporative emissions and fuel recovery systems is monitored by the onboard diagnostic system (OBD II). The system periodically checks the system for leaks, to prevent vapors from escaping into the atmosphere. The system has the ability to detect a leak caused by a hole that is not much larger than a human hair in diameter.

If a leak is detected, the OBD II system will set a diagnostic trouble code (DTC). This is where you enter the picture. The source of the leak must be identified and repaired. If not, the DTC will reset the next time the OBD II system runs its diagnostic checks. Testing the onboard refueling vapor recovery system involves checking all solenoids, valves and plumbing for air tightness, air flow and proper operation. A failure in any of these items will create a failure in the system.

The evaporative system pressure tester must be used with the Select Monitor (or a compatible aftermarket scan tool) to achieve the correct results. Begin by reading the warnings included with the special tool. Section by section testing will ensure all fittings, hoses, pipes, valves and components are tested.

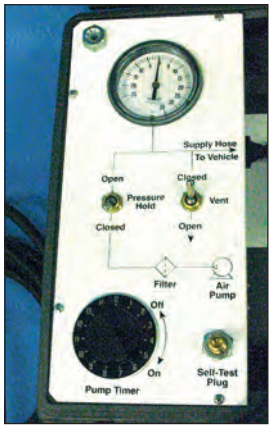
Evaporative Emission System Tester Component Legend

PT .... Pressure Tester
F ..... Fuel
CPC .. Canister Purge Control
FH.... Fuel Hose
M..... Manifold
PCV .. Pressure Control Valve
D ..... Drain
V..... Vent
SOV .. Shut Off Valve
PS .... Pressure Sensor

Pressurizing the Tester

The following steps must be followed to pressurize the tester when instructed to do so:

1. Place the Pressure Hold in the open position.
2. Place the Vent in the closed position.
3. Turn the pump timer ON.
4. Observe the gauge.
5. When the highest pressure is reached, place the Pressure Hold in the closed position.
6. Turn the pump timer off.



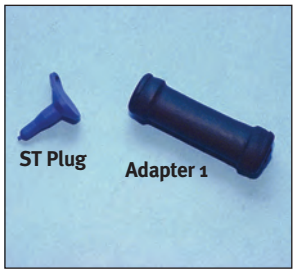
Evaporative System Pressure Tester

Abbreviation	Component	Location
CPC	Canister Purge Control Solenoid	Right under side of intake manifold.
PCV	Pressure control valve	Above rear differential.
D	Drain valve	Above canister right rear of vehicle.
SOV	Shut Off Valve	Located on the fuel filler neck behind the right rear inner fender.

Troubleshooting the evaporative emissions system involves a sequence of tests, listed below:

- Purge System Test
- Drain System Test
- Shut Off Valve Test
- Pressure Control Valve Test
- Fuel Tank and Vent Control Valve Test
- Canister

Follow the directions in each of the above tests. Complete all six tests to evaluate the entire evaporative system. Directions are included in each test to guide you through results that indicate a failure. Always complete the six tests, even if a failure has been identified and repaired early in the test sequence.



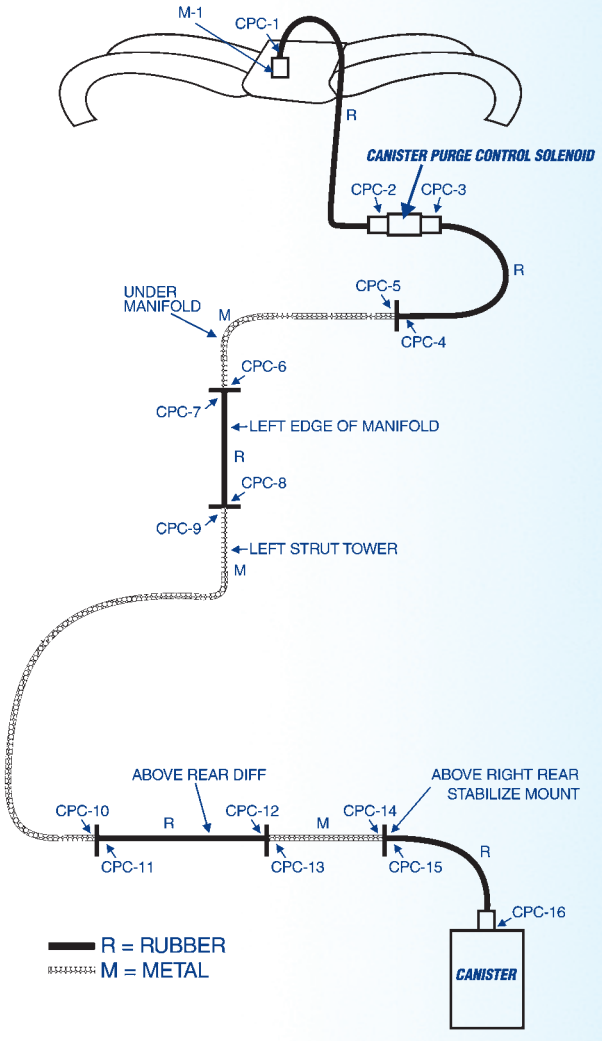
Purge System Test

1. Disconnect CPC-1 from M-1.
2. Start the engine and check for a strong vacuum source at M-1.
3. Turn the engine off and ignition off.
4. Connect the Select Monitor to the data link connector.
5. Connect the inspection mode connectors.
6. Turn the ignition on and engine off.
7. Turn the Select Monitor on and adjust to the system operation check mode. Activate a component and turn it off to establish full control of all system operation check mode items.

Step 8 and 9 test the air tightness of the vacuum line from the intake manifold to the canister purge control solenoid. The air tightness of the solenoid is also checked at this time.

8. Connect PT-1 to CPC-1 and pressurize.
9. Did pressure hold?
   If **YES**, go to step 10. If **NO**, go to step 10F.

Purge System Test



The Subaru Performance Story Grabs the Spotlight—Again!

NEW SUSPENSION AND OTHER PERFORMANCE PARTS DEBUT

With the arrival of beautiful weather, those Subaru owners who live for the throaty thrill and potent look of a fine performance vehicle have already begun to prowl the roads and garages of this country wanting to share their passion for hot cars.

Subaru understands this and has a range of brand new performance parts ready to satisfy that craving. In fact, the Subaru display at the East Coast International Auto Salon showcased the Subaru performance story.

Come June, among the exciting new RS, WRX and STi offerings are Swaybars, Lowering Springs and Adjustable Strut and Spring Sets. These sets can be quickly adjusted to fit the road, track and off-road driving conditions that challenge today's active performance enthusiasts. From street to strip to dirt track, these adjustable strut and spring sets can be easily tuned to provide the responsive feel that hard-driving Subaru owners want.

There are also new STI items including Lower Arm Bars of strong, lightweight tubular stainless steel, a Short Throw Shifter for the six-speed STi, Clutch Discs in either ceramic/metal or organic composition as well as Clutch Covers and Flywheels that allow the engine to rev faster. Added to the already extensive list of popular Subaru Performance Parts, you can offer your customers an incredibly wide assortment of tempting performance parts designed and built exclusively to bring the most out of every Subaru.

SNO-DRIFT WON BY A PAIR OF SUBARU WRXs

With tires grabbing out great chunks of snow and sending showers of fine white powder behind them, racing fans and their hard driving counterparts spent this early winter crusading through the wooded course in Atlanta, Michigan in pursuit of a win at the famous SCCA Sno-Drift Rally held at the end of this past January. When it was over, the team of Patrick Richard and Brian Maxwell took top honors in the Group N with their aggressive approach to the course and obvious confidence in their bright blue 2002 Subaru WRX.

Shane Mitchell and Paul Donnelly came in at a mere one minute behind the winners in their own Subaru WRX. With two Subaru vehicles clocking wins in the top three podium spots, the 2004 racing season got off to an impressive start, which should only help you to talk up performance parts in your neck of the woods!

SUBARU FUNNELS ITS RALLY SUPPORT TO LOCAL PERFORMANCE ENTHUSIASTS

With the interest in motor sports competition and performance parts building to remarkable heights throughout the United States, Subaru has shifted its funding and support from its highly successful national rally team to

performance rally competitions at the local level.

Under the new Subaru Rally Support Program, the company will maintain the largest total contingency payout through the Subaru Championship Cup program. This shift will result in contingency funds to Subaru entrants in the Production GT Class and at selected Club Rally events.

Competitors at most ProRally events will also find the colorful Subaru Rally Parts Support Truck where they can obtain advice about the performance aspects of Genuine Subaru Parts. "This program exhibits our commitment to facilitating the growth of rallying in the U.S.," notes Tim Bennett, SOA Director of Marketing Programs.

SPRING HAS SPRUNG! LET THE TUNE-UPS BEGIN

Spring is finally in full swing and the tough winter has most certainly left a huge amount of maintenance work in its wake.

From air conditioning units in need of fresh refrigerant to squealing brakes calling out for new pads, this is the time of year your customers' cars require a careful maintenance check to ensure that they continue to run at their best.

All systems need a good once-over from electrical to suspension to exhaust. There's no better time to run specials like "Save Cold Cash on a Coolant System Check-Up", "Get a Break on Brake Repairs" or "Fresh Start Subaru Tune-Up Sale." A package deal offering savings on a comprehensive check-up such as "Total Car Care Exam" can put your expertise to work and bring in a welcome spring shower of revenue for your shop.

REMANUFACTURED AXLE SHAFTS: A SMART ALTERNATIVE

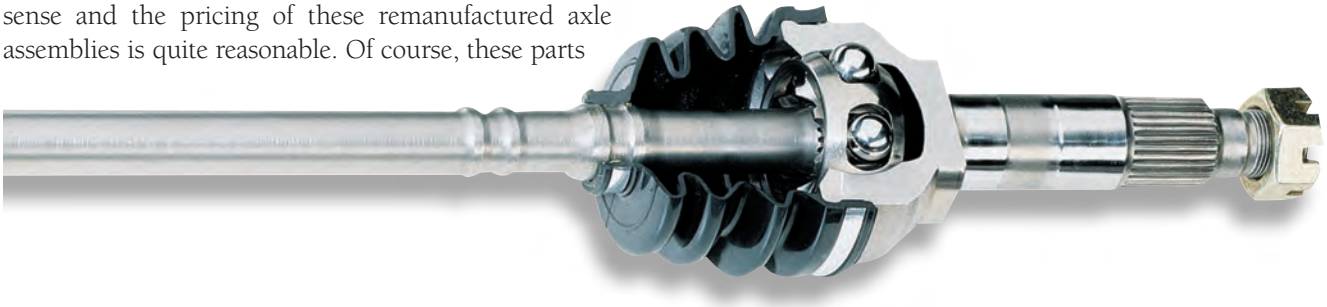
When facing a broken, worn or damaged axle, replacing the axle boot can be a bit of a tricky repair procedure.

While it may be tempting to simply replace a damaged axle boot this procedure may very well consume more labor dollars than the cost of a remanufactured axle assembly. You can make your life a whole lot easier and offer your customer a high-quality axle replacement without breaking their bank.

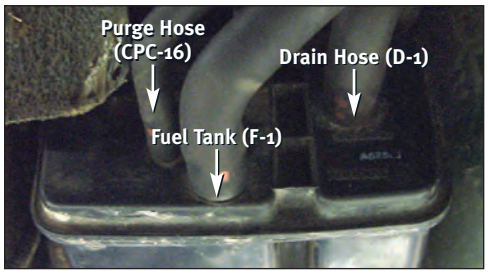
Naturally the labor savings realized will make more sense and the pricing of these remanufactured axle assemblies is quite reasonable. Of course, these parts match the tough specifications of original equipment so you and your customer aren't sacrificing one iota of quality or safety.

Finally, these Genuine Subaru Remanufactured Axle Assemblies are backed by the Genuine Subaru Limited Parts Warranty, so you can install them with confidence.

It's the smart alternative to a tough job.



Step 10 and 11 test the electrical and mechanical operation of the canister purge control solenoid and the vacuum line from the output side of the solenoid to the canister for restrictions or blockages.



Canister with Hoses

10. Disconnect CPC-16 from the canister.
11. Activate the CPC solenoid with the Select Monitor.
12. Did pressure immediately go to zero?
If **YES**, go to step 13. If **NO**, go to step 13F.

Step 13 and 14 test the vacuum hose from the canister purge control solenoid to the canister for air tightness.

13. Insert ST plug into CPC-16 to block the hose.
14. Pressurize.
15. Did pressure hold?
If **YES**, go to step 16. If **NO**, go to step 16F.
16. Turn the CPC solenoid off with the Select Monitor.
17. Remove PT-1 from CPC-1.
18. Connect CPC-1 to M-1.
19. Remove the ST plug from CPC-16.
20. Connect CPC-16 to the canister.
21. Proceed to the Drain System Test.

Purge Line Test 10F

10F. Disconnect CPC-2 from the CPC solenoid.
10F1. Connect ST plug to CPC-2.
10F2. Pressurize.
10F3. Does pressure hold?
If **YES**, replace the CPC solenoid and go to Purge System Test step 8. If **NO**, replace hose and go to Purge System Test step 8.

Purge Line Test 13F

13F. Turn off the CPC solenoid with the Select Monitor.
13F1. Disconnect CPC-4 from CPC-5.
13F2. Pressurize and turn on the CPC solenoid with the Select Monitor.
13F3. Does pressure go to zero immediately?
If **NO**, go to step 13F4. If **YES**, go to step 13G.
13F4. Turn off the CPC solenoid with the Select Monitor and connect CPC-4 to CPC-5.
13F5. Disconnect CPC-3 from the CPC solenoid.
13F6. Pressurize.
13F7. Turn on the CPC solenoid with the Select Monitor.
13F8. Does pressure go to zero immediately?
If **YES**, replace the hose between CPC-3 and CPC-4 and go to Purge System Test step 8. If **NO**, replace the CPC solenoid and go to Purge System Test step 8.

Purge Line Test 13G

13G. Turn off the CPC solenoid with the Select Monitor.
13G1. Connect PT-1 to CPC-5.
13G2. Pressurize.
13G3. Disconnect CPC-8 from CPC-9.
13G4. Does pressure go to zero immediately?
If **YES**, go to step 13H. If **NO**, go to step 13G5.
13G5. Pressurize.
13G6. Disconnect CPC-7 from CPC-8.
13G7. Does pressure go to zero immediately?
If **YES**, replace the hose between CPC-7 and CPC-8 and go to Purge System Test step 8. If **NO**, an obstruction exists in the metal hose from CPC-5 to CPC-6. Clean and remove the obstruction or replace the hose. Then go to Purge System Test step 8.
13H. Connect Adapter-1 to PT-1.
13H1. Connect Adapter-1 to CPC-8.
13H2. Pressurize.
13H3. Disconnect CPC-12 from CPC-13.
13H4. Does pressure drop to zero immediately?
If **YES**, go to step 131. If **NO**, go to step 13H5.
13H5. Pressurize.
13H6. Disconnect CPC-10 from CPC-11.
13H7. Does pressure drop to zero immediately?
If **YES**, replace the hose between CPC-11 and CPC-12 and go to Purge System Test step 8. If **NO**, an obstruction exists in the metal hose between CPC-10 and CPC-9. Clean and remove the obstruction or the replace hose. Then go to Purge System Test step 8.

Purge Line Test 13I

13I. Connect Adapter-1 to CPC-13.
13I1. Pressurize.
13I2. Disconnect CPC-14 to CPC-15.
13I3. Did pressure drop to zero immediately?
If **YES**, replace the hose between CPC-15 and CPC-16 and go to Purge System Test step 8. If **NO**, an obstruction exists in the metal hose between CPC-13 and CPC-14. Clean and remove the obstruction or replace the hose. Then go to Purge System Test step 8.

Purge Line Test 16F

16F. Turn off the CPC solenoid with the Select Monitor.
16F1. Disconnect CPC-14 from CPC-15.
16F2. Connect Adapter-1 with ST plug to CPC-14.
16F3. Pressurize.
16F4. Turn on the CPC solenoid with the Select Monitor.
16F5. Does pressure hold?
If **NO**, go to step l6F6. If **YES**, replace the hose between CPC-l5 and CPC-16.
16F6. Turn off the CPC solenoid with the Select Monitor.
16F7. Disconnect CPC-12 and CPC-13.
16F8. Connect ST Plug to CPC-12.
16F9. Pressurize.
16F10. Turn on the CPC solenoid with the Select Monitor.
16F11. Does pressure hold?
If **YES**, replace the metal hose between CPC-13 and CPC-14 and go to Purge System Test step 8. Ensure hoses

ENGINE COMPONENTS

disconnected in prior step have been reconnected. If **NO**, go to 16F12.
16F12. Turn off the CPC solenoid with the Select Monitor.
16F13. Disconnect CPC-10 from CPC-11.
16F14. Connect Adapter-1 with ST plug to CPC-10.
16F15. Pressurize.
16F16. Turn on the CPC solenoid with the Select Monitor.
16F17. Does pressure hold?

If **YES**, replace the hose between CPC-11 and CPC-12 and go to Purge System Test step 8. If **NO**, go to 16F18.

Purge Line Test 16F18

16F18. Turn off the CPC solenoid with the Select Monitor.
16F19. Disconnect CPC-8 from CPC-9.
16F20. Connect ST Plug to CPC-8.
16F21. Pressurize.
16F22. Turn on the CPC solenoid with the Select Monitor.
16F23. Does pressure hold?

If **YES**, replace the metal hose between CPC-9 and CPC-10 and go to Purge System Test step 8. Ensure hoses disconnected in prior step have been reconnected. If **NO**, go to step 16F24.
16F24. Turn off the CPC solenoid with the Select Monitor.
16F25. Disconnect CPC-6 from CPC-7.
16F26. Connect Adapter-1 with ST plug to CPC-6.
16F27. Pressurize.
16F28. Turn on the CPC solenoid with Select Monitor.
16F29. Does pressure hold?

Purge Line Test16F34

16F34. Does pressure hold?

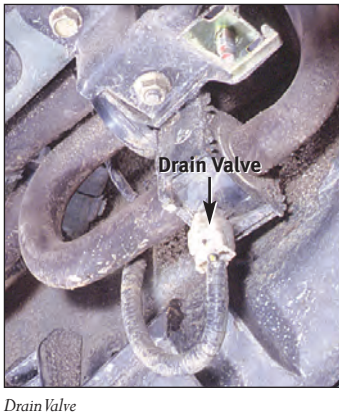
If **YES**, replace the metal hose between CPC-5 and CPC-6 and go to Purge System Test step 8. If **NO**, go to step 16F35.
16F35. Disconnect CPC-3 from CPC solenoid.
16F36. Connect Adapter-1 with ST plug to CPC solenoid.
16F37. Pressurize.
16F38. Turn on the CPC solenoid with the Select Monitor.
16F39. Does pressure hold?

If **YES**, replace the hose between CPC-3 and CPC-4 and go to Purge System Test step 8. If **NO**, replace the CPC solenoid and go to Purge System Test step 8.

Drain System Test

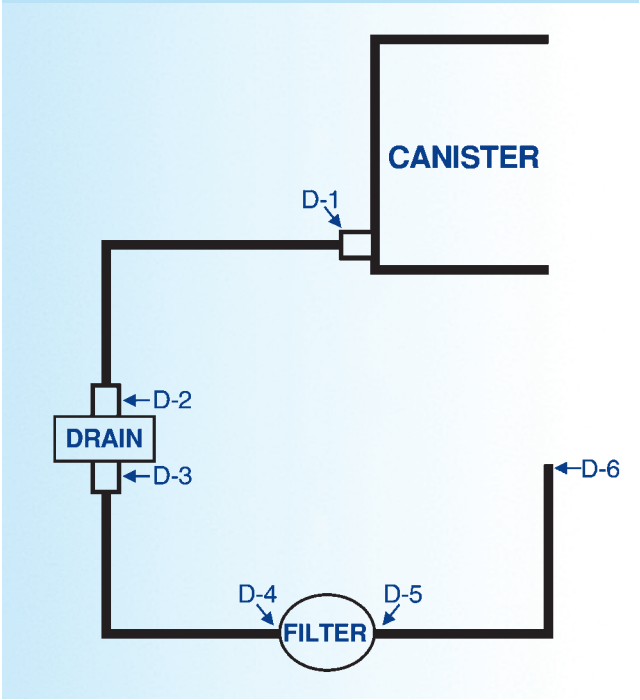
Steps 1 through 4 test the air tightness of the Adapter.

1. Disconnect D-l from canister.
2. Connect PT-1 with ST Adapter-1.
3. Block ST Adapter-1 with ST Plug and pressurize.



Drain Valve

Drain System Test



4. Does pressure hold?
   If **YES**, go to step 5. If **NO**, go to step 5F.
5. Remove ST-plug from ST Adapter-1.

Step 6 and 7 will test the drain hoses, canister, drain valve and filter for restrictions and blockages.

6. Connect ST Adapter-1 with D-1 hose.
7. Pressurize.
8. Did pressure buildup?
   If **NO**, go to step 9. If **YES**, go to step 9F.

Step 9 and 10 will test the air tightness of the vent hoses from the canister to the drain valve and the mechanical and electrical operation of the drain valve.

9. Activate vent valve solenoid with Select Monitor.
10. Pressurize.
11. Does pressure hold for the time the solenoid is on and then drop to zero?
    If **YES**, go to step 12. If **NO**, go to step 12F.
12. Turn off vent valve solenoid with Select Monitor.
13. Remove ST Adapter-1 from D-l.
14. Connect D-1 to canister.
15. Proceed to Shut Off Valve Test.

Drain System Test 9F

9F. Disconnect D-5 from the filter.
9F1. Pressurize. Did pressure hold?
If **YES**, go to step 9F2. If **NO**, replace the hose between D-5 and D-6 or remove the obstruction from the hose.
9F2. Disconnect D-4 from the filter.
9F3. Pressurize. Did pressure hold?
If **YES**, go to step 9F4. If **NO**, replace the filter.
9F4. Disconnect D-3 from the Drain Valve.
9F5. Pressurize. Did pressure hold?
If **YES**, go to step 9F6. If **NO**, replace the hose from D-3 to D-4 or remove obstruction from hose.
9F6. Disconnect D-2 from the Drain Valve.
9F7. Pressurize. Did pressure hold?
If **YES**, replace the hose from D-1 to D-2 or remove obstruction from hose. If **NO**, replace the Drain Valve. Reconnect all hoses.

Shut Off Valve Test

Step 1 through 4 test the vacuum hose from SOV-12 to the shut off valve, the shut off valve itself, and the vacuum hose from the shut off valve to the pressure control valve for restrictions and blockages. Refer to the diagram on page 12.

1. Disconnect SOV-12 from F-4.
2. Disconnect PCV-1 from PCV.
3. Connect PT-1 to SOV-12.
4. Pressurize.
5. Does pressure build up?
   If **NO**, go to step 6. If **YES**, go to step 6F.

Step 6 and 7 will test the air tightness of the vacuum hose from SOV-12 to the shut off valve, the shut off valve itself, and the vacuum hose from the shut off valve to the pressure control valve. The shut-off valve itself is not 100% airtight. Pressure will leak slightly from the shut-off valve to the inside of the fuel neck.

6. Connect ST Plug to PCV-1.
7. Pressurize.
8. Does pressure slowly go to zero?
   If **YES**, go to step 9. If **NO**, go to step 9F.
9. Remove PT-1 from SOV-12 and connect SOV-12 to F-4.
10. Proceed to Pressure Control Valve Test.

Shut Off Valve Test 6F

6F. Pressurize.
6F1. Disconnect SOV-11 from SOV-10.
6F2. Does pressure build up?
If **YES**, replace the hose between SOV-12 and SOV-11 and go to Shut Off Valve Test step 3. If **NO**, connect SOV-11 to SOV-10 and go to step 6F3.
6F3. Pressurize.
6F4. Disconnect SOV-8 from SOV-9.
6F5. Does pressure build up?
If **YES**, clean or replace the metal hose between SOV-l and SOV-9 and go to Shut Off Valve Test step 3. If **NO**, connect SOV-8 to SOV-9 and go to step 6F6.
6F6. Pressurize.
6F7. Disconnect SOV-7 from the Fuel Shut Valve.
6F8. Does pressure build up?
If **YES**, replace the hose between SOV-8 and SOV-7 and go to Shut Off Valve Test step 3. If **NO**, connect SOV-7 to the Fuel Shut Valve.
6F9. Pressurize.
6F10. Disconnect SOV-1 from the Fuel Shut Valve.
6F11. Does pressure build up?
If **YES**, replace the Fuel Shut Valve and go to Shut Off Valve Test step 3. If **NO**, connect SOV-1 to the Fuel Shut Valve and go to step 6F12.

Shut Off Valve Test 6F12

6F12. Pressurize.
6F13. Disconnect SOV-2 from SOV-3.
6F14. Does pressure build up?

If **YES**, replace the hose between SOV-1 and SOV-2 and go to Shut Off Valve Test step 3. If **NO**, clean or replace the metal hose between SOV-3 and SOV-4 and go to Shut Off Valve Test step 3.

Shut Off Valve Test 9F

9F. Go to step 9G.

Shut Off Valve Test 9G

9G. Disconnect SOV-4 from SOV-5.
9G1. Connect Adapter-1 with ST plug to SOV-4.
9G2. Did pressure hold?

If **YES**, replace the rubber hose between PCV-1 and SOV-5 and go to Shut Off Valve Test step 6. If **NO**, go to step 9G3.

9G3. Disconnect SOV-2 from SOV-3.
9G4. Connect ST plug to SOV-2.
9G5. Pressurize. Did pressure hold?

If **YES**, replace the metal hose between SOV-3 and SOV-4 and go to Shut Off Valve Test step 6. If **NO**, go to step 9G6.

9G6. Disconnect SOV-1 from the Shut Off Valve.
9G7. Connect Adapter-1 with ST plug to the Shut Off Valve.
9G8. Pressurize. Did pressure hold?

If **YES**, replace the rubber hose from SOV-1 to SOV-2 and go to Shut Off Valve Test step 6. If **NO**, go to step 9G9.

9G9. Disconnect SOV-7 from the Shut Off Valve and connect ST plug to SOV-7. Pressurize. Does pressure hold?

If **YES**, replace the Shut Off Valve and go to Shut Off Valve Test step 6. If **NO**, go to step 9G10.

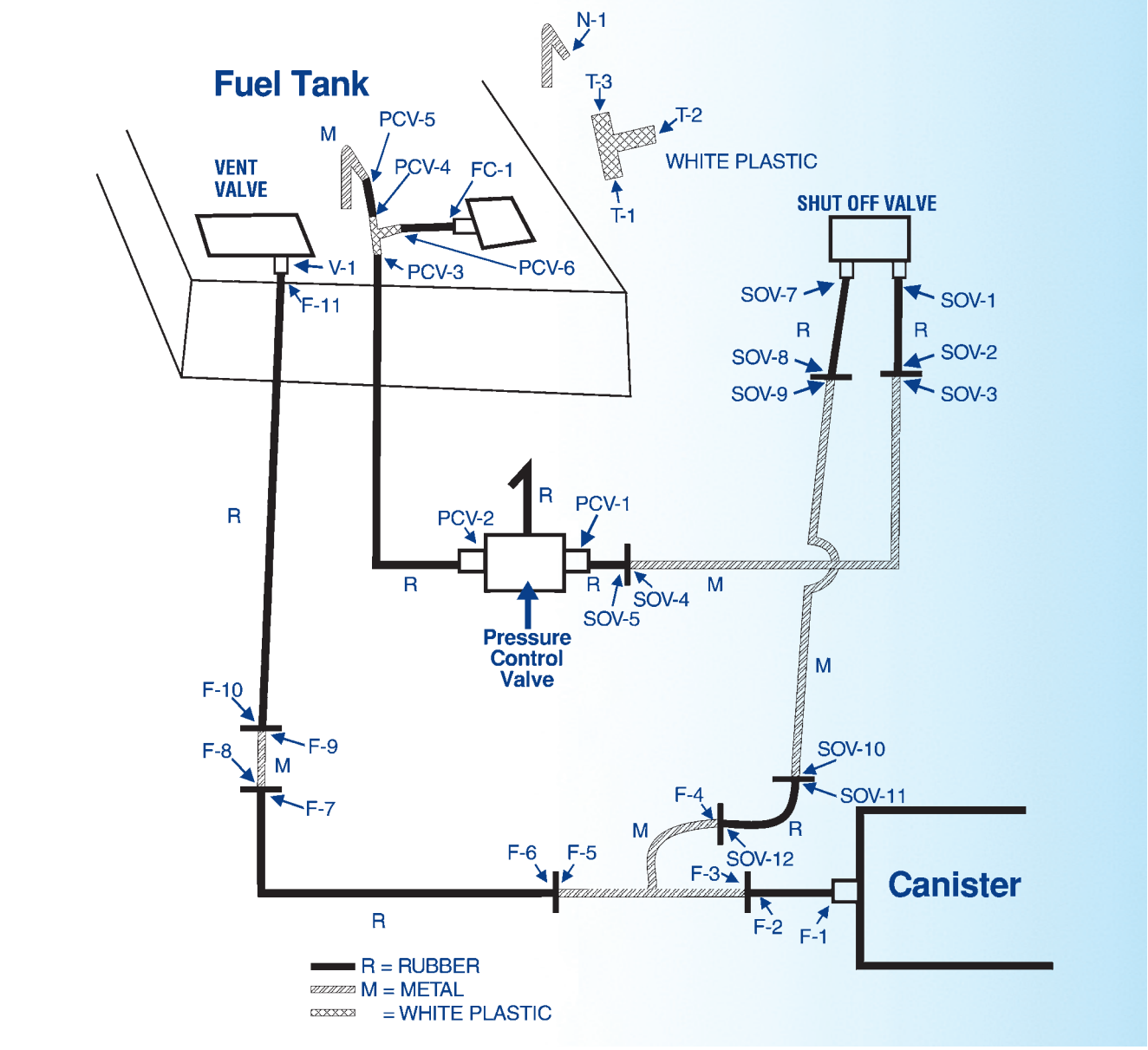
9G10. Disconnect SOV-8 from SOV-9.
9G11. Connect Adapter-1 with ST plug to SOV-9.
9G12. Pressurize. Does pressure hold?

If **YES**, replace the rubber hose between SOV-7 and SOV-8 and go to Shut Off Valve Test step 6. If **NO**, go to step 9G13.

9G13. Disconnect SOV-10 from SOV-11.
9G14. Connect the ST plug to SOV-11.
9G15. Pressurize. Does pressure hold?

If **YES**, replace the metal hose between SOV-10 and SOV-9 and go to Shut Off Valve Test step 6. If **NO**, replace the rubber hose between SOV-11 and SOV-12 and go to Shut Off Valve Test step 6.

Shut Off Valve Test and Pressure Control Valve Test



Pressure Control Valve Test

Step 1 through 8 will test the Pressure control valve for electrical and mechanical operation.

1. Remove ST plug from PCV-1.
2. Connect PT-1 with ST Adapter-1.
3. Disconnect PCV-2 from PCV.
4. Connect Adapter-1 to PCV, applying pressure where PCV-2 connects to PCV.
5. Activate PCV solenoid with Select Monitor.
6. Turn pump timer on with HOLD SWITCH to OPEN position.
7. Does pressure build to approximately 21, then fluctuates by 1 as solenoid turns on and off?
   If **YES**, go to step 8. If **NO**, replace PCV and go to step 1. Turn the pump timer off. Turn the pressure control valve off with the Select Monitor.

   Step 8 tests the PCV for air tightness.
8. Block PCV at PCV-1 and pressurize.
   Did pressure hold? If **YES**, go to step 9. If **NO**, replace the PCV and go to step 1.
9. Turn pump timer off.
10. Turn off PCV with Select Monitor.
11. Remove ST plug from PCV.
12. Remove PT-1 with ST Adapter-1 from PCV.
13. Connect PCV-1 to PCV.
14. Connect PCV-2 to PCV.
15. Proceed to Fuel Tank and Vent Control Valve Test.

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Filters	Includes oil, air and fuel filters
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Fuel Tank and Vent Control Valve Test

Warning: The next step introduces fuel vapors into the atmosphere. Test in well ventilated space. No Smoking!

Steps 1 through 9 tests the air tightness of the fuel tank, lines, and items shown in the illustration.

Warning: The pressure introduced into the fuel tank by the tester can push fuel from an open fuel line into the atmosphere.

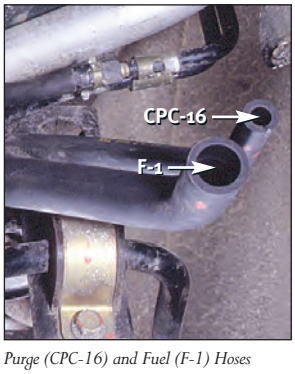
- Adjust the Select Monitor to read the fuel tank pressure.
- Check and record the fuel tank pressure. (With the cap off the pressure should be near zero.)
- Pressure higher or lower than zero could indicate a blockage in the PS-3 hose, PS-2 hose, the fuel tank passage or a failure of the pressure sensor.

Adapter 2 and Pressure Tester Hose

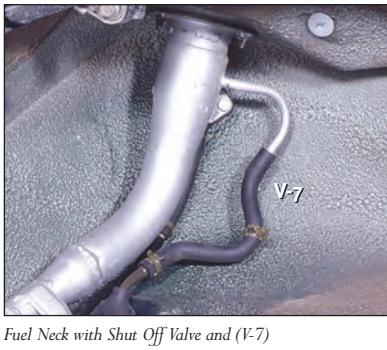
1. Remove Fuel Cap and connect cap to Adapter-2.
2. Connect opposite end of Adapter-2 to filler neck.
3. Remove PT-1 from hose and connect to threaded portion of Adapter-2.
4. Disconnect F-1 from canister.
5. Connect Adapter-1 with ST plug to F-1.
6. Loosen connection V-7. Do not remove at this time.
7. Pressurize.

Check and record the fuel tank pressure. At 24 in HG on the tester pressure gauge, the pressure reading on the Select Monitor should be +0.91 in HG or +23.3 mm HG.

If the pressure is not within specifications check the PS-3 hose for restrictions or blockage, and the PS-2 hose for restrictions, blockage and leaks.



Purge (CPC-16) and Fuel (F-1) Hoses



Fuel Neck with Shut Off Valve and (V-7)

Confirm that the fuel tank passage located at PS-1 is allowing fuel tank pressure to exit the tank.

8. **Warning: Next step introduces fuel vapors into the atmosphere.**
9. After 2 minutes, does pressure hold?

If **YES**, go to step 10. If **NO**, go to step 10F.

Step 10 and 11 will test the mechanical operation of the Vent control valve.

10. Listen to the sound of air leaving the tank as Adapter-1 with ST plug is removed from F-1.
11. Listen to the sound of air leaving the tank as V-7 is disconnected.
12. Did the speed of air escaping the tank increase from steps 10 to 11?

If **YES**, go to step 13. If **NO**, go to step 13F.

13. Connect V-7 to filler neck.
14. Proceed to Canister Test.

Fuel Tank and Vent Control Valve Test 10F

10F. Check all fuel lines, fuel cap and evaporative lines for proper connection.
10F1. Remove all fuel and tank pressure.
10F2. Follow instructions in the appropriate Subaru service manual for removing the fuel tank.
10F3. Plug all inlets and outlets from the fuel tank and external valves.
10F4. Ensure the fuel tank is at least half full and pressurize.
10F5. After leak has been found and repaired go to 10F6.
10F6. Pressurize.

Warning: The next step introduces fuel vapors into the atmosphere.

10F7. After two minutes, does pressure hold?

If **YES**, go to step 10F8. If **NO**, recheck for leaks and go to 10F5.

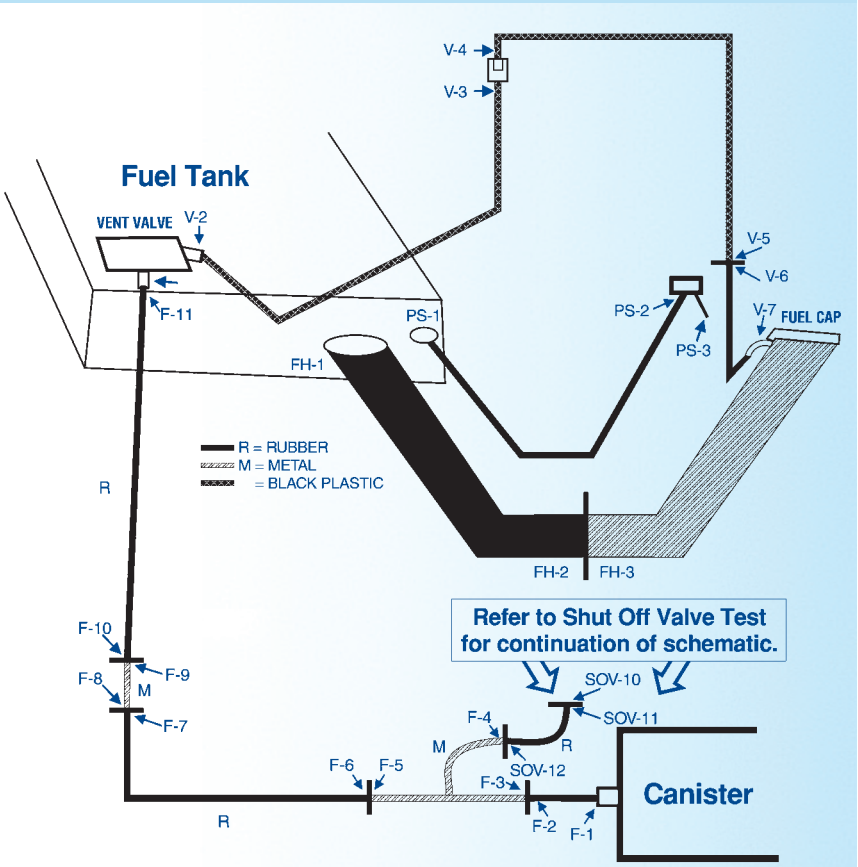
10F8. The following steps will check the operation of the vent control valve. This should be performed before installing the tank because the tank must be removed to replace a faulty valve. Steps 10F9. through 10F11 test the mechanical operation of the Vent Control Valve.

10F9. Listen to the sound of air leaving the tank as plug for F-11 is removed.
10F10. Listen to the sound of air leaving the tank as the plug for V-2 is disconnected.
10F11. Did the speed of air escaping the tank increase from steps 10F9 to 10F10?

If **YES**, remove all fuel and tank pressure and install the tank, using instructions from the appropriate Subaru service manual. If **NO**, remove all fuel and tank pressure and replace the Vent Control Valve using instructions from the appropriate Subaru service manual.

Note: If tank has been removed, perform Fuel Tank and Vent Control Valve Test steps 1 through 13 to confirm air tightness of the fuel tank and Vent Control Valve after installation.

Fuel Tank and Vent Control Valve Test



Fuel Tank and Vent Control Valve Test 13F

13F. Remove all tank pressure.
13F1. Remove V-7 from the fuel neck and connect PT-1.
13F3. Remove V-2 from the Vent Control Valve.
13F4. Pressurize. Did pressure hold?

If **YES**, replace or remove the obstruction from the rubber hose between V-7 and V-2 and go to Fuel Tank and Vent Control Valve Test step 7. If **NO**, go to 13F5.

13F5. Insert the ST Plug into the V-2 hose.
13F6. Pressurize. Did pressure hold?

If **YES**, remove all fuel and tank pressure and replace the Vent Control Valve using instructions from the appropriate Subaru service manual. If

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Aerosols	Includes chlorinated and non-chlorinated brake and carburetor cleaners, aerosol and pour fuel injector cleaners, top engine cleaner, application tools and adapters, glass cleaner, throttle plate cleaner and silicone lubricant
Fluids	Includes factory fill coolant, brake fluid, factory fill windshield washer concentrate and automatic transmission fluid/power steering fluid
Refrigerant	Packaged to the ARI 700 Standard

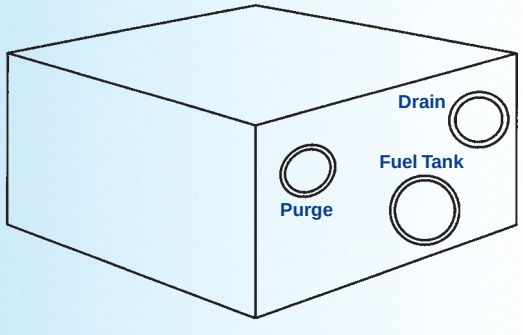
NO, replace the rubber hose between V-7 and V-2 and go to Fuel Tank and Vent Control Valve Test step 7.

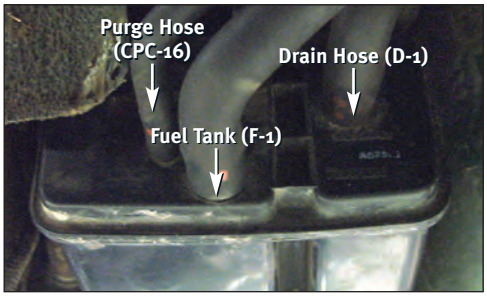
Note: If the tank has been removed, perform Fuel Tank and Vent Control Valve Test steps 1 through 13 to confirm air tightness of the fuel tank and Vent Control Valve after installation.

Canister Test

Steps 1 through 8 tests the air tightness of the canister. Disconnect all three hoses from the canister.

Canister Test





Canister with Hoses

1. Reinstall PT-1 to pressure tester hose.
2. Connect Adapter-1 to PT-1.
3. Connect Adapter-1 to purge hose connection of canister.
4. Connect Adapter-3 to fuel tank hose connection of canister.
5. Connect Adapter-4 to Drain hose connection of canister.
6. Pressurize.
7. After two minutes, does pressure hold?
   If **YES**, go to step 9. If **NO**, go to step 9F.
8. Disconnect three Adapters from canister.
9. Connect all hoses back to canister and secure.

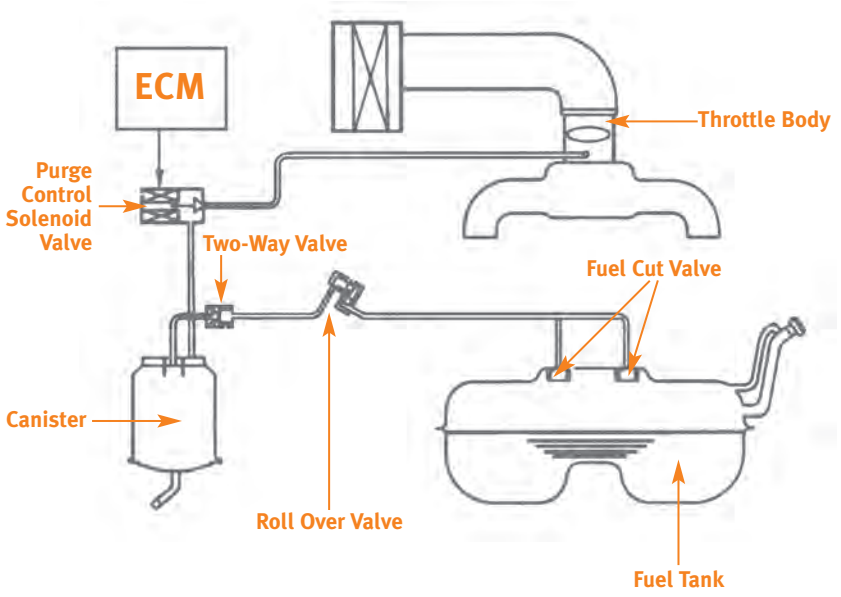
Evaporative Emissions System Theory

Subaru vehicles are equipped with either a Conventional or Enhanced Evaporative Emissions Control System. Both systems function to prevent unburned Hydrocarbons from escaping to the atmosphere.

Conventional Evaporative components include the following:

1. Fuel Cap – Construction incorporates a relief valve that allows air to enter the tank in the event a vacuum develops.
2. Canister – Temporarily stores evaporative gas from the fuel tank.
3. Purge Control Solenoid Valve – Controls the flow of stored evaporative gas from the canister to the intake manifold.
4. Two Way Valve – Controls air flow to the fuel tank. High tank pressure opens the valve allowing the pressure and evaporative gas to the canister. Low tank pressure closes the valve allowing atmosphere to the fuel tank through a pinhole in the valve.
5. Fuel Cut Valve – Used on AWD models. Prevents liquid fuel from entering the evaporative line.

Conventional Evaporative System



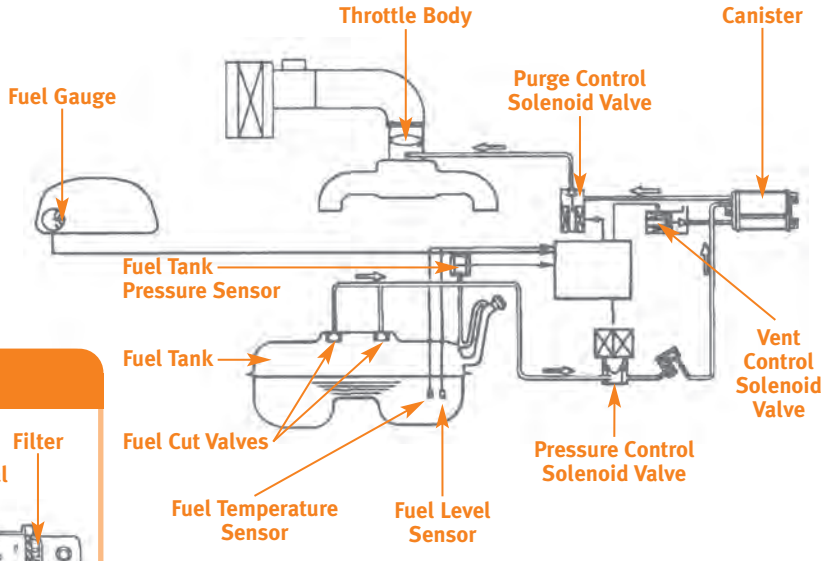
The fuel separator allows fuel vapor to condense and return to the tank as liquid. Some models use a plastic tank mounted in the trunk or cargo areas. Other models use an air space designed into the fuel tank to condense fuel vapors.

System Operation – The ECM grounds the purge control solenoid, turning it on. Ported vacuum then removes the stored evaporative gas from the canister. System activation is controlled based upon coolant temperature, engine load and vehicle speed inputs.

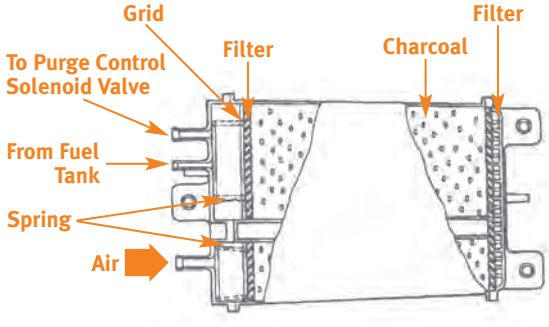
Enhanced Evaporative System

Enhanced Evaporative components include:

1. Canister – Function is unchanged, however the shape is more boxy and is located under the right rear of the vehicle.

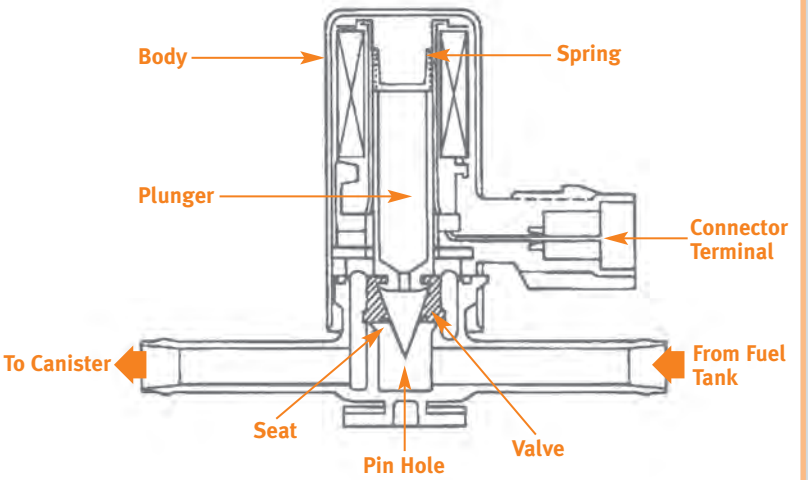


Canister

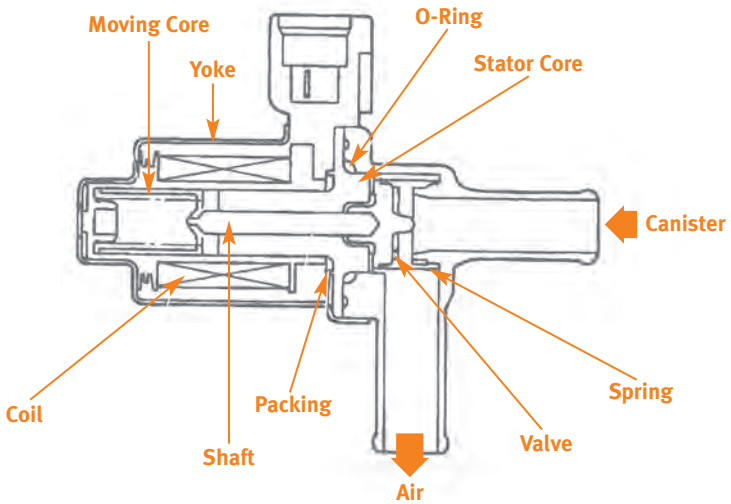


2. Pressure Control Duty Solenoid – Adjusts the pressure inside the fuel tank from a signal from the ECM. It also controls the flow of evaporative gas from the fuel tank to the canister.
3. Vent Control Solenoid Valve – Controls the flow of atmospheric pressure to the canister. During normal operation the valve is open allowing atmospheric pressure to the canister. During the time the ECM is checking the integrity of the evaporative system the valve is closed to isolate the system from atmosphere.

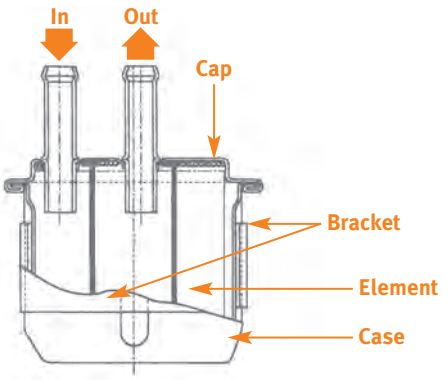
Pressure Control Duty Solenoid



Vent Control Solenoid Valve



Air Filter



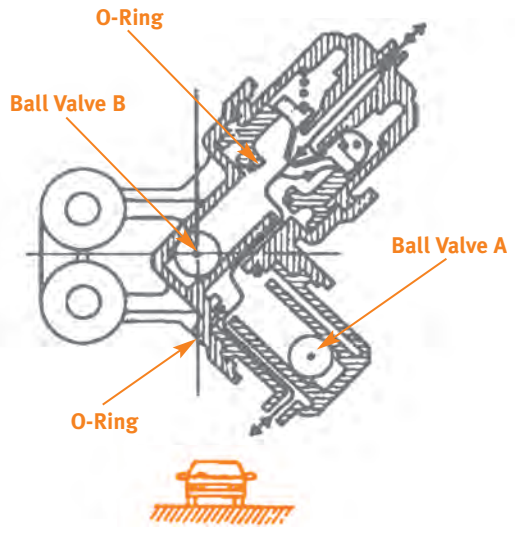
4. Air Filter – Filters air as it enters the vent control solenoid valve.
5. Fuel Tank Pressure Sensor – Monitors fuel tank pressure and sends an input signal to the ECM.

System Operation – Optimum purge control is programmed in the ECM and is influenced by engine load, coolant temperature and vehicle speed.

When fuel tank pressure is low, the pressure control solenoid valve closed. The vent control solenoid is open and the purge control duty solenoid is active. When fuel tank pressure is high, the pressure control solenoid valve is open.

The fuel caps of both systems have a vacuum relief valve that allows atmospheric pressure to enter the fuel tank. This prevents vacuum from forming as the fuel is used, and acts as a back up for the two way valve.

Roll Over Valve in Normal Vehicle Position



Both systems use a rollover valve located under the center rear of the vehicle. Rollover valve operation prevents fuel from flowing through the evaporative line in the event of a vehicle rollover. Valve operation is performed by gravity and the position of two Ball Valves.

With Vehicle on its Side

With Vehicle on its Roof

Evaporative Emissions System Theory

On Board Refueling Vapor Recovery

On Board Refueling Vapor Recovery (ORVR) controls the pressure inside the fuel tank and collects fuels vapors during all vehicle operating conditions and during the time the vehicle is being refueled.

ORVR Components include:

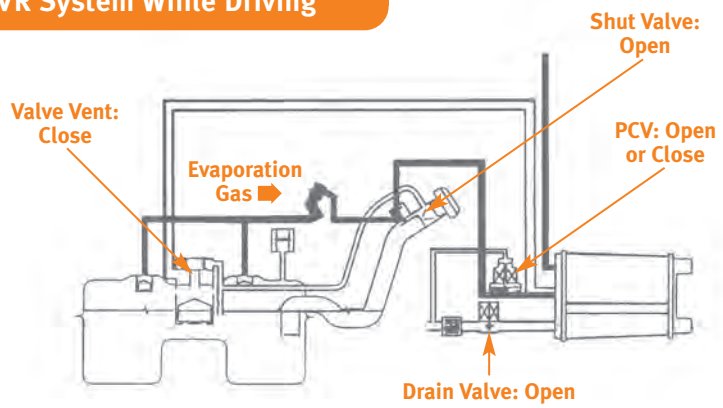
- Fuel Cut Valve (FCV) – Prevents liquid fuel from entering into the evaporative line.
- Valve Vent – Controls the flow of fuel vapors during the time the vehicle is being refueled.
- Pressure Difference Detecting Line – Directs atmospheric pressure to the back side of the valve vent diaphragm.
- Orifice Chamber – Drains fuel from the pressure difference detecting line into the tank.
- Shut Valve – Closes the evaporation line when a filler gun is inserted into the filler neck. Prevents fuel vapors from escaping to atmosphere while refueling.
- Tank Pressure Sensor – Monitors fuel tank pressure for diagnosis.
- Vent Line – Directs fuel vapors from the valve vent to the canister during the time the vehicle is being refueled.
- Pressure Control Valve (PCV) – Controls the flow of fuel vapors from the tank to the canister, except during the time the vehicle is being refueled. Also controls the flow of atmospheric pressure to the tank when a negative pressure develops.
- Drain Valve – Provides a pathway to atmosphere for air after the fuel vapors have been removed by the charcoal element of the canister (only while the vehicle is being refueled).

ORVR System Operation

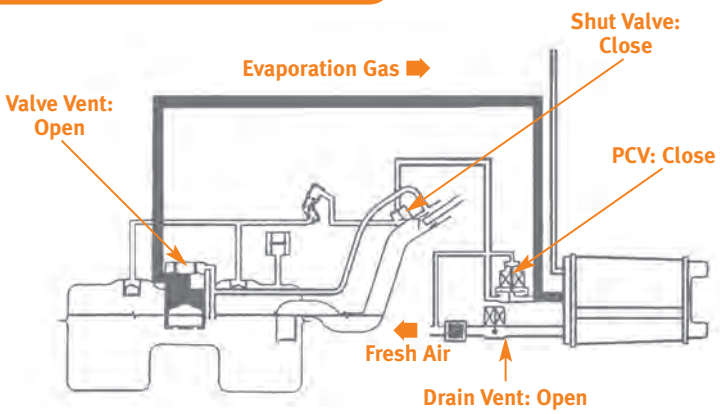
While Driving

While driving, the fuel tank pressure is applied to one side of a diaphragm inside the Pressure Control Valve. When the pressure is greater than atmospheric, a port inside the PCV opens. This allows fuel vapors to the canister. If negative pressure exists, the PCV opens allowing atmospheric pressure to the fuel tank.

ORVR System While Driving



ORVR System While Refueling



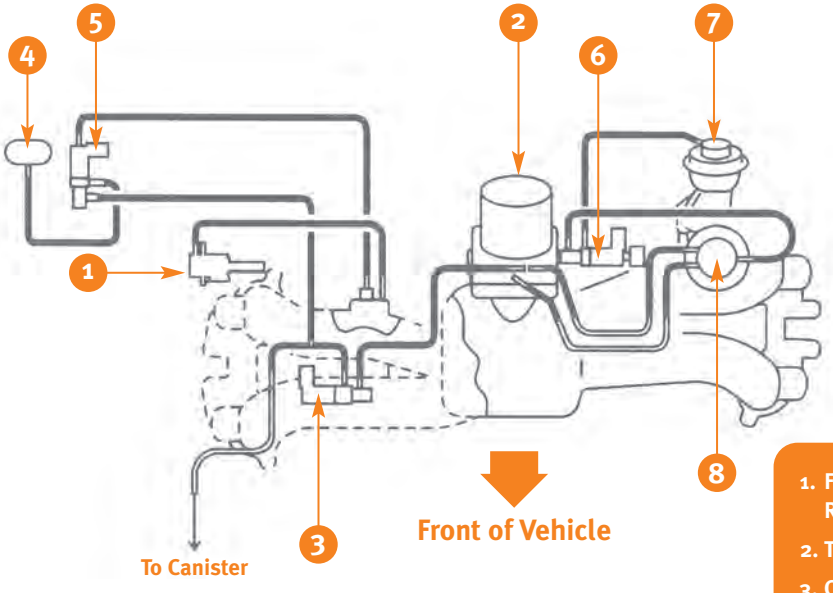
While Refueling

As fuel fills the tank during refueling, the air inside the tank is displaced carrying fuel vapors with it. This large increase in pressure opens the valve vent allowing the fuel vapors to the canister.

The continued filling of the tank pushes the remaining air and fuel vapors through the canister. The charcoal element of the canister absorbs the fuel vapors an directs fuel vapor-free air to the atmosphere though the drain valve and air filter.

The PCV is checked by the ECM for circuit malfunction. Drain valve checks include circuit and performance checks.

1995 and Newer Manifold



Pressure Sources Switching Operation

A Pressure Sources Switching solenoid (PSSS) is used on 1995 and newer Subaru vehicles equipped with OBD II. The PSSS functions via an ECM ground signal and switches to allow atmospheric pressure to reach the pressure sensor during engine start, then every 30 minutes or 3.1 miles. The PSSS switches to allow manifold pressure to reach the pressure sensor when not switched to atmosphere.

1. Fuel Pressure Regulator
2. Throttle Body
3. Canister Purge
4. Pressure Sensor
5. Pressure Sources Switching Solenoid
6. EGR Solenoid
7. EGR Valve
8. Back Pressure Transducer

: Hose

: Pipe

Evaporative Emissions System Theory

The passageway to atmosphere on conventional evaporative systems accesses the atmosphere via the evaporative canister. Enhanced evaporative systems access the atmosphere via an extension of the PSSS.

The pressure sensor functions to monitor manifold and atmospheric pressure. PSSS position determines the pressure source. Changes in pressure (positive or negative) produce a changing reference voltage signal. Reference voltage signal changes are used by the ECM to determine optimum ignition timing and injection duration.

Canister purge flow is also monitored with the Pressure Sensor. The PSSS switches to atmosphere while the purge control solenoid is on.

ORVR Component Changes

The fuel tank and ORVR components have been relocated on 2000 and later Legacy models. This makes necessary movement of key fuel system plumbing. One such movement involves a new hose, which is routed from the fuel neck to the vent control valve located on the driver's rear of the fuel tank. The routing carries the hose through the inner fender into the passenger compartment.

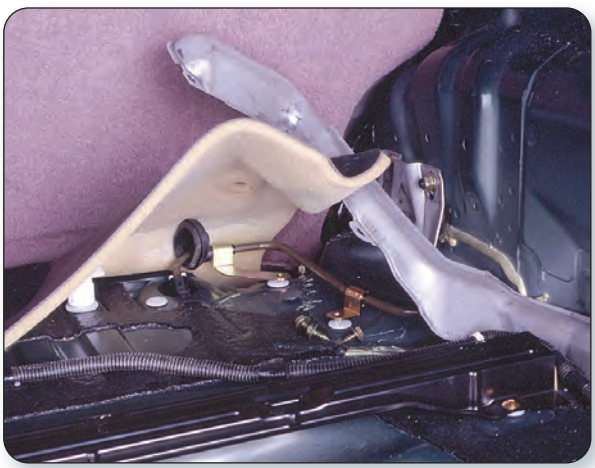


Figure 1: *Hose Quick Connector*

Figure 2: *Fuel Pump and Sub Pump Unit Access*

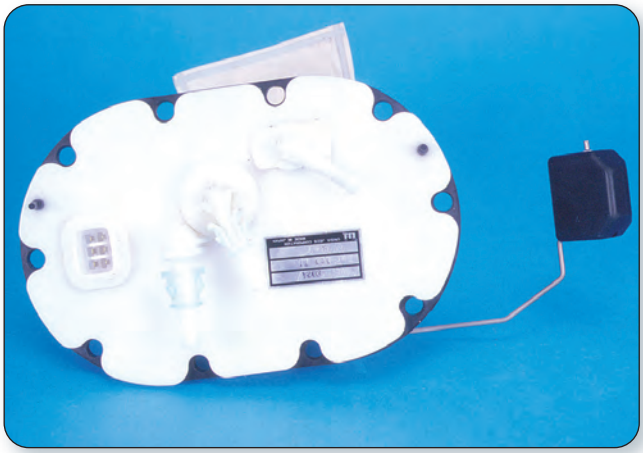


Figure 3: *Resin Based Fuel Pump Assembly*

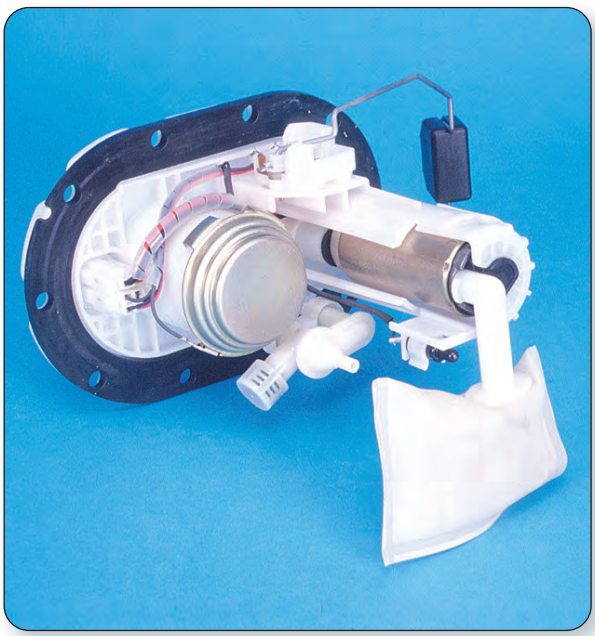


Figure 4: *Round Fuel Filter Housing*

The hose is protected by a metal cover, which must be removed to gain access to the quick connector ***(Figure 1)***. The quick connector must be disconnected before the fuel tank is lowered.

Movement of the fuel tank is accompanied by a change in the fuel pump assembly design and location. The fuel pump assembly and sub pump pickup assembly are now accessed from under the rear seat ***(Figure 2)***. The pumps are located on the lower level of the fuel tank which makes it necessary to remove the fuel from the tank before removing the fuel pump or sub pump pickup assemblies. Failure to remove fuel from the tank will result in fuel being introduced into the passenger compartment.

A fuel drain is located on the passenger side, front of the fuel tank. Use of this drain will lower the fuel from the high

Figure 5: Static ChargeWiring

side of the tank and totally drain the passenger side of the saddle tank. The sub pump pickup side of the tank (the drivers side) will remain full. Consult the appropriate Subaru service manual on proper procedure for draining all fuel from the fuel tank.

The body of the new fuel pump assembly is resin based ***(Figure 3)***. The gasket for the assembly has two location prongs that must be pulled into the outer cover. The assembly includes a round housing ***(Figure 4)*** designed to accept a fuel filter. However, vehicles for the North American market do not have a filter located on the fuel pump.

The small wire connected to cap area of the fuel pump housing carries static charges away from the pump body to vehicle ground ***(Figure 5)***.

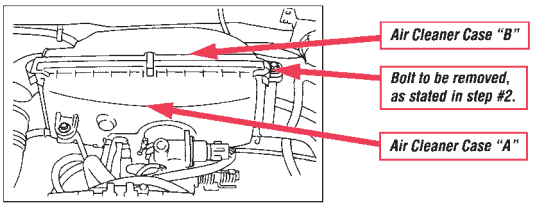
The low fuel level sensor operation has also been enhanced. The sensor itself works the same as before. However, the low level when sensed triggers a circuit located in the fuel gauge to maintain the low level indicator illumination until fuel is added to the tank.

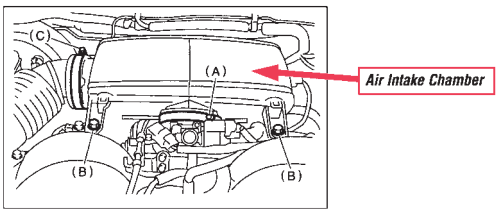
insider info

ISC Valve Cleaning

If you encounter a driveability concern such as idle surges or whistling, it may be caused by carbon buildup on the idle speed control (ISC) valve. In these cases, it is not necessary to replace the ISC valve. Cleaning the ISC valve could correct the condition. To clean an ISC valve, perform the following procedure.

Note: Refer to the chart for vehicle applicability.

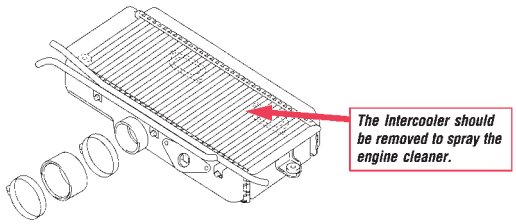




Normally Aspirated Engine ISC Cleaning Procedure

1. Warm up the engine.
2. On 2.2 and 2.5L engines only, remove the bolt that attaches the air cleaner case "B" to the bracket. Undo the three clips that hold air cleaner case "B" to air cleaner case "A." Remove the air cleaner case "B" and the air cleaner element and set them aside. (On all 3.OL H6, remove the entire air intake chamber).
3. Start the engine and maintain 1000-1500 rpm.
4. Spray engine cleaner GM Top Engine Cleaner (Part #12345089) or equivalent toward the upper air-stream of the throttle chamber for approximately 10 seconds.
5. Stop the engine and let it sit for three minutes.
6. Restart the engine and maintain 1000-1500 rpm.
7. Spray engine cleaner on the upper air-stream of the throttle chamber for approximately 10 seconds.
8. Turn the engine off.
9. Reinstall the air cleaner element and air cleaner case "B."
10. Operate the engine between 1000-2000 rpm until no white smoke appears from the tailpipe.
11. Turn the ignition switch OFF and clear memory.

Turbo Engine ISC Cleaning Procedure



1. Warm up the engine.
2. Remove the intercooler and set it aside.
3. Disconnect the mass airflow sensor connector.
4. Cycle the key ON/OFF once (to enter failsafe mode).
5. Start the engine and maintain 1000-1500 rpm.
6. Spray engine cleaner GM Top Engine Cleaner (Part #12345089) or equivalent on the upper air-stream of the throttle chamber for approximately 10 seconds.
7. Stop the engine and let it sit for three minutes.
8. Restart the engine and maintain 1000-1500 rpm.
9. Spray engine cleaner on the upper air-stream of the throttle chamber for approximately 10 seconds.
10. Turn the engine off.
11. Reinstall the intercooler and reconnect the mass airflow sensor connector.
12. Operate the engine between 1000-2000 rpm until no white smoke appears from the tailpipe.
13. Turn the ignition switch OFF and clear memory.

Model Year	Model	Engine Type
1999	Legacy	2.2L California
2000-2001	Legacy	2.5L MT
All	Legacy	3.0L MT
2004	Baja	2.5L Turbo
1999	Impreza	2.2L California
2000-2001	Impreza	2.2L
2002-2004	Impreza	2.0/2.5L Turbo

H6 Driveability

If you get an H6 Subaru vehicle in the shop with a driveability concern, i.e. hesitation, make certain the owner is using a premium grade fuel (91 octane or higher). With the recent increase in fuel prices, there may be some people who have dropped down a notch or two in octane ratings to save a few pennies. While this is understandable, these vehicles were designed to operate properly

on a premium grade fuel. If the owner says they are using a premium grade fuel, ask them if they tend to buy just one brand. If so, suggest they try another brand to see if engine operation is improved. It will take a few tanks of the different brand of fuel for the engine control module (ECM) to 're-learn' its operating parameters on this different fuel.

If you are able to duplicate the owner's concern, perform a Clear Memory function of the ECM, then road test the vehicle again. If the concern has gone away, then the most likely cause of the problem is the fuel being used in the vehicle at that time.

Another factor to take into consideration is the use of oxygenated or reformulated fuels, known as State Winter Oxygenated Gasoline. Oxygenates are fuel additives (alcohols and ethers) that contain oxygen, which can boost gasoline's octane quality, enhance combustion and reduce exhaust emissions. The term oxygenated gasoline most commonly refers to the wintertime program that reduces emissions of carbon monoxide (CO) from motor vehicles. Although required by the federal Clean Air Act, winter oxygenated gasoline programs are implemented by the states. For more information on state fuel programs go to: www.epa.gov/otaq/ regs/fuels/oxy-area.pdf.

Rough Idle and Check Engine Light

A rough engine idle condition may occur when the vehicle's battery is disconnected for less than 30 minutes on some 2001 and later Subaru vehicles, up to and including the 2003 Legacy and Baja. The rough idle condition only affects four cylinder, non-turbo vehicles. 2004 model year vehicles may also be affected.

Clearing the memory with the Select Monitor will correct this condition. Also, the ECU will most likely clear itself if the battery is allowed to remain disconnected for more than 30 minutes.

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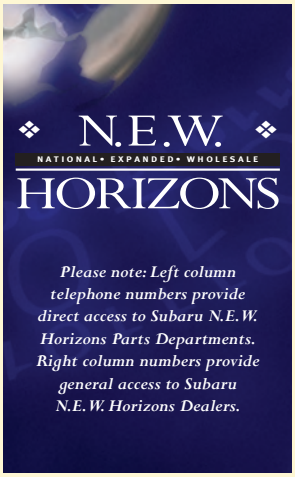

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DTC P0507 - Idle Control System RPM Higher Than Expected

If you find yourself diagnosing a DTC P0507 — Idle Control System RPM higher than expected — check to see if the accelerator or cruise control cables are adjusted properly.

Evaporative Canister Rattle Noise

If you encounter a rattle noise while driving or when closing the rear doors of a 2004 Impreza, the evaporative canister bracket may be rubbing on the right rear tie down hook. Push or bend the canister bracket slightly to the left to increase clearance between the two parts. This can be done by hand in most cases.

Reading OBD Readiness Codes

Many states are now including an inspection of the OBD system as part of their emissions test procedure. This includes, but may not be limited to, inspection of the MIL or Check Engine Light for proper illumination, operation, and status of the Readiness Codes.

Readiness Codes can be checked with a generic scan tool and the New Select Monitor (NSM). Follow the tree below to access the Readiness Codes with the New Select Monitor:

- Each System Check
- EGI
- OBD System
- 12 Data Display

Any item that is a Readiness Code will have an indicator to the right that tells you whether it is Complete or Incomplete. Complete means that the system has been tested by the onboard diagnostic system. Incomplete means that the system has not been tested. In either case the results of the test are not indicated. No support indicates that this vehicle is not equipped with that system.

A vehicle must have all of the Readiness Codes reading Complete before it can be inspected for proper emissions.

Misfire, Fuel System and Component Monitoring are continuously checked and will change from Incomplete to Complete while the ignition is turned from off to on.

The Readiness Codes will all indicate incomplete after the memory of an ECM has been cleared.

Follow the steps below to activate the Readiness Codes to complete:

- 1996 models: Connect the Test Mode (inspection mode connector) and drive on a flat road (highway) at approximately 50 to 55 mph for 20 to 30 minutes.
- 1997 and later: Drive on flat road (highway) at approximately 50 to 55 mph for 30 minutes for warm-up. Then perform 10 minutes at steady speed (without any throttle angle change) at 50-60 mph.

OBD II Cylinder Misfire Codes

If you encounter cylinder misfire codes on Subaru vehicles equipped with the OBD II system, check the past service history to see if the vehicle's fuel filter was recently changed.

There is a short period of time when the vehicle is first started, after the filter has been changed, when the cylinders may not get the fuel charge they should. This may translate into a slight cylinders misfire, which is enough to trigger a misfire DTC.

If the fuel filter was changed recently, clear the codes and test drive the vehicle. Chances are good that the codes will not return if the filter change was the cause of the problem.

Legacy and Impreza Engines with No Injection Pulse #1 Cylinder

Built into the fuel injection control unit is logic that will shut off the #1 injector if the computer believes that it can no longer control the Idle Air Control valve. Remember this while trying to diagnose a "hard" code for the Idle Air Control Valve or a dead miss in number one cylinder due to no injection at idle. A problem in the Idle Air Control valve circuit can be responsible. (Component testing shows that it is usually not the valve itself.)

Another unusual computer response is if the computer is deprived of its "back up power supply." If deprived of this power, some computers will generate a false code for the Idle Air Control valve and kill the injector for cylinder #1. The pin location of this power supply can be found in the Control Unit Module I/O Signal pages of the appropriate service manual.

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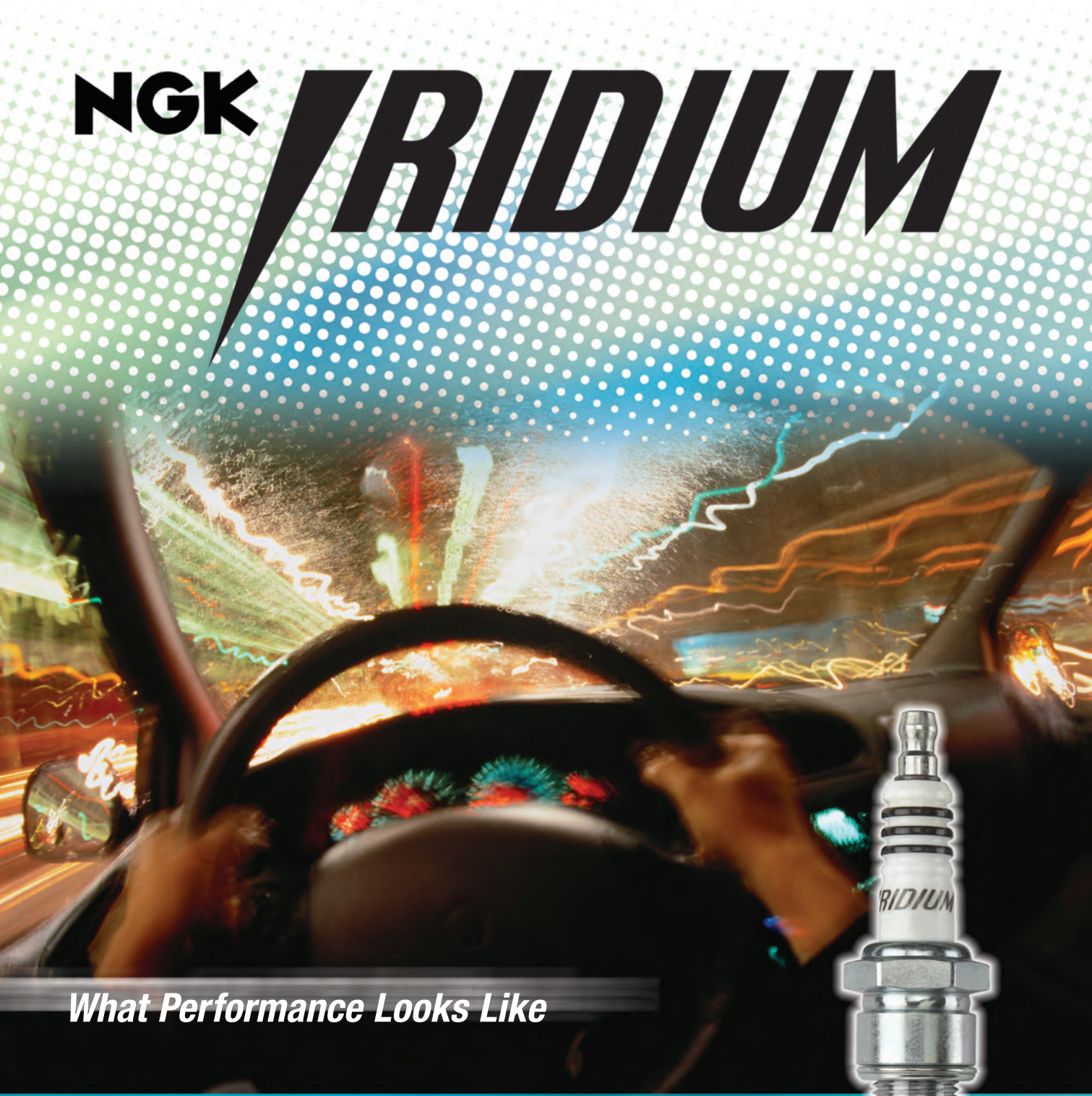

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