Subaru

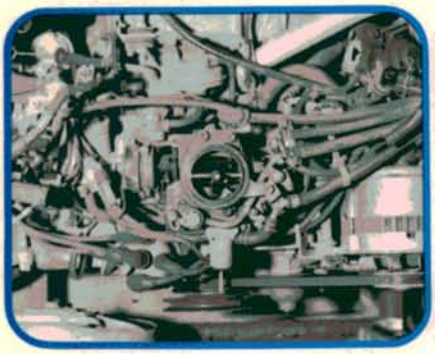
Emission Overview

Subaru uses a mix of old and new technology. They have the basic engine layout that Volkswagen started with before WW II. They pioneered the use of four-wheel drive on passenger cars in the 1970s.

This article will give you a basic overview of the emission systems used during the 1980-84 model years. There were several different carburetors used during this period. We can't cover them all separately, but I will point out differences where they exist. For photographic purposes, I used a 1983-vintage 1800 with a Carter-Weber carburetor.

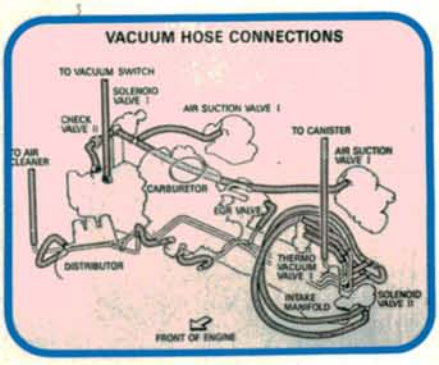
On engines equipped with the Hitachi two-barrel carb, watch for fuel drippage inside the secondary venturi. The drippage can be caused by a loose setscrew that holds the venturi in place. Tighten the setscrew and carefully re-stake it in place.

—By Lou Reichardt



1

There's a lot more here than on the old VW! Subaru used three different emissions systems during the 1983 model year: a Hitachi two-barrel, a Hitachi two-barrel with feedback control, and a Carter-Weber with feedback control. Find out what you're working on before you go too far.



2

The underhood decal is a good source of emissions information if you don't have a manual. It gives a good idea of where things are located on the engine. Check for proper hose routing. Also look for dry or cracked hoses at this time.

3

Two pink test connectors are located next to the coil. You can make resistance and voltage checks of various components from these connectors. When setting the carb duty solenoid ratio, connect your meter to the yellow wire with the red tracer in connector 2.

4

Under the dash are test connectors 3 and 4, which are red and black. These offer access to certain feedback components that (underhood) connectors 1 and 2 do *not*. To prevent damage to the wiring terminals, always probe these connectors from the wiring harness side of the connector.

5

This solenoid valve mounted on the side of the Carter-Weber carb controls air/fuel ratio by varying the open time (duty cycle) of an air bleed passage inside the carb. On the Hitachi carb, a pair of external valves mounted near the carb regulates the air that's bled into the system.

6

The Carter-Weber carb uses an idle stop solenoid to control idle speed. If the engine diesels after shut-off, check for proper operation of this solenoid. If the engine will not hold the correct idle speed, check for constant voltage at the solenoid with the ignition on.

7

These carbs should not be adjusted using the lean drop method. Attach a dwell meter to the proper terminal of test connector 2 and adjust the duty cycle to 31.5 degrees plus or minus 4.5 degrees. Reinstall the anti-tampering pin when you're done.

8

The ECM uses several input sensors to give it the information needed to determine proper duty cycle ratio. Two vacuum switches on the right strut tower measure engine vacuum under normal and accelerating conditions.

9

The oxygen sensor is mounted at the junction of the Y-pipe. It measures the concentration of oxygen in the exhaust and sends this information to the ECM. The ECM then adjusts the carb duty cycle based on oxygen sensor readings to get acceptable emission levels.

10

The thermal sensor mounted on the right side of the intake manifold can be a source of problems. This sensor can work intermittently. Unless the sensor open-circuits completely or short-circuits completely, the ECM may not read it as a failure and may not set a fault code for it.

11

An intermittent thermal sensor may affect choke heater operation. With the ignition on, put a test light on the choke heater terminal. Tap the sensor and watch your test light to see if it flickers or goes out. Check for loose terminal lugs on the sensor itself.

12

A thermal vacuum valve mounted on the left side of the engine controls application of vacuum to the distributor advance and the EGR valve. The ECM also provides vacuum control through a vacuum solenoid. If you have vacuum problems, check these valves for proper operation and correct hose routing.

13

The ECM is capable of self-diagnosis through the use of a light-emitting diode (LED) which flashes trouble codes. Two test terminals near the ECM must be connected to begin self-diagnosis. During normal operation, the LED flashes to monitor oxygen sensor operation.

14

This purge valve mounted on the side of the Carter-Weber carburetor routes fuel vapors from the carb to the charcoal canister. The ECM controls this valve.

15

Probably the most ignored piece of emissions gear is the charcoal canister. That's because it is seldom the source of a problem. This one is the exception to the rule. If this pressed-on purge valve shakes loose, it'll create a vacuum leak.

16

This engine seems to be very susceptible to pinging. Various factory modifications have been made since 1980. Make certain that the timing is correct and that the EGR is working properly. If necessary, remove the EGR valve and then clean carbon deposits out of the EGR inlet passage.

17

To help prevent fuel percolation, a vapor separator is mounted on the left strut tower. This is *not* the primary fuel filter. The primary filter is under the car with the electric fuel pump. A neglected primary fuel filter can cause a variety of driveability problems.

18

To help control emissions, Subaru uses an air induction system to feed air into the exhaust. No air pump's needed because the exhaust pulses pull in the required air. Air switching valves at the rear of each head route the air to the exhaust ports.

19

After a period of 123 seconds, the ECM de-energizes this vacuum solenoid. This cuts the flow of air to the exhaust ports. The oxygen sensor is downstream of the switching valves. If the switching valves stick open, this additional air would continue flowing and would confuse the oxygen sensor.

20

A catalytic converter is used to further reduce HC/CO emissions. The exhaust pulses pull in or draw in secondary air upstream of the switching valves. The pipe shown here by-passes the oxygen sensor in order to route secondary air full-time to the converter.