Module 13
Exhaust Gas Recirculation (EGR) Valve Lift Sensor

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13 EGR Valve Lift Sensor

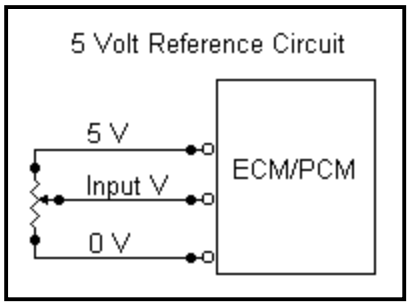
13.1 General Overview

The exhaust gas recirculation (EGR) valve lift sensor is a traditional 5-volt reference type sensor. The primary purpose of the lift sensor is to report to the engine control module (ECM) the position of the EGR valve.

The EGR valve lift sensor is somewhat different than most of the other inputs in that it is mainly used to report the result of an output. The EGR valve is opened by the EGR solenoid valve, which is activated by the ECM. The ECM uses various inputs to determine the amount to open the valve. The EGR valve lift sensor reports back to the ECM the actual position of the valve. The ECM compares this position to its internal tables and determines if the valve is at the correct position for all the given parameters. In the early model if the valve is not at the correct position a diagnostic trouble code (DTC) was set. In the newer models the EGR lift sensor is used in a feedback mode to help the ECM place the EGR in the correct position.

13.2 How Do They Work?

Illustration 13-1



The EGR lift sensor is a standard 5-Volt reference type sensor. As shown in the Illustration 13-1, on the left, the ECM supplies 5 volts and a ground to the sensor on 2 wires. The 5 volts is applied across a resistive strip that is shaped like an arc. The input wire is attached to a wiper that moves across the resistive strip as the EGR valve opens.

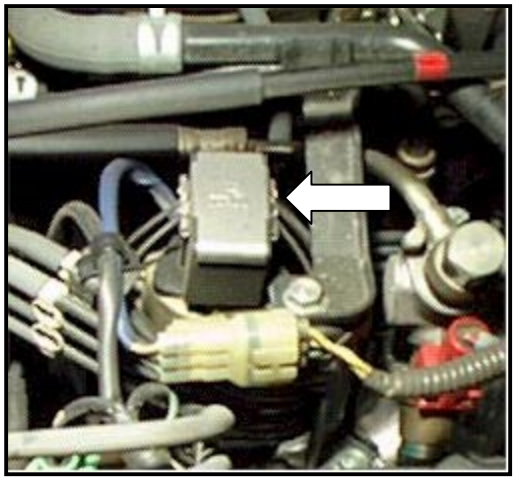
As the wiper is moved across the resistive strip the voltage will change proportionally to its position. When the wiper gets closer to the ground wire, the voltage will be low. When the wiper gets closer to the 5-volt wire the voltage will get higher. The typical voltage range of the EGR lift sensor is 1.2V (closed) to 4.0V (open).

13.3 Component Location

The EGR valve lift sensor is mounted to the top of the EGR valve. The lift sensor is indicated in the Image 13-1 by the white arrow. The lift sensor is mounted permanently to the EGR valve and cannot be bought separately.

The EGR valve is typically mounted on the back right corner of the engine. Some models do not have an EGR valve. Many of the Civics have been engineered in such a way as to not need an EGR valve to control NOx.

Image 13-1 Typical Honda EGR Valve



13.4 How Do You Test Them?

The EGR lift sensor is tested like most other 5-volt reference sensors. You need to confirm a ground on one wire, Approx. 5 volts on another wire, and a valid input voltage on the other wire. The typical input voltage for an EGR valve lift sensor is 1.2 with no vacuum applied and 4.0 volts with vacuum applied (EGR valve fully open).

Monitor the input voltage while moving the valve through its range of motion with a vacuum pump. The voltage transitions should be smooth with no dropouts. While this input voltage could be done using a digital volt-ohm meter (DVOM), it is better to graph the voltage using a digital storage oscilloscope (DSO) or graphing multi meter (GMM).

13.5 EGR Lift Sensor and OBD-II

Pre OBD-II
The forerunner to the OBD-II system, the OBD-I system, was required on all cars sold in California beginning in 1988. It was a very basic system, which illuminated the malfunction indicator light (MIL) when certain sensors failed.

One of the systems that had to be monitored under the OBD-I guidelines was the EGR system. If the EGR valve failed to lift when commanded, the MIL was to be illuminated. Prior to OBD-II this was the lift sensor's primary job, to report to the ECM that the EGR valve was working. The ECM would take the EGR valve lift sensor voltage and compare it to its internal standards. If the valve position was outside the range of the ECM internal tables, a DTC was set and the MIL was illuminated.

The EGR valve lift sensor was primarily used to alarm the ECM when the valve was not working. It appears that the input voltage was not used for any other purposes on the OBD-I systems.

OBD-II
With the advanced monitoring requirements of the OBD-II systems, the EGR valve lift sensor input plays a larger role. It is used when the EGR monitor is run to determine if the valve did in fact lift. Here is the typical series of events that occur when an EGR monitor is run.

The EGR monitor is run as follows if the enable criterion has been met.

- Under a long deceleration period the ECM momentarily opens the EGR valve
- When the EGR monitor activates the EGR valve, it is looking for the correct response from the EGR valve list sensor.
- If it does not get the proper response it will set a DTC for bad a EGR valve or piping
- If the EGR valve lift sensor did respond correctly, the ECM would then look for a momentary drop in manifold vacuum. This is indicated by a momentary drop in the manifold absolute pressure (MAP) sensor input. This indicates that there was exhaust flow into the intake runners. If no significant change was seen in the manifold vacuum, an "inadequate flow" DTC will be set.

With the more powerful OBD-II ECMs, the EGR valve lift sensor input is used to help the ECM place the EGR valve in the optimum position. The ECM compares the lift sensor input to its internal table. If the EGR lift position is not where it should be, the ECM makes "adjustments" to the EGR valve position to put it at its optimum position. This process works similar to a closed loop (CL) operation used in the fuel system.

13.6 Service Issues

The EGR valve lift sensor is a rock solid component. The sensor rarely gives any trouble. The EGR valve itself rarely gives any trouble. Here are two known service tips related to the EGR system:

13.6.1 Code 12 - Clogged Vacuum Chamber

On some of the early model Accords / Preludes, the car would set a DTC 12. The problem was not really with the EGR valve or lift sensor. The problem often was a clogged vacuum chamber in the EGR activation system.

Symptom
The car will set a DTC 12 after driving at highway speeds for approximately 10 minutes. There is usually no other significant symptoms. The car runs fine.

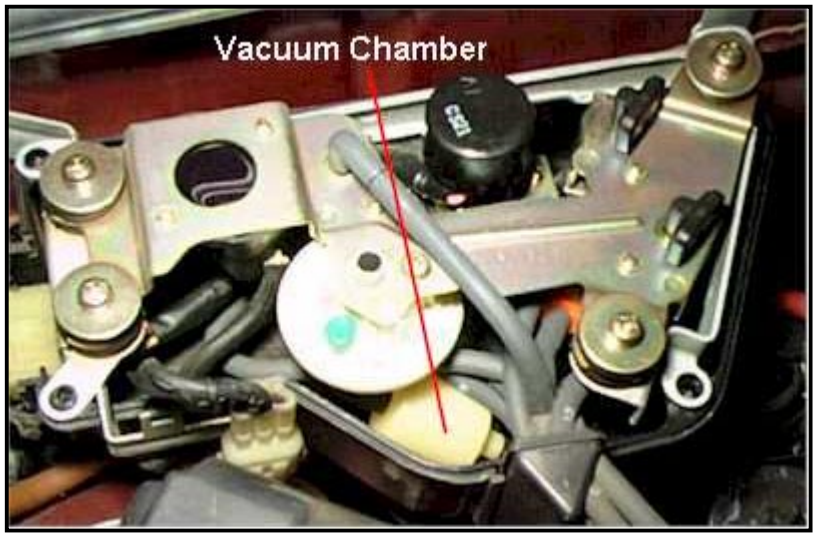
Test

- Disconnect the EGR vacuum hose (#16)
- Attach a vacuum gauge
- With the engine idling clamp the #17 hose
- The vacuum should reach 8" within one second

If the vacuum is sluggish getting to 8" you probably have a clogged vacuum chamber. For a nice detailed troubleshooting flowchart you can refer to the May 1989 Honda Service News.

The Fix
If the vacuum chamber has been diagnosed as bad, simply replace the EGR lift sensor vacuum chamber. The part is relatively inexpensive and they seem to be difficult to clean.

Image 13-2 EGR Vacuum Chamber



The vacuum chamber is located inside the under-hood emissions box. Image 13-2 shows the location of the vacuum chamber with the lid of the emissions box removed.

13.6.2 Code 12 – EGR Valve Closed Voltage Too High

A second problem that will cause a DTC 12 to set is a high lift sensor voltage when the EGR valve is closed. The normal EGR lift sensor voltage for a closed EGR valve is 1.2 – 1.3 volts.

Some EGR valves tend to not completely close as they age due to wear and carbon deposits. If the lift sensor input voltage reaches 1.5 volts or higher with the valve closed, a DTC 12 could be set.

13.6.3 Clogged EGR Ports / 90 – Accords

Symptom
The car "quivers" under acceleration when the EGR valve first opens. This is more noticeable on the automatics. Note that the car has to be hot and above 1800 RPM for the EGR to operate. The car might not have any driveability symptoms, but will fail an EGR functionality test.

The Cause
Some, or all of the 4 EGR runners in the intake manifold clog up. The rough running apparently comes from some ports clogging and all the exhaust gas being fed to the working ports and causing them to have too much exhaust and consequentially cause them to misfire. If all the EGR ports clog, the car will not have any driveability symptoms but will fail an EGR functionality test.

The Fix
The blockage is usually right at the point where the EGR runner enters the main intake runner. This is at the top of the intake runner and about 2 inches back from the head. You will have to pull the intake back from the head to check this. The actual fix varies from tech to tech.

1. Some techs pull the manifold back and reach in the runner with a tool (modified pick or air nozzle) and "poke" it up in the runner to open it up.
2. Some techs pull the manifold off the car and really give the manifold a good cleaning, and flow parts washer solvent through the ports.

The following fix seems to be the most effective.

1990 Accord (models without a removable EGR passage plugs)

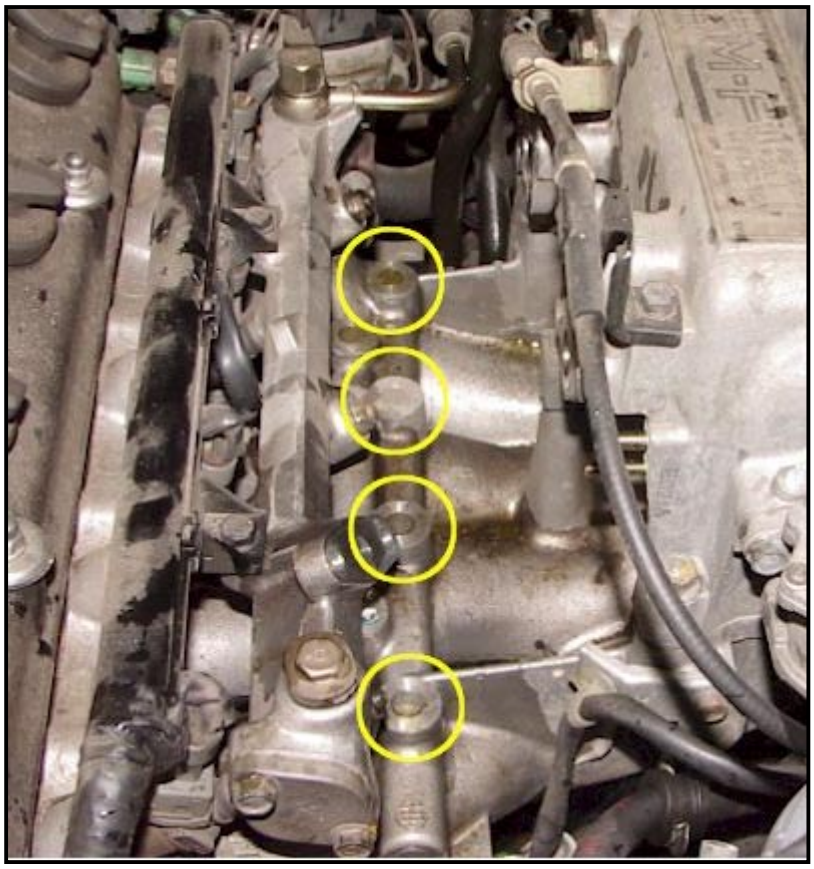
1. For easier access to the EGR ports remove the IAC Valve and Fast Idle Thermovalve from the front of the intake manifold. You should be able to see a machined boss on the top of each intake runner about 2 inches from the head. The four bosses are all in a line and are parallel to the head.
2. Center punch and drill a 5MM (or #8, #9) hole in the center of the boss. This is the proper tap drill size for 6MMx1 which is the size you will tap this hole later in the repair process. Remember to put grease on the drill bit to catch the aluminum chips and drill just far enough to get into the EGR runner.
3. You can now clean out the EGR port by running a rod (or drill bit) through the port and into the intake manifold. You can also use decarbonizing chemicals and compressed air as needed to help clean out these ports.

4. Tap the holes 6MMx1 (remember to use grease in the tap's flutes to catch the aluminum chips). Install 4 6MMx1 short flange bolts, with sealant on the threads and flange.

1990 Accord (with removable EGR passage plugs) and all 1991 and up Accords

The 1991 and up Accords (and some 1990s) have a "removable" plug that will allow access to the EGR port. Use this procedure for these models:

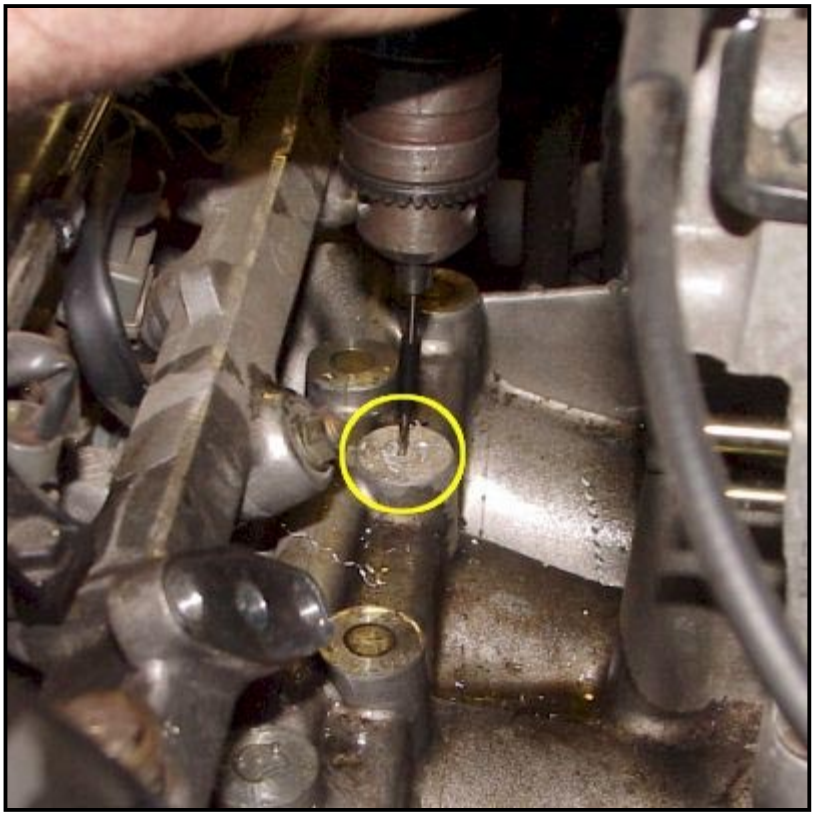
Image 13-3 Ports Visible with IAC and Fast Idle Valves Removed



Step 1

Remove the IAC Valve and Fast Idle Valve as needed to get a clear access to the 4 EGR port plugs. The plugs are shown in Image 13-3.

Image 13-4



Step 2

Center punch and drill a small hole in the middle of the plugs, as shown in Image 13-4.

The hole doesn't have to go all the way through the plug, just about a 1/4" deep (remember to put grease on the bit to catch the chips just in case you drill through).

Image 13-5

Step 3

Pull the plugs by using a small slide hammer that uses a screw tip, as shown in Image 13-5.

It usually helps to break the plug loose by first knocking it down a short distance before trying to pull it out with the slide hammer.

Image 13-6

Step 4

After the plugs are removed, the ports will typically look like the port shown in Image 13-6.

Use a pick to break up the hard carbon and then use solvent nd compressed air as needed to get the port clean.

Image 13-7

Step 5

After the ports have been cleaned (as shown in Image 13-7) replace the plugs.

You can use the original plugs, just epoxy/solder up any holes that are drilled all the way through. A replacement plug is also available from various parts sources.