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EGR Valve Lift Sensor

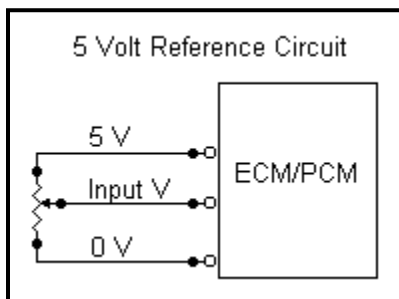
1.1 General Overview

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 control solenoid valve, which is duty cycled 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 command position and determines if the valve is at the correct position. If the valve is not at the correct position a diagnostic trouble code (DTC) is set.

1.2 How Do They Work?

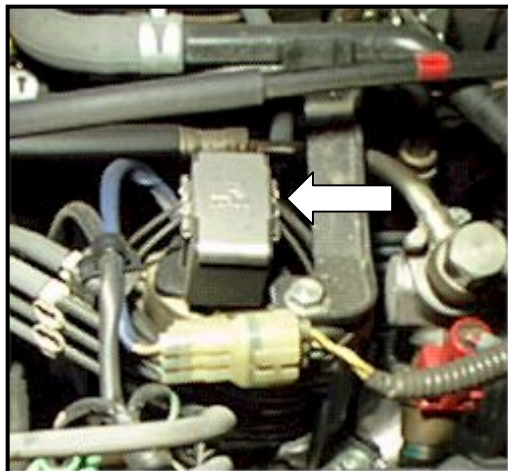
Illustration 1-1



The EGR lift sensor is a standard 5-Volt reference type sensor. As shown in the Illustration 1-1, 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. The typical voltage range of the EGR lift sensor is 1.2V (closed) to 4.2V (open).

Image 1-1 Typical Honda EGR Valve



1.3 Component Location

The EGR valve lift sensor is mounted to the top of the EGR valve. The lift sensor is indicated in the Image 1-1 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 an L4 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.

1.4 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 (<50mv), 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 4.2 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. An EGR lift sensor can be effectively tested with a digital volt-ohm meter (DVOM) since drop outs during a sweep test are extremely rare. The most critical parameter is the closed valve voltage.

1.5 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 lift 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.

1.5.1 DTC 12 - Years 1986 - 1989

On 1986-89 Accords / Preludes, that set a DTC 12, the problem was often 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 symptom. The car runs fine.

Test

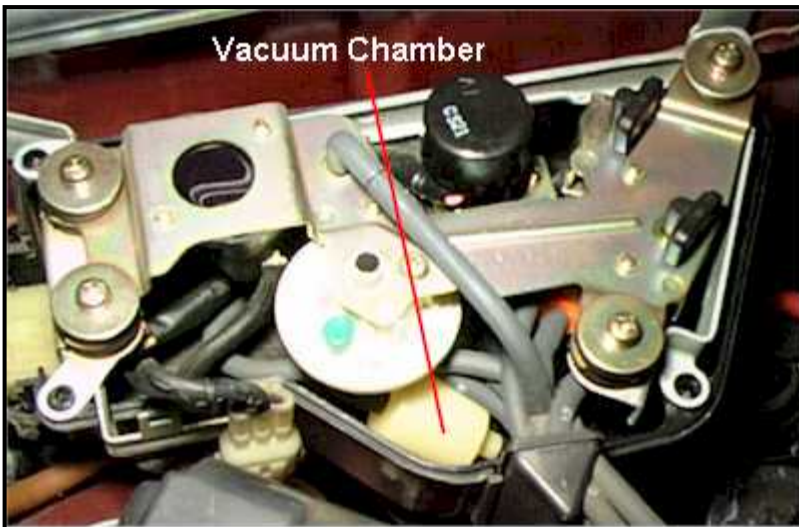
- Disconnect the EGR vacuum hose (#16)
- Attach a vacuum gauge
- With the engine idling clamp the #17 hose
- The vacuum should reach 8" within one second

If the vacuum is sluggish getting to 8" you probably have a clogged vacuum chamber.

The Fix

If the vacuum chamber has been diagnosed as bad, simply replace the EGR lift

Image 1-2 EGR Vacuum Chamber



sions box removed.

sensor vacuum chamber. The part is relatively inexpensive and they seem to be difficult to clean.

The vacuum chamber is located inside the under-hood emissions box. Image 1-2 shows the location of the vacuum chamber with the lid of the emis-

1.5.2 DTC 12 Models 1990-1993

On 1990-93 Accords that store DTC 12, the most probable cause is the failure of the EGR control solenoid valve. Follow this diagnostic procedure:

EGR Lift Sensor Voltage Test

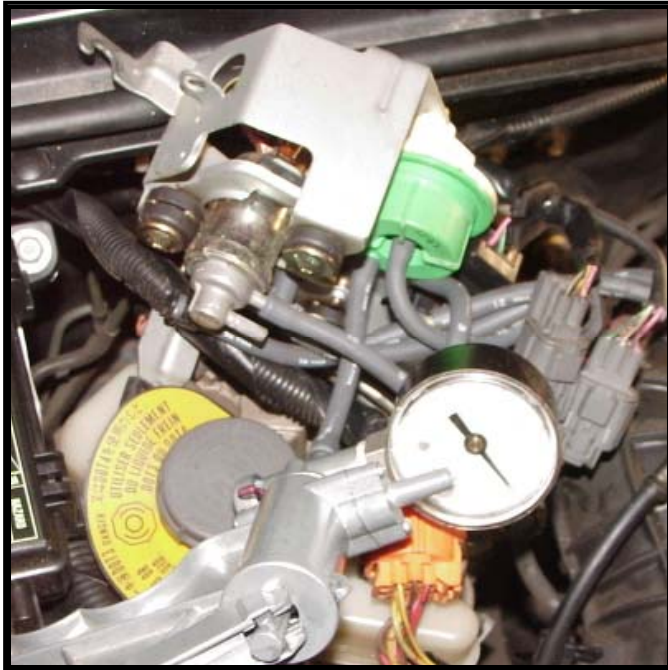
- With the engine off and the key on, check the three wires on the EGR Lift Sensor for a 5-volt reference, a ground (< 50mv), and a signal voltage of 1.2-1.4 volts.
- If the signal voltage exceeds 1.4 volts, remove the EGR Valve and clean carbon from the pintle face and seat and retest. If the closed EGR valve voltage still exceeds 1.4v with the pintle and seat cleaned, replace the valve and repeat this test section.
- Remove Hose #16 from the EGR valve and use a vacuum pump to fully open the EGR valve. Check for approx 4.3-4.5v on the EGR Lift Sensor signal wire. Observe the voltage over several minutes to see if it drops which would indicate the EGR Valve diaphragm is leaking.
- If the EGR valve open voltage is out of range or leaks down, replace the valve and repeat this test section.

EGR Valve Vacuum Signal Test

- Hook a vacuum gauge to Hose #16. Follow Hose #16 to an emissions box. Activate the EGR control solenoid valve located in this box by grounding the pink wire in the 4P (only 3 wires) connector.
- Within 1 second of activating the EGR control solenoid valve the vacuum on Hose #16 should be 8". If it is, the CVC and EGR control solenoid valve are operating properly look for a problem with the ECM ground signal. If the vacuum signal is not correct, proceed to the next test section.

CVC / EGR Solenoid Control Valve Tests

Image 1-3 Checking CVC Vacuum Strength



the throttle body and repeat this test section.

- Disconnect the vacuum hose at the EGR control solenoid valve that comes from the CVC and attach a vacuum gauge as shown in Image 1-3.
 - Check for the availability of 8" of vacuum with the engine running.
 - If the vacuum is not present, check for the availability of manifold vacuum on the other hose on the CVC valve. If manifold vacuum is not present clean the hose and/or its port in
- the throttle body and repeat this test section.
- Replace the CVC Valve if necessary to get 8" of vacuum available to the EGR control solenoid valve.
 - Reattach the hose from the CVC to the EGR control solenoid valve and remove hose #16 from the valve. Attach a vacuum gauge to the EGR control solenoid valve as shown in Image 1-4.
 - With the engine running, activate the EGR control solenoid valve by grounding the solenoid's pink wire (shown at "A").

Image 1-4 Checking EGR Solenoid Vacuum Strength



Image 1-5 Checking For a Leaking Vent



- You should now have the same vacuum level you had available from the CVC within 1 second.
- If the vacuum signal is weaker, check the EGR control solenoid valve vent by removing the vent filter so the vent port is visible (shown at “B”) and block the vent with your finger as shown in Image 1-5.
- If the vacuum strength increases replace the EGR control solenoid valve.
- Note to also replace the EGR control solenoid valve if the valve fails to supply the same vacuum at the Hose #16 port as it is being supplied by the VCV within 1 second of activation, under any conditions.

1.5.3 Code 12 – EGR Valve Closed Voltage Too High

Another 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. If this is the case you can usually remove the EGR valve and clean the pintle and seat of the valve and retest. If the closed EGR valve voltage is still too high, replace the valve.

1.5.4 Clogged EGR Ports / 90 – 93 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)

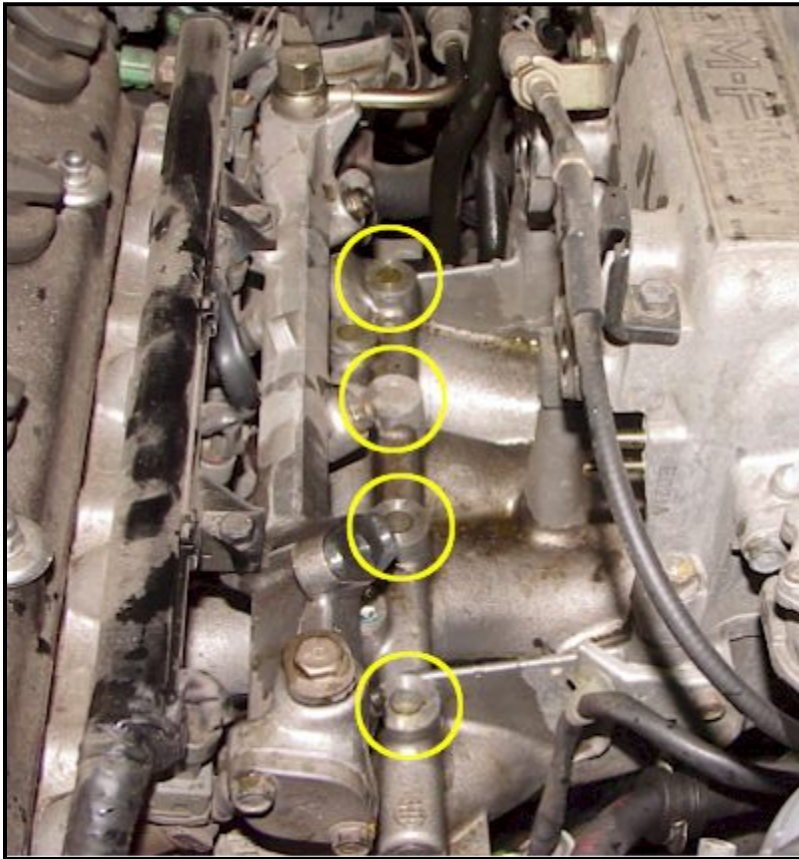
1. For easier access to the EGR ports remove the IAC Valve and Fast Idle Thermovent from the front of the intake manifold. You should be able to see a machined boss on the top of each intake runner about 2 inches from the head. The four bosses are all in a line and are parallel to the head.
2. Center 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 de-carbonizing 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 1991-1993 Accords

The 1991-93 Accords (and some 1990s) have a "removable" plug that will allow access to the EGR port. Use this procedure for these models:

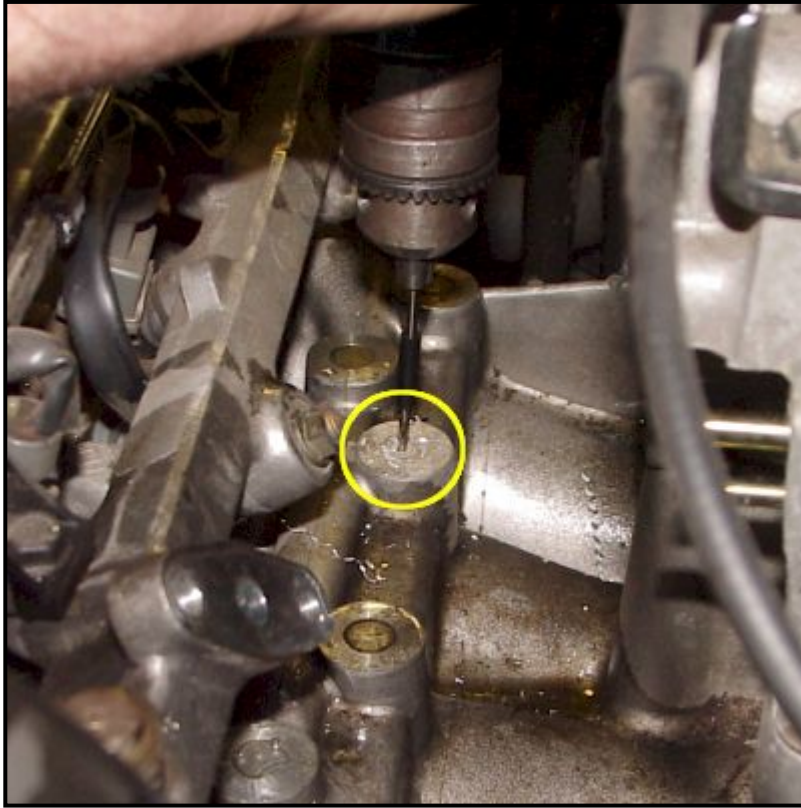
Image 1-6 Ports Visible with IAC and Fast Idle Valves Removed



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 1-6.

Image 1-7

**Step 2**

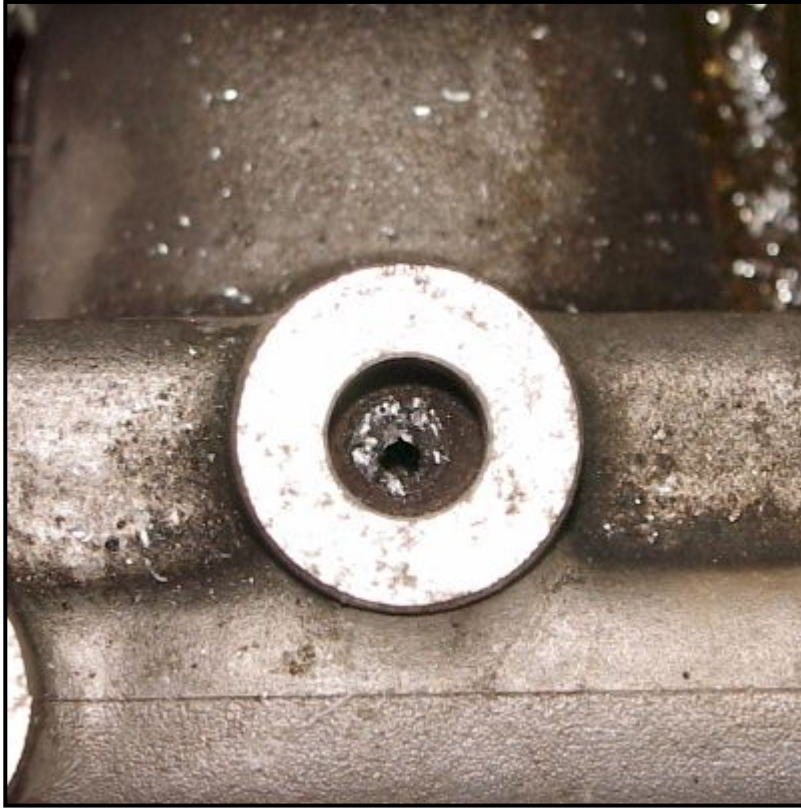
Center punch and drill a small hole in the middle of the plugs, as shown in Image 1-7.

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 1-8**Step 3**

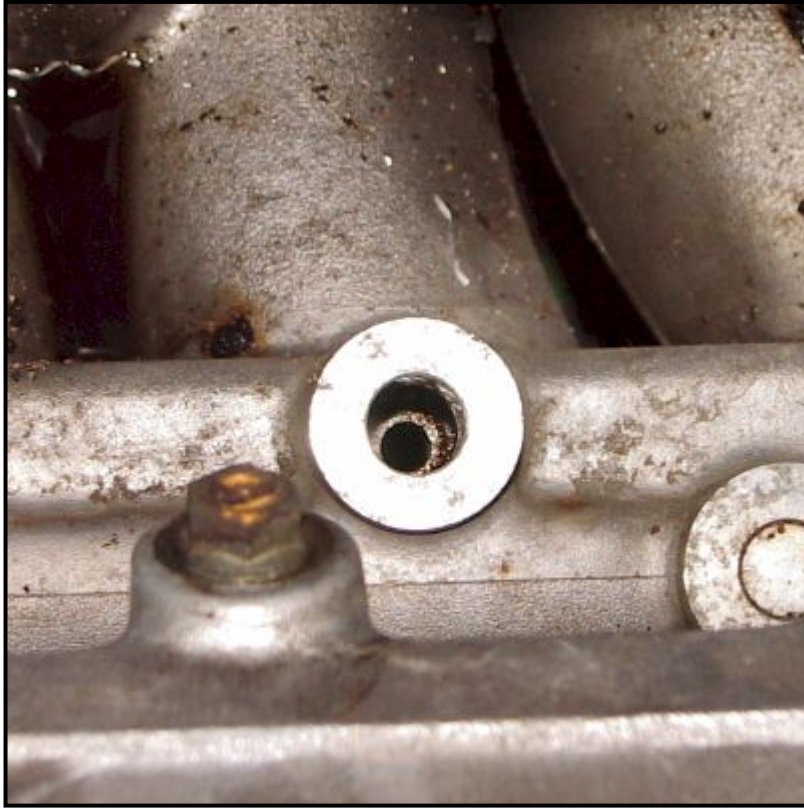
Pull the plugs by using a small slide hammer that uses a screw tip, as shown in Image 1-8.

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 1-9**Step 4**

After the plugs are removed, the ports will typically look like the port shown in Image 1-9.

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

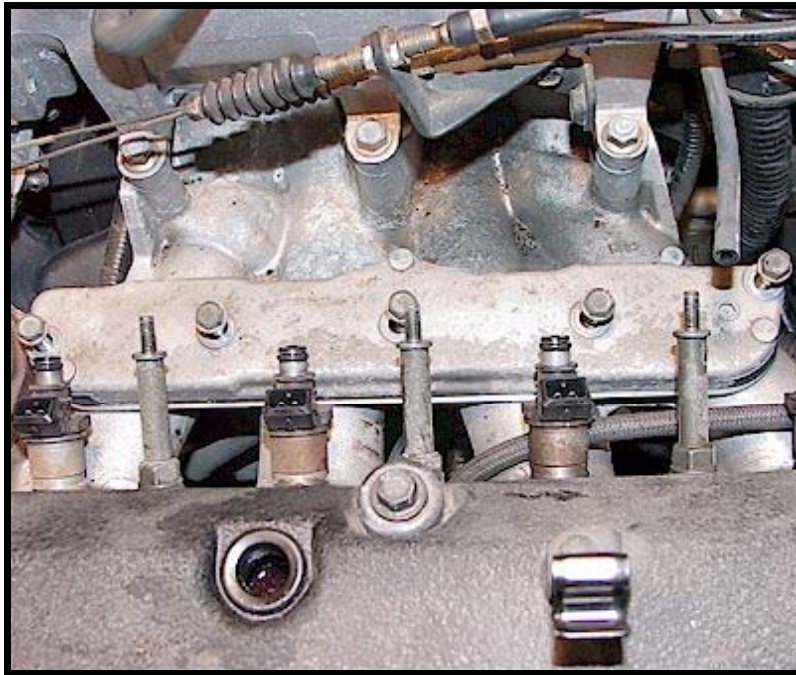
Image 1-10**Step 5**

After the ports have been cleaned (as shown in Image 1-10) 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.

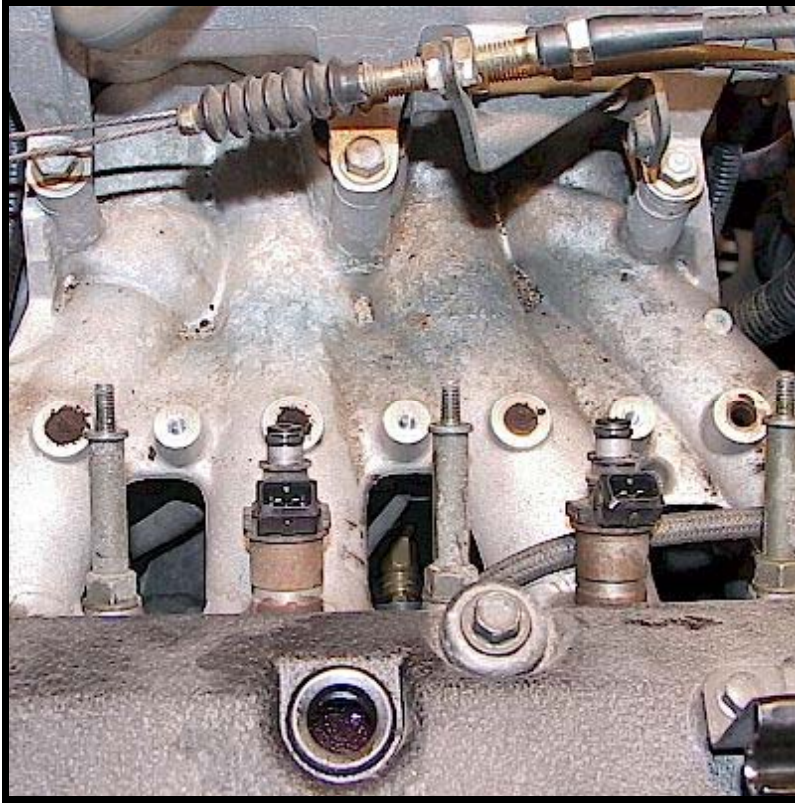
1.5.5 Clogged EGR Ports 1994-97 Accord L4 Engine

Image 1-11 EGR Port Access Plate



On 94-1997 Accord L4 engines, the EGR ports can be reached by removing a cover. This cover is shown in Image 1-11.

Image 1-12 Intake With 3 of 4 Clogged EGR Ports



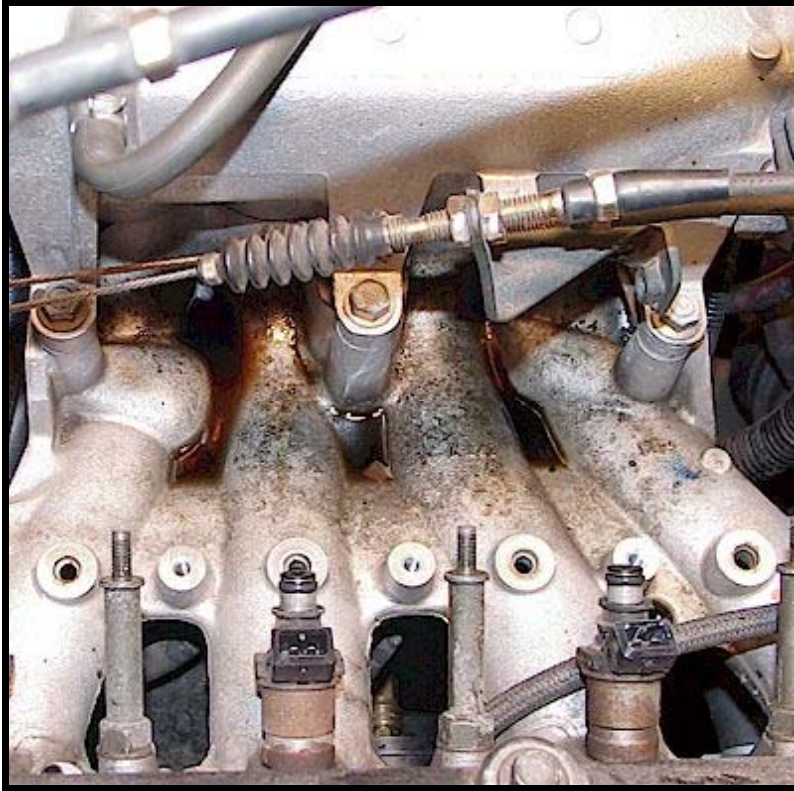
After removing the EGR port top cover and base gasket the 4 EGR ports are easily accessible. In this photo you can see that 3 of the 4 EGR ports are completely clogged with carbon.

Image 1-13 Close Up of Clogged EGR Port



Here is a close-up shot of a clogged EGR port.

Image 1-14 All Ports Cleaned and Ready For Reassembly



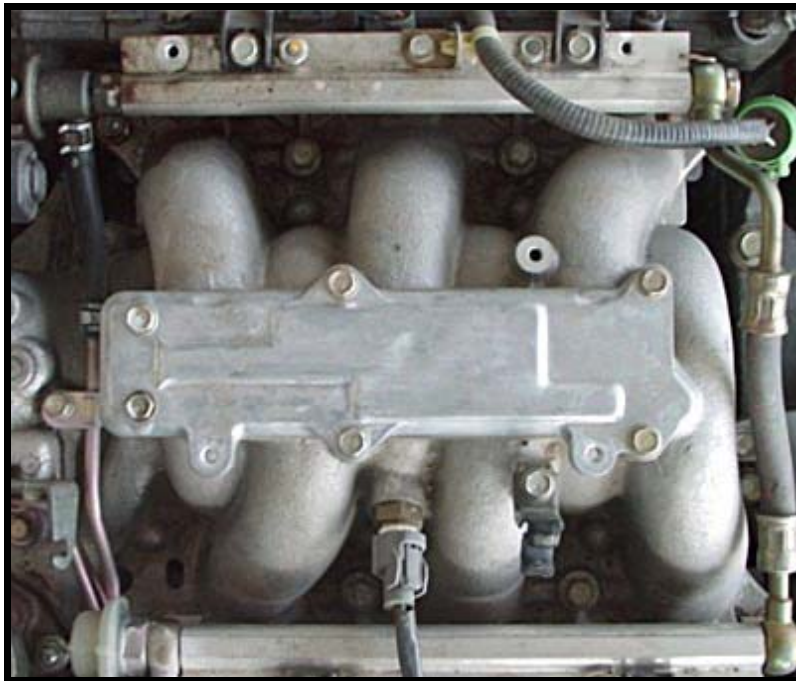
Here is a picture of all 4 ports cleaned up and ready for re-assembly. Cleaning is best done with a pick and then a bottle type wire brush.

1.5.6 Clogged EGR Ports 1995-97 Accord V-6 Engine

If some of the EGR ports clog on a 1995-97 Accord V-6, any or all of these symptoms could be present: rough running/knocking noise above 1800 rpm, stored DTC P0406, stored DTC P0133. If all the EGR ports clog, the car will not have any driveability symptoms but will fail an EGR functionality/Nox test and possibly set a P0406 and/or a P0133 DTC.

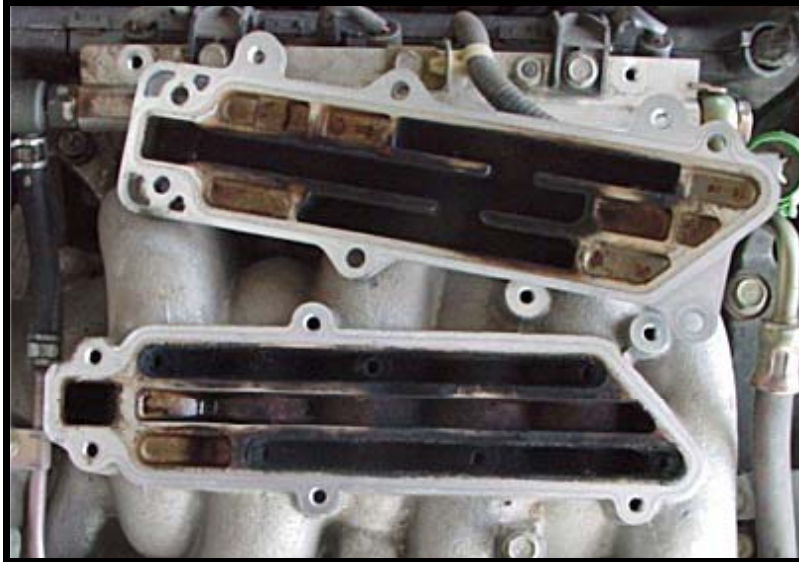
The 95-97 Accord V-6s have a removable EGR port service plate. After removing the plastic top engine cover, simply remove the EGR port service plate that is bolted to the top of the intake runners. Then clean the ports using a bottle brush as shown in the following images.

Image 1-15 EGR Port Service Plate



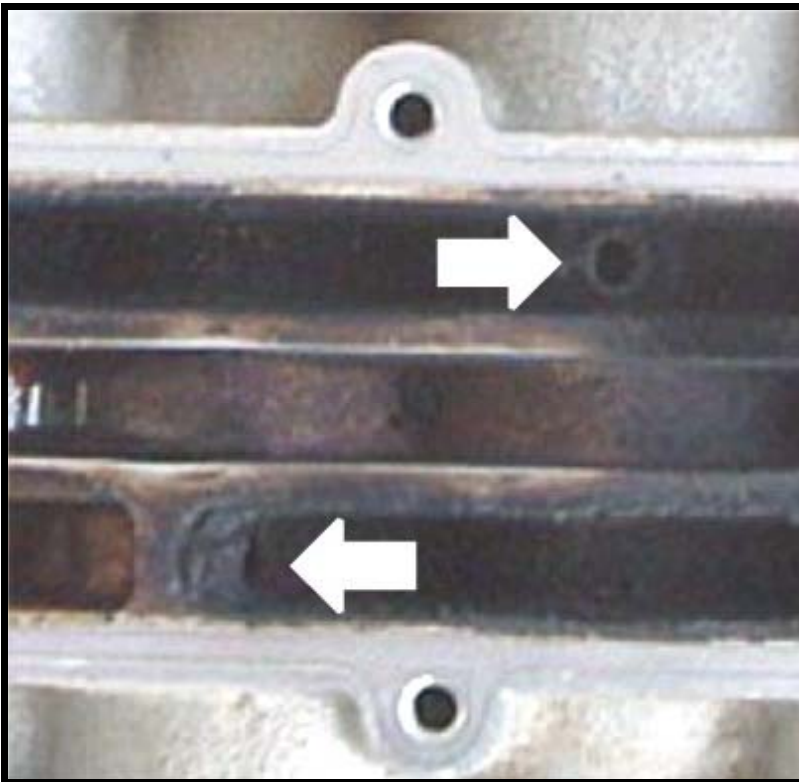
Remove the plastic covers from the top of the intake manifold. Remove the 6 screws that hold the EGR port inspection cover onto the top of the intake manifold as shown in Image 1-15.

Image 1-16 EGR Service Plate Removed



Once the service plate is removed, you can see the six ports that feed the exhaust flow into the individual intake runners.

Image 1-17 Details On EGR Ports



In Image 1-17 you can see the top EGR port is clear and the bottom EGR port is almost totally blocked.

1.5.7 Clogged EGR Ports 98-02 Accord/Odyssey V-6

On this generation V-6 engine, recirculated exhaust enters the intake manifold at one location and is not ported to individual cylinders. When the single EGR port clogs, it does not cause any driveability issues. The main symptom is a stored P0401 DTC.

EGR port clogging on 1998-02 V-6 engines are covered under an extended warranty from American Honda. The problem is currently covered for 8 years or 80,000 miles.

If you are going to repair this problem you will need to obtain the following American Honda TSBs.

| | |
|---------|-------------|
| Accord | TSB# 99-085 |
| Odyssey | TSB# 00-009 |

2 EGR Monitor

| | |
|-------------------------|--|
| Run: | Once-Per-Trip |
| Enable Criteria: | <ol style="list-style-type: none"> 1. Start the engine and allow it to warm up 2. Drive the vehicle at 40-55 mph for at least 2 minutes 3. Decelerate for over 3 seconds with the throttle closed - Do not touch the brakes or clutch. 4. Reduce the speed to 35 mph and maintain this speed until the monitor runs. |
| DTC | <p>A diagnostic trouble codes (DTC) generated from this monitor is stored on the second malfunction during a consecutive trip.</p> <p>All DTCs set from this monitor are standard priority within the freeze frame writing strategy. A freeze frame written by one of these DTCs can only be over written by a high priority DTC, not another standard priority DTC.</p> |
| MIL Info | <p>Illumination The malfunction indicator light (MIL) is illuminated when a second DTC is stored.</p> <p>Extinguishing The MIL is extinguished after three trips without a malfunction reoccurring.</p> |
| General Info: | <p>If a car is equipped with an exhaust gas recirculation (EGR) system, OBD-II regulations require that it be monitored. The EGR valve must be tested once-per-trip for proper lift. The EGR system exhaust gas flow must be checked once-per-trip for proper flow.</p> <p>As you can see from looking at the enabling criteria, Honda does its EGR checks during deceleration. This keeps the test from affecting driveability.</p> <p>When the EGR monitor is activated, the EGR valve is lifted and the EGR lift sensor voltage is compared to expected values. If the actual EGR lift sensor voltage is not within a normal range the DTC, P1491 - EGR Valve Lift - Insufficient is recorded as a pending DTC or a stored DTC.</p> <p>The EGR monitor then checks for proper gas flow by monitoring the affects the opening of the EGR Valve had on the <u>manifold</u> absolute pressure (MAP) sensor input voltage. If the response is not within a normal range, the DTC P0401 - Insufficient Flow Detected is recorded as a pending DTC or a stored DTC.</p> |

| <i>DTCs Generated by the EGR Monitor</i> | | | |
|--|------------------|--------------|----------------------------------|
| OBD Code | MIL Flash | Trips | Description |
| P0401 | 80 | 2 | EGR - Insufficient Flow Detected |
| P1491 | 12 | 2 | EGR Valve - Insufficient Lift |