

Finding and Fixing Vacuum Leaks on the LT5 Engine

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The LT5 has two separate vacuum systems.

Manifold vacuum. The manifold vacuum area runs from the throttle body to the intake valves.

Servo vacuum. The servo vacuum systems use manifold vacuum to run:

- The secondary intake port throttles
- The cruise control system
- HVAC air guide doors
- Power braking

A large leak in the manifold vacuum system will cause:

- A high idle. The programmed OE hot idle speed is 650 rpm. Tuners use other idle speeds, often 750 rpm.
- High coast down idle. The '90 - '92 engines normally run at about 1200 rpm while coasting at 20 mph. A vacuum leak will increase the engine speed during coast down. Generally if the idle speed is 200 rpm high, 200 rpm will be added to the coast down idle speed. $1200 \text{ rpm} + 200 = 1400 \text{ rpm}$. The coast down idle speed is about 800 rpm for the '93-'95 engines.
- A low Idle Air Control count. This is monitored by an engine data scanner. It's normally 10 to 20 at hot idle. It will go to zero if the idle speed is over the programmed idle speed. The idle control system continuously fine-tunes the idle speed by opening and closing the idle air valve. As the valve closes, the count reported by the scanner decreases. If the count goes to zero the idle air control valve is fully closed. At that point the idle speed is out of system control and it will increase in proportion to the size of the leak.

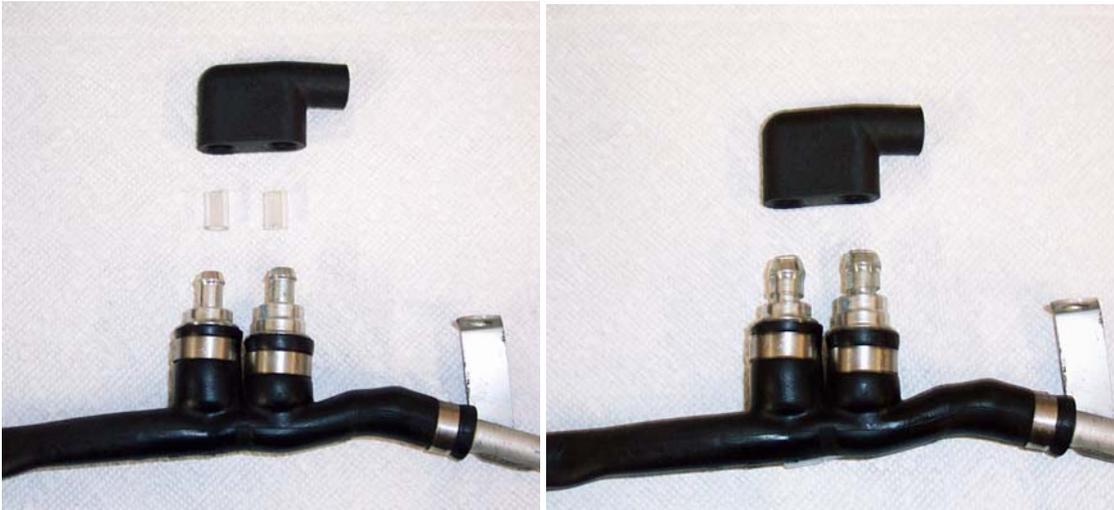
Check if the tachometer is displaying the correctly. It often fails such that the displayed rpm is too high. The digital engine rpm from the engine control system can be shown on the HVAC LCD display. Press the fan up and down arrows together until -00 is displayed. Then press the fan up button until -06 is displayed. Finally, press the fan button (located between the fan up and down buttons) one time. The number displayed x 25 = the engine speed.



The 30 in the display represents 750 rpm. $30 \times 25 = 750$ rpm.

The Six Most Common Sources for Manifold Vacuum Leaks

1. The PCV valve grommet. Like several other rubber parts on the engine, the grommet swells from long-term exposure to oil. Then it fits loose on the PCV valves. The grommet is available from Jerry's Gaskets, pn 10153503. The grommet will fit tightly again if the PVC valves are sleeved.



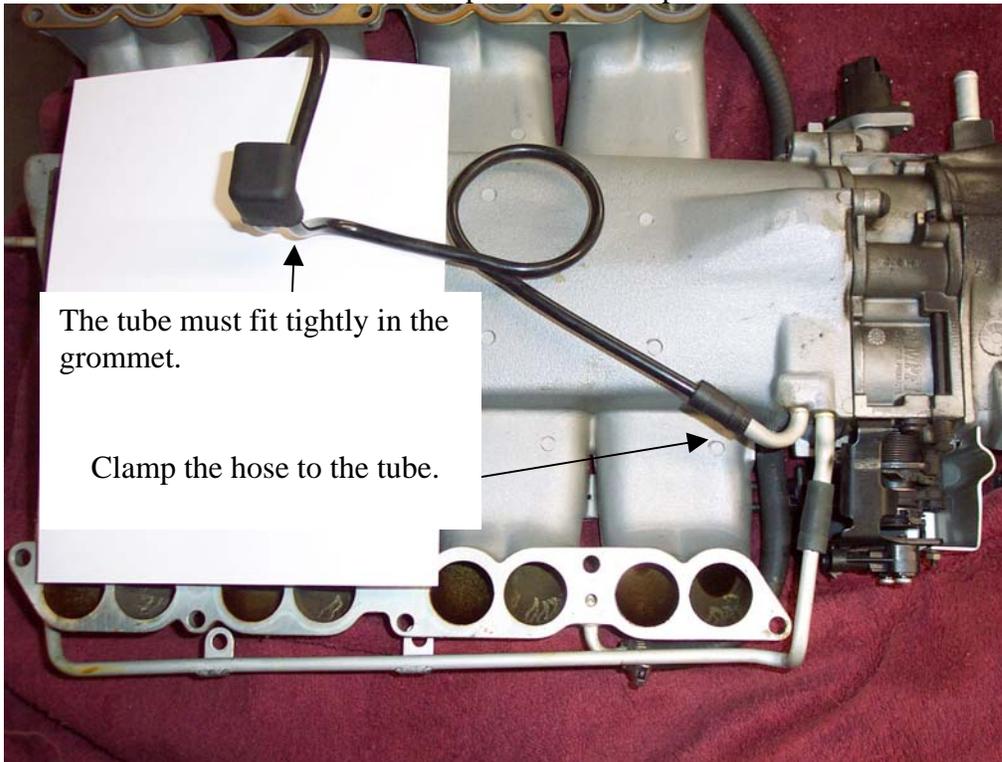
To sleeve the valves, slip short stubs of ¼" vinyl tubing on the nipples. Secure the grommet to the PCV tube with a ¼" wide worm gear clamp just as GM did beginning in '93. Install a plastic tie to hold the grommet down. Clamp it lightly so that the hose that the PCV valves are mounted on does not get crimped at the bottom.

2. The dual vacuum fitting on a '90. Sometimes this fitting whistles while leaking. It's shown here on a '91 plenum for illustration. It is not available from a supplier. It's easy to replace it with two sections of 5/16" fuel line that are two inches long.



Bend the front tube forward a little to create some space between the tubes. Lubricate the ID and OD of the hose and slip it on the plenum. It fits very tight and does not need a clamp. Slip the two vacuum lines in the hoses and clamp them with plastic ties.

3. The Evaporative Emissions hose on '91 and up. This hose can blow off the plenum or the valve grommet if the engine backfires. If either end comes off, there will be a large vacuum leak. It will add about 800 rpm to the idle speed.

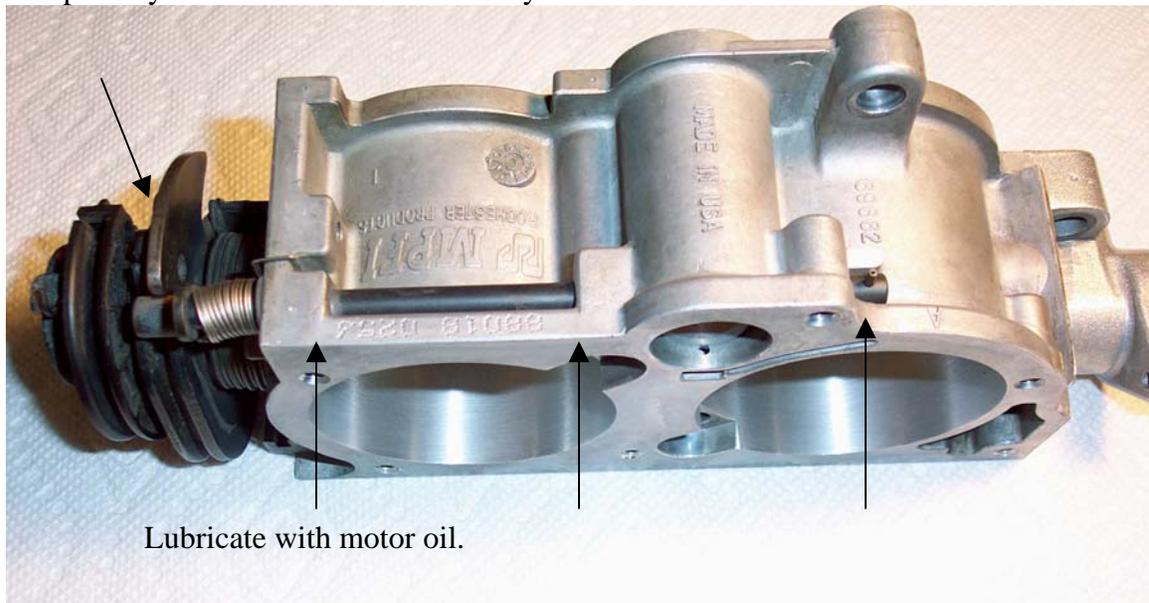


The '91's have the most problems with this because the hose was not clamped. For '92-'95 GM added a clamp. The hose can be clamped with a plastic wire tie. The end that connects to the valve grommet can be reattached with the adhesive described below for the MAP hose.

The hose and tube ends can be reattached without removing the plenum if one is skilled and a little lucky with a wire formed with a hook.

4. The throttle body. When the throttle body was manufactured, the throttle plates were sealed to the bores with a material known as DAG. It's graphite like material. The DAG flakes off over time. Also the DAG can be removed by improper cleaning with a solvent. It's best not to clean the secondary throttle plates. Dirt between the throttle plates and the bores actually helps the seal. If one wants to clean the secondary throttle plate bores, gently use a soft dry cloth. It's not practical to repair the DAG. It's expensive and can fall off or wear out again. If the throttle plate to bore seal needs to be improved, the plates can be burnished for a better fit to the bores.

The primary throttle shaft can have sticky rotation. It can be cleaned and lubricated.

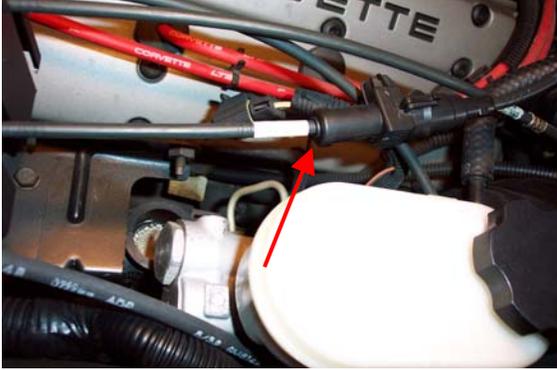


Lubricate with motor oil.

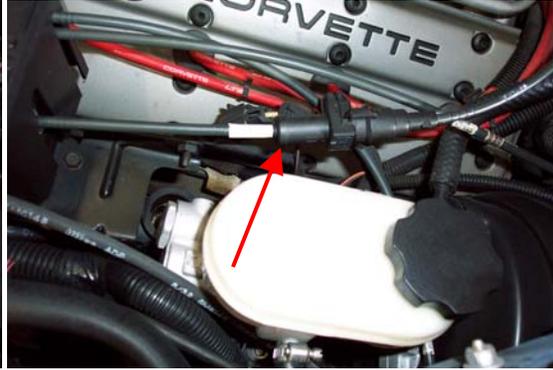
On '92-'95 cars the throttle cable could be too tight and hold the throttle off the idle stop. There should be little slack in the throttle cable. Check it with a finger.



The cable can be loosened with the adjuster. Wrap tape on the cable 1/8" away from the body of the adjuster. Press the release button on the adjuster so that the 1/8" gap is closed. Check that there is now slack in the cable and that the throttle arm cleanly goes to the stop. This adjustment interacts with the cruise cable. If the cruise cable is too tight loosen it by one hole. Loosening the throttle cable also interacts with the wide-open throttle position. The throttle probably won't go to 100% open. It's no problem as long as it is at least 96%. There is little difference in airflow from 96 to 100% opening.



Note the 1/8" gap.



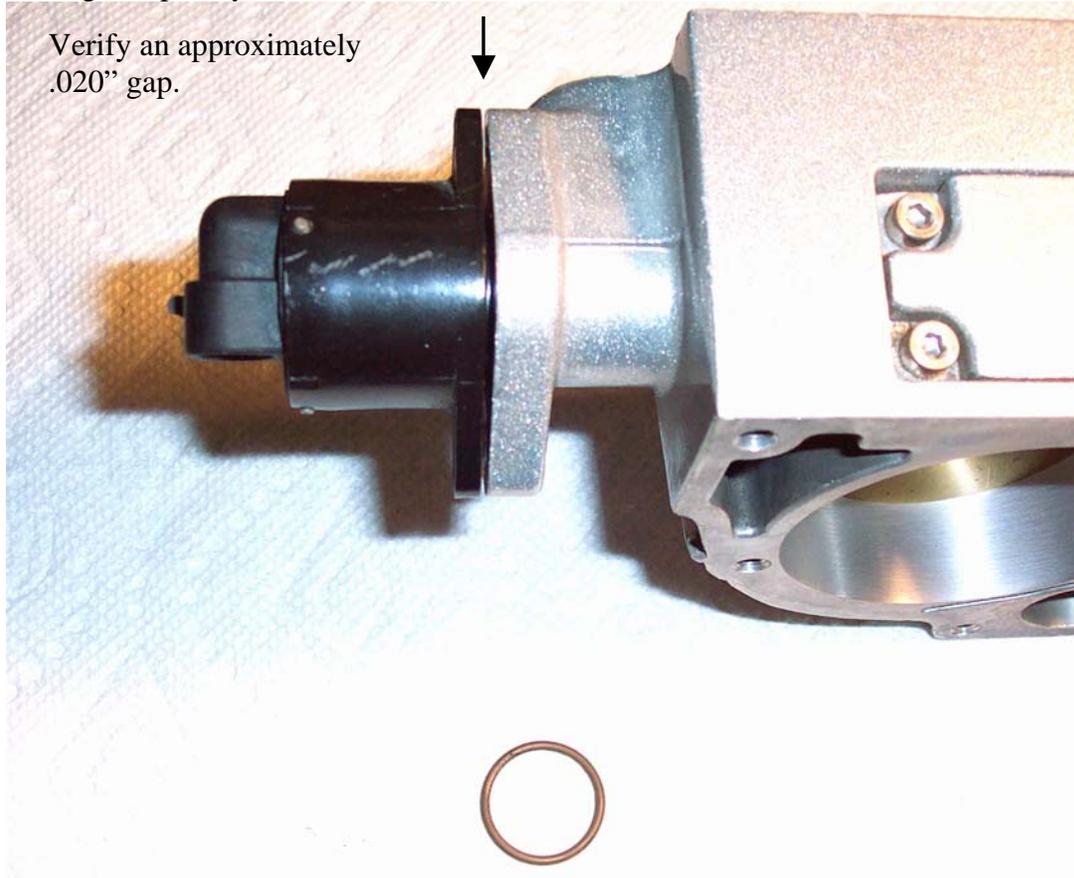
Close the gap. The tape is now adjacent to the adjuster.



Depressing the cable length adjuster. The button is the flat section.

Verify that the IAC valve is fully closing. With the engine idle speed out of control remove the electrical connector from the IAC valve. Shut the engine off. Remove the IAC valve. Remove the o-ring from the valve. Reinsert the valve in the throttle body.

Verify that the body of the valve springs back about .020". This confirms that the valve is closing completely.



5. Injector housing gasket failure. This is more likely to occur on '93-'95 engines. The injector housing and plenum gaskets were revised with different material to address a shrinkage problem. This might have made them more prone to tear. Look down the intake ports to see if the gasket is protruding into the ports.



6. The MAP sensor hose. The rubber end that attaches to the plenum swells and becomes loose. It often separates from the plastic hard line during a backfire. The picture shows the underside of the sensor. The hose can be accessed from the right side of the engine.

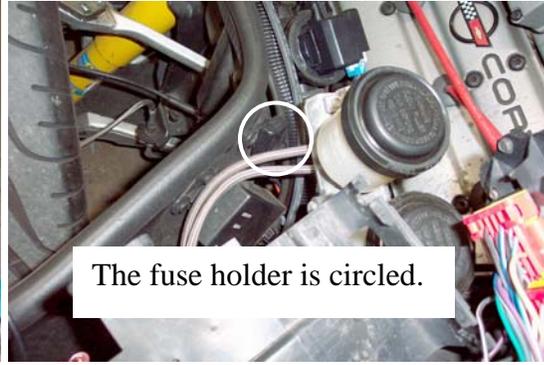


If the rubber end is not too loose, it can be reattached with adhesive. Or it can be replaced with a section of 3/16" vacuum hose. Loctite 416 is similar to the OE adhesive. Loctite 793 is a primer for the adhesive. The primer must dry completely before applying the adhesive. The adhesive sets up in about one second. Be careful not to clog the tube with adhesive. To be safe, apply the adhesive to the outside of the tube, not inside the connector. Check the hose for free flow after the repair is complete.

The Secondary Intake Port Actuator Vacuum System

It uses manifold vacuum as a power source to open the secondary intake port throttles.

The secondary intake port vacuum pump should run for a few seconds and shut off for at least one second after first turning on the ignition switch but not starting the engine. If it is silent it may not be operational. Remove the plastic vacuum hose from the pump. The pump should then run continuously. If the pump does not run, check for 12 volts at the pump connector. If power is not present check the fuse. On '90 -'92 cars the fuse is located on the left wheelhouse. See the picture below. On the '93 - '95 cars the fuse is in the panel at the right door. Fuse 17, labeled as the Valet Fuse.



The pump is available from Jerry's Gaskets and AutoZone. The replacement pump has a '91- '95 connector. For a '90 car install connector GM pn 13586114.

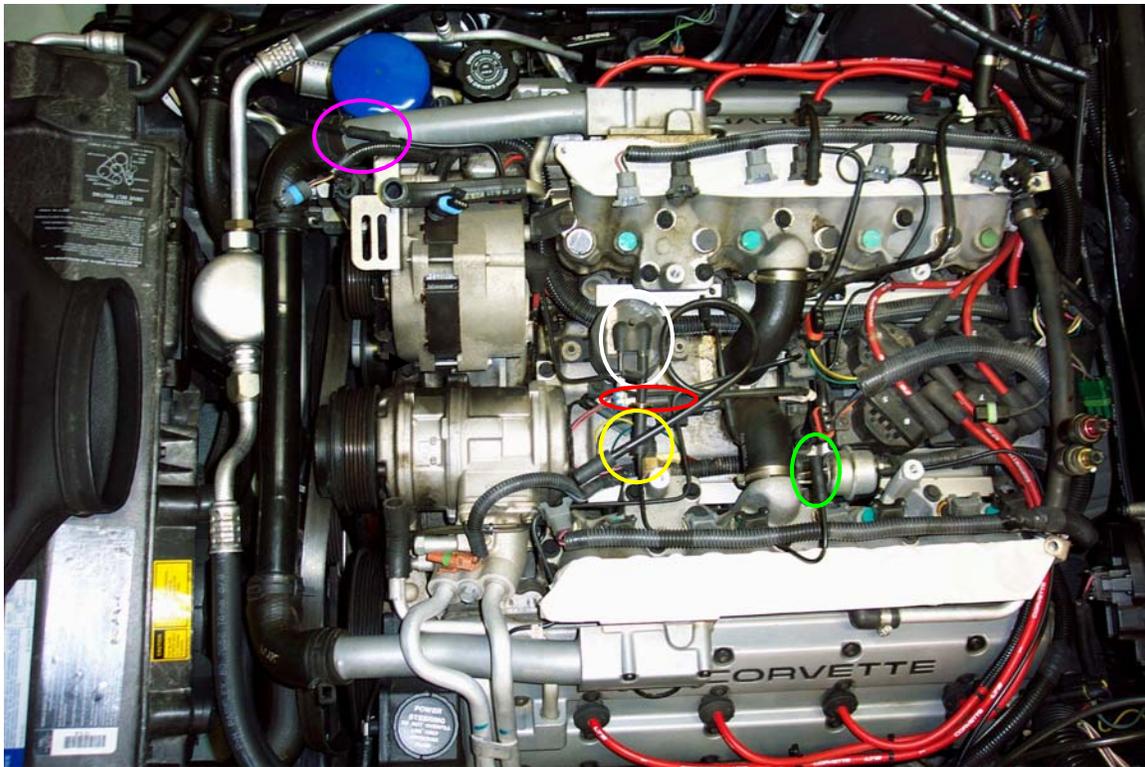
If the pump runs continuously with the hose connected, check for one of the common vacuum leaks described below. As long as the pump can shut off for one second the vacuum connections up to the secondary vacuum valve are tight enough to prevent an error code 61. The engine control system's secondary port vacuum diagnostics are very good. If error code 61 does not set there is a high probability that there is not a secondary port service system vacuum leak large enough to prevent the secondary port throttle actuators from operating.

Error code 56 indicates that there is an electrical failure with the secondary port vacuum diagnostic sensor. This is strictly an electrical problem and has nothing to do with vacuum leakage. The sensor is located under the ECM on '90 -'92 cars. It is located under the plenum on '93 -'95 cars. A false error 61 may be caused by a defective sensor. If errors 56 and 61 are present together, always address the code 56 first.

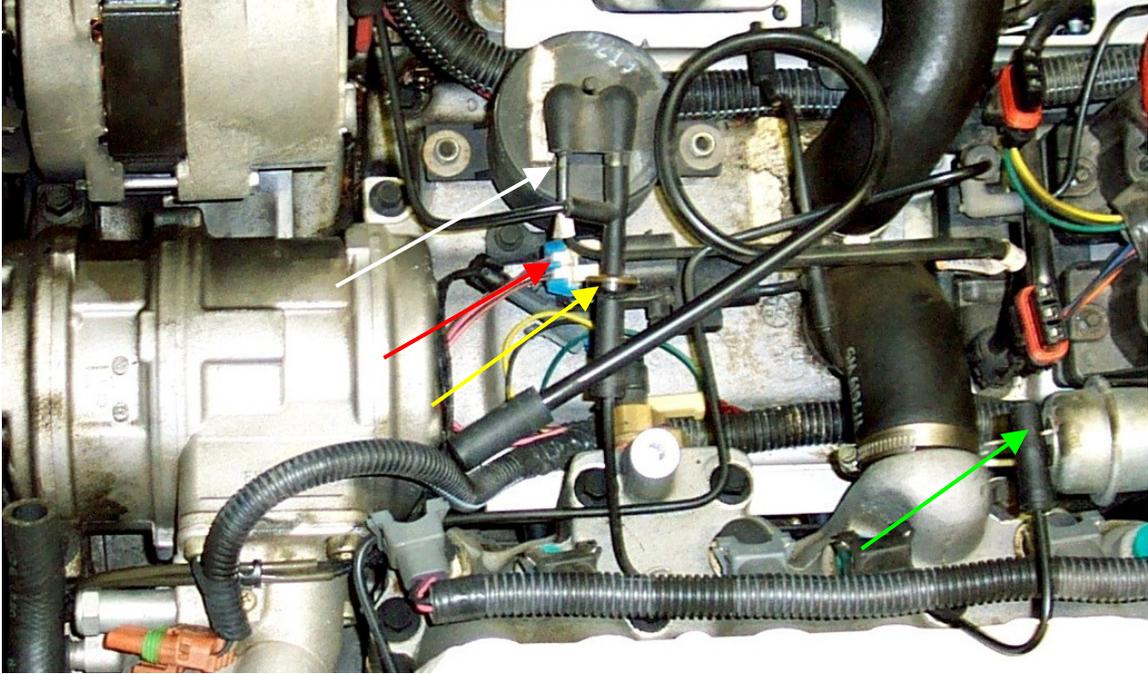


The secondary vacuum pump cycle time can be used as a diagnostic to locate leaks. If the pump can cycle off for one second the vacuum connections are tight enough for the secondary port throttles to operate correctly. There are four common leakage points in the vacuum lines before the secondary solenoid vacuum valve.

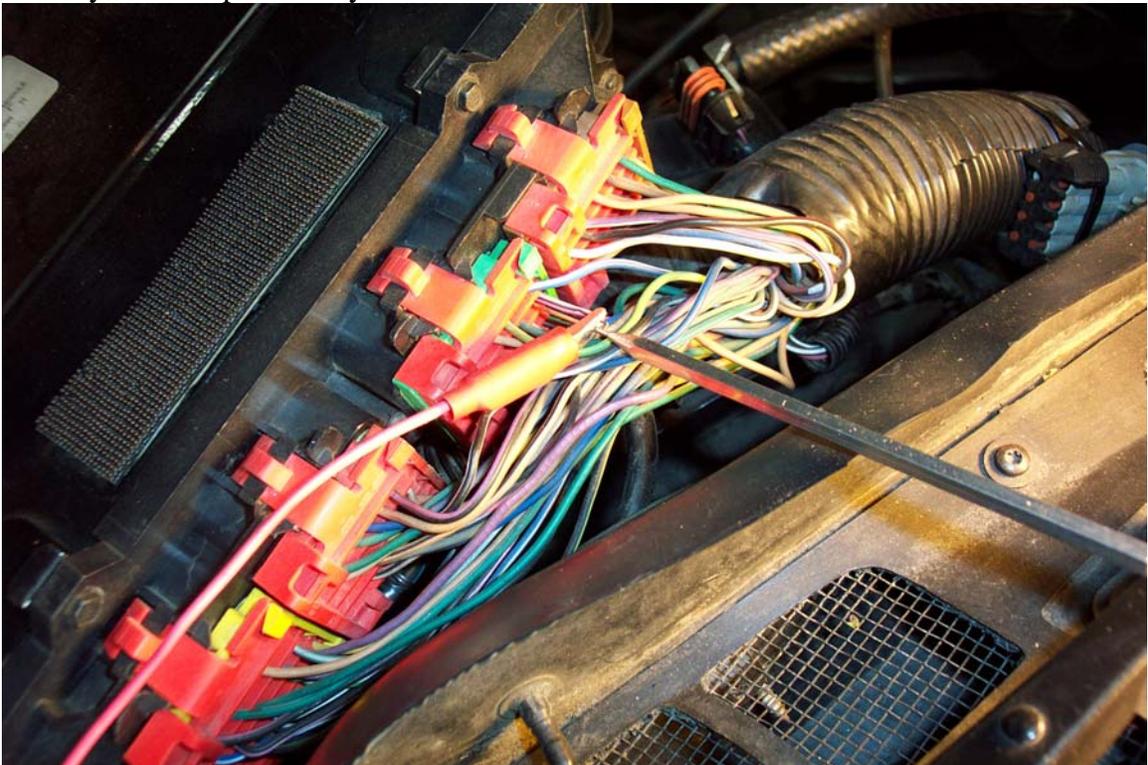
Turn the ignition on without the engine running. With the vacuum pump either running continuously or cycling check for evidence of a vacuum leak by listening for a change in the vacuum pump operation.



- In the pink circle. The secondary vacuum hose connector. This connector can easily pull apart if the engine compartment is serviced or cleaned. The connector ends rarely separate or leak. Sometimes they are impossible to separate. The tube end can separate or leak in the connector. The adhesive for the MAP sensor above can be used to repair it.
- In the yellow circle. The secondary vacuum check valve. See detail picture yellow arrow. To test the vacuum check valve, cover the plenum connector with a finger. The plenum connector is marked in green in the pictures. If the pump stays off longer, the valve is leaking. For '90 - '92 cars the valve is available from Jerry's Gaskets pn 14047619. For '93 -'95 use Jerry's 14056648.
- In the white circle. The secondary vacuum reservoir. See detail picture white arrow. The connection to the "T" fitting connection from the vacuum pump is the most common leak. The adhesive for the MAP sensor above can be used to repair it.
- In the red circle. The secondary vacuum solenoid. See detail picture red arrow. Remove the connector from the valve and block the port from the pump with a finger. If the pump stays off longer, the valve is leaking. The valve is available from Jerry's Gaskets. PN 1997212.



After determining that the vacuum connections are tight before the vacuum solenoid valve, test the connections after the valve. The valve can be opened by grounding pin C17 at the ECM. The “C” connector is the green ECM connector. The pin locations are marked on the connector in very small print. The wire is pink with a black stripe on all model years except for early ‘90’s where it is red.



Slip the pin probe under the wire’s sealing ring and touch the pin. When pin C17 is grounded, the pump will run and the secondary port throttles will open. The pump will

shut off if the vacuum to the actuators is tight. On '93 -'95 cars the vacuum connector for the diagnostic sensor must be sealed during the test. Observe that that the actuator arms pull back. Then look down the secondary intake ports and observe that each throttle is open 100%.