Verifying Secondary Actuator Operation with the Plenum in Place

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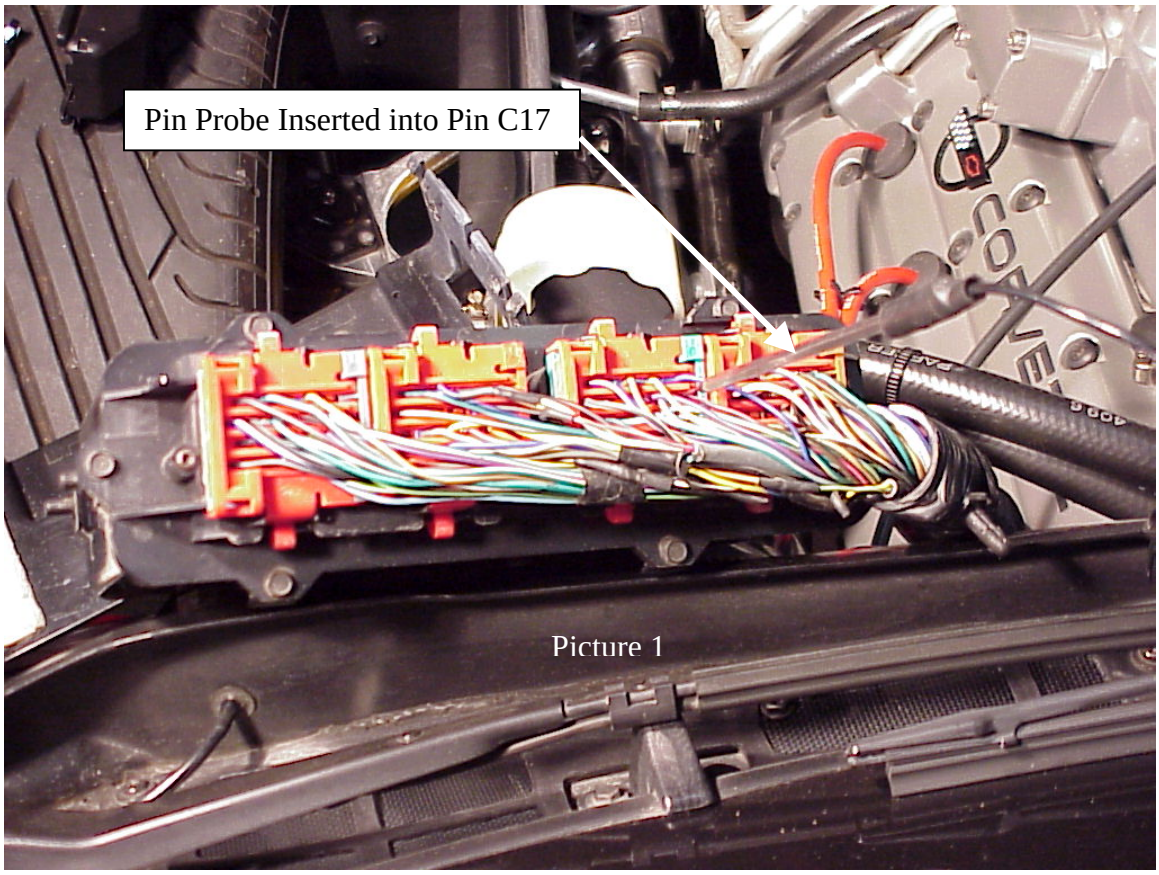
Testing the secondary throttle actuators is easy and can be done any time your left foot gets a little heavy. But what if the test provides less than the expected results? This might lead one to wonder if the secondary throttles are fully opening? Or, are both sets of the throttles opening? The questions can be answered with a Tech I scan tool. However, the actuator operation can be verified without the special tool.

The secondaries can be cycled by grounding the control line at the ECM. The ECM drives the secondary vacuum solenoid valve by grounding the electrical circuit. This can be simulated by connecting a jumper wire from the control line to ground. The secondary control line is connected to pin C17 on all ZR-1's. The circuit can be probed with a pin tool.

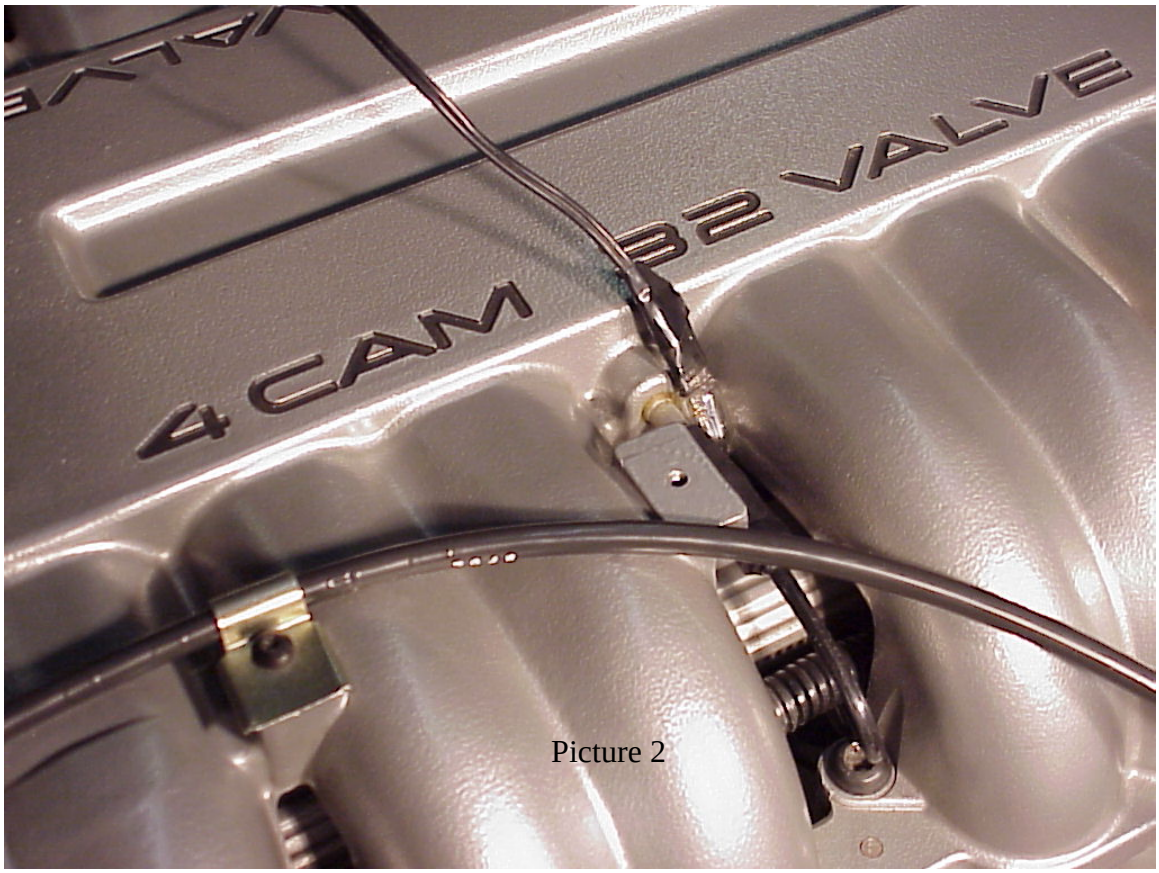
Picture 1 shows how the pin tool can be slipped through the weather pack seal and into contact with the connector pin. Note that the seal is not pierced by the pin. The pin is slipped between the soft sealing ring and the wire. Pin C17 is on the green ECM connector. The wire is pink on '90 LT5's and pink with a black stripe on '91 – '95's.



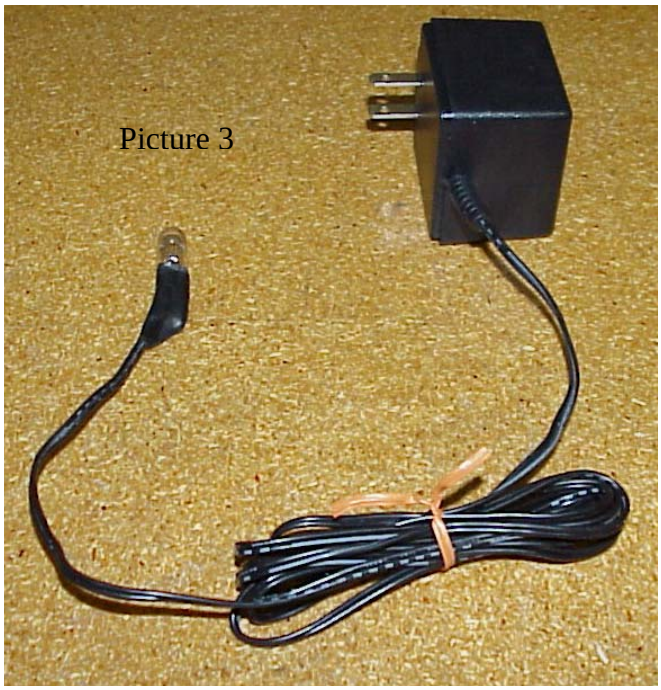
Picture 1

The left and right side actuators can be seen by peering into the engine's valley area. View them by looking downward, between the respective left and right side center intake

runners. In picture 2, the lamp of a light tool is ready to be lowered into the left side valley area.



Picture 2



Picture 3

Picture 3 shows the light tool. The tool can be constructed from a 12 volt power supply and a #168 automotive accessory light bulb. A flashlight will do, but it is not as cool or as effective as the small lamp on the wire.

The secondary actuator verification procedure:

- Connect a jumper wire to the pin tool.
- Turn the ignition key on. This will activate the secondary vacuum pump.
- Connect the other end of the jumper wire to ground.
- Observe the opening rate of the actuators. They should travel to the stop in less than a second.
- Observe that they open completely. The lever must contact the black stop tab.
- Observe that the vacuum pump cycles off when the throttles are open. This indicates that the actuators are not leaking.

The secondaries can also be activated when the engine is idling. The actuators will move a little quicker because the engine is a stronger source of vacuum than the electric pump. The operation of the engine is unaffected except for a momentary dip in the idle speed. The ECM will set an error code because it has detected that secondary vacuum is present when it has not been commanded.

Evaluating the tightness of the secondary vacuum connections. I like to use the electric pump's cycle time as an indicator. The pump is calibrated to turn off at 12" Hg. vacuum. The actuators require 6" Hg. vacuum to fully retract. Therefore, if the pump cycles off, there is plenty of margin in the seal of vacuum system for reliable secondary throttle operation. One second of off time is enough to assure normal operation of the secondaries. If the pump stays off longer, it indicates that the system has an extra margin of vacuum tightness. A lot of off time, indicates that the system has a good margin of vacuum tightness. An extra tight vacuum system does not make the engine perform any better than one that allows the pump to stay off for one second.

Hopefully, your luck is good, and this process confirms your expectations, either positive or negative.

On a related note…

The Problem With the Actuators That Were Produced in Early 2001

The GM service parts operation ran a production run of actuators in the Spring of 2001. Some of the new actuators have been found to be defective. Normally, an actuator will fully retract with 6" Hg. vacuum. The defective parts will require in excess of 10" Hg. vacuum. Also, defective units will twist the arm to the side as they pull in.

The actuators can be identified by the date code that is printed on the arm. The units dated April and May of 2001 may have the defect. As of September 2001, the new parts can also be identified by the red material that is used for the vacuum diaphragm. These units should be tested before installation. It seems like about ½ of them were assembled incorrectly.

Picture 4

Picture 4 shows the normal position of the return spring.

It should be centered on the cone on the end of the cover.

Picture 5

Picture 5 shows the position of the spring, if the unit is improperly assembled.

The defective actuators are assembled in such a way that the spring is off to the side. They will activate, but additional vacuum is necessary to crush the spring sideways at the end of the travel.