Are The Secondaries Working?

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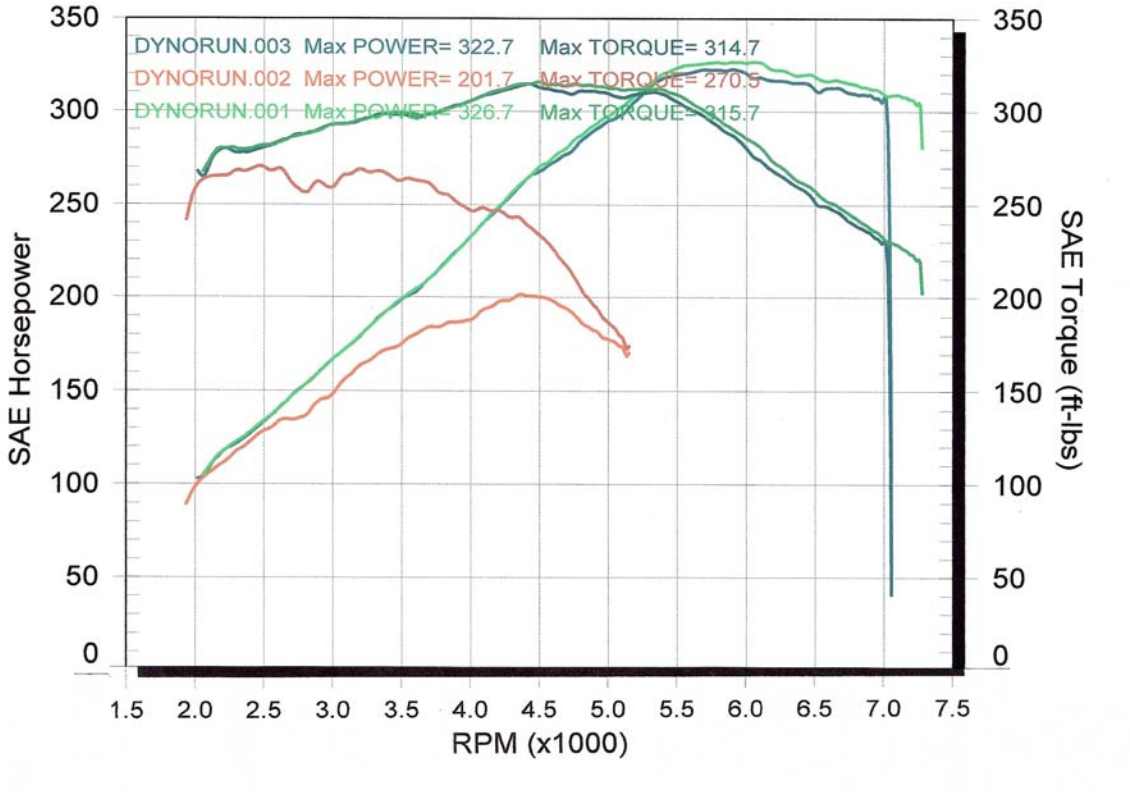
I hear this question a lot. If the secondary intake port throttles are not working the engine will rev very slowly past 5500 rpm. It will take really long to get to 6500 rpm. However if they are working the engine will rev briskly to 7000 rpm in first gear. It will take just a few seconds to reach 7000 rpm in second gear.

The secondary intake port throttles will open at any engine speed, even 900 rpm when the main throttle is opened 100%. If accelerating below 4000 rpm it might be difficult to judge if the secondary ports are opening. However, the chart shows that without the secondary ports power drops sharply after 4400 rpm.



The chart is for a stock ’91 with a Borla exhaust system.
Red: Full Power key off. Green: Full Power key on.
201.7 Dynojet wheel hp / .85 (15% drive line loss factor) = 237 crankshaft hp.
326.7 Dynojet wheel hp / .85 (15% drive line loss factor) = 384 crankshaft hp.

Solving Secondary Intake Port Throttle Problems

- The ’90 valet key switch.

Note that on ’90 cars the Full Power lamp must be on in the driver’s information panel. The valet key switch often malfunctions on the ’90 cars. The secondary port throttles are not enabled when the key is in the Full Power position if the Full Power lamp is not on.

The key switch can be easily repaired. The contacts just need to be cleaned and tightened. Bend the contact arm slightly to obtain more pressure on the contacts.

- Is the Service Engine Soon or Check Engine light on?

If an engine error code is present the engine control system will disable the operation of the secondary intake port throttles.

- Error code 61.

The engine control system has excellent diagnostics for the secondary port throttle vacuum system. There is a vacuum sensor. The control program monitors the vacuum with the sensor. The secondary vacuum actuators need 6 in. Hg. vacuum to operate. If the vacuum is less than 6 in. Hg., a Service Engine Soon or Check Engine error will set. The error code is 61. To filter out false errors, a fault needs to persist for two seconds to set the error code. The error code might not trigger in first or second gears because it might be necessary to shift before the two second period completes. The best way to test for a secondary vacuum leak is to use fourth gear at a low speed like 30 mph. The engine speed will increase slowly enough to stay at wide open throttle for more than two seconds. Code 61 will also set if vacuum to the actuators is present when they are supposed to be closed. When code 61 is active a 3000 rpm rev limit will be imposed.

- Error code 56.

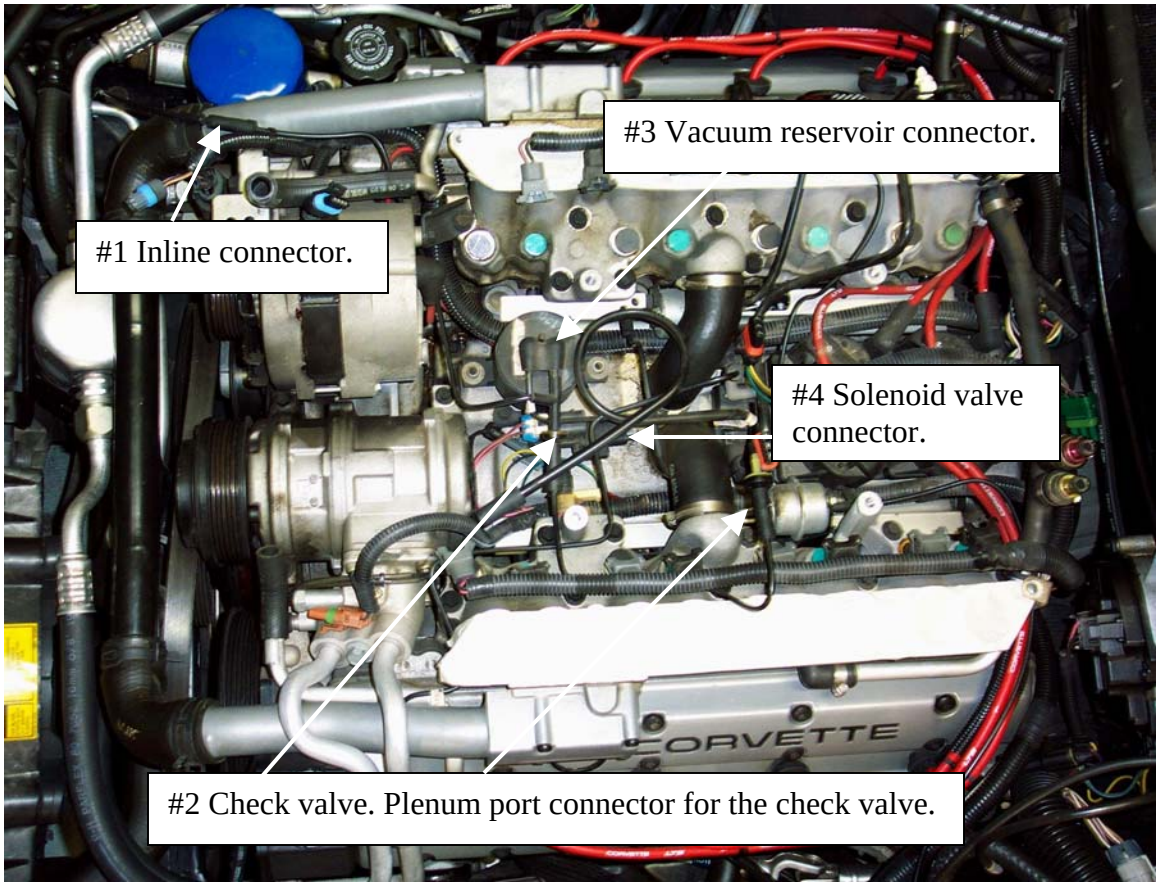
This code sets when the secondary port diagnostic vacuum sensor has an electrical fault. It is not caused by a vacuum leak. The sensor is located under the ECM bracket on ’90 to ’92 cars. It’s located under the plenum on the ’93 to ’95 cars.

- Is there a vacuum leak?

The secondary vacuum pump is a very useful diagnostic tool. The run time of the pump can tell a lot about the tightness of the vacuum connections. When the ignition key is turned on for the first time and the engine is off, the pump will typically run for about three seconds and turn off when 12 in. Hg. vacuum is reached. If the connections are normally tight the pump will stay off for over three seconds. A very tight system can stay off for 60 seconds or more. While three seconds is typical. Even if the pump stays off for only one second, meaning that there is a moderate leak, there is no need to be concerned about the operation of the secondary actuators. As long as error code 61 does not set the port throttles can operate.

- Fixing a vacuum leak.

Divide and conquer. If the vacuum pump runs too long the leak is in the area up to and including the secondary vacuum solenoid valve. The top two causes can be found without removing the plenum. Number 1, the inline connector. It can get disconnected during other engine service or during engine cleaning. Number 2, the vacuum check valve. Remove the vacuum fitting at the left center of the plenum and block the rubber fitting with a finger. If the pump cycles off longer the check valve is leaking. The valve can be replaced under the plenum, or a temporary external valve can be hung in series with the rubber fitting and the plenum fitting. Possible leak Number 3 is under the plenum, the vacuum reservoir connector. Wiggle the connection and see how the pump run time is affected. Leak Number 4 is the solenoid valve. To isolate it, remove the connector from the valve and block the vacuum port on the right side with a finger. The pump’s off time will increase if the valve is leaking.



- What if there are no leaks but the port throttles are not opening?
Perform a visual check of the mechanical system. This can be done while the plenum is in place. Turn on the ignition but don't start the engine. Ground pin C17 on the ECM. Connector C is green. The wire on pin C17 is pink with a black stripe, except on early '90 cars the wire is pink without the stripe. This will activate the secondary solenoid valve. Normally the vacuum pump will run for a few seconds as it pulls back the secondary throttle actuators. If the pump does not stop running, there is a vacuum leak after the solenoid. The operation of the secondary port throttle arms can be observed by looking down between the plenum runners with a flashlight. If a throttle bank does not operate there could be a mechanical problem with the linkage. If you are in a quiet area the vacuum solenoid piston can be heard making a click when it activates. If the there is no click, the solenoid piston could be stuck.
- Removal of the secondary port throttle system.
All of the vacuum parts can be removed if the engine control program in the engine calibration chip is modified to remove the secondary port controls.

As of January of 2018, all of the repair parts are available from http://www.jerrysgaskets.com/ except:
* The vacuum solenoid valve. The original '90 to '91 valve is pn 1997191. It was replaced by 1997222 that has a larger vent filter for '92 to '95 cars. They are functionally interchangeable. 1997222 was discontinued in about 2010. AC-Delco 214-358 is currently available for an EGR application and is a good substitute. This valve does not

have the mounting bracket that is unique to the LT5. Cut off the bottom half of the OE valve bracket and attach it to the bracket on the new valve so that it can be mounted. There is a spline blocking the electrical connector. Cut the spline cut with a sharp blade to remove it.
* The vacuum actuator. They rarely fail. Pn 1996743 was discontinued in about 2010. If one is needed, a takeout part may be available. There are a lot of people that have removed the secondary throttle actuators. Always test the replacement part. AC-Delco made a batch of replacement actuators in about 2005. Some of them have a manufacturing defect. The spring was installed backwards in those units. If so the arm may not pull back 100%. The batch with the units that may have the defect can be identified by the red rubber bellows.