

When Giving More Than 100 Percent is a Problem

Many people like to be strong achievers. Maybe delivering over 100%. A laudable goal, however the LT5 engine has no appreciation for that. Over 100% throttle opening can under fuel the engine by 50% if the secondary intake port throttle controls have been removed.

This particular car arrived with a problem described as rough running when the engine was cold and the ambient temperature was under 30 degrees F. The previous owner had removed the secondary intake port throttles and the calibration chip was programmed to remove the secondary intake port throttle controls. It was reported that the engine ran well when the engine warmed up. At the time of the arrival the ambient temperature was in the 70's. On a test drive the engine ran okay until the throttle was opened fully, then it ran a little rough and was down about 50 hp from 5000 rpm on up. The engine control system did not turn on the Service Engine Soon light.

Data was collected with an engine data scanner while driving at full throttle. It was the easy to see that the secondary port throttles were closing when they should stay open. The second data collection chart below shows that the throttle position is going beyond 100% and coincidental with that the secondary port throttles are closing. Since the secondary intake port throttles have been removed from this engine, what was also happening is that the secondary fuel injectors were turning off and the engine was running lean for fuel.

At 4500 rpm with the main throttle fully open and both intake ports open, the engine is ready to develop maximum torque. However, it was receiving only half of the fuel that it needs. And the power faded away.

A cold engine needs a lot more fuel than a warm engine does. So, when driving cold and the secondary fuel injectors were turned off, the engine would run lean with all throttle openings after the throttle was opened to about 60% once.

The problem was caused by throttle position sensor voltage that was too high. The engine control system expects to see about 4.65 volts at full throttle indicating a 100% open main throttle. The chart shows the throttle position percent going to 12% when the throttle is opened beyond 4.8 volts. The program can't handle this and it turns off the secondary intake port fuel when the main throttle is fully open. The secondary intake port fuel injectors would remain off until the engine was restarted. Then once again the engine would run normally until the main throttle was opened more than about 60%.

The throttle position sensor had been replaced sometime in the past. Most of the currently available new sensors do not match the resistance characteristics of the OE sensor. The OE sensor can be identified by the manufacture's logo, CTS. It is a top-quality part that rarely fails. Trouble starts when it is replaced with what is essentially the wrong sensor.

The OE sensor is set to .53 volt at closed throttle at the factory. This will not work with some new sensors. That's what was wrong with this car.

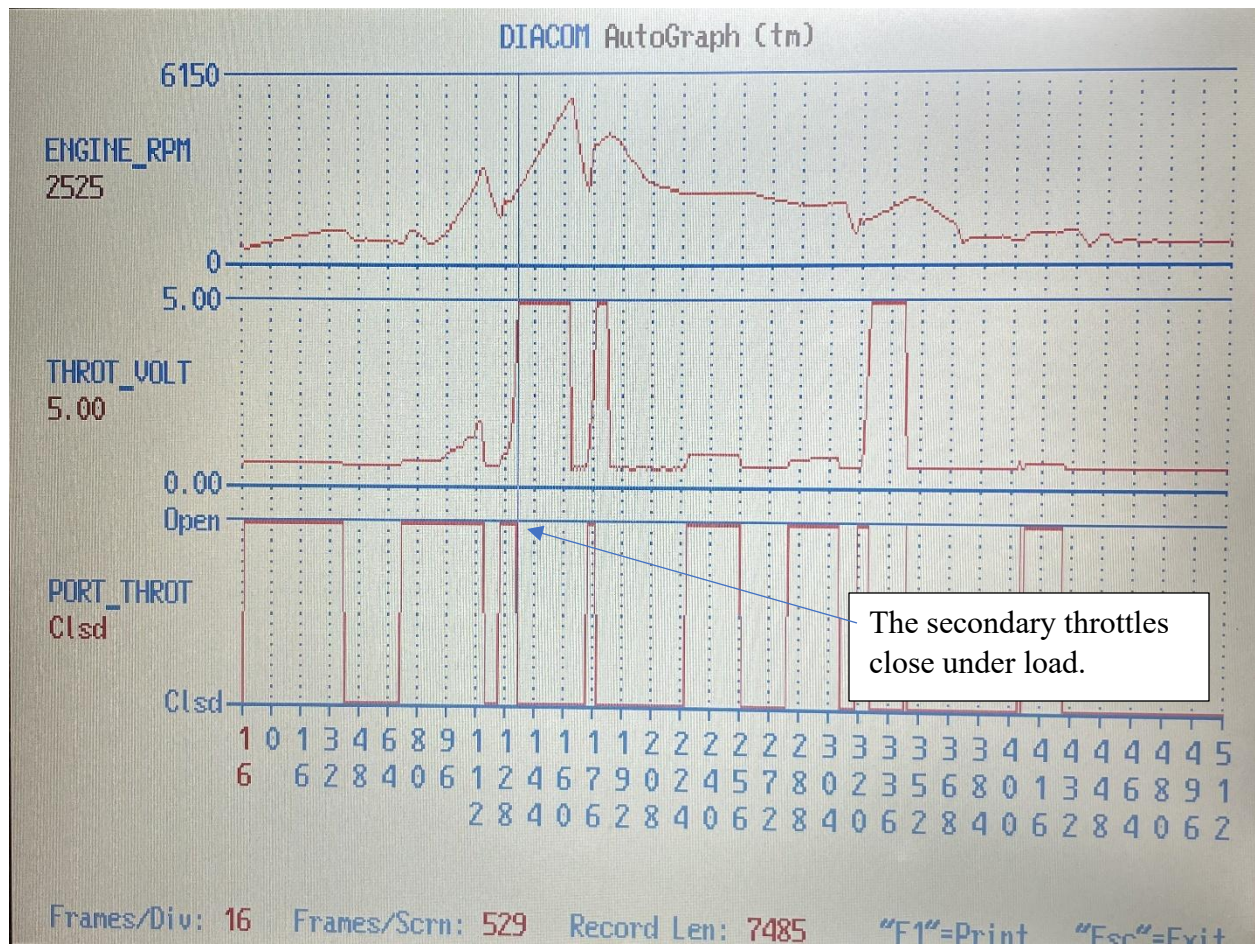
With a replacement sensor observe the full throttle voltage. It must be less than 4.8 volt. If greater than 4.8, adjust it to 4.7. Use -.1 volt as a margin for reliability. Then observe the closed throttle voltage. It must be greater than .23 volt or the system will set an error 22 for throttle position voltage too low. The throttle position percentage is recalibrated when the ignition is turned off and then back on. A voltage between .24 and .59 volts will display as 0% throttle opening on a scanner. The engine control system stays awake for 10 seconds when the ignition key is turned off. The ignition must be turned off for more than 10 seconds to recalibrate the throttle position sensor position. Turn on the ignition again and check that the TPS position is 0%.

In 2026, we use AutoZone sensor TPS131. We set the throttle position voltage to .35 volt.

This chart shows the engine running normally, one data frame before the fault occurs.



The next chart shows the driver's throttle about 100% open and the secondary throttles have closed. This causes a 50% reduction in fuel. The throttle position sensor voltage over 4.8 volts causes the control program to malfunction.



The next chart shows the throttle position opening in percent rolling over from 100% to 12% in one step. The control program can't handle this.

