



# Tech Articles

## Functions of the throttle position sensor (TPS)

by: Ryan Gick

For my first article I am going to discuss the functions of the throttle position sensor (TPS, or TP sensor) as well as how to perform adjustments and troubleshoot this device. This discussion encompasses the 2.5 4-cylinder and 2.8 V6, as well as most other GM engines.

The job of the TPS is to tell the computer the position of the throttle. This sensor is vital in helping the computer determine if the throttle is closed or open, or how fast the throttle opened or closed. The throttle position sensor is a simple potentiometer that uses ground and 5-volt reference inputs to produce a varying output signal depending on the position of its detection arm or shaft. At rest, this sensor outputs a relatively low voltage signal; as the arm/shaft is turned (as it would when the throttle opens), the output voltage increases. If this sensor is out of adjustment or is failing, the result could be stalling, idle surge, flat throttle response, hesitation, or erratic engine operation. Most of the TP sensors you find on stock Fiero engines are the adjustable type while those found on newer GM engines are usually non-adjustable. If the TPS on your engine is adjustable, it must be set correctly in order for the computer to function normally.

In order to set the TPS, you will need a scan tool (or laptop/PC running scan tool software) or a digital voltmeter. You will also need the proper tool to loosen the retaining screws. If you have a scan tool, all you need to do is pull up the TPS voltage data. If you are using a digital voltmeter, then voltage will need to be measured across the blue and black wires going to the TPS. I suggest this measurement be made by going directly to the connectors at the ECM (located between the seats) so the weather seal is not broken in the wiring/connection out in the engine compartment. If this seal is broken, moisture can corrode the connections to the TPS and create all sorts of problems. Once you get your TPS voltage display up, turn the ignition on but do not start the engine. The voltage with closed throttle should be between 0.400 and 0.625 volts for most applications (check appropriate reference guides for your application's specified voltage range). If the voltage you get is not within spec, loosen the TPS retaining screws and adjust as necessary. Normal voltage reading for wide-open throttle (WOT) is above 4.00 volts.

Two trouble codes that are associated with the TPS are 21 and 22. Code 21 will set if the TPS voltage is too high when the computer expects to see it lower. A code 22 will set if the TPS voltage is lower than the computer expects to see. Code 22 is the most common and will usually set if the TPS is out of adjustment or the sensor has failed. The first thing you should do when you get a TPS code is to check adjustment and signal output of the TP sensor *before* replacing it. Be sure to wiggle all connections while watching scan data/voltage readout to make sure the problem is not a loose or bad connection.

There are circumstances that could occur with a failing throttle position sensor that may not set a trouble code. One of the most common symptoms of a failing TPS would be a tip-in hesitation or stumble when you apply throttle to take off from a stop. This can be caused by a dead spot in the TP sensor's internal circuitry, which usually causes the output voltage signal to not change (or it drops out) when the throttle opens. Unfortunately this type of failure is not easy to diagnose without the proper tool—a digital waveform scope. Most digital voltmeters and scan tool displays will not respond fast enough to show this type of a glitch, but some may. If you do find this fault, then the obvious fix is to replace the TP sensor.

Hopefully this article will shed a little insight into the function of the throttle position sensor and how to diagnose problems associated with it.

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