



Tech Articles

Coolant Temperature Sensor (CTS)

By: Ryan Gick from www.gmtuners.com

Hello again Fiero friends. I am going to explain the function of the Coolant Temperature Sensor (aka: CTS, ETC, or Engine Coolant Temp Sensor). After reading this article you should be able to diagnose problems associated with this device as well as gain a better understanding about its function and what role it plays in the engine control system.



Coolant Temperature Sensor (CTS)

The CTS is one of the most vital sensors used by the ECM. It tells the ECM what the temperature of the engine is (or at least the temperature of the coolant running thru the engine). On most stock Fieros, the ECM uses this sensor to calculate ignition spark advance, fuel delivery to the engine, engine idle speed, EGR operation, torque converter clutch enable, and whether or not to permit closed loop fuel operation (which will be discussed in the next article) among other things.

The CTS is a simple thermistor which means its resistance changes based on its temperature. The ECM supplies the CTS with a ground and a small voltage reference signal. The CTS pulls down (towards ground) the voltage reference signal based on temperature and the ECM looks at the amount of voltage pulled down and uses this to calculate temperature. High resistance equates to less reference voltage pull down which the computer interprets as low temperature while low resistance equates to more reference voltage pull down which the computer interprets as high temperature.

Two trouble codes are associated with the CTS. A code 15 indicates the coolant temp reading is lower than expected. If this code is present, before replacing the sensor you should check for an open circuit to the CTS wiring. A code 14 indicates the coolant temp reading is higher than expected. If this code is present, check the CTS signal wire for a short to ground before replacing the sensor. If either code is set, or there is a problem with the CTS itself, it is very likely you will notice a running change in the engine. In cases if the ECM is not getting the correct reading from the CTS, it may be altering the spark advance and fuel delivery to the engine incorrectly which will probably cause a lot of drivability issues such as spark knock (detonation), loss of power, or exhaust odor because of incorrect fuel mixture.

The CTS can be tested using a simple ohmmeter. In order to test this sensor, unplug it from the wiring harness and measure the resistance across its two terminals. The temperature vs. resistance chart is below:

°F	°C	OHMS
210	100	185
160	70	450
100	38	1,800
70	20	3,400
40	4	7,500
20	-7	13,500
0	-18	25,000

On other (non-Fiero) computer systems, the CTS is also used by the computer to calculate other output functions such as coolant fan on/off control, electronic transmission shift points, air conditioning compressor clutch operation, evaporator purge solenoid duty cycle as well as various other functions. As you can see, if there is a problem with the CTS itself or the coolant temp signal going to the computer, a lot of vehicle systems can be affected in addition to engine operation and performance.

Ryan Gick, NIFE Member