P0181: FUEL TEMPERATURE SENSOR A CIRCUIT RANGE/PERFORMANCE

OVERVIEW

Severity	:	High
DIY Difficulty Level	:	Intermediate
Repair Cost	:	**$250-$300**
Can I Still Drive?	:	**Yes** (Short-term only)

What Does The P0181 Code Mean?

When I come across a code P0181, I know that it means that the powertrain control module (PCM) has detected a voltage signal from the fuel temperature sensor (or circuit) that is not within a programmed range. “A” refers to an area of circuitry as opposed to a particular circuit or component.

The fuel temperature sensor is typically integrated into the fuel composition sensor. Designed to provide the PCM with an accurate composition and fuel temperature reading, the fuel composition sensor is a small, computerized device placed in-line between the fuel tank and the fuel rail.

As fuel passes through the sensor, it is monitored to determine how much ethanol, water, and other contaminants are present. An electrical signal to the PCM reflects not only what contaminants are present but also to what degree the fuel has been contaminated.

The level of contamination is measured according to the percentage of contaminants (to fuel) and is input to the PCM as square waveforms. The closer the waveform frequency, the higher the percentage of fuel contamination. Frequency could also be described as the vertical portion of the waveform.

The fuel composition sensor measures the amount of ethanol present in the fuel differently than other contaminants. Fuel composition levels that are as high as eighty-five-percent ethanol are

acceptable in flex fuel vehicles.

The pulse width, or the horizontal portion of the waveform, is indicative of fuel temperature. The broader the pulse width, the higher the temperature of the fuel passing through the fuel composition sensor. On most models, pulse width modulation varies between one and five-milliseconds (hundredths-of-a-second).

If the PCM detects an input signal from the fuel composition sensor, indicating that the fuel temperature is not within a programmed range or if the fuel temperature varies by a greater degree than expected from ambient temperature, a P0181 code will be stored and a malfunction indicator lamp (MIL) may be illuminated. Multiple ignition cycles (with a failure) may be required for MIL illumination in some applications.

What Are The Symptoms Of The P0181 Code?

Symptoms of a P0181 code may include:

- There may be no symptoms
- Other fuel composition codes may be present
- Possibly MIL illumination

What Are The Potential Causes Of The P0181 Code?

Potential causes for this code to set are:

- A bad ambient temperature sensor “A”
- Defective fuel temperature/composition sensor
- Faulty intake air temperature sensor
- Open, shorted, or damaged wiring or connectors
- PCM or a PCM programing error

How Can You Fix The P0181 Code?

A good starting point is always to check for technical service bulletins (TSB) for your particular vehicle. Your issue may be a known issue with a known fix put out by the manufacturer and can save you time and money during diagnosis.

I would typically gain access to a diagnostic scanner, a digital volt/ohmmeter (DVOM), an oscilloscope, an infrared thermometer, and a vehicle information source like All Data DIY to diagnose a code P0181. A scanner with a DVOM and a portable oscilloscope (built-in) would serve you well.

A good place to start any diagnosis is with a visual inspection of all related wiring harnesses and connectors. All damaged or burnt components will need to be repaired or replaced; then retest the

system.

I have found that, when multiple failure cycles are required for MIL illumination, using the OBD II readiness mode can be helpful. When all repairs are completed, I clear the codes and drive the vehicle as usual. I know that my repairs were successful if the PCM enters readiness mode. I know that a malfunction still exists if the code is reset.

Integrated into the fuel composition sensor, the fuel temperature sensor is typically supplied with a five-volt reference voltage and a ground. The variable resistance sensor completes the circuit and provides the PCM with a fluctuating fuel temperature voltage signal.

The DVOM can be used to test reference voltage and ground at the fuel temp sensor connector. Use the DVOM to test the corresponding circuits at the PCM connector if reference voltage is not present. Repair open circuits as required. If no reference voltage is discovered at the PCM connector, suspect a faulty PCM or a programming error.

If the reference and ground are both present at the fuel temperature sensor connector, connect the test leads of the oscilloscope to the ground and signal circuits to observe live data in the form of waveform patterns. Measure actual fuel temperature using the infrared thermometer and compare it with the temperature reflected by the waveform patterns on the oscilloscope.

Suspect that the fuel temperature sensor is defective if the fuel temperature reflected by the fuel temperature sensor fails to coincide with that of the thermometer.

Additional diagnostic notes:

- Use the DVOM to test fuel temperature sensor resistance according to manufacturer's recommendations
- **NOTE**: Disconnect all related controllers prior to testing circuit resistance with the DVOM

Severity Description

Fuel temperature is monitored by the PCM to calculate fuel delivery strategy (in flex fuel vehicles) so this code should be treated as severe.

Reference Sources

Diagnostic Trouble Code (DTC) Charts and Descriptions for P0181 - Page 43.