P009A: INTAKE AIR TEMPERATURE/AMBIENT AIR TEMPERATURE CORRELATION

OVERVIEW

Severity	:	High
DIY Difficulty Level	:	Advanced
Repair Cost	:	**$90-$1000**
Can I Still Drive?	:	**Yes** (Short-term only)

What Does The P009A Code Mean?

If you have a service engine soon lamp accompanied by a code P009A, it means that the powertrain control module (PCM) has detected a discrepancy in the correlating signals between the intake air temperature (IAT) sensor and the ambient air temperature sensor. IAT and ambient air temperature must be monitored in comparison to ensure that no obstructions impede vital air flow to the engine intake.

IAT sensors are normally composed of a thermal resistor that protrudes from a plastic housing on a two-wire pedestal. The sensor is inserted into the air intake pipe or air filter housing. A secondary IAT sensor design integrates the sensor inside the mass air flow (MAF) sensor housing.

Sometimes the IAT thermal resistor is positioned parallel with the MAF hot wire and other times it is located in a recessed area away from air flow. Check IAT sensor location specifications for the vehicle in question before making any assumptions.

The thermal resistor is usually positioned so that intake air may flow across it. The sensor housing is typically designed to be stuffed into its mounting point through a thick rubber grommet. As intake air temperature increases, the level of resistance in the IAT resistor decreases; causing circuit voltage to move towards the reference maximum.

When air is cooler, IAT sensor resistance increases. That results in decreased IAT sensor circuit

voltage. The PCM sees these variations in IAT sensor signal voltage as changes in intake air temperature.

The ambient air temperature sensor acts in much the same manner as the IAT sensor. The ambient air temperature sensor is normally positioned near the grill area.

A code P009A will be stored and a malfunction indicator lamp (MIL) may be illuminated if the PCM detects voltage signals from the IAT sensor and the ambient air temperature sensor which differ by more than the maximum allowable amount for a certain period of time. On some vehicle applications, MIL illumination may require multiple ignition cycles with a failure.

What Are The Symptoms Of The P009A Code?

Symptoms of a P009A engine code may include:

- There may be no symptoms exhibited with this code
- Engine drivability issues
- A reduction in fuel efficiency

What Are The Potential Causes Of The P009A Code?

Causes for this engine code may include:

- IAT sensor left unplugged after service
- Bad ambient air temperature sensor
- Faulty IAT sensor
- Open or shorted circuits or connectors
- Defective PCM or PCM programming error

How Can You Fix The P009A Code?

Prior to diagnosing a P009A, I will require an infrared thermometer with a laser pointer, a diagnostic scanner, a digital volt/ohmmeter (DVOM), and a source of reliable vehicle information.

A stored IAT sensor code would prompt me to inspect the air filter element. It should be relatively clean and inserted into the housing as intended. A visual inspection of IAT sensor and ambient air temperature sensor system wiring and connectors should be undertaken if the air filter element seems to be functioning properly.

Next, I would connect the scanner to the vehicle diagnostic port and retrieve all stored codes and freeze frame data. I generally like to write this information down. It could prove helpful as the diagnostic process unfolds. Now, I would clear the codes and test-drive the vehicle to see if the P009A is reset.

My vehicle information source should yield wiring diagrams, connector pin out charts, component testing specifications, and connector views for the vehicle in question. This information will be crucial when testing individual circuits and sensors. Remember to unplug the PCM (and all related controllers) to prevent controller damage when testing individual system circuits for resistance and continuity with the DVOM.

Testing IAT And Ambient Air Temperature Sensors

- Use the DVOM and your source of reliable vehicle information.
- Place the DVOM on the ohms setting
- Disconnect the sensor to be tested
- Follow component testing specifications

Sensors which fail to comply with testing specifications should be considered defective.

Check For Reference Voltage And Ground

- Probe the reference circuit pin of the individual IAT and ambient air temperature sensor connectors using the positive test lead of the DVOM
- Probe the ground pin with the negative test lead.
- With the key on and the engine off (KOEO), test for reference voltage (typically 5-volts) and a ground at the individual sensor connectors

Test IAT And Ambient Air Temperature Sensor Signal Circuits

- Reconnect the sensor
- Probe the signal circuit of each sensor with the positive test lead of the DVOM
- The negative test lead must be connected to known good engine ground when testing the signal circuit
- Use the infrared thermometer to check actual IAT and ambient air temperature
- Observe the scanner data stream and see what IAT and ambient air temps are being input to the PCM or...
- Use the temperature to voltage chart (found within the vehicle information source) to determine if each sensor is functioning properly
- This is done by comparing actual sensor signal circuit voltage (displayed on the DVOM) with desired voltage
- If either of the sensors do not reflect the appropriate degree of voltage (according to actual IAT and ambient air temperature) suspect that it is bad

If IAT And Ambient Air Temperature Sensor Signal Circuits Both Reflect The Appropriate Amount Of Voltage

- Test the signal circuit (for the sensor in question) at the PCM connector, using the DVOM

- If there is an appropriate sensor signal at the sensor connector that is not found at the PCM connector, suspect that an open circuit exists between the two

Exhaust all other possibilities and suspect PCM failure (or a PCM programing error) only if all IAT and ambient air temperature sensors and circuits are within specifications.

Technical service bulletins (TSB) which parallel the vehicle, symptoms, and codes stored will likely help you with your diagnosis.

Severity Description

IAT sensor input is vitally important to fuel delivery and a stored code P009A should be classified as severe.

Reference Sources

Diagnostic Trouble Code (DTC) Charts and Descriptions for P009A - Page 18.