# P0053: HO2S HEATER RESISTANCE (BANK 1 SENSOR 1)

OVERVIEW

| | | |
|---|---|---|
| **Severity** | : | High |
| **DIY Difficulty Level** | : | Intermediate |
| **Repair Cost** | : | **$100-$200** |
| **Can I Still Drive?** | : | **Yes** (Short-term only) |

## What Does The P0053 Code Mean?

When I discover a stored P0053 code, I know that the powertrain control module (PCM) has detected a malfunction in the heater circuit of the upstream (or pre catalytic converter) oxygen (O2) sensor. Bank 1 indicates the malfunction concerns the bank of the engine that contains the number one cylinder. Sensor 1 means that the problem relates to the upstream sensor.

O2 sensors are made with a zirconium dioxide sensing element protected by a vented steel housing. The sensing element is attached to wire leads in the O2 sensor wiring harness using platinum electrodes. The controller area network (CAN) connects the PCM to the O2 sensor wiring harness. The O2 sensor provides the PCM with data regarding the percentage of oxygen particles in the engine exhaust as compared to the oxygen content of ambient air.

In the heated O2 sensor, battery voltage is used to preheat the sensor during cold start conditions. In addition to the O2 sensor signal circuits there is also a circuit dedicated to heating the sensor. It typically carries battery voltage (12.6-volts minimum) and may have an in-line fuse. When the PCM detects that engine coolant temperature conditions are within a programmed limit, battery voltage is applied to the O2 sensor heater circuit until the PCM enters closed loop operation. Voltage is usually routed through the PCM, sometimes with help from a relay and/or fuses, and is initiated when the ignition switch is turned on during cold start conditions. Once the engine reaches normal operating temperature, the PCM is programmed to discontinue battery voltage to the O2 heater circuit and takes measures to do so.

If the PCM detects a level of resistance from the O2 sensor heater circuit that is greater than programmed limitations allow, a code P0053 will be stored and a malfunction indicator lamp (MIL) will likely be illuminated. Some vehicles may require multiple ignition cycles (with a failure) for the MIL to be illuminated. For this reason you will need to use the OBD-II readiness mode in order to make sure that your repairs are successful. After completing repairs, drive the vehicle until the PCM enters readiness mode or the code is reset.

## What Are The Symptoms Of The P0053 Code?

Symptoms of a this engine code may include:

- Diminished fuel efficiency
- Black smoke from exhaust due to a rich cold start condition
- Delayed start up due to a lean cold start condition
- Other related diagnostic trouble codes may also be stored

## What Are The Potential Causes Of The P0053 Code?

Potential causes of a P0053 trouble code may include:

- A faulty O2 sensor
- Burnt, broken, or disconnected wiring and/or connectors
- Blown fuse or burnt fusible link
- Defective engine control relay

## How Can You Fix The P0053 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.

To diagnose a code P0053, I would gain access to a diagnostic scanner, a digital volt ohmmeter (DVOM), and a reliable vehicle information source, such as All Data DIY.

I would normally begin with a visual inspection of system wiring harnesses and connectors; focusing on harnesses that are routed near hot exhaust pipes and manifolds, as well as those that are routed near sharp edges like the ones found on exhaust shields.

Use the DVOM to test all system fuses and fusible links. Use caution to test these components when they are under load. Fuses that aren't loaded may seem operational, then fail when loaded. Loading this circuit can be accomplished by making sure the O2 sensor heaters are activated.

I would continue by retrieving all stored trouble codes and freeze frame data. This is done by connecting the scanner to the vehicle diagnostic port. Write this information down as it could be

helpful if the P0053 proves to be intermittent. Next, I'd clear the codes and test drive the vehicle to see if the P0053 is immediately reset.

Should the P0053 be reset, make sure that the engine is cold enough to allow the O2 sensor heater to be activated. Bring up the scanner data stream and observe O2 sensor heater input data. Narrow the data stream display to include only pertinent data so you can get a faster data response. If the engine is within the correct temperature range, O2 sensor heater voltage should be the same as battery voltage. A P0053 will be stored if O2 sensor heater voltage varies from that of the battery, due to a resistance issue.

Connect the DVOM test leads to the sensor ground and battery voltage signal wires in order to monitor live data from the O2 sensor. You may also be use the DVOM to check resistance of the O2 sensor in question. Disconnect all related controllers prior to testing system circuit resistance with the DVOM.

Additional diagnostic tips & notes:

- The O2 sensor heater circuit should be energized when the engine is below normal operating temperature
- If blown fuses are found, suspect that the O2 heater circuit has shorted to ground

## Severity Description

Since a P0053 code means that the upstream O2 sensor heater is basically inoperable, it should be addressed at your earliest convenience.

## Reference Sources

Diagnostic Trouble Code (DTC) Charts and Descriptions for P0053 - Pages 12-13.