P2096: POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

OVERVIEW

Severity	:	High
DIY Difficulty Level	:	Intermediate
Repair Cost	:	**$260-$400**
Can I Still Drive?	:	**Yes**

What Does The P2096 Code Mean?

The code P2096, post catalyst fuel trim system too lean on bank 1 simply translates to a lean (too much air and not enough fuel) condition the PCM recognized through the signals from the oxygen sensors. Bank 1 has no meaning on a four or straight six cylinder engine with a single exhaust. On a V-6 or V-8 engine it refers to the oxygen sensor on the number one cylinder side of the engine as bank 1.

A series of oxygen sensors in the exhaust system signal the fuel mixture ratio at all times. Each exhaust system with a catalytic converter will have two sensors — one between the engine and the converter and one after the converter.

Oxygen sensors signal the engine management computer the amount of oxygen present in the exhaust, which is used in determining and controlling the fuel ratio. The higher the oxygen content the leaner the fuel mixture, conversely the opposite is a rich mixture. It does so in a series of pulses called “cross counts.” There is zirconium on the tip of the sensor that reacts to oxygen in a way that when hot, creates its own voltage. It must be around 250 degrees F to operate and will produce up to 0.8 volts.

In operation the oxygen sensor will cycle once every second and send a voltage to the computer that ranges from 0.2 rich to 0.8 for a rich mixture. The perfect mixture will average the signals around 0.45 volts. The computer’s target fuel/air ratio is 14.7:1. An oxygen sensor will not function

at low temperatures such as start up — for this reason most forward sensors have a pre-heater to reduce their warm up time.

The mission of the oxygen sensors are twofold — to indicate the unburned oxygen in the exhaust and secondly, to indicate the proficiency of the catalytic converter. The engine-side sensor signals the mixture entering the converter and the rear sensor signals the mixture exiting the converter.

When the sensors and converter are operating properly, the front sensor will have a higher count than the rear sensor indicating a functioning converter. When the front and rear sensor agree, the front oxygen sensor has failed, the converter is plugged or another component is causing the oxygen sensor to give an erroneous signal.

This code may and may not be noticeable less for the check engine light. It depends on the cause, however, there isn't anything that can fail on a vehicle without adversely effecting something else. Trace the problem to correct the code as soon as possible to avoid damage to any other components.

What Are The Symptoms Of The P2096 Code?

The symptoms of a P2096 code will vary depending on the component or system causing the disruption in the fuel trim. Not all will be present simultaneously.

- Malfunction Indicator Lamp (MIL) illumination with P2096 DTC set
- Rough idle
- Poor fuel economy
- Poor acceleration
- Misfire
- Cherry red hot catalytic converter
- Possible spark knock (detonation / pre-ignition)
- Additional codes associated with the P2096

What Are The Potential Causes Of The P2096 Code?

The causes for this DTC may include:

- Low fuel pressure caused by a clogged filter, failing fuel pump, failed fuel pressure regulator or clogged or leaking injectors.
- Rough running engine due to misfiring plugs. Many engines have misfire codes to indicate the cylinder effected, such as P0304for number 4.
- A large vacuum leak would cause a massive amount of un-metered air to enter the intake manifold resulting in an overly lean mixture.
- A large air leak at or near the number one oxygen sensor would also cause a lean mixture.
- A plugged converter will cause of host of driveability problems as well as set this code. A

severely plugged converter will result in the inability to increase rpm when under load. Look for a code such as P0420– catalytic converter efficiency below threshold if the converter indicating a faulty converter.

- A faulty oxygen sensor. This will set a code in itself, however, a faulty oxygen sensor does not automatically condemn the sensor. The code just means that the sensor signal was not within specifications. An air leak or any of the above will cause an erroneous signal. There is a multitude of O2 codes relating to O2 performance which gives a clue to the problematic area.
- The Mass Airflow sensor will also cause this problem. It would be accompanied by a code such as P0100– Mass Airflow circuit malfunction. The Mass Airflow sensor is a hot wire that senses the volume of air entering the intake manifold. The computer uses this information to control fuel mixture.
- Rusty exhaust systems, cracked exhaust manifolds or damaged or missing gaskets or donuts will cause air leaks.

To make a point as to the cause and effect on vehicles, consider this scenario. A simple air leak forward of the number one oxygen sensor will add additional air to the mixture un-metered by the computer. The oxygen sensor signals a lean mixture due to the un-metered air.

Immediately the computer enriches the mixture to prevent a lean mixture from causing damage due to detonation among other factors. The unnecessarily rich mixture begins to foul the plugs, contaminate the oil, heats up the converter and drops the fuel economy. These are only a few of the things that transpire under these circumstances.

How Can You Fix The P2096 Code?

It's wise to go online and acquire the technical service bulletins (TSBs) associated with these codes and a description. Although all vehicles suffer from similar causes, some may have a service history of problems with a particular component associated with this code.

If you have access to an advanced diagnostic scan tool such as a Tech II or Snap-On Vantage, this will save you a lot of time. The scanner has the ability to graph and display digital information in real-time of each sensor's performance. It will show the oxygen sensors in operation to easily recognize one that is malfunctioning.

Jeeps and some Chrysler products seem to suffer from poor electrical connectors, so inspect them thoroughly. Additionally, Jeeps have had several PCM updates on the later models. The reprogramming of the updates as well as oxygen sensor replacement for any reason is covered under the 8 year / 80,000 mile warranty.

To check if the update has been completed, look next or behind the battery and there will be a serial number with the date of updating the computer. If it hasn't been done it is free for the above period.

Step-by-Step Guide

- Connect the code scanner to the OBD port under the dash. Turn the key to “On” with the engine off. Depress the “Read” button and the codes display. Cross-reference any additional codes with the accompanying code sheet. Direct your attention to these codes first.
- In lieu of additional codes corresponding to code P2096 or P2098test drive the vehicle and look for tell-tale symptoms. Fuel contamination will cause this code. Fill up with a higher grade.
- If the vehicle displays very little power and difficulty in accelerating, look underneath the vehicle with the engine running. A clogged converter will normally glow red.
- Check the engine for vacuum leaks between the Mass Airflow sensor and the intake manifold. Many times leaks sound like a whistle. Repair any leaks and clear the code.
- If the engine displays a miss and there wasn’t a code, determine which cylinder is misfiring. If the exhaust manifold is visible, spay or pour a small amount of water on each cylinder exhaust port. Water will evaporate immediately on good cylinders and slowly on the missing cylinder. If this can’t be accomplished pull the plugs and check the condition.
- Look at the plug wires to make sure they are not burnt or laying on the exhaust.
- Inspect the exhaust system. Look for rust holes, missing gaskets, cracks or looseness. Raise the vehicle and with a 7/8 inch wrench, make sure the oxygen sensor is tight. Inspect the wiring harness and connector.
- If a code for the Mass Airflow sensor displays check its connector. If it is alright replace the MAF sensor.
- Replace the oxygen sensor downstream the catalytic converter on the side of the engine with the number -1 cylinder for code P2096. Also, if a oxygen sensor code stating “heater circuit malfunction” the sensor has most probably failed.

Reference Sources

Diagnostic Trouble Code (DTC) Charts and Descriptions for P2096 - Page 134.