P02C6: CYLINDER 12 FUEL TRIM AT MAX LIMIT

OVERVIEW

Severity	:	High
DIY Difficulty Level	:	Intermediate
Repair Cost	:	**$50-$850**
Can I Still Drive?	:	No

What Does The P02C6 Code Mean?

A stored P02C6 code means that the powertrain control module (PCM) has detected an extremely lean condition in a specific engine cylinder, in this case it's cylinder #12.

The PCM utilizes the fuel trim system to increase or decrease fuel delivery as required. Input signals from the oxygen sensors provide the PCM with the data required to adjust fuel trim. The PCM uses variations in fuel injector pulse width modulation to effect air/fuel ratio changes.

Short term fuel trim is calculated constantly by the PCM. It fluctuates rapidly and is one of the key factors in calculating long term fuel trim. Every vehicle has minimum and maximum fuel trim percentage parameters programmed into the PCM.

The parameters for short term fuel trim are much broader than the parameter specifications for long term fuel trim.

Small variations in fuel trim, typically measured in positive or negative percentage, are normal and will not cause a code P02C6 to be stored. Maximum fuel trim parameters (positive or negative) are normally in the twenty-five-percent range. Once this maximum threshold has been exceeded, a code of this type will be stored.

When the engine is functioning at optimum efficiency and there is little need to increase or decrease the amount of fuel delivered to each cylinder, fuel trim should reflect between zero and ten percent.

When lean exhaust conditions are detected by the PCM, fuel must be increased and fuel trim will reflect a positive percentage. If the exhaust is too rich, the engine needs less fuel and fuel trim should reflect a negative percentage.

OBD-II vehicles will need to establish a pattern for long term fuel trim strategy and this will require multiple ignition cycles.

What Are The Symptoms Of The P02C6 Code?

Symptoms of a P02C6 trouble code may include:

- Diminished engine performance
- Delayed engine startup
- The presence of stored lean exhaust codes
- Misfire codes may also be stored

What Are The Potential Causes Of The P02C6 Code?

Causes for this P02C6 fuel trim code may include:

- Defective/leaking fuel injector
- Bad fuel pump
- Engine vacuum leak (including EGR valve failure)
- Faulty oxygen sensor
- Mass air flow (MAF) or Manifold Air Pressure (MAP) sensor failure

How Can You Fix The P02C6 Code?

If there are MAF or MAP related codes present, diagnose and repair those before attempting to diagnose this P02C6 code.

I would begin my diagnosis with a general inspection of the engine intake manifold area. My focus would be on vacuum leaks. First, I would listen for the sound (hissing) of a vacuum leak. I would be checking all hoses and plastic lines for signs of cracking or collapse.

The PCV lines are a common source of vacuum leaks. Also, check the edges of the intake for signs of gasket failure. Secondly, I would examine the fuel injector in question (cylinder #12) for signs of fuel leakage. If the injector is wet with fuel, suspect that it has failed.

If no obvious mechanical issues are discovered in the engine bay, there are several tools that will be required to continue your diagnosis:

- A diagnostic scanner
- A digital volt/ohmmeter (DVOM)

- A fuel pressure gauge with adapters
- A reliable vehicle information source

Next, I would connect the scanner to the vehicle diagnostic port. I would retrieve all stored codes and freeze frame data, then write it all down for later use. Now, I would clear the codes and test-drive the vehicle to see if any are reset.

Access the scanner data stream and observe oxygen sensor operation in order to see if a lean exhaust condition actually exists. I like to narrow the data stream to include only pertinent data. This yields a faster data response time and a more accurate reading.

Step 1

Use the fuel pressure gauge to test fuel pressure and compare it with manufacturer's specifications. If fuel pressure is within specs, proceed to Step 2. If fuel pressure is below minimum specifications, use the DVOM to test fuel pump relay and fuel pump voltage. If the fuel pump is being supplied an acceptable level of voltage (usually battery voltage), remove the fuel filter and see if it is clogged with debris. If the filter is clogged, it should be replaced. If the filter is not clogged, suspect fuel pump failure.

Step 2

Access the injector connector (for the injector in question) and use the DVOM (or a noid lamp if available) to test for injector voltage and a ground pulse (the latter from the PCM). If no voltage is discovered at the injector connector, proceed to Step 3.

If voltage and a ground pulse are present, reconnect the injector and use a stethoscope (or some other listening device) and listen to it with the engine running. An audible clicking sound should be repeated in regular intervals. If the sound is not present, or if it is intermittent, suspect that the injector for the cylinder in question has failed or is clogged. Either condition will likely warrant replacement of the injector.

Step 3

Most modern fuel injection systems provide a constant supply of battery voltage to each fuel injector, with the PCM supplying a ground pulse at the appropriate instant, to complete the circuit and result in a spray of fuel to the cylinder. Use the DVOM to test system fuses and relays for battery voltage. Replace fuses and/or relays as needed. Test system fuses with the circuit under load.

I have been deceived by a defective fuse that seemed good when the circuit was not loaded (key on/engine off) then failed with the circuit loaded (key on/engine running). If all system fuses and relays are good and there is no voltage present, use your vehicle information source to trace the

circuit. Chances are that it will take you to the ignition switch or fuel injection module (if applicable). Make circuit repairs as required.

Note: Use caution when testing/replacing high pressure fuel system components.

Severity Description

The P02C6 should be classified as severe because a lean fuel condition may result in catastrophic engine damage.

Reference Sources

P02C6: Cylinder 12 Fuel Trim at Max Limit, OBD-Codes.