

P02A1: CYLINDER 2 INJECTOR LEAKING

OVERVIEW

Severity	:	High
DIY Difficulty Level	:	Intermediate
Repair Cost	:	\$170-\$200
Can I Still Drive?	:	No

What Does The P02A1 Code Mean?

If your OBD-II equipped vehicle has stored a code P02A1, it means that the powertrain control module (PCM) has detected a possible leaking fuel injector for a particular cylinder of the engine, in this case it's cylinder #2.

Automotive fuel injectors require a precise degree of fuel pressure to deliver an exact measure of fuel in a precisely sprayed pattern to the combustion chamber of each cylinder. The demands of this precise pattern require that each fuel injector be free of leaks and restrictions.

The PCM monitors factors such as the degree of fuel trim required and exhaust oxygen sensor data, combined with crankshaft position and camshaft position, to detect a lean condition and pinpoint which cylinder of the engine is experiencing a malfunction.

Data signals from the oxygen sensors alert the PCM to lean exhaust oxygen content and also which bank of the engine is affected. Once it is determined that there is a lean exhaust condition on a specific bank of the engine, the position of the camshaft and crankshaft help to determine which injector is having a problem. Once the PCM has established that there is a lean condition and located the affected fuel injector on cylinder #2, a code P02A1 will be stored and a malfunction indicator lamp (MIL) may be illuminated.

Some vehicle applications may require multiple failure cycles in order for a MIL to be illuminated.

What Are The Symptoms Of The P02A1 Code?

Symptoms of a P02A1 trouble code may include:

- Diminished engine performance
- Reduced fuel efficiency
- Lean exhaust codes
- Misfire codes may also be stored

What Are The Potential Causes Of The P02A1 Code?

Causes for this P02A1 fuel injector code may include:

- Defective and/or leaking fuel injector
- Open or shorted fuel injector circuit(s)
- Faulty oxygen sensor(s)
- PCM or programming error
- Mass air flow (MAF) or Manifold Air Pressure (MAP) sensor failure

How Can You Fix The P02A1 Code?

MAF and MAP related codes should be diagnosed and repaired before attempting to diagnose a code P02A1.

I like to begin my diagnosis with a general inspection of the fuel injection rail area. I would concentrate on the fuel injector in question (cylinder #2). Inspect the outside for signs of corrosion and/or leakage. If there is heavy corrosion on the exterior of the fuel injector in question, or if it is leaking, suspect that it has failed.

If no obvious mechanical issues are discovered in the engine bay, there are several tools that will be required for an accurate diagnosis:

- A diagnostic scanner
- A digital volt/ohmmeter (DVOM)
- An automotive stethoscope
- A reliable vehicle information source

Next, I would connect the scanner to the vehicle diagnostic port and retrieve all stored codes and freeze frame data. It will be helpful as my diagnosis unfolds. Now, I would clear the codes and test-drive the vehicle to see if the P02A1 is reset.

If the code P02A1 immediately returns, use the scanner to perform an injector balance test to verify that the misfire is an injector problem. Once you have done so, proceed to step 1.

Step 1

With the engine running, use the stethoscope to audibly monitor the fuel injector in question. An audible clicking sound should be heard and repeated in pattern. If the sound is not present, at all, proceed to step 2. If it is strained or intermittent, suspect that the injector for cylinder #2 has failed or is clogged. Compare the sounds from that cylinder injector to others for comparison, if needed.

Step 2

Use the DVOM to test for voltage and a ground pulse, when the engine is running. Most manufacturers utilize a system of constant battery voltage on one terminal of the fuel injector and a ground pulse (from the PCM) applied to the other terminal at the appropriate time.

If no voltage is discovered at the connector of the fuel injector in question, use the DVOM to test system fuses and relays. Replace fuses and/or relays as needed.

I like to test system fuses with the circuit under a load. A defective fuse that seems good when the circuit is not loaded (key on/engine off) may fail 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 back to the ignition switch or fuel injection module (if applicable).

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

Severity Description

A P02A1 should be classified as severe because a lean fuel condition could cause cylinder head or engine damage.

Reference Sources

[P02A1: Cylinder 2 Injector Leaking](#), OBD-Codes.