P0302: CYLINDER 2 MISFIRE DETECTED

OVERVIEW

Severity	:	High
DIY Difficulty Level	:	Advanced
Repair Cost	:	**$100-$1000**
Can I Still Drive?	:	No

What Does The P0302 Code Mean?

The reason for a code P0302 being stored in your OBD II vehicle is that the powertrain control module (PCM) has detected an individual cylinder misfire.

A P0302 specifically applies to the number 2 cylinder. Consult a reliable vehicle information source for the location of the number 2 cylinder for the vehicle in question.

This type of code may be caused by a fuel delivery problem, a large vacuum leak, an exhaust gas recirculation (EGR) malfunction, or mechanical engine failure, but is most often the result of an ignition system defect resulting in a low or no spark condition.

Virtually all OBD II equipped vehicles use a distributor-less, coil-over-plug (COP), high-intensity spark, ignition system. It is controlled by the PCM to effect precise ignition spark and timing.

The PCM calculates input signals from the crankshaft position sensor, camshaft position sensor, and throttle position sensor (among others depending upon the vehicle) to configure an ignition spark timing strategy.

In a realistic sense, the camshaft position sensor and crankshaft position sensor are vital to operation of the OBD II ignition system. Using input signals from these sensors, the PCM delivers a voltage signal that causes the high-intensity ignition coils (usually one for each cylinder) to fire in sequential order.

Since the crankshaft turns at a speed that is approximately twice as fast as the camshaft(s), it is crucial that the PCM knows their exact position; both overall and in relation to one another. A simple method of explaining this aspect of engine operation is this:

Top dead center (TDC) is the point where the crankshaft and camshaft(s) align with the piston (for the number one cylinder) at its highest point and the intake valve(s) (for cylinder number one) opened. This is known as the compression stroke.

During the compression stroke, air and fuel are drawn into the combustion chamber. At this point, an ignition spark is required to cause combustion. The PCM recognizes the position of the crankshaft and camshaft and initiates the voltage signal required to result in a high-intensity spark from the ignition coil.

Combustion in the cylinder propels the piston back in a downward fashion. As the engine rolls through the compression stroke, and the number one piston begins to withdraw towards the crankshaft, the intake valve(s) is closed. This begins the exhaust stroke.

As the crankshaft completes another revolution, the number one piston once again reaches its highest point. Since the camshaft(s) has only completed a half revolution, the intake valve remains closed and the exhaust valve is opened.

At the top of the exhaust stroke, no ignition spark is required, as this stroke is used to push spent exhaust gases out of the cylinder, through the opening created by the open exhaust valve(s), and into the exhaust manifold.

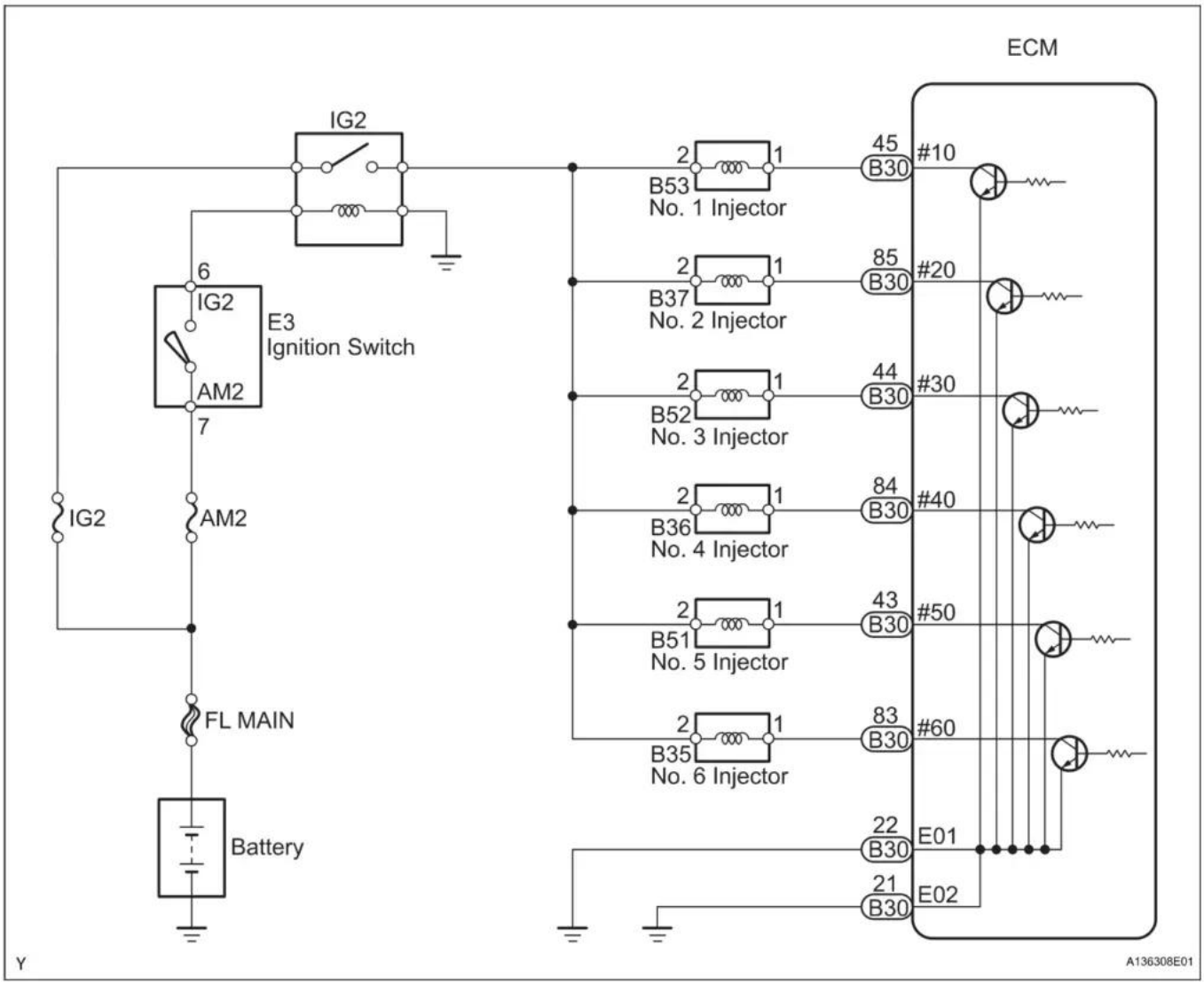
Typical high-intensity ignition coil operation is accomplished with a constant supply of fused, switched (only present with the ignition switch placed in the ON position) battery voltage and a ground pulse supplied (at the appropriate instant) by the PCM.

When the ground pulse is applied to the ignition coil (primary) circuit, the coil emits a high-intensity spark (up to 50,000-volts) for a fraction of a second. This high-intensity spark is transferred through a spark plug wire or boot and a spark plug, which is threaded into the cylinder head or intake manifold, where it makes contact with a precise air/fuel mixture.

The result is a controlled explosion. If this explosion fails to occur, the engine RPM level is affected and the PCM detects it. After that, the PCM monitors camshaft position, crankshaft position, and individual coil feedback voltage inputs to determine which cylinder has misfired or is currently misfiring.

If the cylinder misfire is not consistent or severe enough, the code may appear as pending and the malfunction indicator lamp (MIL) may only flash when the PCM actually detects a misfire (then go off when it does not). The system is designed in this fashion to alert the driver that an engine misfire of this degree can be harmful to the catalytic converter and other engine components.

Once the misfire becomes more consistent and severe, a P0302 will be stored and constant MIL illumination will occur.



P0302 wiring diagram

What Are The Symptoms Of The P0302 Code?

Symptoms of a P0302 may include:

- Diminished engine performance
- Rough or unstable feeling from engine (at idle or under light acceleration)
- Odd odor from engine exhaust
- Flashing or constant MIL (malfunction indicator lamp) illumination

What Are The Potential Causes Of The P0302 Code?

A code P0302 may mean that one or more of the following has happened:

- Defective ignition coil(s)
- Bad spark plug(s), spark plug wires, or spark plug boots
- Faulty fuel injector(s)
- Malfunctioning fuel delivery system (fuel pump, fuel pump relay, fuel injectors, or fuel filter)
- Major engine vacuum leak
- EGR valve stuck in the wide open position
- Clogged EGR ports

How Can You Fix The P0302 Code?

1. Diagnose P0302 Codes

A diagnostic scanner, digital volt/ohmmeter (DVOM), and a reliable vehicle information source will be required to diagnose a stored (or pending) code P0302.

- Begin your diagnosis with a visual inspection of the affected ignition coil, spark plug, and spark plug boot
- Components that are contaminated with liquid (oil, engine coolant, or water) must be cleaned or replaced
- If the recommended maintenance interval demands (all) spark plug replacement, this is a good time to do it
- Inspect primary wiring and connectors, for the ignition coil in question, and make repairs as necessary
- Key-on-engine-running (KOER), listen for the presence of a large vacuum leak and make repairs if necessary
- If lean exhaust codes or fuel supply codes accompany the misfire code, they should be diagnosed and repaired first
- All EGR valve position codes should be rectified prior to diagnosing a misfire code
- Insufficient EGR flow codes should be addressed before diagnosing this code

With all of the above listed issues rectified, connect the scanner to the vehicle diagnostic port and retrieve all stored codes and freeze frame data. I like to write this information down as it can be helpful later.

Now, clear the codes and see if the P0302 is reset during a lengthy test drive.

If the code is reset, use your vehicle information source to search technical service bulletins (TSB) which pertain to the symptoms and code(s) in question. Since TSB lists are compiled from many thousands of repairs, the information found in the appropriate one will likely aid you in making a

correct diagnosis.

Take care to locate the cylinder which is misfiring. Once this is accomplished, you must pinpoint the exact cause of the malfunction. You may spend many hours in testing individual components but I have a simple system to accomplish this task.

2. Testing Procedure For Automatic Transmission

The procedure described is for a vehicle equipped with an automatic transmission. Manual transmission equipped vehicles can also be tested this way but it is more challenging.

It is as follows:

- Determine within what RPM range the misfire most often occurs. This may be done by test driving or checking freeze frame data
- With the RPM range determined, start the engine and allow it to reach normal operating temperature
- Place a chock on both sides of the drive wheels of the vehicle
- Have an assistant get into the driver's seat and place the shifter in DRIVE with the parking brake set and their foot firmly pressing down on the brake pedal
- Take up a position alongside the front of the vehicle, so that you can reach the engine, with the hood open and secure
- Have the assistant gradually increase the RPM level by pressing the accelerator pedal until the misfire is exhibited
- With the engine misfiring, CAREFULLY lift the ignition coil from its perch and note the degree of high-intensity spark being produced
- High-intensity spark should be bright blue in color and stunning in intensity. If it is not, suspect a defective ignition coil
- If you are unsure about the level of spark produced by the coil in question, lift a known working coil from its perch and observe the degree of spark
- Replacement of the corresponding spark plug and boot/wire is recommended if the ignition coil must be replaced
- If the ignition coil seems to be firing normally, turn the engine off and insert a known good spark plug in the boot/wire
- Restart the engine and have the assistant repeat the procedure
- Observe high-intensity spark across the spark plug. It should also be bright blue and intense in nature. If it is not, suspect a defective spark plug for the cylinder in question
- If high-intensity spark (for the affected cylinder) seems normal, you may perform a similar test for the fuel injector by carefully disconnecting it to see if any difference in engine RPM is detected. A working fuel injector will also emit an audible ticking sound
- If the fuel injector is inoperative, use a node light to test for voltage and a ground signal (at the injector connector) while the engine is running

3. Testing For High-intensity Spark

In most cases, you will have found the cause of the misfire by the time you finish testing for high-intensity spark.

- EGR systems which use a system for injecting exhaust gases into individual cylinders are known to cause symptoms which simulate a misfire condition. The EGR cylinder portals clog and cause all of the EGR gases to be dumped into one cylinder, resulting in a misfire
- Use caution when testing high-intensity spark. 50,000-volts can be harmful or even fatal in extreme circumstances
- When testing high-intensity spark, keep it away from fuel sources to avoid catastrophe

Severity Description

Conditions which promote storage of a P0302 are likely to cause catalytic converter and/or engine damage. This code should be classified as severe.

Reference Sources

Diagnostic Chart with Trouble Code for LHD Vehicles for P0302 - Pages 83-90.