Diagnosing Misfires

The ALLDATA Tech-Assist Team

When dealing with misfire codes (P0300, P0301, P0302, P0303, etc.), we tend to take the code(s) cylinder ID(s) with a grain of salt. Why? It's because sometimes, multiple cylinders are indicated because of the PCM's indecision as to which cylinder is actually misfiring. To kick off your diagnosis in the right direction, always confirm which cylinder(s) are misfiring first.

In a situation where you have a P0300 DTC, connect your scan tool to the Data Link Connector (DLC) and check the Misfire Counter to see exactly which cylinders are involved. While you have the scan tool connected, it would also be a good idea run a Relative Compression Test and/or Power Balance Test (NOTE: A lab scope may also be used). Once you have verified if it's a single or multiple cylinder misfire, and identified the cylinders that are misfiring, it's time to focus on the reason.

Basics: Spark, Fuel, Compression/Air flow, Cam Timing

Spark: If you have a lab scope, use the waveform. If not, a wide gap spark tester will do (Image 1). Look for a good hot spark that has a good rhythm – not just one snap or one that skips a beat. If the spark is completely missing, swap the spark plug and then the coil with a good cylinder. If the misfire DTC moves with either of them, then you'll know if the spark plug or the coil is bad.

Fuel: Always check fuel pressure and volume first. Understand that aerated fuel (fuel that contains bubbles of air) can simulate correct pressure on a shop gauge, but not be delivering enough fuel to the cylinders to prevent misfires. Next, check the injector pulse on each cylinder. You can connect a noid light or test lamp at each injector connector to test for a steady, strong flash that does not skip a beat while cranking the engine over. You can also test injector flow. For this test, you will need a fuel pressure gauge and the ability to control the injector pulse with either with a scan tool connected to the PCM or by using an injector pulse tester connected to each injector (Image 2).

Turn the ignition switch to the ON position then read the fuel pressure on the gauge. That is your base fuel pressure and should be the same at the beginning of each injector test. Activate individual injectors with the scan tool or pulse tester and note how much the fuel pressure drops. The fuel pressure should drop equally for each injector. Low to no pressure drop is indicates an injector that is not flowing fuel. Too much of a fuel pressure drop indicates an injector that may be stuck open or leaking. Either issue will result in a misfire.

Compression/Airflow: A vacuum gauge can be used to indicate poor cylinder sealing or air flow problems of a running engine and be a go no-go test when measuring cranking vacuum. But a better all-around test for both cylinder sealing and airflow can be had by performing both cranking and running compression tests (Image 3).

A running compression test (See the Running Compression Test article) is a great test that will not only check cylinder sealing, but lets you know how well the cylinder is breathing – rocker, lifter, cam lobe wear and exhaust restriction problems can be easily identified. NOTE: To further confirm an exhaust restriction, you'll want to remove the upstream O2S or drop the exhaust and see if the engine performance improves.

Cam Timing: Cam timing problems can mean chain slack, belt jump, tensioner/guide problems or even variable valve timing (VVT) problems. Cam timing may have affected the running compression test as well. If the engine is equipped with VVT, use your scan tool (image 4) to watch the "Desired" versus "Actual" cam timing data PIDs and identify a problem. If the tests are inconclusive, you may have to physically look at the timing marks and internal components. A bore scope is a great tool to see the inside of a combustion chamber. There are many inexpensive models that connect to your smart phone.

ALLDATA DIAGNOSTICS™