

## Diagnosing Engine Performance Complaints Misfire Codes Can Be a Diagnostic Challenge

When diagnosing engine performance complaints such as misfire symptoms, be advised that several systems and components can contribute to those symptoms. When considering single or multiple misfire codes, some checks may seem farfetched but trust me if not all are considered the symptoms can elude the most experienced technician, resulting in a misdiagnosis. When this occurs, countless hours of diagnostic time may be invested that are not billable. The condition may be due to electrical, fuel, mechanical, or chemical related issues such as carbon deposits.

### Misfire Monitor

The Powertrain Control Module (PCM) utilizes signals from the Crankshaft Position Sensor to determine when an engine misfire condition occurs. The PCM monitors the rotational speed of the crankshaft, which is stable when comparing one cylinder to another. During the presence of a misfire, the crankshaft speed makes an abrupt rotational change for that cylinder. Following a determined number of misfire events, a code will be stored in memory and the Check Engine Light will be illuminated. Any stored codes may be a single or multiple misfire code.

Misfire codes are usually the result of erratic or lack of spark, fuel metering, timing, compression loss due to mechanical or valve-train issues, vacuum leaks, coolant leaks due to casting leaks or gasket issues allowing coolant to enter the combustion chambers. Do not rule out carbon build-up, especially with vehicles equipped with Direct Fuel Injection. Some vehicle manufacturers warn that excessive wheel balance or braking vibrations may also false set a P0300 random misfire code.

**SINGLE MISFIRE CODES...** If you are fortunate, a cylinder specific trouble code will be stored in memory, which can narrow the search field when making the diagnosis. Single misfire symptoms/codes usually involve an ignition coil, spark plug or fuel injector.

**MULTIPLE MISFIRE CODES...** Multiple misfire symptoms/codes (P0300 code) can be a challenge. The symptoms may involve numerous systems or components such as fuel quality, fuel supply or pressure, oil or coolant consumption, timing, excessive carbon, or any system or component that can affect multiple cylinders and not a single cylinder event. The P0300 code can pose a challenge for the most experienced technician, as many systems and components must be considered in the diagnosis.

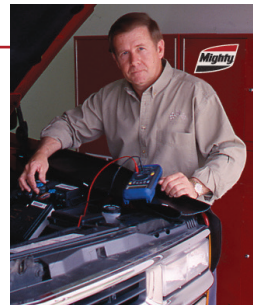
### Misfire Considerations

Following are some checks that should be considered when diagnosing misfire symptoms: Oil pressure related conditions, vacuum leaks, intake or exhaust restriction, fuel related conditions (pressure or volume), crankshaft position sensor/tone wheel, variable valve timing concerns, internal EGR valve leak, coolant leak into combustion chamber, fuel injector failure, defective ignition coil or spark plug, compression loss, PCM (Powertrain Control Module), and carbon build-up especially on GDI (Gasoline Direct Injected) equipped vehicles. When considering the PCM or electrical connections as the culprit, inspect all connections for corrosion, water intrusion, weather seal damage, connector locks, bent, broken or pushed-back terminals, terminal fretting, or evidence of terminal overheating due to excessive current draw.

### Carbon Clean-Up

When misfire codes appear, many technicians assume that an ignition or fuel injection related condition is the culprit. While these components are likely candidates, little attention or consideration is given to carbon related issues. Carbon deposits should be a major concern, especially if the vehicle is equipped with Gasoline Direct Injection. Carbon build-up in the combustion chambers, tops of the pistons and on the intake valves is becoming an issue with those vehicles equipped with this injection system. Carbon is especially a problem with the intake valves, as the fuel is injected directly into the combustion chambers, bypassing the intake valves, eliminating a fuel wash of the valve. The carbon deposits can affect the compression ratio, promote pre-ignition events, hard starts, surging, stumbling, and misfire symptoms, resulting in P0300 random misfire codes.

Performing an annual or every 15K mile clean-up can prevent some major costly repairs. This service can prevent the contamination from getting to a level where the valves are totally encrusted. Minimizing the formation of these deposits before they become a major issue is imperative. Cleaning an engine with heavy deposits can result in large fragments breaking loose, resulting in piston and cylinder wall damage. Oxygen sensors and the catalytic converter can also be damaged from the large fragments. The cleaning process is non-invasive and only requires special chemicals that are introduced into the intake manifold downstream of the mass airflow sensor. Ask your Mighty Rep for a demonstration.



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