# Catalytic Converter and Exhaust System Codes P420-P439

The exhaust system plays a significant role in the performance of the engine. Damage to the system (crushing), leakage or any problem that causes a catalytic converter failure requires extra attention.

A good rule of thumb: The catalytic converter should last the life of any car – meaning anytime you set these series of codes and have a catalytic converter failure, something has likely happened to damage or contaminate the catalytic converter.

Please read the following section carefully for a series of quick and simple tests to insure you correct the underlying problem.

Although many technicians automatically replace a catalytic converter when they see these codes, they often correct only a symptom – not the underlying cause. In some situations, the catalytic converter may be perfectly good, but may not operate efficiently due to an imbalanced fuel mixture, or an exhaust leak or other problems as outlined below.

Before automatically replacing the converter, you can easily verify the performance of the converter with the following manual tests with your 4 or 5-gas analyzer:

**First**, verify that you have a LAMBDA reading between .995 and 1.005 after any repairs. This step is critical, as consistent readings outside this range will reduce the catalytic converter's efficiency:

- Look closely for any indicators of a lean condition. This could be a LAMBDA reading higher than 1.005 – or situations where the O2 value exceeds the CO value, or when fuel trim numbers from your scanner indicates a correction for lean condition. If any of these conditions are present, you likely have a small vacuum leak, weak fuel pressure, restricted fuel filter or something similar. Note: The on-board computer may be making corrections to offset a lean condition, if undiagnosed and repairs are not made, the result could be reduced converter performance and durability.

- High hydrocarbons are often an indicator of other potential problems. If Lambda is good, and hydrocarbons exceed 65 ppm, you may still have an issue with spark or compression. If left unchecked this can result in reduced converter performance and durability, and eventually carbon contamination of the converter and O2 sensors.

**Second,** verify that the converter is functional with this simple test:

- Make sure there are no exhaust leaks and that the engine is in good fuel control.

- Allow the engine and exhaust system to cool off.

- Start the engine, and note the CO2 reading once it stabilizes after approximately one minute of idling.

- Once you have recorded the CO2 reading, raise the engine rpm to a fast idle (between 1500 and 2000 rpm) for 1 minute – and then return to idle and observe the CO2 reading again once stabilized. If your CO2 reading is at least .5% point higher after the fast idle period – your converter is functional and has "lit off". Please note that a catalytic converter can't "light off" unless Lambda is between .98 and 1.02.

- If the readings are virtually the same, you likely have a contaminated or damaged catalytic converter.

- If the test indicates a contaminated or damaged catalytic converter, a more in depth assessment of the engine and all related systems is required, as replacing a catalytic converter that failed due to contamination without finding the underlying cause will lead to a second failure. Common causes of failure due to contamination are:

  - Cooling system (head gasket, intake gasket) leakage
  - Use of non-catalytic converter safe gasket sealants
  - Excess oil consumption
  - Use of improper fuels.

Often, common causes of converter failure such as problems with the ignition system, sensors, EGR system or fuel system components will often have other trouble codes (multiple codes are possible) set at the same time as the P420 – 439 series of codes, making diagnostics much easier.

A **third** test is designed to determine if the catalytic converter is capable of performing its job by checking the inlet and outlet temperatures with in infrared thermometer:

- Make sure there are no exhaust leaks and that the engine is in good fuel control.

- Measure the temperature of a fully warmed up converter (engine at normal operating temperature, and after a 1 minute at fast idle), by pointing your infrared thermometer at the Front Weld Ring (not the shielded area of the converter) and at the Rear Weld Ring. There should be a difference of at least 150 degrees F (65 degrees C), with the Rear Weld Ring being at the higher temperature, indicating that the converter has "lit off" and is capable of doing its job.

- It is important to note that normal converter temperatures rarely exceed 1200 degrees F (650 degrees C) on a properly running car. If you see temperatures higher than that, there is very likely a problem in the ignition, fuel or engine systems.

- Periodic or repeated temperatures exceeding 1600 to 1700 degrees F (870 to 925 degrees C) will likely damage a catalytic converter's precious metals and substrate leading to a total failure.

The **last step** is to verify the repairs by test-driving the vehicle:

- Use a scan tool to verify that the converter has passed the PCM monitors. If it does not, revisit the steps listed above.

- During the test drive, monitor the misfire counter during various speed and load conditions. Misfires introduce both excessive oxygen and fuel into the exhaust. This combination will quickly cause the catalytic converter temperature to rise excessively, which can cause rapid damage (melting) of the substrate.