



## DIAGNOSING NO<sub>x</sub> FAILURES

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One of the major environmental issues facing many areas of the Country today is Photochemical Smog, aka Ground Level Ozone. Smog is created when NO<sub>x</sub> is combined with volatile organic compounds known as Hydrocarbons, (HC) and subjected to sunlight. This explains why some areas are impacted by this phenomena more than others (ie. Southern California).

### **NO<sub>x</sub> + HC + Sunlight = SMOG**

To the elderly, the very young and those with respiratory illness over exposure could mean damage to lung tissue and reduction in lung function.

The sources of unwanted Oxides of Nitrogen (NO<sub>x</sub>) in our atmosphere are many, ranging from coal burning factories to diesel and gas cars and trucks. The automotive industry has been given the task of cleaning up vehicle emissions and NO<sub>x</sub> reduction is a big part of it. The three-way Catalytic Converter has a reduction bed in it's design for this very purpose. However, NO<sub>x</sub> reduction is not dependent solely on the converter.

The first step for any technician in diagnosing a No<sub>x</sub> problem is in understanding what causes elevated levels in the first place. When cylinder temperatures reach approximately 2500°F, NO<sub>x</sub> levels in the engine-out gasses increase. This condition will typically only exist under a load not at idle. One of the systems used by manufactures to control these temperatures is Exhaust Gas Recirculation (EGR).

Under the proper conditions, the PCM (engine computer) will command the EGR valve to open, metering some exhaust gas back into the combustion chamber. This has the effect of lowering the temperature in the chamber which in turn lowers the NO<sub>x</sub> levels. Determining that we have a good working EGR system is key to solving the problem. There can be several components that make up the EGR system on a given vehicle and if any of these become inoperable it could shut the system down.

One of the most common issues to have with this system is carbon build-up, clogging the ports and causing a lack of EGR flow. The easiest and least intrusive way to test for flow is to activate the EGR valve with the engine running at idle. This will create a large vacuum leak and the engine should stall or run very poorly. No change in the running condition indicates a restriction in the system or the valve did not open. If the vehicle is OBD II, it may have a "check engine" light on with the code P0401 – EGR Low Flow. Even though the OBD II system monitors EGR and should set a code alerting the technician to a malfunction, total reliance on the PCM may cause a technician to misdiagnose the problem and replace a good working converter.

Here are some other common causes for high NO<sub>x</sub> emissions:

- Misfire
- Failed Oxygen Sensor
- Leak in exhaust upstream of Converter
- Excessive carbon deposits in combustion chamber
- Advanced ignition timing
- Blocked coolant passage
- Lean Air/Fuel mixture

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Cleaning up the environment...one converter at a time

Gary

