



TechPro

# Bulletin

## OXYGEN SENSOR TESTING

Oxygen sensor testing is pretty simple. Monitoring its voltage output is done best with an oscilloscope. Second best method is using a good voltmeter that has “min/max” capabilities. Scan tool readings would be the least desired method, however, if nothing else is available, this will suffice. Regardless of the method you choose to use, the most important item is that the oxygen sensor being tested is operating on the car. Testing the sensor any other way, such as heating it with a torch is totally unacceptable, and will most likely cause sensor failure by thermally shocking the sensor element. The element is made of a ceramic material that can sustain high temperature exposure. However, when a torch is used, the temperature rate increase is much faster than that of a vehicle. So much so, that the destruction of the element from the increased rate of heat, is most likely. If you intend to put that sensor back in the car, don't use a torch to test it.

*Peter Mc Ardle-*

**Diagnostic Specialist**

## CRANKING VACUUM

All technicians, regardless of their experience or skill level are sooner or later faced with a vehicle that cranks,

but will not start. At some point in the diagnosis, we begin to wonder whether cam timing is the problem, or, if the engine has enough compression to start. The scenario usually goes something like this: A vehicle is towed in from the street, or another shop with an engine which will crank, but will not start.

At this point I get a spark tester, so I can verify that there's enough voltage to the plugs to begin ignition. Then it's time for the carb cleaner, propane, or starting fluid to find out if it's a fuel delivery problem. At this point we need to make a decision whether or not to remove the spark plugs to check compression, or the timing cover to check cam timing. It's about this time that I start to wonder why the engineers who designed this engine, decided to hide or bury all of the components that I need to get to. Then I start to think about all of the times that I did a compression test, or removed timing covers, only to find out that everything was OK. I hate to waste time, especially my own. So, I use a quick way to check an engine's ability to take in and compress air: a cranking vacuum test.

Any mechanical condition serious enough to prevent the vehicle from starting, will result in a loss of cranking vacuum. These conditions include: ring sealing, bent or burned valves, valve timing, and cam wear problems. Intake and exhaust restrictions serious enough to cause a no start can also cause low cranking vacuum.

In order to check cranking vacuum, first locate a manifold vacuum source. Be careful not to use ported vacuum. Next, install your vacuum gauge. If you use a gauge with at least a 4" diameter, it will make the task of taking the readings a lot easier. Crank the engine with the throttle closed, making sure that the engine cranking RPM is normal. Because the engine is not running, vacuum readings will be much lower than at idle. Normal cranking vacuum readings are usually between 1 to 5 inches after 5 seconds of cranking. Engines that have mechanical problems will typically have little or no cranking vacuum. The needle of the gauge will just barely move, never reaching one inch of vacuum. You should try this test on some good running vehicles just to get a good idea what you should see. Once you have a good feel for what the normal values should be, it will be pretty obvious when an engine has a problem. If a vehicle fails this test, repeat the test with a thick piece of cardboard covering the throttle opening. If the cranking vacuum rises to over ten inches, the engine is probably in good condition. The low vacuum readings are the result of open idle air control passages. If vacuum readings are still low, it's time to perform dry and wet compression tests, as well as checking cam timing.

*Joe Gilligan-*

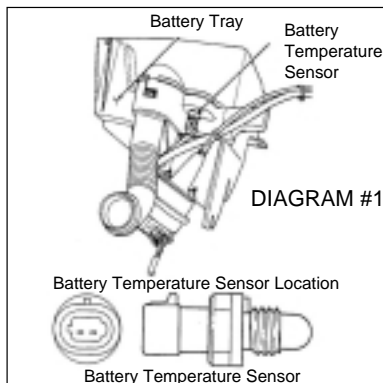
**Diagnostic Specialist**



## DODGE/PLYMOUTH NEON-CHARGE INDICATOR ILLUMINATED- NO CODES

The charging systems in Chrysler built vehicles have been computer controlled since they started using fuel injection. While their computer control systems have evolved, the charging system control has remained unchanged in its operation. System fault indication, however, has changed, particularly on the Neon cars. Previously, the engine control computer would illuminate the “Check Engine” light when a charging system problem existed. The Neon uses a separate “Charge Warning” indicator to alert the driver of a charging system problem. The ECM grounds the circuit for the light, thus illuminating the bulb when a failure in the charging system is detected. Failure codes related to the charging system include codes: 41,44,46, and 47.

You may run across one of these vehicles where the charging system seems to be operating normally, but, the “Charge Warning” indicator is illuminated, and no trouble codes are indicated. If this is the case, take a



quick look at the battery temperature sensor that is mounted in the battery tray (refer to diagram #1). While an open or shorted sensor would trip a code 44, a sensor that is out of range would not, yet it will illuminate the “Charge Warning” indicator. This sensor can be checked either with a scan tool under “Battery Temp”, or using an ohmmeter for checking its resistance. Scan data should closely match the readout for ambient temperature.

Resistance should measure between 9000 and 11,000 ohms at a temperature of 75 to 80 degrees F. It's also a good idea to make sure the connector is dry and free of corrosion.

*James D'Anna-*  
**Top GunTechnician**

## TOYOTA TRUCKS- 1986 TO 95 W/ 22RE ENGINE- INTERMITTENT MISFIRE

You may run across one of these vehicles with an intermittent misfire that seems to affect some or all cylinders. Your basic diagnostics for ignition reveals nothing, while fuel delivery seems to be OK. It seems that these vehicles have problems with wiring harness splices that are located under the intake plenum on the passenger side of the engine. These splice problems usually result in voltage drops on the power side of the fuel injectors. Unfortunately, only one injector can be accessed without removing the plenum. So, if your diagnostics lead you nowhere, try

this tip. First, the upper intake must be removed. Next, unplug all of the injector connectors. Using a test light consisting of a #4651 two-pin headlamp, check for power at the injector power side of the connector. You can do this by grounding one terminal of the headlamp to the battery negative terminal, while connecting the other terminal to the injector connector terminal with either the yellow or blue wire (for 1986 to 1988), or, the black wire with the red stripe (for 1989 to 1995). With the ignition key in the “On” position, the test light should illuminate normally. Be aware, that on the 1986 to 1988 models, the light will illuminate dimmer than normal due to the dropping resistor in the circuit. While the light is illuminated, it's a good idea to give the harness a good wiggle. If the light's brightness changes, you've found the source of the intermittent misfire. The light's brightness should remain consistent for all four injectors. If you find one splice that's bad, it's a good practice to open the harness and repair all four, even if they test OK, in order to prevent a comeback. While you have that plenum off, it wouldn't be a bad idea to clean that throttle body.

*John Rogers-*  
**Asian Specialist**

## NISSAN PATHFINDER 1991 TO 1995- MISSING ABS CODES

Diagnosing the rear anti-lock brake system on these vehicles is pretty simple. If the customer complaint is an illuminated ABS light, however, when you check for codes, and no codes are present, keep this in mind. First, take the vehicle on a test drive where the vehicle speed is over 25 mph for at least one minute. When you return, do not turn the key off, because all memory is lost when the key is off. To get codes, ground the test terminal (#3 of the connector) of the diagnostic connector that is located under the left side of the dash (see diagram #2). Count the number of flashes of the ABS light to determine fault codes.

By the way, if you get a code #11, be aware that the Nissan manual will not mention this code or even give a diagnostic procedure for this code. The rear anti-lock system used by Nissan is the Kelsey-Hayes system used in many foreign and domestic vehicles. Code 11 refers to a fault in the stop lamp circuit. In this case, use normal diagnostics for the stop light switch circuit and the stop lights.

**Richard Mooers-  
Asian Specialist**

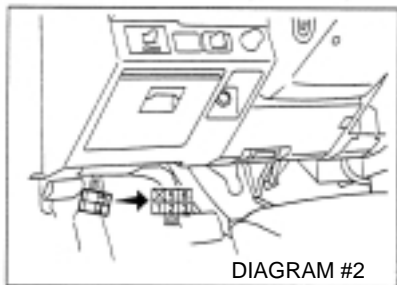


DIAGRAM #2

## HIGH TEMPERATURE GAUGE READINGS- GM 2.8 & 3.1L ENGS.

We usually get a lot of calls regarding high temperature gauge readings on these engines. Usual cooling system diagnostics reveal that everything is OK. Part of the problem is that the dash gauge is reading off a sender that is located in the rear of the engine compartment on the driver's side. This is not the best location for a coolant temperature gauge unit! A fix that has been used with quite a bit of success is to relocate the sender to the same place that the ECM gets its temperature readings from, the thermostat housing. You can accomplish this by using a TX-66 three terminal coolant sensor with an S-619 connector.

First, verify that there are no cooling system problems present. Next, on a cold engine, drain some of the coolant. Remove the two terminal coolant temperature sensor from the thermostat housing and replace it with a TX-66. Cut off the original two-wire connector to this sensor and wire the new three wire connector. Connect the black wire(ground wire) to terminal "A". Connect the yellow wire(signal wire) to terminal "B". The final step is to cut the wire to the gauge sender unit and connect the green wire to the terminal "C" on the connector, using additional wire if necessary(refer to diagram #3). Wire colors may differ in a few applications, so use the appropriate wire diagram. Top off the coolant, and your misleading gauge readings will be gone.

**Joe Dantuono-  
GM Specialist**

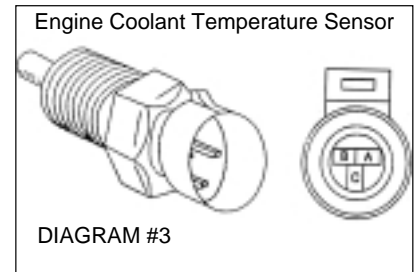


DIAGRAM #3

## FORD OBD II VEHICLES- MIL ILLUMINATED, CODE P1000 PRESENT

We receive numerous calls where the MIL(Malfunction Indicator Lamp) is illuminated and no codes are found, or, a code of P1000 is indicated. Code P1000 is referred to as the Inspection Maintenance Readiness code, or, the IM readiness code. A P1000 code will not cause the ECM to illuminate the MIL. The MIL will only be illuminated when a problem has been found during engine operation. On OBD II vehicles, this won't happen unless the ECM has seen the same problem occur more than once. Depending on which system the fault occurs will determine how many times it will take to illuminate the light. Most emission related trouble codes will need to be detected on a second drive cycle to do this. This means that when a malfunction occurs and the ECM detects it, the ECM will store that trouble code in its memory. There are a lot of criteria that needs to be met before a particular trouble code will cause the MIL to be illuminated. Exceptions to that are in the case of an engine misfire. A severe misfire will result in a rapid

flashing of the MIL light, while a less severe misfire, or a major ECM malfunction (if the MIL circuit is functional) will cause the light to be on steady.

In an OBD II vehicle, if the MIL is illuminated, it means that you definitely have a malfunction and the ECM has already verified that the system in question has had a similar malfunction more than once.

This brings us back to the vehicle with the MIL illuminated and your scan tool reads “no codes present”, or P1000. What’s happening is that the code causing the MIL to illuminate is not a manufacturer specific code, and your scan tool is requesting only Ford specific codes. In this case you will need to set your scanner to the OBD II Generic mode. In this mode, the trouble code(s) should be displayed under the “Codes”, or “Freeze Frame” sections. Be advised that you will not be able to run any Ford specific tests (such as Key ON-Engine Off, or, Key On-Engine Running tests) in this mode. You will have to return to the Ford specific menu for those tests.

The second cause for no codes is that the ECM’s memory has been cleared, thus leaving you with a P1000 code. So what does P1000 mean? A P1000 code means that ALL of the OBD II monitors have not been completed since the ECM’s memory has been

cleared. It is not necessary to clear the P1000 code unless you are performing a state inspection that requires it to be cleared. This code could also be the result of the customer’s driving pattern not permitting all of the OBD II monitors to complete their drive cycle.

A Ford OBD II drive cycle is a specific driving pattern which is used to allow the various OBD II monitors to run and be completed. The requirements for the drive cycle to complete are that all “Trip” monitors are completed. A trip is defined as an engine running, vehicle moving, and the “Trip” monitor has been completed. Therefore, if all OBD II trips have been completed, you have successfully completed the OBD II drive cycle. All scanners will display “Trip Status” as a “Yes” or “No”. A “Yes” simply means that a monitor has run.

Regarding monitors, 1994 & 1995 Ford vehicles use five separate monitors. 1996 & later vehicles use as many as nine. Each monitor has its own criteria to run and complete. Each monitor is actually a test of a particular system’s ability to meet and stay within operating parameters. When ALL of the monitors have run, the P1000 code will be erased. It is best to refer to the specific model’s manual to determine the exact drive cycle procedure. When performing a

drive cycle, a smooth, steady foot on the accelerator will be to your advantage in completing the cycle. Abrupt speed changes and erratic changes in TPS voltage will cause the ECM to take longer to complete, and may even abort certain tests. Avoid wide-open throttle, and exercise caution while driving and viewing the scan tool. Most of the scan tools will indicate each monitor’s status, and whether or not it has been completed. Some monitors are run continuously, and as a result will not indicate a completed status. If for some reason a “trip” was not completed during a drive cycle, the ECM will not need to re-run all of the monitors. It will begin where it had left off, so it is not necessary to repeat the entire process.

With OBD II if you perform a repair and want to verify that you did repair the vehicle, you must keep in mind: the system’s criteria for setting a code, and whether the ECM is looking for two consecutive faults. If this is the case, then it’s mandatory to view the monitor’s status and make sure it’s completed. Don’t rely on the MIL light, because it may take two trips to come on, and that second trip will be when the customer is driving the vehicle.

***Mike Nieto-***  
**Ford Specialist**