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# TechPro Bulletin

## SCAN TOOL TIPS

When computerized vehicles first came out, the G.M. technicians considered themselves lucky because they were able to use a scan tool to view computer and sensor information, while other techs had to back probe with a voltmeter in order to perform diagnostics. Since that time, many of the car manufacturers have made it possible to view much of their computer data through a scan tool. As a result, the scan tool is considered an essential item in order to perform diagnostics. Regardless of which scan tool you use, the important point to keep in mind is that the information you view is "processed" by the computer, and the speed of this information is limited by the speed of the scan tool. What this means to you is that unless there is an obvious failure in any system that you are diagnosing, the scan tool may or may not point you in the right direction. This is especially true when you are looking for intermittent problems. Taking this into consideration, it is always a good practice to verify any potential problem part by actually checking the circuit that is associated with the part in question. This is best accomplished with an oscilloscope or a multi-function meter.

Scan tools also have certain characteristics that must be taken into consideration, otherwise you could make an incorrect diagnosis. We would like to make you aware of some of these characteristics that we have discovered, so you will not be misled as other techs have been in the past. Some apply to more than one brand tool, while others may apply to a particular version of the tool's software. Usually, the manufacturers address the issue with the next version of the software, while others do not. We would like to share with you some of our experiences.

• **Chrysler:** Misleading information concerning camshaft and crankshaft position sensor signals being "observed" by the vehicle's computer on 1998 to 1996 minivans with the: 2.4, 3.3, and 3.8 L engines. In this situation, as long as the ECM sees the sensor's voltage pulse at least once, the scan tool will display that the signal is "Present", when the signal may actually be erratic or no longer be present. In those no start, or driveability problem situations, it is best to verify cam and crank signals with a good multi-function meter, or an oscilloscope.

• **1993 to 1995 Dodge vehicles with the Kelsey Hayes four wheel ABS system:** Some scanners may advise you to use the "grounding" method to check for trouble codes. This method will not work on the EBC-5H systems. Your scanner should be able to communicate with the ABS computer on the CCD connector located on the lower driver's side of the dash. If your scan tool advises you to use a different method for getting trouble codes, then, it is most likely that your scanner/software cannot communicate with this system.

• **Chryslers and Hyundai with Mitsubishi systems:** These systems use a pulsing voltage output to generate stored trouble codes to display on the scanner. In the situation where the ECM is not working properly, the pulsing voltage output may not be generated. Instead, a constant voltage output will be generated, indicating a bad ECM. When the scan tool sees a steady voltage output, it automatically assumes there are no codes present, so it displays: "No Codes". This often misleads techs into thinking that there are other problems in the system, when it is the ECM that's actually the problem.

• **Ford:** When you are diagnosing intermittent "Check Engine" light concerns, make sure that your scanner is not in the "Auto Clear" mode. This will erase any "Continuous Memory" codes that are stored, leading you to believe that none are present.

Non OBD II Fords may display a

"Down Stream" (post catalytic converter) oxygen sensor reading that does not change. If the vehicle is not equipped with one, ignore this display and focus on the other oxygen sensor reading for diagnostics.

• **1994 and earlier Explorers:** When performing ABS self tests, some scanners will instruct you to enable the scan tool before you turn the ignition on. You should actually turn the ignition on and then enable the scan tool.

On other Ford ABS systems, the scan tool may instruct you to access a single wire connector. The single wire connector is used for rear ABS systems. Rear ABS cannot be tested with a scan tool.

***In order to perform tests on Rear ABS systems:*** Make sure that the ABS light is illuminated. Do not turn off the ignition switch, otherwise you will lose any stored codes. Next, ground the single black wire with the orange stripe until the ABS light begins to flash. Then un-ground the wire. At this point, you will be able to read any stored fault codes through the flashes of the ABS light.

***On rear ABS II:*** The single wire (black/orange) wire is connected to a red wire, which is for memory capability for storing fault codes. In order to read codes, just disconnect the wire and ground it as in the previous procedure.

• **General Motors:** GM Vortech engines will always display "0 milliseconds" injector pulse width during engine cranking whether injector pulse is existent or not.

Injector pulse width on some 2.3L engines may be displayed as 3 times the amount of the actual pulse width.

Vehicle speed may be displayed as "3 mph" on some truck four wheel anti-lock systems when the vehicle is not moving.

The "Cam Retard" display may indicate that its parameter is off by over 360 degrees, while it may only be a few degrees off of the typical reading of 0 to 2 degrees.

Incorrect identification of vehicle options, such as: transmission, and whether or not it has sequential fuel injection, will definitely give incorrect data readings.

If you are unable to get codes on 1995 to 1997 trucks with an OBD II connector, try using the "Generic Mode" on your scanner to retrieve non-manufacturer specific codes.

**General Observation:** Some scan tools will give you the option on the amount of data you can access. If you limit the display to only the data that you need, you will then increase the rate at which the information is displayed, which may be helpful if you are trying to track down an intermittent problem.Some scan tools will have different display modes that will determine how the information is displayed. So, if the information that you are viewing is not being displayed in a manner that is helpful, check to see if it is possible to display the data in a different mode.

## MAZDA MILLENIA - OXYGEN SENSOR HEATER OPERATION

If you encounter one of these vehicles which repeatedly sets trouble codes P0135, and P0155, which are oxygen sensor heater malfunction codes, here's some information on how the heater circuit works.

This vehicle uses four sensors: one before each converter, and one after each converter. The main relay supplies power to the heaters of each front oxygen sensor through the ignition switch while in the crank/run position. The rear sensors are wired directly to ground. So, when power is supplied, the heaters are operational. The front sensors operate in a different manner. When the ECM is powered up by the main relay , the heater circuit is grounded for a period of five seconds as a continuity check. After 240 seconds of run time, the ECM will then ground the heater circuit, activating the heaters for the rest of that key cycle. Diagnostics should start by checking that the main relay is supplying power to the front sensors at their connectors. Next verify that there is continuity in the sensor's heater element. Finally, verify the integrity of the ground side of the heater circuit back to the ECM. Terminal

2A at the ECM is the ground circuit for the passenger side sensor, while terminal 2B is the ground for the driver's side circuit.

***In order to verify any repairs:*** clear the fault codes, start and run the engine between 1500-2000RPM for 240 seconds. If the system is operating properly, the voltage reading at terminals 2A and 2B will go low, indicating that the ECM has grounded the heater circuits, allowing them to operate.If trouble codes P0135 and/or P0155 appear while cranking, but do not appear after performing the recommended tests above, make sure that there is adequate voltage from the main relay. If the voltage output supplied by the main relay is lower than normal, check for excessive starter motor current draw, or a weak battery.

**Richard Mooers,**
***Asian Specialist***

## 1996 & UP GM G SERIES VANS - ERRATIC SENSOR SCAN DATA

If you run across a G van with funny looking scan data, such as TPS voltage displaying a higher than normal value, carefully inspect the VCM connectors for evidence of corrosion. On some of these vehicles, the VCM is located under the hood on the driver's side inner fender. What usually happens, especially during the winter, fluid from the windshield washer reservoir will leak or spill, promoting corrosion inside of the connectors. This increases the possibility of a voltage bleed-over to some of the sensor circuits. For example, you may get a vehicle with various sensor codes that indicate high voltage. Your scanner may indicate TPS voltage over 6 volts. Verify that the reference voltage for the TPS is approximately 5 volts. Make sure that the ground circuit voltage is at .050 volts (50 millivolts) or less. If your measured values are acceptable, check the VCM connectors for evidence of corrosion. Also, make sure the windshield washer reservoir is not leaking, otherwise the problem will reoccur.

**Pat Sugar,**
***Top Gun Technician***

## FORD EEC-IV SYSTEMS - INTERMITTENT "CHECK ENGINE" LIGHT WITH NO CODES

Ford EEC-IV systems, just like other systems, constantly monitor circuit conditions for problems that may affect emissions during vehicle operation. When a problem occurs, the ECM will turn on the "Check Engine" light (1988 & later models) to alert the driver of the failure. The illumination of the light does not necessarily guarantee that a fault code has been recorded. The EEC-IV system uses a strategy requiring a failure to occur consistently for at least six seconds in order for a fault code to be recorded in memory. On the other hand, the illumination of the "Check Engine" light does not require the fault to be present that long. If you find yourself in this situation, this tip may help. Enter the self-test called the "Engine Running, Wiggle Test". This test is intended to assist technicians in locating intermittent problems by moving or wiggling sections of wiring harness and their connectors while the engine is running. The real benefit of this test is that the six second requirement for a fault code to be stored is eliminated and any intermittent code will be recorded immediately. Driving the vehicle in this mode may reveal codes that were previously not available. These codes can now be displayed as a "Continuous Memory" code during the "Key On, Engine Off" test.

The "Engine Running, Wiggle Test" can be accessed via two methods. The first way is by using a scan tool. The second is by entering the test manually using a jumper lead in the following manner:

**1.** Start the engine after having the ignition key in the "Off" position for at least ten seconds.

**2.** Ground the STI (Self-Test Input) lead for ten seconds. Remove the ground for one second. Now ground it again for the rest of this test. At this point, you are now in the "Wiggle Test".

**3.** Start moving the wiring harnesses

and their connectors. You may even drive the vehicle in this mode. Any fault detected will be indicated through the illumination of the "Check Engine" light. Once this happens, access the "Continuous Memory" codes to determine where the problem lies.

**James D'Anna,**
***Top Gun Technician***

## CHRYSLER IMPERIAL/FIFTH AVE 1990-93 - AUTO AIR SUSPENSION

As these vehicles get older and the front struts require replacement, the cost of new air suspension struts may approach the worth of the vehicle, making it rather cost prohibitive for the owner, and a job lost for you. It is possible to substitute conventional front springs and struts to keep the cost reasonable. If you choose this option, it will be necessary to make some electrical modifications to the air suspension system control wiring to ensure that the system remains operational and maintain normal rear suspension ride height. Unless you simulate normal or "in trim" height signal inputs from the front height sensors, the suspension control computer will shut down and the rear of the vehicle will eventually sag.

***Each front height sensor has four circuits:*** three inputs and a ground. The inputs are provided through a combination of the opening and closing of magnetic switches in the height sensor. Based on the combination of these switch positions, the computer will determine whether the ride height is: too high, too low, or in trim *(see chart)*.

If we substitute conventional springs and struts, then all we need to do is to simulate an "in trim" input to the computer.The air suspension computer supplies a 5 volt reference to switches A, B, and C. From the chart we can see that switches A and C are both closed in the normal ride height mode. This means that the 5 volt reference on these circuits would be grounded while switch B is open. If we were to check these circuits with a voltmeter, we would measure 0 volts on A and C, while measuring 5 volts on B.

***In order to simulate an "in trim" signal from the front height sensors to the computer:*** cut the wires at terminals 1 and 13. Seal the wire ends and leave them open circuit. Next, cut the wires at terminals 2, 3, 11, and 12 and ground these four wires coming from the computer. These modifications will simulate a normal ride height condition to the computer and it will continue to maintain a normal ride height in the rear as necessary.

**Peter Mc Ardle,**
***Domestic Specialist***

HEIGHT SENSOR SWITCH LOGIC CHART

| SWITCH CONDITION / SUSPENSION POSITION | A | B | C |
|---|---|---|---|
| TOO HIGH | OPEN | CLOSED | OPEN |
| IN TRIM | CLOSED | OPEN | CLOSED |
| TOO LOW | CLOSED | OPEN | OPEN |