

SCAN TOOL DIAGNOSTICS

BY PAUL WEISSLER

Illustrations by Russell J. Von Sauers and Ron Carboni

Published on: August 15, 2001

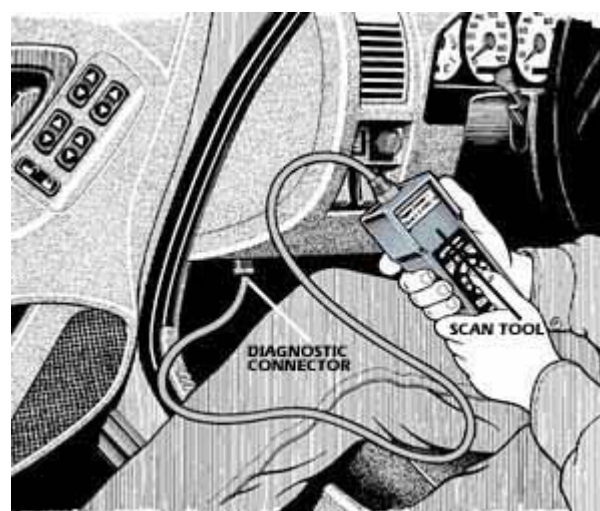
It's state inspection time and you're ready to leave bright and early for the inspection station with the family's '98 minivan. You're starting the day in a less than jovial mood because your daughter said "the light came on" last night on the way home. She said she threw a few dollars of gas into the tank to make it home. Turns out your annoyance is misplaced. Sure enough, the light's on all right, but it's not the fuel warning, it's the Check Engine warning. You stop for gas anyway, and then you pull into the inspection lane.

Well, full tank or not, the minivan does not pass muster.

Failure Is Not An Option

This is a late-model vehicle with what's known as OBD II, the second-generation on-board diagnostic system that replaced OBD I starting in 1994. It's industry-wide and federally mandated. One of the problems with OBD II for the do-it-yourselfer is that you can't get trouble codes by counting the blinks on the Check Engine light like you can on earlier computer-controlled vehicles. You could take your minivan into a high-tech shop, where the minimum charge for diagnosis and inspection could run you somewhere into three figures. Or you can learn about OBD II yourself, but you will need a piece of diagnostic equipment that you probably don't havean OBD II scan tool.

If the Check Engine light came on, it should be no surprise that the vehicle failed an emissions test. With OBD II, that light comes on only if there's a failure that significantly affects emissions. That makes the scan tool even more important since it will reveal a lot of the problems that do not cause the warning light to come on.



OBD II scan tools hook to the car's engine-management computer via a connector under the steering wheel.



Data-stream scan tools will let you investigate the functioning of most sensors, like the throttle position sensor being checked here.

With many problems, the light stays on after the repair is made and the code remains in the computer memory for a certain number of ignition on/off cycles. Your daughter didn't tighten the gas cap correctly, causing a code for the evaporative emissions system to set. Eventually the light will go out and the code will self-erase, perhaps after the next time you start and stop the car. You also can use the scan tool to erase it immediately.

With many other problems, however, the only way to turn off the light and erase the code is with the scan tool. Just a warning: If you erase trouble codes with a scan tool or disconnect the battery for any reason, you also erase the computer's continuous monitoring system. So if you take your car in for a state inspection before enough normal driving, the computer might not have completed all its tests, and your car will fail inspection for that reason.

The OBD II scan tester not only will enable you to find answers to the simpler problems, but will tell you into what areas the seemingly more complicated ones fall. Then you will have a better understanding of what the technician is (or should be) looking for.

Cracking The Code

With an OBD II scan tool you also can read a certain amount of engine operating data: typically rpm, ignition timing, fuel-injection calibrations, readings from a variety of sensors (such as the oxygen, throttle position, barometric and mass airflow sensors), a –calculated load” value and sometimes switch position signals. OBD II also includes a –capture” mode, in which you can use the scan tool to take a –snapshot” of what the sensors were reading at the exact instant a driveability hiccup occurred.

Sensor Scan, Mr. Sulu

With enhanced scan tool capability, you can discover problems that do not trigger the engine-warning light. For example, we recently turned up a generic P0713 code on a late-model car. This is listed in the shop manual as –transmission fluid temperature sensor circuit high input.” If the transmission fluid is running very hot, the transmission could completely fail, and quickly.

A scan tool could save a lot of worry and effort if it has enhanced diagnostics. You can do much of the troubleshooting from the driver's seat the way we did. First we cleared the code with a simple push of a button on the tester. Then we rechecked: The code came back quickly. We cleared it again and looked at the reading that was coming from the transmission temperature sensor to the powertrain computer. It was 131° F, nothing abnormal.

The problem apparently was in the sensor or the circuit, possibly a bad

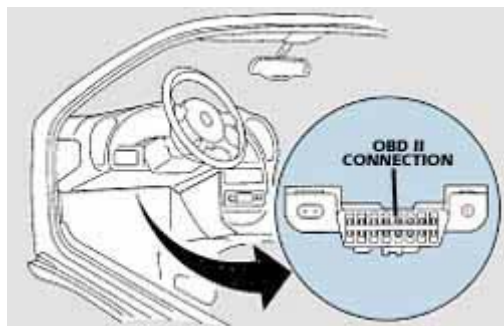


Simple code readers/resetters like this one do not give you sensor data.



Units with more features will let you snapshot and store data while the car is being driven.

connection. The wiring was good and when we started poking around, we found physical damage that clearly indicated the problem was a defective sensor.



HOW IT WORKS: How OBD II Transmits Data

Today's powertrain computers are at the heart of a vehicle's communications network, circulating information from switches and sensors to the other computers that control antilock brakes, air conditioning, transmission, suspension and safety systems. The powertrain computer is also in charge of systems that affect engine emissions, so the information it processes has to be available for evaluation by a technician. That information travels along a wire to a standard 16-terminal diagnostic connector (although, generally, fewer than a half-dozen terminals are live in any given vehicle). Because manufacturers do not all use the same data transmission protocols, the scan tool must be programmed to recognize which one is being used. Fortunately, there has been some standardization, but we're not down to one transmission protocol for all, hence the problem with late-model European cars (including the Cadillac Catera). There are four different so-called standard data pins in the standard connector, and at least four different types of data transmissions that could be used, plus enhanced versions of the standard stuff (other pins are available for additional manufacturer-specific data, such as vehicle diagnostic systems for a/c and ABS).

As anyone with a household PC knows, "plug and play" doesn't always work, and OBD II scan tools can encounter compatibility problems. Some European and Korean cars don't always work when they're supposed to. How can you tell? Checking a scan tool manufacturer's Web site for updates is the way to keep your tool current.

So Many Choices

If you have a late-model vehicle, you have OBD II. However, just because it's generic, and the wiring connector from any OBD II scan tool will plug into your vehicle, doesn't mean any OBD II scan tool will work on your car. The Europeans are the problem, as the latest ones (1998 and later) require a software upgrade. Korean cars are also problematic, and how well they work with any given scan tool needs to be investigated on a case-by-case basis.

The OTC Mind Reader for OBD I can be upgraded with an additional chip



This tester will let you check sensor outputs directly without using the vehicle's on-board computer.

to read generic OBD II in domestic, Japanese and earlier European models (but not the newest Europeans). The Actron ScanTool for OBD I can be updated to the same level of OBD II as the OTC Mind Reader with a plug-in cartridge (or you can buy an OBD II-only model).

AutoXray produces a programmable scan tool. Although it doesn't have the OBD I Chrysler command tests of the Mind Reader, it is the one home mechanic's scan tool we've tested to date that covers all generic OBD II models (including the Europeans) with more on the way. The software will be sold over the Internet. You'll be able to store it on your personal computer and then download it to your scan tool via a cable available from the manufacturer.

Any AutoXray scan tool is designed to be upgraded electronically, from one-make OBD I coverage through the latest models. Although the professionals have had all this software (and a lot more) in their scan tools, you have to wait for it in the general consumer market. Other scan tools may be upgraded to enhanced status and beyond with new cartridges, CD-ROM or via the Internet.

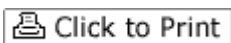
Although Actron has a line of OBD II scan tools, its top tester for car owners is the Actron CP9087, a simple code reader with read-codes and code-erase buttons. You get no sensor readings or other data items. It's a low-cost device (under \$200) that comes with a good assortment of wire leads for making test connections including a back-probe adapter that has a thin, curved metal terminal. This terminal lets the probe slip through a water-sealed connector to reach a wiring terminal for a test connection.

OBD II is entering its sixth full year and the earliest vehicles that have this system are off warranty. OBD II is complex and we've given you just a basic introduction. The OBD II powertrain computer is getting a lot better at finding problems and logging codes. But, the computer won't tell you a thing unless you hook up a scan tool.

Links referenced within this article

Find this article at:

http://www.popularmechanics.com/automotive/how_to_central/electrical_electronic/1272321.html



[SAVE THIS](#) | [EMAIL THIS](#) | [Close](#)



Uncheck the box to remove the list of links referenced in the article.