# Apéndice E: La Computadora en su Auto

## El Cerebro del Auto

Hoy en día, todas las funciones principales de un automóvil son controladas y monitoreadas por computadoras. Ante cualquier síntoma que pueda presentar el vehículo, la computadora de abordo lo detectará y grabará un registro conteniendo un código de error específico, mucho antes que se encienda la luz correspondiente en el panel del conductor (en la industria automotriz, esa luz se conoce como MIL – Luz Indicadora de Desperfecto, Malfunction Indicator Light) para alertarlo que algo anda mal. Algunos de estos desperfectos son de naturaleza simple y de seguro un service mecánico podrá corregirlos sin mayores inconvenientes. Pero existen desperfectos que no son tan sencillos de solucionar y si no se verifican, puede causar daños y hasta destruir el motor.

Moraleja: nuestros automóviles tienen computadoras de abord aunque la mayoría de nosotros no solo ignoremos dónde están o qué hacen, sino simplemente que están. Estas computadoras “esconden” sus datos, no hay una pantalla o display que permite al conductor qué es lo que está sucediendo, qué datos se están procesando. Sin embargo, existen formas mediante las cuales espiar, ver lo que la computadora no quiere mostrar. Veremos un camino posible, en la sección ***¿Cómo espiar la Computadora de su Auto?***

## OBD – Diagnóstico a Bordo (On Board Diagnostics)

When computers began appearing in cars, the auto industry realized that standardization was needed. In the 1980s the Society of Automotive Engineers (SAE) came up with OBD, On Board Diagnostics, a set of diagnostics data variables and also with a relatively standard connector plug. OBD's mission was to reduce emissions, make sure failures could be discovered and fixed quickly via good diagnostics. Those standards were adopted by the very stringent CARB (California Air Resources Board) in 1985 and applied in 1988. They primarily checked the proper functioning of a few components and circuits related to emissions. Unfortunately, the original OBD standard was unable to identify a potential problem until it actually happened or a component completely failed, and then it was often too late. Learning from the first standard, OBD-II is an expanded set with much more standardization both in connectors and fault codes, and was adopted by CARB in 1989 and later by the EPA (Environmental Protection Agency). Starting with 1996, every car sold in the US became required to have a computer that can generate the OBD-II codes and a standard OBD-II connector. In fact, OBD-II is a worldwide standard. Internationally, OBD is handled by the ISO (International Organization for Standardization). As a result, every car can accommodate the same DLC (Data Link Connector) and generates the same generic DTC (Diagnostic Trouble Codes).

## Generic and enhanced codes

To make things a bit more complicated, Diagnostic Trouble Codes can either be "generic," i.e. the lowest common denominator, or "enhanced," i.e. include codes used only by specific manufacturers. General Motors, Ford, and Chrysler all have their own set of enhanced codes. A standard OBD-II scanner can read all those codes, but not necessarily interpret them as they may apply to a single vehicle of a particular model year. **Automotive networks** And it doesn't stop there. There are also different Data Communication Network Interfaces (DCNI) for vehicles. In the US, SAE specifies "Class 2" J1850 VPW Variable Pulse Width (GM) and "SCP" J1850 PWM Pulse Width Modulation (Ford). Internationally, the ISO specifies the "K-line" 9141-2 standard (also used by Chrysler) and on newer vehicles the "KWP2000" 14230-4 standard. The Canadians use yet another standard. Not all of these protocols use the same pins on the connector, and sometimes it is possible to determine the protocols just by looking at what pins are present.

## OBD-II scanners

The task of a scanner is to interface with one or more of those automotive data communication network interfaces that are very different from any PC network, read the codes, and convert them into something a PC's serial port can read. Yes, serial port. We're talking lowest common denominator here. These days that's increasingly a USB port, but for now you'll need a serial-to-USB converter if your PC does not have a serial port anymore. A popular scanner is the T16 series from Multiplex Engineering (www.multiplex-engineering.com). It can emulate the popular automotive network standards and can be had with a variety of plugs, including one that directly connects to a Palm hotsync cable.

## OBD-II Data loggers

In addition to scanners, there is another type of device that uses the OBD-II system--data loggers. Data loggers collect all generated data, up to several hundred hours' worth. An example of a data logger is the Davis CarChip (www.davisnet.com) that, via software, is able to recreate every aspect of a trip--speed, distance, breaking and acceleration and much more. The implications are staggering. Such a system, of course, could easily determine speeding violations. However, it could also provide important clues to what happened right before an accident. Fact is that OBD-III is already being developed, and it will have more sensor s and faster interfaces, and it also may contain transponders that could allow automatic vehicle locating and monitoring.

## Software needed

As is, OBD-II simply generates data in the form of codes (see "OBD-II Codes" below). It is up to software to interpret those codes and convert them into meaningful information that can be used to figure out what is wrong with a car, how to fix it, and more. As with all data, experts and professionals may simply take a look at the codes and know exactly how to interpret them. However, having a good software interface is preferable for most of us, and a number of companies have developed special OBD-II software for proprietary scanner tools, but also for PCs and even for Palms and Pocket PCs. Many of those packages are very well designed, with excellent user interfaces, data interpretation, graphic depictions of data, and ways to show how different data points are interrelated and affect each other. See the review of AutoEnginuity's ScanTool on the previous page.

## OBD-II Caveats

Technology, of course, moves very rapidly and the state-of-the-art in 1996 is old hat by now. How many of us still use 1996-vintage hardware and software? In addition, since OBD-II was conceived to work on every car and every computer (which the automotive field calls ECU, for Electronic Control Unit), it was sort of a lowest common denominator. For example, OBD-II doesn't require the high rate of data polling that may be needed on some of today's high-tech powerplants. Also, since OBD was originally conceived to get a handle on air pollution, there is a heavy slant to monitoring those components that affect a car's emissions. Fortunately, the wealth of data collected by OBD-II can tell us quite a bit about the operation of the engine sitting under the hood of our cars. In addition, OBD-II provide real-time data acquisition which can be used for more than just fault diagnostics. Some software uses it to measure vehicle performance and it might even be used for tuning purposes. --[*Conrad H. Blickenstorfer*](mailto:cb@pencomputing.com)

## ¿Cómo espiar la Computadora de su Auto?

Es requisito legal en el territorio de los Estados Unidos, para todo vehículo cuyo modelo sea 1996 o superior, que el mismo sea compatible con OBD-II. De esta manera se garantiza que exista una forma de conectarse a la computadora de abordo y acceder a los datos almacenados en ella. Estos datos proveen información muy importante relacionada con diversos síntomas que el vehículo pueda experimentar. Cada vez que la computadora detecta una situación inusual, se registran todas las lecturas de los sensores en ese momento. Estos datos permiten realizar una evaluación de los riesgos y la performance del vehículo.

Instrucciones

1. Encontrar el conector de datos OBDII (DLC):

* Buscar el DLC debajo de la guantera, en el lado del acompañante.
* El conector debe tener un mínimo de 16 pins. Algunos fabricantes pueden agregar más pins.

1. Conseguir un cable que conecte un OBD-II DLC a una computadora:

* Existen varias posibilidades, sólo hay que asegurarse que el terminal de la computadora permita conexión mediante un puerto USB.

1. Conectar los cables:

* Conectar el cable obtenido en el paso anterior, al DLC. Utilizar los primeros 16 pins abiertos en el conector de datos.

1. Instalar software adecuado para leer los datos de la computadora de abord:

* Existen varios programas capaces de leer computadoras compatibles con OBD-II.
* Algunos programas son gratuitos, tal como ScanMaster ELM y OBD Gauge.
* Existen también productos comerciales, lógicamente más completos.

1. Conectar a la computadora:

* Enchufar el otro extremo del cable al puerto USB de la computadora.
* En general, se recomienda la utilización de una laptop, por comodidad y practicidad.

1. Leer los datos de la computadora de abordo:

* Utilizar el software elegido para leer los datos.
* Cada programa puede presentar ligeras variantes en la forma en que se inicia el proceso de lectura. Acuda al manual de usuario del fabricante para obtener la información acumulada en la computadora de abordo.

# Fuentes

<http://www.pencomputing.com/frames/obd2.html>

<http://www.ehow.com/how_6608575_read-car-computer.html>