

## What is EOBD

The American Environmental Protection Agency and the European parliament have set targets for reducing the levels of pollution produced by passenger and commercial vehicles. In order to ensure that these targets can be met, manufacturers are required to build new vehicles which meet increasingly stiff emissions standards. The manufacturers must further maintain these emission standards for the useful life of the vehicle. In order to meet and maintain these standards the vehicles are fitted with On-Board Diagnostic systems which monitor the integrity and effectiveness of all emission related components.

As vehicles are becoming more and more complex, many of the systems fitted to them are being controlled by electronic control modules. Most vehicles now have multiple control modules (e.g. Engine, Transmission, Body, Suspension, etc.) located at different locations on the vehicle. The On-Board Diagnostic systems are integrated into the vehicle control modules.

With so many different vehicle and component manufacturers, a common interface was required to communicate with these control modules. In 1988, the SAE (Society of Automotive Engineers) created a standard that defined a standard diagnostic socket (J1962) and a set of diagnostic test signals.

With the diagnostic socket and diagnostic signals agreed, another standard was produced that defined a universal inspection and diagnosis method to ensure that a vehicle is performing to Original Equipment Manufacturer (OEM) specifications. This standard is known as EOBD (European On-Board Diagnostics).

The fundamental requirement for an EOBD system is that in the event of an emissions related component fault, a DTC (Diagnostic Trouble Code) will be stored in the memory of the control module responsible for that component, and a Malfunction Indicator Lamp (MIL) will illuminate on the vehicle's instrument pack to alert the driver. The DTC can then be retrieved using diagnostic equipment to determine the type and status of the fault.

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## Identifying Compliant Vehicles

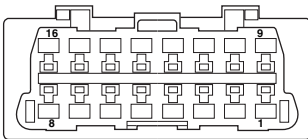
All petrol engine vehicles manufactured since 2000 should be EOBD compliant. Some manufacturers began incorporating On-Board Diagnostic systems as early as 1994, however not all are 100% compliant. All diesel engine vehicles are expected to have support from 2004. This means that diagnostic information, related to vehicle emissions, may be extracted from the vehicle via the J1962 diagnostic socket using the scan tool.

The scan tool can communicate with any EOBD compliant vehicle using one of the five diagnostic communication protocols defined in the standard.

These are

- ISO 9141
- Keyword 2000 (originally a European protocol)
- J1850 PWM (pulse width modulated) protocol used by Ford
- J1850 VPW (variable pulse width modulated) used by General Motors in USA designed vehicles
- CAN (controller area network) currently being legislated for and likely to be a principle diagnostic communication system in the future. A European protocol.

It is normally possible to tell which is used on a specific vehicle by examining the diagnostic socket (as below), however the scan tool's software will automatically detect the protocol used on the vehicle to which it is connected.



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- If the diagnostic socket has a pin in the '7' or '15' position, then the vehicle uses either the ISO 9141 or Keyword 2000 protocol.
- If the diagnostic socket has a pin in the '2' or '10' position, then the vehicle uses one of the SAE J1850 protocols.
- If the diagnostic socket has a pin in the '6' or '14' position, then the vehicle uses the CAN protocol.

**NOTE:** Although there are different EOBD electrical connection protocols, the command set is fixed according to the SAE J1979 standard.

## Diagnostic Trouble Codes

Diagnostic Trouble Codes (DTCs) are divided into mandatory and voluntary codes. Mandatory codes are allocated by the ISO (International Standards Organisation)/SAE (Society of Automotive Engineers). Voluntary codes are allocated by various vehicle manufacturers and are manufacturer specific and in some instances, vehicle specific.

ISO/SAE controlled diagnostic trouble codes are those codes where industry uniformity has been achieved. These codes were felt to be common enough across most manufacturer's applications that a common number and fault message could be assigned. All unspecified numbers in each grouping have been reserved for future growth. Although service procedures may differ widely amongst manufacturers, the fault being indicated is common enough to be assigned a particular fault code. Codes in this area are not to be used by manufacturers until they have been approved by ISO/SAE.

Areas within each of the fault code blocks have been allocated for manufacturer controlled DTCs. These are fault codes that will not generally be used by the majority of the manufacturers due to basic system, implementation, or diagnostic strategy differences.

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## Interpreting EOBD Fault Codes

Use the following rules to determine the basic meaning of an EOBD fault code.

P	Powertrain
B	Body
C	Chassis
U	Network

The first character indicates which area of the vehicle the code applies to.

0	Standard (SAE) code
1	Manufacturer's own code

The second character specifies the type of code:

1	Fuel and air metering
2	Fuel and air metering, specifically injector circuit
3	Ignition system and misfire detection
4	Auxiliary emission controls
5	Vehicle speed control and idle control system
6	Computer output circuit
7	Transmission related faults
8	Transmission related faults

If the first character was 'P' (Powertrain) then the third character identifies the specific Powertrain system concerned:

The last two characters identify the specific fault as seen by the on-board systems.