

Cracking the Code

The problem with cracking the Code Background: For the past 20-years vehicle manufacturers have been producing cars that incorporate some form of "On Board Diagnosis" (O.B.D) system. O.B.D allows any device incorporating an Electronic Control Unit (E.C.U) to provide diagnostic guidance by transmitting a code that correlates to a particular fault on the vehicle. Therefore provided a technician can read the code and has the key to decipher it they have a good starting point to the diagnosis. The first O.B.D systems were small as they only provided the fault codes available from the Engine Management's electronic control unit. This was because O.B.D was originally developed in America by the "California Air Resources Board" CARB, as a way of policing a vehicle's exhaust emissions. CARB's system was known as O.B.D 1. It transmitted stored fault codes via a single wire to a non-generic electrical connector. This made things difficult for vehicle inspectors and non franchised retailers as they needed a dedicated communication lead for all applications. However, in 1996 CARB introduced O.B.D 2, which was an enhanced system incorporating a generic 16-pin connector. Europe: On the 13th October 1998, the European Union passed an EU directive stipulating the introduction of the European On-Board Diagnosis (EOBD), which was incorporated into national law by most member states. New diesel-powered passenger car models were only eligible for homologation with effect from January 01, 2003 if they were equipped with an EOBD system. Production diesel-powered passenger cars were required to be equipped with an EOBD system from 2004. The deadline with regard to new petrol-driven models was January 01, 2000. Just like the American system, EOBD made it compulsory for all vehicle manufacturers to fit a generic 16-pin diagnostic socket and also to use a generic protocol when transmitting emission related codes. The Generic 16-pin EOBD socket The E.O.B.D socket also provides individual connection to each control unit and/or allows all of the control units to communicate via one wire, which is known as the K-line. Two terminals of the connector are also reserved for can-bus communication, most manufacturers now utilise the vehicle's can-bus for full vehicle diagnostics. So, now that all cars sold in Europe have a generic diagnostic socket, it should be easier and more cost effective to diagnose faults and service vehicles. However, the EOBD enforcement only necessitates vehicle manufacturers to make generically available the emission related fault codes and not codes from the entire vehicle. Therefore, diagnostic codes and functions for non-emission systems such as ABS, SRS, and ESP can only be accessed by using each vehicle manufacturer's specific, non generic, protocol. Because the protocol used by manufactures when transmitting non-emission related fault codes differs between each manufacture, most scan-tool manufacturers are forced down the time-consuming process of reverse-engineering the software needed to diagnose and read faults from the non-emission related electronic systems. This increases the cost and reduces the availability of software, which is a great shame because nowadays on board diagnostic systems normally offer all of the following functions:

Read fault codes (provides the technician with a starting point in the diagnosis)

Erase fault codes (Allows the codes to be removed from the control unit's memory after the repair has been completed)

Drive individual actuators (Allows the technician to actuate suspected components)

Display live data (Read data showing how the control unit is programmed)

Re-program the control unit (allows adjustment and adaptation of the system and re-programming of the control unit)

Scan tools: Because O.B.D systems have evolved, so has the equipment. The simple code reader has become a multifunctional scan-tool, which provides access to all of the functions available on a vehicle's O.B.D system.

However, because of the differences with the communication protocol used by vehicle manufacturers, most of today's scan tools are software programmable, meaning that the different software required to communicate with different manufacturers systems is loaded onto the scan tool from a data pod, C.D or even via on-line connection. When a code has been extracted from the system or the live data has been read, it's down to the technician to perform the necessary diagnosis using their own knowledge and experience together with dedicated measuring equipment such as a multimeter and/or an oscilloscope. Why are scan tools becoming so important? The number of electronic systems on today's vehicles is constantly increasing, with the latest vehicles containing around 40 control units, so there are a lot of fault codes available to the technician. However it's not the inability to read fault codes that's the cause of concern to most independent garages, it's the fact that all manufacturers use their scan tools to adjust and re-program most systems. For example with the new Audi A8 and A6 you can't replace the brake pads without using such diagnostic equipment.

Job	Vehicle	Reason for scan tool	Replace
parking brake pads,	New Audi A6 and A8	Used to wind-back the brake callipers.	
Replace any of the vehicle's control units	Most CAN-Bus vehicles from 2000 on	re-programme the new control unit	
containing an airbag	Remove code and warning light	Replace an airbag or pyrotechnical device (body-shop)	All vehicles
vehicle	Most CAN-Bus vehicles from 2003 on	Fit a tow bar to a C.A.N-Bus module	
module	Fit a steering component to a vehicle with an electronic stability system	On most vehicles it's used to programme the trailer	Most
vehicles from 2001 onwards with electronic stability system.	Re-align the straight ahead position of the steering wheel		
Supply a new ignition key	All vehicles from 2000 onward	Re-programme the key	
Service the vehicle	All vehicles from 2000 onward	Switch off the service lamp	
All diagnosis work	All vehicles from 2000 onward	Read fault codes	Erase

Conclusion: From the above list you can see that a workshop is unable to operate at even a basic level without utilising a scan tool, therefore the independent garage's future rests heavily on having access to such equipment, along with a vast range of software to enable it to test each vehicle. If

vehicle manufacturers could only agree to a generic protocol, the cost of such software would be reduced considerably. Furthermore the lack of generic protocol does not help us to improve road safety. Most vehicles now incorporate SRS, EPS and ABS, systems, which are all linked to safety. Therefore perhaps such systems should be tested for faults during the MOT. After all we have got a generic emission related protocol so surely we should have a generic protocol for vehicle safety related systems.