

# Getting to the heart of CAN technology

Believe it or not, CAN technology is nothing new. It's been around for years and, as a result, so have the tools and knowledge needed to diagnose and repair it. The Technical Book finds out more about solving CAN trouble quickly

**WONDER** how often technicians refer to CAN Bus as new technology? The fact is that CAN (Controller Area Network) technology has been used by the automotive industry in production models for over 15 years.

Following its introduction in the early 90s on high-end marques such as Mercedes, it's now used by many mainstream vehicle manufacturers. During the last 5 or 6 years its use has increased dramatically; the result being tens of thousands of CAN-equipped vehicles maintained by aftermarket repairers.

## The basics of automotive CAN

A CAN network refers to a group of modules and the interconnections used to transfer data between them. The interconnections are referred to as the 'bus' and are the highway along which the data travels to and from the modules. This bus is the common link between the modules and provides a solution to data sharing without the need to duplicate wiring.

There are various types of bus available and it's likely that more than one will be fitted to a given vehicle. The most common example is a 'wired bus'. This is available in either a single-wire or twisted-pair configurations. The twisted pair is used to reduce electromagnetic noise during data transfer. The alternative to a wired bus is a fibre optic system which transfers data using light pulses down the fibre links.

## Data transfer around the network

Each module has a unique address and can send and receive data along the bus to which it is connected. Transmitted data is sent as a series of digital bits (1s and 0s) in a pre-determined format (11-bit or 29-bit, for example) and speed (125kbp/s or 500kbp/s) depending on the CAN type.

The data itself is packaged with other information such as message identifiers and a check sum to verify the data is complete. It is normal for a central body controller to be incorporated in the system to monitor the data flowing along the bus. This gateway can prioritise the data according to importance.

## Why is CAN used?

The two fundamental benefits of a CAN network are achieved by reducing wiring and increasing data transfer speed. By simplifying wiring looms and connectors, manufacturers are able to save weight and costs during production which will in turn benefit the customer through lower prices and running costs. By increasing data transfer speeds, it's possible to carry much more information around the network in any given time.

## Multiple CAN networks

As previously mentioned, it's normal for a vehicle to have more than one CAN Bus system. For example, the latest Mondeo incorporates 3 networks:

- High speed – This transfers data at 500kBit/s and manages high priority messages from modules such as the PCM, ABS and steering system.
- Medium speed (x2) – These transfer data at 125kBit/s and manage modules with lower priority, such as door modules, lighting control and audio systems.

All of these CAN networks use the GEM module as a common gateway which allows data to cross over from the high to the medium-speed bus if required.



**DIAGNOSTIC DEPTH:** Getting to the bottom of CAN faults requires the use of a reliable and advanced tool, such as the OmiScan unit from Omitec.

**TROUBLE FREE:** Despite popular perceptions, CAN technology is nothing new. It's been around for more than 15 years and, thankfully, so have the skills and tools needed to solve repair problems.

## Diagnostic tests on CAN Bus vehicles...

**When it comes to diagnosing CAN systems, don't panic! Understanding the problem is the key to finding the fix. There are two main areas to consider when diagnosing CAN-equipped vehicles. Take a look to find out more . . .**

**Diagnosing the modules and associated components**  
This requires serial diagnostics in the same way as ISO (non-CAN) modules do. Technicians need to be equipped with dedicated diagnostic tools designed to deal with high-speed CAN data transfer.

### Diagnosing the CAN Bus network

When there is a problem on the CAN Bus itself, a DTC with a 'U' prefix will often be stored in the body controller that monitors the data. In the case of the latest Mondeo, a DTC of 'U0121 lost communications with ABS module' could be read from the GEM module to indicate that the data from the braking module is missing.

Unfortunately, the design of a CAN network may create other problems when faults occur. With all the modules being connected to each other, it's possible that a single module fault can crash the entire network or share its faults and symptoms with other controllers. This can make fault finding a difficult and time consuming process.

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