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CAN Technologies Support Automotive Systems

Greg Reed, Contributing Technical Editor -- Test & Measurement World, 12/11/2006

Mark Zachos is founder and president of Dearborn Group, which specializes in automotive applications for controller area networks (CAN) technology. In addition, he is an active member of the Society of Automotive Engineers, where he serves on three prominent committees: In Vehicle Networks, Vehicle Diagnostics, and Truck & Bus Communications.

In this exclusive Test & Measurement World interview, he shared insights on CAN technology and its implementation progress with in-vehicle network systems.

Q: CAN was developed for automotive applications to reduce weight and cost of wire harnesses. Has it fulfilled this mission?

A: I think the answer depends on how you look at the issue. CAN has gone much further than just addressing the cost and weight mission. Most new automotive applications such as electronic braking, stability control, advanced engine control, and a host of body and convenience functions would be more expensive or impractical to implement in modern vehicles today without a system like CAN.

Vehicle OEMs like Ford and GM now spend more money on electronics than steel. Modules add significant weight and there can be many of them. They still require wires to the various electro-mechanical components. If all the new features available today were installed without the modern electronics packages, cars would surely weigh and cost more. The electronics have allowed more "bells and whistles" that people want. Now, saving weight and money can be debated as being the real mission for CAN.

Q: Could you describe a vehicle network and the various components?

A: Most vehicles today actually have multiple networks. Some high-end cars have six or more separate networks.

The Powertrain network connects the engine controller to the transmission control module and to the other electronic control units (ECUs) needed to run the car. This network is also usually utilized for diagnostics communication to off-board tools. The Body network connects all the ECUs controlling the door locks, power seats, windows, mirrors, the lighting controllers, the instrument cluster, and many other of the bells and whistles inside the car. The body network also can communicate to the power-train network through a special gateway controller. Some cars also have an Entertainment network connecting the radio to the DVD player, etc.

Q: Some automotive diagnostics have been mandated by governments. Do existing tools provide adequate diagnostic capability?

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A: Yes and no. Some of the more interesting tests are still proprietary to the vehicle OEMs while some of the mandated diagnostics (OBD-II) services give only minimal information. Some OEMs provide the bare minimum to aftermarket auto repairers. So tests for such functions like actual voltage or current levels displayed real time from a component are still unavailable. For some tools, only pass/fail testing exists.

Q: How does one test and measure CAN bus communications? Is special equipment required?

A: Testing of CAN bus communications requires a special tool for converting the CAN signals and message frames into data that can be read by a computer. For example, Dearborn Group offers the Gryphon S-3 tool for interfacing a PC to the CAN bus. Advanced CAN analyzer functions such as data measurement and decoding, triggering and logging, and recording bus faults are also supported by these tools.

Q: What are some special diagnostics considerations for military vehicles?

A: A few considerations are display of classified information, warning lamp indicators, and prognostics. The display of some basic diagnostics information such as top speed, distance traveled, system status, and so on can be construed as classified information creating problems displaying it to maintenance personnel without a suitable clearance. Also, depending on where the vehicle is operating—for example, in a motor pool or in a combat situation--the driver might choose to ignore a warning lamp displaying diagnostic status.

Prognostics (predictive diagnostics) is important to help predict when a vehicle might fail. Having a military vehicle stop in a dangerous combat situation is not good. Commanders would like to know the current status of their vehicles and if they are capable of completing a mission. Prognostic technology can be applied to the automotive industry, too. It may not be a life and death situation to have your car stop on a highway, but it still is important to know the state of health predicted for your car.

Q: In summary, what are the primary benefits offered by CAN?

A: CAN systems allow automotive engineers to design vehicles with advanced powertrain functions. Also, it permits the integration of the bells and whistle convenience functions that customers desire. Finally, it facilitates diagnostic operations for improved vehicle maintenance.



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