Industry:  Transportation R&D  
Product:  Yokogawa MW100 Data Acquisition System

Introduction
In the transportation industry, vehicle manufacturers perform a wide range of performance and durability tests on the complex systems that comprise a modern vehicle. Test parameters cover an equally wide range and include an extensive amount of temperature, pressure, flow, vibration, speed and electrical parameter measurements. Of this, temperature is perhaps the most common; a test vehicle can be outfitted with dozens of thermocouple sensors attached to virtually every area and major system of the vehicle.

The material and installation cost of sensor wire for these tests is significant. Engineers and technicians look for ways to reduce the complexity of their test systems and at the same time improve the performance. A solution is clearly needed to reduce the ever-increasing quantities of sensor wiring.

Application
Provide a method to monitor and record large numbers of sensor data on a vehicle that does not require a discreet cable connection from each sensor to an input channel, thus reducing the wiring costs. Utilize a serial data bus for this connection that is also the integral control network interface for certain vehicle systems.

In some vehicle brands, a serial data bus called CAN (Controller Area Network) is used to carry information between certain vehicle control systems such as the engine management, cruise control, and anti-lock brake systems. Many of the data points that need to be monitored and recorded during the vehicle test phase may be present on the CAN bus. In addition, a dedicated CAN bus can be implemented to carry test data only, or discrete sensor values can be placed on an existing bus.

A vehicle test team will need a monitoring and recording system that can interface directly to a CAN network where it can receive the needed data in the form of CAN messages. Ideally, the test system should be able to acquire both digital CAN message data, and traditional analog sensor inputs on the same platform. It must have stand-alone data logging capability (attach sensor wires, CAN connection) and run with no PC connection, and include high capacity Compact Flash media that can store many channels of data at fast intervals for long time periods. It must also be compact and portable and powered by 12-24VDC for in-vehicle applications.

Solution
The new CAN Interface Module (model code MX118-CAN-M30) for the MW100 allows the MW100 to be used in a number of monitoring and data logging applications in transportation industry product testing and development. In automotive testing applications, temperature measurement is by far the most common requirement for data acquisition. On test vehicles and in test stands, dozens of thermocouples are typically used to sense a wide range of temperature data on many vehicle areas and systems that include:

- Under-hood- engine, cooling system, HVAC, exhaust, and induction systems
- Driveline- transmission, differential and brake systems
- Interior- HVAC ducts and passenger compartment

The traditional method of wiring many thermocouples to discreet inputs on a data acquisition system is very wire and labor intensive. An alternative method that reduces the cabling requirements is CAN bus. With CAN bus, multiple thermocouples and other analog sensors can be wired to a data acquisition module that measures each input and outputs the data on a serial CAN interface. Using this method, many thermocouple wire pairs can be reduced to a single data cable.

The MW100 with the CAN interface module is the ideal system for monitoring and recording the data traveling on the CAN bus.

For an under-hood temperature measurement application, thermocouple sensors can be attached to a thermocouple-to-CAN converter module such as a CSM Thermo-Scan MiniModul. This device can measure up to 8 thermocouples (16 input models are available), and output the values on a single data cable the diameter of a pencil, allowing easy pass through of the firewall to an on-board data acquisition system.
The MW100 provides its full range of data logging and PC connectivity functions to any stationary or portable test application that requires monitoring and recording of CAN bus message data. Combined with hardware such as the CSM Thermo-Scan modules, a large number of analog signals can be condensed into a single cable connection and quickly and easily attached to an MW100 system for data logging.

The CAN interface module can be combined with any combination of standard MW100 I/O modules, providing the user with a truly flexible data acquisition/data logging system that can handle a wide range of stationary and in-vehicle testing applications.

A complete MW100 demonstration system with CAN interface to a CSM thermocouple module is shown below.

**Additional References:**

For detailed product information and specifications, see the following documents:

- MW100 CAN Interface Module Bulletin; 04M10B01-02E-A
- MW100 Bulletin; 04M10B01-01E
- MW100 General Specifications; GS04M10B01-01E