INTRODUCTION TO THE CONTROLLER AREA NETWORK (CAN) PROTOCOL

The Controller Area Network (CAN) protocol, developed by ROBERT BOSCH GmbH, offers a comprehensive solution to managing communication between multiple CPUs. The CAN protocol specifies versatile message identifiers that can be mapped to specific control information categories. Communications may occur at a maximum recommended rate of 1 Mbit/sec (roughly a 40 meter bus length). The protocol has found wide acceptance in automotive in-vehicle applications as well as many non-automotive due to its low cost, high performance, and the availability of various CAN protocol implementations.

In-vehicle networking protocols must satisfy unique requirements not present in other networking protocols such as those found in telecommunications and data processing. These requirements include a high level of error detection, low latency times and configuration flexibility.

The CAN protocol provides four primary benefits. First, a standard communications protocol simplifies and economizes the task of interfacing subsystems from various vendors onto a common network. Second, the communications burden is shifted from the host-CPU to an intelligent peripheral; the host-CPU has more time to run its system tasks. Third, as a multiplexed network, CAN greatly reduces wire harness size and eliminates point-to-point wiring. Lastly, as a standard protocol, CAN has broad market appeal which motivates semiconductor makers to develop competitively-priced CAN devices.

An example of an application well-served by the CAN protocol is automotive networking because many modules are inter-dependent. Sub-systems such as the engine, transmission, anti-lock braking, and accident avoidance systems require the exchange of particular performance and position information within a defined communications latency. The engine transmits engine speed and acceleration parameters to the transmission to allow smoother shifting. Perhaps the transmission requests the engine to reduce fuel injection before a gear change.

CAN is a CSMA/CD-A, or Carrier Sense Multiple Access by Collision Detection using Arbitration protocol. Through a multi-master architecture, prioritized messages of length 8 bytes or less are sent on a serial bus. Error detection mechanisms, such as a 15-bit Cyclical Redundancy Check (CRC), provide a high level of data integrity. For information on the CAN protocol, please read the CAN Specification, Version 2.0.

The CAN 2.0 protocol was chosen by the SAE Truck & Bus Control and Communications Network Subcommittee of the Truck & Bus Electrical Committee to support its "Recommended Practice for Serial Control and Communciations Vehicle Network CLASS C" called the SAE J1939 specification. The SAE CLASS C passenger car subcommittee is currently evaluating CAN, which is a candidate for its high speed networks. Products using CAN Version 2.0 are already in production. The previous CAN specification, Version 1.2, has been successfully implemented in passenger car, train and factory automation applications since 1989. CAN Version 2.0, which features an "extended frame" with a 29-bit message identifier, broadens the application base for this protocol by allowing J1850 message schemes to be mapped into the CAN message format.

The Intel 82526 was the first implementation of the CAN protocol, in production since 1989. The Intel 82527 is a follow-on to the 82526 which implements CAN Version 2.0, provides greater message handling capability and implements a more flexible interface to CPUs.

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