

ITS DATA BUS ARCHITECTURE REFERENCE MODEL INFORMATION REPORT

Foreword—This SAE Information Report represents a proposed reference model for an in-vehicle ITS Data Bus (IDB). The IDB will enable OEMs, dealers, and vehicle owners to reliably and safely install a wide range of electronics equipment in their vehicles at any time during the vehicle's life cycle. The primary audiences for this document are SAE members and automotive engineering and consumer electronics professionals.

This document is based on the results of two workshops led by the SAE ITS Data Bus committee in 1995 and 1996. The goal of the reference model is to describe an ITS Data Bus for ITS, entertainment, and security devices (modules). Without this document, current vehicle design cycles will involve the installation of technology which is three or four (or more) years old by the time the customer takes delivery. A reference model with open industry standard interfaces will allow auto companies to offer state-of-the-art entertainment, traveler information, communications, and security devices to their customers. Vehicle OEM and third party electronics companies will be able to design automotive electronics for use across multiple car platforms and across vehicle manufacturers, using a standard communications interface.

This document introduces the IDB reference model and describes its overall concepts. Details of the IDB specification will be covered in SAE J2366, J2367, and J2368.

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1. Scope—This SAE Information Report describes a reference model for an in-vehicle data bus for Intelligent Transportation Systems (ITS). It introduces the ITS Data Bus (IDB) reference model and describes overall IDB concepts.

2. References

2.1 Applicable Publications—The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J2366—ITS Data Bus Standard

SAE J2367—ITS Data Bus Gateway Reference Design Recommended Practice

SAE J2368—ITS Data Bus Conformance Testing Standard

In-Vehicle Electronics for IVHS - Workshop Results - SAE, December 1995

In-Vehicle Electronics for Intelligent Transportation Systems II - Workshop Results - SAE, July 1996

3. Rationale for This Information Report

3.1 The Need—Vehicle OEMs would like to be able to offer state of the art entertainment, traveler information, communications and security devices (modules) to their customers, but are hampered by the current design cycle of new vehicles. OEM and third party electronics companies would like to be able to design automotive electronics for use across multiple vehicle platforms and across vehicle manufacturers, but there is currently no single standard interface. Drivers would like to be able to install a variety of state of the art electronics devices in their vehicles even after purchase, but installation can be complicated and expensive, and rarely results in integrated systems.

3.2 The Problem—Most modern computing paradigms embrace the concepts of network and distributed computing. It is natural therefore to consider these concepts as one addresses the requirements of the vehicle. Although vehicle manufacturers are indeed using multiplex buses (the automotive equivalent of a local area network), there remain a number of problems. For a variety of reasons vehicle companies are not converging on a single standard. As a result, device manufacturers must design and build multiple versions of their products to attach to the various buses, raising the cost. A device (electronic module) connected to the vehicle's multiplex bus must be qualified through the normal design cycle of the vehicle, which does not easily allow unplanned-for electronics to be added by the manufacturer, the dealer, or the customer. For warranty, safety, and liability reasons, electronic devices must not be allowed to interfere in any way with the operation of the vehicle or of any of its subsystems, so they cannot be easily retrofitted to the vehicle's multiplex bus.

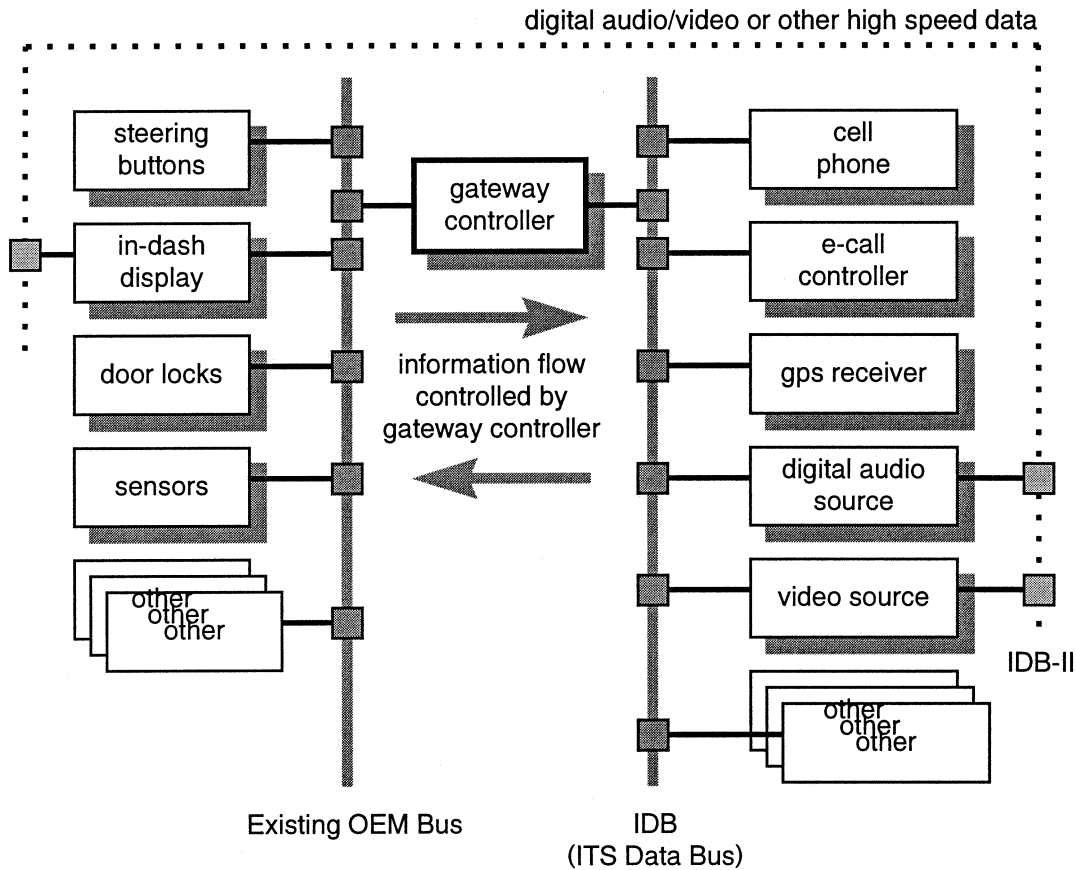


FIGURE 1—DUAL BUS ARCHITECTURE

3.3 The Solution—A dual-bus architecture, as shown in Figure 1, is proposed as the basis for a family of SAE standards, in which an IDB is connected to the vehicle's multiplex bus through a gateway. This allows electronic device manufacturers to build a single, automotive version of their product that plugs into the IDB on any vehicle. In addition, the IDB is independent of all vehicle systems, except for power, eliminating the need for a full electrical bench qualification (of course, maximum power drain in ignition-on and ignition-off states will have to be specified and EMC specifications will have to be met by IDB devices). The gateway, under control of the vehicle company, acts as a "firewall", allowing only authorized message traffic to pass between the vehicle's multiplex bus and the IDB devices. This "firewall" has significant safety benefits, as it prevents ITS bus message traffic from interfering with basic functions of the vehicle.

4. Functional Requirements of the ITS Data Bus—These requirements were developed through an iterative consensus process. Evolutionary changes to these requirements, the technical details of implementation, and performance specifications will be dealt with in SAE J2366 and related documents.

4.1 Overall Goals—The overall goals describe the design philosophy of the IDB rather than quantifiable specifications.