Introduction to High-Speed, Balanced Impedance Connectors and Cables for Differential Data Bus Applications

**HIGH SPEED, HIGH BANDWIDTH PERFORMANCE**

for Military Grade Connectors and Cables

In response to requests for ruggedized, shielded connectors and cables to replace unshielded systems for high-speed serial data, Glenair developed its Mighty Mouse line of high-speed serial data cordsets. Available for 100BASE-T, 1000BASE-T Gigabit Ethernet, IEE 1394, USB 2.0 and CAN Bus applications, these cordsets combined aerospace-grade data cables with Series 80 Mighty Mouse harsh environment connectors for maximum performance and minimum size. These cables, which used our standard Series 80 Mighty Mouse connectors with High grade rigid dielectric insulators, have been successfully used in hundreds of Ethernet and other high-speed data protocol applications. Now Glenair is proud to introduce our latest High-Speed Mighty Mouse innovation, a Fluoropolymer PFA Insulator equipped Mighty Mouse connector series that delivers even better impedance, VSWR and insertion loss performance.

The new High-Speed Mighty Mouse connectors and ASAP cordsets presented in this catalog offer the same space and weight savings...
as our original High grade rigid dielectric versions with superior performance in 2, 3, and 4 pair differential cable applications.

**High-Speed Data Protocols**

**Ethernet**

Avionic and other military vehicle data transfer systems are growing increasingly complicated—the number of data paths, data rates and the quantity and sophistication of subsystems continue to escalate. In addition to transmission speed, accuracy and reliability are tremendously important. Ethernet communication technology, with its huge installed base and history of reliability, is ideally suited for military vehicles and other field applications. Although there are many MIL-STD-1553 bus architecture and data link systems in use, applications such as tactical radar require faster data rates than older architectures can deliver.

Basic Ethernet protocol is referred to as “CSMA/DC” (Carrier Sense, Multiple Access and Collision Detection). To define some terms: “Carrier Sense,” the hosts can detect whether the medium is idle or busy; “Multiple Access,” multiple hosts are connected to the common medium; and “Collision Detection,” when a host transmits, the protocols can determine whether its transmission has collided with the transmission of another host. If two or more information packets are sent simultaneously, a collision occurs and neither transmission is successful—collision detection instructs the system to retransmit the colliding packets. Legacy Ethernet is half-duplex, meaning information can move in only one direction at a time, and is less-than-ideal for many avionic applications, as fastest-possible communication is not guaranteed. The collision problem occurs in any bus-oriented architecture, such as MIL-STD-1553.

Full-duplex, switched Ethernet eliminates the collision problem by employing links that are point-to-point (not a bus) with a separate twisted pair for transmission and reception. Full-duplex also has the ability to send and receive data at the same time by employing a network of Ethernet switches able to forward incoming packets to their appropriate destinations. Gigabit Ethernet transfers data on four pairs of wires instead of only two pairs under legacy Ethernet forms. Further, transmission coding is enhanced for Gigabit Ethernet so that the standard clock rate of 125 MHz that produces 100 mbps data transfer rates in so-called “Fast Ethernet” is supercharged to 1,000 mbps. Gigabit Ethernet can fit an order of magnitude more data into the same cable than can Fast Ethernet, but employs the same transmission schemes and frame format as the earlier Ethernet versions.

**IEEE 1394**

In the early 1990s, Apple Computer and Texas Instruments worked with the Institute of Electrical and Electronics Engineers (IEEE) to establish a very fast serial bus interface standard that supports data transfer rates of up to 400 mbps (in 1394a) and 800 mbps (in 1394b). Products supporting the 1394 standard go under different names, depending on the company. Apple uses the name FireWire, Texas Instrument uses Lynx and Sony uses i.link to describe their 1394 products. A single 1394 port can be used to connect up 63 external devices. In addition to its high speed, 1394 also supports isochronous data, delivering data at a guaranteed rate. This isochronous feature makes it ideal for devices that need to transfer high levels of data in real-time, such as video and audio applications. 1394 makes full use of all SCSI (Small Computer System Interface, a parallel interface standard used for attaching peripheral devices to computers).

**MIL-STD-1553**

MIL-STD-1553 defines all aspects of the serial digital multiplex data bus for military vehicles. Multiplexing combines two or more information channels on to a common transmission medium. When compared to older analog point-to-point wire bundles, multiplexing allows for weight reduction, simplicity of system design, standardization and flexibility. The 1553 data bus provides integrated, centralized system control and a standard interface for all interconnected equipment. Devices connect using twisted, shielded pairs of wires to maintain message integrity. All devices in the system are connected to a redundant pair of buses to provide a second path of traffic should one of the buses become damaged. Data rates of 1 megabit per second (mbps) are standard under MIL-STD-1553. MIL-STD-1773 contains the requirements for fiber optic cabling systems as a 1553 bus transmission medium.