AS5643/IEEE-1394b

Deliver Flexible Deterministic Solution for Aerospace and Defense Applications

SAE International®
SAE Standard AS5643 together with IEEE-1394b provide the interface requirements for Military and Aerospace Vehicle applications.

1394b is a high speed serial bus capable of 122Mbit/s (S100) to 3.92Gbit/s data rates on a network consisting of daisy-chained, starred, treed and looped topologies and supports copper and fiber optic wiring.

Asynchronous stream packets are used to send Anonymous Subscriber Messages.

Pre-assigned addressing and bandwidth insure deterministic operation and high reliability.
Time synchronization is determined by the Control Computer (CC) sending out Start of Frame (STOF) packets at the specified frame rate (typically 80Hz or 100Hz).

All Remote Nodes, aka LRUs, receive the STOF packets and synchronize to them.

The ASM messages are transmitted at the network profile assigned offset times relative to the STOF.

Receiving nodes can deterministically anticipate and therefore guarantee resources are available and therefore guarantee the message can be received and processed.

The network profile system architecture determines the frame rate and offset time for every node on the 1394b bus.

Offset times can be adjusted during initialization.
Fault tolerance in a Vehicle System Data bus is essential to keep an aircraft flying even when one or more components fail

- AS5643 capitalizes on 1394b loop topology support to create the first level of fault tolerance
- Dual or Tri redundant system architecture provides a second level of fault tolerance

- CRC and Vertical Parity Check (VPC) provide both bus level and system level error detection

- Remote node (LRU) generated heartbeat is monitored by the CC, aka Vehicle Management Computer (VMC), to insure the device is operational and sending fresh data
Unlike other technologies, AS5643 didn’t create new requirements causing changes to existing COTS 1394b silicon solutions
- CC’s typically use the same Open Host Controller Interface (OHCI) implementations used in Macs and PCs
- LRU’s typically use the same general purpose implementation used in cameras, robotics and other industrial applications

In addition to nearly two decades of commercial use, 1394 and AS5643 are actively being used in multiple aerospace and defense programs
- Fix wing, Rotorcraft, UAV, Missiles and Spacecraft

Takes full advantage of existing 1394 ecosystem such as chipsets, IP-cores, software stacks, test and measurement equipment and manufacturing test systems
Within the SAE Aerospace Systems, AS–1A–3 group the following standards or recommendations have been developed relating to AS5643 and IEEE–1394

- AS5643 – IEEE–1394b Interface Requirements for Military and Aerospace Vehicle Applications
- AS5643/1 – S400 Copper Media Interface Characteristics Over Extended Distances
- AS5657 – Test Plan/Procedure for AS5643
- AS5706 – Test Plan/Procedure for AS5643/1
- New slash sheets for S100 and S200 over copper