



# Standardized Interface Comparison\*

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	Protocol	Network Configurations	Packet Length**	Data Rate	Allowable Cable Length	Governing Standards	Flight Heritage	Duplex Communications	Physical Interface	Supports Variable Port/System Rates
SpW	Differential voltage signaling token passing full duplex self-managing serial protocol.	Point-to-Point, Star, Ring, Tree	System Defined	2 to 400 Mbps	up to 10 m	IEEE Standard 1355-1995 SpaceWire Standard ECSS-E-50-12 LVDS ANSI/TIA/EIA-644	NASA 2004 ESA 2003	Full-Duplex	DS Encoded LVDS	Yes
CAN	Differential voltage signaling priority based broadcast type of bus. No destination address contained packet	Bus	up to 128 bits	up to 1 Mbps	~30m at 1Mbps up to 1000m with reduced signaling rate	CAN 2.0A CAN 2.0B ISO 11898:1993 ISO 11898:1995	NASA 2000 Surrey Nanosatellite Applications Platform (SNAP) Boeing 777 and Airbus A320, A330 since 1995 European Space Agency/ Swedish Space Corporation (SMART-1) 2003	Half-Duplex	NRZ Encoded Differential	No
1553	Differential voltage signaling, command/response, time division multiplexing, network interface, with dual redundant physical layer.	Bus	660 bits	1 Mbps	up to 190m	MIL-STD-1553A MIL-STD-1553B	Since 1973 for Military aircraft applications. Used for space flight since the 1980's on most programs and platforms	Half-Duplex	Manchester Encoded Differential	No
1394	Differential voltage signaling asynchronous/isochronous real-time address based data transfer serial bus interface.	Tree	Asynchronous: up to 16544 bits Isochronous: up to 32928 bits	100 Mbps 200 Mbps 400 Mbps	up to 4.5m	IEEE Std. 1394-1995 IEEE Std. 1394a-2000 amendment IEEE Std. 1394b-2002 amendment IEEE Std. 1394c-2006 amendment	Lockheed Martin/Boeing Military Aircraft Since 1990. Spaceflight applications: NASA had developed an application at JPL (but this might not have ever flown). Will be flown on the NPP and NPOES satellites - using Aeroflex 1394 chip set.	Full-Duplex	DS Encoded Differential	Yes
Ethernet	Differential voltage signaling address (source/destination) based broadcast operation Carrier Sense Multiple Access/Collision Detection interface.	Bus, Ring, Star	Minimum packet size : 512 bits Maximum packet size : 12144 bits	10Mbps 100Mbps 1Gbps	up to 300m (10Mbps) up to 100m (100Mbps) up to 100m (1Gbps)	IEEE 802.3	Used on Airbus A380 and Boeing 787commercial aircraft. Specific Ethernet standard is AFDX (avionics full duplex switched Ethernet). It is being studied for potential space applications - including by NASA Goddard.	Half and Full Duplex	Manchester II Di-phase Encoded Differential	No (Backwards Compatible)
USB	Differential host controlled scheduled polled isochronous/asynchronous serial interface.	Star, Tree, Point-to-point	Max data (1.5Mbps): 64 bits Max data (12Mbps): 512 bits Max data (400Mbps): 8192 bits	Low Speed 1.5 Mbps Full Speed 12 Mbps High Speed 400 Mbps	up to 5 m	USB 1.1 USB 2.0	Being studied for potential space application - including by AFRL under "Reactive Space", "plug and play" initiative. No known space flight application yet.	Full-Duplex	NRZI Encoded Differential	No (Backwards Compatible)

\* All fields are based on information that was readily available on the web or per the standards.

\*\* The Packet Length contains the overhead bits. Some examples of overhead bits are: Headers, Sync, Parity, CRC Acknowledge, end of Frame/Package