Field Protocol Overview

The Protocol Quick Reference Chart below is a brief overview of the most widely accepted field networks used in the process industries. Since the specifications are not fully comprehensive, we suggest further research before selecting the optimal protocol for your specific application. Please refer to more detailed protocol descriptions throughout the FieldLink reference guide and/or consult with a StoneL Network Solutions specialist.

Network Protocols

Protocol	Topology	Max Distance[1]	Max # Devices	Cabling	Power Delivery[2]	Hazardous Area Wiring	Data Transfer Size	Bus Access Method
pages 32-97 ASi INTERFACE	Not Limited	100m (328 ft) 300m (984 ft) with 2 repeaters Additional distance with multiple parallel repeaters. Tuners and terminators available for special extensions	31 62 with extended addressing	Unshielded, Untwisted Pair	Current; up to 8 Amps Voltage Range; 26.5 to 31.6 VDC	Explosion Proof and Nonincendive Devices; Conduit, Tray cabling and Nonincendive Wiring	4 Bits	Cyclic polling
pages 98-111 DeviceNet™	Trunk/Drop with Branching	500m@125Kbit/s[4] 250m@250Kbit/s[4] 100m@500Kbit/s[4]	62	(2) 2-wire with Shield (5-wire bundle)	Current; up to 8 Amps Voltage Range; 11 to 25 VDC	Explosion Proof and Nonincendive Devices; Conduit and Tray cabling	1 Byte Variable up to 8 Bytes	Selectable: cyclic polling, change of state and more (device specific)
pages 112-127 Fieldbus Foundation *H1 Level*	Trunk with Branching or Chicken Foot	1900m (6200ft) 120m spur[5] Using FISCO 1000m	32 (16)[6]	Shielded Twisted Pair	Current; up to 500 mA Voltage Range; 9 to 32 VDC	Intrinsically Safe (I.S.), Explosion Proof and Nonincendive Devices; Conduit, I.S., Tray cabling and Nonincendive Wiring	2 Bytes Discrete 5 Bytes Analog Variable	Publisher-Subscriber method with data transfer. Token passing client-server for calibration and diagnostics
pages 128-141 PROFIBUS *DP, RS-485*	Trunk/Drop	1200m@94Kb/s 400m@500Kb/s 100m@12Mb/s	32 up to 126	Shielded Twisted Pair	Current; up to 8[7] Amps Voltage Range; 11 to 25 VDC	Explosion Proof and Nonincendive Devices; Conduit and Tray cabling	1 Byte Variable up to 244 Bytes	Token passing for multi-master, cyclic polling for data to master; acyclic for diagnostic and calibration
pages 128-141 PROFIBUS *PA*	Trunk with Branching or Chicken Foot	1900m (6200ft) 120m spur Using FISCO 1000m	32	Shielded Twisted Pair	Current; up to 500 mA Voltage Range; 9 to 32 VDC	Intrinsically Safe (I.S.), Explosion Proof and Nonincendive Devices; Conduit, I.S., Tray cabling and Nonincendive Wiring	1 Byte Variable, up to 244 Bytes	Transparent to PROFIBUS-DP with coupler. Cyclic polling for data and acyclic for diagnostics and calibration with link master.
pages 142-151 MODBUS *RS-485*	Trunk/Drop	1200m (4000 ft)	32	Shielded Twisted Pair	Current; up to 8[7] Amps Voltage Range; 11 to 25 VDC	Explosion Proof and Nonincendive Devices; Conduit and Tray cabling	1 Byte Variable (RTU Mode)	Synchronous and asynchronous poll and response

1. Maximum length is given due to communication limitations. Bus length may be further limited due to voltage drop from high power transfer.
2. Typical maximum power delivered via the network.
3. Approximate speed for 64 I/O points distributed over 16 field devices using cyclic data exchange. Accessing method varies with protocol operation and will affect cycle time significantly.
4. Maximum length based on thick cable. Maximum spur length limited to 6m; cumulative spur length varies inversely with baud rate.
5. Maximum spur length reduced with more than 12 devices per segment.
6. Typical maximum is 16. Theoretical maximum is 32.
7. Power supplied on separate wires from communication signal.

Transmission Rate	Approximate Cycle Time[3]	Special Features	Strengths	Weaknesses	Optimal Applications
167Kbit/s	3ms Varies with number of devices and times scanned	Analog available with 2.1 version masters with multi-scan 3.0 version offers diagnostic and data transfer capabilities	• Low cost • Easy to install • Easy to support • Fast • Supports high power • Flexible topology	• Short bus length • Limited data/node	Use for discrete I/O where low cost and simplicity are important. May readily interface with most PLC, DCS Systems. Gateways conveniently to high level protocols.
125Kbit/s 250Kbit/s 500Kbit/s	9ms 6ms 3ms	EDS file used for device parameters and rapid start-up	• Interfaces to A-B • Flexible implementation • Flexible data capabilities • Supports high power • ODVA marketing	• 4-20mA instrumentation not widely available	Use for discrete I/O into Allen Bradley PLCs. Also may be desirable for motor control applications.
31.25Kbit/s (IEC 61158-2)	200ms	Function blocks used for process control may be distributed into field devices. Time stamping of data optimizes control	• Long length • Well supported • Convenient user objects • Extensive diagnostics • Capable of being I.S.	• Moderate speed • Expensive field devices • Limited bus power	Use for analog I/O in process or discrete I/O over long distance. Use for IS analog & discrete I/O. Supported by many process instrument manufacturers throughout the world.
9.6Kbit/s to 12Mbit/s	0.5ms @ 12Mb/s	GSD file used for device parameters	• Long length • Very fast • Well supported in Europe and North America	• Must have auxiliary power	Use for analog and discrete I/O with high speed requirements. Used extensively for variable speed drives. Well supported by European manufacturers. Ideal for high speed AS-Interface Gateway applications.
31.25Kbit/s (IEC 61158-2)	100ms	Couples directly to DP in transparent manner (DP limited to 45Kbit/sec) or links to DP as a slave/master to PA	• Long length • Well supported in Europe • Capable of being I.S.	• Moderate speed • Limited bus power • Must be connected to control system via PROFIBUS-DP	Use for analog I/O in process or discrete I/O over long distance. Use for IS analog and Discrete I/O/ Bridges readily into PROFIBUS-DP. Supported by many European process instrument manufacturers.
9.Kbit/s to 56Kbit/s	75ms @ 38.4Kbit/s	—	• Easy to install • Easy to support • Widely used on existing DCS systems • Long length	• Moderate speed • Must have auxiliary power	Use for discrete and analog I/O where large amounts of data on multiple field devices over long distance. Most common existing I/O bus. Common with AS-Interface gateways.