# FIELDBUS COMPARISON CHART

## BACKGROUND INFORMATION (Sheet 1)

| Fieldbus Name | Technology Developer | Year Introduced | Governing Standard | Openness |
|---|---|---|---|---|
| **PROFIBUS DP / PA** | Siemens | DP-1994, PA-1995 | EN 50170 / DIN 19245 part 3(DP) /4 (PA), IEC 1158-2 (PA) | ASICs from Siemens and Profichip, Products from over 300 vendors |
| **INTERBUS-S** | Phoenix Contact, Interbus Club | 1984 | DIN 19258 | Products from over |
| | | | EN 50.254 | 400 manufacturers |
| **DeviceNet** | Allen-Bradley | March 1994 | ISO 11898 &11519 | 17 chip vendors, 300+ product vendors, Open specification |
| **ARCNET** | Datapoint | 1977 | ANSI/ATA 878.1 | Chips, boards, ANSI docs |
| **AS-I** | AS-I Consortium | Fall 1993 | Submitted to IEC | AS-II.C. Market item |
| **Foundation Fieldbus H1** | Fieldbus Foundation | 1995 | ISA SP50/IEC 61158 | Chips/software/products from multiple vendors |
| **Foundation Fieldbus High Speed Ethernet (HSE)** | Fieldbus Foundation | In development - lab test phase, Prelim spec available to members | IEEE 802.3u | Multitude of suppliers for Ethernet components, Extremely low cost |
| | | | RFC for IP, TCP & UDP | |
| **IEC/ISA SP50** | ISA & Fieldbus F. | 1992 - 1996 | IEC 1158/ANSI 850 | Multiple chip vendors |
| **Fieldbus** | | | | |
| **Seriplex** | APC, Inc. | 1990 | Seriplex spec | Chips available multiple interfaces |
| **WorldFIP** | WorldFIP | 1988 | IEC 1158-2 | Multiple chip vendors |
| **LonWorks** | Echelon Corp. | March 1991 | | Public documentation on protocol |
| **SDS** | Honeywell | Jan., 1994 | Honeywell Specification, Submitted to IEC, ISO11989 | 17 chip vendors, |
| | | | | 100+ products |
| **ControlNet** | Allen-Bradley | 1996 | ControlNet International | Open Specification, 2 Chip Vendors |
| **CANopen** | CAN In Automation | 1995 | CiA | 17 chip vendors, 300 product vendors, Open specification |
| **Ethernet** | DEC, Intel, Xerox | 1976 | IEEE 802.3, DIX v. 2.0 | Multitudes of Chips and Products |
| **Modbus Plus** | Modicon | | | Proprietary, requires license/ASICs |
| **Modbus RTU/ASCII** | Modicon | | EN 1434-3 (layer 7) | Open specification, no special hardware required |
| | | | IEC 870-5 (layer 2) | |
| **Remote I/O** | Allen-Bradley | 1980 | | Proprietary |
| **Data Highway Plus (DH+)** | Allen-Bradley | | | Proprietary |

# PHYSICAL CHARACTERISTICS (Sheet 2)

| Fieldbus Name | Network Topology | Physical Media | Max. Devices (nodes) | Max. Distance |
|---|---|---|---|---|
| **PROFIBUS DP/PA** | Line, star & ring | Twisted-pair or fiber | 127 nodes<br>(124 slaves - 4 seg, 3 rptrs) + 3 masters | 100m between segments @ 12Mbaud; 24 Km (fiber) (baud-rate and media dependent) |
| **INTERBUS-S** | Segmented with "T" drops | Twisted-pair, fiber, and slip-ring | 256 nodes | 400 m/segment, 12.8 Km total |
| **DeviceNet** | Trunkline/dropline with branching | Twisted-pair for signal & power | 64 nodes | 500m (baud-rate dependent)<br>6Km w/ repeaters |
| **ARCNET** | Star, bus, distributed star | Coax, Twisted-pair, Fiber | 255 nodes | Coax 2000 feet; Twisted pair 400 feet; Fiber 6000 Feet |
| **AS-I** | Bus, ring, tree star, of al | Two wire cable | 31 slaves | 100 meters, 300 with repeater |
| **Foundation Fieldbus H1** | Star or bus | Twisted-pair, fiber | 240/segment, 65,000 segments | 1900m @ 31.25K wire |
| **Foundation Fieldbus HSE** | Star | Twisted-pair, fiber | IP addressing - essentially unlimited | 100m @ 100Mbaud twisted-pair<br>2000m @ 100Mbaud fiber full duplex |
| **IEC/ISA SP50** | Star or bus | Twisted-pair fiber, and radio | IS 3-7 | 1700m @ 31.25K |
| **Fieldbus** | | | non IS 128 | 500M @ 5Mbps |
| **Seriplex** | Tree, loop, ring, multi-drop, star | 4-wire shielded cable | 500+ devices | 500+ ft |
| **WorldFIP** | Bus | Twisted-pair, fiber | 256 nodes | up to 40 Km |

| | | | | |
|---|---|---|---|---|
| **LonWorks** | Bus, ring, loop, star | Twisted-pair, fiber, power line | 32,000/domain | 2000m @ 78 kbps |
| **SDS** | Trunkline/Dropline | Twisted-pair for signal & power | 64 nodes, | 500m (baud-rate dependent) |
| | | | 126 addresses | |
| **ControlNet** | Linear, Tree, Star, or Combination Thereof | Coax, fiber | 99 nodes | 1000m (coax) 2 nodes |
| | | | | 250m with 48 nodes |
| | | | | 3km fiber; 30km fiber w/ repeaters |
| **CANopen** | Trunkline/Dropline | Twisted Pair + optional Signal & Power | 127 Nodes | 25-1000m (baud-rate dependent) |
| **Industrial Ethernet** | Bus, Star, Daisy-Chain | Thin Coax, Twisted Pair, Fiber; Thick Coax (rare) | 1024 nodes, expandable to more via Routers | Thin: 185m |
| | | | | 10 Base T (Twisted Pair): Max 100m long (90 meters horizontal cable, 5m drops, 1m patch) |
| | | | | Max 4 hubs/repeaters between nodes |
| | | | | 4Km distances w/o routers |
| | | | | Fiber: 100 Base FX 400m |
| | | | | 2.5 Km multi mode w/o Switches; 50 Km mono mode w/ Switches |
| **Modbus Plus** | Linear | Twisted Pair | 32 nodes per segment, 64 max | 500m per segment |
| **Modbus RTU/ASCII** | Line, star, tree | Twisted Pair | 250 nodes per segment | 350m |
| | Network w/ segments | | | |
| **Remote I/O** | Linear Trunk | Twinaxial | 32 nodes/segment | 6 km |
| **DH+** | Linear Trunk | Twinaxial | 64 nodes/segment | 3 km |

# TRANSPORT MECHANISM (Sheet 3)

| Fieldbus Name | Communication Methods | Transmission Properties | Data Transfer Size | Arbitration Method | Error Checking | Diagnostics |
|---|---|---|---|---|---|---|
| **PROFIBUS DP/PA** | Master/slave | DP: 9.6, 19.2, 93.75, 187.5, 500 Kbps, 1.5, 3, 6, 12 Mbps | 0-244 bytes | Token passing | HD4 CRC | Station, module & channel diagnostics |
| | peer to peer | PA: 31.25 kbps | | | | |
| **INTERBUS-S** | Master/slave with total frame transfer | 500kBits/s, | 1-64 Bytes data | None | 16-bit CRC | Segment location of CRC error and cable break |
| | | full duplex | 246 Bytes Parameter | | | |
| | | | 512 bytes h.s., | | | |
| | | | unlimited block | | | |
| **DeviceNet** | Master/slave, multi-master, peer to peer | 500 kbps, | 8-byte variable message with fragmentation for larger packets | Carrier-Sense Multiple Access w/ Non-Destructive Bit-wise Arbitration | CRC check | Bus monitoring |
| | | 250 kbps, | | | | |
| | | 125 kbps | | | | |
| **ARCNET** | Peer to peer | 19.53K to 10M | 0 to 507 bytes | Token passing | 16-bit CRC | Built in Acknowledgements at Datalink layer |
| **AS-I** | Master/slave with cyclic polling | Data and power, EMI resistant | 31 slaves with 4 in and 4 out | Master/slave with cyclic polling | Manchester Code, hamming-2 | Slave fault, device fault |
| **Foundation Fieldbus H1** | Client/server publisher/ subscriber, Event notification | 31.25 kbps | 128 octets | Scheduler, multiple backup | 16-bit CRC | Remote diagnostics, network monitors, parameter status |
| **Foundation Fieldbus HSE** | Client/Server, Publisher/Subscriber, Event Notification | 100Mbps | Varies, Uses Standard TCP/IP | CSMA/CD | CRC | |
| **IEC/ISA SP50** | Client/server Publisher/ subscriber | 31.25 kbps IS+1, 2.6, 5 Mbps | 64 octets high & 256 low priority | Scheduler, tokens, or master | 16-bit CRC | Configurable on network management |
| **Fieldbus** | | | | | | |
| **Seriplex** | Master/slave | 200 Mbps | 7680/transfer | Sonal multiplexing | End of frame & echo check | Cabling problems |
| | peer to peer | | | | | |
| **WorldFIP** | Peer to peer | 31.25 kbps, 1 & 2.5 Mbps, 6 Mbps fiber | No limit, variables 128 bytes | Central arbitration | 16-bit CRC, data "freshness" indicator | Device message time-out, redundant cabling |

| | | | | | | |
|---|---|---|---|---|---|---|
| **LonWorks** | Master/slave<br>peer to peer | 1.25 Mbs full duplex | 228 bytes | Carrier Sense, Multiple Access | 16-bit CRC | Database of CRC errors and device errors |
| **SDS** | Master/slave,<br>peer to peer,<br>multi-cast,<br>multi-master | 1Mbps,<br>500 kbps,<br>250 kbps,<br>125 kbps | 8-byte variable message | Carrier-Sense Multiple Access w/ Non-Destructive Bitwise Arbitration | CRC check | Bus monitoring |
| **ControlNet** | Producer/Consumer, Device Object Model | 5 Mbps | 0-510 bytes variable | CTDMA Time Slice Multiple Access | Modified CCITT with 16-bit Polynomial | Duplicate Node ID, Device, Slave Faults |
| **CANopen** | Master/slave, peer to peer, multi-cast, multi-master | 10K, 20K, 50K, 125K, 250K, 500K, 800K, 1Mbps | 8-byte variable message | Carrier-Sense Multiple Access w/ Non-Destructive Bitwise Arbitration | 15 Bit CRC | Error Control & Emergency Messages |
| **Industrial Ethernet** | Peer to Peer | 10, 100Mbps | 46-1500 Bytes | CSMA/CD | CRC 32 | |
| **Modbus Plus** | Peer to Peer | 1Mbps | variable | | | |
| **Modbus RTU/ASCII** | Master/Slave | 300 bps - 38.4Kbps | 0-254 Bytes | | | |
| **Remote I/O** | Master/Slave | 57.6 - 230 kbps | 128 Bytes | | CRC 16 | none |
| **DH+** | Multi-Master, Peer<>Peer | 57.6 kbps | 180 Bytes | | | none |

# PERFORMANCE (Sheet 4)

| Fieldbus Name | Cycle Time: 256 Discrete<br>16 nodes with 16 I/Os | Cycle Time: 128 Analog<br>16 nodes with 8 I/Os | Block transfer of 128 bytes<br>1 node |
|---|---|---|---|
| **PROFIBUS DP/PA** | Configuration dependent<br>typ <2ms | Configuration dependent<br>typ <2ms | not available |
| **INTERBUS-S** | 1.8 ms | 7.4 ms | 140 ms |
| **DeviceNet** | 2.0 ms Master-slave polling | 10 ms Master-slave polling | 4.2 ms |
| **ARCNET** | Application Layer Dependent | Application Layer Dependent | Application Layer Dependent |
| **AS-I** | 4.7 ms | not possible | not possible |
| **Foundation Fieldbus H1** | <100 ms typical | <600 ms typical | 36 ms @ 31.25k |
| **Foundation Fieldbus HSE** | Not Applicable; Latency <5ms | Not Applicable; Latency <5ms | <1ms |
| **IEC/ISA SP50** | Configuration dependent | Configuration dependent | 0.2 ms @ 5 Mbps<br>1.0 ms @ 1 Mbps |
| **Seriplex** | 1.32 ms @ 200 kbps, m/s | 10.4 ms | 10.4 ms |
| **WorldFIP** | 2 ms @ 1 Mbps | 5 ms @ 1 Mbps | 5 ms @ 1 Mbps |
| **LonWorks** | 20 ms | 5 ms @ 1 Mbps | 5 ms @ 1 Mbps |
| **SDS** | <1 ms, event driven | 5 ms polling @ 1 Mbps | 2 ms @ 1 Mbps |
| **ControlNet** | <0.5 ms | <0.5 ms | <0.5 ms |
| **CANopen** | <1 ms | 5 ms polling @ 1 Mbps | <2.5 ms |
| **Industrial Ethernet** | Application Layer Dependent | Application Layer Dependent | Application Layer Dependent |
| **Modbus Plus** | | | |
| **Modbus RTU/ASCII** | | | |
| **Remote I/O** | 12msec @230, 40 msec @57.6 bus cycle time | | |
| **DH+** | | | |