

Foundation Fieldbus Protocol

The open, non-proprietary FOUNDATION™ architecture provides a communications protocol for control and instrumentation systems in which each device has its own “intelligence” and communicates via an all-digital, two-way communications system.

Foundation Fieldbus technology has the following key features:

- Bi-directional communications protocol used for communications among field devices and to the control system,
- A Function Block structure for true distributed control,
- Device Description technology for parameterization and integration of data,
- Network hierarchy for subsystem integration and,
- Well-defined system management structure for reliability and determinism of functional execution.

The complete fieldbus solution includes H1 (31.25 kbit/s) fieldbus for continuous control, and COTS (Commercially Available Off The Shelf)-based, 100 Mbit/s High Speed Ethernet (HSE) for advanced process and discrete automation. Users can implement tightly-integrated digital control based on a unified system architecture and high-speed backbone for plant operations. This, in turn, removes the constraints on device and subsystem interoperability.

Foundation H1 is intended primarily for process control, provides a field-level interface and allows device integration. Running at 31.25 kbit/s, the technology interconnects devices such as transmitters and actuators on a field network. H1 is designed to operate on existing twisted pair instrument cabling with power and signal on the same wire, and uses the same IEC 61158-2-compliant physical bus characteristics as PROFIBUS PA.

H1 provides two different device classes. Basic field devices offer the typical field device functionality. These instruments comprise a function block application, act as a publisher and subscriber of process variables (PVs), transmit alarms and trends, and provide server functionality for host access and management functions. Link master devices are used for bus interfaces in process control systems. These devices can function as a scheduler and time master for regulating communication on a fieldbus segment. They can also be used for linking devices and can simultaneously operate many connections to multiple devices in order to support both client and server applications.

High Speed Ethernet (HSE) is typically used as a control backbone for the supervisory level. Running at 100 Mbit/s, HSE technology is designed for device, subsystem and enterprise integration. It supports the entire range of fieldbus capabilities, including standard function blocks and Device Descriptions (DDs), as well as application-specific Flexible Function Blocks (FFBs) for advanced process and discrete/hybrid/batch applications. Linking devices provide a gateway between



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H1 and HSE, whereas Host Devices are computers or control system with Ethernet ports, which do not contain any control capability but communicate with HSE devices.

A Linking Device is connected to the Ethernet and operates multiple H1 segments. It acts as a bridge between these segments, as a gateway between the H1 devices and the devices operated on the Ethernet network, and may even have its own function block application. Foreign I/O Gateways are components for integrating third-party fieldbuses, such as PROFIBUS DP or DeviceNet. This is done by incorporating the objects of the foreign fieldbus into the FF architecture as multiple I/O function blocks. The fourth class consists of the Ethernet Devices. These devices integrate directly into the Ethernet network.

Using Foundation fieldbus increases information flow and takes advantage of all smart device capabilities. When actual devices in the field are close to the fieldbus I/O, one can multi-drop up to 16 devices on one port, thereby significantly saving on wiring expenditures. The Foundation system offers a back-up link active schedule (LAS) to ensure secure control of automatic transferring to the backup device when upgrading or during card failure. Interoperability is made possible because both Fieldbus devices and software conform to the same standard. End users can select the best device for a specific measurement or control task, regardless the manufacturer.



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