ControlWave FOUNDATION™ Fieldbus Interface

The FOUNDATION™ Fieldbus Interface (FFI) allows a ControlWave to support bi-directional multi-drop digital communication between fieldbus devices on an H1 bus and host communication on a High-Speed Ethernet (HSE) network.

FOUNDATION™ Fieldbus

FOUNDATION fieldbus (FF) provides a worldwide industry standard open architecture that allows process automation systems to maximize the use of intelligent field devices. The utilization of digital field devices brings the power of asset management to improve plant performance by delivering higher data quality to those making operational decisions.

FF consists of two separate bus networks. The first is the 31.25 Kb (H1) bus for multi-drop connection to 2-wire field devices. The second is the 10/100 Mbps Ethernet control network backbone with HSE protocol which passes fieldbus data bi-directionally to a ControlWave or to the Asset Management Suite (AMS) for integration within the PlantWeb® architecture.

The FFI brings the benefits of digital field devices to a wide range of industry applications including oil & gas and water & wastewater.

Benefits

- Improved field-wide digital connectivity.
- Enables proactive management of operational and maintenance decisions.
- Integrated and standalone designs compatible with all ControlWave family products with Ethernet connectivity.
- Interoperability with dozens of field devices from multiple manufacturers.
- High reliability with back-up link active schedule (LAS) support.
- Asset optimization with Emerson AMS.

The FFI consists of the following components: a 3-slot chassis, the FFbus Interface module (FFI CPU module), and up to two FFbus H1 segment modules (H1 modules).

The 3-slot chassis can be used as a stand-alone device that communicates to any ControlWave RTU through an Ethernet connection and receives power independently, or connected directly to a ControlWave Micro where it receives power through the backplane. Slot 1 of the chassis holds the FFI CPU module that allows communication with a ControlWave RTU and an optional PC running Emerson's Asset Management Suite (AMS) or other software.

FOUNDATION Fieldbus Interface CPU and two H1 Segment Modules

ControlWave Micro connected to the FOUNDATION Fieldbus Interface

**Remote Automation Solutions**

EMERSON™

The remaining slots hold one or two H1 modules that allow communication with fieldbus devices. Four types of H1 modules are available that support one H1 segment with or without conditioned power or two H1 segments with or without conditioned power.

FFI CPU Module

The FFI CPU module includes a high-performance processor, and supports an HSE server and data management software that exchanges data between the low-speed H1 segments and high-speed Ethernet-based ControlWave devices.

The FFI CPU provides a high-speed Ethernet port for communications to a PlantWeb® host network using FF HSE protocol. AMS connectivity is included in the FFI and does not require any additional software or licensing from Remote Automation Solutions to utilize retrieval and viewing of asset, diagnostic, and configuration data located in the devices using Emerson AMS.
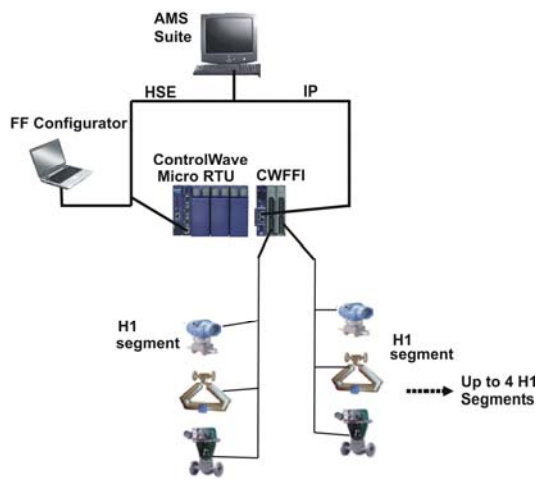
Typical Installation

A second Ethernet port on the FFI CPU module is used for port forwarding of TCP/IP messages to the ControlWave. This eliminates the need for multiple network connections. The FFI CPU module also has its own integral 3-amp power supply which powers the FFI.

H1 Segment Modules

Single or dual H1 segment modules are available. Single H1 modules support one H1 segment. Dual H1 modules support two H1 segments. You can connect up to 16 devices per segment. Up to two H1 modules can be installed in the 3-slot chassis with support for up to four H1 segments.

H1 modules are completely isolated from the FFI CPU module electronics. H1 modules have removable terminal bocks for convenient wiring and servicing. The terminal blocks can accommodate wire size 16 to 22 American Wire Gauge (AWG).

Single or dual H1 modules can be ordered with or without an optional FF-compliant 125 mA conditioned H1 segment power supply. Depending on your total device power consumption, these internal conditioned power supplies can greatly simplify the installation process and reduce additional external components. External segment power may also be supplied from FF-compatible power supplies.

The H1 module functions as the H1 Link Master by maintaining the Link Active Scheduler for the segment, and each module has its own dedicated communications link to the FFI CPU module.

Field Interface Configurator

The Field Interface Configurator is a PC-based software tool used to configure the HSE server located on the FFI CPU module, monitor data, and manage applications involving fieldbus devices and the ControlWave. The Field Interface Configurator allows you to connect to the HSE server and establish bi-directional data relationships between parameters located in the fieldbus devices.
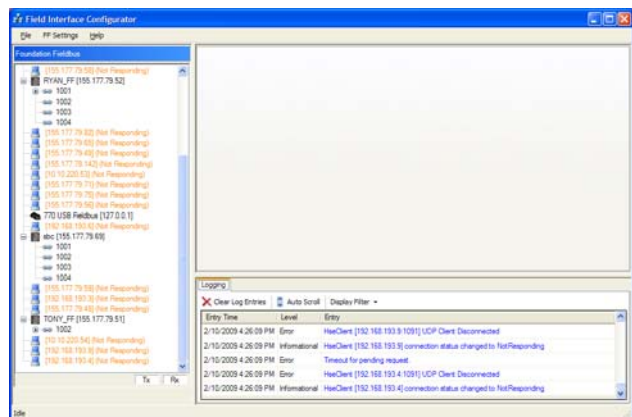
Field Interface Configurator

The Field Interface Configurator supports three methods for connecting to HSE servers.

- Automatically detect all HSE servers on the network by using an auto-detection mode.
- Only listen for HSE servers currently in the server list.
- Manually add an HSE server.

Once connected to an HSE server, the Field Interface Configurator automatically displays fieldbus devices connected to the H1 segments, and shows the available fieldbus device parameters based on the fieldbus device descriptor file. The Field Interface Configurator allows you to commission the device by setting its tag and address, and then configure the device through changing parameter settings in the various resource, transducer, and function blocks.

Function Block Application Designer

One of the primary features of the Field Interface Configurator is its ability to direct input from fieldbus devices on an H1 segment into one or more ControlWave RTUs. Use the Field Interface Configurator's Function Block Application Designer utility to create applications, which you then download to the FFI that controls the H1 segments.

Use the Function Block Application Designer's graphical interface to create, maintain, save, and load applications (data relationships) built with function blocks. These applications are bi-directional and can read information from or write information to fieldbus devices. Applications created with the Function Block Application Designer can be scheduled (occurring automatically on a specified timeframe) or unscheduled (occurring as permitted by the free time on the segment).
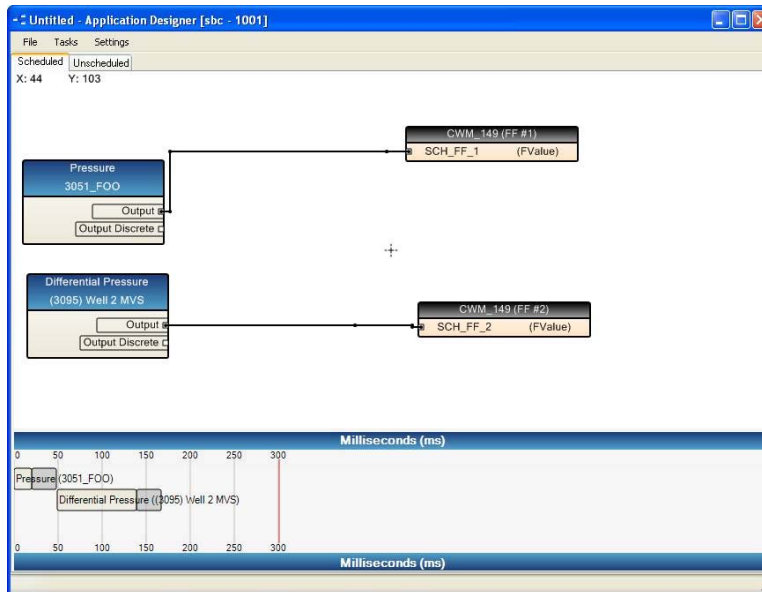
Fuction Block Application Designer

Supported Devices

AutoMAX FlowServe	Positioner	BUSWITCH
E+H	Prowirl	E+H Prowirl Rev 1
Fisher	Positioner	DVC5000_R1
Fisher	Positioner	DVC6000_R1
MicroMotion	Gas Chromatograph	XA700GC_R1
Rosemount		3095_R1
Rosemount	PLC	848L_R1
Rosemount	Pressure	2051_R1
Rosemount	Pressure	3051_R7
Rosemount	Remote Indicator	752_R3
Rosemount	Temperature	3144_R2
Rosemount	Temperature	3244_R5
Rosemount	Temperature	644_R1
Rosemount	Temperature	644_R2
Rosemount	Temperature	848T_R6
Rosemount	Vortex Flowmeter	8800_R7
Rosemount	Vortex Flowmeter	8800_R9
Rosemount Analytical	Analyzer	5081A_R2
Rosemount Analytical	Analyzer	5081C/T_R2
Rotork	Actuator	FF01:080800456
Siemens	Differential Pressure	SieTrans_R1_A
SMAR	FF to 4-20mA converter	FI-302

Note: For other devices, contact your LBP.

ControlWave FOUNDATION Fieldbus Interface: CPU Module

Wiring Terminals

Terminal	Label	Definition
TB1 – 1	Vin +	Input Power Positive
TB1 – 2	Vin –	Input Power Negative
TB1 – 3	Vin G	Chassis Ground
4	USB	Not Currently Used
5	E1	Ethernet Port
6	E2	Ethernet Port
TB2	RS485	Not Currently Used

Processor

Type	32-bit ARM®-based Atmel® AT91SAM9260 processor with processor bus clock frequency at 180 MHz.

Memory

Flash	256 MB NAND
Synchronous DRAM (SDRAM)	64 MB

Communications

Ethernet Port	Quantity	2
	Type	100BASE-TX twisted pair. IEEE multi-segment 100 Mbps baseband Ethernet
	Maximum Segment	100 m (330 ft)
	Connector	RJ45

Power

Input Supply	FFI CPU Module	18 to 30 Vdc
Requirements	FFI CPU Module	2.54 W at 24 Vdc
Battery Backup (RTC)	Type	3 Vdc, 48 mAh, lithium
	Normal Use Life	10 years
	Backup Life	48,000 hours
	Shelf Life	10 years

Physical

Weight	CPU Module	104.89 g (3.7 oz)
	3-Slot Chassis	320.35 g (11.3 oz)

| Dimensions | CPU Module | 25.4 mm W by 152.4 mm H by 88.9 mm D
(1 in. W by 6 in. H by 3.5 in. D) |
| | 3-Slot Chassis | 85.60 mm W by 152.4 mm H by 127.57 mm D
(3.37 in. W by 6.0 in. H by 5.02 in. D) |

## ControlWave FOUNDATION Fieldbus Interface: H1 Segment Modules

Wiring Terminals

Single H1 Segment
With Conditioned Power
(only the top terminal block is
used)
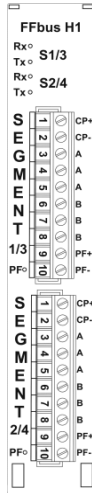
Terminal	Label	Definition
TB1 – 1	CP+	Conditioned Power Positive
TB1 – 2	CP-	Conditioned Power Negative
TB1 – 3	A	Fieldbus A
TB1 – 4	A	Fieldbus A
TB1 – 5	A	Fieldbus A
TB1 – 6	B	Fieldbus B
TB1 – 7	B	Fieldbus B
TB1 – 8	B	Fieldbus B
TB1 – 9	PF+	Over-Current Open-Collector
TB1 – 10	PF-	Ground

Single H1 Segment
Without Conditioned Power
(only the top terminal block is
used)
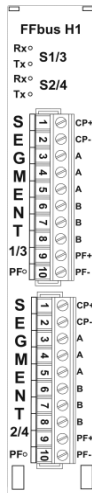
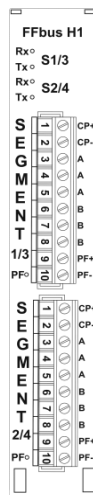| Terminal	Label	Definition
TB1 – 1	CP+	No Connection
TB1 – 2	CP-	No Connection
TB1 – 3	A	Fieldbus A
TB1 – 4	A	Fieldbus A
TB1 – 5	A	Fieldbus A
TB1 – 6	B	Fieldbus B
TB1 – 7	B	Fieldbus B
TB1 – 8	B	Fieldbus B
TB1 – 9	PF+	No Connection
TB1 – 10	PF-	No Connection

Wiring Terminals (continued)

Dual H1 Segment
With Conditioned Power
(both terminal blocks are
used)
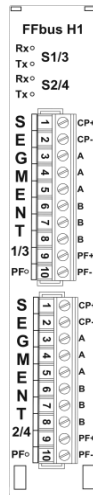
Terminal	Label	Definition
TB1 & TB2 – 1	CP+	Conditioned Power Positive
TB1 & TB2 – 2	CP-	Conditioned Power Negative
TB1 & TB2 – 3	A	Fieldbus A
TB1 & TB2 – 4	A	Fieldbus A
TB1 & TB2 – 5	A	Fieldbus A
TB1 & TB2 – 6	B	Fieldbus B
TB1 & TB2 – 7	B	Fieldbus B
TB1 & TB2 – 8	B	Fieldbus B
TB1 & TB2 – 9	PF+	Over-Current Open-Collector

Dual H1 Segment
Without Conditioned Power
(both terminal blocks are
used)

Terminal	Label	Definition
TB1 & TB2 – 1	NC	No Connection
TB1 & TB2 – 2	NC	No Connection
TB1 & TB2 – 3	A	Fieldbus A
TB1 & TB2 – 4	A	Fieldbus A
TB1 & TB2 – 5	A	Fieldbus A
TB1 & TB2 – 6	B	Fieldbus B
TB1 & TB2 – 7	B	Fieldbus B
TB1 & TB2 – 8	B	Fieldbus B
TB1 & TB2 – 9	PF+	No Connection
TB1 & TB2 – 10	PF-	No Connection

Device Communication

Up to four H1 modules are supported, and up to 16 fieldbus devices can be connected to each H1 segment.

Note: The actual number of devices supported depends upon the power consumption of each device and the type of connecting cable in use.

Power

Requirement	1.18 W per segment (from internal power conditioner or external power supply)
Over-Voltage Protection	+/- 36 Vdc, fieldbus connections + 28 Vdc, alarm connections

Conditioned Power Output (H1 module with conditioned power option)	18 to 24 Vdc 125 mA maximum 150 mA over-current fault indication
Terminator (H1 module with conditioned power option)	100 Ω 1%, 1 μF, 50 V
Segment Module Impedance	Compliant with FF Standard
Physical	
Weight	173 g (6.1 oz)
Dimensions	25.4 mm W by 152.4 mm H by 88.9 mm D (1 in. W by 6 in. H by 3.5 in. D)

ControlWave FOUNDATION Fieldbus Interface: Common Specs

Physical	
Wiring	16 to 22 AWG at the removable terminal block.
Environmental	
Operating Temperature	–40 to 70 °C (–40 to 158 °F)
Storage Temperature	–40 to 85 °C (–40 to 185 °F)
Relative Humidity	IEC68-2-3; 5-95% non-condensing
Vibration	IEC68-2-6; 0.15 mm or 20 m/sec^2
Mechanical Shock	IEC68-2-27; 11 ms, sinusoidal 50 Gs non-operating, 15 Gs operating
Thermal Shock	IEC68-2-14; air to air from –20 to 85 °C (–4 to 185 °F)
Approvals	
If installed in a ControlWave Micro	Same as the ControlWave Micro in which the product is placed
Product Markings for Hazardous Locations	Class I, Division 2, Groups A, B, C, and D, T4A
Complies with the following European Standards	EN55011 (Emissions) EN61000-4-2 (Electrostatic Discharge Immunity) EN61000-4-4 (Electrical Fast Transients Immunity) EN61000-4-6 (Conducted Immunity) EN61000-4-8 (Power Frequency Magnetic Field Immunity) EN61000-6-2 (Radiated RF Immunity)
Evaluated per North American Standards	CSA C22.2 No. 142 and No. 213 UL/CSA E60079-0-02 and E60079-15-02 UL 1604 – 3rd Edition UL 508 – 17th Edition

Approvals

Miscellaneous Approvals	RoHS2	RoHS (2) EU Directive 2011/65/EU: This product may be considered out-of-scope when used for the intended design purpose in a Large Scale Fixed Installation (LSFI). Consult https://www.emerson.com/compliance for up-to-date product information.
	RoHS (China)	

For customer service and technical support,
visit *www.EmersonProcess.com/Remote/Support*.

Global Headquarters,
North America, and Latin America:
Emerson Automation Solutions
Remote Automation Solutions
6005 Rogerdale Road
Houston, TX 77072 U.S.A.
T +1 281 879 2699 | F +1 281 988 4445
www.EmersonProcess.com/Remote

Europe:
Emerson Automation Solutions
Remote Automation Solutions
Unit 8, Waterfront Business Park
Dudley Road, Brierley Hill
Dudley UK DY5 1LX
T +44 1384 487200 | F +44 1384 487258

Middle East/Africa:
Emerson Automation Solutions
Remote Automation Solutions
Emerson FZE
P.O. Box 17033
Jebel Ali Free Zone – South 2
Dubai U.A.E.
T +971 4 8118100 | F +971 4 8865465

Asia-Pacific:
Emerson Automation Solutions
Remote Automation Solutions
1 Pandan Crescent
Singapore 128461
T +65 6777 8211| F +65 6777 0947

Remote Automation Solutions

EMERSON