FF Link/B

FOUNDATION™ Fieldbus H1 Master

Datasheet

A-FFL/B

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1. PREFACE

1.1. ABOUT THIS DOCUMENT

This document contains the technical data for the FF Link /B FOUNDATION™ Fieldbus H1 module.

The FF Link allows the user to interface FOUNDATION™ Fieldbus (FF) H1 devices to EtherNet/IP (Target or Originator) or Modbus TCP (Master or Slave).

The FF Link operates as an FF H1 master allowing EtherNet/IP devices (e.g. Rockwell Automation Logix platform) or Modbus devices to exchange process, alarming, and diagnostic data with H1 devices as well as provide parameterization and asset management of H1 devices using either the Slate software or Device Type Managers (DTMs).

The FF Link is configured using the Aparian Slate application. This program can be downloaded from www.aparian.com free of charge.

The **Primary Interface** can be configured to be any one of the following four interface modes:

EtherNet/IP Target
A Logix controller can own the FF Link over EtherNet/IP using up to four class 1 connections. This will allow the FF Link to exchange data with the Logix controller using the input and output assembly of the EtherNet/IP Class 1 connections. Data from H1 devices are mapped to the Logix controller over EtherNet/IP.

Modbus TCP Master
The data from H1 devices will be written to, or read from, the module's internal Modbus Registers. The Modbus Auxiliary Map can then be used to configure the Modbus data exchange between multiple remote Modbus Slave devices and the module's internal Modbus registers. The Modbus communication utilizes Modbus TCP.

Modbus TCP Slave
The data from H1 devices will be written to, or read from, the module's internal Modbus Registers using the internal mapping functions. These Modbus registers can be accessed by a remote Modbus Master using Modbus TCP.

EtherNet/IP Originator
As an EtherNet/IP originator, the module can use one of two methods to read and write data to and from the EtherNet/IP network:

EtherNet/IP Class 1 Connection

The FF Link can be configured to own EtherNet/IP IO by using the Slate software to configure the Class 1 connections. Each FF Link can own up to 10 EtherNet/IP devices. Data from the EtherNet/IP IO (via the input and output assemblies) can be exchanged with the H1 devices.

EtherNet/IP Explicit Messaging

This allows the FF Link to exchange data with up to 10 EtherNet/IP devices using explicit messaging over EtherNet/IP. The module can use either **Class 3**, Unconnected Messaging (**UCMM**), or **Logix Tag** (Direct-To-Tag) to exchange data with the remote EtherNet/IP devices with configurable Class, Instance, Attribute values (when using UCMM or Class 3). Logix Tag messages are used to exchange data with a Logix controller by directly writing to or reading from Logix tags. The user can browse to the Logix controller (using the Slate Target Browser) as well as browse the Logix Controller Tag list (using the Slate Tag Browser) to select the desired destination Tag.

The FF Link has a built-in Isolated Power Conditioner which can supply up to 420mA. The power conditioner is protected against a configurable overcurrent limit. The module also has a configurable built-in fieldbus terminator.

The FF Link uses an internal mapping strategy allowing the user to map any FF H1 data to any supported interface and vice versa.

Up to 32 FOUNDATION™ Fieldbus H1 devices are supported by the FF Link. The data is formatted into the engineering units for use in either a Logix platform or Modbus Master/Slave device by using the automatically generated mapping imports for Logix User Defined Data Types (UDTs) or padding for Modbus Registers. The latter ensures alignment with the 16-bit data structure.

The FF Link supports module redundancy when using EtherNet/IP Target mode. This allows two identically configured FF Link modules to operate in an “Active – Standby” strategy. Using the provided Logix Add-On-Instruction (AOI), the H1 data from the Active FF Link is marshalled to the Logix user tags. Should the Active FF Link fail for any reason (e.g. loss of power, network failure, bus failure), then the previously Standby FF Link will automatically become the new Active module.

The FF Link will allow the user to monitor and extract H1 device alarms from each H1 device on the connected H1 fieldbus from either a Logix controller or Modbus Master/Slave device.

A range of statistics and tools are available to provide a detailed diagnostic overview of each FF Link which simplifies commissioning. The Slate configuration utility allows the user to perform an H1 packet capture of the running fieldbus which can be used to analyse the bus behaviour and packets received. The FF Link also provides global and device specific statistics.

The FF Link module has two Ethernet ports allowing the user to configure either a Linear or Ring (Device Level Ring – DLR) Ethernet topology. The Ethernet ports can also be setup for port mirroring allowing for better fault analysis.

The FF Link can synchronize to an NTP Server allowing for automatic time synchronization. It also supports an onboard non-volatile event log for improved fault finding.

1.2. FEATURES

- Operates as a FOUNDATION™ Fieldbus H1 Master.
- Supports up to 32 FOUNDATION™ Fieldbus H1 field devices.
- Module has various configurable primary interfaces:
    - EtherNet/IP Target
    - Modbus TCP Slave
    - Modbus TCP Master
    - EtherNet/IP Originator (Class 1 connection with up to 10 EtherNet/IP connections and Explicit Messaging with up to 10 EtherNet/IP devices).
- Provides a built-in Isolated Power Conditioner that can supply up to 420mA.
- Allows the use of external Power Conditioners for Intrinsically Safe (IS) applications.
- Provides a built-in software enabled Fieldbus terminator.
- Dual Ethernet ports which support Device-Level-Ring (DLR).
- Built-in H1 packet capture.
- Built-in Modbus packet capture.
- Supports detailed H1 live list.
- Device Specific UDT, tag and logic generation for import into a Studio5000 project.
- Supports H1 Master Redundancy.
- Supports H1 Alert (Alarm) extraction.
- Network Time Protocol (NTP) supported for external time synchronization.
- Device Type Manager (DTM) supported.
- Online change configuration supported.
- Optional Advanced H1 scheduling.
- Small form factor – DIN rail mounted.

1.3. ARCHITECTURE

The figures below provide examples of typical network setup for an H1 Master architecture using either an EtherNet/IP or Modbus TCP Interface.

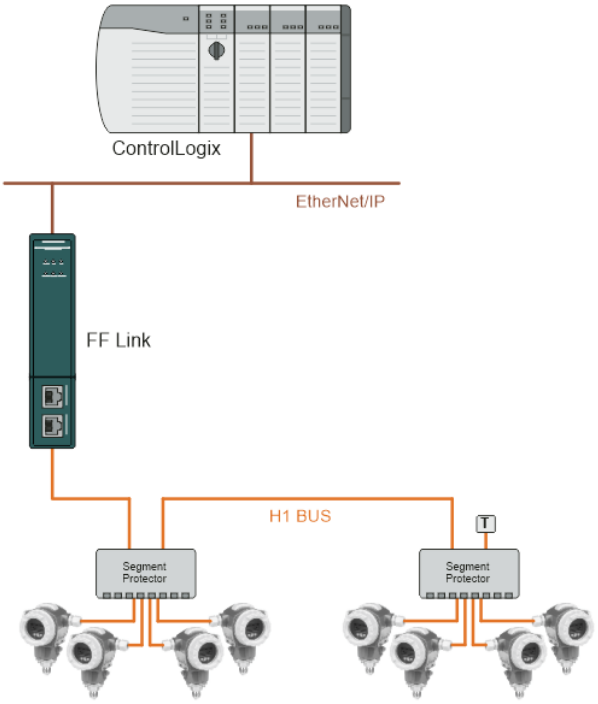

Figure 1.1 – FF Link - FF Link H1 Master to Logix (EtherNet/IP target) architecture

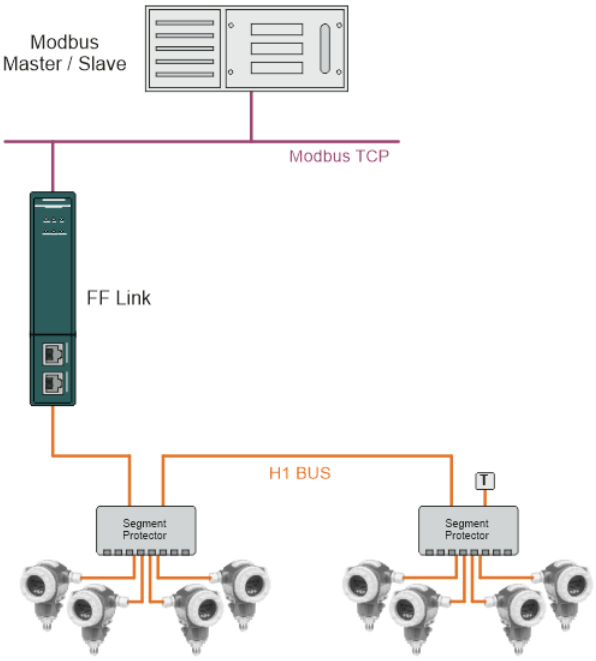

Figure 1.2 – FF Link H1 Master to Modbus TCP architecture

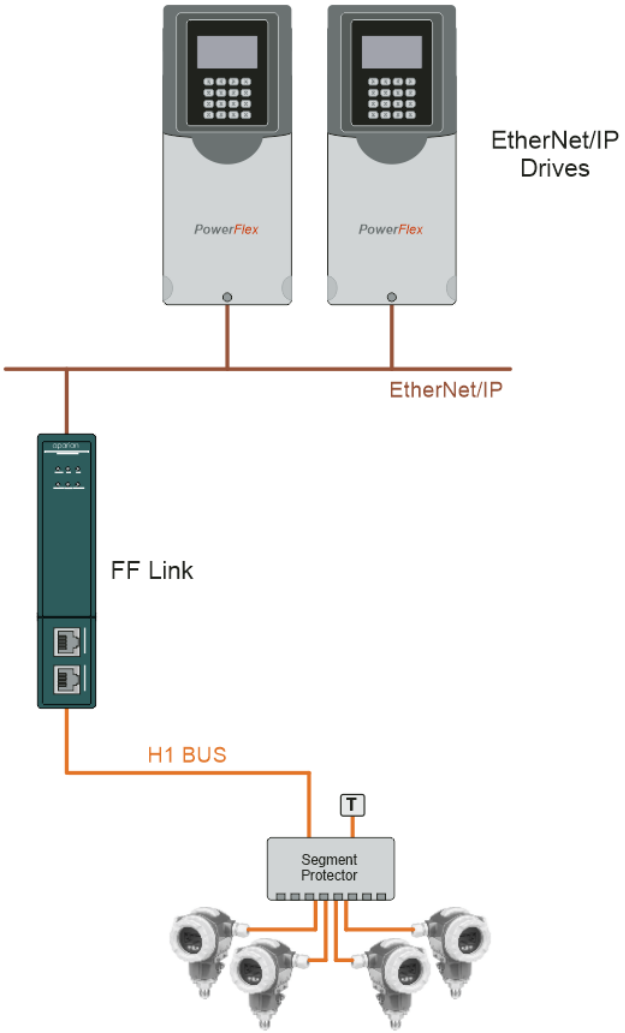

Figure 1.3 – FF Link H1 Master to EtherNet/IP Originator architecture

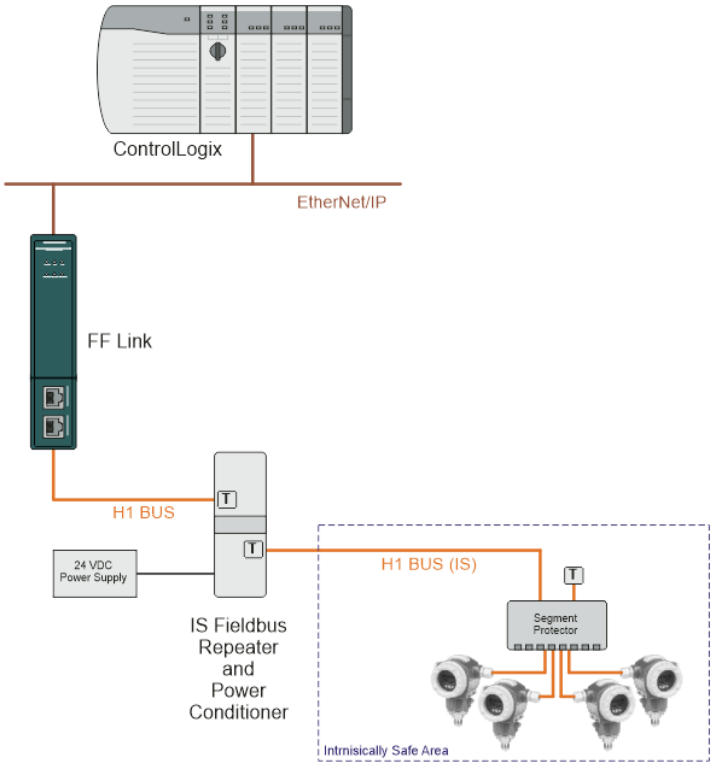

Figure 1.4 – FF Link H1 Master with External Intrinsically Safe Repeater

2. TECHNICAL SPECIFICATIONS

2.1. DIMENSIONS

Below are the enclosure dimensions. All dimensions are in millimetres.

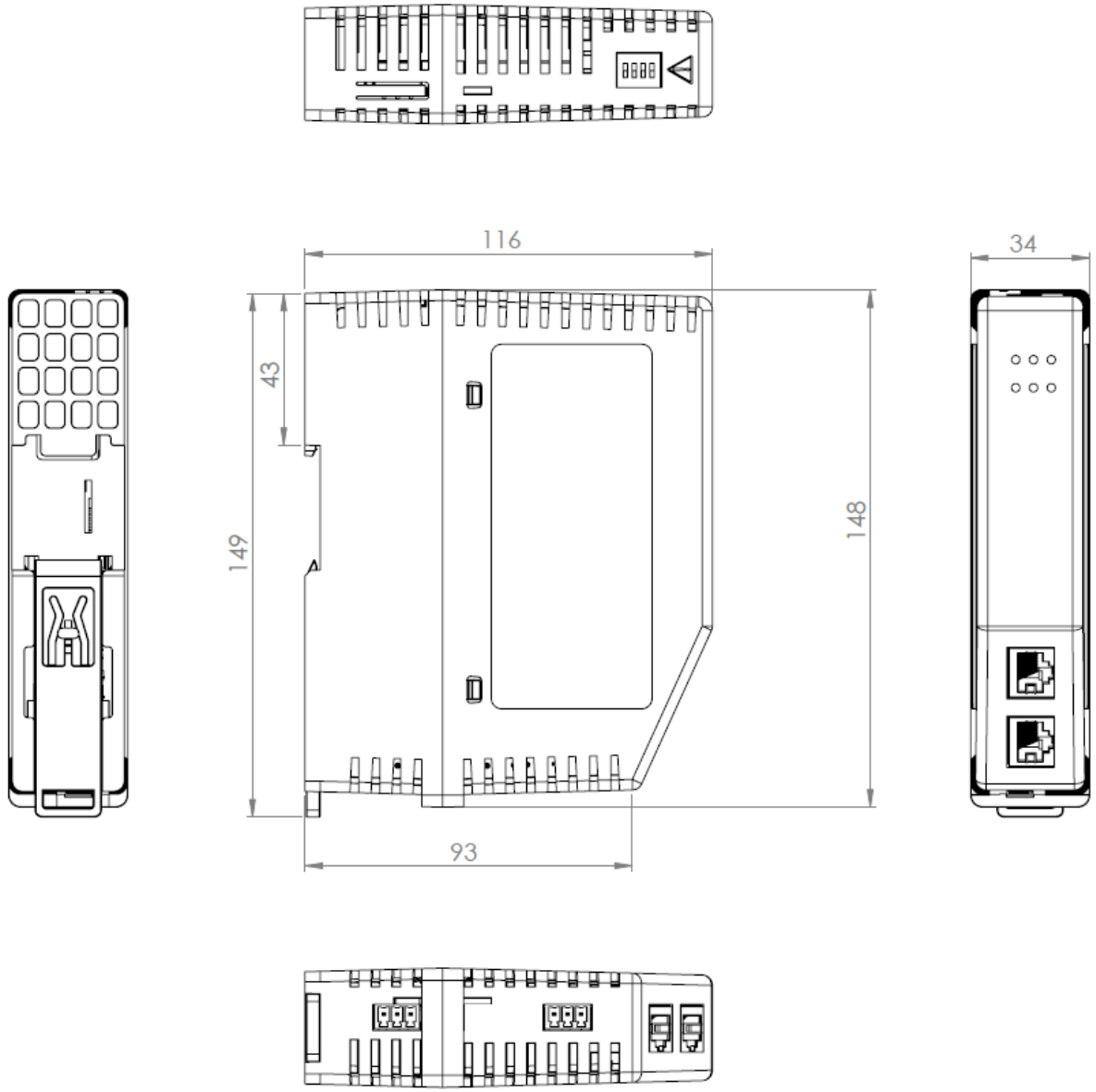

Figure 2.1 – FF Link enclosure dimensions

2.2. ELECTRICAL

Specification	Rating
Power requirements	Input: 22 – 26 V DC
Power consumption	Maximum: 135 mA @ 24V => 3.3 W (No Bus Load) Maximum: 580 mA @ 24V => 14.0 W (Full Bus Load of 400 mA)
Connector	3-way terminal
Conductors	24 – 18 AWG
Enclosure rating	IP20, NEMA/UL Open Type
Temperature	-20 – 70 °C (Power Conditioner Load <= 220 mA, Full Bus Load <= 200 mA) -20 – 60 °C (Power Conditioner Load <= 320 mA, Full Bus Load <= 300 mA) -20 – 50 °C (Power Conditioner Load <= 420 mA Full Bus Load <= 400 mA)
Earth connection	Yes, terminal based
Emissions	IEC61000-6-4
ESD Immunity	EN 61000-4-2
Radiated RF Immunity	IEC 61000-4-3
EFT/B Immunity	EFT: IEC 61000-4-4
Surge Immunity	Surge: IEC 61000-4-5
Conducted RF Immunity	IEC 61000-4-6

Table 2.1 - Electrical specification

2.3. ETHERNET

Specification	Rating
Connector	RJ45
Conductors	CAT5 STP/UTP
ARP connections	Max 100
TCP connections	Max 100
CIP connections	Max 20
Communication rate	10/100Mbps
Duplex mode	Full/Half
Auto-MDIX support	Yes
Embedded switch	Yes, 2 x Ethernet ports
Device Level Ring (DLR)	Supported

Network Time Protocol (NTP)	Supported

Table 2.2 - Ethernet specification

2.4. ETHERNET/IP TARGET

Specification	Rating
Class 1 Connection Size	Max Input Size – 500 bytes (492 bytes mapped data) Max Output Size – 496 bytes (492 bytes mapped data)
Class 1 Connection Count	1 - 4
Class 3 Messaging Supported	Yes
UCMM Messaging Supported	Yes

Table 2.3 – EtherNet/IP Target specification

2.5. ETHERNET/IP ORIGINATOR

Specification	Rating
Class 1 Cyclic Connections Supported	Yes
Class 3 / UCMM Connections Supported	Yes
Class 1 Connection Count	10
Class 3 / UCMM Target Device Count	10
Class 3 / UCMM Mapping Count	50
Direct-To-Tag Logix Support	Yes

Table 2.4 – EtherNet/IP Originator specification

2.6. MODBUS TCP MASTER

Specification	Rating
Modes Supported	Modbus TCP
Max Modbus Slave device	20
Max Modbus Mapping	100
Mapping Ranges	Holding Register 0 – 65535 Input Register 0 – 65535

	Input Status 0 – 65535 Coil Status 0 – 65535
Base Offset	Modbus (Base 0) PLC (Base 1)
Configurable Modbus TCP Port	Yes
Data Re-formatting Supported	BB AA BB AA DD CC CC DD AA BB DD CC BB AA

Table 2.5 – Modbus Master specification

2.7. MODBUS TCP SLAVE

Specification	Rating
Modes Supported	Modbus TCP
Mapping Ranges	Holding Register 0 – 65535 Input Register 0 – 65535 Input Status 0 – 65535 Coil Status 0 – 65535
Base Offset	Modbus (Base 0) PLC (Base 1)
Configurable Modbus TCP Port	Yes

Table 2.6 – Modbus Slave specification

2.8. H1

Specification	Rating
Connector	3-way terminal
Conductor	24 – 18 AWG
LAS	Supported
H1 Alarming	Supported
Intrinsically Safe (IS) applications	Supported
Advanced H1 Scheduling	Supported
Maximum Slave Devices	32

Isolated	Yes
Internal Power Conditioner Voltage	Maximum: 23.0 V DC Minimum: 19.0 V DC
Internal Power Conditioner Current	Maximum: 420 mA – Max. Ambient Temperature <= 50 °C Maximum: 320 mA – Max. Ambient Temperature <= 60 °C Maximum: 220 mA – Max. Ambient Temperature <= 70 °C Note: Includes 20mA for internal MAU
Internal Termination	100 Ω - Software Enabled

Table 2.7 – H1 specification

2.9. CERTIFICATIONS

Certification	Mark
CE Mark	CE
RoHS2 Compliant	RoHS2
ODVA Conformance	EtherNet/IP™
UL Mark File: E494895	c UL us LISTED CLASS 1, DIV 2, GROUPS A, B, C, D
ATEX	Ex II 3 G Ex nA IIC T4 X Gc -20°C ≤ Ta ≤ 70 °C
UKCA	UK CA

Table 2.8 – Certifications