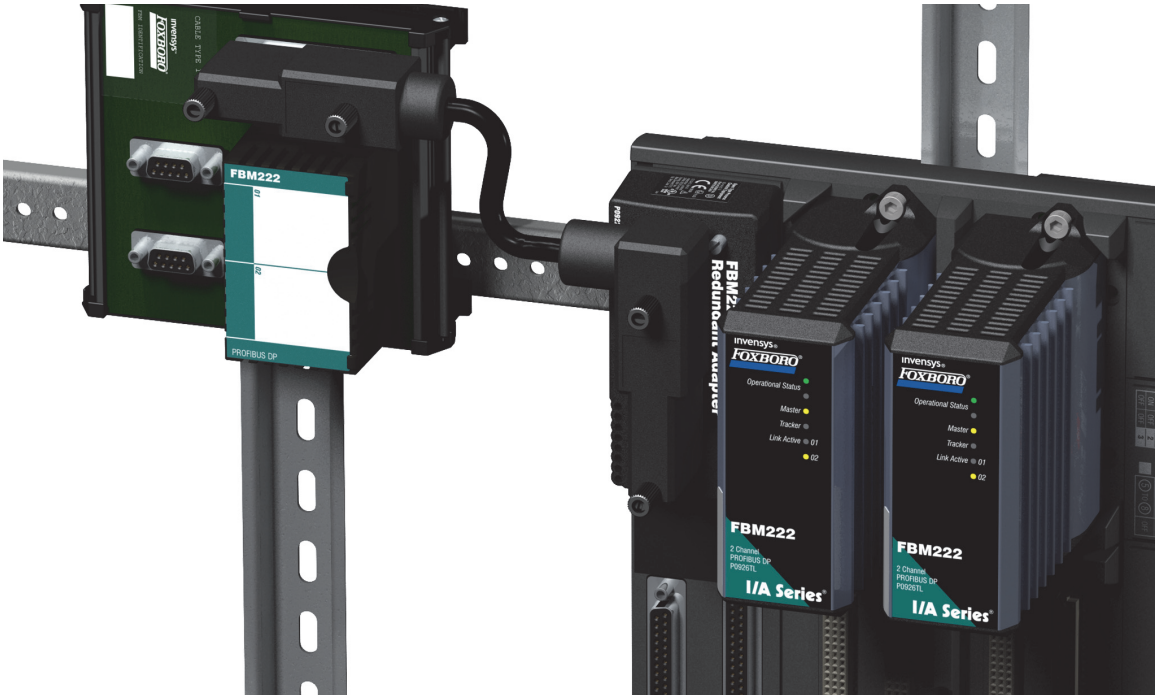
Foxboro Evo™ Process Automation System Hardware

Product Specifications

Foxboro® by Schneider Electric

PSS 31H-2z22 B4

FBM222, Redundant PROFIBUS Communication Interface Module



The FBM222 Redundant PROFIBUS Communication Interface Module provides a reliable, high-capacity interface between PROFIBUS-DP slave devices and the Foxboro Evo™ or I/A Series® system.

FEATURES

Key features of the FBM222 are:

- Integrates PROFIBUS-DP/PA slave devices into the Foxboro Evo or I/A Series control system
- Conforms to the PROFIBUS-DP Specification IEC61158 Part 3
- Supports up to 125 slave devices per port with up to 244 byte data transfer, depending on how many bytes are supported by each slave device
- Maximizes uptime by providing redundant TAs, hot-swappable redundant FBM modules, and fully redundant communication between the FBM222 and fault-tolerant control processors
- Enables addition, modification and removal of devices without impacting on-going operations
- Supports PROFIBUS DPV1 devices
- Propagates the PROFIBUS-PA device values and status to Foxboro Evo control blocks
- Provides a user-selectable status parameter for input data as well as read-back values for output data
- Supports PROFIBUS-DP Class 1 and Class 2 Masters along with multi-master configurations
- Provides two galvanically isolated PROFIBUS channels

- Suitable for installation in Class 1, Division 2 and Zone 2 locations
- Supports the FBM223 Termination Assembly allowing a simple upgrade from an FBM223 while maintaining existing wiring and cable.

OVERVIEW

The Redundant PROFIBUS Communication Interface Module (FBM222) provides an interface between the Foxboro Evo or I/A Series system and PROFIBUS-DP/PA slave devices, including motor drives, I/O modules, and field I/O devices. The FBM222, which can be used in a single or redundant configuration, supports two PROFIBUS links with a maximum of 125 slave devices per port when repeaters are utilized. The FBM222 connects the slave devices to the versatile and robust Foxboro Evo or I/A Series control system via Distributed Control Interface (DCI) blocks. Physical PROFIBUS-DP wiring is in accordance with Electronic Industrial Association (EIA) standard RS-485.

There are multiple ways to connect FBM222s installed as a redundant pair to a PROFIBUS-DP network. When the PROFIBUS segments are single networks as shown in Figure 1, an FBM228/FBM222 Redundant Adapter (P0922RK) connects a single termination cable to the redundant pair. The other end of the cable is plugged into a termination assembly (TA), which provides connections for the two network segments (Figure 1).

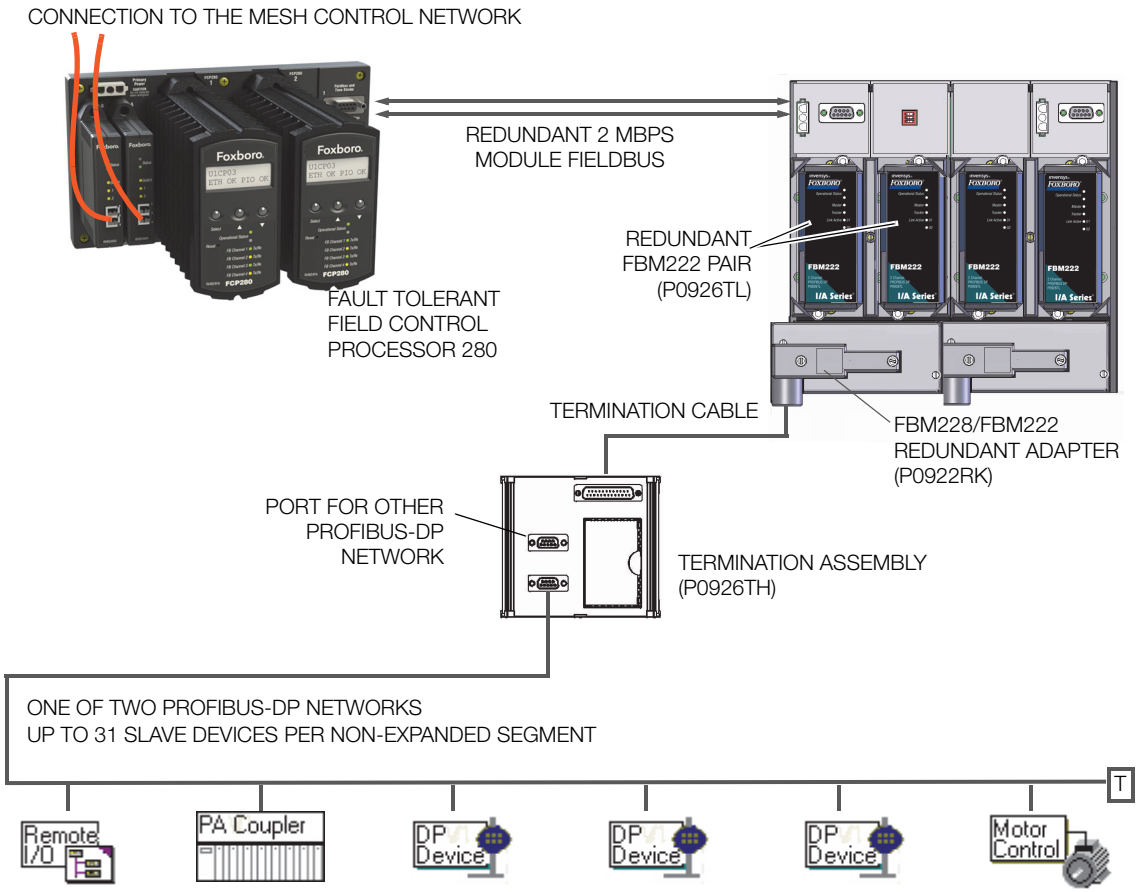


Figure 1. Redundant FBM222 with Single PROFIBUS-DP Network

When the segments contain redundant media, two TAs are connected via termination cables and the FBM222 Redundant Adapter - Dual Network (P0926XM). The TAs in turn are connected to each network by third-party redundant link modules, such as the ABB™ Redundant Link Module (RLM01) (Figure 2). The Siemens™ Optical Link Module (OLM) can also be connected to these TAs in a configuration other than the one shown below.

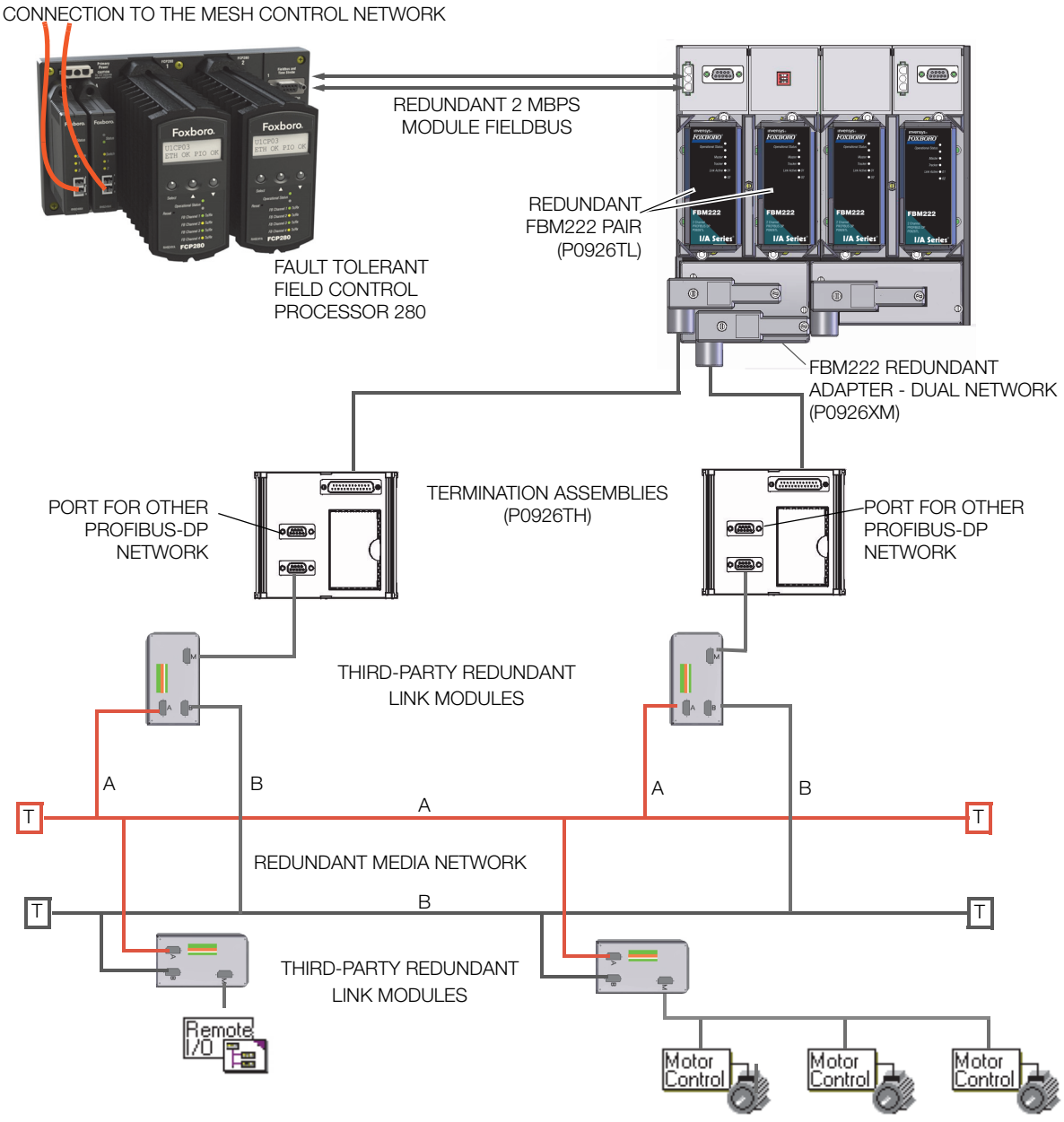


Figure 2. Redundant FBM222s with Redundant Media PROFIBUS-DP Network

NETWORK EXPANSION

Without the use of repeaters (non-expanded bus configuration) up to 31 slave devices can exist on each PROFIBUS-DP network segment. Depending on the selected data transfer rate, cabling distances up to 1200 m (3960 ft) are possible without the use of repeaters (see Table 1).

The use of repeaters provides for expansion of the bus, allowing up to 125 devices per port (Figure 3).

With regard to cabling distances in an expanded bus configuration (repeaters used), Table 1 applies in determining the maximum length of each bus segment.

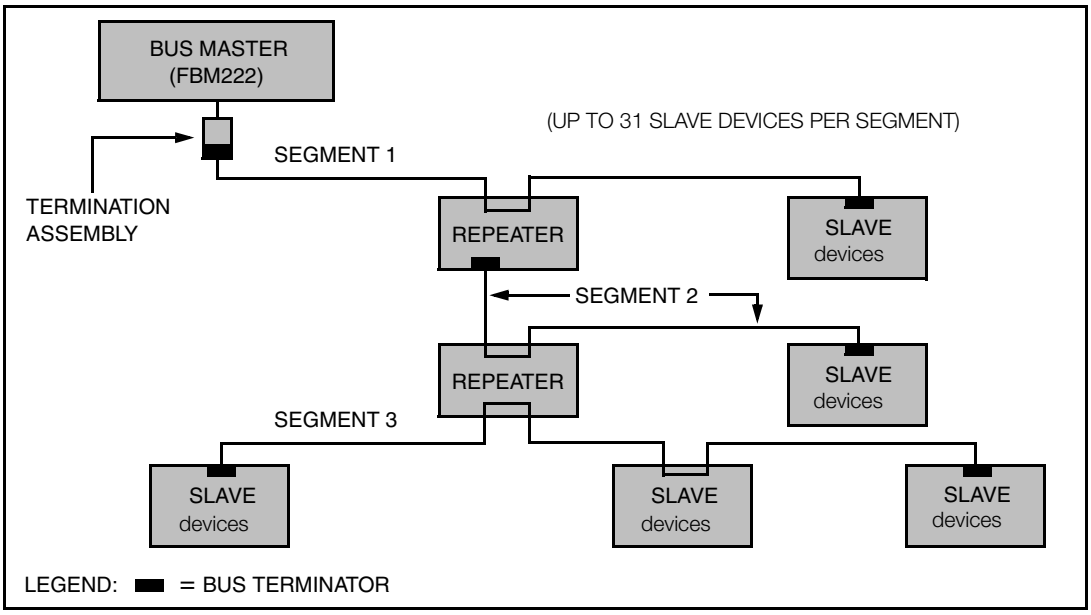


Figure 3. PROFIBUS-DP Network Expansion Using Repeaters

Table 1. Maximum PROFIBUS-DP Bus Segment Length

Data Transfer Rate, in kbit/s	9.6	19.2	45.45	93.75	187.5	500	1500	3000	6000	12000
Maximum Segment Length, in Meters	1200	1200	1200	1200	1000	400	200	100	100	100

GSD FILES

A General Slave Data (GSD) file, provided by the device manufacturer, is available for each PROFIBUS device type. The file contains information specific to the device and specifies parameters such as baud rates, timing information and supported options such as diagnostics and data length.

The Foxboro Evo or I/A Series system uses the information in the GSD file to set up communication to the slave device. The GSD files are imported into the Foxboro Evo Control Editors and used by the device editor to select supported options and configure operational parameters. Refer to *Field Device Manager for PROFIBUS-DP Devices* (PSS 31S-10B4 B3) for additional information on these Control editors for configuring, commissioning and maintaining PROFIBUS_DP networks.

FBM CAPACITY

For the complete specification of the number of devices supported versus maximum I/O per device, refer to *Field Control Processor 280 (FCP280) Sizing Guidelines and Excel Workbook* (B0700FY), *Field Control Processor 270 (FCP270) Sizing Guidelines and Excel Workbook* (B0700AV) or *Z-Module Control Processor 270 (ZCP270) Sizing Guidelines and Excel Workbook* (B0700AW).

The host FCP280, FCP270, or ZCP270 can make up to 1,000 connections to the I/O data being accessed (read or written) by each FBM222 over its PROFIBUS-DP networks at a minimum slave interval of 250 ms.

A connection may be to:

- An analog input or output value (integer or floating point)
- A string input or output
- A single digital input or output value
- Multiple digital input or output values (packed in groups of up to 32 digital points per connection).

A Foxboro control station can access up to 1,000 analog I/O values, or 32,000 digital I/O values, or a combination of digital, analog, and string I/O, via the FBM222.

With a redundant FBM222, the control station can access the FBM data in an update period of 500 ms.

With a non-redundant FBM222, the update period can be as fast as 100 ms.

The FBM222 supports up to 125 PROFIBUS slave devices per FBM222 port.

Refer to *Implementing PROFIBUS Networks in Foxboro Evo Control Software Applications* (B0750BE) for additional information on the unique sizing guidelines for the FBM222.

NOTE

The performance numbers presented in this section relate only to the capability of the FBM222 itself, and do not take into account loading on the control station from other FBMs.

COMPACT DESIGN

The FBM222 has a compact design, with a rugged extruded aluminum exterior for physical and electrical protection of the circuits. Enclosures specially designed for mounting of the FBMs provide various levels of environmental protection, up to harsh environments per ISA Standard S71.04.

The module can be removed or replaced without removing field device termination cabling, power, or communications cabling.

VISUAL INDICATORS

Light-emitting diodes (LEDs) incorporated into the front of the module provide visual indication of the module's operational status, its role in a redundant pair (Master or Tracker), and the communication activity of the two PROFIBUS communication channels.

CONTROL STATIONS

The FBM222 provides the interface to PROFIBUS devices for either the FCP280 or FCP270 Field Control Processor or the rack mounted ZCP270 Z–Form Control Processor.

When deployed for use with an FCP280 (as shown in Figure 1 and Figure 2), the module is installed in an adjacent baseplate, When deployed for use with an FCP270, the module is installed in the same baseplate or in an adjacent baseplate. For both FCPs, the FBM222 communicates with the control processor over a 2 Mbps HDLC module Fieldbus. The FCP, in turn, is connected over a 100 Mbps switched network to other control stations, supervisory applications, system management stations, and other Foxboro control resources.

With the optionally redundant FBM222, a highly available system can be configured, as shown in Figure 2 and including:

- A redundant FBM222 combination
- Fault-tolerant control processors
- Redundant communications between the control processor and the FBMs
- Redundant power supplies
- Redundant PROFIBUS network links using third-party redundant network components.

When the control station is a ZCP270, the FBM222s are installed in a DIN rail mounted FBM subsystem consisting of a Fieldbus Communications Module 100 (FCM100), the FBM222s, and other FBM types.

The subsystem is connected to the ZCP270 via a 100 Mbps Ethernet network. For additional information on this communication network, refer to the *DIN Rail Mounted Subsystem Overview* (PSS 21H-2W1 B3.)

MODULAR BASEPLATE MOUNTING

In addition to the four-position baseplate shown in Figure 1 and Figure 2, the module can be mounted on any of standard FBM baseplates described in *DIN Rail Mounted Subsystem Overview* (PSS 21H-2W1 B3). The baseplate is either DIN rail mounted or rack mounted, and includes signal connectors for the FBMs, redundant independent dc power connections, and I/O cable connections.

REDUNDANT OPERATION

The FBM222 extends the uptime benefits of the fault tolerant Foxboro Evo or I/A Series architecture from the control station to the termination assembly. When configured as a redundant pair, the FBM222s operate in a master/tracker relationship, with one module providing the interface connection to PROFIBUS devices, and the other tracking the master. If there is an operating fault in the master, the two modules automatically switch roles with no interruption in service. The role switch transfers functions so seamlessly that no data updates are lost.

If a module fails, it can be removed from the baseplate and replaced with no loss of data.

By utilizing the PROFIBUS Redundant Adapter – Dual Network (P0926XM), the customer can implement fully redundant PROFIBUS network links. The customer also has the option of implementing a single network PROFIBUS link with the FBM228/FBM222 Redundant Adapter (P0922RK) if a fully redundant PROFIBUS network is not necessary.

LEGACY FBM223 UPGRADE

The FBM222 can upgrade the legacy FBM223 in existing installations with minimal effort. It can use the existing FBM223 TA and termination assembly cable, to maintain existing field wiring. During the software portion of this upgrade, the FBM222 can use the existing FBM223 database, port configuration files (*.PMA), slave device configuration files (*.PSL), and GSD files.

For instructions on performing this upgrade, refer to the “FBM223 to FBM222 Upgrade Procedure” appendix in *Implementing PROFIBUS Networks in Foxboro Evo Control Software Applications* (B0750BE).

TERMINATION ASSEMBLY

Features

Key features include:

- Combination foot that supports 32 or 35 mm DIN rail mounting
- Two standard PROFIBUS 9-pin D connectors.

Overview

Field I/O signals connect to the FBM222 via the DIN rail mounted FBM222 Active termination assembly (TA). The TA (p/n P0926TH), which is constructed of a rugged polyvinyl chloride (PVC) material, is also available in a version with a fire retardant Polyamide base (P0926TJ).

The TA and its associated termination cable provide feed-through connection between PROFIBUS-DP compliant field devices and the FBM222.

The DIN rail mounted TA connects to the FBM's baseplate by means of a removable termination cable. The cable is available in a variety of lengths, up to 30 meters (98 feet), allowing the TA to be mounted either in the enclosure or in an adjacent enclosure. The TA-to-FBM cable length is not included in determining the maximum network cable length.

Termination cables are available in the following materials:

- Polyurethane
- Low Smoke Zero Halogen (LSZH).

Refer to Table 2.

The FBM222 also supports the FBM223 Passive termination assembly (P0917SY), enabling owners to upgrade to the redundant PROFIBUS communication interface without replacing the TAs and associated field wiring. However, with this TA, the length of the TA-to-FBM cable is included when calculating the maximum network cable length.

Table 2. Termination Cable Types and Part Numbers

Cable Length m (ft)	Type 1 P/PVC[a]	Type 1 LSZH [b]	Type 1 H/XLPE[c]
0.5 (1.6)	P0916DA	P0928AA	P0916VA
1.0 (3.2)	P0916DB	P0928AB	P0916VB
2.0 (6.6)	P0931RM	P0928AC	P0931RR
3.0 (9.8)	P0916DC	P0928AD	P0916VC
5.0 (16.4)	P0916DD	P0928AE	P0916VD
10.0 (32.8)	P0916DE	P0928AF	P0916VE
15.0 (49.2)	P0916DF	P0928AG	P0916VF
20.0 (65.6)	P0916DG	P0928AH	P0916VG
25.0 (82.0)	P0916DH	P0928AJ	P0916VH
30.0 (98.4)	P0916DJ	P0928AK	P0916VJ

(a) P/PVC is polyurethane outer jacket and semi-rigid PVC primary conductor insulation. Temperature range; -20 to +80°C (-4 to +176°F).

(b) Low smoke zero halogen or low smoke free of halogen (LSZH) is a material classification used for cable jacketing. LSZH is composed of thermoplastic or thermoset compounds that emit limited smoke and no halogen when exposed to high sources of heat. Temperature range: -40 to +105°C (-40 to +221°F)

(c) H/XLPE is Hypalon outer jacket and XLPE (cross-linked polyethylene) primary conductor insulation. Temperature range: -40 to +90°C (-40 to +194°F). Hypalon cables are no longer available for purchase.

FUNCTIONAL SPECIFICATIONS

PROFIBUS-DP Communications

INTERFACE

Two communication channels provide interface to two galvanically isolated PROFIBUS-DP networks

BUS CHARACTERISTICS

General

Electronic Industrial Association (EIA) RS-485 communications. The physical communication medium consists of twisted-pair shielded copper cable containing a single conductor pair.

Data Transfer Rate (Baud Rate)

Selectable, 9.6 to 12,000 kbit/sec (see Table 1)

Maximum Allowable Bus Length

The maximum allowable length of a PROFIBUS-DP bus segment is a function of the user selected data transfer rate as listed in Table 1 on page 4

Maximum Cable Length, FBM222 to TA

30 m (90 ft) which is not included when determining the bus segment length

Maximum Number of Devices on a Bus

Per EN 50170, for a non-expanded bus (repeaters not used), one master (FBM222) and up to 31 slaves are supported. When repeaters are used, the FBM222 supports 125 devices per port.

FBM222 Channel Isolation

Each communication channel is galvanically isolated and referenced to earth (ground). The module can withstand, without damage, a potential of 600 V ac applied for one minute between either channel and earth.

CAUTION

This does not imply that the channels are intended for permanent connection to voltages of these levels. Exceeding the limits for input voltages, as stated elsewhere in this specification, violates electrical safety codes and may expose users to electric shock.

Conformance to PROFIBUS-DP Standards

PROFIBUS-DP bus topologies and communications are in accordance with specifications presented in the following standards:

- PROFIBUS Fieldbus standard EN 50170
- EIA standard RS-485.

FBM222 Power Requirements

INPUT VOLTAGE RANGE (REDUNDANT)

24 V dc +5%, -10%

CONSUMPTION

6 W (maximum)

HEAT DISSIPATION

6 W (maximum)

Regulatory Compliance

ELECTROMAGNETIC COMPATIBILITY (EMC)

European EMC Directive 2004/108/EC

Meets: EN 50081-2 Emission standard
EN 50082-2 Immunity standard
EN 61326 EMC Standard (Industrial Levels)

CISPR 11, Industrial Scientific and Medical (ISM) Radio-frequency Equipment - Electromagnetic Disturbance Characteristics - Limits and Methods of Measurement

Meets: Class A Limits

IEC 61000-4-2 ESD Immunity

Contact 4 kV, air 8 kV

IEC 61000-4-3 Radiated Field Immunity

10 V/m at 80 to 1000 MHz

IEC 61000-4-4 Electrical Fast Transient/Burst Immunity

2 kV on I/O, dc power and communication lines

IEC 61000-4-5 Surge Immunity

2 kV on ac and dc power lines;1 kV on I/O and communication lines

IEC 61000-4-6 Immunity to Conducted Disturbances Induced by Radio-frequency Fields

3 V (rms) at 150 kHz to 80 MHz on I/O, dc power and communication lines

FUNCTIONAL SPECIFICATIONS (CONTINUED)

Regulatory Compliance (Cont.)

ELECTROMAGNETIC COMPATIBILITY (EMC) (CONT.)

IEC 61000-4-8 Power Frequency Magnetic Field Immunity
30 A/m at 50 and 60 Hz

IEC 61000-4-11 Voltage Dips, Short Interruptions and Voltage Variations Immunity
Compliant

PRODUCT SAFETY

Underwriters Laboratories (UL) for U.S. and Canada
UL/UL-C listed as suitable for use in Class I, Groups A-D; Division 2; temperature code T4 enclosure based systems.

PRODUCT SAFETY (CONT.)

Underwriters Laboratories (UL) for U.S. and Canada (Cont.)
Communications circuits also meet the requirements for Class 2 as defined in Article 725 of the National Electrical Code (NFPA No.70) and Section 16 of the Canadian Electrical Code (CSA C22.1). Conditions for use are as specified in *Implementing PROFIBUS Networks in Foxboro Evo Control Software Applications* (B0750BE).

European Low Voltage Directive 2006/95/EC and Explosive Atmospheres (ATEX) Directive 94/9/EC
ATEX (DEMKO) Ex nA IIC T4 Gc certified when connected as described in the *DIN Rail Mounted Subsystem User's Guide* (B0400FA). For use in an enclosure suited for an ATEX Zone 2 classified area.

Calibration Requirements

Calibration of the module and termination assembly is not required.

ENVIRONMENTAL SPECIFICATIONS(1)

Operating

TEMPERATURE

FBM222
-20 to +70°C (-4 to +158°F)

Termination Assembly
-20 to +50°C (-4 to +122°F)

RELATIVE HUMIDITY
5 to 95% (noncondensing)

ALTITUDE
-300 to +3,000 m (-1,000 to +10,000 ft)

Storage

TEMPERATURE
-40 to +70°C (-40 to +158°F)

RELATIVE HUMIDITY
5 to 95% (noncondensing)

Contamination

Suitable for use in Class G3 (Harsh) environments as defined in ISA Standard S71.04, based on exposure testing according to EIA Standard 364-65, Class III.

Vibration

7.35 m/S^2 (0.75 g) from 5 to 500 Hz

(1) The environmental limits of this module may be enhanced by the type of enclosure containing the module. Refer to the applicable Product Specification Sheet (PSS) which describes the specific type of enclosure that is to be used.

PHYSICAL SPECIFICATIONS

Mounting

MODULE

The FBM222 mounts on a standard Modular Baseplate. The Modular Baseplate can be mounted horizontally or vertically on a DIN rail, or mounted horizontally in a 19-inch rack using a mounting kit. Refer to *DIN Rail Mounted Modular Baseplates* (PSS 21H-2W6 B4) for details.

TERMINATION ASSEMBLY

The TA accommodates multiple DIN styles including 32 mm (1.26) and 35 mm (1.38 in) rails.

Mass

MODULE

284 g (10 oz) approximate (each module)

Dimensions

MODULE

HEIGHT

102 mm (4 in)
114 mm (4.5 in) including mounting lugs

WIDTH

45 mm (1.75 in)

DEPTH

104 mm (4.11 in)

TERMINATION ASSEMBLY

See page 12

Part Numbers

FBM222 MODULE

P0926TL

FBM228/FBM222 REDUNDANT ADAPTER

P0922RK

FBM222 REDUNDANT ADAPTER — DUAL NETWORK

P0926XM

TERMINATION ASSEMBLY

P0926TH (PVC)
P0926TJ (Polyamide)

Indicators (mounted on front of each module)

OPERATIONAL STATUS

Red and green light-emitting diodes (LEDs)

MODULE ROLE IN REDUNDANT PAIR

2 amber LEDs to indicate the module's role in a redundant pair, either Master or Tracker

CHANNEL COMMUNICATION ACTIVITY

2 amber LEDs, one per port

Termination Cables

CABLE LENGTHS

Up to 30 m (98 ft)

CABLE MATERIALS

Polyurethane or Low Smoke Zero Halogen (LSZH)

TERMINATION CABLE TYPE

Type 1 - Refer to Table 2 on page 8

CABLE CONNECTION

Termination Assembly

25-pin male D-subminiature

Modular Baseplate

37-pin male D-subminiature

Termination Assembly Construction Material

MATERIAL

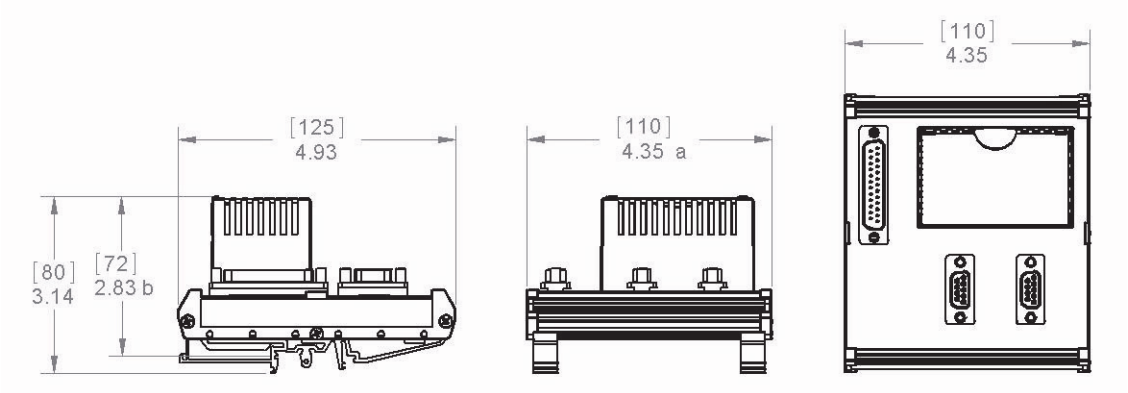
Polypropylene (PVC) Material (P0926TH)
Polyamide (P0926TJ)

FAMILY GROUP COLOR

Green - communication

DIMENSIONS – NOMINAL

9 Pin D Subconnector Termination Assembly
FBM222 Active TA (P0926TH and P0926TJ)
[mm]
in



(a) Overall width – for determining DIN rail loading.
(b) Height above DIN rail (add to DIN rail height for total).

RELATED PRODUCT SPECIFICATION SHEETS

PSS Number	Description
PSS 31H-2COV B3	Compact 200 Series I/O Subsystem Overview
PSS 21H-2W1 B3	DIN Rail Mounted FBM Subsystem Overview
PSS 21H-2W2 B3	DIN Rail Mounted FBM Equipment, Agency Certifications
PSS 21H-2W6 B4	DIN Rail Mounted Modular Baseplates
PSS 31S-10B4 B3	Field Device Manager for PROFIBUS-DP Devices

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