

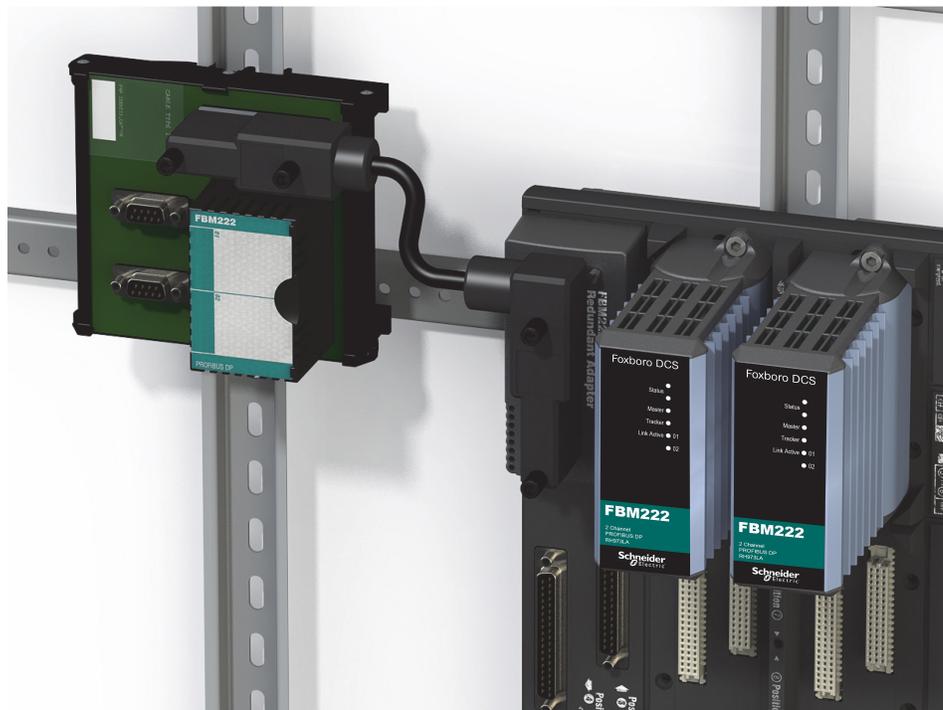
## Foxboro™ DCS

# FBM222, Redundant PROFIBUS Communication Module

## PSS 41H-2S222

### Product Specification

August 2019



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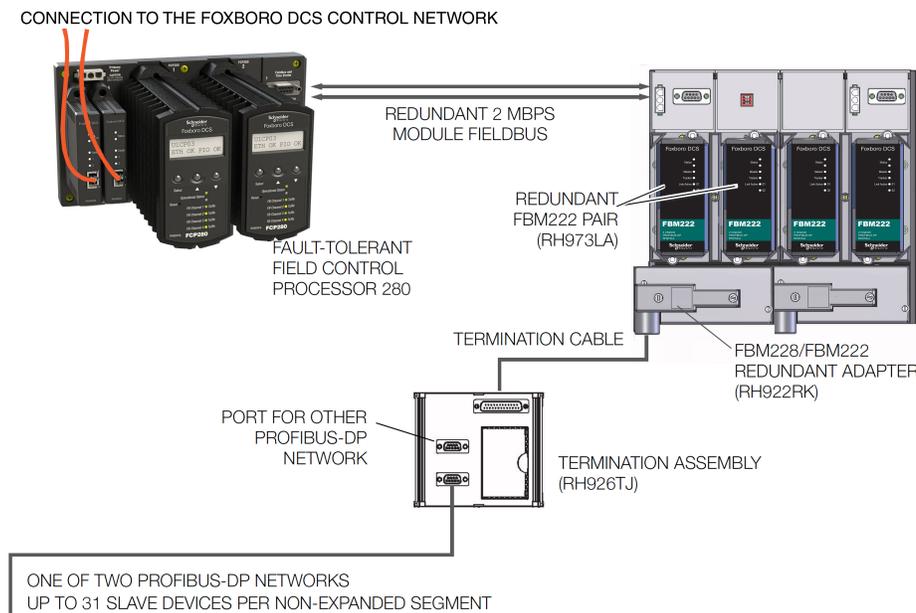
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# Overview

The Redundant PROFIBUS Communication Module (FBM222) provides an interface between the Foxboro™ DCS 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 ports with up to 125 slave devices per port when repeaters are utilized. The FBM222 connects the slave devices to the versatile and robust Foxboro DCS using 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 (RH922RK) 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).

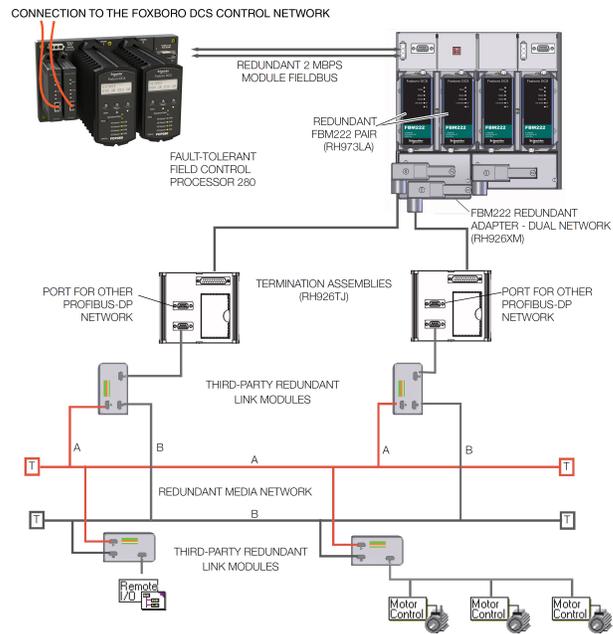
**Figure 1 - Redundant FBM222 with Single PROFIBUS-DP Network**



When the segments contain redundant media, two TAs are connected using termination cables and the FBM222 Redundant Adapter - Dual Network (RH926XM). 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, page 4). The Siemens™ Optical Link Module (OLM) can also be connected to these TAs in a configuration other than the one shown in Figure 2, page 4.

**NOTE:** For proper redundancy operations between RH973LA and superseded P0926TL, verify that the FBM222 module is updated to a software version 2.19 or later.

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



**Table 1 - Part Numbers**

FBM222	RH973LA
Redundant Adapter	RH922RK
Redundant Adapter – Dual Network	RH926XM
Termination Assembly	RH926TJ

## Features

- Integrates PROFIBUS-DP/PA slave devices into the Foxboro DCS
- 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 Fieldbus Modules (FBMs), 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 DCS 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 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 FBM222 while maintaining existing wiring and cable

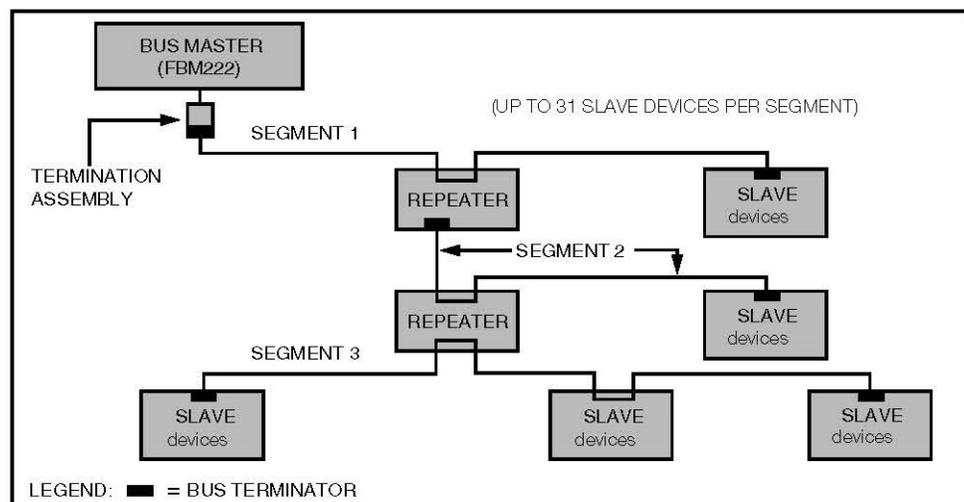
## Network Expansion

In the non-expanded bus configuration, up to 31 slave devices can exist on each PROFIBUS-DP network segment without the use of repeaters. Depending on the selected data transfer rate, cabling distances up to 1200 m (3937 ft) are possible without the use of repeaters (see *Table 2, page 6*).

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 2, page 6* determines the maximum length of each bus segment.

**Figure 3 - PROFIBUS-DP Network Expansion Using Repeaters**



**Table 2 - Maximum PROFIBUS-DP Bus Segment Length**

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

## GSD or DTM Files

A General Slave Data (GSD) file or a Device Type Manager (DTM) 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.

Foxboro DCS uses the information in the GSD/DTM file to set up communication to the slave device. The GSD/DTM files are imported into the Foxboro DCS Control Editors (Control Editors) and used by the device editor to select supported options and configure operational parameters. For more information on these Control Editors for configuring, commissioning and maintaining PROFIBUS\_DP networks, see *Field Device Manager for PROFIBUS-DP Devices* (PSS 31S-10FDMPB).

## FBM Capacity

For more information on the complete specification of the number of devices supported against maximum I/O per device, see *Field Control Processor 280 (FCP280) Sizing Guidelines and Excel® Workbook* (B0700FY).

The host FCP280 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.

You can create a connection 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, using 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.

**NOTE:** For more information on the unique sizing guidelines for the FBM222, see *Implementing PROFIBUS Networks in Foxboro DCS Control Software Applications* (B0750BE). The performance numbers presented here are related only to the capability of the FBM222 itself, and do not take into account loading on the control station from other FBMs.

## Standard Design

The FBM222 has 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.

**NOTE:** Before removing or replacing FBM222 modules, see *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA).

## 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 the FCP280 Field Control Processor.

When deployed for use with an FCP280 (as shown in *Figure 1, page 3* and *Figure 2, page 4*), the module is installed in an adjacent baseplate. 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, page 4*, 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

## Modular Baseplate Mounting

In addition to the four-position baseplate shown in *Figure 1, page 3* and *Figure 2, page 4*, the module can be mounted on any of standard FBM baseplates described in *Standard 200 Series Subsystem Overview* (PSS 31H-2S200). 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 DCS 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 detected in the master, the two modules automatically change roles with no interruption in service. The role change 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 (RH926XM), 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 (RH922RK) 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 more information on performing this upgrade, see *Implementing PROFIBUS Networks in Foxboro DCS Control Software Applications* (B0750BE).

## Termination Assembly

Field I/O signals connect to the FBM222 using the 200 Series FBM222 active TA (RH926TJ), is a Polyamide TA.

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

- Combination DIN Rail Foot that supports 32 or 35 mm (1.3 or 1.4 in) DIN rail mounting
- Two standard PROFIBUS 9-pin D connectors

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 these materials:

- Polyurethane
- Low Smoke Zero Halogen (LSZH)

For more information, see *Table 3*.

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.

# Functional Specifications

<p>PROFIBUS-DP Communications</p>	<ul style="list-style-type: none"> <li>• Interface: Two communication channels provide interface to two galvanically isolated PROFIBUS-DP networks.</li> <li>• Bus Characteristics:             <ul style="list-style-type: none"> <li>◦ General: Electronic Industrial Association (EIA) RS-485 communications. The physical communication medium consists of twisted-pair shielded copper cable containing a single conductor pair.</li> <li>◦ Data Transfer Rate (Baud Rate): Selectable, 9.6 to 12,000 kbit/sec (refer to <i>Table 2</i>)</li> <li>◦ 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 <i>Table 2</i></li> <li>◦ Maximum Cable Length, FBM222 to TA: 30 m (98 ft) which is not included when determining the bus segment length</li> <li>◦ 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.</li> </ul> </li> </ul>
<p>FBM222 Channel Isolation</p>	<p>Each communication channel is galvanically isolated and referenced to ground. The module can withstand, without damage, a potential of 600 V ac applied for one minute between either channel and ground.</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>⚡ ⚠ DANGER</b></p> <p><b>HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH</b></p> <p>The channels are not meant for permanent connection to voltages of these levels. Exceeding the defined range for input voltages, as stated elsewhere in this specification, violates electrical safety codes and can expose users to electric shock.</p> <p><b>Failure to follow these instructions will result in death or serious injury.</b></p> </div>
<p>Conformance to PROFIBUS-DP Standards</p>	<p>PROFIBUS-DP bus topologies and communications are in accordance with specifications presented in these standards:</p> <ul style="list-style-type: none"> <li>• PROFIBUS Fieldbus standard EN 50170</li> <li>• EIA standard RS-485.</li> </ul>
<p>Power Requirements</p>	<ul style="list-style-type: none"> <li>• Input Voltage Range (Redundant): 24 V dc +5%, -10%</li> <li>• Consumption: RH973LA - 6.5 W (maximum)</li> <li>• Heat Dissipation: RH973LA - 6.5 W (maximum)</li> </ul> <p><b>NOTE:</b> When replacing FBM222 (P0926TL) with FBM222 (RH973LA), the increased maximum power consumption and heat dissipation should be considered (FBM222 P0926TL - 6 W, FBM222 RH973LA - 6.5 W).</p>

Regulatory Compliance: Electromagnetic Compatibility (EMC)	<ul style="list-style-type: none"> <li>• <i>European EMC Directive 2014/30/EU:</i> Meets: EN61326-1:2013 Class A Emissions and Industrial Immunity Levels</li> </ul>
Regulatory Compliance: Product Safety	<ul style="list-style-type: none"> <li>• <i>Underwriters Laboratories (UL) for U.S. and Canada:</i> UL/UL-C listed as suitable for use in UL/UL-C listed Class I, Groups A-D; Division 2; temperature code T4 enclosure based systems when connected to specified Foxboro DCS processor modules. 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). For more information, see <i>Standard and Compact 200 Series Subsystem User's Guide (B0400FA)</i>.</li> <li>• <i>European Low Voltage Directive 2014/35/EU and Explosive Atmospheres (ATEX) directive 2014/34/EU:</i> DEMKO certified as Ex nA IIC T4 for use in certified Zone 2 enclosure when connected to specified Foxboro DCS processor modules as described in the <i>Standard and Compact 200 Series Subsystem User's Guide (B0400FA)</i>. For use in an enclosure suited for an ATEX Zone 2 classified area.</li> </ul>
RoHS Compliance	Complies with European RoHS Directive 2011/65/EU, including amending Directives 2015/863 and 2017/2102.
Calibration Requirements	Calibration of the module and termination assembly is not needed.

## Environmental Specifications

	Operating	Storage
<b>Temperature</b>	<ul style="list-style-type: none"> <li>• FBM222: -20 to +70°C (-4 to +158°F)</li> <li>• Termination Assembly — PA: -20 to +70°C (-4 to +158°F)</li> </ul>	-40 to +70°C (-40 to +158°F)
<b>Relative Humidity</b>	5 to 95% (noncondensing)	5 to 95% (noncondensing)
<b>Altitude</b>	-300 to +3,000 m (-1,000 to +10,000 ft)	
<b>Vibration</b>	7.5 m/s <sup>2</sup> (5 to 500 Hz)	
<b>Contamination</b>	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.	

**NOTE:** The environmental limits of this module can be enhanced by the type of enclosure containing the module. Refer to the applicable Product Specification Sheet (PSS) that describes the type of enclosure to be used.

## Physical Specifications

Mounting	<ul style="list-style-type: none"> <li>• <b>Module:</b> 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. See <i>Standard 200 Series Baseplates</i> (PSS 41H-2SBASPLT) for more information.</li> <li>• <b>Termination Assembly:</b> The TA accommodates multiple DIN styles including 32 mm (1.26 in) and 35 mm (1.38 in) rails.</li> </ul>
Weight	<ul style="list-style-type: none"> <li>• <b>Module:</b> 284 g (10 oz) approximate (each module)</li> </ul>
Dimensions - Module	<ul style="list-style-type: none"> <li>• <b>Height:</b> 102 mm (4 in), 114 mm (4.5 in) including mounting lugs</li> <li>• <b>Width:</b> 45 mm (1.75 in)</li> <li>• <b>Depth:</b> 104 mm (4.11 in)</li> </ul>
Dimensions - Termination Assemblies	Refer to <i>Dimensions - Nominal</i> , page 14
Part Numbers	<ul style="list-style-type: none"> <li>• <b>FBM222:</b> RH973LA</li> <li>• <b>FBM228/FBM222 Redundant Adapter:</b> RH922RK</li> <li>• <b>FBM222 Redundant Adapter — Dual Network:</b> RH926XM</li> <li>• <b>Termination Assembly:</b> RH926TJ (Polyamide)</li> </ul>
Indicators (mounted on front of each module)	<ul style="list-style-type: none"> <li>• <b>Operational Status:</b> Red and green light-emitting diodes (LEDs)</li> <li>• <b>Module Role in Redundant Pair:</b> 2 amber LEDs to indicate the module's role in a redundant pair, either Master or Tracker</li> <li>• <b>Channel Communication Activity:</b> 2 amber LEDs, one per port</li> </ul>

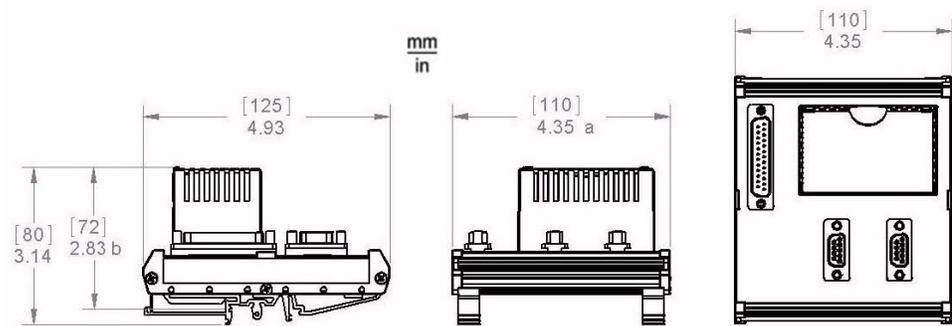
Termination Cables	<ul style="list-style-type: none"> <li>• Cable Lengths: Up to 30 m (98 ft)</li> <li>• Cable Materials: Polyurethane or Low Smoke Zero Halogen (LSZH)</li> <li>• Termination Cable Type: Type 1 - See <i>Table 3, page 13</i></li> <li>• Cable Connection: <ul style="list-style-type: none"> <li>◦ FBM Baseplate End: 37-pin male D-subminiature</li> <li>◦ Termination Assembly End: 25-pin D-subminiature</li> </ul> </li> </ul>
Termination Assembly Construction	<ul style="list-style-type: none"> <li>• Material: Polyamide (PA), compression</li> </ul>

**Table 3 - Cable Types and Part Numbers**

Cable Length m (ft)	Type 1 P/PVC <sup>(a)</sup>	Type 1 LSZH <sup>(b)</sup>
0.5 (1.6)	RH916DA	RH928AA
1.0 (3.3)	RH916DB	RH928AB
2.0 (6.6)	RH931RM	RH928AC
3.0 (9.8)	RH916DC	RH928AD
5.0 (16.4)	RH916DD	RH928AE
10.0 (32.8)	RH916DE	RH928AF
15.0 (49.2)	RH916DF	RH928AG
20.0 (65.6)	RH916DG	RH928AH
25.0 (82.0)	RH916DH	RH928AJ
30.0 (98.4)	RH916DJ	RH928AK
<p>(a) P/PVC is polyurethane outer jacket and semi-rigid PVC primary conductor insulation. Temperature range: -20 to +80°C (-4 to +176°F).</p> <p>(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).</p>		

# Dimensions - Nominal

**Figure 4 - 9 Pin D Subconnector Termination Assembly  
FBM222 Active TA (RH926TJ)**



(a) Overall width — for determining DIN rail loading.

(b) Height above DIN rail (add to DIN rail height for total).

## Related Product Documents

<b>Document Number</b>	<b>Description</b>
PSS 41H-2COV	<i>Compact 200 Series I/O Subsystem Overview</i>
PSS 41H-2SOV	<i>Standard 200 Series Subsystem Overview</i>
PSS 41H-2CERTS	<i>Standard and Compact 200 Series I/O - Agency Certifications</i>
PSS 41H-2SBASPLT	<i>Standard 200 Series Baseplates</i>
PSS 31S-10FDMPB	<i>Field Device Manager for PROFIBUS-DP Devices</i>
B0400FA	<i>Standard and Compact 200 Series Subsystem User's Guide</i>
B0700FY	<i>Field Control Processor 280 (FCP280) Sizing Guidelines and Excel® Workbook</i>
B0750BE	<i>Implementing PROFIBUS Networks in Foxboro Evo DCS Control Software Applications</i>

 **WARNING:** This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information, go to [www.p65warnings.ca.gov/](http://www.p65warnings.ca.gov/).

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