Foxboro®

by Schneider Electric

I/A Series® System

Field Device System Integrators (FBM230/231/232/233) User's Guide

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Preface

This document provides information for installing, configuring, troubleshooting, and operating the I/A Series® system Field Device System Integrators (FBM230/231/232/233). The FBM230/231/232/233 interface an I/A Series system to third-party devices that have an RS-232, RS-422, RS-485 or Ethernet interface.

Protocol specific drivers, are dynamically downloaded to the FBM230/231/232/233 with code specifically designed to interface to the third party device's protocol. Custom configuration files are provided with each protocol for those unique configuration aspects of the particular protocol. The configuration procedures, software requirements and configuration dialog boxes for each driver are described in their respective Protocol Specific User's Guide.

Who This Book Is For

This book is intended for the use of process control engineers and operators, instrument and maintenance engineers, and other qualified and authorized personnel involved in setting up, configuring, and maintaining I/A Series equipment to provide an interface to field devices.

What You Should Know

— NOTE

This document is designed to be used with Field Device System Integrators (FDSI) drivers. FDSI does not function usefully without a driver downloaded into the FBM.

Prior to using this book, you should be generally familiar with the I/A Series system, and with the *DIN Rail Mounted Subsystem User's Guide* (B0400FA). Detailed information relating to the various I/A Series software and hardware elements is found in the reference documents listed below.

You should also be familiar with the field device's protocol that you intend to interface to an I/A Series system.

Revision Information

For this release of the document (B0700AH-T), the following change was made:

Global

- Updated the document with changes related to RoHS compliance.

Reference Documents

The following documents provide additional and related information:

- *FBM230 Field Device System Integrator Module, Four Serial Ports, Single* (PSS 21H-2Z30 B4)

- *FBM231 Field Device System Integrator Module, Four Serial Ports, Redundant* (PSS 21H-2Z31 B4)
- *FBM232 Field Device System Integrator Module, 10/100Mbps Ethernet, Single* (PSS 21H-2Z32 B4)
- *FBM233 Field Device System Integrator Module, 10/100 Mbps Ethernet, Redundant* (PSS 21H-2Z33 B4)
- *DIN Rail Mounted Subsystem User's Guide* (B0400FA)
- *Field Control Processor 280 (FCP280) User's Guide* (B0700FW)
- *Field Control Processor 270 (FCP270) User's Guide* (B0700AR)
- *Z-Module Control Processor 270 (ZCP270) User's Guide* (B0700AN)
- *FDSI Driver - Modbus (Serial and TCP/IP)* (B0700BG)
- *FDSI OPC User's Guide* (B0700BH)
- *Integrated Control Block Descriptions* (B0193AX)
- *Integrated Control Block Descriptions for FOUNDATION fieldbus Specific Control Blocks* (B0700EC)
- *System Manager* (B0750AP)
- *I/A Series Configuration Component (IACC) User's Guide* (B0700FE)
- *Integrated Control Configurator* (B0193AV)
- *System Definition: A Step-by-Step Procedure* (B0193WQ and associated on-line Help)
- *Process Operations and Displays* (B0700BN)
- *System Management Displays* (B0193JC)
- *FoxView Software* (B0700FC)
- *The MESH Control Network Architecture Guide* (B0700AZ)

Most of these documents are available on the I/A Series Electronic Documentation media (K0173WT). The latest revisions of each document are also available through our Global Customer Support at *https://support.ips.invensys.com.*

Glossary of Terms

The following terminology, used throughout this document, relates to the FBM230/231/232/233 and its associated equipment.

Backup Module — The FBM231 or FBM233 that is physically inserted into the baseplate in the position of backup module.

Control Station/Control Processor — This term refers to any I/A Series module or workstation that effects process control via the I/A Series Ethernet Control network. An example is the Field Control Processor 280 (FCP280). The control processor controls process variables using algorithms contained in functional control blocks configured by on-site process engineers to implement the desired control strategies.

DIN Rail Mounted Subsystem	The DIN rail mounted subsystem provides a high speed communication interface between the host control processor (for example, an I/A Series control station) and field I/O sensors and actuators. DIN rail mounted devices, which include FBMs, FCMs and supporting cables and connectors, mount on a baseplate which, in turn, mounts on a DIN rail. The DIN rail mounted subsystem is described in detail in *DIN Rail Mounted Subsystem User's Guide* (B0400FA).
DHCP	Dynamic Host Configuration Protocol that enables a device to receive addresses from the server.
DCI	Distributed Control Interface (DCI) control blocks are I/A Series control blocks that handle digital I/O communications (see block descriptions in Chapter "Distributed Control Interface (DCI Blocks)"). These control blocks are used in conjunction with the FBM230/231/232/233 to interface digital field device I/O communications with the I/A Series control station.
ECB	An equipment control block is created for each FBM and external field device, that provides communications with that FBM or external field device.
FBM	Fieldbus Modules provide the interface between process sensors/actuators and the Fieldbus in a standard I/A Series system. The FBM230/231/232/233 are examples of the many types of FBMs offered as part of the I/A Series system.
FCM	The Fieldbus Communications Module is an interface which allows the FBM230/231/232/233 (and other I/A Series DIN rail mounted modules) to communicate with the control station via the I/A Series 100 Mbps Ethernet Fieldbus. It converts the 10 Mbps or 100 Mbps Ethernet signals used by the control station to 2 Mbps signals used by the FBM230/231/232/233, and vice versa.
FDSI	Field Device System Integrators
Fieldbus	With regard to the I/A Series system, this term applies in general to the 2 Mbps Module Fieldbus. (Figure 1-1 shows how this bus is used in the I/A Series communication network.)
FoxCAE	Computer-Aided Engineering software, part of the I/A Series system, is used to configure control strategies.
Letterbug	This is an identifier for I/A Series control devices, particularly for Fieldbus Modules (FBMs).
Main Module	The FBM231 or FBM233 that is physically inserted into the baseplate in the position of main module.

Master	The FBM231 or FBM233 module of the pair that is communicating with the field device(s). Either module of the pair can be the Master module as indicated by a status indicator on the front of the module.
Modular Baseplate	The modular baseplate provides mounting for DIN rail mounted modules (see Chapter 4 “Installation”). Its 2- 4- or 8- mounting positions can accommodate FBMs, FCMs and FCP280s/FCP270s. The modular baseplates also provide the necessary connectors for dc power, time strobe, the I/A Series Fieldbus module, and termination cables.
OLE	Object Linking and Embedded
OPC	OLE for Process Control.
Parameter	This is a named element in the data structure of a device function block, ECB, or I/A Series control block.
RS-232, RS-422 and RS-485	Electronic Industries Association (EIA) standard RS-232, RS-422 and RS-485 define the physical medium and electrical signal characteristics used in conjunction with the FBM230/231. The physical cabling defined by EIA RS-485 consists of twisted-pair shielded copper cable containing a single conductor pair (referred to as 2-wire). The physical cabling defined by EIA RS-422 consists of shielded cable containing a two conductor pairs (referred to as 4-wire).
TA	The termination assembly provides the means of attaching the FBM230/231 to field devices.
Tracker	The FBM231 or FBM233 module of the pair that is tracking the master module communication with the field device(s). Either module of the pair can be the Tracker module as indicated by a status indicator on the front of the module.

1. Introduction

This chapter provides an overview of the FBM230/231/232/233 and the field network configurations in which it is used.

The Field Device System Integrator (FDSI) modules (FBM230/231/232/233) integrate third-party field device protocols into an I/A Series system. The FBM230/231 provides digital communications to/from field devices (input/output devices) using the RS-232, RS-422, or RS-485 communication standard and the FBM232/233 provides digital communications to/from field devices (input/output devices) using Ethernet 10/100 Mbps networks.

- The FBM230 has four serial ports that can be independently software configured for the RS-232, RS-422, or RS-485 communication standard
- The FBM231, used in pairs, provides a redundant version of the FBM230 for dual ported field devices.
- The FBM232 has a single 10/100 Mbps copper Ethernet connection to field devices
- FBM233, used in pairs, provides a redundant version of the FBM232 for Ethernet dual ported field devices.

Figure 1-1, Figure 1-2, Figure 1-6, and Figure 1-7 show the relationship between the various equipment elements in an I/A Series system interface. The FBM230/231/232/233 and the Field Control Processor 280 (FCP280), Field Control Processor 270 (FCP270), or the Fieldbus Communications Module (FCM100Et and FCM100E), provide a communication interface between the I/A Series system and the field devices.

FBM230/231

The FBM230/231 has four ports - each port can be individually configured for RS-232, RS-422 or RS-485. In non-redundant configurations, FBM230 is used for interfacing single ported field devices. In redundant configurations, the FBM230 and FBM231 can both interface dual ported field devices. (See “Redundant FDSI Connections Using FBM230/FBM232” on page 109 for information on using the FBM230 in redundant configurations in comparison with configurations using the FBM231.) The FBM230/231 can support up to 4 direct connect field devices (RS-232 or RS-422) or up to 64 RS-485 field devices distributed over its four ports.

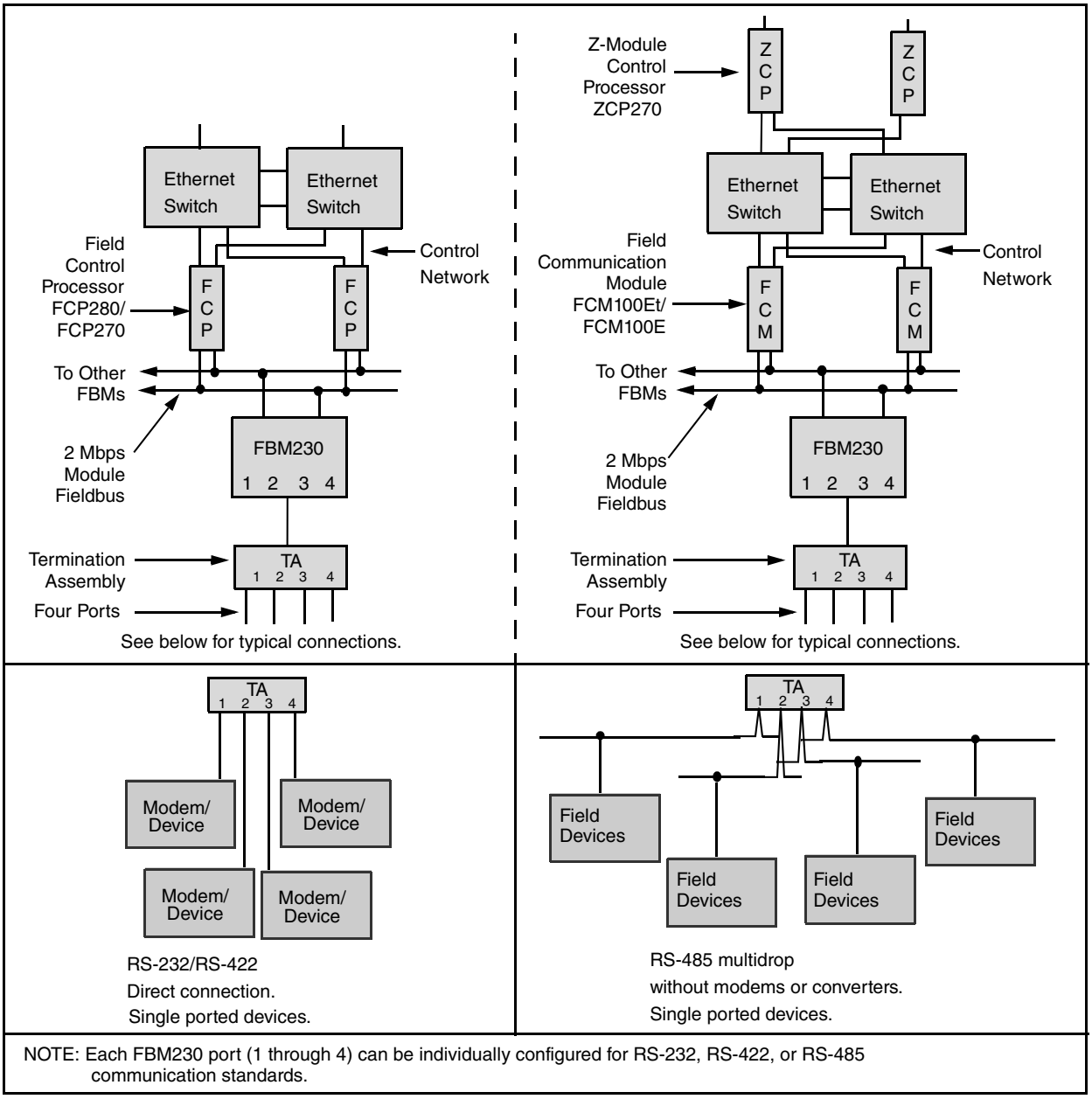


Figure 1-1. FBM230 in Typical Network Configurations

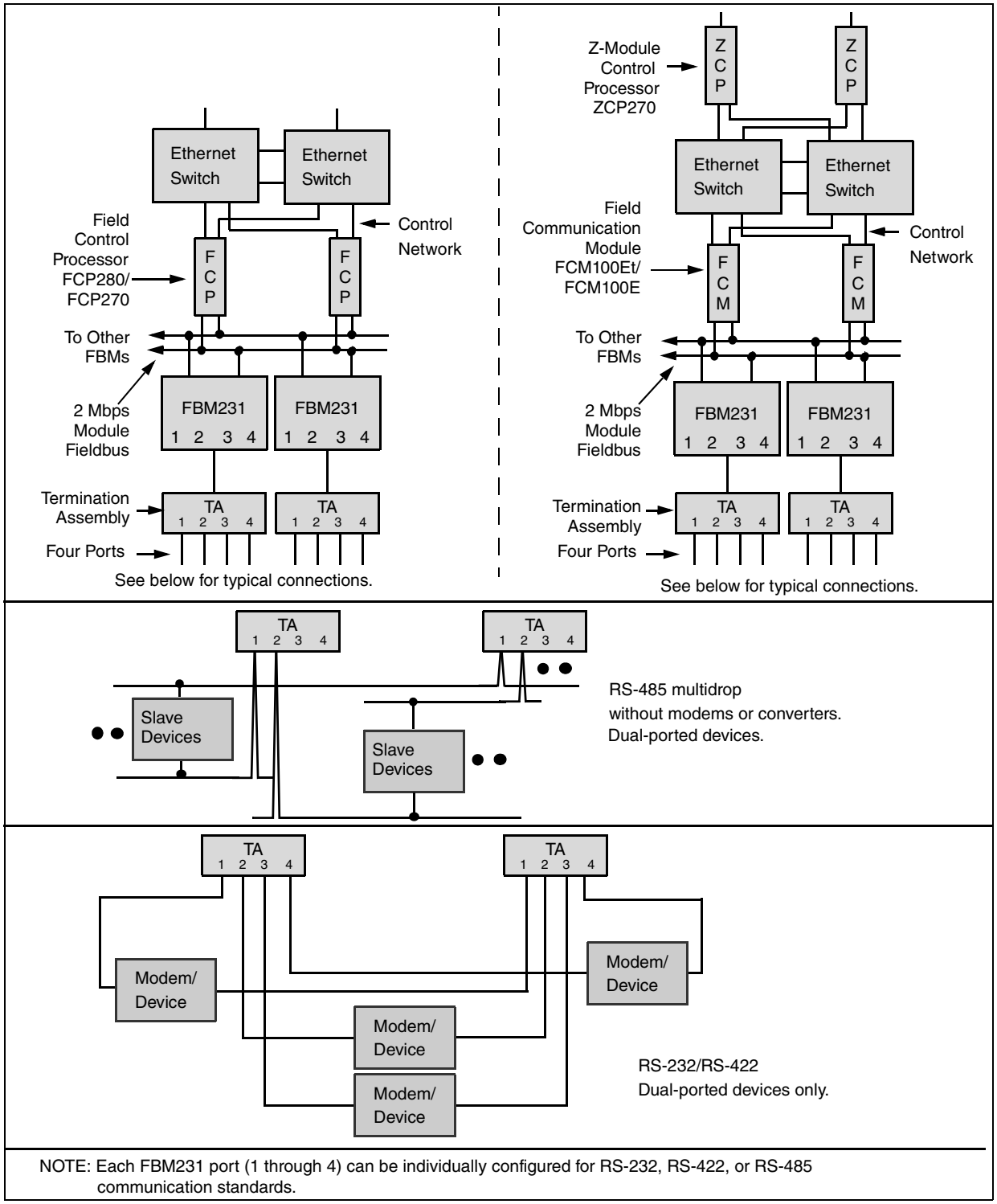


Figure 1-2. FBM231 in Typical Network Configurations

The FBM230/231 and its associated termination assembly (TA) accommodate several types of connections to devices: single ported and/or dual ported connections (Figure 1-1), direct connection to devices, connection to modems when used with RS-232, and intrinsic safety protective devices between the TA and the device.

Physically, the FBM230/231 mounts on a baseplate along with other DIN rail mounted modules (see Figure 1-3). The FBM231 (see Figure 1-4) is a redundant version of the FBM230. It must have another FBM231 in the next slot of the baseplate. A pair of modules combine to provide redundancy at the Fieldbus Module (FBM) level, with field wiring to two termination assemblies (see Figure 1-4). In this configuration, one FBM231 is the Master, and the other is the Tracker module. Input points on the control station are updated from the device inputs received on the network connected to the Master. Device output points are written by both the Master and Tracker module. Role switching is automatic if actual problems are detected, or you can switch the roles at any time via System Manager or SMDH.

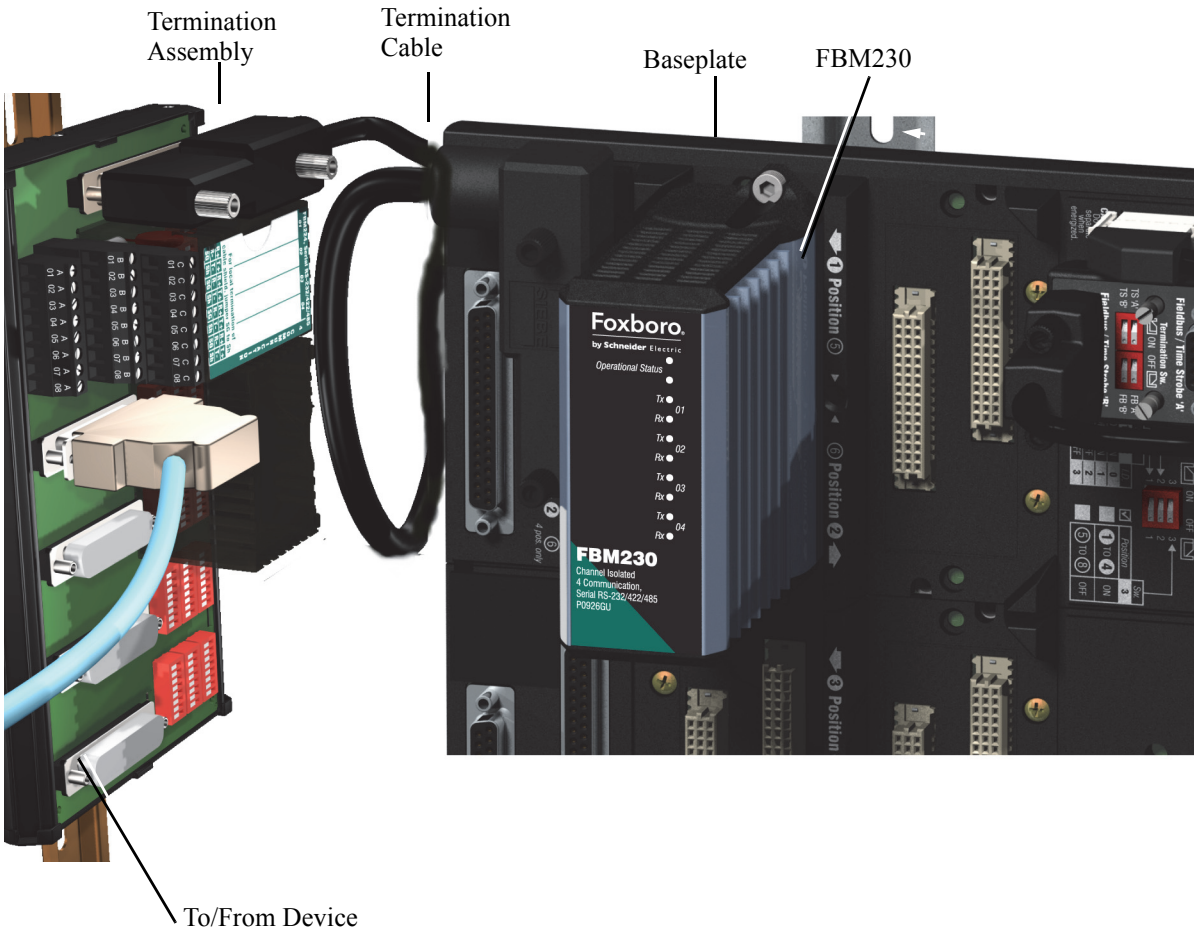


Figure 1-3. DIN Rail Mounted FBM230

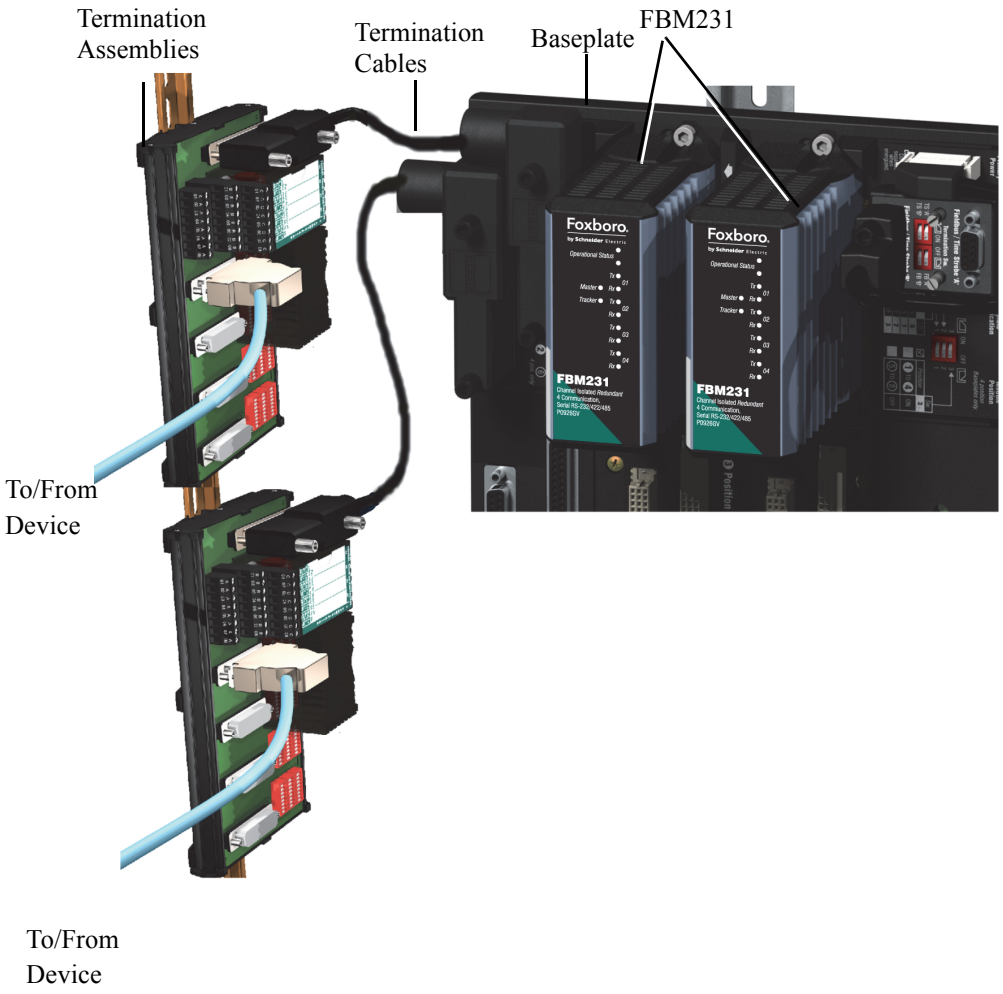


Figure 1-4. DIN Rail Mounted FBM231

A TA provides physical connection of the devices to the FBM230/231 ports (see Figure 1-5). The TA is available with compression screws or ring lugs for making field wire connections to/from the field devices. A single FBM230 uses one TA to connect to single ported field devices. In a redundant architecture using a pair of FBM230s or 231s, separate TAs are used to connect to the two ports of a dual ported device. The TA provides for the connection of up to four RS-422 and/or RS-485 cable connections and serial RS-232 DB-25 cable connections in any combination. Switches on the TA, used with RS-232, provide for selection of the clear-to-send, request-to-send and other RS-232 signals. In an RS-485 configuration, the FBM230/231 can be located anywhere on the bus. If the FBM230/231 is located at the end of a bus segment, terminators (terminating resistors) for the prevention of signal reflection on the TA are switch selectable. Where devices are positioned at the ends of the bus segments, line terminators are typically included as part of the devices. The RS-422/485 signals should be terminated at the ends of the bus.

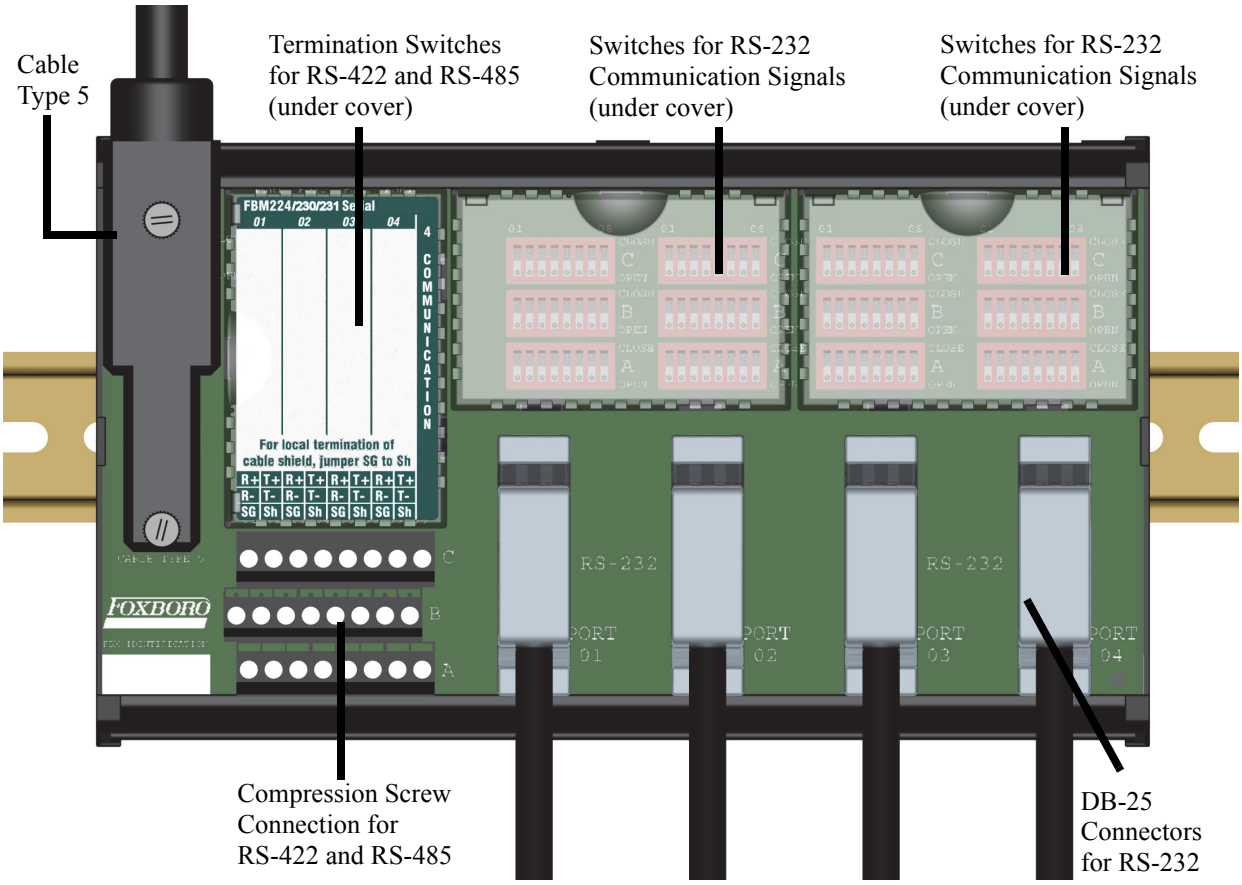


Figure 1-5. FBM230/231 Termination Assembly

FBM232/233

The FBM232/233 has a single 10/100 Mbps copper Ethernet connector (RJ-45). The protocol conforms to IEEE standard 802.3 (supports TCP/IP).

Connecting devices to an FBM232/233 requires the use of an Ethernet hub or Ethernet switch.

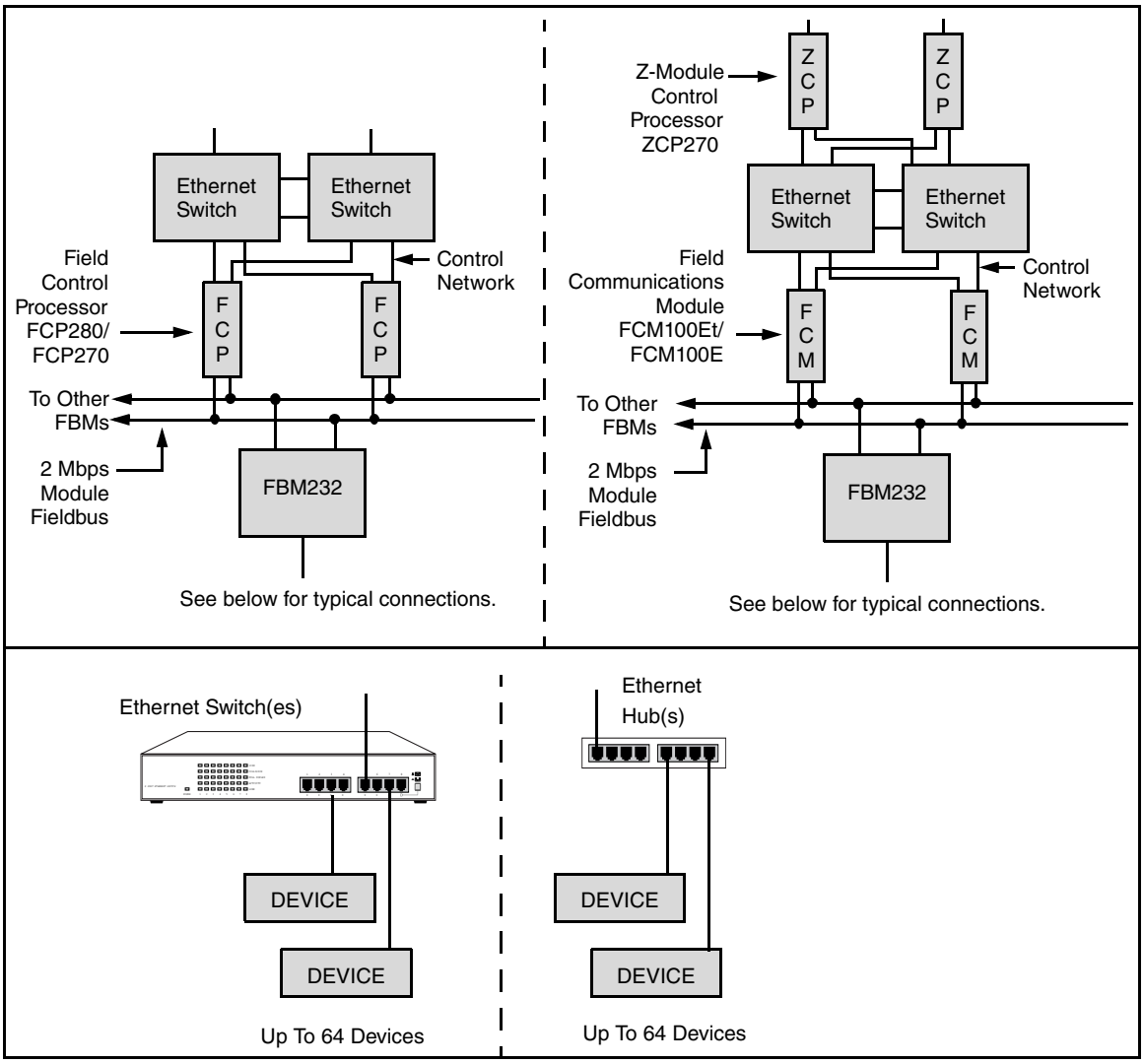


Figure 1-6. FBM232 in Typical Network Configurations

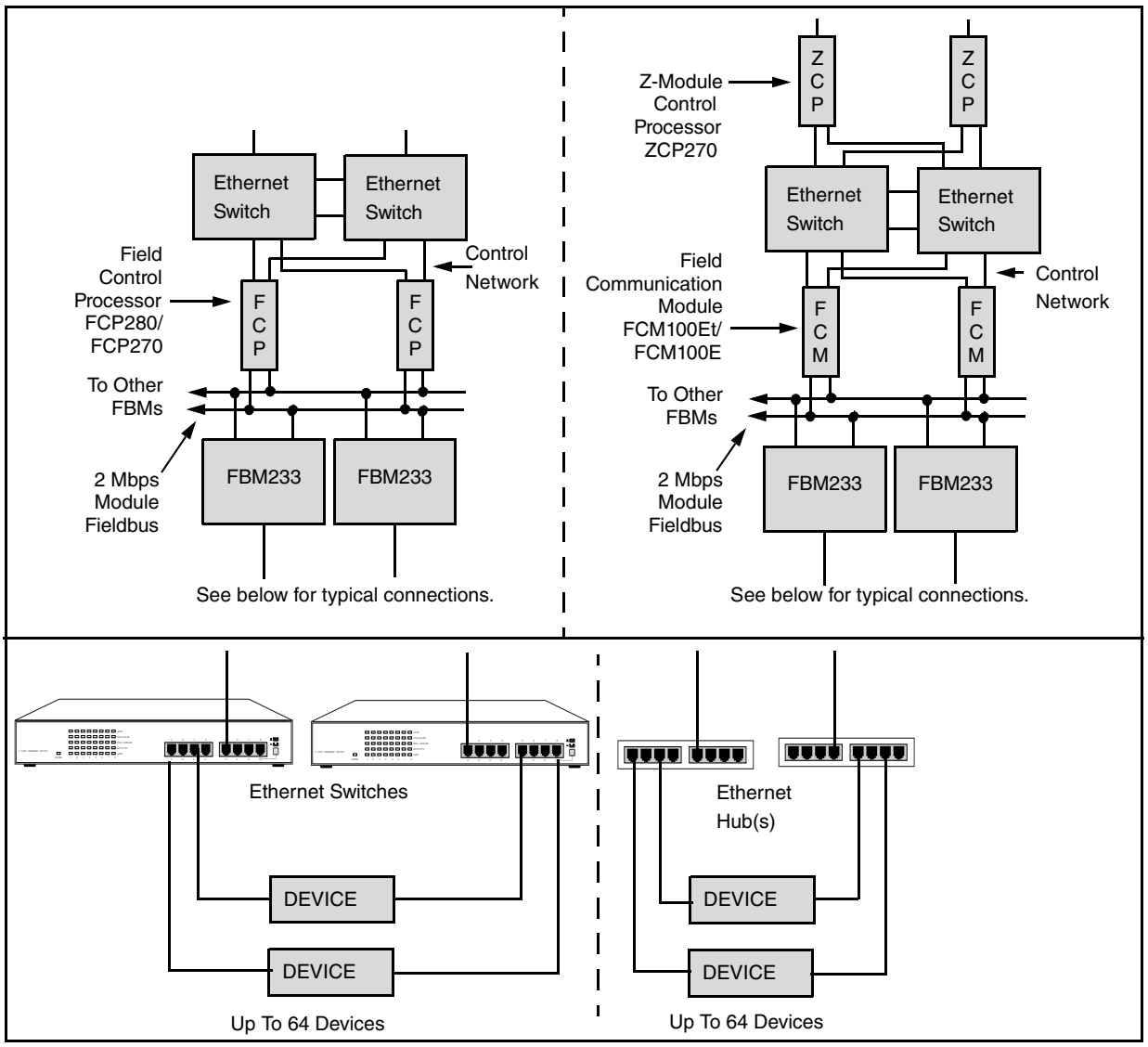


Figure 1-7. FBM233 in Typical Network Configurations

Physically, the FBM232/233 mounts on a baseplate along with other DIN rail mounted modules (see Figure 1-8). The FBM233 (see Figure 1-9) is a redundant version of the FBM232. It must have another FBM233 in the next slot of the baseplate. It does not require a TA. A pair of modules combine to provide redundancy at the Fieldbus Module (FBM) level (see Figure 1-9). In this configuration, one FBM233 is the Master, and the other is the Tracker module. Input points on the control station are updated from the device inputs received on the network connected to the Master. Depending on the redundancy algorithm of the FDSI driver being used, device output points may be written by only the Master module or by both the Master and Tracker modules. Role switching is automatic if actual problems are detected, or you can switch the roles at any time via System Manager or SMDH.

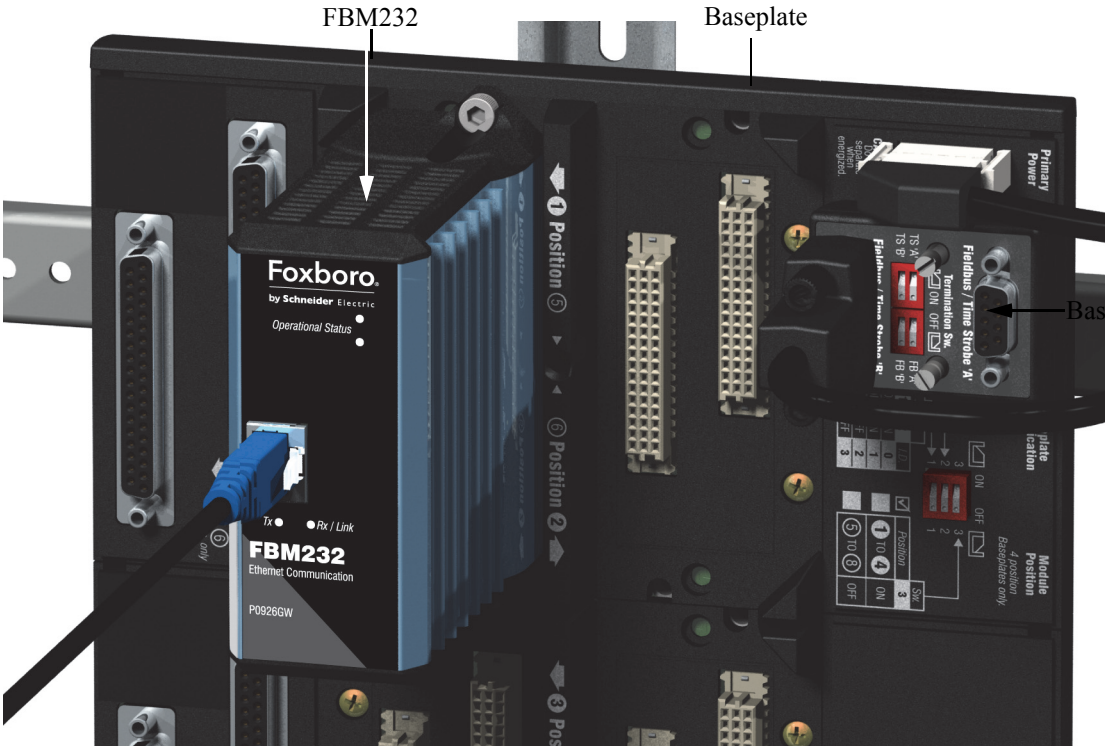


Figure 1-8. DIN Rail Mounted FBM232

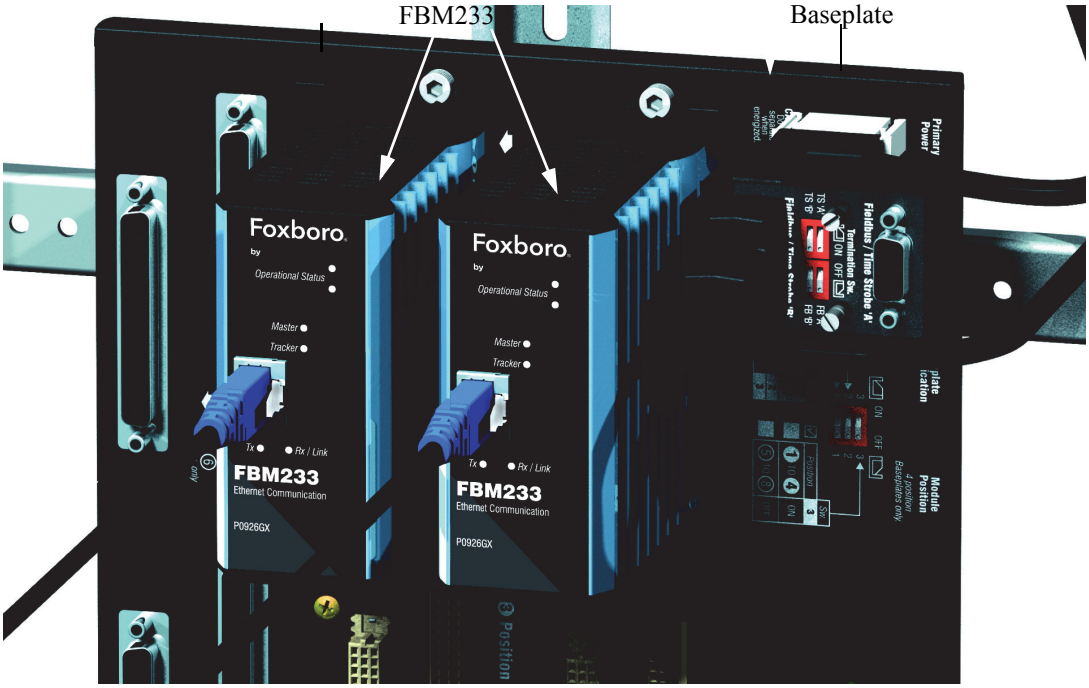


Figure 1-9. DIN Rail Mounted FBM233

FCP280 and FCP270

The FCP280 and FCP270 provide conversion of the 100 Mbps Ethernet control network signals to the 2 Mbps signals required by the FBMs. They are also baseplate mounted, and are designed fro installation in strategic plant areas. Refer to the following manuals for more information:

- For detailed information on the functional aspects of the I/A Series DIN rail mounted equipment, refer to *DIN Rail Mounted Subsystem User's Guide* (B0400FA).
- For detailed information on FCP280, refer to *Field Control Processor 280 (FCP280) User's Guide* (B0700FW).
- For detailed information on FCP270, refer to *Field Control Processor 270 (FCP270) User's Guide* (B0700AR).

FCM100Et and FCM100E

The FCM100Et and FCM100E modules, which are also baseplate mounted, provide conversion of the 100 Mbps Ethernet control network signals to the 2 Mbps signals required by the FBMs. Refer to the following manuals for more information:

- For detailed information on the functional aspects of I/A Series DIN rail mounted equipment, FCM100Et and FCM100E, refer to *DIN Rail Mounted Subsystem User's Guide* (B0400FA).
- For detailed information on the ZCP270, refer to *Z-Module Control Processor 270 (ZCP270) User's Guide* (B0700AN).

Software Functional Components

The FBM230/231/232/233 interfaces with the control processor and other hardware and software elements of the I/A Series system to provide control, alarming, trending, and display capabilities. Software residing in the control processor and I/A Series workstations provides full support of the FBM230/231/232/233. The major functional components of this software are:

- FDSI drivers – Input Output drivers are dynamically downloaded to the FBMs 230/231/232/233 with software code specifically designed to interface to the third party device's protocol. Custom configuration files are provided with some FDSI drivers for those unique configuration aspects of the particular protocol. The configuration procedures and the software requirements for each driver are described in the device protocol specific document.
- FDSI Configuration Software – Provides for configuration of the FBM230/231/232/233 in the network to which it is connected. The software prepares configuration files that contain information needed by the FBMs to communicate with the devices to which it is connected. This software executes in an I/A Series workstation and includes the necessary user interface. Software elements in the control processor and the FBM support run-time use of the configured information.
- Run-Time Software – Supports the reading and writing of data, from and to the devices in the network, as standard field I/O values in an I/A Series system. This software includes Distributed Control Interface (DCI) control blocks that interface I/O signals from devices.

- I/A Series system software – Integrates the FBM230/231/232/233 and connected devices into the overall I/A Series system equipment configuration. This integration is consistent with the integration of other I/A Series Fieldbus Module (FBM) types, and the field devices.
- Diagnostics – Provide startup and maintenance fault detection and diagnosis for the FBM230/231/232/233.

I/A Series Control Blocks

The FBM230/231/232/233 input/output (reading/writing data to/from the devices) uses equipment control blocks (ECBs) and Distributed Control Interface (DCI) blocks. Table 1-1 lists the ECBs and DCI blocks used with the FBM230/231/232/233. For descriptions of the ECBs and DCI blocks used with the FBM230/231/232/233, refer to *Integrated Control Block Descriptions* (B0193AX).

Table 1-1. ECBs and DCI Blocks Used with the FBM230/231/232/233

ECB/DCI Block	Description
ECB210	Fieldbus Communications Module (FCM100Et and FCM100E) for DIN rail subsystem
ECB200	Parent ECB, representing the FBM230 or 232
ECB202	Parent ECB, representing the FBM231 or 233
ECB201	Child ECB, representing a device
RIN	Real Input DCI block
RINR	Redundant Real Input DCI block
ROUT	Real Output DCI block
BIN	Binary Input DCI block
BINR	Redundant Binary Input DCI block
BOUT	Binary Output DCI block
IIN	Integer Input DCI block
IINR	Redundant Integer Input DCI block
IOUT	Integer Output DCI block
PAKIN	Packed Input DCI block
PAKINR	Redundant Packed Input DCI block
PAKOUT	Packed Output DCI block
STRIN	String Input DCI Block
STROUT	String Output DCI Block

The Integrated Control Configurator (ICC) or Integrated Automation Control Configurator (IACC) configures the ECBs, DCI, and I/A Series control blocks for the FBM230/231/232/233.

The DCI blocks contain the identification of the data to be transferred to/from the device.

The port configuration file defines the communication parameters for the FBM230/231 port (for example, port baud rate and number of stop bits) and for the FBM232/233 port (for example,

Internet address). There is one ECB200 for each FBM230/232 and one ECB202 for each pair of FBM231/233. There is one port configuration file that defines all four FBM230/231 ports and one port configuration file that defines the FBM232/233 port.

The device configuration file, if used, defines the communication parameters for the devices (for example, point address and read rate). There is one ECB201 per device.

Specifications

The specifications for the FBM230/231/232/233 are provided in the following Product Specification Sheets (PSS):

- *I/A Series Hardware Field Device System Integrator FBM230* (PSS 21H-2Z30 B4)
- *I/A Series Hardware Field Device System Integrator FBM231* (PSS 21H-2Z31 B4)
- *I/A Series Hardware Field Device System Integrator FBM232* (PSS 21H-2Z32 B4)
- *I/A Series Hardware Field Device System Integrator FBM233* (PSS 21H-2Z34 B4).

2. Quick-Start Example

This chapter provides a sequence for installing and configuring an FBM230/231/232/233 to get your I/A Series system and field devices up and running in the shortest possible time.

Figure 2-1 outlines a typical sequence for installing and configuring combined I/A Series system and field equipment. Following Figure 2-1 is the summary procedure, whose steps are keyed to the figure. The summary procedure provides references to sections in the manual or other manuals where you can find the details of a procedure.

The FDSI configurator contains the port configurator and the device configurator to create files containing configuration information needed by the FBM230/231/232/233 to communicate with the devices. The I/O device driver defines the block addresses and type of data that will be transferred for a specific device type. The Integrated Automation Control Configurator (IACC) or Integrated Control Configurator (ICC) creates the ECB200s, ECB201s and ECB202s. The FDSI, IACC or ICC configurators can be used independently. There is no defined order. Therefore:

- To create the FBM230/231/232/233 port or device configuration files, the ECBs are not needed.
- When you create the ECB blocks with the IACC or ICC, the FBM230/231/232/233 port and device configuration files are not needed.

The reference between control blocks and configuration files is created by entering the FILEID and SFILID parameters in the ECB200 and ECB202. The reference to a device configuration file is created by entering the FILEID in ECB201. Figure 2-1 recommends a sequence that you can modify based on your system requirements.

NOTE

1. This procedure assumes that you are familiar with I/A Series system concepts and the field device(s) protocol that you desire to integrate into an I/A Series system. Appropriate documents and chapters within this document are referenced as part of each step.
2. For more comprehensive information on installing and configuring the FBM230/231/232/233 and its associated equipment, refer to the subsequent chapters of this document.

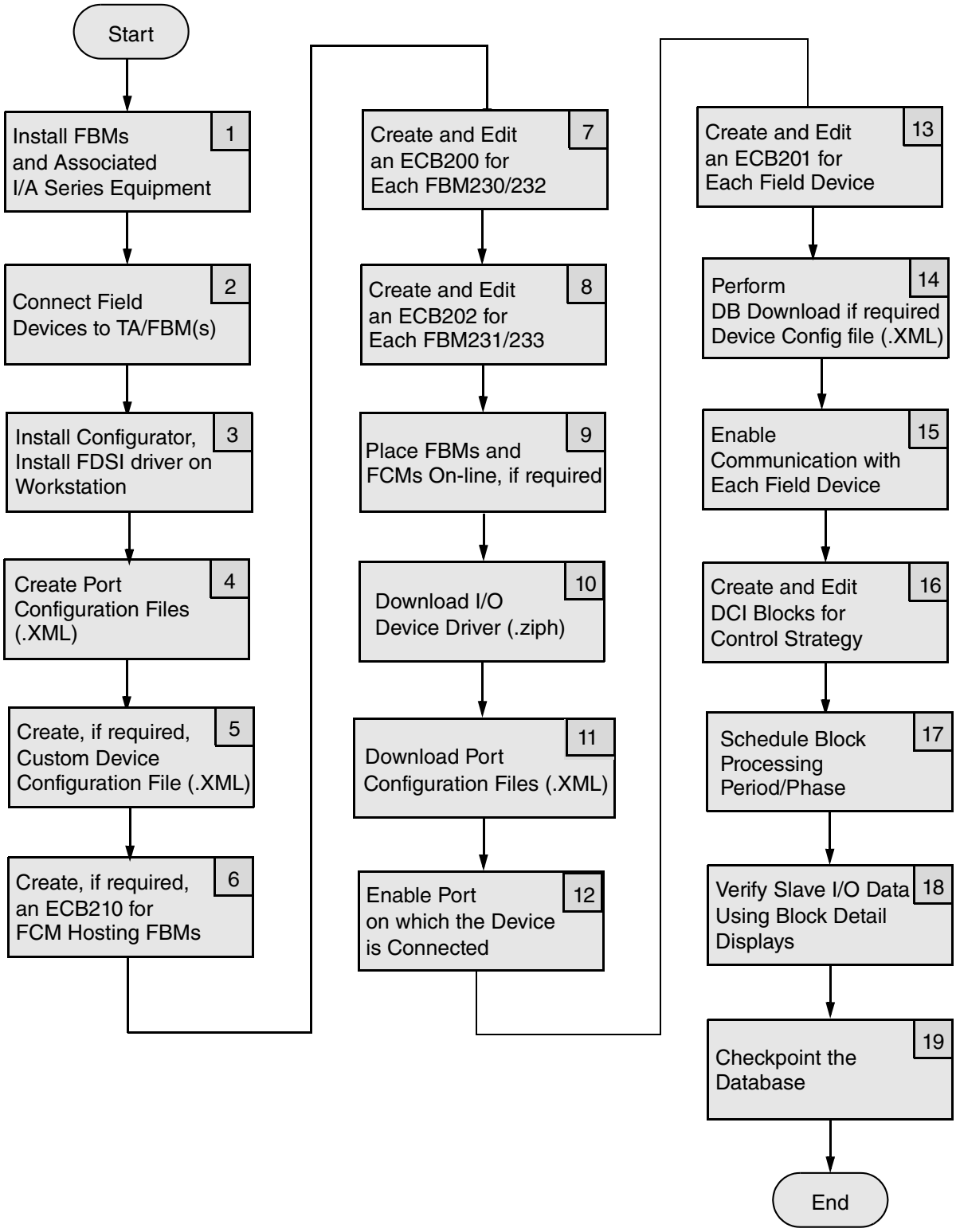


Figure 2-1. Typical FBM230/231/232/233 Integration Process

1. **Install the I/A Series system, including the FBM**230/231/232/233.
   a. Install the major elements of the I/A Series system equipment as described in the documents listed in the Preface.

b. Perform the system definition (SysDef) by referring to the document listed in the Preface.

c. Install the I/A Series system software by referring to the documents listed in the Preface.

d. Install:

- The FBM230/231/232/233 module, as required
- One letterbug for each single FBM230 and FBM232 and one for each redundant pair of FBM231 or FBM233
- The associated FCP280, FCP270, FCM100Et or FCM100E
- TA(s) for FBM230/231
- Hub/Ethernet switch, if required, for FBM232/233.

Refer to *DIN Rail Mounted Subsystem User's Guide* (B0400FA) and Chapter 4 "Installation" of this User's Guide.

2. **Connect Field Devices to the TAs/Ethernet Network.**

   Connect the field devices directly to the FBM TAs or Ethernet network as described in Chapter 4 "Installation".

3. **Install the FDSI Configurator, Install FDSI Driver on Workstation.**

   Install the FDSI Configurator as described in "Installing the FDSI Drivers and FDSI Configurator" on page 114.

   Install the FDSI driver on the designated workstation. Installation of the driver is general software install for PCs.

4. **Create Port Configuration Files.**

   a. Start Configurator (See "Installing the FDSI Configurator" on page 117.)

   b. Create Port Configuration file. (See "Creating/Editing a Port Configuration File" on page 133.)

   c. Save the Port Configuration Files. (See "Saving the Port and Device Configuration Files" on page 152.)

5. **Create, if required, Device Configuration File for Custom Drivers.**

   a. Create Device Configuration files. (See "Creating/Editing a Device Configuration File" on page 139.)

   b. Save the Device Configuration Files. (See "Saving the Port and Device Configuration Files" on page 152.)

Refer to the FDSI driver document to determine what files require configuration and to "Port and Device Configuration Files" on page 113 for the procedures to configure the device.

6. **Create, if required, an ECB210 for FCM100Et or FCM100E that hosts the FBMs.**

   Refer to *DIN Rail Mounted Subsystem User's Guide* (B0400FA).

   a. Open the Integrated Control Configurator.

   b. Add an ECB210 for the FCM100Et or FCM100E.

   c. Configure the ECB210.

7. **Create and Edit ECB200 for each FBM230/232.**

See “Creating and Editing the FBM230/232 ECB (ECB200)” on page 85.

a. Open, if not already open, the Integrated Control Configurator.

b. Add an ECB200 for each FBM230/232.

c. Configure the ECB200. Configure the FILEID parameter with the port configuration filename (*filename*.XML). [See “Equipment Control Blocks (ECBs)” on page 85.] Configure the SFILID parameter with the name of the I/O Device Driver filename (*filename*.ziph).

8. **Create and Edit ECB202 for each FBM231/233.**

See “Creating and Editing the FBM231/233 ECB (ECB202)” on page 87.

a. Open, if not already open, the Integrated Control Configurator.

b. Add an ECB202 for each FBM231/233.

c. Configure the ECB202. Configure the FILEID parameter with the port configuration filename (*filename*.XML) (see “Equipment Control Blocks (ECBs)” on page 85). Configure the SFILID parameter with the name of the Device Driver filename (*filename*.ziph).

9. **Place FBM(s) and FCMs On-line via System Manager or System Management Displays (SMDH).**

See “Placing the FBM On-Line/Off-Line” on page 190.

10. Download FDSI driver Device Configuration File (.ziph)

See “SOFT_DOWNLOAD” on page 189.

11. Download Port and FDSI driver Device Configuration Files (.XML)

See “DB Download” on page 198.

12. **Ensure that the Port on which the Device is Connected is Enabled.**

See “Placing the FBM On-Line/Off-Line” on page 190.

13. **Create and Edit an ECB201 for each Field Device.**

See “Creating and Configuring Device ECB (ECB201)” on page 88.

a. Open, if not already open, the IACC or the ICC.

b. Add an ECB201 for each device.

c. Configure the ECB201. Configure the FILEID parameter, if required by the FDSI driver, with the device configuration filename (*filename*.XML). [See “Equipment Control Blocks (ECBs)” on page 85.]

14. **Download Device files (DB DOWNLOAD).**

Perform DB Download of device files, if needed, for drivers. See “DB Download” on page 198.

15. **Enable Communication with each Field Device via System Manager or SMDH.**

See “Enable/Disable Communication to a Device” on page 199.

16. **Create and Edit DCI Blocks for all Device I/O Points to be Processed.**

See “Configuring DCI Blocks” on page 96.

17. **Schedule Block Processing Period/Phase**.

See “DCI Block Processing” on page 92.

18. **Verify Device I/O Data using the Block Detail Displays.**
    a. Access the FoxSelect™ compound/block overview utility. Refer to *Process Operations and Displays* (B0700BN) for details.
    b. Access the block detail display for each DCI block created, and confirm its data.
19. **Checkpoint the Database.** For details, refer to *System Manager* (B0750AP), *System Management Displays* (B0193JC), *I/A Series Configuration Component (IACC) User's Guide* (B0700FE), or *Integrated Control Configurator* (B0193AV).

3. Functional Characteristics

This chapter addresses various requirements and constraints relating to the connection of the FBM230/231/232/233 network, and its operation in conjunction with the control processor and the field devices.

When planning for the installation and operation of the FBM230/231/232/233 and the network, you must consider the following factors:

- The FBM230/231/232/233 functional and environmental constraints
- The network configuration.

Functional and Environmental Constraints

The FBM230/231/232/233 is used with the Field Control Processor 280 (FCP280), Field Control Processor 270 (FCP270), or the I/A Series Fieldbus Communication Module (FCM100Et or FCM100E). The FBM230/231/232/233 connects to the FCP280, FCP270, or to the FCM100Et or FCM100E via a 2 Mbps Module Fieldbus, and coexists on this Module Fieldbus with other Fieldbus Modules (FBMs).

I/A Series software v8.0 (or higher) is required for FBM230/231/232/233 operation.

Refer to the following documents for functional and environmental specifications relating to the single FBM230/232 and redundant FBM231/233 modules and associated TAs:

- *I/A Series Hardware Field Device System Integrator Module (FBM230)* (PSS 21H-2Z30 B4)
- *I/A Series Hardware Field Device System Integrator Module (FBM231)* (PSS 21H-2Z31 B4)
- *I/A Series Hardware Field Device System Integrator Module (FBM232)* (PSS 21H-2Z32 B4)
- *I/A Series Hardware Field Device System Integrator Module (FBM233)* (PSS 21H-2Z34 B4)

Factors to be considered when designing a fieldbus network configuration for your particular application are:

- Network Configuration – Type of module
- Other Factors – Distance, length, number of devices
- Intrinsic safety.

These factors are addressed in the following subsections.

Network Configuration

FBM230/231

The FBM230/231 is used in the network configurations shown in Figure 1-1 on page 2 and Figure 1-2 on page 3.

EIA communication interface standards specify the physical RS-485 bus. The topology is a linear bus with drops (connections to stations) not greater than 0.3 m, and no branches. RS-485 devices cannot be more than 1200 m (4000 ft) cable length from the FBM230/231, per EIA standards. RS-485 devices connect to the TA using screw compression or ring-lug connections on the TA. The FBM230/231, having four ports, supports communication over four, three, two, or one bus depending on its configuration.

EIA communication interface standards specify the physical RS-422 bus. RS-422 is an asynchronous communication connection to stations or a direct connection to modem/converter to RS-485, or other devices. RS-422 devices cannot be more than 1200 m (4000 ft) cable length from the FBM230/231, per EIA standards. RS-422 devices connect to the TA using screw compression or ring-lug connections on the TA. The FBM230/231, having four ports, supports communication over four, three, two, or one link to the modem(s) or devices.

EIA communication interface standards specify the physical RS-232 bus. RS-232 is an asynchronous communication connection to stations or direct connection to modems/RS-232 converters to RS-422, RS-485, or other devices. The connections are made using 25-pin D-Connectors on the TAs. RS-232 devices cannot be more than 15 m (50 ft) cable length from the FBM230/231, per EIA standards. The FBM230/231, having four ports, supports communication over four, three, two, or one link to the modem(s) or devices.

FBM232/233

The FBM232/233 is used in the network configurations shown in Figure 1-6 and Figure 1-7.

The FBM232/233 has, on the front of the module, an RJ-45 connector, with computer Network Interface Card (NIC) pinout, for Ethernet 10Base-T/100Base-TX connectivity. Maximum cable length is 100 m (330 ft) on the Ethernet interface. Devices must be connected to the FBM232/233 through the use of Ethernet hubs or switches.

Ethernet Interfaces

The FBM232/233 supports a single Ethernet 10/100 Mbps TCP/IP or UDP/IP connection to the foreign data network and automatically adjusts itself to either 10 or 100 Mbps depending on the device(s) attached. The FBM232/233 are configurable to:

- accept a fixed IP address configuration
- accept an IP address from a connected DHCP server
- use TCP/IP or UDP for data transport.

Summary of Communication Link Characteristics

Table 3-1 summarizes the communication link characteristics.

Table 3-1. Communication Link Characteristics

Specification	RS-232	RS-422	RS-485	Ethernet
Mode of Operation	Single ended	Differential	Differential	TCP/IP
Maximum Cable Length	15 m (50 ft)	1200 m (4000 ft)	1200 m (4000 ft)	100 m (330 ft)
Maximum Data Rate	20 kpbs	115 kbps	115 kbps	10/100 Mbps (auto-adjust)

Table 3-1. Communication Link Characteristics (Continued)

Specification	RS-232	RS-422	RS-485	Ethernet
Maximum Number of Devices per FBM	4	4	64	64

Other Factors

You should consider the following factors when designing a configuration for your application:

- The number of devices allowed per FBM230/231/232/233
- Allowable bus length
- Use of modems/RS-232 converters to RS-422 or RS-485 and other devices
- Type of cable used (per RS-422, RS-485, or RS-232 specifications)
- Ethernet cables
- Intrinsic safety.

These factors are addressed in the following subsections of this chapter.

Number of Devices

The FBM230/231 has four ports; RS-232, and/or RS-422, and/or RS-485. The FBM230/231 with RS-232 or RS-422 communication supports a maximum of 4 devices, one device on each of its four ports. The FBM230/231 with RS485 communication supports a maximum of 64 devices distributed over its four ports

The FBM232/233 supports a maximum of 64 devices.

You should consider the control processor loading when determining the number of devices on the network. Refer to:

- *Field Control Processor 280 (FCP280) Sizing Guidelines and Excel® Workbook* (B0700FW)
- *Field Control Processor 270 (FCP270) Sizing Guidelines and Excel Workbook* (B0700AV)
- *Z-Module Control Processor 270 (ZCP270) Sizing Guidelines and Excel Workbook* (B0700AW).

Cable Lengths

The maximum cable length for RS-232 communication from the DB-25 cable connection on the FBM230/231 TA to the user supplied device is not more than 15 m (50 ft) cable length.

The maximum cable length for RS-422 and RS-485 communication from connection on the TA to the user supplied device is 1200 m (4000 ft)

For each FBM230/231 port, you must choose a baud rate and parity to transfer data that can be supported by all devices to be accessed via that port. For each device, you must choose a data transfer frequency that can be supported by the device.

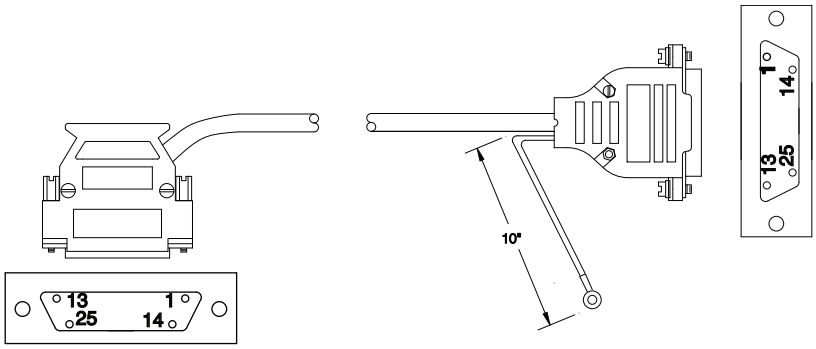
For the FBM232/233 the maximum cable length is 100 m (330 ft) on the Ethernet interface. The FBM232/233 is a standard TCP/IP interface. The use of hubs or switches can extend the distance from the FBM232/233 to the device.

RS-232 Cables

Table 3-2 lists the cables and Figure 3-1 shows the pinouts for the standard RS-232 cables available from Foxboro.

Table 3-2. RS-232 Communication Cables

Option	Cable Length	Cable Part No.
RS-232 VT100	20 ft	P0970XD
	40 ft	P0970WY
RS-232 Modem	20 ft	P0970XC
	40 ft	P0970WX
DCE (Local)	20 ft	P0970XD
	40 ft	P0970WY



Pinouts for RS-232 Cables

WIRE TABLE				WY/WX	WY/WX
WIRE PAIR	WIRE NO.	A.W.G. SIZE	WIRE COLOR	FROM	TO
1	1	28	WHT/BLK	N/C	N/C
	2	28	WHT/BRN	N/C	N/C
2	3	28	WHT/RED	P1-2	P2-2
	4	28	WHT/ORN	P1-7	P2-7
3	5	28	WHT/YEL	P1-3	P2-3
	6	28	WHT/GRN	P1-7	P2-7
4	7	28	WHT/BLU	P1-4	P2-4
	8	28	WHT/VIO	P1-7	P2-7
5	9	28	WHT/GRY	P1-5	P2-5
	10	28	WHT/BLK/BRN	P1-7	P2-7
6	11	28	WHT/BLK/RED	P1-6	P2-6
	12	28	WHT/BLK/ORN	P1-7	P2-7
7	13	28	WHT/BLK/YEL	NC/P1-15	NC/P2-15
	14	28	WHT/BLK/GRN	NC/P1-7	NC/P2-15
8	15	28	WHT/BLK/BLU	P1-8	P2-8
	16	28	WHT/BLK/VIO	P1-7	P2-7
9	17	28	WHT/BLK/GRY	N/C	N/C
	18	28	WHT/BRN/RED	N/C	N/C
10	19	28	WHT/BRN/ORN	P1-17	P2-17
	20	28	WHT/BRN/YEL	P1-7	P2-7
11	21	28	WHT/BRN/GRN	P1-20	P2-20
	22	28	WHT/BRN/BLU	P1-7	P2-7
12	23	28	WHT/BRN/VIO	P1-22	P2-22
	24	28	WHT/BRN/GRY	P1-7	P2-7
13	25	28	WHT/RED/ORN	P1-24	P2-24
	26	28	WHT/RED/YEL	P1-7	P2-7
	SHLD	-	-	SHLD	SHLD LUG

Figure 3-1. P0970WX/WY/XC/XD RS-232 Cables

RS-485 and RS-422 Cable Specifications

Cable specifications for the RS-485 and RS-422 communication interface standard are based on the use of Type A cable (shielded twisted-pair) parameters listed in Table 3-3.

Table 3-3. RS-485 and RS-422 Cable Specifications

Impedance	135 to 165 ohms, at a frequency of 3 to 20 MHz
Capacitance	15-20 pf/ft
Loop resistance	110 ohms/km
Wire gauge	0.64 mm (22 AWG)
Conductor area	> 0.33 mm^2

The Type A cable (described here) is available with various protection characteristics: buried cable, cable with PE sheath, and so on. Refer to the cable manufacturer's specifications for details.

Ethernet Cables

Table 3-4 lists the standard Ethernet cables available from Foxboro.

Table 3-4. Ethernet Cables

Cable	Type
Category	CAT5
Connectors	RJ-45
Part Numbers and Length of Cable from Module to Hub/Switch/Device and/or from Hub/Switch to Device	P0972UB 0.5 m (1.6 ft), P0971XK 3 m (10 ft), P0971XL 15 m (50 ft), P0972MR 30 m (100 ft), P0971XM 50 m (165 ft), P0971XN 100 m (330 ft)
Null Hub Adapter - Crossover Cable	P0971PK

Intrinsic Safety Considerations

The FBM230/231/232/233, of itself, does not offer intrinsically safe operation. However, intrinsic safety can be achieved through the use of intrinsic safety barriers (such as those manufactured by the Pepperl & Fuchs Company). A safety barrier can be used as shown in Figure 3-2.

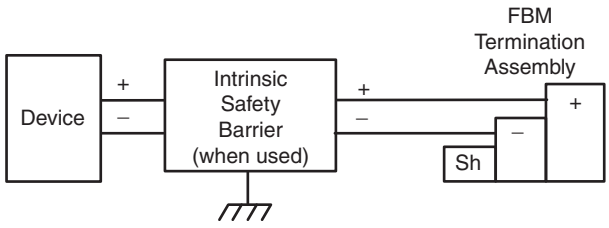


Figure 3-2. Intrinsic Safety Barrier Usage

4. Installation

This chapter provides installation information for the FBM230/231/232/233, any associated termination assembly (TA) and connection to the field device/network.

Before installing the FBM230/231/232/233, you must install the major elements of the I/A Series system equipment as follows:

1. Perform system definition (SysDef) by referring to the documents listed in the Preface of this document.
2. Install the FBM230/231/232/233's associated baseplate(s), if not already installed. Refer to *DIN Rail Mounted Subsystem User's Guide* (B0400FA).
3. Install the I/A Series software by referring to the documents listed in the Preface of this document.
4. Load the I/O Device Driver into an I/A Series system by following the instructions supplied with the specific I/O Device Driver. The I/O Device Driver and the FDSI Configurator are supplied on a separate CD.

This chapter describes the installation of each of the FBMs and is divided into the following major headings:

- "FBM230 Installation" on page 25. Serial non-redundant module.
- "FBM231 Installation" on page 43. Serial redundant module.
- "FBM232 Installation" on page 63. Ethernet non-redundant module.
- "FBM233 Installation" on page 70. Ethernet redundant module.

Refer to the Hardware Installation section of the protocol specific User's Guide which determines which FBM to use.

FBM230 Installation

A typical FBM230 installation is shown in Figure 4-1. As shown in Figure 4-1, the FBM230 mounts on the baseplate, and the termination assembly (TA) connects to the baseplate by means of a termination cable.

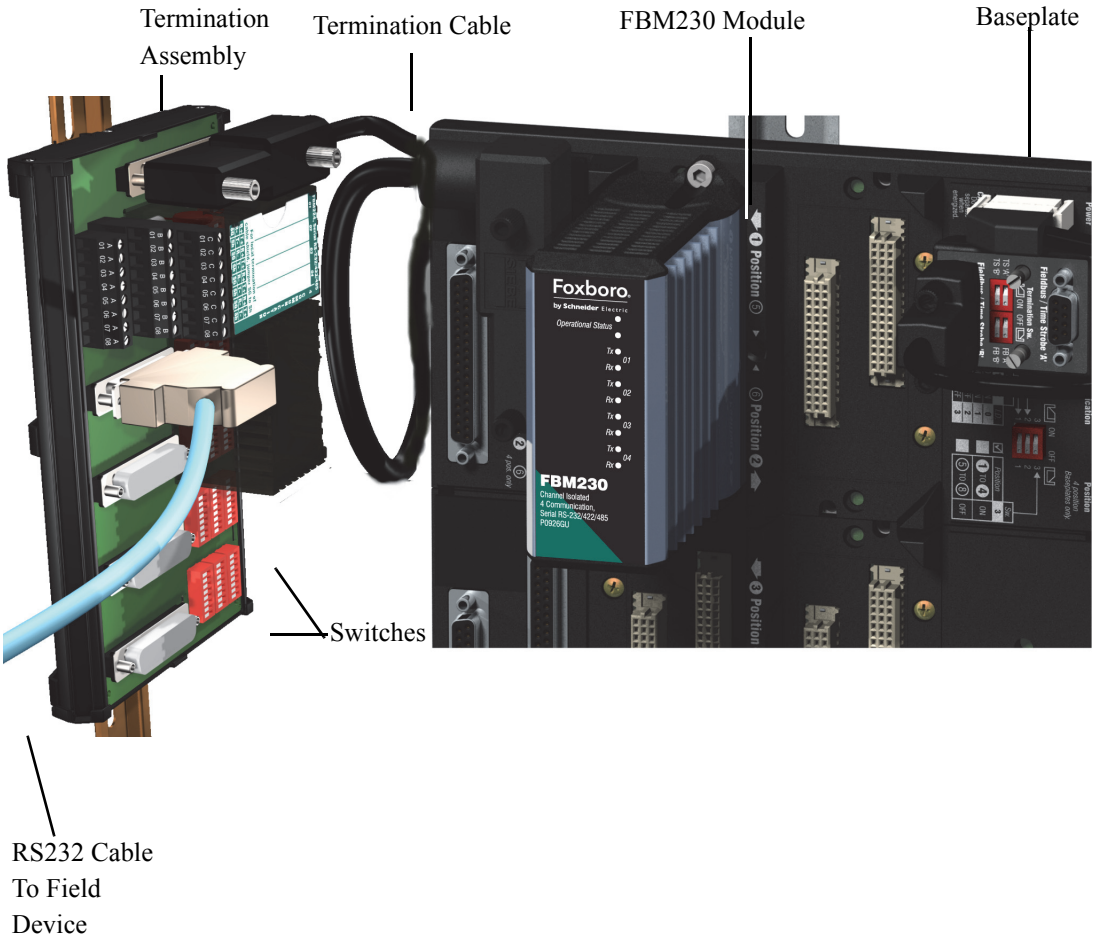


Figure 4-1. FBM230 and Termination Assembly

Figure 4-2 shows the available FBM mounting slots in the horizontal and vertical baseplates. The non-redundant FBM230 can be located in any slot on the baseplate.

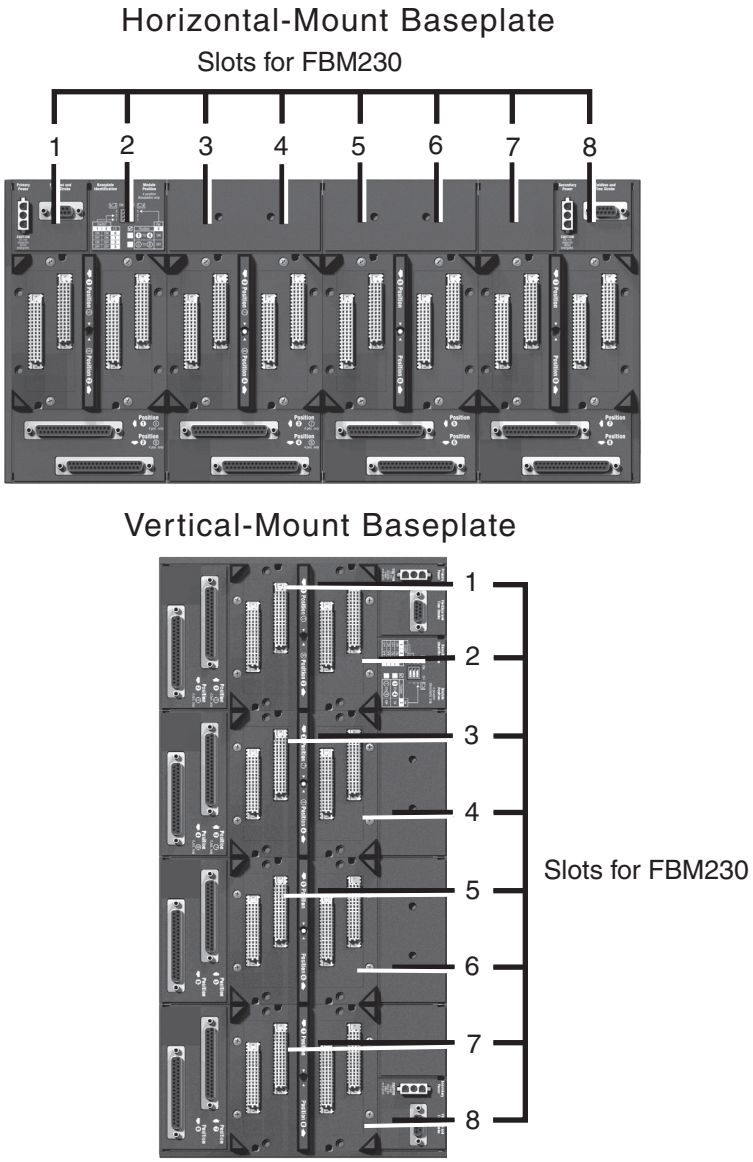


Figure 4-2. FBM230 Mounting Slots in Baseplate

The part numbers for the FBM230 and associated TA are listed in Table 4-1. Use a Type 5 communication cable between the FBM and the TA. Table 4-2 lists the available lengths and part numbers for a Type 5 communication cable for the FBM230.

Table 4-1. Part Numbers for the FBM230 and TA

Equipment	Part Number
FBM230	P0926GU
FBM230 Termination Assembly with Compression Screws	RH926GH (supersedes P0926GH)
FBM230 Termination Assembly with Ring-Lugs	P0926PA

Table 4-2. Termination Cables (Type 5) for the FBM230

Cable Part Number	Length
RH928AW (supersedes P0928AW)	1.0 (3.2)
RH928AX (supersedes P0928AX)	2.0 (6.6)
RH928AY (supersedes P0928AY)	3.0 (9.8)
RH928AZ (supersedes P0928AZ)	5.0 (16.4)

FBM230 Module Installation

For general instructions on installing the FBMs and TAs, refer to Figure 4-2 and the *DIN Rail Mounted Subsystem User's Guide* (B0400FA).

FBM230 Termination Assembly Installation

Install the FBM230 TA per the general installation instructions in *DIN Rail Mounted Subsystem User's Guide* (B0400FA).

The following subsection describes how to make the device cable connections to the TA.

FBM230 Termination Assembly Cable Connections

The (TA) provides physical connection of the devices to the FBM230 ports (see Figure 4-3). TA, P0926GH, has compression screws and TA, P0926PA (moved to Available), has ring-lugs for making field wire connections to/from the field devices. The compression screw TA is supplied with 8-jumpers (X0175LT) for jumpering RS-422 and RS-485 signals between screw terminals. The TAs provide for:

- connecting up to four RS-422 and/or RS-485 cables via screw compression or ring-lug terminals
  - selecting termination resistor for RS-422
  - selecting termination resistor for RS-485 when the FBM230 is located at end of the bus
- connecting up to four RS-232 devices via DB-25 cable connectors.
  - selecting and switching clear-to-send, request-to-send, and other RS-232 signals
- connecting an earthing point for RS-232/RS-422/RS-485 cable shields.

In an RS-485 configuration, the FBM230 can be located anywhere on the bus. If the FBM230 is located at the end of a bus, terminators on the TA are switch selectable (terminating resistors for the prevention of signal reflection). In an RS-422 configuration, switch selectable terminations on the TA are available for both the transmit and/or receive cables.

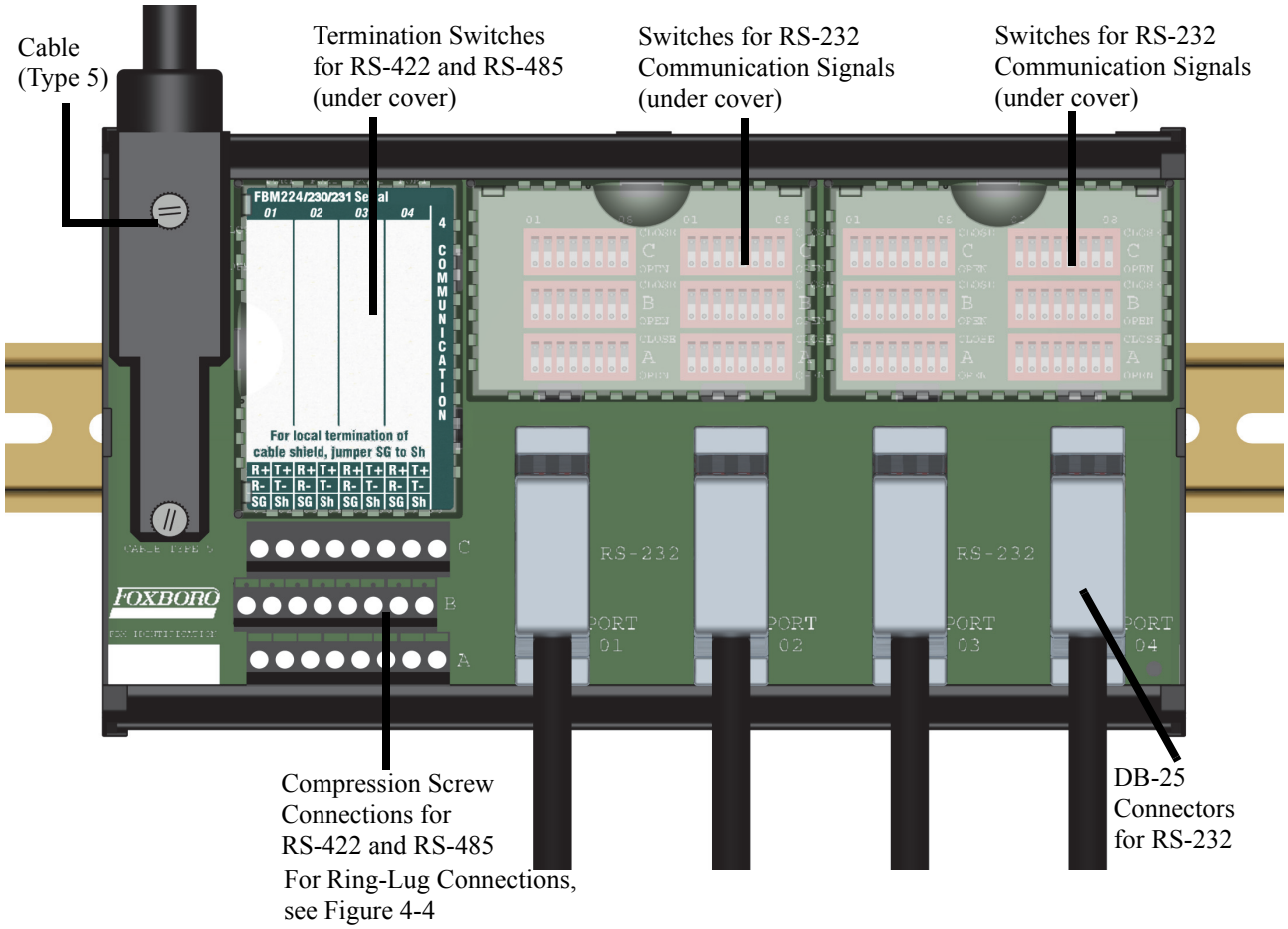


Figure 4-3. FBM230/231 Termination Assembly

RS-422 and RS-485 Cable Connections

Any of the four ports of an FBM230 can be RS-232, RS-422 or RS-485. The FBM230 ports are non-redundant to support single ported field devices. The communication standard for each port depends on the configuration of the FBM230 ports and the field device.

RS-485, two-wire, uses a twisted pair cable with one shield. It is bidirectional (transmit and receive are on the same pair) (see Figure 4-5 on page 31). Each RS-485 cable has a single pair (Rx/Tx+ and Rx/Tx-).

RS-422 uses a four-wire shielded cable. It has a transmit pair (TxD+/TxD-), a receive pair (RxD+/RxD-) and one shield (see Figure 4-8 on page 34).

The RS-422 and RS-485 cable connections are shown on the label of the FBM230 TA (see Figure 4-4). Whether a port is using RS-232, RS-422 and/or RS-485 depends on the configuration of the particular port and the field device. The termination assembly has four separate terminals, R+, T+, R-, and T-. For 2-wire RS-485 a jumper (supplied by Foxboro) is required between R+ and T+ and between R- and T-.

Cable shields are connected to the SG terminal for each port. SG is signal ground and Sh is frame ground. SG is the odd numbered (1, 3, 5 and 7) terminals on the TA. Sh is the even (2, 4, 6 and 8) numbered terminals on the TA.

The RS-232 communication switches for a configured RS-422 or RS-485 port should be set such that the C5 and C6 switches are in the CLOSED position and the rest of the switches are in the OPEN position.

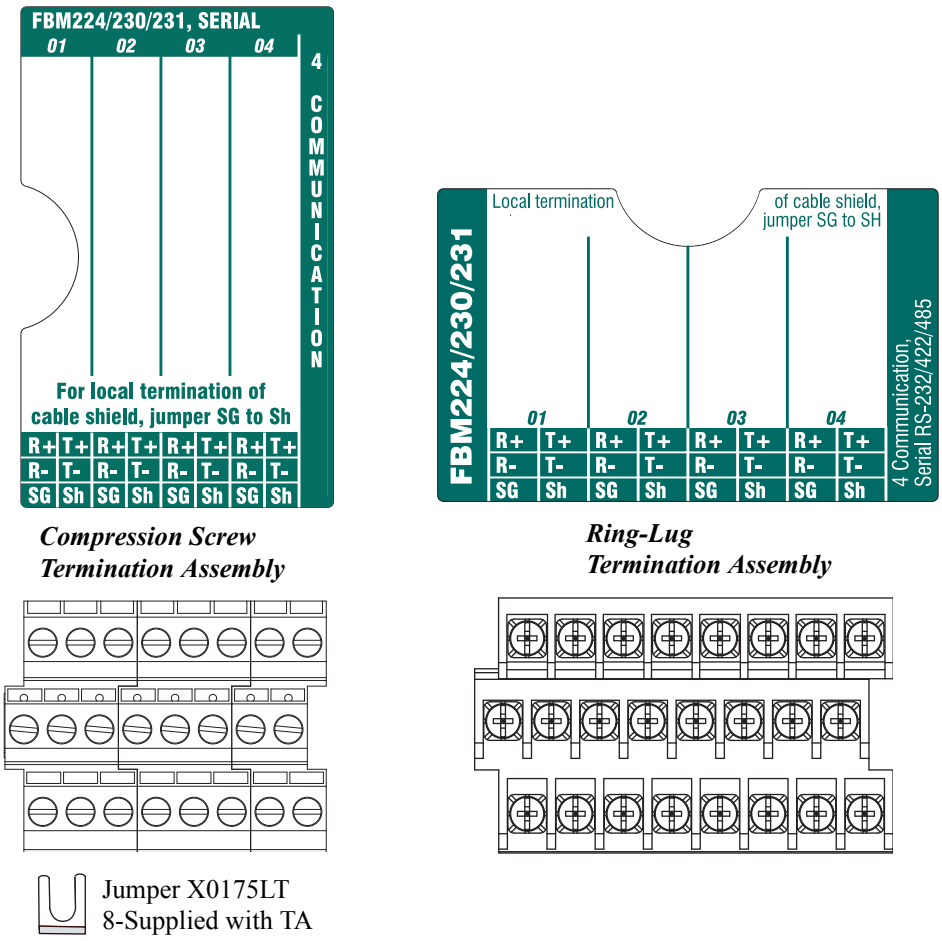


Figure 4-4. FBM230/231 Termination Assembly Labels for RS-422 and RS-485

RS-485 cabling configurations require consideration of where the master is located on the bus. The FBM230 can be located at the end of the bus, or it can be located at a point other than the end of the bus. When the FBM230 is located at the end of the RS-485 bus, connected and communicating to 2-wire RS-485 field devices, the terminator switches should be closed. Otherwise, the terminator switches should be open.

RS-422 configurations require device terminations at one end of the receive and transmit cables. The terminator switches should be closed, if the field device does not have terminating resistors on the transmit and receive cable. Otherwise, the terminator switches should be open.

Connecting an RS-485 Device to the FBM230 TA

In a non-redundant system, one twisted-pair cable from/to the single ported device is connected to compression connections on the TA. When the FBM230 is at a point along the length of the bus (but not at either end), one twisted-pair cable from/to the next device is connected to the TA to continue the bus to the next device. Refer to Figure 4-5. If connected to 2-wire RS-485 devices, external wiring from/to the device connects to the T+ and T- terminals. When the FBM230 is at an end point of the bus, you should close only one terminator switch (TX switch in the CLOSE

position) for each port. For cable specifications, refer to “RS-485 and RS-422 Cable Specifications” on page 22.

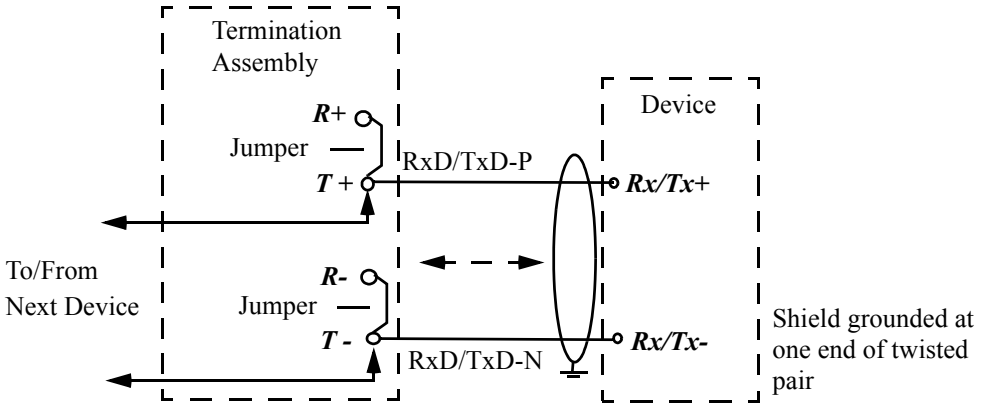


Figure 4-5. RS-485 (2-wire) Non-redundant Device Connection

To connect an RS-485 (2-wire) channel to the TA:

1. Route the RS-485 cable(s) through the I/A Series enclosure to the TA.
2. Use strain relief wire ties on the cable(s).
3. To make the device cable connections at the FBM230 TA when the FBM230/231 is at a point along the length of the bus (but not at either end point), proceed as follows:
   a. Connect the receive and transmit (RxD/TxD-P) wire to T+ (Port 1, 2, 3, or 4) and the receive and transmit (RxD/TxD-N) wire to T- (Port 1, 2, 3, or 4) compression screw or ring-lug terminals as shown in Figure 4-6.
   b. Connect the next device’s receive and transmit (RxD/TxD-P) wire to T+ (Port 1, 2, 3, or 4) and the receive and transmit (RxD/TxD-N) wire to T- (Port 1, 2, 3, or 4) compression screw or ring-lug terminals as shown in Figure 4-6.
   c. Connect a jumper (supplied with compression TAs) between (RxD/TxD-P) T+ (Port 1, 2, 3, or 4) and (RxD/TxD-P) R+ (Port 1, 2, 3, or 4) compression screw or ring-lug terminals as shown in Figure 4-6.
   d. Connect a jumper (supplied with compression TAs) between (RxD/TxD-N) T- (Port 1, 2, 3, or 4) and (RxD/TxD-N) R- (Port 1, 2, 3, or 4) compression screw or ring-lug terminals as shown in Figure 4-6.
   e. Connect the cable shield to the SG terminal of the TA. The cable shield must be grounded at only one end of the cable, not both. If the shield is not grounded at the device, connect a jumper wire between the Sh and the SG terminal of the TA. SG is the odd numbered (1, 3, 5 and 7) terminals on the TA. Sh is the even (2, 4, 6 and 8) numbered terminals on the TA.
   f. Set all RS-422/RS-485 bus termination switches for the channel to the open position (see Figure 4-12 on page 37).
   g. Set the RS-232 switches for the channel such that the C5 and C6 switches are in the CLOSED position and the rest of the switches are in the OPEN position (see Figure 4-15 on page 39).

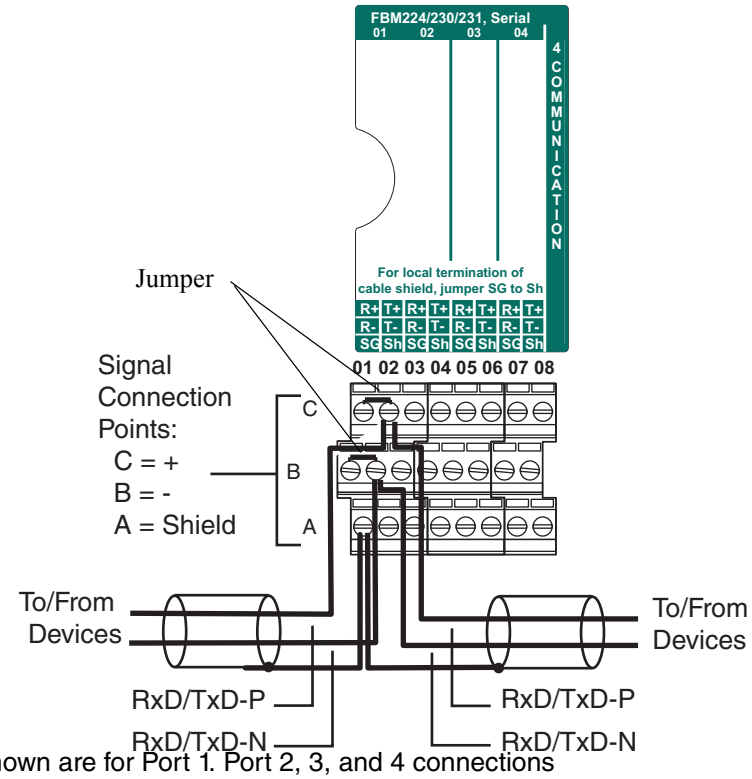
Input/Output Cabling

Port 1
C02 = RxD/TxD-P
B02 = RxD/TxD-N
A01 = Shield

Port 2
C04 = RxD/TxD-P
B04 = RxD/TxD-N
A03 = Shield

Port 3
C06 = RxD/TxD-P
B06 = RxD/TxD-N
A05 = Shield

Port 4
C08 = RxD/TxD-P
B08 = RxD/TxD-N
A07 = Shield



Note: Cable connections shown are for Port 1. Port 2, 3, and 4 connections are made in a similar manner.

Figure 4-6. RS-485 (2-wire) TA Cable Connections, FBM230 Located Mid Bus

4. If the FBM230 is located at either end point of the RS-485 bus,
   - **a.** Connect the transmit/receive (RxD/TxD-P) wire to T+ (Port 1, 2, 3, or 4) and the receive/transmit (RxD/TxD-N) wire to T- (Port 1, 2, 3, or 4) compression screw or ring-lug terminal as shown in Figure 4-7.
   - **b.** Connect a jumper (supplied with compression TAs) between (RxD/TxD-P) T+ (Port 1, 2, 3, or 4) and (RxD/TxD-P) R+ (Port 1, 2, 3, or 4) compression screw or ring-lug terminals as shown in Figure 4-7.
   - **c.** Connect a jumper (supplied with compression TAs) between (RxD/TxD-N) T- (Port 1, 2, 3, or 4) and (RxD/TxD-N) R- (Port 1, 2, 3, or 4) compression screw or ring-lug terminals as shown in Figure 4-7.
   - **d.** Connect the cable shield to the SG terminal of the TA. The cable shield must be grounded at only one end of the cable, not both. If the shield is not grounded at the device, connect a jumper wire between the Sh and the SG terminal of the TA. SG is the odd numbered (1, 3, 5 and 7) terminals on the TA. Sh is the even (2, 4, 6 and 8) numbered terminals on the TA.
   - **e.** Set the RS-232 switches for the channel such that the C5 and C6 switches are in the CLOSED position and the rest of the switches are in the OPEN position (see Figure 4-15 on page 39).
   - **f.** Terminate the bus as described in “TA Terminations For RS-422 or RS-485” on page 35.

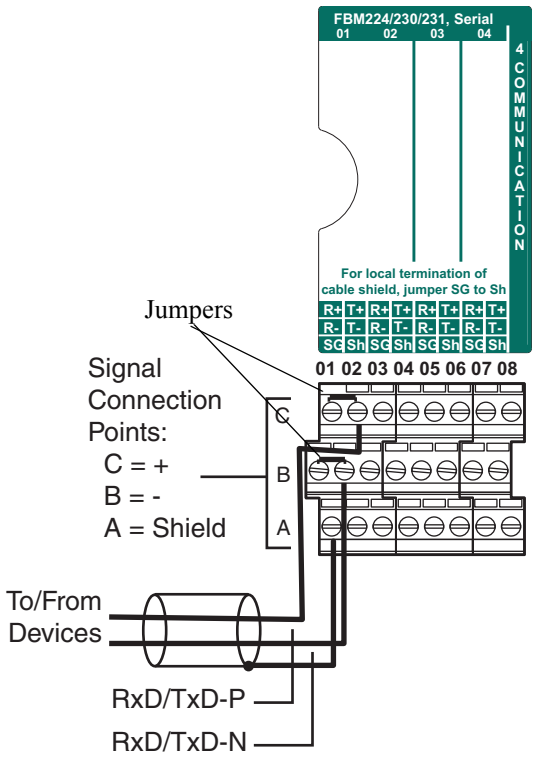
Input/Output Cabling

Port 1
C02 = RxD/TxD-P
B02 = RxD/TxD-N
A01 = Shield

Port 2
C04 = RxD/TxD-P
B04 = RxD/TxD-N
A03 = Shield

Port 3
C06 = RxD/TxD-P
B06 = RxD/TxD-N
A05 = Shield

Port 4
C08 = RxD/TxD-P
B08 = RxD/TxD-N
A07 = Shield



Note: Cable connections shown are for Port 1. Ports 2, 3, and 4 connections are made in a similar manner.

Figure 4-7. RS-485 (2-wire) TA Cable Connections, FBM230 Located at Bus End Point

NOTE

RS-485 configurations require device terminations at **both** ends of the bus. All other devices on the bus **must not** be terminated.

Connecting an RS-422 Device to the FBM230 TA

In a non-redundant RS-422 system, one cable, consisting of a pair of transmit wires, a pair of receive wires and one shield, can be connected to the compression or ring-lug connections on the TA. See Figure 4-8. RS-422 configurations require device terminations at one end of the receive and transmit cables. The terminator switches should be closed, if the field device does not have terminating resistors on the transmit and receive cable. Otherwise, the terminator switches should be open.

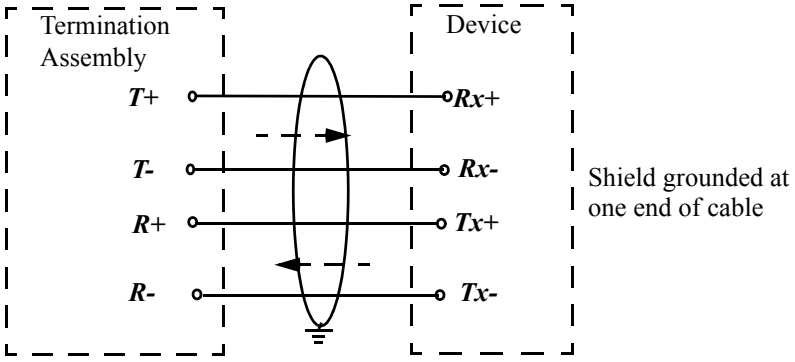


Figure 4-8. RS-422 Non-redundant Connection

To connect an RS-422 channel to the TA:

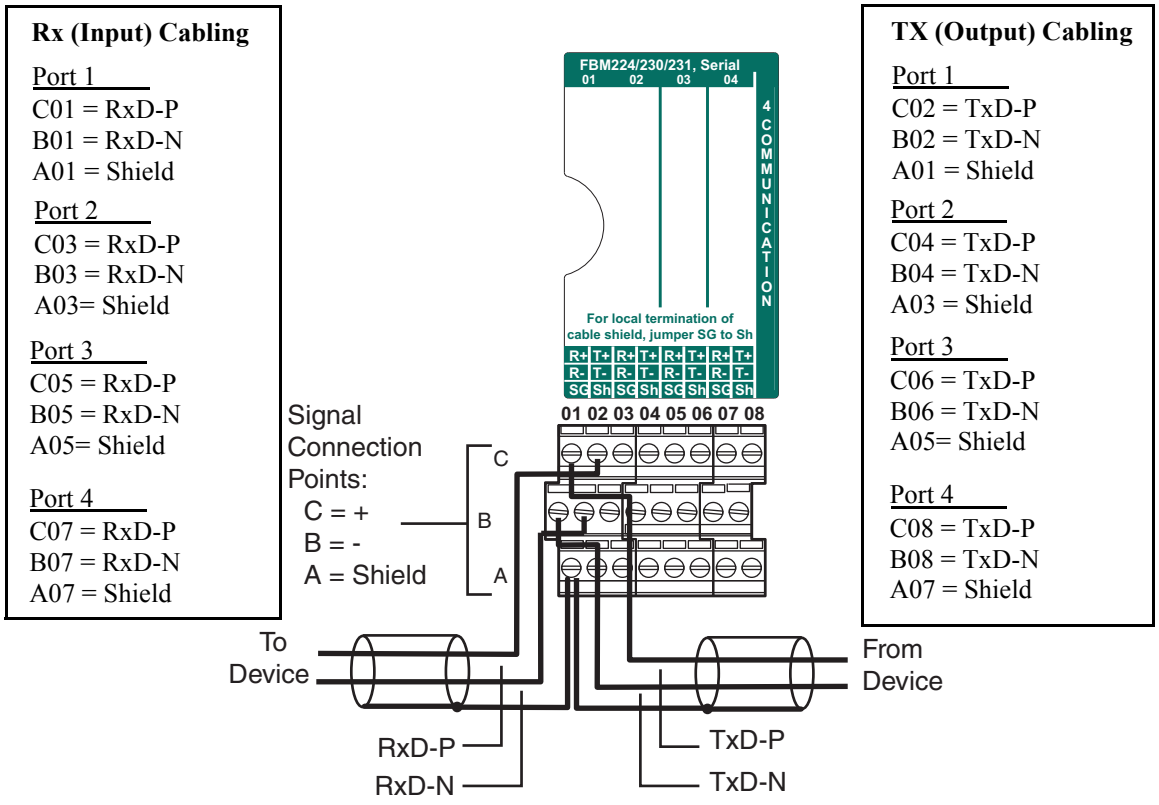
1. Route the RS-422 cable(s) through the I/A Series enclosure to the TA.
2. Use strain relief wire ties on the cable(s).
3. To make the device cable connections at the FBM230 TA for RS-422, proceed as follows:
   - **a.** Connect the receive cable (RxD-P and RxD-N) to T+ and T- (Port 1, 2, 3, or 4) compression screw or ring-lug terminal as shown in Figure 4-9.
   - **b.** Connect the receive cable shield to the SG (Port 1, 2, 3, or 4) compression screw or ring-lug terminal as shown in Figure 4-9. SG is the odd numbered (1, 3, 5 and 7) terminals on the TA.
   - **c.** If the shield is not grounded at the device, connect a jumper wire between the Sh and the SG (Port 1, 2, 3, or 4) compression screw or ring-lug terminal as shown in Figure 4-9. Sh is the even (2, 4, 6 and 8) numbered terminals on the TA.

     The cable shield must be grounded at only one end of the cable, not both.
   - **d.** Connect the transmit cable (TxD-P and TxD-N) to R+ and R- (Port 1, 2, 3, or 4) compression screw or ring-lug terminal as shown in Figure 4-9.
   - **e.** Connect the transmit cable shield to the SG (Port 1, 2, 3, or 4) compression screw or ring-lug terminal as shown in Figure 4-9.
   - **f.** If the shield is not grounded at the device, connect a jumper wire between the Sh and the SG (Port 1, 2, 3, or 4) compression screw or ring-lug terminal as shown in Figure 4-9.

     The cable shield must be grounded at only one end of the cable, not both.
   - **g.** Set the RS-232 switches for the channel such that the C5 and C6 switches are in the CLOSED position and the rest of the switches are in the OPEN position (see Figure 4-15 on page 39).
   - **h.** Terminate the bus as described in “TA Terminations For RS-422 or RS-485” on page 35.

— NOTE

RS-422 configurations require device terminations at **one** end of the transmit and receive bus.



Note: Cable connections shown are for Port 1. Port 2, 3, and 4 connections are made in a similar manner.

Figure 4-9. RS-422 TA Cable Connections

TA Terminations For RS-422 or RS-485

Eight termination resistors for an RS-422 or RS-485 bus are available on the TA to terminate the field device or RS-485 bus. Each of the four FBM230 ports has a transmit and a receive resistor that is placed across the bus/field device when the switch is switched to the CLOSE position.

RS-485 configurations require device terminations at both ends of the bus. All other devices on the bus segment must not be terminated. When the FBM230 is located at either end of the bus, it must be terminated. Figure 4-10 shows the terminating scheme for RS-485. For RS-485, the twisted-pair cable can be terminated on the TA (Tx switch in the CLOSE position).

RS-422 configurations require device terminations at one end of the receive and transmit cables. Figure 4-11 shows the terminating scheme for RS-422. For RS-422, both the transmit and receive cables can be terminated on the TA (Tx and Rx switch in the CLOSE position).

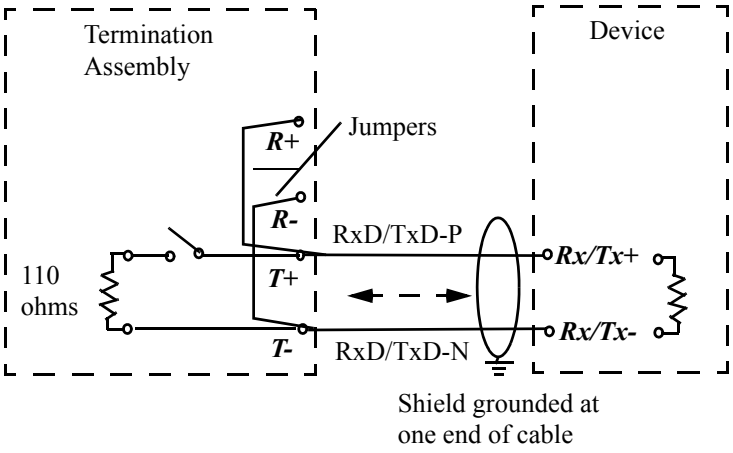


Figure 4-10. RS-485 (2-wire) Termination Resistor

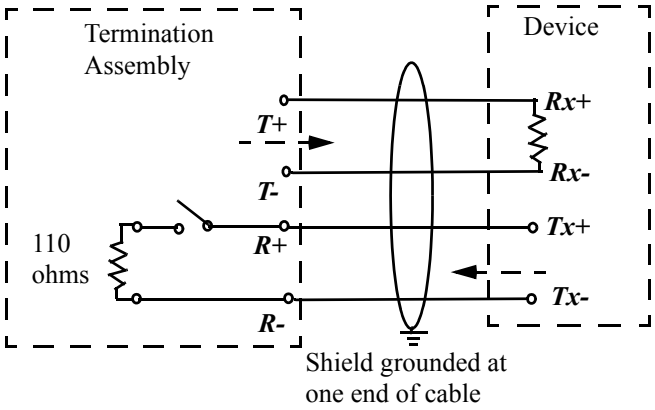


Figure 4-11. RS-422 Termination Resistor

To make RS-422 terminations or RS-485 bus terminations with the FBM230 located at the end point of the bus, proceed as follows:

NOTE

1. RS-485 configurations require device terminations at **both** ends of the bus. All other devices on the bus segment **must not** be terminated.
2. RS-422 configurations require device terminations at **one** end of the receive and transmit cables.

1. Remove the plastic housing next to the compression screws on the TA by squeezing the plastic housing on both sides and lifting the housing.
2. Press the required termination switch on the TA to the CLOSE position (termination) (refer to Figure 4-12 for compression screw TAs and to Figure 4-13 for ring-lug TAs) for each cable requiring termination. This provides line termination by inserting termination resistors across the line.

— NOTE

Set unused PORTn Tx and Rx switches to the OPEN position.

3. Terminate Ports 1, 2, 3 and/or 4 (if used) in the same manner (see Figure 4-12).

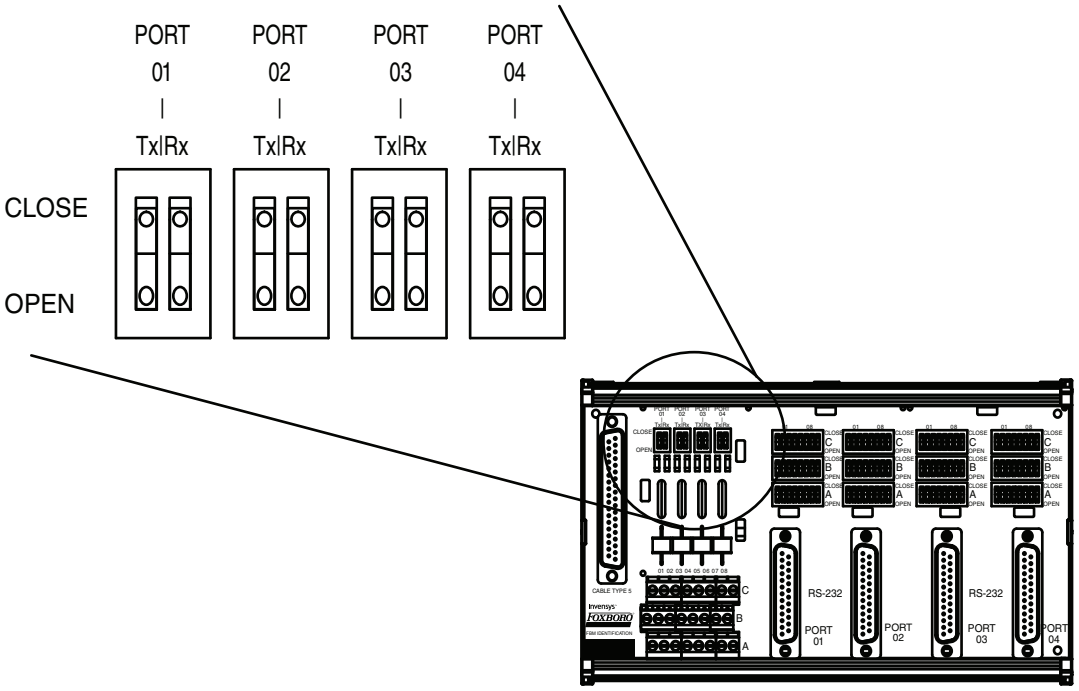


Figure 4-12. Compression Screw TA RS-422 and RS-485 Termination Switches

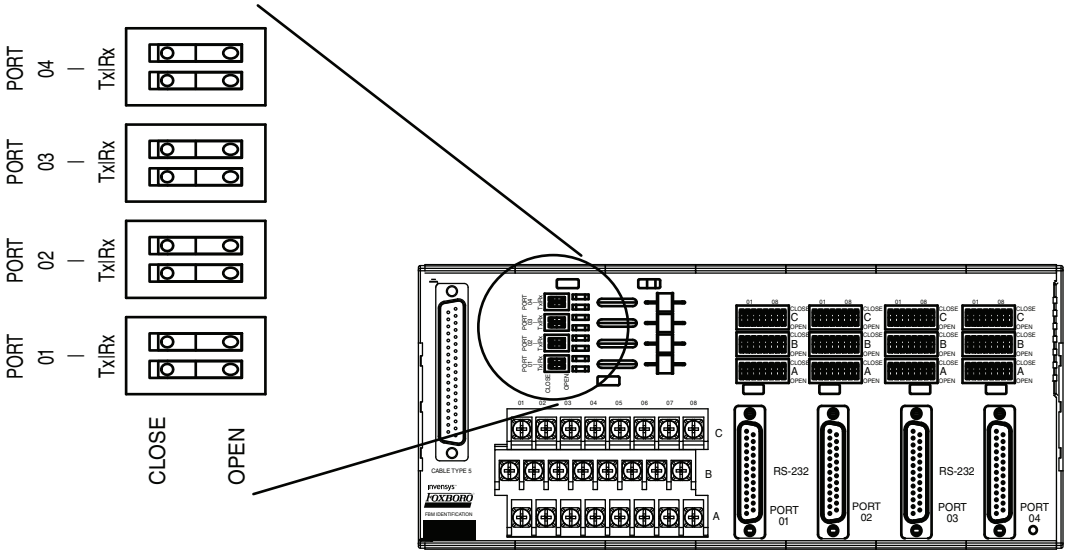


Figure 4-13. Ring-Lug TA RS-422 and RS-485 Termination Switches

4. Replace the plastic housing covering the termination resistors.

RS-232 Cable Connections

Any of the four ports of an FBM230 can be RS-232, RS-422, or RS-485. Each port of an FBM230 supports a non-redundant single ported device.

RS-232 devices cannot be more than 15 m (50 ft) cable length from the FBM230, per EIA standards. RS-232 uses the DB-25 connectors on the TA.

Connecting an RS-232 Port to the TA

In a non-redundant system, one input/output cable to/from the device per each FBM230 port is made to the RS-232 DB-25 connectors on the TA.

The following figure (Figure 4-14) is an example of RS-232 non-redundant port and direct cabling for a single ported device. Cabling requirements for third-party devices must be provided by the third party. For cable standard RS232, refer to “RS-232 Cables” on page 22.

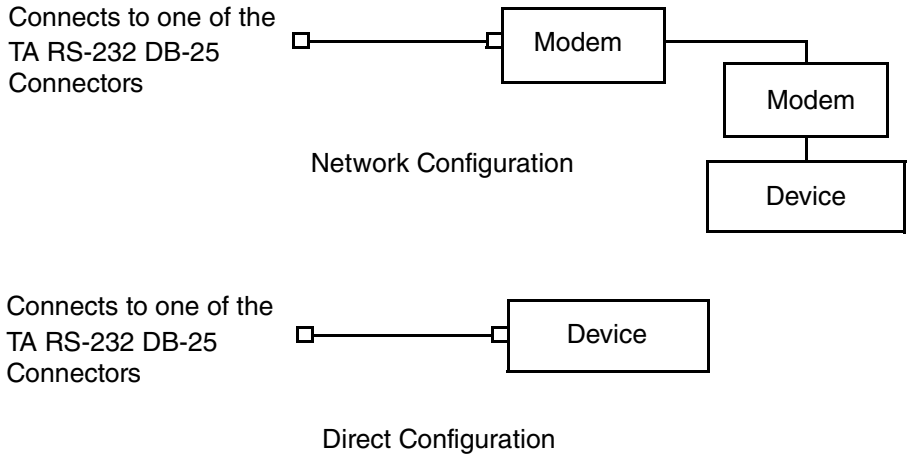


Figure 4-14. RS-232 FBM230 Direct Cabling Configuration, Example

To connect a single ported device to the TA for RS-232 communication:

1. Turn off device equipment power.
2. Determine the device to be connected and connect the appropriate cable to the device.
3. Connect the signal cable shield at the device end (modem, programmable controller, device, and so on) to a suitable earthing point on the device.
4. Route the RS-232 cable(s) through the I/A Series enclosure to the TA.
5. Use strain relief wire ties on the cable(s).
6. Remove the dust cover from the DB-25 connector on the TA for the port(s) (PORT 01, 02, 03, and/or 04) that is configured for RS-232 communications.
7. Connect the DB-25 connector from the device to PORT 01, 02, 03, and/or 04 female connector.
8. If the signal cable shield is not connected to an earthing connection at the device (refer to Step 3), connect a jumper between the Sh screw compression terminal and

the SG screw compression terminal for Port 01, 02, 03, or 04 (See Figure 4-4 on page 30) of the TA.

The cable shield must be earthed at only one end of the cable, not both. At the TA, the shield for the DB-25 cable is not normally connected to earth on the TA. Connecting a jumper wire between the Sh and the SG terminal on the TA earths the shield to frame earth.

9. Set the RS-232 switches on the TA. Refer to "TA RS-232 Switch Settings" on page 39.

FBM230 TA RS-232 Switches

The RS-232 switches located on the TA consist of 24 switches for each port that you must configure before communication between the FBM230/231and its devices can begin. The switch settings depend on the device and the cable between the switches and the device.

Figure 4-15 shows the 24 switches in four groups (PORT 01 to PORT 04). Each port has 3 switch banks with a total of 24 individual switches per port. Each switch bank A, B, and C has 8 switches labeled 01 to 08. The designator CLOSE indicates that the switch is closed, when the switch is in the pressed down position.

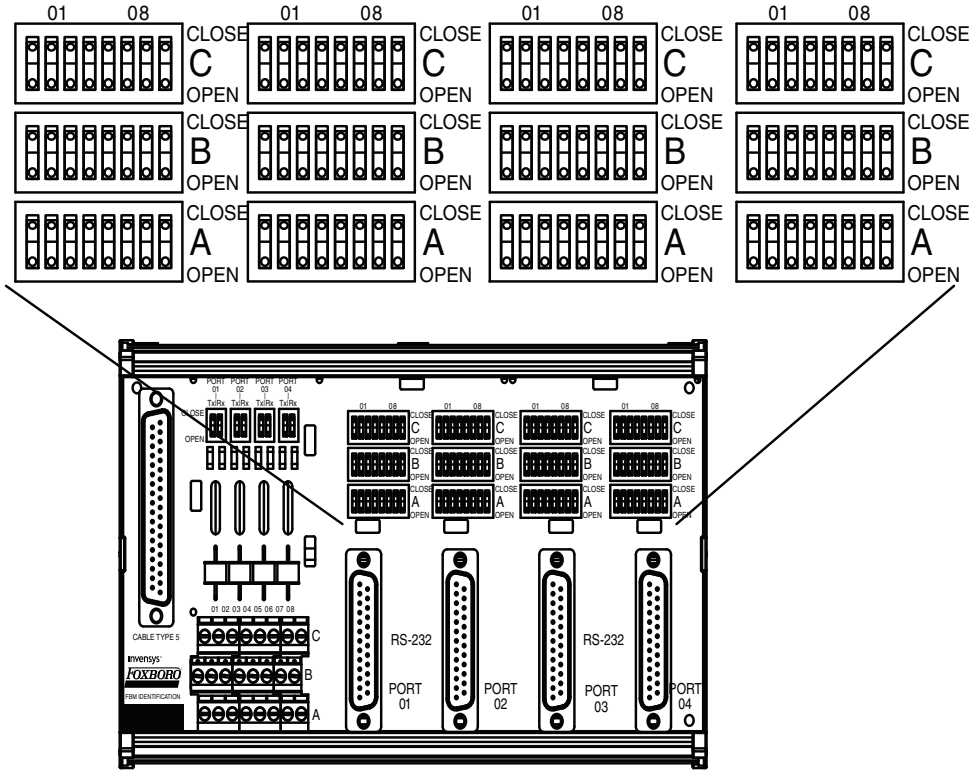


Figure 4-15. FBM230 TA RS-232 Switches

TA RS-232 Switch Settings

The TA has 24 individual switches per port that are set open or closed depending on the device, and the type of cable. The switch settings for each of the four ports are identical. However, the user-configured port usage (RS-422 or RS-485 versus RS-232) for each port and the cable connected to the port, determines the required switch settings for each port. Figure 4-15 shows the

switches and the communication signal that is routed for each switch closure. Any switch not closed for a given configuration is set to open (OPEN position).

Use a serial port adapter DB-9 female connector to DB-25 female connector for devices that require a DB-9 connector. Table 4-3 correlates the DB-25 to DB-9 pin connections

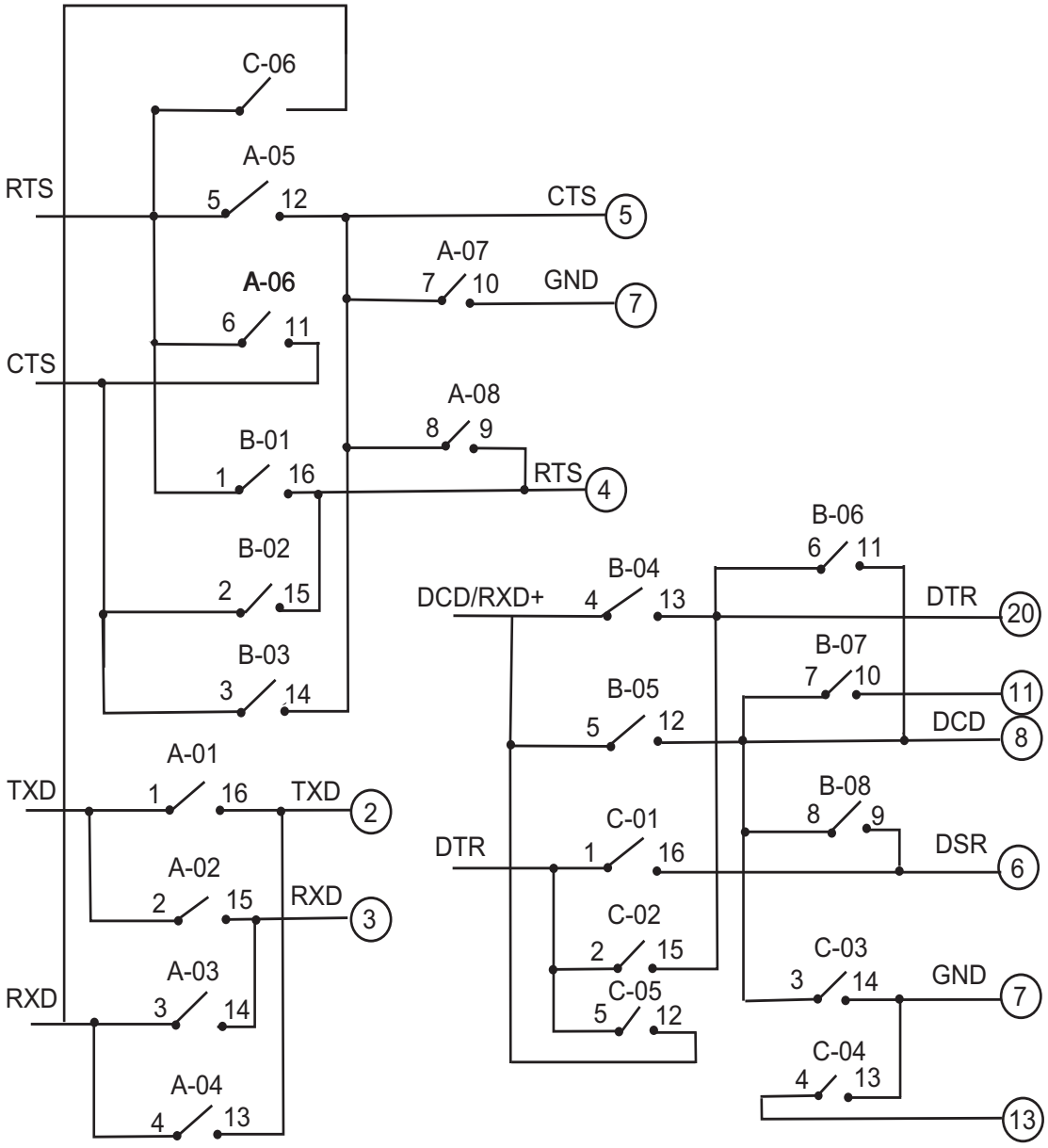
Table 4-3. Serial Port Adapter Pin Connections

Female DB-9 Pin	Female DB-25 Pin
1	8
2	3
3	2
4	20
5	7
6	6
7	4
8	5
9	22

FBM230 Termination Assembly RS-232 Switch Pinout

Figure 4-16 shows the Clear (CTS) and Request-to-Send (RTS), Data Carrier Detected (DCD), Transmit (TXD) and Receive Data (RXD) switches from the output of the DB-25 cable to the field device. Using this figure, you can select different RS-232 switch settings for various cable configurations. Figure 4-16 shows the switch settings for only Port 1. The switch settings for each of the four ports, switch numbers, and pinouts are identical for each port.

Figure 4-17 shows the switch settings (only Port 1) for a standard handshake connection. Figure 4-18 shows the switch settings (only Port 1) for a no-handshake connection. Figure 4-19 shows the switch settings (only Port 1) for a modem connection. Switch settings for Ports 2, 3, and 4 are the same. The figures are examples and show general switch settings. You should refer to the vendors document to understand the communication requirements for a particular device and then set the switches accordingly.



NOTES:

1. Numbers in circles are DB-25 connector pin numbers.
2. Pin numbers for switches are the same for each port.
3. Switch numbers for each port are shown in the following table:

Port 1	Port 2	Port 3	Port 4
C	C	C	C
B	B	B	B
A	A	A	A

4. See Table 4-3 for Port Adapter DB-25 to DB-9 pin connections.
5. Switches C-07 and C-08 are not used and can be in any position (CLOSED or OPEN).

Figure 4-16. RS-232 TA Switches

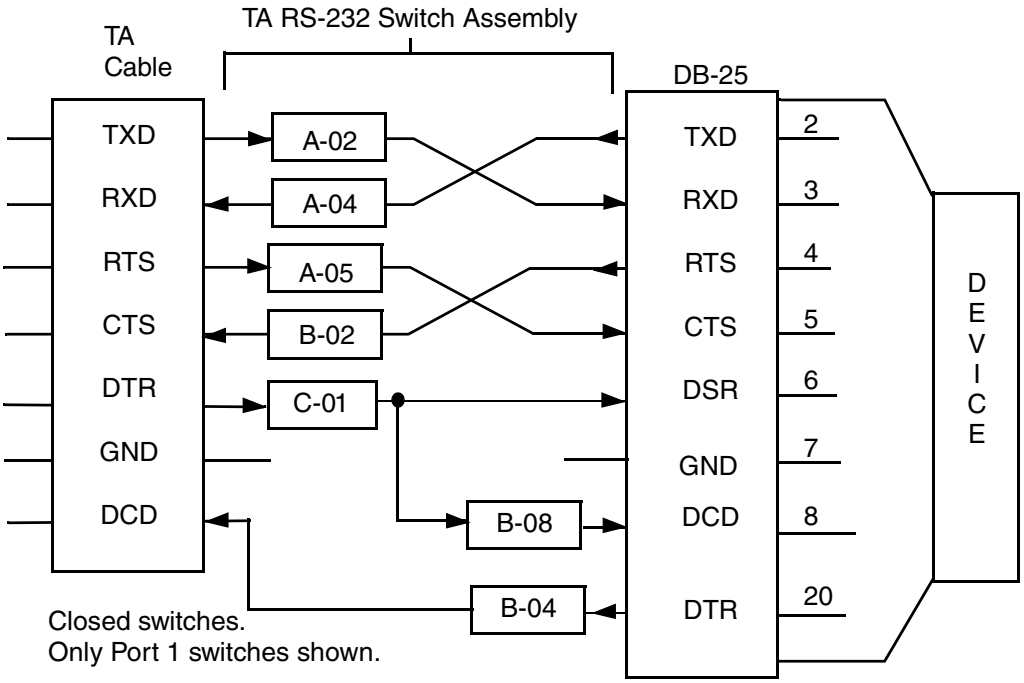


Figure 4-17. RS-232 Switches, Null Modem - Standard Handshake

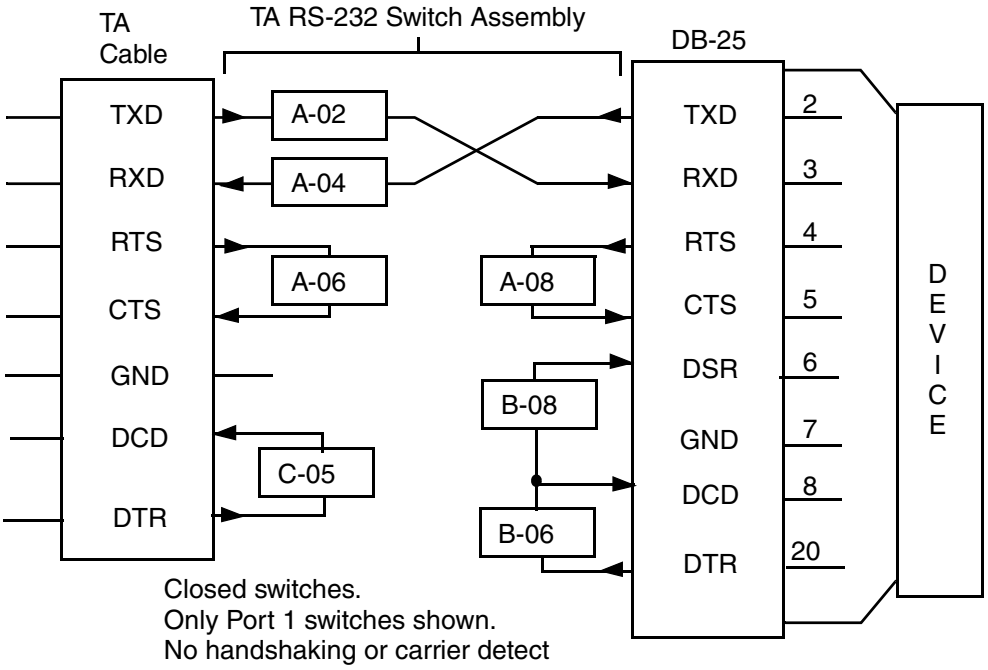


Figure 4-18. RS-232 Switches, Null Modem - No Handshake

⚠ CAUTION

Partial handshakes can be provided by combinations of the configurations shown in Figure 4-17 and Figure 4-18. Refer to device documentation for specific device requirements.

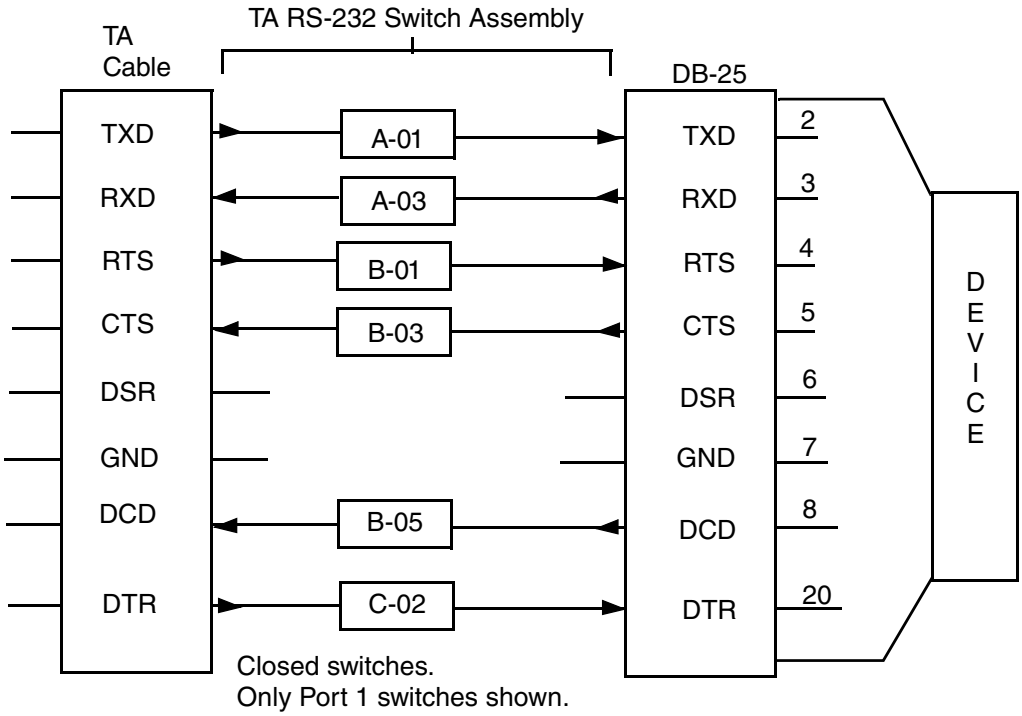


Figure 4-19. RS-232 Switches, Modem Connection (Typical)

FBM231 Installation

A typical FBM231 installation is shown in Figure 4-20. As shown in Figure 4-20, the FBM231 mounts on the baseplate, and the termination assemblies (TAs) connect to the baseplate by means of termination cables. The FBM231 installation is identical to the FBM230, except that there are two modules, two termination assemblies, two termination cables, and two cables to the redundant field device. The FBM231 termination cables and termination assemblies are identical to the FBM230 termination cable and TA.

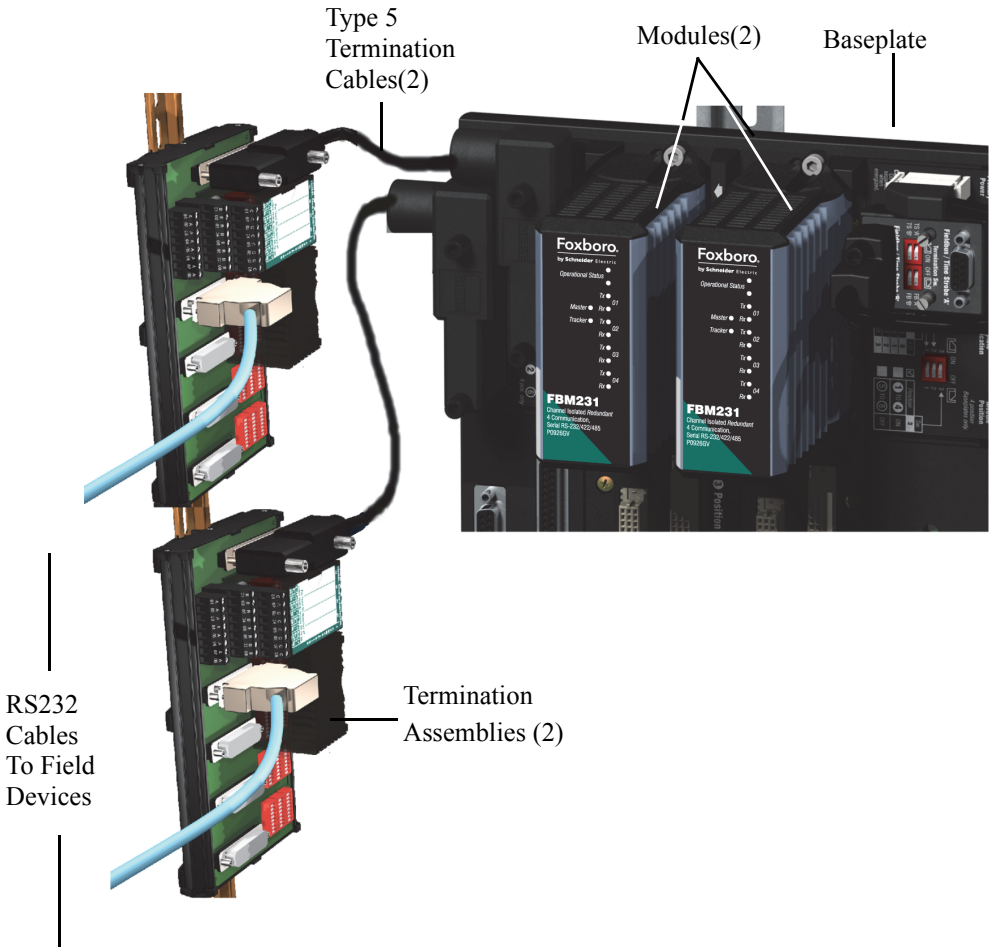


Figure 4-20. FBM231 and Termination Assemblies

Figure 4-21 shows the available FBM mounting slots in the horizontal and vertical baseplates. The redundant FBM231 must be located in adjacent positions on the baseplate (positions 1 and 2, 3 and 4, 5 and 6 or 7 and 8).

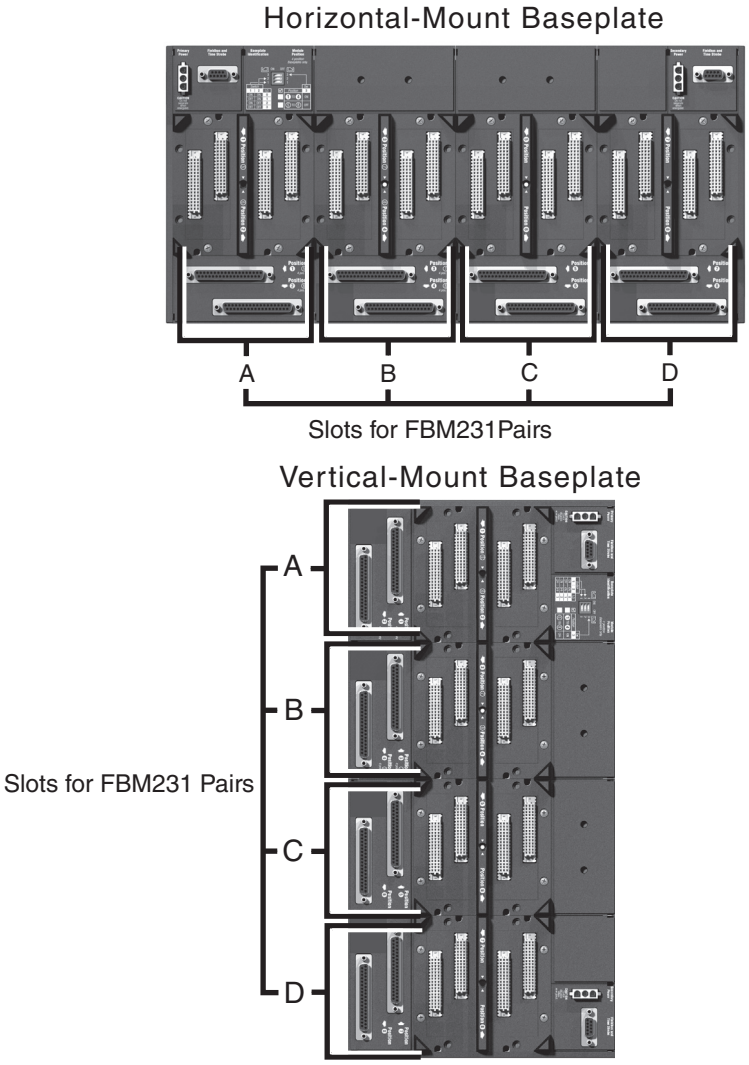


Figure 4-21. FBM231 Mounting Slots in Baseplate

The part numbers for the FBM231 and associated TAs are listed in Table 4-4. Use Type 5 Communication cables between the FBM and the TA. Table 4-5 lists the available lengths and part numbers for Type 5 communication cables for the FBM231.

Table 4-4. Part Numbers for FBM231 and TAs

Equipment	Part Number
FBM231	P0926GV
FBM231 Termination Assembly with Compression Screws	RH926GH (supersedes P0926GH)
FBM231 Termination Assembly with Ring- Lugs	P0926PA

Table 4-5. Termination Cables (Type 5) for FBM231

Cable Part Number	Length
RH928AW (supersedes P0928AW)	1.0 m (3.2 ft)
RH928AX (supersedes P0928AX)	2.0 m (6.6 ft)
RH928AY (supersedes P0928AY)	3.0 m (9.8 ft)
RH928AZ (supersedes P0928AZ)	5.0 m (16.4 ft)

FBM231 Module Installation

For instructions on installing the two modules of the FBM231, refer to Figure 4-21 and the *DIN Rail Mounted Subsystem User's Guide* (B0400FA).

FBM231 Termination Assemblies Installation

Install the two FBM231 TAs per the installation instructions in *DIN Rail Mounted Subsystem User's Guide* (B0400FA).

The following subsection describes how to make the device cable connections to the TA.

FBM231 Termination Assembly Cable Connections

Each of the TAs provide physical connection for each port of a dual ported device to the FBM231 ports (see Figure 4-22). TA, P0926GH, has compression screws and TA, P0926PA (moved to Available), has ring-lugs for making field wire connections to/from the field devices. Each of the compression screw TAs are supplied with 8-jumpers (X0175LT) for jumpering RS-422 and RS-485 signals between screw terminals. Each of the two TAs provide for:

- connecting up to four RS-422 and/or RS-485 cables via screw compression or ring-lug terminals
  - selecting termination resistor for RS-422
  - selecting termination resistor for RS-485 when the FBM231 is located at end of the bus
- connecting up to four RS-232 devices via DB-25 cable connectors.
  - selecting and switching clear-to-send, request-to-send, and other RS-232 signals
- connecting an earthing point for RS-232/RS-422/RS-485 cable shields.

In an RS-485 configuration, the FBM231 can be located anywhere on the bus. If the FBM231 is located at the end of a bus, terminators on the TA are switch selectable (terminating resistors for the prevention of signal reflection). In an RS-422 configuration, switch selectable terminations on the TA are available for both the transmit and/or receive cables.

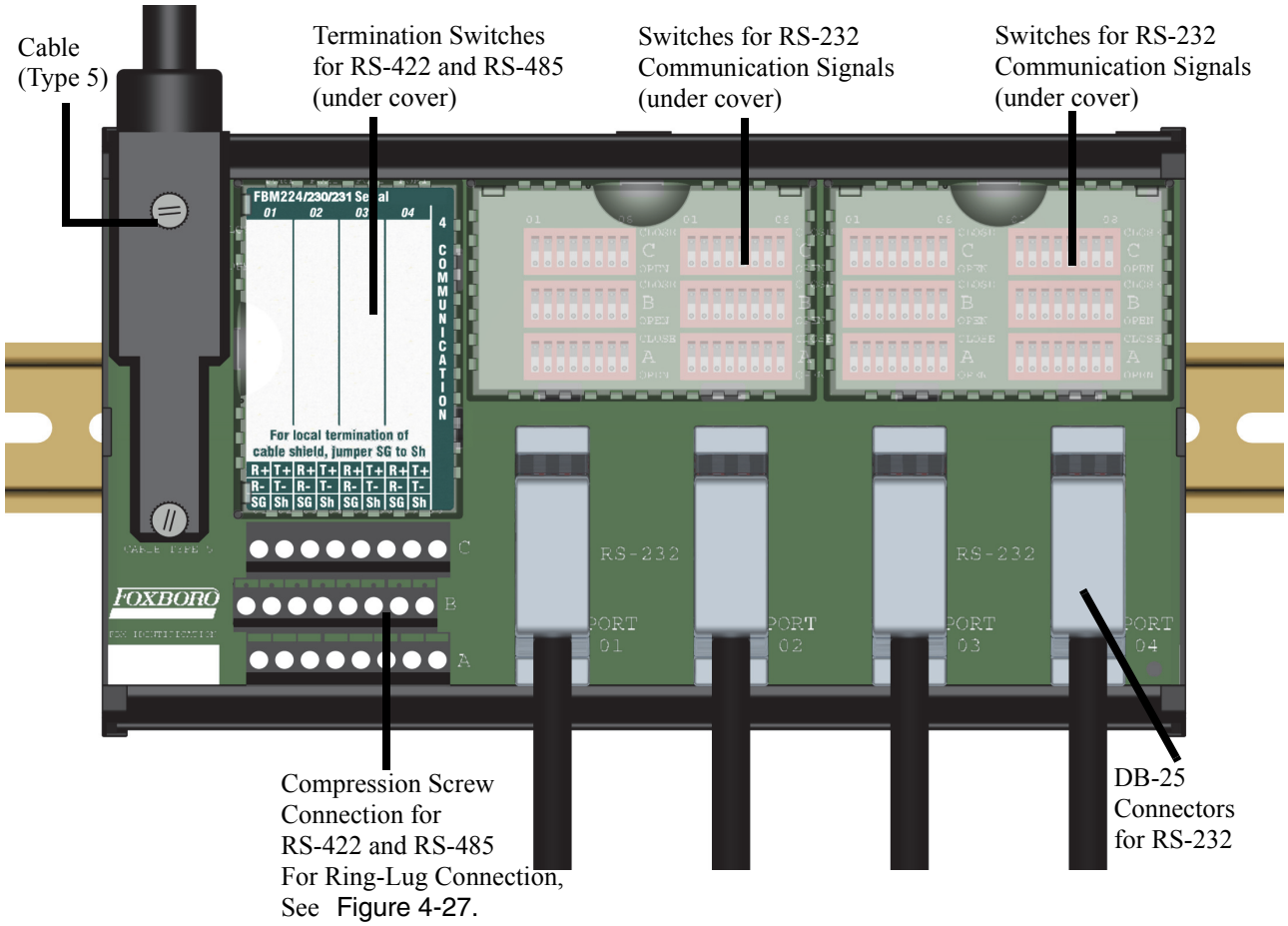


Figure 4-22. FBM231 Termination Assembly (one shown)

RS-422 and RS-485 Cable Connections

Each of the four redundant ports of the FBM231 can be RS-232, RS-422 or RS-485. The FBM231 ports are redundant to support dual ported devices. The communication standard for each redundant port depends on the configuration of the FBM231 ports and the field device.

RS-485, two-wire, uses a twisted pair cable with one shield. It is bidirectional (transmit and receive are on the same pair) (see Figure 4-24 on page 49). Each RS-485 cable has a single pair (Rx/Tx+ and Rx/Tx-).

RS-422 uses a four-wire shielded cable. It has a transmit pair (TxD+/TxD-), a receive pair (RxD+/RxD-) and one shield (see Figure 4-27 on page 52).

The RS-422 and RS-485 cable connections are shown on the label of each or the FBM231 TAs (see Figure 4-22). As indicated on the label for each TA, an FBM231 has four separate communication ports. Whether a port is using RS-232, RS-422 and/or RS-485 depends on the configuration of the particular port and the field device. Each termination assembly has four separate terminals, R+, T+, R-, and T-. For 2-wire RS-485 a jumper (supplied by Foxboro) is required between R+ and T+ and between R- and T-.

Cable shields are connected to the SG terminal for each port. SG is signal ground and Sh is frame ground. SG is the odd numbered (1, 3, 5 and 7) terminals on the TA. Sh is the even (2, 4, 6 and 8) numbered terminals on the TA.

The RS-232 communication switches for a configured RS-422 or RS-485 port should be set such that the C5 and C6 switches are in the CLOSED position and the rest of the switches are in the OPEN position.

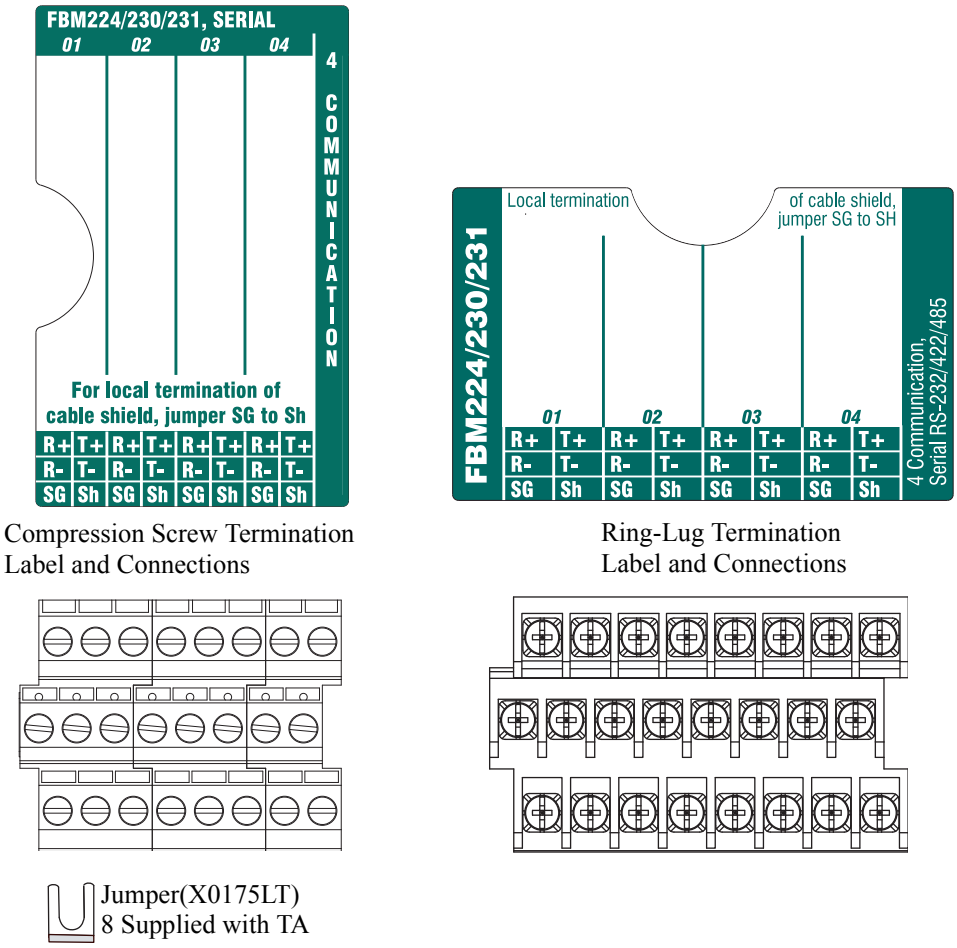


Figure 4-23. FBM231 Termination Assembly Label (One Shown) for RS-422 and RS-485

RS-485 cabling configurations require consideration of where the master is located on the bus. The FBM231 can be located at the end of the bus, or it can be located at a point other than the end of the bus. When the FBM231 is located at the end of the RS-485 bus, connected and communicating to 2-wire RS-485 field devices, the terminator switches should be closed. Otherwise, the terminator switches should be open.

RS-422 configurations require device terminations at one end of the receive and transmit cables. The terminator switches should be closed, if the field device does not have terminating resistors on the transmit and receive cable. Otherwise, the terminator switches should be open.

Connecting an RS-485 Device to the FBM231 TA

In a redundant system, one twisted-pair cable from/to each port of the dual ported device is connected to compression connections on each TA. When the FBM231 is at a point along the length of the bus (but not at either end), one twisted-pair cable from/to the next device is connected to the TA to continue the bus to the next device. Refer to Figure 4-24. If connected to 2-wire RS-485 devices, external wiring from/to the device connects to the T+ and T- terminals. When the FBM231 is at an end point of the bus, you should close only one terminator switch (TX switch in

the CLOSE position) for each redundant port. For cable specifications, refer to "RS-485 and RS-422 Cable Specifications" on page 22.

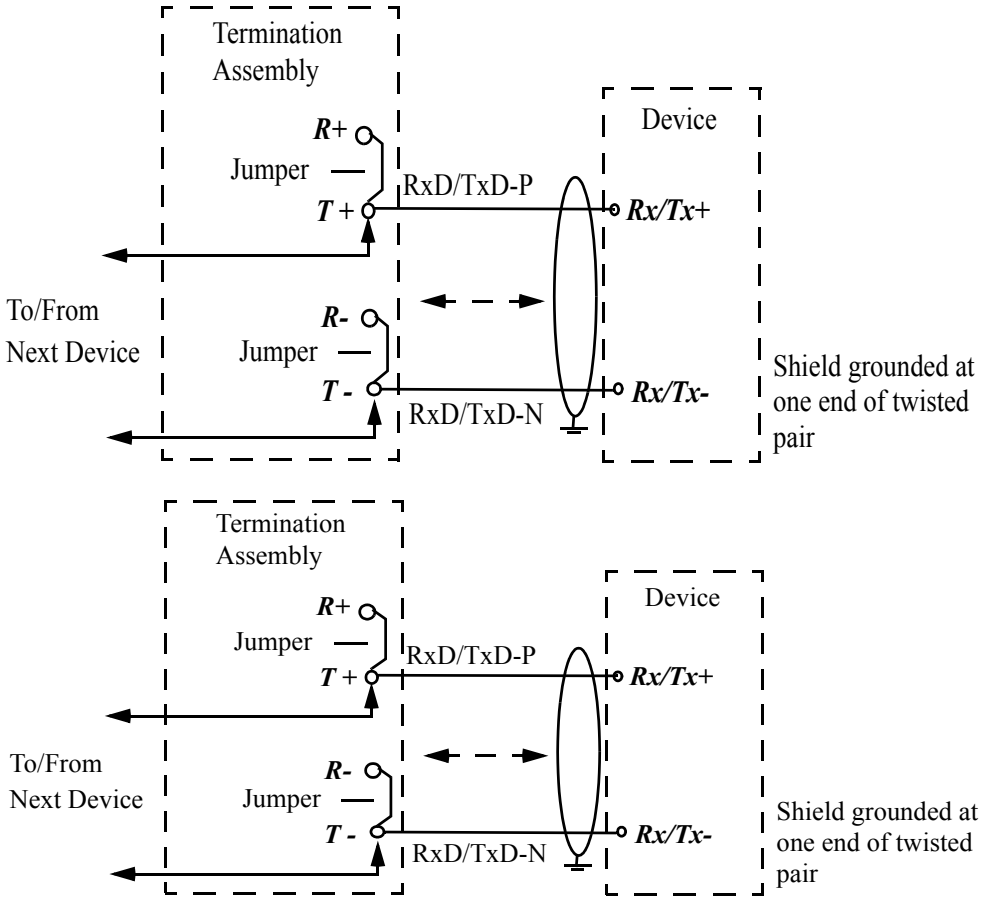


Figure 4-24. RS-485 (2-wire) Redundant Device Connection to FBM231

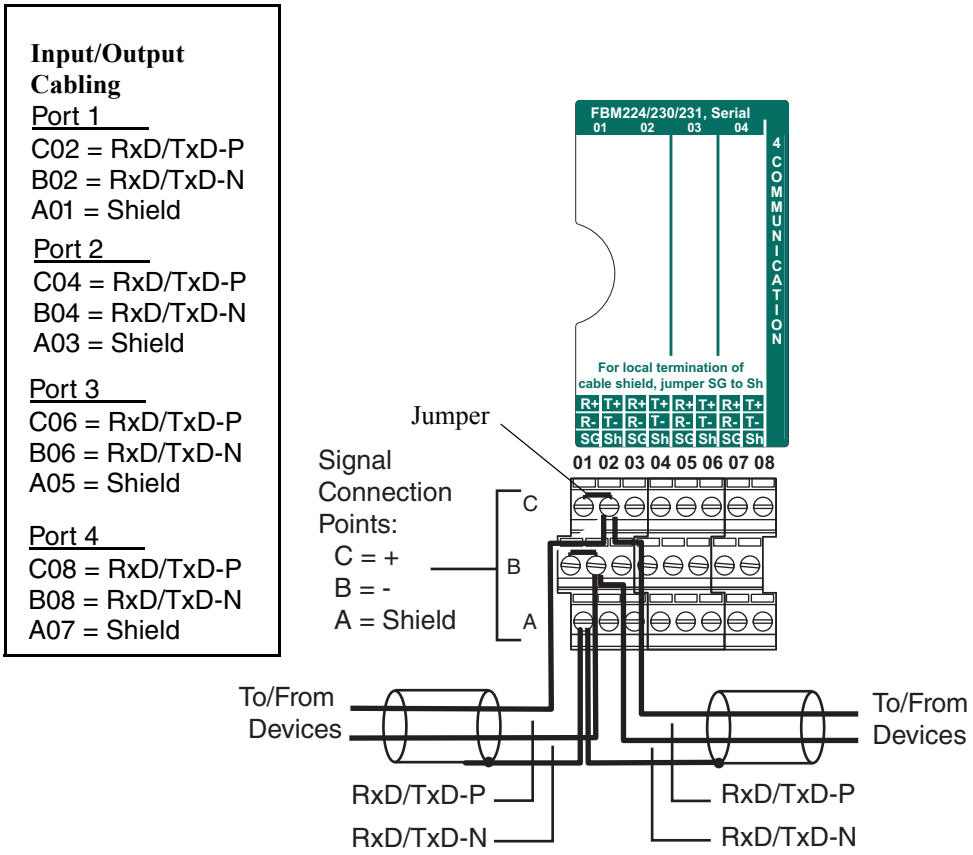
To connect an RS-485 (2-wire) channel to the TA:

1. Route the RS-485 cable(s) through the I/A Series enclosure to the TA.
2. Use strain relief wire ties on the cable(s).
3. To make the device cable connections at the FBM231 TA when the FBM231 is at a point along the length of the bus (but not at either end point), proceed as follows:
   a. Connect the receive and transmit (RxD/TxD-P) wire to T+ (Port 1, 2, 3, or 4) and the receive and transmit (RxD/TxD-N) wire to T- (Port 1, 2, 3, or 4) compression screw or ring-lug terminals as shown in Figure 4-25.
   b. Connect the next device's receive and transmit (RxD/TxD-P) wire to T+ (Port 1, 2, 3, or 4) and the receive and transmit (RxD/TxD-N) wire to T- (Port 1, 2, 3, or 4) compression screw or ring-lug terminals as shown in Figure 4-25.
   c. Connect a jumper wire between (RxD/TxD-P) T+ (Port 1, 2, 3, or 4) and (RxD/TxD-P) R+ (Port 1, 2, 3, or 4) compression screw terminals as shown in Figure 4-25.
   d. Connect a jumper wire between (RxD/TxD-N) T- (Port 1, 2, 3, or 4) and (RxD/TxD-N) R- (Port 1, 2, 3, or 4) compression screw terminals as shown in Figure 4-25.

e. Connect the cable shield to the SG terminal of the TA. The cable shield must be grounded at only one end of the cable, not both. If the shield is not grounded at the device, connect a jumper wire between the Sh and the SG terminal of the TA. SG is the odd numbered (1, 3, 5 and 7) terminals on the TA. Sh is the even (2, 4, 6 and 8) numbered terminals on the TA.

f. Set all RS-422/RS-485 bus termination switches for the channel to the open position (see Figure 4-31 and Figure 4-32 on page 56).

g. Set the RS-232 switches for the channel such that the C5 and C6 switches are in the CLOSED position and the rest of the switches are in the OPEN position (see Figure 4-35 on page 59).



Note: Cable connections shown are for Port 1. Port 2, 3, and 4 connections are made in a similar manner.

Figure 4-25. RS-485 (2-wire) TA Cable Connections (One Shown), FBM231 Located Mid Bus

4. If the FBM231 is located at either end point of the RS-485 bus,

a. Connect the transmit/receive (RxD/TxD-P) wire to T+ (Port 1, 2, 3, or 4) and the receive/transmit (RxD/TxD-N) wire to T- (Port 1, 2, 3, or 4) compression screw or ring-lug terminal as shown in Figure 4-26.

b. Connect a jumper wire between (RxD/TxD-P) T+ (Port 1, 2, 3, or 4) and (RxD/TxD-P) R+ (Port 1, 2, 3, or 4) compression screw or ring-lug terminals as shown in Figure 4-26.

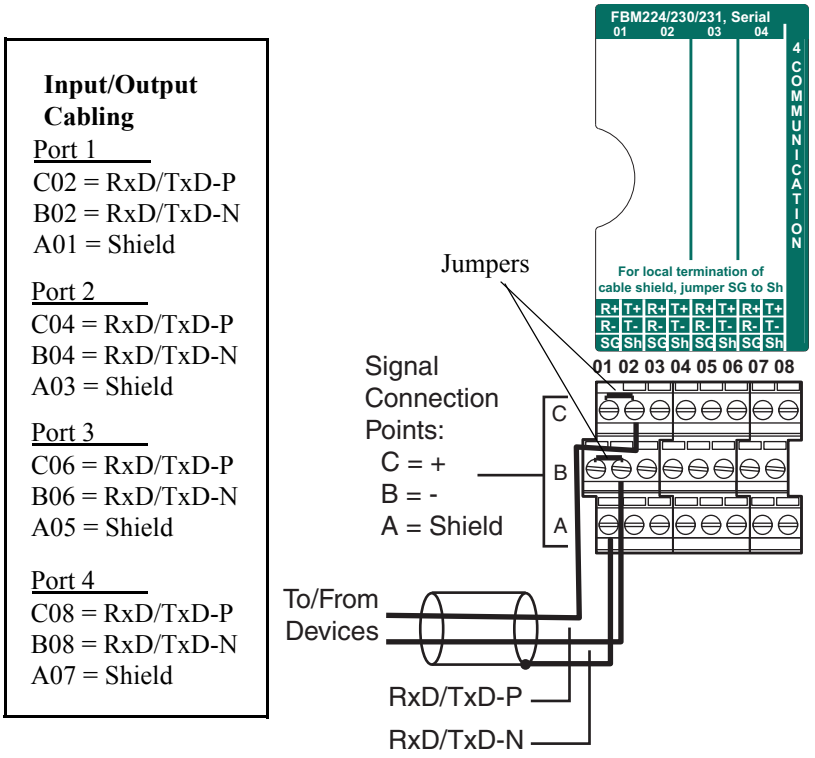
c. Connect a jumper wire between (RxD/TxD-N) T- (Port 1, 2, 3, or 4) and (RxD/TxD-N) R- (Port 1, 2, 3, or 4) compression screw or ring-lug terminals as shown in Figure 4-26.

d. Connect the cable shield to the SG terminal of the TA. The cable shield must be grounded at only one end of the cable, not both. If the shield is not grounded at the device, connect a jumper wire between the Sh and the SG terminal of the TA. SG is the odd numbered (1, 3, 5 and 7) terminals on the TA. Sh is the even (2, 4, 6 and 8) numbered terminals on the TA.

e. Set the RS-232 switches for the channel such that the C5 and C6 switches are in the CLOSED position and the rest of the switches are in the OPEN position (see Figure 4-35 on page 59).

f. Terminate the bus as described in "TA Terminations For RS-422 or RS-485" on page 54.

5. Repeat Steps 1 through 4 for the redundant channel to the redundant device.



Note: Cable connections shown are for Port 1. Ports 2, 3, and 4 connections are made in a similar manner.

Figure 4-26. RS-485 (2-wire) TA Cable Connections (One Shown), FBM231 Located at Bus End Point

NOTE

RS-485 configurations require device terminations at **both** ends of the bus. All other devices on the bus **must not** be terminated.

Connecting an RS-422 Device to the FBM231 TA

In a redundant RS-422 system, two cables, each consisting of a pair of transmit wires, a pair of receive wires and one shield, can be connected to the compression or ring-lug connections on each TA of the redundant channel. See Figure 4-27. RS-422 configurations require device terminations at one end of the receive and transmit cables. The terminator switches should be closed, if the field device does not have terminating resistors on the transmit and receive cable. Otherwise, the terminator switches should be open.

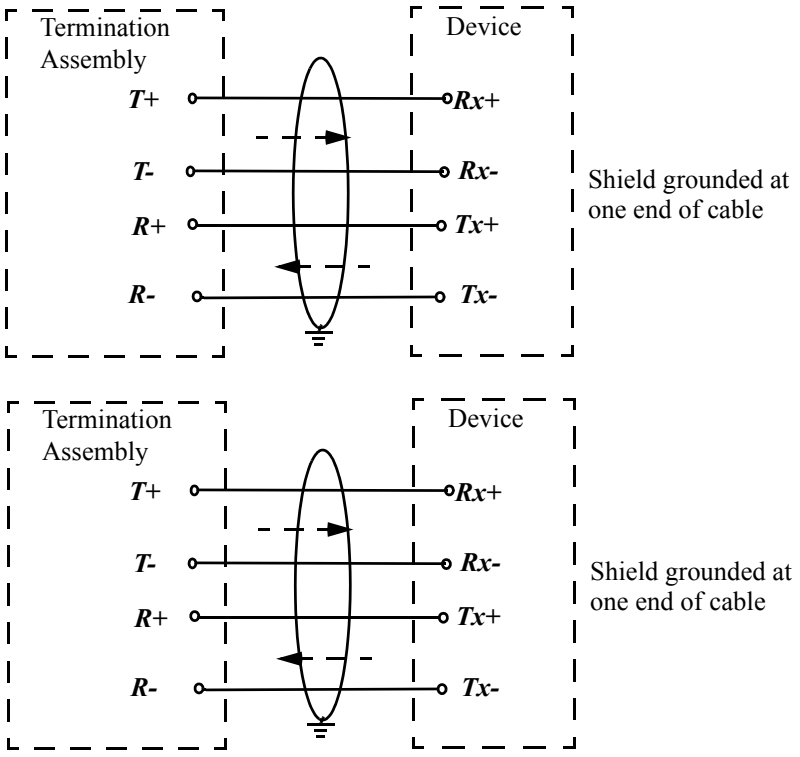


Figure 4-27. RS-422 Redundant Connection to FBM231

To connect an RS-422 channel to the TA:

1. Route the RS-422 cable(s) through the I/A Series enclosure to the TA.
2. Use strain relief wire ties on the cable(s).
3. To make the device cable connections at the FBM231 TA for RS-422, proceed as follows:
   a. Connect the receive cable (RxD-P and RxD-N) to T+ and T- (Port 1, 2, 3, or 4) compression screw or ring-lug terminal as shown in Figure 4-28.
   b. Connect the receive cable shield to the SG (Port 1, 2, 3, or 4) compression screw or ring-lug terminal as shown in Figure 4-28.
   c. If the shield is not grounded at the device, connect a jumper wire between the Sh and the SG (Port 1, 2, 3, or 4) compression screw or ring-lug terminal as shown in Figure 4-28.

      The cable shield must be grounded at only one end of the cable, not both.
   d. Connect the transmit cable (TxD-P and TxD-N) to R+ and R- (Port 1, 2, 3, or 4) compression screw or ring-lug terminal as shown in Figure 4-28.

e. Connect the transmit cable shield to the SG (Port 1, 2, 3, or 4) compression screw terminal as shown in Figure 4-28.

f. If the shield is not grounded at the device, connect a jumper wire between the Sh and the SG (Port 1, 2, 3, or 4) compression screw or ring-lug terminal as shown in Figure 4-28.

The cable shield must be grounded at only one end of the cable, not both.

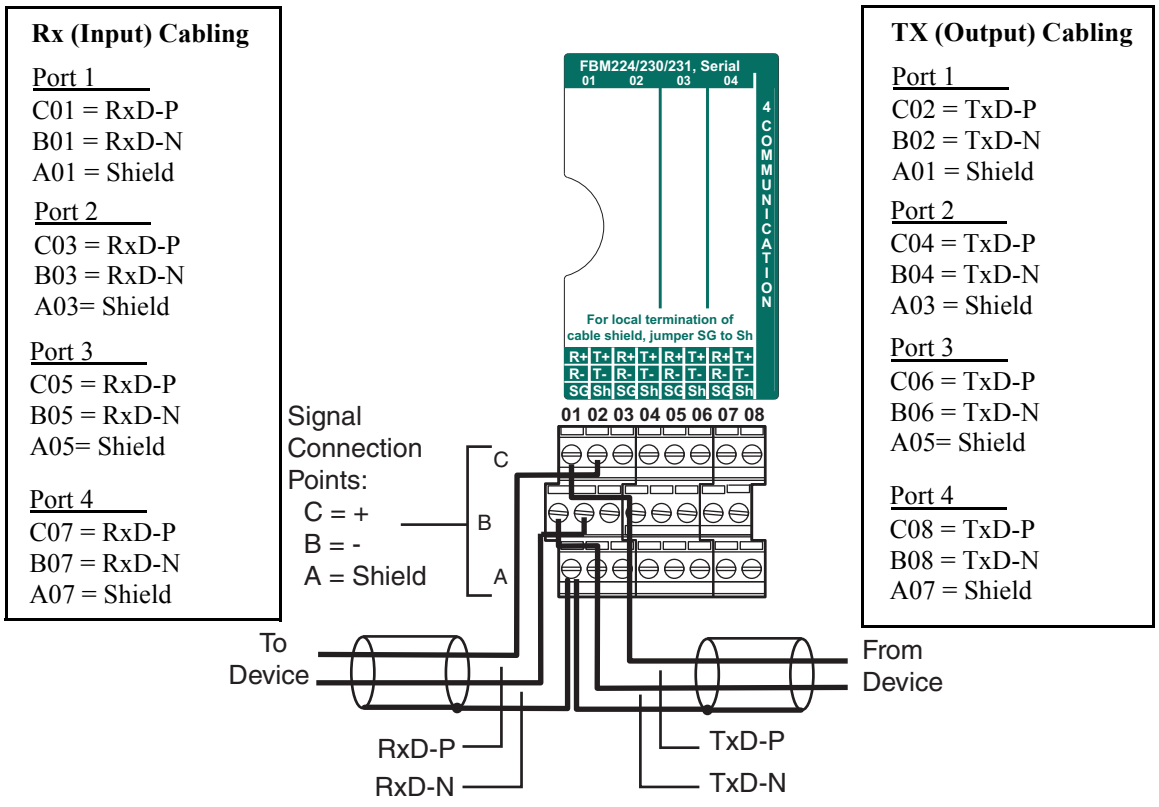
g. Set the RS-232 switches for the channel such that the C5 and C6 switches are in the CLOSED position and the rest of the switches are in the OPEN position (see Figure 4-35 on page 59).

h. Terminate the bus as described in "TA Terminations For RS-422 or RS-485" on page 54.

i. Repeat Steps 1 through 3 for the redundant channel to the redundant device.

NOTE

RS-422 configurations require device terminations at **one** end of the transmit and receive bus.



Note: Cable connections shown are for Port 1. Port 2, 3, and 4 connections are made in a similar manner.

Figure 4-28. RS-422 TA Cable Connections (One Channel Shown)

TA Terminations For RS-422 or RS-485

Eight termination resistors for an RS-422 or RS-485 bus are available on the TA to terminate the field device or RS-485 bus. Each of the four FBM231 ports has a transmit and a receive resistor that is placed across the bus/field device when the switch is switched to the CLOSE position.

RS-485 configurations require device terminations at both ends of the bus. All other devices on the bus segment must not be terminated. When the FBM231 is located at either end of the bus, it must be terminated. Figure 4-29 shows the terminating scheme for RS-485. For RS-485, the twisted-pair cable can be terminated on the TA (Tx switch in the CLOSE position).

RS-422 configurations require device terminations at one end of the receive and transmit cables. Figure 4-30 shows the terminating scheme for RS-422. For RS-422, both the transmit and receive cables can be terminated on the TA (Tx and Rx switch in the CLOSE position).

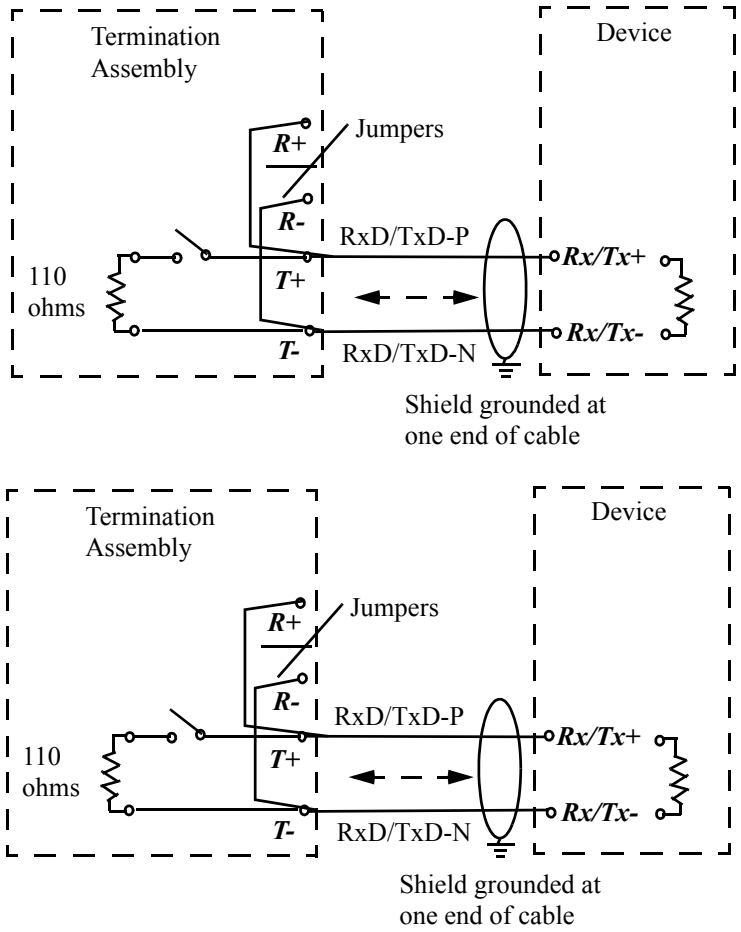


Figure 4-29. RS-485 (2-wire) Termination Resistor

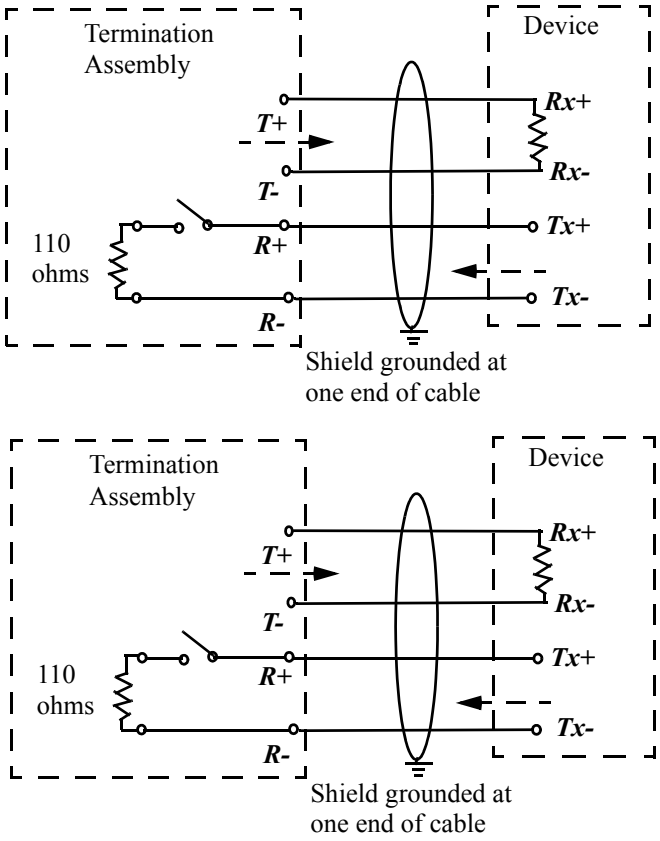


Figure 4-30. RS-422 Termination Resistor

To make bus terminations with the FBM231 located at the end point of the bus, proceed as follows:

NOTE

1. RS-485 configurations require device terminations at **both** ends of the bus. All other devices on the bus segment **must not** be terminated.
2. RS-422 configurations require device terminations at **one** end of the receive and transmit cables.

1. Remove the plastic housing next to the compression screws on the TA by squeezing the plastic housing on both sides and lifting the housing.
2. Press the required termination switch on the TA to the CLOSE position (termination) (refer to Figure 4-31 for compression screw TAs and Figure 4-32 for ring-lug TAs) for each cable requiring termination. This provides line termination by inserting termination resistors across the line.

NOTE

Set unused PORTn Tx and Rx switches to the OPEN position.

3. Terminate Ports 1, 2, 3 and/or 4 (if used) in the same manner (see Figure 4-31 or Figure 4-32).

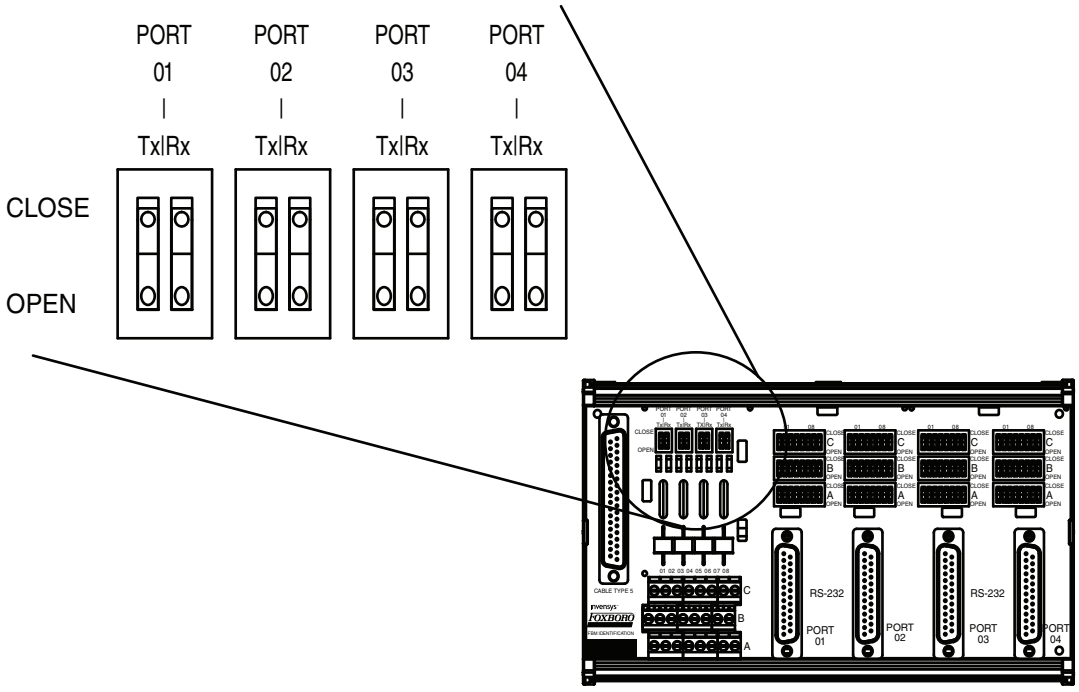


Figure 4-31. Compression Screw TA RS-422 and RS-485 Termination Switches

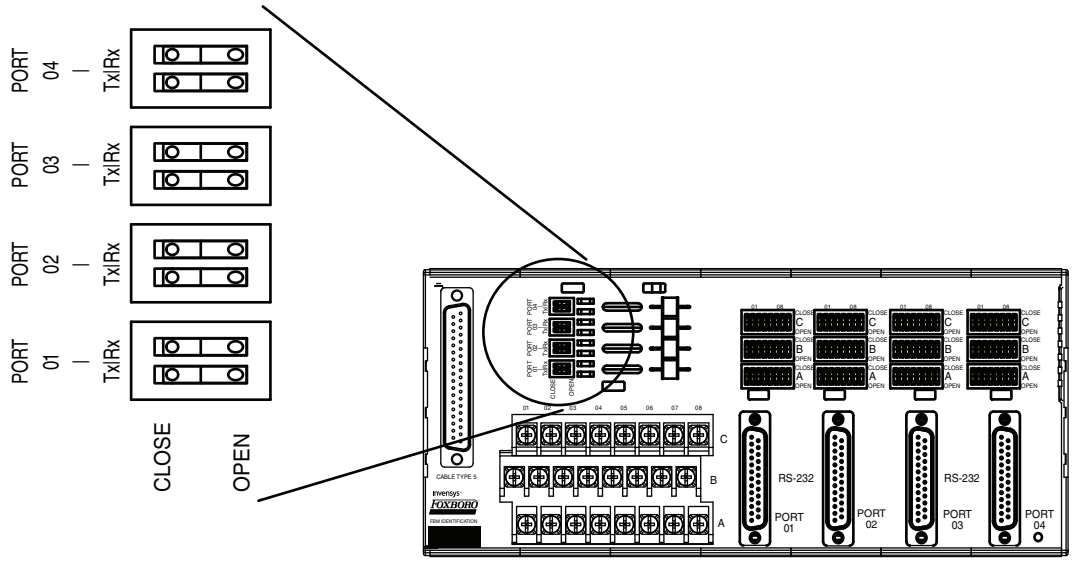


Figure 4-32. Ring-Lug TA RS-422 and RS-485 Termination Switches

4. Replace the plastic housing covering the termination resistors.

RS-232 Cable Connections

Each of the redundant four ports of the FBM231 can be RS-232, RS-422 or RS-485. Each redundant port of an FBM231 supports dual ported devices depending on the configuration of the FBM231ports and the devices.

RS-232 devices cannot be more than 15 m (50 ft) cable length from the FBM231, per EIA standards. RS-232 uses the DB-25 connectors on the TA.

Connecting an RS-232 Port to the TA

In a redundant system, two input/output cables to/from the device per each FBM231 port is made to the RS-232 DB-25 connectors on the TA.

The following figures (Figure 4-33 and Figure 4-34), show examples of RS-232 cabling for dual ported devices. Each DB-25 cable from/to the device connects to the Port 01 (02, 03, or 04) of one TA of the FBM231 pair and the other cable connects to same port (01, 02, 03, or 04) of the other TA of the other FBM231 pair. Cabling requirements for third-party devices must be provided by the third party.

Connecting a dual ported device to the TA for RS-232 communication is the same as connecting a single ported device to the TA as described above, except that the connections are made for each port of the dual ported device. For standard RS232 cables, refer to “RS-232 Cables” on page 22.

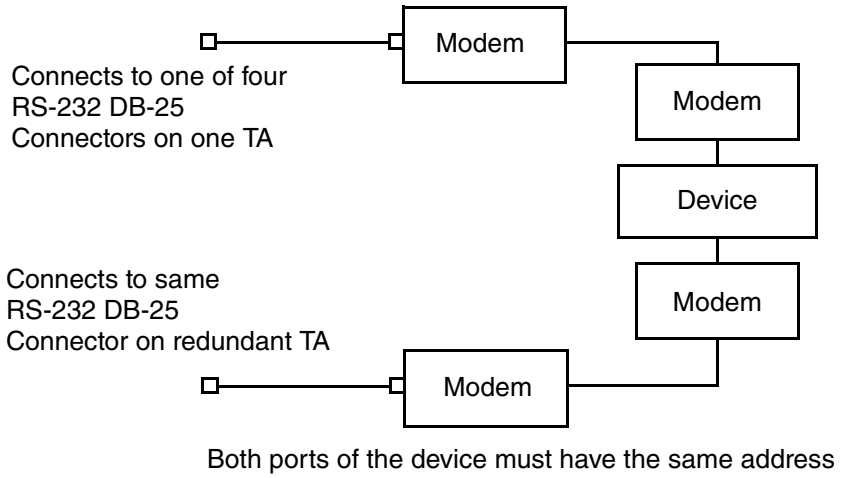


Figure 4-33. RS-232 FBM231 Redundant Cabling Configuration, Example

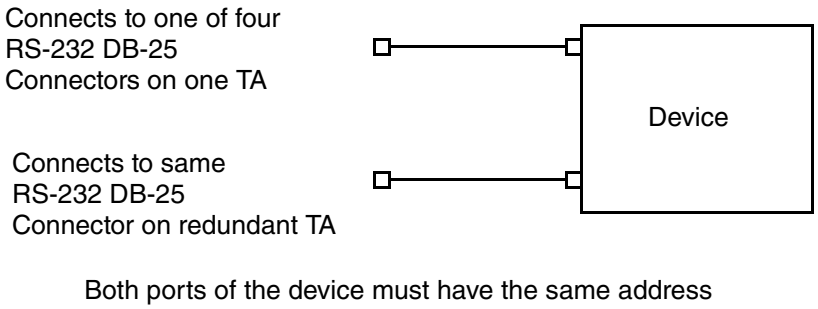


Figure 4-34. RS-232 FBM231 Redundant Cabling Configuration, Example

To connect a dual ported device to the TA for RS-232 communication:

1. Turn off device equipment power.
2. Determine the device to be connected and connect the appropriate cable to the device.

3. Connect the signal cable shield at the device end (modem, programmable controller, device, and so on) to a suitable earthing point on the device.
4. Route the RS-232 cable(s) through the I/A Series enclosure to the TA.
5. Use strain relief wire ties on the cable(s).
6. Remove the dust cover from the DB-25 connector on the TA for the port(s) (PORT 01, 02, 03, and/or 04) that is configured for RS-232 communications.
7. Connect the DB-25 connector from the device to PORT 01, 02, 03, and/or 04 female connector.
8. If the signal cable shield not connected to an earthing connection at the device (refer to Step 3), connect a jumper between the Sh screw compression terminal and the SG screw compression terminal for Port 01, 02, 03, or 04 (See Figure 4-23) of the TA.

   The cable shield must be earthed at only one end of the cable, not both. At the TA, the shield for the DB-25 cable is not normally connected to earth on the TA. Connecting a jumper wire between the Sh and the SG terminal on the TA earths the shield to frame earth.
9. Set the RS-232 switches on the TA. Refer to “TA RS-232 Switch Settings” on page 59.
10. Repeat steps 1 through 9 for the redundant, or dual port, of the device.

FBM231 TA RS-232 Switches

The RS-232 switches located on each TA consist of 24 switches for each port that you must configure before communication between the FBM231and its devices can begin. The switch settings depend on the device and the cable between the switches and the device.

Figure 4-35 shows the 24 switches in four groups (PORT 01 to PORT 04). Each port has 3 switch banks with a total of 24 individual switches per port. Each switch bank A, B, and C has 8 switches labeled 01 to 08. The designator CLOSE indicates that the switch is closed, when the switch is in the pressed down position.

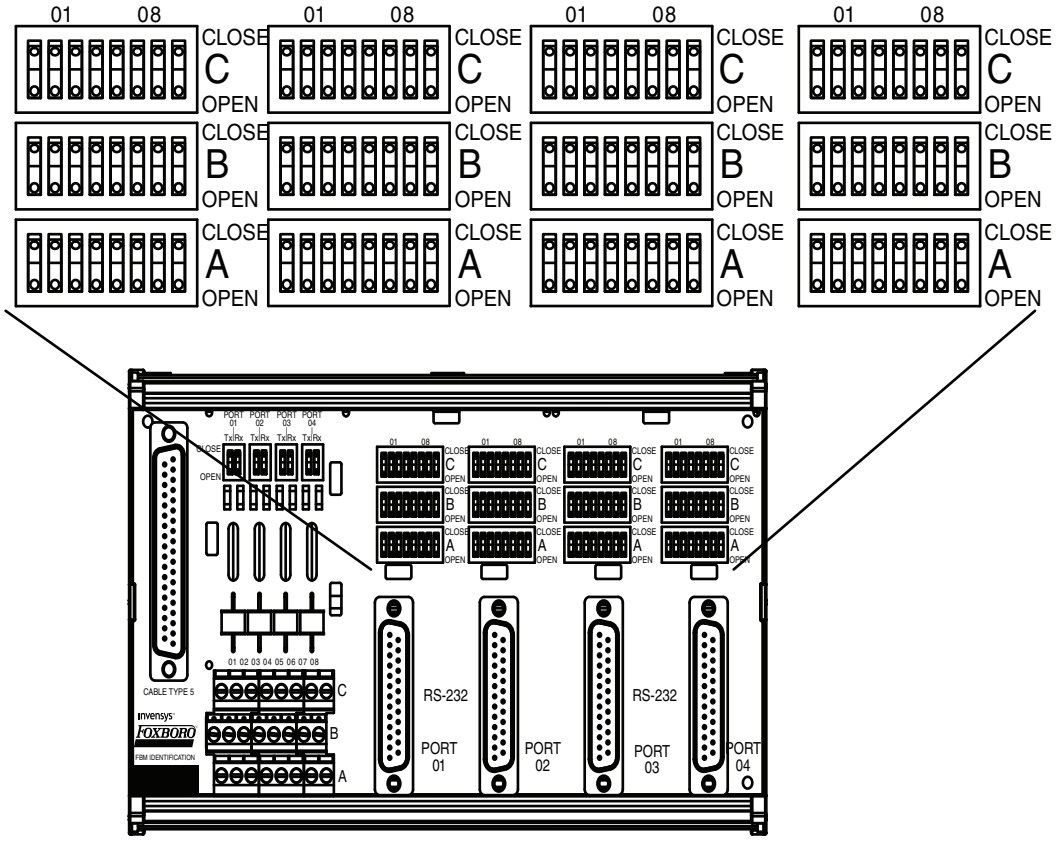


Figure 4-35. FBM231TA RS-232 Switches

TA RS-232 Switch Settings

Each TA has 24 individual switches per port that are set open or closed depending on the device, and the type of cable. The switch settings for each of the four ports are identical. However, the user-configured port usage (RS-422 or RS-485 versus RS-232) for each port and the cable connected to the port, determines the required switch settings for each port. Figure 4-36 shows the switches and the communication signal that is routed for each switch closure. Any switch not closed for a given configuration is set to open (OPEN position).

Use a serial port adapter DB-9 female connector to DB-25 female connector for devices that require a DB-9 connector. Table 4-6 correlates the DB-25 to DB-9 pin connections

Table 4-6. Serial Port Adapter Pin Connections

Female DB-9 Pin	Female DB-25 Pin
1	8
2	3
3	2
4	20
5	7
6	6

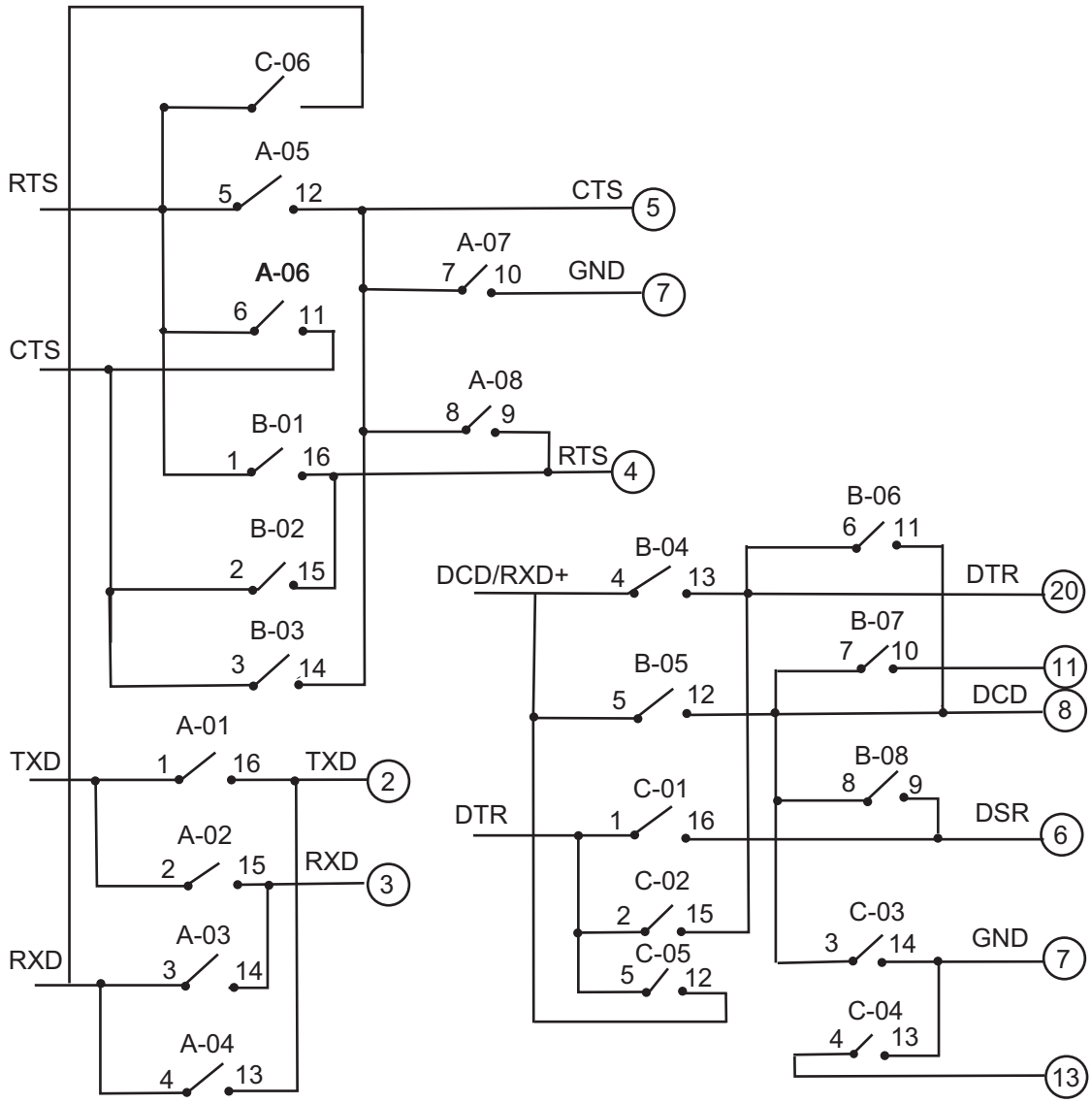
Table 4-6. Serial Port Adapter Pin Connections (Continued)

Female DB-9 Pin	Female DB-25 Pin
7	4
8	5
9	22

FBM231 Termination Assembly RS-232 Switch Pinout

Figure 4-36 shows the Clear (CTS) and Request-to-Send (RTS), Data Carrier Detected (DCD), Transmit (TXD) and Receive Data (RXD) switches from the output of the DB-25 cable to the field device. Using this figure, you can select different RS-232 switch settings for various cable configurations. Figure 4-36 shows the switch settings for only Port 1. The switch settings for each of the four ports, switch numbers, and pinouts are identical for each port.

Figure 4-37 shows the switch settings (only Port 1) for a standard handshake connection. Figure 4-38 shows the switch settings (only Port 1) for a no-handshake connection. Figure 4-39 shows the switch settings (only Port 1) for a modem connection. Switch settings for Ports 2, 3, and 4 are the same. The figures are examples and show general switch settings. You should refer to the vendors document to understand the communication requirements for a particular device and then set the switches accordingly.



NOTES:

1. Numbers in circles are DB-25 connector pin numbers.
2. Pin numbers for switches are the same for each port.
3. Switch numbers for each port are shown in the following table:

Port 1	Port 2	Port 3	Port 4
C	C	C	C
B	B	B	B
A	A	A	A

4. See Table 4-3 for Port Adapter DB-25 to DB-9 pin connections.
5. Switches C-07 and C-08 are not used and can be in any position (CLOSED or OPEN).

Figure 4-36. RS-232 TA Switches

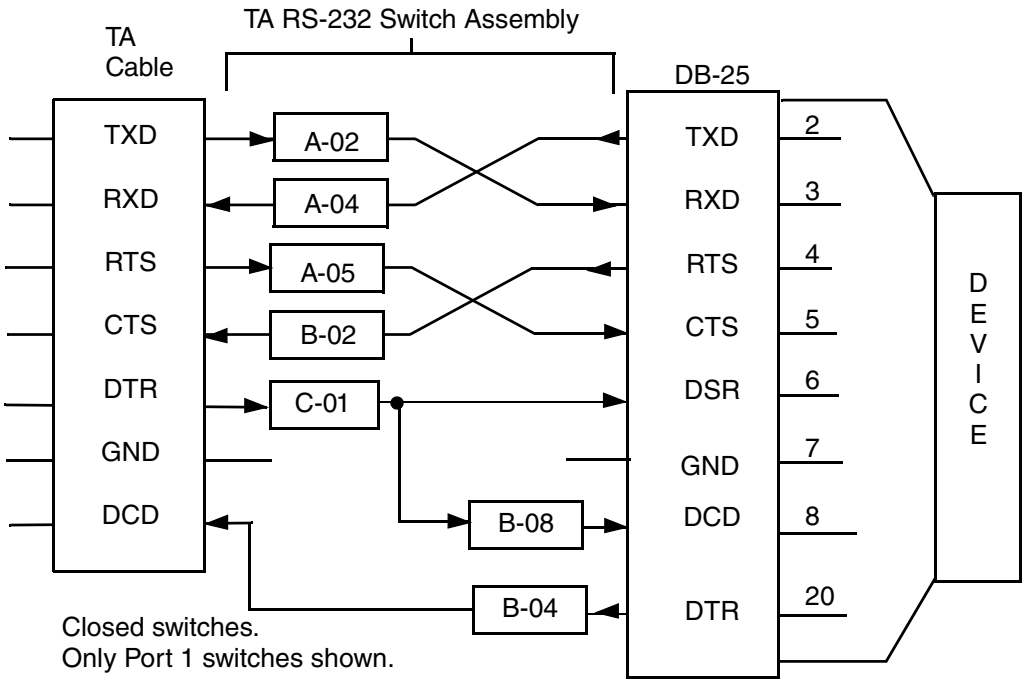


Figure 4-37. RS-232 Switches, Null Modem - Standard Handshake

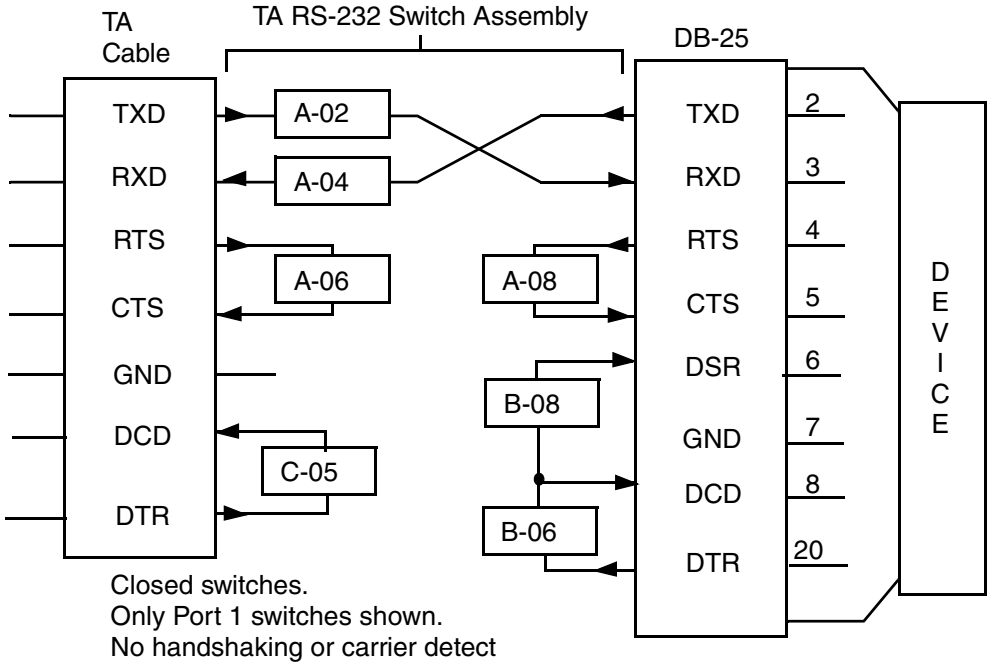


Figure 4-38. RS-232 Switches, Null Modem - No Handshake

⚠ CAUTION

Partial handshakes can be provided by combinations of the configurations shown in Figure 4-37 and Figure 4-38. Refer to device documentation for specific device requirements.

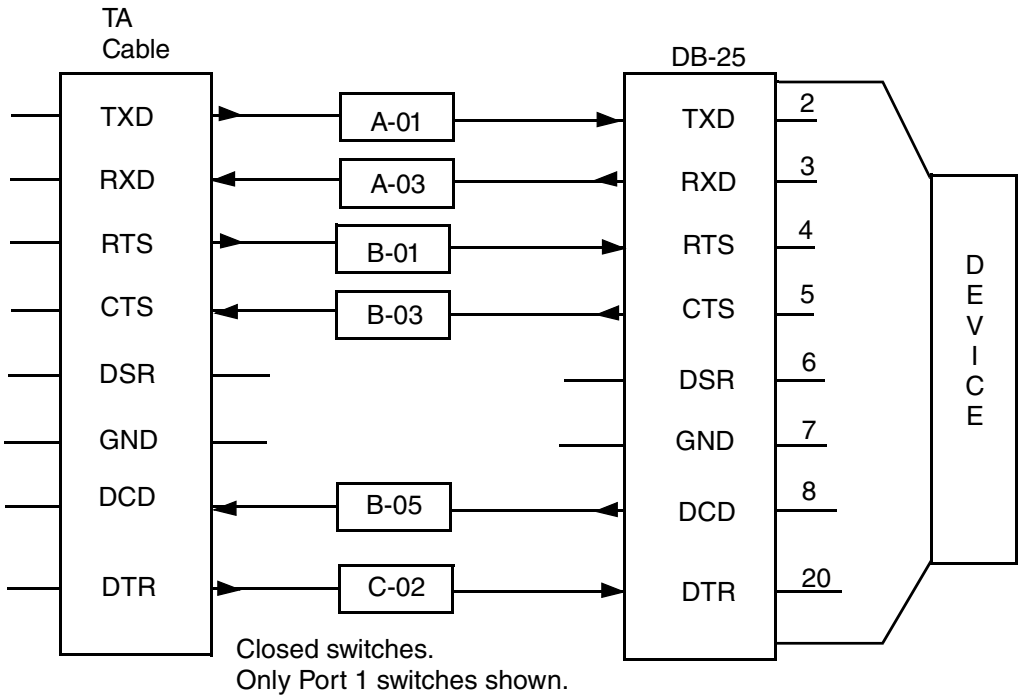


Figure 4-39. RS-232 Switches, Modem Connection (Typical)

FBM232 Installation

A typical FBM232 installation is shown in Figure 4-40. As shown in Figure 4-40, the FBM232 mounts on the baseplate, and connects to the field device(s) via an Ethernet hub or switch by means of an RJ-45 connector inserted into the front face of the FBM. The use of an Ethernet hub or switch is required to connect the FBM232 to the devices.

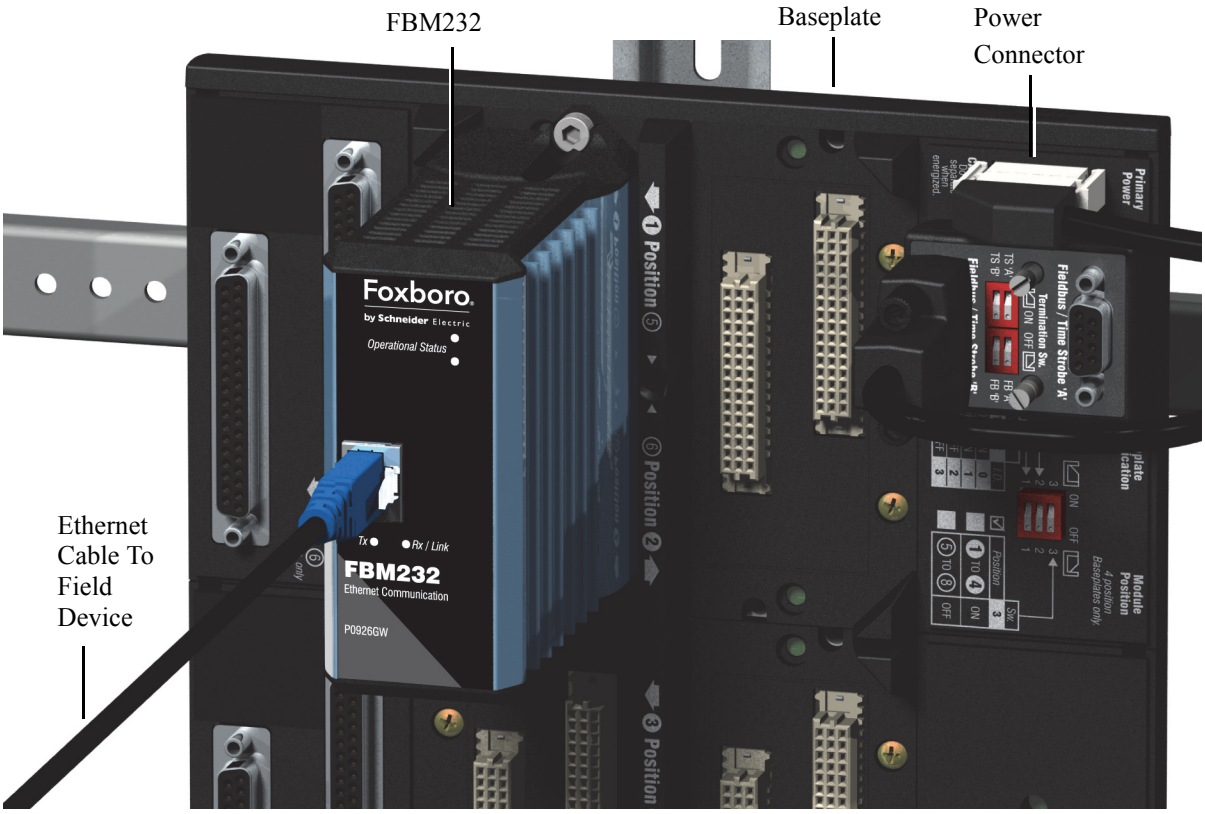


Figure 4-40. FBM232 Installation

Figure 4-41 shows the available FBM mounting slots in the horizontal and vertical baseplates. The non-redundant FBM232 can be located in any slot on the baseplate.

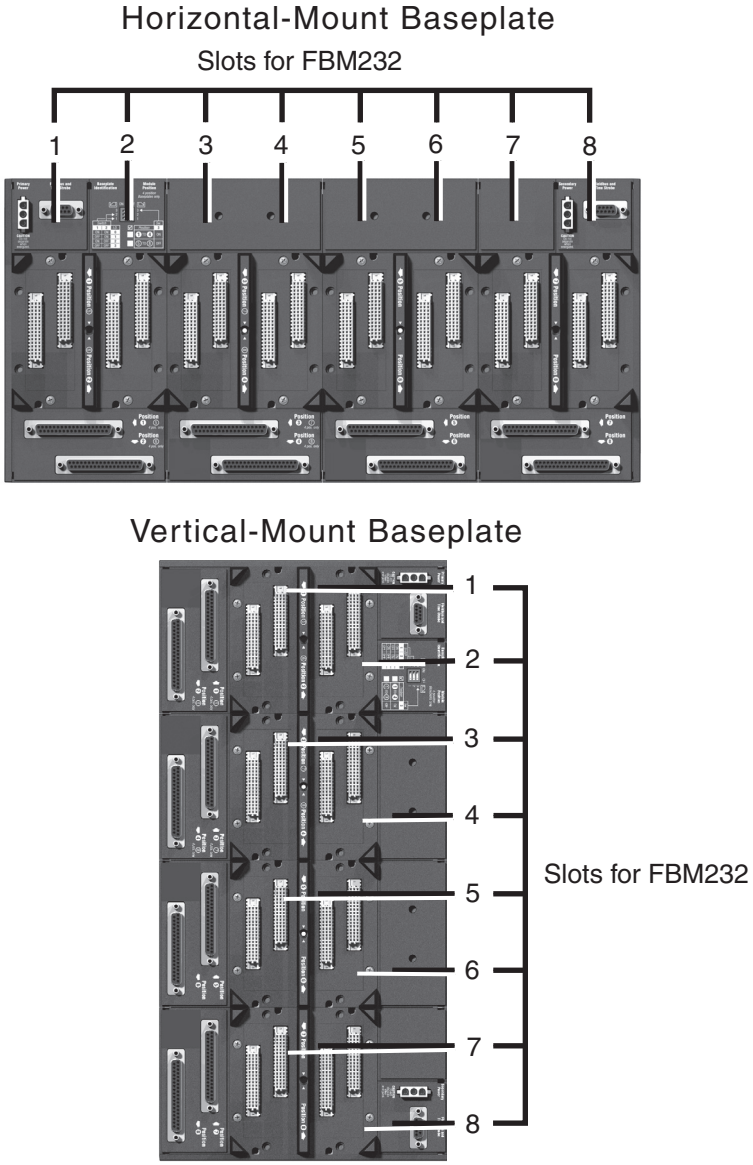


Figure 4-41. FBM232 Mounting Slots in Baseplate

The part number for the FBM232 is listed in Table 4-1.

Table 4-7. Part Number for FBM232

Equipment	Part Number
FBM232	P0926GW

FBM232 Module Installation

For general instructions on installing the FBMs, refer to Figure 4-41 and the *DIN Rail Mounted Subsystem User's Guide* (B0400FA).

The following subsections describe how to make the FBM232 Ethernet cable connections.

FBM232 Ethernet Cable Connection

As shown in Figure 4-42, the FBM232 is a single module that mounts on the baseplate, and connects to the field device(s) via an Ethernet hub or switch by means of an RJ-45 connector located on the front face of the FBM. The RJ-45 connector, with standard computer NIC pinout, for Ethernet 10Base-T/100Base-TX connectivity has a maximum cable length of 100 m (330 ft) to the Ethernet interface.

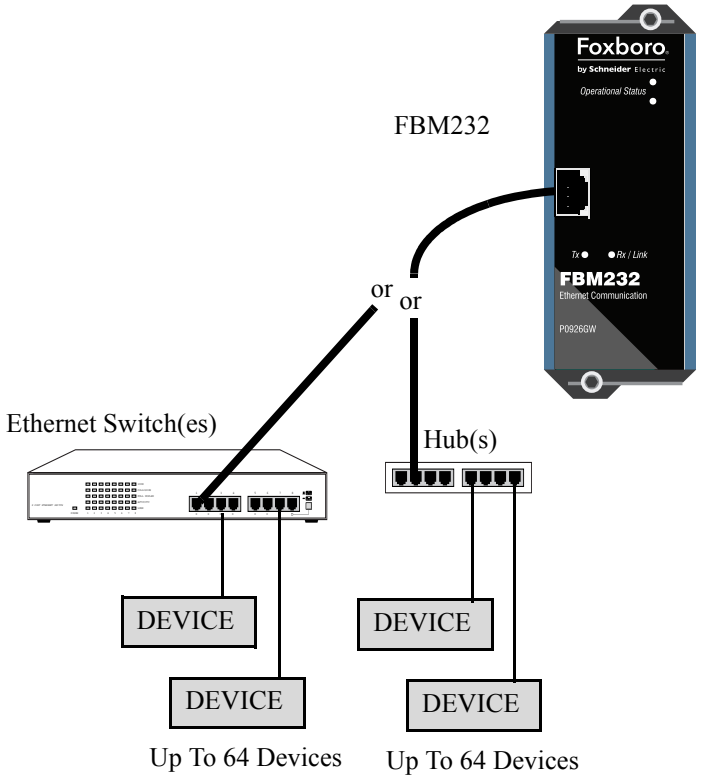


Figure 4-42. FBM232 Ethernet Connections

NOTE

The direct connection between FBM232 and field device (using a crossover cable) is not supported. An Ethernet hub or switch must be used to connect the FBM232 to the field device.

Ethernet hubs or switches must be used to connect the FBM232 to the field device(s). Generally, any third party Ethernet hub or switch can be used. The minimum requirement of the Ethernet hub or switch is that it must support TCP/IP and UDP communications. Also, if the hub/switch is faster than 10 Mbps, it must support 10/100 Auto-Negotiate. For any additional restrictions, refer to the user guide of the protocol-specific Driver being used.

NOTE

The Ethernet hub/switch can be shared among multiple FBM232/233 and other devices as long as the network bandwidth is not impacted.

Whenever the FBM232 is powered on (or reset), it must have an active Ethernet connection to a powered Ethernet hub or switch. Therefore, it is recommended to have the Ethernet hub or switch on a reliable power source.

NOTE

If the FBM232 boots up without an active Ethernet connection, it will improperly initialize its Ethernet interface and disable its transmitter. The only way to recover from this state is to establish an active Ethernet connection to the FBM232 and then reset the FBM module.

Industrial Ethernet Switch

Schneider Electric (Foxboro) offers a 5 port 10/100 base TX switch (P0972WE) to connect devices to the FBM232. This switch (refer to Figure 4-43) is DIN rail mounted and supports Ethernet protocol to/from Ethernet devices.

Figure 4-43. 10/100 Ethernet 5 Port Switch (P0972WE)

The switch mounts on an ISO/DIN rail and requires 24V dc that can be supplied by the system 24 volt power supply. If redundant power is required an external diode module can be used.

For detailed physical and electrical specifications, refer to *Model SFNB 5TX 2891001* at www.phoenixcontact.com/us/products.

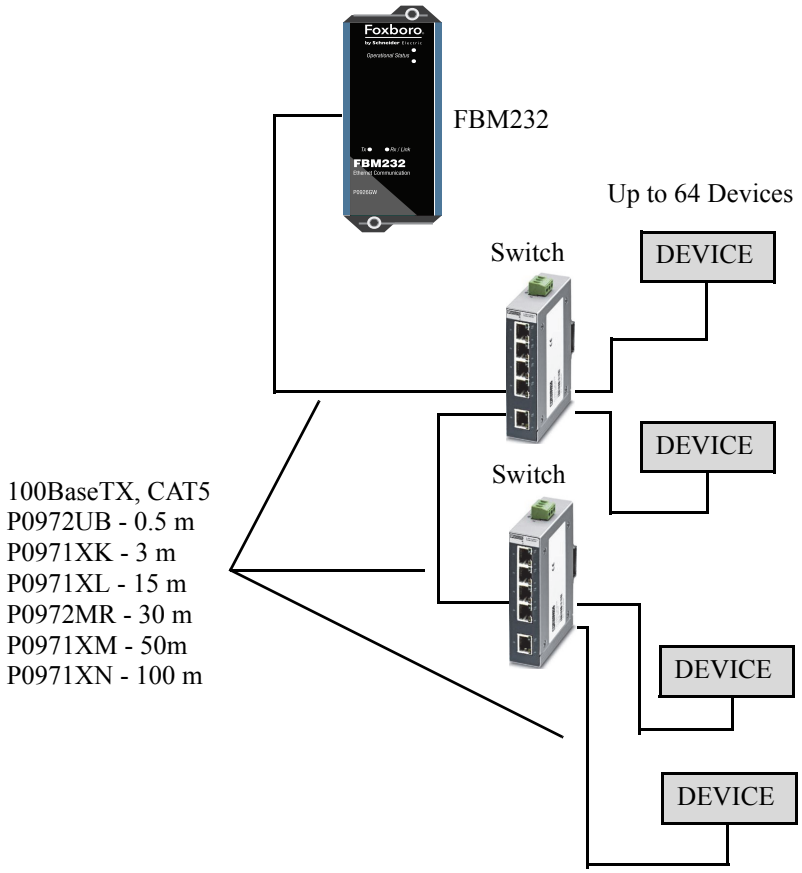


Figure 4-44. FBM232 Connection to 5 Port Switch

Installing Ethernet Hubs

To install the hubs, proceed as follows:

1. Mount the hub on the DIN rail. Refer to the vendor's literature.
2. Connect the cabling as shown in Figure 4-44. The cable used is a shielded twisted pair between the FBM232, the switch, and the device.
3. Connect the FPS400-24 power supply to the switch. Refer to "FPS 400-24 Power Supply Connections to DIN Rail Mounted Switch" on page 68.

FPS 400-24 Power Supply Connections to DIN Rail Mounted Switch

The FPS400-24 power supply is used with DIN rail modules and Ethernet switches. Cable P0972RN 1.8 m (6 ft) connects power from the FPS400-24 to the Ethernet hubs. (see Figure 4-45).

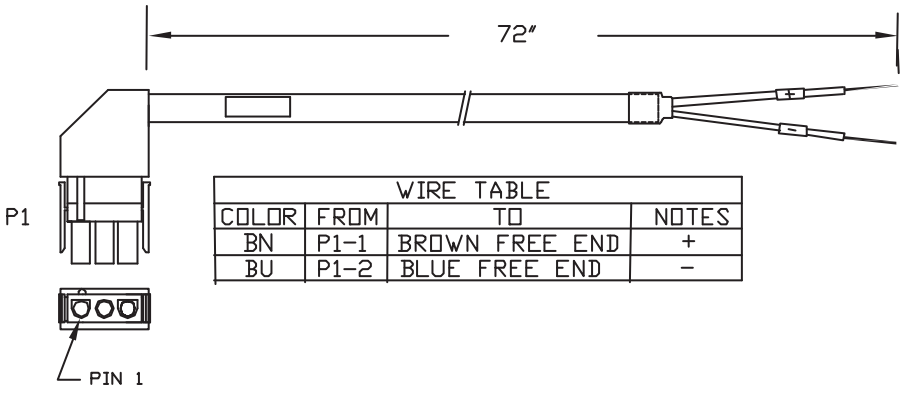


Figure 4-45. P0972RN, FPS400-24 Power Cable to Hub

If your hub accepts redundant input power, you must have redundant (two) FPS400-24 power supplies. To install a hub powered from an FPS400-24, perform the following:

1. Run and dress the cable P0972RN to the switch input power terminal. If required, cut the cable to the proper length and strip 1/2 inch of insulation from the cable ends.
2. Insert the brown wire of cable P0972RN into the + 24 Vdc power terminal of the switch. Tighten the screw on the hub power input terminal.
3. Insert the blue wire of cable P0972RN into the ground terminal of the switch. Tighten the screw on the ground terminal.
4. Insert P1 of the cable P0972RN (refer to Figure 4-45) into an empty dc output plug of the FPS400-24.
5. Connect the earth terminal of the switch to the cabinet's earth terminal.

Installing Ethernet Switches

Foxboro offers a variety of Ethernet switches that allow you to connect devices to the FBM232. For information on the Fast Ethernet Switches refer to *The MESH Control Network Ethernet Equipment (*PSS 21H-7C3 B4).

Connect the cabling as shown in Figure 4-46. As shown in Figure 4-46, Ethernet switches and hubs may be used depending on the location of the devices within the plant. The cable used is a shielded twisted pair between the FBM232 and the Ethernet switch. For information on the cabling and configuration of Ethernet switches offered by Foxboro, refer to *The MESH Control Network Architecture Guide* (B0700AZ).

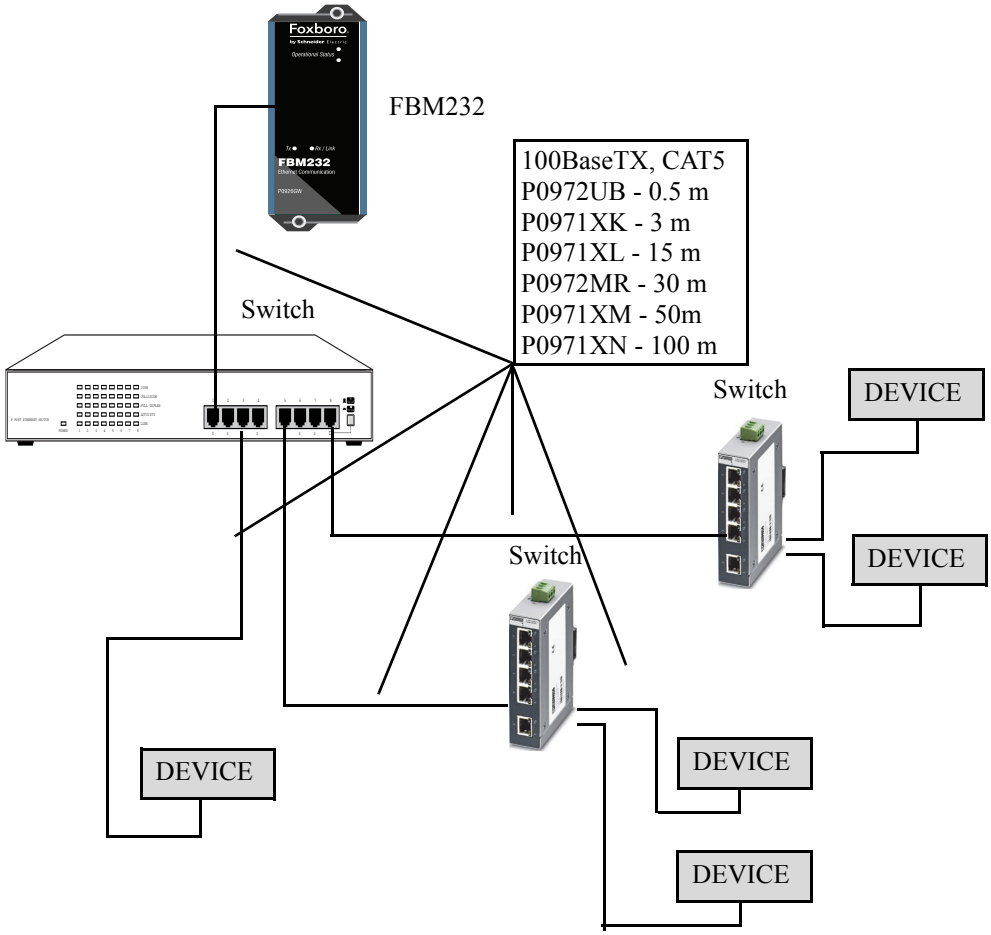


Figure 4-46. FBM232 Connection to Ethernet Switch

FBM233 Installation

A typical FBM233 installation is shown in Figure 4-47. As shown in Figure 4-47, the FBM233 mounts on the baseplate, and connects to the field device(s) via an Ethernet hub or switch by means of an RJ-45 connector inserted into the front face of the FBM. The FBM233 installation is identical to the FBM232, except that there are two modules and two cables to the redundant field device(s).

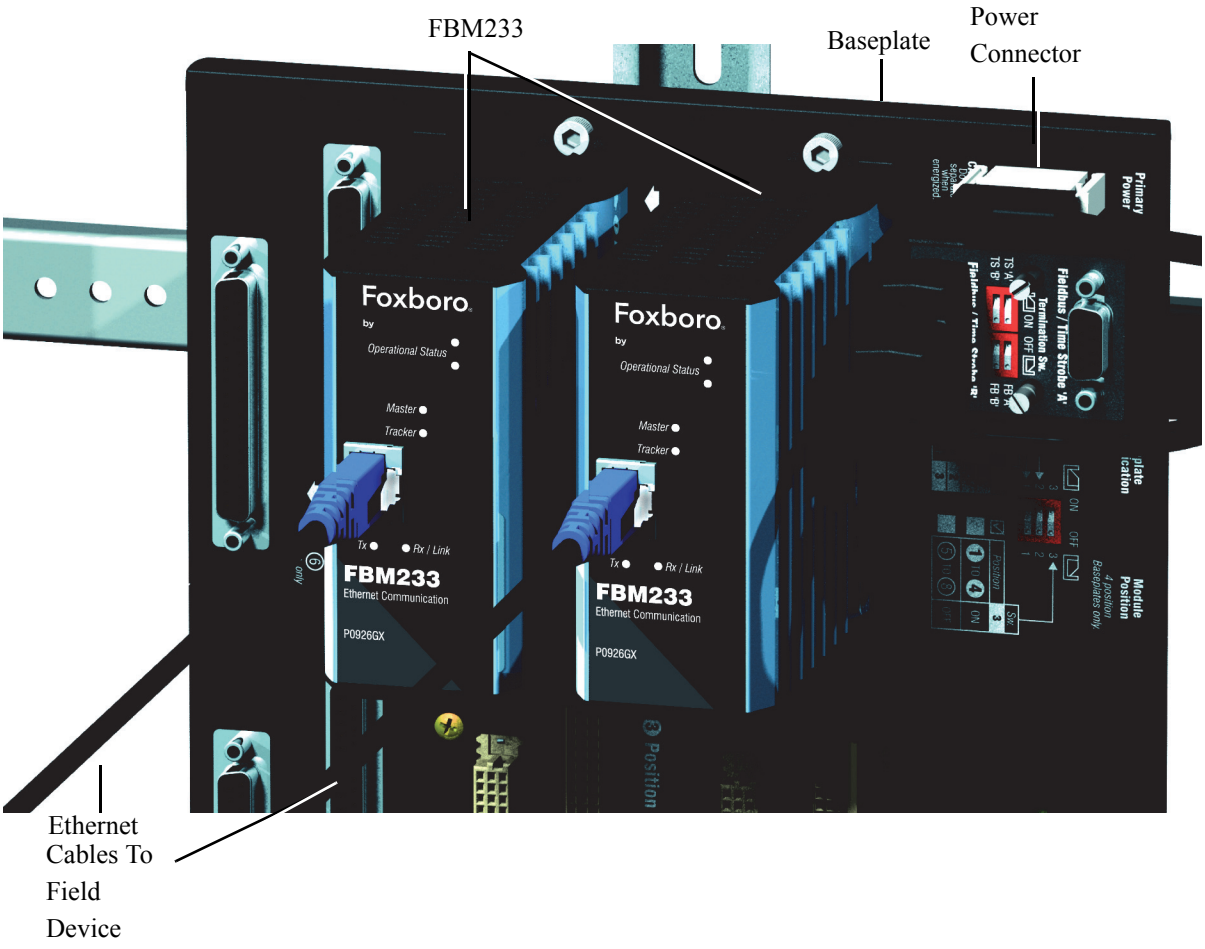


Figure 4-47. Redundant FBM233 Installation

Figure 4-48 shows the available FBM mounting slots in the horizontal and vertical baseplates. The redundant FBM233 must be located in odd and adjacent even positions on the baseplate (positions 1 and 2, 3 and 4, 5 and 6 or 7 and 8).

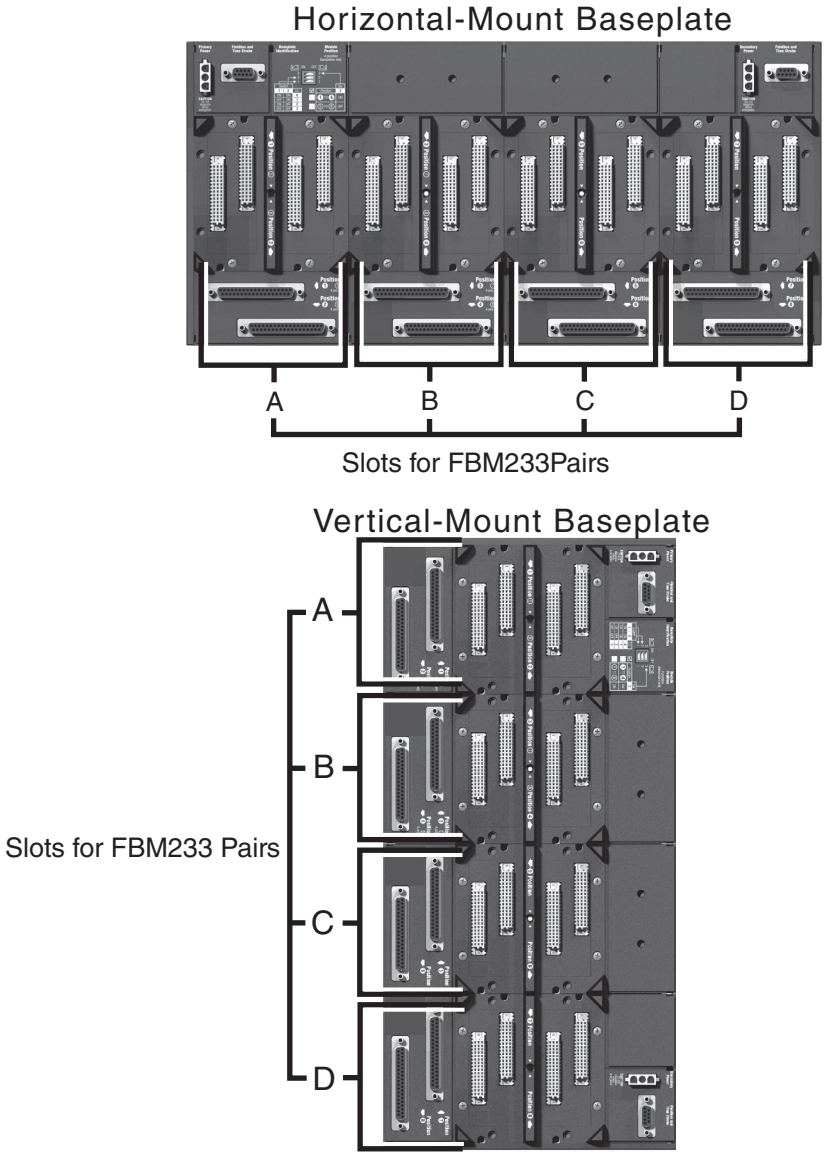


Figure 4-48. FBM233 Mounting Slots in Baseplate

The part number for an FBM233 is listed in Table 4-8.

Table 4-8. Part Number for FBM233

Equipment	Part Number
FBM233	P0926GX

FBM233 Module Installation

For general instructions on installing the FBMs and TAs, refer to *Figure 4-48* and the *DIN Rail Mounted Subsystem User's Guide* (B0400FA).

The following subsections describe how to make the FBM233 Ethernet cable connections.

FBM233 Ethernet Cable Connection

As shown in Figure 4-49, the FBM233 are redundant modules that mount on the baseplate, and connect to the field device(s) via Ethernet hubs or switches by means of the RJ-45 connectors located on the front face of the FBM. The RJ-45 connectors, with standard computer NIC pin-out, for Ethernet 10Base-T/100Base-TX connectivity have a maximum cable length of 100 m (330 ft) to the Ethernet interface.

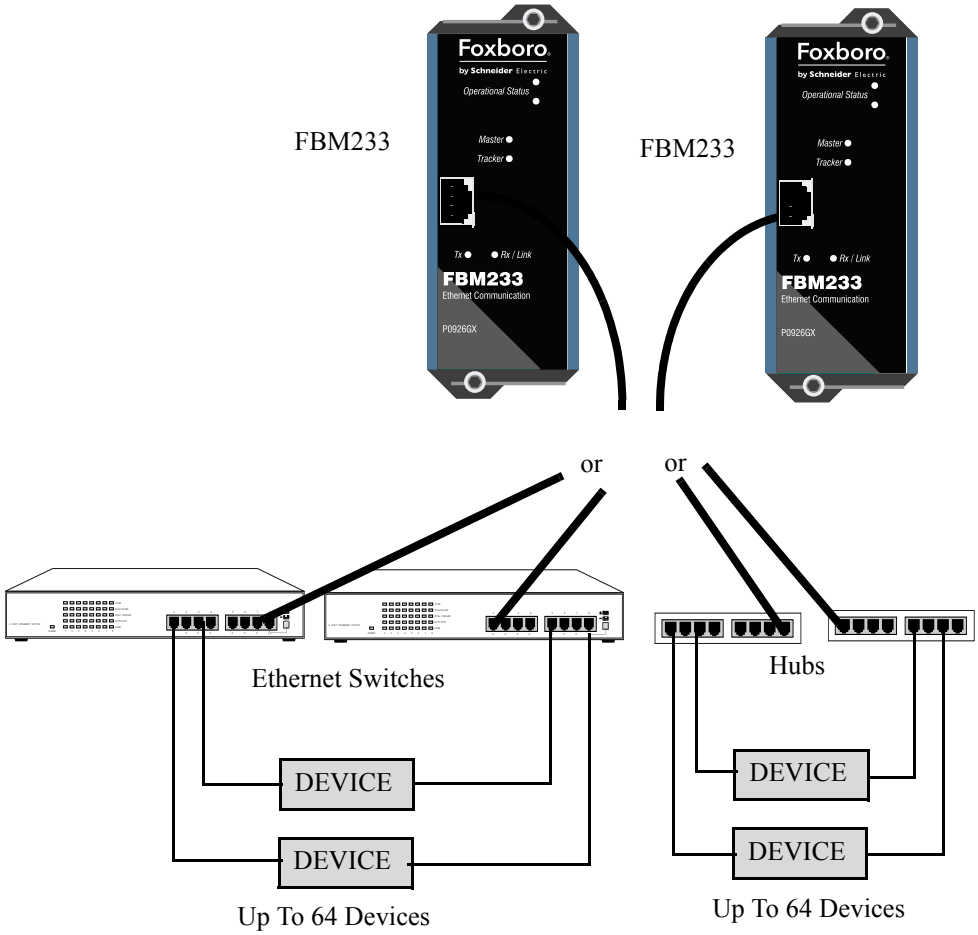


Figure 4-49. FBM233 Ethernet Connections

NOTE

The direct connection between FBM233 and field device (using a crossover cable) is not supported. Ethernet hubs or switches must be used to connect the FBM233 to the field device.

Ethernet hubs or switches must be used to connect the FBM233 to the field device(s). Generally, any third party Ethernet hub or switch can be used. The minimum requirement of the Ethernet hub or switch is that it must support TCP/IP and UDP communications. Also, if the hub/switch is faster than 10 Mbps, it must support 10/100 Auto-Negotiate. For any additional restrictions, refer to the user guide of the protocol-specific Driver being used.

NOTE

The Ethernet switches can be shared among multiple FBM232/233 and other devices as long as the network bandwidth is not impacted.

Whenever the FBM233 is powered on (or reset) it must have an active Ethernet connection to a powered Ethernet hub or switch. Therefore, it is recommended to have the Ethernet switch on a reliable power source.

NOTE

If the FBM233 boots up without an active Ethernet connection, it will improperly initialize its Ethernet interface and disable its transmitter. The only way to recover from this state is to establish an active Ethernet connection to the FBM233 and then reset the FBM module.

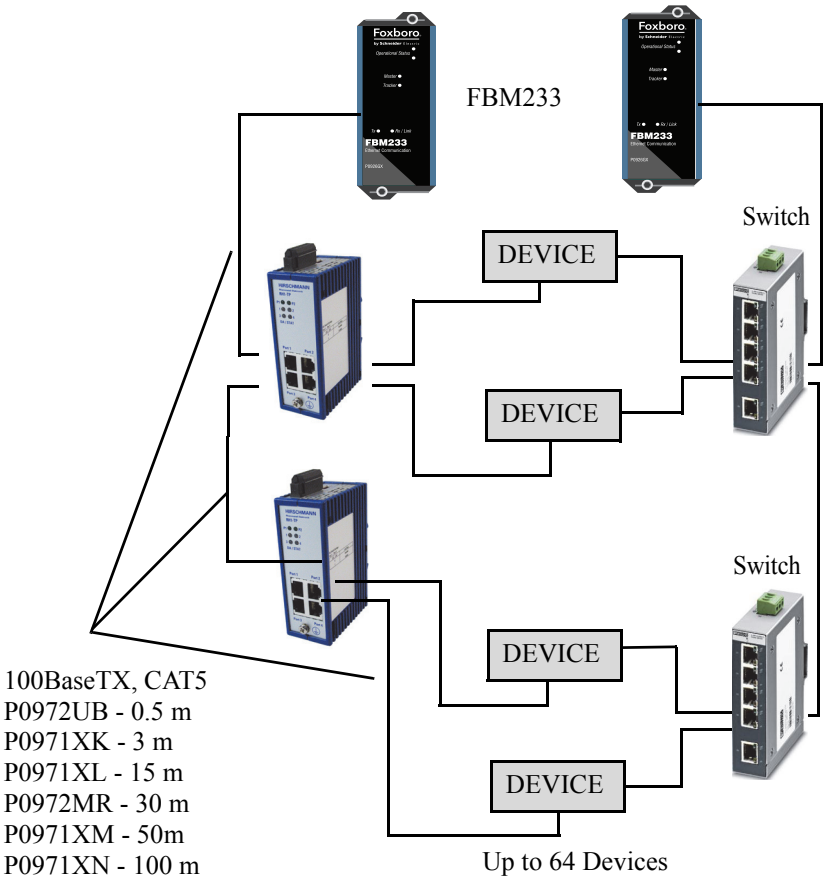
Industrial Ethernet Switch

Schneider Electric (Foxboro) offers a 5 port 10/100 base TX switch (P0972WE) to connect devices to the FBM233. This switch (refer to Figure 4-50) is DIN rail mounted and supports Ethernet protocol to/from Ethernet devices.

Figure 4-50. 10/100 Ethernet 5 Port Switch (P0972WE)

The switch mounts on an ISO/DIN rail and requires 24V dc that can be supplied by the system 24 volt power supply. If redundant power is required an external diode module can be used.

For detailed physical and electrical specifications, refer to *Model SFNB 5TX 2891001* at www.phoenixcontact.com/us/products.



Note: Type of cable used depends on type of device used.

Figure 4-51. FBM233 Connection to Hub

Installing Ethernet Hubs

To install the hubs, proceed as follows:

1. Mount the hub on the DIN rail. Refer to the vendor's literature.
2. Connect the cabling as shown in Figure 4-51. The cable used is a shielded twisted pair between the FBM233, the hub, and the device.

NOTE

Connecting two hubs in series requires a crossover cable between the two hubs (see Figure 4-51).

3. Connect the FPS400-24 power supply to the hub. Refer to "FPS 400-24 Power Supply Connections to Hubs" on page 75.

FPS 400-24 Power Supply Connections to Hubs

The FPS400-24 power supply is used with DIN rail modules and Ethernet hubs. Cable P0972RN 1.8 m (6 ft) connects power from the FPS400-24 to the Ethernet hubs. (see Figure 4-52).

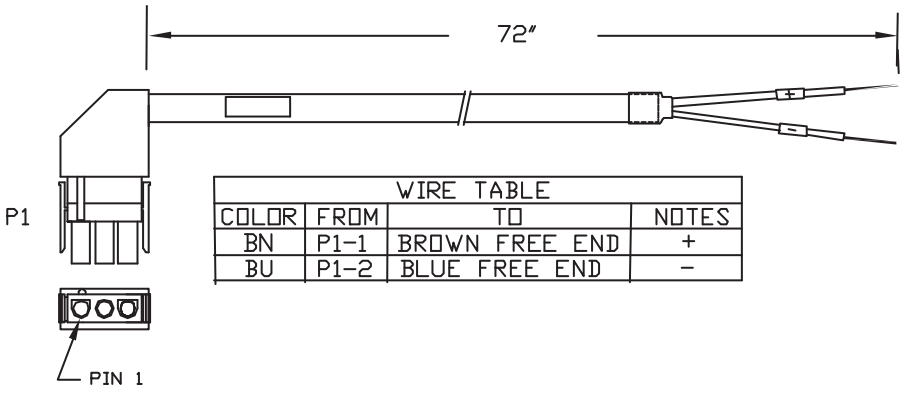


Figure 4-52. P0972RN, FPS400-24 Power Cable to Hub

If your hub accepts redundant input power, you must have redundant (two) FPS400-24 power supplies. To install a hub powered from an FPS400-24, perform the following:

1. Run and dress the cable P0972RN to the hub input power terminal. If required, cut the cable to the proper length and strip 1/2 inch of insulation from the cable ends.
2. Insert the brown wire of cable P0972RN into the +24 Vdc power terminal of the hub. Tighten the screw on the hub power input terminal.
3. Insert the blue wire of cable P0972RN into the ground terminal of the hub. Tighten the screw on the hub ground terminal.
4. Insert P1 of the cable P0972RN (see Figure 4-45) into an empty dc output plug of the FPS400-24.
5. Connect the earth terminal of the switch to the cabinet's earth terminal.

Installing Ethernet Switches

Foxboro offers a variety of Ethernet switches that allow you to connect devices to the FBM233. For information on the Fast Ethernet Switches refer to *The MESH Control Network Ethernet Equipment (*PSS 21H-7C3 B4).

Connect the cabling as shown in Figure 4-53. As shown in Figure 4-53, Ethernet switches and hubs may be used depending on the location of the devices within the plant. The cable used is a shielded twisted pair between the FBM233 and the Ethernet switch. For information on the cabling and configuration of Ethernet switches offered by Foxboro, refer to *The MESH Control Network Architecture Guide* (B0700AZ).

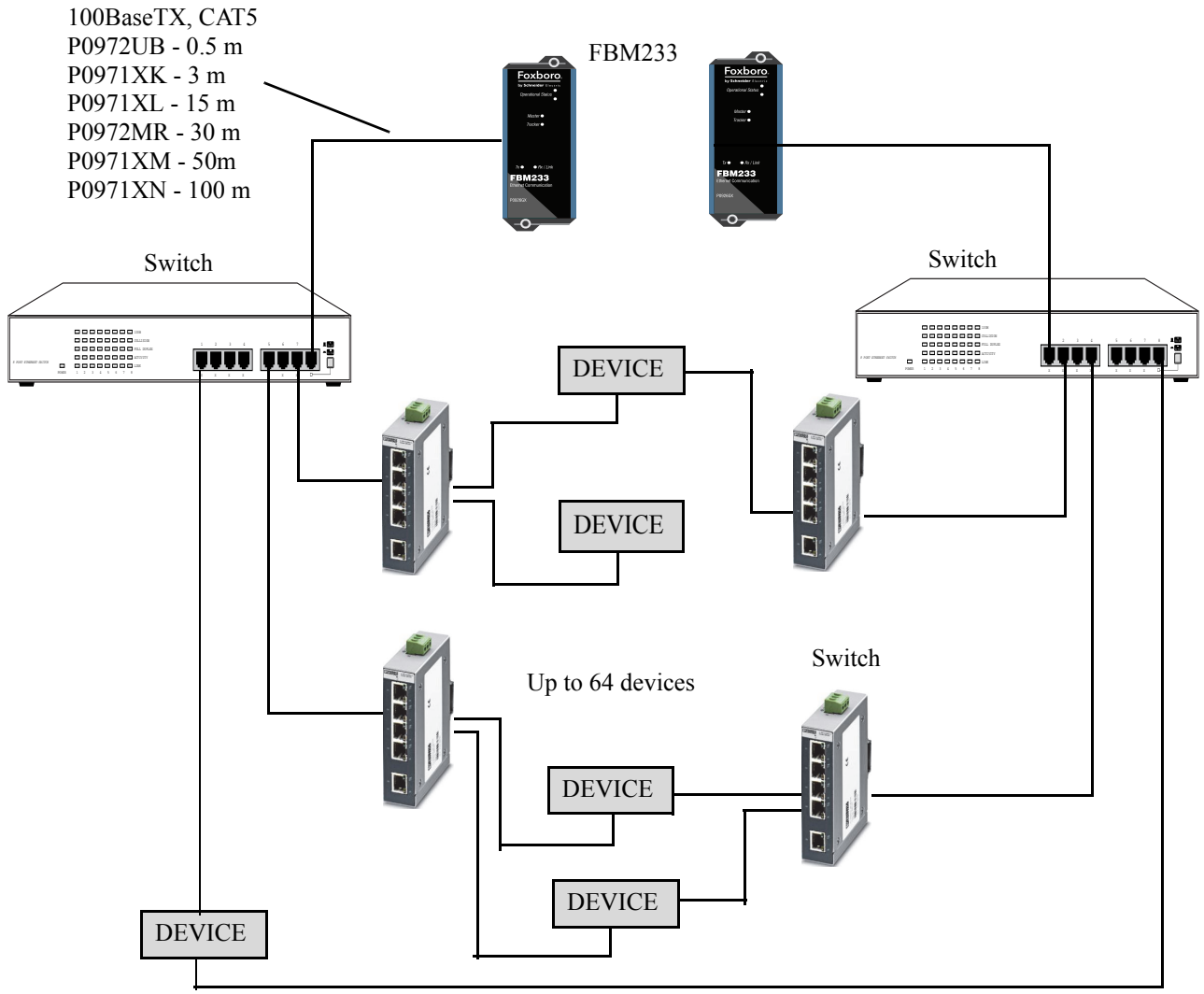


Figure 4-53. FBM233 Connection to Ethernet Switch

5. Control Block Configuration Information

This chapter provides information necessary for configuring the control blocks associated with the FBM230/231/232/233 I/O functions.

ECBs and DCI Blocks Used with the FBM230/231/232/233

The FBM230/231/232/233 input/output (reading/writing data from/to the devices) control block configuration involves configuring the associated equipment control blocks (ECBs) and Distributed Control Interface (DCI) blocks. Table 5-1 lists the ECBs and DCI blocks used with the FBM230/231/232/233. For descriptions of the ECBs and DCI blocks used with the FBM230/231/232/233, refer to *Integrated Control Block Descriptions* (B0193AX).

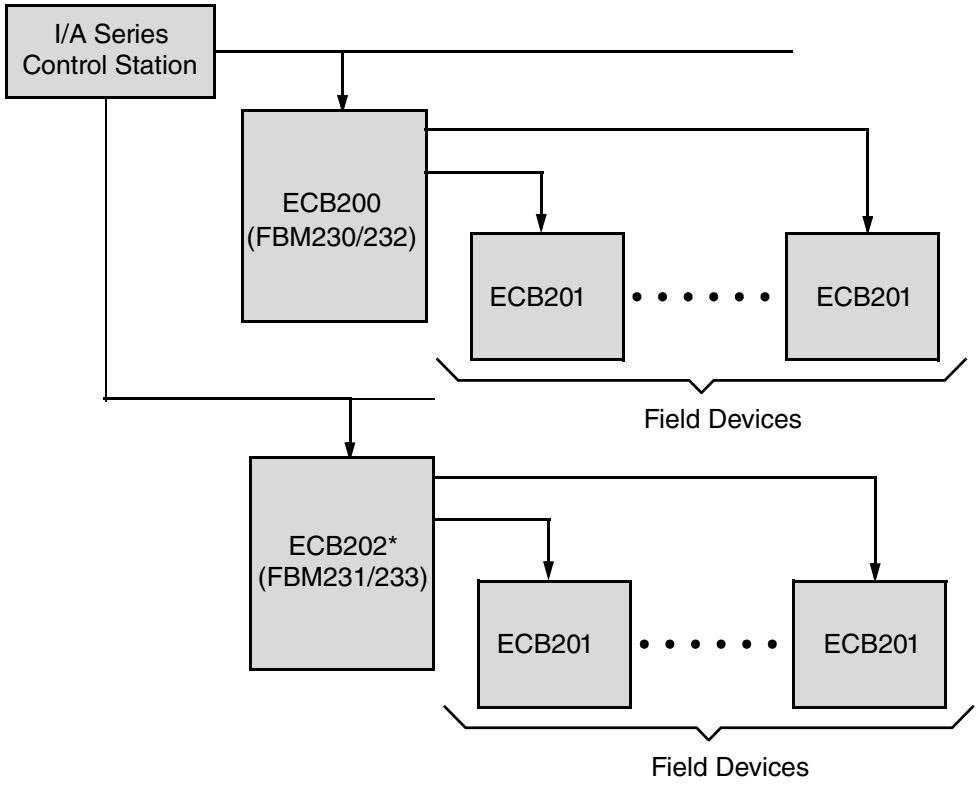
Table 5-1. ECBs and DCI Blocks Used with the FBM230/231/232/233

ECB/DCI Block	Description
ECB200	Parent ECB, representing the FBM230 or 232
ECB202	Parent ECB, representing the FBM231 or 233
ECB201	Child ECB, representing a device
RIN	Real Input DCI block
RINR	Redundant Real Input DCI block
ROUT	Real Output DCI block
BIN	Binary Input DCI block
BINR	Redundant Binary Input DCI block
BOUT	Binary Output DCI block
IIN	Integer Input DCI block
IINR	Redundant Integer Input DCI block
IOUT	Integer Output DCI block
PAKIN	Packed Input DCI block
PAKINR	Redundant Packed Input DCI block
PAKOUT	Packed Output DCI block
STRIN	String Input DCI Block
STROUT	String Output DCI Block

This chapter provides information regarding control block configuration. For specific information on the ECB and DCI block parameter settings, refer to *Integrated Control Block Descriptions* (B0193AX).

Block Interconnections

To perform process control operations, you must create and configure equipment control blocks (ECBs), DCI control blocks, and other I/A Series control blocks for control scheme implementation. Figure 5-1 shows the required ECBs and illustrates the parent/child relationship between the device ECBs (ECB201s), the FBM230/232 ECB (ECB200) and the FBM231/233 ECB (ECB202).



* Each ECB202 block represents a pair of redundant FBMs: FBM231s or FBM233s.

Figure 5-1. ECB Hierarchy

Letterbug Assignments

For an FCM100Et or FCM100E, the first four characters of the FBM DEV_ID parameter (SLOT) must match the first 4 characters of the FCM100Et or FCM100E name. For an FCP280 or FCP270, the last two characters of the 6 character DEV_ID must be the slot position number (01, 02, ..., 07, 08 for the FBM230/232; 0A, 0B, 0C, or 0D for the FBM231/233). For a non-redundant FBM, the last two characters (03) reflect the physical position (slot 03) of the FBM in its associated baseplate (0). For a redundant FBM pair, the last two characters (0C) reflect the physical position (slot 0C) of the module pair in its associated baseplate (0). Refer to *DIN Rail Mounted Subsystem User's Guide* (B0400FA) for additional information.

Configuration Procedures

Each FBM230 or FBM232 (see Figure 5-1) requires one configured ECB200. Each pair of FBM231 or FBM233 modules requires one configured ECB202. For each device associated with the FBMs, a child ECB201 must be configured and connected to the (parent) ECB200 or ECB202. In addition, a DCI block must be configured for each FBM parameter that is connectable. Table 5-1 lists the DCI block types used in data transfer operations. The DCI blocks can be configured anywhere in the Continuous List hierarchy (List 1 or 2), in any compound in a control processor (except the ECB compound and station compound).

Figure 5-2 shows the user-configured connections between the various elements of a typical control system. In this figure, a RIN block processes a real input from Device #1, and a ROUT block processes a real output value directed to Device #n.

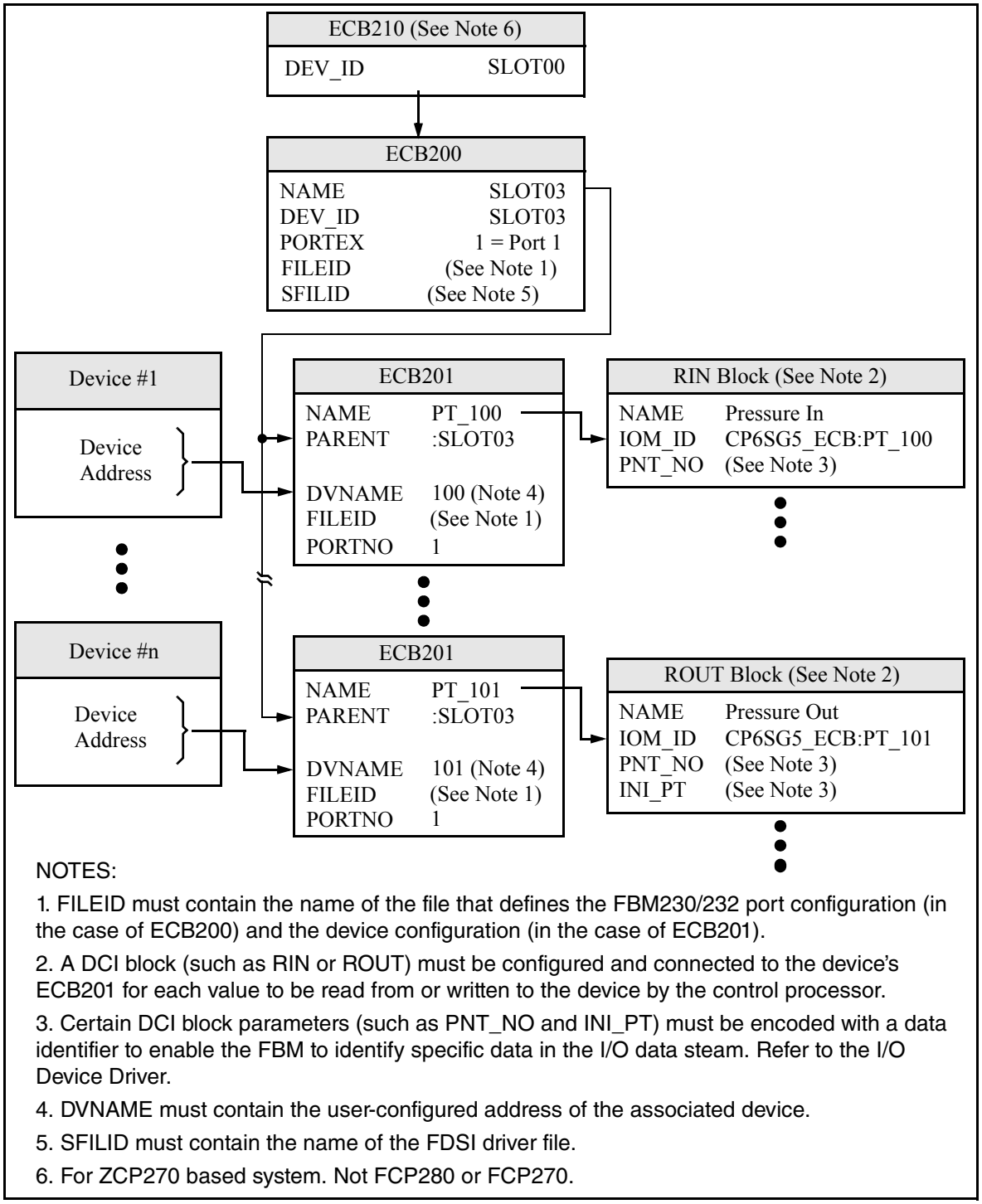
Figure 5-3 shows the user-configured connections between the various elements of a typical control scheme using an FBM233. In this figure, a ROUT block is used to process a real output value directed to the field devices.

Configuration for other types of device parameters and corresponding DCI blocks is similar, with similar interconnections between the ECBs and DCI blocks. Table 5-2 lists key parameters, which either specify the linkages between ECBs and DCI blocks or contain information relating to the transfer of I/O values.

The ECB200, ECB201, ECB202, and DCI block parameters are defined in *Integrated Control Block Descriptions* (B0193AX).

— NOTE

The Basic Processing Cycle (BPC) for a CP being used to connect to the FBMs should not be configured for less than 500 ms.



NOTES:

1. FILEID must contain the name of the file that defines the FBM230/232 port configuration (in the case of ECB200) and the device configuration (in the case of ECB201).

2. A DCI block (such as RIN or ROUT) must be configured and connected to the device's ECB201 for each value to be read from or written to the device by the control processor.

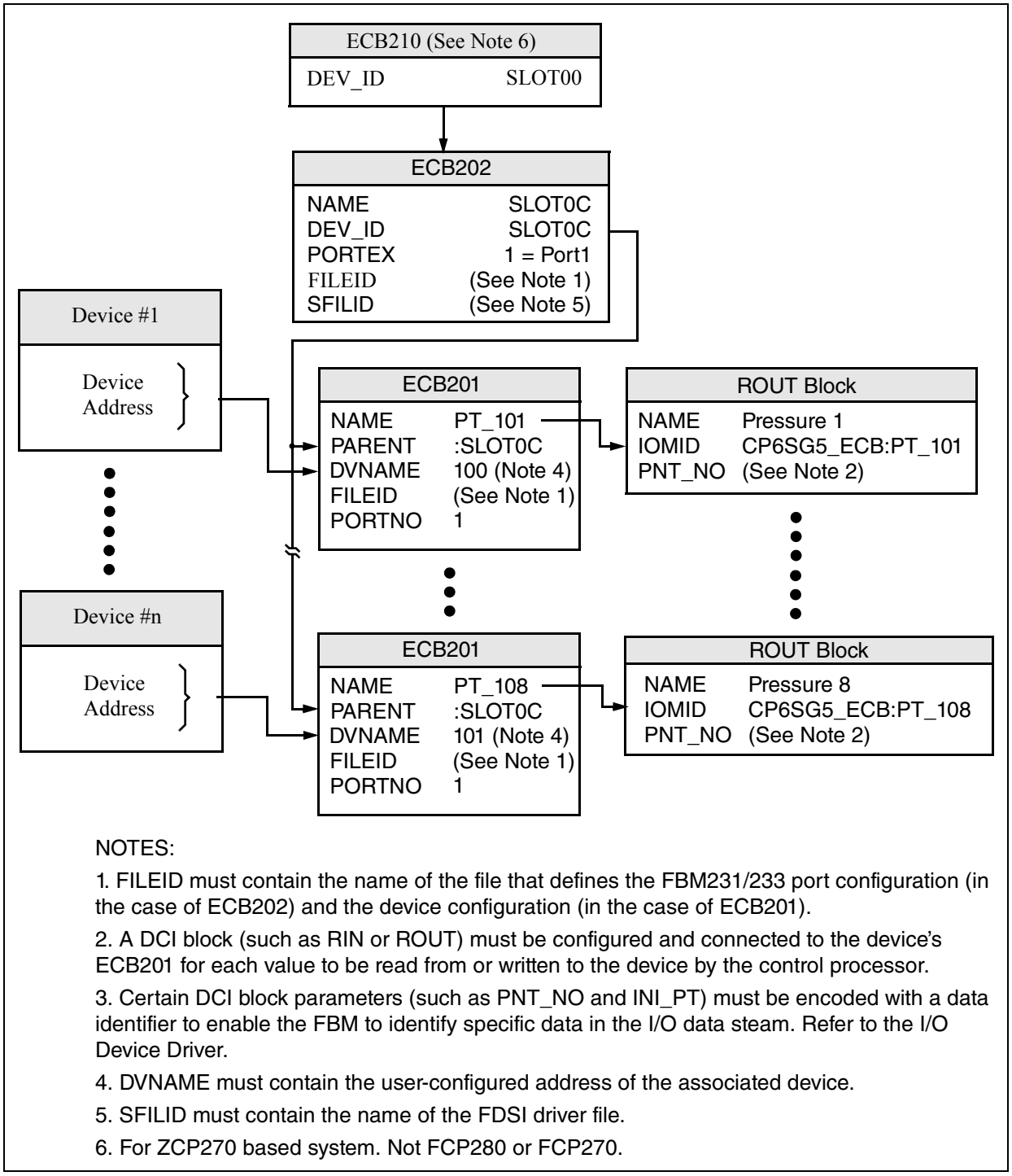
3. Certain DCI block parameters (such as PNT_NO and INI_PT) must be encoded with a data identifier to enable the FBM to identify specific data in the I/O data steam. Refer to the I/O Device Driver.

4. DVNAME must contain the user-configured address of the associated device.

5. SFILID must contain the name of the FDSI driver file.

6. For ZCP270 based system. Not FCP280 or FCP270.

Figure 5-2. Typical Modbus Configured ECB200 and ECB201 Block Interconnections



NOTES:

1. FILEID must contain the name of the file that defines the FBM231/233 port configuration (in the case of ECB202) and the device configuration (in the case of ECB201).

2. A DCI block (such as RIN or ROUT) must be configured and connected to the device's ECB201 for each value to be read from or written to the device by the control processor.

3. Certain DCI block parameters (such as PNT_NO and INI_PT) must be encoded with a data identifier to enable the FBM to identify specific data in the I/O data steam. Refer to the I/O Device Driver.

4. DVNAME must contain the user-configured address of the associated device.

5. SFILID must contain the name of the FDSI driver file.

6. For ZCP270 based system. Not FCP280 or FCP270.

Figure 5-3. Typical Modbus Block Interconnections for ECB202 and ECB201

Table 5-2. Key Parameters For ECBs and DCI Blocks

ECB or DCI Block	Parameter	Usage	Typical Syntax
ECB210 for FCM100Et or FCM100E	NAME	A user-configured name used for communications between the control processor and DIN rail baseplate(s).	SLOT01
	DEV_ID	User-configured letterbug of the FCM. For a nonredundant FCM100Et or FCM100E, the last two characters of the 6 character DEV_ID must be the slot position number (01,02, ...,07,08 for the FCM. For a redundant FCM100Et or FCM100E, the slot position number must be 0A, 0B, 0C, or 0D.	SLOT01
ECB200	NAME	A user-configured name used by the control processor to access this ECB.	SLOT03
	DEV_ID	User-configured letterbug of the FBM. First four characters must match first four characters of the FCM100Et or FCM100E. For FCP280 or FCP270 last two characters are baseplate slot number.	SLOT03 (See Note below)
ECB202	NAME	A user-configured name used by the control processor to access this ECB.	SLOT0A
	DEV_ID	User-configured letterbug of the FBM. First four characters must match the first four characters of the FCM100Et or FCM100E name. For FCP280 or FCP270 last two characters are baseplate slot number.	SLOT0A (See Note below)
ECB200/202	FILEID	Contains the name of the file that defines the FBM port configuration. (See “Saving the Port and Device Configuration Files” on page 152 for details.)	FB2301.XML
	SFILID	Contains the name of the FDSI driver file. Refer to the FDSI driver document.	Driver .ziph
	CHAN	For FCP280 only, identifies the Primary ECB (ECBP, ECB11) to which the ECB is assigned. See B0193AX.	1, 2, 3, or 4
ECB201	NAME	A user-configured name used by the control processor to access this ECB.	PT_100
	PARENT	Contains the user-configured pathname of the ECB200/202 hosting this field device.	:SLOT03
	DVNAME	Contains the user-configured address of the associated device. All devices on a bus must have a unique address.	
	FILEID	Contains the name of the file that defines the device configuration. (See “Saving the Port and Device Configuration Files” on page 152 for details.)	1101.XML
	DEVOPTS	Assigned by the I/O Device Driver. Refer to the I/O Device Driver document.	
	PORTNO	Contains the FBM port number (1 = Port 1, 2 = Port 2, 3 = Port 3, 4 = Port 4) to which the device is connected.	1

Table 5-2. Key Parameters For ECBs and DCI Blocks (Continued)

ECB or DCI Block	Parameter	Usage	Typical Syntax
All DCI Blocks: BIN (BINR), RIN (RINR), BOUT, ROUT, PAKIN (PAKINR), PAK-OUT, IIN (IINR), IOUT, STRIN, STROUT	IOM_ID	Contains the user-configured pathname of the ECB201 (device ECB) associated with the device to be accessed by this block. For the redundant DCI blocks (BINR, RINR, IINR, PAKINR), IOMID1, IOMID2, and IOMID3 are configurable strings that specify the primary, secondary, and tertiary device ECBs.	CP6SG5_ECB:PT_100
	PNT_NO, INI_PT, etc.	In each DCI block, you must configure a data identifier to identify, to the FBM, specific data in the I/O data stream and to specify the elements of the data. Examples of these parameters are PNT_NO, INI_PT, PKINGP, and PKCOGP (see Table 5-7 on page 89 for a complete listing). Refer to the I/O Device Driver document.	

⚠ CAUTION

When modifying an ECB201 configuration with changes that are related to DCI connections (for example, when changing a device address), you are advised not to wait for the system to report any possible error(s) associated with that change. Rather, you should monitor the ECB201 block detailed display while modifying the ECB201 configuration (see Chapter 8 “Process Operator Displays”). This ensures that all possible errors are detected (and resolved) before commencement of process control operations.

Equipment Control Blocks (ECBs)

Creating and Editing the FBM230/232 ECB (ECB200)

ECB200 is the equipment control block for the FBM230/232. Refer to *Integrated Control Block Descriptions* (B0193AX) for the ECB200 parameter definitions.

To create and edit an ECB200:

1. Access the IACC, ICC, or FCS Configuration Tools. For detailed instructions, refer to the appropriate book:
   - For IACC - *I/A Series Configuration Component (IACC) User's Guide* (B0700FE)
   - For ICC - *Integrated Control Configurator* (B0193AV)
   - For FCS Configuration Tools - *Foxboro Control Software Block Configurator User's Guide* (B0750AH).
2. Select a compound or insert a new compound.
3. Add an ECB200.
4. Select the ECB200 block then edit the block’s parameters.

   Table 5-4 lists the key ECB200 parameters for FBMs 230/232. Refer to *Integrated Control Block Descriptions* (B0193AX) for the ECB200 parameter definitions.

   The value for PORTEX is an integer. Table 5-3 lists the value to enter for FBM230/231 and the ports selected by that entry.

— NOTE

The FILEID parameter in the ECB200 must be configured (set) with the name (*FILENAME*.XML) of the port configuration file (refer to"Saving the Port and Device Configuration Files" on page 152).

Table 5-3. PORTEX Values for FBM230/231/232/233

Entered Value	Meaning	Entered Value	Meaning	Entered Value	Meaning
0	No ports	6	Ports 2 and 3	12	Ports 3 and 4
1	Port 1	7	Ports 1, 2, and 3	13	Ports 1, 3, and 4
2	Port 2	8	Port 4	14	Ports 2, 3, and 4
3	Ports 1 and 2	9	Ports 1 and 4	15	All Four Ports
4	Port 3	10	Ports 2 and 4		
5	Ports 1 and 3	11	Ports 1, 2, and 4		
Only the value of 1 is used for FBM232/233. FBM230/231 can use all values					

Table 5-4. ECB200 Key Parameters for FBM230/232

Parameter	Description
NAME	Contains the name used by the CP to access this ECB.
TYPE	ECB200
PERIOD	Scan rate, 1 = 0.5 second. This is the scan period at which the Control Processor scans DCI blocks. The scan rate of the device is independent of this scan period. Devices are scanned by the scan rate configured in the FDSI Configurator.
DEV_ID	6-character ID: first four characters same as the FCM100Et or FCM100E. For the FCP280 or FCP270, the last two are baseplate positions. See "Letterbug Assignments" on page 80.
PORTEX	A configurable decimal number that defines the existence of each port for the associated FBM. See Table 5-3.
FILEID	Name of the port configuration file (.XML).
SFILID	Name (filename.ziph) of the type of I/O Device Driver associated with FBM.
HWTYPE	The Hardware Type for FBM230 is 230 and for FBM232 is 232.
SWTYPE	The Software Type for FBM230 is 230 and for FBM232 is 232.

Creating and Editing the FBM231/233 ECB (ECB202)

ECB202 is the equipment control block for the FBM231/233. Refer to *Integrated Control Block Descriptions* (B0193AX) for the ECB202 parameter definitions.

To create and edit an ECB202:

1. Access the IACC, ICC, or FCS Configuration Tools. For detailed instructions, refer to the appropriate book:
   - For IACC - *I/A Series Configuration Component (IACC) User's Guide* (B0700FE)
   - For ICC - *Integrated Control Configurator* (B0193AV)
   - For FCS Configuration Tools - *Foxboro Control Software Block Configurator User's Guide* (B0750AH).
2. Select a compound or insert a new compound.
3. Add an ECB202.
4. Select the ECB202 block, then select and edit all block parameters.

   Table 5-5 lists the key ECB202 parameters for FBMs 231/233. Refer to *Integrated Control Block Descriptions* (B0193AX) for the ECB202 parameter definitions.

— NOTE

The FILEID parameter in the ECB202 must be configured (set) with the name (*FILENAME*.XML) of the port configuration file (refer to"Saving the Port and Device Configuration Files" on page 152).

Table 5-5. ECB202 Key Parameters for FBM231/233

Parameter	Description
NAME	Contains the name used by the CP to access this ECB.
TYPE	ECB202
PERIOD	Scan rate, 1 = 0.5 second. This is the scan period at which the Control Processor scans DCI blocks. The scan rate of the device is independent of this scan period. Devices are scanned by the scan rate configured in the FDSI Configurator.
DEV_ID	6-character ID: first four characters same as the FCM100Et or FCM100E. For the FCP280 or FCP270, the last two are baseplate positions. See "Letterbug Assignments" on page 80.
PORTEX	A configurable decimal number that defines the existence of each port for the associated FBM. See Table 5-3.
FILEID	Name of the port configuration file (.XML).
SFILID	Name (filename.ziph) of the type of I/O Device Driver associated with FBM.

Table 5-5. ECB202 Key Parameters for FBM231/233 (Continued)

Parameter	Description
HWTYPE	The Hardware Type for FBM231 is 231 and for FBM233 is 233.
SWTYPE	The Software Type for FBM231 is 231 and for FBM233 is 233.

Creating and Configuring Device ECB (ECB201)

For each device associated with the FBMs, a child ECB201 must be configured and connected to the (parent) ECB200 or ECB202. ECB201 can reside in the same compound as the ECB200 or ECB202 or it can reside in any other user-configured compound.

You create and edit the device ECBs (ECB201s) in a manner similar to that used for the ECB200/202. Table 5-6 lists the key ECB201 parameters for FBMs. Refer to *Integrated Control Block Descriptions* (B0193AX) for the ECB201 parameter definitions. Also, refer to the NOTE below.

1. Access the IACC, ICC, or FCS Configuration Tools. For detailed instructions, refer to the appropriate book:
   - For IACC - *I/A Series Configuration Component (IACC) User's Guide* (B0700FE)
   - For ICC - *Integrated Control Configurator* (B0193AV)
   - For FCS Configuration Tools - *Foxboro Control Software Block Configurator User's Guide* (B0750AH).
2. Add an ECB201 for a device.

   The insert position for the ECB201 must be in the ECB zone of the compound.
3. Select the ECB201 block, then select and edit all block parameters.

Table 5-6. ECB201 Key Parameters for Devices

Parameter	Description
NAME	Contains the name used by the CP to access this ECB.
TYPE	ECB201
DEV_ID	6-character ID.
HWTYPE	Contains the number of the parent FBM (230, 231, 232, or 233).
SWTYPE	Contains the number of the parent FBM (230, 231, 232, or 233).
PARENT	Contains the pathname of the ECB200/202 under which this device is installed.
DVNAME	This field contains the Mode address or the Ethernet address of the device. Refer to the I/O Device Driver document.
DVADDR	This field is left blank. It does not contain the address of the device.

Table 5-6. ECB201 Key Parameters for Devices (Continued)

Parameter	Description
DVOPTS	Refer to the I/O Device Driver document.
PORTNO	The port number (1, 2, 3 or 4) of the FBM on which the device will be installed. Dual ported devices are connected to the same port on the pair of FBMs.
FILEID	Name of the device configuration file (.XML) associated with this device.

— NOTE

The PARENT parameter is entered as a full pathname: CP6SG5_ECB:SLOT06. As an alternative, an abbreviated form can be used. For example,

SLOT06 can be used, provided that the parent ECB (the ECB200) resides in the PRIMARY_ECB compound (CP6SG5_ECB), or

:SLOT06 can be used if the child ECB is to reside in the current compound (the same compound as the parent ECB).

— NOTE

The FILEID parameter in the ECB201 associated with the device (and thus the device configuration file) must be configured (saved) with the name (*FILE-NAME*.XML) of the device configuration file (refer to"Saving the Port and Device Configuration Files" on page 152).

Distributed Control Interface (DCI Blocks)

DCI Block Point Number Parameters

DCI block point number parameters specified in Table 5-7 must be encoded (configured) by connecting to or entering a data identifier using the IACC or ICC. This identifier enables the FBM to identify specific data coming from or going to the input/output stream.

Table 5-7. DCI Block Point Number Parameters Requiring a Data Identifier

DCI Block	Parameter(s) to be Coded
BIN (Binary Input)	PNT_NO
BINR (Redundant Binary Input)	BI1_PT, BI2_PT, BI3_PT [BI3_PT optional; needed if ARBOPT =1 (TMR)]
BOUT (Binary Output)	PNT_NO, INI_PT (INI_PT optional; needed if external initialization request)
IIN (Integer Input)	PNT_NO
IINR (Redundant Integer Input)	II1_PT, II2_PT, II3_PT [II3_PT optional; needed if ARBOPT =1 (TMR)]

Table 5-7. DCI Block Point Number Parameters Requiring a Data Identifier (Continued)

DCI Block	Parameter(s) to be Coded
IOUT (Integer Output)	PNT_NO, INI_PT (INI_PT optional; needed if external initialization request)
PAKIN (Packed Binary Inputs)	PKINGP
PAKINR (Redundant Packed Binary Inputs)	PK1_PT, PK2_PT, PK3_PT [PK3_PT optional; needed if ARBOPT =1 (TMR)]
PAKOUT (Packed Boolean Outputs)	PKCOGP
RIN (Real Input)	PNT_NO
RINR (Redundant Real Input)	RI1_PT, RI2_PT, RI3_PT [RI3_PT optional; needed if ARBOPT =1 (TMR)]
ROUT (Real Output)	PNT_NO, INI_PT (INI_PT optional; needed if external initialization request)
STRIN (String Input)	PNT_NO, device specific
STROUT (String Output)	PNT_NO, device specific

The format of the data identifier is device and FDSI driver dependent. Refer to the I/O Device Driver User's Guide supplied with your specific driver.

In general the data identifier includes the starting address of that data type that is to be included in this particular communication with the device.

Fail-safe Actions

Two distinct fail-safe options can be configured in each DCI output connection: the "Fail-safe upon loss of CP communications" option and the "Fail-safe upon CP request" option. These options are downloaded into the FBM from the CP when the output is created or modified. The "Fail-safe upon loss of CP communications" option is enabled only if the FSENAB option is set. The "Fail-safe upon CP request" option is always enabled, regardless of the FSENAB option.

CP Fail-safe Actions

Fail-safe options can be configured in the fail-safe option (FSOPTN) parameter in each DCI output block, except the PAKOUT block, in the control processor. These options are:

- Fail-safe upon loss of CP communications
- Fail-safe, if bad measurement
- Fail-safe, if the set fail-safe (SETFS) parameter is set
- Bad output up loss of CP communications
- Bad output if bad measurement
- Bad output is SETFS.

The "Fail-safe upon loss of CP communications" and "Bad output upon loss of CP communications options are used only by the FBM logic (see "FBM Fail-safe Actions" on page 91).

If "Fail-safe if bad measurement" or "Bad output if bad measurement" is set and the error option (EROPT) is set in the DCI block, the control processor requests the FBM to take actions configured in the DCI connection under these conditions:

- If EROPT=1, when the primary input/measurement is BAD, out-of-service (OOS), or has a broken linkage to a source parameter.
- If EROPT=2, when the primary input/measurement is BAD, OOS, ERR, or has a broken linkage to a source parameter.

If "Fail-safe if set fail-safe (SETFS)" or "Bad output if set fail-safe (SETFS)" is set, and if the SETFS parameter is set in the DCI block, the control processor requests the FBM to take actions configured in the DCI connection.

In addition, when the compound containing the DCI block is turned off and any of the FSOPTN parameter options are configured, the control processor will write the fail-safe value (FSOUT) configured in the DCI block to the FBM, and then the FBM will write the fail-safe value to the device. The only exception to this rule is when the FSOPTN parameter is set to 4, 32, or 36 (bit 2 and/or bit 5 is set). In this case, the FDSI FBM will not write the fail-safe value to the device when the compound containing the DCI block is turned off.

NOTE

If an output needs to have a fail-safe value before the corresponding DCI block or the compound containing the block is deleted, the user must write the fail-safe value manually from FoxView™ software.

FBM Fail-safe Actions

You can configure a Fail-safe Enable (FSENAB) option in the ECB200/202 of the FBM230/231/232/233. This option is downloaded from the control processor when the FBM is rebooted or when the configuration of the ECB200/202 is changed. It is used by the FBM to enable/disable logic to assert fail-safe action on all ports automatically when a loss of CP communications is detected.

For the PAKOUT block, only the FBM fail-safe actions are supported and the fail-safe option (PFSOPT) for the block can be either 1 or 0. The value of the PFSOPT parameter should have a value of 1 to enable the FBM fail-safe action for the PAKOUT block. Bits 1 to 32 of the fail-safe value (PFSOUT) are mapped to bits 32 to 1 in the device.

The possible FSENAB values for the FBM230/231/232/233 are:

0 = Disable Fail-safe logic for all fieldbus devices (default).
1 = Enable Fail-safe logic for all fieldbus devices.

A Fail-Safe Delay (FSDLAY) value must also be configured in the ECB200/202 and is valid for all ports. The Fail-Safe Delay is a communications fail timer. When enabled by FSENAB it specifies the length of time (in units of 0.01 seconds) that the FBM can be without communication from the control station before taking fail-safe action. The value is downloaded from the CP when the FBM is rebooted, and at any time that the configuration of the ECB200/202 is changed. The fail-safe timer counts down and is reset to the FSDLAY value whenever a DCI read or write message is received.

Four fail-safe options can be configured in each DCI output connection:

- Fail-safe on loss of CP communications
- Fail-safe on CP request
- Bad output on loss of CP communications
- Bad output on CP request.

These options are downloaded into the FBM from the CP when the output is connected. The "Fail-safe on loss of CP communications" and "Bad output on loss of CP communications" options are enabled only if FSENAB is set for the FBM. The "Fail-safe on CP request" and "Bad output on CP request" are always enabled, regardless of the FSENAB option.

If the FSENAB option is set (FSENAB = 1), and the fail-safe timer expires, the FBM performs the following actions:

- If the "Fail-safe upon loss of CP communications" (FSOPTN) option is configured, the FBM writes the fail-safe value configured for that output to the field device and sets the Fail-Safe Active (FSA) status in the associated DCI output connection record. The FBM then re-initializes the output readback value to the fail-safe value in its DCI connection. (The output readback value is the value sent back to the CP in response to a Read Data message in both the value and extension fields of the reply message.)
- If the "Bad Output upon loss of CP communications" option is set, the FBM sets the BAD status in the associated DCI output connection record.

When CP communication is restored, the fail-safe timer is automatically reset to full value by the first DCI message received, and the FBM sends the values from the first received message to the devices and clears the fail-safe status in the associated DCI output connection records.

When the FBM receives an explicit request from the CP to set assert fail-safe for an output, the FBM performs the following actions:

- If the "Fail-safe upon CP request" option is configured for that output, the fail-safe value configured in the output connection is written to the field device. This action is taken independent of the FSENAB options.
- If the "Bad output CP request" option is set, the FBM sets the BAD status in the associated DCI output connection record.

When the FBM receives a write data command from the CP that does not request fail-safe action, the FBM clears the FSA and BAD status in the associated DCI connection record.

DCI Block Processing

The following is an overview of DCI block processing (and data read/write) operations.

NOTE

Scheduling of block processing depends on the period/phase of the ECB or control block. For proper operation, you must synchronize the associated ECB and control block processing, if required, by configuring these parameters appropriately. It is recommended that you use the default ECB values and modify only the block periods and phase.

The control processor processes the ECBs and DCI blocks as an integral part of its compound processing, each Basic Processing Cycle (BPC). The order of processing is the same as the order of the compounds, ECBs, and blocks configured in the control database.

NOTE

The BPC for a CP being used to connect to the FBMs should not be configured for less than 500 ms.

Processing of the ECBs and control blocks is performed in the following sequence:

1. Scheduling of an ECB or control block depends on its Period and Phase parameter settings. It is the user's responsibility to synchronize (if required) the associated ECB and control block processing by configuring these parameters appropriately.
2. ECBs scheduled to be processed are executed to read fresh inputs:
   When a parent or child ECB is processed, its DCI linked list is examined. For each DCI input or output block ready to be run in that BPC, its DCI connection requests are added to a read list for that ECB.
   When the read list is complete, a Read_Data message is sent to the FBM to retrieve the current data contained in the DCI connection records in the FBM. (If necessary, multiple messages are used to retrieve, from each FBM, all data required by the DCI blocks for that BPC.) All read list data is moved into the DCI connection records in the DCI blocks as data is retrieved.
3. Control blocks scheduled to be processed are executed:
   When all ECBs have been processed, the control blocks are processed. When the DCI blocks are processed, all DCI connection data is processed. (Refer to "Key DCI Block Functions" on page 93 for a description of the common functions performed in the DCI blocks.) During this processing, the DCI blocks set write request flags in the DCI connection records for any outputs that need to be written to the field devices.
4. ECBs scheduled to be processed, and containing fresh outputs to be written, are executed:
   When all control blocks have been processed, the ECBs are processed once again to drive the field outputs (in the control output blocks) that have been changed in that BPC. When a DCI parent or child ECB is processed, its linked list is examined once again. For each DCI connection record with a pending write request flag, a write list is generated.
   When the write list is complete, a message is sent to the FBM to write the current output data contained in the DCI output connection records in the control processor. (If necessary, multiple messages are used to write all data requested by the DCI blocks for that BPC.)

Key DCI Block Functions

Some key DCI block functions that can be selected by parameter settings are described in the following paragraphs. For more specific information on these functions, refer to the DCI block descriptions (BIN, BINR, BOUT, RIN, RINR, ROUT, IIN, IINR, IOUT, PAKIN, PAKINR, PAKOUT, STRIN, and STROUT) in *Integrated Control Block Descriptions* (B0193AX).

Periodic/Change-Driven Execution

All DCI blocks are executed periodically according to their Period/Phase parameter configuration. The BOUT, ROUT, and PAKOUT blocks normally set write requests to the FBM only when their desired output value changes. If the secondary loop timer (SECTIM) is configured nonzero in the BOUT or ROUT blocks (SECTIM does not apply to PAKOUT blocks), write requests are also set in BOUT and ROUT blocks if the timer expires between output changes.

Auto/Manual Mode Operation

All DCI blocks except PAKIN and PAKINR support the Auto/Manual mode of operation. This allows the operator to substitute the inputs in the BIN/BINR, RIN/RINR, and IIN/IINR blocks, and to drive the ROUT, IOUT, and PAKOUT outputs directly. Separate inputs can be used to drive the outputs of the BOUT block when the block is in Manual mode (Set for the BOUT block).

Simulation Mode

In the RIN/RINR, BIN/BINR, IIN/IINR, PAKIN/PAKINR blocks, the input is provided by a separate, configurable input parameter. In the ROUT, IOUT, BOUT, and PAKOUT blocks, confirmation of the output value change is simulated automatically. The simulation mode may be used in conjunction with the Auto/Manual mode. The two features may co-exist in any DCI block.

Signal Conditioning and Linear Scaling

Signal conditioning and linear scaling of analog inputs/outputs can be configured in the RIN/RINR and ROUT blocks. The SCI and SCO parameters can be used to specify any of the standard signal conditioning algorithms supported by the I/A Series control processor, except thermocouple and RTD conversions. For a description of the SCI conditioning algorithms, refer to the appendix associated with the RIN/RINR block, in *Integrated Control Block Descriptions* (B0193AX). For a description of the SCO conditioning algorithms, refer to the ROUT block in *Integrated Control Block Descriptions* (B0193AX).

Input Limiting

The input values of the RIN (RINR) block are constrained by the engineering range (HSCI1/LSCI1) configured in the block. If the input value is out-of-range, it is clamped to the high/low range value, and the corresponding Limited High/Limited Low (LHI/LLO) status bit is set in the value record.

Confirmed Outputs

The outputs of the ROUT, BOUT, IOUT, and PAKOUT blocks are confirmed by a readback of the actual value written to the FBM. When an output is sent from the control processor to the FBM, the FBM echoes the value to the control processor as the readback value. (In I/A Series terminology, this type of output is referred to as a “shadow” output and is reflected in the shadow status bit (Bit 12) in the value record.) The actual output value of the block is not updated until confirmation of the requested change at the field device is received.

If you have specified a read/write command, the value read back from the device is presented to the control processor as the readback value.

On the next ROUT, BOUT, IOUT, or PAKOUT block cycle in the control processor, the block output value is updated with the readback value from the FBM, thus completing confirmation of the change in the control processor.

Output Clamping

The output value of the ROUT block is constrained by the limit values (HOLIM/LOLIM) configured in the block. The limit values are constrained by the engineering range (HSCO1/LSCO1) configured in the block. If the output value exceeds its limiting constraints, it is clamped to the

high/low value, and the corresponding Limited High/Limited Low (LHI/LLO) status bit is set in the value record.

Output Initialization

The output value of a BOUT, ROUT, IOUT, or PAKOUT block initializes to the value read back from the FBM.

However, the initial output value is retained unchanged when modifying the configuration of a block, or when rebooting with the warm restart option. (These are the conditions under which it is not desirable to change the current output value).

If you have the fail-safe value configured in a fail-safe parameter, and the compound containing the block is turned off or deleted, the control processor sets the output value to the fail-safe value configured in the fail-safe parameters. Table 5-8 lists the fail-safe parameters for each of the output DCI blocks.

Table 5-8. DCI Block Fail-Safe Value Parameters

DCI Output Block	Fail-Safe Value Parameter
BOUT	FSCOUT
IOUT	FSIOUT
PAKOUT	PFSOUT
ROUT	FSOUT

Cascade Initialization

Upstream logic in a cascade is initialized by a BOUT, ROUT, or IOUT block in each of the following cases:

- When the DCI block initializes
- When the DCI block mode changes from Manual to Auto mode
- When control processor/FBM communication recovers from a failure condition
- When the readback value transitions from Bad and/or Out-of-Service status to Good status
- When the Initialization Input (INI_PT), if used, is cleared.

Redundant Input Selection

In the RINR, BINR, IINR, and PAKINR blocks, arbitration voting logic is used to select one of the redundant input values. In the RINR block, an arbitration tolerance limit (ARBLIM) is used to determine whether the analog inputs agree. In the BINR block, the discrete inputs must have the same Boolean value in order to agree.

If any two inputs agree and are healthy, the first of the two inputs is selected. If none of the healthy inputs agrees, or if none of the inputs is healthy, the selection is made according to a pre-configured selection option (SELOPT) in the block.

DCI Parameter Status Bits

Table 5-9 shows the DCI parameter status (for example, the value record status for MEAS in a RIN block), as implemented by the I/A Series control processor. The bit numbers in Table 5-9 represent the bit numbers in the parameter status word, not the block status bit of the DCI or other control blocks. User-written software applications can access any of the 16 bits of the value record status word. Refer to *Integrated Control Software Concepts* (B0700AG).

Table 5-9. DCI Parameter Status

DCI Parameter Status[1]	Meaning
Out-of-Service (OOS) (Bit 11)	The Out-of-Service (OOS) bit is set when: ♦ a point is initialized (CONNECT_DATA) ♦ the parent device (device connection) is not operational ♦ the point (data connection) is not operational ♦ the parent device is disabled ♦ a control processor to the FBM communication fails.
Bad Value (BAD) (Bit 8)	The Bad Value of a DCI connection is set when: ♦ an invalid float format is detected ♦ a device fails (no communication with the device) ♦ a control processor to the FBM communication fails.
Error (ERR) (Bit 15)	Not supported
Limited High (LHI) (Bit 13)	Not supported
Limited Low (LLO) (Bit 14)	Not supported
Fail-Safe (FS) (Bit 4)	Fail-safe has been asserted by the FBM.

1. Standard I/A Series status bits (used with all blocks)

Configuring DCI Blocks

In a control strategy, the DCI control blocks interface the I/A Series system to the field devices. The DCI blocks used with devices are listed in Table 5-1.

The DCI blocks are created in the same general manner as the ECBs. For detailed information, refer to *I/A Series Configuration Component (IACC) User's Guide* (B0700FE) or *I/A Series Integrated Control Configurator* (B0193AV). For parameter definitions, refer to *Integrated Control Block Descriptions* (B0193AX).

As part of the editing operations performed on the newly created DCI blocks, certain parameters (PNT_NO, R11_PT and others) must contain a point address to specify the particular point to be accessed regarding the input or output data handled by the DCI block.

In conjunction with creating and editing DCI blocks, you must configure the various blocks and compounds required for the desired control scheme. Refer to the following documents to perform these operations:

- *DIN Rail Mounted Subsystem User's Guide* (B0400FA)

- *Integrated Control Software Concepts* (B0700AG)
- *Integrated Control Block Descriptions* (B0193AX)
- *Integrated Control Block Descriptions for Foundation fieldbus Specific Control Blocks* (B0700EC).

To create and edit a DCI block in an existing compound:

1. Access the ICC or IACC.
2. View the desired compound.
3. Add a DCI block to the compound.
4. Configure the parameters for the DCI block.

— NOTE

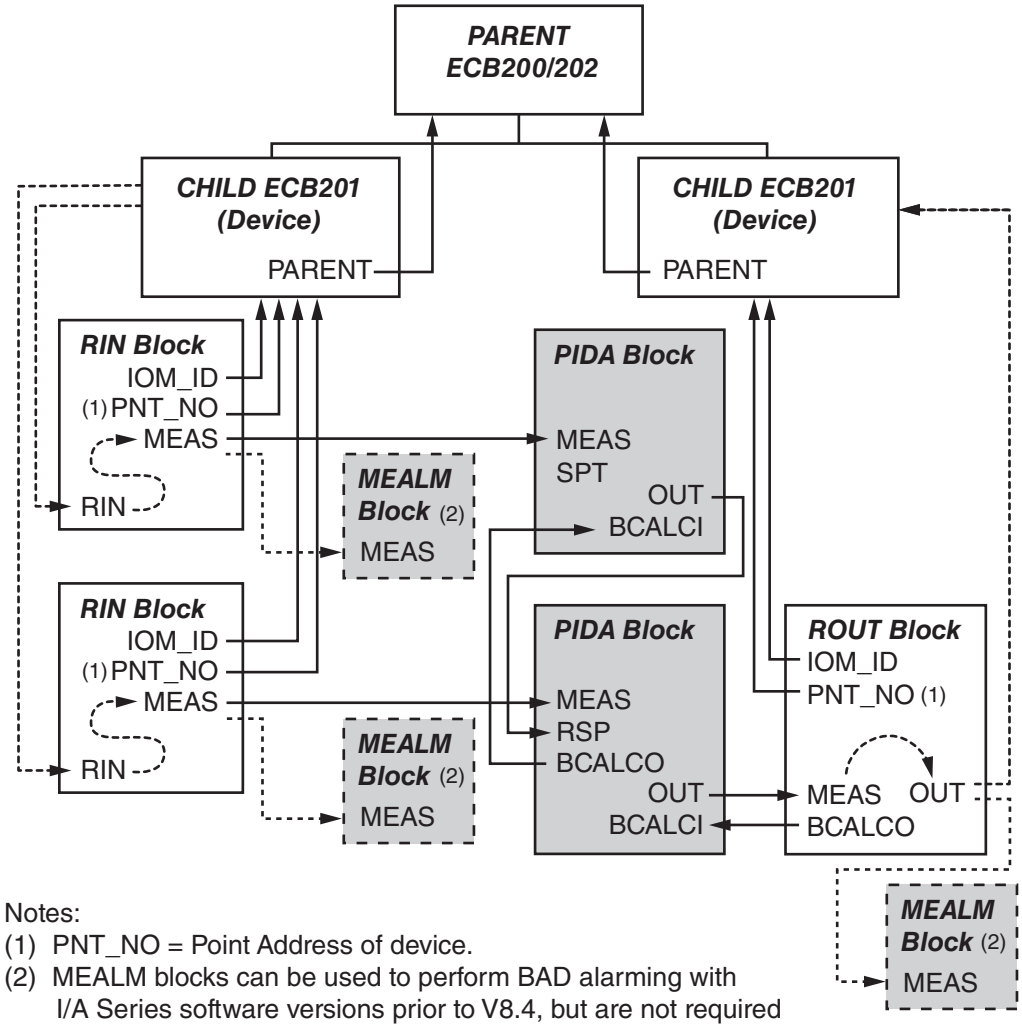
The engineering units configured for the block detail display must match the units configured in the device.

To verify operation of the DCI blocks and the device data using the block detail displays:

1. Access the FoxSelect compound/block overview utility. Refer to *Process Operations and Displays* (B0700BN) for details.
2. Access the block detail display for each DCI block created, and confirm its data.

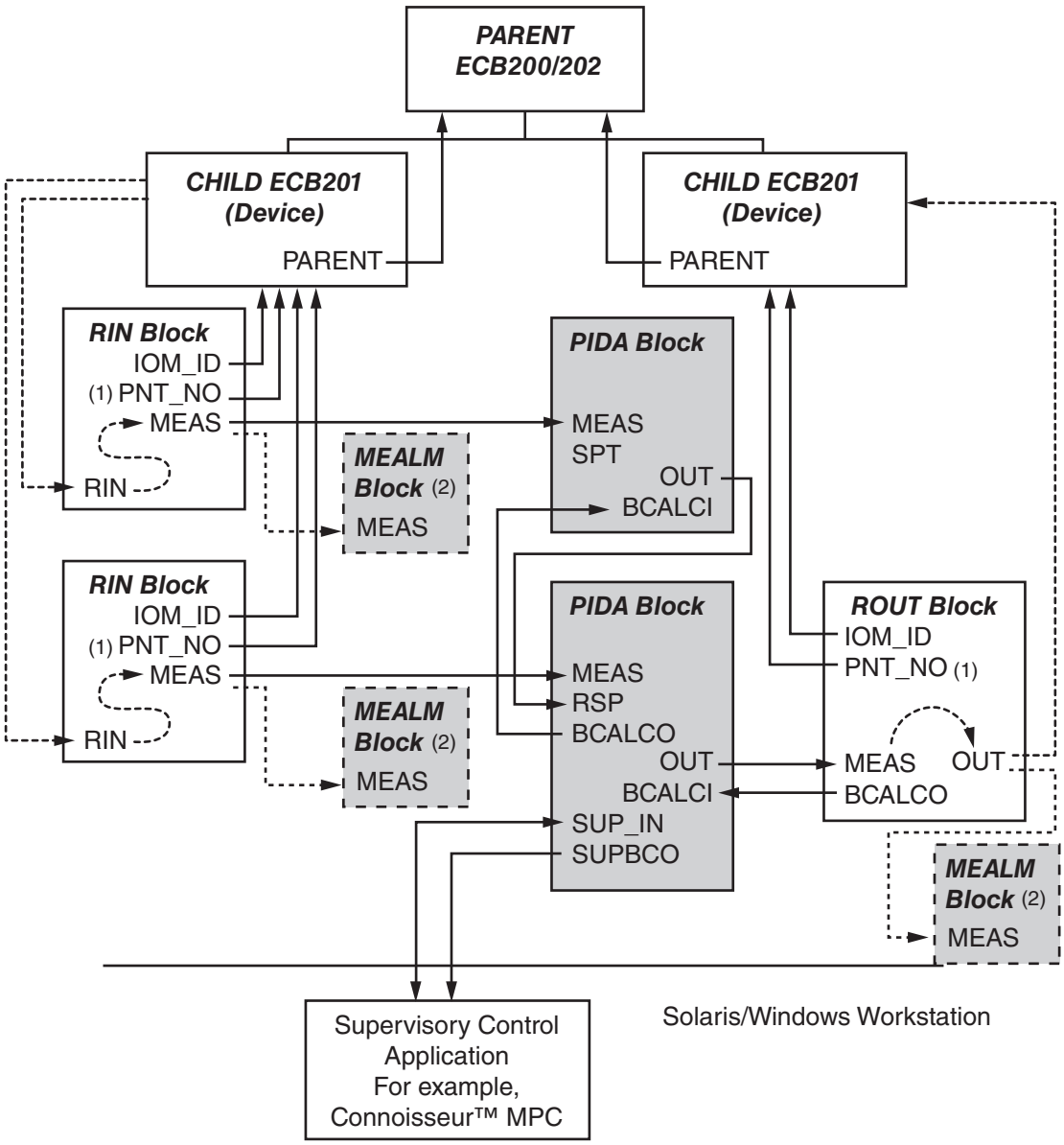
Control Schemes Using DCI Blocks

The DCI blocks can be integrated into many different I/A Series control schemes. Examples of simple cascade, supervisory control, motor start/stop, and event coordination configurations using DCI blocks are illustrated in Figure 5-4 through Figure 5-7.



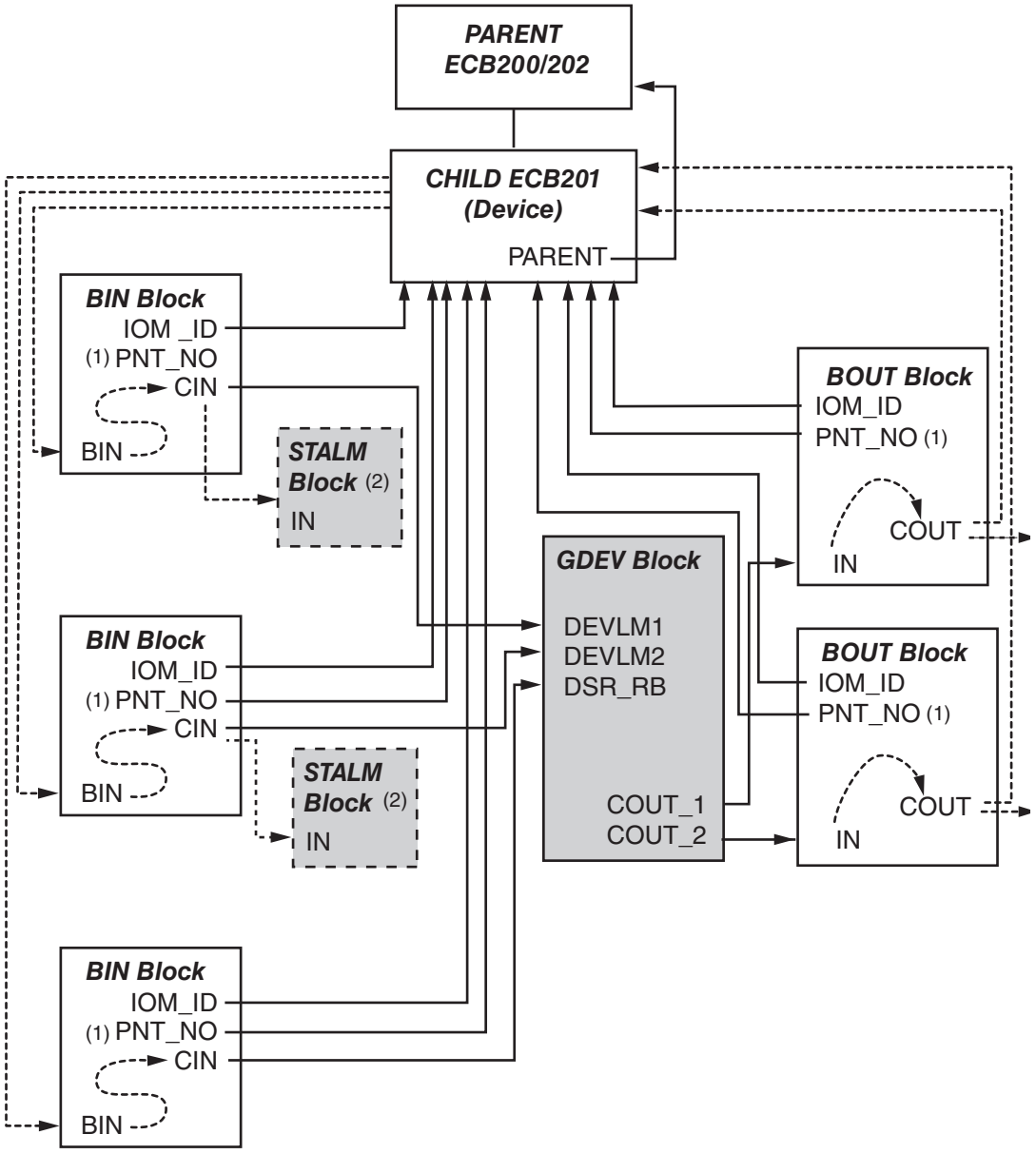
Notes:
(1) PNT_NO = Point Address of device.
(2) MEALM blocks can be used to perform BAD alarming with I/A Series software versions prior to V8.4, but are not required with I/A Series V8.4 or later software. Additional alarming capabilities have been added to I/A Series V8.4 DCI blocks.

Figure 5-4. Simple Cascade Configuration



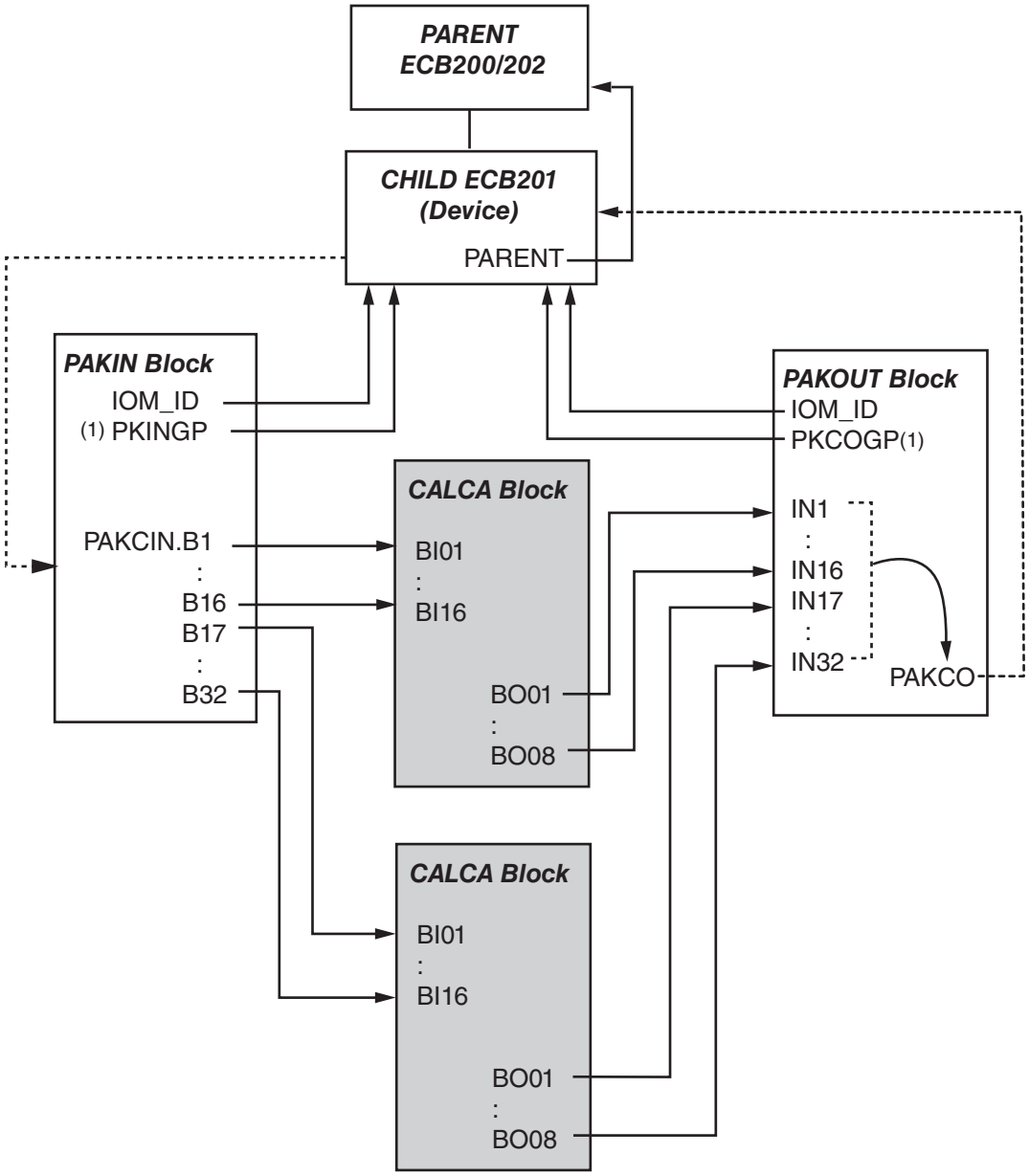
Notes:
(1) PNT_NO = Point Address of device.
(2) MEALM blocks can be used to perform BAD alarming with I/A Series software versions prior to V8.4, but are not required with I/A Series V8.4 or later software. Additional alarming capabilities have been added to I/A Series V8.4 DCI blocks.

Figure 5-5. Supervisory Control Configuration



Notes:
(1) PNT_NO = Point Address of device.
(2) STALM blocks can be used to perform BAD and state alarming with I/A Series software versions prior to V8.4, but are not required with I/A Series V8.4 or later software. Additional alarming capabilities have been added to I/A Series V8.4 DCI blocks.

Figure 5-6. Motor Start/Stop Configuration



Note:
(1) PKINGP and PKCOGP = Point Address of device.

Figure 5-7. Event Coordination Configuration

6. FDSI Module Redundancy

This section describes the architectures using redundant FDSI modules. The first section describes FDSI connections using redundant FDSI FBMs (231 and 233), and the second section describes FDSI connections using two simplex FDSI FBMs (230 and 232).

Redundant FDSI Connections Using FBM231/FBM233

This section describes the architectures using redundant FDSI FBMs 231 and 233. Depending on the devices connected and the device protocol several redundancy architectures are supported.

Standard Redundant FDSI Connections (Default Configuration)

A redundant system consists of two FDSIs modules, a pair of FBM231s or a pair of FBM233s containing identical FDSI drivers, communicating with a set of dual-ported devices. These FDSIs are called the Main (left module in baseplate) and Backup (right module in baseplate) FDSI. Each is driving a separate network called the Main and Backup networks. Each device on these networks must be dual-ported in that it must have two ports, each able to access the same database on the device. One port of each device is connected to the Main network and one port to the Backup network (see Figure 6-2 and Figure 6-3). While using FBM233s there should be no connection between the Main network and the Backup network preventing a single failure, such as a babbling device, bringing down both networks.

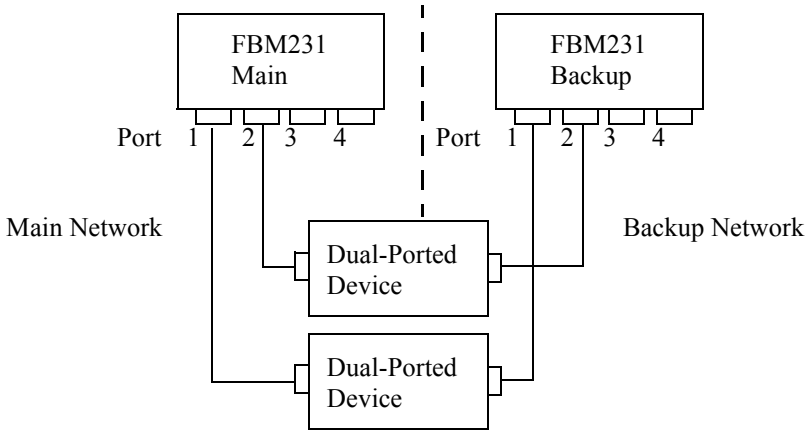


Figure 6-1. FBM231 Main and Backup Networks

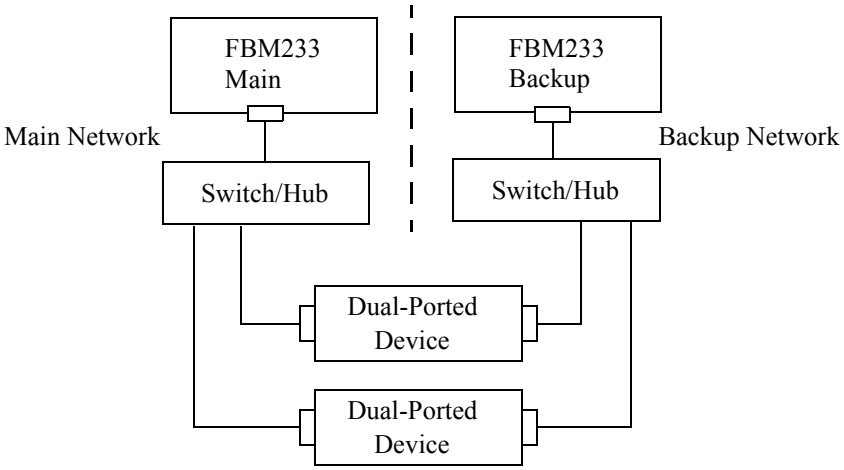


Figure 6-2. FBM233 Main and Backup Networks to Dual-Ported Devices

A redundant system with FBM233s could be used also with devices with a single-port if the application requires only cable and FBM level redundancy (see Figure 6-3). For example, a system with a pair of FBM233s could be connected to a single OPC server with one Ethernet port.

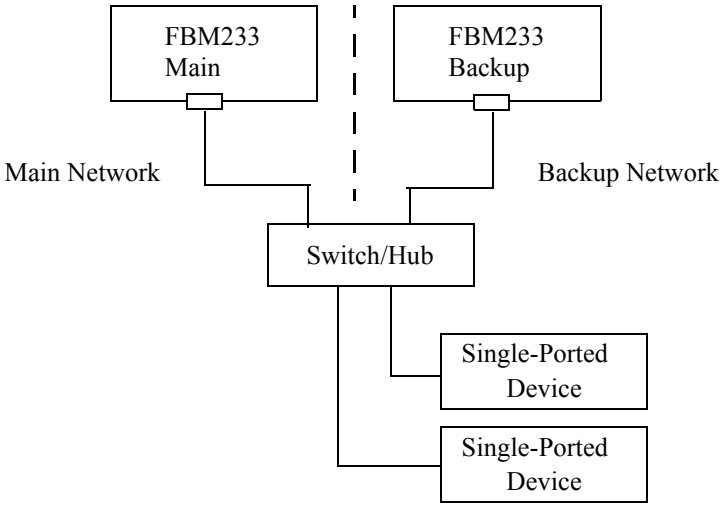


Figure 6-3. FBM233 Main and Backup Networks to Single-Ported Devices

A pair of redundant FDSIs (Main and Backup) operate in concert. A communication link (on baseplate backplane) between them allows them to monitor each other's health and to share information about the health of the attached devices. One of the FBMs is in the **Master** role and the other is in the **Tracker** role. These are logical roles and either of the FBMS can be in Master role. When both FBMS are healthy, whichever FBM powers up first becomes the Master and the other FBM becomes the Tracker. On input, both the FBMs receive input data from the device, but the Control Processor (CP) only receives data from the FBM in the Master role. On output, the CP sends data changes to both the Master and Tracker FBMs. Subsequently, depending on the driver, both FBMs or only the Master FBM forwards the output data to the device on their respective device ports.

The FBMs may be rebooted independently of each other via System Manager or SMDH. This is accomplished using the **RESET** option on the Equipment Change display.

Redundant Role Switch-over

The FDSIs determine “device connection status” of a device by monitoring messages from the device. For the redundancy system to work, a device on the network must be able to send one or more messages to the FDSI continuously at intervals no longer than a configurable ‘time out” time. Examples of such data from a device include unsolicited periodic heart beat messages, responses to periodic polled messages from the FDSI, or input point change notifications, or input point changes looped back from output points written from the FDSI. The mechanism used in a driver to monitor the device connection status is driver and device protocol dependent.

Both FDSIs exchange the device connection status for each device and each FDSI maintains a table of all devices (ECB201s) added by the CP to the FBM database. The table in the Master FDSI and the table in the Tracker FDSI are identical. Each table indicates the connection status of each device on each network.

Automatic role switch occurs only if the current Master module does not have good communication with one or more devices and the Tracker module has communication from all the enabled devices. An enabled device is a device for which “device communication” is enabled from System Manager or SMDH. When a role switch occurs the Master and Tracker roles are reversed.

If any device is not communicating on either network, that condition is system alarmed. The time out used in determining device communication failure is driver and device dependent. This system alarm is recognized as any other I/A Series system alarm, as opposed to a process alarm. By using the Station Manager, you can determine which AW is hosting the device that is alarming, which Control Processor (CP) hosted by that AW is alarming, which FDSI pair hosted by the CP is alarming, which device connected to that FDSI pair, and which port of the device (Main or Backup) is at fault. You can acknowledge the alarm and continue to monitor the fault.

For example, in a system, the initial status consists of Main in Master role and backup in Tracker role. If the fault is on the Backup network, the Main continues to work normally and no data is lost. If the failure is the Backup FDSI, it is alarmed, but communications continue via the Main FDSI. If the Main FDSI fails, or if the fault is on the Main network, it is alarmed, the Backup FDSI takes over as Master and communication continues. All incoming data to the CP (control processor) comes through the Backup FDSI, which is now the new Master. After the problem is fixed, the alarming condition is removed. However, the Backup network continues to be used for live data until a problem occurs on the Backup network with one of the devices or you manually switch the roles in System Manager or SMDH.

If a cable fails on either the Main or Backup network, the mechanisms are similar to the loss of a single device. The main difference is that the switch over time may be faster than loss of communication to a device.

If a dual-ported device fails to communicate properly through one of its ports to the FDSI the color of the device’s icon on the equipment displays in System Manager or SMDH is changed to yellow. If there is no communication from single-ported device or from both ports of a dual-ported device the color of the device’s icon on the equipment displays in System Manager or SMDH is changed to red and the device is failed. The port ECB’s icon appears yellow in System Manager or SMDH if any associated device ECB icon is yellow or red.

Note that at anytime, as long as both FDSIs are functional and the cable is in place, both the Main and Backup networks are carrying incoming data. Because the data is current on each network you can cause a role switch at any time and there is no delay in data updates. The only delay that occurs, happens when a fault first occurs. That delay is limited to the time it takes to recognize the fault. During that delay, data continues to flow to and from all devices that are not expe-

riencing the fault. The actual switch over time is not measurable in terms of data updates. The only thing measurable is the time to recognize the fault.

In a fully redundant link, if the Master detects that any single device has failed on its specific link, it forces a “role switch”, which causes the Tracker to become Master and vice-versa, and generates a system alarm. The automatic role switch only occurs if no devices are failed on the Tracker’s link.

If both Master and Tracker have failed devices on their respective links, an automatic role switch does not occur. If a dual-ported device is unable to communicate on its port connected to the Master and an automatic role switch can not occur due to one or more failed devices on the Tracker, the device is marked failed and color of the device’s icon on the equipment displays in System Manager or SMDH is changed to red, as the CP won’t be able to get input from this device.

You can force a role switch via the **SWITCH ROLES** option in the Equipment Change display of System Manager or SMDH. User activated role switch from System Manager or SMDH works in all cases except when the current master is able to communicate to all enabled devices and the Tracker is not able to reach one or more of those devices on its network.

Since automatic role switch occurs only if the partner is able to reach all the enabled devices, you could disable communication to the failed devices to get the automatic role switch functionality with the FBMs communicating to good devices only. This may be used to get the automatic role switch functionality while fixing or replacing the failed devices.

The status of the Main and Backup FBMs is reflected in the System Manager or SMDH displays and the FBM Detail displays. The FBM231/233s also have Master and Tracker LEDs to indicate role status. The Equipment Information pages clearly indicate Main and Backup connection status for each device. If the ECBs are yellow, you can use these displays to determine which side of the connection has failed. For example if the device ECB is in “yellow” state and the ECB201 display shows the status “Backup active, Main failed”, it implies that the CP is getting data from the device through the backup network and FBM and the main FBM is unable to communicate with the device on the main network.

Tracker Education

If only a single FBM231 or FBM233 is plugged in the baseplate or if one of the two modules is present but defective, the single working module operates as a Master.

When a good second module is plugged in the baseplate, the current Master “educates” the partner module. If the new module has the same driver revision as the current master, the education process consists of passing the port configuration file, and device configuration file (depending on the driver), and adding any DCI blocks the CP has previously added to the Master. If the driver revision on the new module is different, the Master also updates the driver on the new module. While the education process is going, data continues to flow from the devices to CP though the Master FDSI uninterrupted.

Once the Tracker education is complete the new module goes online and the two modules act in concert as described earlier. The Tracker education process could take several minutes. This duration depends on several factors, such as the number of DCI blocks to be added, number of devices, and the size of device configuration files used.

Role switch requests from System Manager or SMDH are not honored while the Tracker education process is going on.

Optional Redundancy Configuration with FBM233s with Device Scans from Master FBM Only

This configuration is recommended in cases where the device gets overloaded when scans are performed from both master and tracker. Figure 6-4 shows the architecture of this configuration.

NOTE

This configuration is only applicable when FDSIs are connected to private networks with no DHCP server. The FDSI port configuration should not have DHCP enabled. This redundancy configuration is not supported by the FDSI OPC client driver.

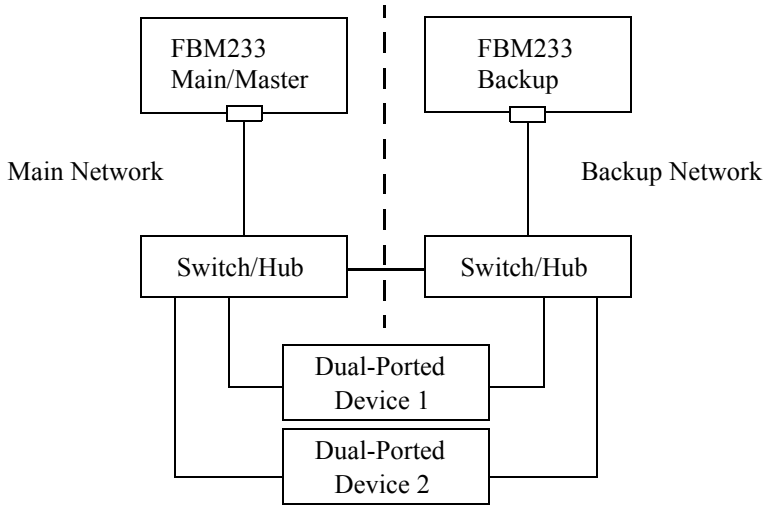


Figure 6-4. Redundant FDSI 233s Configuration with External Interlink

This option is chosen by specifying “EXT_ILINK” for the redundancy algorithm parameter in the port configuration xml file. A sample port configuration with this option selected is shown in Figure 6-5.

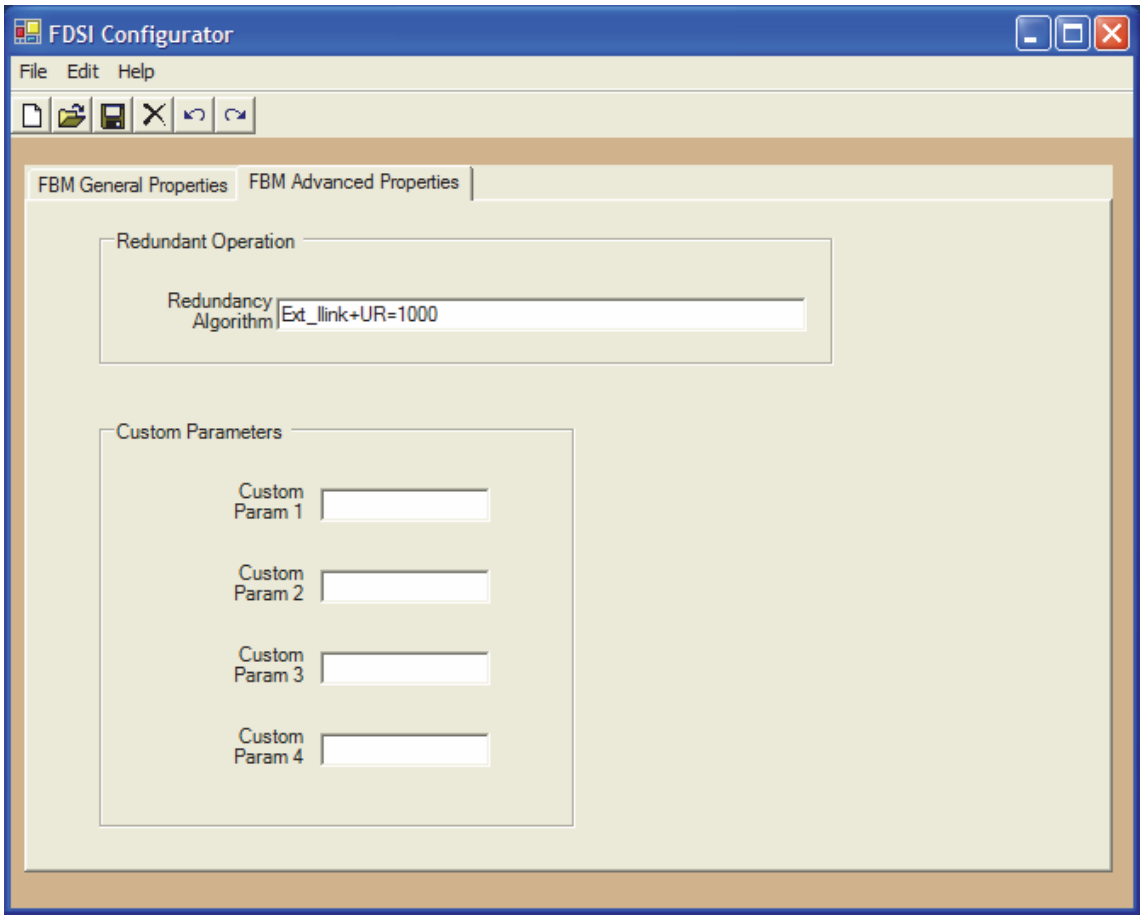


Figure 6-5. Example FDSI 233 Port Configuration File for Redundancy Configurations with Device Scan from Master Only

In this configuration, only the master FBM sends out scan messages and write messages to the device. The tracker FBM does not perform scan messages or writes to the device. The tracker sends out heartbeat messages to monitor the status of its link to the device.

A device used in this configuration needs to be able to support application level heart beat messages or "ping" (ICMP) messages on the port connected to the tracker module and respond to the scan and write messages form the master. The master periodically updates the tracker with any changes to the input points, so that in the case of role switch, the CP will not see any bump in the value or status of any point, i.e. provide a bumpless role switch. The update rate is configurable. The tracker database is updated by default at 500ms. Optionally the user can configure a different update rate by adding "`+UR= number`" to the redundancy algorithm parameter. The "number" is the update rate in milliseconds. For instance to select an update rate of 1 second the redundancy algorithm parameter on the port configuration needs to be specified as:

```
Ext_Ilink+UR=1000
```

The master communicates the input point updates to the tracker through the Ethernet port. Hence this configuration requires an external path between the Ethernet ports of master and tracker. If the master and tracker are connected to separate switches, a link between the two switches is needed. The external interlink between the two FBMs is essential for the functioning of this configuration and if this link fails, a system alarm is raised and the message "external interlink failed" will be sent to SMON log.

The role switch algorithm is same as in the standard redundant configuration. However this configuration uses more FDSI resources than the standard configuration and the number of devices that can be supported may be smaller. The master and tracker exchange device status information on the interlink between the modules. The tracker marks the status of a device as good if it is able to get responses to heartbeat messages.

In failure modes where the master FBM loses connection to the Ethernet, the bumpless role switch can not be guaranteed as the master communicates data updates to the tracker through the Ethernet link.

In cases where the main and backup networks use different subnets, the FDSI port configuration file needs to be configured with proper subnet mask so that the master FBM and tracker FBM can communicate through their Ethernet ports and any switches.

For example if the master is on 192.168.1.2 and the tracker is in 192.168.2.2 the Subnet mask for the master and tracker FBMs need to be set to 255.255.252.0.

UDP protocol is used by the master to communicate the input point updates to the tracker. If the tracker loses communication to the master all the points in the tracker will be set to OOS state. The device status in the tracker is based on the ability of tracker to communicate to the device. Even if the tracker-to-master external link is broken, role switch can still occur if the tracker is able to access all the devices and the master is not able to communicate to one or more devices. Following role switch under those conditions, the points will have OOS state right after the role switch but will eventually go to “good” state once the new master completes scanning of all the devices.

Redundant FDSI Connections Using FBM230/FBM232

As an alternative to using redundant FBM231/FBM233, you can implement redundant systems using simplex FDSI FBMs and redundant CP DCI blocks (BINR, IINR, RINR, and PAKINR). This section describes the architectures using FBM230s and FBM232s.

Unlike FBM231/FBM233 operation, the two FBM230/232 modules receive information from and send information to the CP separately. The two FBMs do not communicate with each other.

On input, both FBMs receive input data from the device and send the data to the CP. On output, the CP sends data changes to one of the FBMs. You will need to provide a CP application (for example, a CALC block) that can determine which FBM to use to write to the field device.

Considerations

Implementing a redundancy scheme using the architectures described in this section should be considered when one or more conditions is satisfied. This redundancy solution works best if:

- You have an application that needs fast switch-over for input data from a failed FBM to another FBM. The redundancy configurations based on FBM231 and 233 have switch-over times of the order of 3 to 4 seconds. If your application needs faster switch-over times of the order of a CP BPC time, you should consider using one of the architectures described in this section.
- The device is able to accept scan requests from more than one FDSI FBM. Be aware that with some devices, scanning from more than one FBM can impose heavy process-

ing load on the device servicing the scan requests. Refer to the device specifications for device loading capabilities and considerations.

- You have a system with all input points or mostly input points with a few output points. For systems with output points, you will need separate sets of output DCI blocks, one for each FBM. Consequently, the number of output blocks required doubles with systems using dual simplex FBMs for redundancy. Additionally, you will need a CP application (for example, a CALC block) that can determine which FBM to use to write to the field device for systems with output points.

If you have a device that provides redundant data paths using a serial port and an Ethernet port, the architecture shown in Figure 6-9 is the only way to implement FDSI redundancy.

Note that in all of these architectures, the FBMs do not exchange any data and hence the drivers running have more FBM processing power available to handle the devices than with 231 or 233.

The architectures listed below can also be augmented to use triple modular redundancy (TMR) at the FBM level, provided that the field devices can support three redundant input data connections.

Architectures

Depending on the devices connected and the device protocol, several redundancy architectures are supported. The architectures consist of two FDSI modules: two FBM230s, two FBM232s, or one FBM230 and one FBM232. Figure 6-6 through Figure 6-9 show some possible redundant architectures that use FDSI FBMs 230 and 232 and redundant DCI blocks

Figure 6-6 shows a system where a device has two Ethernet ports and is able to accept connections on both ports. This architecture provides a redundant system that can withstand a single point of failure anywhere in the system. An example of this architecture is interfacing the I/A Series system to Triconex® controllers using the two FDSI FBM232s running the TSAA driver.

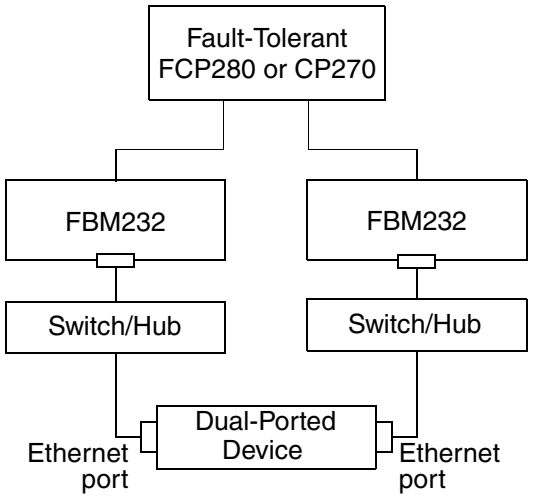


Figure 6-6. Connection of Two FBM232s to a Dual-Ported Device

Figure 6-7 shows a system with two FBM232s and a device that is capable of servicing scan request from two masters through a single port. For example, a system with a pair of FBM232s could be connected to a single OPC server with one Ethernet port.

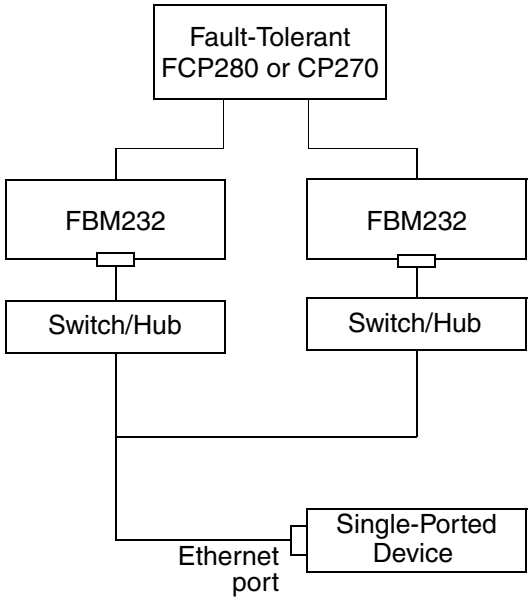


Figure 6-7. Connection of Two FBM232s to a Single-Ported Device

Figure 6-8 shows a system where a device has two serial ports and is able to accept connections on both ports. This architecture uses two FBM230s and provides a redundant system that can withstand a single point of failure anywhere in the system.

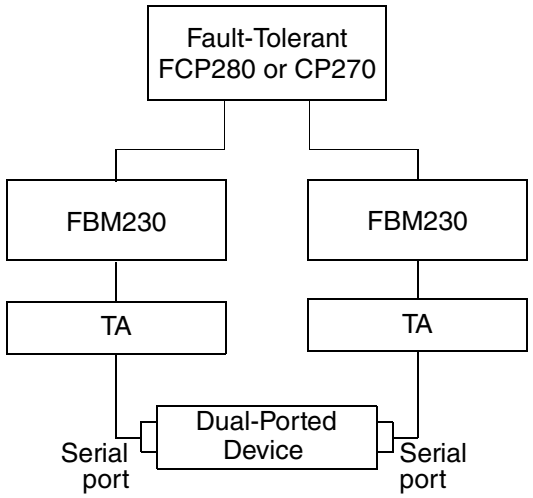


Figure 6-8. Connection of Two FBM230s to a Dual-Ported Device

Figure 6-9 shows a system where a device has a serial port as well as an Ethernet port, and can accept connections on both ports. This architecture uses one FBM230 and one FBM232.

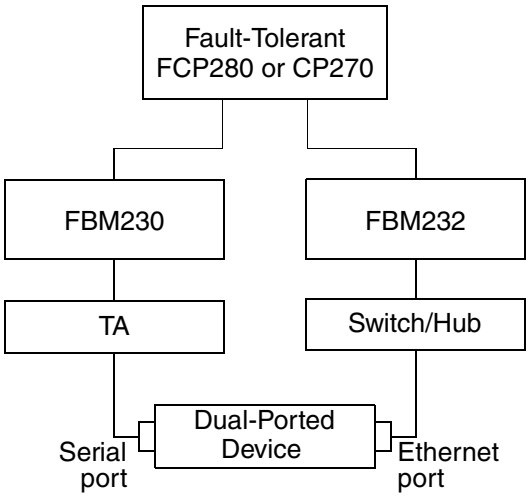


Figure 6-9. Connection of an FBM230 and an FBM232 to a Dual-Ported Device

7. Port and Device Configuration Files

This chapter describes how to configure the FBM230/231/232/233 ports and device configuration files associated with the FBM230/231/232/233 ports and devices.

The Field Device Systems Integrator (FDSI) Configurator produces configuration files containing:

- user-specified information defining the configuration of the FBM230/231/232/233 ports
- user-specified information defining the data transferred with the devices.

This information is used by the FBM230/231/232/233 to initialize itself, to install special configurations and to maintain communication with the devices.

This chapter describes the general port configuration and device configuration for the FBM230/231/232/233 ports. These general instructions may be modified for a specific I/O Device Driver. For instructions on the I/O Device Driver, refer to the I/O Device Driver instructions supplied with your specific driver. Device configuration files are not required for all custom I/O Device Drivers.

NOTE

You may configure the ECB200/202 and all device ECBs (ECB201s) before, or after, creating the FBM230/231/232/233 port configuration and/or device configuration files.

Hardware Configurations

The FDSI Configurator runs on a Windows XP® or Server 2003 workstation. The Configurator also runs on I/A Series systems with Windows XP or Server 2003 based AW stations with or without InFusion® software (see Figure 7-1).

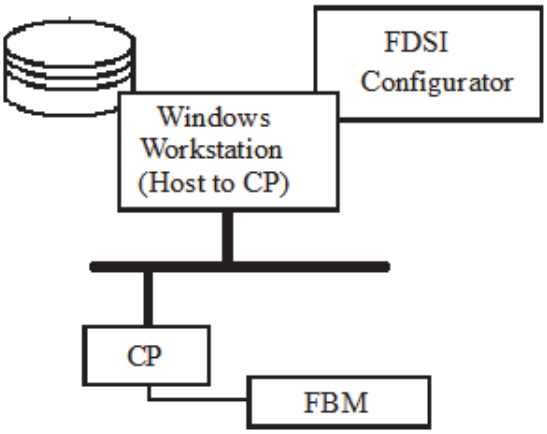


Figure 7-1. I/A Series Hardware Configuration Supporting the FDSI Configurator

The configuration files are platform independent files created on a Windows® workstation.

Installing the FDSI Drivers and FDSI Configurator

FDSI Driver installation deposits files into specific directories and therefore, does not require shutting down the I/A Series software nor rebooting the I/A Series workstation. If you are installing the FDSI Configurator on an I/A Series workstation, then you must shutdown the I/A Series software before installing the FDSI Configurator.

Installing the FDSI Driver

— NOTE

The FDSI Driver installation will only work on a Windows® workstation. In order to use these drivers on a Solaris™ workstation, complete the FDSI Driver installation on a Windows workstation, and then copy the driver-related files to the Solaris workstation. The driver-related files (located in the directory `D:\usr\fox\sp\files\devices\`) consist of the driver ZIPH file (`*.ziph`), the revision text file (`*_rev.txt`) and any XML configuration files (`*.xml`). These files must be copied to the Solaris workstation in the corresponding directory `/usr/fox/sp/files/devices/`. After copying the driver-related files to the Solaris workstation, rename each of the ZIPH and XML files to be all CAPITAL letters (e.g., from "`Modbus.ziph`" to "`MODBUS.ZIPH`"). Additionally, run the `dos2unix` command on the XML configuration files and the revision text file to make the files compatible with the UNIX® environment.

To install the FDSI Driver:

1. If you have the same FDSI Driver installed as the one being installed on your system, uninstall it before starting the installation of a new FDSI Driver as follows:
   a. Select `Start`.
   b. Select `Settings`.

c. Click **Control Panel**.

d. Click **Add Remove Program.**

e. Highlight the driver.

f. Click **Remove** to uninstall the existing driver.

2. Insert the FDSI Installation CD into the CD drive on the station.

   The FDSI setup program starts automatically. A dialog box similar to Figure 7-2 appears on your screen.

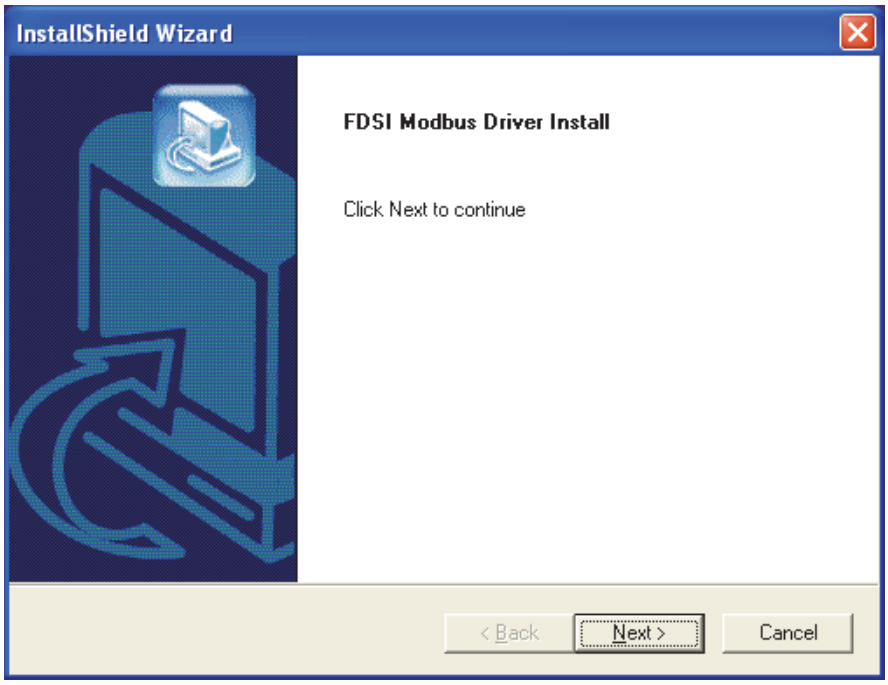


Figure 7-2. InstallShield Wizard Welcome Display for FDSI Driver

3. Click **Next** to start the installation procedure. A dialog box similar to Figure 7-3 appears on your screen.

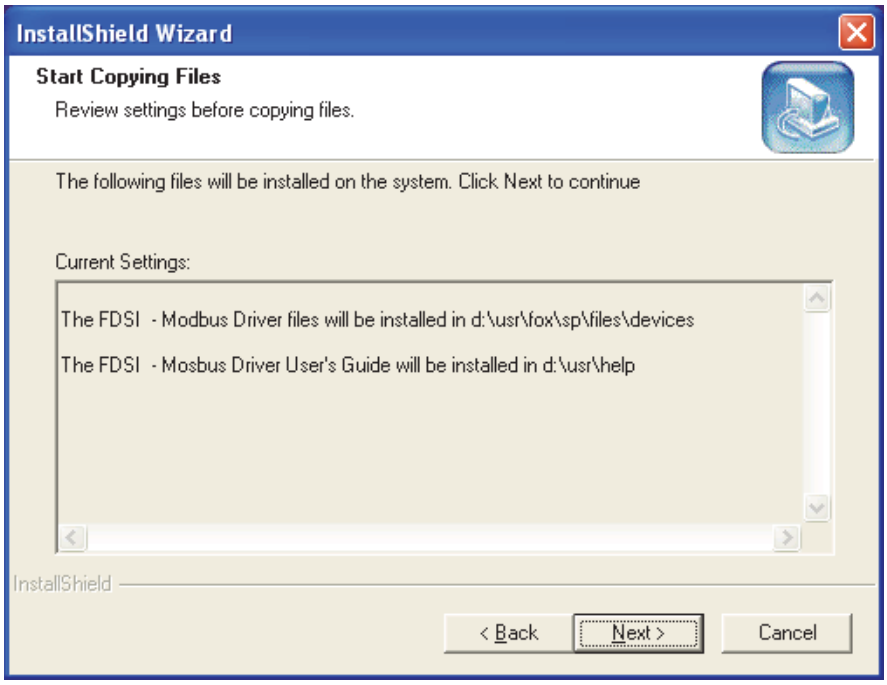


Figure 7-3. Start Copying Files Display for FDSI Driver

4. Click **Next** to continue. A dialog box similar to Figure 6-4 appears on your screen.

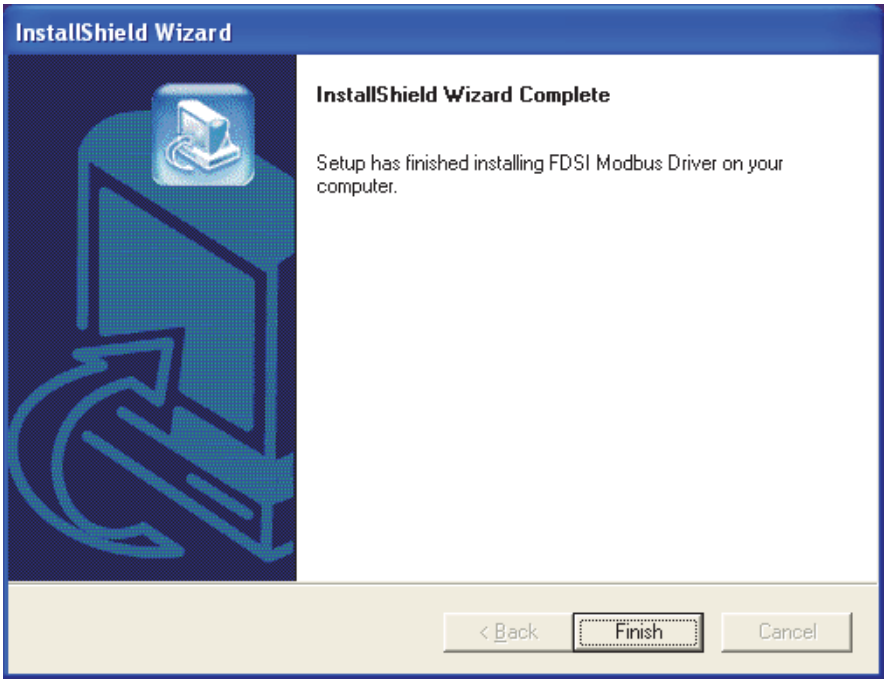


Figure 7-4. InstallShield Wizard Complete Display for FDSI Driver

5. Click **Finish** to complete the installation of the FDSI driver.

Installing the FDSI Configurator

1. If you are installing the FDSI Configurator on an I/A Series station, then you must shutdown the I/A Series software before starting the FDSI Configurator. To shutdown the I/A Series software:
   a. Select **Start**.
   b. Select **Settings**.
   c. Click **Control Panel**.
   d. Click **Foxboro I/A**.
   e. Select **Startup Options for Reboot.**
   f. Select **Autologon** option from the **I/A Series Off** group.
   g. Click **OK**.
   h. Reboot the station using the **Shutdown/Reboot** from the **SftMnt** menu on Foxview.
2. If you already have the FDSI Configurator installed on your system, you must first uninstall it before you can install the new one. Uninstall an FDSI Configurator as follows:
   a. Select **Start**.
   b. Select **Settings**.
   c. Click **Control Panel**.
   d. Click **Add/Remove Programs.**
   e. Highlight the FDSI Configurator.
   f. Select **Remove** to uninstall the existing version.
3. Insert the FDSI Configurator Installation CD into the CD drive on the station. The Setup program starts automatically. Figure 7-5 appears on your screen, and then changes to Figure 7-10 (on page 123) if Microsoft .NET Framework 2.0 is already installed in your station.

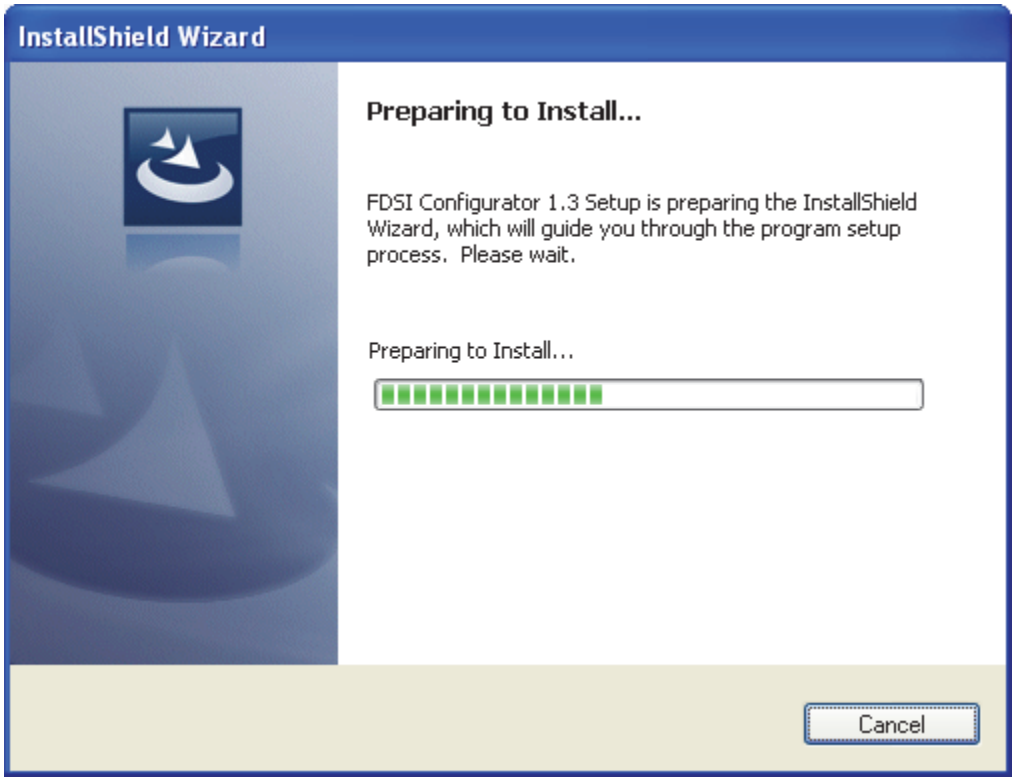


Figure 7-5. Preparing to Install Display for FDSI Configurator

4. If Microsoft .NET Framework 2.0 has not been previously installed or an older version of Microsoft .NET has been installed, the setup will ask you to install Microsoft .NET Framework 2.0. Figure 7-6 appears on your screen.

NOTE

The Microsoft .NET Framework 2.0 requires Windows Installer 3.0 or above. If the station is not installed with Windows Installer 3.0, then install Windows Installer 3.0 first from the FDSI Configurator Installation CD. After successful installation of Windows Installer 3.0, start installing Microsoft .NET Framework 2.0 by clicking `Setup.exe` from the FDSI Configurator Installation CD.

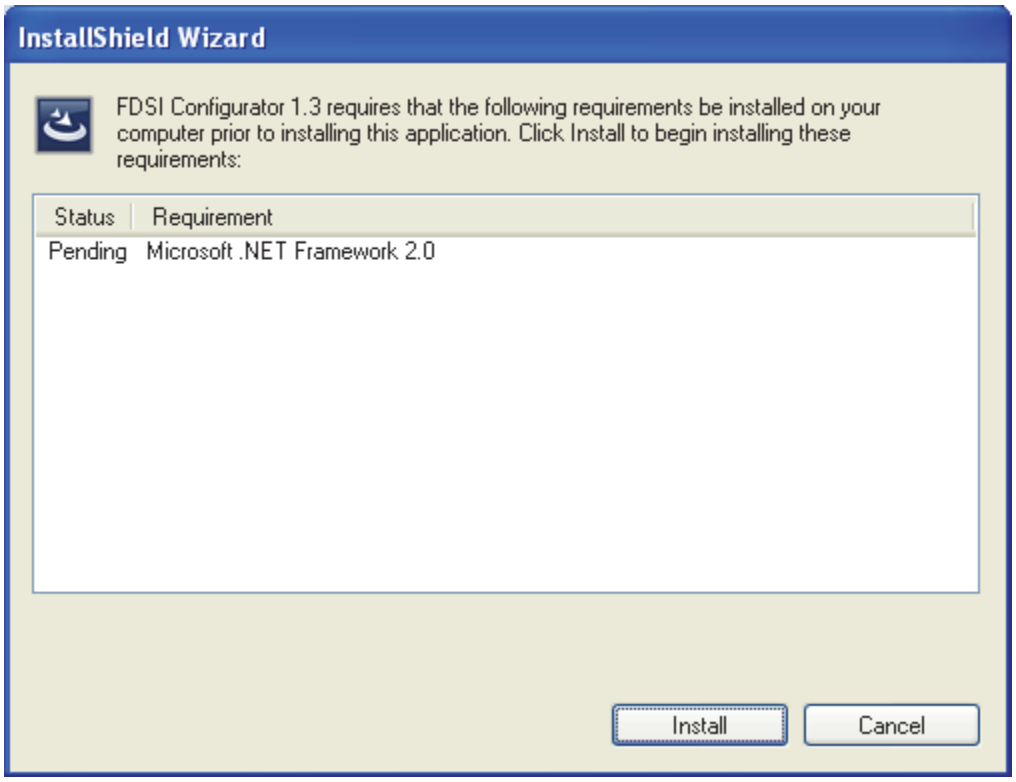


Figure 7-6. Installing Pending Requirements

a. Click **Install** to install Microsoft .NET Framework 2.0.
Click **Cancel** to cancel the FDSI Configurator installation.
If you click **Install**, Figure 7-7 appears on your screen.

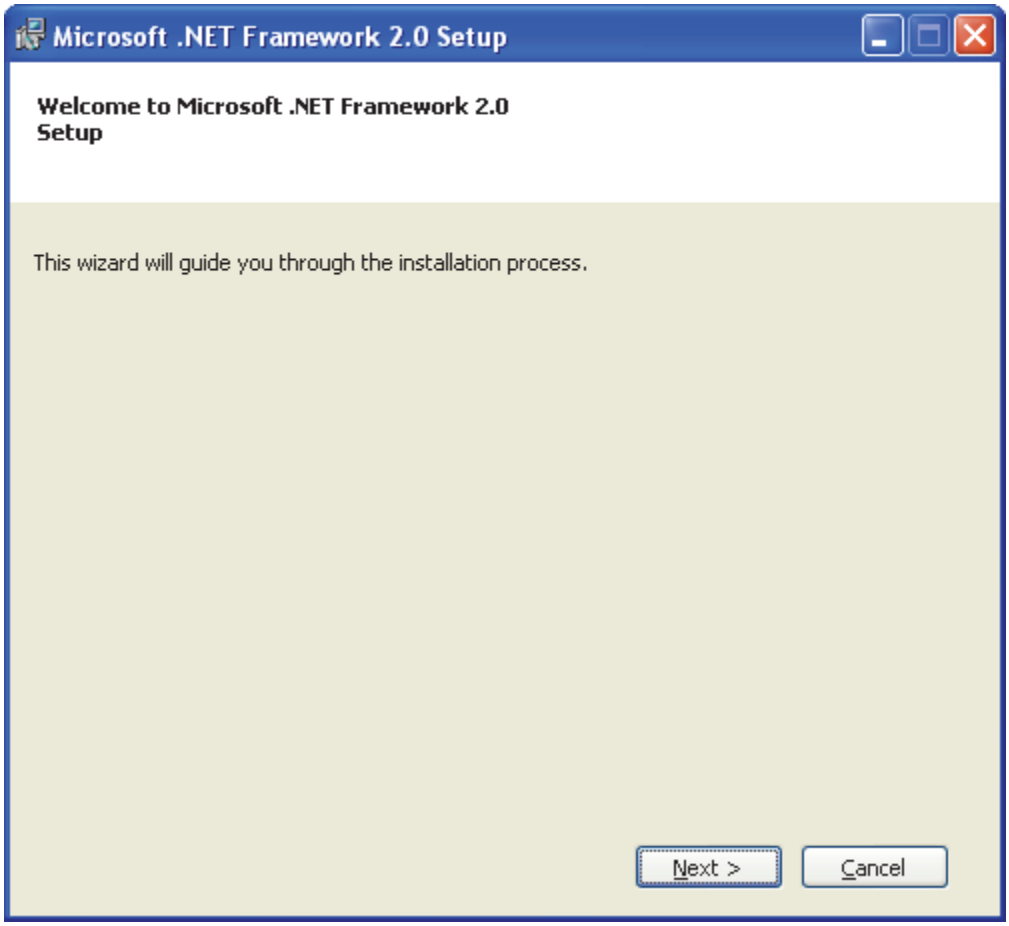


Figure 7-7. Microsoft .NET Framework 2.0 Setup

b. Click **Next** to install the .NET Framework 2.0 packages.
Click **Cancel** to cancel the installation.
If you click **Next**, Figure 7-8 appears on your screen.

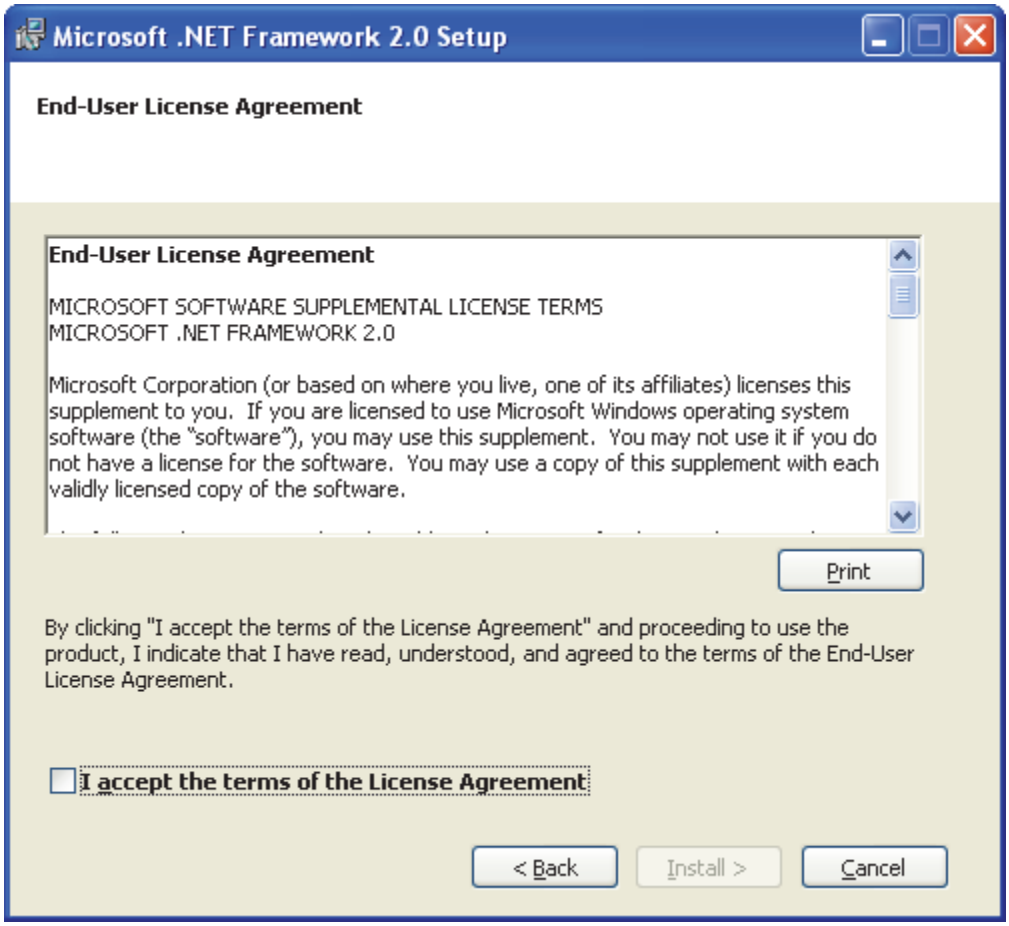


Figure 7-8. End-User License Agreement

c. Check the **I accept the terms of the License Agreement** check box and then click **Install** to begin installation.
Click **Cancel** to cancel the installation.
Click **Back** for the previous screen (Figure 7-7).
Click **Print** to print the End-User License Agreement.
If you click **Install**, Figure 7-9 appears on your screen.

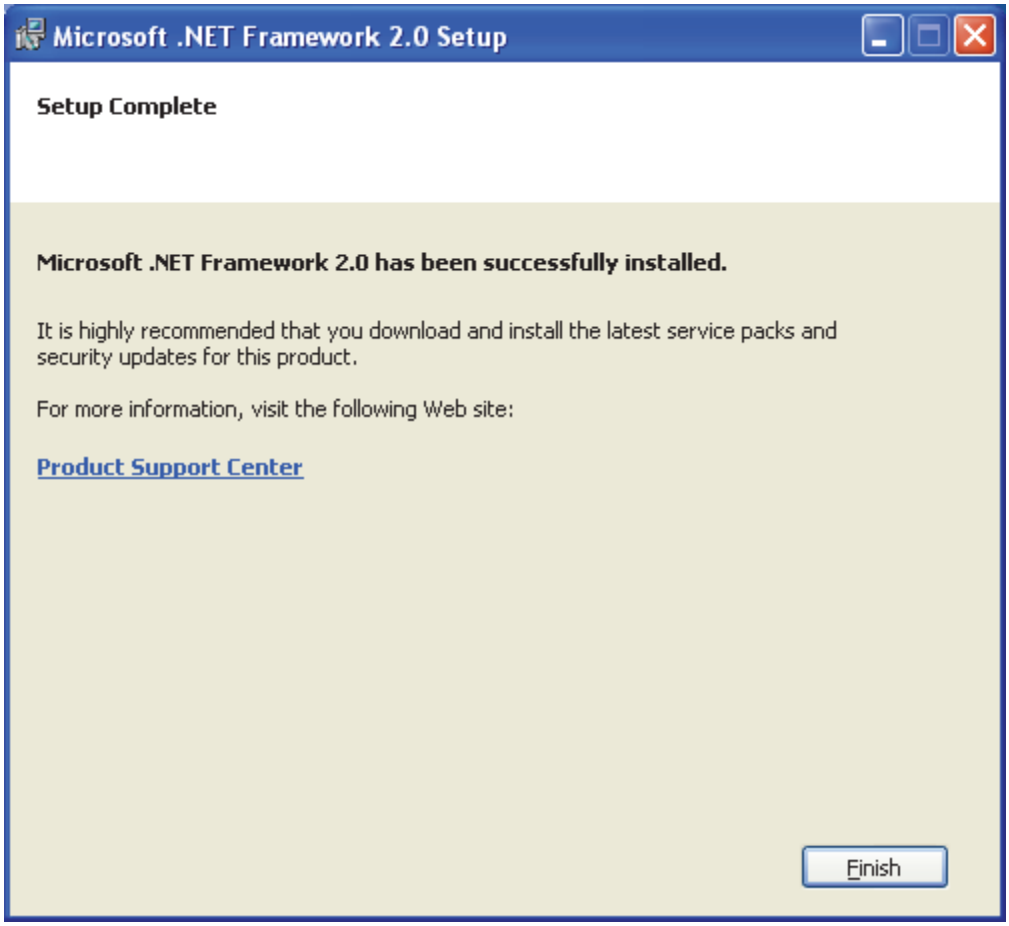


Figure 7-9. Setup Complete

d. Click Finish to close the dialog box and start the installation of the FDSI Configurator. Figure 7-5 appears on your screen and then changes to Figure 7-10.

5. The Welcome to the InstallShield Wizard dialog box appears (Figure 7-10).

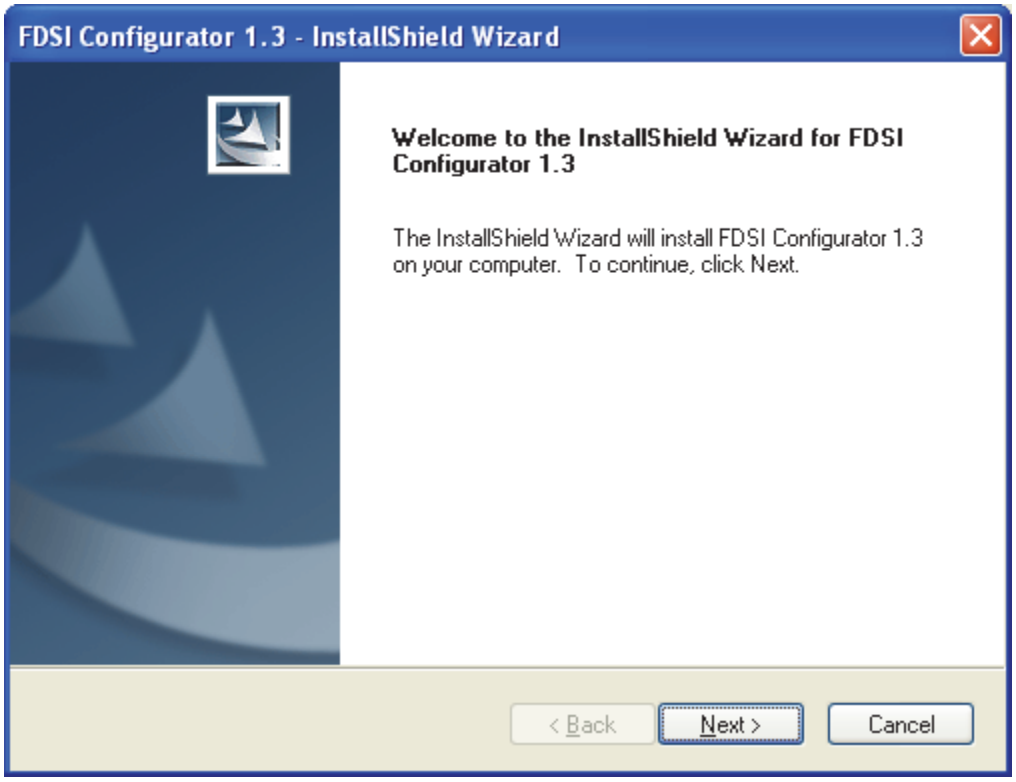


Figure 7-10. Welcome Display for FDSI Configurator

a. Click **Next** to begin installation.
Click **Cancel** to cancel installation.
If you click **Next**, Figure 7-11 appears on your screen.

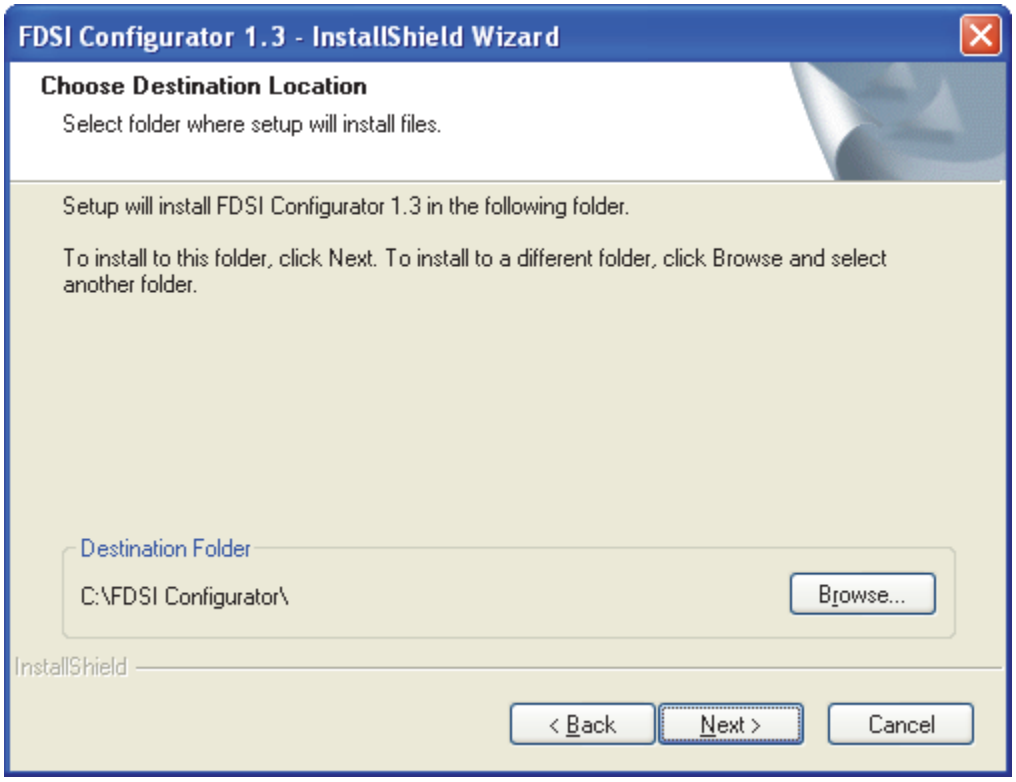


Figure 7-11. Choose Destination Folder Display for FDSI Configurator

b. Click **Browse** to selecting the destination folder.
Click **Back** for the previous dialog (Figure 7-10).
Click **Next** to continue the installation.
Click **Cancel** to cancel the installation.
If you click **Next**, Figure 7-12 appears on your screen.

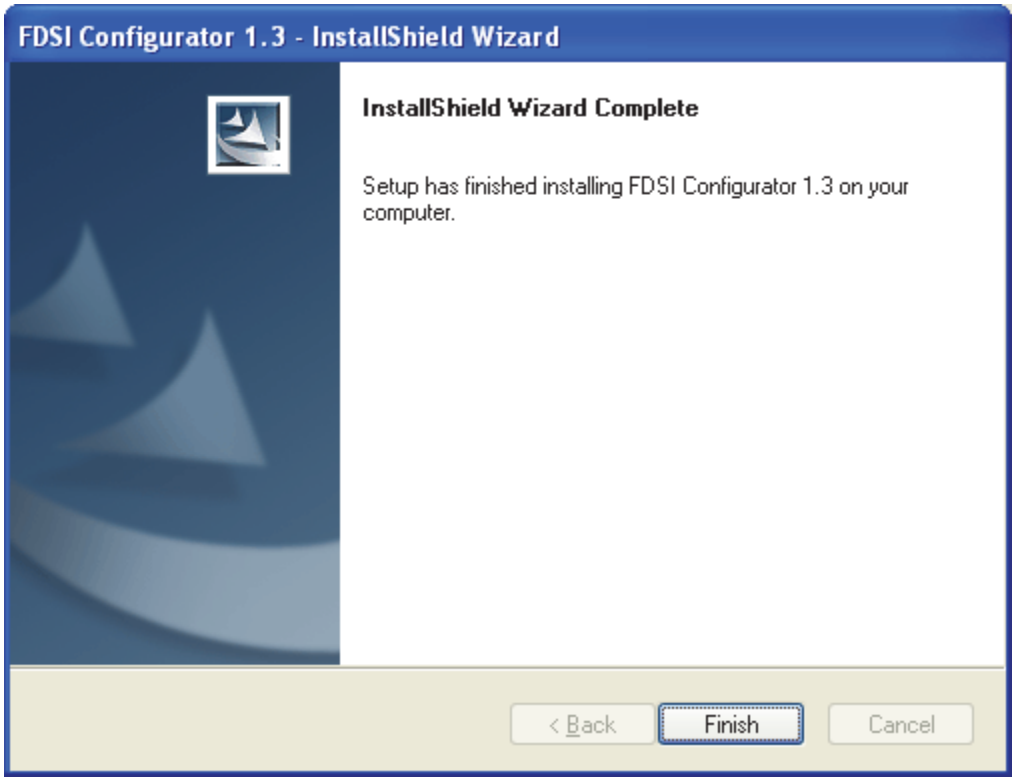


Figure 7-12. InstallShield Wizard Complete

c. Click **Finish** to close the dialog.

6. The installation is complete. To start I/A Series software at boot time, return to the Windows Control Panel and reboot as follows:
   a. Select **Start**.
   b. Select **Settings**.
   c. Click **Control Panel**.
   d. Click **Foxboro I/A**.
   e. Select **Startup Options for Reboot** dialog box will appear.
   f. Select **Autologon (Standard I/A Series operation)** option from the **I/A Series On** group.
   g. Click **OK**.
   h. Reboot the station using the Windows **Start** -> **Shutdown** -> **Restart** method.

FDSI Configurator-Principles of Operation

The FDSI Configurator produces two corresponding configuration files, in accordance with user-entered data:

- Port configuration file – This file defines the communication parameters for each port of the FBM230/231/232/233.
- Device configuration file – This file contains device specifications relating to the configurations and transfer of data with the devices.

Linkage to the configuration file (<filename>.XML) is provided through the ECBs for the FBM230/231/232/233 and the devices on the network. The filename of the port configuration file is specified in the FILEID parameter of the ECB200/202 (representing the FBM230/231/232/233).

The filename of the device configuration file is specified in the FILEID parameter of the ECB201 block (representing the device). These ECB/file relationships are illustrated in Figure 7-13. Note that, as indicated in Figure 7-13, a single device configuration file (detailing the device communication parameters) may be used by more than one ECB201.

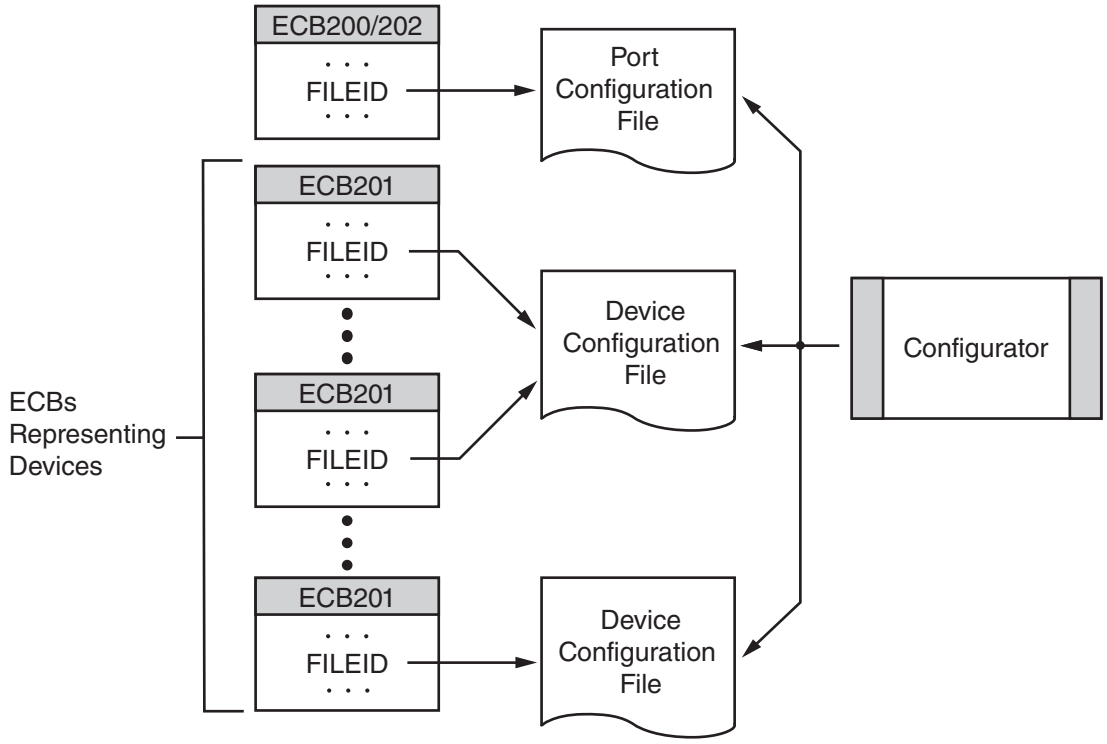


Figure 7-13. ECB/Configurator File Relationships

— NOTE

The ECBs cannot be created or edited using the FDSI Configurator. Setting of the FILEID parameter in the ECBs is done through a control configurator: IACC, ICC, or FoxCAE™.

Once the port configuration and the device configuration files are created, they are stored in the host workstation. If the files are created on a workstation other than the host workstation, the files must be stored in the Application Workstation in the *usr/fox/SP/file/devices* file. As a final step in the configuration process (described later in this document), the files are downloaded to the FBM for use in initializing and maintaining communications with the devices.

— NOTE

When using Solaris workstations on The Mesh control network, be aware that the FDSI Configurator cannot be installed on a Solaris workstation. The configurator must be installed on a Windows workstation and the generated XML file must be copied over to the Solaris workstation. To maintain cross-platform compatible filenames, the XML filename must have all CAPITAL letters. Additionally, the **`dos2unix`** command must be run on the XML configuration files to make them compatible with the UNIX environment.

Not all drivers require device configuration files. In contrast, some drivers, like OPC, require their own configuration screens. However, the framework is the same and the files are handled the same as described in this document - the only difference is the content.

FDSI Configurator-Operation

Figure 7-14 shows the major steps in operating the FDSI Configurator. The following subsections elaborate on these steps, providing a detailed operating procedure.

The port and device configuration files specify FBMs ports and data for the devices. The ICC editor creates the blocks for the ECB200/202s and ECB201s. All the configurators (port, device and ICC) can be used independently. There is no certain order needed:

- You can create the port and device configuration files without the configured ECBs;
- You can create the ECBs with the ICC and at a later time create the port and device configuration files.

The reference between both configuration steps is created by entering the FILEID parameter in the ECB200/202 and ECB201.

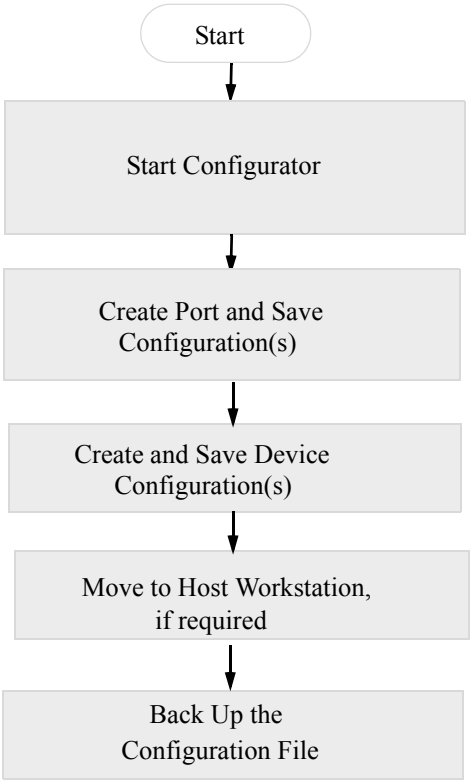


Figure 7-14. Configuration Operations

Starting the FDSI Configurator

The FDSI Configurator supports creating new files or modifying existing configuration files. When modifying an existing configuration file, you may save the file under a different name to create a new configuration file based on the existing one.

You start the FDSI Configurator from the **`Start`** menu pick, as follows:

a. Select **`Start`**.
b. Select **`Programs`**.
c. Select **`FDSI Configurator`**.
d. Click **`FDSI Configurator`**.

NOTE

The FDSI Configurator is also available from the Configurator menu in I/A Display or the FDSI shortcut.

This brings up the first FDSI Configurator (Figure 7-15) display. The fields and buttons on the display are described in Table 7-1 and the menus are described in the following paragraphs.

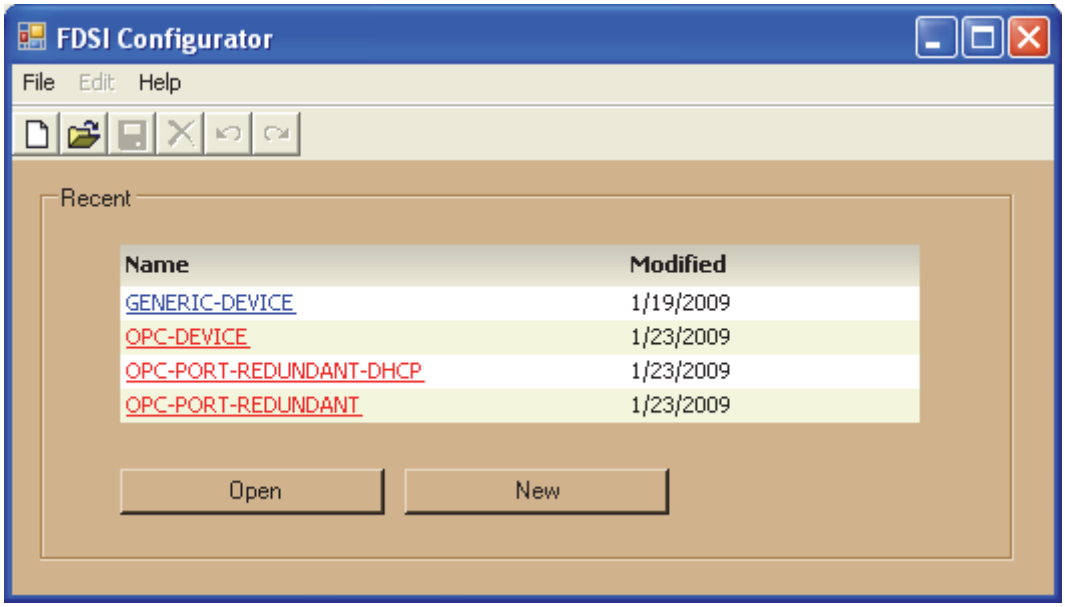


Figure 7-15. FDSI Configurator Display

Table 7-1. FDSI Configurator Display

Menu	Submenu	Description
Recent	Name	Lists the names of the most recent saved file. Clicking on a recent saved file, opens the Device configuration screen (General) for that file.
	Modified	Lists the date of the most recent saved file.
	Open	Open, opens the Existing XML file which allows you to select any file saved on your system.
	New	New opens the new Configuration dialog box that allows you to select a port or device configuration.

FDSI Configurator File and Edit Menu, and Toolbar

Figure 7-16 shows the File menu, Figure 7-17 shows the Toolbar and Figure 7-18 shows the Edit menu. Table 7-2 describes the functions listed in the File menu, Toolbar and Edit menu. Noted in the table for each menu entry are the submenu, toolbar icon (if any), and a description of its function.

Figure 7-16. File Menu

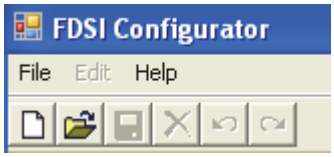


Figure 7-17. Menu Toolbar

Figure 7-18. Edit Menu

Table 7-2. FDSI Configurator File and Edit Menu, and Toolbar

Submenu	Toolbar	Description
New		Opens a new configuration dialog box for a new port or device file.
Open		Opens an existing .XML configuration dialog box to select an existing port or device file for modification.
Save		Saves a port and device file.
Undo		Deletes the last operation.
Redo		Restores the last operation.
Close		Closes the current window and returns you to the FDSI Configurator display (Figure 7-15).
Exit		Exits the configurator.

Proceed to the paragraph “Opening a New Configuration” on page 130, or to “Opening an Existing Configuration” on page 132.

Opening a New Configuration

To open a new configuration file:

1. Click **File > New** or on the FDSI Configurator display.

   This brings up the New Configuration display. Figure 7-19 shows the New Configuration display and Table 7-3 lists the function of each of the controls. The display lists the standard configurators that are loaded on the system. If no configurators have been loaded on the system, a blank screen is displayed. The following are the standard configurators that are loaded on the system:

   - Generic Serial: FBM230 and FBM231configurator for RS-232, RS422, or RS485 ports
   - Generic Ethernet: FBMs232 and FBM233 configurator for Ethernet ports
   - OPC: FBMs232 and FBM233 configurator for Ethernet ports using OPC.

NOTE

Refer to the *FDSI OPC User's Guide* (B0700BH) for details about configuring OPC.

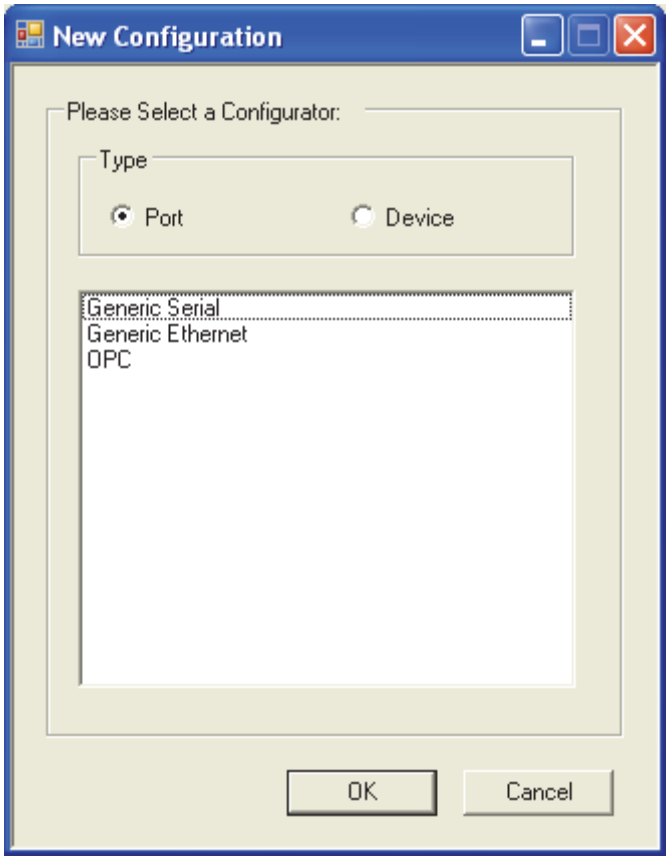


Figure 7-19. New Configuration Display

Table 7-3. Open Configurator Display Fields

Function	Sub-Function	Description
Type	Port	Selects the Port configurator for the device that is highlighted on the display.
	Device	Selects the Device configurator for the device that is highlighted on the display.
OK		Clicking on OK selects the Port configurator or the Device configurator for the device that is highlighted on the display
Cancel		Cancels the Open Configurator display operation and returns you to the FDSI Configurator display.

2. Click the **`Device`** or **`Port`** radio-button.
3. Highlight the type of device that you wish to configure.

4. Select **OK**.

   If the Port radio-button was selected, the Port configuration display; Figure 7-21 for RS-232, RS-422, or RS-485 ports, Figure 7-24 for Ethernet ports, or OPC appears.

   If the Device radio button was selected, the Device configuration displays (Figure 7-27 through Figure 7-29) appear.

5. Proceed to the paragraph "Creating/Editing a Port Configuration File" on page 133, or to "Creating/Editing a Device Configuration File" on page 139.

Opening an Existing Configuration

To open an existing port or device configuration file:

1. Click **File > Open** or  on the FDSI Configurator display (Figure 7-15).

   This brings up the Open Existing XML Configuration dialog box (Figure 7-20). The last file saved is displayed. If no file has been previously saved, a blank screen is displayed.

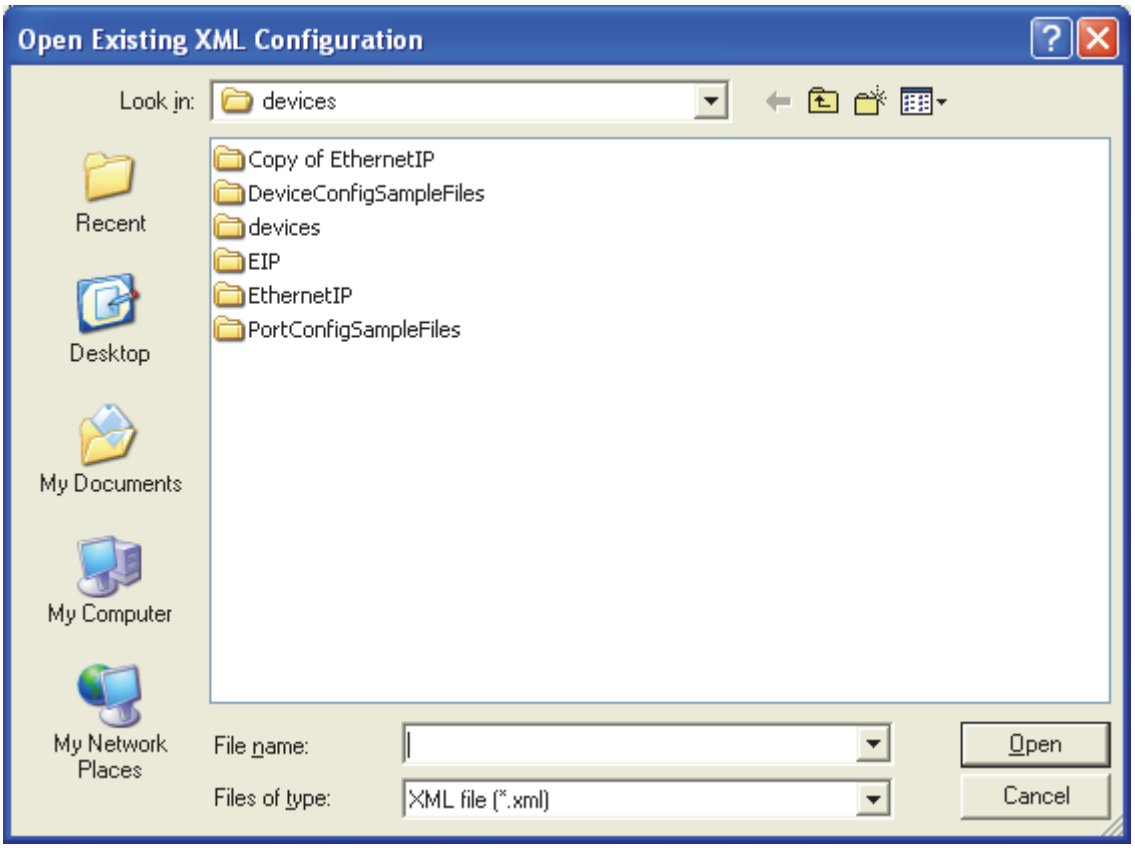


Figure 7-20. Open Existing XML Configuration Display

2. Highlight or type in the filename that represents the file to configure.
3. Select **OK**.

   If a Port configuration file was selected, the Port configuration display; Figure 7-21 for RS-232, RS-422, or RS-485 ports, Figure 7-24 for Ethernet ports, or OPC appears.

   If the Device configuration display was selected, the Device configuration displays (Figure 7-27 through Figure 7-29) appear.

4. Proceed to the paragraph “Creating/Editing a Port Configuration File” on page 133, or to “Creating/Editing a Device Configuration File” on page 139.

Creating/Editing a Port Configuration File

Port Configuration Files

The FDSI port configurator creates the port configuration file, which specifies the communication settings for each of the ports of the FBM230/231/232/233.

An FBM230/231 has four ports, any of which can be configured to be RS-232, RS-422, or RS-485 communication interfaces and can be configured to operate at speeds up to 115.2 kbps.

— NOTE

RS-232 only supports to 38.4 kbps.

An FBM232 has one port and the FBM233 has two ports which is an Ethernet interface that requires specifying an Ethernet address. (You assign devices to the FBM ports by setting the ECB201 PARENT and PORTNO parameter in the ECB201.)

You use the port configuration file to specify communication parameters for the specific FBM used with your system.

The information configured by the port configurator for an FBM230/231 includes:

- The communication interface standard for the port: RS-232, RS-422, or RS-485
- The baud rate for each port
- The parity for the each port: none, odd, or even.

The information configured by the port configurator for an FBM232/233 defines the Ethernet address for the Ethernet port.

The Port Configuration displays for an RS-232, RS-422, RS-485 or Ethernet port are defined below. If you create or modify a port configuration, a dialog box asks you to save the configuration.

FBM General Properties Tab for RS-232, RS-422, RS-485 Port Configuration

Figure 7-21 shows the display and Table 7-4 lists the functions for the FBM General Properties tab, which configures the RS-232, RS-422, or RS-485 port configuration display.

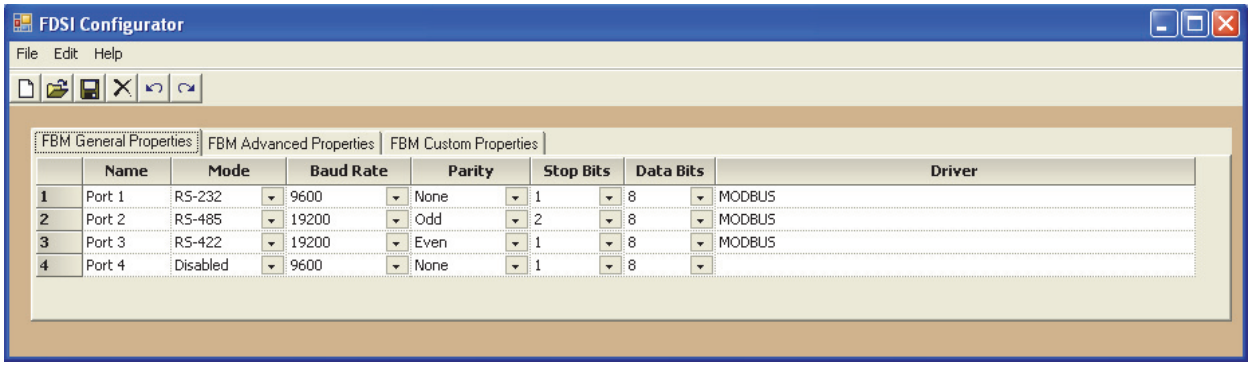


Figure 7-21. Serial Port FBM General Properties Tab

Table 7-4. Serial Port FBM General Properties Tab Functions

Function	Description	Variables
Name	Name is the ports number of the FBM230/231. It is a fixed number that can not be changed.	Port 1, Port 2, Port 3, or Port 4
Port Mode	Selects the port communication interface standard. If Disabled is selected, this record does not define a valid port and the parameters for the port are not shown on the Port Configuration display.	Disabled, RS-232, RS-484, RS-422
Baud Rate	Defines the baud rate of the port.	300, 600, 1200, 2400, 4800, 9600, 19200, 38400 (57600, 115200 for non-RS-232 devices)
Parity	Defines the parity to be used.	None, Odd, Even
Stop Bits	Number of stop bits used. Number of stop bits assigned depends on the device.	1, 1.5, 2.
Data Bits	Number of data bits used.	8, etc.
Driver	Name of the I/O Device Driver used to transmit/receive data to/from the device.	User defined

Figure 7-22 shows the display for the FBM Advanced Properties tab, which configures the Redundant/Non Redundant operation of the FBM. If FBM231 is chosen, the “Redundancy Algorithm” edit box is enabled. The default value is the string “Default”.

See the driver specific User document to determine which Redundancy algorithm may be available. If a special redundancy scheme is required, type the algorithm string into the edit box as shown in Figure 7-22.

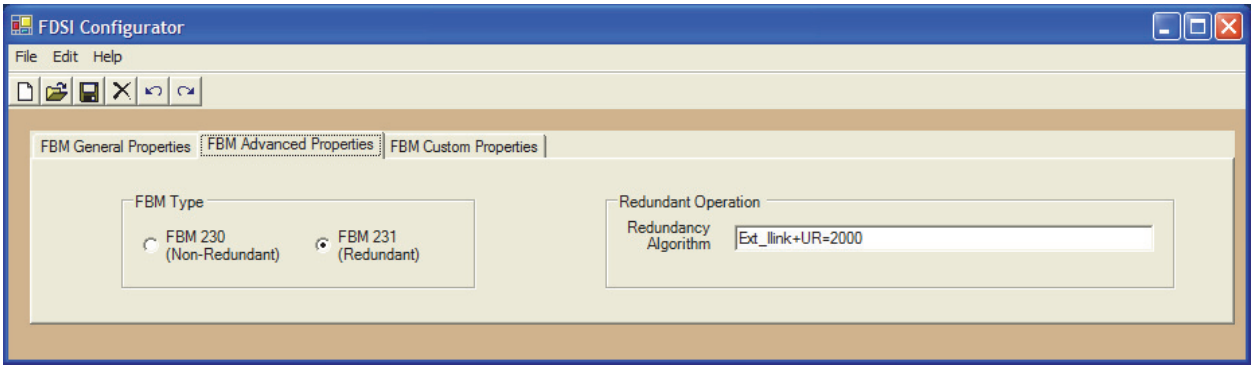


Figure 7-22. Serial Port FBM Advanced Properties Tab

— NOTE

No FDSI serial driver supports this configuration as of the date of the release of this document.

Figure 7-23 shows the FBM Custom Properties tab which contains six custom parameter edit fields. These fields are driver specific and one or more up to six may be required. See the driver specific user guide to determine if any custom properties are to be entered. There is no default value. If the field is left blank the value is not included in the XML file. If a string is typed into the edit box, then that custom field is included in the XML file when the file is saved.

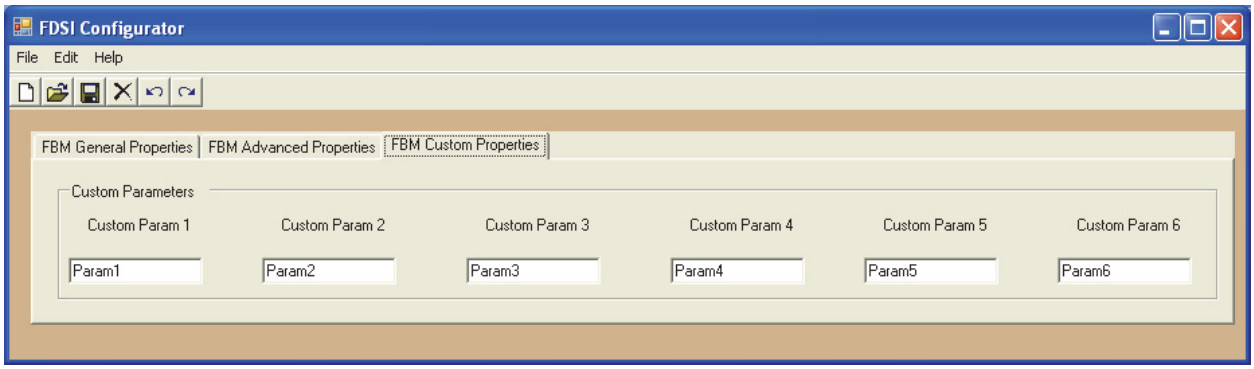


Figure 7-23. Serial Port FBM Custom Properties Tab

To configure the RS-232, RS-422, RS-485 Port:

1. Click the **Mode** down arrow and highlight the desired value: Disabled, RS-232, RS-422, or RS-485 communication interface standard for the port.

— NOTE

If the port is enabled, an FDSI driver name is required. If a port is disabled, it cannot be used.

2. Click the **Baud Rate** down arrow and highlight the desired baud rate for the port.
3. For Parity, Stop Bits and Data Bits, click the appropriate down arrow and highlight the desired parity, stop bit or data bit for the port.
4. Place the cursor in the **Driver** entry and type in the name of the I/O Device Driver.
5. Switch to the Advanced tab. Select the Redundant or Non Redundant FBM type for the appropriate operation.
   If you choose **FBM 231 (Redundant)**, the Redundancy Algorithm is enabled. If your driver requires a special redundancy scheme, type the algorithm string into the edit box.
6. Switch to the Custom tab. If your driver requires any custom properties, add up to six in the edit boxes. These strings are included as custom fields in the XML file when the file is saved.
7. If you create or modify a port configuration display, you should save the port configuration. If you attempt to close the dialog box without saving, a dialog box asks you to save the configuration.

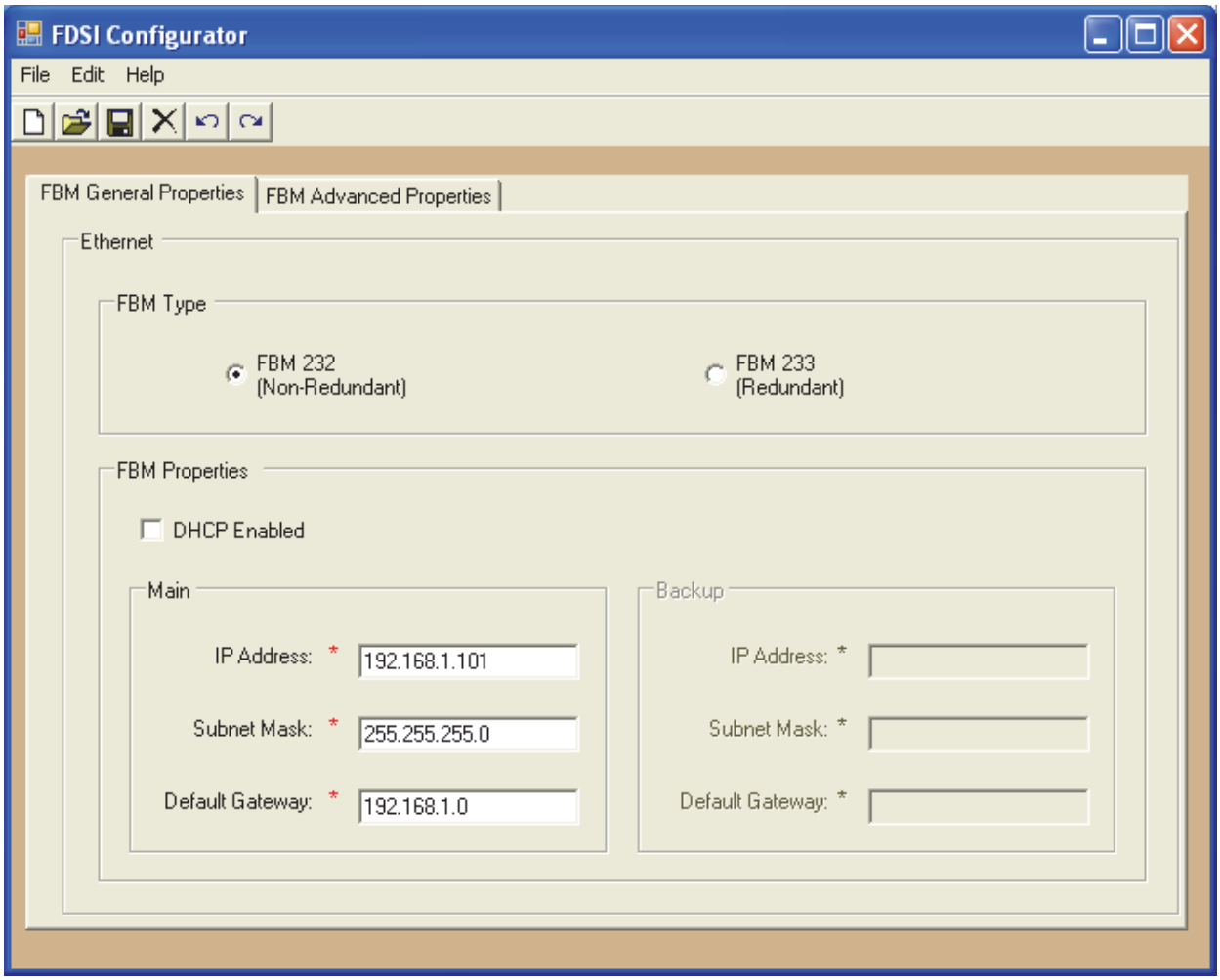
8. Proceed to "Saving the Port and Device Configuration Files" on page 152.

   You can save multiple FBM port configuration files by assigning and saving each file with a unique name.

After you save the port configuration file, proceed to "Creating/Editing a Device Configuration File" on page 139.

Ethernet Port Configuration Display

Figure 7-24 shows the Ethernet Port General Properties tab and Table 7-5 describes the functions of this tab.



NOTE: The fields with * mark are mandatory. The file save operation will fail if any of those fields is blank.

Figure 7-24. Ethernet Port General Properties Tab - Simplex Configuration

Table 7-5. Ethernet Port General Properties Tab Properties

Ethernet Port Properties	Property	Description
FBM Type	FBM232 (Non-Redundant)	Selects a non-redundant FBM232 and when selected allows you to enter the address for the Main FBM only.
	FBM233 (Redundant)	Selects a redundant FBM233 and when selected allows you to enter the address for the Main and Backup FBM.
FBM Properties	DHCP Enabled	Dynamic Host Configuration Protocol automatically makes connections to a server which provides the device address to the FBM. Otherwise, the address must be manually entered below. This selection is device dependent.
	Main and Backup - IP Address	It is the Ethernet IP Address assigned to each FBM232/233 to identify it on the network. (For example, 152.158.196.23)
	Main and Backup - Subnet Mask	Mask address used to mask out a segment or a set of equipment grouped together by a specific protocol feature. (For example, 255.255.196.23)
	Main and Backup - Default Gateway	It is the unique Ethernet IP Address assigned to the default Ethernet Gateway.

Figure 7-25 shows the Ethernet Port Advanced Properties tab. If FBM233 has been selected for redundant operation, the Redundancy Algorithm field is enabled. The default value is the string “Default”. Other options may be available depending on the driver. Refer to the driver specific User's guide to determine if any options can be configured in this field.

This tab contains four custom parameters available for Ethernet drivers. These fields are driver specific and up to four may be required. See the driver specific user guide to determine if this port requires any custom properties. There is no default value. If a string is typed into the edit box, then that custom field is included in the XML file when the file is saved.

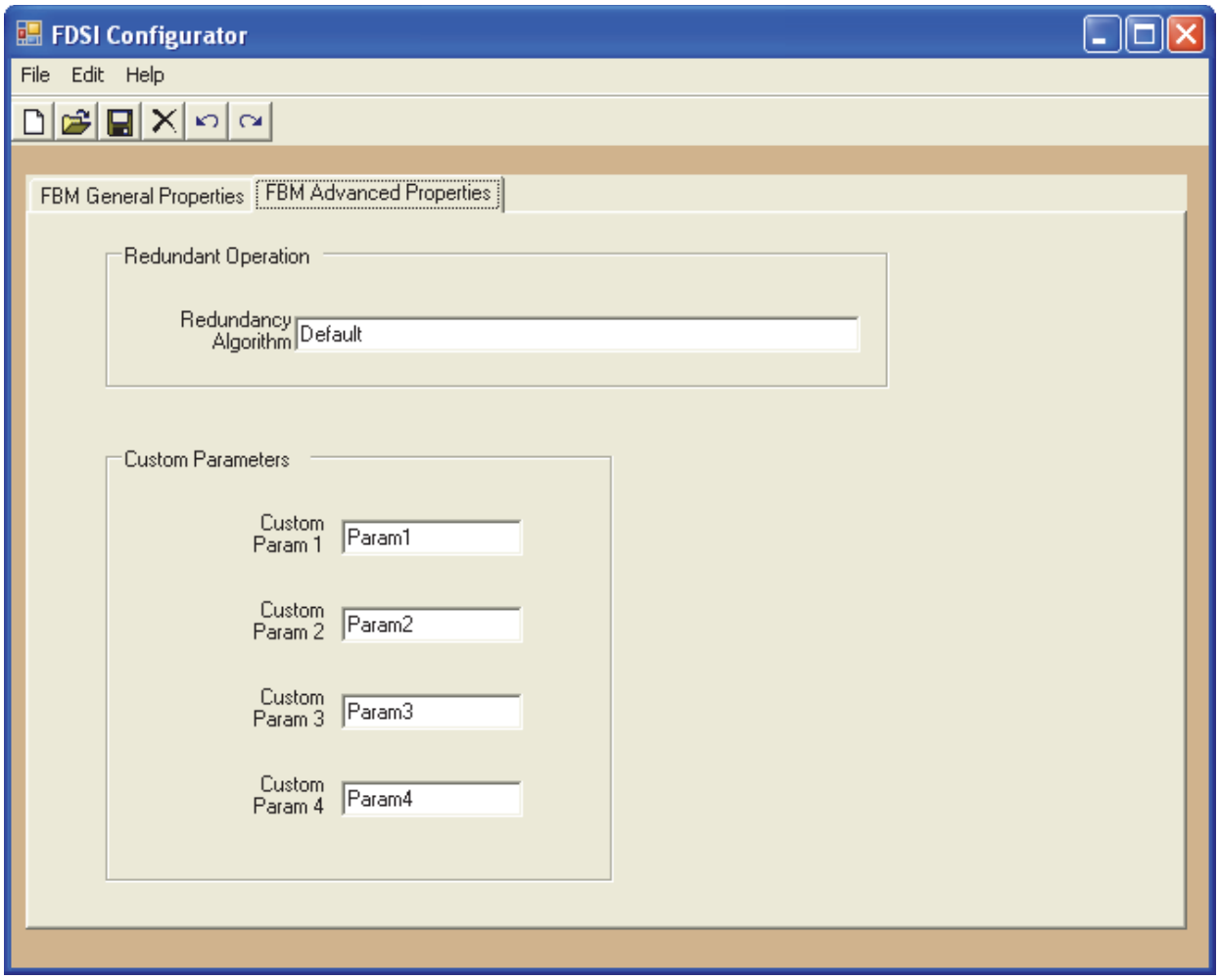


Figure 7-25. Ethernet Port Advanced Properties Tab - Redundant Operation

To specify an Ethernet port configuration:

1. Click on the radio-button for the **FBM232 (Non-Redundant)** or **FBM233 (Redundant).**
2. Click on the radio-button for **DHCP** to enable DHCP**.**
3. Place the cursor in the **IP Address** entry and type in the address of the device.
4. Place the cursor in the **Subnet Mask** entry and type in the address mask for the device.
5. Place the cursor in the **Default Gateway** entry and type in the address of the device.
6. Repeat Steps 2 through 5 for a redundant FBM233.
7. Switch to the FBM Advanced Properties tab. If you chose FBM233 (Redundant), the Redundancy Algorithm is enabled. If your driver requires a special redundancy scheme, type the algorithm string into the edit box.
   If your driver requires any custom properties, add up to six in the edit boxes. These strings are included as custom fields in the XML file when the file is saved.

Proceed to “Saving the Port and Device Configuration Files” on page 152. You can save multiple FBM port configuration files by assigning and saving each file with a unique name

After you save the port configuration file, proceed to “Creating/Editing a Device Configuration File” on page 139.

Adding a New Port to an Existing Configuration

To add another port to an existing FBM for an existing configuration, perform the following:

1. Modify the port .XML file to enable the desired port for RS232 communication (see “Creating/Editing a Port Configuration File” on page 133).

⚠ WARNING

Performing a DB download on an operational system, downloads only the changes to a database. However, you should consider the effects of a DB download on the operating system. You may consider disabling the other port(s) of the FBM230/231, before performing a DB download.

2. Perform a “DB download” of this new .XML file to the FBM230 or FBM231 (see“DB Download” on page 198).
3. Modify the ECB200 PORTEX parameter to add another port (see)“Creating and Editing the FBM230/232 ECB (ECB200)” on page 85 or “Creating and Editing the FBM231/233 ECB (ECB202)” on page 87.
4. Go to Equipment Change of the ECB200 and enable this additional port for the FBM230 (see “Placing the FBM On-Line/Off-Line” on page 190).
5. Create a new ECB201 for the device on the new port (see“Creating and Configuring Device ECB (ECB201)” on page 88).
6. Go to Equipment Change for this new ECB201 and enable communications for this device (see “Enable/Disable Communication to a Device” on page 199).

OPC Configuration Display

NOTE

Refer to the F*DSI OPC User's Guide* (B0700BH) for details about configuring OPC.

Creating/Editing a Device Configuration File

Creating/Editing a device file uses three displays:

- General display - Defines the name, an optional heartbeat, and the address of the device being configured
- Group display - Defines a name for groups so that device points can be grouped together
- Point display - Assigns a name, address, DCI block and data conversion functions to each point of a device.

NOTE

You should create and edit device configuration files only if specified in the FDSI driver document.

Figure 7-26 illustrates the properties configured by each display.

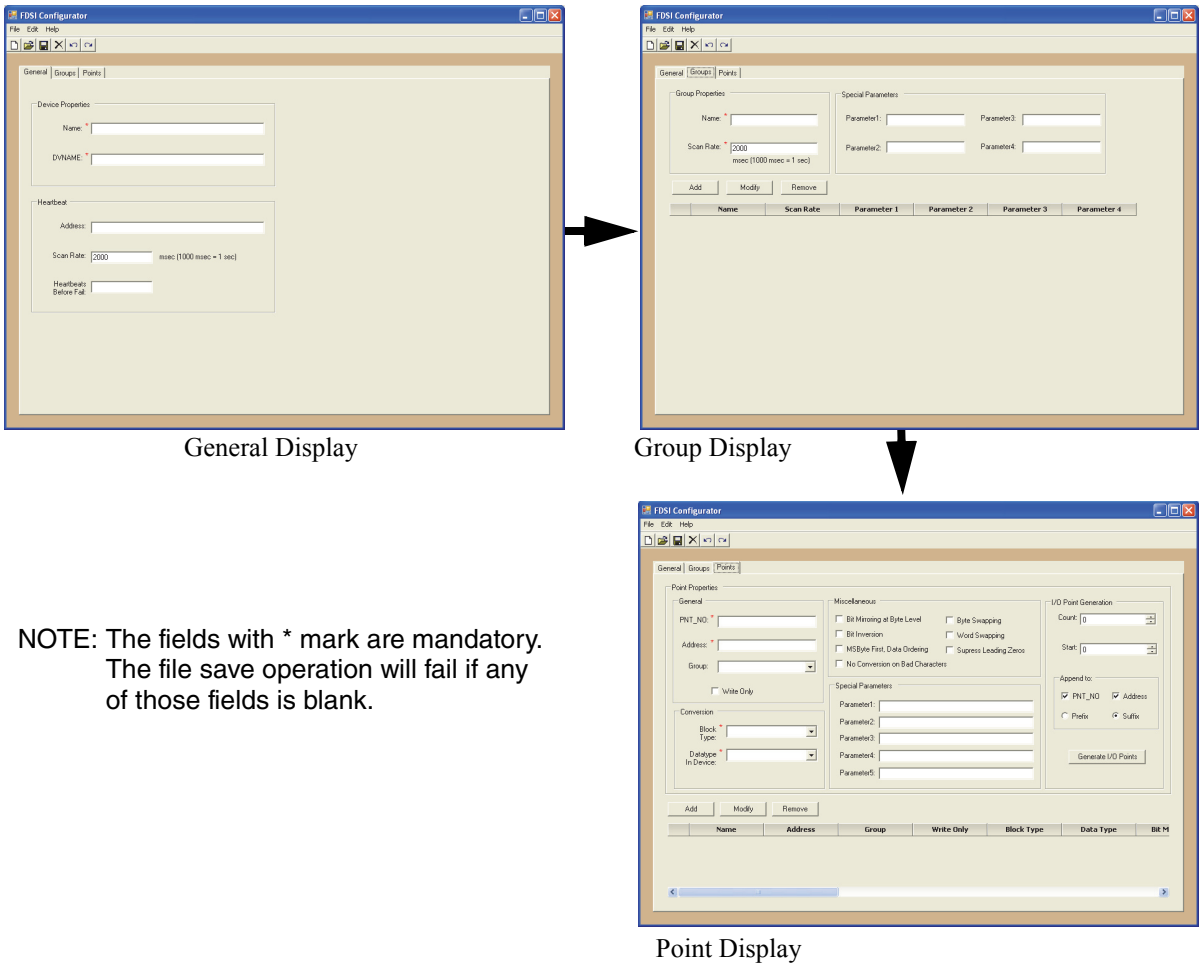
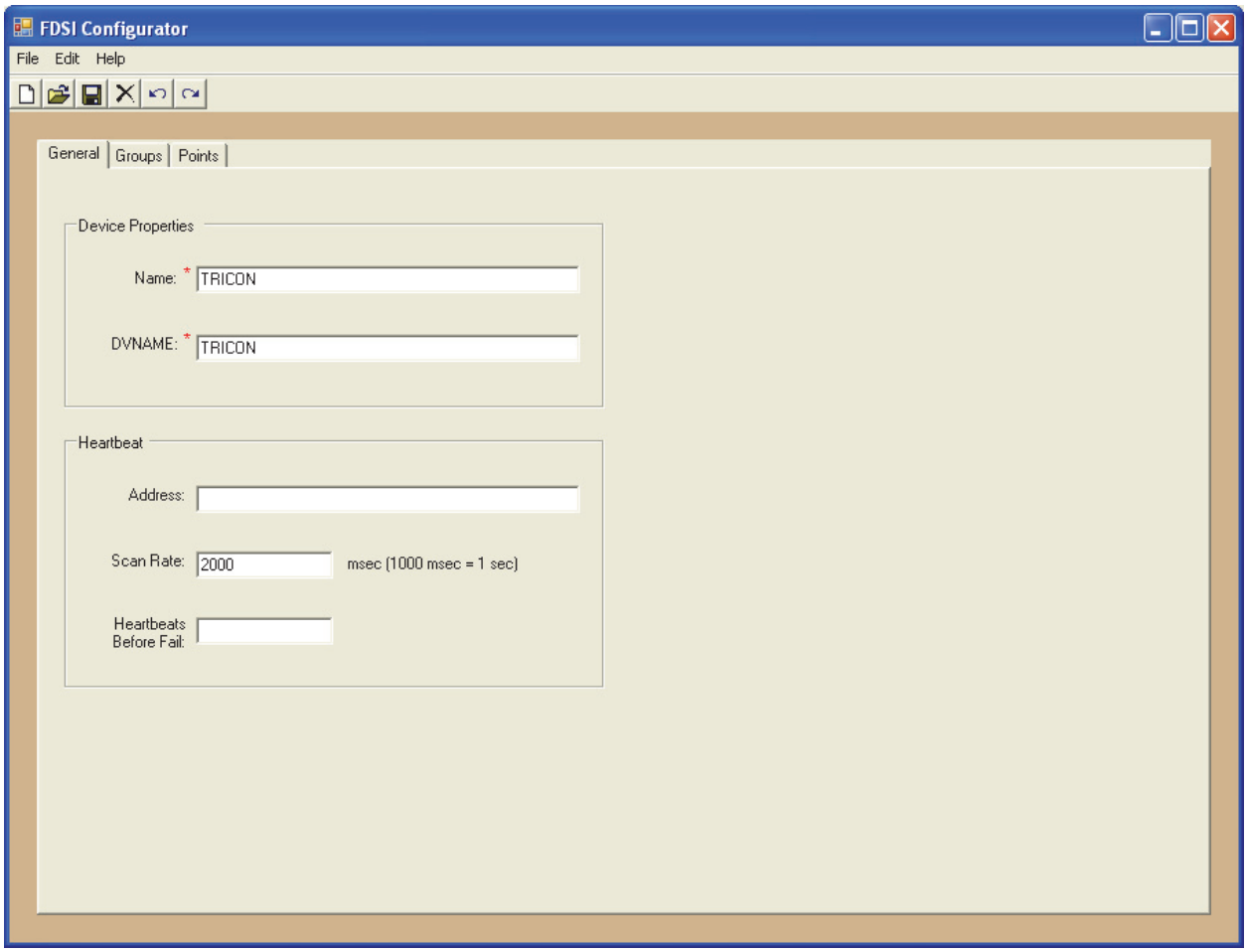


Figure 7-26. Device Configuration Overview

You select a display by clicking the tab on the top of the display. You can configure the device using the above displays in any order. However, it is recommended that you follow the order of the tabs on the top of the display to configure the device file. If you create or modify a device file, you should save it.

General Display

Figure 7-27 shows the display and Table 7-6 describes the functions on the Device Properties display. You select the Device Properties display by clicking the General tab.



NOTE: The fields with * mark are mandatory. The file save operation will fail if any of those fields is blank.

Figure 7-27. Device Properties Display

Table 7-6. Device Properties Display

	Device Properties	Description
Device Properties	Name	Name is a user-defined string of characters used to define a unique configuration file. The device configuration file should be saved using the same name as specified here.
	DVNAME	The name of the device used to identify the type of the device (optional).

Table 7-6. Device Properties Display (Continued)

	Device Properties	Description
Heartbeat	Address	It is the address of the heartbeat point in the device. Refer to the paragraph "Heartbeat" on page 142.
	Scan Rate	The value configured for heartbeat applies to one device connected to a port of the FBM. Heartbeat is the same value for all specifications configured for a single ported device or dual ported device. The rate can be 1 ms to 999999999999 ms (99999 s). An average default is 2000 ms (20 s).
	Heartbeats Before Fail	The number of heartbeats that the FBM can miss before it fails the device/channel. The number can 1 to 999999999999 for a device. An average default is 20. Refer to the paragraph "Heartbeat" on page 142.

To specify the general device properties of a device:

1. Place the cursor in the **Name** entry and type in the name of the device.
2. Place the cursor in the **DVNAME** entry and type in the name of the device.

To specify a heartbeat for a device:

1. Place the cursor in the **Address** entry and type in the address of the heartbeat point.
2. Place the cursor in the **Scan Rate** entry and type in the scan rate for the device.
3. Place the cursor in the **Heartbeats Before Fail** entry and type in the number of heartbeats for the device.

To unspecify a heartbeat for a device:

1. Place the cursor in the **Address, Scan Rate** and **Heartbeats Before Fail** entry and type in the number zero.

Heartbeat

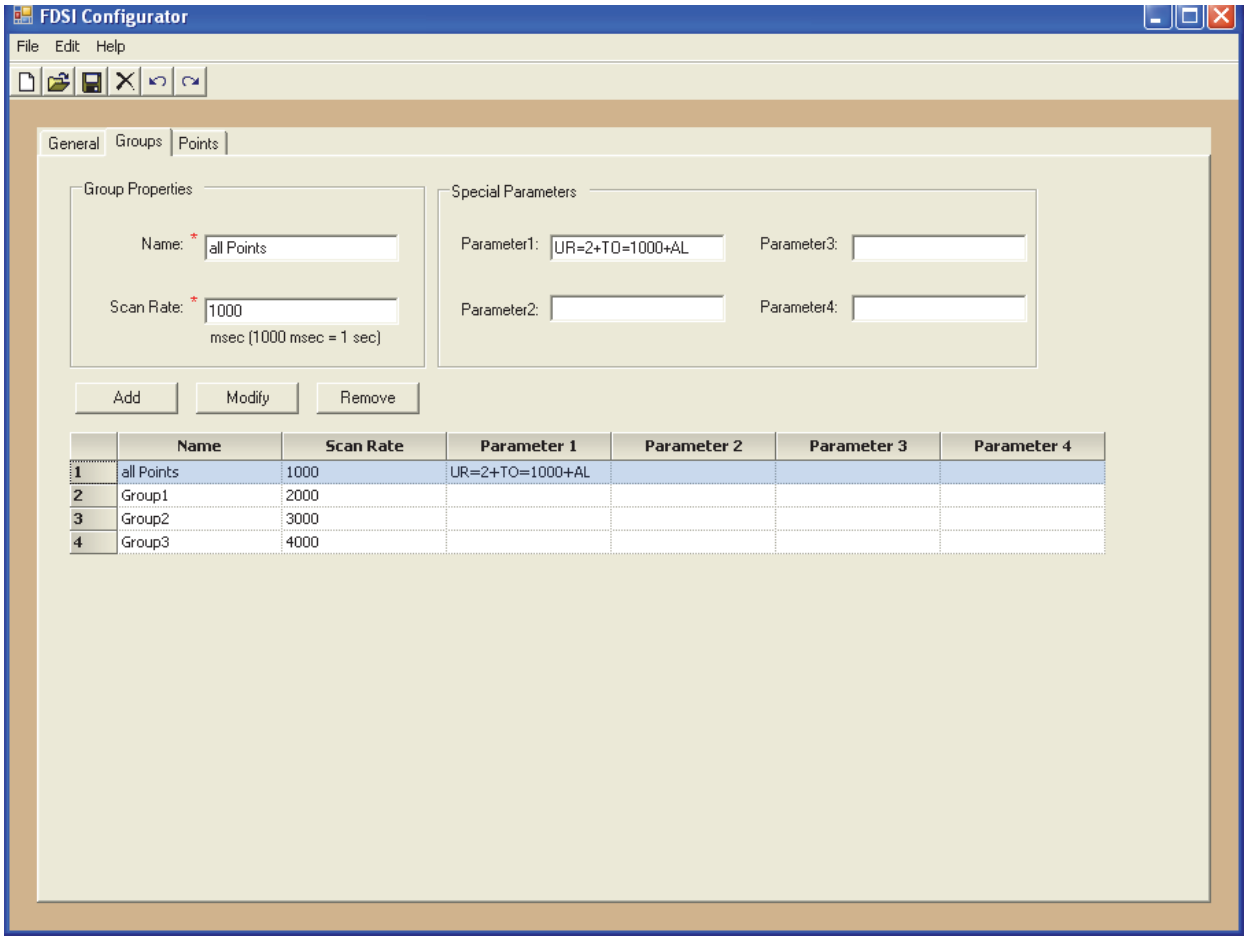
Heartbeat is used for detecting the absence of communication with a device in protocols that provide periodic input messages to the FDSI.

— NOTE

Not all devices support the heartbeat command. Ensure that a device supports the function before configuring the heartbeat. If heartbeat is configured for a device that does not support the command, the heartbeat fails. If a heartbeat is configured for a driver that does not support heartbeat, the heartbeat is ignored.

Group Display

Figure 7-28 shows the display and Table 7-7 describes the functions on the Group Properties display. You select the Group Properties display by clicking the Groups tab. Group is a grouping of I/O points. Point grouping is not required for standard drivers. Custom drivers may use the I/O point grouping.



NOTE: The fields with * mark are mandatory. The file save operation will fail if any of those fields is blank.

Figure 7-28. Group Properties Display

Table 7-7. Group Properties Display

Function	Sub-Function	Description	Variable
Group Properties	Name	Name is a user-defined string of characters used to define the group number. This can be the name of a single FBM port connected to a device.	User defined
	Scan Rate	This parameter specifies how often the specified data is to be read from the device (Data is written to a device only on demand from the CP).	1 to 99999000 ms (.001 to 99999 s
Special Parameters	Parameter 1 to Parameter 4	Special device parameters as required by device and specific installed I/O device driver. Refer to the applicable device drive driver document for more information.	0 to 64 characters
Add		Adds the name, scan rate and special parameters from Group Properties to the tabular list.	N/A
Modify		Allows you to modify the name, scan rate, and/or special parameters in the selected line of the tabular list.	N/A
Remove		Removes the name, scan rate, and/or special parameters from the selected line in the tabular list.	N/A

To specify a group name and the scan rate for a group of points:

1. Place the cursor in the Group Properties **Name** entry and type in the name of the group.
2. Place the cursor in the Group Properties **Scan Rate** entry and type in the desired scan rate for the named group.
3. Click the **Add** button to add the name and scan rate to the tabular list.

To modify the name of a group, to change the scan rate, or to change a parameter for a group of points:

1. Click the line number in the left column of the tabular list.

   This places the values, listed in the line number for the Name, Scan Rate and Parameters, to the Group Properties and to the Special Parameter boxes.
2. Place the cursor in the **Name, Scan Rate,** and/or **Parameter 1, 2, 3, or 4** entry box in Group Properties and/or Special Parameter boxes and type in the new value.
3. Click **Modify** button.

To delete a group name, group scan rate and special parameters:

1. Click the line number in the left column of the tabular list.

2. Click **Remove** button.

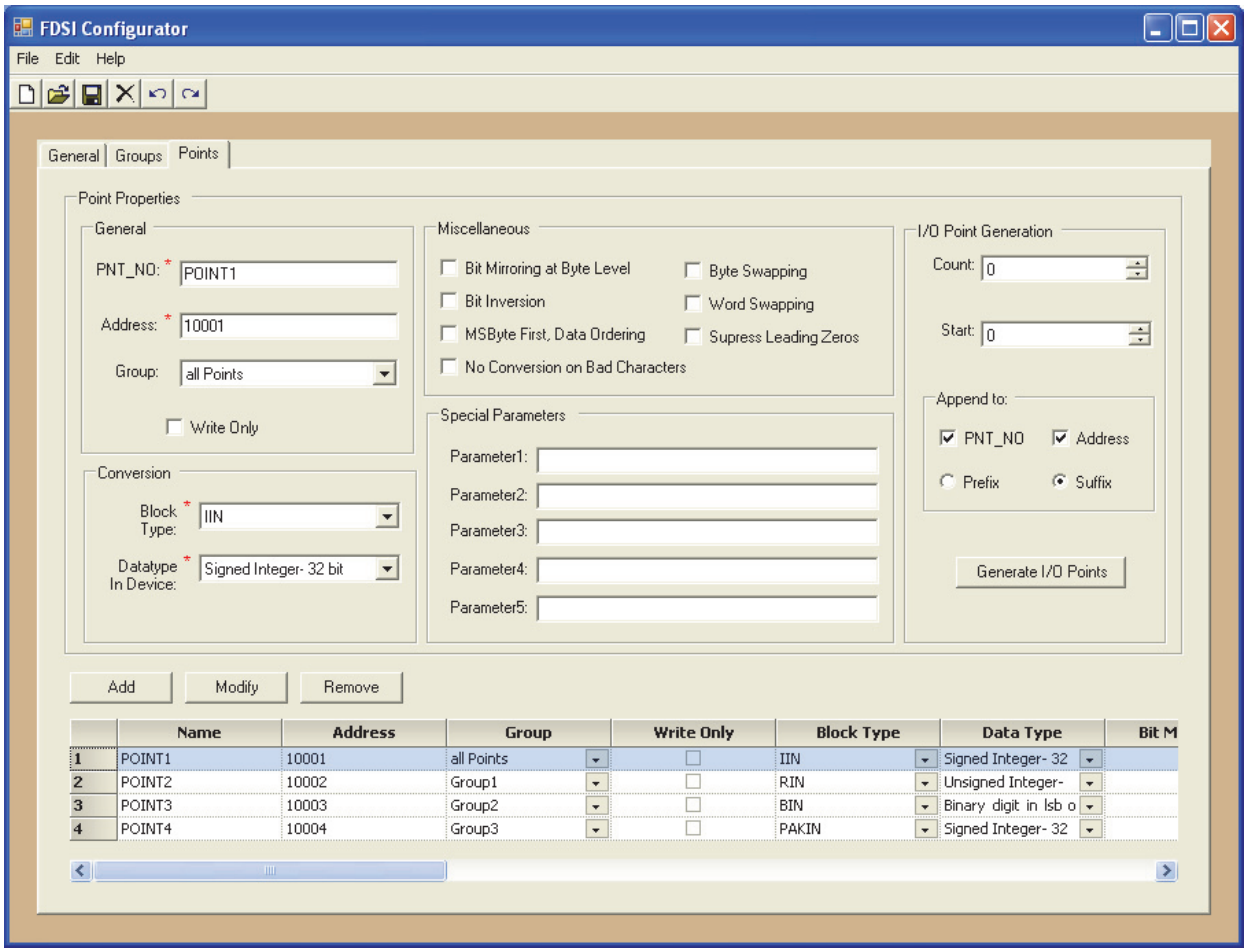
To alphabetize the list of name, scan rate and/or special parameters:

1. If the tabular list is more than one screen long, scroll the list of names, scan rates and special parameters to the desired group of names.
2. Click **Name, Scan Rate,** and/or **Parameter 1, 2, 3, or 4** column up or down arrow (for example, Name ▲).

   The tabular list alphabetizes in ascending or descending order depending on the selected name, scan rate and/or special parameter column.

Point Display

Figure 7-29 shows the display and Table 7-8 describes the functions on the Point Properties display. You select the Point Properties display by clicking the Points tab.



NOTE: The fields with * mark are mandatory. The file save operation will fail if any of those fields is blank.

Figure 7-29. Point Properties Display

Table 7-8. Point Properties Display

Function	Sub-Function		Description	Value
Point Properties	General	Point Number (PNT_NO)	Point Number is a user-defined string of characters that define the point. Must exactly match the DCI block parameter entries.	User Defined. Up to 32 characters
		Address	The point address is the address within the memory of the device from which data are to be read and to which the outputs are written. This address must be compatible with the configuration of the device.	Device dependent
		Group	The group name is a user-defined string of characters that was entered using the Group Properties display.	User Defined
		Write Only	Specifies whether the point has the option to “write only” or “read/write” a point.	Read/Write or Write Only
	Conversion	Block Type	Selects the type of block used by the point address. See “Block Types and Data Types” on page 150.	IIN, RIN, BIN, PAKIN, STRIN, IOUT, ROUT, BOUT, PAKOUT, STROUT
		Data Type	Defines the type of data to be processed to/from the point. See “Block Types and Data Types” on page 150 and Table 7-9 on page 151.	

Table 7-8. Point Properties Display (Continued)

Function	Sub-Function		Description	Value
Point Properties	I/O Point Generation	Count	Automatically generates in the tabular list a number of points specified by the indicated count. The points are named as indicated in the Name entry. The name can be appended by the Append Number to Name specification.	0 to 2000
		Start	Defines the point number in the tabular list at which the automatic generation of points will begin	User defined integer
		Append to: PNT_NO	When checked, appends a number to either the prefix or suffix of the Name of the point.	No Append, Append
		Append to: Address	When checked, appends a number to either the prefix or suffix of the Address of the point.	No Append, Append
		Append to: Prefix	When checked, specifies that the automatic generation of I/O Points should be added to the prefix of the selected PNT_NO and/or Address	No Append, Append
		Append to: Suffix	When checked, specifies that the automatic generation of I/O Points should be added to the suffix of the selected PNT_NO and/or Address	No Append, Append
	Generate I/O Points		Click to begin generating I/O as specified by the I/O Point Generation selections.	

Table 7-8. Point Properties Display (Continued)

Function	Sub-Function		Description	Value
Point Properties	Miscellaneous	Bit Mirroring at Byte Level	When checked, bit 1 becomes bit 8, bit 2 becomes bit 7, and so forth.	Bit Mirroring, No Bit Mirroring
		Bit Inversion	When checked, inverts 1s (true) to 0s (false) and 0s to 1s.	No Bit Inversion, Bit Inversion
		MS Byte First, Data Ordering	When checked, Most Significant Byte (MSB) is transmitted to/from the FBM first. If not, the Least Significant Byte (LSB) is transmitted.	MS Byte first, LS Byte first
		No Conversion on Bad Value	When checked, refer to I/O Device Driver document.	No Conversion, Conversion
		Byte Swapping	When checked, byte swapping for 2 byte values: [byte 1 | byte 0] swapped to [byte 0 | byte 1] 4 byte values: [byte 3 | byte 2 | byte 1 | byte 0] swapped to [byte 0 | byte 1 | byte 2 | byte 3]	No Swapping, Swapping
		Word Swapping	When checked, Word swapping for characters: [bit 1...bit 16] swapped to [bit 16...bit 1]. [bit 1...bit 32] swapped to [bit 32...bit 1]. Word swapping for words: [bit 1...bit 16] [bit 17...bit 32] swapped to [bit 16...bit 1] [bit 32...bit 17].	No Swapping, Swapping
		Suppress Leading Zeroes	When checked, suppresses all leading zeroes of the transmitted/received word	No Suppression, Suppression
	Special Parameters	Parameter 1 to Parameter 5	Used to define special parameters for a particular protocol. Refer to the I/O Device Driver supplied with your system.	Protocol and Device specific
Add			Adds the Point Properties to the tabular list.	N/A
Modify			Allows you to modify the Point Properties in the selected line of the tabular list.	N/A

Table 7-8. Point Properties Display (Continued)

Function	Sub-Function	Description	Value
Remove		Removes the Point Properties from the selected line in the tabular list.	N/A

To specify General Properties for points on the Point Properties display:

1. Place the cursor in the Point Properties General **PNT_NO** entry and type in the name of the point.
2. Place the cursor in the Point Properties General **Address** entry and type in the address of the point.
3. Click the Point Properties General **Group** pull-down menu button  to select the group for the point.
4. Click the Point Properties General **Write Only** check box to write only for a point.

To specify Conversion Properties for points (see "Block Types and Data Types" on page 150):

1. Click the Point Properties Conversion **Block Type** menu button  to select the desired block for the point.
2. Click the Point Properties Conversion **Data Type In Device** menu button  to select the data type for the point.

To specify Miscellaneous Properties for points:

1. Click the Point Properties **Miscellaneous** checkbox(es) to select the desired miscellaneous properties for the point.

To specify Special Parameter Properties for points:

1. Place the cursor in the Special Parameters, Parameter 1 through Parameter 5 box, and type in the parameter properties for the point.

If you desire to automatically generate additional points:

1. Click the I/O Point Generation **Count** Up/Down buttons  and select a number corresponding to the desired number of points to be generated or enter a number into the edit box.
2. Click the I/O Point Generation **Start** Up/Down buttons  and select a number corresponding to the start point to be generated or enter a number in the edit box.
   e. Click the **PNT_NO** and/or **Address** to specify whether the point number and/or address should be incremental as specified by the I/O Point Generation selections.
   f. Click the **Prefix** and/or **Suffix** radio-buttons to append the number as a prefix and/or suffix of the point number and/or address of the point.
   g. Click the **Generate I/O Points** button to generate the points and to add the points to the tabular list.

To modify the Point Properties of a point:

1. Click the line number in the left column of the tabular list.

   This places the properties for the selected line number into the Point Properties boxes above the tabular list.
2. Place the cursor or type in the changed value or click on the box to select a new value in Group Properties boxes.

3. Click **Modify** button.

To delete the Properties of a point:

1. Click the line number in the left column of the tabular list.
2. Click **Remove** button.

To alphabetize a list of names, addresses or any other point property:

1. If the tabular list is more than one screen long, scroll the list to the desired group of point properties.
2. Click **Name, Address,** or any other point property column up or down arrow (for example, 

).

   The tabular list alphabetizes in ascending or descending order depending on the selected column.

Block Types and Data Types

The value transferred between the FBM and the control processor depends on the DCI block and the specified data type in the device. Using the data type you can transfer:

- Signed and unsigned integers
- IEEE single -precision (4-byte) floating-point values
- Single binary values or packed binary values in groups of up to 32.

The IIN, IINR, RIN, and RINR blocks normally transfer 16-bit or 32-bit values. If you specify:

- a signed data type with 16 bits, the 16 bits are interpreted as a signed value. The range is -32768 to +32767.
- a signed data type with 32 bits, the 32 bits are interpreted as a signed integer. For a signed 4-byte value, the range is -2147483647 to +2147483646.
- an unsigned data type with 16 bits, the 16 bits are as an unsigned value. The range is 0 to 65535.

The IOUT and ROUT blocks normally transfer 16-bit values or 32-bit values. If you specify:

- a signed data type with 16 bits, the 16 bits are interpreted as a signed value. The range is -32768 to +32767.
- a signed data type with 32 bits, the 32 bits are interpreted as a signed integer. For a signed 4-byte value, the range is -2147483647 to +2147483646.
- an unsigned data type with 16 bits, the 16 bits are interpreted as an unsigned value. The range is 0 to 65535.

The RIN, RINR, and ROUT blocks can transfer a 4-byte IEEE floating-point value. If you specify a data type floating point, the floating-point values are handled as 32-bit DCI connections. Real input blocks can also have integer and boolean inputs. With devices that support 16-bit registers, two consecutive registers make up the 32 bits interpreted as a standard single-precision IEEE floating-point number.

PAKOUT, PAKIN, and PAKINR blocks transfer 1 to 32 single bits, without format.

BOUT and BIN blocks transfer single bits as specified by the starting address.

Some devices send the data low-order byte first, others send the data high-order byte first. You need to know what your devices send and then adjust, as appropriate, the byte or bit swapping (see Table 7-8).

Table 7-9 describes the optional data types and range of values for DCI input blocks and DCI output blocks.

Table 7-9. DCI Block Type and Valid Data Types in Devices
Table 7-10.

Data Type	DCI Block													
	IIN	IINR	RIN	RINR	BIN	BINR	PAKIN	PAKINR	STRIN	IOUT	ROUT	BOUT	PAKOUT	STROUT
Float			X	X							X			
Signed Character	X	X	X	X						X	X			
Char	X	X	X	X						X	X			
Signed Integer - 16 bit	X	X	X	X						X	X			
Signed Integer - 32 bit	X	X	X	X			X	X		X	X		X	
Unsigned Integer - 16 bit	X	X	X	X						X	X			
Unsigned Integer - 32 bit	X	X	X	X						X	X			
ASCII	X	X	X	X						X				
ASCII Hex	X	X	X	X						X				
ASCII with ‘0’, for ‘1’			X	X	X	X						X		
Binary Digit in LSB of a byte					X	X	X	X				X		
STRING									X					X
ASCII with One decimal place											X			
ASCII with 3 decimal places											X			
ASCII with No decimal place											X			
ASCII with 2 decimal places											X			
ASCII with 4decimal places											X			
ASCII with 5 decimal places											X			
ASCII with One decimal places with leading + sign for positive numbers											X			
ASCII with 2 decimal places with leading + sign											X			
ASCII with three decimal places with leading + sign											X			
ASCII Hex Integer											X			

— NOTE

Data types for some custom devices may have data types that are unique to the device. You should refer to the I/O Device Driver document to see if there are any unique data types. Not all data types in Table 7-9 apply to all FDSI drivers.

If you create or modify a device configuration, you should save the configuration. If you attempt to close the dialog box without saving, a dialog box asks you to save the configuration.

Proceed to "Saving the Port and Device Configuration Files" on page 152. You can save multiple FBM port configuration files or device files by assigning and saving each file with a unique name.

Saving the Port and Device Configuration Files

You can save a port or device instance (device configuration file) when the file is created or modified.

— NOTE

The port and device configuration files are saved to the station from which the configurator is executing. They must be manually copied to the host boot stations.

The Save XML Configuration dialog box is used to save configurations and working copies of configurations.

By default, the filename of a configured port or device file is derived from the device identifier and uses the extension .xml.

<*FILENAME*>.xml

The files are stored in a subdirectory of the AW on the D drive folder used for storing FBM images:

\usr\fox\sp\files\devices

Thus, a fully defined filename would be:

\usr\fox\sp\files\devices\<*FILENAME*>.xml

Enter "FILENAME.xml" into the FILEID parameter of any ECB201 representing a device that is to be transacted using the configuration.

Enter "FILENAME.xml" into the FILEID parameter of any ECB200 or ECB202 representing a port of the FBM.

— NOTE

Configuration file names must be all uppercase characters on UNIX® devices.

You may enter any filename you desire to override the default filename.

To save a port or device configuration file to an .xml file:

1. From the port or device configuration display, click **`File > Save`** or click the save icon  .

— NOTE

If a port does not specify an FDSI driver, a warning message dialog box appears indicating the port and a reminder to enter a driver or disable the port.

This invokes a Save XML Configuration dialog box (Figure 7-30). The dialog box allows you to enter or change the filename or directory. You can use any name for any port or device configuration file with the .XML extension.

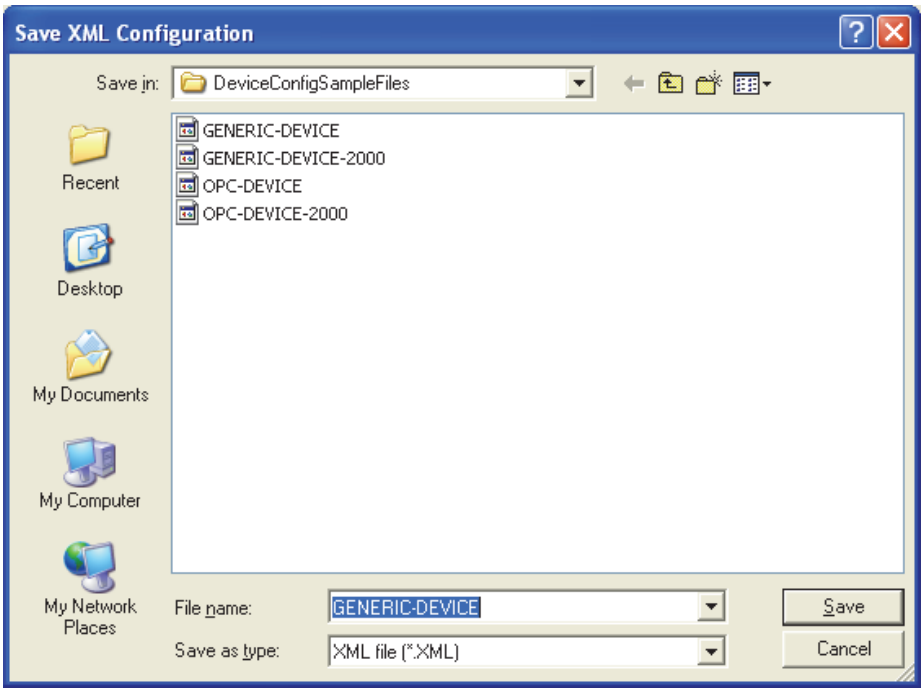


Figure 7-30. Save XML Configuration Dialog Box

2. The Save XML Configuration dialog box (Figure 7-30) shows all configurations that are saved on the system including the standard Foxboro supplied configurations. If an you are replacing an existing file, select it an click **Save**.
3. If a different name is desired, enter the desired name for the file and click **Save**.

   After the device file is saved, you must copy all the device files to the appropriate I/A Series station that is the CP host.

Downloading Configuration Files to the FBM

Prior to downloading the configuration files, you must place the ECBs on-line. Downloading of the port configuration file and device configuration files to the FBM is performed using the System Manager or the I/A Series System Management Display Handler (SMDH) utility (see "Placing the FBM On-Line/Off-Line" on page 190).

For the operations to commence, two types of files must be downloaded from the I/A Series control processor to the FBM:

- The port configuration file(s) to ECB200(s) and/or ECB202(s)
- The device configuration files to ECB201s.

The device configuration file for each assigned device is stored in a file separate from the port configuration file. This allows you to add or remove devices without downloading the configuration for all devices. This saves significant time in the download process.

When a device is downloaded to the FBM from System Manager or SMDH, all of the existing device configuration files for an FBM are first erased in the FBM.

Backing Up Configuration Files

The configuration files, .xml files, are not saved when performing a Save_All. There is no automatic save and restore of these files. Problems could occur when moving control database to a new CP on a different host, or if the host is lost and a restore needs to be performed, or when doing a Day 0 upgrade. The files are contained in the folder:

`/usr/fox/sp/files/devices` (for UNIX systems).

`\usr\files\sp\files\devices` (for Windows® systems).

— NOTE

You should manually back up the files and restore them to this folder following a Day 0 installation.

8. Process Operator Displays

This chapter provides references for information on the process operator displays used with the I/A Series system (and thus with the FBM230/231/232/233).

The I/A Series system provides the following types of displays for performance of process control operations:

- Select Screen Display (compound and block overview display)
- Group Displays
- User-Generated Displays
- Block Detail Displays
- Compound Detail Displays
- Station Displays.

For information on how these displays are used, refer to *Process Operations and Displays* (B0700BN).

Block Detail Displays

Three Equipment Control Blocks (ECB200, ECB201 and ECB202) relate to the FBM230/231/232/233 and their associated field devices as follows:

- ECB200 represents the FBM230 or FBM232
- ECB202 represents the FBM231 or FBM233
- ECB201 represents each field device attached to the FBMs.

The block detail displays for these ECBs are described in the following subsections. To access the block detail displays, use the FoxSelect to select the appropriate compound and then select the ECB200, ECB201, or ECB202.

— NOTE

Before modifying an ECB201 configuration with changes that are related to DCI connections, refer to the caution statement in Chapter 5 “Control Block Configuration Information” (on page 79).

ECB200 (FBM230/232) Block Detail Display

Figure 8-1 shows an ECB200 Block Detail display for FBM230/232. Descriptions not provided in the following display can be found in *Integrated Control Block Descriptions* (B0193AX).

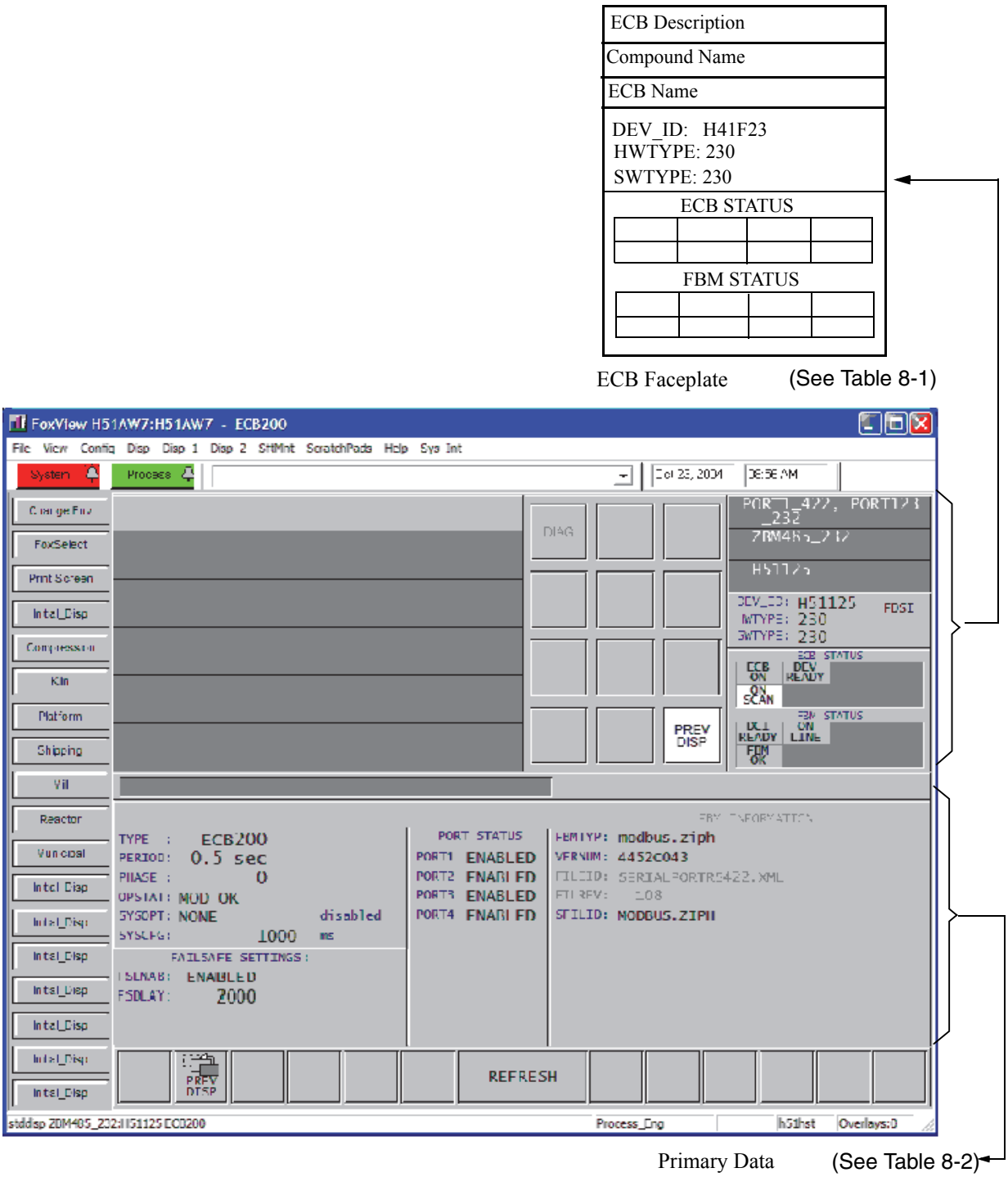


Figure 8-1. ECB200 (FBM230/232) Block Detail Display

Control Buttons

- PREV DISP – Calls up the previously accessed block detail display.
- DIAG - Displays the statuses of the FBM when in abnormal states - see page 158

ECB200 (FBM230/232) Faceplate

The text fields of the ECB200 faceplate (upper-right corner of the block detail display) are defined in Table 8-1.

Table 8-1. ECB200 (FBM230/232) Faceplate

Text Field		Description
ECB Description		ECB200's description as configured in the DESCRP parameter.
Compound Name		Name of the compound that holds the ECB200.
ECB Name		ECB200's name as configured in the NAME parameter.
DEV_ID		Device Identification - 6-character identifier of the FBM.
HWTYPE		Hardware Type - Configured based on the type of the associated FBM. For FBM230/232, HWTYPE is 230/232.
SWTYPE		Software Type- Configured based on the type of the associated FBM. For FBM230/232, SWTYPE is 230/232.
ECB STATUS	ECB ON/ECB OFF	ECB On - The ECB is on line/off line.
	DEV READY	Device Ready - The device is ready for operation.
	UNDEF	Undefined - The ECB is not correctly configured or the return code in the DCI FBM response to a Connect Device or Read Status indicates a configuration error. For example, Invalid Hardware/Software type, Invalid Port, Duplicate Connection, Insufficient FBM Memory/Connections Available, Invalid Device Name, or Invalid Device Option).
	ON/OFF SCAN	The ECB has been placed on/off scan.
	DEV FAIL	Device Fail - Device has failed and is no longer communicating.
	COMM FAIL	Communication Fail - Communications between CP and FBM has failed.

Table 8-1. ECB200 (FBM230/232) Faceplate (Continued)

FBM STATUS	DCI READY/NOT READY	The FBM is ready or not ready for operation.
	ON/OFF LINE	The FBM has been switched on/off line using the System Manager or SMDH display.
	UNRESLVD	Unresolved - A failure occurred whose connection source is unknown. Potential exists for recovery from failure.
	FBM OK	The FBM is operable.
	DLOAD FAIL	Database Download Fail – A failure occurred during a recent database (DB) download operation.

ECB200 (FBM230/232) Primary Data

The ECB200 primary data, displayed in the lower part of Figure 8-1, consists of ECB200 parameters, which are described in Table 8-2.

Table 8-2. ECB200 (FBM230/232) Block Detail Display, Primary Data

Text Field		Description
FBM INFORMATION		
PORT STATUS, PORT1-PORT4	ENABLED	Communication with the port has been ENABLED or DISABLED from System Manager or SMDH.
FBMTYP TYPE	230/232	FBM Type is configured based on the type of the associated FBM. For FBM230/232, FBM TYP is 230/232.
VERNUM	nnnnnnnn	Version Number (8 characters) - Cyclic Redundancy Check (CRC) of the I/O Device Driver file. The d drive of the AW has a .txt file for the device driver that contains the CRC of the device driver. Version Number contains the CRC of the downloaded driver file. You should check that the Version Number (CRC downloaded) matches the number in the .txt file of the device driver.
FILEID	<file-name>.XML	File Identification - Contains the name of the file that defines the FBM230/232 port configuration (in the case of ECB200).
FILREV	1.1	File Revision Contains the revision of the file that defines the FBM230/232 port configuration.
SFILID	<file-name>.ZIPH	Software File Identification - The name of the FDSI driver file.

Diagnostic Status - ECB200 (FBM230/232)

The DIAG (Diagnostic) button on the ECB200 Block Detail display only shows statuses of an FBM when it is in one or more abnormal states, and when the ECB's hardware types are 230 or 232. This button does not show statuses for any other hardware type.

Separate messages are provided for the statuses of the Main and Tracker FBMs, if present. The following are potential messages which can be displayed in the Block Detail display.

1. Cannot Load Driver- FDSI does not have its downloadable driver (.ziph) installed. The driver must be reinstalled as discussed in “SOFT_DOWNLOAD” on page 189. The ECB’s SFILID parameter lists the name of this driver, as shown in Table 5-2 “Key Parameters For ECBs and DCI Blocks” on page 84.
2. Port File Invalid - The port file, sent as part of the DB download, is not valid.

Different messages are shown in FoxView, depending on the FBM type.

ECB202 (FBM231/233) Block Detail Display

Figure 8-2 shows an ECB202 Block Detail display for FBM231/233. Descriptions not provided in the following display can be found in *Integrated Control Block Descriptions* (B0193AX).

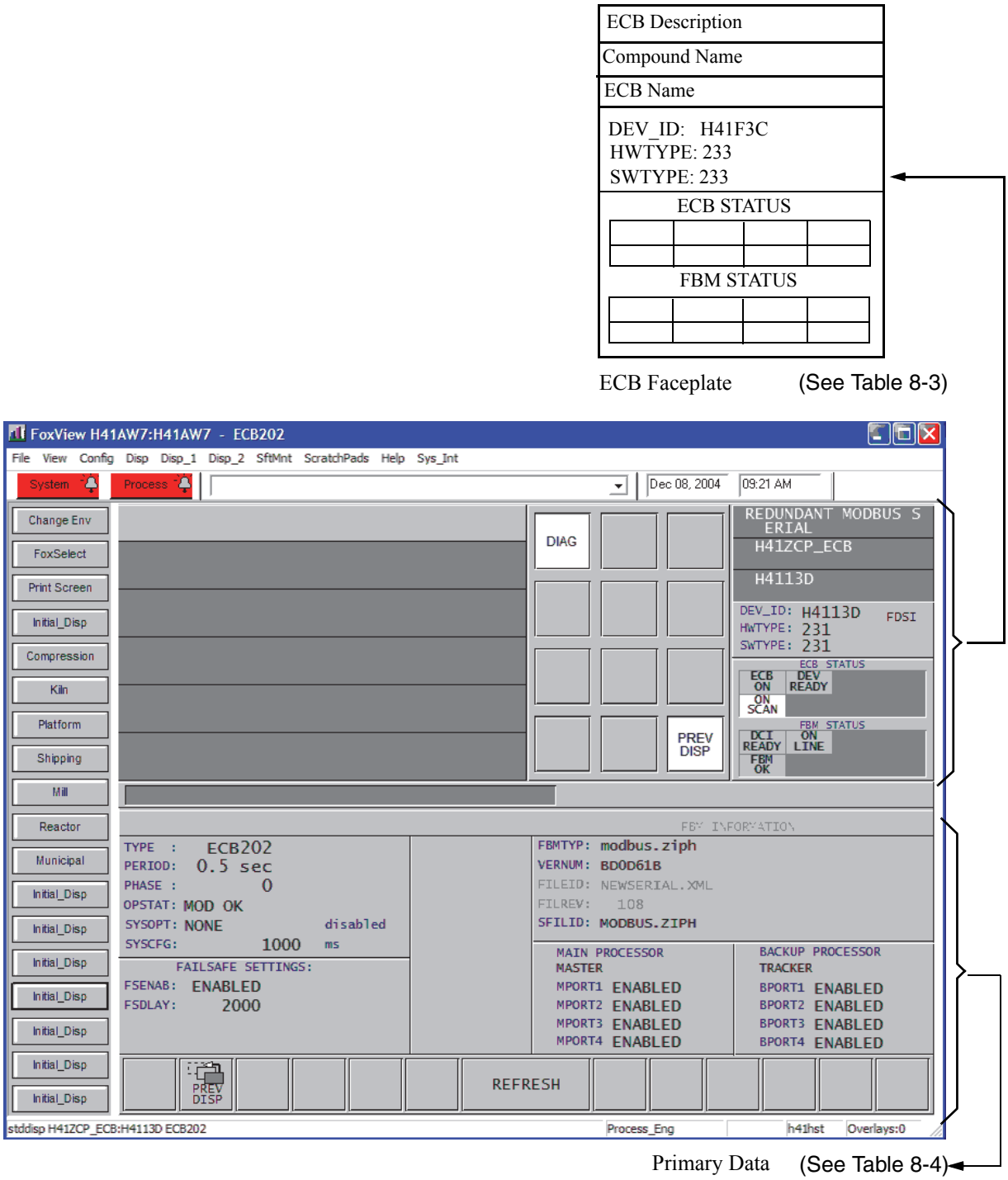


Figure 8-2. ECB202 (FBM231/233) Block Detail Display

Control Buttons

- PREV DISP – Displays the previously accessed block detail display.
- DIAG - Displays the statuses of the FBM when in abnormal states - see page 162

ECB202 (FBM231/233) Faceplate

The text fields of the ECB202 faceplate (upper-right corner of the block detail display) are defined in Table 8-3.

Table 8-3. ECB202 (FBM231/233) Faceplate

Text Field		Description
ECB Description		ECB202's description as configured in the DESCRP parameter.
Compound Name		Name of the compound that holds the ECB202.
ECB Name		ECB202's name as configured in the NAME parameter.
DEV_ID		Device Identification - 6-character identification of the FBM.
HWTYPE		Hardware Type - Configured based on the type of the associated FBM. For FBM231/233, HWTYPE is 231/233.
SWTYPE		Software Type - Configured based on the type of the associated FBM. For FBM231/233, SWTYPE is 231/233.
ECB STATUS	ECB ON/OFF	The ECB is operable.
	DEV READY	Device Ready - The device is ready for operation.
	UNDEF	Undefined - The ECB is not correctly configured or the return code in the DCI FBM response to a Connect Device or Read Status indicates a configuration error. For example, Invalid Hardware/Software type, Invalid Port, Duplicate Connection, Insufficient FBM Memory/Connections Available, Invalid Device Name, or Invalid Device Option).
	ON/OFF SCAN	The ECB has been placed on/off scan.
	DEV FAIL	Device Fail - Device has failed and is no longer communicating.
	COMM FAIL	Communication Fail - Communications between CP and FBM has failed.
FBM STATUS	DCI READY/NOT READY	The FBM is ready or not ready for operation.
	ON/OFF LINE	The FBM has been switched on/off line using the System Manager or SMDH display.
	UNRESLVD	A failure occurred whose connection source is unknown. Potential exists for recovery from failure.
	FBM OK	The FBM is operable.
	DLOAD FAIL	Database Download Fail – A failure occurred during a recent database (DB) download operation.

ECB202 (FBM231/233) Primary Data

The ECB202 primary data, displayed in the lower part of Figure 8-2, consists of ECB202 parameters, which are described in Table 8-4.

Table 8-4. ECB202 (FBM231/233) Block Detail Display, Primary Data

Text Field		Description
FBM INFORMATION		
FBM TYPE	231/233	FBM Type is configured based on the type of the associated FBM. For FBM231/233, HWTYPE is 231/233.
VERNUM	nnnnnnnn	Version Number (8 characters) - Cyclic Redundancy Check (CRC) of the I/O Device Driver file. The d drive of the AW has a .txt file for the device driver that contains the CRC of the device driver. Version Number contains the CRC of the downloaded driver file. You should check that the Version Number (CRC downloaded) matches the number in the .txt file of the device driver.
FILEID	<file-name>.XML	File Identification - Contains the name of the file that defines the FBM231/233 port configuration.
FILREV	1.1	File Revision - Contains the revision of the file that defines the FBM231/233 port configuration.
SFILID	<file-name>.ZIPH	Software File Identification - The name of the FDSI driver file.
MAIN PROCESSOR	Master/Tracker	The processor of the redundant pair located in the odd slot of the baseplate (main) is operational as the Master or Tracker module.
MPORT1-MPORT4	ENABLED	Main Port(s) of the main processor have been ENABLED or DISABLED from System Manager or SMDH. If Main is Enabled than the Backup is ENABLED. If Main is DISABLED than the Backup is DISABLED.
BACKUP PROCESSOR	Master/Tracker	The processor of the redundant pair located in the even slot of the baseplate (backup) is operational as the Master or Tracker module.
BPORT1-BPORT4	ENABLED	Backup Port(s) of the backup processor have been ENABLED or DISABLED from System Manager or SMDH. If Main is Enabled than the Backup is ENABLED. If Main is DISABLED than the Backup is DISABLED

Diagnostic Status - ECB202 (FBM231/233)

The DIAG (Diagnostic) button on the ECB202 Block Detail display only shows statuses of an FBM when it is in one or more abnormal states. Separate messages are provided for the statuses of

the Main and Tracker FBMs, if present. The following are potential messages which can be displayed in the Block Detail display.

1. Not Operational - FBM software is not functional, potentially due to an issue with the hardware or software
2. Offline - FBM is offline
3. HDLC Fault - fault detected on the communication bus between the CP and FBM
4. Interlink Fault - fault detected on the communication bus between two redundant FBMs
5. Slot Conflict - hardware error exists within redundant FBMs. The modules must be replaced.
6. Power1 Fault - primary power source to FBM baseplate is not detected
7. Power2 Fault - secondary power source to FBM baseplate is not detected
8. Cannot Load Driver- FDSI does not have its downloadable driver (.ziph) installed. The driver must be reinstalled as discussed in “SOFT_DOWNLOAD” on page 189. The ECB’s SFILID parameter lists the name of this driver, as shown in Table 5-2 “Key Parameters For ECBs and DCI Blocks” on page 84.
9. Port File Invalid - the port file, sent as part of the DB download, is not valid.
10. Trker Edu In Process - the Master module is synchronizing with the Tracker module’s database.

Different messages are shown in FoxView, depending on the FBM type.

ECB201 (Field Device) Block Detail Display

Figure 8-3 shows an ECB201 Block Detail display for each field device. Descriptions not provided in the following display can be found in *Integrated Control Block Descriptions* (B0193AX).

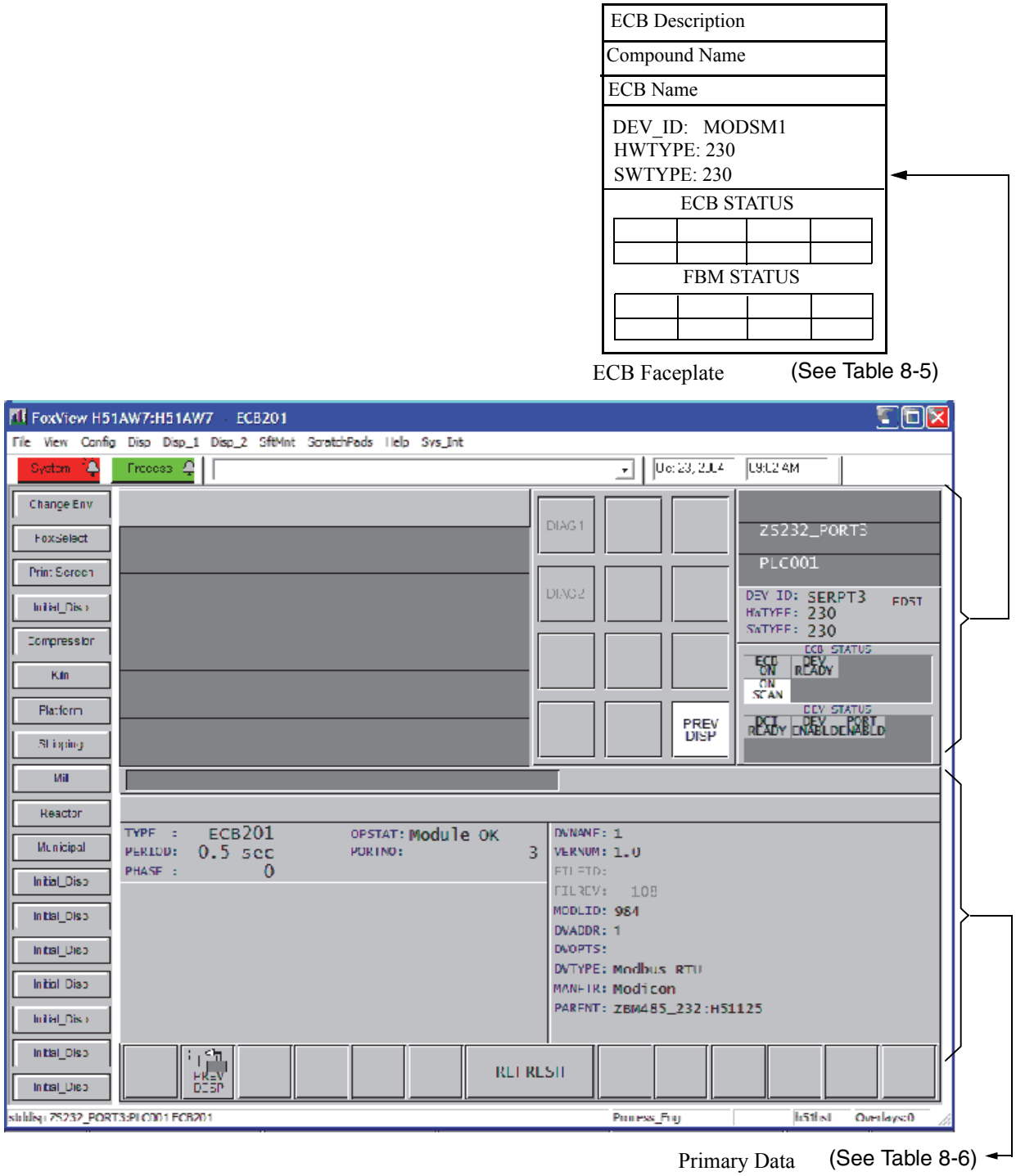


Figure 8-3. ECB201 (Field Device) Block Detail Display

Control Buttons

- PREV DISP – Calls up the previously accessed block detail display.
- DIAG - Displays the statuses of the FBM when in abnormal states - see page 166

ECB201 (Field Device) Faceplate

The text fields of the ECB201 faceplate (upper-right corner of the block detail display) are defined in Table 8-5.

Table 8-5. ECB201 (Field Device) Faceplate

Text Field		Description
ECB Description		ECB201's description as configured in the DESCRP parameter.
Compound Name		Name of the compound that holds the ECB201.
ECB Name		ECB201's name as configured in the NAME parameter.
DEV_ID		Device Identification - 6-character name of the FBM.
HWTYPE		Hardware Type - Configured based on the type of the associated FBM. For FBM230/232, HWTYPE is 230/232. For FBM231/233, HWTYPE is 231/233.
SWTYPE		Software Type - Configured based on the type of the associated FBM. For FBM230/232, HWTYPE is 230/232. For FBM231/233, HWTYPE is 231/233.
ECB STATUS	ECB ON	The ECB is operable.
	DEV READY	Device Ready - The device is ready for operation.
	UNDEF	Undefined - The ECB is not correctly configured or the return code in the DCI FBM response to a Connect Device or Read Status indicates a configuration error. For example, Invalid Hardware/Software type, Invalid Port, Duplicate Connection, Insufficient FBM Memory/Connections Available, Invalid Device Name, or Invalid Device Option).
	ON/OFF SCAN	The ECB has been placed on/off scan.
	DEV FAIL	Device Fail - Device has failed and is no longer communicating.
	COMM FAIL	Communication Fail - Communications between CP and FBM has failed.
DEV STATUS	READY/NOT READY	The FBM is ready/not ready for operation.
	ON/OFF LINE	The FBM has been switched on/off line using the System Manager or SMDH display.
	UNRESLVD	Unresolved - A failure occurred whose connection source is unknown. Potential exists for recovery from failure.
	DEV ENABLED/ DSABLD	Device Enabled/Disabled - The device is ready/not ready for operation.
	DLOAD FAIL	DB Download Fail – A failure occurred during a recent database (DB) download operation.

ECB201 (Field Device) Primary Data

The ECB201 primary data, displayed in the lower part of Figure 8-3, consists of ECB201 parameters, which are described in Table 8-6.

Table 8-6. ECB201 (Field Device) Block Detail Display, Primary Data

Text Field		Description
DVNAME		Device Name - Name of the device configured in associated ECB201. Refer to the I/O Device Driver.
VERNUM		Version Number - Version of the I/O Device Driver.
FILEID	<file-name>.XLH	File Identification - Displays the name of the device configuration file, which is downloaded from the control processor when DB Download is selected on the device Equipment Change display. The file extension is always .XLH.
FILREV		File Revision - Not applicable to the FBM230/231/232/233.
MODLID		Model Identification - Type of Driver loaded on system.
DVADDR		Device Driver - Refer to the I/O Device Driver.
DVOPTS		Device Options - Refer to the I/O Device Driver.
DVTYPE		Device Type - Name of the I/O Device Driver.
MANFTR		`Manufacturer -` Not applicable to the FBM230/231/232/233`.`
PARENT		Compound name containing the ECB201.
OPSTAT	Module OK/NOT OK	Operational Status - FBM Module OK or NOT OK.
PORTNO	1, 2, 3, or 4	Port Number - The display shows port numbers 1, 2, 3, or 4 depending on the configured port. For FBM232/233, always displays 1.

Diagnostic Status - ECB201 (Field Device)

The DIAG (Diagnostic) button on the ECB201 Block Detail display only shows statuses of an FBM when it is in one or more abnormal states. This section only details the statuses shown for FDSI, as other statuses appear depending on the hardware type used with this ECB201.

Separate messages are provided for the statuses of the Main and Tracker FBMs, if present. The following are potential messages which can be displayed in the Block Detail display.

1. Main Port Failed - communications to the Main[1] FBM have failed
2. Bkup Port Failed - communications to the Backup[2] FBM have failed

1. The Main FBM is a single module in an odd numbered baseplate slot, or, of a redundant pair, the module in the odd numbered baseplate slot, to the left of the Backup.
2. The Backup FBM is the module in the even numbered baseplate slot, to the right of the Main module.

3. Backup Port Active - Backup module has the role of Master.
4. Main Port Active - Main module has the role of Master.
5. Dual - Ported - indicates that a redundant connection exists between redundant modules
6. Heartbeat Config Error - Heartbeat for the FBM has been configured incorrectly, and must be corrected in the source XML file.

Different messages are shown in FoxView, depending on the FBM type.

9. Maintenance

This chapter provides maintenance information for the FBM230/231/232/233.

NOTE

In general, maintenance includes inspection and cleaning, checking system management displays, checking the status of LED indicators, and checking for loose cable connections.

⚠ WARNING

To prevent explosion, install and remove cables, wiring, modules and other replaceable components only when the area is known to be nonhazardous.

Overview

The general I/A Series system management philosophy applies to the FBM230/231/232/233 incorporated into the I/A Series system. Through the System Management Displays, you can receive status information on these FBMs, as well as send change requests to the FBMs.

System management for the FDSI FBMs is supported on the following system and display management packages:

- System Manager - discussed in *System Manager* (B0750AP)
- SMDH - discussed in *System Management Displays* (B0193JC)
- FoxView - discussed in *Process Operations and Displays* (B0700BN)
- Foxboro Control Software InTouch® Application - discussed in *Foxboro Control Software InTouch Application User's Guide* (B0750AQ).

System Management Displays

Operators will view data regarding their control equipment using display applications such as the System Manager or the System Management Display Handler (SMDH).

The I/A Series System Manager allows you to access equipment information and status for an I/A Series system, including the FBM230/231/232/233, FDSI slave devices, and their associated Control Processor. This display reflects the system's current operating status and provide a valuable maintenance aid by allowing you to observe the current operating status of the various system elements and intervene in system operations. For information on navigating through the System Manager screens, see *System Manager* (B0750AP).

For information on viewing the FBM230/231/232/233 and device runtime information in the Foxboro Control Software InTouch Application, refer to *Foxboro Control Software InTouch Application User's Guide* (B0750AQ).

The I/A Series System Management Display Handler (SMDH) obtains current and historical information about the system, and displays this information in System Management displays. With regard to the FBM230/231/232/233 and associated devices, the SMDH provides the following displays:

- A Fieldbus[1] level display (PIO Network), which shows the control processor, FCM(s), and any other Fieldbus devices
- A module Fieldbus[1] level display (PIO Sub-Network), which shows the selected FCM and associated FBMs, and associated field devices
- A device level display (I/O Display), which shows the associated field devices for the selected FBM
- Detailed equipment information (EQUIP INFO) and equipment change (EQUIP CHG) displays for each FBM and the associated field devices.

For detailed information on the first three items above (Fieldbus level display and module Fieldbus level display, and I/O device display), refer to *System Management Displays* (B0193JC).

FBM230/232 (ECB200) Equipment Information Display

Typical Equipment Information display pages for the FBM230/232 (ECB200) are shown in Figure 9-1 through Figure 9-3. Table 9-1 describes the available text fields in the order that they appear on the I/A Series System Manager and SMDH display pages, from left column to right column.

1. The term “Fieldbus” as used here pertains to the I/A Series 100 Mbps Ethernet and/or the I/A Series system 2 Mbps Module Fieldbus.

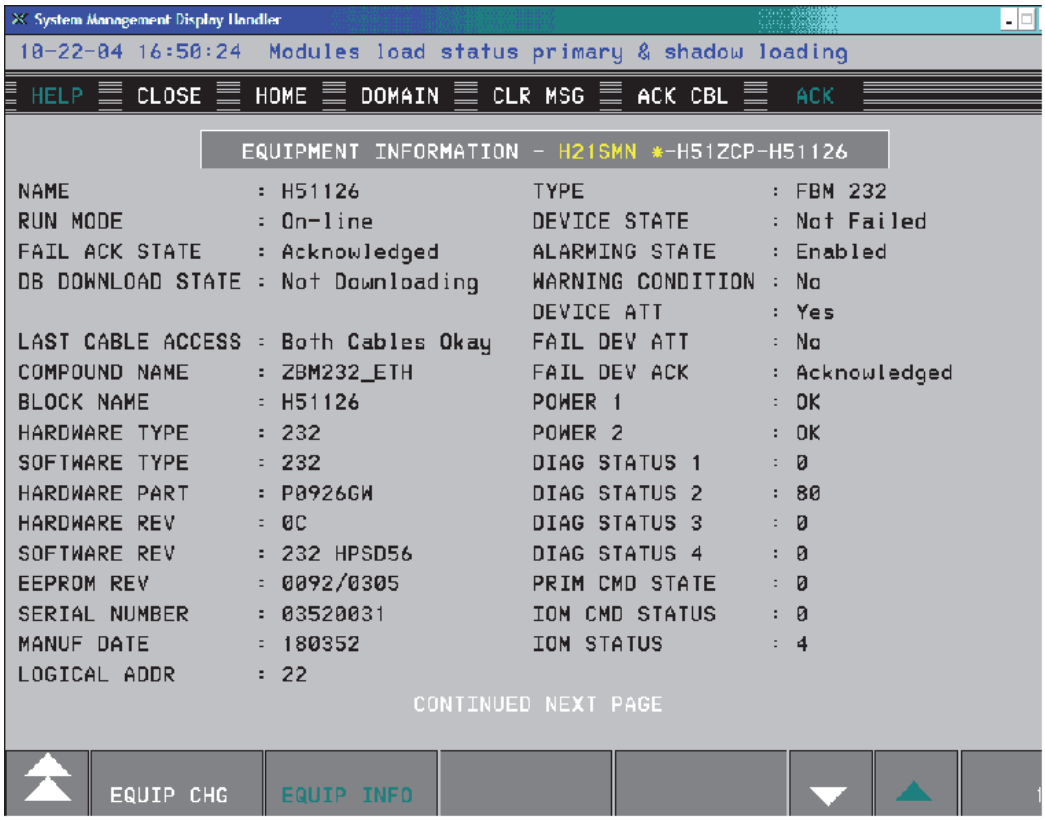


Figure 9-1. FBM230/232 (ECB200) Equipment Information Display – Typical (1 of 3)

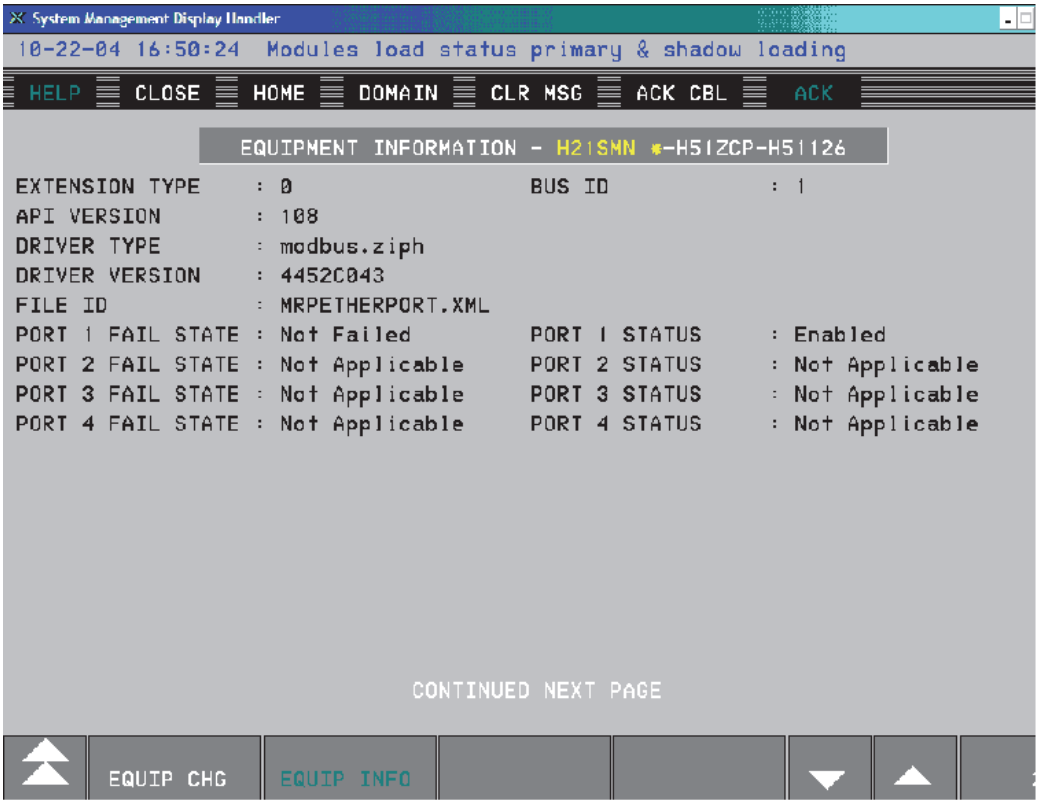


Figure 9-2. FBM230/232 (ECB200) Equipment Information Display – Typical (2 of 3)

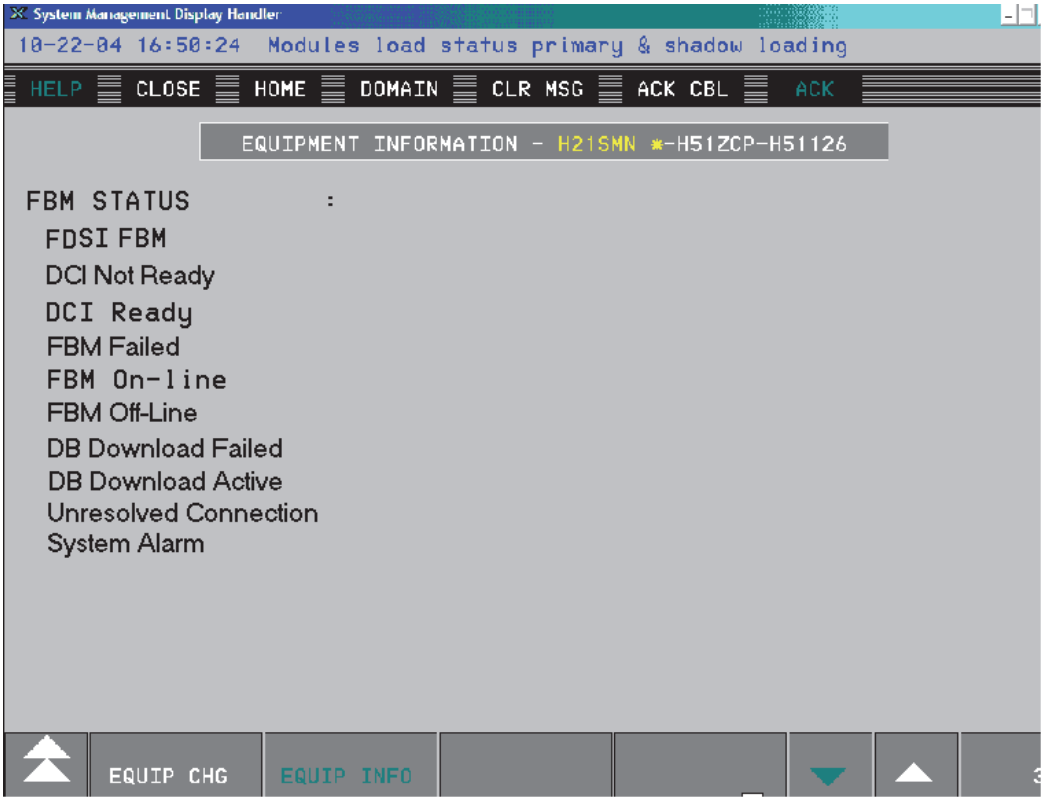


Figure 9-3. FBM230/232 (ECB200) Equipment Information Display – Typical (3 of 3)

Table 9-1. FBM230/232 (ECB200) Equipment Information Display Fields

Field	Description
NAME	User-supplied ECB name.
RUN MODE	On-line or Off-line (default) is displayed. Set the **RUN MODE** using the **GO ON-LINE** and **GO OFF-LINE** options in the Equipment Change display. If the FBM automatically goes off-line: ♦ Check hardware ♦ Check related fields, such as **FBM STATUS** ♦ Download (restart) the FBM.
FAIL ACK STATE	Acknowledged (default) or Not Acknowledged is displayed. If the **DEVICE STATE** value changes from Not Failed to Failed, the **FAIL ACK STATE** value changes to Not Acknowledged to indicate this transition, and remains until you acknowledge the FBM failure.
DB DOWNLOAD STATE	DB Download State DOWNLOADING is displayed when the control database file is being downloaded. DB Download State Failed is displayed when the control database file has not been downloaded.
LAST CABLE ACCESS	"Both Cables OK", "A Fail/B Okay, "A Fail/B Fail", "A Okay/B Fail" is displayed. This field indicates whether transmissions were successfully sent the last time either Bus A or B was used. A Fail/B Fail status indicates a PIO bus send failure. To resolve this: ♦ Check the PIO bus. ♦ Switch to the other cable if the bus is bad.
COMPOUND NAME	Compound name containing the FBM ECB200.
BLOCK NAME	Block name for the FBM ECB200.
HARDWARE TYPE	FBM number related to this FBM. Entered in ICC.
SOFTWARE TYPE	Type of application software used with this FBM hardware type. Entered in ICC.
HARDWARE PART	Hardware part number related to this FBM.
HARDWARE REV	Hardware release level of this FBM hardware type.
SOFTWARE REV	Release level of this FBM software.
EEPROM REV	Firmware release for this FBM.
SERIAL NUMBER	Serial number assigned to this FBM hardware module.
MANUF DATE	Date of manufacture for this FBM: first 2 characters = factory number, second two characters = year of manufacture, third two characters = week of manufacture.
LOGICAL ADDR	Logical Address is the number of the FBM, 1 through 120. FBMs are typically numbered as they appear in the display (left to right).
TYPE	Predefined type FBM230/232 is determined by the primary FBM when checking the devices on its Fieldbus. Entries are: FBM230 or FBM232, for FBM230/232.
DEVICE STATE	Failed or Not Failed (default) is displayed. This field changes to Failed if a fatal hardware fault (including a possible communications cable break) causes the FBM to fail.

Table 9-1. FBM230/232 (ECB200) Equipment Information Display Fields (Continued)

Field	Description
ALARMING STATE	Alarming State indicates whether alarming is enabled or inhibited for the device. When alarming is inhibited, the System Monitor continues to indicate overall system and network health (a green **SYS BAR**) while equipment is Failed or Off-line.
WARNING CONDITION	Yes is displayed if the device has a non-fatal error condition; otherwise, No is displayed.
DEVICE ATT	Yes is displayed if the FBM230/232 has devices attached; otherwise, No is displayed.
FAIL DEV ATT	Yes is displayed if one or more devices connected to the FBM has failed; otherwise, No is displayed.
FAIL DEV ACK	Acknowledged (default) or Not Acknowledged is displayed. If any of the devices attached to the FBM fail and become unacknowledged, Not Acknowledged is displayed.
POWER 1	OK or Failed indicates the state of primary power to FBM.
POWER 2	OK or Failed indicates the state of backup power to FBM.
DIAG STATUS 1	Diagnostic Status 1 is a hexadecimal value related to the hardware status. Typically this value is 0, indicating a non-fail-safe condition – typical status for an FBM with a green status LED on. If PS 1 is bad a 1 is displayed. If PS 2 is bad a 2 is displayed.
DIAG STATUS 2	Diagnostic Status 2 is a hexadecimal value indicating the FBM startup condition. If the value is 0, there is no history of the last start condition due to lack of communications. Hexadecimal values and the related conditions are as follows: **Value Condition** 10 = FBM lost power (cold start) 20 = CP requested FBM reboot 2F = FDSI application exception 3A = Reboot due to Driver Crash 40 = Watchdog Failure 80 = CP requested FBM go offline If the FBM is operating normally, this field can be safely ignored.
DIAG STATUS 3	Diagnostic Status 3 is a hexadecimal value relating to the previous software or hardware error for the selected FBM. If the FBM is operating normally, this field can be safely ignored. For resolution of the FBM hardware and software errors indicated by this diagnostic status field, contact IOM Global Customer Support.

Table 9-1. FBM230/232 (ECB200) Equipment Information Display Fields (Continued)

Field	Description
DIAG STATUS 4	Diagnostic Status 4 is a hexadecimal value relating to the current software or hardware error for the selected FBM. Normally, this value is 0 (no error). Other values are fatal errors; the FBM is not operational. Typical values and their meaning are as follows: **Value Condition** 0 = No error 15 = Hardware type mismatch (FBM installed in the wrong slot, module is a 230/232 and you enter 231/233 in ECB200) 16 = Software type mismatch (module is a 230/232 and you enter 231/233 in ECB200) Corrective actions include: ♦ Installing the FBM in the correct slot ♦ Correcting ECB200 and ECB201 configuration errors ♦ Restarting the FBM using the DOWNLOAD function on the Equipment Change display ♦ Reloading the FBM software using the EEPROM UPDATE function. If the above actions do not correct the problem, contact IOM Global Customer Support.
PRIM CMD STATE	Primary Command Status is a value related to the status of communication between the primary FBM and the FBM230/232. Typically, this value is 0 or 1, where 1 indicates that a successful retry took place and communication has been restored to normal. For the FBM230/232, Primary Command Status can have the following values: **Value Condition** 0 = Normal, no error 1 = Success with retry (this condition is very rare) 2 = FCM timed out FBM 3 = CP timed out FCM > 3 = Link level protocol error (this is very rare and transient)
IOM CMD STATUS	IOM Command Status is a hexadecimal value associated with the return status included in the header of every response from the FBM230/231 to the primary FBM. Typically, the hexadecimal value is 0, indicating the command was understood and action was taken. **Value Condition** 0 = Command understood, action taken. 1 = Command not understood. 2 = Command understood, but unable to take action. 4 = Invalid argument.

Table 9-1. FBM230/232 (ECB200) Equipment Information Display Fields (Continued)

Field	Description
IOM STATUS	IOM Status is a hexadecimal value related to the current FBM230/232 status. Typically this value is 4, indicating the FBM is online. Value Condition 1 = FBM status has changed – requests CP to poll for extended status. 2 = Diagnostic Register is nonzero. This indicates a fatal error. The FBM does not start if this value is set. 4 = Non-fail-safe condition. 8 = Not used. 10 = Not used. 20 = Not used. 40 = FBM is off-line. 80 = Initialization is taking place – all channel and I/O data is initializing.
EXTENSION TYPE	Not applicable to the FBM230/232.
API VERSION	Internal Application Interface in use.
DRIVER TYPE	Name of I/O Device Driver. The extension should always be .ziph
DRIVER VERSION	Cyclic Redundancy Check (CRC) of the I/O Device Driver file. The d drive of the AW has a .txt file for the device driver that contains the CRC of the device driver. Driver Version contains the CRC of the downloaded driver file. You should check that the Driver Version (CRC downloaded) matches the number in the .txt file of the device driver.
FILE ID	Name of the FBM230/232 port configuration file, which is downloaded from the control processor when DB Download is selected on the FBM230/232 Equipment Change display. The File ID extension should always be .XML.
PORT 1 FAIL STATE	The following are displayed: ♦ Failed – when Port 1 is configured and failed ♦ Not Failed – when Port 1 is configured and not failed.
PORT 2 FAIL STATE	The following are displayed: ♦ Failed – when Port 2 is configured and failed ♦ Not Failed – when Port 2 is configured and not failed.
PORT 3 FAIL STATE	The following are displayed: ♦ Failed – when Port 3 is configured and failed ♦ Not Failed – when Port 3 is configured and not failed.
PORT 4 FAIL STATE	The following are displayed: ♦ Failed – when Port 4 is configured and failed ♦ Not Failed – when Port 4 is configured and not failed.
BUS ID	Bus ID is not applicable for the FBM230/232.
PORT 1 STATUS	Either Enabled or Disabled is displayed, if Port 1 is configured.
PORT 2 STATUS	Either Enabled or Disabled is displayed, if Port 2 is configured.
PORT 3 STATUS	Either Enabled or Disabled is displayed, if Port 3 is configured.

Table 9-1. FBM230/232 (ECB200) Equipment Information Display Fields (Continued)

Field	Description
PORT 4 STATUS	Either Enabled or Disabled is displayed, if Port 4 is configured.
FBM STATUS	The following are displayed to define the FBM230/232 status: FDSI FBM DCI Not Ready DCI Ready FBM Failed FBM On-Line FBM Off-Line DB Download Failed DB Download Active Unresolved Connection System Alarm

FBM231/233 (ECB202) Equipment Information Display

Typical Equipment Information display pages for FBM231/233 (ECB202) are shown in Figure 9-4 through Figure 9-6. Table 9-2 describes the available text fields in the order that they appear on the I/A Series System Manager and SMDH display pages, from left column to right column.

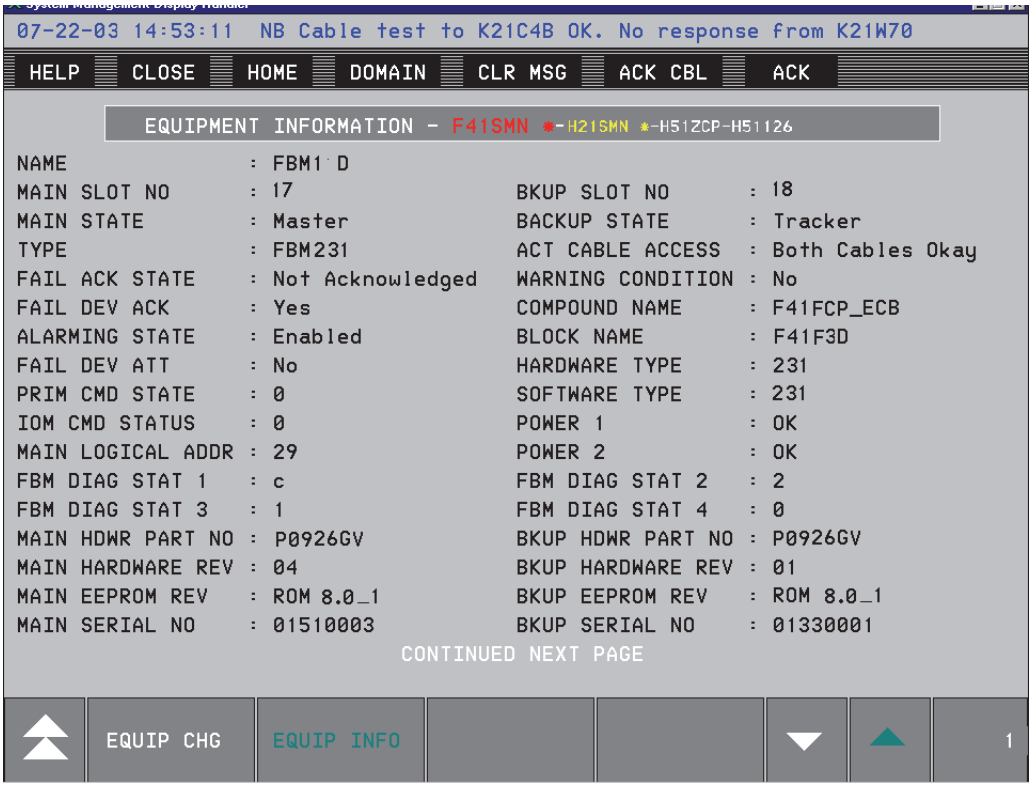


Figure 9-4. FBM231/233 (ECB202) Equipment Information Display – Typical (1 of 3)

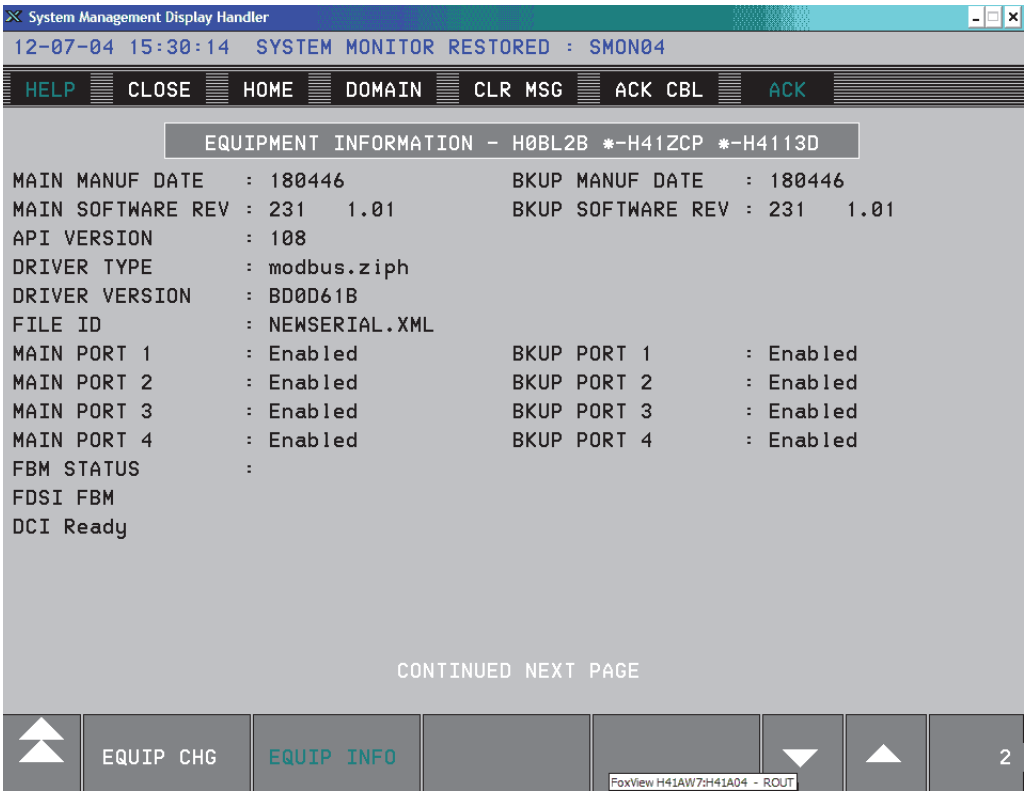


Figure 9-5. FBM231/233 (ECB202) Equipment Information Display – Typical (2 of 3)

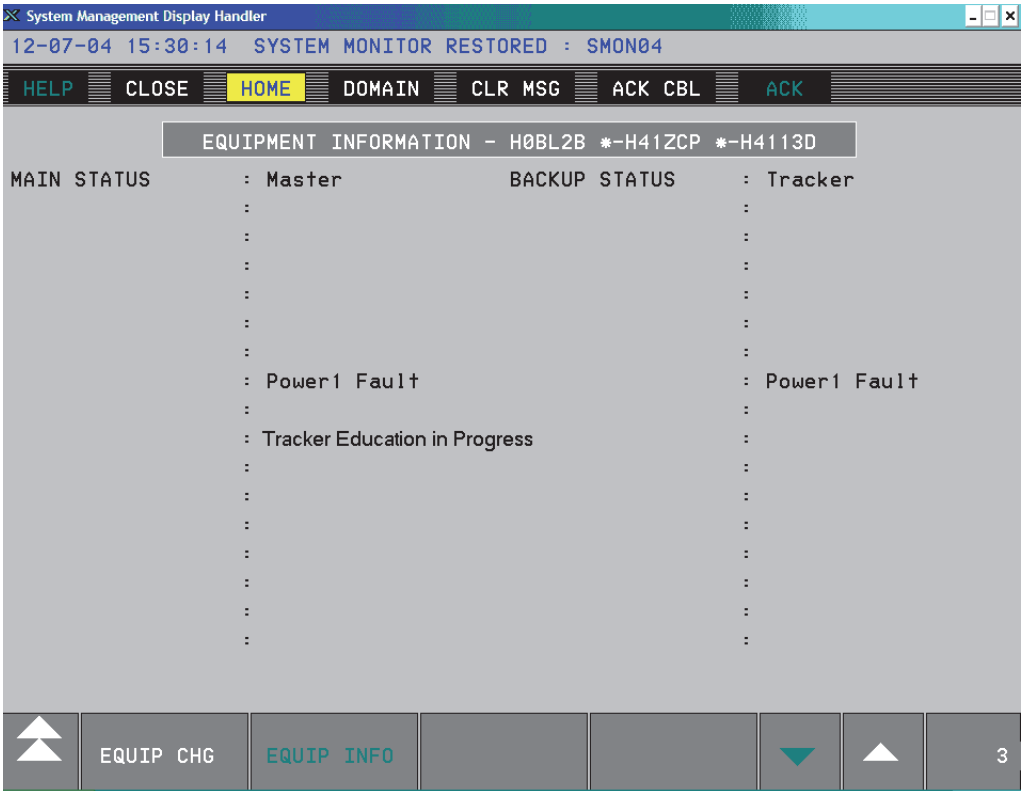


Figure 9-6. FBM231/233 (ECB202) Equipment Information Display – Typical (3 of 3)

Table 9-2. FBM231/233 (ECB202) Equipment Information Display Fields

Field	Description
NAME	User-supplied ECB name.
MAIN SLOT NO	Baseplate slot number where the main FBM is installed.
MAIN STATE	Main State indicates the main FBM operational state: Main Downloading Main Off-Line Main EE Updating Master Main Failed Tracker
TYPE	Predefined FBM type from ECB202.
FAIL ACK STATE	Acknowledged (default) or Not Acknowledged is displayed. If the **DEVICE STATE** value changes from Not Failed to Failed, the **FAIL ACK STATE** value changes to Not Acknowledged to indicate this transition, and remains until the FBM failure is acknowledged by the user.
FAIL DEV ACK	Yes (default) or No is displayed. If any of the devices attached to the FBM fail and become unacknowledged, No is displayed.
ALARMING STATE	Alarming State indicates whether alarming is Enabled or Inhibited for the device. When alarming is inhibited, the System Monitor continues to indicate overall system and network health (a green **SYS BAR**) while equipment is Failed or Off-line.
FAIL DEV ATT	Yes is displayed if one or more devices connected to the FBM has failed; otherwise, No is displayed.
PRIM CMD STATE	Primary Command Status is a value related to the status of communication between the primary FBM and the FBM. Typically, this value is 0 or 1, where 1 indicates that a successful retry took place and communication has been restored to normal. Primary Command Status can have the following values: **Value Condition** 0 = Normal, no error 1 = Success with retry (this condition is very rare) 2 = FCM timed out FBM 3 = CP timed out FCM > 3 = Link level protocol error (this is very rare and transient)
IOM CMD STATUS	IOM Command Status is a hexadecimal value associated with the return status included in the header of every response from the FBM to the primary FBM. Typically, the hexadecimal value is 0, indicating the command was understood and action was taken. **Value Condition** 0 = Command understood, action taken. 1 = Command not understood. 2 = Command understood, but unable to take action. 4 = Invalid argument.

Table 9-2. FBM231/233 (ECB202) Equipment Information Display Fields (Continued)

Field	Description
MAIN LOGICAL ADDR	Logical Address is the number of the main FBM, 1 through 120. FBMs are typically numbered as they appear in the display (left to right).
FBM DIAG STAT 1	Diagnostic Status 1 is a hexadecimal value related to the hardware status. Typically this value is 0, indicating a non-fail-safe condition – typical status for an FBM with a green status LED on. If PS 1 is bad a 1 is displayed. If PS 2 is bad a 2 is displayed.
FBM DIAG STAT 3	Diagnostic Status 3 is a hexadecimal value relating to the previous software or hardware error for the selected FBM. If the FBM is operating normally, this field can be safely ignored. For resolution of the FBM hardware and software errors indicated by this diagnostic status field, contact IOM Global Customer Support.
MAIN HDWR PART NO	Hardware part number related to the main FBM231/233 (P0926GV or P0926GX).
MAIN HARDWARE REV	Hardware release level of the main FBM.
MAIN EEPROM REV	Firmware release for the main FBM.
MAIN SERIAL NUMBER	Serial number assigned to the main FBM.
BKUP SLOT NO	Baseplate slot number where the backup FBM is installed.
BACKUP STATE	Backup State indicates the main FBM operational state: Bkup Downloading Bkup Off-Line Bkup EE Updating Master Bkup Failed Tracker
ACT CABLE ACCESS	Both Cables OK, Cable A Not OK, Cable B Not OK, or Both Cables Not OK is displayed. This field indicates whether transmissions were successfully sent the last time either Bus A or B was used. A Not OK status indicates a PIO bus send failure. To resolve this: ♦ Check the PIO bus. ♦ Switch to the other cable if the bus is bad.
WARNING CONDITION	Yes is displayed if the device has a non-fatal error condition; otherwise, No is displayed.
COMPOUND NAME	Compound name containing the FBM ECB202.
BLOCK NAME	Block name for the FBM ECB202.
HARDWARE TYPE	Configured value for HWTYPE parameter in ECB202.
SOFTWARE TYPE	Configured value for SWTYPE parameter in ECB202.
POWER 1	OK or Failed indicates the state of primary power to FBM. Refer to FBM DIAG STAT 1.
POWER 2	OK or Failed indicates the state of backup power to FBM. Refer to FBM DIAG STAT 1.

Table 9-2. FBM231/233 (ECB202) Equipment Information Display Fields (Continued)

Field	Description
FBM DIAG STAT 2	Diagnostic Status 2 is a hexadecimal value indicating the FBM startup condition. If the value is 0, there is no history of the last start condition due to lack of communications. Hexadecimal values and the related conditions are as follows: **Value Condition** 10 = FBM lost power (cold start) 20 = CP requested FBM reboot 21 = Partner module requested FBM reboot 2F = FDSI application exception 39 = Reboot after Software Download 3A = Reboot due to Driver Crash 40 = Watchdog Failure 80 = CP requested FBM go offline If the FBM is operating normally, this field can be safely ignored. For resolution of the FBM hardware and software errors indicated by this diagnostic status field, contact IOM Global Customer Support.
FBM DIAG STAT 4	Diagnostic Status 4 is a hexadecimal value relating to the current software or hardware error for the selected FBM. Normally, this value is 0 (no error). Other values are fatal errors; the FBM is not operational. Typical values and their meaning are as follows: **Value Condition** 0 = No error 15 = Hardware type mismatch (FBM installed in the wrong slot, module is a 231/233 and you enter 230/232 in ECB202) 16 = Software type mismatch (ECB configuration error, module is a 231/233 and you enter 230/232 in ECB202) Corrective actions include: ♦ Installing the FBM in the correct slot ♦ Correcting ECB200, ECB201and ECB202 configuration errors ♦ Restarting the FBM using the DOWNLOAD function on the Equipment Change display ♦ Reloading the FBM software using the EEPROM UPDATE function. If the above actions do not correct the problem, contact IOM Global Customer Support.
BKUP HDWR PART NO	Hardware part number related to the backup FBM.
BKUP HARDWARE REV	Hardware release level of the backup FBM.
BKUP EEPROM REV	Firmware release for the backup FBM.
BKUP SERIAL NUMBER	Serial number assigned to the backup FBM.

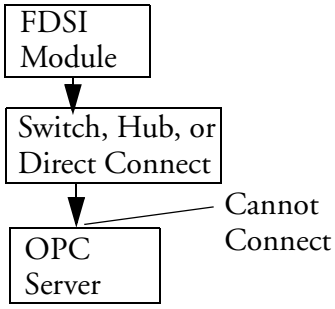
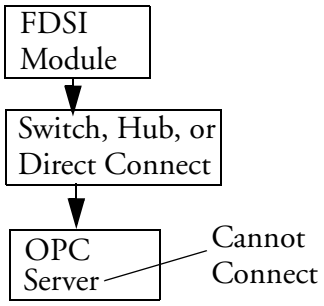
Table 9-2. FBM231/233 (ECB202) Equipment Information Display Fields (Continued)

Field	Description
MAIN MANUF DATE	Date of manufacture for this FBM. For **MAIN MANUF DATE** in Figure 9-5, the factory number is 18, the year is 04, and the week is 46.
MAIN SOFTWARE REV	Release level of the main FBM software.
FILE ID	Name of Port Configuration File (*filename*.XML).
MAINPORT 1	The following are displayed: ♦ Failed – when Port 1 is configured and failed ♦ Not Failed – when Port 1 is configured and not failed ♦ Not Configured – when Port 1 is not configured ♦ Enabled/Disabled – when the port is enabled/disabled.
MAINPORT 2	The following, for only FBM231, are displayed: ♦ Failed – when Port 2 is configured and failed ♦ Not Failed – when Port 2 is configured and not failed ♦ Not Configured – when Port 2 is not configured ♦ Enabled/Disabled – when the port is enabled/disabled. The following are displayed for FBM233: ♦ Not Configured or Not Applicable.
MAINPORT 3	The following, for only FBM231, are displayed: ♦ Failed – when Port 3 is configured and failed ♦ Not Failed – when Port 3 is configured and not failed ♦ Not Configured – when Port 3 is not configured Enabled/Disabled – when the port is enabled/disabled. The following are displayed for FBM233: ♦ Not Configured or Not Applicable.
MAINPORT 4	The following, for only FBM231, are displayed: ♦ Failed – when Port 4 is configured and failed ♦ Not Failed – when Port 4 is configured and not failed ♦ Not Configured – when Port 4 is not configured ♦ Enabled/Disabled – when the port is enabled/disabled. The following are displayed for FBM233: ♦ Not Configured or Not Applicable.
FBM STATUS	The following may be displayed to define the FBM status: FDSI FBM FBM On-Line DCI Not Ready FBM Off-Line DCI Ready Unresolved Connection FBM Failed System Alarm FBM Failed DB Download Failed DB Download Active Unresolved Connection System Alarm
BKUP MANUF DATE	Date of manufacture for this FBM. For **BKUP MANUF DATE** in Figure 9-5, the factory number is 18, the year is 04, and the week is 46.
BKUP SOFTWARE REV	Release level of the backup FBM software.

Table 9-2. FBM231/233 (ECB202) Equipment Information Display Fields (Continued)

Field	Description
FILE REVISION	Internal Application Interface in use.
BKUP PORT 1	The following are displayed: ♦ Failed – when Port 1 is configured and failed ♦ Not Failed – when Port 1 is configured and not failed ♦ Not Configured – when Port 1 is not configured ♦ Enabled/Disabled – when the port is enabled/disabled.
BKUP PORT 2	The following, for only FBM231, are displayed: ♦ Failed – when Port 2 is configured and failed ♦ Not Failed – when Port 2 is configured and not failed ♦ Not Configured – when Port 2 is not configured ♦ Enabled/Disabled – when the port is enabled/disabled. The following are displayed for FBM233: ♦ Not Configured or Not Applicable.
BKUP PORT 3	The following, for only FBM231, are displayed: ♦ Failed – when Port 3 is configured and failed ♦ Not Failed – when Port 3 is configured and not failed ♦ Not Configured – when Port 3 is not configured ♦ Enabled/Disabled – when the port is enabled/disabled. The following are displayed for FBM233: ♦ Not Configured or Not Applicable.
BKUP PORT 4	The following, for only FBM231, are displayed: ♦ Failed – when Port 4 is configured and failed ♦ Not Failed – when Port 4 is configured and not failed ♦ Not Configured – when Port 4 is not configured ♦ Enabled/Disabled – when the port is enabled/disabled. The following for FBM233 are always displayed: ♦ Not Configured or Not Applicable.
MAIN STATUS	Main Status indicates the operational status of the main FBM (See Table 9-3 for meaning of messages): Can not Load Driver Port File Invalid Tracker Education In Progress Gateway not Connected OPC Machine not Connected OPC Server not Connected
BKUP STATUS	Backup Status indicates the operational status of the backup FBM (See Table 9-3 for meaning of messages): Can not Load Driver Port File Invalid Tracker Education In Progress OPC Machine not Connected OPC Server not Connected
* The COMM Fault text field is displayed if the FBM is unable to communicate with a device on any of it's channels, even if this is due to the lack of an electrical connection to the device.	

Table 9-3. FBM231/233 (ECB202) Main and Backup Status Messages

Message	Description	Corrective Action
Can not Load Driver	This is reported when the FDSI is switched to online and it has no FDSI driver, as in the case of a new FDSI.	Perform a download of the FDSI driver (see "SOFT_DOWNLOAD" on page 189).
Port File Invalid	Bad format of the Port file. Someone accessed the file and incorrectly change the format of the file.	Restore the port file from the backup file.
Tracker Education In Progress	Tracker Module is being updated from Master.	This is an informational message and occurs during software download.
OPC Machine not Connected	PC hosting OPC Server not connected. 	1. Check IP Address of the OPC Server. 2. Check cabling to the OPC Server. 3. Check power to OPC Server.
OPC Server not Connected	PC hosting OPC Server cannot connect to OPC Server application. 	1. Check CLASS_ID of OPC Server. 2. Check power to OPC Server. 3. Check DCOM settings of the server. Refer to Section 1.2 "Installation" in the *FDSI OPC User's Guide* (B0700BH).

FBM230/231/232/233 Equipment Change Display

The Equipment Change display for the FBM230/231/232/233 is shown in Figure 9-7. The display is similar for each FBM230/231/232/233. Table 9-4 describes the available text fields in the order that they appear on the I/A Series System Manager and SMDH display pages, from left column to right column

Figure 9-7. FBM230/231/232/233 Equipment Change Display

Table 9-4. FBM230/231/232/233 Equipment Change Actions

Action	Description
GO ON-LINE	Connects the FBM230/231/232/233 to the I/A Series control processor, thus enabling communication. When you select GO ON-LINE on the ECB202 (FBM231/233) Equipment Change display a dialog box appears that allows you to select the main or backup module.
GO OFF-LINE	Disconnects the FBM230/231/232/233 from the I/A Series control processor, thus disabling communication.When you select GO OFF-LINE on the ECB202 (FBM231/233) Equipment Change display a dialog box appears that allows you to select the main or backup module.
RESET FBM	Restarts the FBM230/231/232/233 logic. This action does **not** download the FBM image. When you select RESET FBM on the ECB202 (FBM231/233) Equipment Change display a dialog box appears that allows you to select the main or backup module.

Table 9-4. FBM230/231/232/233 Equipment Change Actions (Continued)

Action	Description
DB DOWNLOAD	Selects downloading of the .XML port configuration file to the FBM230/231/232/233.
EEPROM/SOFT DOWNLOAD	A pop-up box appears that allows you to update the EEPROM downloading an image to the FBM or to select Software Download to download the .ziph I/O Device Driver to the FBM. You should download the appropriate file. When you select EEPROM/SOFT DOWNLOAD on the ECB202 (FBM231/233) Equipment Change display a dialog box appears that allows you to select the main or backup module for EEPROM updating. You should use EEPROM to update the firmware in an FBM230/231/232/233 with updated EEPROM software provided by Foxboro. You should use this action only when Foxboro authorizes and distributes an official release. **⚠ CAUTION** Do not attempt to use or power down the FBM while the EEPROM is being updated. The FBM may require replacement. The update takes approximately 10 minutes. When the update is complete, the FBM reboots. The system displays a message in the message line indicating whether the update was a success or failure.
SWITCH ROLES	Switches the Master/Tracker roles of the main and backup modules for FBM231 and FBM233.
ENABLE PORT 1 *	Enables communications to devices on Port 1.
DISABLE PORT 1 *	Disables communications to devices on Port 1.
ENABLE PORT 2 *	Enables communications to devices on Port 2. Not used with FBM232/233.
DISABLE PORT 2 *	Disables communications to devices on Port 2.
ENABLE DEVICE ALARMING	Allows device alarms to propagate upward in the I/A Series system. The alarm that is active is displayed in a pop-up box.
ENABLE PORT 3 *	Enables communications to devices on Port 3. Not used with FBM232/233.
DISABLE PORT 3 *	Disables communications to devices on Port 3.
ENABLE PORT 4 *	Enables communications to devices on Port 4. Not used with FBM232/233.
DISABLE PORT 4 *	Disables communications to devices on Port 4.
INHIBIT DEVICE ALARMING	Inhibits device alarms from propagating upward in the I/A Series system.The alarm that is active is displayed in a pop-up box
* These key actions are only available if the associated port is configured.	

DB Download (FBM230/231/232/233)

Selecting DB DOWNLOAD, on the ECB200/202 equipment change display, downloads the .XML port configuration file containing communications information for up to four ports supported by the FBM230/231/232/233.

The DB DOWNLOAD, performs a manual download of the port configuration database files into the FBM230/231/232/233. This manual procedure must be done to get the configuration files into the FBM230/231/232/233 initially. When a pair of redundant modules (FBM231/233) are present, the DB DOWNLOAD takes place on the "Master" FBM. Subsequently, the Master automatically "educates" the "Tracker FBM. In other words, the Master sends the port configuration .XML file and all the DCI block configuration information to the Tracker module.

During DB DOWNLOAD, the FBM Equipment Information page indicates DCI NOT READY and DOWNLOAD ACTIVE. When the download completes, the FBM Equipment Information page indicates DCI READY and the FBM changes color on the display. If the ECB is not active the FBM is yellow.

When the port configuration file is downloaded successfully by the hosting workstation, the data is uploaded automatically from the FBM230/231/232/233 into the CP.

Once the configuration file has been uploaded into the CP data base, it is saved automatically in the CP checkpoint file on the hosting I/A Series workstation when the next checkpoint operation is performed.

If the FBM230/231/232/233 reboots, the CP automatically downloads all files that have been previously uploaded into its data base. If the CP reboots, and the checkpoint file contains uploaded files, each file is automatically downloaded into the FBM.

The port configuration file for the ECB200/202 may be downloaded (DB Download - Equipment Change Action) at any time that the FBM is on line. The FBM230/231/232/233 examines the file for configuration changes, and apply the changes without disturbing those ports whose configuration has not been changed. There is no SMDH DB Download Success or Failure message accompanying the DB Download for the ECB200/202.

EEPROM/SOFT DOWNLOAD (FBM230/231/232/233)

The EEPROM/SOFT DOWNLOAD action allows you to select two functions:

- EEPROM update and
- Download of the I/O Device Driver.

When you select EEPROM/SOFT DOWNLOAD on the ECB202 Equipment Change display a dialog box appears that allows you to select either function (see Figure 9-8 and Figure 9-9).

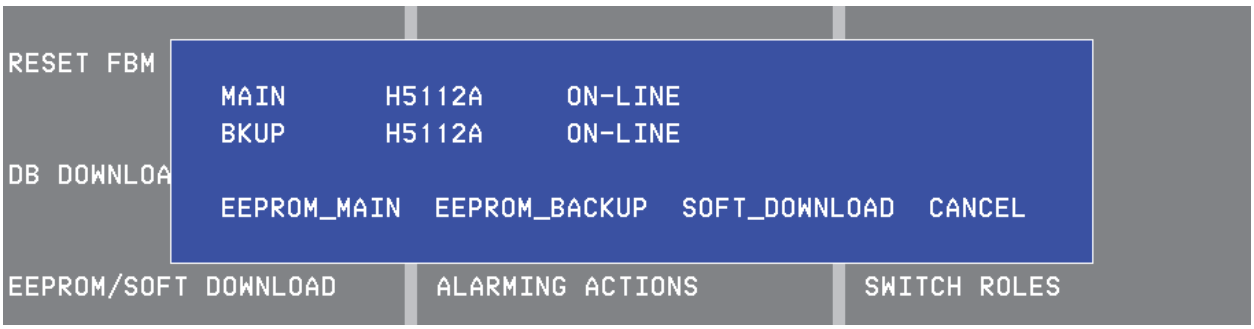


Figure 9-8. FBM231/233 EEPROM Update/Soft Download

When you select EEPROM/SOFT DOWNLOAD on the ECB200 Equipment Change display a dialog box appears that allows you to select either function (see Figure 9-9).

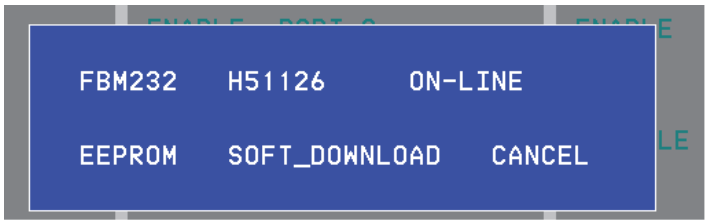


Figure 9-9. FBM230/232 EEPROM/SOFT DOWNLOAD

EEPROM

You should use EEPROM to update the firmware in an FBM230/231/232/233 with updated EEPROM software provided by Foxboro. You should use this action only when Foxboro authorizes and distributes an official release. The FBM should be Off-Line when performing an EEPROM update.

⚠ CAUTION

Do not attempt to use or power down the FBM while the EEPROM is being updated. Partial transfer of data may cause FBM modules to become unusable.

1. For FBM231/233, click **EEPROM/SOFT_DOWNLOAD.**

   The dialog box for redundant FBM231/233 (see Figure 9-8) appears.

   a. Click **EEPROM_MAIN** or **EEPROM_BACKUP**

      The update takes approximately 10 minutes. When the update is complete, the FBM reboots. The system displays a message in the message line indicating whether the update was a success or failure.

   b. Click **EEPROM_BACKUP** or **EEPROM_MAIN**.

      Select the module opposite from that which was selected in step a.

      The update takes approximately 10 minutes. When the update is complete, the FBM reboots. The system displays a message in the message line indicating whether the update was a success or failure.

2. For the FBM230/232, click **EEPROM/SOFT_DOWNLOAD**.

   The dialog box for single FBM230/232 (see Figure 9-9) appears.

   a. Click **EEPROM_MAIN**.

      The update takes approximately 10 minutes. When the update is complete, the FBM reboots. The system displays a message in the message line indicating whether the update was a success or failure.

— NOTE

If the FDSI FBM firmware is updated from software Revision 1.34 or earlier to software Revision 1.35 or later, the FDSI storage is reformatted and the Equipment Information screen displays the message “Driver not loaded”. This means that after the EEPROM update, the driver and configuration files must be re-downloaded (via the **EEPROM/SOFT_DOWNLOAD** and then the **DB Download** operations). The exception to this is for redundant FDSI (FBM231 and FBM233) which can obtain these files from the other module in the pair as part of Tracker Education process.

SOFT_DOWNLOAD

Selecting SOFT_DOWNLOAD, on the ECB200/202 equipment change display, downloads the.ziph I/O Device Driver file to FBM230/231/232/233. This can be downloaded at any time when the FBM is on-line. This download can require several writes for one driver. Equipment Information for ECB200/202, page 3, shows download active during this process. Once device driver is downloaded, the FBM reboots and returns to it’s state before the download occurred. Once the download is complete, the CRC of the downloaded I/O device driver is shown in the DRIVER VERSION field of ECB200 (see Table 9-1 “FBM230/232 (ECB200) Equipment Information Display Fields” on page 173). When a pair of redundant modules (FBM231/233) are present, the SOFT_DOWNLOAD takes place first on one module then the other. Each module will reboot automatically during the SOFT_DOWNLOAD. When the SOFT_DOWNLOAD is active the Equipment Information display for the FBM indicates DOWNLOAD ACTIVE.

The D: drive of the AW has a usr/fox/sp/device.txt file for the device driver that contains the CRC of the device driver. Driver Version contains the CRC of the downloaded driver file. You should check that the Driver Version (CRC downloaded) matches the number in the .txt file of the device driver.

After the software is downloaded, the FBM reboots automatically. During the reboot the FBM appears FAILED and the host CP is red failed in SMDH.

There is no SMDH SOFT_DOWNLOAD Success or Failure message accompanying the SOFT_DOWNLOAD for the ECB200/202.

SMDH Enable/Disable Port

The SMDH ENABLE/DISABLE PORT key actions, on the ECB200/202 Equipment page, enable/disable communications from an FBM to all devices accessed by the port.

An SMDH ENABLE PORT or DISABLE PORT action key enables or disables a port, depending on the key action. Separate actions keys are provided for each of the four ports on the FBM230/231 and the FBM232/233 uses only the Port 1 key.

Selecting the DISABLE PORT key causes the FBM to disable all communications over the specified port. All DCI data connections to all devices on the disabled network remain connected, but the data is marked OOS (Out-Of-Service) by the FBM logic.

Selecting the ENABLE PORT key enables Fieldbus communications for the specified port for all devices except those that were previously disabled (that is, the lower-level disable for the device overrides the higher-level enable for the port).

When the CP or the FBM230/231/232/233 reboots, it enables or disables the port, depending on the port enable/disable status stored in the checkpoint file.

Placing the FBM On-Line/Off-Line

Place an FBM on-line as follows:

1. If you are using the System Manager, open the System Manager, and select the FBM in the left-hand pane.
2. Either:
   - Right-click the FBM to open its context menu. -OR-
   - From the Actions menu, open the Equipment Change submenu.
3. Put the FBM online:
   a. For the FBM230/232, click **Go On-line**.
   b. For FBM231/233, click **Go On-line**.
   A dialog box prompts you to select the module to go on line. Click the radio button for **Main** or **Backup**.
   Enter the reason for the mode change if prompted.
4. Click **OK**.
5. Then either:
   - Right-click the FBM to open its context menu. -OR-
   - From the Actions menu, open the Equipment Change submenu.
6. Click **Software Download**. The action downloads the I/O Device Driver (.ziph) to the FBM and restarts the FBM logic. For the redundant FBM231 and FBM233, the confirmation dialog box prompts selection of either the Main or Backup module for the driver download.
7. Then either:
   - Right-click the FBM to open its context menu. -OR-
   - From the Actions menu, open the Equipment Change submenu.
8. Click **DB Download**. For the redundant modules, the configuration database is downloaded to the Master module, which in turn updates the Tracker module.

   More information is available in *System Manager* (B0750AP).

   -OR-

1. Access the I/A Series System Management displays. For detailed information, refer to *System Management Displays* (B0193JC).
2. Select the FBM ECB on the System Management displays, and click on the **Equipment Change** button.
3. On the **Equipment Change** window for the FBM230/232:
   a. For the FBM230/232, click **GO ON-LINE**.
   b. For FBM231/233, click **GO ON-LINE.**

      The dialog box for redundant FBM231/233s (see Figure 9-10) appears.

      1. Click **MAIN** or **BACKUP**.

      2. Click **BACKUP** or **MAIN**.

      Select the module opposite from that which was selected in step b1.

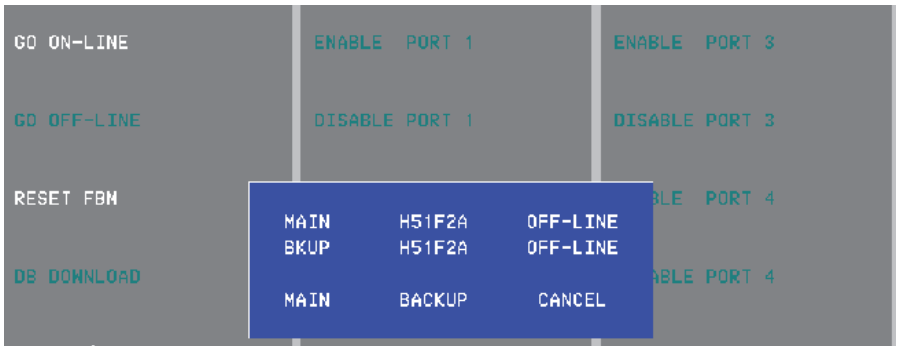


Figure 9-10. FBM231/233 GO ONLINE/OFF-LINE, Equipment Change button

c. Download the I/O Device Driver by clicking **EEPROM/SOFT DOWNLOAD**.

A pop-up box appears that allows you to select EEPROM update or software download of the .ziph I/O Device Driver (SOFT_DOWNLOAD). You should select **SOFT_DOWNLOAD**.

d. Download the FBM port configuration file (.XML) by selecting **DB DOWNLOAD**.

e. For FBM230/231, enable the port(s) by clicking **ENABLE PORT 1**, **ENABLE PORT 2**, **ENABLE PORT 3**, and/or **ENABLE PORT 4**.

f. For FBM232/233, enable the port by selecting **ENABLE PORT 1**.

To place an FBM off-line:

1. If you are using the System Manager, open the System Manager, and select the FBM in the left-hand pane.
2. Either:
   - Right-click the FBM to open its context menu. -OR-
   - From the Actions menu, open the Equipment Change submenu.
3. Put the FBM off-line:
   a. For the FBM230/232, click **Go Off-line**.
   b. For FBM231/233, click **Go Off-line**.
   A dialog box prompts you to select the module to go on line. Click the radio button for **Main** or **Backup**.
   Enter the reason for the mode change if prompted.
4. Click **OK**.

-OR-

1. Access the I/A Series System Management displays. For detailed information, refer to *System Management Displays* (B0193JC).
2. Select the FBM ECB on the System Management displays, and click on the **Equipment Change** button.
3. On the **Equipment Change** window for the FBM230/232:
   a. For the FBM230/232, click **GO OFF-LINE**.
   b. For FBM231/233, click **GO OFF-LINE.**

   The dialog box for redundant FBM231/233s appears (see Figure 9-10).

1. Click **MAIN** or **BACKUP**.
2. Click **BACKUP** or **MAIN**.

Select the module opposite from that which was selected in step b1.

Device Equipment Information Display (FBM230/231/232/233 - ECB201)

Typical Equipment Information display pages for field devices are shown in Figure 9-11 through Figure 9-13. The display (ECB201) is similar for each device connected to the FBM230/231/232/233s. Table 9-5 describes the available text fields in the order that they appear on the display pages, from left column to right column.

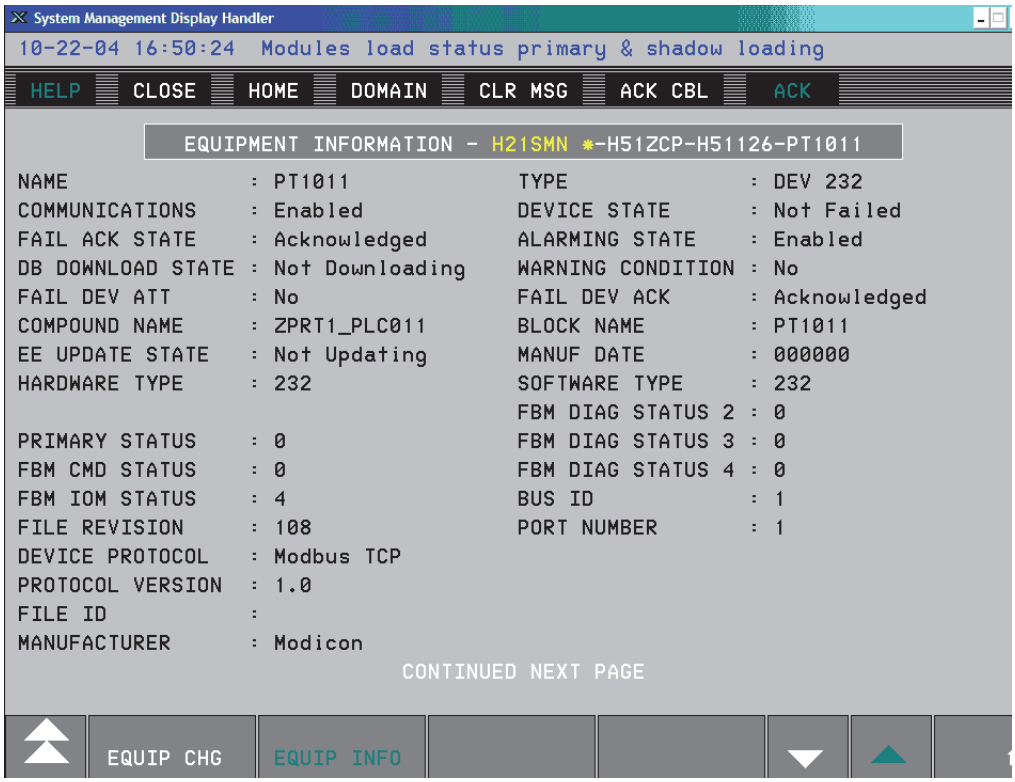


Figure 9-11. Device Equipment Information Display (ECB201) – Typical (1 of 3)

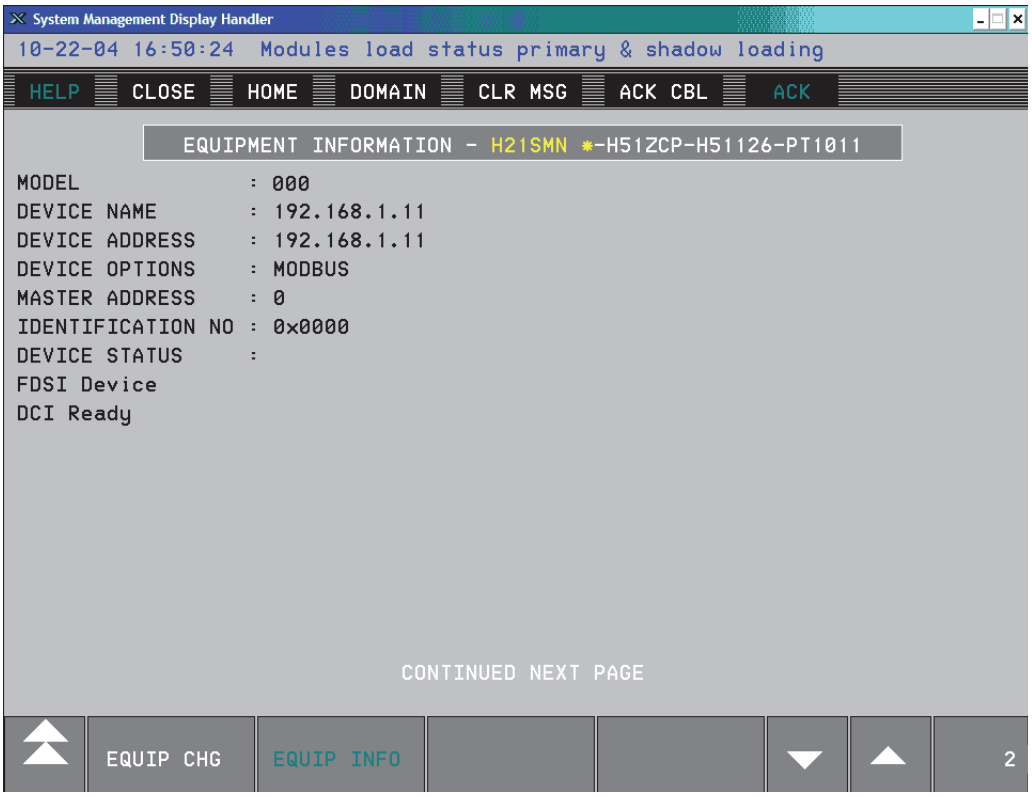


Figure 9-12. Device Equipment Information Display (ECB201) – Typical (2 of 3)

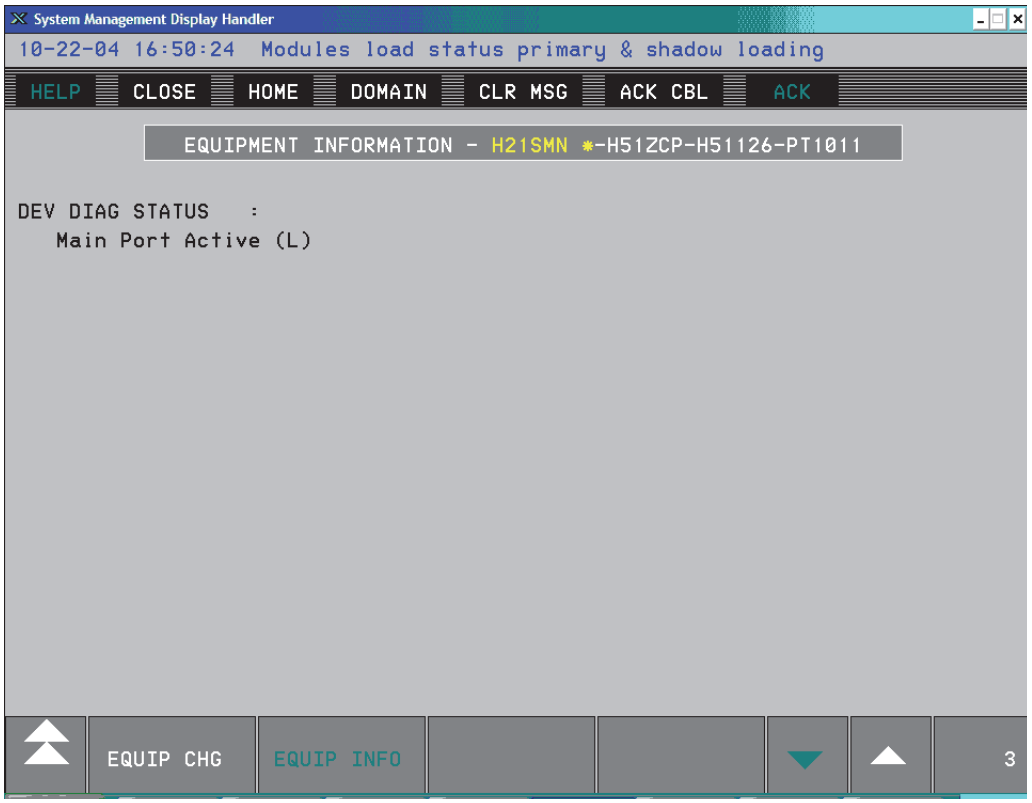


Figure 9-13. Device Equipment Information Display (ECB201) – Typical (3 of 3)

Table 9-5. Device Equipment Information Display Fields (FBM230/231/232/233 - ECB201)

Field	Description
NAME	User-supplied ECB name.
COMMUNICATIONS	Indicates the state (Enabled or Disabled) of communications to/from a field device.
FAIL ACK STATE	Acknowledged (default) or Not Acknowledged is displayed. If the **DEVICE STATE** value changes from Not Failed to Failed, the **FAIL ACK STATE** value changes to Not Acknowledged to indicate this transition, and remains until the device failure is acknowledged by the user.
DB DOWNLOAD STATE	Downloading or Not Downloading (default) is displayed. Downloading is displayed when the device configuration file is being downloaded.
FAIL DEV ATT	Not used with FBM230/231/232/233. No is always displayed.
COMPOUND NAME	Compound name containing the ECB201.
EE UPDATE STATE	Not used with field devices. Not Updating is always displayed.
HARDWARE TYPE	Hardware number (230/231/232/233) of the FBM related to this device.
PRIMARY STATUS	Primary Status is a value related to the status of communication between the primary FBM and the FBM230/231/232/233. Typically, this value is 0 or 1, where 1 indicates that a successful retry took place and communication has been restored to normal. For the FBM230/231/232/233, Primary Status can have the following values: **Value Condition** 0 = Normal, no error 1 = Success with retry (this condition is very rare) 2 = FCM timed out FBM 3 = CP timed out FCM > 3 = Link level protocol error (this is very rare and transient)
FBM CMD STATUS	FBM Command Status is a hexadecimal value associated with the return status included in the header of every response from the FBM230/231/232/233 to the primary FBM. Typically, the hexadecimal value is 0, indicating the command was understood and action was taken. **Value Condition** 0 = Command understood. 1 = Command not understood. 2 = Command understood, but unable to take action. 4 = Invalid argument.

Table 9-5. Device Equipment Information Display Fields (FBM230/231/232/233 - ECB201) (Continued)

Field	Description
FBM IOM STATUS	FBM IOM Status is a hexadecimal value related to current FBM230/231/232/233 status. Typically this value is 4, indicating the instructions are valid. **Value Condition** 1 = FBM status has changed – requests CP to poll for extended status. 2 = Diagnostic Register is nonzero. This indicates a fatal error. The FBM does not start if this value is set. 4 = Non-fail-safe condition. This is the typical status for an FBM230/231/232/233 (green status LED on). This value is reset only if the output mode of operation is fail-safe. 8 = Not used. 10 = Not used. 20 = Not used. 40 = FBM is off-line. In off-line mode, the software control is ROM-based. In on-line mode, the software is RAM-based. 80 = Initialization is taking place – all channel and I/O data is initializing. Also, indicates that the FBM has a delayed response message ready.
FILE REVISION	Not applicable to the FBM230/231/232/233.
DEVICE PROTOCOL	Name of the I/O Device Driver.
VERSION PROTOCOL	Version number of the I/O Device Driver.
FILEID	File ID displays the name of the device configuration file, which is downloaded from the control processor when DB Download is selected on the device Equipment Change display. The file extension is always .XML.
MANUFACTURER	Not applicable to the FBM230/231/232/233.Typically N/A is displayed.
TYPE	Field device (DEV 230/231/232/233) represented by the ECB201.
DEVICE STATE	Failed or Not Failed (default) is displayed. This field changes to Failed if a device fatal hardware fault (including a possible communications cable break) causes the device to fail.
ALARMING STATE	Indicates whether alarming is enabled or inhibited for the device. When alarming is inhibited, the System Monitor continues to indicate overall system and network health (a green **SYS BAR**) while equipment is Failed or Off-line.
WARNING CONDITION	Yes is displayed if the device has a non-fatal error condition; otherwise, No is displayed.
FAIL DEV ACK	Acknowledged (default) or Not Acknowledged is displayed.
BLOCK NAME	Block name for the ECB201.
MANUF DATE	Not used. Displays all zeroes.

Table 9-5. Device Equipment Information Display Fields (FBM230/231/232/233 - ECB201) (Continued)

Field	Description
SOFTWARE TYPE	Type of application software (230/231/232/233) used with this hardware type.
FBM DIAG STATUS 2	Not applicable to the FBM230/231/232/233.
FBM DIAG STATUS 3	Not applicable to the FBM230/231/232/233.
FBM DIAG STATUS 4	Not applicable to the FBM230/231/232/233.
BUS ID	Not applicable for the FBM230/231/232/233.
PORT NUMBER	The display shows port numbers 1, 2, 3, or 4 depending on the configured port. For FBM232/233, always displays 1.
MODEL	Not used. Displays all zeroes.
DEVICE NAME	Device Name of the device configured in associated ECB201. Refer to the I/O Device Driver.
DEVICE ADDRESS	Refer to the I/O Device Driver.
DEVICE OPTIONS	Refer to the I/O Device Driver.
MASTER ADDRESS	Not applicable for the FBM230/231/232/233.
IDENTIFICATION NO	Not applicable for the FBM230/231/232/233.
DEVICE STATUS	The following are displayed to define the device status: FDSI Device DCI Not Ready (see below) DCI Ready (see below) Device Failed Device Disabled DB Download Failed DB Download Active Unresolved Connection System Alarm
	For a device that does not require a device configuration file (no entry in FILE ID of ECBs, the device goes DCI Ready when the device ECB is created. For a device that requires a configuration file, the status remains DCI Not Ready until a configuration file is downloaded.
DEV DIAG STATUS	The following are displayed to define the device diagnostic status: Dual Ported Main Port Failed (L) Backup Port Failed (R) Main Port Active (L) Backup Port Active (R) Heart Beat Config Error

Device Equipment Change Display

The Equipment Change display for the field device is shown in Figure 9-14. The display is similar for each device connected to the FBM230/231/232/233s. The actions that are active for this display are described in Table 9-6.

Figure 9-14. Device Equipment Change Display

Table 9-6. Device Equipment Change Actions

Action	Description
ENABLE COMMUNICATIONS[1]	Enables communication between the device and the FBM230/231/232/233.
DISABLE COMMUNICATIONS[1]	Disables communication between the device and the FBM230/231/232/233.
GENERAL DOWNLOAD[1]	N/A for FDSI.
DOWNLOAD[1]	N/A for FDSI.
EEPROM UPDATE	N/A for devices.
PERIODIC PIO BUS SWITCH	N/A for devices.
BUS A: ENABLE SWITCHING	N/A for devices.
BUS B: ENABLE SWITCHING	N/A for devices.
BUS A: DISABL SWITCHING	N/A for devices.
BUS B: DISABL SWITCHING	N/A for devices.

Table 9-6. Device Equipment Change Actions (Continued)

Action	Description
ENABLE DEVICE ALARMING	Enables device alarms to propagate upward to the I/A Series system.
INHIBIT DEVICE ALARMING	Inhibits device alarms from propagating upward to the I/A Series system.
RESET ATTENTION BIT	N/A for FDSI.
SWITCH ROLES	N/A for devices.
DB DOWNLOAD[1]	Downloads the appropriate device configuration file. This action is only allowed if communication is disabled.

1. If the device parent FBM230/232 is off-line, these key actions are not available. If the device parent FBM231/233 main and backup modules are off-line, these key actions are not available.

DB Download

The DB DOWNLOAD key, in both System Manager and SMDH, performs a manual download of the device configuration data base files into the FBM. If a driver requires a **DevCfg** file, this manual procedure must be done to get the configuration files into the FBM230/231/232/233 initially.

— NOTE

The use of the DevCfg (device configuration) file is dependent on the I/O Device Driver. Some I/O Device Drivers do not use the DevCfg file, and other I/O Device Drivers may only use the DevCfg for advanced features. Refer to the specific I/O Device Driver's user guide to determine if DevCfg file is needed.

When the file is downloaded successfully by the hosting workstation, the device configuration file is uploaded from the FBM230/231/232/233 into the CP.

Once the configuration file has been uploaded into the CP database, it is saved automatically in the CP checkpoint file on the hosting I/A Series workstation when the next checkpoint operation is performed.

If the FBM reboots, the CP automatically downloads all files that have been previously uploaded into its data base. If the CP reboots, and the checkpoint file contains uploaded files, each file is automatically downloaded into the FBM.

The configuration file for an ECB may be downloaded at any time by first disabling communications to the device, then doing the DB Download. As soon as the DB Download pick has been selected (SMDH Equipment Change), the Enable Communications pick may be selected. There is no need for a delay between these two picks.

SMDH displays a Download Active or Download Failure message accompanying the Download for the ECB.

To download the device configuration file to each device, proceed as follows:

1. If you are using the System Manager, open the System Manager, and select the FBM in the left-hand pane.
2. Either:
   - Right-click the FBM to open its context menu. -OR-
   - From the Actions menu, open the Equipment Change submenu.
3. Click **DB Download**. For the redundant modules, the configuration database is downloaded to the Master module, which in turn updates the Tracker module.

   More information is available in *System Manager* (B0750AP).

   -OR-

1. Select the FBM230/231/232/233 module on the System Management displays. For detailed information, refer to *System Management Displays* (B0193JC).
2. Select a device associated with the FBM230/231/232/233, click the **Equipment Change** button.
3. On the **Equipment Change** window for the device:
   a. Disable communications by selecting **DISABLE COMMUNICATIONS.**

      The device configuration file does not download unless device communications are disabled.

   b. Download the device configuration file by selecting **DB DOWNLOAD**.

   c. Enable communications with the device by selecting **ENABLE COMMUNICATIONS**.

   d. Repeat Steps 2 and 3 for each additional connected device.

Enable/Disable Communication to a Device

System Manager and SMDH support key actions, on the ECB201 equipment change display, to enable/disable FBM communications to/from a field device. This function helps to isolate and diagnose device faults without degrading or losing communications to other devices on the same network.

Selecting the System Manager **Enable Control/Communications** selection or the SMDH ENABLE COMMUNICATIONS key enables communications to the field device. The FBM sets the device status to Enabled.

Selecting the System Manager **Disable Control/Communications** selection or the SMDH DISABLE COMMUNICATIONS key disables communications to the field device. The FBM marks all the data values OOS (Out-Of-Service), and sets the device status to Disabled.

Upon reboot of the CP, after DCI connections are re-established, communications to the device are either enabled or disabled depending on the Enable/Disable status stored in the CP checkpoint file.

Upon reboot of the FBM, after DCI connections are re-established, communications to the device are either enabled or disabled, depending on the current Enable/Disable status stored in the CP station.

To enable communications with each device, proceed as follows:

1. Select the FBM230/231/232/233 module on the System Management displays.
2. Select a device associated with the FBM230/231/232/233, and select the **Equipment Change** button.

3. On the **Equipment Change** window for the device:
   a. Disable communications by selecting **DISABLE COMMUNICATIONS, or**
   b. Enable communications with the device by selecting **ENABLE COMMUNICATIONS**.
   c. Repeat Steps 2 and 3 for each additional connected device.

LED Status Indicators

FBM230/231 LEDs

Light-emitting diodes (LEDs) incorporated into the front of the FBMs provide visual indication of the module's operational status, and communication activity of its communication channels (see Figure 9-15).

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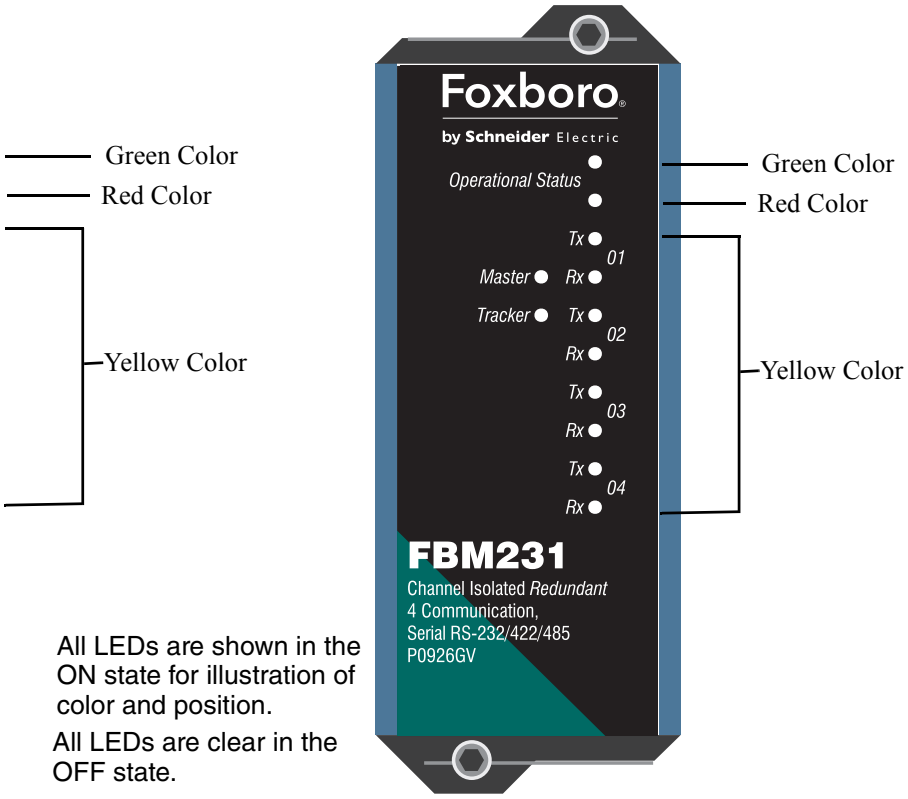

Figure 9-15. FBM230/231 LED Status Indicators

On the front of all FBMs, two Operational Status LEDs (red and green) indicate the operational status of the module. During normal on-line operation of the FBM with communications enabled with the connected field devices, the green LED is on, and the red LED is off.

The FBM230/231 LEDs 01 through 04 (Transmit (Tx) and Receive (Rx)) indicate the operational status of the communication channels. Each LED is on when the FBM is transmitting and receiving valid messages from the field device on the channel.

On the redundant FBM231, the Master and Tracker LEDs indicate the master/tracker status of the redundant module pair. The Master LED is on when the module is controlling communications. The Tracker LED is on when the module is ready to control communications.

Table 9-7 lists the state of the FBM LEDs under various operating conditions. It assumes that you have properly configured the ECB201s for communication with field devices. It also assumes that you have placed the FBMs on-line and enabled device communications using the SMDH displays.

Table 9-7. FBM230/231 Operational Status LEDs

Operational Status		Tx/Rx 01 to 04	FBM231 Master LED	FBM231 Tracker LED	Status
Red LED	Green LED				
Normal Operation					
Off	On	On/Off	Master-On Tracker-Off	Master-Off Tracker-On	FBM is on-line and functional with device communications enabled. LEDs Tx/Rx 01 to 04 are on only for channels with normal communications. State of Tracker of Master (FBM231) is shown is LEDs.
Power Off					
Off	Off	Off	Off	Off	Power to FBM is failed or switched off.
Off-Line					
On	On	Off	Master-On Tracker-Off	Master-Off Tracker-On	FBM is off-line but functional.
Software Download (Reboots the FBM)					
Off	On	On for channels with normal communication	Master-On Tracker-Off	Master-Off Tracker-On	♦ Tracker goes Red/Green. ♦ Master will go Red/Green. ♦ Master will go Red only. ♦ Tracker will go Red only. ♦ Both reboot. ♦ Whichever comes online first is the Master.
EEPROM Update					
On	Flashing	Off	Master-On Tracker-Off	Master-Off Tracker-On	♦ Solid Red/Green. ♦ Green Flashes. ♦ Solid Red/Green. ♦ Reboot. EEPROM Update action completes in less than ten minutes.

Table 9-7. FBM230/231 Operational Status LEDs (Continued)

Operational Status		Tx/Rx 01 to 04	FBM231 Master LED	FBM231 Tracker LED	Status
Red LED	Green LED				
Failsafe					
Master-Flashing Tracker-Off	On	On for channels with normal communication	Master-On Tracker-Off	Master-Off Tracker-On	During normal operation, the FBM experienced a break in communication with the I/A Series control station and reverted to its fail-safe mode. (Refer to "Output Initialization" on page 95 for details.)
Partner Gone					
Off	On	On for channels with normal communication	Master-On	Tracker-Flashing	FBM231 has lost communication with its partner module.
Port Communication Problem					
Off	On	Any one LED off	On or Off	On or Off	If any Tx or Rx/Link LED is off, this indicates a fault in the associated field device, cabling, or FBM port.
Port Communication Problem - Tracker Module (FBM231)					
Off	On	Occasional flickering of a Tracker's LED	On or Off	On or Off	If the Tracker's LEDs (FBM231) Tx/Rx 01 through 04 mostly follow the Master's LEDs (FBM231) Tx/Rx 01 through 04, but one occasionally flickers, this indicates a problem in the Tracker's communication hardware for the port. The FBM231 eventually declares a fault (after enough communication errors).
Module Failure					
On	Off	Off	On or Off	On or Off	Module failure.

FBM232/233 LEDs

Light-emitting diodes (LEDs) incorporated into the front of the FBM232/233 provide visual indication of the module's operational status, and communication activity of its communication channel (see Figure 9-16).

Figure 9-16. FBM232/233 LED Status Indicators

On the front of all FBMs, two Operational Status LEDs (red and green) indicate the operational status of the module. During normal on-line operation of the FBM with communications enabled with the connected field devices, the green LED is on, and the red LED is off.

The FBM232/233 LEDs Tx and Rx/Link (Transmit (Tx) and Receive (Rx)) indicate the operational status of the communication channel. Each LED is on when the FBM is transmitting and receiving valid messages from the field device on the channel.

On the redundant FBM233, the Master and Tracker LEDs indicate the master/tracker status of the redundant module pair. The Master LED is on when the module is controlling communications. The Tracker LED is on when the module is ready to control communications.

Table 9-8 lists the state of the FBM LEDs under various operating conditions. It assumes that you have properly configured the ECB201s for communication with field devices. It also assumes that you have placed the FBMs on-line and enabled device communications using the SMDH displays.

Table 9-8. FBM232/233 Operational Status LEDs

Operational Status					
Red LED	**Green LED**	**Tx and Rx/Link**	**FBM233 Master**	**FBM233 Tracker**	**Status**
Normal Operation					
Off	On	On/Off	Master-On Tracker-Off	Master-Off Tracker-On	FBM is on-line and functional with device communications enabled. Tx and Rx/Link LEDs are on only for channels with normal communications. State of Tracker or Master (FBM233) is shown in LEDs.
Power Off					
Off	Off	Off	Off	Off	Power to FBM is failed or switched off.
Off-Line					
On	On	Off	Master-On Tracker-Off	Master-Off Tracker-On	FBM is off-line but functional.
Software Download (Reboots the FBM)					
Off	On	On for channels with normal communication	Master-On Tracker-Off	Master-Off Tracker-On	♦ Tracker goes Red/Green. ♦ Master will go Red/Green. ♦ Master will go Red only. ♦ Tracker will go Red only. ♦ Both reboot. ♦ Whichever comes online first is the Master.
EEPROM Update					
On	Flashing	Off	Master-On Tracker-Off	Master-Off Tracker-On	♦ Solid Red/Green. ♦ Green Flashes. ♦ Solid Red/Green. ♦ Reboot. EEPROM Update action completes in less than ten minutes.
Partner Gone					
Off	On	On for channels with normal communication	Master-On	Tracker-Flashing	FBM233 has lost communication with its partner module.

Table 9-8. FBM232/233 Operational Status LEDs (Continued)

Operational Status		Tx and Rx/Link	FBM233 Master	FBM233 Tracker	Status
Red LED	Green LED				
Fail Safe					
Master-Flashing, Tracker-Off	Flashing	On for channels with normal communications	On or Off	On or Off	During normal on-line operation, the FBM experienced a break in communications with the I/A Series control station and reverted to its fail-safe mode. (Refer to "Output Initialization" on page 95 for details.)
Port Communication Problem					
Off	On	Any one LED off	On or Off	On or Off	If any Tx or Rx/Link LED is off, this indicates a fault in the associated field device, cabling, or FBM port.
Port Communication Problem - Tracker Module (FBM233)					
Off	On	Occasional flickering of a Tracker's LED	On or Off	On or Off	If the Tracker's LEDs (FBM233) Tx and Rx Link mostly follow the Master's LEDs (FBM233) Tx and Rx Link, but one occasionally flickers, this indicates a problem in the Tracker's communication hardware for the port. The FBM233 eventually declares a fault (after enough communication errors).
Module Failure					
On	Off	Off	On or Off	On or Off	Module failure.

FBM Diagnostics

Diagnostics can be built to show:

- the IP Address of an FBM232/233 on the device network
- the percentage of memory usage in an FBM230/231/232/233
- the usage of the CPU located in an FBM230/231/232/233.

The value is shown in the detail display of a RIN or STRIN control block.The value displayed for the IP Address diagnostic is the IP Address (for example, 152.155.181.247). The value displayed for memory and CPU usage diagnostic is a value between 0 and 100.

The diagnostics can be built by:

1. Creating a control block (RIN or STRIN). The particular control block for each diagnostic is listed below.

2. Connecting the block to the ECB200 or ECB202 by entering the name of the ECB in the IOM_ID of the RIN or STRIN block.
3. Entering the FBMs point number in the PNT_NO of the RIN or STRIN block. The PNT_NO is specified in the particular diagnostic listed below.

For redundant FBM231/233s, individual diagnostics can be built for the master, main and the backup module.

If an incorrect IP Address is shown, the value should be corrected. If the memory usage is 100 percent or above 100 percent, reduce the number of blocks running in the FBM s, or the reduce CPU usage by packing the data (using PAKIN/PAKOUT blocks) to/from the device. If the CPU usage is 100 percent or above 100 percent, you can decrease the scan rate of the device, increase the BPC of the control blocks, reduce the number of control blocks, reduce CPU usage by packing the data (using PAKIN/PAKOUT blocks) to/from the device.

ECB200 Diagnostics (FBM230/232)

The diagnostics for ECB200 FBMs (FBM230/232) are:

- IP Address (for FBM232 only)
- CPU Usage (for FBM230/232)
- Memory Load (for FBM230/232).

IP Address (for FBM232 only)

To show the IP Address of an FBM232 on the device network:

1. Create a STRIN block.
2. STRIN block IOM_ID is ECB200 name.
3. STRIN block PNT_NO is $FBM0_IPADDRESS.

The results are shown in the detail display of the STRIN block as shown in Figure 9-17.

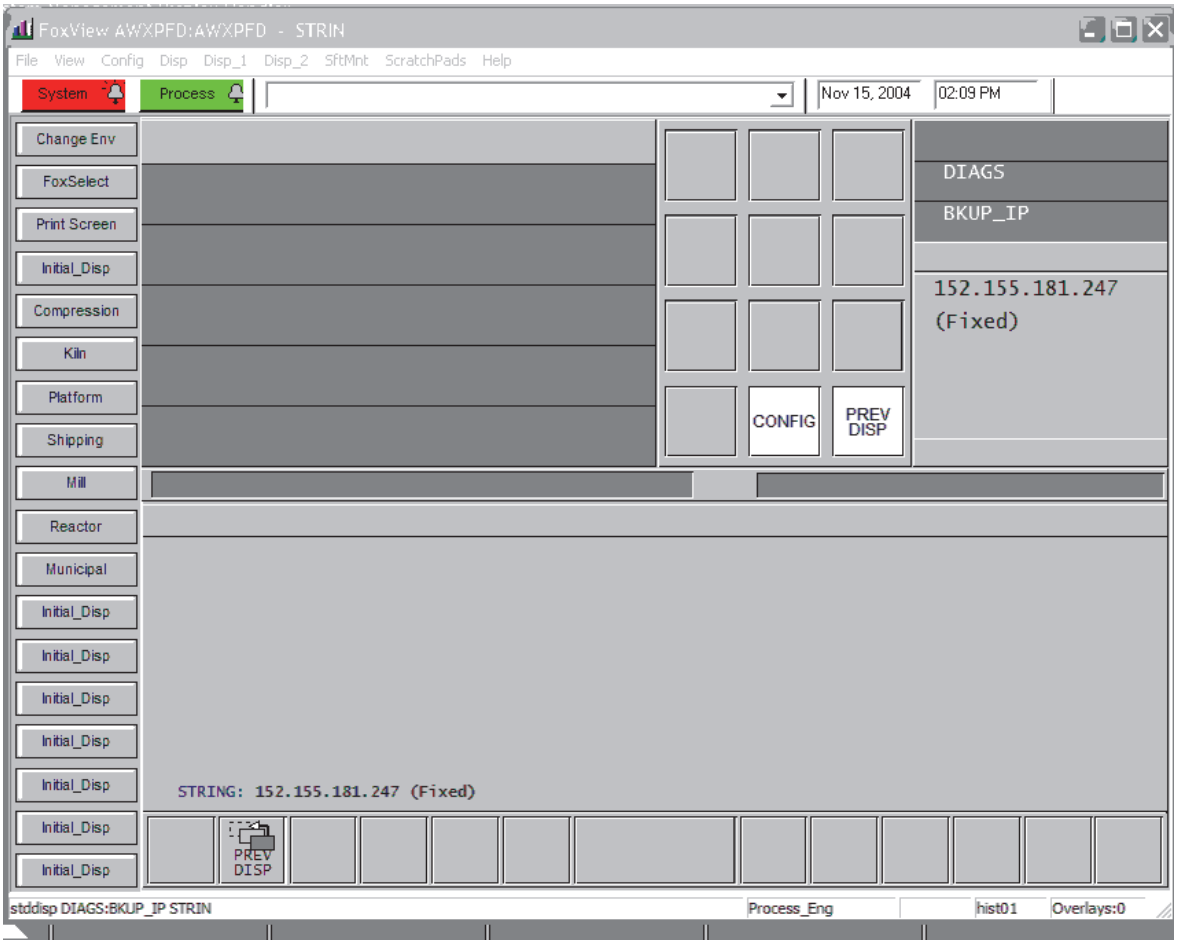

Figure 9-17. FBM Diagnostics, IP Address

CPU Usage (for FBM230/232)

To show the CPU Usage of an FBM230/232:

1. Create a RIN block.
2. RIN block IOM_ID is ECB200 name.
3. RIN block PNT_NO is $FBM0_CPU_USAGE.

The results are shown in the detail display of the RIN block as shown in Figure 9-18.

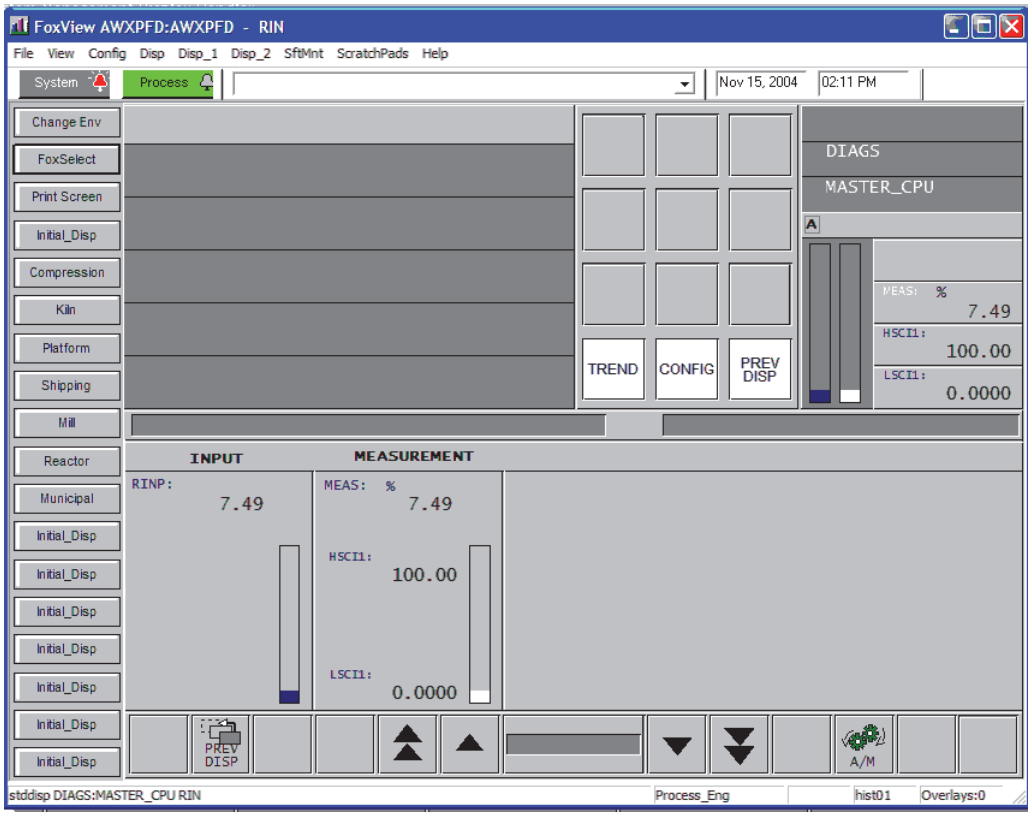

Figure 9-18. FBM Diagnostics, FBM CPU Usage

Memory Load (for FBM230/232)

To show the Memory load of an FBM230/232:

1. Create a RIN block.
2. RIN block IOM_ID is ECB200 name.
3. RIN block PNT_NO is $FBM0_MEM_LOAD.

The results are shown in the detail display of the RIN block as shown in Figure 9-19.

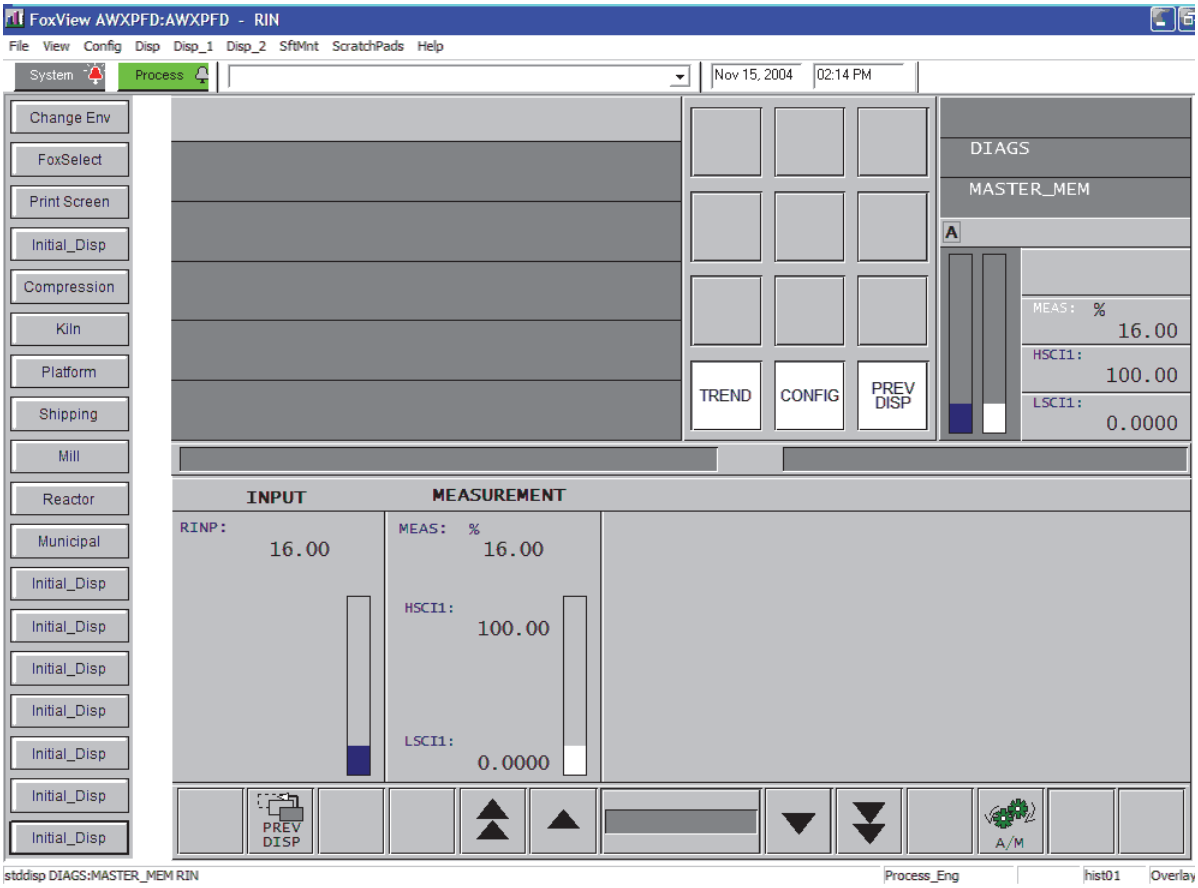

Figure 9-19. FBM Diagnostics, FBM Memory Load

ECB202 Diagnostics (FBM231/233)

The diagnostics for ECB202 FBMs (FBM231/233) are:

- IP Address (for FBM233 only)
- CPU Usage (for FBM231/233)
- Memory Load (for FBM231/233).

IP Address (for FBM233 only)

To show the IP Address of an FBM233 on the device network:

1. Create a STRIN block.
2. STRIN block IOM_ID is ECB202 name.
3. STRIN block PNT_NO is $FBMX_IPADDRESS.

   where X is the following:

   0 = Master

   M = Main

   B = Backup.

The results are shown in the detail display of the STRIN block as shown in Figure 9-17.

CPU Usage (for FBM231/233)

To show the CPU Usage of an FBM231/233:

1. Create a RIN block.
2. RIN block IOM_ID is ECB202 name.
3. RIN block PNT_NO is $FBMX_CPU_USAGE.

   where X is the following:

   0 = Master

   M = Main

   B = Backup.

The results are shown in the detail display of the RIN block as shown in Figure 9-18.

Memory Load (for FBM231/233)

To show the Memory load of an FBM231/233:

1. Create a RIN block.
2. RIN block IOM_ID is ECB202 name.
3. RIN block PNT_NO is $FBMX_MEM_LOAD.

   where X is the following:

   0 = Master

   M = Main

   B = Backup.

The results are shown in the detail display of the RIN block as shown in Figure 9-19.

Device Communication Status and Error Counters For FBM 230/231

DCI IIN blocks may be created to monitor the status of the serial communications at the Port and Device levels. These counter blocks are divided into two categories: Port counter blocks and Device counter blocks. Port counter blocks monitor information at the port level, while device counter blocks monitor information for specific device. The list of available counter blocks is as follows:

Port Counters:

1. Number of good messages sent
2. Number of good messages received
3. Number of parity errors
4. Number of framing errors
5. Number of checksum errors
6. Number of transmit errors
7. Port Scan Time
8. Reset Counters[2]

[2.] Note: Reset Counters will clear all counters for a given port, as well as any device counters for devices on that port.

Device Counters:

9. Number of good messages sent
10. Number of good messages received
11. Response timeout

Configuration of these counter blocks is described in following sections. These counters can be a diagnostic aid or for monitoring the health of a communication link to the device. Optionally, the values of the counters may also be incorporated into other user defined blocks for alarming purposes. Ideally, the error counters should always be equal to zero.

Some error causing conditions are as follows:

- A Framing Error usually indicates a noisy line, mismatched baud rates or parity settings between the FBM and the receiver or an incoming break signal.
- If there is a continuous parity error, this may indicate mismatched parity settings.
- Intermittent parity errors may be an indication of a noisy communications line.
- Continuous response timeouts indicate that the device is not responding to a query and may be powered off, disconnected or have some other condition present that prevents it from responding.
  If this is a first time installation, response timeouts may indicate a possible mismatch in the communication parameters.

Port Counters

Good Messages Sent

The number of good messages sent on a specific serial port may be monitored. Block definition is as follows:

NAME	*	Name of the point
TYPE	IIN	Defines the block as an integer input block
IOM_ID	*	Provides a complete path to the parent ECB200 or ECB202 block
PNT_NO	*	FBM230: $P#_MSGS_SENT FBM231: $P#M_MSGS_SENT $P#B_MSGS_SENT '#' is port number (1,2,3 or 4) Prefix '$P#M' corresponds to counter value on the Main FBM, while '$P#B' corresponds to counter value on the Backup FBM.

Good Messages Received

The number of good messages received on a specific serial port may be monitored. Block definition is as follows:

NAME	*	Name of the point
TYPE	IIN	Defines the block as an integer input block

IOM_ID	*	Provides a complete path to the parent ECB200 or ECB202 block
PNT_NO	*	FBM230: $P#_MSGS_RCVD FBM231: $P#M_MSGS_RCVD $P#B_MSGS_RCVD '#' is port number (1,2,3 or 4) Prefix '$P#M' corresponds to counter value on the Main FBM, while '$P#B' corresponds to counter value on the Backup FBM.

Parity Error Counter

The number of parity errors on a specific serial port may be monitored. Block definition is as follows:

NAME	*	Name of the point
TYPE	IIN	Defines the block as an integer input block
IOM_ID	*	Provides a complete path to the parent ECB200 or ECB202 block
PNT_NO	*	FBM230: $P#_PARITY_ERRS FBM231: $P#M_PARITY_ERRS $P#B_PARITY_ERRS '#' is port number (1,2,3 or 4) Prefix '$P#M' corresponds to counter value on the Main FBM, while '$P#B' corresponds to counter value on the Backup FBM.

Framing Error Counter

The number of framing errors on a specific serial port may be monitored. Block definition is as follows:

NAME	*	Name of the point
TYPE	IIN	Defines the block as an integer input block
IOM_ID	*	Provides a complete path to the parent ECB200 or ECB202 block
PNT_NO	*	FBM230: $P#_FRAMING_ERRS FBM231: $P#M_FRAMING_ERRS $P#B_FRAMING_ERRS '#' is port number (1,2,3 or 4) Prefix '$P#M' corresponds to counter value on the Main FBM, while '$P#B' corresponds to counter value on the Backup FBM.

Checksum Error Counter

The number of checksum errors on a specific serial port may be monitored. Block definition is as follows:

NAME	*	Name of the point
TYPE	IIN	Defines the block as an integer input block
IOM_ID	*	Provides a complete path to the parent ECB200 or ECB202 block
PNT_NO	*	FBM230: $P#_CKSUM_ERRS FBM231: $P#M_CKSUM_ERRS $P#B_CKSUM_ERRS '#' is port number (1,2,3 or 4) Prefix '$P#M' corresponds to errors on the Main FBM, while '$P#B' corresponds to errors on the Backup FBM.

Transmit Error Counter

The number of transmit errors on a specific serial port may be monitored. Block definition is as follows:

NAME	*	Name of the point
TYPE	IIN	Defines the block as an integer input block
IOM_ID	*	Provides a complete path to the parent ECB200 or ECB202 block
PNT_NO	*	FBM230: $P#_XMIT_ERRS FBM231: $P#M_XMIT_ERRS $P#B_XMIT_ERRS '#' is port number (1,2,3 or 4) Prefix '$P#M' corresponds to errors on the Main FBM, while '$P#B' corresponds to errors on the Backup FBM.

Port Scan Time

The port scan time may be monitored. The scan time is defined as the number of milliseconds required to empty the port's send queue one time. In a Send/Reply protocol, the second send message will not be sent until the first message's reply comes in. Therefore, this time also includes receive time. In addition, if I/A Series software sends many write values, this time also includes the time needed to send the write commands. If it takes 5000 milliseconds to read all the points from the Devices on a port, then the number returned will be higher than 5000, depending on the number of writes that were added to the port's send queue.

Block definition is as follows:

NAME	*	Name of the point
TYPE	IIN	Defines the block as an integer input block
IOM_ID	*	Provides a complete path to the parent ECB200 or ECB202 block

PNT_NO	*	FBM230: $P#_SCAN_TIME FBM231: $P#M_SCAN_TIME $P#B_SCAN_TIME '#' is port number (1,2,3 or 4) Prefix '$P#M' corresponds to errors on the Main FBM, while '$P#B' corresponds to errors on the Backup FBM.

Reset Counters

All counter blocks will be reset to 0 when the value in this block toggles.

NAME	*	Name of the point
TYPE	BOUT	Defines the block as a boolean output block
IOM_ID	*	Provides a complete path to the parent ECB200 or ECB202 block
PNT_NO	*	$P#_RESET_CNTRS '#' is port number (1,2,3 or 4)

Device Counters

Good Messages Sent

The number of good messages sent to a specific device may be monitored. Block definition is as follows:

NAME	*	Name of the point
TYPE	IIN	Defines the block as an integer input block
IOM_ID	*	Provides a complete path to the parent ECB201 device block
PNT_NO	*	FBM230/232: $MSGS_SENT FBM231/233: $M_MSGS_SENT $B_MSGS_SENT Prefix '$M' corresponds to counter value on the Main FBM, while '$B' corresponds to counter value on the Backup FBM.

Good Messages Received

The number of good messages received from a specific device may be monitored. Block definition is as follows:

NAME	*	Name of the point
TYPE	IIN	Defines the block as an integer input block
IOM_ID	*	Provides a complete path to the parent ECB201 device block

PNT_NO	*	FBM230/232: $MSGS_RCVD FBM231/233: $M_MSGS_RCVD $B_MSGS_RCVD Prefix '$M' corresponds to counter value on the Main FBM, while '$B' corresponds to counter value on the Backup FBM.

Response Timeout Counter

The number of response timeouts (query sent, but no reply received) on a specific device may be monitored. The value displayed in this block will be updating ONLY for the block corresponding to the current master FBM. In other words, when the Main FBM is running as master, the "$M" block will be updating, but when the Backup FBM is running as master, the "$B" block will be updating. Block definition is as follows:

NAME	*	Name of the point
TYPE	IIN	Defines the block as an integer input block
IOM_ID	*	Provides a complete path to the parent ECB201 device block
PNT_NO	*	FBM230/232: $RESP_TIMEOUTS FBM231/233: $M_RESP_TIMEOUTS $B_RESP_TIMEOUTS Prefix '$M' corresponds to timeouts on the Main FBM, while the prefix '$B' corresponds to timeouts on the Backup FBM.

Device Communication Status and Error Counters For FBM 232/233

DCI IIN type blocks may be created to monitor the status of the Ethernet communications at the Device level only - there is no port. The list of available counter blocks is as follows:

Device Counters:

1. Number of good messages sent
2. Number of good messages received
3. Response timeout
4. Reset counters

Good Messages Sent

The number of good messages sent to a specific device may be monitored. Block definition is as follows:

NAME	*	Name of the point
TYPE	IIN	Defines the block as an integer input block

IOM_ID	*	Provides a complete path to the parent ECB201 device block
PNT_NO	*	FBM230/232: $MSGS_SENT FBM231/233: $M_MSGS_SENT $B_MSGS_SENT Prefix '$M' corresponds to counter value on the Main FBM, while '$B' corresponds to counter value on the Backup FBM.

Good Messages Received

The number of good messages received from a specific device may be monitored. Block definition is as follows:

NAME	*	Name of the point
TYPE	IIN	Defines the block as an integer input block
IOM_ID	*	Provides a complete path to the parent ECB201 device block
PNT_NO	*	FBM230/232: $MSGS_RCVD FBM231/233: $M_MSGS_RCVD $B_MSGS_RCVD Prefix '$M' corresponds to counter value on the Main FBM, while '$B' corresponds to counter value on the Backup FBM.

Reset Counters

All counter blocks will be reset to 0 when the value in this block toggles.

NAME	*	Name of the point
TYPE	BOUT	Defines the block as a boolean output block
IOM_ID	*	Provides a complete path to the parent ECB201 block
PNT_NO	*	$RESET_CNTRS

Response Timeout Counter

The number of response timeouts (query sent, but no reply received) on a specific device may be monitored. The value displayed in this block will be updating ONLY for the block corresponding to the current master FBM. In other words, when the Main FBM is running as master, the "$M" block will be updating, but when the Backup FBM is running as master, the "$B" block will be updating.

This counter will increment only when the device is connected physically to the network with a good Ethernet TCP socket connection. In other words, this timeout is related to the application layer level response from the device.

If the device is turned off or if there is no network connection from the FBM to the device, this counter remains at zero.

Block definition is as follows:

NAME	*	Name of the point

TYPE	IIN	Defines the block as an integer input block
IOM_ID	*	Provides a complete path to the parent ECB201 device block
PNT_NO	*	FBM230/232: $RESP_TIMEOUTS FBM231/233: $M_RESP_TIMEOUTS $B_RESP_TIMEOUTS Prefix '$M' corresponds to timeouts on the Main FBM, while the prefix '$B' corresponds to timeouts on the Backup FBM.

Ethernet Hubs and Switches

The FDSI was designed and tested for operation with the Ethernet hubs and switches in the switch-specific documents listed in *The MESH Control Network Architecture Guide* (B0700AZ), and the legacy hubs below. The FBMs may operate with similar, off-the-shelf equipment, but Foxboro is not responsible for any system malfunctions that may occur if such equipment is used.

For controls and indicators and maintenance on the Ethernet hubs and switches, refer to the appropriate vendor's literature.

You can obtain more information about the legacy Ethernet hub at *http://www.hirschmann.de.*

Table 9-9. Legacy Ethernet Hub

Foxboro Part No.[1]	Vendor No.
P0972WE (10Mbps)	RH1-TP

1. This hub has been superseded by switches listed in the switch-specific documents listed in *The MESH Control Network Architecture Guide* (B0700AZ).

For controls and indicators and maintenance on the Ethernet switches, refer to the switch-specific documents listed in *The MESH Control Network Architecture Guide* (B0700AZ).

Redundant Module Removal/Replacement

For a redundant FBM pair, either module in the pair can be removed at any time without disrupting communications. (The opposite module immediately assumes full communication functionality.)

⚠ WARNING

To prevent explosion, install and remove cables, wiring, modules and other replaceable components only when area is known to be nonhazardous.

Connector Pinouts

RJ-45 Connector Pinouts

An RJ-45 connector is used on FBM232/233 for Ethernet twisted pair links. An RJ-45 connector has 8-pins, and may also be referred to as an "8-pin Modular Connector". A male RJ-45 plug is mounted on each end of the twisted pair cable. A female RJ-45 jack or receptacle is integrated into the Ethernet hub or NIC. The pinouts for an RJ-45 connector are listed in Table 9-10.

Table 9-10. RJ-45 Connector Pinouts

Pin Number	10/100Base-T Function	Pin Number	10/100Base-T Function
1	TD+ (Transmit Data)	5	Not used
2	TD- (Transmit Data)	6	RD- (Receive Data)
3	RD+ (Receive Data)	7	Not Used
4	Not used	8	Not Used

DB-25 Connector Pinouts

Four DB-25 connectors are used on the Termination Assembly for RS-232 communication. Each of the connectors are a DB-25 female connector with pinouts as listed in Table 9-11.

Table 9-11. DB-25 Connector Pinouts

Pin	Function	Pin	Function
2	TxD	6	DSR
3	RxD	7	Ground
4	RTS	8	DCD
5	CTS	20	DTR

Service and Support

If you need assistance, please contact Invensys Global Customer Support at 1-866-746-6477 or visit at *https://support.ips.invensys.com*.

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