Overview

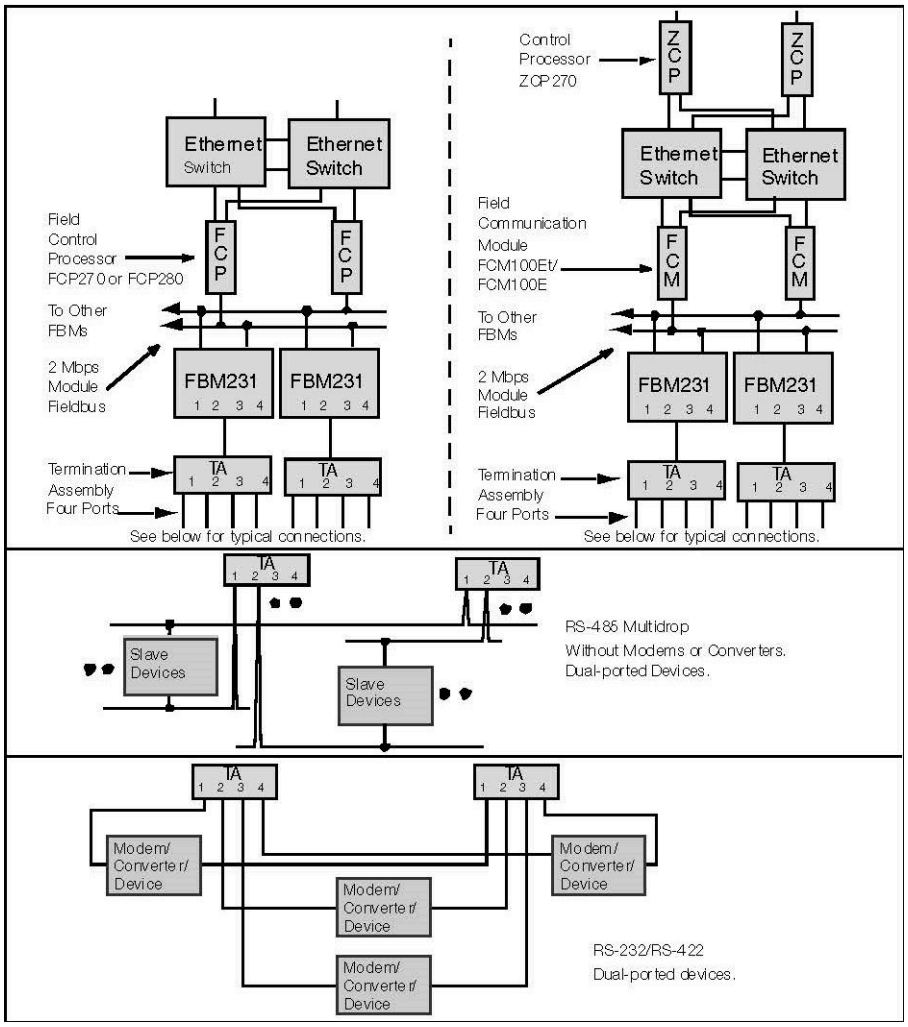
The FBM231 Redundant Field Device System Integrator (FDSI) modules provide a serial interface between dual-ported field I/O devices and the EcoStruxure™ Foxboro™ DCS system.

A pair of FBM231 modules combine to provide redundancy at the Fieldbus Module (FBM) level, with field wiring to two termination assemblies (see Figure 1). 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, depending on the I/O driver, are written by both the Master and Tracker module. Role switching is automatic if actual problems are detected (for example, heartbeat) by the I/O driver, or the user can switch the roles at any time via SMDH.

The FBM231 has four ports - each can be individually configured in software for RS-232, RS422 or RS-485. This allows a single FBM231 the flexibility to connect to multiple similar but not identical devices. Ports 1, 2, 3, and/or 4 can be configured as a single logical port with redundant cables allowing you to interface with dual-ported I/O devices within your plant. The general network configurations are shown in Figure 1.

The FBM231 and its associated termination assemblies (TA) accommodate several types of connections to dual-ported devices; direct connection to devices; connection to modems when used with the RS-232 communication interface, and multidrop connections to RS-485 devices. Intrinsic safety devices can be connected between the TA and the field device. For single ported devices, you should use the FBM230.

Figure 1. FBM231 in Typical Network Configurations



NOTE: Each FBM231 port (1 through 4) can be individually configured for RS-232, RS-422, or RS-485 communications standards.

Features

The key features of the FBM231 are:

- Redundant FBM231 modules communicate with dual-ported devices
- Four ports - each can be individually configured in software for RS-232, RS-422 or RS-485
- Supports RS-232, RS-422 or RS-485 communication interface standards
- I/O software driver is downloadable from a library of available protocols.
- Up to 2000 DCI block connections
- Communicates with up to 64 RS-485 or up to 4 direct connect RS-232 or RS-422 devices
- Integrates field device data into a Foxboro DCS control database
- Field mounted
- Class G3 (harsh) environments.

Serial Link Setup

Data communication between two FBM231 modules and dual-ported field devices are through two 4-ported termination assemblies (TA) connected to each of the redundant FBM231. Each TA has compression screw or ring lug terminals for each port for RS-422 and RS485 wiring, with DIP-switch-selectable bus termination resistors per port. For RS-232 wiring, the TA has four standard DB-25 male connectors and a break-out bank of 24 DIP switches for each port that can be used for any RS-232 wiring configuration (for example, to connect Clear-to-Send to Request-to-Send).

Physical wiring is in accordance with Electronic Industrial Association (EIA) standard RS-232, RS422, or RS-485.

I/O Drivers

This FBM is a generic hardware module in which different software drivers can be loaded. These drivers configure the FBM to recognize a particular protocol used by the field device. Several of the software drivers are standard product offerings. Other custom drivers can be developed to meet specific needs. These drivers are dynamically downloaded to the pair of FBM231s with software code specifically designed to interface with the third party device’s protocol.

The configuration procedures and the software requirements for each driver are unique to the device(s) being integrated into the system.

Configurator

The FDSI configurator sets up the FBM231 port via XML based device configuration files. The port configurator allows for easy setup of the communication parameters for each port (such as, communication interface standard, baud rate, parity). The device configurator is not needed for all devices, but when needed it configures device specific and point specific considerations (such as, scan rate, address of the data to be transferred and the amount of data to be transferred in one transaction).

Operations

Each FBM231 can access up to 64 devices in RS485 mode to read or write data.

From the Foxboro DCS control station to which the FBM231 is connected (refer to Figure 1, page 3), up to 2000 Distributed Control Interface (DCI) data connections can be made to read or write data. Supported data types are determined by the particular driver loaded on the FBM231, which converts the data to the DCI data types listed below:

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

Thus a FBM231 can access up to 2000 analog I/O values, or up to 64000 digital I/O values, or a combination of digital and analog values spread over the four ports of the FBM231 up to the maximum capacity a user allows within the sizing guidelines of the control processor. The frequency of access to the FBM231 data by a control station can be as fast as 500 ms. The performance depends on each device type and the layout of data in the device.

The FBM231 collects the required data from the devices, performs the necessary conversions, and then stores the converted data in its database for incorporation into the Foxboro DCS plant management functions and operator displays. Data may also be written out to the individual devices from the Foxboro DCS system.

Control Block Support

The FBM232 offers control block support for the following standard Foxboro DCS system Distributed Control Interface (DCI) block types:

BIN	Binary Input
BINR	Binary Input Redundant
BOUT	Binary Output
IIN	Integer Input
IOUT	Integer Output
PAKIN	Packed Input
PAKOUT	Packed Output
PLSOUT	Pulse Output
RIN	Real Input
RINR	Real Input Redundant
ROUT	Real Output
STRIN	String Input
STROUT	String Output

The DCI blocks are configured just like other Foxboro DCS control blocks. The DCI blocks address and read/write data from/to the addressed field device.

Standard, Rugged Design

The FBM231 has a rugged extruded aluminum exterior for physical and electrical protection of the circuits. Enclosures, specially designed for mounting the FBMs, provide various levels of environmental protection, up to harsh environments per ISA Standard S71.04.

High Reliability

The redundancy of the module pair, coupled with the high coverage of detected faults, provides very high subsystem availability time.

Either module may be replaced without upsetting field input or output signals to the other module. A module can be removed or replaced without removing field device termination cabling, power, or communications cabling.

Modular Baseplate Mounting

The FBM231 modules mount on a Modular Baseplate, which accommodates up to four or eight FBMs. The Modular Baseplate is either DIN rail mounted or rack mounted. The Modular Baseplate includes signal connectors for the FBMs, redundant independent DC power connections, I/O cable connections, and 2 Mbps Module Fieldbus connections.

Redundant FBM231 modules must be located in adjacent odd and even positions on the baseplate (positions 1 and 2, 3 and 4, 5 and 6, or 7 and 8). Two TA cables connect from the baseplate to the associated TA. Each port of a dual-ported device connects to one of the two TAs.

Fieldbus Communication

The Fieldbus Communication Module (FCM100Et or FCM100E) or the Field Control Processor (FCP280 or FCP270) interface the redundant 2 Mbps module Fieldbus used by the FBMs. The FBM231 accepts communication from either path of the redundant 2 Mbps module Fieldbus - should one path fail or be switched at the system level, the module continues communication over the active path.

Visual Indicators

Light-emitting diodes (LEDs) incorporated into the front of the module provide visual indication of the module’s operational status, and the communication activity (transmit and receive) of each of the four communication ports. Two additional LEDs indicate the master or tracker status of the modules.

Termination Assembly

The FBM231 termination assembly (TA) is part of the Foxboro DCS system Standard 200 Series subsystem field wiring termination family.

Each FBM231 TA and its associated termination cable provide connection compliance to the electrical interface standards (RS-232, RS-422 or RS-485) between the field devices and the FBM231. A pair of FBM231s use two TAs. Each TA connects to a port of a dual-ported device.

Each TA has four DB-25 cable connectors for RS-232 communication interface and switches to match the RS-232 signal pinout of the DB-25 connectors to various field devices.

The TA has a three-tier compression screw or ring lug connection for RS-422 and RS-485 communication interfaces. Switch-selectable termination resistors are built into the TA for active termination when used with RS-422 and RS-485 communication interfaces.

Key features for each TA include:

- Combination foot that supports 32 or 35 mm DIN rail mounting
- Three-tier termination for RS-422 and RS-485 and four DB-25 cable connectors for RS-232 communication interfaces
- Switches to select transmit and receive signals and other RS-232 communication signals
- Switch-selectable termination resistors for RS-422 and RS-485 communication
- Polyamide construction.

Functional Specifications

<table>
<tr>
<td>Device Communications</td>
<td>
Interface

Four serial I/O communication ports interface four direct connect RS-232, RS-422 dual-ported devices or up to 64 dual-ported devices via four RS-485 buses (Up to 16 devices per port). Each port is a dual-logical port to dual-ported devices.

Bus Characteristics

General
Electronic Industrial Association (EIA) RS-232, RS-422 or RS485 communications selectable on a per port basis. The RS-485 physical communication medium consists of twisted-pair shielded copper cable containing a single conductor pair. The RS-422 is a 4–wire physical communication medium. The RS-232 physical communication medium is a DB-25 cable to a customer supplied device/modem/converter.
EIA RS-232, RS-422 and RS-485 I/O Communication

Asynchronous communication, direct connect link (RS-232)
Transmission Rate: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 baud.
Protocol: 8-bit characters; odd, even or no parity, 1 or 2 stop bits.

NOTE: For driver specific limitations on I/O Capacity and Data Types Transferred, refer to the corresponding driver PSS or User’s Guide.

I/O Capacity

Up to 64 devices per FBM231 maximum (number of actual devices is performance dependent) with up to 2000 DCI point connections.

Data Types Transferred

2-byte or 4-byte signed or unsigned integers, 4-byte IEEE single-precision floating values, or binary values. Automatic conversion for other types as implemented by the downloadable driver.

Fastest Allowed ECB Block Period

500 msec

Channel Isolation

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

⚠⚠DANGER
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH
Although the module can withstand a maximum of 600 VAC applied for one minute between any channel, DO NOT apply voltages beyond the published input ranges. The channels are NOT intended for permanent connection to hazardous voltage circuits. Understand that connection of these channels to voltages greater than 30 VAC or 60 VDC violates electrical safety code requirements and may expose users to electric shock.
Failure to follow these instructions will result in death or serious injury.
</td>
</tr>
<tr>
<td>Module Fieldbus Communication</td>
<td>Communicates with its associated FCM100Et, FCM100E, FCP270, or FCP280 via the redundant 2 Mbps module Fieldbus.</td>
</tr>
</table>

FBM231 Power Requirements	• Input Voltage Range (Redundant) 24 V DC +5%, -10% • Consumption 7 W (maximum) each module • Heat Dissipation 7 W (maximum) each module
Regulatory Compliance, Electromagnetic Compatibility (EMC)	European EMC Directive 2014/30/EU Meets: EN61326-1:2013 Class A Emissions and Industrial Immunity Levels
Regulatory Compliance, Product Safety	• *Underwriters Laboratories (UL) for U.S. and Canada* UL/UL-C listed as suitable for use in UL/UL-C listed Class I, Groups A-D; Division 2; temperature code T4 enclosure based systems when connected to specified Foxboro DCS processor modules as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA). Communications circuits also meet the requirements for Class 2 as defined in Article 725 of the National Electrical Code (NFPA No.70) and Section 16 of the Canadian Electrical Code (CSA C22.1). Conditions for use are as specified in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA). • *European Low Voltage Directive 2014/35/EU and Explosive Atmospheres (ATEX) Directive 2014/34/EU* DEMKO certified as Ex nA IIC T4 for use in certified Zone 2 enclosure when connected to specified processor modules as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA).
IECEx Certification	IECEx Certified
Calibration Requirements	Calibration of the module or termination assembly is not required.

Environmental Specifications

	Operating	Storage
Temperature	Rev A to L: -20 to +70°C (-4 to +158°F) Rev M and later: 0 to +70°C (32 to +158°F)	-40 to +70°C (-40 to +158°F)
Relative Humidity	5 to 95% (noncondensing)	5 to 95% (noncondensing)
Contamination	Suitable for use in Class G3 (Harsh) environments as defined in ISA Standard S71.04, based on exposure testing according to EIA Standard 364-65, Class III.	

Physical Specifications

Mounting	The FBM231 mounts on a Modular Baseplate. The Modular Baseplate can be mounted horizontally or vertically on a DIN rail, or mounted horizontally in a 19-inch rack using a mounting kit. Refer to PSS 31H-2SBASPLT for details. The TA has a combination foot that supports 32 or 35 mm DIN rail mounting.
Part Numbers	• Module: P0926GV • TA Ring Lug: P0926PA • TA Compression Screw: RH926GH (supersedes P0926GH)
Dimensions (Module)	• Height: 102 mm (4 in) 114 mm (4.5 in) including mounting lugs • Width: 45 mm (1.75 in) • Depth: 104 mm (4.11 in)
Dimensions (TA)	See Dimensions — Nominal, page 14.
Mass	• Module: 284 g (10 oz) approximate • Termination Assembly ◦ Ring Lug (P0926PA): 363 g (0.8 lb) approximate ◦ Compression Screw (RH926GH (supersedes P0926GH)): 272 g (0.6 lb) approximate
Cables	• FBM231 to TA Lengths 1 m (3.2 ft) to 5 m (16.4 ft) • Termination Cable Type Type 5 - See, Termination Cable Types and Part Numbers, page 13. • TA RS-232 Connection (DB-25 Cable) to Modem/Converter/Device Up to 15 m (50 ft) for custom cables per EIA Standard RS232. • RS-422 and RS-485 Up to 1200 m (3937 ft)