

**FBM233 Field Device System Integrator Module, 10/100 Mbps Ethernet, Redundant**



*The FBM233 Redundant Field Device System Integrator (FDSI) module provides an Ethernet interface between single or dual-ported field I/O devices and the I/A Series® system.*

**FEATURES**

Key features of the FBM233 are:

- ▶ Redundant 10 Mbps or 100 Mbps Ethernet network transmission rate to/from field devices
- ▶ Communicates with up to 64 field devices
- ▶ I/O software driver is downloadable from a library of available protocols
- ▶ Up to 2000 DCI block connections
- ▶ Integrates field device data into an I/A Series control database using Ethernet connectivity
- ▶ Field mounted
- ▶ Class G3 (harsh) environments.

**OVERVIEW**

Each FBM233 module has a single 10/100Mbps copper Ethernet connection and a single RJ-45 connector on the front of the module for connectivity to dual-ported Ethernet devices. The FBM233 is connected to Ethernet switches or hubs in order to communicate with one external device or up to 64 external devices.

A pair of modules combine to provide redundancy at the Fieldbus Module (FBM) level. 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. Device output points, depending on the I/O driver, are written by both the Master and Tracker module. Role switching is automatic if problems are detected (for example, loss of heartbeat from any device) by the I/O driver, or the user can switch the roles at any time via SMDH. The general network configuration is shown in Figure 1.

## **I/O DRIVERS**

This FBM is a generic Ethernet hardware module in which different software drivers can be loaded. These drivers configure the FBM to recognize a particular protocol used by the device. Several of these software drivers are a standard product offerings. Other custom drivers can be developed to meet specific needs. These drivers are dynamically downloaded to the FBM233 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.

## **ETHERNET LINK SETUP**

Data communication between the FBM233 and field devices are through the RJ-45 connector located on the front of the FBM233 module. The RJ-45 connector of the FBM233 can be connected through hubs, or through Ethernet switches to the field devices (refer to "ETHERNET HUBS AND SWITCHES" on page 7). The FBM233 is connected to Ethernet switches or hubs in order to communicate with one external device or up to 64 external devices.

## **CONFIGURATOR**

The FDSI configurator sets up the FBM233 port and XML based device configuration files. The port configurator allows for easy setup of the communication parameters for each port (such as, Dynamic Host Configuration Protocol (DHCP), IP addresses). 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 FBM233 pair can access up to 64 devices to read or write data.

From the I/A Series control station to which the FBM233 is connected (refer to Figure 1), 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 FBM233, 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 an I/A Series control station 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 using the FBM233. The frequency of access to the FBM233 data by a control station can be as fast as 500 ms. The performance is dependant on each device type and the layout of data in the device.

The FBM233 collects the required data from the devices, performs the necessary conversions, and then stores the converted data in its database for incorporation into the I/A Series plant management

functions and operator displays. Data may also be written out to the individual devices from the I/A Series system.

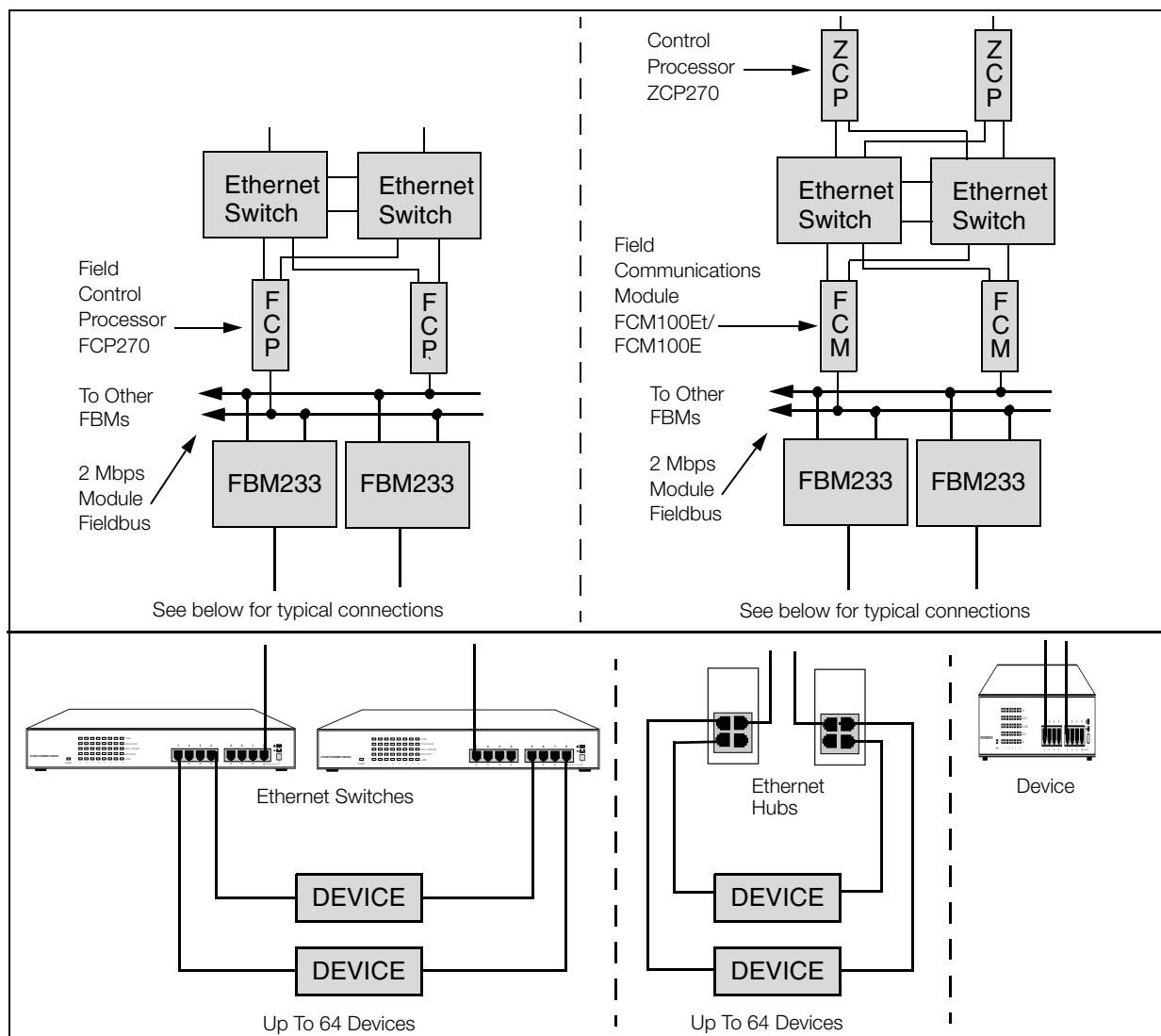


Figure 1. FBM233 Redundant Module Configuration

## CONTROL BLOCK SUPPORT

The FBM233 offers control block support for the following standard I/A Series® 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 I/A Series control blocks. The DCI blocks address and read/write data from/to the addressed field device.

## COMPACT, RUGGED DESIGN

The FBM233 has a compact design, with 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 Class G3 harsh environments per ISA Standard S71.04.

## HIGH RELIABILITY

The redundancy of the module pair, coupled with the high coverage of 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 power to the other FBM modules in the Modular Baseplate.

## MODULAR BASEPLATE MOUNTING

The module mounts 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, provides connections for independent dc power supplies, I/O cable connections, 2 Mbps Module Fieldbus connections.

Redundant modules 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).

## FIELDBUS COMMUNICATION

The Fieldbus Communication Module (FCM100Et or FCM100E) or the Field Control Processor (FCP270) interface the redundant 2 Mbps module Fieldbus used by the FBMs. The FBM233 accepts communication from either path of the 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 or Receive) of the Ethernet ports. Two additional LEDs provide the master or tracker status of the modules.

## FUNCTIONAL SPECIFICATIONS

### Device Communications

#### BUS CHARACTERISTICS

*Communication Type*

Ethernet

*Communication Transmission Rate*

10 Mbps or 100 Mbps

*Communication Protocol*

UDP/IP or TCP/IP

*IP Address*

Fixed or DHCP

#### 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 FBM233 maximum (number of actual devices is performance dependent) with up to 2000 DCI 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 in the downloadable driver.

#### FASTEST ALLOWED ECB BLOCK PERIOD

500 msec

### Module Fieldbus Communication

Communicates with its associated FCM100Et, FCM100E or FCP270 via the redundant 2 Mbps module Fieldbus.

### FBM233 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 89/336/EEC*

Meets: EN 50081-2 Emission standard

EN 50082-2 Immunity standard

EN 61326 Annex A for Industrial Environments

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

Meets: Class A Limits

*IEC 61000-4-2 ESD Immunity*

Contact 4 kV, air 8 kV

*IEC 61000-4-3 Radiated Field Immunity*

10 V/m at 80 to 1000 MHz

*IEC 61000-4-4 Electrical Fast*

*Transient/Burst Immunity*

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

*IEC 61000-4-5 Surge Immunity*

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

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

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

*IEC 61000-4-8 Power Frequency Magnetic Field Immunity*

30 A/m at 50 and 60 Hz

## FUNCTIONAL SPECIFICATIONS (CONTINUED)

### Regulatory Compliance (Cont.)

#### 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. Communications circuits 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 *I/A Series DIN Rail Mounted Subsystem User's Guide* (B0400FA).

#### EUROPEAN LOW VOLTAGE DIRECTIVE 73/23/EEC AND EXPLOSIVE ATMOSPHERES (ATEX) DIRECTIVE 94/9/EC

CENELEC (DEMKO) certified as EEx nA IIC T4 for use in CENELEC certified Zone 2 enclosure certified as associated apparatus for supplying non-incendive field circuits for Zone 2, Group IIC, potentially explosive atmospheres when connected to specified I/A Series processor modules as described in the *I/A Series DIN Rail Mounted Subsystem User's Guide* (B0400FA).

#### Calibration Requirements

Calibration of the module is not required.

## ENVIRONMENTAL SPECIFICATIONS

### Operating

#### TEMPERATURE

-20 to +70°C (-4 to +158°F)

#### RELATIVE HUMIDITY

5 to 95% (noncondensing)

### Storage

#### TEMPERATURE

-40 to +70°C (-40 to +158°F)

#### RELATIVE HUMIDITY

5 to 95% (noncondensing)

#### Contamination

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

## PHYSICAL SPECIFICATIONS

### Mounting

The FBM233 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 21H-2W6 B4 for details.

### Dimensions

#### HEIGHT

102 mm (4 in)

114 mm (4.5 in) including mounting lugs

#### WIDTH

45 mm (1.75)

#### DEPTH

104 mm (4.11 in)

### Part Number

P0926GX

### Mass

284 g (10 oz) approximate, per module

### Cables

#### FROM MODULE TO HUB/SWITCH/DEVICE

1 m (3.3 ft) up to 100 m (330 ft)

#### CONNECTORS

RJ-45

#### NULL HUB ADAPTER

P0971PK

## ETHERNET HUBS AND SWITCHES

### 4-Port 10 Mbps Hubs for ISO/DIN Rail

The 4-Port 10 Mbps Industrial Hubs are DIN rail mounted and support 10 Mbps Ethernet protocol to/from devices that communicate at speeds of 10 Mbps. You can connect up to three dual-ported Ethernet devices, using a pair of hubs, to a redundant FBM233. Multiple hubs can be interconnected to connect up to 64 devices to the FBM233.



10 Mbps (P0926WE)

Figure 2. 4-Port, 10 Mbps (P0972WE) Ethernet Hub

The hub mounts on an ISO/DIN rail and the 24 Vdc can be supplied redundantly from the FPS400-24 to the hub.

A terminal block contains an integrated indicator contact, receiving error and warning messages of the hub which are defined as digital signals. These

signals, for example, can be utilized as process messages when connected to a digital input FBM. The indicator/contact becomes active as soon as disturbances appear in the hub, that is, when a power supply should fail or at least one twisted pair port reports a faulty link status or has auto-partitioned.

For diagnosis, there are LEDs available which indicate fault, link status, segmentation, power and received data.

### Fast Ethernet Switches

For information on the Fast Ethernet switches refer to *The MESH Control Network Ethernet Equipment* (PSS 21H-7C3 B4).



## FUNCTIONAL SPECIFICATIONS - 10 MBPS HUBS

### Communications

#### **BUS CHARACTERISTICS**

*Communication Type*

Ethernet and Fast Ethernet

*Communication Transmission Rate*

P0972WE - 10 Mbps

#### **STANDARD SUPPORTED**

IEEE 802.3, IEEE 802.3u

### Power Requirements

#### **INPUT VOLTAGE RANGE (REDUNDANT)**

24 V dc +5%, -10%

#### **CONSUMPTION**

P0972WE - 130 mA (maximum)

#### **OVERLOAD CURRENT PROTECTION**

Non-interchangeable thermal fuse

#### **POWER TERMINAL BLOCK**

5 pin; 2 redundant power supply inputs,  
1 common ground, and 2 outputs for fault  
relay output.

### Regulatory Compliance

#### **ELECTROMAGNETIC COMPATIBILITY (EMC)**

*European EMC Directive 89/336/EEC*

EN 50081-2 Emission standard; EN 50082-2  
Immunity standard

*EN 61000-4-2 ESD Immunity*

Contact +6.0 kV, air 8 kV

*EN 61000-4-3 Radiated Field Immunity*

10 V/m at 80 to 1000 MHz

*EN 61000-4-4 Electrical Fast*

*Transient/Burst Immunity*

2 kV power line, 1 kV data line

*EN 61000-4-5 Surge Immunity*

Power line 2 kV (line/earth), 1 kV (line/line),  
1 kV data/line

*EN 61000-4-6 Immunity to Conducted  
Disturbances*

3 V at 10 kHz to 150 MHz, 10 V at 150 kHz  
to 80 MHz

### Product Safety

#### **SAFETY CERTIFICATION**

*Safety of Industrial Control Equipment*

cUL 508 (E175531)

*Safety of Information Technology Equipment*

cUL 60950 (E168643)

#### **UNDERWRITERS LABORATORIES (US AND CANADIAN CERTIFICATION)**

*Hazardous Locations*

cUL 1604; Class 1, Div 2 (E203960)

#### **FACTORY MUTUAL**

*Hazardous Locations*

FM3611; Class 1, Div 2 (3012523)

FM 3810 (3012523)

#### **EUROPEAN UNION COMPLIANCE**

Meets European Union directives for Explosive  
Atmospheres (ATEX) 94/9/EEC, Low Voltage  
72/23/EEC and Electromagnetic Compatibility  
89/336/EEC.

#### **EMC EMITTED IMMUNITY**

EN 55022 Class A

FCC CFR Part 15 Class A



## ENVIRONMENTAL SPECIFICATIONS - 10 MBPS HUBS

### Operating

#### TEMPERATURE

0 to +60°C (32 to +140°F)

#### RELATIVE HUMIDITY

10 to 95% (noncondensing)

### Storage

#### TEMPERATURE

-25 to +70°C (-10 to +158°F)

#### RELATIVE HUMIDITY

10 to 95% (noncondensing)

## PHYSICAL SPECIFICATIONS - 10 MBPS HUBS

### Mounting

The hubs mount on a horizontal or vertical DIN rail in the enclosure.

### Mass

P0972WE - 530 g (1.17 lb) approximate

### Dimensions - P0972WE

#### HEIGHT

125 mm (4.92 in)

#### WIDTH

40 mm (1.57)

#### DEPTH

80 mm (3.15 in)

### Connectors

#### NUMBER

P0972WE - 4 ports in compliance to 10BASE-T

#### TYPE

RJ-45 sockets

### Cables

#### FROM MODULE TO HUB

1 m (3.3 ft) or 100 m (330 ft)

#### FROM FPS400-24 POWER SUPPLY TO HUB

1.8 m (6 ft)

#### FROM HUB TO DEVICE

1 m (3.3 ft) up to 100 m (330 ft)

### Shock

#### IEC 60068-2-27 SHOCK

15 g, 11 ms duration, 18 shocks

#### IEC 60068-2-6 VIBRATION

1 mm, 2 Hz to 13.2 Hz; 0.7 g, 13.3 Hz to 100 Hz;  
90 min.

3.5 mm, 3 Hz to 9 Hz; 1 g, 9 Hz to 150 Hz;  
10 cycles, 1 octave/min.