

FBM243/243b, FoxCom™ Dual Baud Rate, Intelligent Device Modules



The FBM243 accepts eight channels from Foxboro® FoxCom field devices. In cases where closed loop control is required within a single module, the FBM243b accepts four channels from FoxCom field devices and sends four channels of 4 to 20 mA outputs.

OVERVIEW

The FBM243, FoxCom Dual Baud Rate, Intelligent Device Module contains eight individual channels. The FBM243b, FoxCom Dual Baud Rate, Intelligent Device Module contains four individual input channels and four 0 to 20 mA analog output channels.

Each input provides internal isolated power and digital communication capabilities to a Foxboro Intelligent Field Device. Each channel communicates over a single twisted pair of wires and each channel of the FBM243/243b is channel isolated.

The modules also allow the use of an external power supply to power the Intelligent Field Device. (The use of an external power supply common to two or more loops requires the use of a cable balun module to maintain digital communication line balance). The baud rate is determined by the configuration of the field device connected to each channel, independently of the other channels. The modules provide bidirectional digital communication at 4800 baud rate between the Intelligent Field Device and the system redundant Fieldbus, or provides

bidirectional digital communication at 600 baud rate between the field device and the modules while allowing a simultaneous 4 to 20 mA analog signal from the field device to an emergency shutdown system.

The FBM243/243b is an Intelligent Field Device host, enabling the system to receive digital messages from the field device in engineering units. Each message is received ten times per second at 4800 baud, and two times per second at 600 baud, and contains:

- ▶ Up to three measured variables in IEEE 32-bit floating-point format
- ▶ Security information
- ▶ Diagnostics
- ▶ Message checking.

This information is available to all elements of the system.

Since communication is bidirectional, the system can display the output, transmitter temperature (°C and °F), and the results of continuous self-diagnostics. In addition, the following information can be displayed or reconfigured from a console, a Field Communicator, or PC-Based Configurator:

- ▶ Output in engineering units
- ▶ Fail-safe information
- ▶ Tag number, name and location
- ▶ Device name (letterbug)
- ▶ Last calibration date
- ▶ Two levels of upload/download capabilities.

When connected to the appropriate TAs, the FBM243/243b modules provide functionality formerly provided by the 100 Series FBM I/O subsystem. TAs are available for the FBM243 which support the functionality of the 100 Series FBM18 and FBM43. TAs are available for the FBM243b which support the functionality of the 100 Series FBM39 and FBM44.

FEATURES

Key features of the FBM243/243b are:

- ▶ For the FBM243, eight individual digital communication channels
- ▶ For the FBM243b, four individual dual baud, FoxCom communication channels and four 0 to 20 mA analog output channels
- ▶ Receives messages ten times per second at 4800 baud, and two times per second at 600 baud, and contains:
 - Up to three measured variables in IEEE 32-bit floating-point format
 - Security information
 - Diagnostics
 - Message checking.
- ▶ Allows use of an external power supply or the FBM243 internal isolated power to power the Intelligent Field Device
- ▶ Digital communication capabilities to a Foxboro Intelligent Field Device over a single twisted pair of wires
- ▶ Allows a simultaneous 4 to 20 mA analog signal from the field device to an emergency shutdown system
- ▶ Termination Assemblies (TAs) for locally or remotely connecting field wiring to the FBM243
- ▶ Termination Assemblies (TAs) for non-intrinsically safe or intrinsically safe applications.

COMPACT DESIGN

The FBM243/243b has a compact design, with a rugged extruded aluminum exterior for physical protection of the circuits. Enclosures specially designed for mounting of the FBMs provide various levels of environmental protection, up to harsh environments per ISA Standard S71.04.

VISUAL INDICATORS

Light-emitting diodes (LEDs) incorporated into the front of the module provide visual indication of the module operational status, and communication activity of the input channels.

EASY REMOVAL/REPLACEMENT

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

NOTE

For safety reasons, always consider the possible impact on plant operations before removing the module.

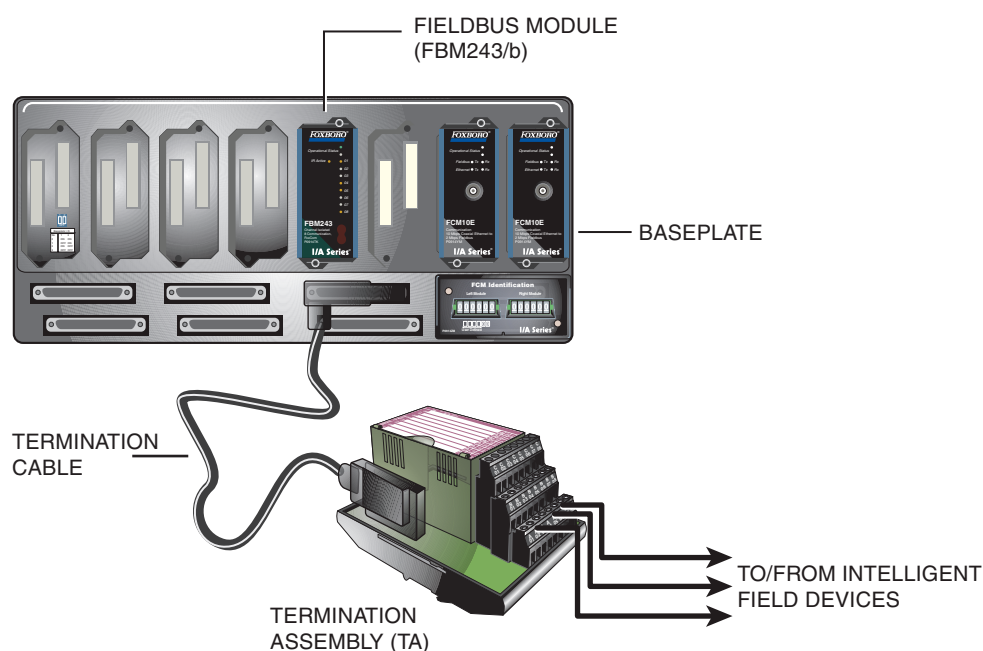


Figure 1. FBM243/243b I/O Configuration

FIELDBUS COMMUNICATION

The Fieldbus Communications Module (FCM) or the Field Control Processor (FCP) interfaces to the redundant 2 Mbps module Fieldbus used by the FBMs. The FBM243/243b accepts communication from either path (A or B) of the 2 Mbps Fieldbus — should one path fail or be switched at the system level, the module continues communication over the active path.

MODULAR BASEPLATE MOUNTING

The FBM243/243b mounts on a Standard or Compact 200 Series Modular Baseplate (see Figure 1), which accommodates up to four or eight Fieldbus Modules. The Modular Baseplate is either DIN rail mounted or rack mounted, and includes signal connectors for redundant Module Fieldbus, redundant independent dc power, and termination cables.

TERMINATION ASSEMBLIES

Field I/O signals connect to the FBM subsystem via DIN rail mounted termination assemblies (TAs).

For the FBM243, Termination Assemblies (P0916BA and P0931KJ) contain a 51 ohm resistor in series with each channel for use in non-intrinsically safe applications.

Termination Assembly (P0917XW) is a direct channel for use in intrinsically safe applications. An intrinsic safety barrier must be connected to each channel of this TA providing the necessary resistance for each channel.

TAs P0916BA and P0917XW are available in Polypropylene (PVC) material, while TA P0931KJ is available in Polyamide material.

For the FBM243b, TAs P0924QQ and P0924QY are available for use in non-intrinsically safe applications. TA P0924QY has output bypass jacks which assist in removing FBMs from service while continuing to provide manually driven milliamp output signals from an Output Bypass Station through the bypass jacks to prevent interruption of the process output signals, used during system maintenance.

The DIN rail mounted TAs connect to the FBM subsystem baseplate by means of a removable termination cable. The cable is available in a variety of lengths, up to 30 meters (98 feet), allowing the TA to be mounted in either the enclosure or in an adjacent enclosure.

Termination cables are available in the following materials:

- ▶ Polyurethane
- ▶ Low Smoke Zero Halogen (LSZH).

Refer to Table 1 on page 8.

CABLE BALUN MODULE

A Cable Balun Module maintains digital communication line balance for Intelligent Field Devices connected in FBM loops that are powered from a common external power supply. This powering method effectively connects one line of each loop to a single point. (Without the baluns, the multiple common connections at the external power source cause communication cross-talk between the loops.) Baluns are not required for loops that use internal power sourcing (powered from the FBM). The Cable Balun Module (Foxboro Part Number P0903SV) contains four baluns, with one balun used for each loop powered from the external power supply. Each balun adds 28 ohms of resistance to its associated loop.

Cable Balun Module		
Module Model	Module Part No.	No. of Baluns in the Module
CBM-4	P0903SV	4

FUNCTIONAL SPECIFICATIONS

Field Device Channel

INTERFACE

FBM243

8 isolated and independent channels

FBM243b

4 channel isolated, dual baud, FoxCom
communication channels and four
0 to 20 mA analog output channels

COMMUNICATIONS

Non-redundant, point-to-point, master/slave,
asynchronous, half-duplex communication, at a
software selectable baud rate of 600 or 4800
baud. Each channel baud rate may be
independently set.

ERROR CHECKING

CCITT 2-byte CRC

SPEED

10 messages per second at 4800 baud, or
2 messages per second at 600 baud.

MAXIMUM DISTANCE (INTERFACE TO FIELD DEVICE)

[Shielded twisted pair, or at minimum, twisted
pair with overall shield using 0.50 mm² (22 AWG)
wire]

600 m (2000 ft) (shielded twisted pair) at
4800 baud, or 1800 m (6000 ft) at 600 baud
The maximum allowable distance decreases
when the loop is operated through an intrinsic
safety barrier. See MI 020-350.

COMPLIANCE VOLTAGE

19 V dc minimum at 20.5 mA

Includes voltage drop across 51 Ω resistor in
Termination Assembly and 136 Ω resistor and
diodes in Redundant Adapter.

MAXIMUM LOOP RESISTANCE

Up to 400 Ω with Intrinsic Safety Barrier installed.
Up to 330 Ω with Intrinsic Safety Barrier not
installed.

FBM INPUT IMPEDANCE

200 Ω nominal

ISOLATION

Each channel is galvanically isolated and
referenced to ground, and the card itself is
referenced to ground. The module withstands,

without damage, a potential of 600 V ac applied
for one minute between any channel and earth
(ground) and between channels.

CAUTION

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

FIELD DEVICE INTERNAL POWER

23.1 to 25.3 V dc, source resistance 200 Ω
(includes 51 Ω resistor in Termination Assembly
and 136 Ω in Module)

FBM243b Output Channels (Four) - Specifications

ACCURACY - ANALOG (INCLUDES LINEARITY)

$\pm 0.03\%$ of Span

Accuracy temperature coefficient: ± 50 ppm/ $^{\circ}\text{C}$

OUTPUT LOAD

750 Ω maximum

OUTPUT PROCESSING DELAY

30 ms maximum

RESOLUTION

13 bits

FIELD DEVICE CABLING DISTANCE

Maximum distance of the field device from the
FBM is a function of compliance voltage (19.6 V
dc at 20.4 mA input), wire gauge, and voltage
drop at the field device.

LOOP POWER SUPPLY PROTECTION

Each channel is channel-to-channel galvanically
isolated, current limited, and voltage regulated.
All analog outputs are limited by their design to
about 25 mA. If the output FET shorts, the output
current could increase up to 35 mA. In normal
operation the FBM outputs a constant current
into a 0 to 750 ohm load.

FUNCTIONAL SPECIFICATIONS (CONTINUED)

Fieldbus Communication

Communicates with its associated FCM via the redundant 2 Mbps module Fieldbus

Power Requirements**INPUT VOLTAGE RANGE (REDUNDANT)**

24 V dc +5%, -10%

CONSUMPTION

7 W (maximum)

HEAT DISSIPATION

3 W (maximum)

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 (Industrial

Levels)

CISPR 11, Industrial Scientific and Medical (ISM) Radio-frequency Equipment -

Electromagnetic Disturbance Characteristics - Limits and Methods of Measurement

Meets: Class A Limits

IEC 61000-4-2 ESD Immunity

Contact 4 kV, air 8 kV

IEC 61000-4-3 Radiated Field Immunity

10 V/m at 80 to 1000 MHz

IEC 61000-4-4 Electrical Fast

Transient/Burst Immunity

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

IEC 61000-4-5 Surge Immunity

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

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. These modules are also UL

and UL-C listed as associated apparatus for

supplying non-incendive communication

circuits for Class I, Groups A-D hazardous

locations when connected to specified

Foxboro Evo™ 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 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 Foxboro Evo processor modules as

described in the *Standard and Compact*

200 Series Subsystem User's Guide

(B0400FA).

Calibration Requirements

Calibration of the module and termination assembly is not required.

ENVIRONMENTAL SPECIFICATIONS⁽¹⁾

Operating

TEMPERATURE

FBM243/243b
-20 to +70°C (-4 to +158°F)
Termination Assembly
-20 to +50°C (-4 to +122°F)

RELATIVE HUMIDITY

5 to 95% (noncondensing)

ALTITUDE

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

Storage

TEMPERATURE

-40 to +70°C (-40 to +158°F)

RELATIVE HUMIDITY

5 to 95% (noncondensing)

ALTITUDE

-300 to +12,000 m (-1,000 to +40,000 ft)

Contamination

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

Vibration

7.5 m/S² (0.75 g) from 5 to 500 Hz

PHYSICAL SPECIFICATIONS

Mounting

MODULE

The FBM243/243b mounts on a Modular Baseplate. The Modular Baseplate can be mounted on a DIN rail (horizontally or vertically), or horizontally on a 19-inch rack using a mounting kit. Alternatively, FBM243/243b mounts on a 100 Series conversion mounting structure. Refer to *Standard 200 Series Baseplates* (PSS 31H-2SBASEPLT) or *100 Series Conversion Mounting Structures* (PSS 31H-2W8) for details.

TERMINATION ASSEMBLY

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

Weight

MODULE

284 g (10 oz) approximate

TA - COMPRESSION SCREW

363 g (0.8 lb) approximate

Dimensions

MODULE

HEIGHT
102 mm (4 in)

114 mm (4.5 in) including mounting lugs

WIDTH

45 mm (1.75 in)

DEPTH

104 mm (4.11 in)

TERMINATION ASSEMBLIES

See page 9

Part Numbers

FBM243 MODULE

P0914TK

FBM243 TA - COMPRESSION SCREW

P0916BA and P0931KJ for non-intrinsic safety applications

P0917XW for intrinsic safety applications

FBM243b MODULE

P0927AD

FBM243b TA - COMPRESSION SCREW

P0924QQ and P0924QY (with output bypass jacks) for non-intrinsic safety applications

Indicators (mounted on front of module)

OPERATIONAL STATUS

Red and green light-emitting diodes (LEDs)

CHANNEL COMMUNICATION ACTIVITY

8 amber LEDs, one per channel

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

PHYSICAL SPECIFICATIONS (CONTINUED)

Termination Cables

CABLE LENGTHS

Up to 30 m (98 ft).

CABLE MATERIALS

Polyurethane or Low Smoke Zero Halogen (LSZH)

TERMINATION CABLE TYPE

Type 1 - Refer to Table 1

CABLE CONNECTION

FBM Baseplate End

37-pin D-subminiature

Termination Assembly End

25-pin D-subminiature

Termination Assembly Construction Material

MATERIAL

P0916BA and P0917XW

Polypropylene (PVC) Material, compression

P0931KJ, P0924QQ and P0924QY

Polyamide Material, compression

Field Termination Connections

COMPRESSION-TYPE ACCEPTED WIRING SIZES

Solid/Stranded/AWG

0.2 to 4 mm²/0.2 to 2.5 mm²/24 to 12 AWG

Stranded with Ferrules

0.2 to 2.5 mm² with or without plastic collar

Table 1. Termination Cable Types and Part Numbers

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

(a) P/PVC is polyurethane outer jacket and semi-rigid PVC primary conductor insulation.

Temperature range: -20 to +80°C (-4 to +176°F)

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

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

Upgrade Use of Termination Assemblies

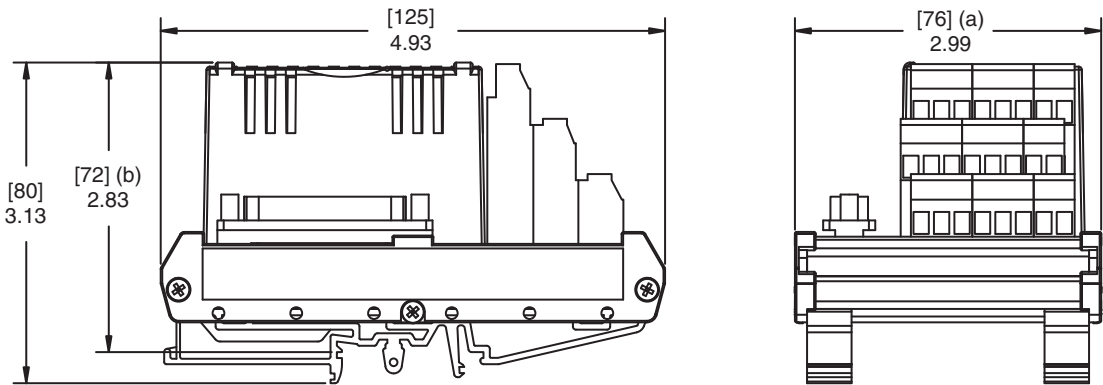
When an FBM243/243b is used to replace the 100 Series FBM, it may use any of the appropriate termination assemblies listed above for the 100 Series FBM's field I/O wiring. Alternatively, the

FBM243/243b can accept this field wiring through a Termination Assembly Adapter (TAA) instead of a termination assembly. This is discussed in *Termination Assembly Adapter Modules for 100 Series Upgrade* (PSS 31H-2W4).

DIMENSIONS – NOMINAL

[mm]
in

TERMINATION ASSEMBLY - Compression



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

RELATED PRODUCT SPECIFICATION SHEETS

PSS Number	Description
PSS 31H-2S200	Standard 200 Series Subsystem Overview
PSS 31H-2W100	100 Series Fieldbus Module Upgrade Subsystem Overview
PSS 31H-2CERTS	Standard and Compact 200 Series I/O - Agency Certifications
PSS 31H-2W4	Termination Assembly Adapter Modules for 100 Series Upgrade
PSS 31H-2SBASEPLT	Standard 200 Series Baseplates
PSS 31H-2W8	100 Series Conversion Mounting Structures
PSS 21S-3CP270ICS	Control Processor 270 (CP270) Integrated Control Software



Invensys Systems, Inc
10900 Equity Drive
Houston, TX 77041
United States of America
<http://www.invensys.com>

Global Customer Support
Inside U.S.: 1-866-746-6477
Outside U.S.: 1-508-549-2424
Website: <https://support.ips.invensys.com>

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