

**FBM246/246b, FoxCom™ Redundant Dual Baud Rate, Intelligent Device Interface Module**



*The FBM246 consists of a pair of Fieldbus Modules that contain eight individual channels, each providing digital communication capabilities to an Inven'sys® Intelligent Field Device. The FBM246b consists of a pair of Fieldbus Modules that each contain four dual baud, FoxCom™ communication channels and four 0 to 20 mA analog output channels.*

**FEATURES**

Key features of the FBM246/246b are:

- ▶ For the FBM246, eight individual digital communication channels
- ▶ For the FBM246b, four 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.
- ▶ Redundant modules increase reliability
- ▶ Allows use of an external power supply or the FBM246/246b internal isolated power to power the Intelligent Field Device

- ▶ Digital communication capabilities to an Invensys 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 FBM246/246b
- ▶ TAs for non-intrinsically safe or intrinsically safe applications.

## OVERVIEW

The FBM246, FoxCom™ Dual Baud Rate Intelligent Device Interface to Intelligent Field Devices consists of a pair of Fieldbus Modules that contain eight individual FoxCom channels.

The FBM246b, FoxCom™ Dual Baud Rate Intelligent Device Interface to Intelligent Field Devices consists of a pair of Fieldbus Modules that contain four dual baud, FoxCom communication channels and four 0 to 20 mA analog output channels.

Each input provides internal isolated power and digital communication capabilities to an Invensys Intelligent Field Device. Each channel communicates over a single twisted pair of wires and each channel of the FBM246/246b 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.). A redundant pair of the modules combine to provide redundancy at the Fieldbus Module (FBM) level, with field I/O wired to one common termination assembly (see Figure 1).

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 module while allowing a simultaneous 4 to 20 mA analog signal to an emergency shutdown system.

The modules are Intelligent Field Device hosts, 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 the 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 the 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 FBM246b module provides functionality formerly provided by the 100 Series FBM I/O subsystem. TAs are available which support the functionality of the 100 Series FBM46.

## HIGH RELIABILITY

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

The microprocessor of each module executes the I/O application program, plus diagnostic routines that validate the health of the FBM.

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

## NOTE

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

## COMPACT DESIGN

FBM246/246b 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.

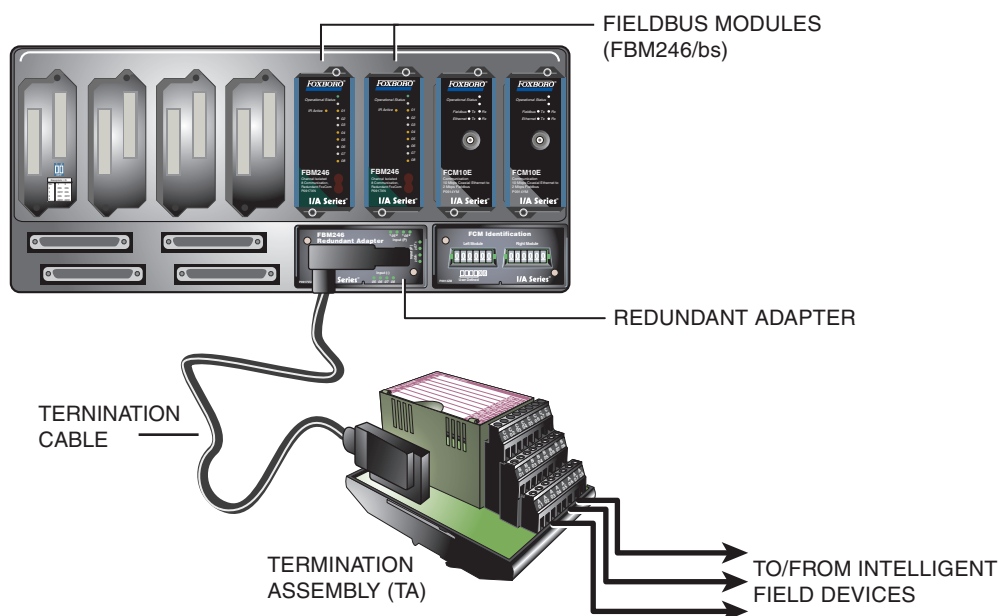


Figure 1. Redundant I/O Configuration

## VISUAL INDICATORS

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

## 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 FBM246/246b 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 FBM246/246b modules mount on a DIN rail mounted Modular Baseplate, 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.

Redundant modules must be located in adjacent positions on the baseplate (positions 1 and 2, 3 and 4, 5 and 6, or 7 and 8). To achieve redundancy, a redundant adapter module is placed on the two adjacent baseplate termination cable connectors to provide a single termination cable connection (see Figure 1). A single termination cable connects from the redundant adapter to the associated termination assembly (TA).

**TERMINATION ASSEMBLIES**

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

For the FBM246, 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 FBM246b, 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.

A redundant adapter connects the redundant FBMs baseplate input/output connectors together. The redundant adapter provides a single termination connection to a single TA (see Figure 1).

The DIN rail mounted TAs connect to the redundant adapter 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 9.

**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 (Invensys 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

##### *FBM246*

Eight isolated and independent channels

##### *FBM246b*

Four 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 mm<sup>2</sup> (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  $\Omega$  resistor in Termination Assembly and 136  $\Omega$  resistor and diodes in Redundant Adapter.

#### MAXIMUM LOOP RESISTANCE

Up to 400  $\Omega$  with Intrinsic Safety Barrier installed.  
Up to 330  $\Omega$  with Intrinsic Safety Barrier not installed.

#### FBM INPUT IMPEDANCE

200  $\Omega$  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 any channel.

#### 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  $\Omega$  (includes 51  $\Omega$  resistor in Termination Assembly and 136  $\Omega$  in Redundant Adapter)

### FBM246b Output Channels (Four) - Specifications

#### ANALOG ACCURACY

$\pm 0.05\%$  of span

#### OUTPUT LOAD

750  $\Omega$  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), wire resistance, 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.

### Fieldbus Communication

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

## FUNCTIONAL SPECIFICATIONS (CONTINUED)

### Power Requirements

#### INPUT VOLTAGE RANGE (REDUNDANT)

24 V dc +5%, -10%

#### CONSUMPTION

10 W (maximum) per pair

#### HEAT DISSIPATION

6 W (maximum) per pair

### 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

I/A Series® processor modules as described

in the *I/A Series DIN Rail Mounted*

*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 *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 and termination assembly is not required.

## ENVIRONMENTAL SPECIFICATIONS<sup>(1)</sup>

### Operating

#### TEMPERATURE

*FBM246/246b*

-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/S<sup>2</sup> (0.75 g) from 5 to 500 Hz

## PHYSICAL SPECIFICATIONS

### Mounting

#### MODULE

The FBM246/246b 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. 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). Alternatively, FBM246b mounts on a 100 Series conversion mounting structure. Refer to *DIN Rail Mounted Modular Baseplates* (PSS 21H-2W6 B4) or *100 Series Conversion Mounting Structures* (PSS 21H-2W8 B4) for details.

#### TERMINATION ASSEMBLY

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

### Mass

#### MODULE

284 g (10 oz) approximate (each module)

#### 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 10

### Part Numbers

#### FBM246 MODULE

P0917XN

#### FBM246 TA - COMPRESSION SCREW

P0916BA and P0931KJ for use with non-intrinsic safety applications

P0917XW for use with intrinsic safety applications

(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)

### Part Numbers (Cont.)

#### **FBM246b MODULE**

P0927AE

#### **FBM246b TA - COMPRESSION SCREW**

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

#### **REDUNDANT ADAPTER**

*FBM246*

P0917VU

*FBM246b*

P0924DZ

### Indicators (mounted on front of each module)

#### **OPERATIONAL STATUS**

Red and green light-emitting diodes (LEDs)

#### **CHANNEL COMMUNICATION ACTIVITY**

8 amber LEDs, one per channel

### 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 on page 9

#### **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 mm<sup>2</sup>/0.2 to 2.5 mm<sup>2</sup>/24 to 12 AWG

*Stranded with Ferrules*

0.2 to 2.5 mm<sup>2</sup> with or without plastic collar

## PHYSICAL SPECIFICATIONS (CONTINUED)

Table 1. Termination Cable Types and Part Numbers

| Cable Length<br>m (ft) | Type 1<br>P/PVC (a) | Type 1<br>LSZH (b) | Type 1<br>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.

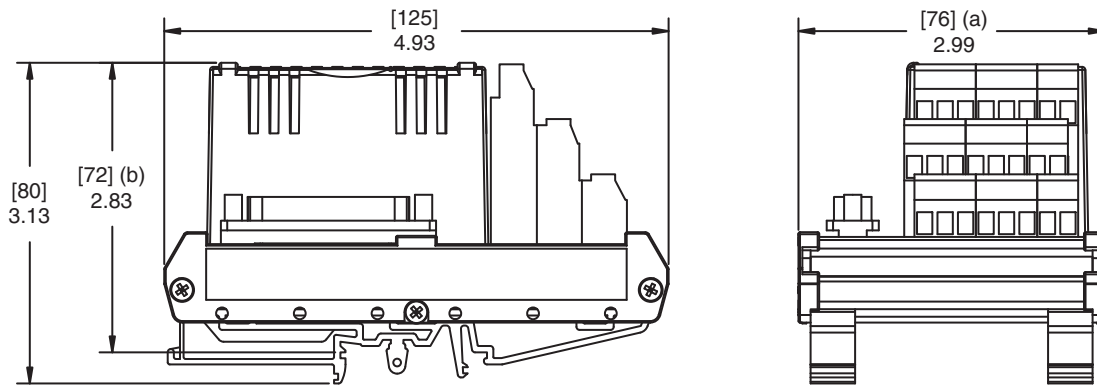
### Use of Termination Assemblies in 100 Series Upgrade Subsystem

When an FBM246b is used to replace the 100 Series FBM46, it may use any of the appropriate termination assemblies listed above for the FBM46's field I/O wiring. Alternatively, the FBM246b 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 21H-2W4 B4).

**DIMENSIONS—NOMINAL**

[mm]  
in

Termination Assemblies



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

**RELATED PRODUCT SPECIFICATION SHEETS**

| <b>PSS Number</b> | <b>Description</b>                                          |
|-------------------|-------------------------------------------------------------|
| PSS 21H-2W1 B3    | DIN Rail Mounted FBM Subsystem Overview                     |
| PSS 21H-2W1 B4    | 100 Series Fieldbus Module Upgrade Subsystem Overview       |
| PSS 21H-2W2 B3    | DIN Rail Mounted FBM Equipment, Agency Certification        |
| PSS 21H-2W4 B4    | Termination Assembly Adapter Modules for 100 Series Upgrade |
| PSS 21H-2W6 B4    | DIN Rail Mounted Modular Baseplates                         |
| PSS 21H-2W8 B4    | 100 Series Conversion Mounting Structures                   |
| PSS 21S-3B2 B3    | Control Processor 270 (CP270) Integrated Control Software   |

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