

FBM207/b/c Voltage Monitor/Contact Sense Input Modules

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Discrete inputs can be sensed across all the usual voltage levels found in industrial facilities. The FBM207/b/c uses one of the several termination assemblies to match to the externally powered voltage level. In cases where the inputs are critical to the plant's control scheme, the FBM 207/b/c may be installed as a redundant pair with standard control blocks used to manage the redundancy.

OVERVIEW

The FBM207/b/c Voltage Monitor/Contact Sense Input Module functions as a 16-channel dc voltage monitor or 16-channel contact sensor. Each channel accepts a 2-wire input from a dc voltage source (FBM207) or pair of contacts or solid state switches (FBM207b/ FBM207c). Associated termination

assemblies (TAs) support discrete input signals at voltages of 60 V dc, 120 V ac/125 V dc, or 240 V ac. For voltages higher than 60 V dc, the TAs have additional signal conditioning hardware that provides voltage attenuation and optical isolation.

The module is available in three distinct types, and each type with its associated TA supports discrete inputs as shown below:

FBM207	Provides voltage monitoring at: -60 V dc -120 V ac/125 V dc -240 V ac Provides switch inputs with: -External 120 V ac/125 V dc -External 240 V ac
FBM207b	24 V dc Contact Sense
FBM207c	48 V dc Contact Sense

Each discrete input is galvanically isolated from other channels and ground. Group isolated when used with external excitation.

The module performs signal conversion required to interface electrical input signals from field sensors to the redundant module Fieldbus. In addition, it executes programs for Discrete Input, Ladder Logic, Pulse Count, and Sequence of Events, with configurable options of Input Filter Time.

The module can be used as a single unit, or as a redundant pair (two FBM207s). When used as a redundant pair, the modules combine to provide redundancy at the Fieldbus Module (FBM) level, with field input signals received from one common termination assembly through a redundant adapter affixed to the FBMs' baseplate. The input current for redundant modules is doubled. A redundant digital input block in the Foxboro Evo™ Control Software validates each input in conjunction with information to/from the module, and selects the input with the highest quality for processing in the control strategy.

In a redundant configuration, contact sense power from each module is diode OR'd together in the redundant adapter to assure redundant power.

A redundant contact input function block, CINR, is used for each redundant pair of inputs. The CINR block handles input reads and initialization logic for the redundant channels. On each execution cycle of the CINR block, identical reads are sent to both modules, fully exercising the fieldbus and the logic circuitry of each module.

FEATURES

Key features of the FBM207/b/c modules are:

- ▶ Sixteen discrete inputs
- ▶ Supports discrete input signals at voltages of:
 - 15 to 60 V dc - contact sense
 - 120 V ac/125 V dc - voltage monitoring or switch inputs
 - 240 V ac - voltage monitoring or switch inputs
- ▶ Each input is galvanically isolated. Group isolated with external excitation
- ▶ Single or redundant modules
- ▶ Compact, rugged design suitable for enclosures in Class G3 (harsh) environments
- ▶ Executes programs for Discrete Input, Ladder Logic, Pulse Count, and Sequence of Events with configurable Input Filter Time option
- ▶ Termination Assemblies (TAs) for locally or remotely connecting field wiring to the FBM207
- ▶ Termination Assemblies for per channel internally and/or externally loop powered devices
- ▶ Various Termination Assemblies (TAs) have additional signal conditioning hardware that provides voltage attenuation and optical isolation.

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COMPACT DESIGN

FBM207/b/c has a compact design, with a rugged extruded aluminum exterior for physical protection of the circuits.

Enclosures specially designed for mounting the FBMs provide various levels of environmental protection, up to harsh environments (Class G3), per ISA Standard S71.04.

VISUAL INDICATORS

Light-emitting diodes (LEDs) incorporated into the front of the module provide visual indication of the Fieldbus Module operational status, as well as the discrete states of the individual input points.

EASY REMOVAL/REPLACEMENT

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

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

SEQUENCE OF EVENTS

The Sequence of Events (SOE) software package (for use with I/A Series® software V8.x and Control Core Services software v9.0 or later) is used for acquisition, storage, display, and reporting of events associated with digital input points in a control system. SOE, using the optional GPS based time synchronization capability, supports data acquisition across control processors at intervals of up to one millisecond, depending on the signal source.

Refer to *Sequence of Events* (PSS 31S-2SOE) to learn more about this package, and to *Time Synchronization Equipment* (PSS 31H-4C2) for a description of the optional time synchronization capability.

I/A Series systems with software earlier than V8.x can support SOE through ECB6 and EVENT blocks. However, these systems do not support GPS time synchronization and use a timestamp sent by the Control Processor which is only accurate to the nearest second and is not synchronized between different Control Processors.

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FIELDBUS COMMUNICATION

A Fieldbus Communications Module or a Control Processor interfaces to the redundant 2 Mbps module Fieldbus used by the FBMs. The FBM 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 module mounts on a DIN rail mounted 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 odd and even adjacent positions on the baseplate (positions 1 and 2, 3 and 4, 5 and 6, or 7 and 8). To achieve the redundancy, a redundant adapter module is placed on the two adjacent baseplate termination cable connectors to provide a single termination cable connection. A single termination cable connects from the redundant adapter to the associated TA.

To system configurator applications and monitoring through SMON, System Manager, and SMDH, redundant modules appear to be separate, nonredundant modules. The functional redundancy for these modules is provided by their associated control blocks.

SECURITY

Field power, for contacts or solid-state switches, is current limited.

TERMINATION ASSEMBLIES

Field I/O signals connect to the FBM subsystem via DIN rail mounted TAs. The TAs used with the FBM207/b/c are described in "TERMINATION ASSEMBLIES AND CABLES" on page 9.

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FUNCTIONAL SPECIFICATIONS

Communication

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

Input

16 isolated and independent channels

Accuracy

Pulse Count

No missing pulses for pulse rate 0 to 250 Hz

Filter/Debounce Time(1)

Configurable (No Filtering, 4, 8, 16, or 32 ms)

Voltage Monitor Function - Input

INPUT

Logic One, On-State Voltage: 15 to 60 V dc

Logic Zero, Off-State Voltage: 0 to 5 V dc

Current: 1.4 mA (typical) at 5 to 60 V dc

SOURCE RESISTANCE LIMITS

Logic One, On-State: 1 k Ω (maximum) at 15 V dc

Logic Zero, Off-State: 100 k Ω (minimum) at 60 V dc

Contact Sensor Function - Input

RANGE (EACH CHANNEL)

Contact open (off) or closed (on)

OPEN-CIRCUIT VOLTAGE

FBM207b, 24 V dc $\pm 15\%$; FBM207c, 48V dc $\pm 15\%$

SHORT-CIRCUIT CURRENT

3.2 mA (typical)

LOGIC ONE, ON-STATE RESISTANCE

1.0 k Ω (maximum)

LOGIC ZERO, OFF-STATE RESISTANCE

100 k Ω (minimum)

Isolation

Each channel is galvanically isolated from all other channels and earth (ground). The module withstands, without damage, a potential of 600 V ac applied for one minute between any channel and ground, or between a given channel and any other 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.

Power Requirements

INPUT VOLTAGE RANGE (REDUNDANT)

24 V dc +5%, -10%

CONSUMPTION (MAXIMUM)

FBM207, 3 W; FBM207b, 4 W; FBM207c, 5 W

HEAT DISSIPATION (MAXIMUM)

FBM207, 5.5 W; FBM207b, 4 W; FBM207c, 5 W

Loop Power Supply Protection

Current limited at 3.2 mA (typical)

Field Terminations Functional Specifications

Refer to "TERMINATION ASSEMBLIES AND CABLES" on page 9.

Calibration Requirements

Calibration of the module and termination assembly is not required.

(1) Digital filtering available for 200 Series FBM or competitive migration modules with version 1.25H or later firmware.

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FUNCTIONAL SPECIFICATIONS (CONTINUED)

Regulatory Compliance

ELECTROMAGNETIC COMPATIBILITY (EMC)

European EMC Directive 2004/108/EC

Meets: EN 50081-2 Emission standard
EN 50082-2 Immunity standard
EN 61326 EMC Standard (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, V 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

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

IEC 61000-4-8 Power Frequency Magnetic Field Immunity

30 A/m at 50 and 60 Hz

PRODUCT SAFETY - LOW VOLTAGE INPUTS

Underwriters Laboratories (UL) for U.S. and Canada

UL/AUL-C listed as suitable for use in 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 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 2006/95/EC and Explosive Atmospheres (ATEX) directive 94/9/EC

CENELEC (DEMKO) certified for use in CENELEC certified Zone 2 enclosures and certified as associated apparatus for supplying non-incendive field circuits for Zone 2, Group IIC, potentially explosive atmospheres when connected as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA).

PRODUCT SAFETY - TERMINATION

ASSEMBLIES WITH HIGH VOLTAGE INPUTS

Underwriters Laboratories (UL) for U.S. and Canada

UL/AUL-C listed as suitable for use in ordinary locations and compliant with UL 3121, First Edition, and Canadian Standard, C22.2 No.1010.1-92 when connected to specified Foxboro Evo processor modules as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA).

European Low Voltage Directive 73/23/EEC Certified for use in ordinary locations and compliant with IEC 61010 when connected as described in the *Standard and Compact 200 Series Subsystem User's Guide* (B0400FA).

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ENVIRONMENTAL SPECIFICATIONS⁽²⁾

Operating Conditions

TEMPERATURE

FBM207/b/c

-20 to +70°C (-4 to +158°F)

Termination Assembly

PVC

-20 to +50°C (-4 to 122°F)

PA

-20 to +70°C (-4 to +158°F)

RELATIVE HUMIDITY

5 to 95% (noncondensing)

Storage Conditions

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.

Vibration

7.5 m/s² from 5 to 500 Hz

⁽²⁾ The environment ranges can be extended by the type of enclosure containing the module. [Refer to the Product Specification Sheet (PSS) applicable to the enclosure that is to be used.]

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PHYSICAL SPECIFICATIONS

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Mounting

FBM207/FMB207b/FBM207c mounts on a Modular baseplate. 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 even adjacent positions on the baseplate (positions 1 and 2, 3 and 4, 5 and 6, or 7 and 8). See PSS 31H-2SBASEPLT for details.

Termination Assembly

The TA mounts on a DIN rail and accommodates multiple DIN rail styles including 32 mm (1.26 in) and 35 mm (1.38 in)

Weight

MODULE

284 g (10 oz) approximate

TERMINATION ASSEMBLY - COMPRESSION

127 mm (5.02 in) – 272 g (0.60 lb, approximate)

146 mm (5.75 in) – 317 g (0.7 lb, approximate)

TERMINATION ASSEMBLY - RING LUG

198 mm (7.78 in) – 400 g (0.90 lb, approximate)

216 mm (8.51 in) – 440 g (1.0 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)

Dimensions - Termination Assembly

COMPRESSION SCREW

Refer to page 13.

RING LUG

Refer to page 14.

Part Numbers

MODULES

FBM207

P0914TD

FBM207b

P0914WH

FBM207c

P0917GY

TERMINATION ASSEMBLIES

Refer to "TERMINATION ASSEMBLIES AND CABLES" on page 9.

REDUNDANT ADAPTER

P0926ZY

Termination Cables

CABLE LENGTHS

Up to 30 m (98 ft)

CABLE MATERIALS

Polyurethane or Low Smoke Zero Halogen (LSZH)

TERMINATION CABLE TYPE

Type 4 - Refer to Table 2

CABLE CONNECTION

37-pin male D-subminiature

Construction - Termination Assembly

MATERIAL

Polypropylene (PVC), compression

Polyamide (PA), compression

PVC, ring lug

PA, ring lug

FAMILY GROUP COLOR

Dark blue - discrete

TERMINAL BLOCKS

Inputs - 2 tiers, 16 positions

Excitation - 2 tiers, 4 positions

Field Termination Connections

COMPRESSION - 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

RING-LUG - ACCEPTED WIRING SIZES

#6 size connectors (0.375 in (9.5 mm))

0.5 to 4 mm²/22 AWG to 12 AWG