

Compact FBM207b Contact Sense Input Interface Modules



The Compact FBM207b Contact Sense Input Interface Module functions as a 16-channel contact sensor.

FEATURES

Key features of the Compact FBM207b are:

- ▶ Sixteen discrete inputs: 24 V dc contact sense
- ▶ Each input is galvanically isolated.
- ▶ 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 Compact FBM207b
- ▶ Termination Assemblies for per channel internally loop powered devices

OVERVIEW

The Compact FBM207b Contact Sense Input Interface Module functions as a 16-channel contact sensor for 24 V dc inputs. Each channel accepts a pair of contacts or solid state switches. Associated termination assemblies (TAs) support discrete input signals. It is part of the Compact 200 Series I/O subsystem described in *Compact 200 Series I/O Subsystem Overview* (Reference 1). (See Table 3, "Reference Documents," on page 11 at the end of this document.)

Each discrete input is galvanically isolated from other channels and ground.

The module performs signal conversion required to interface electrical input signals from field sensors to the redundant module Fieldbus. In addition, it may execute 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. When used as a redundant pair, the modules combine to provide redundancy at the FBM level, with field input signals received from one common termination assembly through a redundant adapter affixed to the Compact FBMs' baseplate. The input current for redundant modules is doubled. A redundant digital input block in the control software validates each input in conjunction with information to/from the module, and selects the input with the higher quality for processing in the control strategy.

A redundant contact input function block, CINR, is used for each 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 queried from each module, fully exercising the fieldbus and the logic circuitry of each module.

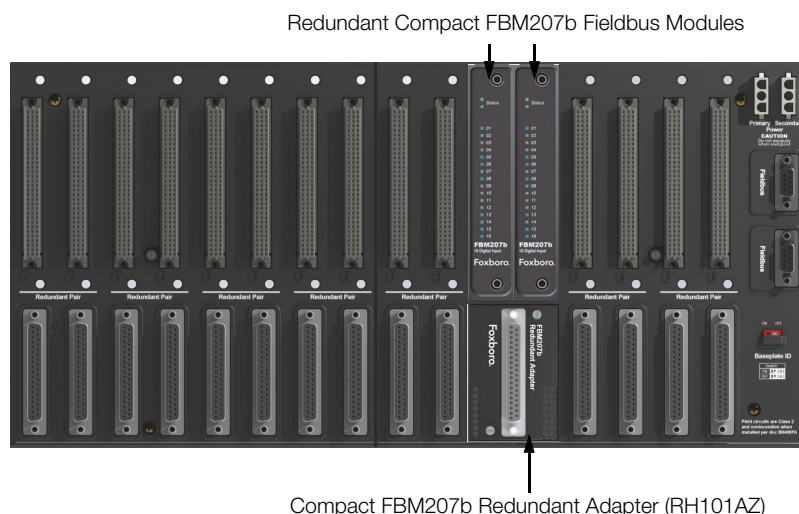


Figure 1. Compact FBM207b Redundant Module Configuration

COMPACT DESIGN

The Compact FBM207b's design is narrower than the standard 200 Series FBMs, with a rugged acrylonitrile butadiene styrene (ABS) 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 module's operational status, as well as the discrete states of the individual input points.

EASY REMOVAL/REPLACEMENT

The module mounts on a Compact 200 Series baseplate which is either DIN rail mounted or rack mounted horizontally, and includes signal connectors for redundant Fieldbus, redundant independent dc power, and termination cables. Two screws on the FBM secure the module to the Compact 200 Series baseplate.

Redundant modules must be located in adjacent positions on the baseplate, with the first module located in an odd-numbered position (for example, the positions labelled "3" and "4"). To achieve redundancy, a redundant adapter module is placed on the two adjacent baseplate termination cable connectors to provide termination for a single cable (see Figure 1). A single termination cable connects from the redundant adapter to the associated termination assembly (TA).

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

REDUNDANT MODULES IN FOXBORO EVO HMI

The redundant pair of modules appear as two independent modules to system management software applications (such as System Manager, and System Manager/Display Handler (SMDH)). The functional redundancy for these modules is provided by their associated control blocks.

SEQUENCE OF EVENTS

The Sequence of Events (SOE) software package is used to acquire, store, display, and report events associated with a contact's change of state. System time is distributed to the FBM and the state change is marked with a precision of one millisecond and an accuracy of +/- 0.5 milliseconds. The contact signal may be passed through a debounce filter of variable period. System time is usually set by an optional master timekeeper receiving GPS time signals. This permits multiple control processors to be synchronized in time and therefore provide a consistent time basis for post-event analysis.

Refer to *Sequence of Events* (Reference 2) to learn more about this package, and to *Time Synchronization Equipment* (Reference 3) for a description of the optional time synchronization capability.

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 off at the system level, the module continues communication over the active path.

OVERCURRENT PROTECTION

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

TERMINATION ASSEMBLIES (TA)

Field I/O signals connect to the FBM subsystem via DIN rail mounted TAs. The TAs used with the Compact FBM207b are described in "TERMINATION ASSEMBLIES AND CABLES" on page 8.

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

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

Contact Sensor Function - Input

RANGE (EACH CHANNEL)

Contact open (off) or closed (on)

OPEN-CIRCUIT VOLTAGE

24 V 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)

5 W

HEAT DISSIPATION (MAXIMUM)

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 8.

Calibration Requirements

Calibration of the module and termination assembly is not required.

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

± 2 kV on ac and dc power lines; ± 1 kV 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/UL-C listed as suitable for use in Class I, Groups A-D; Division 2; temperature code T4 enclosure based systems.

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 *DIN Rail Mounted Subsystem User's Guide* (Reference 4).

European Low Voltage Directive 2006/95/EC and Explosive Atmospheres (ATEX) directive 94/9/EC

ATEX (DEMKO) Ex nA IIC T4 Gc certified when connected as described in the *DIN Rail Mounted Subsystem User's Guide* (Reference 4). For use in an enclosure suited for an ATEX Zone 2 classified area.

ENVIRONMENTAL SPECIFICATIONS

Operating Conditions

TEMPERATURE

FBM207b

-20 to + 60°C (-4 to +140°F)

Termination Assembly

PVC⁽¹⁾

-20 to +50°C (-4 to 122°F)

PA

-20 to +70°C (-4 to +158°F)

RELATIVE HUMIDITY

5 to 95% (noncondensing)

ALTITUDE

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

Storage Conditions

TEMPERATURE

-40 to +85°C (-40 to +185°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 from 5 to 500 Hz

(1) Do not use this termination assembly when the temperature specification exceeds +50°C (122°F).

PHYSICAL SPECIFICATIONS

Mounting

MODULE

The Compact FBM207b mounts on a Compact 200 Series 16-slot horizontal baseplate. The baseplate can be mounted on a horizontal DIN rail, 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, 7 and 8, 9 and 10 (the second 1 and 2), 11 and 12 (the second 3 and 4), 13 and 14 (the second 5 and 6), or 15 and 16 (the second 7 and 8)). Refer to *Compact 200 Series 16-Slot Horizontal Baseplate* (Reference 5) 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)

Mass

MODULE

185 g (6.5 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

130 mm (5.12 in)

WIDTH

25 mm (0.98 in)

DEPTH

150 mm (5.9 in) - Including baseplate connectors, 139 mm (5.46 in)

Dimensions - Termination Assembly

COMPRESSION SCREW

Refer to page 10.

RING LUG

Refer to page 10.

Part Numbers

COMPACT FBM207b MODULE

RH101AF

TERMINATION ASSEMBLIES

Refer to "TERMINATION ASSEMBLIES AND CABLES" on page 8.

REDUNDANT ADAPTER

RH101AZ

Termination Cables

CABLE LENGTHS

Up to 30 m (98 ft)

CABLE MATERIALS

Polyurethane (PVC) or Low Smoke Zero Halogen (LSZH)

TERMINATION CABLE TYPE

Type 4 or Type 4H - Refer to Table 2

CABLE CONNECTION

37-pin male D-subminiature

Construction - Termination Assembly

MATERIAL

PVC, compression

Polyamide (PA), compression

PVC, ring lug

FAMILY GROUP COLOR

Dark blue - discrete

TERMINAL BLOCKS

Inputs - 2 tiers, 16 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

TERMINATION ASSEMBLIES AND CABLES

General Description

Field I/O signals connect to the FBM subsystem via DIN rail mounted termination assemblies (TAs). Multiple types of TAs are available with FBMs to provide pass-thru I/O signal connections.

The termination assembly can be used with a single Compact FBM207b or with a redundant pair (two Compact FBM207bs).

The DIN rail mounted termination assemblies connect to the FBM subsystem baseplate by means of removable termination cables. When used with a redundant module pair, the termination assembly is connected to the baseplate using a Compact FBM207b redundant adapter (RH101AZ). The DIN rail mounted TAs connect to the redundant adapter by means of a removable termination cable.

The cables for both single and redundant configurations are available in a variety of lengths, up to 30 meters (98 feet), allowing the termination assemblies to be mounted as needed by plant design. Refer to Table 2 on page 9 for termination cable part numbers and specifications.

Discrete Inputs

Termination assemblies with discrete contact sense inputs support sixteen 2-wire discrete input signals at passive low voltage levels of +24 V dc.

Low Voltage Discrete Inputs

Contact sense inputs use the FBM +24 V dc supplied to all input channels on the assembly, to wet field contacts.

A load may not be required for proper operation of the input channels. A diode may be required for a dc inductive load only.

FUNCTIONAL SPECIFICATIONS - TERMINATION ASSEMBLIES

FBM Type	Input Signal	TA Part No. ^(a)		Termination Type ^(b)	TA Cable Type ^(c)	TA Certification Type ^(d)
		PVC	PA			
Compact FBM207b	16 channel, contact sense 24 V dc contact wetting from Compact FBM207b FBM207b channel isolation	P0916JS P0916PP	P0916XT	C RL	4	1, 2

(a) PVC (polyvinyl chloride) termination assemblies rated from -20 to +50°C (-4 to 122°F); PA (polyamide) termination assemblies rated from -20 to +70°C (-4 to +158°F).

(b) C= TA with compression terminals, RL = TA with ring lug terminals.

(c) See to Table 2 for cable part numbers and specifications.

(d) See to Table 1 Termination Assembly certification definitions.

Table 1. Certifications for Termination Assemblies

Type	Certification
Type 1	TAs are UL/UL-C listed as suitable for use in Class I; Groups A-D; Division 2 temperature code T4 hazardous locations. They are CENELEC (DEMKO) certified Ex nA IIC T4 for use in Zone 2 potentially explosive atmospheres.
Type 2	TAs are UL/UL-C listed as associated apparatus for supplying non-incendive field circuits Class I; Groups A-D; Division 2 hazardous locations when connected to specified DIN rail mounted FBMs and field circuits meeting entity parameter constraints specified in <i>DIN Rail Mounted Subsystem User's Guide</i> (Reference 4). They are also CENELEC (DEMKO) certified as associated apparatus for supplying field circuits for Group IIC, Zone 2 potentially explosive atmospheres. Field circuits are also Class 2 limited energy (60 V dc, 30 V ac, 100 VA or less) if customer-supplied equipment meets Class 2.

Table 2. Cable Types and Part Numbers

Length m (ft)	Type 4, 26 AWG ^(a) P/PVC	Type 4H, 22 AWG ^{(a)(b)} P/PVC	Type 4 LSZH ^(c)	Type 4H ^{(b)(c)} , LSZH
0.5 (1.6)	RH100CJ	-	RH100BN	-
1.0 (3.2)	RH100CK	-	RH100BP	-
2.0 (6.6)	RH100CL	-	RH100BQ	-
3.0 (9.8)	RH100CM	-	RH100BR	-
5.0 (16.4)	RH100CN	-	RH100BS	-
10.0 (32.8)	RH100CP	RH100CX	RH100BT	RH100DC
15.0 (49.2)	RH100CQ	RH100CY	RH100BU	RH100DD
20.0 (65.6)	RH100CR	RH100CZ	RH100BV	RH100DE
25.0 (82.0)	RH100CS	RH100DA	RH100BW	RH100DF
30.0 (98.4)	RH100CT	RH100DB	RH100BX	RH100DG

(a) P/PVC cable assembles polyurethane outer jacket and semi-rigid PVC primary conductor insulation temperature range: -20 to +70°C (-4 to 158°F)

(b) Type 4H cables are used to reduce voltage drop in long (greater than 5 m (15 ft)) cable run applications.

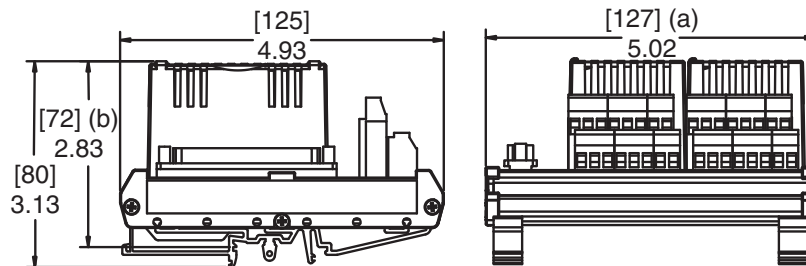
(c) Low smoke zero halogen or low smoke free of halogen (LSZH) is a material classification used for cable jacketing. LSZH is composed of thermoplastic or thermoset compounds that emit limited smoke and no halogen when exposed to high sources of heat. Temperature range: -40 to +105°C (-40 to +221°F)

DIMENSIONS—NOMINAL

[mm]
in

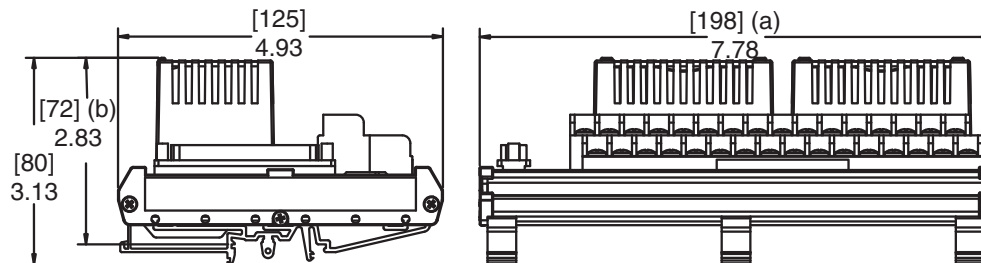
Compression Termination Assemblies

P0916JS, P0916XT¹



Ring Lug Termination Assemblies

P0916PP



(a) Overall width — for determining DIN rail loading.

(b) Height above DIN rail (add to DIN rail height for total).

¹Dimensions shown are for the PVC and polyamide termination assemblies.

RELATED PRODUCT DOCUMENTS

Table 3. Reference Documents

Reference	Document Number	Description
1	PSS 31H-2COV B3	Compact 200 Series I/O Subsystem Overview
2	PSS 21S-2B9 B4	Sequence of Events
3	PSS 21H-4C2 B3	Time Synchronization Equipment
4	B0400FA	DIN Rail Mounted Subsystem User's Guide
5	PSS 31H-2C200 B4	Compact 200 Series 16-Slot Horizontal Baseplate

Table 4. Other Related Documents

Document Number	Description
PSS 31H-2W12 B3	DIN Rail Mounted Compact 200 Series I/O Equipment, Agency Certifications
PSS 31H-2C480 B4	Compact Power Supply - FPS480-24
PSS 31S-3B3 B3	Field Control Processor 280 (FCP280) Integrated Control Software
PSS 21S-3B2 B3	Control Processor 270 (CP270) Integrated Control Software

