

FBM237, 0 to 20 mA Output Module (Redundant Ready)

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The FBM237 contains eight 0-20 mA analog output channels. In situations where control system reliability is important, the FBM237 may have a redundant module installed. This permits all eight outputs to maintain operation in the presence of a single fault and during the time that the suspect module is removed and replaced. The 0-20 mA signals are electrically compatible with HART® field devices.

OVERVIEW

The FBM237, 0 to 20 mA Output Module contains eight channels. The outputs are galvanically isolated from other channels and ground. The module can be used as a single unit, or as a redundant pair (two FBM237s).

When used as a redundant pair, field output signals are wired to one common termination assembly (see Figure 1). Each module in the pair independently holds the output(s) at its specified output value(s).

FEATURES

The key features of the FBM237 are:

- ▶ Eight 20 mA dc analog output channels
- ▶ Each output channel is galvanically isolated
- ▶ Single or redundant modules
- ▶ Compact, rugged design suitable for enclosure in Class G3 (harsh) environments
- ▶ Termination Assemblies (TAs) for locally or remotely connecting field wiring to the FBM237

- ▶ TA for use with Output Bypass Station to maintain outputs during maintenance operations
- ▶ 3-tier termination assembly for per channel internally and/or externally loop powered transmitters.

REDUNDANT ANALOG OUTPUTS

A redundant analog output function block, AOUTR, is used for each redundant pair of outputs. The AOUTR block handles output writes and initialization logic for the redundant channels. On each execution cycle identical output writes are sent to both modules, fully exercising the fieldbus and the logic circuitry of each module. When a failure is detected in one of the modules, its output is driven to 0 mA and the corresponding channel in the good module automatically continues supplying the proper current.

Each output channel drives an external load. Transmitter power from each module is diode OR'd together in the redundant adapter to assure redundant power. The microprocessor of each module executes the analog output application program, plus security routines that validate the health of the module.

Configurable options in the modules include Fail-Safe Action (Hold/Fallback), Analog Output Fail-Safe Fallback Data (on a per channel basis), Fieldbus Fail-Safe Enable, and Fieldbus Fail-Safe Delay Time. The Analog Output Fail-Safe Fallback Data option must be set for 0 mA output. This removes one of the pair of output channels from service for detectable problems such as a module not properly receiving output writes, or not passing security tests on FBM microprocessor writes to output registers. Setting of the Analog Output Fail-Safe Fallback Data option for 0 mA output also minimizes the possibility of a "fail high" result.

PHYSICAL DESIGN

FBM237 has a modular 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.

HIGH RELIABILITY

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

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

VISUAL INDICATORS

Light-emitting diodes (LEDs) incorporated into the front of the module provide visual status indications of fieldbus module functions.

FIELDBUS COMMUNICATION

A Fieldbus Communications Module or a Control Processor interfaces to the redundant 2 Mbps module Fieldbus used by the FBMs. The FBM237 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 the Standard Modular baseplate, which accommodates up to eight Fieldbus Modules. The Modular baseplate is either DIN rail mounted or rack mounted, and includes signal connectors for redundant Fieldbus, redundant independent dc power, and termination cables. Redundant modules must be located in adjacent

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of which two pairs of modules (positions 1 and 2, 3 and 4, 5 and 6, or 7 and 8). To achieve the redundant output, 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 TA.

To system configurator applications and to other systems monitoring through SMON, System Manager, and SMDH, redundant FBM237 modules

appear to be separate, nonredundant modules. The functional redundancy for these modules is provided by their associated control blocks.

TERMINATION ASSEMBLIES (TA)

Field I/O signals connect to the FBM subsystem via DIN rail mounted termination assemblies. The TAs used with the FBM237 are described in "TERMINATION ASSEMBLIES AND CABLES" on page 7.

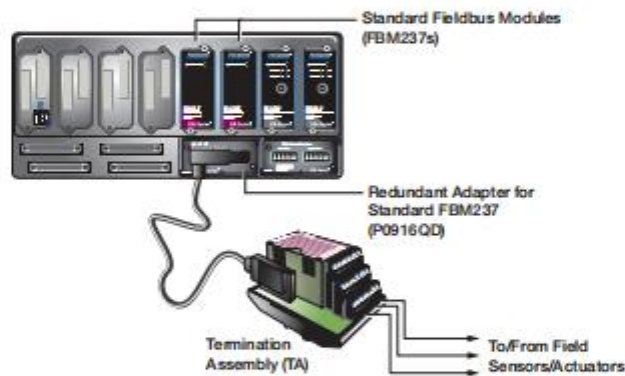


Figure 1. Redundant I/O Configuration

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PSS 31H-2Z37

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FUNCTIONAL SPECIFICATIONS

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Output Channels

Eight 20 mA dc analog output channels. Each channel is isolated and independent.

NOTE

Redundant pairs (output) are connected by a common field I/O connector, and therefore are not isolated from each other.

Accuracy - Analog (includes linearity)

±0.05% of Span (between 0.1 mA and 20 mA)
Accuracy temperature coefficient: ±50 ppm/°C

Output Load

750 Ω maximum

Output Processing Delay

30 ms maximum

Output Range (each channel)

0 to 20.4 mA dc

Resolution

13 bits

Field Device Cabling Distance

Maximum distance of the field device from the FBM is a function of compliance voltage (18 V dc at 20.4 mA output), wire gauge, and voltage drop at the field device.

HART® Protocol Compatibility

The channels meet the impedance requirements for a HART high Impedance Device and can be used in a HART loop without interfering with the HART signals between the field device and a Hand-Held Communicator (HHC).

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.

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.

Communication

Communication with its associated FCM or FCP via the module fieldbus.

Power Requirements

INPUT VOLTAGE RANGE (REDUNDANT)

24 V dc +5%, -10%

CONSUMPTION (MAXIMUM)

7 W (maximum) at 24 V dc

HEAT DISSIPATION (MAXIMUM)

5 W (maximum) at 24 V dc

Calibration Requirements

Calibration of the module and termination assembly is not required.

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, V dc power and communication

lines

FUNCTIONAL SPECIFICATIONS (CONTINUED)

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, 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

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). Also see, "Certification for Termination Assemblies" on page 9.

NOTE

CENELEC (DEMKO) Certification does not apply to Termination Assembly P0917QZ. See Table 2 on page 8.

ENVIRONMENTAL SPECIFICATIONS⁽¹⁾

Operating Conditions

TEMPERATURE

Module

-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)

ALTITUDE

-300 to +3000 m (-1000 to +10 000 ft)

Storage Conditions

TEMPERATURE

-40 to +70°C (-40 to +158°F)

RELATIVE HUMIDITY

5 to 95% (noncondensing)

ALTITUDE

-300 to +12 000 m (-1000 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 (5 to 500 Hz)

(1) 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.

PHYSICAL SPECIFICATIONS

Mounting

MODULE

The FBM237 mounts on a modular baseplate. The 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) along with the appropriate redundancy adapter. Refer to *Standard 200 Series Baseplates* (PSS 31H-2SBASEPLT) for details. Alternatively, a non-redundant FBM237 mounts on a 100 Series conversion mounting structure. Refer to *100 Series Conversion Mounting Structures* (PSS 31H-2W8) 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 ASSEMBLIES

Compression

181 g (0.40 lb, approximate)

Ring Lug

249 g (0.55 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 Assemblies

Refer to page 10

Part Numbers

FBM237 MODULE

P0914XS

TERMINATION ASSEMBLIES

See "0 to 20 mA Analog Outputs - FBM237 Termination Assemblies" on page 7.

REDUNDANT ADAPTER

P0916QD

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 3

CABLE CONNECTION

25-pin male D-subminiature

Construction - Termination Assembly

MATERIAL

Polypropylene (PVC), compression
Polyamide (PA), compression
PVC, ring lug

FAMILY GROUP COLOR

Raspberry red - analog

TERMINAL BLOCKS

Outputs - 3 tiers, 8 positions
Output Bypass Jacks - 8 (P0917QZ)

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