Bailey Hartmann & Braun symphony™

Harmony Rack Analog Input/Output

Data Sheet

Description

Harmony rack I/O incorporates a variety of input and output devices to interface process signals to the Symphony Enterprise Management and Control System. Analog input modules interface field inputs such as pressure and flow transmitter signals, thermocouple (TC) inputs, and resistive temperature device (RTD) inputs. Analog output modules provide output signals to adjust final control elements such as control valves, pumps, positioners, actuators, etc.

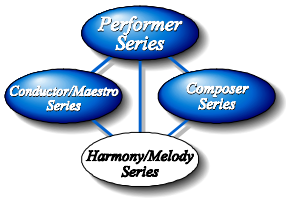
An analog I/O module consists of a single printed circuit board that occupies one slot in a module mounting unit (MMU). In general, jumpers and switches on the printed circuit board and jumpers and dipshunts on the termination unit configure the module and its I/O channels. A cable connects the I/O module to its termination unit. The physical connection points for field wiring are on the termination unit.

Analog Input

IMASI13

The IMASI13 Isolated Analog Input module processes up to 16 analog field inputs for a Harmony controller. The controller utilizes function codes 215 (enhanced analog module definition), 216 (enhanced analog input definition), and 217 (enhanced calibration command) to configure and calibrate the module, and to configure and access the module input channels. Each channel can be individually programmed for the following input types:

- 4 to 20 milliampere.
- –10 to +10 VDC.
- –100 to +100 millivolt (DC).
- Thermocouple:
  E, J, K, L, N (14 AWG), N (28 AWG), R, S, T, U.
  Chinese E, S.
- RTD:
  10 Ω copper.
  100 Ω platinum (U.S. Lab. Standard, U.S. Industry Standard, European Standard).
  120 Ω nickel.
  Chinese 53 Ω copper.



Each channel features a dedicated A/D converter with a resolution of 24 bits. Input processing, calibration, point value calculations, lead wire resistance adjustment, cold junction compensation, gain and offset adjustment and engineering units conversion are all automatically performed by the IMASI13 module. Each channel has a separate stable reference that automatically insures measurement accuracy and data integrity over time and temperature.

Each channel provides underrange, overrange, and open input detection. Onboard circuitry detects either open field wires or a disconnected termination device cable. Open input detection is provided for all input types and can detect any combination of open input wires. Input channels are individually isolated from every other channel and from system electronics.

IMFEC11

The IMFEC11 Analog Input module processes up to 15 analog field inputs for a Harmony controller. The controller utilizes function codes 132 (analog input group) to configure and access the module input channels. Additionally, function code 133 (smart field device definition) is required to access FSK field bus devices. Each channel can be individually programmed for the following input types:

- 4 to 20 milliampere.
- –10 to +10 VDC.

A single two-wire input links a maximum of 15 FSK digital devices on a field bus when using an IMFEC11 module. This capability eliminates conversion errors and increases process control accuracy.

The IMFEC11 module can also interface Bailey-Fischer & Porter smart transmitters and other smart devices (Table 1). The module operates in one of two user-selectable modes: FSK field bus mode (FSK digital data and communication) and FSK analog point-to-point mode (analog inputs with or without FSK digital communication available).

Table 1. Bailey-Fischer & Porter Smart Transmitter Devices

Nomenclature	Transmitter Description
AVS	Electro-pneumatic smart positioner
BCN	Pressure transmitter
EQN	Temperature transmitter
EQS	Platinum Standard™ temperature transmitter
PTS	Pressure transmitter
SM, XM, XE	Smart magnetic flowmeter
TBN480	Conductivity transmitter
TBN580	pH transmitter
TBN581	ORP/pION transmitter

IMFEC12

The IMFEC12 Analog Input module processes up to 15 analog field inputs for a Harmony controller. The controller utilizes function codes 132 (analog input group) to configure and access the module input channels. Each channel can be individually programmed for the following input types:

- 4 to 20 milliampere.
- –10 to +10 VDC.

Analog Output

IMASO11

The IMASO11 Analog Output module processes up to 14 analog control outputs for a Harmony controller. The controller utilizes function codes 149 (analog output group) to configure and access the module output channels. Each channel can be individually programmed for the following output types:

- 4 to 20 milliampere.
- 1 to 5 VDC.

Each output reads back the signal to the field to insure accurate operation and eliminate the need to calibrate outputs.

Related Documents

Number	Document Title
WBPEEUS240011?0	Harmony Rack Input/Output, Overview

Specifications

Property	Characteristic/Value
General	
Mounting	Occupies one slot in a standard module mounting unit.
Overvoltage category (ANSI/ISA S82.01-1994 and IEC 1010-1)	I for power II for outputs II for inputs
Environmental Ambient temperature Relative humidity Altitude Air quality	 0° to 70°C (32° to 158°F) 5% to 95% up to 55°C (131°F) (noncondensing) 5% to 45% at 70°C (158°F) (noncondensing) Pollution degree: I Sea level to 3 km (1.86 miles) Noncorrosive
Electromagnetic compatibility Conducted transients	<table><tr><th>Test</th><th>Common Mode</th><th>Normal Mode</th></tr><tr><td>Voltage/current surge (1.2/50 µS to 8/20 µS) (IEC 1000-4-5, EN 61000-4-5)</td><td>±2 kV_P</td><td>±1 kV_P</td></tr><tr><td>Fast transient bursts (IEC 1000-4-4, EN 61000-4-4)</td><td>±2 kV_P</td><td>N/A</td></tr><tr><td>Damped oscillatory wave, 0.1 MHz and 1 MHz (IEC 1000-4-12, EN 61000-4-12)</td><td>±1 kV_P</td><td>±0.5 kV_P</td></tr><tr><td>Ring wave (IEC 1000-4-12, EN 61000-4-12)</td><td>±2 kV_P</td><td>±1 kV_P</td></tr></table>

Property	Characteristic/Value
General *(continued)*	
Electrostatic discharge (IEC 1000-4-2, EN 61000-4-2)	Contact: ±6 kV Air: ±8 kV
Magnetic and electromagnetic fields Power frequency magnetic field (IEC 1000-4-8, EN 61000-4-8) Pulse magnetic field (IEC 1000-4-9, EN 61000-4-9) Damped oscillatory magnetic field, 0.1 MHz and 1 MHz (IEC 1000-4-10, EN 61000-4-10) Radiated radio-frequency electromagnetic field, 80 MHz to 1GHz (ENV 50140) Radiated radio-frequency field, 900 ±5 MHz (ENV 50204) Radio-frequency common mode, amplitude modulated, 0.15 MHz to 80 MHz (ENV 50141)	 Continuous: 30 A_{RMS}/m Short duration: 300 A_{RMS}/m Peak value: 300 A/m Peak value: 30 A/m Unmodulated RMS: 10 V/m Amplitude modulated: 80% AM (1 kHz) Unmodulated RMS: 10 V/m Pulse modulated: Duty cycle 50%, Rep. cycle 200 Hz Unmodulated RMS: 10 V/m Amplitude modulated: 80% AM (1 kHz) Source impedance: 150 Ω
Emission test RF radiated fields, 30 MHz to 1000 MHz (ENV 55011)	Class A
CE mark declaration EMC96 Directive 89/336/EEC Low Voltage Directive 73/23/EEC	This product, when installed in a Symphony cabinet, complies with the following Directives/Standards for CE marking. EN50082-2 Generic Immunity Standard - Part 2: Industrial Environment EN50081-2 Generic Emission Standard - Part 2: Industrial Environment EN61010-1 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements
Certifications Canadian Standards Association (CSA) (pending for IMASI13, IMASO11) Factory Mutual (FM) (pending)	 Certified for use as process control equipment in an ordinary (nonhazardous) location. Approval for the following categories: Nonincendive for: Class I Division 2, Groups A,B,C,D Class II, Division 2, Groups F,G
IMASI13	
Power requirements Operating voltage	 + 5 VDC, ± 5% at 500 mA typical
Analog inputs Current High level Low level Thermocouple	16 independently configured channels 4 to 20 mA -10 VDC to +10 VDC -100 mV to +100 mV Type E, J, K, L, N (14 AWG), N (28 AWG), R, S, T, U, Chinese E, S

Property	Characteristic/Value
IMASI13 *(continued)*	
Analog inputs *(continued)* 3-wire RTD	100 Ω platinum: U.S. Lab. Standard 100 Ω platinum: U.S. Industry Standard 100 Ω platinum: European Standard 120 Ω nickel 10 Ω copper Chinese 53 Ω copper
Input impedance Current Voltage	 10 MΩ minimum 100 kΩ minimum
A-to-D resolution conversion	24 bits 180 msec for all 16 channels; each channel has dedicated A/D converter
Accuracy (% of full scale range) Current High level voltage Low level voltage Resistance Temperature effect 0° to 70° C (32° to 158° F)	 0.02% 0.04% 0.03% 0.05% ± 0.003% of full scale range per degree C maximum
Maximum lead wire resistance effect Voltage Uncompensated Compensated Resistance Uncompensated Compensated	 1 µV of error per Ω of lead wire resistance 0.1 µV of error per Ω of lead wire resistance 0.020Ω error per Ω of lead wire resistance 0.008Ω of error per Ω of lead wire resistance
Input setting (time)	0.5 seconds to within 1% after full scale step change
Cold junction reference accuracy	± 0.5° C
Software temperature linearization accuracy	± 0.1° C
Common mode isolation Tested	300 VDC/V_{RMS} at 60 Hz 1,400 V_{RMS} at 60 Hz for 2 sec
Rejection (50-60 Hz) Normal mode Common mode	 -80 dB minimum -120 dB minimum
Peak or continuous voltage	± 15 VDC absolute maximum[1]
IMFEC11/IMFEC12	
Power Requirements Operating voltage Power dissipation	 5 VDC, ± 5% at 85 mA typical +15 VDC, ± 5% at 25 mA typical –15 VDC, ± 5% at 20 mA typical 1.1 W typical
Analog inputs Current Voltage	15 independently configured channels 4 to 20 mA -10 to +10 VDC
Input impedance	>1 MΩ
A-to-D resolution Analog conversion	14 bits with polarity 200 msec

Property	Characteristic/Value
IMFEC11/IMFEC12 *(continued)*	
Accuracy (% of full scale range) Current Voltage (-10 to +10 VDC) Voltage (0 to 1 VDC) FSK digital (IMFEC11 only)	 0.10% 0.10% 0.25% Same as transmitter accuracy for each input
FSK digital updates (IMFEC11 only)	3 to 10 times/sec (in field bus configuration)
Common mode voltage	–12 VDC minimum, +15 VDC maximum ±12 VDC (±1 VDC) input span ±10 VDC (±5 VDC) input span ±5 VDC (±10 VDC) input span
Rejection (50-60 Hz) Normal mode Common mode	 –70 dB minimum –90 dB minimum
Communication baud rate	9,600 baud
IMASO11	
Power requirements Operating voltage Power dissipation	 +5 VDC, ±5% at 250 mA typical +15 VDC, ±5% at 100 mA typical -15 VDC, ±5% at 90 mA typical +24 VDC, ±10% at 310 mA typical (from termination unit) 1.5 W (+5 VDC) typical 2 W (+15 VDC) typical 1.75 W (-15 VDC) typical 8 W (24 VDC) typical
Analog outputs Current Voltage	14 independently configured channels 4 to 20 mA 1 to 5 VDC
Output load Current Voltage	 750 Ω maximum 22 kΩ minimum
D-to-A resolution	10 bits
Accuracy (full scale range) 4 to 20 mA 1 to 5 VDC	 ± 0.25% ± 0.15%
Current limiting: Short circuit protection	 50 mA nominal output current limit

NOTES:
1. Absolute maximum ratings indicate limits beyond which damage to the device may occur and device operation is not guaranteed.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Module Nomenclature

1	2	3	4	5	6	7	
I	M	A	S	I	1	3	Analog input: 4 to 20 mA, –10 to +10 VDC,100 to +100 mVDC, thermocouple, RTD
I	M	A	S	O	1	1	Analog output: 4 to 20 mA, 1 to 5 VDC
I	M	F	E	C	1	1	Analog input: 4 to 20 mA, -10 to +10 VDC, FSK
I	M	F	E	C	1	2	Analog input: 4 to 20 mA, -10 to +10 VDC

Related Hardware Nomenclature

							IMASI13	IMASO11	IMFEC11	IMFEC12
1	2	3	4	5	6					
N	K	A	S	0	1	Cable (PVC jacket), termination unit	•			
N	K	A	S	1	1	Cable, termination unit	•			
N	K	S	L	0	1	Cable (PVC jacket), termination unit (NTFB01)			•	
N	K	S	L	1	1	Cable, termination unit (NTFB01)			•	
N	K	T	U	0	1	Cable (PVC jacket), termination unit		•	•	•
N	K	T	U	1	1	Cable, termination unit		•	•	•
N	T	A	I	0	5	Termination unit			•	•
N	T	A	I	0	6	Termination unit	•			
N	T	D	I	0	1	Termination unit		•		
N	T	F	B	0	1	Termination unit (field bus)			•	

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