

Features and Benefits

- **Wide variety of Input/Output (I/O) types:** Analog (high and low levels, and temperature), digital, control, turbine control, field bus, and sequence of events (SOE).
- **Modular to meet varying I/O requirements:** I/O modules are provided to meet nearly all I/O processing requirements (isolation, A/D conversion, auto calibration).
- **Dedicated, secure I/O communications:** Fast response parallel bus supports up to 64 I/O modules to a single controller pair.
- **Graceful degradation of I/O:** Configurable, fail-safe output modes.
- **Compatibility with existing systems:** I/O modules can be used to expand existing INFI 90® OPEN, in conjunction with Harmony block I/O, and can communicate directly with all Harmony controllers.
- **Surface-mount technology:** Provides high reliability and consistent quality.



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The Harmony rack I/O system utilizes a wide variety of input, output, and signal conditioning modules to interface process signals to the Symphony™ Enterprise Management and Control System. Module types, ranging from standard analog and digital I/O to specialty I/O such as turbine control, field bus, and SOE, can be combined to provide a comprehensive set of functionality to meet all market and industrial requirements.

In addition, Harmony rack I/O, providing functions at the module mounting unit (MMU) level, and Harmony block I/O can operate in parallel with a single set of Harmony controllers to form an optimum solution for a specific application.

Rack I/O Components

As mentioned previously, the main components of Harmony rack I/O are I/O modules, termination units, and I/O expander bus (Fig. 1 and 2). The following sections provide further explanation.

I/O Expander Bus

The I/O expander bus is a high speed, synchronous, parallel bus. It provides a communication path between controllers and I/O modules. The I/O expander bus parallel signal lines are located on the MMU backplane. Inserting a rack-mounted controller and I/O modules into the mounting unit connects them to the expander bus.

I/O Module

An I/O module interfaces and processes field device input and output signals. There are several different I/O module types available. Table 1 lists the available module types and gives a brief description. All I/O modules share the same layout and connection, configuration, and mounting methods. Refer to the *Harmony Rack Input/Output* data sheets for individual I/O module capabilities.

Table 1. I/O Modules

Nomenclature	Description
IMASI23	Analog input: 4 to 20 mA, 0 to 5 VDC, 1 to 5VDC, 0 - 10VDC, 0 - 100 mVDC, thermocouple, RTD
IMASO11	Analog output: 4 to 20 mA, 1 to 5 VDC
IMCIS22	Control I/O (4 analog in, 2 analog out, 3 digital in, 4 digital out)
IMDSI13	Digital input: 24 VDC
IMDSI14	Digital input: 48 VDC
IMDSI22	Universal digital input: 24 VDC, 48 VDC, 125 VDC, 120 VAC
IMDSM04	Pulse input
IMDSO14	Digital output: 24 VDC, 48 VDC
IMDSO15	Digital output: Onboard electromechanical relay
IMFCS01	Frequency counter
IMFEC11	Analog input: 4 to 20 mA, -10 to +10 VDC, FSK, 1 - 5VDC, 0 - 1VDC, 0 - 5VDC, 0 - 10VDC
IMFEC12	Analog input: 4 to 20 mA, -10 to +10 VDC, 1 - 5VDC, 0 - 1VDC, 0 - 5VDC, 0 - 10VDC
IMHSS03	Hydraulic servo
IMQRS22	Quick response I/O (4 analog in, 2 analog out, 3 digital in, 4 digital out)
IMSED01	SOE digital input (with 16 SOE digital inputs)
IMSET01	SOE timing (with 16 SOE digital inputs and a timesynch input)

Depending on the module type, front panel features include:

- Front panel mode indicator.
- Front panel I/O status indicators.
- Front accessed stop/reset button.

In general, the I/O module functions include:

- Range and mode selection for analog I/O.
- Voltage threshold selection for digital inputs.
- Response time (debounce) selection.
- Signal buffering.
- Signal conditioning.
- Signal isolation.
- Noise rejection.
- Analog-to-digital and digital-to-analog conversion.
- Cold junction compensation for thermocouples.

The I/O module connects to field signals through the termination unit. The module and termination unit connect using a termination cable. The module connects to power and the I/O expander bus at the MMU backplane connectors. Inserting the module into the mounting unit makes both the power and communication connections. An I/O module can be removed and installed while system power is applied.

Termination Unit

In general, a termination unit is a passive device that connects and distributes signals between the I/O module and field wiring terminals. The terminal block field wiring connection points are located on the termination unit. Field wiring can enter the cabinet from either the top or the bottom then attaches to a termination unit. A termination unit has several purposes:

- Field wiring termination.
- I/O channel signal routing.
- Range and mode selection for analog I/O.
- Voltage threshold selection for digital inputs.
- Field power or system powered I/O selection.
- Circuit protection (fuses).
- Shield (chassis ground) connection.

Field connections remain undisturbed if the I/O module is removed or replaced. Each type of I/O module requires its own type of termination unit. The number of wiring terminals depends on the number and types of I/O channels. To simplify the installation process, the terminals are clearly marked to identify wiring connections. Harmony rack I/O supports alternate termination methods such as intrinsic barriers, rail mount termination, and third-party supplied termination.

Circuit Protection

Most I/O modules along with their termination units incorporate some type of current limiting or fusing where appropriate to protect against short circuits. Current limiting prevents excessive current levels at faulted terminals which could cause circuit damage.

Highlights

The Harmony Rack Mount Termination System (Fig. 1) is a field wiring termination solution for process applications where space is limited. By terminating the I/O field wires behind the module mounting unit a very compact control system can be created.

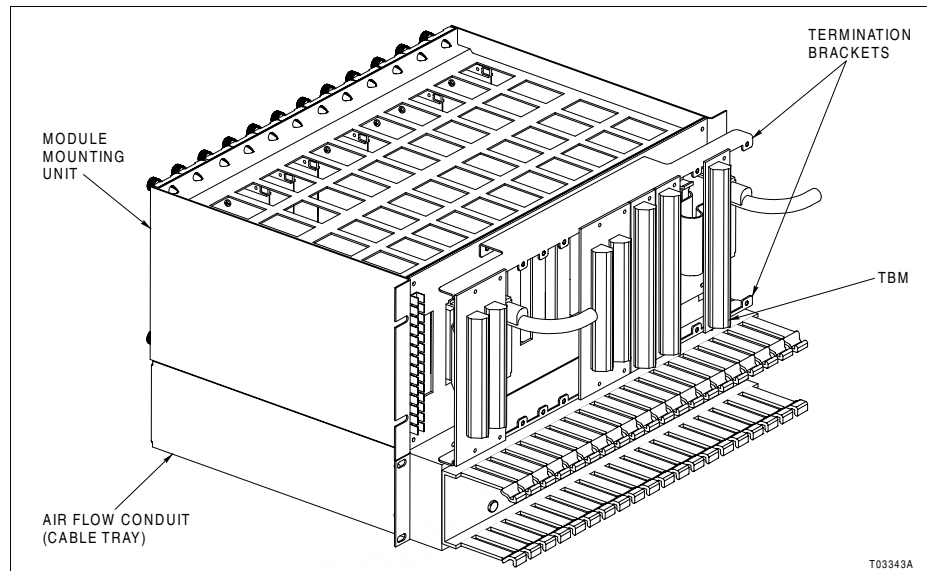


Figure 1. Harmony Rear Mount Termination System

The rack mount termination system consists of a module mounting unit (MMU), cable tray, termination brackets, and a series of termination devices. I/O modules can be easily installed from the front of the module mounting unit into the respective termination device that is attached to the rear of the module mounting unit.

The cable tray is mounted to an air flow conduit and is used to keep field wires and cables organized and untangled. The air flow conduit is mounted below the rack mount termination system and provides a path for cabinet cooling.

There are several termination devices (TBM) to choose from for the rack mount termination system. The termination device (Fig. 2) is selected based on the application requirements. The available termination devices cover a wide range of I/O applications. The width of the termination device varies from one to two slots in a module mounting unit. Easy to use clamp terminals accept up to 2.1 square millimeter (14 AWG) wire.

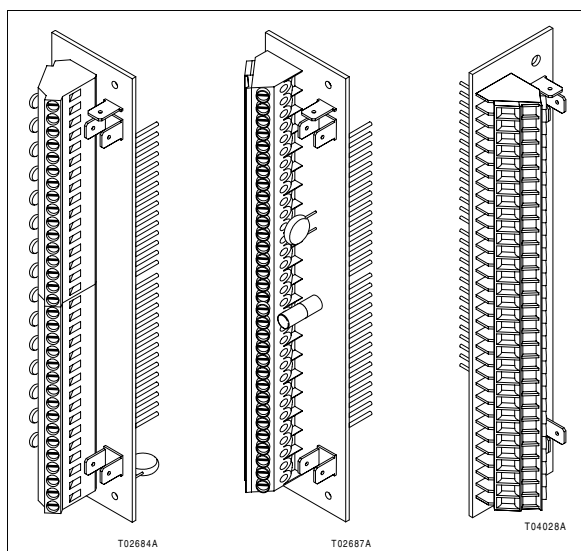


Figure 2. Rack Mount Termination Devices

Device Application

Termination Device Type	MMU Slots Occupied	Function	Power	I/O Modules
NTBMA2	1	16 digital inputs	Field	IMDSI12, IMDSI13, IMDSI14, IMDSI15, IMDSI22
		16 digital outputs	Field	IMDSO14
		14 analog outputs	System	IMASO11
		8 single-pole double-throw relay outputs	Field	IMDSO15
NTBMB2	2	16 digital inputs switching common	System	IMDSI12, IMDSI13, IMDSI14, IMDSI15, IMDSI22
		16 digital outputs	System	IMDSO14
NTBMB4	1	14 digital inputs switching hot	System	IMDSI12, IMDSI13, IMDSI14, IMDSI15, IMDSI22
		14 digital outputs	System	IMDSO14
NTBMC2	1	15 analog inputs (4-20 mA current loop) FSK (P to P mode)	System	IMFEC11 (analog mode) FSK (P to P mode)
NTBMD2	1	15 analog inputs (4-20 mA current loop or differential voltage)	Field	IMFEC11 (analog mode)
NTBMG2	1	3 digital inputs 4 digital outputs 4 analog inputs 2 analog outputs	Field Field Field System	IMCIS12, IMQRS12, IMCIS22, IMQRS22
		3 digital inputs 4 digital outputs 4 analog inputs 2 analog outputs	Field Field System System	
NTBMJ2	2	16 analog inputs (2 wire 4-20 mA devices)	System	IMASI13
NTBML2	2	16 analog inputs (TC, 3-wire-RTD, and differential analog volt)	Field	
NTBML4	2	16 analog inputs (4-20 mA)	Field	