



TC00893B

Description

The Harmony Input/Output (I/O) System utilizes a variety of input and output blocks to interface process signals to the Symphony™ Enterprise Management and Control System. Digital input/output (DIO) blocks have input channels to read the states of switches, relay contacts, solenoids, etc. and output channels used in AC/DC switching applications. Digital output (DOT) blocks provide output channels for AC/DC switching applications. The digital outputs can be used to drive annunciators such as buzzers and lamps and to drive two-state final control elements such as actuators, relays, and solenoids. Digital switching of current loads up to ten amperes can be achieved by using auxiliary relay assemblies (RLY) with DIO blocks. These digital blocks along with other types of blocks for analog and control I/O interface and remote I/O communication combine to create a complete I/O system (Fig. 1). Refer to the *Harmony Input/Output System* overview for a complete system description.

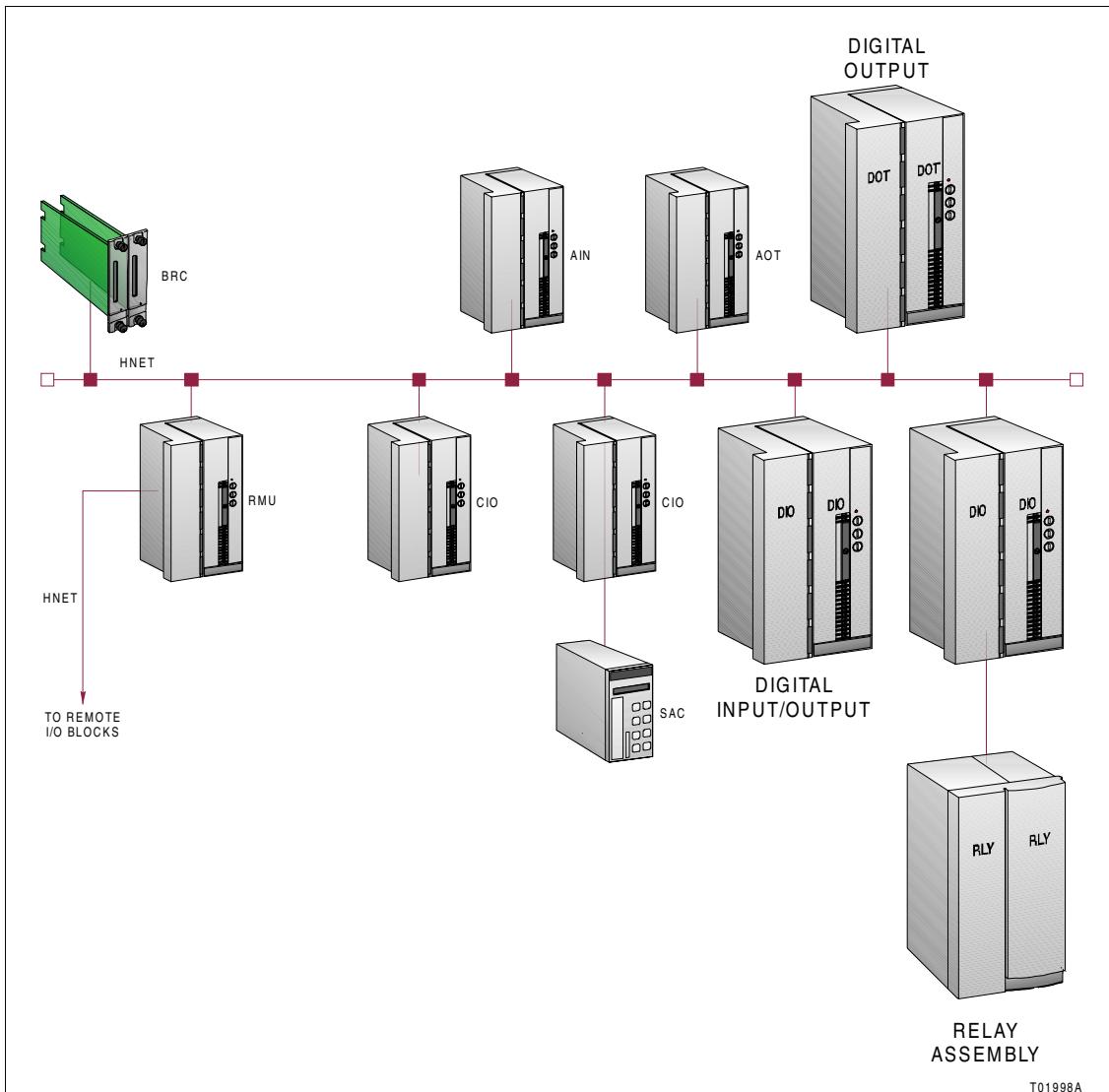


Figure 1. Harmony I/O System

Operation

Each digital I/O block has an onboard microprocessor which controls and performs the following functions for the block:

- Hnet communication.
- Digital input/output processing.
- Redundancy link communication.
- Block diagnostics.
- Status reporting.

Along with these functions, the microprocessor is also responsible for executing the I/O block portion of the control configuration. The complete control configuration made up of linked function codes resides and is retained in the Harmony controller at all times. The controller only off-loads a portion of the configuration to be executed by the individual I/O blocks.

Function codes are predefined, fixed function algorithms. The controller uses the following function codes to interface to a digital I/O block:

- I/O device definition (FC 221).
- Digital in/channel (FC 224).
- Digital out/channel (FC 225).

Specifications are set on a per channel basis rather than on an I/O group basis. The function codes provide addressing, and start-up, execute (i.e., run time), override, simulation, and failure mode operation specifications. The I/O channel function codes are exception reporting function codes.

Digital Input

The Harmony I/O System supports 24 VDC, 48 VDC, 125 VDC, 120 VAC, and 240 VAC digital inputs through DIO-400 blocks. Each DIO block supports 16 input channels. The DIO can accept all input ranges which are jumper selectable on a per channel basis. Debounce time for digital inputs is software selectable.

The DIO block reads voltage levels at its input channels, converts the voltages to boolean logic states (0 or 1), then reports the input states to the controller. The block provides channel status information along with each reported input.

The digital input channels provide onboard current limiting for short circuit protection. The current limiting prevents circuit damage that can result from excessive current levels at an input channel caused by field input faults. A channel will recover to full function after correcting the fault condition. The DIO blocks have optically isolated input channels.

Digital Output

The Harmony I/O System supports digital outputs through DIO-400 blocks and DOT-100 and DOT-120 blocks.

The output channels of the DIO-400 block are open-collector outputs that can switch 24 VDC and 48 VDC with a maximum load current of 250 milliamperes. User selectable default states of 0, 1, or hold are provided. The outputs are optically isolated channels. Optionally, the 24 VDC outputs of the DIO block can be used to drive either DPDT electromechanical relays of an RLY-100 block or solid state relays of an RLY-200 block. Depending on the RLY block type, the relay outputs can switch voltages up to 240 VAC with a maximum load current of ten amperes.

The I/O system supports 24 VDC, 48 VDC, 125 VDC, 120 VAC, and 240 VAC digital outputs through DOT blocks. The output channels of DOT blocks are SPDT electromechanical relay outputs. These outputs can switch voltages up to 240 VAC with a maximum load current of three amperes.

The DOT-120 output channels are fused and monitored through readback circuitry on the block. The block constantly monitors readback from the output contacts to verify and insure hardware and field wiring integrity. The block also reports the readback values to the controller.

Related Documents

Number	Document Title
WBPEEUD240001??	Harmony Analog Input/Output, Data Sheet
WBPEEUD240003??	Harmony Control Input/Output, Data Sheet
WBPEEUD240004??	Harmony Input/Output System, Data Sheet
WBPEEUS240008??	Harmony Input/Output System, Overview

I/O Specifications

Property	Characteristic/Value ¹																																		
I/O blocks DIO-400 DOT-100 DOT-120	Universal in, 24/48 VDC out Onboard SPDT electromechanical relay out Onboard monitored SPDT electromechanical relay out (with readback and fusing)																																		
Microprocessor	16-bit processor running at 16 MHz																																		
Memory	64 kb SRAM 512 kb Flash RAM																																		
Redundancy link data rate	1 Mbaud																																		
Block logic power (BLP) - refer to I/O Power Requirements	21.6 VDC minimum 24.0 VDC nominal 28.0 VDC maximum																																		
Field power (IFP/LFP) - refer to I/O Power Requirements	24.0 VDC nominal 48.0 VDC nominal 125.0 VDC nominal 120.0 VAC nominal 240.0 VAC nominal																																		
Common mode isolation Tested	300 VDC/V _{RMS} at 60 Hz 1,400 V _{RMS} at 60 Hz for 2 sec																																		
Input protection ²	Continuous short to ground																																		
Dimensions	<table border="1"> <thead> <tr> <th rowspan="2">Type</th> <th colspan="2">Height</th> <th colspan="2">Width</th> <th colspan="2">Depth</th> </tr> <tr> <th>mm</th> <th>in.</th> <th>mm</th> <th>in.</th> <th>mm</th> <th>in.</th> </tr> </thead> <tbody> <tr> <td>I/O module</td> <td>266</td> <td>10.5</td> <td>76</td> <td>3.0</td> <td>162</td> <td>6.4</td> </tr> <tr> <td>Nonredundant base</td> <td>267</td> <td>10.5</td> <td>138</td> <td>5.4</td> <td>169</td> <td>6.7</td> </tr> <tr> <td>Redundant base</td> <td>267</td> <td>10.5</td> <td>217</td> <td>8.5</td> <td>169</td> <td>6.7</td> </tr> </tbody> </table>	Type	Height		Width		Depth		mm	in.	mm	in.	mm	in.	I/O module	266	10.5	76	3.0	162	6.4	Nonredundant base	267	10.5	138	5.4	169	6.7	Redundant base	267	10.5	217	8.5	169	6.7
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Overvoltage (installation) category	ANSI/ISA-S82.01-1994 and IEC 1010-1 I for circuits above 150 V II for circuits below 150 V																																		
Environmental	Refer to the Harmony I/O System data sheet for environmental specifications and design standards including certification and CE mark directives.																																		
Design standards																																			

NOTES:

1. All specification values are maximums unless stated otherwise.
2. The DOT-120 block provides channel fuses for output protection. Other digital outputs may require some type of external output protection.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Property ¹			DIO-400
240 VAC LFP current	DI	Typ ²	75 mA
	DI	Max ⁵	140 mA
	DI ⁷	Fault	230 mA
Heat dissipation ⁸ 24 VDC DI, 24 VDC DO	Typ		7.2 W
	Max		9.8 W
Heat dissipation ⁸ 48 VDC DI, 24/48 VDC DO	Typ		7.6 W
	Max		10.6 W
Heat dissipation ⁸ 125 VDC DI, 24/48 VDC DO	Typ		12.4 W
	Max		21.4 W
Heat dissipation ⁸ 120 VAC DI, 24 VDC DO	Typ		12.3 W
	Max		20.8 W
Heat dissipation ⁸ 240 VAC DI, 24/48 VDC DO	Typ		19.1 W
	Max		34.5 W

NOTES:

1. For redundant DIO blocks (i.e., redundant base and two I/O modules), calculate power requirements as $2 \times$ BLP and $2 \times$ IFP/LFP for digital inputs and $2 \times$ BLP and $1 \times$ IFP/LFP for digital outputs.
2. 66 percent channel activity with no faults.
3. When using an RLY block with a DIO block, replace DO current requirements with RLY current requirements.
4. 100 mA digital outputs.
5. All channels active with no faults.
6. 250 mA digital outputs.
7. 16 digital input faults.
8. Heat dissipation values include both BLP and IFP/LFP power and include the base and one I/O module.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Output Power Requirements

Property ¹		DOT-100	DOT-120	RLY-100	RLY-200
24 VDC BLP current	Typ	190 mA	200 mA	—	—
	Max	210 mA	220 mA	—	—
24 VDC IFP/LFP current	Typ ²	215 mA	215 mA	300 mA	100 mA
	Max ³	350 mA	350 mA	445 mA	150 mA
	Fault ⁴	215 mA	215 mA	—	—
Heat dissipation ⁵ 24 VDC DO	Typ	9.4 W	10.0 W	—	—
	Max	13.9 W	13.0 W	—	—
Heat dissipation ⁵ 48 VDC DO	Typ	9.4 W	10.4 W	—	—
	Max	13.9 W	13.8 W	—	—
Heat dissipation ⁵ 125 VDC DO	Typ	9.4 W	12.2 W	—	—
	Max	13.9 W	17.1 W	—	—
Heat dissipation ⁵ 120 VAC DO	Typ	9.4 W	12.0 W	—	—
	Max	13.9 W	16.8 W	—	—
Heat dissipation ⁵ 240 VAC DO	Typ	9.4 W	15.8 W	—	—
	Max	13.9 W	23.2 W	—	—

NOTES:

1. For redundant DOT blocks (i.e., redundant base and two I/O modules), calculate power requirements as $2 \times$ BLP and $2 \times$ IFP/LFP.
2. 66 percent channel activity with no faults.
3. All channels active with no faults.
4. DOT - faults on 66 percent of channels.
5. Heat dissipation values include both BLP and IFP/LFP power and include the base and one I/O module.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE