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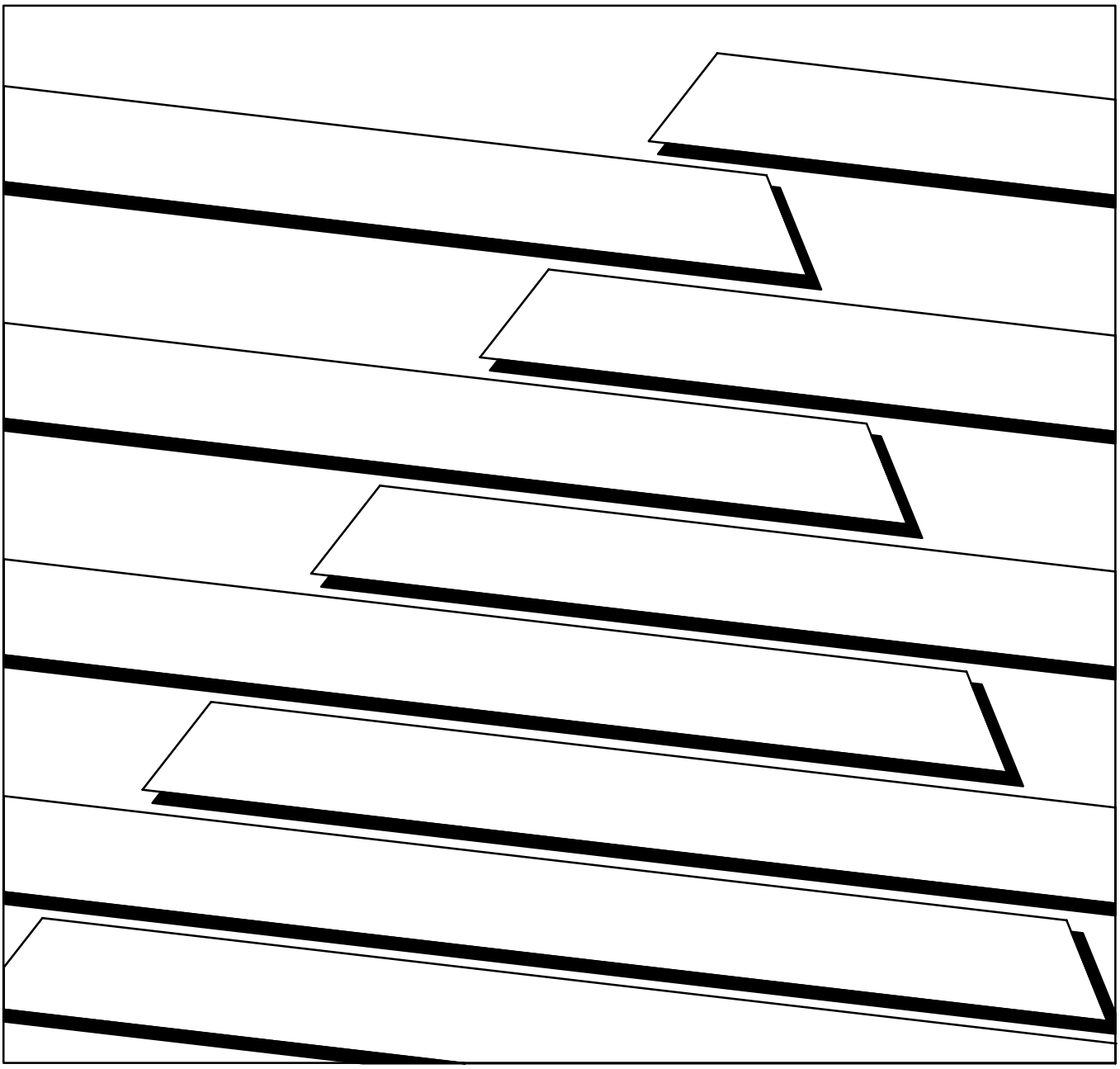
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ALLEN-BRADLEY

1791 Discrete I/O
AC and DC Block I/O
Input and Output Modules

User Manual



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Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for example. Since there are many variables and requirements associated with any particular installation, Allen-Bradley does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI–1.1, “Safety Guidelines For The Application, Installation and Maintenance of Solid State Control” (available from your local Allen-Bradley office) describes some important differences between solid-state equipment and electromechanical devices which should be taken into consideration when applying products such as those described in this publication.

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Throughout this manual we make notes to alert you to possible injury to people or damage to equipment under specific circumstances.



ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage or economic loss.

Attention helps you:

- Identify a hazard.
- Avoid the hazard.
- Recognize the consequences.

Important: Identifies information that is especially important for successful application and understanding of the product.

Important: We recommend you frequently backup your application programs on appropriate storage medium to avoid possible data loss.

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Summary of Changes

Summary of Changes

This release of the publication contains updated information on:

- revised labels
- changed fuse specifications
- which modules do or do not support complementary I/O

Manual Organization

To help you find new and revised information in this release of the publication, we have included change bars as shown to the right of this paragraph.

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Using This Manual

Purpose of Manual

This manual shows you how to use your block I/O with an Allen-Bradley programmable controller. It helps you install, program and troubleshoot your module.

Audience

You must be able to program and operate an Allen-Bradley programmable controller (PLC) to make efficient use of block I/O modules.

We assume that you know how to do this in this manual. If you do not, refer to the appropriate PLC programming and operations manual before you attempt to program this module.

Vocabulary

In this manual, we refer to:

- the block I/O module as the “block” or the “module”
- the programmable controller as the “controller” or “processor”

Manual Organization

This manual is divided into five chapters. The following chart shows each chapter with its corresponding title and brief overview of the topics covered in that chapter.

Chapter	Title	Topics Covered
1	Introducing Block I/O	Description of the modules, including general and hardware features
2	I/O Interface and System Design	Compatibility, device determination and fusing
3	Installing Block I/O	Module power requirements, location, and wiring information
4	Configuring Your Block I/O for PLC Family Programmable Controllers	How to set the configuration switches and address the block I/O
5	Troubleshooting	How to use the indicators to troubleshoot your block I/O module
Appendix A	Specifications	Specifications for the block I/O modules

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About Block I/O

Block I/O consists of small, self-contained remote I/O devices complete with power supply, programmable controller interface, input/output connections and signal conditioning circuitry. Table P.A is a list of block I/O modules covered in this publication.

Table P.A
Types of Discrete Block I/O

Catalog Number	Voltage	Description
1791-16A0/B	120V ac	16 input ac block I/O module
1791-0A16/B	120V ac	16 output ac block I/O module
1791-8AC/B	120V ac	8 input/8 output ac block I/O module
1791-8AR/B	120V ac	8 input/8 relay output ac block I/O module
1791-32A0/B	120V ac	32 input, 0 output ac block I/O module
1791-0A32/B	120V ac	0 input, 32 output ac block I/O module
1791-16AC/B	120V ac	16 input, 16 output ac block I/O module
1791-24A8/B	120V ac	24 input, 8 output ac block I/O module
1791-24AR/B	120V ac	24 input, 8 relay output ac block I/O module
1791-16B0/B	24V dc	16 input dc block I/O module
1791-0B16/B	24V dc	16 output dc block I/O module
1791-8BC/B	24V dc	8 input/8 output dc block I/O module
1791-8BR/B	24V dc	8 input/8 relay output dc block I/O module
1791-32B0/B	24V dc	32 input, 0 output dc block I/O module
1791-0B32/B	24V dc	0 input, 32 output dc block I/O module
1791-16BC/B	24V dc	16 input, 16 output dc block I/O module
1791-24B8/B	24V dc	24 input, 8 output dc block I/O module
1791-24BR/B	24V dc	24 input, 8 relay output dc block I/O module

Related Publications

For a list of publications with information on Allen-Bradley products, consult our publication index (SD499).

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Chapter 1

Introducing Discrete Block I/O

Chapter Objectives

In this chapter, you will learn what ac and dc block I/O is, its features, and how it functions.

General Description

Block I/O modules are small, self-contained remote I/O devices complete with power supply, programmable controller interface, input/output connections and signal conditioning circuitry.

Table 1.A
Types of Discrete Block I/O

Catalog Number	Voltage	Inputs	Outputs	Description
1791-16A0/B	120V ac	16		16 input, 0 output
1791-0A16/B	120V ac		16	0 input, 16 output
1791-8AC/B	120V ac	8	8	8 input, 8 output
1791-8AR/B	120V ac	8	8	8 input, 8 relay output
1791-32A0/B	120V ac	32		32 input, 0 output
1791-0A32/B	120V ac		32	0 input, 32 output
1791-16AC/B	120V ac	16	16	16 input, 16 output
1791-24A8/B	120V ac	24	8	24 input, 8 output
1791-24AR/B	120V ac	24	8	24 input, 8 relay output
1791-16B0/B	24V dc	16		16 input, 0 output
1791-0B16/B	24V dc		16	0 input, 16 output
1791-8BC/B	24V dc	8	8	8 input, 8 output
1791-8BR/B	24V dc	8	8	8 input, 8 relay output
1791-32B0/B	24V dc	32		32 input, 0 output
1791-0B32/B	24V dc		32	0 input, 32 output
1791-16BC/B	24V dc	16	16	16 input, 16 output
1791-24B8/B	24V dc	24	8	24 input, 8 output
1791-24BR/B	24V dc	24	8	24 input, 8 relay output
1791-IOBX[1]	24V dc	64	64	64 sinking input, 64 sourcing output
1791-IOVX[1]	24V dc	64	64	64 sourcing input, 64 sinking output
1791-IOBW[1]	24V dc	32	32	32 sinking input, 32 sourcing output
1791-IOVW[1]	24V dc	32	32	32 sourcing input, 32 sinking output

[1] Not covered in this manual. Refer to individual user manuals for these products.

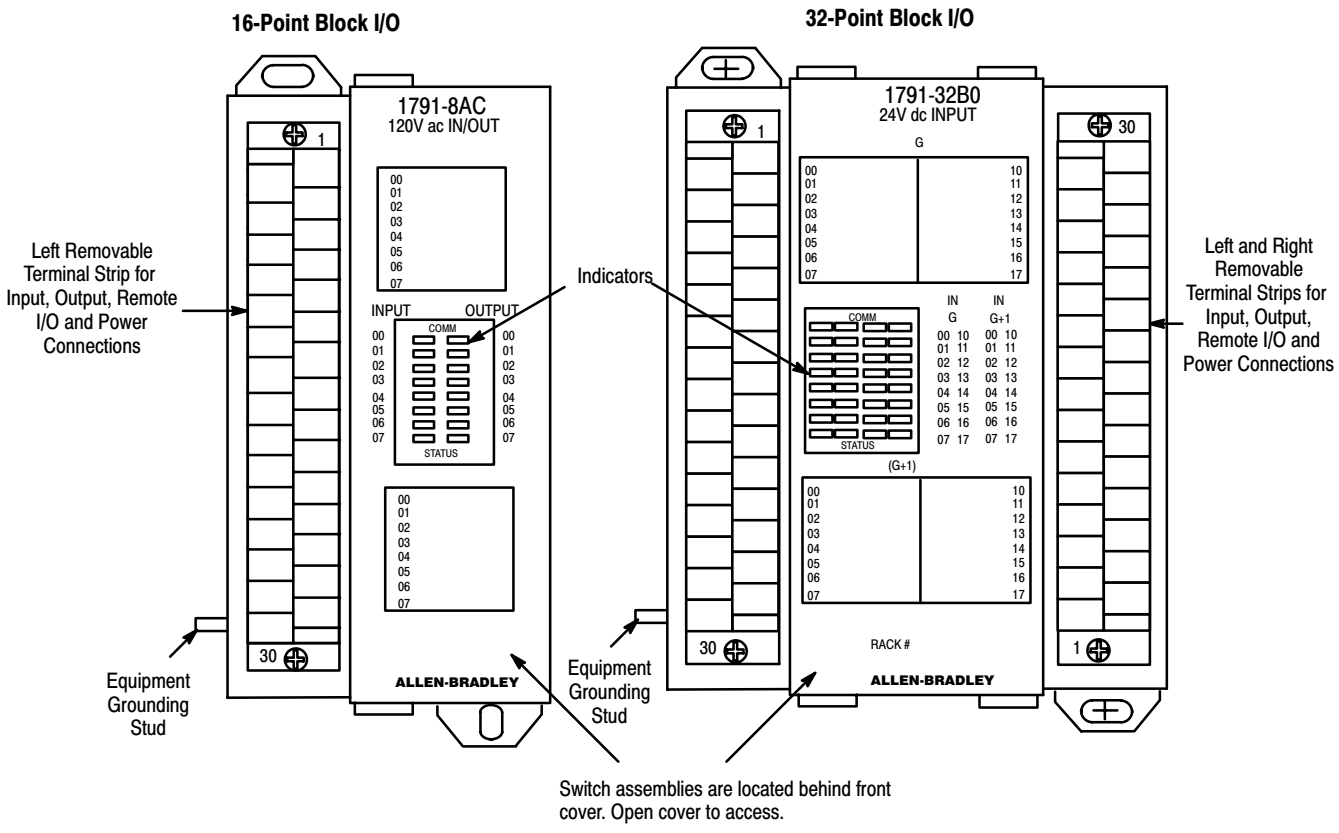
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The blocks are compatible with PLC-2®, PLC-3®, PLC-5/250® and PLC-5® family programmable controllers, and the SLC® 5/02 modular controllers. Refer to the table below for information on using block I/O with various Allen-Bradley programmable controllers.

If You are Using:	You must use:
PLC-2 family programmable controller	1771-SN sub-I/O scanner or 1772-SD and -SD2 remote I/O scanners
PLC-3 family programmable controller	Block attaches directly to controller
PLC-5 family programmable controller	
PLC-5/250 programmable controller	
SLC programmable controller	1747-SN remote I/O scanner

Figure 1.1 shows the physical features of the block I/O.

Figure 1.1
Major Features of the Block I/O Modules



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Terminal Strip - Remote I/O link, power and input/output connections are made to the removable terminal strip for easy connection of wiring, and block replacement if necessary.

Switch Assembly - Two switch assemblies are provided for setting the I/O rack number, starting I/O group, communication rate, last chassis, and last state.

Status Indicators - Indicators display the status of communication and input/output. Use these indicators to help in troubleshooting.

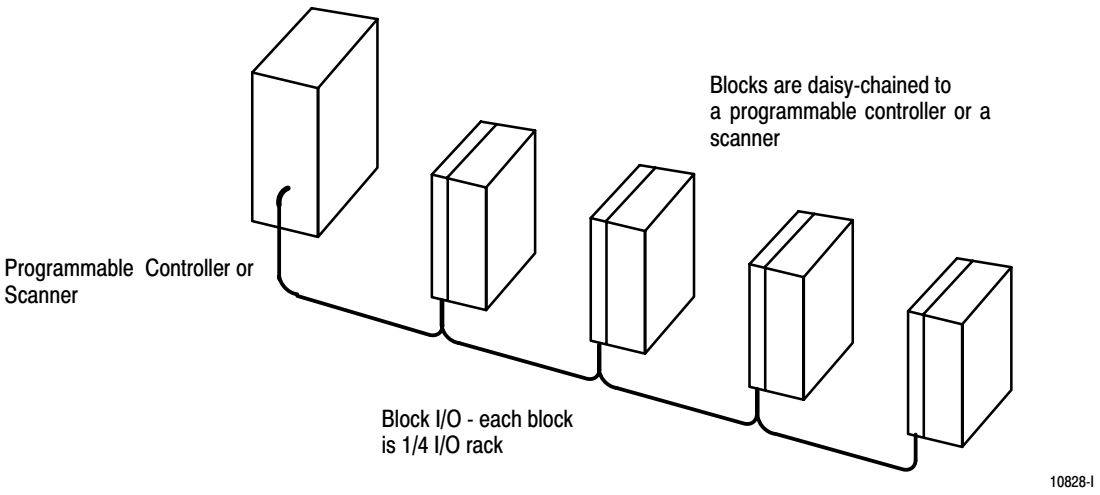
How Block I/O Fits in a PLC System

Block I/O is a complete I/O interface that includes the functionality of the I/O rack, adapter, power supply, and I/O modules in a single unit. Connect sensors and actuators to the module and use the remote I/O cable to connect the block I/O to your programmable controller.

Connect the block I/O to your remote I/O link as you would any other device (Figure 1.2). The block looks like a 1/4 I/O rack to the processor, and uses two words of input image table memory and two words of output image table memory. The block is addressed directly on the remote I/O link.

Input and output data is scanned asynchronously and transferred back and forth between the block and the controller input and output image table.

Figure 1.2
Block I/O Connection in a PLC System



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Chapter 2

I/O Interface and System Design

Chapter Objectives

In this chapter, you will learn what is compatible with block I/O, how to determine what devices to use, and what fuse to use for outputs.

Input Compatibility

Block I/O inputs convert ac or dc signals from user devices to the appropriate logic level for use within the processor. Typical input devices include:

- proximity switches
- limit switches
- selector switches
- float switches
- pushbutton switches

AC block output modules are compatible with 1771 series input modules that require greater than 3mA for the off-state current. A 1771 I/O input module that meets these specifications is:

- cat. no. 1771-ID16 ac isolated input module

AC block input modules are compatible with 1771 series output modules if the off-state leakage current of the module is less than the block module minimum off-state current and the on-state voltage minimum of the ac block input is greater than the supply voltage minus the on-state voltage drop across the 1771 output module. Some 1771 I/O modules that meet these specifications are:

- cat. no. 1771-OAN ac (120V) output module
- cat. no. 1771-OD16 ac (120V) isolated output module at 120V ac
- cat. no. 1771-ODD ac (120V) isolated output module at 120V ac
- cat. no. 1771-ODZ isolated ac output module

DC block output modules are compatible with 1771 series input modules that require greater than 0.5mA for the off-state current. Some 1771 I/O input modules that meet these specifications are:

- cat. no. 1771-IB dc (12–24V) input module
- cat. no. 1771-IBD dc (10–30V) input module
- cat. no. 1771-IBN dc (10–30V) input module
- cat. no. 1771-ICD dc (20–60V) input module
- cat. no. 1771-IN ac (24V) input module
- cat. no. 1771-IQ16 dc (24V) input module
- cat. no. 1771-IH dc (24-48V) input module

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DC block input modules are compatible with 1771 series output modules if the off-state leakage current of the module is less than the block module minimum off-state current and the on-state voltage minimum of the dc block input is greater than the supply voltage minus the on-state voltage drop across the 1771 output module. Some 1771 I/O modules that meet these specifications are:

- 1771-OB dc output driver module
- 1771-OBD dc (10–60V) output module
- 1771-OBN dc (10–30V) output module

Other Allen-Bradley products that are compatible with block inputs are shown in Table 2.A.

Table 2.A
Compatibility of Other Allen-Bradley Products

	Product	AC	DC	Product	AC	DC
Outputs	**Contactors**					
	Bulletin 100	100-A75	100-A45 (pure coil) 100-B180 (economized coil)	Bulletin 500	NEMA 0–2	NEMA 00
	Relays (Bulletin 700)					
	Type F	Yes	Yes	Type PK	Yes	Yes
	Type N	Yes	No	Type R	Yes	No
	Type P	Yes	Yes	Type RM	Yes	Yes
	Type PH	Yes	Yes			
Inputs	**Photoswitches**					
	Series 4000	Yes	Yes	Series 6000	Yes	Yes
	Series 5000	Yes	Yes	Series 7000	Yes	Yes
	Proximity Switches					
	871C	Yes	Yes	871	Yes	Yes
	871L	Yes	Yes	871Z	Yes	Yes
	871P	Yes	N/A	802PR	see 1	N/A
	871T	Yes	Yes	871T	Yes	Yes

1 Refer to individual switch specifications

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When selecting devices to use with the block I/O inputs, verify that the on–state voltage and currents of the device fall into the on–state region for the block input. Also verify that the off–state current and voltage fall into the off–state region of the block I/O module (Figure 2.1).

Figure 2.1
dc Input Specifications

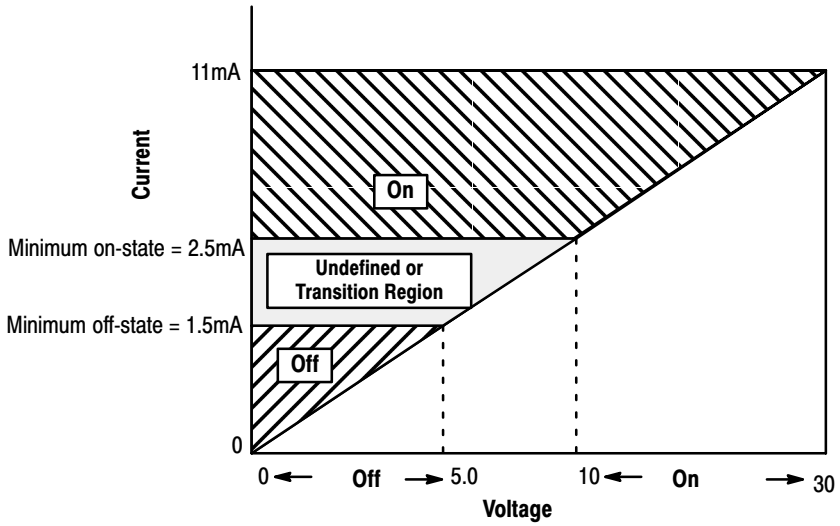
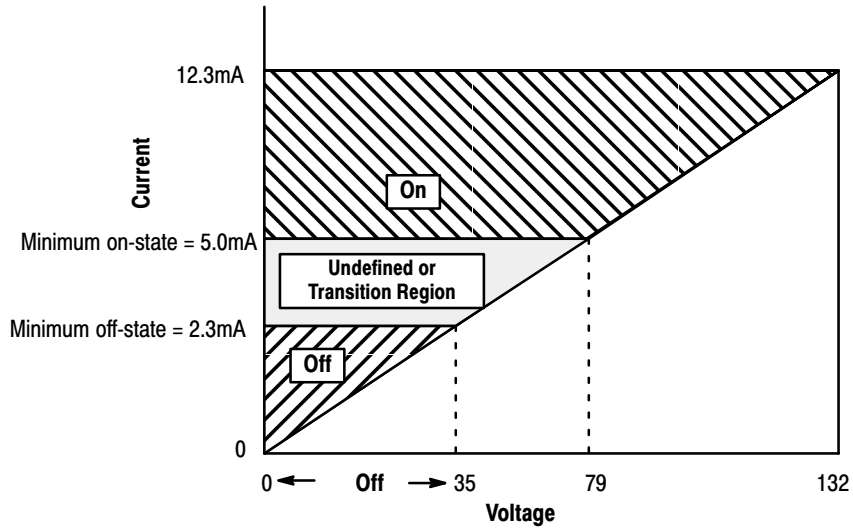


Figure 2.2
ac Input Specifications at 60Hz



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Example: You want to use an ac 2–wire Bulletin 871C Proximity Switch for an input to a block I/O module. To determine if the switch is compatible with the block, verify the following:

$I_{block-off} > I_{leakage-switch}$
$V_{supply} - V_{switch-on} > V_{block-on}$

where:

$I_{block-off}$ = minimum off-state current of block input
$I_{leakage-switch}$ = maximum off-state leakage current of proximity switch
V_{supply} = minimum value of supply voltage
$V_{switch-on}$ = maximum on-state voltage drop of proximity switch
$V_{block-on}$ = minimum on-state voltage specification

Simplified schematics of ac and dc input circuits are shown in Figure 2.3 and Figure 2.4.

Figure 2.3
Simplified Schematic of ac Input Circuit

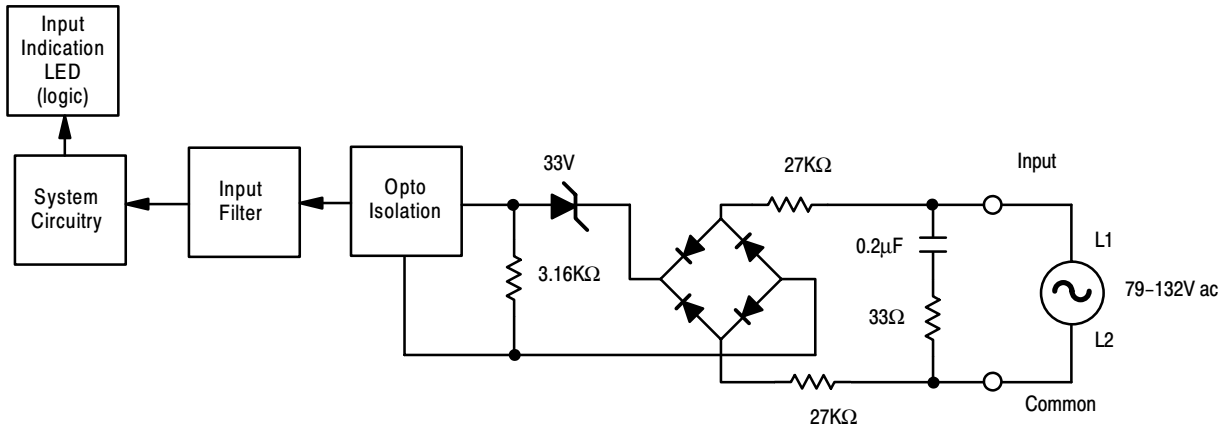
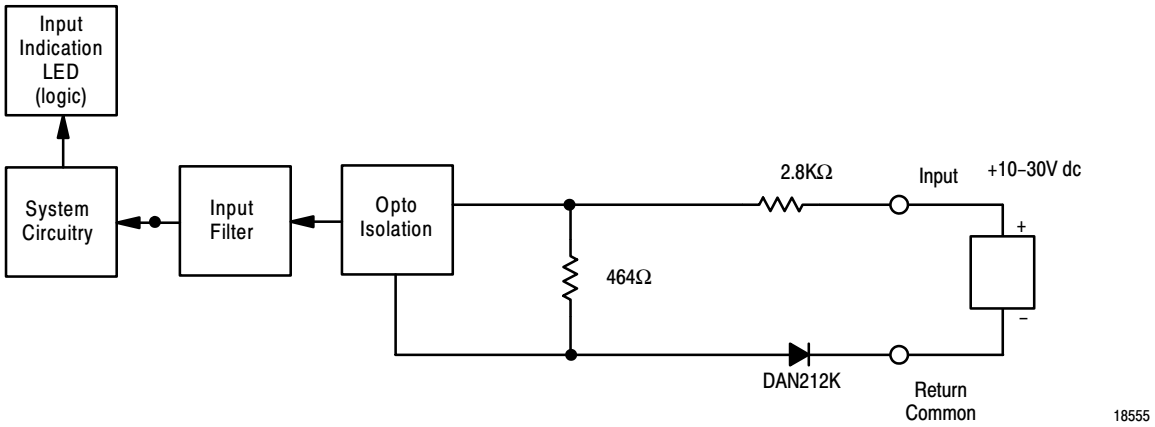


Figure 2.4
Simplified Schematic of Sinking dc Input Circuit



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Output Compatibility

The block I/O may be used to drive a variety of output devices. Typical output devices compatible with the block I/O outputs include:

- motor starters
- solenoids
- indicators

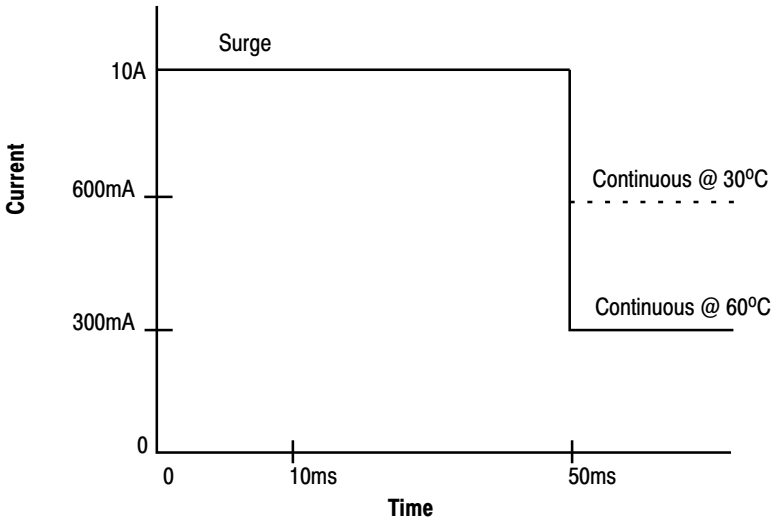
When designing a system, ensure that the block I/O output can supply the necessary surge and continuous current for proper operation. Take care to ensure that the surge and continuous current are not exceeded. Damage to the module could result.

The block I/O outputs are capable of directly driving the block I/O inputs of the same type.

AC Outputs

The ac output circuits for block I/O are capable of driving ac loads with a maximum surge current (inrush) of 10A/1200 Watts and a maximum holding current of 300mA/36 Watts at 60ºC (600mA/72 Watts at 30ºC). The maximum drive characteristics are shown below.

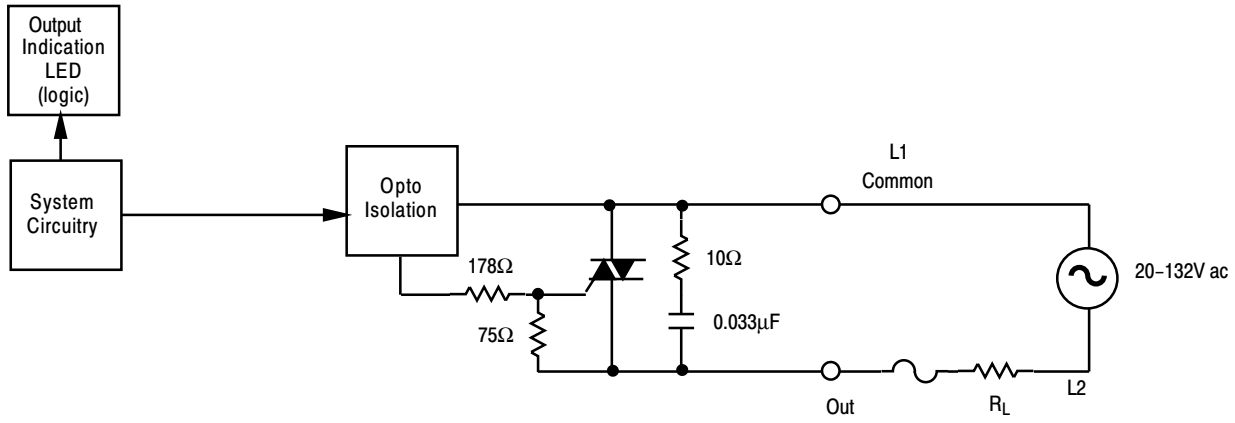
Figure 2.5
ac Output Drive Current



The drive circuit for ac outputs is shown in Figure 2.6.

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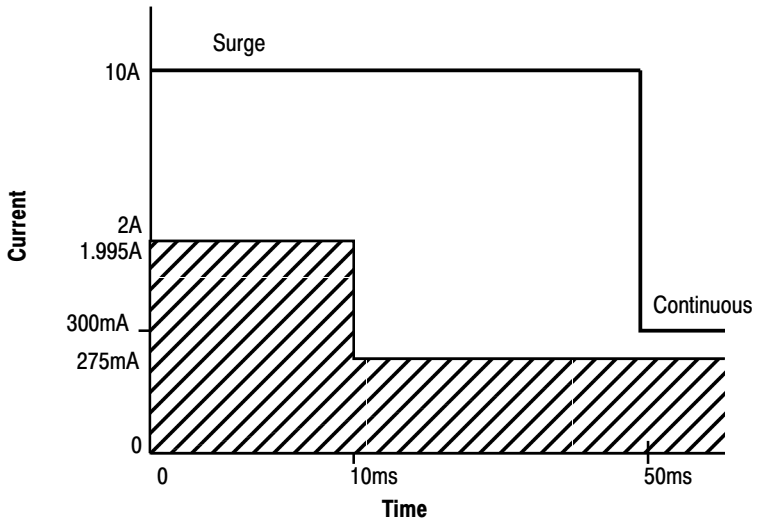
Figure 2.6
Simplified Schematic of ac Output Circuit



When sizing output loads, check the documentation supplied with the output device for the surge and continuous current needed to operate the device. Refer to Table 2.A to determine which Allen-Bradley products will directly interface to the outputs.

Example: The output device is an ac solenoid operated air valve with an inrush current (surge) of 1.995A for 10ms and a holding current (continuous) of 275mA. Figure 2.7 shows that the load of the output device is within the operating specifications of the ac output.

Figure 2.7
ac Output Drive Current Load for ac Air Valve

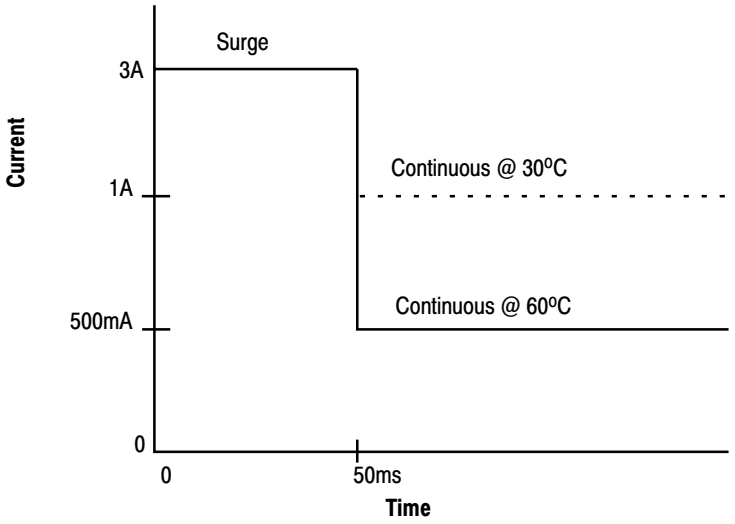


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DC Outputs

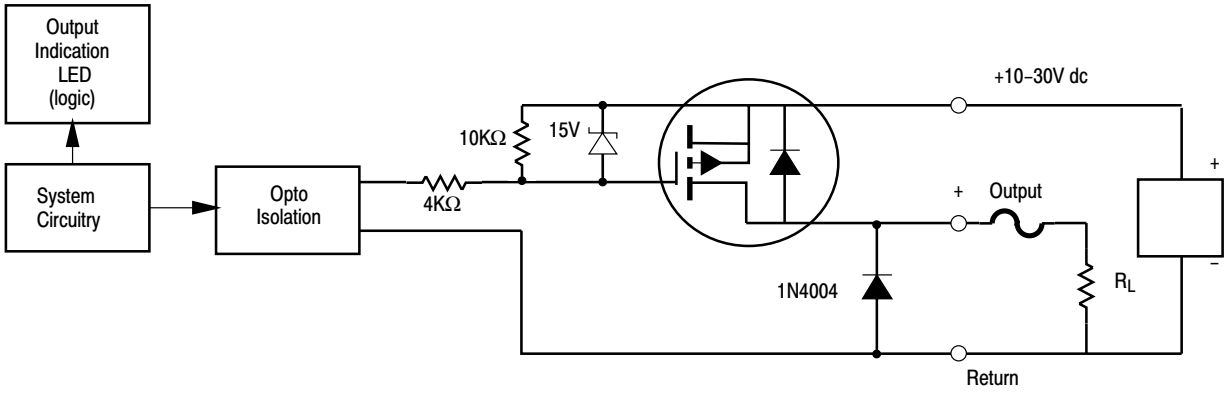
The dc output circuits for block I/O are capable of driving dc loads with a maximum surge current (inrush) of 3A/72 Watts and a maximum holding current of 500mA/12 Watts at 60ºC (1A/24 Watts at 30ºC). The maximum drive characteristics are shown below (Figure 2.8).

Figure 2.8
dc Output Drive Current



The drive circuit for dc outputs is shown in Figure 2.9.

Figure 2.9
Simplified Schematic of dc Output Circuit



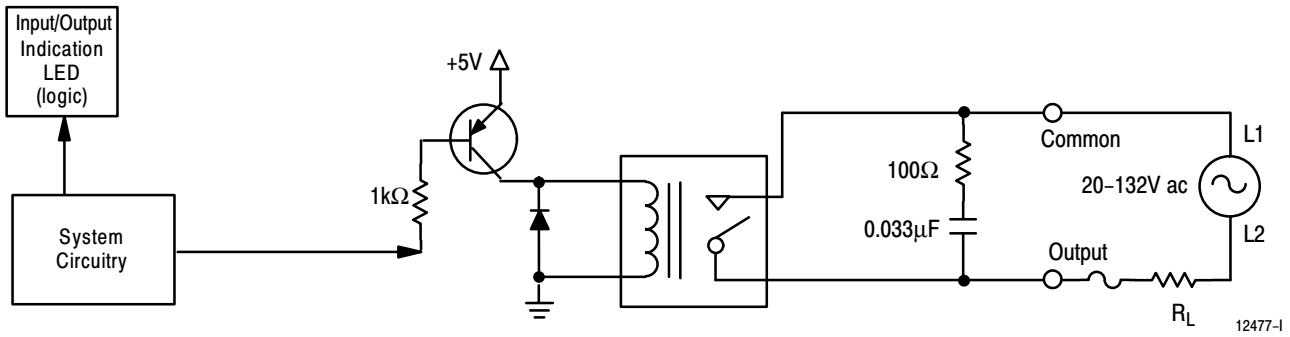
When sizing output loads, check the documentation supplied with the output device for the surge and continuous current needed to operate the device. Refer to Table 2.A to determine which Allen-Bradley products will directly interface to the outputs.

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Relay Output

The relay outputs on block I/O modules are electro-mechanical outputs and do not require specific compatibility with the load device as to current sinking or sourcing.

Figure 2.10
Simplified Schematic of Relay Output Circuit



Fusing

The 16- and 32-point ac and dc block I/O modules are internally fused to protect the module. No external power fusing is required. Outputs are not fused. Fusing of outputs is recommended. If desired to fuse an output, you must provide external fusing.

Table 2.B
Recommended Fuses

Type of Circuit	Part Number[1]	Size	Rating in Amps	Maximum Surge Current[2] (repeatable every 2s)
ac	SAN-O SS2-1.0	0.25 in. x 1.25 in.	1.0A	3.0A for 50ms
	SAN-O MQ2-1.0	5mm x 20mm	1.0A	2.5A for 50ms
dc	Littelfuse 322 1.25	0.25 in. x 1.25 in.	1.25A	2.25A for 50ms
	SAN-O MQ4-800	5mm x 20mm	800mA[3]	2.0A for 50ms

[1] **Note:** Do not substitute another fuse for those listed.
[2] The recommended fuses will withstand surges of the above listed currents for the time specified.
[3] Current must be limited to 650mA when using this fuse.·

Both ac and dc block I/O modules (except relay output modules) are derated linearly above 30°C up to and including 60°C, as shown in Table 2.C.

For modules with relay outputs, refer to Appendix A for output current and surge current ratings.

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Table 2.C
Output Ratings and Non-fused Surge Currents

Catalog Number	Voltage	Mounting	Maximum Output Rating at: 30°C	60°C	Maximum Surge Current
1791-0A16/B	120V ac	Vertical	600mA	300mA	10A for 50ms (repeatable every 2s)
	120V ac	Horizontal	300mA	150mA	
1791-8AC/B	120V ac	Vertical	600mA	300mA	
	120V ac	Horizontal	300mA	150mA	
1791-0A32/B	120V ac	Vertical	600mA	300mA	
	120V ac	Horizontal	300mA	150mA	
1791-16AC/B	120V ac	Vertical	600mA	300mA	
	120V ac	Horizontal	300mA	150mA	
1791-24A8/B	120V ac	Vertical	600mA	300mA	
	120V ac	Horizontal	300mA	150mA	
1791-0B16/B	24V dc	Vertical	1A	500mA	3A for 50ms (repeatable every 2s)
	24V dc	Horizontal	500mA	250mA	
1791-8BC/B	24V dc	Vertical	1A	500mA	
	24V dc	Horizontal	500mA	250mA	
1791-0B32/B	24V dc	Vertical	1A	500mA	
	24V dc	Horizontal	500mA	250mA	
1791-16BC/B	24V dc	Vertical	1A	500mA	
	24V dc	Horizontal	500mA	250mA	
1791-24B8/B	24V dc	Vertical	1A	500mA	
	24V dc	Horizontal	500mA	250mA	

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Chapter 3

Installing Block I/O

Chapter Objectives

In this chapter, you will learn how to mount the block, connect the input and output wiring to the block, add surge suppression (if required), connect remote I/O wiring, terminate the remote I/O link, and select remote I/O link speed.

Pre-installation Considerations

Before installation, you must determine the:

- scanner/processor to use
- number of blocks on your network
- throughput requirements
- total distance of the installation
- transmission rate desired
- external fuses required (if any)

Acceptable combinations are shown in Table 3.A.

Table 3.A
Acceptable Combinations of Processor and Block I/O

When using	and	Maximum Capacity	Baud Rate Used	Maximum Network Distance
PLC-2 family	1771-SN	16 blocks with 150 ohm terminator	57.6K	10,000 cable-feet
			115.2K	5,000 cable-feet
	1772-SD, 1772-SD2	16 blocks/channel, 28 blocks/scanner with 150 ohm terminator	57.6K	10,000 cable-feet
			115.2K	5,000 cable-feet
PLC-3 family	Any PLC-3 scanner module	16 blocks/channel, 64 blocks/scanner with 150 ohm terminator. 128 blocks with 2 scanners and 150 ohm terminator.	57.6K	10,000 cable-feet
			115.2K	5,000 cable-feet
	1775-S5, or -SR5 module	32 blocks/channel, 64 blocks/scanner with 82 ohm terminator. 128 blocks with 2 scanners, 82 ohm terminator and extended node addressing.	57.6K	10,000 cable-feet
			115.2K	5,000 cable-feet
			230.4K	2,000 cable-feet
PLC-5 family	PLC-5VME (6008-LTV)[2]	4 blocks with 150 ohm terminator	57.6K	10,000 cable-feet
	PLC-5/11	4 blocks with 150 ohm terminator	57.6K	10,000 cable-feet
			115.2K	5,000 cable-feet
			230.4K	2,500 cable-feet
	PLC-5/15[1]	12 blocks with 150 ohm terminator	57.6K	10,000 cable-feet

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When using	and	Maximum Capacity	Baud Rate Used	Maximum Network Distance
PLC-5 family (continued)	PLC-5/20	12 blocks with 82 ohm or 150 ohm terminator	57.6K	10,000 cable-feet
			115.2K	5,000 cable-feet
			230.4K	2,500 cable-feet
	PLC-5/25	16 blocks with 150 ohm terminator, 28 blocks with 82 ohm terminator and extended node addressing	57.6K	10,000 cable-feet
	PLC-5/30	16 blocks/channel, 28 blocks per processor with 150 ohm terminator	57.6K	10,000 cable-feet
			115.2K	5,000 cable-feet
		28 blocks/channel, 28 blocks per processor with 82 ohm terminator and extended node addressing	57.6K	10,000 cable-feet
			115.2K	5,000 cable-feet
			230.4K	2,500 cable-feet
	PLC-5/40	16 blocks/channel, 60 blocks per processor with 150 ohm terminator	57.6K	10,000 cable-feet
			115.2K	5,000 cable-feet
		32 blocks/channel, 60 blocks per processor with 82 ohm terminator and extended node addressing	57.6K	10,000 cable-feet
			115.2K	5,000 cable-feet
			230.4K	2,500 cable-feet
	PLC-5/40L	16 blocks/channel, 32 blocks per processor with 150 ohm terminator	57.6K	10,000 cable-feet
			115.2K	5,000 cable-feet
		32 blocks/channel, 60 blocks per processor with 82 ohm terminator and extended node addressing	57.6K	10,000 cable-feet
			115.2K	5,000 cable-feet
			230.4K	2,500 cable-feet
	PLC-5/60	16 blocks/channel, 64 blocks per processor with 150 ohm terminator	57.6K	10,000 cable-feet
			115.2K	5,000 cable-feet
		32 blocks/channel, 92 blocks per processor with 82 ohm terminator and extended node addressing	57.6K	10,000 cable-feet
			115.2K	5,000 cable-feet
			230.4K	2,500 cable-feet
	PLC-5/60L	16 blocks/channel, 32 blocks per processor with 150 ohm terminator	57.6K	10,000 cable-feet
			115.2K	5,000 cable-feet
		32 blocks/channel, 64 blocks per processor with 82 ohm terminator and extended node addressing	57.6K	10,000 cable-feet
			115.2K	5,000 cable-feet
			230.4K	2,500 cable-feet

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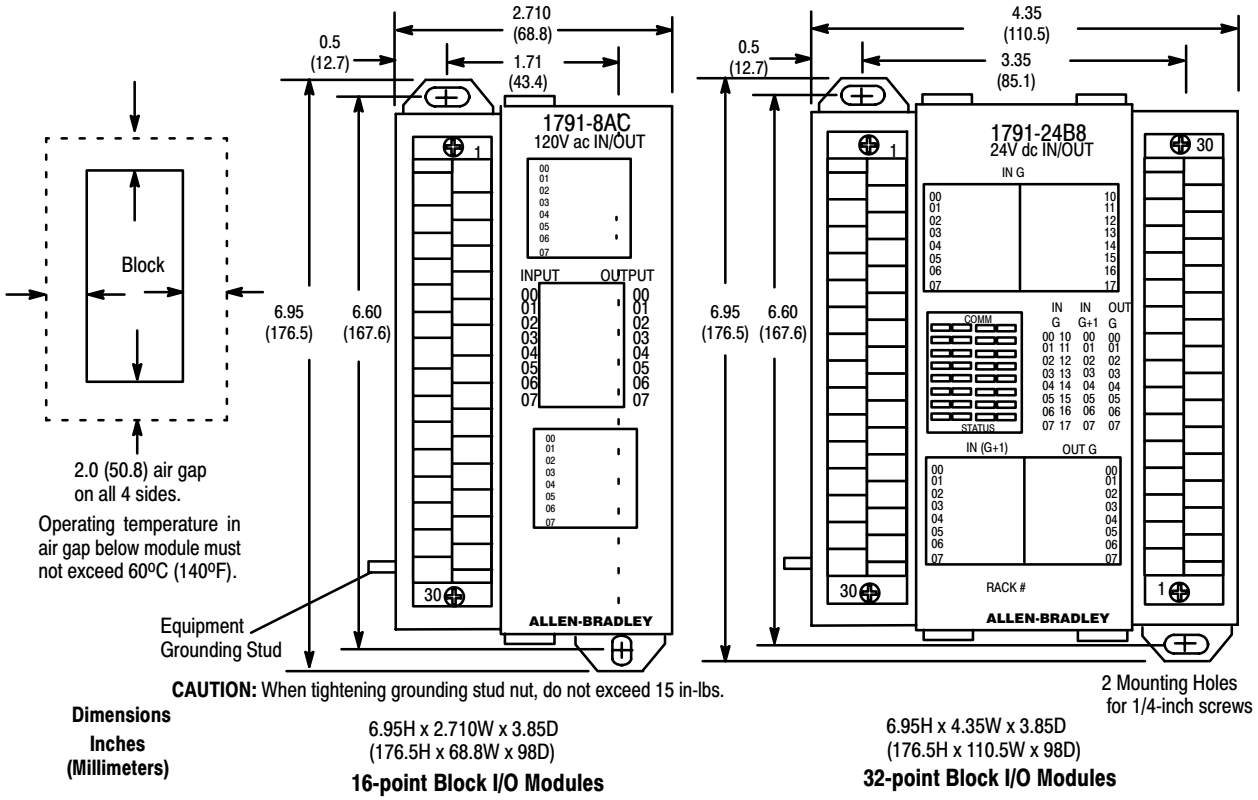
When using	and	Maximum Capacity	Baud Rate Used	Maximum Network Distance
PLC-5 family (continued)	PLC-5/250 - requires a 5150-RS remote scanner	16 blocks/channel, 32 blocks/scanner, (128 blocks with 4 scanners) with 150 ohm terminator and extended node addressing	57.6K	10,000 cable-feet
			115.2K	5,000 cable-feet
		32 blocks/channel, 32 blocks/scanner, (128 blocks with 4 scanners) with 82 ohm terminator and extended node addressing	57.6K	10,000 cable-feet
			115.2K	5,000 cable-feet
			230.4K	2,500 cable-feet
SLC-5/02 or SLC-5/03 Controllers	1747-SN Remote I/O Scanner Module	16 blocks with 150 ohm terminator	57.6K	10,000 cable-feet
			115.2K	5,000 cable-feet
		16 blocks with 82 ohm terminator	230.4K	2,500 cable-feet

[1] PLC-5/15 series A and PLC-5/15 series B prior to revision H (B/H) can only address 3 blocks.
[2] PLC-5/25 revisions prior to A/D can only address 7 blocks.

Installing the Block I/O

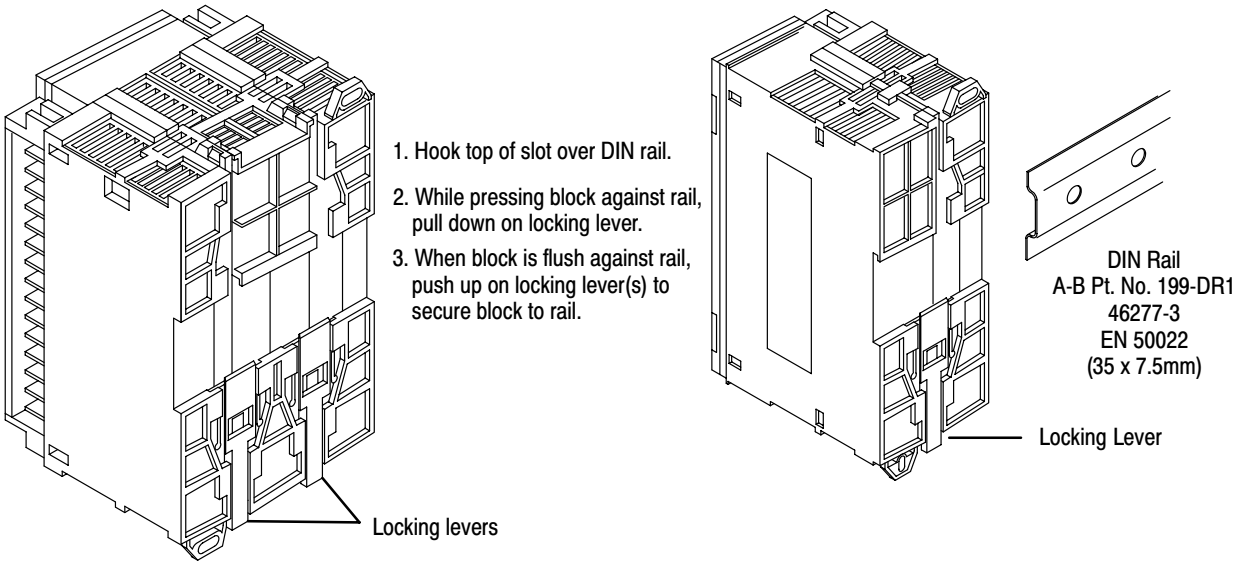
Figure 3.1 shows the mounting dimensions for the block I/O module. Mount the blocks vertically with a minimum of 2” between blocks. This air gap is necessary to maintain proper cooling air flow through the block.

Figure 3.1
Mounting Dimensions for the Block I/O Modules



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Figure 3.2
Mounting on a DIN Rail

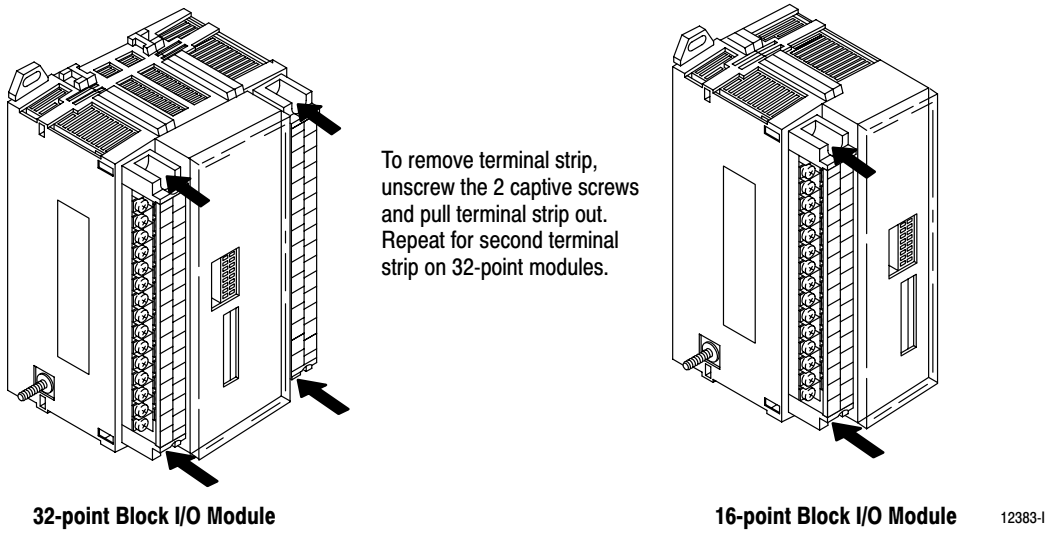


Connecting Wiring

Make wiring connections to the removable terminal block which plugs into the front of the block.

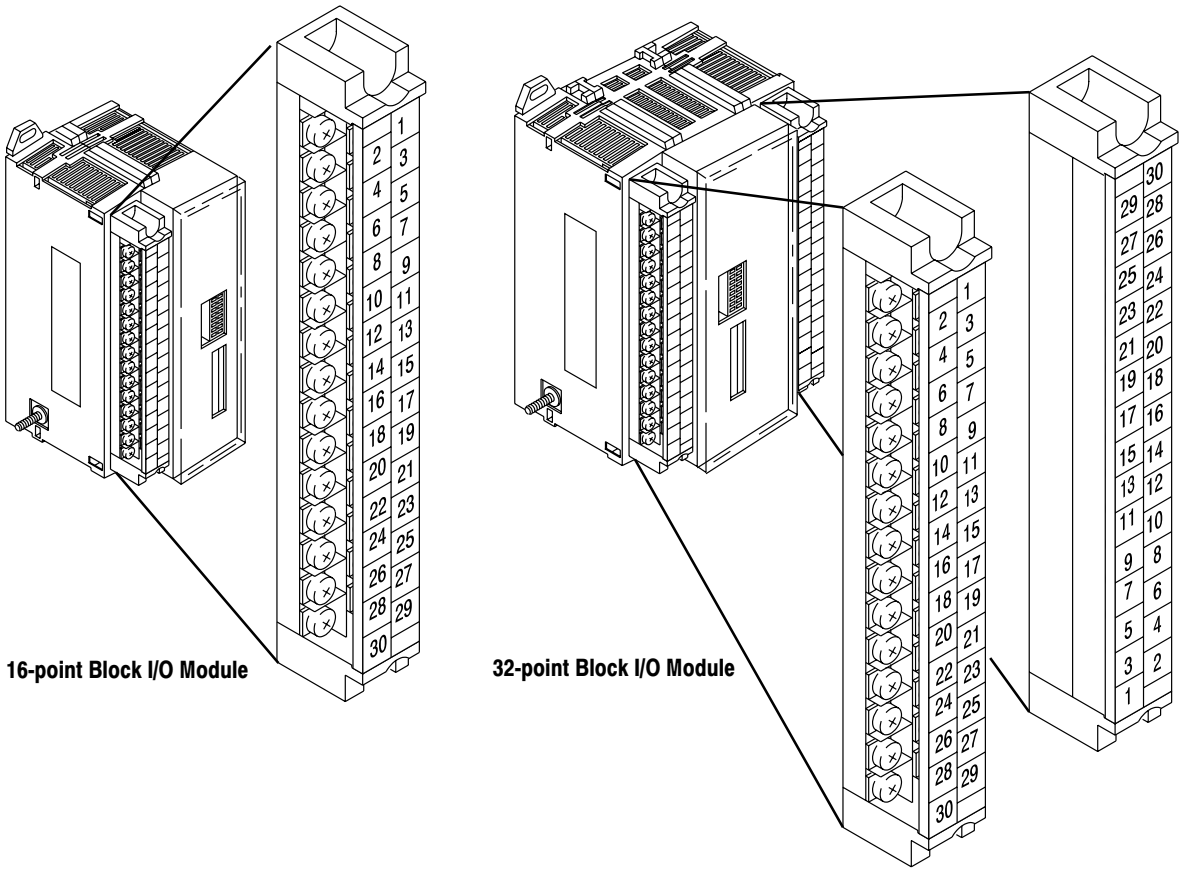
ATTENTION: The terminal blocks are not keyed to prevent incorrect insertion. If you remove a terminal block, make certain that each terminal block is inserted with the lower row of screws on the outside of the block (positioned toward the outside of the module).

Figure 3.3
Removing the Terminal Block



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Figure 3.4
Terminal Block Pin Numbering

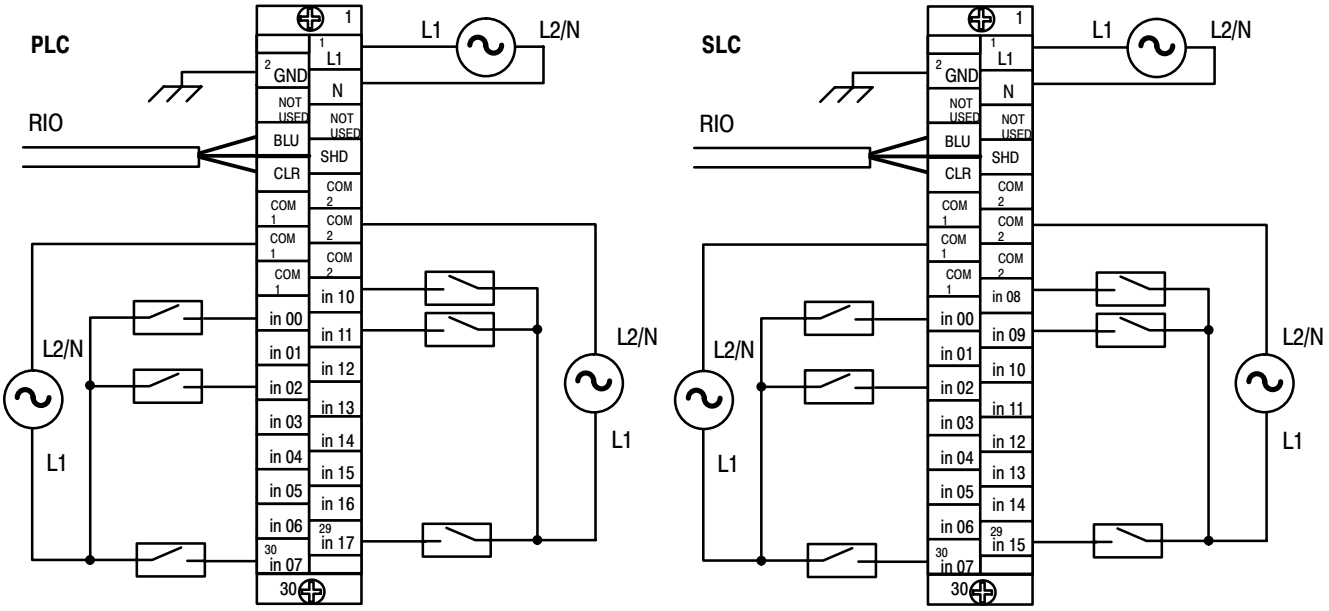


Refer to the table below for the Figure and page number of the wiring for each block I/O module.

Catalog Number	Wiring Connections	Catalog Number	Wiring Connections	Catalog Number	Wiring Connections
1791-16A0	Figure 3.5, page 3-6	1791-16AC	Figure 3.11, page 3-14	1791-8BR	Figure 3.17, page 3-23
1791-0A16	Figure 3.6, page 3-7	1791-24A8	Figure 3.12, page 3-16	1791-32B0	Figure 3.18, page 3-24
1791-8AC	Figure 3.7, page 3-8	1791-24AR	Figure 3.13, page 3-18	1791-0B32	Figure 3.19, page 3-26
1791-8AR	Figure 3.8, page 3-9	1791-16B0	Figure 3.14, page 3-20	1791-16BC	Figure 3.20, page 3-28
1791-32A0	Figure 3.9, page 3-10	1791-0B16	Figure 3.15, page 3-21	1791-24B8	Figure 3.21, page 3-30
1791-0A32	Figure 3.10, page 3-12	1791-8BC	Figure 3.16, page 3-22	1791-24BR	Figure 3.22, page 3-32

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Figure 3.5
Input Connections for the 1791-16A0 Series B



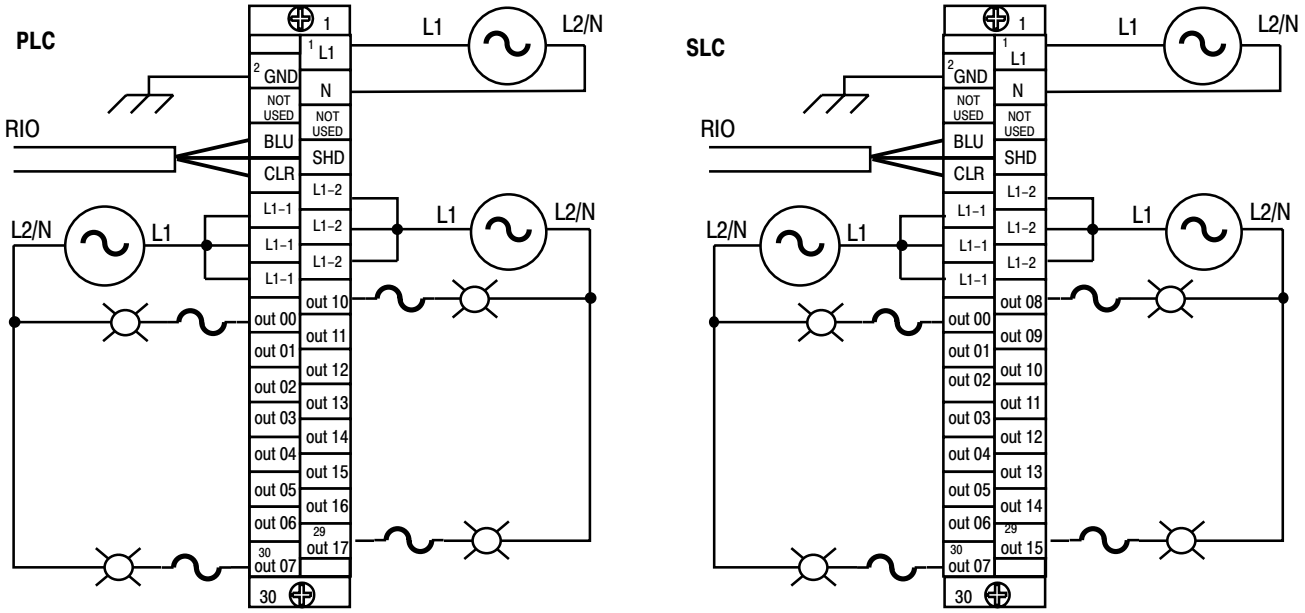
NOTE: Com 1 connections are internally connected together.
Com 2 connections are internally connected together.

Connections	1791-16A0 Series B		
	Designation	**Description**	**Terminal**
Power Connections	L1	ac hot	1
	N	ac neutral	3
	GND	Chassis ground	2[1]
Remote I/O Connections	BLU	Blue wire - RIO	6
	CLR	Clear wire - RIO	8
	SHD	Shield - RIO	7
I/O Connections			
Input	in 00 thru in 07	Input 00 thru 07	16, 18, 20, 22, 24, 26, 28, 30
	COM 1	L2/N Input Common	10, 12, 14[2]
Input	COM 2	L2/N Input Common	9, 11, 13[3]
	PLC: in 10 thru in 17 SLC: in 08 thru in 15	PLC: Input 10 thru Input 17 SLC: Input 08 thru Input 15	15, 17, 19, 21, 23, 25, 27, 29
	Not used	For internal test only; not for customer use.	4, 5

[1] Connect chassis ground to equipment grounding stud. These are not internally connected.
[2] Terminals 10, 12 and 14 are internally connected.
[3] Terminals 9, 11 and 13 are internally connected.

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Figure 3.6
Output Wiring Connections for the 1791-0A16 Series B



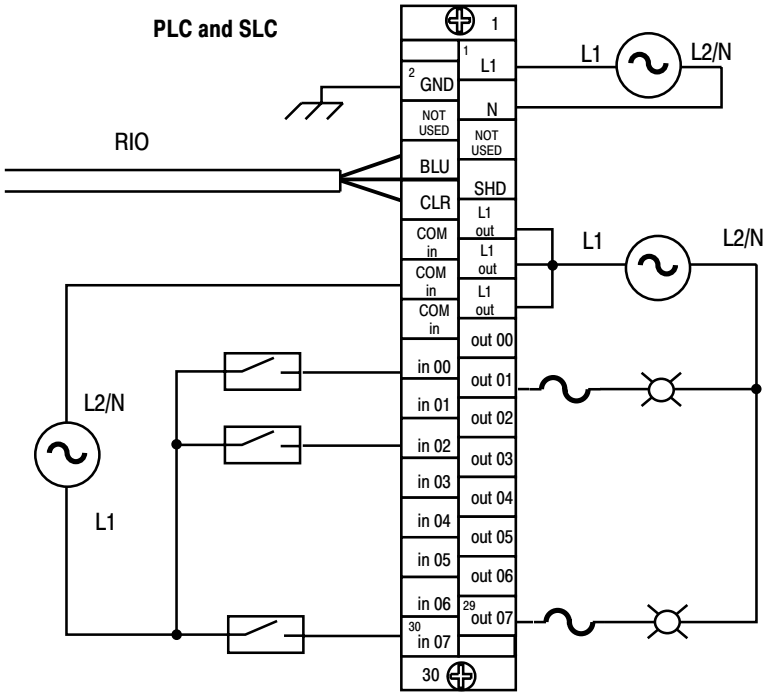
NOTE: L1-1 connections must be externally connected together to accommodate total amperage.
L1-2 connections must be externally connected together to accommodate total amperage.
Output fusing is recommended. Refer to Table 2.B on page 2-8.

Connections	1791-0A16 Series B		
	Designation	**Description**	**Terminal**
Power Connections	L1	ac hot	1
	N	ac neutral	3
	GND	Chassis ground	2[1]
Remote I/O Connections	BLU	Blue wire - RIO	6
	CLR	Clear wire - RIO	8
	SHD	Shield - RIO	7
I/O Connections			
Output	out 00 thru out 07	Output 00 thru 07	16, 18, 20, 22, 24, 26, 28, 30
	L1–1	L1 output supply	10, 12, 14[2]
Output	L1–2	L1 output supply	9, 11, 13[3]
	PLC: out 10 thru out 17 SLC: out 08 thru out 15	PLC: Output 10 thru 17 SLC: Output 08 thru 15	15, 17, 19, 21, 23, 25, 27, 29
	Not used	For internal test only; not for customer use.	4, 5

[1] Connect chassis ground to equipment grounding stud. These are not internally connected.
[2] Terminals 10, 12 and 14 must be externally connected by customer.
[3] Terminals 9, 11 and 13 must be externally connected by customer.

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Figure 3.7
Input/Output Wiring Connections for the 1791-8AC Series B



NOTE: COM in connections are internally connected together.
L1 out connections must be externally connected together to accommodate total amperage.
Output fusing is recommended. Refer to Table 2.B on page 2-8.

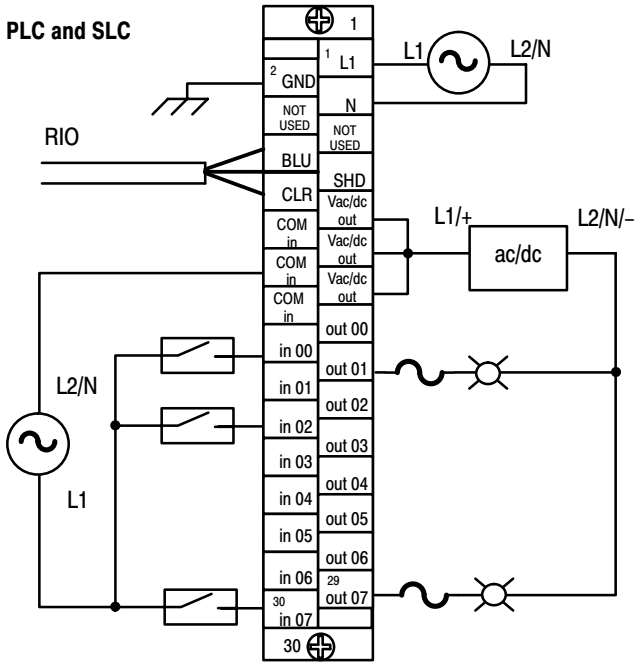
12390–I

Connections	1791-8AC Series B		
	Designation	**Description**	**Terminal**
Power Connections	L1	ac hot	1
	N	ac neutral	3
	GND	Chassis ground	2[1]
Remote I/O Connections	BLU	Blue wire - RIO	6
	CLR	Clear wire - RIO	8
	SHD	Shield - RIO	7
I/O Connections			
Input	in 00 thru in 07	Input 00 thru 07	16, 18, 20, 22, 24, 26, 28, 30
	COM in	L2/N input common	10, 12, 14[2]
Output	L1 out	L1 output supply	9, 11, 13[3]
	out 00 thru out 07	Output 00 thru 07	15, 17, 19, 21, 23, 25, 27, 29
	Not used	For internal test only; not for customer use.	4, 5

[1] Connect chassis ground to equipment grounding stud. These are not internally connected.
[2] Terminals 10, 12 and 14 are internally connected.
[3] Terminals 9, 11 and 13 must be externally connected by customer.

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Figure 3.8
Input/Output Wiring Connections for the 1791-8AR Series B



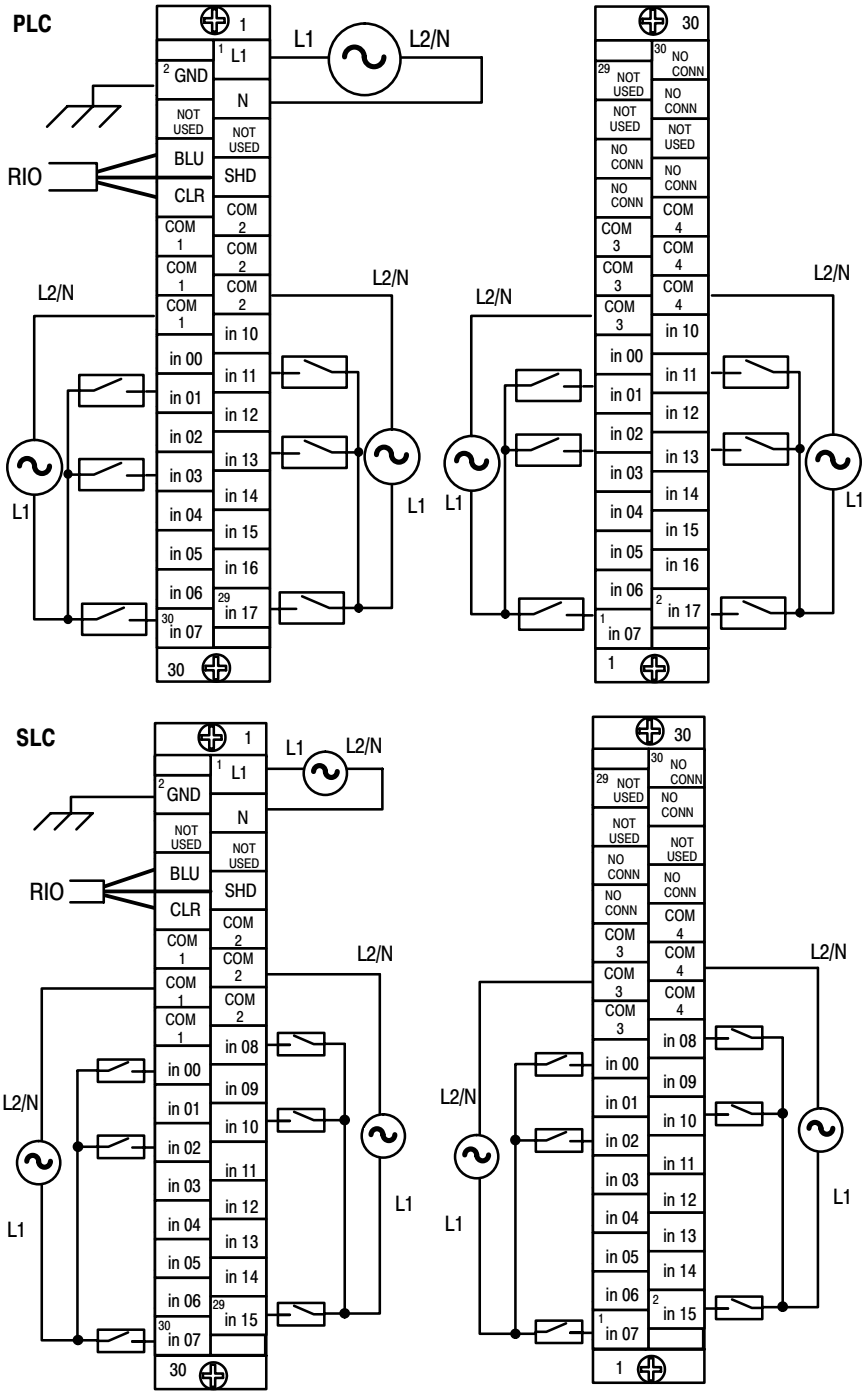
NOTE: COM in connections are internally connected together.
Vac/dc out connections must be externally connected together to accommodate total amperage.
Output fusing is recommended. Size fuse according to output load and surge current requirements. 12387–I

Connections	1791–8AR Series B		
	Designation	**Description**	**Terminal No.**
Power Connections	L1	ac hot	1
	N	ac neutral	3
	GND	Chassis ground	2[1]
Remote I/O Connections	BLU	Blue wire – RIO	6
	CLR	Clear wire – RIO	8
	SHD	Shield – RIO	7
I/O Connections			
Input	in 00 thru in 07	Input 00 thru 07	16, 18, 20, 22, 24, 26, 28, 30
	COM in	L2/N input common	10, 12, 14[2]
Output	Vac/dc out	ac or dc output supply	9, 11, 13[3]
	out 00 thru out 07	Output 00 thru 07	15, 17, 19, 21, 23, 25, 27, 29
	Not used	For internal test only; not for customer use.	4, 5

[1] Connect chassis ground to equipment grounding stud. These are not internally connected.
[2] Terminals 10, 12 and 14 are internally connected.
[3] Terminals 9, 11 and 13 must be externally connected by customer.

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Figure 3.9
Input Wiring Connections for the 1791-32A0 Series B



NOTE:

COM 1 connections are internally connected together.
COM 2 connections are internally connected together.
COM 3 connections are internally connected together.
COM 4 connections are internally connected together.

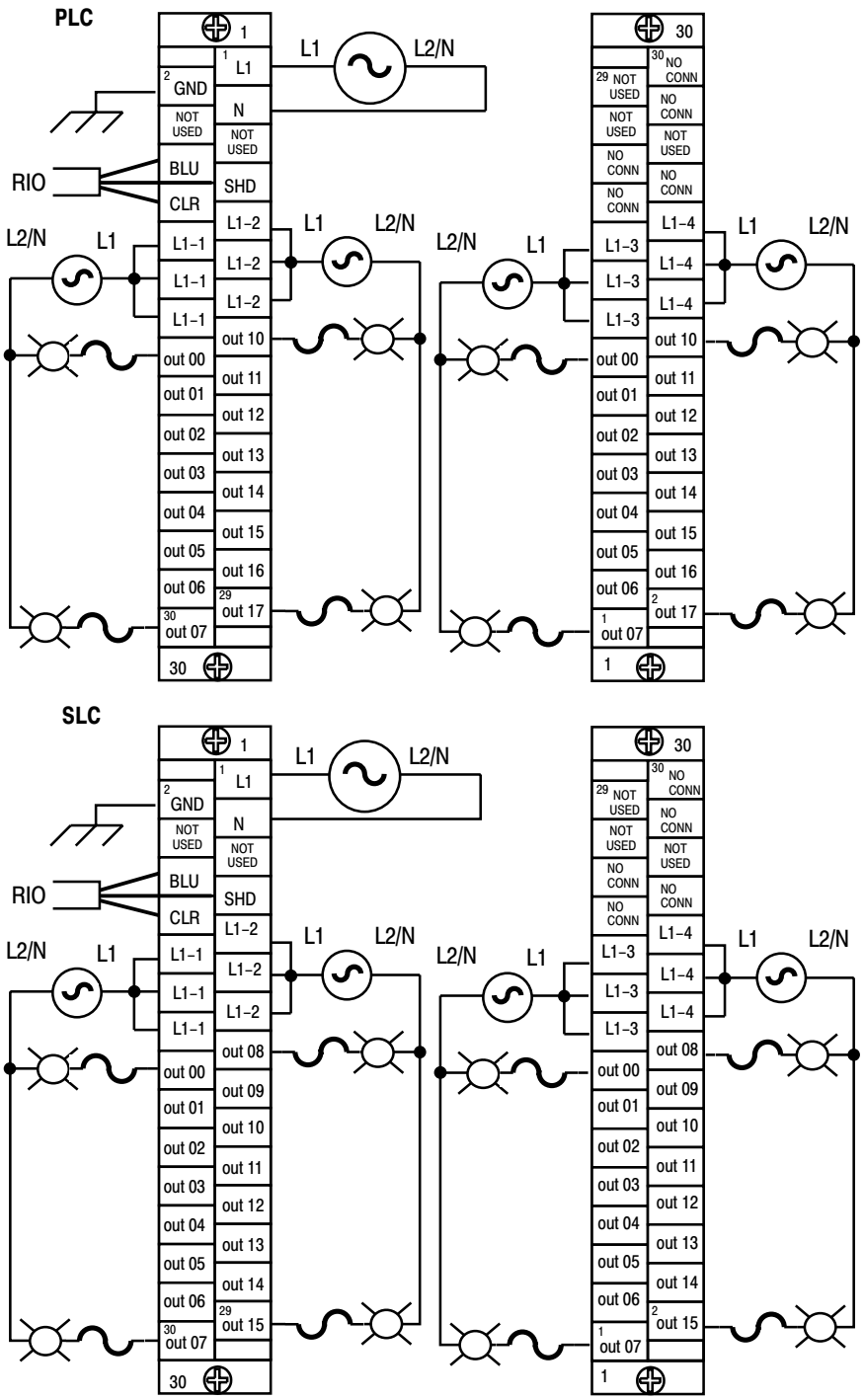
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Connections	1791-32A0 Series B		Connector/Terminal	
	Designation	**Description**	**Left Conn.**	**Right Conn.**
Power Connections	L1	ac hot	1	
	N	ac neutral	3	
	GND	Chassis ground	2[1]	
Remote I/O Connections	BLU	Blue wire – RIO	6	
	CLR	Clear wire – RIO	8	
	SHD	Shield – RIO	7	
I/O Connections				
Input (G)[6]	in 00 thru in 07	Input 00 thru 07	16, 18, 20, 22, 24, 26, 28, 30	
	COM 1	L2/N Input Common	10, 12, 14[2]	
	COM 2	L2/N Input Common	9, 11, 13[3]	
	PLC: in 10 thru in 17 SLC: in 08 thru in 15	PLC: Input 10 thru 17 SLC: Input 08 thru 15	15, 17, 19, 21, 23, 25, 27, 29	
Input (G+1)[7]	in 00 thru in 07	Input 00 thru 07		15, 13, 11, 9, 7, 5, 3, 1
	COM 3	L2/N Input Common		17, 19, 21[4]
	COM 4	L2/N Input Common		18, 20, 22[5]
	PLC: in 10 thru in 17 SLC: in 08 thru in 15	PLC: Input 10 thru 17 SLC: Input 08 thru 15		16, 14, 12, 10, 8, 6, 4, 2
	Not used	For internal test only; not for customer use.	4, 5	29, 27, 26
	No Conn	No internal connection; customer can use.		30, 28, 25, 24, 23

[1] Connect chassis ground to equipment grounding stud. These are not internally connected.
[2] Left connector terminals 10, 12 and 14 are internally connected together.
[3] Left connector terminals 9, 11 and 13 are internally connected together
[4] Right connector terminals 21, 19 and 17 are internally connected together
[5] Right connector terminals 22, 20 and 18 are internally connected together
[6] IN (G) = input module group (1 word).
[7] IN (G+1) = input module group plus 1 word

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Figure 3.10
Output Wiring Connections for the 1791-0A32 Series B



NOTE: L1–1 connections must be externally connected together to accommodate total amperage.
L1–2 connections must be externally connected together to accommodate total amperage.
L1–3 connections must be externally connected together to accommodate total amperage.
L1–4 connections must be externally connected together to accommodate total amperage.
Output fusing is recommended. Refer to Table 2.B on page 2-8.

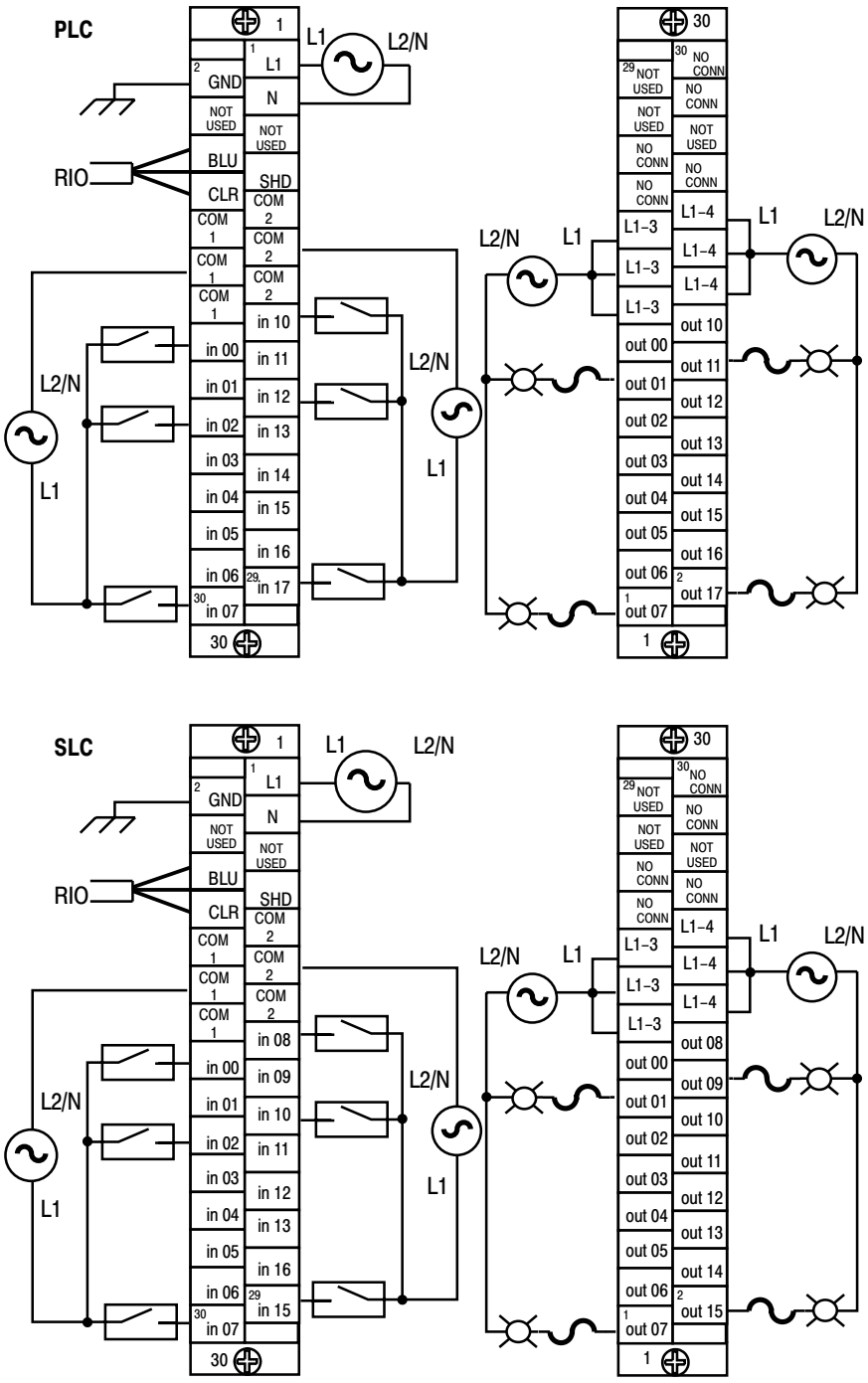
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Connections	1791-0A32 Series B		Connector/Terminal	
	Designation	**Description**	**Left Conn.**	**Right Conn.**
Power Connections	L1	ac hot	1	
	N	ac neutral	3	
	GND	Chassis ground	2[1]	
Remote I/O Connections	BLU	Blue wire – RIO	6	
	CLR	Clear wire – RIO	8	
	SHD	Shield – RIO	7	
I/O Connections				
Output (G)[6]	PLC: out 00 thru 07 SLC: out 00 thru 07	PLC: Output 00 thru 07 SLC: Output 00 thru 07	16, 18, 20, 22, 24, 26, 28, 30	
	L1–1	L1 output supply	10, 12, 14[2]	
	PLC: out 10 thru 17 SLC: out 08 thru 15	PLC: Output 10 thru 17 SLC: Output 08 thru 15	15, 17, 19, 21, 23, 25, 27, 29	
	L1–2	L1 output supply	9, 11, 13[3]	
Output (G + 1)[7]	PLC: out 00 thru 07 SLC: out 00 thru 07	PLC: Output 00 thru 07 SLC: Output 00 thru 07		15, 13, 11, 9, 7, 5, 3, 1
	L1–3	L1 output supply		17, 19, 21[4]
	PLC: out 10 thru 17 SLC: out 08 thru 15	PLC: Output 10 thru 17 SLC: Output 08 thru 15		16, 14, 12, 10, 8, 6, 4, 2
	L1–4	L1 output supply		22, 20, 18[5]
	Not used	For internal test only; not for customer use.	4, 5	29, 27, 26
	No Conn	No internal connection; customer can use.		30, 28, 25, 24, 23

[1] Connect chassis ground to equipment grounding stud. These are not internally connected.
[2] Terminals 10, 12 and 14 must be externally connected by customer to accommodate total amperage.
[3] Terminals 9, 11 and 13 must be externally connected by customer to accommodate total amperage.
[4] Terminals 17, 19 and 21 must be externally connected by customer to accommodate total amperage.
[5] Terminals 18, 20 and 22 must be externally connected by customer to accommodate total amperage.
[6] OUT (G) = output module group (one word).
[7] OUT (G + 1) = output module group plus one word.

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Figure 3.11
Input/Output Wiring Connections for the 1791-16AC Series B



NOTE: COM 1 connections are internally connected together.
COM 2 connections are internally connected together.
L1–3 connections must be externally connected together to accommodate total amperage.
L1–4 connections must be externally connected together to accommodate total amperage.
Output fusing is recommended. Refer to Table 2.B on page 2-8.

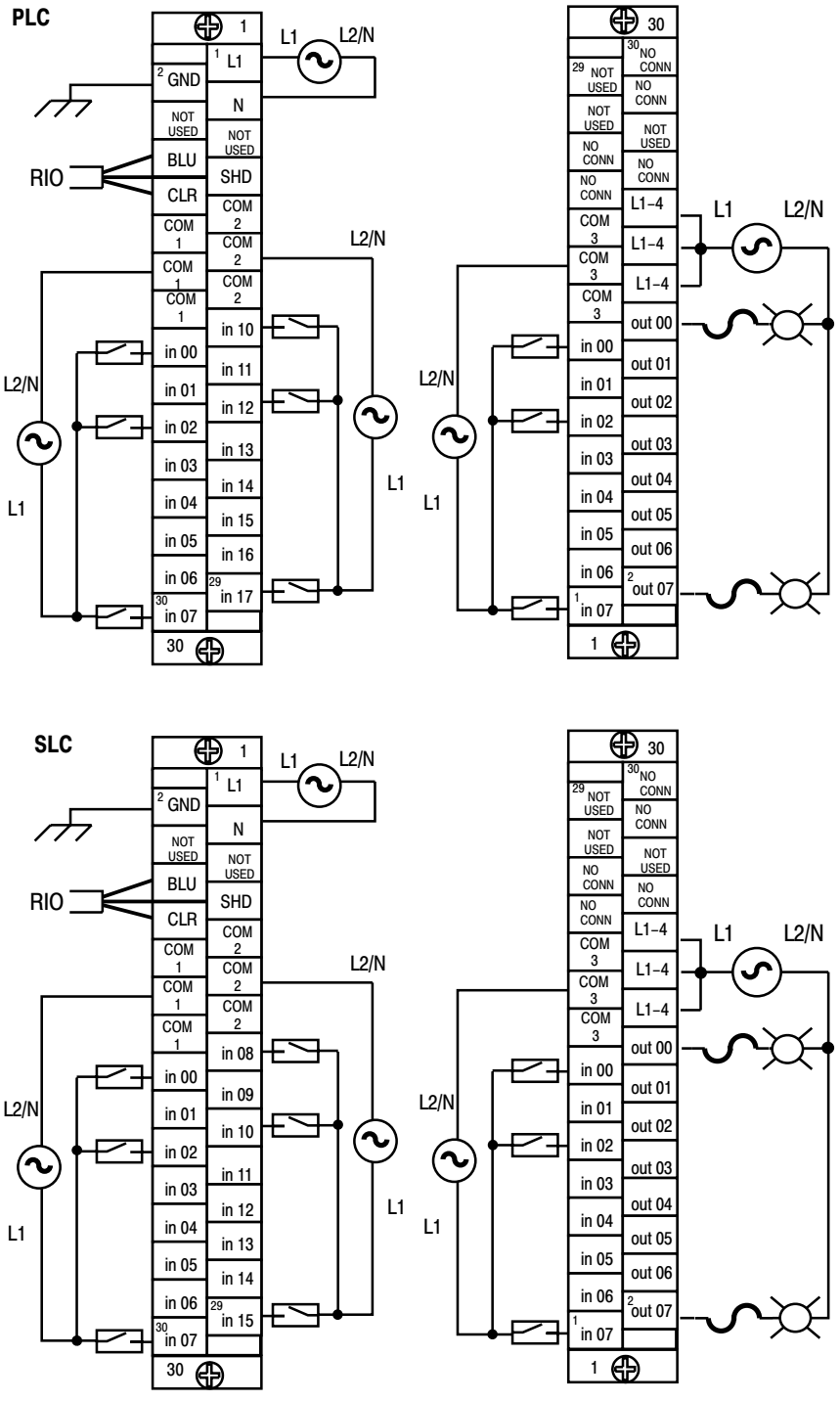
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Connections	1791–16AC Series B		Connector/Terminal	
	Designation	**Description**	**Left Conn.**	**Right Conn.**
Power Connections	L1	ac hot	1	
	N	ac neutral	3	
	GND	Chassis ground	2[1]	
Remote I/O Connections	BLU	Blue wire – RIO	6	
	CLR	Clear wire – RIO	8	
	SHD	Shield – RIO	7	
I/O Connections				
Input (G)[6]	in 00 thru in 07	Input 00 thru 07	16, 18, 20, 22, 24, 26, 28, 30	
	COM 1	L2/N Input Common	10, 12, 14[2]	
	COM 2	L2/N Input Common	9, 11, 13[3]	
	PLC: in 10 thru in 17 SLC: in 08 thru in 15	PLC: Input 10 thru 17 SLC: Input 08 thru 15	15, 17, 19, 21, 23, 25, 27, 29	
Output (G)[7]	PLC: out 00 thru 07 SLC: out 00 thru 07	PLC: Output 00 thru 07 SLC: Output 00 thru 07		15, 13, 11, 9, 7, 5, 3, 1
	L1–3	L1 output supply		21, 19, 17[4]
	PLC: out 10 thru 17 SLC: out 08 thru 15	PLC: Output 10 thru 17 SLC: Output 08 thru 15		16, 14, 12, 10, 8, 6, 4, 2
	L1–4	L1 output supply		22, 20, 18[5]
	Not used	For internal test only; not for customer use.	4, 5	29, 27, 26
	No Conn	No internal connection; customer can use.		30, 28, 25, 24, 23

[1] Connect chassis ground to equipment grounding stud. These are not internally connected.
[2] Terminals 10, 12 and 14 are internally connected together.
[3] Terminals 9, 11 and 13 are internally connected together.
[4] Terminals 17, 19 and 21 must be externally connected by customer to accommodate total amperage.
[5] Terminals 18, 20 and 22 must be externally connected by customer to accommodate total amperage.
[6] IN (G) = input module group.
[7] OUT (G) = output module group.

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Figure 3.12
Input/Output Wiring Connections for the 1791-24A8 Series B



NOTE: COM 1 connections are internally connected together.
COM 2 connections are internally connected together.
COM 3 connections are internally connected together.
L1–4 connections must be externally connected together to accommodate total amperage.
Output fusing is recommended. Refer to Table 2.B on page 2-8.

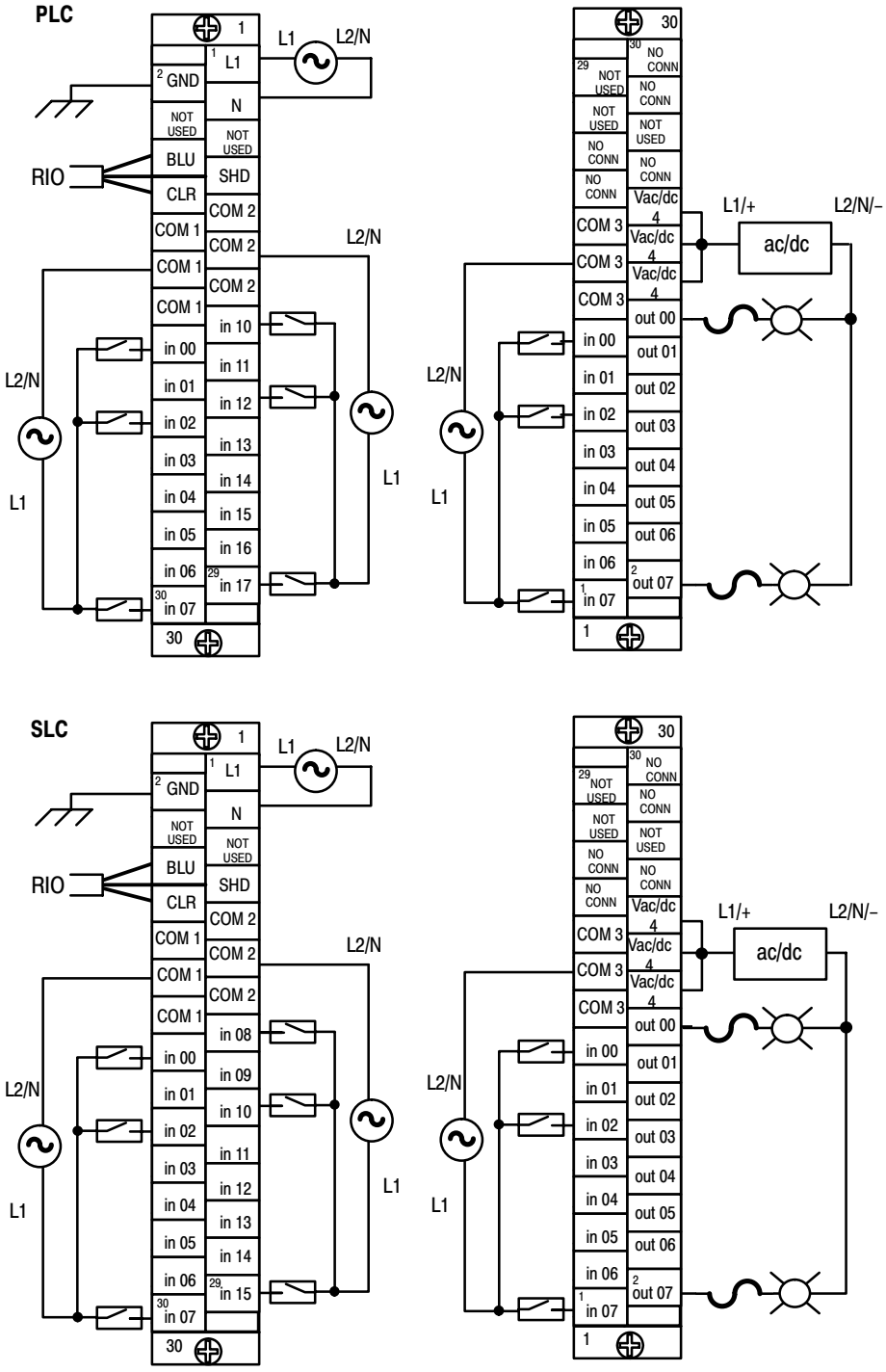
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Connections	1791-24A8 Series B		Connector/Terminal	
	Designation	**Description**	**Left Conn.**	**Right Conn.**
Power Connections	L1	ac hot	1	
	N	ac neutral	3	
	GND	Chassis ground	2[1]	
Remote I/O Connections	BLU	Blue wire – RIO	6	
	CLR	Clear wire – RIO	8	
	SHD	Shield – RIO	7	
I/O Connections				
Input (G)[6]	in 00 thru in 07	Input 00 thru 07	16, 18, 20, 22, 24, 26, 28, 30	
	COM 1	L2/N Input Common	10, 12, 14[2]	
	COM 2	L2/N Input Common	9, 11, 13[3]	
	PLC: in 10 thru in 17 SLC: in 08 thru in 15	PLC: Input 10 thru 17 SLC: Input 08 thru 15	15, 17, 19, 21, 23, 25, 27, 29	
Input (G + 1)[7]	in 00 thru in 07	Input 00 thru 07		15, 13, 11, 9, 7, 5, 3, 1
	COM 3	L2/N Input Common		17, 19, 21[4]
Output (G)[8]	L1-4	L1 Output Supply		22, 20, 18[5]
	PLC: out 00 thru out 07 SLC: out 00 thru out 07	PLC: Output 00 thru 07 SLC: Output 00 thru 07		16, 14, 12, 10, 8, 6, 4, 2
	Not used	For internal test only; not for customer use.	4, 5	29, 27, 26
	No Conn	No internal connection; customer can use.		30, 28, 25, 24, 23

[1] Connect chassis ground to equipment grounding stud. These are not internally connected.
[2] Left connector terminals 10, 12 and 14 are internally connected together.
[3] Left connector terminals 9, 11 and 13 are internally connected together.
[4] Right connector terminals 21, 19 and 17 are internally connected together.
[5] Right connector terminals 22, 20 and 18 must be externally connected to accommodate total amperage.
[6] (IN G) = input module group (1 word).
[7] IN (G+1) = input module group plus 1 word.
[8] OUT (G) = output module group (1 word).

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Figure 3.13
Input/Output Wiring Connections for the 1791-24AR Series B



NOTE: COM 1 connections are internally connected together.
COM 2 connections are internally connected together.
COM 3 connections are internally connected together.
Vac/dc 4 connections must be externally connected together to accommodate maximum amperage.
Output fusing is recommended. Size fuse according to output load and surge current requirements.

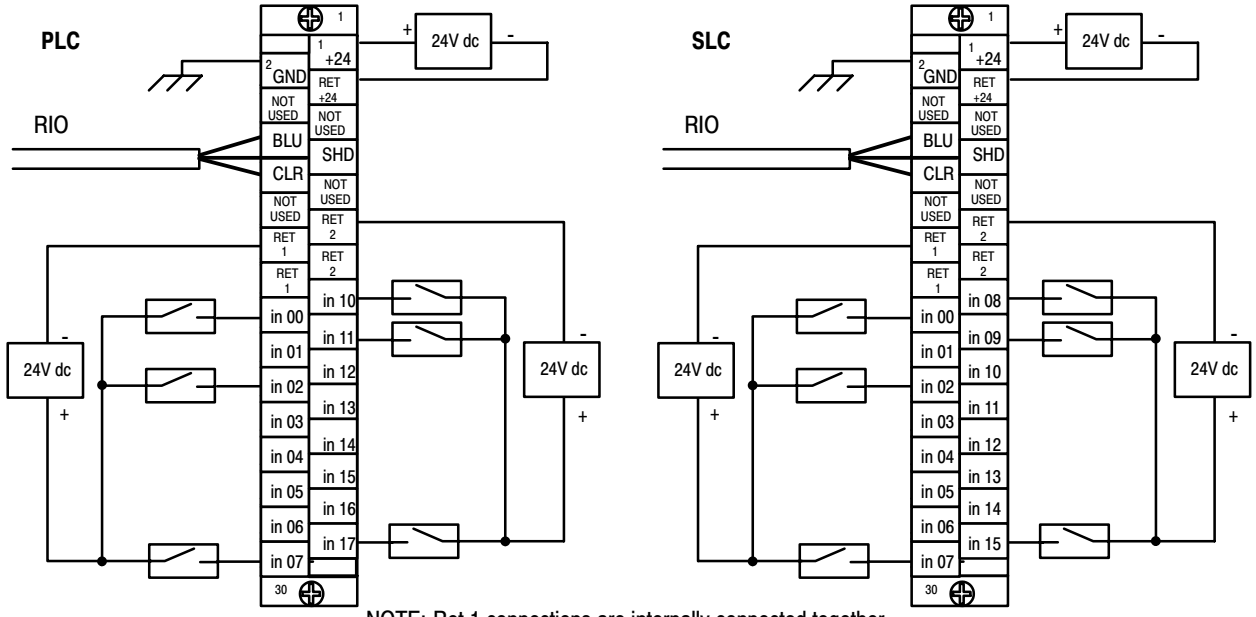
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Connections	1791–24AR Series B		Connector/Terminal	
	Designation	**Description**	**Left Conn.**	**Right Conn.**
Power Connections	L1	ac hot	1	
	N	ac neutral	3	
	GND	Chassis ground	2[1]	
Remote I/O Connections	BLU	Blue wire – RIO	6	
	CLR	Clear wire – RIO	8	
	SHD	Shield – RIO	7	
I/O Connections				
Input (G)[6]	in 00 thru in 07	Input 00 thru 07	16, 18, 20, 22, 24, 26, 28, 30	
	COM 1	L2/N Input Common	10, 12, 14[2]	
	COM 2	L2/N Input Common	9, 11, 13[3]	
	PLC: in 10 thru in 17 SLC: in 08 thru in 15	PLC: Input 10 thru 17 SLC: Input 08 thru 15	15, 17, 19, 21, 23, 25, 27, 29	
Input (G+1)[7]	in 00 thru in 07	Input 00 thru 07		15, 13, 11, 9, 7, 5, 3, 1
	COM 3	L2/N Input Common		21, 19, 17[4]
Output (G)[8]	Vac/dc 4	ac or dc Output Supply		22, 20, 18[5]
	PLC: out 00 thru out 07 SLC: out 00 thru out 07	PLC: Output 00 thru 07 SLC: Output 00 thru 07		16, 14, 12, 10, 8, 6, 4, 2
	Not used	For internal test only; not for customer use.	4, 5	29, 27, 26
	No Conn	No internal connection; customer can use.		30, 28, 25, 24, 23

[1] Connect chassis ground to equipment grounding stud. These are not internally connected.
[2] Left connector terminals 10, 12 and 14 are internally connected together.
[3] Left connector terminals 9, 11 and 13 are internally connected together.
[4] Right connector terminals 21, 19 and 17 are internally connected together.
[5] Right connector terminals 22, 20 and 18 must be externally connected to accommodate total amperage.
[6] IN (G) = input module group (1 word).
[7] IN (G+1) = input module group plus 1 word.
[8] OUT (G) = output module group (1 word).

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Figure 3.14
Input Wiring Connections for the 1791-16B0 Series B



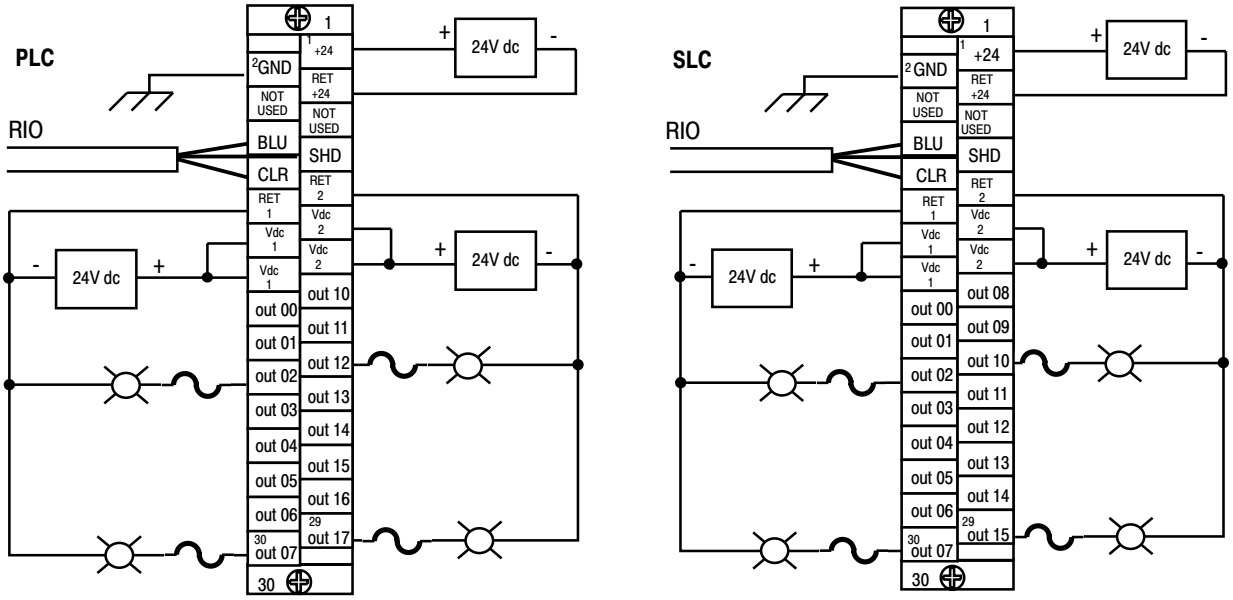
NOTE: Ret 1 connections are internally connected together.
Ret 2 connections are internally connected together.

Connections	1791-16B0 Series B		
	Designation	**Description**	**Terminal No.**
Power Connections	+24	+24V dc Power	1
	RET +24	dc Return	3
	GND	Chassis ground	2[1]
Remote I/O Connections	BLU	Blue wire - RIO	6
	CLR	Clear wire - RIO	8
	SHD	Shield - RIO	7
I/O Connections			
Input	in 00 thru in 07	Input 00 thru 07	16, 18, 20, 22, 24, 26, 28, 30
	RET 1	RET 1 Input Common	12, 14[2]
Input	RET 2	RET 2 Input Common	11, 13[3]
	PLC: in 10 thru in 17 SLC: in 08 thru in 15	PLC: Input 10 thru input 17 SLC: Input 08 thru input 15	15, 17, 19, 21, 23, 25, 27, 29
	Not Used	For internal test only; not for customer use.	4, 5, 9, 10

[1] Connect chassis ground to equipment grounding stud. These are not internally connected.
[2] Terminals 12 and 14 are internally connected.
[3] Terminals 11 and 13 are internally connected.

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Figure 3.15
Output Wiring Connections for the 1791-0B16 Series B



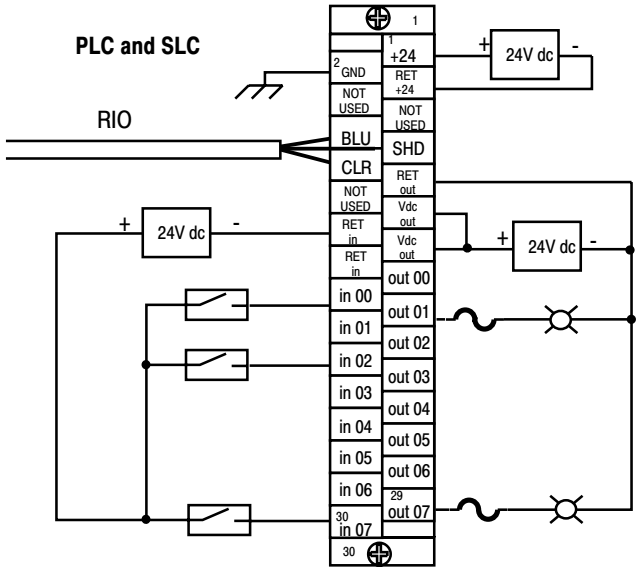
Note: Vdc 1 connections must be externally connected together to accommodate amperage rating.
Vdc 2 connections must be externally connected together to accommodate amperage rating.
Output fusing is recommended. Refer to Table 2.B on page 2-8.

Connections	1791-0B16 Series B		
	Designation	**Description**	**Terminal No.**
Power Connections	+24	+24V dc Power	1
	RET +24	dc Return	3
	GND	Chassis ground	2[1]
Remote I/O Connections	BLU	Blue wire - RIO	6
	CLR	Clear wire - RIO	8
	SHD	Shield - RIO	7
I/O Connections			
Output	out 00 thru out 07	Output 00 thru 07	16, 18, 20, 22, 24, 26, 28, 30
	Vdc 1	+24V dc output supply	12, 14[2]
	RET 1	dc output return	10
Output	Vdc 2	+24V dc output supply	11, 13[3]
	RET 2	dc output return	9
	PLC: out 10 thru out 17 SLC: out 08 thru out 15	PLC: Output 10 thru 17 SLC: Output 08 thru 15	15, 17, 19, 21, 23, 25, 27, 29
	Not used	For internal test only; not for customer use.	4, 5

[1] Connect chassis ground to equipment grounding stud. These are not internally connected.
[2] Terminals 12 and 14 must be externally connected by customer to accommodate amperage rating.
[3] Terminals 11 and 13 must be externally connected by customer to accommodate amperage rating.

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Figure 3.16
Input/Output Wiring Connections for the 1791-8BC Series B



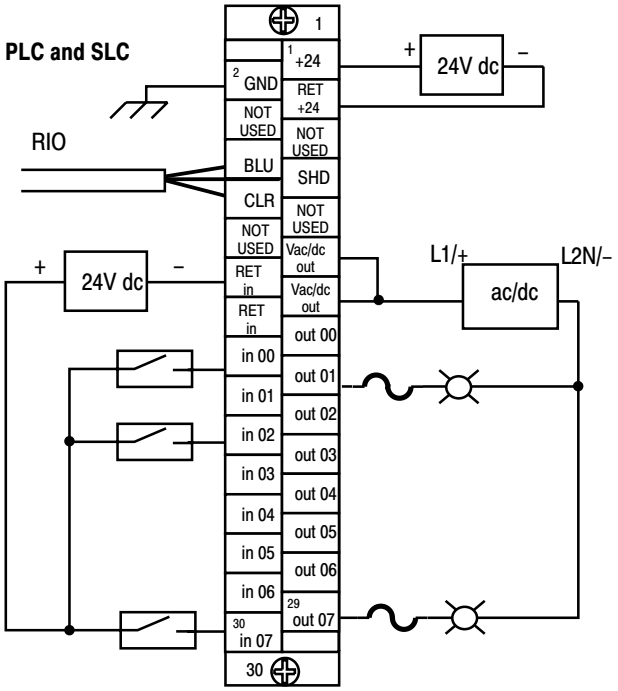
NOTE: RET in connections are internally connected together.
Vdc out connections must be externally connected together to accommodate amperage rating.
Output fusing is recommended. Refer to Table 2.B on page 2-8.

Connections	1791-8BC Series B		
	Designation	**Description**	**Terminal No.**
Power Connections	+24	+24V dc Power	1
	RET +24	dc Return	3
	GND	Chassis ground	2[1]
Remote I/O Connections	BLU	Blue wire - RIO	6
	CLR	Clear wire - RIO	8
	SHD	Shield - RIO	7
I/O Connections			
Input	in 00 thru in 07	Input 00 thru 07	16, 18, 20, 22, 24, 26, 28, 30
	RET in	dc input Return	12, 14[2]
Output	Vdc out	dc output Supply	11, 13[3]
	RET out	dc output Return	9
	out 00 thru out 07	Output 00 thru 07	15, 17, 19, 21, 23, 25, 27, 29
	Not used	For internal test only; not for customer use.	4, 5, 10

1 Connect chassis ground to equipment grounding stud. These are not internally connected.
2 Terminals 12 and 14 are internally connected.
3 Terminals 11 and 13 must be externally connected by customer to accommodate amperage rating.

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Figure 3.17
Input/Output Wiring Connections for the 1791-8BR Series B



NOTE: RET in connections are internally connected together.
Vac/dc out connections must be externally connected together to accommodate amperage rating.
Output fusing is recommended. Refer to Table 2.B on page 2-8.

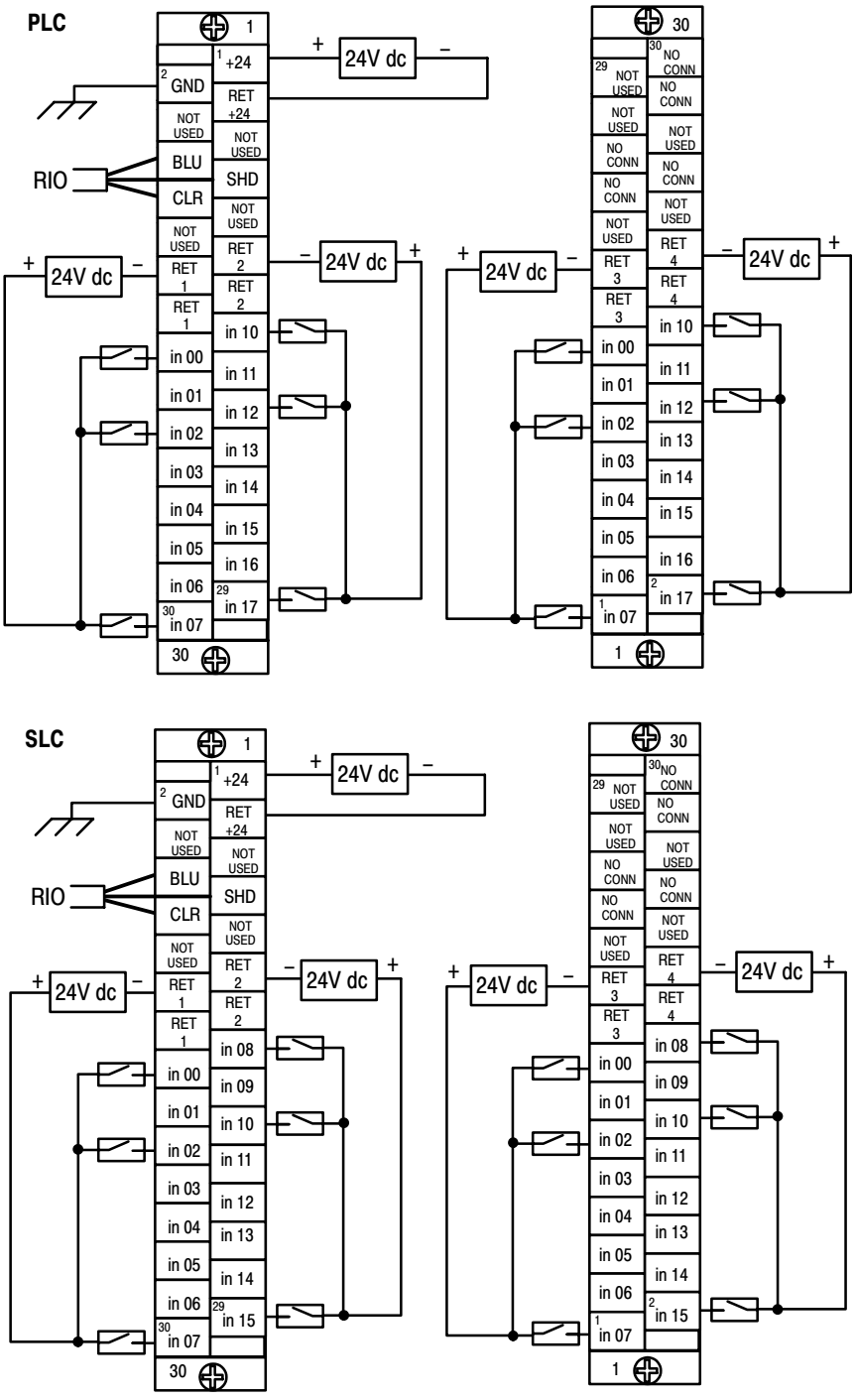
12399–I

Connections	1791–8BR Series B		
	Designation	**Description**	**Terminal No.**
Power Connections	+24	+24V dc Power	1
	RET +24	dc Return	3
	GND	Chassis ground	2[1]
Remote I/O Connections	BLU	Blue wire – RIO	6
	CLR	Clear wire – RIO	8
	SHD	Shield – RIO	7
I/O Connections			
Input	in 00 thru in 07	Input 00 thru 07	16, 18, 20, 22, 24, 26, 28, 30
	RET in	dc input Return	12, 14[2]
Output	Vac/dc out	ac or dc Output Supply	11, 13[3]
	out 00 thru out 07	Output 00 thru 07	15, 17, 19, 21, 23, 25, 27, 29
	Not used	For internal test only; not for customer use.	4, 5, 9, 10

1 Connect chassis ground to equipment grounding stud. These are not internally connected.
2 Terminals 12 and 14 are internally connected.
3 Terminals 11 and 13 must be externally connected by customer to accommodate amperage rating.

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Figure 3.18
Input Wiring Connections for the 1791-32B0 Series B



NOTE: RET 1 connections are internally connected together.
RET 2 connections are internally connected together.
RET 3 connections are internally connected together.
RET 4 connections are internally connected together.

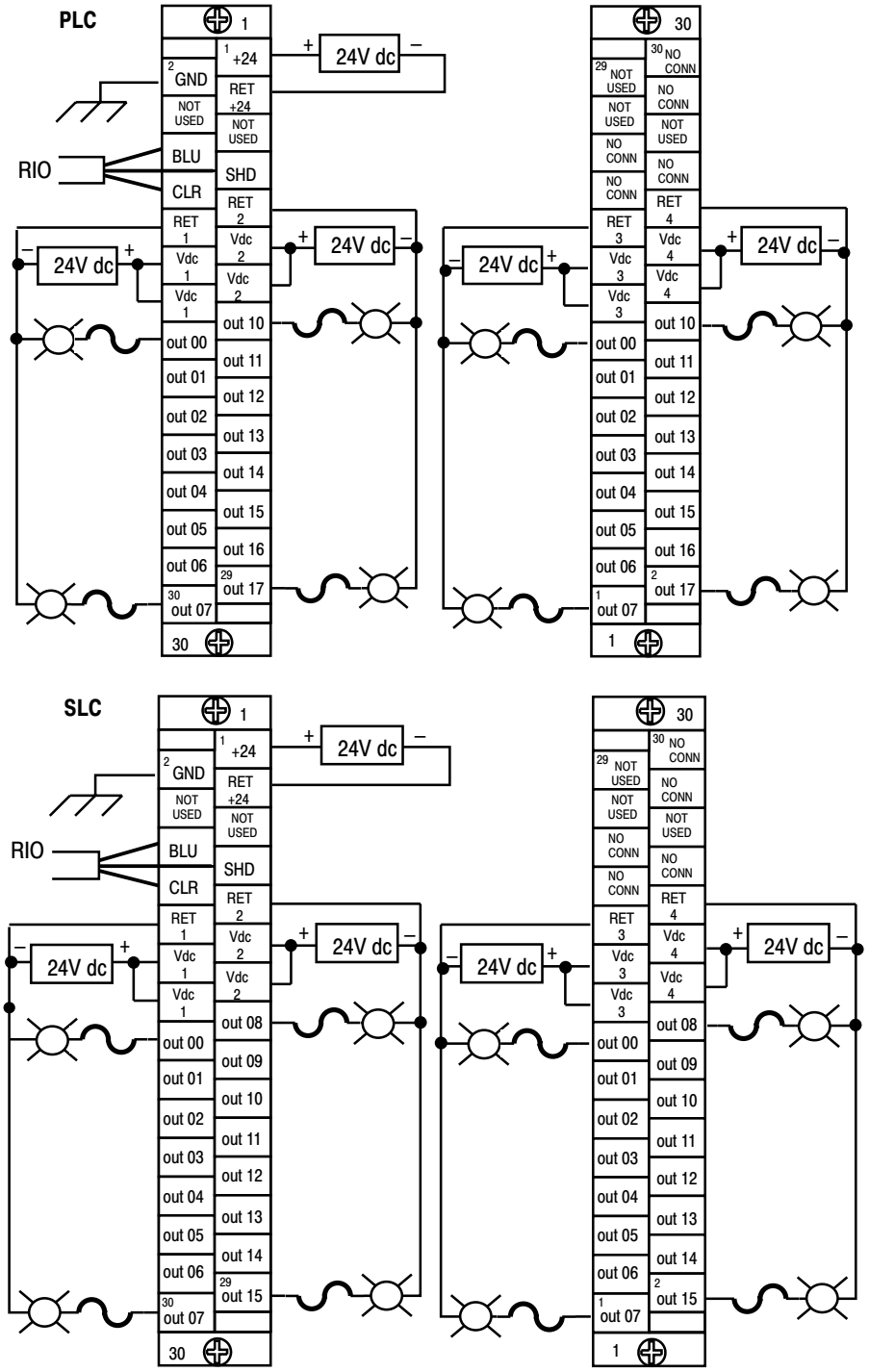
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Connections	1791–32B0 Series B		Connector/Terminal	
	Designation	Description	Left	Right
Power Connections	+24	+24V dc Power	1	
	RET +24	dc Return	3	
	GND	Chassis ground	2[1]	
Remote I/O Connections	BLU	Blue wire – RIO	6	
	CLR	Clear wire – RIO	8	
	SHD	Shield – RIO	7	
I/O Connections				
Input (G)[6]	PLC: in 00 thru 07 SLC: in 00 thru 07	PLC: Input 00 thru 07 SLC: Input 00 thru 07	16, 18, 20, 22, 24, 26, 28, 30	
	RET 1	dc input return	12, 14[2]	
	PLC: in 10 thru 17 SLC: in 08 thru 15	PLC: Input 10 thru 17 SLC: Input 08 thru 15	15, 17, 19, 21, 23, 25, 27, 29	
	RET 2	dc input return	11, 13[3]	
Input (G + 1)[7]	PLC: in 00 thru 07 SLC: in 00 thru 07	PLC: Input 00 thru 07 SLC: Input 00 thru 07		15, 13, 11, 9, 7, 5, 3, 1
	RET 3	dc input return		19, 17[4]
	PLC: in 10 thru 17 SLC: in 08 thru 15	PLC: Input 10 thru 17 SLC: Input 08 thru 15		16, 14, 12, 10, 8, 6, 4, 2
	RET 4	dc input return		20, 18[5]
	Not used	For internal test only; not for customer use.	4, 5, 9, 10	29, 27, 26, 22, 21
	No Conn	No internal connection; customer can use.		30, 28, 25, 24, 23

[1] Connect chassis ground to equipment grounding stud. These are not internally connected.
[2] Terminals 12 and 14 are internally connected together.
[3] Terminals 11 and 13 are internally connected together.
[4] Terminals 19 and 17 are internally connected together.
[5] Terminals 20 and 18 are internally connected together.
[6] IN (G) = input module group.
[7] IN (G + 1) = input module group plus 1.

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Figure 3.19
Output Wiring Connections for the 1791-0B32 Series B



Note: Vdc 1 connections must be externally connected together to accommodate amperage rating.
Vdc 2 connections must be externally connected together to accommodate amperage rating.
Vdc 3 connections must be externally connected together to accommodate amperage rating.
Vdc 4 connections must be externally connected together to accommodate amperage rating.
Output fusing is recommended. Refer to Table 2.B on page 2-8.

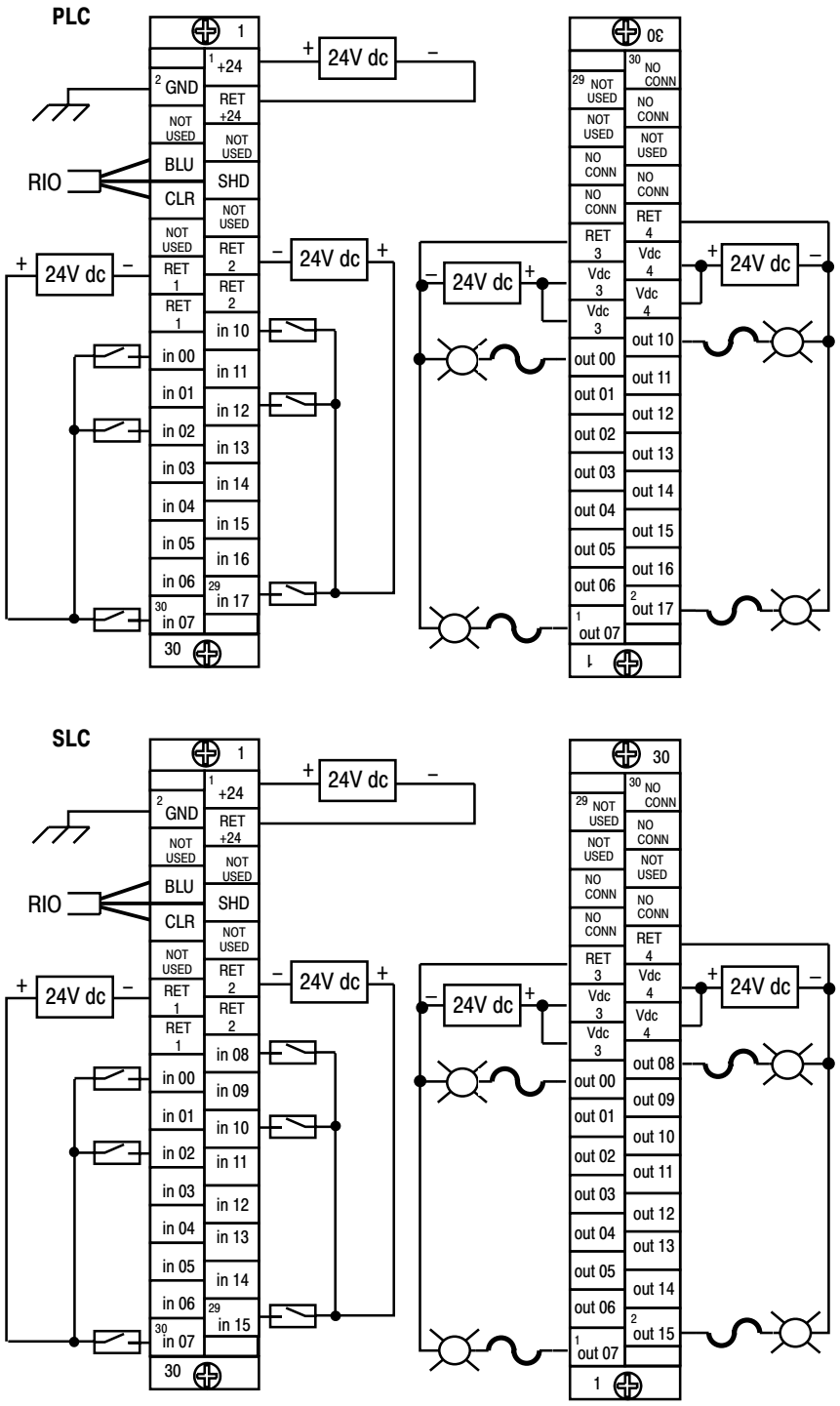
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Connections	1791–0B32 Series B		Connector/Terminal	
	Designation	**Description**	**Left**	**Right**
Power Connections	+24	+24V dc Power	1	
	RET +24	dc Return	3	
	GND	Chassis ground	2[1]	
Remote I/O Connections	BLU	Blue wire – RIO	6	
	CLR	Clear wire – RIO	8	
	SHD	Shield – RIO	7	
I/O Connections				
Output (G)[6]	PLC: out 00 thru 07 SLC: out 00 thru 07	PLC: Output 00 thru 07 SLC: Output 00 thru 07	16, 18, 20, 22, 24, 26, 28, 30	
	Vdc 1	+24V dc output supply	12, 14[2]	
	RET 1	dc output return	10	
	PLC: out 10 thru 17 SLC: out 08 thru 15	PLC: Output 10 thru 17 SLC: Output 08 thru 15	15, 17, 19, 21, 23, 25, 27, 29	
	Vdc 2	+24V dc output supply	11, 13[3]	
	RET 2	dc output return	9	
Output (G + 1)[7]	PLC: out 00 thru 07 SLC: out 00 thru 07	PLC: Output 00 thru 07 SLC: Output 00 thru 07		15, 13, 11, 9, 7, 5, 3, 1
	Vdc 3	+24V dc output supply		19, 17[4]
	RET 3	dc output return		21
	PLC: out 10 thru 17 SLC: out 08 thru 15	PLC: Output 10 thru 17 SLC: Output 08 thru 15		16, 14, 12, 10, 8, 6, 4, 2
	Vdc 4	+24V dc output supply		20, 18[5]
	RET 4	dc output return		22
	Not used	For internal test only; not for customer use.	4, 5	29, 27, 26
	No Conn	No internal connection; customer can use.		30, 28, 25, 24, 23

[1] Connect chassis ground to equipment grounding stud. These are not internally connected.
[2] Terminals 12 and 14 must be externally connected by customer to accommodate amperage rating.
[3] Terminals 11 and 13 must be externally connected by customer to accommodate amperage rating.
[4] Terminals 19 and 17 must be externally connected by customer to accommodate amperage rating.
[5] Terminals 20 and 18 must be externally connected by customer to accommodate amperage rating.
[6] OUT (G) = output module group.
[7] OUT (G + 1) = output module group plus 1.

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Figure 3.20
Input/Output Wiring Connections for the 1791-16BC Series B



NOTE: RET 1 connections are internally connected.
RET 2 connections are internally connected.
Vdc 3 connections must be externally connected to accommodate amperage rating.
Vdc 4 connections must be externally connected to accommodate amperage rating.
Output fusing is recommended. Refer to Table 2.B on page 2-8.

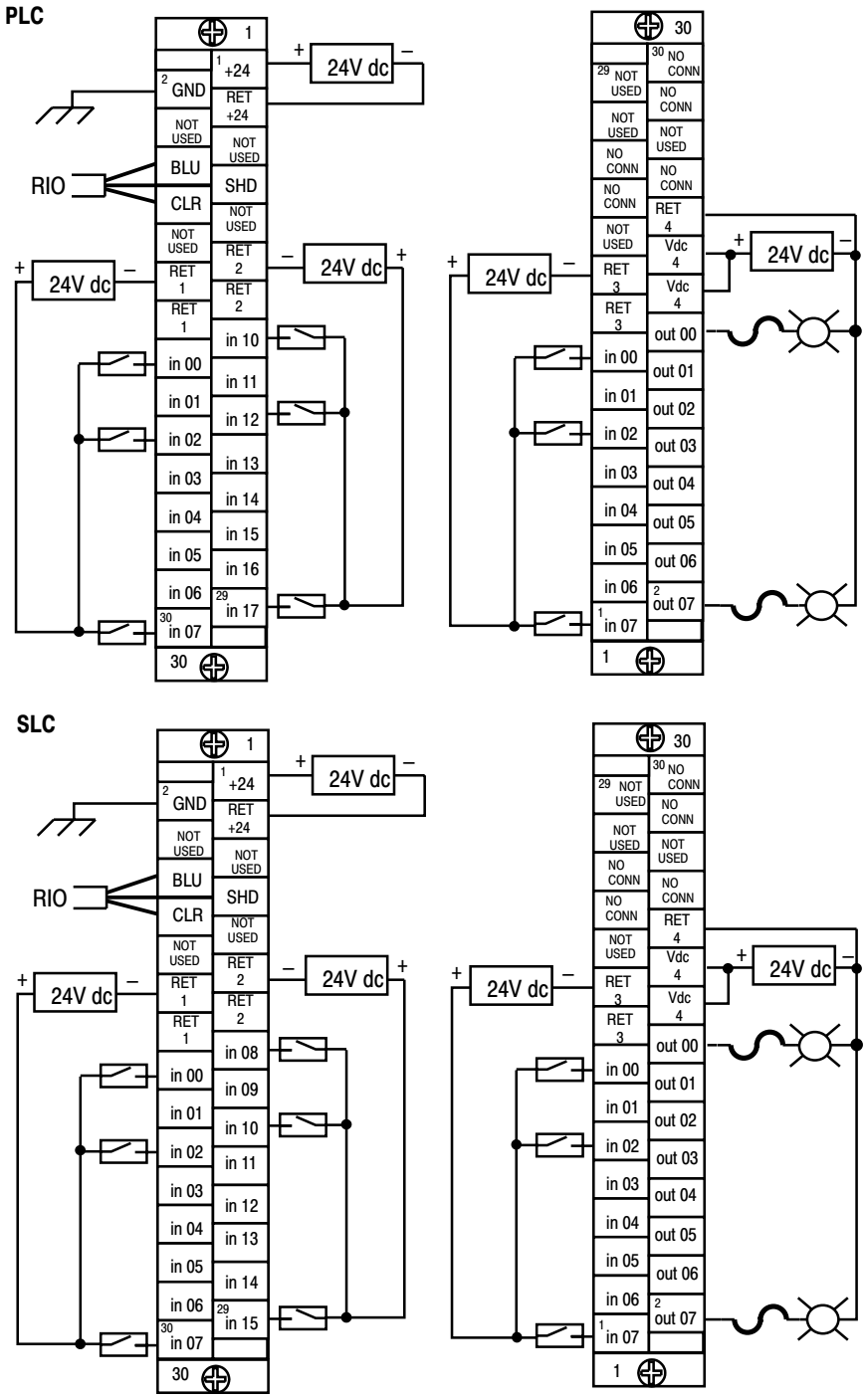
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Connections	1791-16BC Series B		Connector/Terminal	
	Designation	Description	Left	Right
Power Connections	+24	+24V dc Power	1	
	RET +24	dc Return	3	
	GND	Chassis ground	2[1]	
Remote I/O Connections	BLU	Blue wire – RIO	6	
	CLR	Clear wire – RIO	8	
	SHD	Shield – RIO	7	
I/O Connections				
Input (G)[6]	PLC: in 00 thru 07 SLC: in 00 thru 07	PLC: Input 00 thru 07 SLC: Input 00 thru 07	16, 18, 20, 22, 24, 26, 28, 30	
	RET 1	dc input return	12, 14[2]	
	PLC: in 10 thru 17 SLC: in 08 thru 15	PLC: Input 10 thru 17 SLC: Input 08 thru 15	15, 17, 19, 21, 23, 25, 27, 29	
	RET 2	dc input return	11, 13[3]	
Output (G)[7]	PLC: out 00 thru 07 SLC: out 00 thru 07	PLC: Output 00 thru 07 SLC: Output 00 thru 07		15, 13, 11, 9, 7, 5, 3, 1
	Vdc 3	+24V dc output supply		19, 17[4]
	RET 3	dc output return		21
	PLC: out 10 thru 17 SLC: out 08 thru 15	PLC: Output 10 thru 17 SLC: Output 08 thru 15		16, 14, 12, 10, 8, 6, 4, 2
	Vdc 4	+24V dc output supply		20, 18[5]
	RET 4	dc output return		22
	Not used	For internal test only; not for customer use.	4, 5, 9, 10	29, 27, 26
	No Conn	No internal connection; customer can use.		30, 28, 25, 24, 23

[1] Connect chassis ground to equipment grounding stud. These are not internally connected.
[2] Terminals 12 and 14 are internally connected.
[3] Terminals 11 and 13 are internally connected.
[4] Terminals 17 and 19 must be externally connected by customer to accommodate amperage rating.
[5] Terminals 20 and 18 must be externally connected by customer to accommodate amperage rating.
[6] IN (G) = input module group.
[7] OUT (G) = output module group.

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Figure 3.21
Input/Output Wiring Connections for the 1791-24B8 Series B



NOTE: RET 1 connections are internally connected together.
RET 2 connections are internally connected together.
RET 3 connections are internally connected together.
Vdc 4 connections must be externally connected together to accommodate amperage rating.
Output fusing is recommended. Refer to Table 2.B on page 2-8.

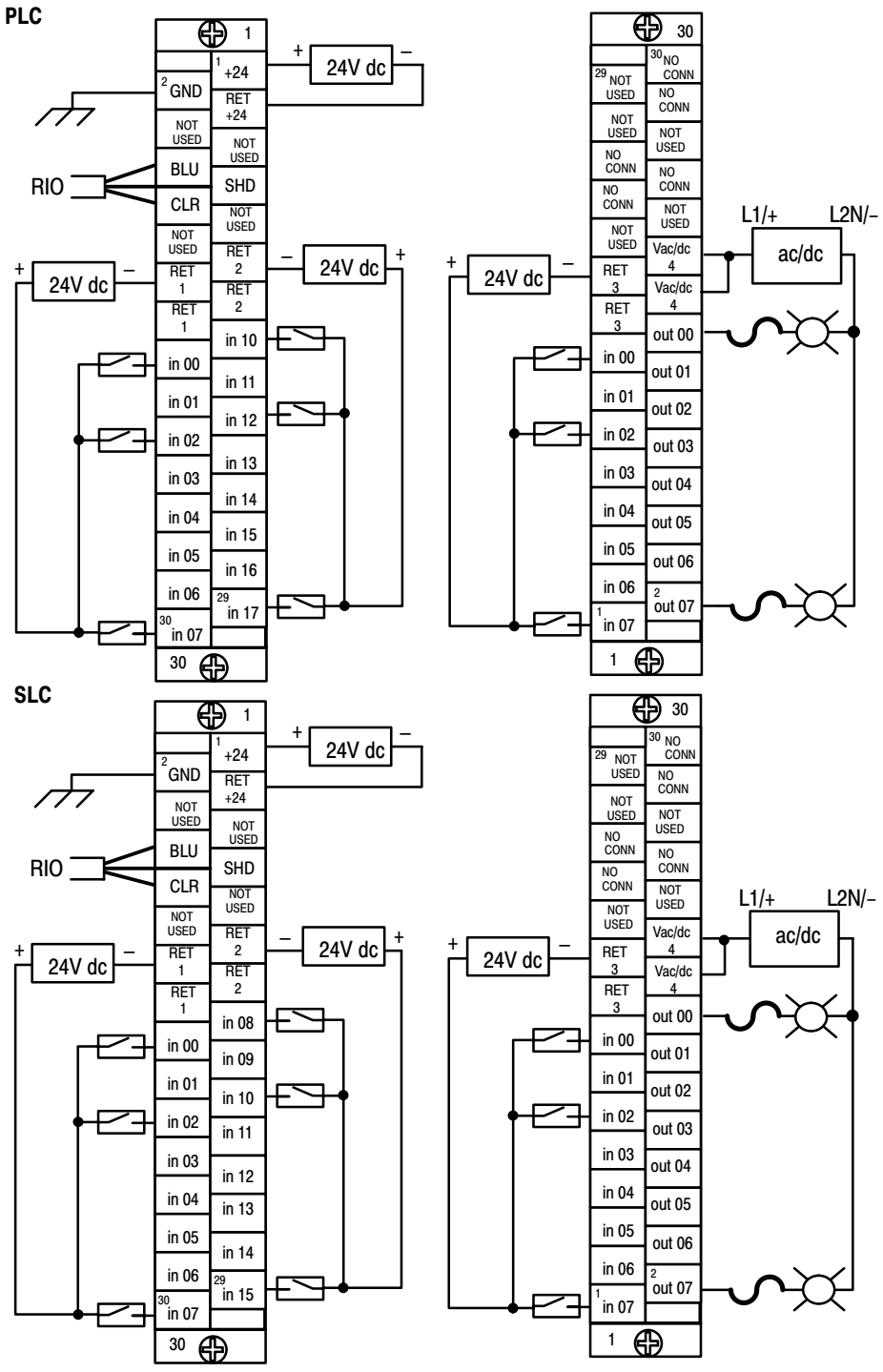
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Connections	1791–24B8 Series B		Connector/Terminal	
	Designation	Description	Left Conn.	Right Conn.
Power Connections	+24	+24V dc Power	1	
	RET +24	dc Return	3	
	GND	Chassis ground	2[1]	
Remote I/O Connections	BLU	Blue wire – RIO	6	
	CLR	Clear wire – RIO	8	
	SHD	Shield – RIO	7	
I/O Connections				
Input (G)[6]	PLC: in 00 thru 07 SLC: in 00 thru 07	PLC: Input 00 thru 07 SLC: Input 00 thru 07	16, 18, 20, 22, 24, 26, 28, 30	
	RET 1	dc input return	12, 14[2]	
	PLC: in 10 thru 17 SLC: in 08 thru 15	PLC: Input 10 thru 17 SLC: Input 08 thru 15	15, 17, 19, 21, 23, 25, 27, 29	
	RET 2	dc input return	11, 13[3]	
Input (G + 1)[7]	PLC: in 00 thru 07 SLC: in 00 thru 07	PLC: Input 00 thru 07 SLC: Input 00 thru 07		15, 13, 11, 9, 7, 5, 3, 1
	RET 3	dc input return		19, 17[4]
Output (G)[8]	PLC: out 00 thru 07 SLC: out 00 thru 07	PLC: Output 00 thru 07 SLC: Output 00 thru 07		16, 14, 12, 10, 8, 6, 4, 2
	V dc 4	dc output supply		20, 18[5]
	RET 4	dc output return		22
	Not used	For internal test only; not for customer use.	4, 5, 9, 10	29, 27, 26, 21
	No Connection	No internal use; customer can use.		30, 28, 25, 24, 23

[1] Connect chassis ground to equipment grounding stud. These are not internally connected.
[2] Terminals 12 and 14 are internally connected.
[3] Terminals 11 and 13 are internally connected.
[4] Terminals 17 and 19 are internally connected.
[5] Terminals 20 and 18 must be externally connected by customer to accommodate amperage rating.
[6] IN G = input module group.
[7] IN (G + 1) = input module group plus 1.
[8] OUT (G) = output module group.

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Figure 3.22
Input/Output Wiring Connections for the 1791-24BR Series B



NOTE: RET 1 connections are internally connected together.
RET 2 connections are internally connected together.
RET 3 connections are internally connected together.
Vac/dc 4 connections must be externally connected together to accommodate amperage rating.
Output fusing is recommended. Size fuse according to output load and surge current requirements.

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Connections	1791-24BR Series B		Connector/Terminal	
	Designation	Description	Left Conn.	Right Conn.
Power Connections	+24	+24V dc Power	1	
	RET +24	dc Return	3	
	GND	Chassis ground	2[1]	
Remote I/O Connections	BLU	Blue wire – RIO	6	
	CLR	Clear wire – RIO	8	
	SHD	Shield – RIO	7	
I/O Connections				
Input (G)[6]	PLC: in 00 thru 07 SLC: in 00 thru 07	PLC: Input 00 thru 07 SLC: Input 00 thru 07	16, 18, 20, 22, 24, 26, 28, 30	
	RET 1	dc input return	12, 14[2]	
	PLC: in 10 thru 17 SLC: in 08 thru 15	PLC: Input 10 thru 17 SLC: Input 08 thru 15	15, 17, 19, 21, 23, 25, 27, 29	
	RET 2	dc input return	11, 13[3]	
Input (G + 1)[7]	PLC: in 00 thru 07 SLC: in 00 thru 07	PLC: Input 00 thru 07 SLC: Input 00 thru 07		15, 13, 11, 9, 7, 5, 3, 1
	RET 3	dc input return		19, 17[4]
Output (G)[8]	PLC: out 00 thru 07 SLC: out 00 thru 07	PLC: Output 00 thru 07 SLC: Output 00 thru 07		16, 14, 12, 10, 8, 6, 4, 2
	Vac/dc 4	ac or dc output supply		20, 18[5]
	Not used	For internal test only; not for customer use.	4, 5, 9, 10	29, 27, 26, 22, 21
	No Connection	No internal use; customer can use.		30, 28, 25, 24, 23

[1] Connect chassis ground to equipment grounding stud. These are not internally connected.
[2] Terminals 12 and 14 are internally connected.
[3] Terminals 11 and 13 are internally connected.
[4] Terminals 19 and 17 are internally connected.
[5] Terminals 20 and 18 must be externally connected by customer to accommodate amperage rating.
[6] IN G = input module group.
[7] IN (G + 1) = input module group plus 1.
[8] OUT (G) = output module group.

Table 3.B
Acceptable Wiring Cables for Block I/O Connection

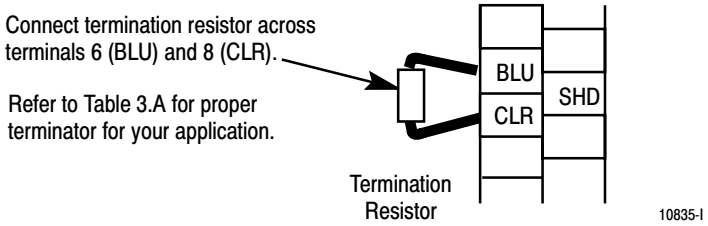
Use	Cable Type
Remote I/O link	Belden 9463
Input and output wiring	Up to 14AWG (2mm^2) stranded with 3/64 inch insulation

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Termination Resistor

A termination resistor must be installed on the last block in a series. Connect the resistor as shown in Figure 3.23.

Figure 3.23
Installing the Termination Resistor



Surge Suppression

Output modules contain surge suppression circuitry for the block output devices. The ac output modules provide an RC network to limit the magnitude of voltage transients that may occur when a device is wired in parallel or series with hard contacts. The dc output modules have clamping diodes that shunt voltage transients to the power supply.

Important: We recommend that you use an additional suppression device if an output module is being used to control an inductive device such as:

- relays
- solenoids
- motor starters
- motors

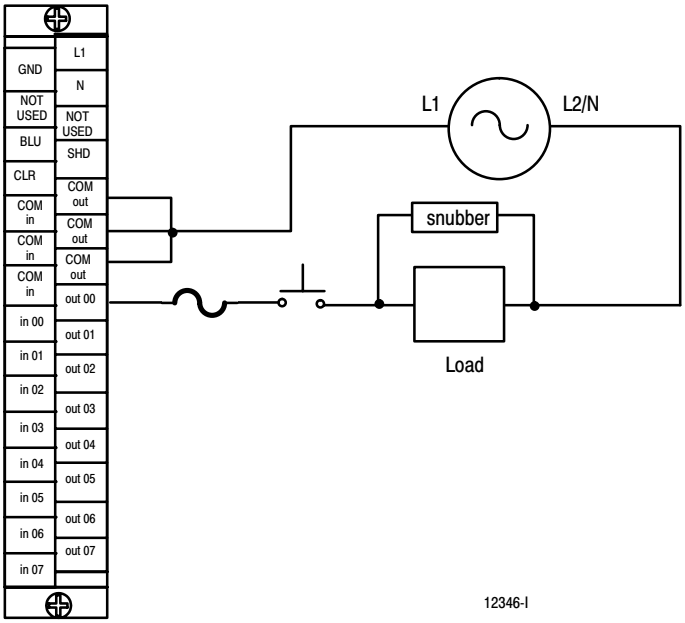
and is in series with or parallel to a “hard contact” such as:

- pushbuttons
- selector switches

By adding a suppression device directly across the coil of an inductive device, you will prolong the life of the output devices and switch contacts. Figure 3.24 shows an output module with a suppression device.

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Figure 3.24
Connecting Surge Suppression Devices



The impedance characteristic is the most important factor in selecting a suppression device; thus no single suppression device can be recommended for every possible load. Table 3.C shows acceptable Allen-Bradley suppression devices and their catalog numbers for typical loads.

Table 3.C
Allen-Bradley Suppression Devices

Suppression Device	Catalog Number
Motor Starter Bulletin 509	599-K04[1]
Relay Bulletin 700 Type N or P	700-N24[1]
Miscellaneous	700-N24[2]

1 Maximum coil voltage 150V ac or dc
2 Bulletin 700-N24 is a universal surge suppressor. You can use it on electromagnetic devices with the limitation of 35 sealed VA, 150V.

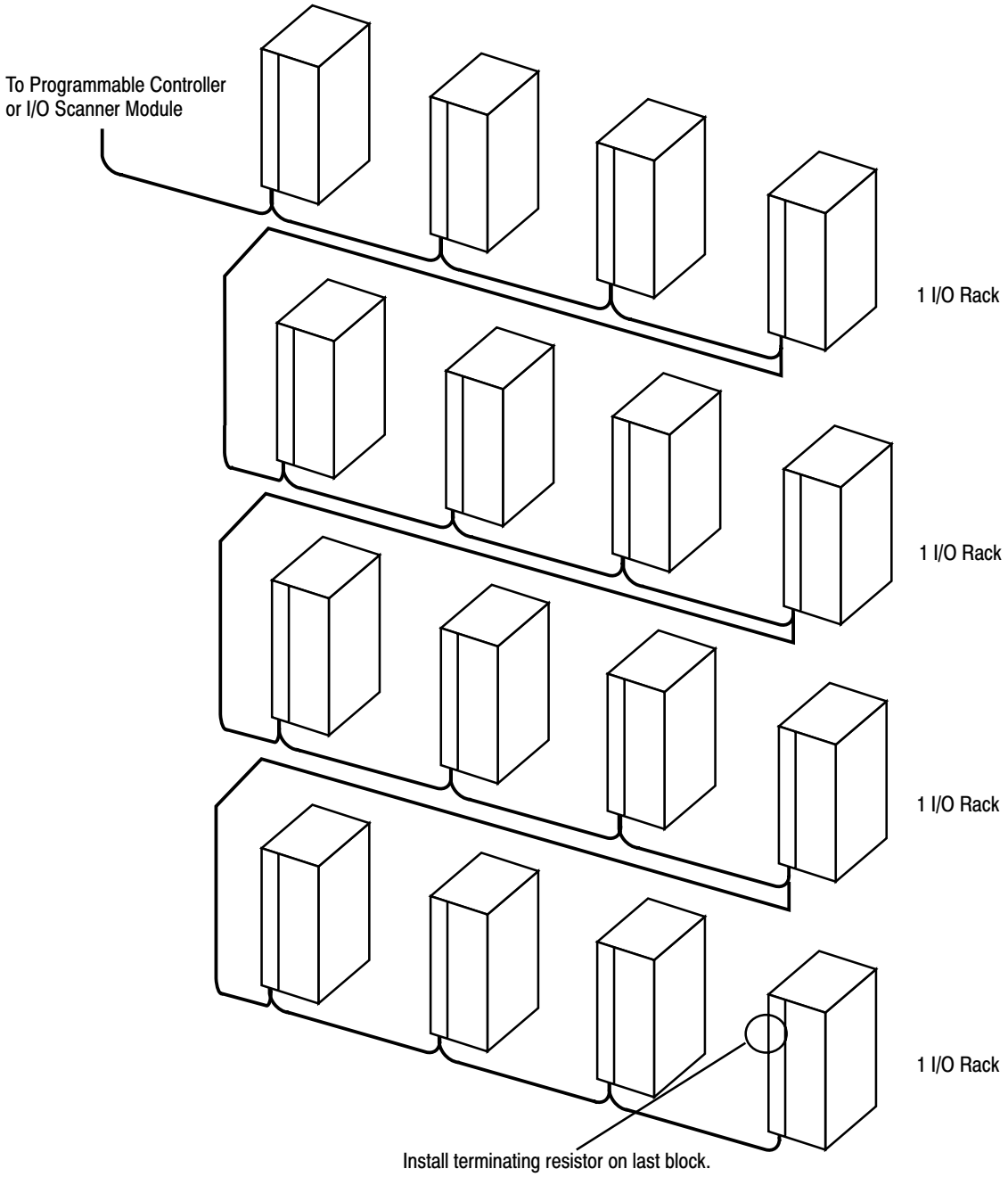
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Remote I/O Link Wiring

Blocks must be wired in series as shown in Figure 3.25 or Figure 3.26. Do not attempt to wire any block in parallel.

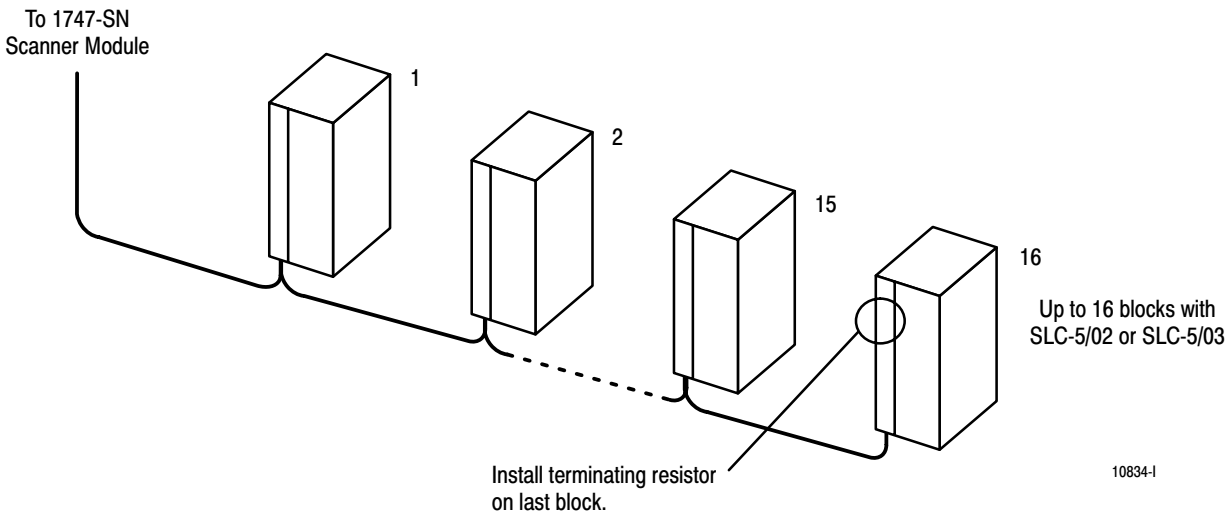
The number of blocks used depends not only on the user requirements but also on the system used. Refer to Table 3.A (page 3-1) for maximum block usage for individual systems.

Figure 3.25
Series Connection for Block I/O Using PLC-2, PLC-3 or PLC-5 Family Programmable Controllers



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Figure 3.26
Series Configurations for Block I/O Using the SLC Programmable Controller



Extended Node Capability

If this is the last remote I/O adapter on the remote I/O link in a PLC system, you must use a terminating resistor to terminate both ends of the remote I/O link (scanner end and last block end). The size of the terminator is determined by the system configuration.

Older system configurations must use a 150 ohm resistor at both ends. With newer devices that can support it, you can use an 82 ohm termination resistor at both ends. The 82 ohm terminators provide “extended node” capability which allows you to have up to 32 physical devices on the remote I/O link. (The number of logical racks capable of being addressed by the scanner is not affected.)

ATTENTION: Devices that are operating at 230.4K baud must have 82 ohm terminators in place for proper operation.

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Compatibility of 1771 I/O Products with Extended Node Numbers

Certain products are **not compatible** with extended node capabilities obtained with the use of 82 ohm terminators. Table 3.D lists those products that are **not compatible**.

Table 3.D
Non-compatible Products

Device		Series
Scanners -	1771-SN	All
	1772-SD	All
	1772-SD2	All
	1775-SR	All
	1775-S4A	All
	1775-S4B	All
Adapters -	1771-AS	All
	1771-ASB	Series A
	1771-DCM	All
Miscellaneous -	1771-AF	All
	1771-AF1	All

Selecting Remote I/O Link Speed

The remote I/O link can operate at three speeds: 57.6K, 115.2K or 230.4K bits/s. The selection of link speed is dependent on the scanner/processor used, throughput requirements, distance required and the type of remote I/O devices being used.

Throughput Requirements

The throughput, a portion of which is I/O scan time, must be balanced against the distance requirements for the application. The typical discrete I/O scan time is shown in Table 3.E below. Use these values along with your processor/scanner manual to determine system throughput.

Table 3.E
I/O Scan Time vs. Remote I/O Link Distance

	57.6K Bits/s	115.2K Bits/s	230.4K Bits/s
Typical Discrete I/O Scan Time (each block)	10ms	7.0ms	3ms
Remote I/O link distance	10,000 ft.	5,000 ft.	2,500 ft.

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Chapter 4

Configuring Your Block I/O for PLC Family Programmable Controllers

Chapter Objectives

In this chapter, you will learn how to configure your block I/O when used with PLC family programmable controllers. This includes the following:

- setting the configuration switches
- addressing the block I/O

Setting the Configuration Switches

Each block I/O module has two 8-position switches for setting:

- starting I/O group
- I/O rack number
- communication rate
- last chassis
- last state
- complementary I/O
- input filter speed (dc inputs only)
- processor restart/lockout

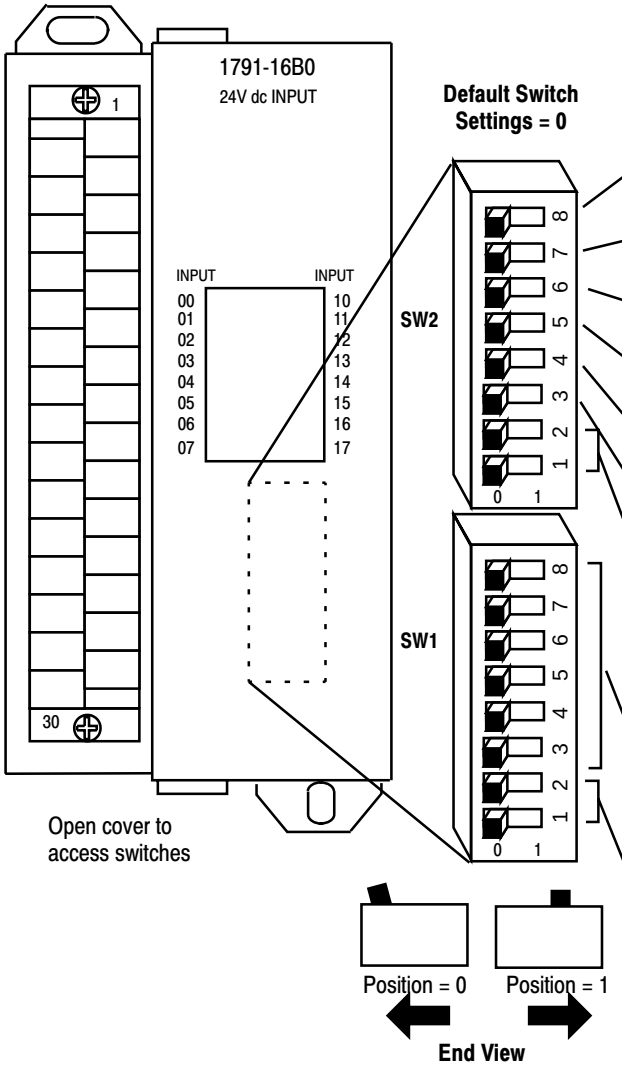
These switches are accessible by opening the clear plastic door on the front of the module (Figure 4.1).



ATTENTION: Cycle power to the block I/O module after setting the switches.

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Figure 4.1
Switch Settings for the ac and dc Block I/O Modules (16-point illustrated)



Default Switch Settings = 0

SW2–8
Not used

dc Applications		ac Applications
SW2–7	Filter Speed Select	SW2–7
0	Slow	Not Used
1	Fast	
Note: For inputs only		

SW2–6	Last I/O Group
0	Not last rack
1	Last rack

SW2–5	Processor Restart/Lockout (PRL)
0	Processor Restart
1	Processor Lockout

SW2–4	Hold Last State
0	Reset Outputs
1	Hold Last State

SW2–3	Complementary I/O[1]
0	Non-Completed Systems
0	Complementary Rack[1]
1	Primary Rack[1]
[1] See Note.	

Communication Rate		
SW2–2	SW2–1	Bits/s
0	0	57.6 K
0	1	115.2 K
1	0	230.4 K
1	1	230.4 K

SW1–3 thru 8	Rack Address
Refer to Table 4.F for settings.	

Starting Quarter		
SW1–2	SW1–1	Module Group
0	0	0 (1st)
0	1	2 (2nd)
1	0	4 (3rd)
1	1	6 (4th)

12403–I

ATTENTION: Cycle power to the module after setting the switches.

NOTE: Only block I/O modules with all inputs or all outputs can use complementary I/O.

Series A block I/O modules do not support complementary I/O. If using series A modules, set this switch to 0.

Set switch **SW2–3** to 0 if this rack will have a unique address (not complemented). If this rack address is a duplicate of another I/O block or chassis, set the switch to 1 for primary or 0 for complementary. Refer to Table 4.G for the complementary I/O rack address.

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Table 4.F
Switch Settings for Block I/O (Primary Rack)

1747-SN Rack Number	1771-SN Rack Number	PLC-2 Rack Number	PLC-5 Rack Number	PLC-5/250 Rack Number	PLC-3 Rack Number	SW1 Switch Position					
						8	7	6	5	4	3
Rack 0	Rack 1	Rack 1	Not Valid	Rack 0	Rack 0	0	0	0	0	0	0
Rack 1	Rack 2	Rack 2	Rack 1	Rack 1	Rack 1	0	0	0	0	0	1
Rack 2	Rack 3	Rack 3	Rack 2	Rack 2	Rack 2	0	0	0	0	1	0
Rack 3	Rack 4	Rack 4	Rack 3	Rack 3	Rack 3	0	0	0	0	1	1
	Rack 5	Rack 5	Rack 4	Rack 4	Rack 4	0	0	0	1	0	0
	Rack 6	Rack 6	Rack 5	Rack 5	Rack 5	0	0	0	1	0	1
	Rack 7	Rack 7	Rack 6	Rack 6	Rack 6	0	0	0	1	1	0
			Rack 7	Rack 7	Rack 7	0	0	0	1	1	1
			Rack 10	Rack 10	Rack 10	0	0	1	0	0	0
			Rack 11	Rack 11	Rack 11	0	0	1	0	0	1
			Rack 12	Rack 12	Rack 12	0	0	1	0	1	0
			Rack 13	Rack 13	Rack 13	0	0	1	0	1	1
			Rack 14	Rack 14	Rack 14	0	0	1	1	0	0
			Rack 15	Rack 15	Rack 15	0	0	1	1	0	1
			Rack 16	Rack 16	Rack 16	0	0	1	1	1	0
			Rack 17	Rack 17	Rack 17	0	0	1	1	1	1
			Rack 20	Rack 20	Rack 20	0	1	0	0	0	0
			Rack 21	Rack 21	Rack 21	0	1	0	0	0	1
			Rack 22	Rack 22	Rack 22	0	1	0	0	1	0
			Rack 23	Rack 23	Rack 23	0	1	0	0	1	1
			Rack 24	Rack 24	Rack 24	0	1	0	1	0	0
			Rack 25	Rack 25	Rack 25	0	1	0	1	0	1
			Rack 26	Rack 26	Rack 26	0	1	0	1	1	0
			Rack 27	Rack 27	Rack 27	0	1	0	1	1	1
				Rack 30	Rack 30	0	1	1	0	0	0
				Rack 31	Rack 31	0	1	1	0	0	1
				Rack 32	Rack 32	0	1	1	0	1	0
				Rack 33	Rack 33	0	1	1	0	1	1
				Rack 34	Rack 34	0	1	1	1	0	0
				Rack 35	Rack 35	0	1	1	1	0	1
				Rack 36	Rack 36	0	1	1	1	1	0
				Rack 37	Rack 37	0	1	1	1	1	1
					Rack 40	1	0	0	0	0	0
					Rack 41	1	0	0	0	0	1
					Rack 42	1	0	0	0	1	0
					Rack 43	1	0	0	0	1	1
					Rack 44	1	0	0	1	0	0
					Rack 45	1	0	0	1	0	1
					Rack 46	1	0	0	1	1	0
					Rack 47	1	0	0	1	1	1
					Rack 50	1	0	1	0	0	0

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1747-SN Rack Number	1771-SN Rack Number	PLC-2 Rack Number	PLC-5 Rack Number	PLC-5/250 Rack Number	PLC-3 Rack Number	SW1 Switch Position					
						8	7	6	5	4	3
					Rack 51	1	0	1	0	0	1
					Rack 52	1	0	1	0	1	0
					Rack 53	1	0	1	0	1	1
					Rack 54	1	0	1	1	0	0
					Rack 55	1	0	1	1	0	1
					Rack 56	1	0	1	1	1	0
					Rack 57	1	0	1	1	1	1
					Rack 60	1	1	0	0	0	0
					Rack 61	1	1	0	0	0	1
					Rack 62	1	1	0	0	1	0
					Rack 63	1	1	0	0	1	1
					Rack 64	1	1	0	1	0	0
					Rack 65	1	1	0	1	0	1
					Rack 66	1	1	0	1	1	0
					Rack 67	1	1	0	1	1	1
					Rack 70	1	1	1	0	0	0
					Rack 71	1	1	1	0	0	1
					Rack 72	1	1	1	0	1	0
					Rack 73	1	1	1	0	1	1
					Rack 74	1	1	1	1	0	0
					Rack 75	1	1	1	1	0	1
					Rack 76	1	1	1	1	1	0
					Not Valid	1	1	1	1	1	1

Rack address 77 is an illegal configuration.
PLC-5/11 processors can scan rack 03.
PLC-5/15 and PLC-5/20 processors can scan racks 01–03.
PLC-5/25 and PLC-5/30 processors can scan racks 01–07.
PLC-5/40 and PLC-5/40L processors can scan racks 01–17.
PLC-5/60 and PLC-5/60L processors can scan racks 01–27.
PLC-5/250 processors can scan racks 00–37.

Table 4.G
Switch Settings for Block I/O as Complementary I/O
(PLC–2 and PLC–5 only)

PLC–2 Rack Number	PLC–5 Rack Number	SW1 Switch Position					
		8	7	6	5	4	3
Rack 1	Not Valid	0	0	1	0	0	0
Rack 2	Rack 1	0	0	1	0	0	1
Rack 3	Rack 2	0	0	1	0	1	0
Rack 4	Rack 3	0	0	1	0	1	1
Rack 5	Rack 4	0	0	1	1	0	0
Rack 6	Rack 5	0	0	1	1	0	1
Rack 7	Rack 6	0	0	1	1	1	0
	Rack 7	0	0	1	1	1	1

ATTENTION: Series A modules do not support complementary I/O.

When configured as complementary I/O:

- PLC-2 can scan racks 01–07
- PLC-5/11 can scan rack 03
- PLC-5/20, PLC-5/30, PLC-5/40, PLC-5/60 can scan racks 01–07

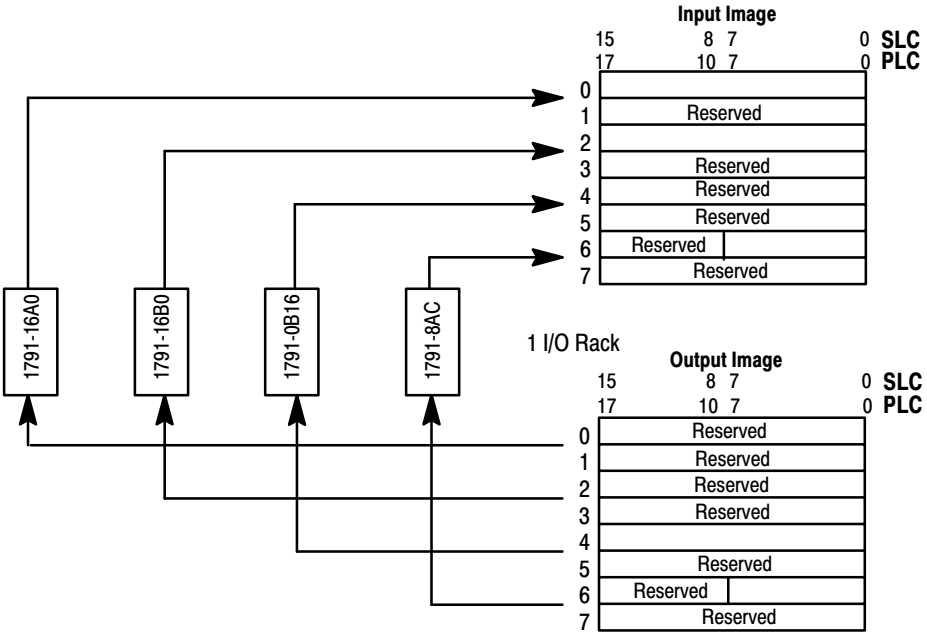
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The SLC 500 controllers communicate with the block I/O using an I/O Scanner module (cat. no. 1747-SN series A). Refer to the user manual for the 1747-SN/A Scanner module for more information.

Note: These block I/O modules are **not** compatible with the **1747-DSN** Distributed I/O Scanner module.

Each block I/O module uses 2 words of output image table memory and 2 words of input image table memory. Each block occupies 1/4 rack of data table, with 4 blocks comprising 1 logical rack. Image table usage for one assigned rack number and examples of image table usage are shown in Figures 4.2 through 4.10.

Figure 4.2
I/O Image Table for One Assigned Rack Number with 16-point Modules



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Figure 4.3
Input/Output Image Table Usage Example for One Starting I/O Group for 16 Output Modules (cat. no. 1791-0A16, -0B16)

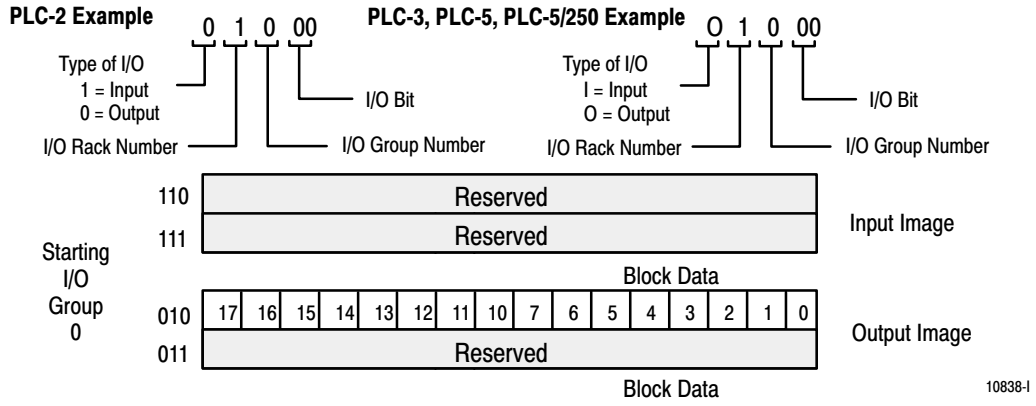


Figure 4.4
Input/Output Image Table Usage Example for One Starting I/O Group with 16 Input Modules (cat. no. 1791-16A0, -16B0)

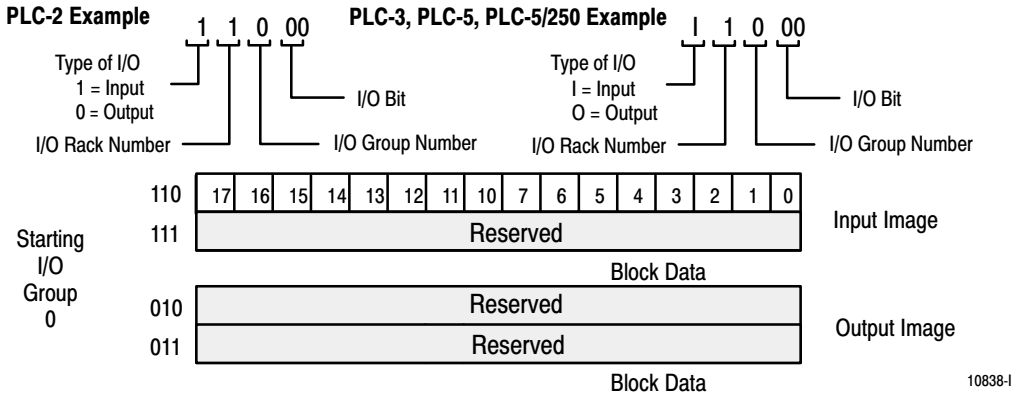
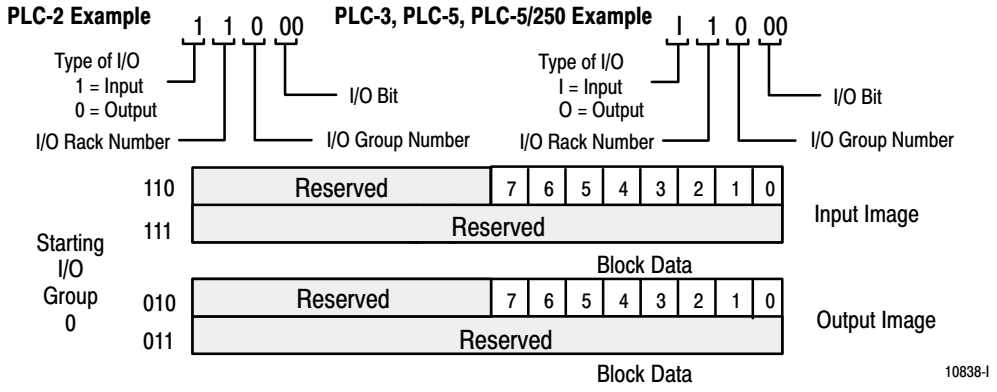


Figure 4.5
Input/Output Image Table Usage Example for One Starting I/O Group for 8 Input/8 Output Modules (cat. no. 1791-8AC, -8BC, -8AR, -8BR)



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Figure 4.6
I/O Image Table for One Assigned Rack Number with 32-point Modules

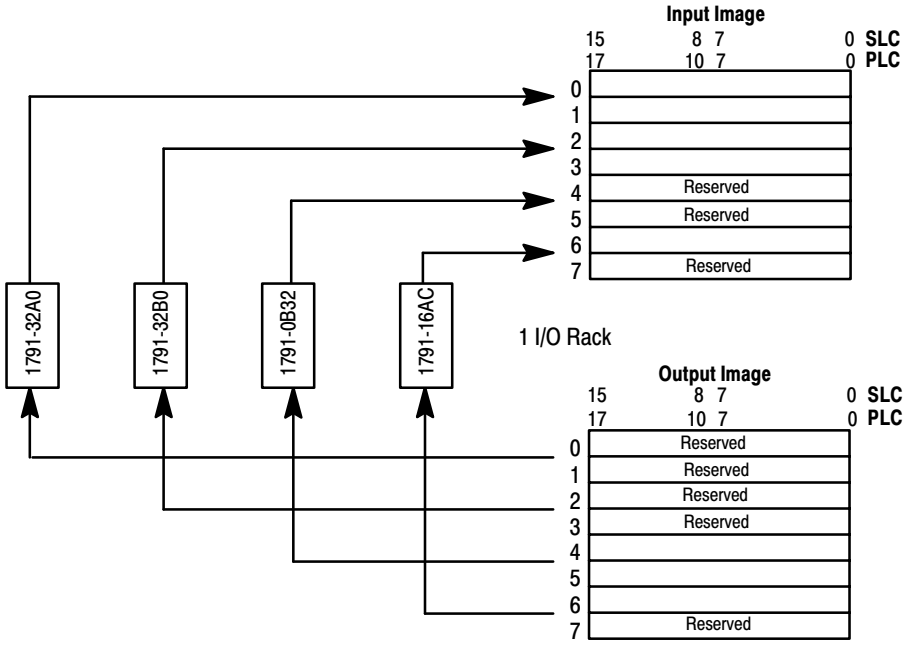
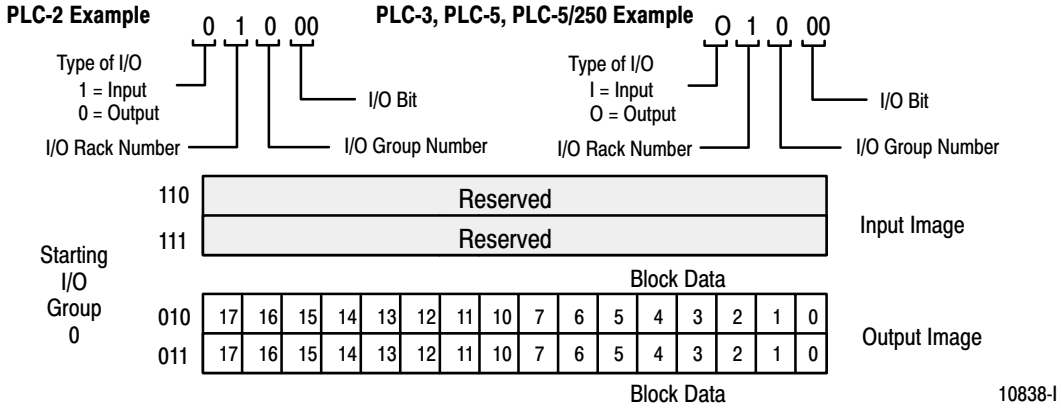


Figure 4.7
Input/Output Image Table Usage Example for One Starting I/O Group for 32 Output Modules (cat. no. 1791-0A32, -0B32)



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Figure 4.8
Input/Output Image Table Usage Example for One Starting I/O Group with 32 Input Modules (cat. no. 1791-32A0, -32B0)

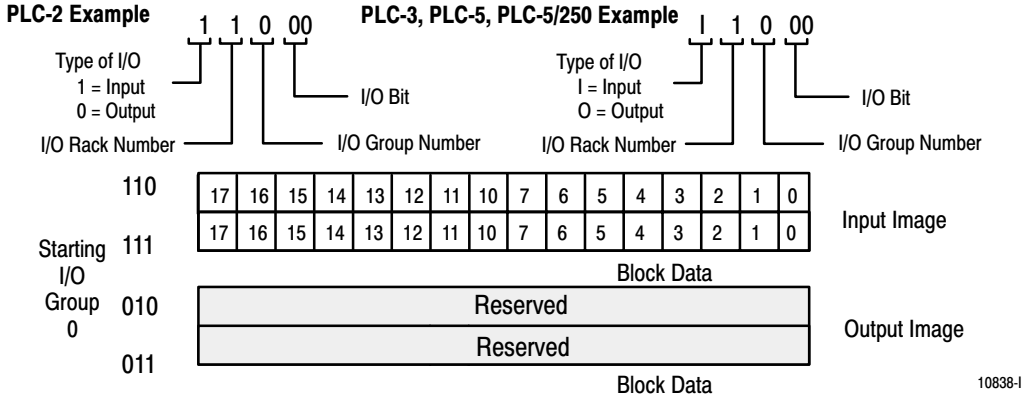


Figure 4.9
Input/Output Image Table Usage Example for One Starting I/O Group for 16 Input/16 Output Modules (cat. no. 1791-16AC, -16BC)

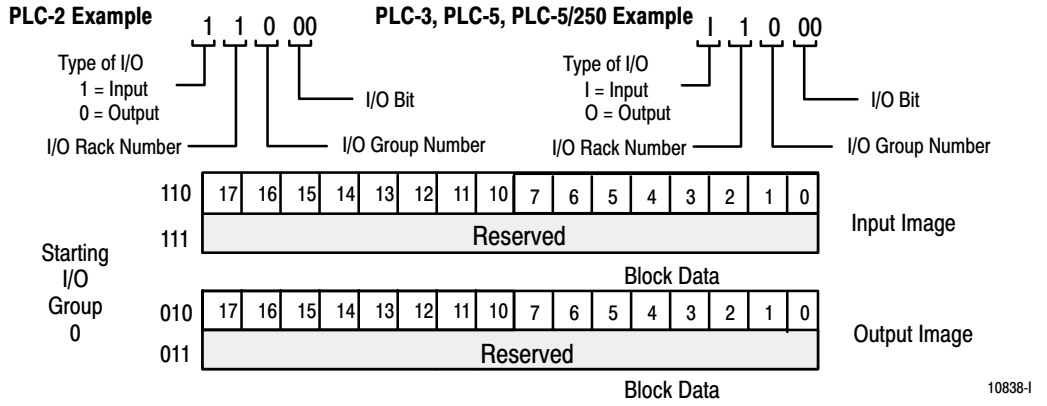
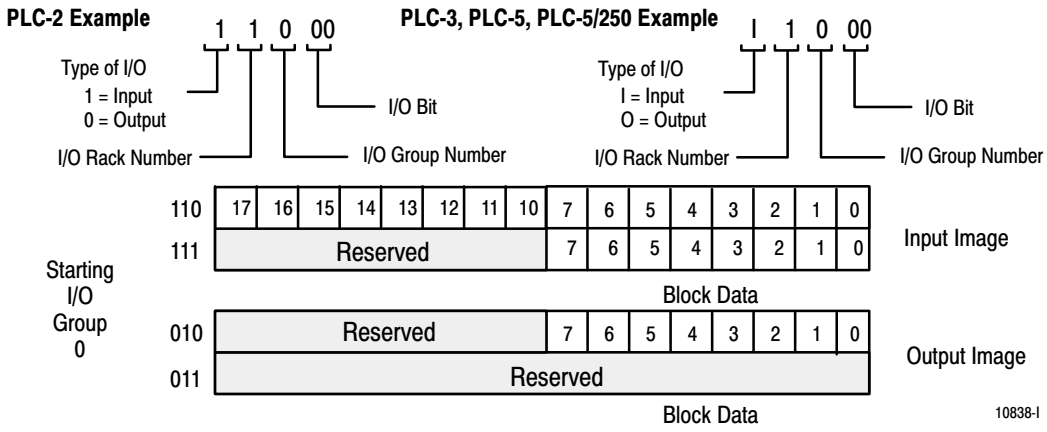


Figure 4.10
Input/Output Image Table Usage Example for One Starting I/O Group for 24 Input/8 Output Modules (cat. no. 1791-24A8, -24B8, -24AR, -24BR)



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Using Complementary I/O

PLC-2 and PLC-5 family processors support a complementary I/O configuration. Complementary I/O can allow you to maximize memory usage without increasing memory size. Refer to the user's manual for your processor to see if it supports this type of configuration.

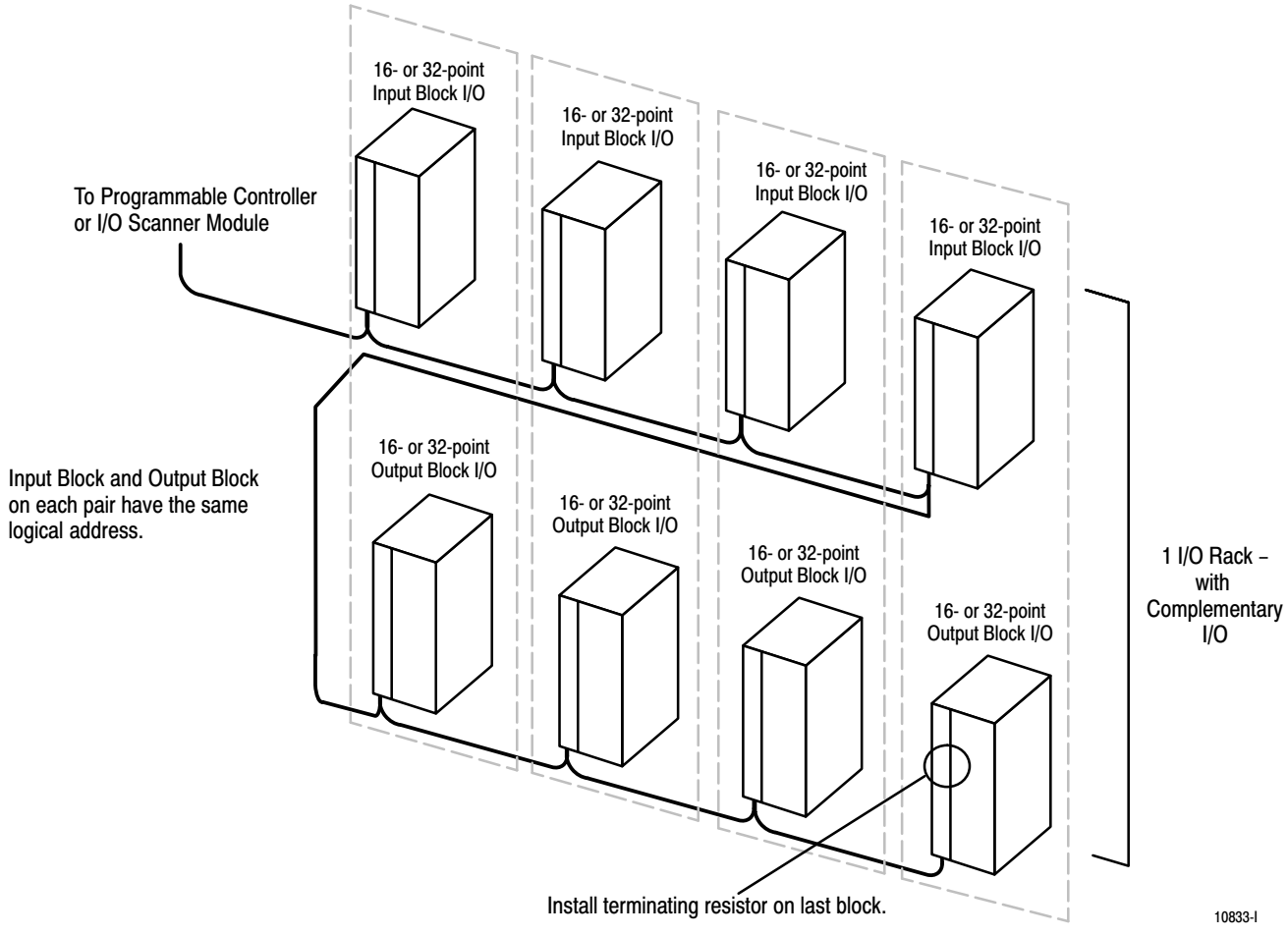
You configure complementary I/O by duplicating an I/O rack number of one I/O chassis (primary) in another I/O chassis (complementary), I/O group for I/O group. The I/O modules in the complementary chassis perform the opposite function of the corresponding modules in the primary chassis.

Important: Series A block I/O modules do not support complementary I/O. If using complementary I/O, use series B modules.

When using I/O racks in a complementary configuration, the block I/O must be paired with a device which occupies 1/4 rack of I/O space (i.e. primary and complementary must be the same logical rack size).

Note: The 1747-SN series A is not capable of supporting complementary I/O.

Figure 4.11
Processor Data Table Use with Complementary I/O



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Remote rack numbers which can have a complementary rack are rack numbers 01 thru 07 only (Table 4.H).

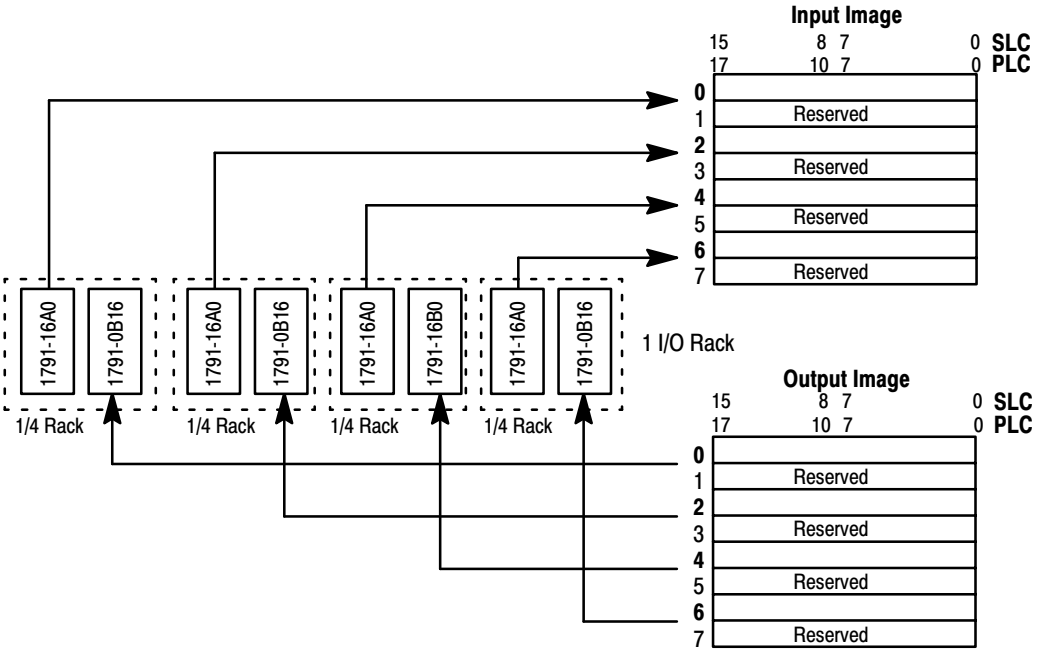
When configured as complementary I/O:

- PLC-2 can scan racks 01–07
- PLC-5/11 can scan rack 03
- PLC-5/20, PLC-5/30, PLC-5/40, PLC-5/60 can scan racks 01–07

Table 4.H
PLC–2 and PLC–5 With Complementary I/O

PLC–2 Rack Number	PLC–5 Rack Number	SW1 Switch Position					
		8	7	6	5	4	3
Rack 1	Not Valid	0	0	1	0	0	0
Rack 2	Rack 1	0	0	1	0	0	1
Rack 3	Rack 2	0	0	1	0	1	0
Rack 4	Rack 3	0	0	1	0	1	1
Rack 5	Rack 4	0	0	1	1	0	0
Rack 6	Rack 5	0	0	1	1	0	1
Rack 7	Rack 6	0	0	1	1	1	0
	Rack 7	0	0	1	1	1	1

Figure 4.12
I/O Image Table for One Assigned Rack Number with Series B 16-point Modules using Complementary I/O



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Figure 4.13
Input/Output Image Table Usage Example for One I/O Group for Series B 16-point Output Modules (cat. no. 1791-0A16, -0B16) Complemented by Series B 16-point Input Modules (cat. no. 1791-16A0, -16B0)

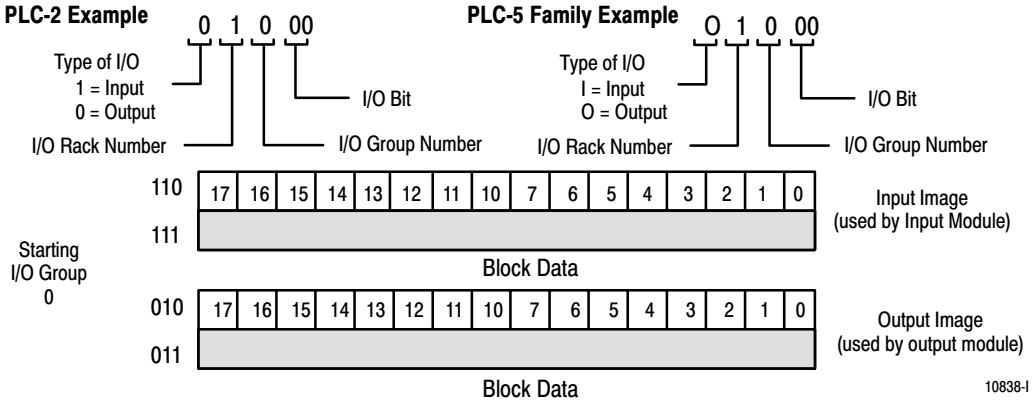
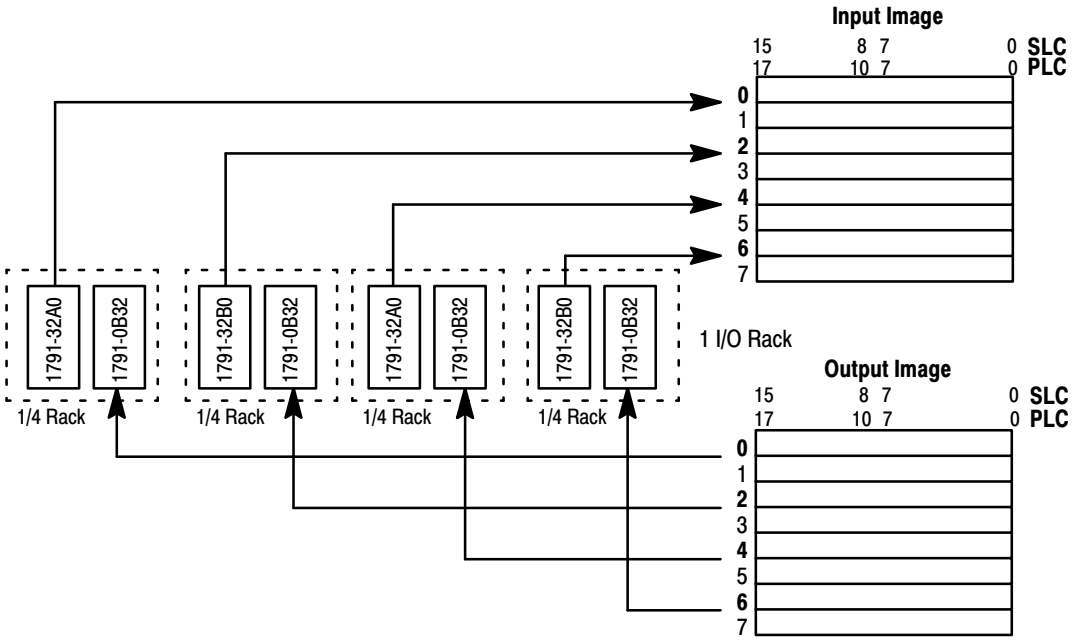


Figure 4.14
I/O Image Table for One Assigned Rack Number with Series B 32-point Modules using Complementary I/O



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Figure 4.15
Input/Output Image Table Usage Example for One I/O Group for Series B 32-point Output Modules (cat. no. 1791-0A32, -0B32) Complemented by Series B 32-point Input Modules (cat. no. 1791-32A0, -32B0)

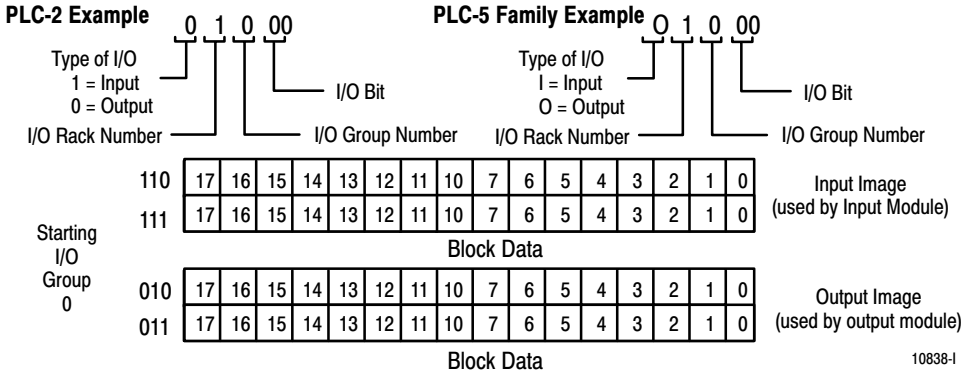
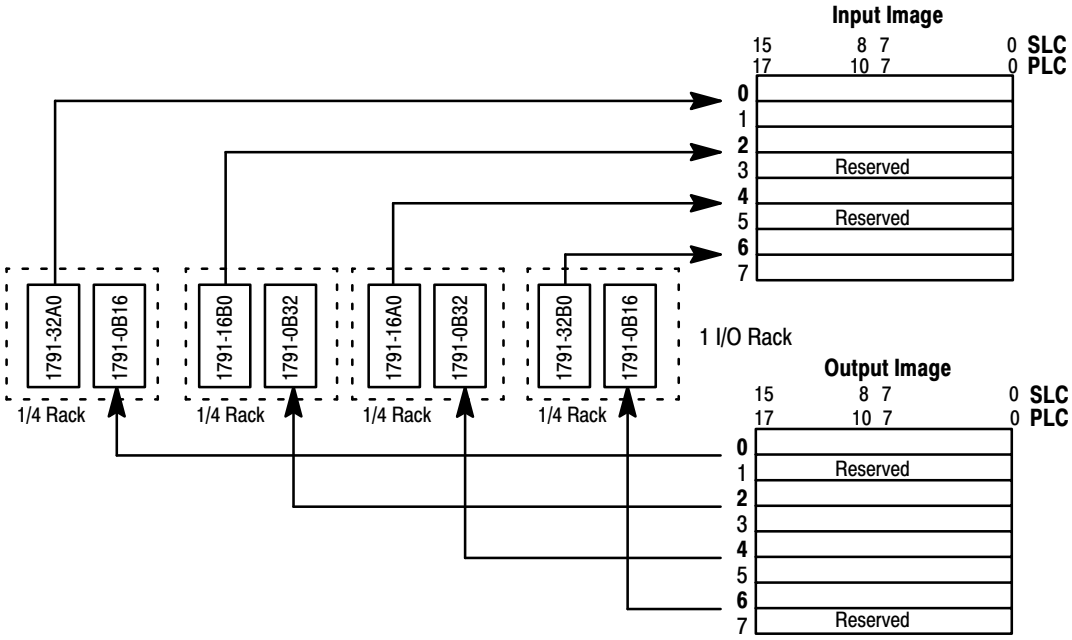
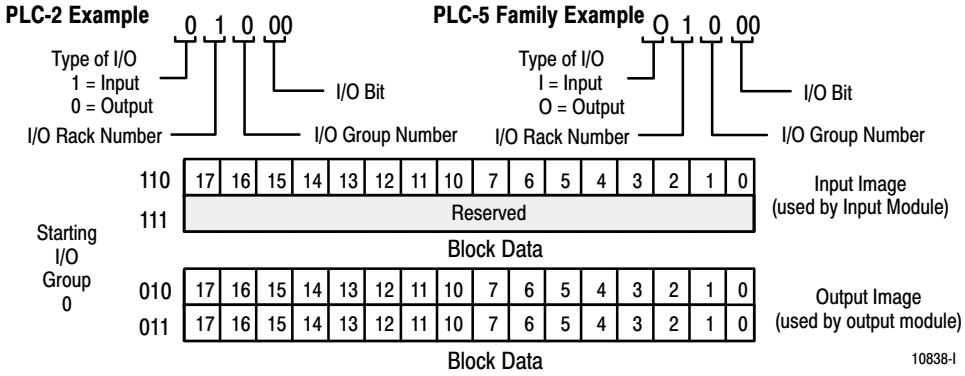


Figure 4.16
I/O Image Table for One Assigned Rack Number with Series B 32-point Modules and Series B 16-point Modules Complemented by each other



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Figure 4.17
Input/Output Image Table Usage Example for One I/O Group for Series B 32-point Output Modules (cat. no. 1791-0A32, -0B32) Complemented by Series B 16-point Input Modules (cat. no. 1791-16A0, -16B0)



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Chapter 5

Troubleshooting

Chapter Objectives

In this chapter you will learn about the indicators on the block I/O module, and how to use them to troubleshoot the unit.

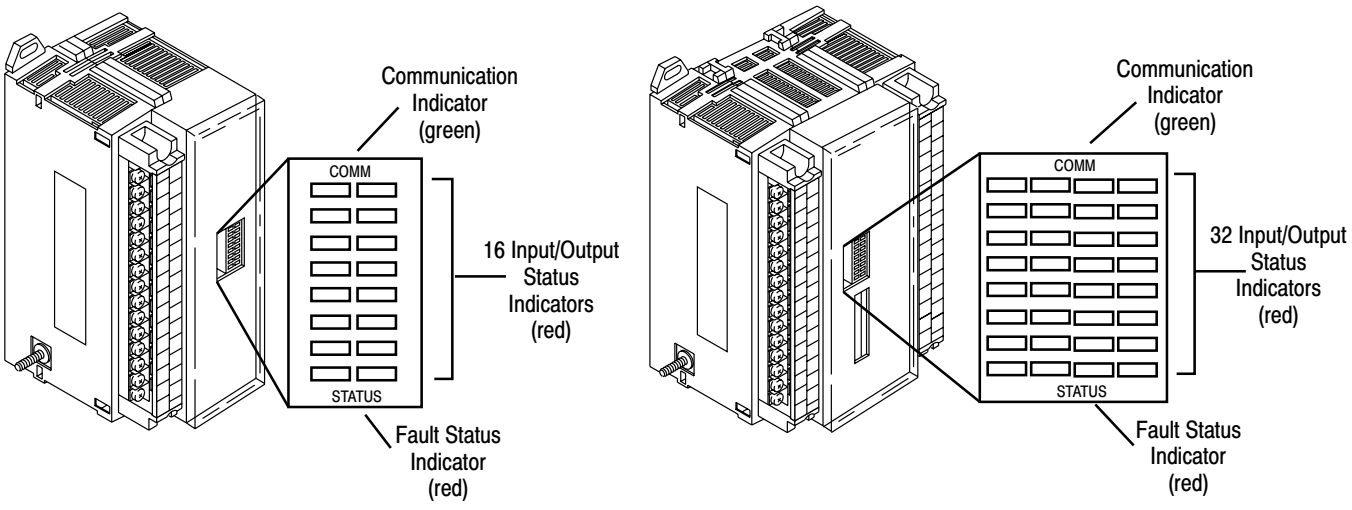
Indicators

Each block I/O module has indicators (Figure 5.1) which provide indication of module status. Each module has the following:

Indicator	Color	Quantity	Description
COMM	Green	1	Indicates whether communication is occurring between processor or scanner and the block module
STATUS	Red	1	Indicates hardware or software error, and if communication has failed
I/O Status	Red	16	Reflect the state of the individual inputs and/or outputs (on or off)

Figure 5.1 shows the location of the indicators. Refer to Table 5.A for status indications reported by the indicators.

Figure 5.1
Indicators on the Block I/O Module



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Table 5.A
Troubleshooting Chart

Indication	Probable Cause	Corrective Action
Green COMM indicator on Red STATUS indicator off I/O status indicator on/off	Normal operation	None required
Red STATUS indicator on	Block failed self-test, or a major fault is detected.	Cycle power to the block. If problem persists, replace the block.
Red STATUS indicator flashing Green COMM indicator off	Communication failure – RIO cable off, 100ms between valid frames, 20ms idle time exceeded. Improper processor or scanner switch settings.	Check remote I/O cable connections, verify scanner or processor switch settings.
Green COMM indicator off	No communication with processor, scanner etc.	Check that power is applied to block. Make sure that proper number of blocks are configured. Check remote I/O link for duplicate address.
Green COMM indicator flashing	Reset command (or output disable bit for SLC) has been issued by processor or scanner.	Check program. Correct as necessary. Check terminator, resistors and cable wiring.
	SLC or programmable controller in program mode.	Place in run mode.
COMM and STATUS indicators alternately flashing	Processor restart lockout is selected and a fault has occurred. (Communication to block is established.)	Cycle power to block.

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Appendix A

Specifications

For Specifications for:	Refer to:
1791-16A0/B	Page A-2
1791-0A16/B	Page A-3
1791-8AC/B	Page A-4
1791-8AR/B	Page A-5
1791-32A0/B	Page A-12
1791-0A32/B	Page A-13
1791-16AC/B	Page A-14
1791-24A8/B	Page A-15
1791-24AR/B	Page A-16
1791-16B0/B	Page A-7
1791-0B16/B	Page A-8
1791-8BC/B	Page A-9
1791-8BR/B	Page A-10
1791-32B0/B	Page A-18
1791-0B32/B	Page A-19
1791-16BC/B	Page A-20
1791-24B8/B	Page A-21
1791-24BR/B	Page A-22

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1791-16A0 Series B Specifications

Input Specifications		
Inputs per Block		16 (2 groups of 8)
Nominal Input Current		11.0mA
Nominal Input Voltage		120V ac
On–state Voltage Range		79–132V ac, 47–63Hz
Off-state Voltage	Maximum	35V
On-state Current	Minimum	5mA @ 79V, 60Hz
Off-state Current	Minimum	2.3mA (60Hz)
Input Impedance	Maximum	15K ohms @ 60Hz
Input Signal Delay	Off to on On to off	1.0ms 26ms (maximum) (allows for 1/2 cycle dropout)
General Specifications		
External Power (Internally protected - no external fuse required)		
	Voltage Current	85–132V ac, 47–63Hz 150mA
Dimensions	Inches Millimeters	6.95H X 2.7W X 3.85D 176.5H X 68.8W X 98D
Isolation	Power supply to RIO I/O Group-to-Group I/O Group-to-Logic	500V ac 1250V ac 1250V ac
Power Dissipation	Maximum	8.9 Watts
Thermal Dissipation	Maximum	30.35 BTU/hr
Environmental Conditions		
	Operational Temperature Storage Temperature Relative Humidity	0 to 60°C (32 to 140°F) –40 to 85°C (–40 to 185°F) 5 to 95% noncondensing
Conductors	Wire Size Category	14 gauge ($2mm^2$) stranded maximum 3/64 inch insulation maximum 1[1]

[1] You use this conductor category information for planning conductor routing as described in the system level installation manual.

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1791-0A16 Series B Specifications

Output Specifications		
Outputs per Block		16 (2 groups of 8)
Output Voltage Range		20–132V ac, 47–63Hz
Output Current Rating		
	Vertical Mtg.	300mA @ 60°C, 600mA @ 30°C
	Horizontal Mtg.	150mA @ 60°C, 300mA @ 30°C
Surge Current		10A for 50ms each, repeatable every 2 sec.
Minimum On-state Current		50mA per output
Maximum On-state Voltage Drop		1.5V peak @ 300mA
Off-state Leakage Current (maximum)		3mA
Output Signal Delay	Off to on	1.0ms @ 60Hz; 1.0ms @ 50Hz
	On to off	8.3ms @ 60Hz; 10.0ms @ 50Hz
General Specifications		
External Power (Internally protected - no external fuse required)		
	Voltage	85–132V ac, 47–63Hz
	Current	150mA
Dimensions	Inches	6.95H X 2.7W X 3.85D
	Millimeters	176.5H X 68.8W X 98D
Isolation	Power supply to RIO	500V ac
	I/O Group-to-Group	1250V ac
	I/O Group-to-Logic	1250V ac
Power Dissipation	Maximum	16.9 Watts
Thermal Dissipation	Maximum	57.63 BTU/hr
Environmental Conditions		
	Operational Temperature	0 to 60°C (32 to 140°F)
	Storage Temperature	–40 to 85°C (–40 to 185°F)
	Relative Humidity	5 to 95% noncondensing
Conductors	Wire Size	14 gauge ($2mm^2$) stranded maximum 3/64 inch insulation maximum
	Category	1[1]

[1] You use this conductor category information for planning conductor routing as described in the system level installation manual.

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1791-8AC Series B Specifications

Input Specifications		
Inputs per Block		1 group of 8
Nominal Input Current		11.0mA
Nominal Input Voltage		120V ac
On-state Voltage Range		79–132V ac, 47–63Hz
Off-state Voltage	Maximum	35V
On-state Current	Minimum	5mA @ 79V, 60Hz
Off-state Current	Minimum	2.3mA (60Hz)
Input Impedance	Maximum	15K ohms @ 60Hz
Input Signal Delay	Off to on On to off	1.0ms 26ms (maximum) (allows for 1/2 cycle drop-out)
Output Specifications		
Outputs per Block		1 group of 8
Output Voltage Range		20–132V ac
Output Current Rating	 Vertical Mtg. Horizontal Mtg.	 300mA @ 60°C, 600mA @ 30°C 150mA @ 60°C, 300mA @ 30°C
Surge Current		10A for 50ms each, repeatable every 2 sec.
Minimum On-state Current		50mA per output
Maximum On-state Voltage Drop		1.5V peak @ 300mA
Off-state Leakage Current (maximum)		3mA
Output Signal Delay	Off to on On to off	1.0ms @ 60Hz; 1.0ms @ 50Hz 8.3ms @ 60Hz; 10.0ms @ 50Hz
General Specifications		
External Power (Internally protected - no external fuse required)	 Voltage Current	 85–132V ac, 47–63Hz 150mA
Dimensions	Inches Millimeters	6.95H X 2.7W X 3.85D 176.5H X 68.8W X 98D
Isolation	Power supply to RIO I/O Group-to-Group I/O Group-to-Logic	500V ac 1250V ac 1250V ac
Power Dissipation	Maximum	12.9 Watts
Thermal Dissipation	Maximum	43.99 BTU/hr
Environmental Conditions	 Operational Temperature Storage Temperature Relative Humidity	 0 to 60°C (32 to 140°F) –40 to 85°C (–40 to 185°F) 5 to 95% noncondensing
Conductors	Wire Size Category	14 gauge ($2mm^2$) stranded maximum 3/64 inch insulation maximum 1[1]

[1] You use this conductor category information for planning conductor routing as described in the system level installation manual.

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1791-8AR Series B Specifications

Input Specifications		
Inputs per Block		1 group of 8
Nominal Input Current		11.0mA
Nominal Input Voltage		120V ac
On-state Voltage Range		79–132V ac, 47–63Hz
Off-state Voltage	Maximum	35V
On-state Current	Minimum Maximum	5mA @ 79V, 60Hz 12.3mA @ 132V, 60Hz
Off-state Current	Minimum	2.3mA (60Hz)
Input Impedance	Maximum	15K ohms @ 60Hz
Input Signal Delay	Off to on On to off	1.0ms 26ms (maximum) (allows for 1/2 cycle drop-out)
Output Specifications		
Outputs per Block		1 group of 8 Form A (normally open) electromechanical relays
Output Voltage Range (load dependent)[1]		20–132V ac @ 1A resistive maximum 20–30V dc @ 1A resistive maximum 125V dc @ 0.2A resistive maximum
Output Current Rating (at rated power)[2, 3]		**Resistive – P.F. = 1, cos θ = 1.0** 1A @ 20–132V ac 1A @ 20–30V dc 0.2A @ 125V dc **Inductive – P.F. = 0.4, cos θ = 0.4** 0.5A @ 20–132V ac 1A @ 20–30V dc, L/R = 7ms 0.1A @ 125V dc, L/R = 7ms
Surge Current (at rated power with inductive loads)[1, 3]		0.5A @ 20–132V ac, cos θ = 0.4 1A @ 20–30V dc, L/R = 7ms 0.1A @ 125V dc, L/R = 7ms
Power Rating (continuous and surge loads)		132W ac maximum for 132V ac resistive output 30W dc maximum for 30V dc resistive output 25W dc maximum for 125V dc resistive output 66VA maximum for 132V ac inductive output 30VA maximum for 30V dc inductive output 12.5VA maximum for 125V dc inductive output
Contact Load	Minimum	10mA per output
Operate/Release Time		5ms (±1ms) typical
Bounce Time	Maximum	1ms
Switching Frequency (for contact cooling)	Maximum	1Hz (60 cpm) @ maximum rated output current 10Hz (600 cpm) @ minimum rated output current
Off-state Leakage Current (maximum)		2mA (from snubber across contacts)
Expected Life of Electrical Contacts		100K operations minimum @ rated loads

Specifications continued on next page

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1791-8AR Series B Specifications

General Specifications		
External Power (Internally protected - no external fuse required)		
	Voltage	85–132V ac, 47–63Hz
	Current	150mA
Dimensions	Inches	6.95H X 2.7W X 3.85D
	Millimeters	176.5H X 68.8W X 98D
Isolation	Power supply to RIO	500V ac
	I/O Group-to-Group	1250V ac
	I/O Group-to-Logic	1250V ac
	Between open contacts	1000V ac (initial)
Power Dissipation	Maximum	16.5 Watts
Thermal Dissipation	Maximum	56.1 BTU/hr
Environmental Conditions		
	Operational Temperature	0 to 60°C (32 to 140°F)
	Storage Temperature	–40 to 85°C (–40 to 185°F)
	Relative Humidity	5 to 95% noncondensing
Conductors	Wire Size	14 gauge ($2mm^2$) stranded maximum 3/64 inch insulation maximum
	Category	1[4]

[1] Surge limiting circuitry is not provided in the module. For reliable operation, you must ensure that surges do not exceed either the voltage or current rating of the module.

[2] Spikes, peaks and surges must be within the power rating specifications.

[3] Do not attempt to parallel outputs to increase load current. The output that turns on fastest would carry the full load current.

[4] You use this conductor category information for planning conductor routing as described in the system level installation manual.

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1791-16B0 Series B Specifications

Input Specifications		
Inputs per Block		16 – 2 groups of 8
On-state Voltage Range		10–30V dc
On-state Current	Maximum Minimum	11.0mA @ 30V 2.5mA @ 10V
Off-state Voltage	Maximum	5V dc
Off-state Current	Minimum	1.5mA
Input Impedance	Maximum	3.4K ohms
Input Signal Delay	Fast Slow	1.0ms on; 5.0ms off (maximum) 1.0ms on; 18.0ms off (maximum)
General Specifications		
External Power (internally protected - no external fuse required)	Voltage Current	 19.2–30V dc 300mA
Dimensions	Inches Millimeters	6.95H X 2.7W X 3.85D 176.5H X 68.8W X 98D
Isolation	Power supply to RIO I/O Group-to-Group I/O Group-to-Logic	500V ac 500V ac 500V ac
Power Dissipation	Maximum	14.3 Watts
Thermal Dissipation	Maximum	48.7 BTU/hr
Environmental Conditions	Operational Temperature Storage Temperature Relative Humidity	 0 to 60°C (32 to 140°F) –40 to 85°C (–40 to 185°F) 5 to 95% noncondensing
Conductors	Wire Size Category	14 gauge (2mm^2) stranded maximum 3/64 inch insulation maximum 2[1]

[1] You use this conductor category information for planning conductor routing as described in the system level installation manual.

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1791-0B16 Series B Specifications

Output Specifications		
Outputs per Block		16 – 2 groups of 8
Output Voltage Range		10–30V dc
Output Current Rating		
	Vertical Mtg.	500mA @ 60°C, 1A @ 30°C
	Horizontal Mtg.	250mA @ 60°C, 500mA @ 30°C
Surge Current		3A for 50ms each, repeatable every 2 sec.
Minimum On-state Current		1mA per output
Maximum On-state Voltage Drop		1.0V @ rated current
Off-state Leakage Current (maximum)		0.5mA
Output Signal Delay		0.5ms on; 1.0ms off (maximum)
General Specifications		
External Power (internally protected - no external fuse required)		
	Voltage	19.2–30V dc
	Current	300mA
Dimensions	Inches	6.95H X 2.7W X 3.85D
	Millimeters	176.5H X 68.8W X 98D
Isolation	Power supply to RIO	500V ac
	I/O Group-to-Group	500V ac
	I/O Group-to-Logic	500V ac
Power Dissipation	Maximum	12.5 Watts
Thermal Dissipation	Maximum	43.0 BTU/hr
Environmental Conditions		
	Operational Temperature	0 to 60°C (32 to 140°F)
	Storage Temperature	–40 to 85°C (–40 to 185°F)
	Relative Humidity	5 to 95% noncondensing
Conductors	Wire Size	14 gauge ($2mm^2$) stranded maximum 3/64 inch insulation maximum
	Category	2[1]

[1] You use this conductor category information for planning conductor routing as described in the system level installation manual.

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1791-8BC Series B Specifications

Input Specifications		
Inputs per Block		8 – 1 group of 8
On-state Voltage Range		10–30V dc
On-state Current	Maximum Minimum	11.0mA @ 30V 2.5mA @ 10V
Off-state Voltage	Maximum	5V dc
Off-state Current	Minimum	1.5mA
Input Impedance	Maximum	3.4K ohms
Input Signal Delay	Fast Slow	1.0ms on; 5.0ms off (maximum) 1.0ms on; 18.0ms off (maximum)
Output Specifications		
Outputs per Block		8 – 1 group of 8
Output Voltage Range		10–30V dc
Output Current Rating	Vertical Mtg. Horizontal Mtg.	500mA @ 60ºC, 1A @ 30ºC 250mA @ 60ºC, 500mA @ 30ºC
Surge Current		3A for 50ms each, repeatable every 2 sec.
Minimum On-state Current		1mA per output
Maximum On-state Voltage Drop		1.0V @ rated current
Off-state Leakage Current (maximum)		0.5mA
Output Signal Delay		0.5ms on; 1.0ms off (maximum)
General Specifications		
External Power (internally protected - no external fuse required)	Voltage Current	19.2–30V dc 300mA
Dimensions	Inches Millimeters	6.95H X 2.7W X 3.85D 176.5H X 68.8W X 98D
Isolation	Power supply to RIO I/O Group-to-Group I/O Group-to-Logic	500V ac 500V ac 500V ac
Power Dissipation	Maximum	11.8 Watts
Thermal Dissipation	Maximum	41.0 BTU/hr
Environmental Conditions	Operational Temperature Storage Temperature Relative Humidity	0 to 60ºC (32 to 140ºF) –40 to 85ºC (–40 to 185ºF) 5 to 95% noncondensing
Conductors	Wire Size Category	14 gauge ($2mm^2$) stranded maximum 3/64 inch insulation maximum 2[1]

[1] You use this conductor category information for planning conductor routing as described in the system level installation manual.

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1791-8BR Series B Specifications

Input Specifications		
Inputs per Block		8 – 1 group of 8
On-state Voltage Range		10–30V dc
On-state Current	Maximum Minimum	11.0mA @ 30V 2.5mA @ 10V
Off-state Voltage	Maximum	5V dc
Off-state Current	Minimum	1.5mA
Input Impedance	Maximum	3.4K ohms
Input Signal Delay	Fast Slow	1.0ms on; 5.0ms off (maximum) 1.0ms on; 18.0ms off (maximum)
Output Specifications		
Outputs per Block		1 group of 8 Form A (normally open) electromechanical relays
Output Voltage Range (load dependent)[1]		20–132V ac @ 1A resistive maximum 20–30V dc @ 1A resistive maximum 125V dc @ 0.2A resistive maximum
Output Current Rating (at rated power)[2, 3]		**Resistive – P.F. = 1, cos θ = 1.0** 1A @ 20–132V ac 1A @ 20–30V dc 0.2A @ 125V dc **Inductive – P.F. = 0.4, cos θ = 0.4** 0.5A @ 20–132V ac 1A @ 20–30V dc, L/R = 7ms 0.1A @ 125V dc, L/R = 7ms
Surge Current (at rated power with inductive loads)[1, 3]		0.5A @ 20–132V ac, cos θ = 0.4 1A @ 20–30V dc, L/R = 7ms 0.1A @ 125V dc, L/R = 7ms
Power Rating (continuous and surge loads)		132W ac maximum for 132V ac resistive output 30W dc maximum for 30V dc resistive output 25W dc maximum for 125V dc resistive output 66VA maximum for 132V ac inductive output 30VA maximum for 30V dc inductive output 12.5VA maximum for 125V dc inductive output
Contact Load	Minimum	10mA per output
Operate/Release Time		5ms (±1ms) typical
Bounce Time	Maximum	1ms
Switching Frequency Maximum for contact cooling		1Hz (60 cpm) @ maximum rated output current 10Hz (600 cpm) @ minimum rated output current
Off-state Leakage Current (maximum @ 132V ac)		2mA (from snubber across contacts)
Expected Life of Electrical Contacts		100K operations minimum @ rated loads

Specifications continued on next page.

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1791-8BR Series B Specifications

General Specifications		
External Power (internally protected - no external fuse required)		
	Voltage	19.2–30V dc
	Current	300mA
Dimensions	Inches	6.95H X 2.7W X 3.85D
	Millimeters	176.5H X 68.8W X 98D
Isolation	Power supply to RIO	500V ac
	I/O Group-to-Group	500V ac
	I/O Group-to-Logic	500V ac
Power Dissipation	Maximum	14.5 Watts
Thermal Dissipation	Maximum	49.4 BTU/hr
Environmental Conditions		
	Operational Temperature	0 to 60°C (32 to 140°F)
	Storage Temperature	–40 to 85°C (–40 to 185°F)
	Relative Humidity	5 to 95% noncondensing
Conductors	Wire Size	14 gauge ($2mm^2$) stranded maximum 3/64 inch insulation maximum
	Category	2[4]

1 Surge limiting circuitry is not provided in the module. For reliable operation, you must ensure that surges do not exceed either the voltage or current rating of the module.

2 Spikes, peaks and surges must be within the power rating specifications.

3 Do not attempt to parallel outputs to increase load current. The output that turns on fastest would carry the full load current.

4 You use this conductor category information for planning conductor routing as described in the system level installation manual.

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1791-32A0 Specifications

Input Specifications		
Inputs per Block		32 (4 groups of 8)
Nominal Input Current		11.0mA
Nominal Input Voltage		120V ac
On–state Voltage Range		79–132V ac, 47–63Hz
Off-state Voltage	Maximum	35V
On-state Current	Minimum Maximum	5mA @ 79V, 60Hz 12.3mA @ 132V, 60Hz
Off-state Current	Minimum	2.3mA (60Hz)
Input Impedance	Maximum	15K ohms @ 60Hz
Input Signal Delay	Off to on On to off	1.0ms 26ms (maximum) (allows for 1/2 cycle dropout)
General Specifications		
External Power (internally protected - no external fuse required)		
	Voltage Current	85–132V ac, 47–63Hz 150mA
Dimensions	Inches Millimeters	6.95H X 4.35W X 3.85D 176.5H X 110.5W X 98D
Isolation	Power supply to RIO I/O Group-to-Group I/O Group-to-Logic	500V ac 1250V ac 1250V ac
Power Dissipation	Maximum	13.62 Watts
Thermal Dissipation	Maximum	46.44 BTU/hr
Environmental Conditions		
	Operational Temperature Storage Temperature Relative Humidity	0 to 60°C (32 to 140°F) –40 to 85°C (–40 to 185°F) 5 to 95% noncondensing
Conductors	Wire Size Category	14 gauge stranded maximum 3/64 inch insulation maximum 1[1]

[1] You use this conductor category information for planning conductor routing as described in the system level installation manual.

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1791-0A32 Specifications

Output Specifications		
Outputs per Block		32 (4 groups of 8)
Output Voltage Range		20–132V ac, 47–63Hz
Output Current Rating		
	Vertical Mtg.	300mA @ 60ºC, 600mA @ 30ºC
	Horizontal Mtg.	150mA @ 60ºC, 300mA @ 30ºC
Surge Current		10A for 50ms each, repeatable every 2 sec.
Minimum On-state Current		50mA per output
Maximum On-state Voltage Drop		1.5V peak @ 300mA
Off-state Leakage Current (maximum)		3mA
Output Signal Delay	Off to on	1.0ms @ 60Hz; 1.0ms @ 50Hz
	On to off	8.3ms @ 60Hz; 10.0ms @ 50Hz
General Specifications		
External Power (internally protected - no external fuse required)		
	Voltage	85–132V ac, 47–63Hz
	Current	150mA @ 132V ac
Dimensions	Inches	6.95H X 4.35W X 3.85D
	Millimeters	176.5H X 110.5W X 98D
Isolation	Power supply to RIO	500V ac
	I/O Group-to-Group	1250V ac
	I/O Group-to-Logic	1250V ac
Power Dissipation	Maximum	31.3 Watts
Thermal Dissipation	Maximum	106.73 BTU/hr
Environmental Conditions		
	Operational Temperature	0 to 60ºC (32 to 140ºF)
	Storage Temperature	–40 to 85ºC (–40 to 185ºF)
	Relative Humidity	5 to 95% noncondensing
Conductors	Wire Size	14 gauge stranded maximum 3/64 inch insulation maximum
	Category	1[1]

[1] You use this conductor category information for planning conductor routing as described in the system level installation manual.

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1791-16AC Specifications

Input Specifications		
Inputs per Block		16 (2 groups of 8)
Nominal Input Current		11mA
Nominal Input Voltage		120V ac
On-state Voltage Range		79–132V ac, 47–63Hz
Off-state Voltage	Maximum	35V
On-state Current	Minimum Maximum	5mA @ 79V, 60Hz 12.3mA @ 132V, 60Hz
Off-state Current	Minimum	2.3mA (60Hz)
Input Impedance	Maximum	15K ohms @ 60Hz
Input Signal Delay	Off to on On to off	1.0ms 26ms (maximum) (allows for 1/2 cycle drop-out)
Output Specifications		
Outputs per Block		16 (2 groups of 8)
Output Voltage Range		20–132V ac
Output Current Rating	Vertical Mtg. Horizontal Mtg.	300mA @ 60°C, 600mA @ 30°C 150mA @ 60°C, 300mA @ 30°C
Surge Current		10A for 50ms each, repeatable every 2 sec.
Minimum On-state Current		50mA per output
Maximum On-state Voltage Drop		1.5V peak @ 300mA
Off-state Leakage Current (maximum)		3mA
Output Signal Delay	Off to on On to off	1.0ms @ 60Hz; 1.0ms @ 50Hz 8.3ms @ 60Hz; 10.0ms @ 50Hz
General Specifications		
External Power (internally protected - no external fuse required)	Voltage Current	 85–132V ac, 47–63Hz 150mA
Dimensions	Inches Millimeters	6.95H X 4.35W X 3.85D 176.5H X 110.5W X 98D
Isolation	Power supply to RIO I/O Group-to-Group I/O Group-to-Logic	500V ac 1250V ac 1250V ac
Power Dissipation	Maximum	22.76 Watts
Thermal Dissipation	Maximum	77.6 BTU/hr
Environmental Conditions	Operational Temperature Storage Temperature Relative Humidity	 0 to 60°C (32 to 140°F) –40 to 85°C (–40 to 185°F) 5 to 95% noncondensing
Conductors	Wire Size Category	14 gauge stranded maximum 3/64 inch insulation maximum 1[1]

[1] You use this conductor category information for planning conductor routing as described in the system level installation manual.

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1791-24A8 Specifications

Input Specifications		
Inputs per Block		24 (3 groups of 8)
Nominal Input Current		11mA
Nominal Input Voltage		120V ac
On-state Voltage Range		79–132V ac, 47–63Hz
Off-state Voltage	Maximum	35V
On-state Current	Minimum Maximum	5mA @ 79V, 60Hz 12.3mA @ 132V, 60Hz
Off-state Current	Minimum	2.3mA (60Hz)
Input Impedance	Maximum	15K ohms @ 60Hz
Input Signal Delay	Off to on On to off	1.0ms 26ms (maximum) (allows for 1/2 cycle drop-out)
Output Specifications		
Outputs per Block		8 (1 group of 8)
Output Voltage Range		20–132V ac
Output Current Rating	Vertical Mtg. Horizontal Mtg.	300mA @ 60°C, 600mA @ 30°C 150mA @ 60°C, 300mA @ 30°C
Surge Current		10A for 50ms each, repeatable every 2 sec.
Minimum On-state Current		50mA per output
Maximum On-state Voltage Drop		1.5V peak @ 300mA
Off-state Leakage Current (maximum)		3mA
Output Signal Delay	Off to on On to off	1.0ms @ 60Hz; 1.0ms @ 50Hz 8.3ms @ 60Hz; 10.0ms @ 50Hz
General Specifications		
External Power (internally protected - no external fuse required)	Voltage Current	85–132V ac, 47–63Hz 150mA
Dimensions	Inches Millimeters	6.95H X 4.35W X 3.85D 176.5H X 110.5W X 98D
Isolation	Power supply to RIO I/O Group-to-Group I/O Group-to-Logic	500V ac 1250V ac 1250V ac
Power Dissipation	Maximum	18.76 Watts
Thermal Dissipation	Maximum	63.97 BTU/hr
Environmental Conditions	Operational Temperature Storage Temperature Relative Humidity	0 to 60°C (32 to 140°F) –40 to 85°C (–40 to 185°F) 5 to 95% noncondensing
Conductors	Wire Size Category	14 gauge stranded maximum 3/64 inch insulation maximum 1[1]

[1] You use this conductor category information for planning conductor routing as described in the system level installation manual.

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1791-24AR Specifications

Input Specifications		
Inputs per Block		24 (3 groups of 8)
Nominal Input Current		11.0mA
Nominal Input Voltage		120V ac
On-state Voltage Range		79–132V ac, 47–63Hz
Off-state Voltage	Maximum	35V
On-state Current	Minimum Maximum	5mA @ 79V, 60Hz 12.3mA @ 132V, 60Hz
Off-state Current	Minimum	2.3mA (60Hz)
Input Impedance	Maximum	15K ohms @ 60Hz
Input Signal Delay	Off to on On to off	1.0ms 26ms (maximum) (allows for 1/2 cycle drop-out)
Output Specifications		
Outputs per Block		1 group of 8 Form A (normally open) electromechanical relays
Output Voltage Range (load dependent)[1]		20–132V ac @ 1A resistive maximum 20–30V dc @ 1A resistive maximum 125V dc @ 0.2A resistive maximum
Output Current Rating (at rated power)[2, 3]		**Resistive – P.F. = 1, cos θ = 1.0** 1A @ 20–132V ac 1A @ 20–30V dc 0.2A @ 125V dc **Inductive – P.F. = 0.4, cos θ = 0.4** 0.5A @ 20–132V ac 1A @ 20–30V dc, L/R = 7ms 0.1A @ 125V dc, L/R = 7ms
Surge Current (at rated power with inductive loads)[1, 3]		0.5A @ 20–132V ac, cos θ = 0.4 1A @ 20–30V dc, L/R = 7ms 0.1A @ 125V dc, L/R = 7ms
Power Rating (continuous and surge loads)		132W ac maximum for 132V ac resistive output 30W dc maximum for 30V dc resistive output 25W dc maximum for 125V dc resistive output 66VA maximum for 132V ac inductive output 30VA maximum for 30V dc inductive output 12.5VA maximum for 125V dc inductive output
Contact Load	Minimum	10mA per output
Operate/Release Time		5ms ($\pm$1ms) typical
Bounce Time	Maximum	1ms
Switching Frequency Maximum for contact cooling		1Hz (60 cpm) @ maximum rated output current 10Hz (600 cpm) @ minimum rated output current
Off-state Leakage Current (maximum)		2mA (from snubber across contacts)
Expected Life of Electrical Contacts		100K operations minimum @ rated loads

Specifications continued on next page

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1791-24AR Specifications

General Specifications		
External Power (internally protected-no external fuse required)		
	Voltage	85–132V ac, 47–63Hz
	Current	150mA
Dimensions	Inches	6.95H X 4.35W X 3.85D
	Millimeters	176.5H X 110.5W X 98D
Isolation	Power supply to RIO	500V ac
	I/O Group-to-Group	1250V ac
	I/O Group-to-Logic	1250V ac
	Between open contacts	1000V ac (initial)
Power Dissipation	Maximum	11.36 Watts
Thermal Dissipation	Maximum	38.74 BTU/hr
Environmental Conditions		
	Operational Temperature	0 to 60°C (32 to 140°F)
	Storage Temperature	–40 to 85°C (–40 to 185°F)
	Relative Humidity	5 to 95% noncondensing
Conductors	Wire Size	14 gauge ($2mm^2$) stranded maximum 3/64 inch insulation maximum
	Category	1[4]

1 Surge limiting circuitry is not provided in the module. For reliable operation, you must ensure that surges do not exceed either the voltage or current rating of the module.

2 Spikes, peaks and surges must be within the power rating specifications.

3 Do not attempt to parallel outputs to increase load current. The output that turns on fastest would carry the full load current.

4 You use this conductor category information for planning conductor routing as described in the system level installation manual.

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1791-32B0 Specifications

Input Specifications		
Inputs per Block		32 – 4 groups of 8
On-state Voltage Range		10–30V dc
On-state Current	Maximum Minimum	11.0mA @ 30V 2.5mA @ 10V
Off-state Voltage	Maximum	5V dc
Off-state Current	Minimum	1.5mA
Input Impedance	Maximum	3.4K ohms
Input Signal Delay	Fast Slow	1.0ms on; 5.0ms off (maximum) 1.0ms on; 18.0ms off (maximum)
General Specifications		
External Power (internally protected - no external fuse required)	Voltage Current	 19.2–30V dc 300mA
Dimensions	Inches Millimeters	6.95H X 4.35W X 3.85D 176.5H X 110.5W X 98D
Isolation	Power supply to RIO I/O Group-to-Group I/O Group-to-Logic	500V ac 500V ac 500V ac
Power Dissipation	Maximum	16.3 Watts
Thermal Dissipation	Maximum	55.6 BTU/hr
Environmental Conditions	Operational Temperature Storage Temperature Relative Humidity	 0 to 60ºC (32 to 140ºF) –40 to 85ºC (–40 to 185ºF) 5 to 95% noncondensing
Conductors	Wire Size Category	14 gauge (2mm^2) stranded maximum 3/64 inch insulation maximum 2[1]

[1] You use this conductor category information for planning conductor routing as described in the system level installation manual.

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1791-0B32 Specifications

Output Specifications		
Outputs per Block		32 – 4 groups of 8
Output Voltage Range		10–30V dc
Output Current Rating		
	Vertical Mtg.	500mA @ 60°C, 1A @ 30°C
	Horizontal Mtg.	250mA @ 60°C, 500mA @ 30°C
Surge Current		3A for 50ms each, repeatable every 2 sec.
Minimum On-state Current		1mA per output
Maximum On-state Voltage Drop		1.0V @ rated current
Off-state Leakage Current (maximum)		0.5mA
Output Signal Delay		0.5ms on; 1.0ms off (maximum)
General Specifications		
External Power (internally protected - no external fuse required)		
	Voltage	19.2–30V dc
	Current	300mA
Dimensions	Inches	6.95H X 4.35W X 3.85D
	Millimeters	176.5H X 110.5W X 98D
Isolation	Power supply to RIO	500V ac
	I/O Group-to-Group	500V ac
	I/O Group-to-Logic	500V ac
Power Dissipation	Maximum	19.2 Watts
Thermal Dissipation	Maximum	65.5 BTU/hr
Environmental Conditions		
	Operational Temperature	0 to 60°C (32 to 140°F)
	Storage Temperature	–40 to 85°C (–40 to 185°F)
	Relative Humidity	5 to 95% noncondensing
Conductors	Wire Size	14 gauge ($2mm^2$) stranded maximum 3/64 inch insulation maximum
	Category	2[1]

1 You use this conductor category information for planning conductor routing as described in the system level installation manual.

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1791-16BC Specifications

Input Specifications		
Inputs per Block		16 – 2 groups of 8
On-state Voltage Range		10–30V dc
On-state Current	Maximum Minimum	11.0mA @ 30V 2.5mA @ 10V
Off-state Voltage	Maximum	5V dc
Off-state Current	Minimum	1.5mA
Input Impedance	Maximum	3.4K ohms
Input Signal Delay	Fast Slow	1.0ms on; 5.0ms off (maximum) 1.0ms on; 18.0ms off (maximum)
Output Specifications		
Outputs per Block		16 – 2 groups of 8
Output Voltage Range		10–30V dc
Output Current Rating	 Vertical Mtg. Horizontal Mtg.	 500mA @ 60°C, 1A @ 30°C 250mA @ 60°C, 500mA @ 30°C
Surge Current		3A for 50ms each, repeatable every 2 sec.
Minimum On-state Current		1mA per output
Maximum On-state Voltage Drop		1.0V @ rated current
Off-state Leakage Current (maximum)		0.5mA
Output Signal Delay		0.5ms on; 1.0ms off (maximum)
Specifications continued on next page		
General Specifications		
External Power (internally protected - no external fuse required)	 Voltage Current	 19.2–30V dc 300mA
Dimensions	Inches Millimeters	6.95H X 4.35W X 3.85D 176.5H X 110.5W X 98D
Isolation	Power supply to RIO I/O Group-to-Group I/O Group-to-Logic	500V ac 500V ac 500V ac
Power Dissipation	Maximum	17.8 Watts
Thermal Dissipation	Maximum	60.6 BTU/hr
Environmental Conditions	 Operational Temperature Storage Temperature Relative Humidity	 0 to 60°C (32 to 140°F) –40 to 85°C (–40 to 185°F) 5 to 95% noncondensing
Conductors	Wire Size Category	14 gauge ($2mm^2$) stranded maximum 3/64 inch insulation maximum 2[1]

[1] You use this conductor category information for planning conductor routing as described in the system level installation manual.

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1791-24B8 Specifications

Input Specifications		
Inputs per Block		24 – 3 groups of 8
On-state Voltage Range		10–30V dc
On-state Current	Maximum Minimum	11.0mA @ 30V 2.5mA @ 10V
Off-state Voltage	Maximum	5V dc
Off-state Current	Minimum	1.5mA
Input Impedance	Maximum	3.4K ohms
Input Signal Delay	Fast Slow	1.0ms on; 5.0ms off (maximum) 1.0ms on; 18.0ms off (maximum)
Output Specifications		
Outputs per Block		8 – 1 group of 8
Output Voltage Range		10–30V dc
Output Current Rating	Vertical Mtg. Horizontal Mtg.	500mA @ 60°C, 1A @ 30°C 250mA @ 60°C, 500mA @ 30°C
Surge Current		3A for 50ms each, repeatable every 2 sec.
Minimum On-state Current		1mA per output
Maximum On-state Voltage Drop		1.0V @ rated current
Off-state Leakage Current (maximum)		0.5mA
Output Signal Delay		0.5ms on; 1.0ms off (maximum)
General Specifications		
External Power (internally protected - no external fuse required)	Voltage Current	19.2–30V dc 300mA
Dimensions	Inches Millimeters	6.95H X 4.35W X 3.85D 176.5H X 110.5W X 98D
Isolation	Power supply to RIO I/O Group-to-Group I/O Group-to-Logic	500V ac 500V ac 500V ac
Power Dissipation	Maximum	17.1 Watts
Thermal Dissipation	Maximum	58.1 BTU/hr
Environmental Conditions	Operational Temperature Storage Temperature Relative Humidity	0 to 60°C (32 to 140°F) –40 to 85°C (–40 to 185°F) 5 to 95% noncondensing
Conductors	Wire Size Category	14 gauge (2mm^2) stranded maximum 3/64 inch insulation maximum 1[4]

[1] You use this conductor category information for planning conductor routing as described in the system level installation manual.

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1791-24BR Specifications

Input Specifications		
Inputs per Block		24 – 3 groups of 8
On-state Voltage Range		10–30V dc
On-state Current	Maximum Minimum	11.0mA @ 30V 2.5mA @ 10V
Off-state Voltage	Maximum	5V dc
Off-state Current	Minimum	1.5mA
Input Impedance	Maximum	3.4K ohms
Input Signal Delay	Fast Slow	1.0ms on; 5.0ms off (maximum) 1.0ms on; 18.0ms off (maximum)
Output Specifications		
Outputs per Block		1 group of 8 Form A (normally open) electromechanical relays
Output Voltage Range (load dependent)[1]		20–132V ac @ 1A resistive maximum 20–30V dc @ 1A resistive maximum 125V dc @ 0.2A resistive maximum
Output Current Rating (at rated power)[2, 3]		**Resistive – P.F. = 1, cos θ = 1.0** 1A @ 20–132V ac 1A @ 20–30V dc 0.2A @ 125V dc **Inductive – P.F. = 0.4, cos θ = 0.4** 0.5A @ 20–132V ac 1A @ 20–30V dc, L/R = 7ms 0.1A @ 125V dc, L/R = 7ms
Surge Current (at rated power with inductive loads)[1, 3]		0.5A @ 20–132V ac, cos θ = 0.4 1A @ 20–30V dc, L/R = 7ms 0.1A @ 125V dc, L/R = 7ms
Power Rating (continuous and surge loads)		132W ac maximum for 132V ac resistive output 30W dc maximum for 30V dc resistive output 25W dc maximum for 125V dc resistive output 66VA maximum for 132V ac inductive output 30VA maximum for 30V dc inductive output 12.5VA maximum for 125V dc inductive output
Contact Load	Minimum	10mA per output
Operate/Release Time		5ms (±1ms) typical
Bounce Time	Maximum	1ms
Switching Frequency Maximum for contact cooling		1Hz (60 cpm) @ maximum rated output current 10Hz (600 cpm) @ minimum rated output current
Off-state Leakage Current (maximum @ 132V ac)		2mA (from snubber across contacts)
Expected Life of Electrical Contacts		100K operations minimum @ rated loads

Specifications continued on next page

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1791-24BR Specifications

General Specifications		
External Power (internally protected - no external fuse required)		
	Voltage	19.2–30V dc
	Current	300mA
Dimensions	Inches	6.95H X 4.35W X 3.85D
	Millimeters	176.5H X 110.5W X 98D
Isolation	Power supply to RIO	500V ac
	I/O Group-to-Group	500V ac
	I/O Group-to-Logic	500V ac
Power Dissipation	Maximum	14.5 Watts
Thermal Dissipation	Maximum	49.4 BTU/hr
Environmental Conditions		
	Operational Temperature	0 to 60°C (32 to 140°F)
	Storage Temperature	–40 to 85°C (–40 to 185°F)
	Relative Humidity	5 to 95% noncondensing
Conductors	Wire Size	14 gauge ($2mm^2$) stranded maximum 3/64 inch insulation maximum
	Category	1[4]

1 Surge limiting circuitry is not provided in the module. For reliable operation, you must ensure that surges do not exceed either the voltage or current rating of the module.

2 Spikes, peaks and surges must be within the power rating specifications.

3 Do not attempt to parallel outputs to increase load current. The output that turns on fastest would carry the full load current.

4 You use this conductor category information for planning conductor routing as described in the system level installation manual.

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