MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

ALLEN-BRADLEY

1791-N4V2

FOUR-INPUT TWO-OUTPUT ANALOG BLOCK

Applicable product family: Allen-Bradley Block I/O

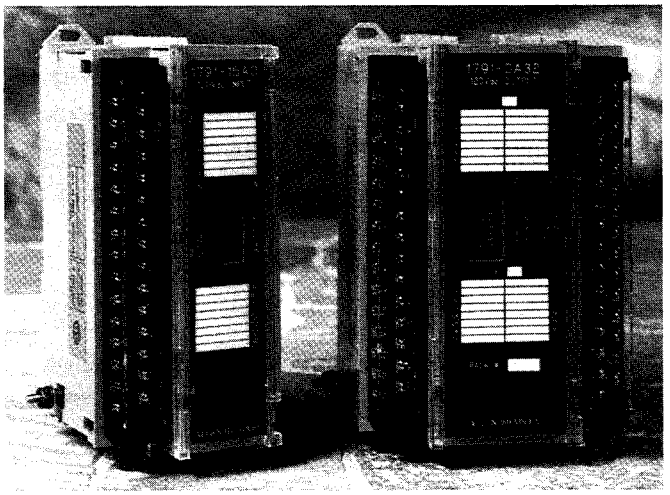
OFFICIAL SOURCE

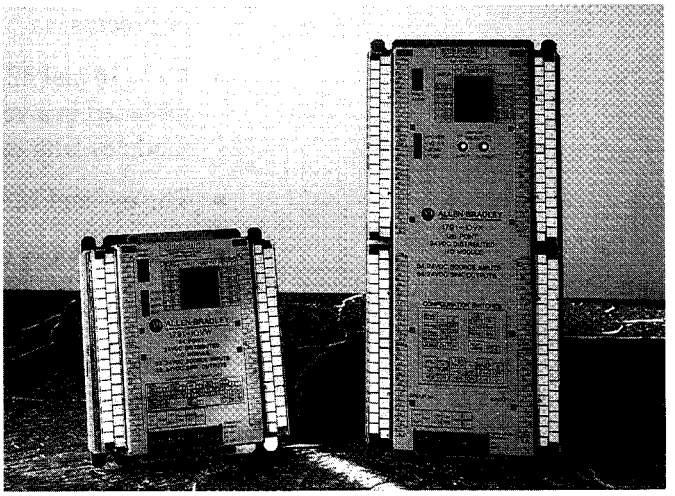
1791-N4V2.pdf

The following pages are selected from the supplied manufacturer document and retain their original page content.

1791 Block I/O

Product Data





Allen-Bradley's block I/O product family includes 16, 32, 64 and 128 input/output points in small, easily mounted packages. Each 1791 block I/O module provides the functionality of the I/O rack, adapter, power supply and I/O module in a single package. They can:

- be located close to sensors and actuators which reduces the amount of wiring and time needed for installation
- be an exclusive I/O solution, or part of a total remote I/O system including operator interface devices, racks, drives, and non-Allen-Bradley application-specific devices
- communicate with both PLC® and SLC™ processors.

Discrete 16-point blocks feature either 120V ac or 24V dc power, and have either 16 inputs, 16 outputs, a combination of 8 inputs and 8 outputs or 8 inputs and 8 relay outputs.

Discrete 32-point blocks feature either 120V ac or 24V dc power, and have either 32 inputs, 32 outputs, a combination of 16 inputs and 16 outputs, a combination of 24 inputs and 8 outputs, or 24 inputs and 8 relay outputs.

Discrete high-density blocks feature 24V dc power with 32 inputs and 32 outputs or 64 inputs and 64 outputs.

Analog blocks are available in 24V dc or 120V ac versions, each with four selectable inputs and two outputs.

Features

The 1791 series of block modules have the following features:

- Self-contained package provides cost-effective distribution of as few as 16 discrete I/O points to a remote location
- Small size allows blocks to be installed in a protected area of a machine or process
- Most 16 and 32-point ac, dc and analog blocks can be panel or DIN-rail mounted in a vertical (recommended) or horizontal orientation. (Block modules with relay outputs must be mounted in a vertical position.)
- The 64- and 128-point dc blocks can be vertically mounted in a panel
- Analog blocks can be scaled to engineering units
- Analog blocks provide 24V dc power for 4-20mA devices
- Analog blocks provide PLC compatibility via block transfer or SLC compatibility via discrete transfer modes
- Removable terminal strips allow easy module replacement without rewiring

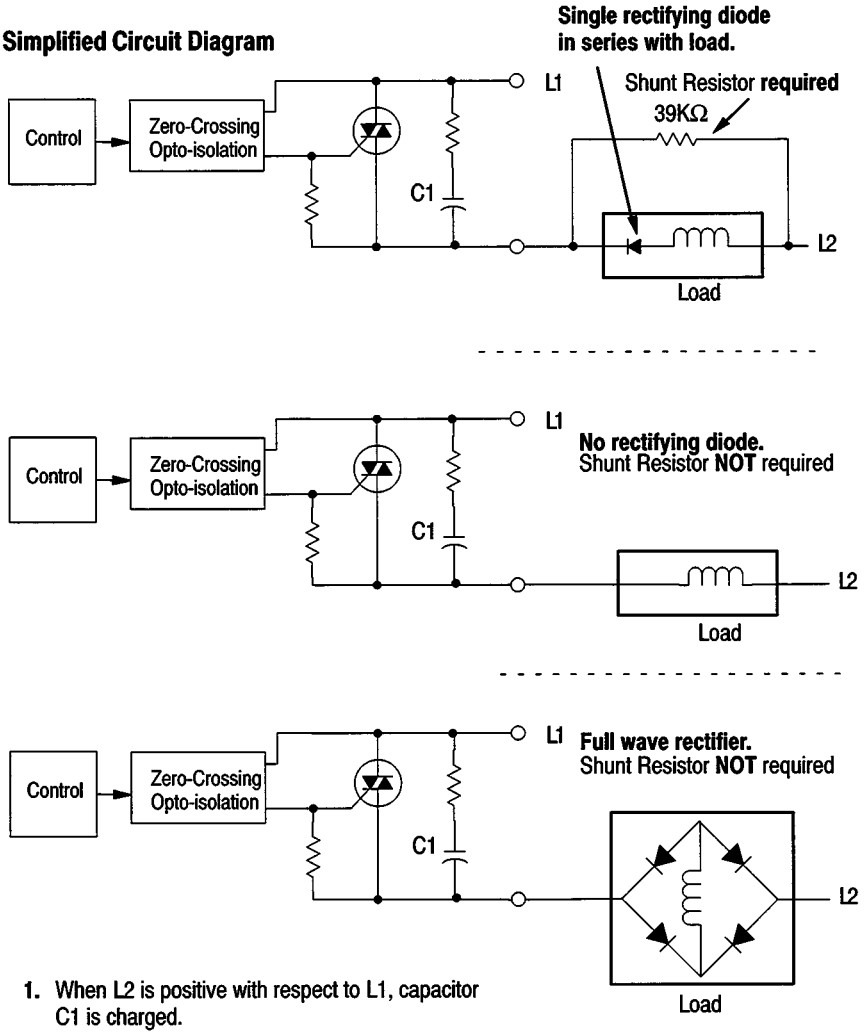
Compatibility

1791 block I/O modules are compatible with PLC-2, PLC-3 and PLC-5 family programmable controllers and SLC family processors. However, when using PLC-3 programmable controllers, you must use a 1775-S5 or -SR5 scanner module. **Do not use** 1775-SR, -S4A or -S4B scanner modules. When using SLC family processors, you must use a 1747-SN scanner module.

Some 1791 ac output modules use zero-crossing technology to allow output turn-on when the voltage is less than some specified level (typically 40–50V). This type of circuit greatly reduces the stress on contacts and other devices that are sensitive to current surges.

When using an output module that includes zero-crossing technology with a device that includes a single diode in series with the load, place a shunt resistor across the load. The resistor is required to allow proper output turn-on.

Simplified Circuit Diagram



1. When L2 is positive with respect to L1, capacitor C1 is charged.
2. When the polarity switches, the diode prevents C1 from discharging.
3. With C1 charged (possibly up to line voltage), the zero-crossing opto-triac sees that voltage, and won't turn on.
4. The shunt resistor allows a bleed-off of the voltage on the capacitor, allowing the circuit to function properly.

1791 modules currently using zero-crossing technology include:

- 1791-0A16 series B
- 1791-0A32 series B
- 1791-8AC series B
- 1791-16AC series B
- 1791-24A8 series B

Using this Publication

This publication provides you with information about Allen-Bradley's block I/O modules. The information is divided into two sections. The first section deals with general information that pertains to all of our block modules. The second section provides module-specific information. Table 1 lists the block I/O modules and the page number on which you can find individual specification sheets.

Table 1
Types of Block I/O

Catalog Number	Voltage	Inputs	Outputs	Description	Refer to page:
1791-16A0/B	120V ac	16		16 input, 0 output	13
1791-0A16/B	120V ac		16	0 input, 16 output	15
1791-8AC/B	120V ac	8	8	8 input, 8 output	17
1791-8AR/B	120V ac	8	8	8 input, 8 relay output	19
1791-32A0/B	120V ac	32		32 input, 0 output	23
1791-0A32/B	120V ac		32	0 input, 32 output	25
1791-16AC/B	120V ac	16	16	16 input, 16 output	27
1791-24A8/B	120V ac	24	8	24 input, 8 output	29
1791-24AR/B	120V ac	24	8	24 input, 8 relay output	31
1791-16B0/B	24V dc	16		16 input, 0 output	35
1791-0B16/B	24V dc		16	0 input, 16 output	37
1791-8BC/B	24V dc	8	8	8 input, 8 output	39
1791-8BR/B	24V dc	8	8	8 input, 8 relay output	41
1791-32B0/B	24V dc	32		32 input, 0 output	45
1791-0B32/B	24V dc		32	0 input, 32 output	47
1791-16BC/B	24V dc	16	16	16 input, 16 output	49
1791-24B8/B	24V dc	24	8	24 input, 8 output	51
1791-24BR/B	24V dc	24	8	24 input, 8 relay output	53
1791-IOBX	24V dc	64	64	64 sinking input, 64 sourcing output	57
1791-IOVX	24V dc	64	64	64 sourcing input, 64 sinking output	61
1791-IOBW	24V dc	32	32	32 sinking input, 32 sourcing output	65
1791-IOVW	24V dc	32	32	32 sourcing input, 32 sinking output	69
1791-N4V2	120V ac	4	2	4 selectable input, 2 voltage output	73
1791-N4C2	120V ac	4	2	4 selectable input, 2 current output	77
1791-NDV	24V dc	4	2	4 selectable input, 2 voltage output	81
1791-NDC	24V dc	4	2	4 selectable input, 2 current output	85

Block I/O Input Modules

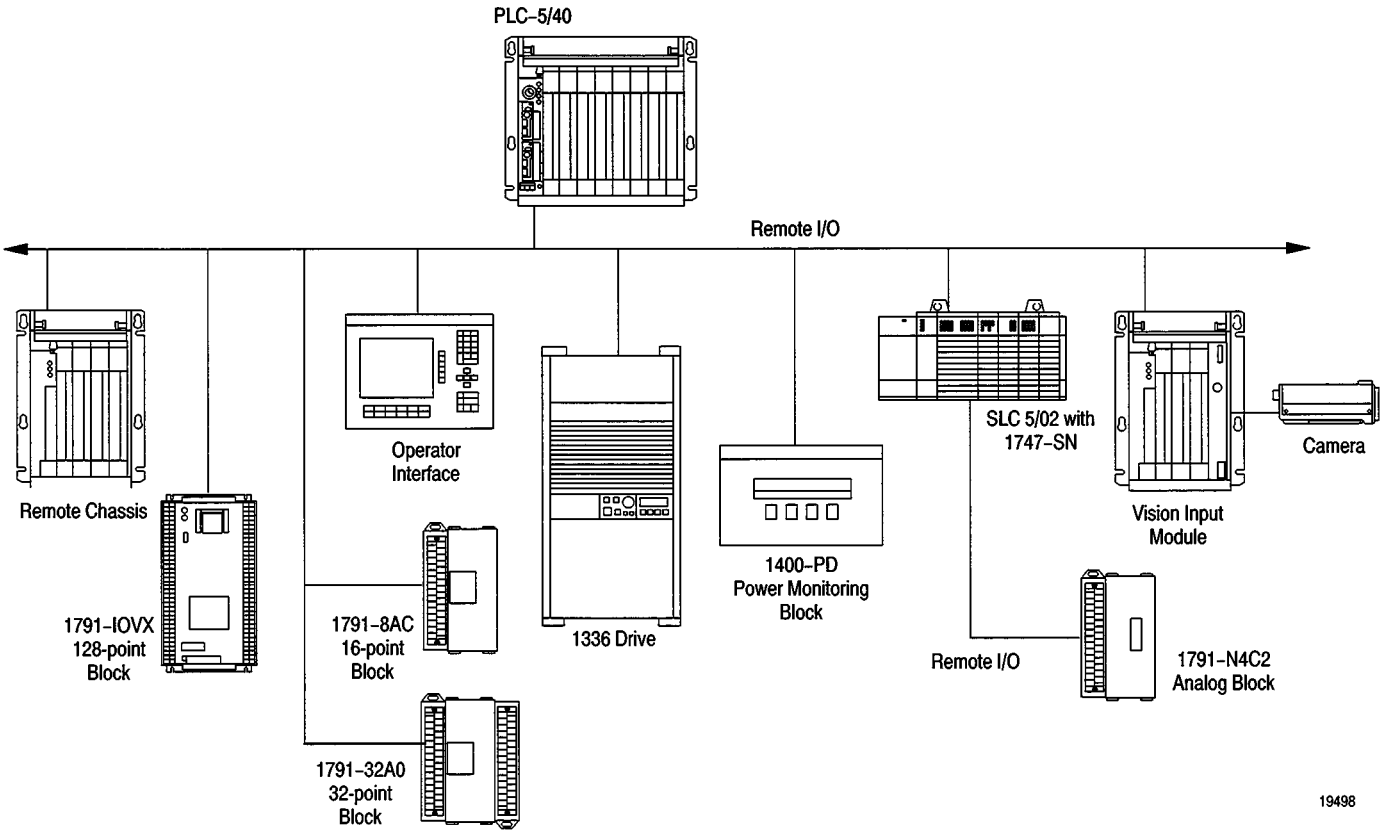
The 1791 discrete ac and dc input modules convert signals from user devices to the appropriate logic level for use within the processor. Typical input devices include:

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

Refer to the individual specification sheets elsewhere in this publication for complete specifications for these modules.

An example of block I/O usage is shown in Figure 1.

Figure 1
Example of Block I/O in a System



Input Filtering

Input filtering limits the effect of voltage transients caused by contact bounce and/or electrical noise. If not filtered, voltage transients could produce false data. Selectable filter time is provided on some dc input blocks.

Module logic circuits and the rest of the system are protected from possible damage due to electrical transients by opto-electrical isolation.

Complementary I/O

Series B **input modules** can be configured for complementary I/O when used with a PLC-2 or PLC-5 family programmable controller.

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 (e.g. output modules complement input modules).

Table 2
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

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

NOTE: Remote rack numbers which can have a complementary rack are rack numbers 01 thru 07 only.

Block I/O Output Modules

Block I/O output modules control the ON/OFF status of ac and dc user devices. Typical output devices include:

- motor starters
- solenoids
- indicators

Refer to the individual specification sheets for complete specifications for these modules.

Complementary I/O

Series B output modules can also be configured for complementary I/O when used with a PLC-2 or PLC-5 family programmable controller.

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 input I/O modules in the complementary chassis perform the opposite function of the corresponding output modules in the primary chassis. Refer to Table 2 above.

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:

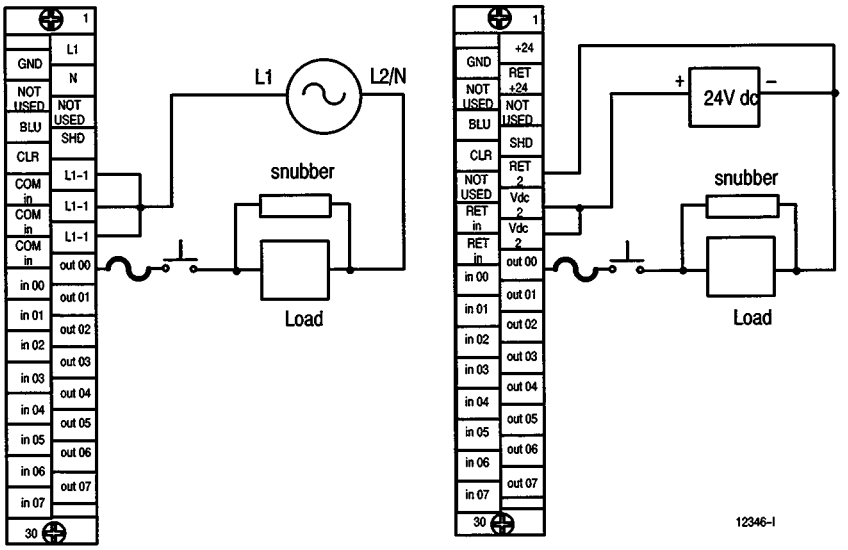
- relays
- motor starters
- solenoids
- motors

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. The diagram below shows an output module with a suppression device.

Figure 2
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 shows acceptable Allen-Bradley suppression devices and their catalog numbers for typical loads.

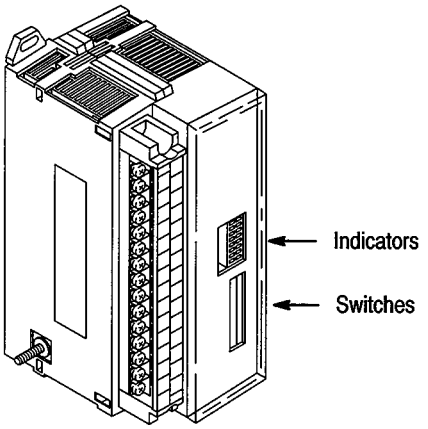
Table 3
Allen-Bradley Suppression Devices

Suppression Device	Catalog Number
Motor Starter Bulletin 509	599-K04[1]
Relay Bulletin 700 Type N or P	700-N24[2]
Miscellaneous	700-N24[3]

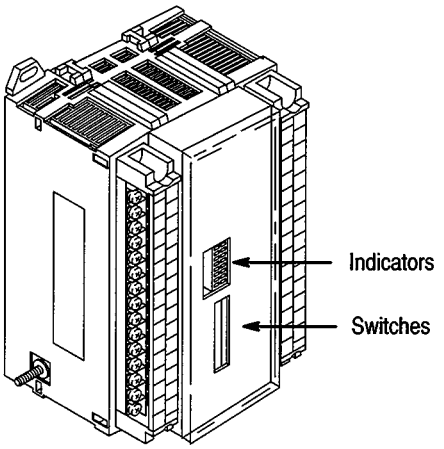
[1] For starters with 120V ac coils
[2] Maximum coil voltage 150V ac or dc
[3] Bulletin 700-N24 is a universal surge suppressor. You can use it on electromagnetic devices with the limitation of 35 sealed VA, 150V.

Status Indicators

The front panel of each block I/O module contains status indicators. Each status indicator shows the ON/OFF condition of an individual input or output. Refer to the individual module specification sheets for more information.



16-Point Blocks



32-Point Blocks

Fault Mode Selection

You can select the failure mode (last state or reset) for outputs when a fault is detected by positioning a switch on the front of the module. When an output module detects a fault its outputs are put into the state indicated by the switch position.

Fusing

Block I/O modules are internally fused to protect the module. No external power fusing is required.

1791 high-density block I/O modules (64 and 128 input/output) have internal fusing. Each group of 16 output points is protected by a 5.0A fuse. Refer to the user manual (Table 6) for instructions on changing the fuse.

The ac and dc block I/O module outputs are not fused. Fusing of these outputs is recommended. If desired to fuse an output, you must provide external fusing. Refer to Table 4 for recommended fuses for block I/O output modules.

Table 4
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.

Block I/O output modules are derated linearly above 30°C up to and including 60°C.

Table 5
Output Module Derating

Catalog Number	Voltage	Maximum Output Rating at: 30°C	60°C	Maximum Surge Current with non-fused Outputs
1791-0A16/B	120V ac	600mA	300mA	10A for 50ms (repeatable every 2s)
1791-8AC/B	120V ac	600mA	300mA	10A for 50ms (repeatable every 2s)
1791-0A32/B	120V ac	600mA	300mA	10A for 50ms (repeatable every 2s)
1791-16AC/B	120V ac	600mA	300mA	10A for 50ms (repeatable every 2s)
1791-24A8/B	120V ac	600mA	300mA	10A for 50ms (repeatable every 2s)
1791-0B16/B	24V dc	1A	500mA	3A for 50ms (repeatable every 2s)
1791-8BC/B	24V dc	1A	500mA	3A for 50ms (repeatable every 2s)
1791-0B32/B	24V dc	1A	500mA	3A for 50ms (repeatable every 2s)
1791-16BC/B	24V dc	1A	500mA	3A for 50ms (repeatable every 2s)
1791-24B8/B	24V dc	1A	500mA	3A for 50ms (repeatable every 2s)
1791-IOBW	24V dc	300mA per point 2.4A continuous per 16 point group maximum surge current 1.0A for 25ms 1 pulse per second maximum		
1791-IOVW	24V dc			
1791-IOBX	24V dc			
1791-IOVX	24V dc			

Analog Block I/O

Four versions of analog block I/O are available:

Catalog Number	Voltage	Inputs	Outputs	Description
1791-N4V2	120V ac	4	2	4 selectable input, 2 voltage output
1791-N4C2	120V ac	4	2	4 selectable input, 2 current output
1791-NDV	24V dc	4	2	4 selectable input, 2 voltage output
1791-NDC	24V dc	4	2	4 selectable input, 2 current output

Analog block I/O features:

- 14-bit resolution for both voltage and current inputs and voltage outputs
- 13-bit resolution for current outputs
- calibration constants are stored in nonvolatile memory
- scaling to engineering units for all signal types
- alarming for all signal types
- input filtering for the four input channels

Refer to the individual specification sheets for complete specifications for these modules.

Associated Publications

Each block I/O module ships with an installation data sheet or user manual. Table 6 lists these publications.

Table 6
Associated Publications

Catalog Number	Description	Installation Instructions	User Manual
1791-16A0/B	16 input, 0 output	1791-2.24	1791-6.5.3
1791-0A16/B	0 input, 16 output	1791-2.23	
1791-8AC/B	8 input, 8 output	1791-2.25	
1791-8AR/B	8 input, 8 relay output	1791-2.26	
1791-16B0/B	16 input, 0 output	1791-2.27	
1791-0B16/B	0 input, 16 output	1791-2.28	
1791-8BC/B	8 input, 8 output	1791-2.29	
1791-8BR/B	8 input, 8 relay output	1791-2.10	
1791-32A0/B	32 input, 0 output	1791-2.14	
1791-0A32/B	0 input, 32 output	1791-2.13	
1791-16AC/B	16 input, 16 output	1791-2.15	
1791-24A8/B	24 input, 8 output	1791-2.16	
1791-24AR/B	24 input, 8 relay output	1791-2.17	
1791-32B0/B	32 input, 0 output	1791-2.19	
1791-0B32/B	0 input, 32 output	1791-2.18	
1791-16BC/B	16 input, 16 output	1791-2.20	
1791-24B8/B	24 input, 8 output	1791-2.21	
1791-24BR/B	24 input, 8 relay output	1791-2.22	
1791-N4V2	4 selectable input, 2 voltage output	1791-2.11	1791-6.5.5
1791-N4C2	4 selectable input, 2 current output	1791-2.12	
1791-NDV	4 selectable input, 2 voltage output	1791-2.30	
1791-NDC	4 selectable input, 2 current output	1791-2.31	
1791-IOBW	32 sinking input, 32 sourcing output		1791-6.5.7
1791-IOVW	32 sourcing input, 32 sinking output		
1791-IOBX	64 sinking input, 64 sourcing output		1791-6.5.2
1791-IOVX	64 sourcing input, 64 sinking output		

Where to Find More Information

The remainder of this publication contains specification sheets for each of the block I/O modules. Refer to the table below for the page number for each specific module.

Catalog Number	Voltage	Description	Refer to page:
1791-16A0/B	120V ac	16 input ac block I/O module	13
1791-0A16/B	120V ac	16 output ac block I/O module	15
1791-8AC/B	120V ac	8 input/8 output ac block I/O module	17
1791-8AR/B	120V ac	8 input/8 relay output ac block I/O module	19
1791-32A0/B	120V ac	32 input, 0 output ac block I/O module	23
1791-0A32/B	120V ac	0 input, 32 output ac block I/O module	25
1791-16AC/B	120V ac	16 input, 16 output ac block I/O module	27
1791-24A8/B	120V ac	24 input, 8 output ac block I/O module	29
1791-24AR/B	120V ac	24 input, 8 relay output ac block I/O module	31
1791-16B0/B	24V dc	16 input dc block I/O module	35
1791-0B16/B	24V dc	16 output dc block I/O module	37
1791-8BC/B	24V dc	8 input/8 output dc block I/O module	39
1791-8BR/B	24V dc	8 input/8 relay output dc block I/O module	41
1791-32B0/B	24V dc	32 input, 0 output dc block I/O module	45
1791-0B32/B	24V dc	0 input, 32 output dc block I/O module	47
1791-16BC/B	24V dc	16 input, 16 output dc block I/O module	49
1791-24B8/B	24V dc	24 input, 8 output dc block I/O module	51
1791-24BR/B	24V dc	24 input, 8 relay output dc block I/O module	53
1791-IOBX	24V dc	64 input/64 output dc block I/O module	57
1791-IOVX	24V dc	64 input/64 output dc block I/O module	61
1791-IOBW	24V dc	32 input/32 output dc block I/O module	65
1791-IOVW	24V dc	32 input/32 output dc block I/O module	69
1791-N4V2	120V ac	analog block I/O module	73
1791-N4C2	120V ac	analog block I/O module	77
1791-NDV	24V dc	analog block I/O module	81
1791-NDC	24V dc	analog block I/O module	85