LISTEN. THINK. SOLVE.℠

CompactBlock I/O
CompactBlock LDX I/O

SELECTION GUIDE

1790 SERIES
1791 SERIES

ALLEN-BRADLEY • ROCKWELL SOFTWARE

Rockwell Automation

About This Selection Guide

This publication aims to guide you through the selection process of Rockwell Automation in-cabinet block I/O products, namely CompactBlock LDX I/O and CompactBlock I/O, for your control applications.

Additional Resources

The publications listed in this table contain more information on CompactBlock LDX I/O modules.

Related Publications for CompactBlock LDX I/O Modules

Pub. Title	Pub. Number
1790 CompactBlock LDX I/O Product Profile	1790-PP002
CompactBlock LDX Analog Modules User Manual	1790-UM001
CompactBlock LDX I/O for DeviceNet Technical Data	1790D-TD001
CompactBlock LDX I/O for PROFIBUS DP Technical Data	1790P-TD001
CompactBlock LDX RTD/Resistance Input Module User Manual	1790-UM002
CompactBlock LDX I/O Thermocouple Modules User Manual	1790-UM003
DeviceNet Analog Base D-Shell CompactBlock LDX I/O Installation Instructions	1790-IN004
DeviceNet Analog Base Terminal Block CompactBlock LDX I/O Installation Instructions	1790-IN002
DeviceNet Digital Base D-Shell Block CompactBlock LDX I/O Installation Instructions	1790-IN007
DeviceNet Digital Base D-shell Block CompactBlock LDX I/O Series B Installation Instructions	1790-IN013
DeviceNet Digital Base Terminal Block CompactBlock LDX I/O Series A Installation Instructions	1790-IN006
DeviceNet Digital Base Terminal Block CompactBlock LDX I/O Series B Installation Instructions	1790-IN012
Digital Expansion Terminal Block CompactBlock LDX I/O Installation Instructions	1790-IN005
Profibus DP Digital Base Terminal Block CompactBlock LDX I/O Installation Instructions	1790-IN009

The publications listed in this table contain more information on CompactBlock I/O modules.

Related Publications for CompactBlock I/O Modules

Pub. Title	Pub. Number
1791D CompactBlock I/O Product Profile	1791D-PP002
CompactBlock I/O for DeviceNet Technical Data	1791D-TD001
CompactBlock I/O for Profibus DP Technical Data	1791P-TD001
CompactBlock I/O on Remote I/O Technical Data	1791R-TD001
CompactBlock Distributed I/O on PROFIBUS DP Series D Installation Instructions	1791P-IN002
CompactBlock Distributed I/O on Remote I/O Series D Installation Instructions	1791R-IN002
CompactBlock I/O Analog Combination Input/Output Expansion Module Installation Instructions	1791D-IN002
CompactBlock I/O for DeviceNet Modules Series D Installation Instructions	1791D-IN003
CompactBlock Distributed I/O on Remote I/O Installation Instructions	1791R-IN001

You can view or download publications at http://literature.rockwellautomation.com. To order paper copies of technical documentation, contact your local Rockwell Automation distributor or sales representative.
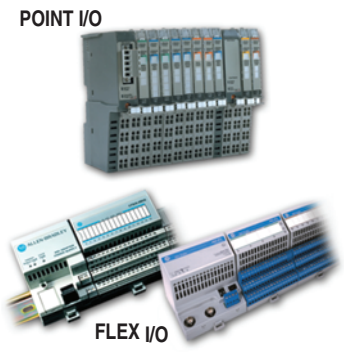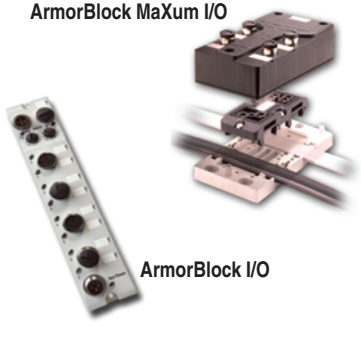
IP 20 Block I/O Overview

Introduction

Rockwell Automation offers a wide selection of distributed I/O products for use in your control system. Distributed I/O can be mounted in-cabinet (IP 20) requiring an enclosure for protection from the environment, or as an On-Machine configuration (IP 67) not requiring an additional enclosure.

Both in-cabinet and On-Machine distributed I/O types are offered in modular and block I/O styles. Modular I/O is a system of interface cards and communication adapters that interface directly with the sensors and actuators of the machine or process, and communicate their status to the controller via a communication network. It allows the system designer to mix and match I/O interfaces and communication adapters. Block I/O is a complete assembly of sensor and actuator interface points including a network adapter.

This publication will guide you in the selection of in-cabinet block I/O products, namely CompactBlock I/O and CompactBlock LDX I/O.

Distributed I/O Product Matrix

In-Cabinet		On-Machine	
Modular	POINT I/O FLEX I/O	ArmorPoint I/O	**Modular**
Block	CompactBlock I/O CompactBlock LDX I/O	ArmorBlock MaXum I/O ArmorBlock I/O	**Block**
In-Cabinet		On-Machine	

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General Features

This section discusses the general features of Rockwell Automation products in the in-cabinet block I/O category.

Space-efficient

A small form factor allows the distributed I/O products to be mounted into shallow enclosures and confined areas, thus saving cabinet space.

Cost-effective

The in-cabinet block I/O platform is a cost-effective solution for automation applications that exist in less-rigorous IP 20 environments.

The compact size of the products reduces your need for large enclosures, and the fact that the I/O is distributed means that extensive wiring is greatly reduced. Having single bus cabling also helps to ease maintenance work.

Meets Industrial Standards

All modules are tested to meet the most stringent industrial requirements to withstand electromagnetic (EM) interference, vibration, and shock.

Allows Flexibility in I/O Selection

A wide variety of base and expansion combinations lets you eliminate unnecessary I/O points.

In addition, CompactBlock LDX I/O modules, including digital (24V dc, 120V ac, and relay), analog (current and voltage), and temperature (resistance temperature detector and thermocouple), are compatible with a variety of sensors.

Easy to Install and Configure

Modular electronic data sheet (EDS) or generic station description (GSD) files, rotary switches, and auto-baud rate detection provide easy commissioning.

Offers Built-in Network Connectivity

Built-in network adapters offer direct network connectivity. DeviceNet and PROFIBUS DP networks are supported on CompactBlock LDX I/O and CompactBlock I/O systems. In addition, remote I/O is supported on the CompactBlock I/O system.

Supports Localized Control (CompactBlock I/O system only)

DeviceLogix smart-component technology on DeviceNet blocks enable localized, simple control functions for faster sense-to-actuation time.

Easy to Maintain

CompactBlock LDX I/O on the DeviceNet network has two termination types, namely D-shell connector and fixed-screw terminal block. The D-shell connector allows for simple, fast connections and easy maintainability.

D-shell Connector

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The CompactBlock I/O module contains a removable terminal block that allows for easy module replacement without rewiring. Removable terminal blocks on all modules are easy to maintain and help reduce your downtime.

Removable Terminal Block

Retaining Screw

Retaining Screw

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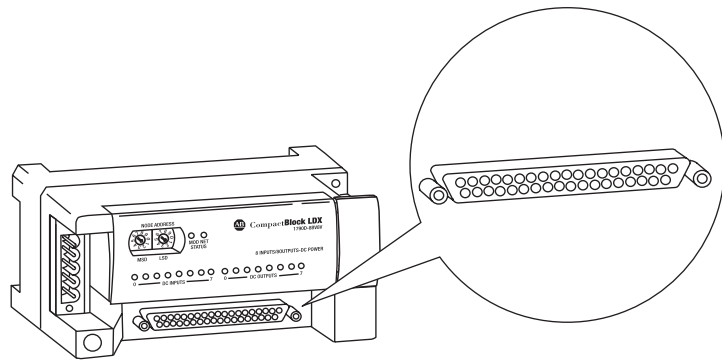
Product-specific Features

This section discusses the features specific to the CompactBlock LDX I/O and CompactBlock I/O systems.

CompactBlock LDX I/O System (1790D/1790P)

The CompactBlock LDX I/O system offers you a compact, cost-effective, and diverse distributed I/O solution for automation solutions. Offering 24V dc, 120V ac, relay, analog, and temperature modules, CompactBlock LDX I/O supports a wide breadth of field devices and is compatible on both DeviceNet and PROFIBUS DP networks.

CompactBlock LDX I/O is especially suitable where low cost and confined space are coupled with less-stringent IP 20 environmental requirements.

- CompactBlock LDX I/O has universal sink/source inputs that reduce the number of components to stock and allows flexibility of input types.
- The digital base modules support up to 3 digital expansion modules and up to 80 points of I/O for the DeviceNet network and 64 points of I/O for the PROFIBUS DP network.
- The analog base modules, both current and voltage, support two additional modules of up to 32 points of digital I/O. The resistance temperature detector (RTD) and thermocouple base modules do not support any expansion.
- CompactBlock LDX I/O is compatible with a broad range of sensors (Type 3 for dc, Type 1 for ac).
- The node address switches and auto-baud rate detection ease network commissioning.

CompactBlock LDX I/O offers the leading, lowest-cost, device-level communication network, the DeviceNet network, to translate simple messages from the controller to the plant floor.

- By using modular EDS files, it is easy to connect and configure CompactBlock LDX I/O.
- Cyclic and change-of-state messaging increase network throughput, thus helping to increase productivity.
- ODVA conformance improves the level of interoperability with other DeviceNet products.
- CompactBlock LDX I/O for the DeviceNet network works with any available DeviceNet scanner.

CompactBlock LDX I/O is also available on another network, PROFIBUS DP.

- Configure by using GSD files and any PROFIBUS DP configuration package.
- CompactBlock LDX I/O for the PROFIBUS DP network works with any available PROFIBUS DP scanner.

CompactBlock I/O System (1791D/1791P/1791R)

The CompactBlock I/O system provides you with an easy-to-use, compact, and cost-effective distributed I/O solution. Handling 24V dc and analog applications on three networks, it can be distributed throughout your plant for applications such as material handling, conveyors, packaging, or where space is limited.

CompactBlock I/O products provide higher performance and more benefits than other block I/O products.

- IEC/NEMA Type 3+ inputs offer the widest range of compatible sensors.
- 10…30V dc device power accommodates a broad range of applications.
- Digital base modules range from 4…16 points per module, with each module containing a built-in network adapter. Each digital expansion module contains 16 points.
- Analog expansion module provides 4 inputs and 2 outputs for either 0…20 mA, 4…20 mA, or 0…10V dc with each channel configurable by wiring.
- Address switches and auto baud ease network commissioning.
- Hardware Watchdog function secures state of I/O modules in case of a failure.
- Output short-circuit protection protects outputs in case of accidental miswiring.
- Having removable terminal blocks on all modules saves maintenance costs.

The CompactBlock I/O system offers the leading, lowest-cost, device-level communication network, the DeviceNet network, to translate simple messages from the controller to the plant floor, giving you better diagnostic capabilities.

- A single bus cable is used for reduced wiring costs.
- Retention screws prevent cable disconnection from challenging environments.

- Cyclic or change-of-state operation increases network bandwidth by sending I/O messages only when necessary.
- ODVA conformance improves the level of interoperability with other DeviceNet products.
- DeviceLogix smart component technology is included. This feature enables localized, simple control functions for faster sense-to-actuation times.

The CompactBlock I/O system for the DeviceNet network works with any available DeviceNet scanner.

CompactBlock I/O products are also available on remote I/O (RIO) and PROFIBUS DP networks.

- RIO block configuration is accomplished via DIP switches, and no software is needed.
- Configure by using GSD files and any PROFIBUS DP configuration package.
- All base modules are compatible with all expansion modules (except for the 1791D-4BO module which is not expandable).

Feature Comparison

This table provides a summarized comparison of the main features of CompactBlock LDX I/O products with those of CompactBlock I/O products.

Feature Comparison

Features	CompactBlock LDX I/O	CompactBlock I/O
Network	- DeviceNet - PROFIBUS	- DeviceNet - PROFIBUS - Remote I/O
Base type	- 16-channel - 32-channel	- 16-channel
Termination	- Fixed terminal block - Removable D-shell	- Removable terminal block
Local control	—	DeviceLogix
I/O type	- Digital - Analog - Thermocouple - RTD	- Digital - Analog
Expansion	Up to 3 expansion modules	Up to 1 expansion module

Product Specifications for CompactBlock LDX I/O

This table contains specifications that are common to all of the 1790 base and expansion modules. Individual module-connection sizes, word/bit definitions, schematics, wiring diagrams, and specifications can be found in their respective Technical Data publications as listed in Related Publications for CompactBlock LDX I/O Modules on page 5.

Environmental Specifications

Temperature, operating	0…55 °C (32…131 °F) IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)
Temperature, storage	-40…85 °C (-40…185 °F) IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)
Relative humidity	5…90% non-condensing IEC 60068-2-30 (Test Db, Unpackaged Nonoperating)
Operating altitude	2000m
Vibration	5g @ 10…500 Hz IEC60068-2-6 (Test Fc, Operating)
Shock, operating Shock, nonoperating	10g IEC60068-2-27 Test Ea, (Unpackaged Shock) 30g IEC60068-2-27 Test Ea, (Unpackaged Shock)
Emissions	Group 1, Class A CISPR 11
ESD immunity	8 kV air discharges IEC 61000-4-2
Radiated RF immunity	10V/m with 1 kHz sine-wave 80%AM from 80…1000 MHz 10V/m with 200Hz 50% Pulse 100%AM @ 900 MHz IEC 61000-4-3
EFT/B immunity	±1 kV @ 5 kHz on power ports ±2 kV @ 5 kHz on signal ports ±2 kV @ 5 kHz on communication ports IEC 61000-4-4
Surge transient immunity	±1 kV line-line (DM) and ±2 kV line-earth (CM) on power ports ±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports ±2 kV line-earth (CM) on shielded ports IEC 61000-4-5
Conducted RF immunity	10V rms with 1 kHz sine-wave 80%AM from 150 kHz…80 MHz IEC 61000-4-6
Enclosure type rating	IP 20

Environmental Specifications (Continued)

Mounting	DIN rail or panel mount
Dimensions (HxWxD), approx.	16ch DeviceNet version: 52 x 104 x 42 mm (2.03 x 4.07 x 1.64 in.) 32ch DeviceNet version: 52 x 176 x 42 mm (2.03 x 6.93 x 1.64 in.) 16ch PROFIBUS version: 52 x 118.5 x 42 mm (2.03 x 4.62 x 1.64 in.)
Weight, approx.	16ch version: 0.1 kg (0.3 lb) 32ch version: 0.3 kg (0.9 lb)

DeviceNet Specifications for 1790D CompactBlock LDX I/O

Network protocol	I/O Slave messaging: - Poll command, Bit Strobe command, Cyclic command, COS command
Network length, thick cable	500 m (1600 ft) @ 125 Kbps 200 m (600 ft) @ 250 Kbps 100 m (330 ft) @ 500 Kbps
Network length, flat media	420 m (1230 ft) @ 125 Kbps 200 m (490 ft) @ 250 Kbps 75 m (245 ft) @ 500 Kbps
Communication rate	Auto-baud rate selection: 125, 250, 500 Kbps
Indicators	1 red/green module status, 1 red/green network status
Number of nodes	64 max - rotary-switch type node address setting

General Specifications for 1790D CompactBlock LDX I/O

Isolation voltage	50V dc (continuous), Reinforced Insulation Type Tested at 1250V dc for 60 s, I/O to system
Wire size	0.25…2.5 mm^2 (22…14 AWG) solid or stranded copper wire rated at 75 °C or greater 1.2 mm (3/64 in.) insulation max
Wiring category[1]	2 - on signal ports 2 - on power ports 2 - on communication ports

General Specifications for 1790D CompactBlock LDX I/O (Continued)

Product certifications [2] (when product or packaging is marked)	c-UL-us	UL Listed Industrial Control Equipment, certified for U.S. and Canada.
	c-UL-us	UL Listed for Class I, Division 2, Group A,B,C,D Hazardous Locations, certified for U.S. and Canada.
	CE	European Union 89/336/EEC EMC Directive, compliant with: EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions European Union 73/23/EEC LVD, compliant with: EN61131-2; Programmable Controllers
	C-Tick	Australian Radiocommunications Act, compliant with AS/NZS CISPR11; Industrial Emissions
	ODVA	Open DeviceNet Vendor Association (ODVA) conformance tested to DeviceNet specifications

[1]   Use this wiring category information for planning conductor routing. Refer to Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

[2]   See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

PROFIBUS DP Specifications for 1790P CompactBlock LDX I/O

Network protocol	PROFIBUS-DP (EN50170) • Communication of the slave with a Class 1 master • Communication of the slave with a Class 2 master
Implementation type	DPC31
Station type	Slave
Freeze mode	Supported
Sync mode	Supported
Auto baud rate	Supported
Fail safe mode	Supported[1]
FMS support	Not supported
Redundancy	Not supported
Repeater control signal	RS485 signal

PROFIBUS DP Specifications for 1790P CompactBlock LDX I/O (Continued)

Network length/ communication rate	1000 m (3280 ft) @ 9.6 kbps 1000 m (3280 ft) @ 19.2 kbps 1000 m (3280 ft) @ 45.45 kbps 1000 m (3280 ft) @ 93.75 kbps 1000 m (3280 ft) @ 187.5 kbps 400 m (1312 ft) @ 500 kbps 200 m (656 ft) @ 1.5 Mbps 100 m (328 ft) @ 3 Mbps 100 m (328 ft) @ 6 Mbps 100 m (328 ft) @ 12 Mbps
Indicators	1 red/green module status 1 red/green network status
Number of nodes	100 max - rotary-switch type node address setting (0-99)

[1]   Dependant upon the scanner module being used. For example, the SST scanner (catalog number SST-PFB-SLC) does not fully support Fail Safe mode as it only resets outputs to 0. You cannot define behavior such as Hold Last State or Fault Value with the SST scanner.

General Specifications for 1790P CompactBlock LDX I/O

Isolation	Type test 1250V ac rms for 60 s between field power and the PROFIBUS DP network (I/O to logic)	
Wire size	$0.25…2.5 \text{ mm}^2$ (22…14 AWG) solid or stranded copper wire rated at 75 °C or greater 1.2 mm (3/64 in.) insulation max	
Wiring category	$2^{[1]}$	
Product certifications (when product or packaging is marked)	c-UL-us	UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada
	FM	FM Approved Equipment
	CE[2]	European Union 89/336/EEC EMC Directive, compliant with: EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions European Union 73/23/EEC LVD Directive, compliant with: EN 61131-2; Programmable Controllers
	C-Tick[3]	Australian Radiocommunications Act, compliant with: AS/NZS 2064; Industrial Emissions

[1]   Use this wiring category information for planning conductor routing. Refer to Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

[2]   See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Product Specifications for CompactBlock I/O Modules

This table contains specifications that are common to all of the 1791 base and expansion modules. Individual module-connection sizes, word/bit definitions, schematics, wiring diagrams, and specifications can be found in their respective Technical Data publications as listed in Related Publications for CompactBlock I/O Modules on page 6.

Environmental Specifications

Temperature, operating	0…60 °C (32…140 °F) IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)
Temperature, storage	-40…85 °C (-40…185 °F) IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)
Relative humidity	5-95 % non-condensing IEC 60068-2-30 (Test Db, Unpackaged Nonoperating)
Operating altitude	2000 m
Vibration	5g @ 10…500 Hz IEC60068-2-6 (Test Fc, Operating)
Shock, operating Shock, nonoperating	30g 50g IEC60068-2-27 Test Ea, (Unpackaged Shock)
Emissions	Group 1, Class A CISPR 11
Radiated RF immunity	10V/m with 1 kHz sine-wave 80%AM from 80…1000 MHz 10V/m with 200 Hz 50% Pulse 100%AM @ 900 MHz IEC 61000-4-3
EFT/B immunity	±1 kV @ 5 kHz on power ports ±2 kV @ 5 kHz on signal ports ±2 kV @ 5 kHz on communication ports IEC 61000-4-4
Surge transient immunity	±1 kV line-line (DM) and ±2 kV line-earth (CM) on power ports ±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports ±2 kV line-earth (CM) on shielded ports IEC 61000-4-5
Conducted RF immunity	10V rms with 1 kHz sine-wave 80%AM from 150 kHz…80 MHz IEC 61000-4-6
Enclosure type rating	IP 20
Mounting	DIN rail or panel mount

DeviceNet Specifications for 1791D CompactBlock I/O

Network protocol	I/O Slave messaging: - Poll command, Bit Strobe command, Cyclic command, COS command
Network length, thick cable	500 m (1600 ft) @ 125 Kbps 200 m (600 ft) @ 250 Kbps 100 m (330 ft) @ 500 Kbps
Network length, flat media	420 m (1230 ft) @ 125 Kbps 200 m (490 ft) @ 250 Kbps 75 m (245 ft) @ 500 Kbps
Communication rate	Auto-baud rate selection: 125, 250, 500 Kbps
Indicators	1 red/green for module/network status, 1 green for logic status, 1 yellow for I/O status
Number of nodes	64 max - rotary-switch type node address setting

General Specifications for 1791D CompactBlock I/O

Isolation voltage: I/O to DeviceNet I/O group-to-group I/O group-to-logic	500V ac 500V ac 500V ac	
DeviceNet power	11…25V dc	
Wiring category	2[1]	
Wire size	2 mm^2 (14 gauge) stranded maximum (3/64 in. insulation max)	
Product certifications (when product or packaging is marked)	c-UL-us	UL Listed Industrial Control Equipment, certified for U.S. and Canada
	c-UL-us	UL Listed for Class I, Division 2, Group A,B,C,D Hazardous Locations, certified for U.S. and Canada.
	FM	FM Approved Equipment
	CE[2]	European Union 89/336/EEC EMC Directive, compliant with: EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions European Union 73/23/EEC LVD Directive, compliant with: EN 61131-2; Programmable Controllers

General Specifications for 1791D CompactBlock I/O (Continued)

Product certifications (when product or packaging is marked)	C-Tick[3]	Australian Radiocommunications Act, compliant with: AS/NZS 2064; Industrial Emissions
(continued)	ODVA	Open DeviceNet Vendor Association (ODVA) conformance tested to DeviceNet specifications

[1]   Use this wiring category information for planning conductor routing. Refer to Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

[2]   See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

PROFIBUS DP Specifications for 1791P CompactBlock I/O

Network protocol	PROFIBUS-DP (EN50170) • Communication of the slave with a Class 1 master • Communication of the slave with a Class 2 master
Implementation type	DPC31
Station type	Slave
Freeze mode	Supported
Sync mode	Supported
Auto baud rate	Supported
Fail safe mode	Supported[1]
FMS support	Not supported
Redundancy	Not supported
Network length/ communication rate	1000 m (3280 ft) @ 9.6 kbps 1000 m (3280 ft) @ 19.2 kbps 1000 m (3280 ft) @ 45.45 kbps 1000 m (3280 ft) @ 93.75 kbps 1000 m (3280 ft) @ 187.5 kbps 400 m (1312 ft) @ 500 kbps 200 m (656 ft) @ 1.5 Mbps 100 m (328 ft) @ 3 Mbps 100 m (328 ft) @ 6 Mbps 100 m (328 ft) @ 12 Mbps
Indicators	1 red/orange/green module status 1 yellow network status
Number of nodes	100 max - rotary-switch type node address setting (0-99)

[1]   Dependant upon the scanner module being used. For example, the SST scanner (catalog number SST-PFB-SLC) does not fully support Fail Safe mode as it only resets outputs to 0. You cannot define behavior such as Hold Last State or Fault Value with the SST scanner.

General Specifications for 1791P CompactBlock I/O

Isolation voltage	Auxiliary I/O power to PROFIBUS: 500V ac I/O group-to-group: 500V ac I/O group-to-PROFIBUS: 500V ac	
PROFIBUS DP power	18…26.4V dc	
Wiring category	2[1]	
Wire size	2 mm^2 (14 gauge) stranded maximum (3/64 in. insulation max)	
Product certifications (when product is marked)	c-UL-us	UL Listed Industrial Control Equipment, certified for U.S. and Canada
	c-UL-us	UL Listed for Class I, Division 2, Group A,B,C,D Hazardous Locations, certified for U.S. and Canada.
	CE[2]	European Union 89/336/EEC EMC Directive, compliant with: EN 50081-2; Industrial Emissions EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity
	C-Tick[3]	Australian Radiocommunications Act, compliant with: AS/NZS 2064; Industrial Emissions

[1] Use this wiring category information for planning conductor routing. Refer to Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

[2] See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Remote I/O Specifications for 1791R CompactBlock I/O

Network protocol	Remote I/O
Network length/ communication rate	3048 m (10000 ft) max @ 57.6 kbps, 1524 m (5000 ft) max @ 115.2 kbps, 762 m (2500 ft) max @ 230.4 kbps
Indicators	1 red/orange/green module status, 1 green comm status
Number of nodes	Processor-dependent. Refer to processor manual.

General Specifications for 1791R CompactBlock I/O

Isolation voltage	Power supply to Remote I/O: 500V ac I/O group-to-Remote I/O: 500V ac I/O group-to-logic: 500V ac	
Remote I/O power	18…26.4V dc	
Wiring category	2[1]	
Wire size	2 mm^2 (14 gauge) stranded maximum (3/64 in. insulation max)	
Product certifications (when product is marked)	c-UL-us	UL Listed Industrial Control Equipment, certified for U.S. and Canada
	c-UL-us	UL Listed for Class I, Division 2, Group A,B,C,D Hazardous Locations, certified for U.S. and Canada.
	CE[2]	European Union 89/336/EEC EMC Directive, compliant with:
		EN 50081-2; Industrial Emissions EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity
	C-Tick[3]	Australian Radiocommunications Act, compliant with: AS/NZS 2064; Industrial Emissions

[1] Use this wiring category information for planning conductor routing. Refer to Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

[2] See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Specify a CompactBlock I/O System

What This Chapter Contains   This chapter guides you in specifying a CompactBlock I/O system.

Step 1: Select a Communication Network

Using this table as a guide, select the communication network that is most suitable. This will determine the type of CompactBlock I/O products you will need.

Select a Communication Network

Application Requirements	Network	Select
• Connections of low-level devices directly to plant-floor controllers, without interfacing them • Data sent as needed • More diagnostics for improved data collection and fault detection • Less wiring and reduced start-up time than a traditional, hard-wired system	DeviceNet	1790D-*xxx*
• Connecting to an existing PROFIBUS DP 5 m (16.4 ft) bus, 12 MB network	PROFIBUS	1790P-*xxx*
• Connecting to an existing Allen-Bradley remote I/O network	Remote I/O	1790R-*xxx*

CompactBlock I/O Modules on the DeviceNet Network

This graphic shows how CompactBlock I/O modules fit into a typical DeviceNet system.

CompactBlock I/O Modules in a DeviceNet System
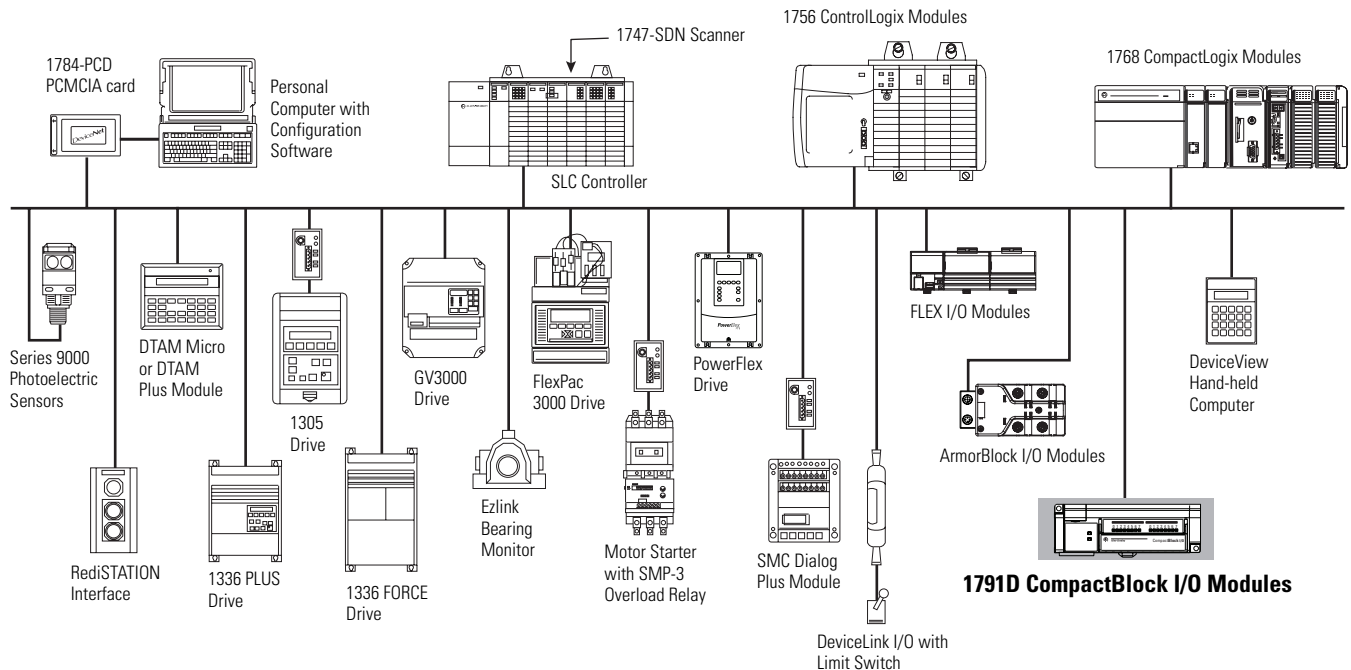
See Chapter 4 for DeviceNet network specifications.

In addition, CompactBlock I/O modules on the DeviceNet network have these features:

- Input Filtering
- Idle and Fault Mode Selection
- DeviceLogix Functionality
- Optional I/O Assemblies

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.

To configure an input filter, an input signal delay is set to turn off-to-on or on-to-off for nominal amounts of time. The mode and filter time is set through RSNetworx for DeviceNet software, or a similar configuration tool.

Idle and Fault Mode Selection

When the PLC, SLC, or PC-based programmable controller is in Program mode, the DeviceNet scanner puts the CompactBlock module in an **idle state**. If the DeviceNet scanner drops off the network, the module goes to a **fault state**.

In both idle and fault states, the module resets its outputs by default. You can use RSNetworx for DeviceNet software or a similar configuration tool to change the default and set the module to save the last received outputs.
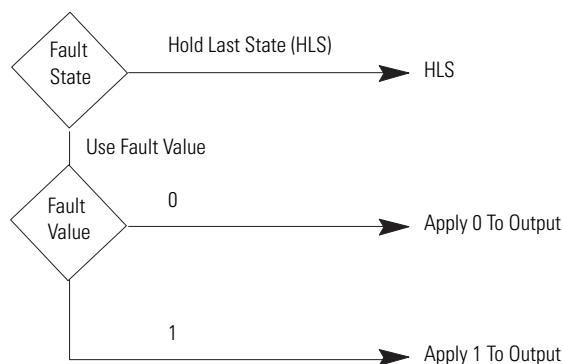
Fault state can be set to HLS or use fault value. The fault value can be set to 0 or 1. The same logic applies for idle conditions.

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DeviceLogix Functionality

The CompactBlock I/O family also offers modules that have DeviceLogix capability, a local logic that provides you with the ability to control outputs and manage status information locally, within the device. DeviceLogix capability is configured through a function block editor that is accessed through RSNetWorx for DeviceNet software. This editor lets you create local logic by using boolean operators, such as AND and OR, set and reset latches, as well as a variety of timers and counters. User support for the editor can be found in the DeviceLogix Ladder Editor User Manual, publication ACIG-UM002, and online help.

CompactBlock products that support DeviceLogix technology have some device-specific capabilities and capacities, which are identified in this table.

Capability/Capacity	CompactBlock I/O Modules
Function blocks supported	• Boolean - AND, OR, XOR, NOT, NAND, NOR, XNOR • Latches - RSL and SRL • Timers - PUL, OND, and OFD • Counters - UPC and UPD
Number of function blocks included in a configuration, max	48
Function block processing time	1 ms/24 blocks 2 ms/48 blocks
Network input bits	32
Network output bits	8
Available status bits	• Explicit message connection • Polled connection • Change-of-state/cyclic connection • Network fault • Minor module fault • Polled connection fault • Polled connection idle • Change-of-state/cyclic connection fault
Logic status indication	• Logic disabled - none • Logic enabled - solid green • Local forces are applied and local logic is enabled - flashing green

Optional I/O Assemblies

The DeviceLogix-capable versions of CompactBlock I/O modules give you the ability to choose how much data the modules produce or consume over the DeviceNet network. Two new parameters have been added to the EDS files that let you select the amount of data that will be transmitted or received.

Produced I/O Assembly

These three options are for Produced Data:

- **Default assembly** - Produces the device's input data and any fault/status data the device has.
- **Input only assembly** - Produces only the state of the device's inputs. This lets those who do not make use of the Diagnostic bits reduce their network traffic.
- **DeviceLogix assembly** - Produces all of the standard information from the Default assembly plus the data that is available as a result of invoking DeviceLogix technology.

    These new DeviceLogix data are available:

  - **Logic Enabled bit** - This bit is high when the DeviceLogix configuration is running on a device and has been enabled. This can be used, for example, in the PLC program or on a DeviceNet MMI to indicate the presence of local logic control.
  - **Network Output bits** - These bits are used in the DeviceLogix configuration to send information back over the network. For example, the output of any function block can be connected to a network output bit.
  - **Hardware Output bits** - The DeviceLogix configuration lets you locally control the state of hardware outputs. Therefore these bits are produced by the device so that the state of the outputs can be sent back to the network master. If an output in the device is not under DeviceLogix control, its status is still controlled by the normal consumed data.

    Please refer to the CompactBlock I/O for DeviceNet Technical Data, publication, 1791D-TD001. The assemblies for CompactBlock I/O devices are listed in the publication, in the sections that contain specific module information.

Consumed I/O Assembly

DeviceLogix technology provides the device the ability to consume data from the DeviceNet master other than the normal state of the hardware outputs. This data is called Network Input Bits. Up to 32 of these bits can be consumed by the device. Five options exist for the variable amount of consumed data: 0, 1, 2, 3, or 4 bytes. A standard 16-output CompactBlock I/O module, for instance, consumes 16 bits (2 bytes). With DeviceLogix technology, you can choose to consume an additional 2 bytes of Network Inputs. If a hardware output is controlled by local logic, its state is no longer consumed and that bit becomes available to be used as a Network Input. For more on this concept, please refer to the DeviceLogix Ladder Editor User Manual, publication ACIG-UM002.

CompactBlock I/O Modules on the PROFIBUS DP Network

This illustration shows how CompactBlock I/O modules fit into a typical PROFIBUS DP system.
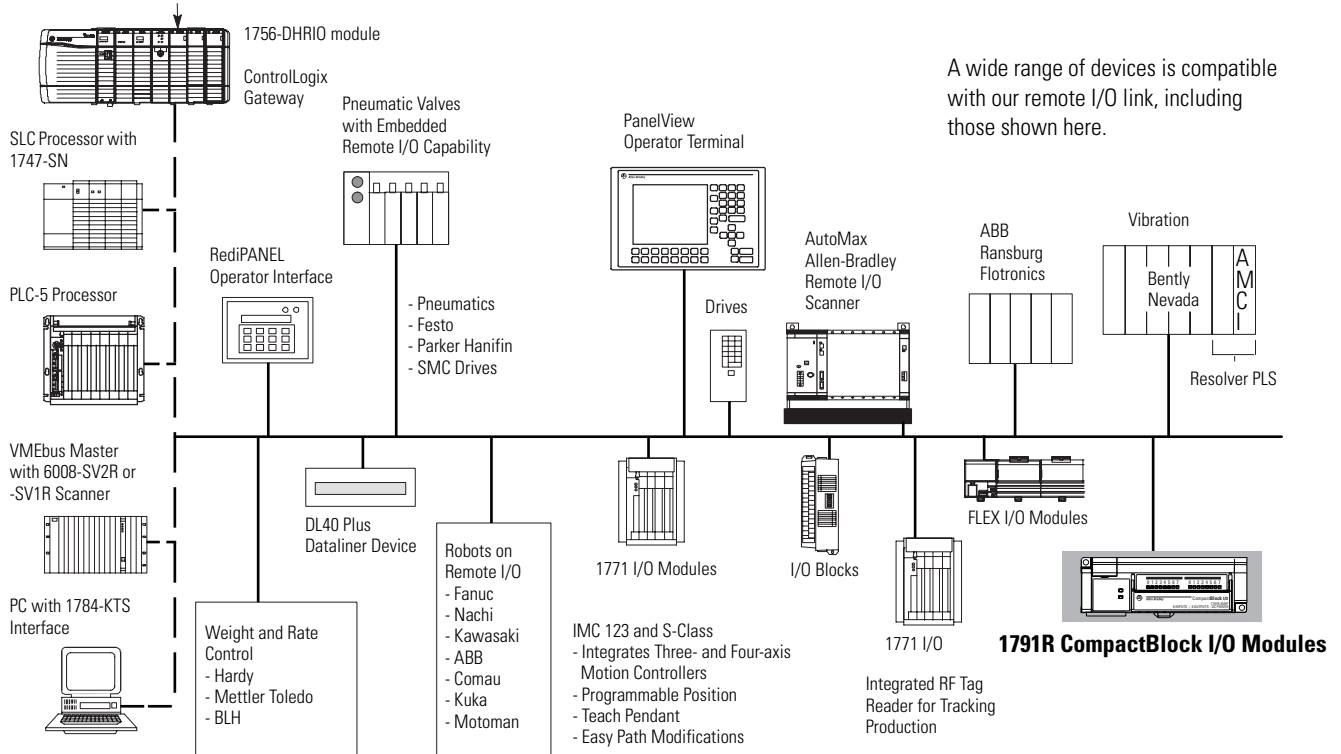
CompactBlock I/O Modules in a PROFIBUS DP System

1791P CompactBlock I/O Modules

FlexArmor Modules

1790P CompactBlock LDX I/O Modules
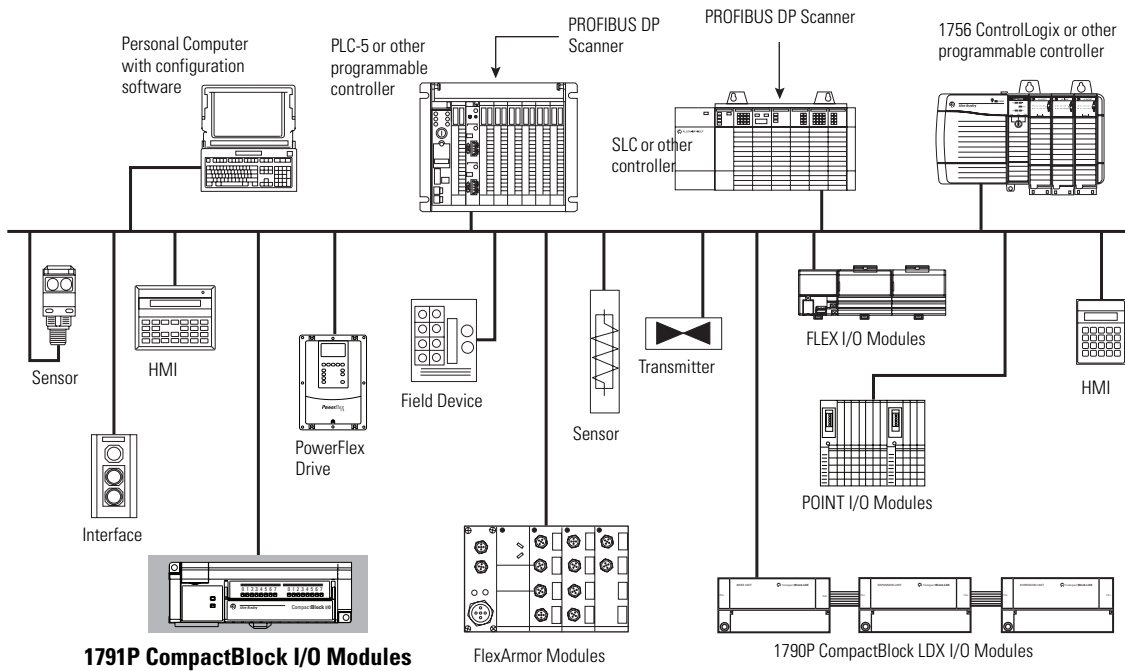
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See Chapter 4 for PROFIBUS DP network specifications.

CompactBlock I/O Modules on Remote I/O

This graphic shows how your CompactBlock I/O modules fit into a typical remote I/O system.

CompactBlock I/O Modules in a Remote I/O System

A wide range of devices is compatible with our remote I/O link, including those shown here.

1756-DHRIO module

ControlLogix Gateway

SLC Processor with 1747-SN

Pneumatic Valves with Embedded Remote I/O Capability

PanelView Operator Terminal

RediPANEL Operator Interface

PLC-5 Processor

AutoMax Allen-Bradley Remote I/O Scanner

ABB Ransburg Flotronics

Vibration

Bently Nevada

A M C I

Drives

- Pneumatics
- Festo
- Parker Hanifin
- SMC Drives

Resolver PLS

VMEbus Master with 6008-SV2R or -SV1R Scanner

DL40 Plus Dataliner Device

FLEX I/O Modules

PC with 1784-KTS Interface

Robots on Remote I/O
- Fanuc
- Nachi
- Kawasaki
- ABB
- Comau
- Kuka
- Motoman

1771 I/O Modules

I/O Blocks

1771 I/O

1791R CompactBlock I/O Modules

Weight and Rate Control
- Hardy
- Mettler Toledo
- BLH

IMC 123 and S-Class
- Integrates Three- and Four-axis Motion Controllers
- Programmable Position
- Teach Pendant
- Easy Path Modifications

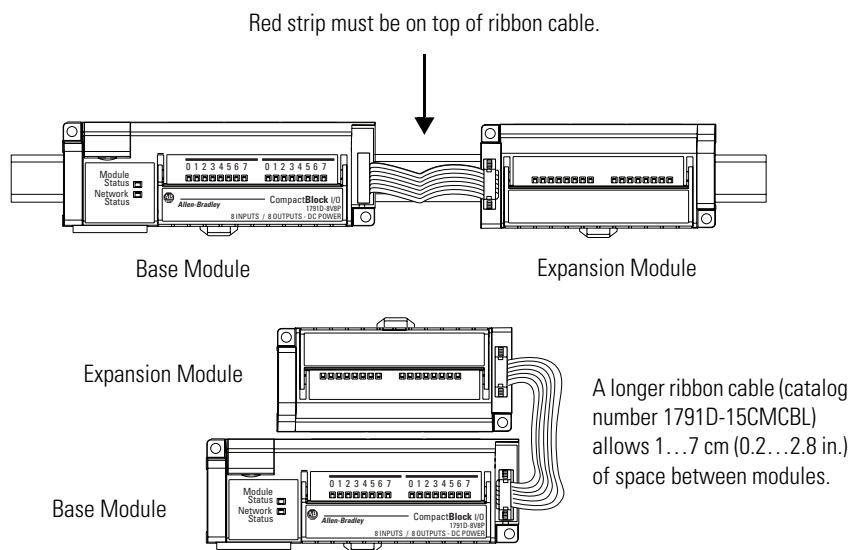Integrated RF Tag Reader for Tracking Production

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See Chapter 4 for remote I/O network specifications.

Step 2: Select Base and Expansion Modules

Determine the number of I/O inputs and outputs required and their mix.

Possible Configurations for CompactBlock I/O Modules on DeviceNet, PROFIBUS DP, and Remote I/O Networks

Each base module supports one expansion module.

Red strip must be on top of ribbon cable.

Base Module   Expansion Module

Expansion Module

Base Module

A longer ribbon cable (catalog number 1791D-15CMCBL) allows 1…7 cm (0.2…2.8 in.) of space between modules.

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Termination Type

The CompactBlock module contains a removable terminal block that allows for easy module replacement without rewiring. See Removable Terminal Block on page 10.

CompactBlock I/O Base and Expansion Modules

This table lists the catalog numbers for all the CompactBlock I/O base modules.

CompactBlock I/O Base Modules

I/O mix	DeviceNet	PROFIBUS DP	Remote I/O
	1791D-*xxx*	**1791P-*xxx***	**1791R-*xxx***
4 in sink (not expandable)	1791D-4B0	—	—
4 in sink/4 out source	1791D-4B4P	1791P-4B4P	1791R-4B4P
8 in sink/8 out source	1791D-8B8P	1791P-8B8P	1791R-8B8P
8 in source/8 out sink	1791D-8V8P	1791P-8V8P	1791R-8V8P
8 out source	1791D-0B8P	—	—
16 in sink	1791D-16B0	1791P-16B0	1791R-16B0
16 in source	1791D-16V0	—	—
16 out sink	1791D-0V16P	—	—
16 out source	1791D-0B16P	1791P-0B16P	1791R-0B16P

This table lists the catalog numbers for all the CompactBlock I/O universal expansion modules. These modules function with DeviceNet, RIO, and PROFIBUS bases. Use one expansion per base module.

CompactBlock I/O Expansion Modules

I/O Mix	Catalog No.
24V dc CompactBlock I/O expansion, 16 out source	1791D-0B16PX
24V dc CompactBlock I/O expansion, 16 out sink	1791D-0V16PX
24V dc CompactBlock I/O expansion, 16 in sink	1791D-16B0X
24V dc CompactBlock I/O expansion, 16 in source	1791D-16V0X
Analog CompactBlock I/O expansion, 4 inputs, 2 outputs	1791D-N4CV2X

For detailed specifications of the modules, refer to the respective Technical Data publications as listed in Related Publications for CompactBlock I/O Modules on page 6.

Step 3: Select Optional Accessories

This table lists the optional components for CompactBlock I/O modules.

Optional Components for CompactBlock I/O Modules

Optional Component	Catalog No.
24V dc block I/O longer ribbon cable, 15 cm	1791D-15CMCBL
24V dc block I/O long cable, 30 cm	1791D-30CMBL
24V dc block I/O replacement ribbon cable, 4 cm	1791D-4CMCBL
Block I/O replacement terminal block, 21-pin NEMA	1791D-RTBN21
RIO six-position connector, lock screws	1791R-RIOSCON