Installation Instructions

Allen-Bradley

ControlLogix Remote I/O (RIO) Module

Catalog Number 1756-RIO/B

About This Publication

Use this publication as a guide to install the ControlLogix Remote I/O (RIO) Module. Refer to the 1756-RIO user manual, publication 1756-UM534, for additional information. You can download a .pdf file of the manual at: http://www.rockwellautomation.com/literature.

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.rockwellautomation.com/literature.) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

	**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
	**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard and recognize the consequences.
	**SHOCK HAZARD:** Labels may be on or inside the equipment to alert people that dangerous voltage may be present.
	**BURN HAZARD:** Labels may be on or inside the equipment to alert people that surfaces may reach dangerous temperatures.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

Environment and Enclosure

ATTENTION: This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC 60664-1), at altitudes up to 2000 m (6562 ft) without derating.

This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR 11. Without appropriate precautions, there may be difficulties with electromagnetic compatibility in residential and other environments due to conducted and radiated disturbances.

This equipment is supplied as open-type equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The enclosure must have suitable flame-retardant properties to prevent or minimize the spread of flame, complying with a flame spread rating of 5VA, V2, V1, V0 (or equivalent) if non-metallic. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

In addition to this publication, see the following:

- Industrial Automation Wiring and Grounding Guidelines, Allen-Bradley publication 1770-4.1, for additional installation requirements
- NEMA Standard 250 and IEC 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure

Prevent Electrostatic Discharge

ATTENTION: This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wriststrap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- Use a static-safe workstation, if available.
- Store the equipment in appropriate static-safe packaging when not in use.

ATTENTION: If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Removal and Insertion Under Power

WARNING: When you insert or remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding. Repeated electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance that can affect module operation.

Multi-point Network Communication Connections

WARNING: If you connect or disconnect the communication cable with power applied to this module or any device on the network, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

North American Hazardous Location Approval

The following information applies when operating this equipment in hazardous locations:	**Informations sur l'utilisation de cet équipement en environnements dangereux:**
Products marked 'CL I, DIV 2, GP A, B, C, D' are suitable for use in Class I Division 2 Groups A, B, C, D, Hazardous Locations and nonhazardous locations only. Each product is supplied with markings on the rating nameplate indicating the hazardous location temperature code. When combining products within a system, the most adverse temperature code (lowest 'T' number) may be used to help determine the overall temperature code of the system. Combinations of equipment in your system are subject to investigation by the local Authority Having Jurisdiction at the time of installation.	Les produits marqués 'CL I, DIV 2, GP A, B, C, D' ne conviennent qu'à une utilisation en environnements de Classe I Division 2 Groupes A, B, C, D dangereux et non dangereux. Chaque produit est livré avec des marquages sur sa plaque d'identification qui indiquent le code de température pour les environnements dangereux. Lorsque plusieurs produits sont combinés dans un système, le code de température le plus défavorable (code de température le plus faible) peut être utilisé pour déterminer le code de température global du système. Les combinaisons d'équipements dans le système sont sujettes à inspection par les autorités locales qualifiées au moment de l'installation.
WARNING: **EXPLOSION HAZARD –** • Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous. • Do not disconnect connections to this equipment unless power has been removed or the area is known to be nonhazardous.Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product. • Substitution of components may impair suitability for Class I, Division 2. • If this product contains batteries, they must only be changed in an area known to be nonhazardous.	**AVERTISSEMENT:** **RISQUE D'EXPLOSION –** • Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement. • Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher les connecteurs.Fixer tous les connecteurs externes reliés à cet équipement à l'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens fournis avec ce produit. • La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe I, Division 2. • S'assurer que l'environnement est classé non dangereux avant de changer les piles.

About the Module

The ControlLogix 1756-RIO module connects a ControlLogix processor to a remote I/O network.

The module can act as a scanner or as an adapter on the network. For additional information, see publication 1756-UM534.

IMPORTANT This module is shipped in scanner mode, with a blank configuration.

1756-RIO Module as a Scanner

As a scanner, with one remote I/O channel, the 1756-RIO module scans I/O on a remote I/O network.

The module supports the following:

- All remote I/O baud rates: 57.6, 115.2, 230.4 Kbaud
- Rack numbers from 0...76 octal
- All combinations of partial racks
- Up to 32 physical adapters

  To support 32 physical adapters, you must use an 82 Ω resistor; 150 Ω resistors allow only 16 adapters.

- Block transfers at all possible locations

The module can update block transfers (BTs) automatically via the 1756-RIO module or can be controlled by the ControlLogix controller. It transfers all I/O via produced/consumed connections over the backplane to the controller.

1756-RIO Module as an Adapter

As an adapter, the 1756-RIO module lets the controller exchange data with or monitor an existing scanner. The module supports the following features:

- Has one remote I/O channel
- Emulates one or more racks
- All remote I/O baud rates: 57.6, 115.2, 230.4 Kbaud
- Rack numbers from 0...76 octal
- All combinations of partial racks
- Block transfers at all possible locations
- Can monitor I/O on a network with an existing remote I/O scanner (Monitor Mode)
- Transfers all I/O to the controller via produced/consumed connections over the backplane to the controller.

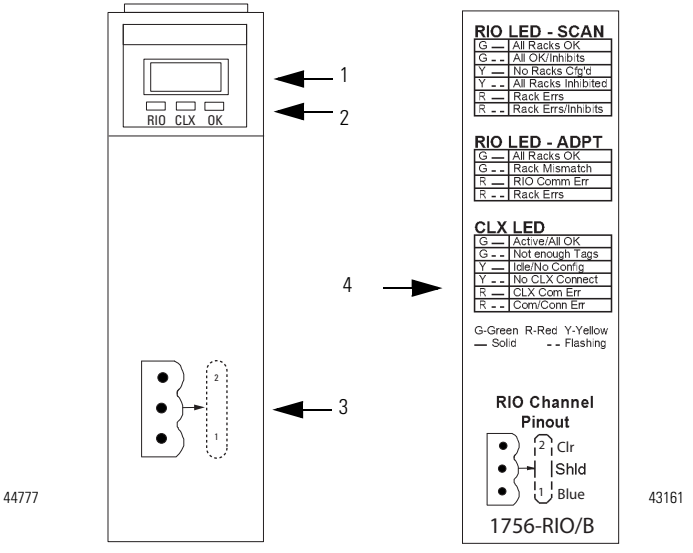
IMPORTANT The module firmware can be updated using the Windows utilities software supplied with the module.

Before You Begin

Before you install your I/O module, you should do the following:

- Identify the module components. See page 10.
- Note the power requirements. See page 11.
- Install and connect a ControlLogix chassis and power supply. See publication 1756-IN080.
- Install RSLogix 5000 programming software, version 17 or later, and the associated firmware.
- Install RSLinx software, version 2.54 or later, with an activation. Use RSLinx Gateway software or RSLinx Professional software. Do not use RSLinx Lite.
- Install the 1756-RIO module Add-on Profile from the CD provided with the module.
- Determine the slot location. You can install the module in any slot in any size ControlLogix chassis. See page 12.
- The 1756-RIO/B module requires firmware revision 3.1 or above.

Module Components



Item	Description
1	4-character scrolling display
2	Three status indicators: • RIO indicates the status of the remote I/O network • CLX indicates the status of the connection to the processor • OK indicates the module's own internal state
3	3-pin connector (blue hose) that connects to the remote devices This is also known as the removable terminal block (RTB).
4	Inside-door label with error codes

IMPORTANT Note that a cable from a 1756-RIO/A module will plug directly into a 1756-RIO/B module, but it is rotated 180°.

Power Requirements

This module receives power from the 1756-chassis power supply and requires two sources of power from the ControlLogix backplane.

- 450 mA at 5.1V DC
- 5 mA at 24V DC

Add these current/power values (2.5 W) to the requirements of all other modules in the chassis to prevent overloading the power supply.

Install the Module

You can install or remove the module while chassis power is applied if you observe these precautions.

WARNING: When you insert or remove the module while backplane power is on, an electrical arc can occur. If you connect or disconnect the communications cable with power applied to this module or any device on the network, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding. Repeated electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance that can affect module operation.

For this installation, we will assume chassis power is off.

Installing and Connecting a Chassis

Before installing the module, you must install and connect a ControlLogix chassis and power supply. See ControlLogix Chassis Installation Instructions, publication 1756-IN080.

To determine the slot location in the chassis, remember that chassis slots are numbered starting from the left, at 0. Slot 0 is the first slot to the right of the power supply.

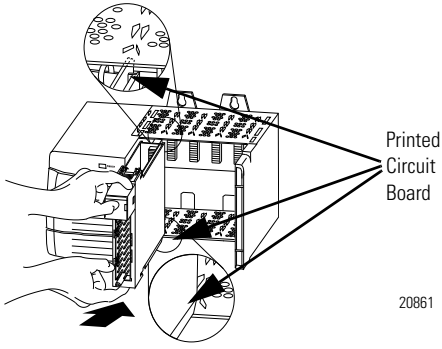
You can do the following:

- Use any size chassis.
- Install the module in any available slot.
- Install multiple 1756-RIO modules in the same chassis, depending on how your power supply is rated.

Install the Module in the Chassis

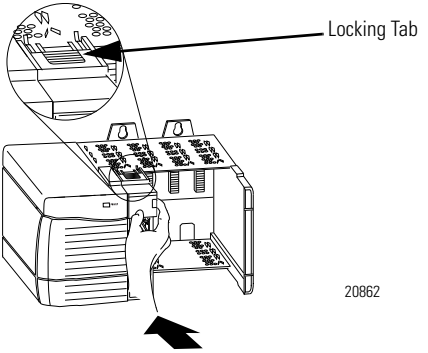
To install the module, follow these steps.

1. Align the circuit board with the top and bottom chassis guides.



WARNING: When you insert or the remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding. Repeated electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance that can affect module operation.

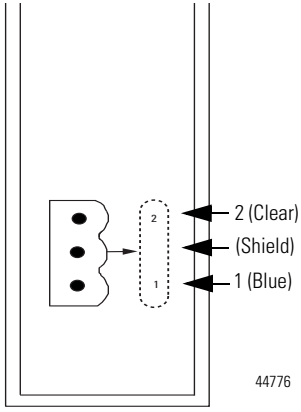
2. Slide the module into the chassis until the module locking tabs click.



ATTENTION: Do not force the module into the backplane connector. If you cannot seat the module with firm pressure, check the alignment. Forcing the module into the chassis can damage the backplane connector or the module. The module is fully installed when it is flush with the power supply or other installed modules.

Install the Removable Terminal Block (RTB)

Push the removable terminal block (RTB) into the 3-pin connector.



WARNING: If you connect or disconnect the communication cable with power applied to this module or any device on the network, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

Wire the Connector for the Remote I/O Network

To wire the connector for the remote I/O network, refer to the Cabling and Termination table and follow these steps.

Cabling and Termination

Connector Pin	Description
1 (bottom)	Line 1 (blue)
N/A	Shield
2	Line 2 (clear)

1. Connect Line 1 (blue) of the remote I/O cable to the lower pin on the 1756-RIO module.
2. Connect the shield to the middle pin.
3. Connect Line 2 (clear) of the remote I/O cable to the upper pin on the 1756-RIO module.
4. Terminate both ends of a remote I/O network by using external resistors attached to the physical ends of the network.

   There should be two terminators at the ends network. The terminator is connected between Line 1 (blue) and line 2 (clear).

Select the Proper Resistor

Use 82 Ω resistors if the network operates at 230.4 kbps or if the network operates at 57.6 kbps, or 115.2 kbps and none of the devices in this table are present. The maximum number of devices on the network is 32.

Use 150 Ω resistors if the network contains any of the devices in this table, or if the network operates at 57.6 kbps or 115.2 kbps and you do not require the network to support more than 16 devices.

Device Resistors

Cat. No.	Series
1747-ASB	All
1771-AS	All
1771-ASB	Series A
1775-S5	All
1794-ASB	All
1771-DCM	All
1771-SN	All
1772-SD	All
1772-SD2	All
1775-S4A	All
1775-S4B	All
1775-SR5	All

Baud Rate Cable Limits

Baud Rate	Maximum Cable Length
57.6 Kbaud	3048 m (10000 ft)
115.2 Kbaud	1524 m (5000 ft)
230.4 Kbaud	762 m (2500 ft)

Apply Chassis Power

Turn on the chassis power supply.

Check Power Supply and Module Status

The following indicates the correct power supply status and display indicators for the 1756-RIO module.

Chassis Power-supply Status Indicators

The chassis power-supply indicator should be green. The module OK status indicator should be solid red immediately after you turn on the chassis power supply and then it turns solid green. Refer to the installation instructions for your particular 1756-chassis power supply for recommended actions for checking your power supply.

Alphanumeric Display at Powerup

The 4-character, alphanumeric display shows either 'RIO Scanner' or 'RIO Adapter', followed by the firmware version number, and any banner text defined in the module configuration.

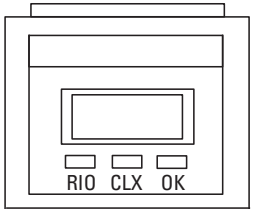
The display shows the following messages at powerup.

Message	Description
B#*nn*	Stages in the start-up processes; *nn* is a hexadecimal number
Boot	Next stage in power-up sequence
RIO Scanner v. *x.xx.xx*	Module firmware revision

If the indicator on the 1756-RIO module does not cycle through these messages on powerup, refer to the Troubleshooting section of the 1756 RIO user manual, publication 1756-UM534.

Module Status Indicators

The module has three status indicators to indicate the state of internal operations. The status indicators are labeled RIO, CLX, and OK.



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RIO Status Indicator – Remote Devices Status

The RIO indicator displays the status of the remote I/O network connection. Status varies depending on the mode of the module.

Scanner Mode

This table shows status in order of priority, highest first.

Indicator	Status	Description
RIO	Red	A frame-receive error has been received in the last second (CRC error, abort, or time-out). Indicator stays red for one second after the error occurs. One or more racks are in error.
	Flashing red/off	At least one rack that is being scanned (not inhibited) is in error. One or more racks are inhibited.
	Yellow	Idle, no racks are configured.
	Flashing yellow/off	All configured racks are inhibited.
	Flashing green/off	No racks being scanned (not inhibited) are in error, but one or more racks are inhibited.
	Green	Successful communication with all configured racks, no inhibited racks.

Adapter Mode

This table shows status in order of priority, highest first.

Indicator	Status	Description
RIO	Red	A frame-receive error has been received in the last second (CRC error, abort, or time-out). Indicator stays red for one second after the error occurs.
	Flashing red/off	One or more racks are not being scanned.
	Flashing green/off	Configuration mismatch on one or more racks.
	Green	All racks are being scanned and there are no configuration mismatches.

CLX Status Indicator – ControlBus Status

The CLX indicator displays the status of communication with the ControlLogix processor.

Indicator	Status	Description
CLX	Green	The module has successfully processed a request from the ControlBus backplane within the last five seconds. All required connections are open.
	Flashing green/off	Controlling Connection is open, but not all required connections are open.
	Yellow	Idle, no requests received from the backplane in the last five seconds. No connections; empty configuration.
	Flashing yellow/off	Controlling Connection is not open.
	Red	The module has returned a CIP error to a request from the backplane within the last second. All required connections are open.
	Flashing red/off	The module has returned a CIP error within the last second. All required connections are not open.

OK Status Indicator – Module Health

Indicator	Status	Description
OK	Green	Indicates that module has passed all power-up diagnostics and is functioning normally.
	Red	Indicates that module start-up diagnostics have failed or a major module fault, such as watchdog time-out or jabber inhibit, has occurred.

IMPORTANT If all three status indicators are solid red and the 4-character display shows M#*xx*, (where *xx* is the error number), a fatal error has occurred. Refer to the 1756-RIO user manual, publication 1756-UM534, for information on clearing fatal errors. Make a note of the error code numbers to give Technical Support, if you need to call for help.

Interpret the Alphanumeric Display

The remote I/O (RIO) communication interface module displays alphanumeric messages that provide diagnostic information about your module. The warning messages appear twice on the display, then the normal display resumes. The table summarizes the messages.

Alphanumeric Display Message Descriptions

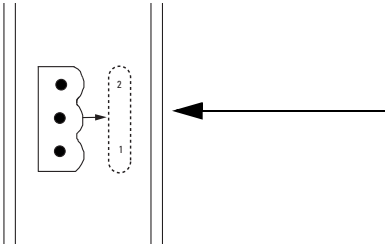
Message	Description
RIO Scanner v. *x.xx.xx* [banner] RIO Adapter v. *x.xx.xx* [banner]	The module's firmware revision, displayed at powerup. The three parts of the revision number are the major revision, the minor revision, and the build number. This is followed by the status banner.

Configure the Module

Once installed, your 1756-RIO module must be configured. Refer to the 1756-RIO user manual, publication 1756-UM534, for information on module configuration.

Uninstall the Removable Terminal Block (RTB)

To remove the RTB, grasp firmly and pull out.



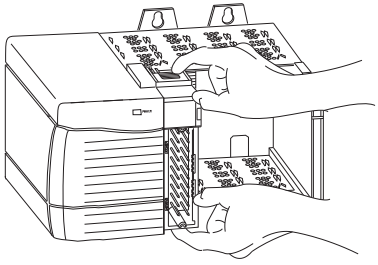
WARNING: If you connect or disconnect the communication cable with power applied to this module or any device on the network, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

Uninstall the Module

WARNING: When you insert or the remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding. Repeated electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance that can affect module operation.

To remove the module, follow the steps below.

1. Push in top and bottom locking tab.



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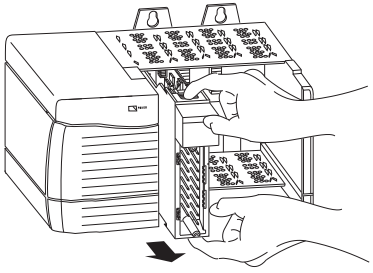
2. Pull the module out of the chassis.



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Replacing the Module

If you are replacing an existing module with an identical one, and you want to resume identical system operation, you must do the following:

- Install the new module in the same slot.
- Run the configuration program and download the appropriate configuration to the module.
- Check that the module has the correct firmware, scanner, or adapter version.

Specifications

Technical Specifications - 1756-RIO

Attribute	1756-RIO
Module location	1756 ControlLogix chassis
Backplane current, max	450 mA @ 5.1V DC 5 mA @ 24 V DC
Isolation voltage	50V (continuous), basic insulation type, RIO communication lines to backplane. Type tested at 500V AC for 60 s
Power dissipation	2.5 W
Screw terminal torque	0.5…0.6 N•m (5…7 lb•in)
Wiring category(1)	2 - on communication ports
Wire size	0.52 mm^2 (20 AWG)
Wire type	Belden 9463 twinaxial
Enclosure type rating	None (open-style)
North American temperature code	T4A

(1) Use this Conductor Category information for planning conductor routing. Refer to Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-RIO

Attribute	1756-RIO
Operating temperature 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)	0…60 °C (32…140 °F)
Nonoperating temperature 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)	-40…85 °C (-40…185 °F)
Surrounding air temperature, max	60 °C (140 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5…95% noncondensing
Operating shock IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Nonoperating shock IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Emissions CISPR 11	Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80…2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM at 900 Mhz 10V/m with 200 Hz 50% Pulse 100% AM at 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000…2700 MHz

Environmental Specifications - 1756-RIO

Attribute	1756-RIO
EFT/B immunity IEC 61000-4-4	±2 kV at 5 kHz on communication ports
Surge transient immunity IEC 61000-4-5	± 2 kV line-earth (CM) on communication ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz…80 MHz

Certifications(1) - 1756-RIO

Certification(2)	1756-RIO
c-UL-us	UL Listed Industrial Control Equipment, certified for U.S. and Canada. See UL File E65584. UL listed for Class 1, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 2004/108/EC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)
C-Tick	Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Emissions

(1) When product is marked.

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

Additional Resources

These documents contain additional information concerning related Rockwell Automation products.

Resource	Description
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certification website, http://www.ab.com	Provides declarations of conformity, certificates, and other certification details.

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

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