

Installation Instructions

ControlLogix Remote I/O (RIO) Module

Catalog Number 1756-RIO

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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://literature.rockwellautomation.com>.

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://literature.rockwellautomation.com>) 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.

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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.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
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.

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:

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

Preventing 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.
-

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.

North American Hazardous Location Approval

<p>The following information applies when operating this equipment in hazardous locations:</p>	<p>Informations sur l'utilisation de cet équipement en environnements dangereux:</p>		
<p>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.</p>	<p>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.</p>		
<p>WARNING</p> 	<p>EXPLOSION HAZARD –</p> <ul style="list-style-type: none"> 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. 	<p>AVERTISSEMENT</p> 	<p>RISQUE D'EXPLOSION –</p> <ul style="list-style-type: none"> 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 inadapte 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 Universal 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](#).

ATTENTION



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

1756-RIO Module as a Scanner

As a scanner, the 1756-RIO module scans I/O on a Remote I/O network. The module:

- has one remote I/O channel.
- supports all remote I/O baud rates: 57.6, 115.2, 230.4 Kbaud.
- supports rack numbers from 0...76 octal.
- supports all combinations of partial racks.
- supports up to 32 physical adapters. To support 32 physical adapters, you must use an 82 Ω resistor; 150 Ω resistors allow only 16 adapters.
- supports block transfers at all possible locations.
- can update block transfers (BTs) automatically by the 1756-RIO or can be controlled by the ControlLogix controller.
- 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 allows the controller to exchange data with or monitor an existing scanner. The module:

- has one remote I/O channel.
- emulates one or more racks.
- supports all remote I/O baud rates: 57.6, 115.2, 230.4 Kbaud.
- supports rack numbers from 0...76 octal.
- supports all combinations of partial racks.
- supports 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.

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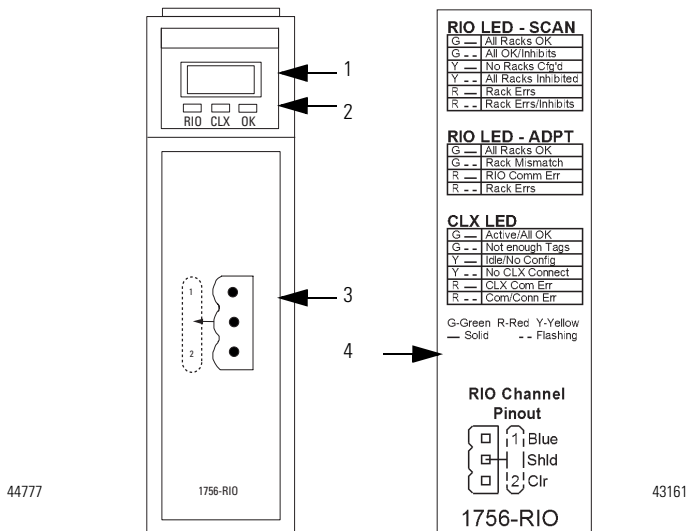
The module firmware can be updated using the Windows utilities software supplied with the module.

Before You Begin

Before you install your I/O module, you should:

- identify the module components. See [page 8](#).
- note the power requirements. See [page 9](#).
- 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 9](#).

Module Components



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Item	Description
1	A 4-character scrolling display.
2	Three status indicators: <ul style="list-style-type: none"> • 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	A 3-pin connector (blue hose) that connects to the remote devices. This is also known as the removable terminal block (RTB).
4	An inside-door label with error codes.

Power Requirements

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

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

Add these current/power values (4 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. For this installation, we will assume chassis power is off.

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.

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.

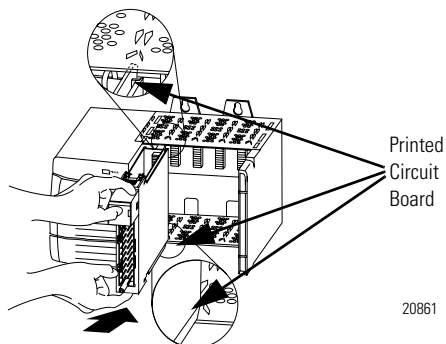
You can:

- 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.

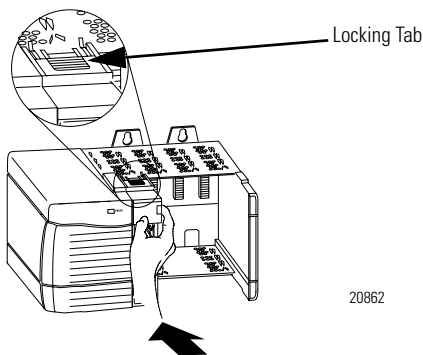
Install the Module in the Chassis

To install the module, follow these steps.

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



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

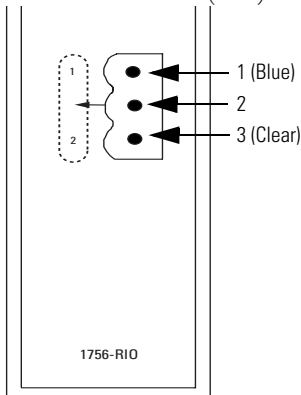


ATTENTION

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.



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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 (top)	Line 1 (blue)
2	Shield
3	Line 2 (clear)

1. Connect Line 1 (blue) of the remote I/O cable to the upper 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 lower 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 on the network. The terminator is connected between Line 1 (blue) and line 2 (clear).

Select the Proper Resistor

Use 82 ohm 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 ohm 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	10000 ft
115.2 Kbaud	5000 ft
230.4 Kbaud	2500 ft

Apply Chassis Power

Turn the chassis power supply on.

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 Power-up

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.

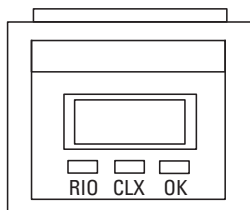
The display shows the following messages at power-up.

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 publication [1756-UM534](#), the 1756 RIO user manual.

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

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 1 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

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 1 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 startup 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 publication [1756-UM534](#), the 1756-RIO User Manual, for information on clearing fatal errors. Make a note of the error code numbers to give Tech Support, if you need to call for help.

Interpret the Alphanumeric Display

The Remote I/O (RIO) Communications Interface Module displays alphanumeric messages that provide diagnostic information about your module. The warning messages display twice, then the normal display resumes. The table summarizes the messages.

Alphanumeric Display Message Descriptions

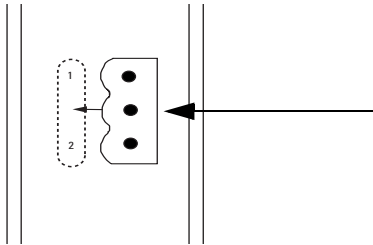
Message	Description
RIO Scanner v. x.xx.xx [banner]	The module's firmware version, displayed at powerup. The three parts of the version number are the major revision, the minor revision, and the build number. This is followed by the LED banner.
RIO Adapter v. x.xx.xx [banner]	

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.

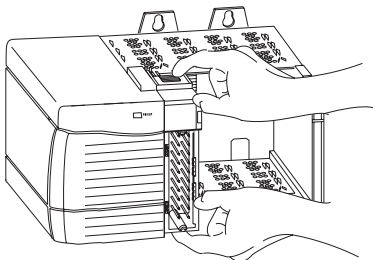


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Uninstall the Module

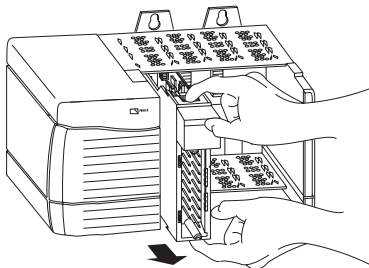
To remove the module, follow the steps below.

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:

- install the new module in the same slot.
- run the configuration program and download the appropriate configuration to the module.
- check that it has the correct firmware, scanner, or adapter version.

Specifications

Technical Specifications - 1756-RIO

Attribute	Value
Module location	1756 ControlLogix chassis
Backplane current, max	675 mA @ 5.1V DC 5 mA @ 24 V DC
Isolation voltage	30V (continuous), Basic insulation type
Power dissipation	4 W
Screw terminal torque	0.5...0.6 N•m (5...7 lb•in)
Wiring category ⁽¹⁾	2 - on communications ports
Wire size	0.519 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. See Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).

Environmental Specifications - 1756-RIO

Attribute	Value
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)
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 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz

Environmental Specifications - 1756-RIO

Attribute	Value
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⁾	Value
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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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 Certifications website, http://ab.com	Provides declarations of conformity, certificates, and other certification details.

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.

Notes:

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At <http://support.rockwellautomation.com>, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit <http://support.rockwellautomation.com>.

Installation Assistance

If you experience a problem within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your product up and running.

United States	1.440.646.3434 Monday – Friday, 8 a.m. – 5 p.m. EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

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