

# ControlNet Modular Repeater Medium-distance Fiber Module

Catalog Number 1786-RPFM

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## About the Module

Use the 1786-RPFM module when you need a medium-distance fiber link between two ControlNet products. Maximum distance is 3000 m (9843 ft). The fiber link provides ground isolation between nodes and is less susceptible to noisy environments than copper media.

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**IMPORTANT** The supported distance depends on the quality of the fiber, number of splices, and connectors. The total light loss through the fiber link must be less than 13.3 dB.

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### 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.

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

	<b>WARNING:</b> 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.
	<b>ATTENTION:</b> 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.
	<b>SHOCK HAZARD:</b> Labels may be on or inside the equipment, for example, drive or motor, to alert people that dangerous voltage may be present.
	<b>BURN HAZARD:</b> Labels may be on or inside the equipment, for example, drive or motor, to alert people that surfaces may reach dangerous temperatures.
<b>IMPORTANT</b>	Identifies information that is critical for successful application and understanding of the product.

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## Environment and Enclosure

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**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, Rockwell Automation 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.





**ATTENTION:** This equipment is not resistant to sunlight or other sources of UV radiation.

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## North American Hazardous Location Approval

<b>The following information applies when operating this equipment in hazardous locations.</b>	<b>Informations sur l'utilisation de cet équipement en environnements dangereux.</b>
<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>
<div style="display: flex; align-items: center;">  <div> <p><b>WARNING:</b> <b>Explosion Hazard -</b></p> <ul style="list-style-type: none"> <li>• Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.</li> <li>• 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.</li> <li>• Substitution of components may impair suitability for Class I, Division 2.</li> <li>• If this product contains batteries, they must only be changed in an area known to be nonhazardous.</li> </ul> </div> </div>	<div style="display: flex; align-items: center;">  <div> <p><b>AVERTISSEMENT:</b> <b>Risque d'Explosion -</b></p> <ul style="list-style-type: none"> <li>• Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement.</li> <li>• 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.</li> <li>• La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe I, Division 2.</li> <li>• S'assurer que l'environnement est classé non dangereux avant de changer les piles.</li> </ul> </div> </div>

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## European Hazardous Location Approval

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### European Zone 2 Certification (The following applies when the product bears the Ex Marking.)

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This equipment is intended for use in potentially explosive atmospheres as defined by European Union Directive 94/9/EC and has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of Category 3 equipment intended for use in potentially explosive atmospheres, given in Annex II to this Directive. Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 60079-15 and EN 60079-0.

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**WARNING:** You must follow these guidelines:

- This equipment must be installed in an enclosure providing at least IP54 protection when applied in Zone 2 environments.
  - This equipment shall be used within its specified ratings defined by Rockwell Automation.
  - Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.
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## Prevent Electrostatic Discharge

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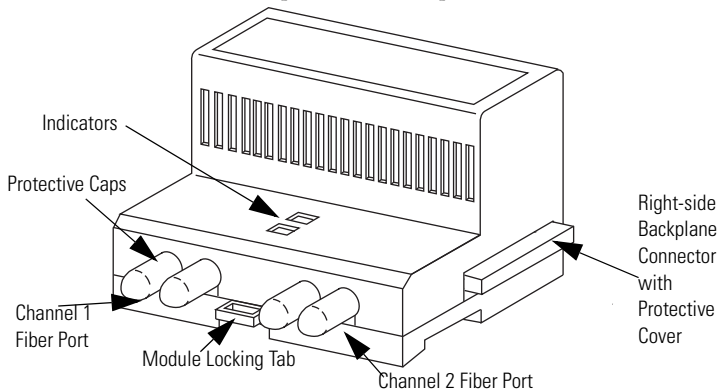


**ATTENTION:** This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- 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.
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## Module Components

The illustration shows the components that comprise the 1786-RPFM module.



Both sides of the module contain a backplane connector.

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## Mount the Module

Mount the module on a 35 x 7.5 mm (1.38 x 0.30 in.) DIN rail, Allen-Bradley part number 199-DR1, 46277, EN 50022.

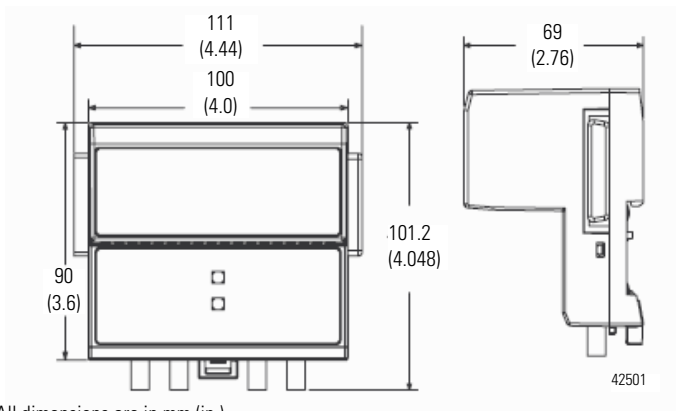


**ATTENTION:** This product is grounded through the DIN rail to chassis ground. Use zinc-plated yellow-chromate steel DIN rail to assure proper grounding. The use of other DIN-rail materials (for example, aluminum or plastic) that can corrode or oxidize, or are poor conductors, can result in improper or intermittent grounding. Secure DIN rail to mounting surface approximately every 200 mm (7.87 in.) and use end-anchors appropriately.

### TIP

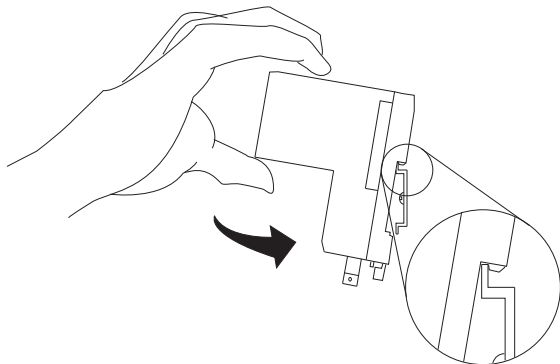
When using the 1786-RPFM module, we recommend horizontal mounting if cabinet temperatures are expected to approach 60 °C (140 °F). If your expected temperatures are much lower than 60 °C (140 °F), vertical mounting is acceptable. If using vertical mounting, we recommend that the 1786-RPA repeater adapter module be mounted at the top.

## Mounting Dimensions



All dimensions are in mm (in.).

1. Position the module at a 30° angle.



2. Hook the lip on the back of the module to the top of the DIN rail and press the bottom of the module until the locking tab snaps securely in place.

### TIP

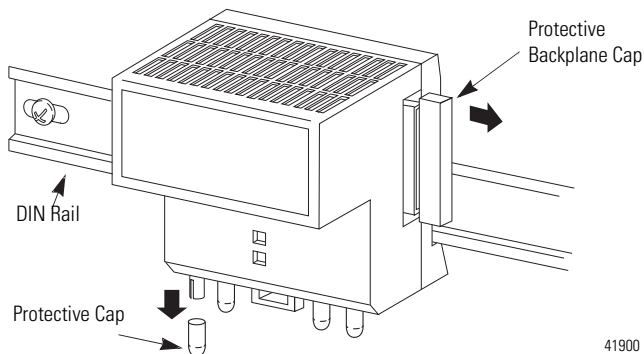
Use a screwdriver to move the locking tab downward, if the module is not secured.

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**WARNING:** If 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.



Both sides of the module contain a backplane connector.

If	Then
You will connect another module	Remove the protective backplane cap.
You will not use the backplane connector	Keep the protective cap on to protect the connector from dust.

3. If necessary, remove the protective caps from the transmit and receive fiber channels.

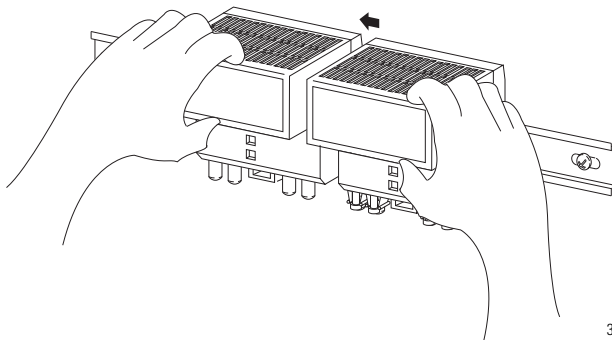


**ATTENTION:** Do not discard the end cap. Use this end cap to cover the exposed interconnections on the last module on the DIN rail. Failure to do so could result in equipment damage.



If	Then
You will use a channel	Remove the protective cap from the channel.
You will not use a channel	Keep the protective cap on to protect the channel from dust.
You place the module in storage	Keep the protective cap on to protect the channel from dust.

4. If applicable, slide the module to the left to mate with the repeater adapter or another repeater module.



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**IMPORTANT** Make certain that you secure the adapter and repeater modules with DIN-rail anchors. If you do not, loss of communication or module damage may result.

Consult with your local distributor for attenuation specifications before you purchase your fiber media components.

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You can attach a maximum of four modules to the repeater adapter, or, the number of modules whose total power consumption does not exceed 1.6 A @ 5V DC, whichever occurs first.

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**IMPORTANT** If you exceed the module or power limit, you may damage the repeater adapter and modules.

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### Select Fiber Cable

The type of fiber cable you choose depends on the network environment. The quality of fiber cable determines the distance you can achieve. The maximum length of a fiber cable section for the module depends on the quality of fiber, number of splices, and the number of connectors. The total attenuation for a cable must be less than 13.3 dB. Typically, cable attenuation for a wavelength of 1300 nm is less than 1.5 dB/km.

Refer to the specification table on [page 13](#) and also to the ControlNet Fiber Media Planning and Installation Guide, publication [CNET-IN001](#), for more details.

Also, consult with your local distributor for attenuation specifications before you purchase your fiber media components.

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**IMPORTANT** Avoid splicing your cable. Connectors can cause considerable attenuation and limit the maximum length of your system. Make certain to check the attenuation of different cable sections after you install the cable.

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### Terminate Your Cable

You must terminate a medium distance cable in the field. To terminate, we recommend that you cover unused ports with a suitable protector cap to prevent dust and other contaminants from damaging the fiber transceiver ports.

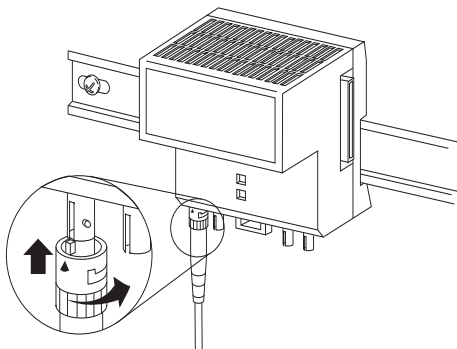
For unused ports, we recommend that you place a simplex jumper between the transmit port and receive port of an unused channel.

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## Connect the Fiber Module

If you are wiring only one channel, you can use either channel 1 or channel 2. Do these steps to connect to channel 1, receive (RX).

1. Align the knob of the cable connector with the groove of the module connector.
2. Insert the connector into channel 1 RX.



3. Twist the receive connector until the bayonet lug locks into place.
4. Repeat these procedures to connect to channel 1, transmit (TX).

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**IMPORTANT** Make certain the fiber cable you connect to channel 1 (receive) on one module is set to channel 1 (transmit) on the other module. You can use channel 1 or channel 2 on either module.

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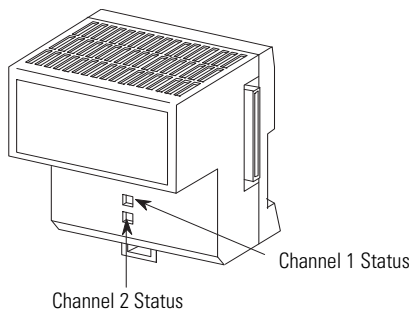
**ATTENTION:** Under certain conditions, viewing the optical port may expose the eye to hazard. When viewed under some conditions, the optical port may expose the eye beyond the maximum permissible exposure recommendations.

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### Troubleshoot the Module

Use the channel 1 or 2 status indicators to check module status and troubleshoot the module.



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Indicator	Probable Cause
Off	Repeater not connected to the power supply.
Green	Channel is operating normally.
Flashing Green	No activity on the channel.



**ATTENTION:** Class 1 laser product. Laser radiation is present when the system is open and interlocks bypassed. Allow only trained and qualified personnel to install, replace, or service this equipment.

## Specifications

### Technical Specifications - 1786-RPFM

Attribute	Value
All supply voltages or voltage ranges	Backplane: 5V DC, 400 mA
Dissipation	2 W
Communication rate	5 Mbps
Mounting orientation	Any mounting orientation
Minimum enclosure size (HxWxD), approx	304.8 x 196.8 x 101.6 mm (12 x 7.75 x 4 in.)
Fiber type	62.5/125 Micron multimode OM-1 fiber
Power level	
TX power, min	(-16 dBm) @ 25 °C (77 °F) into 62.5/125 µm Micron multimode fiber (-19.5 dBm) @ 25 °C (77 °F) into 50/125 µm Micron multimode fiber
RX responsivity, min	-32.8 dBm @ 25 °C (77 °F)
Fiber termination type ST	Plastic or ceramic
Fiber operation wavelength	1300 nm
Optical power budget	13.3 dB <sup>(1)</sup>
Transmitter output	<5 mW/nm
Enclosure type rating	None (open-style)
North American temp code	T5
IEC temp code	T4

- (1) This includes all loss associated with the fiber link, including splices, fiber attenuation, bulkhead connectors, and the ST terminations.

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### Environmental Specifications - 1786-RPFM

Attribute	Value
Temperature, operating  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)
Temperature, surrounding air, max	60 °C (140 °F)
Temperature, nonoperating  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
Vibration  IEC60068-2-6 (Test Fc, Operating)	5 g @ 10...500 Hz
Shock, operating  IEC60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating  IEC60068-2-27 (Test Ea, Unpackaged Shock)	50 g

**Environmental Specifications - 1786-RPFM**

<b>Attribute</b>	<b>Value</b>
Emissions CISPR 11	Group 1, Class A
ESD immunity IEC 61000-4-2	4 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 and 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz

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**Certifications<sup>(1)</sup> - 1786-RPFM**

<b>Certification<sup>(2)</sup></b>	<b>Value</b>
UL	UL Listed Industrial Control Equipment. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C.  CSA Certified Process Control Equipment for Class I, Division 2 Group A, B, C, D Hazardous Locations. See CSA File LR69960C.
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations
CE	European Union 2004/108/EC EMC Directive, compliant with: <ul style="list-style-type: none"> <li>• EN 61326-1; Meas./Control/Lab., Industrial Requirements</li> <li>• EN 61000-6-2; Industrial Immunity</li> <li>• EN 61000-6-4; Industrial Emissions</li> <li>• EN 61131-2; Programmable Controllers (Clause 8, Zone A &amp; B)</li> </ul>
C-Tick	Australian Radiocommunications Act, compliant with: <ul style="list-style-type: none"> <li>• AS/NZS CISPR 11; Industrial Emissions</li> </ul>
Ex	European Union 94/9/EC ATEX Directive, compliant with: <ul style="list-style-type: none"> <li>• EN 60079-15; Potentially Explosive Atmospheres, Protection 'n'</li> <li>• EN 60079-0; General Requirements</li> <li>• II 3 G Ex nA IIC T4X</li> </ul>

(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
ControlNet Coax Taps Installation Instructions, publication <a href="#">1786-IN007</a>	Document contains procedures and specifications for the installation of ControlNet coaxial taps.
ControlNet Coax Media Planning and Installation Guide, publication <a href="#">CNET-IN002</a>	Document describes the components and topologies for creating a ControlNet coax media system.
ControlNet Fiber Media Planning and Installation Guide, publication <a href="#">CNET-IN001</a>	Document describes the components and topologies for creating a ControlNet fiber media system.
Industrial Automation Wiring and Grounding Guidelines, publication <a href="#">1770-IN041</a>	More information on proper wiring and grounding techniques.

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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**Notes:**

## Notes:

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# Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At <http://www.rockwellautomation.com/support/>, 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://www.rockwellautomation.com/support/>.

## 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 or Canada	1.440.646.3434
Outside United States or Canada	Use the <a href="#">Worldwide Locator</a> at <a href="http://www.rockwellautomation.com/support/americas/phone_en.html">http://www.rockwellautomation.com/support/americas/phone_en.html</a> , or contact your local Rockwell Automation representative.

## 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 to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

## Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete this form, publication [RA-DU002](#), available at <http://www.rockwellautomation.com/literature/>.

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