



## *Installation Instructions*

# **ControlNet Modular Repeater Medium Distance Fiber Module**

Cat. Nos. 1786-RPFM

Use this document as a guide when you install a ControlNet™ repeater fiber module for medium distances. This document contains:

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This product is associated with a planning and installation guide, publication CNET-IN001A-EN-P, The ControlNet Fiber Media Planning and Installation Guide. To view it, visit [www.ab.com/manuals](http://www.ab.com/manuals) or [www.theautomationbookstore.com](http://www.theautomationbookstore.com)

You can purchase a printed manual by:

- contacting your local distributor or Rockwell Automation representative
- visiting [www.theautomationbookstore.com](http://www.theautomationbookstore.com) and placing an order
- calling 800.963.9548 (USA/Canada) or 001.320.725.1574 (outside USA/Canada)

## Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Allen-Bradley does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1, *Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control* (available from your local Allen-Bradley office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

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Throughout this manual we use notes to make you aware of safety considerations:

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### ATTENTION



Identifies information about practices or circumstances that can lead to personal injury or death, property damage or economic loss

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Attention statements help you to:

- identify a hazard
- avoid a hazard
- recognize the consequences

### IMPORTANT

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

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## European Communities (EC) Directive Compliance

If this product has the CE mark it is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

### EMC Directive

This product is tested to meet the Council Directive 89/336/EC Electromagnetic Compatibility (EMC) by applying the following standards, in whole or in part, documented in a technical construction file:

- EN 50081-2 EMC — Generic Emission Standard, Part 2 — Industrial Environment
- EN 50082-2 EMC — Generic Immunity Standard, Part 2 — Industrial Environment

This product is intended for use in an industrial environment.

### Low Voltage Directive

This product is tested to meet Council Directive 73/23/EEC Low Voltage, by applying the safety requirements of EN 61131-2 Programmable Controllers, Part 2 - Equipment Requirements and Tests. For specific information required by EN 61131-2, see the appropriate sections in this publication, as well as the Allen-Bradley publication Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

This equipment is classified as open equipment and must be mounted in an enclosure during operation to provide safety protection.

## Fiber Optic Safety Statements

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### ATTENTION



Do not look directly into the fiber ports. Light levels will cause damage to your eyesight.

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### ATTENTION



"Hazardous areas require the use of specifically designed products. This product is designed for Class I, Division 2 hazardous environments, and nonhazardous environments only. Allen-Bradley provides similar products which are intrinsically safe and are suitable for more hazardous environments. Use the appropriate products that are designed for the specific hazardous environments that your installation requires.

In intrinsically safe applications, consult with your local safety coordinator, and publication CNET-IN003A-US-P, the ControlNet EX Media Planning and Installation Manual because you need specific products on both ends of the fiber link."

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## Rockwell Automation Support

Rockwell Automation offers support services worldwide, with over 75 sales/support offices, over 500 authorized distributors, and 260 authorized systems integrators located throughout the United States alone, plus Rockwell Automation representatives in every major country around the world. Contact your local Rockwell Automation representative for:

- sales and order support
- product technical training
- warranty support
- support service agreements

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## Obtain Pre-Sales Product Support

If you need to contact Rockwell Automation for pre-sales product support, try one of the following methods:

- Call your local Rockwell Automation representative
- Network pre-sales support line, 1.440.646.3638 (3NET)
- Pre-Sales e-mail, [RAcle3net@ra.rockwell.com](mailto:RAcle3net@ra.rockwell.com)

## Obtain Technical Product Support

If you need to contact Rockwell Automation for technical assistance, try one of the following methods:

<b>Type of technical support:</b>	<b>Access at:</b>
Personalized Service	Call your local Rockwell Automation representative
Post-sales Technical Support	1.440.646.5800
Email your questions to	<a href="mailto:racleasktheexpert@ra.rockwell.com">racleasktheexpert@ra.rockwell.com</a>
Internet site	<a href="http://www.ab.com">www.ab.com</a> , then select Product Support or <a href="http://www.ab.com/support/products/pccards.html">www.ab.com/support/products/pccards.html</a>

**Note:** You can access Rockwell Automation Knowledge Documents from this internet address.

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## About the Fiber Module

Use this module when a medium-distance (distances of 3000m/ 9843ft) fiber link is required between two ControlNet products. This fiber link provides ground isolation between nodes and is less susceptible to noisy environments than traditional copper media.

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**IMPORTANT**

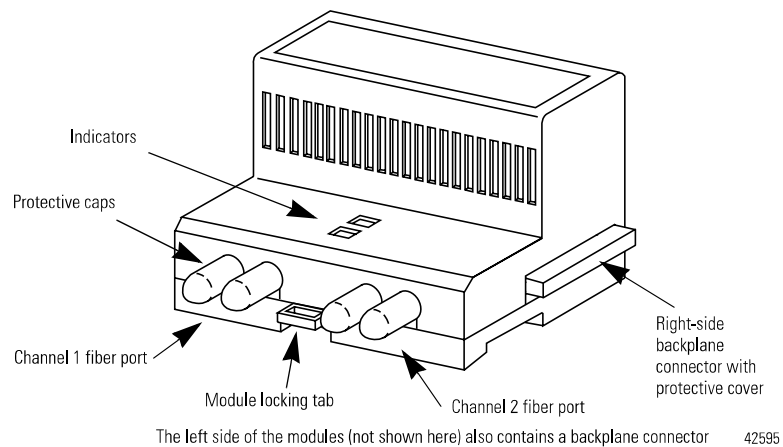
The distance that can be supported is dependent on the quality of the fiber, number of splices, and connectors. The total loss of the fiber link must be less than 13.3 dB.

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The module provides:

- two fiber channels
- activity LED indicators for each fiber channel

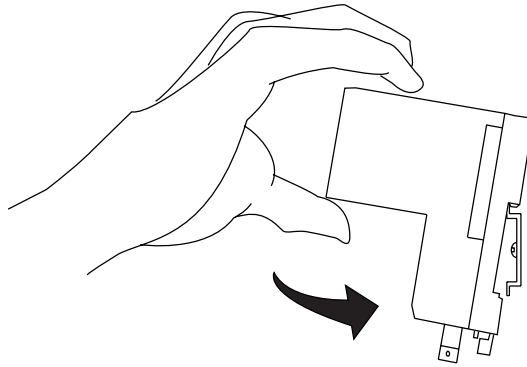
**Figure 1 Components of the Module**



## Mount the Fiber Module

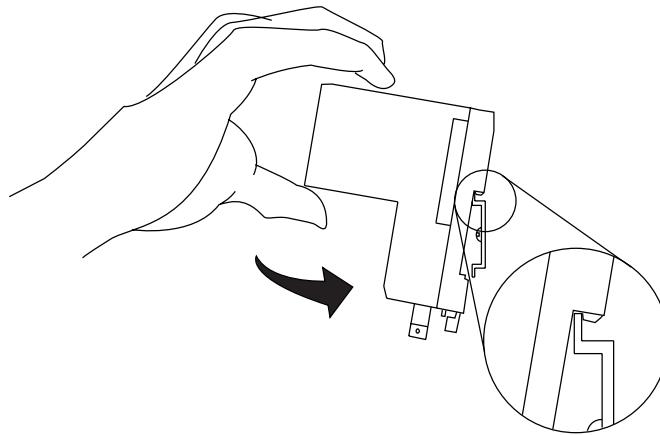
To mount the module on the DIN rail:

1. Position the module on a 35 x 7.5mm DIN rail (Allen- Bradley part number 199- DR1; 46277- 3; EN 50022) at a 30° angle.



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2. Hook the lip on the rear of the module onto the top of the DIN rail, and rotate the module onto the rail.

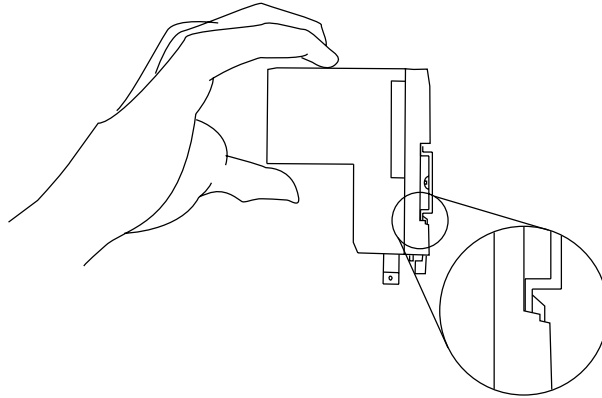


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3. Press the module down onto the DIN rail until flush.

The locking tab should snap into position and lock the module to the DIN rail.

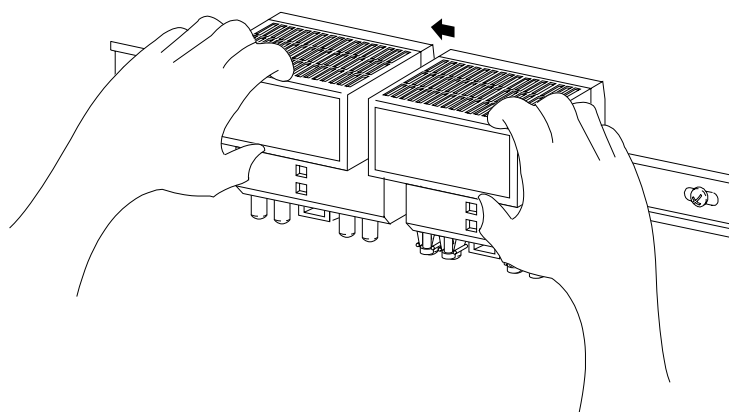
4. If the module does not snap into position, use a screwdriver or similar device to move the locking tab down while pressing the module flush onto the DIN rail. Release the locking tab to lock the module in place. If necessary, push up on the locking tab to lock.



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5. Remove the protective backplane cap as shown in “Remove the Protective Caps” on page 10.
6. Once attached to the DIN rail, slide modules to the left to mate with the repeater adapter or another repeater module.

**ATTENTION**

Be certain that the adapter and repeater modules are secured together with DIN rail anchors. Failure to do so may result in the loss of communications and/ or cause damage to the modules. The total number of modules that can be attached to the repeater adapter can not exceed four or the total power consumption of the modules can not exceed 1.6A @ 5VDC, whichever comes first.

**IMPORTANT**

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

**IMPORTANT**

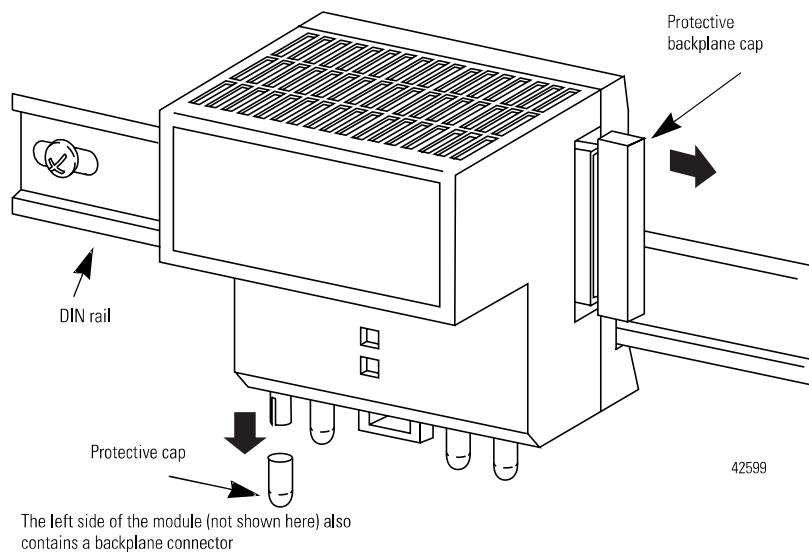
If this is the right-most module, a DIN rail latch must be used on the right side of the fiber module.

7. Connect the fiber cable as shown in “Connect the Fiber Cable” on page 13.

## Remove the Protective Caps

1. Remove the protective caps from the fiber ports that you are going to use.
2. Save the caps for future use.

**Figure 2 Protective Caps**



<b>If you plan:</b>	<b>Then:</b>
not to use channel(s)	keep the protective caps on the channels to protect the unit from dust.
to place the module in storage	keep the protective caps on the channels to protect the unit from dust.
to connect another module to the right backplane connector	remove the protective backplane cap and save cap or future use.
not to connect to the right backplane connector	leave the backplane cap on.

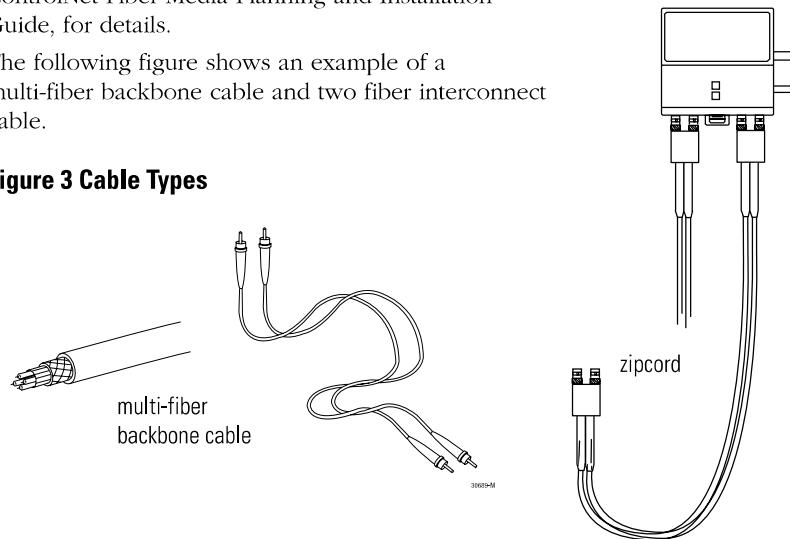
## Choose Fiber Cable Types

Multi-fiber cables for backbone use are available with a wide range of fiber counts; between 2 and 216 fibers. Rockwell offers the short distance (< 300 m) fiber cable preterminated “zipcord” as a kit for use with the 1786-RPFS fiber module. You terminate the medium and long distance (> 300 m) cable in the field.

The type of fiber cable you choose to use depends on the network environment. Consult your installation professional to determine the best type of cable to use for your environmental conditions. Refer to Publication CNET-IN001A-EN-P, The ControlNet Fiber Media Planning and Installation Guide, for details.

The following figure shows an example of a multi-fiber backbone cable and two fiber interconnect cable.

**Figure 3 Cable Types**



## What is termination?

Termination is simply the process of attaching a connector to the ends of our fiber cable. This is done in a similar manner as the coax BNC is terminated to the end of a coax cable. We terminate the coax network at the two ends of the network to prevent reflections in the system. This is not required for fiber. We recommend that you cover unused ports with a suitable protector cap to prevent dust and other contaminants from damaging the fiber transceiver ports. The protector cap for fiber is equivalent to the dust cap for a ControlNet Tap drop cable.

However, for a ControlNet drop cable we also provide a 1786-TCAP for unused taps to make them electronically transparent to the network. For the Fiber repeaters we recommend that a simplex jumper be placed between the transmit port and receive port of an unused channel. This is somewhat similar to the 1786-TCAP for the coax. See Figure 2 on page 10.

## Specifications for 1786-RPFM Fiber Optic Cable

The quality of the fiber cable determines the distance you can achieve. Consult your local distributor for attenuation specifications prior to purchasing your fiber media components. The table below provides specifications for fiber optic cable:

Item	Description
Fiber Type	62.5/125µm
Fiber Termination Type	ST® (Plastic or ceramic)
Fiber Operating Wavelength	1300nm
Optical Power Budget	13.3db <sup>1</sup>

<sup>1</sup>This includes all loss associated with the fiber link, including: splices, fiber attenuation, bulkhead connectors, and the 1786-RPFM ST terminations.

The medium-distance fiber module (1786-RPFM) is designed for use with 62.5/125µm multi-mode optic fiber and plastic or ceramic ST type connectors. The wavelength used is 1300 nm.

## Estimate Cable Lengths

The maximum length of a fiber cable section for the 1786-RPFM is dependent on the quality of the fiber, number of splices, and the number of connectors. The total attenuation for a cable section **must** be less than 13.3dB.

Typically cable attenuation for a wavelength of 1300nm is less than 1.5dB/km.

### IMPORTANT

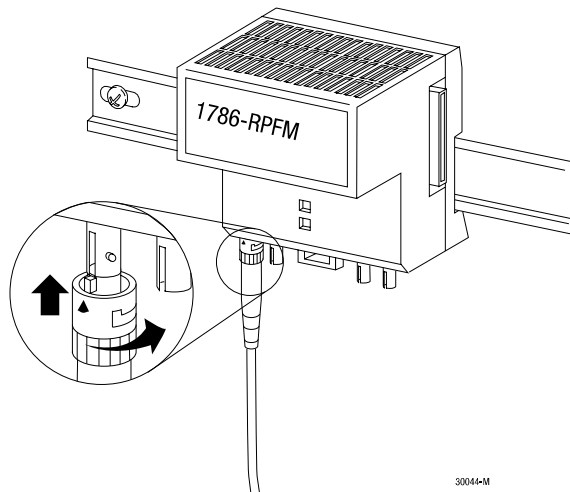
Avoid splicing your cable. Connectors can cause considerable attenuation and limit the maximum length of your system. Be certain to check the attenuation of different cable sections after the cable is installed.

## Connect the Fiber Cable

If you are going to use only one channel, use either Channel 1 or Channel 2.  
To connect the cable for Channel 1:

1. Connect to Channel 1 Receive (RX).
  - a. Align the knob of the cable connector with the groove of the module connector, and insert the connector into Channel 1 RX.

**Figure 4 Connect the Fiber Cable**



- b. Twist the Receive connector until the bayonet lug is locked into place
2. Connect to Channel 1 Transmit (TX), repeat Step 1.

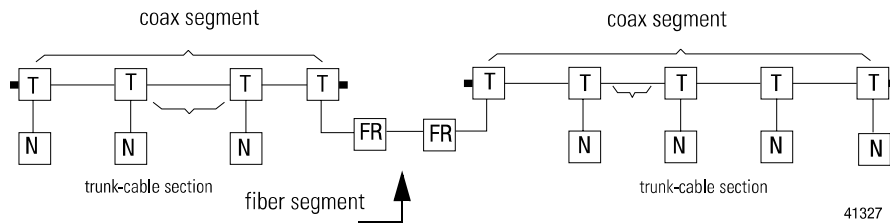
To connect the fiber cable to Channel 2:

1. Repeat the steps for Channel 1 and refer to the following figure.

### Example Topology

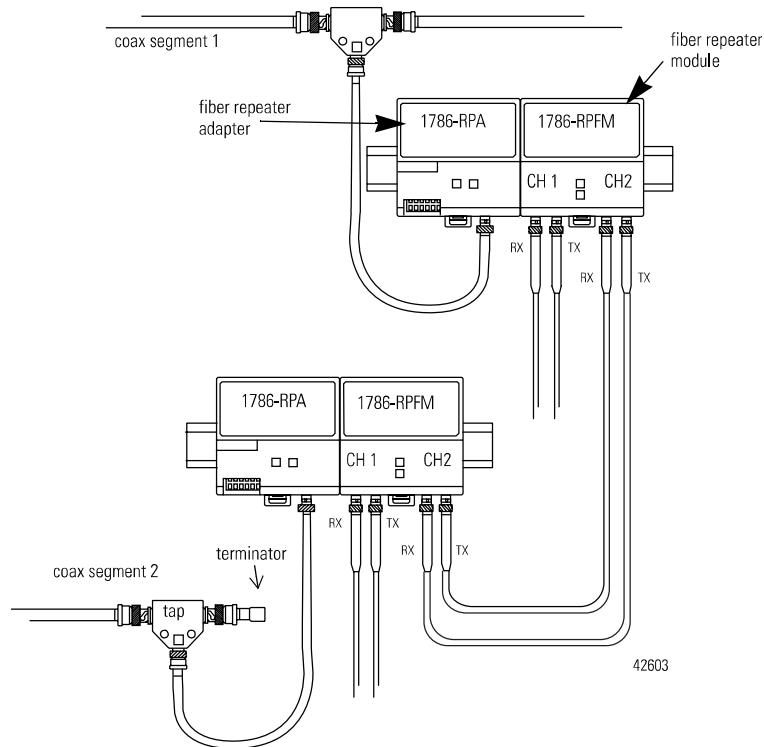
**Figure 5 This topology is for example purposes only.**

Create a new segment with a fiber repeater.



When you insert a fiber repeater into your media system, you create a new segment or link. The same restrictions on the number of taps and cable length apply to this new segment.

**Figure 6 Basic fiber topology**



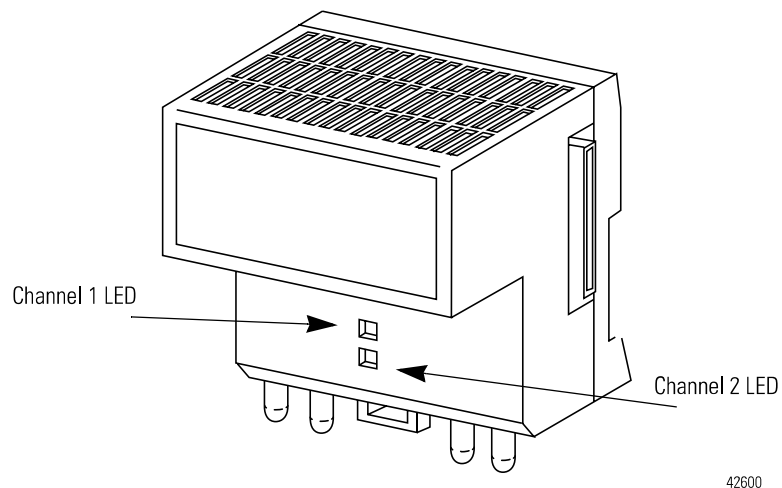
**IMPORTANT**

Be certain that the fiber cable you connect to Channel 1 (RX) on one 1786-RPFM repeater to Channel 1 (TX) on the other 1786-RPFM repeater. You can use Channel 1 or Channel 2 on either module.

## Status Indicators

The figure below identifies the LEDs on the module.

**Figure 7 Status Indicators:**



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Status Indicator (LEDs)	Probable Cause
Off	Repeater not connected to power supply
Green	Repeater is running without errors. The received data frames are within specification for bit width distortion.
Flashing Green/Off	No data activity on network.

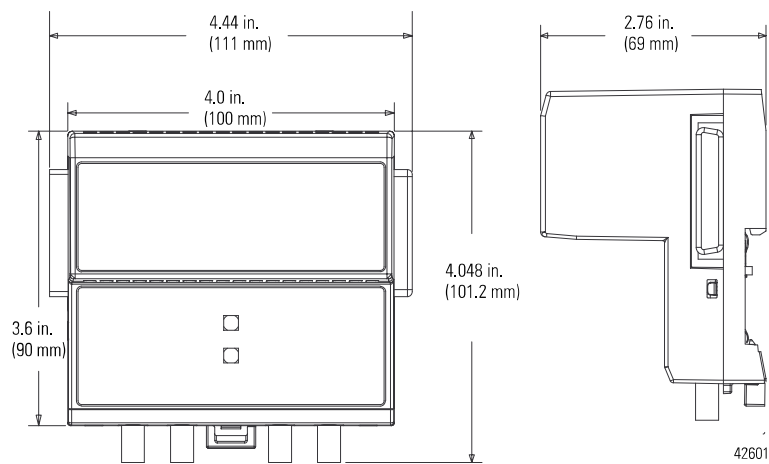
## Related Publications

The table below lists publications that you may want to refer to for additional information:

Publication	Publication Number
Industrial Automation Wiring and Grounding Guidelines	1770-4,1
ControlNet Fiber Media Planning and Installation Manual	CNET-IN001A-EN-P
ControlNet Coax Tap Installation Instructions	1786-5,7
ControlNet COAX Media Planning and Installation Manual	CNET-IN002A-EN-P
ControlNet Cable System Component List	AG-2,2

## Mounting Dimensions






Figure 8 Mounting Dimensions





## Specifications

Specification	Range
<b>Communication Rate</b>	5M bits/s
<b>Operation Voltage</b>	Class 2 operational power is provided from 1786-RPA at 5 V dc <sup>(2)</sup>
<b>Backplane Power Requirements</b>	400 mA maximum
<b>Indicators</b>	Channel 1 Status - Green Channel 2 Status - Green
<b>Environmental Conditions</b>	This product must be mounted within a suitable system enclosure to prevent personal injury resulting from accessibility to live parts. The interior of this enclosure must be accessible only by the use of a tool.
Operating Temperature	0 to 60° C (32 to 125° F)
Storage Temperature	-40 to 85° C (-40 to 185° F)
Pollution	This industrial control equipment is intended to operate in a Pollution Degree 2 environment, in overvoltage category II applications, (as defined in IEC publication 664A) at altitudes up to 2000 meters without derating.
Relative Humidity	5 to 95% non-condensing
Shock	Operating Non-operating
	30 g peak acceleration, 11(± 1)ms pulse width 50 g peak acceleration, 11(± 1)ms pulse width
Vibration	Tested 5 g @ 10-500Hz per IEC 68-2-6

Specification	Range
<b>Fiber Type</b> 62.5/125 micron Fiber TerminationTypeST® Fiber Operating Wavelength Optical Power Budget LED Light Output <sup>2</sup>	(plastic or ceramic) 1300 nm 13.3 dB <sup>(1)</sup> <5 mW/mm
<b>Agency Certification</b> (when product or package marked)	 Listed Industrial Control Equipment  Certified Process Control Equipment Certified Class 1, Division 2, Groups A, B, C, D  Approved Class 1, Division 2, Groups A, B, C, D  Marked for all applicable directives  Marked for all applicable acts N223

<sup>1</sup>This includes all loss associated with the fiber link, including: splices, fiber attenuation, bulkhead connectors, and the ST terminations.

<sup>2</sup>Power to operate this equipment must be supplied from a source compliant with "Class 2" as defined in the National Electrical Code ANSI/NFPA 70, or the Canadian Electrical Code - Part 1, C22.1.

## Hazardous Location Approval

### The following information applies when operating this equipment in hazardous locations:

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 that has jurisdiction at the time of installation.



#### 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.

### Informations sur l'utilisation de cet équipement en environnements dangereux:

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.



#### 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 1, Division 2.
- S'assurer que l'environnement est classé non dangereux avant de changer les piles.

## Notes:

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