Installation Instructions

ControlNet Fiber Optic Ring Repeater Modules

Cat. Nos. 1786-RPFRL, -RPFRXL

Use this document as a guide when you install a ControlNet™ fiber optic ring repeater module. This module is specifically designed for use in ring topologies; however, you can also use this module in a point-to-point topology. Refer to About the Fiber Ring Module on page 7 and Understand Basic Fiber Topology on page 8. This document contains:

TIP

Throughout this manual, when we refer to both the 1786-RPFRL and 1786-RPFRXL modules, we show the modules' combined catalog number in this way:

1786-RPFR(X)L

Publication 1786-IN003B-EN-P - February 2002

This product is associated with a planning and installation guide, publication CNET-IN001A-EN-P, ControlNet Fiber Media Planning and Installation Guide. To view or download it, visit www.ab.com/manuals or www.theautomationbookstore.com
You can purchase a printed manual by:

- contacting your local distributor or Rockwell Automation representative
- visiting 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 these products 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. In no event will Allen-Bradley be responsible or liable for indirect or consequential damage resulting from the use or application of these products.

Any illustrations, charts, sample programs, and layout examples shown in this publication 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.

Throughout this publication, notes may be used to make you aware of safety considerations. The following annotations and their accompanying statements help

you to identify a potential hazard, avoid a potential hazard, and recognize the consequences of a potential hazard:

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.

IMPORTANT

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

ATTENTION

Environment and Enclosure

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

This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance.

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 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.

See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure. Also, see the appropriate sections in this publication, as well as the Allen-Bradley publication 1770-4.1 ("Industrial Automation Wiring and Grounding Guidelines"), for additional installation requirements pertaining to this equipment.

ATTENTION

Preventing Electrostatic Discharge

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.
- If available, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

Fiber Optic Safety Statements

ATTENTION

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

WARNING

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-IN003, ControlNet EX Media Planning and Installation Manual, because you need specific products on both ends of the fiber link.

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

Obtain Pre-Sales Product Support

If you need to contact Rockwell Automation for pre-sales product support, call your local Rockwell Automation representative.

Obtain Technical Product Support

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

Type of technical support:	Access at:
Personalized Service	Call your local Rockwell Automation representative
Post-sales Technical Support	1.440.646.5800
Email your questions to	racleasktheexpert@ra.rockwell.com
Internet site	www.ab.com

Related Publications

This table lists publications that you may want to refer to for additional information. Refer to page 2 for ordering instructions.

Publication	Publication Number
Industrial Automation Wiring and Grounding Guidelines	1770-4.1
ControlNet Coax Tap Installation Instructions	1786-5.7
ControlNet Modular Repeater Installation Instructions	1786-IN013
ControlNet Fiber Media Planning and Installation Manual	CNET-IN001
ControlNet Coax Media Planning and Installation Manual	CNET-IN002
ControlNet EX Media Planning and Installation Manual	CNET-IN003
ControlNet Media System Component List	AG-2.2

About the Fiber Ring Module

The ControlNet Fiber Ring Repeater is a modular repeater that supports fiber media redundancy by using a ring topology. The implementation of fiber-optic technology permits very long transmission ranges and provides optimum protection against EMI effects both along the transmission link and at the repeaters themselves (because of the electrical isolation).

Use this module when a long-distance fiber link (ring or point-to-point) 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.

IMPORTANT

The distance between repeaters 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 15dB for the 1786-RPFRL and 10.5dB for the 1786-RPFRXL.

The total size of the ring or length of the copper and fiber ControlNet network is limited by the ControlNet protocol to 20Km or less. Refer to Determine Maximum Network Length on page 17 for more information.

To determine the maximum distance between any 2 fiber modules, refer to the table on page 16.

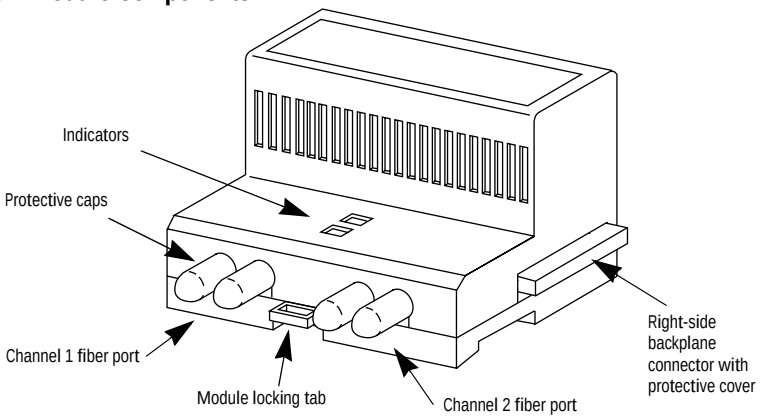
TIP

You must use an adapter module (1786-RPA) with the 1786-RPFR(X)L module.

The modules provide:

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

Figure 1 Module Components



About Fiber Topology

The topology examples in this section are for illustration purposes only. Refer to the ControlNet Fiber Media Planning and Installation Guide, publication CNET-IN001, for details.

Understand Basic Fiber Topology

The 1786-RPFR(X)L module is used to create a redundant optical link between segments. When used in a ring topology, a single media failure between any two 1786-RPFR(X)L modules in a ring will not impact the communication link.

The repeaters detect the failure of an optical link. When a failure occurs, the affected channel port LED will be either:

- red, indicating a faulty link, or
- flashing green/off, indicating no network activity is present
- Refer to Interpreting the Status Indicators on page 24 for more information on status indicator LEDs.

We recommend that you install the duplex optical cables of the two optical channels along different routes.

The fiber repeater consists of a repeater adapter (1786-RPA) and 1 to 3 fiber repeater modules (1786-RPFS, -RPFM, -RPFRL, and -RPFRXL).

In addition to using the fiber repeater in a ring topology, you can also use it:

- to extend the total length of your segment
- to create a star configuration (multiple directions from one point)

The number of fiber repeaters and cable length total limit depends on your network topology. A fiber optic ring may contain as many as 20 member modules, depending on the application. For more information on topology application rules in relation to fiber rings, refer to the ControlNet Fiber Media Planning and Installation Guide, publication CNET-IN001, for details.

Example Topology Applications

The following figures show applications using example topologies.

TIP

Redundant power supplies help to increase reliability. The power supplies should be powered from separate mains.

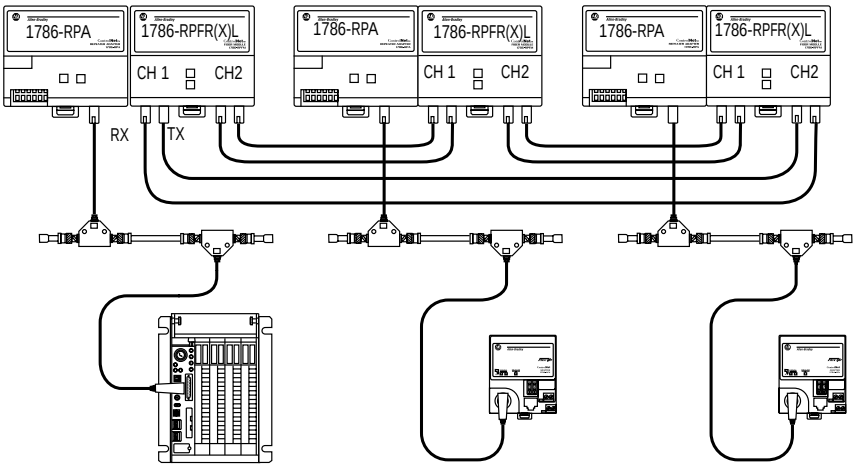
Figure 2 Fiber Ring Topology Example

Use this configuration to achieve redundancy over a long distance (not available when you use traditional copper media).

IMPORTANT

Because hardware and copper media redundancy cannot be achieved outside the ring, the 1786-RPFR(X)L modules cannot be used in a ring topology to achieve network redundancy. The ring topology is inherently redundant when connected as a ring. If your application requires hardware and copper media redundancy, use a linear fiber topology. You may use the 1786-RPFR(X)L modules as well as the standard 1786 RPFS/M modules in a linear fiber topology

In a redundant topology, we recommend that you keep the number to a minimum, and keep copper segments as short as possible.

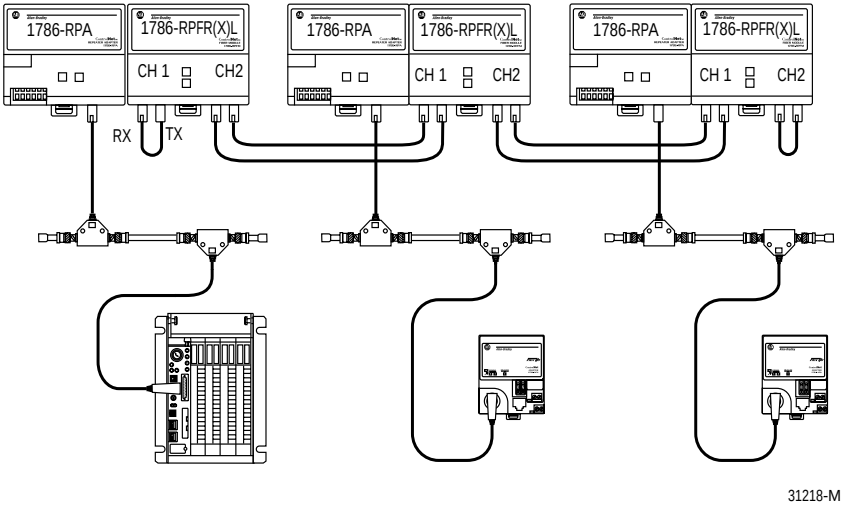


31219-M

On all 1786-RPFRL or -RPFRXL modules, the left-most connector is the RX port; the right-most connector is the TX port.

Figure 3 Fiber Linear Topology Example

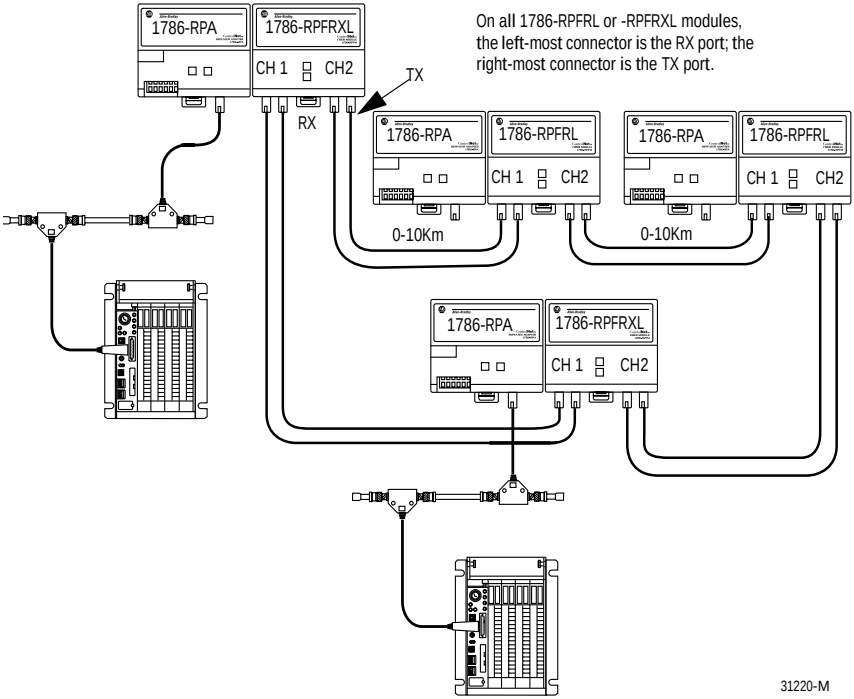
Use this configuration for long distances. You can achieve fiber and copper redundancy by duplicating the ControlNet components (copper media) and hub components in the configuration.



On all 1786-RPFRL or -RPFRXL modules, the left-most connector is the RX port; the right-most connector is the TX port.

Figure 4 Example Combining Long Distance and Extra-long Distance Modules

Use this configuration to achieve redundancy over long and extra-long distances. See the table on page 17 for distance limitations due to system delays.



IMPORTANT Grounding of the module is accomplished via a ground clip that is designed to contact a DIN rail mount. The modules must be mounted on a DIN rail for proper operation and grounding, and the DIN rail must be properly grounded.

Mount the Fiber Modules

TIP

Horizontal mounting is preferred. Vertical mounting is allowed. We recommend that the 1786-RPA be mounted at the top if vertical mounting is chosen.

WARNING

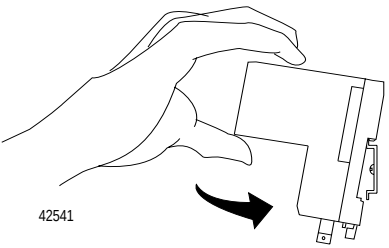
Removal and Insertion Under Power (RIUP) is not supported. The modules must be powered down while connecting and disconnecting the modules from the 1786-RPA/or interconnected modules.

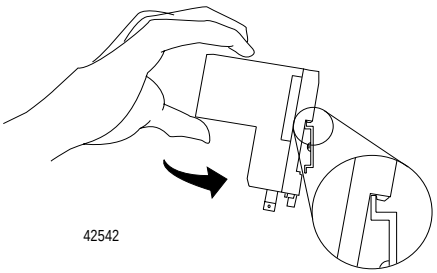
If you insert or remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

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).

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

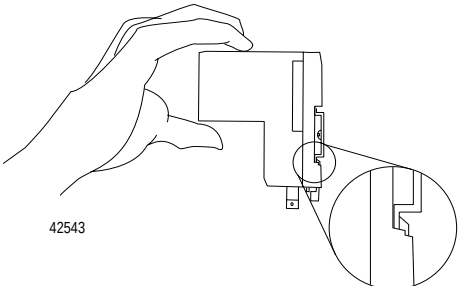




3. Press the module onto the DIN rail until flush.

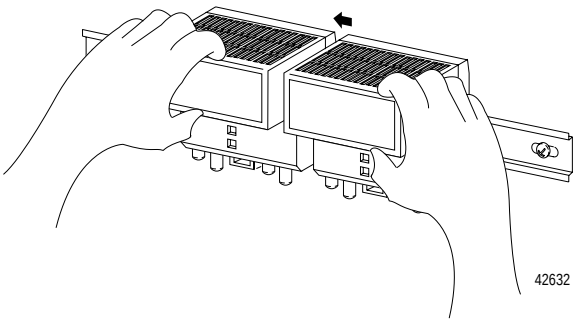
   The locking tab should snap into position and lock the module to the DIN rail.

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



5. Remove the protective backplane cap as shown on page 15.

6. Once the modules are attached to the DIN rail, slide them together to mate the repeater adapter with the 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 (1786-RPA) cannot exceed four or the total power consumption of the modules cannot exceed 1.6A @ 5V dc, whichever comes first.

The 1786-RPFR(X)L requires 520mA each, therefore you can attach only three to the repeater module (1786-RPA).

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

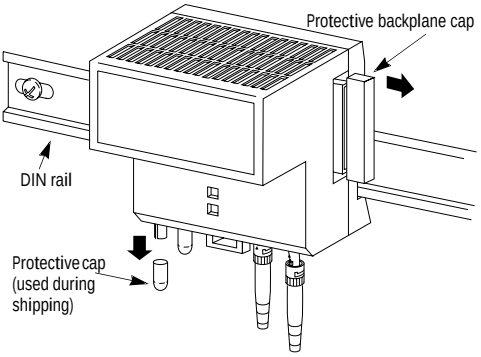
7. Connect the fiber cable as described on page 20.

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.

   The left side of the module (not shown here) also contains a backplane connector

   .



If you plan:	Then:
not to use a channel and the module is connected to the network	attach a small section of fiber cable to create a jumper. This is not required for module operation, but turns all status LEDs green.
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 for future use.
not to connect to the right backplane connector	leave the backplane cap on.

Choose Fiber Optic Cable for the 1786-RPFR(X)L Module

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-IN001, ControlNet Fiber Media Planning and Installation Guide, for details.

Understand the Maximum Optical Power Budget

The following table shows the maximum optical power budget available for different cable types. Note that the 1786-RPFRL module cannot be used with single mode fiber.

Module	Cable Type	Optical Power Budget	Termination Type
1786-RPFRL	62.5/125µm, multimode, 1300nm, graded index	15dB	ST
1786-RPFRXL	62.5/125µm, multimode, 1300nm, graded index	10.5dB	ST
	9/125µm, single mode, 1300nm, graded index	10.5dB	ST

The sample formulas in the following example illustrate how you can determine the total loss for fiber optic cables in your system configuration. The values we use in the formulas are typical; yours may vary, depending on your application.

EXAMPLE

Determining total loss for fiber optic cables

The total loss of the fiber optic cable between two modules must not exceed the optical power budget. The total loss is the sum of each connector loss plus the loss of the fiber plus the loss associated with the splices in the system, if any. The total loss can be determined as follows:

total loss = [(loss per connector) x (the number of connectors)] + [(loss per Km of fiber) x (Km of fiber)] + [(other losses)]

For example, with 2 connectors, each having 0.3dB of loss, 10 Km of multimode fiber with a loss of 1dB/Km, and no splices, the total loss is 10.6dB. See the following formula:

total loss = [(0.3dB x 2) + (1dB/Km x 10 Km)]
total loss = 10.6dB

This fiber optic cable is acceptable for use between two 1786-RPFRL modules because the total loss is less than the optical power budget of 15dB. However, this cable could not be used with the 1786-RPFRXL module because the total loss exceeds the optical power budget of 10.5dB.

Determine Maximum Network Length

The quality of the fiber cable determines the maximum distance between modules in a networked system. The delay in the system (described in the following table) determines the maximum length you can achieve with your network.

The worst-case delay (between any nodes) must be less than 121 µs. The table below lists worst-case delays for physical layer components.

component	delay
coaxial cable	4.3ns/m
fiber	5.01ns/m
1786-RPA	901ns
1786-RPFM	94ns
1786-RPFS	153ns
1786-RPCD	94ns
1786-RPFRL 1786-RPFRXL	550ns

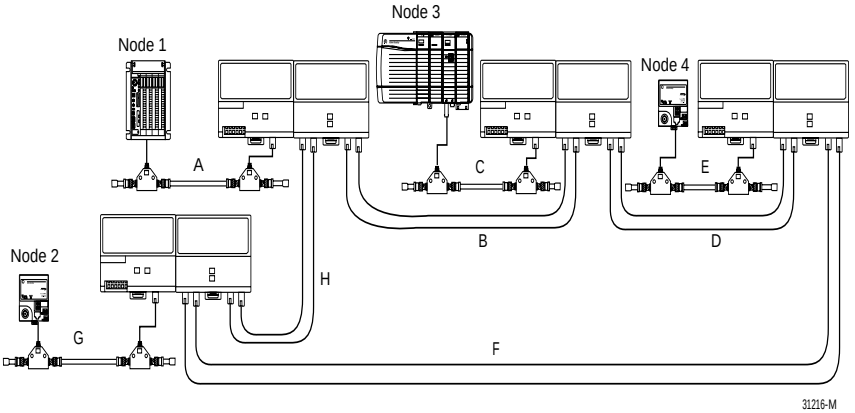
TIP

When determining the worst-case delay for your system, consider how many components you want to use. You can use as many as twenty 1786-RPFR(X)L modules in a ring or series as long as you do not exceed the maximum network length, as determined by the worst-case delay.

The maximum cable distance (that is, the longest route between any two adjacent or non-adjacent nodes) is limited by the ControlNet protocol to 20Km or less. Refer to Determine Maximum Network Length on page 17 for more information.

See Figure 5 on page 18 and the example on page 19 to understand how to determine the worst-case delay for your system.

Figure 5 Determine Worst-case Delay



segment	length
A (copper)	200m
B (optical)	2km
C	10m
D	1km
E	20m
F	5km
G	20m
H	200m

EXAMPLE

Determining worst-case delay

See Figure 5 on page 18.

To determine the worst-case delay in a ring topology, first disregard the shortest fiber segment in the system.

In this diagram, the shortest segment is segment H, the 200m fiber. Remove segment H. You will see that the worst-case delay is between nodes 1 and 2.

You must account for worst-case delays introduced by physical media when setting up the media configuration screen in RSNetWorx. System delays will affect the slot time RSNetWorx calculates. If too many components with too great a delay are entered into RSNetWorx, the slot time will be too large. This affects system performance and artificially limits network length. If you do not account for all media components in the worst-case delay path, the slot time may be too small. Erratic network operation will result. Refer to the documentation supplied with RSNetWorx for information on using it.

In this example, you would enter the total length of all media components between nodes 1 and 2 into RSNetWorx. The totals of the components between nodes 1 and 2 are as follows:

coax media: *200m + 20m = 220m*

fiber media: *2Km + 1Km + 5Km = 8Km*

1786-RPA module: *1 (at node 1) + 1 (at node 2) = 2 x RPA delay*

1786-RPFR(X)L module*: 4*

This example shows you in a simple way how to account for system delays. However, the calculation can be fairly complex, depending on the total number of components in your worst-case delay path. For example, 500m of fiber at 5.01ns/m has more delay than 550m of coaxial cable at 4.3ns/m.

Set up Network SMAX Parameter in RSNetWorx

You must set up the SMAX parameter in RSNetWorx for use with the 1786-RPFR(X)L module. The SMAX parameter sets the maximum scheduled node address on a ControlNet network. Refer to the documentation supplied with RSNetWorx for more information on using it. Keep these points in mind when setting up the SMAX parameter.

- SMAX must be set to one greater than the actual number of nodes on a network. For example, on a network with 49 nodes that transmit in scheduled time, you must set SMAX to 50.

- The nodes may be numbered in any order, but at least 1 node number must be missing. For example:

  – from 1-49, or
  – from 1-25 and 27 to 50, or
  – from 1-44 and 46-50

  This limits the maximum size of the network to 98 nodes when using 1786-RPFR(X)L modules.

IMPORTANT When 1786-RPFR(X)L modules are installed in a ring, the maximum network address is 98. This allows the module to use one slot time for a "quiet time" to synchronize the modules.

Connect the Fiber Cable Between the 1786-RPFR(X)L Modules

Terminate the Cable

Before you can connect the cable to the module you will need to terminate the cable. Termination is simply the process of attaching a connector to the ends of the fiber cable. We recommend that you use a quality kit such as the Corning Cable Systems Termination Kit with the UniCam® ST® connectors. The Corning Cable Systems Termination Kit has proven to be a simple and reliable method to terminate fiber cable.

For more information, visit www.corningcablesystems.com.

IMPORTANT

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

If splicing is necessary for your application, consider using fusion splicing to keep loss at a minimum.

TIP

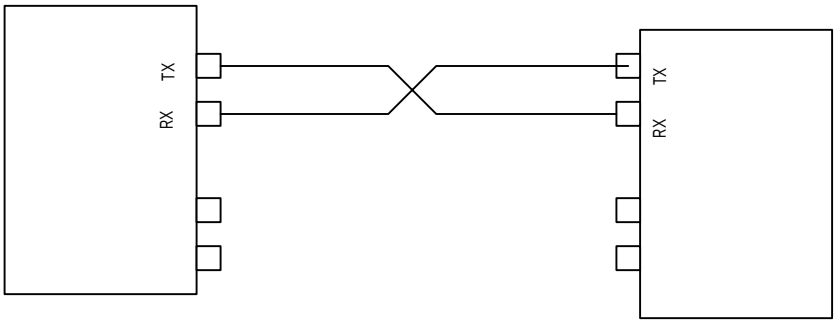
Consult your local distributor for attenuation specifications prior to purchasing your fiber media components.

Connect the Cable

A simple way to connect cables is to use the tracer on the cable to identify and follow the cable throughout your system. A tracer is simply one of the two wires on the duplex cable that is either:

- printed with the cable legend, or
- ribbed

In the following procedure (beginning on page 23), we tell you how to connect the cable between the fiber modules by making a simple “criss-cross” connection. To do this, you will connect the cables between modules from the Receive (RX) end of one channel to the Transmit (TX) end of the other module as shown in the following diagram:



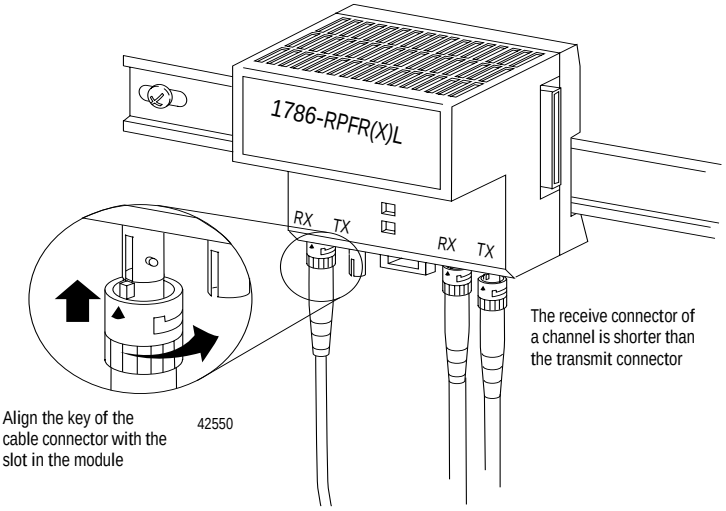
TIP

Channels 1 and 2 on the module are identical. Channel 1 of a module can be connected to either channel of another module.

To connect the cable:

1. Use the tracers on the cable to connect the Receive port (RX) and Transmit port (TX) at the starting module.

   To attach the cable connector to the module connector:



   a. Align the key of the cable connector with the slot in the module connector, and insert the connector into the RX port.
   b. Push and twist the locking cap until the bayonet lug is locked into place.

2. At the second module, connect the cables in reverse (tracer to TX port on module 1, non-tracer to RX port on module 1 and tracer to RX port on module 2, non-tracer to TX port on module 2).

3. Connect the other end of the cable to the Transmit (TX) port of a channel on the second module.

Interpreting the Status Indicators

See Figure 7 on page 27 for the LEDs on the 1786-RPFR(X)L module.

Fiber repeaters receive status information from the repeater adapters. Because of this, you should use the 1786-RPFR(X)L LEDs in conjunction with the 1786-RPA LEDs to diagnose a problem.

for status indicators for this module:	see the table on page:
1786-RPA	25
1786-RPFR(X)L	27

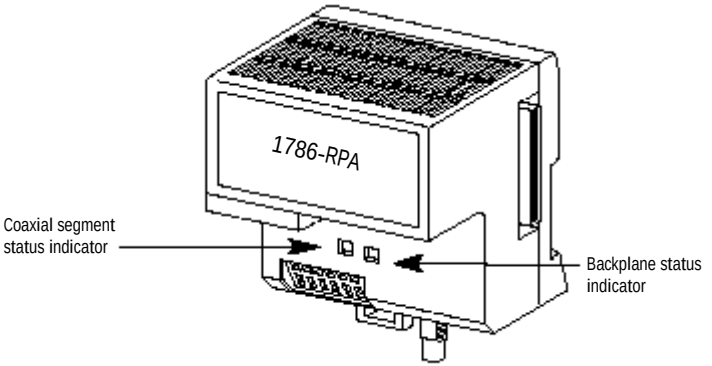
TIP

In general, if the LEDs on the 1786-RPA module are green, the 1786-RPFR(X)L module is operating properly.

For more information on the 1786-RPA module, refer to the ControlNet Modular Repeater Adapter Installation Instructions, publication 1786-5.13.

1786-RPA Status Indicators

Figure 6 1786-RPA Status Indicators

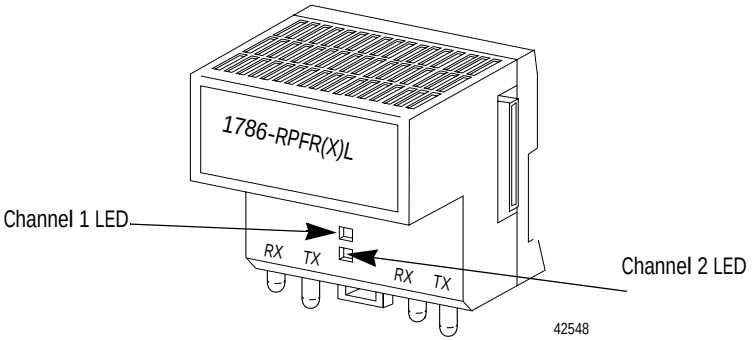


Status Indicator (LEDs) displays	Means
If both are:	**The module is:**
alternately red/green	being powered up or reset. The LEDs alternately flash red and green for about 5 seconds.
steady green	operating normally
Status Indicator (LEDs) displays	**Means**
If both are:	**The module is:**
off	not powered. Check the power line for correct voltage.
red	experiencing a repeater fault: • If the fault indication is caused by a jabber condition, the fault indication will automatically be cleared when the jabber condition is removed from the coax or fiber port. • If a jabber condition is not causing the fault, replace the repeater adapter.

If either is:	The coax or backplane segment is:
flashing red/off	• experiencing a high level of network errors. This may indicate a broken cable, broken tap, or missing segment terminator. • If the flashing LED is the status for the connected module (s), this is an indication that the error is coming from the modules. • If LED 1 is flashing, the problem is in the coax segment. • If LED N is flashing, the problem is in the connected modules. Refer to the 1786-RPFR(X)L status indicators table on page 27. **Important:** The indicators will flash red-off on a system that has no network activity. This is normal for a system having no ControlNet nodes installed or enabled.
flashing green/off	• experiencing temporary network errors. This situation will normally correct itself. • If the flashing LED is the status for the connected module (s), this is an indication that the error is coming from the modules. • If LED 1 is flashing, the problem is in the coax segment. • If LED N is flashing, the problem is in the connected modules. Refer to the 1786-RPFR(X)L status indicators table on page 27. When troubleshooting your coax segment, make sure: • all BNC connectors and pins are properly seated • all taps are A-B taps • all terminators are 75 and are installed at both ends of the coax segments • the coax cable has not been inadvertently grounded To troubleshoot backplane problems, use the 1786-RPFR(X)L status indicators. See the table on page 27 for an explanation of the LEDs.

1786-RPFR(X)L Status Indicators

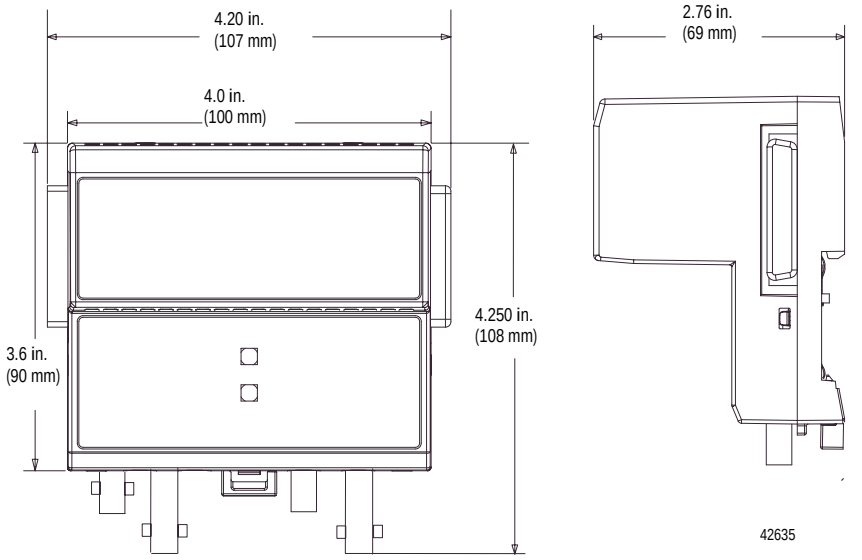
Figure 7 1786-RPFR(X)L Status Indicators



Status Indicator (LEDs) displays	Means
off	Repeater not connected to power supply.
green	Repeater is running without network errors.
flashing green/off	No data activity on network. If the cable is attached: • ensure that the Receive (Rx) channel is connected to the Transmit (Tx) channel on both modules • check for broken fiber.
flashing red/off	Module is powered, but not ready for operation. This state should also occur during module reset and last for approximately 5 seconds.
intermittent red	As more data errors are detected the frequency of the flashing red increases until a solid red displays.
red	Excessive receive signal distortion. • Be certain that you are using the correct fiber type for your module. • Check fiber length and attenuation to ensure that it is within specification. • Replace the downstream 1786-RPFRL module on the channel having the intermittently flashing red LED. • Be certain that your total network length is not out of specification. See Figure 4 on page 12 for network lengths. • Be certain that SMAX is correctly defined in RSNetWorx. Refer to Set up Network SMAX Parameter in RSNetWorx on page 20.

Mounting Dimensions

Figure 8 Mounting Dimensions



Horizontal Mounting Requirements

Horizontal mounting requirements are:

RPA width +(4.2 inches x number of RPFR(X)L) + 2 inches

Consult the applicable 1786-RPA document for enclosure requirements.

IMPORTANT Maintain adequate separation from other equipment to guarantee that ambient temperature is within the operating range of this module. The installer must follow applicable separation codes for safe operation.

Specifications

Item	Description
Communication Rate	5M bits/s
Backplane Current Consumption	a maximum of 520mA at 5V dc, Class 2 operating power supplied by catalog number 1786-RPA(1) Min 4.7V Max 5.3V
Power Requirements	2.8 Watts
Optical Power Budget	See Optical Power Budget table on page 16
OperatingTemperature	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 to 60°C (32 to 140°F)
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Un-packaged Non-operating Dry Heat), IEC 60068-2-14 (Test Na, Un-packaged Non-operating Thermal Shock): –40 to 85°C (–40 to 185°F)
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat): 5 to 95% non-condensing
Vibration	IEC60068-2-6 (Test Fc, Operating): 5g @ 10-500Hz
Shock	IEC60068-2-27 (Test Ea, Unpackaged Shock): Operating 30g Non-operating 50g
Emissions	CISPR 11: Group 1, Class A
ESD Immunity	IEC 61000-4-2: 6kV contact discharges 8kV air discharges
Radiated RF Immunity	IEC 61000-4-3: 10V/m with 1kHz sine-wave 80%AM from 30MHz to 1000MHz 10V/m with 200Hz 50% Pulse 100%AM at 900Mhz
EFT/B Immunity	IEC 61000-4-4: 2kV at 5kHz on power ports

Item	Description
Conducted RF Immunity	IEC 61000-4-6: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz
Enclosure Type Rating	None (open-style)
Agency Certification (when product or package marked)	c-UL-us UL Listed Industrial Control Equipment, certified for US and Canada c-UL-us UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada CE(2) European Union 89/336/EEC EMC Directive, compliant with: EN 50081-2; Industrial Emissions EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity C-Tick(2) Australian Radiocommunications Act, compliant with: AS/NZS 2064; Industrial Emissions

(1) The power supplied by the 1786-RPA is Separated Extra Low Voltage (SELV), compliant with Class 2 requirements of the National Electrical Code (ANSI/NFPA 70) and the Canadian Electrical Code (C22.1).

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

Hazardous Location Information

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.

www.rockwellautomation.com

Corporate Headquarters
Rockwell Automation, 777 East Wisconsin Avenue, Suite 1400, Milwaukee, WI, 53202-5302 USA, Tel: (1) 414.212.5200, Fax: (1) 414.212.5201

Headquarters for Allen-Bradley Products, Rockwell Software Products and Global Manufacturing Solutions
Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe: Rockwell Automation SA/NV, Vorstlaan/Boulevard du Souverain 36-BP 3A/B, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
Asia Pacific: Rockwell Automation, 27/F Citicorp Centre, 18 Whitfield Road, Causeway Bay, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Headquarters for Dodge and Reliance Electric Products
Americas: Rockwell Automation, 6040 Ponders Court, Greenville, SC 29615-4617 USA, Tel: (1) 864.297.4800, Fax: (1) 864.281.2433
Europe: Rockwell Automation, Brühlstraße 22, D-74834 Elztal-Dallau, Germany, Tel: (49) 6261 9410, Fax: (49) 6261 17741
Asia Pacific: Rockwell Automation, 55 Newton Road, #11-01/02 Revenue House, Singapore 307987, Tel: (65) 351 6723, Fax: (65) 355 1733

Publication 1786-IN003B-EN-P - February 2002 PN 957657-33

Supersedes Publication 1786-IN003A-EN-P - February 2001