



Allen-Bradley

POINT I/O ControlNet Adapter

1734-ACNR

User Manual

**Rockwell
Automation**

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.

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.

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
- recognize the consequence

SHOCK HAZARD



Labels may be located on or inside the equipment (e.g., drive or motor) to alert people that dangerous voltage may be present.

BURN HAZARD



Labels may be located on or inside the equipment (e.g., drive or motor) to alert people that surfaces may be dangerous temperatures.

This publication contains new and revised information not in the last release.

Revised Information

See the table for a summary of the major changes in this manual.

Chapter	Revised to include
2	Warning statement updates to the procedures that describe wiring and installing a replacement adapter
3	Before You Begin section on the following: • Understand messaging • Establish I/O connections • Configure autobaud • Understand adapter data capability
4	Update on how to add analog, discrete, other, and specialty modules to the I/O configuration

Change Bars

We marked with change bars (as shown with this paragraph) the areas in this manual that are different from previous editions and indicate the addition of new or revised information.

Notes:

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1734-POINT I/O Module/RSLogix5000 Controller Tag Reference

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Read this preface to familiarize yourself with the rest of the manual. It provides information concerning:

- who should use this manual
- the purpose of this manual
- related documentation
- conventions used in this manual
- terminology used in this manual

Who Should Use This Manual

Use this manual if you are responsible for designing, installing, programming, or troubleshooting control systems that use the ControlNet Adapter.

You should have a basic understanding of electrical circuitry and familiarity with relay logic. If you do not, obtain the proper training before using this product.

Purpose of the Manual

This manual is a reference guide for the ControlNet Adapter.

It describes the procedures you use to install, program and troubleshoot your module.

This manual also includes several application examples.

Related Documentation

The following documents contain additional information concerning Allen-Bradley products. To obtain a copy, contact your local Allen-Bradley office or distributor.

Many of these publications are available online from <http://literature.rockwellautomation.com/>.

For specifications concerning the 1734-ACNR adapter, refer to POINT I/O ControlNet Adapter Installation Instructions, publication 1734-IN582.

Publication	Publication Number
ControlNet Cable System Planning and Installation Manual	CNET-IN002
ControlNet Coax Tap Installation Instructions	1786-5.7
Industrial Automation Wiring and Grounding Guidelines	1770-4.1
POINT I/O Digital and Analog Modules and POINTBLOCK I/O Modules User Manual	1734-UM001
POINT I/O Technical Data	1734-TD002
POINT I/O RS-232 ASCII Module User Manual	1734-UM009
POINT I/O RS-232 ASCII Module Installation Instructions	1734-IN588
POINT I/O ControlNet Adapter Installation Instructions	1734-IN582
POINT I/O 24V dc Expansion Power Supply Installation Instructions	1734-IN058
POINT I/O Field Potential Distributor Installation Instructions	1734-IN059
POINT I/O 120V ac Input Module Installation Instructions	1734-IN010
POINT I/O Input Module Installation Instructions	1734-IN051
POINT I/O Encoders/Counter Module User Manual	1734-UM006
POINT I/O 5V Encoders/Counter Module Installation Instructions	1734-IN005
POINT I/O 220V ac Input Module Installation Instructions	1734-IN008
POINT I/O RTD and Isolated Thermocouple Input Module	1734-IN011
POINT I/O Thermocouple and RTD Input Module User Manual	1734-UM004
POINT I/O Input Module Installation Instructions	1734-IN052
POINT I/O 120/220V ac Output Module Installation Instructions	1734-IN009
POINT I/O Protected Output Module Installation Instructions	1734-IN056
POINT I/O Protected Output Module Installation Instructions (OB2EP)	1734-IN586
POINT I/O 2 Voltage Output Analog Module Installation Instructions	1734-IN002
POINT I/O Protected Sink Output Module Installation Instructions	1734-IN585
POINT I/O 2 Relay Output Module Installation Instructions (OX2)	1734-IN587

Publication	Publication Number
POINT I/O 2 Relay Output Module Installation Instructions (OW2)	1734-IN055
POINT I/O Synchronous Serial Interface Absolute Encoder Module	1734-UM007
POINT I/O Cold Junction Compensation Wiring Base Assembly	1734-IN583
POINT I/O Wiring Base Assembly Installation Instructions	1734-511
POINT I/O 5V dc and 24V dc Very High Speed Counter Module	1734-IN003
Very High Speed Counter Module User Manual	1734-UM003
ControlLogix Redundancy System User Manual	1756-UM523
Getting Results with RSLogix5000	9399-RLD300
RSLinx Getting Results Guide	LNXENT-GR001
RSNetWorx for ControlNet Getting Results	CNET-GR001

Common Techniques Used in This Manual

We use the following conventions throughout this manual.

- Bulleted lists such as this one provide information, not procedural steps.
- Numbered lists provide sequential steps or hierarchical information.
- Steps written in the format I/O Configuration>New Menu identify the main menu first and the sub menu second.

Terminology

The following table lists ControlNet terminology used throughout this manual.

Term	Meaning
Actual Packet Interval (API)	The measure of how frequently a specific connection produces its data.
Connection ID (CID)	An identifier assigned to a transmission that is associated with a particular connection between producers and consumers that identifies a specific piece of application information.
Network Update Time (NUT)	Repetitive time interval in which data can be sent on the link.
Requested Packet Interval (RPI)	The measure of how frequently the originating application requires the transmission of data from the target application.
Scheduled	Data transfers that occur in a deterministic and repeatable manner on predefined NUTs.
Unconnected Service	The messaging service that does not rely on the set-up of a connection between devices before allowing information exchanges.
Unscheduled	Data transfer that use the remaining time in the NUT after the scheduled transfers have been completed.

About the Module

Chapter Objectives

This chapter describes the ControlNet adapter (Catalog Number 1734-ACNR) and contains the following main sections.

- adapter description and features
- hardware components that include diagnostic indicators, a network access port (NAP), and network address switch assemblies

This manual addresses the 1734-ACNR, Series A adapter that is compatible with ControlLogix, FlexLogix, and SoftLogix (5800). It is not compatible with PLC-5 and SLC processors. Use a Series B adapter (not released when we wrote this manual) with PLC-5 and SLC processors.

The 1734-ACNR adapter manages data transfers between controllers on the ControlNet network and POINT I/O modules plugged into the POINTBus backplane.

IMPORTANT

The 1734-ACNR adapter requires Series C POINT I/O modules or later.

The ControlNet network is a communication architecture that enables the exchange of messages between ControlNet products compliant with the ControlNet International specification.

The 1734-ACNR adapter features include a variety of control system solutions, a local communication network access through the network access port (NAP), and redundant media.

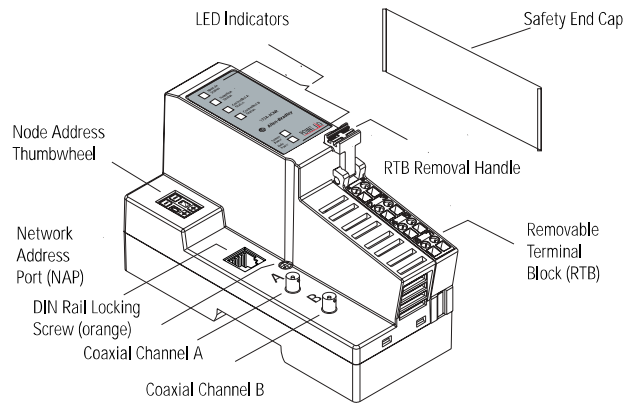
Hardware Components

Refer to the figure to see major components of the adapter.

Diagnostic Indicators

Health indicators on the front panel of the adapter describe both normal operation and error conditions in your remote I/O system.

For a description of the diagnostic indicators and status display and how to use them for troubleshooting, see the Diagnostics chapter of this manual.



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Network Access Port (NAP)

The network access port provides a bidirectional electrical interface for programming, maintenance, and I/O monitoring devices in both redundant and non-redundant connections.

Refer to the ControlNet Cable System Planning and Installation User Manual, publication CNET-IN002 for more information.

Network Address Switch Assemblies

You must set two switch assemblies to configure your adapter with its unique network (node) address. These switches are on the front of the module. Read these switches on power up to establish the network address of the module.

TIP

For optimum throughput, use lower numbers and assign sequential addresses to ControlNet nodes.

Install Your Adapter

Chapter Objectives

This chapter describes the procedures for installing your adapter, including how to:

- determine power requirements
- set the network address switches
- install the ControlNet adapter
- wire the ControlNet adapter
- connect programming terminals to the network via the NAP
- install the I/O modules
- install a replacement adapter to an existing system

Determine Power Requirements

The 1734-ACNR adapter requires a typical 24V dc power supply with a maximum of 10.2 watts of power @ 28.8 volts. It provides 5 watts @ 5 volts for the POINTBus and dissipates 5 watts @ 28.8 volts.

The ControlNet adapter provides a maximum backplane output current of 1.0A. See the Specifications section of this manual for:

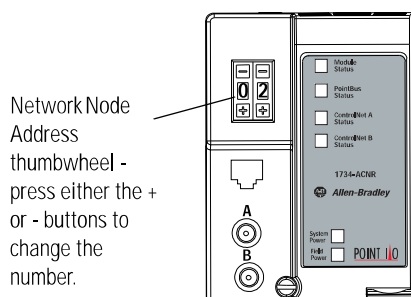
- backplane current consumption for each POINT I/O catalog number
- current consumption for each of the POINT I/O modules connected to the 1734 adapter

Extend backplane current beyond 1.0A with a 1734-EP24DC Backplane Extension Power Supply.

- Use a 1734-EP24DC power supply to supply up to an additional 1.3A of backplane current.
- Use multiple 1734-EP24DC power supplies to reach the maximum limit of 63 base modules if 25 or fewer of these modules are analog.

Set the Node Address

Set the node address using the 2-position thumbwheel switch. Valid settings range from 01 to 99. Press either the + or - buttons to change the number.



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Install the Adapter

To install the adapter on the DIN rail prior to installing other base units, proceed as follows:

ATTENTION

You must use Series C POINT I/O modules with the 1734-ACNR adapter. Series A and B POINT I/O modules will not work with the 1734-ACNR adapter.

1. Position the adapter vertically above the DIN rail.
2. Press down firmly to install the adapter on the DIN rail.

The locking mechanism will lock the adapter to the DIN rail.

WARNING

If you connect or disconnect the ControlNet 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.

3. Set the node address on the node address thumbwheel.
4. Remove the safety end cap by sliding it up.

This exposes the backplane and power interconnections.

ATTENTION

Do not discard the end cap. Use this end cap to cover the exposed interconnections on the last mounting base on the DIN rail. Failure to do so could result in equipment damage or injury from electric shock.

Wire the Adapter

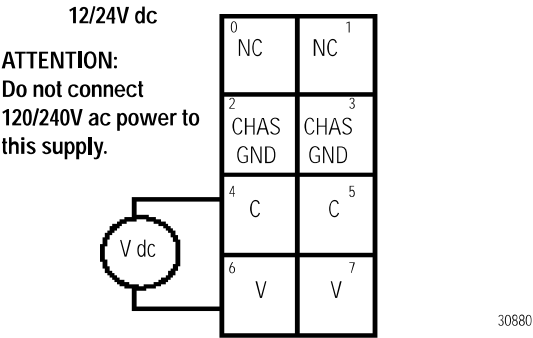
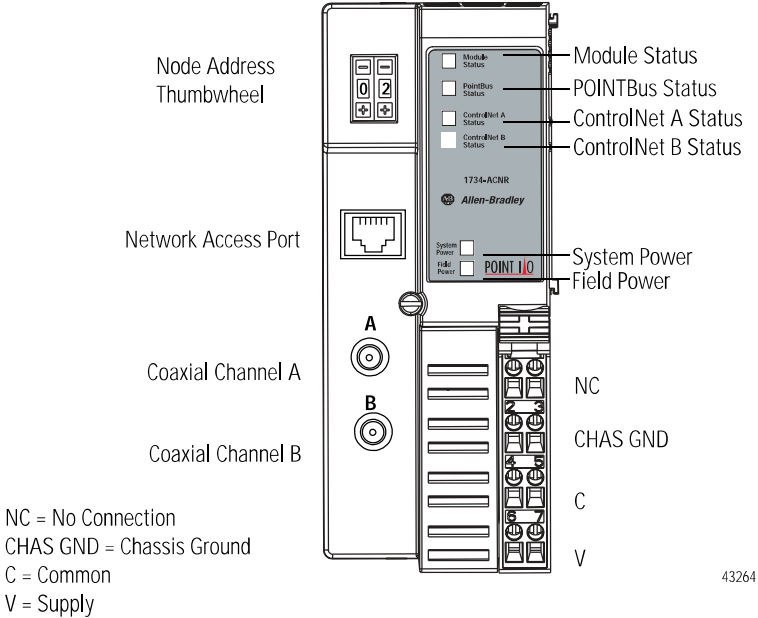
ATTENTION

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.

ATTENTION

If you connect or disconnect wiring while the field-side 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.

See the figure to guide you in wiring the adapter.

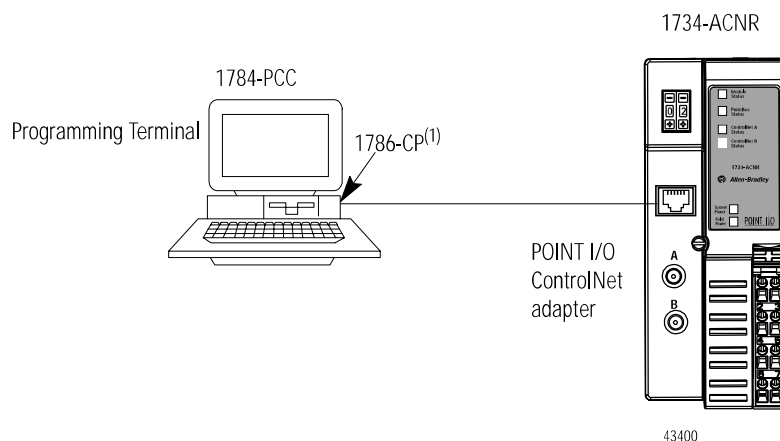


This dc supply will be connected to the internal power bus.
NC = No Connection CHAS GND = Chassis Ground C = Common V = Supply

Connect Programming Terminals to the Network via the NAP

You can connect programming terminals to the ControlNet network by connecting to the network access port (NAP), as shown in the figure.

Using 1784-PCC Communication Card and NAP



(1) The 1786-CP cable can be plugged into any ControlNet product's NAP to provide programming capability on the ControlNet network. A programming terminal connected through this cable is counted as a node and must have a unique address.

ATTENTION



Use the 1786-CP cable when connecting a programming terminal to the network through NAPs. Using a commercially available RJ-style cable could result in possible network failures.

Install the I/O Modules

After installing and wiring the adapter, install the POINT I/O modules used for your application.

For more information on installing and wiring the multiple POINT I/O modules, see the:

- installation instructions for each catalog number
- POINT I/O digital and analog modules user manual in publication 1734-UM001
- the list of publications in the Preface as a guide

IMPORTANT

Do not leave any empty slots when installing a POINT I/O system with the 1734-ACNR adapter.

Replace an Adapter

To replace an adapter in an existing system, proceed as follows.

ATTENTION

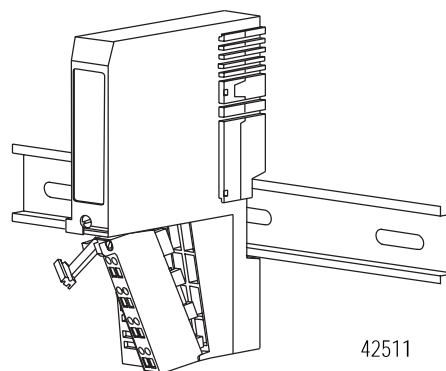
You must use Series C POINT I/O modules with the 1734-ACNR module. Series A and B POINT I/O modules will not work with the 1734-ACNR adapter.

ATTENTION

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.

1. Remove the existing adapter from the DIN rail as follows.
 - A. Disconnect the ControlNet cable from the adapter.
 - B. Pull up on the RTB removal handle to remove the terminal block.



- C. Remove the adjacent module from its base.
 - D. Use a small-bladed screwdriver to rotate the DIN rail locking screw to a vertical position.

This releases the locking mechanism.

- E. Lift straight up to remove.
2. Remove the safety end cap on the replacement adapter by sliding it up.

This exposes the backplane and power connections.

3. Position the replacement adapter vertically above the DIN rail.

Make certain the DIN rail lock is in the horizontal position.

4. Slide the adapter down, allowing the interlocking side pieces to engage the adjacent module.

5. Press firmly to seat the adapter on the DIN rail.

The adapter locking mechanism snaps into place.

6. Set the node address on the node address thumbwheel.

7. Insert the RTB starting with the end opposite the handle into the base unit.

This end has a curved section that engages with the wiring base.

8. Reinsert the terminal block by rotating the terminal block into the wiring base until it locks itself into place.
9. Replace the adjacent module in its base.
10. Use a tap to connect the ControlNet cable to the adapter.

You must use a tap to connect the adapter to the ControlNet cable. Do not directly connect the adapter to the coax cable. Without the ControlNet tap, the wiring violates the ControlNet specification, inducing electrical characteristics such as impedance and noise that cause the ControlNet network to fail.

Plan to Use Your Adapter

Chapter Objectives

This chapter explains how the adapter operates on a ControlNet network and provides information to assist in configuring your system. This chapter contains the following information.

- Overview of adapter operation
 - I/O connections
 - Rack connections
 - Direct connections
 - Explicit messaging communications
 - Software requirements
- Understanding ControlNet I/O
 - Scheduled data-transfer connections on a ControlNet network

Overview of Adapter Operation

Connections are established between a scanner and an adapter to exchange input and output data on the network. Status information is transferred along with the I/O data.

I/O Connections

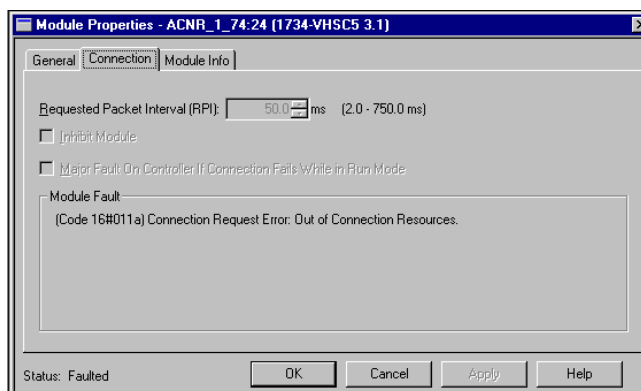
The adapter supports 25 direct and 5 rack I/O connections to the POINT I/O modules. From a single 1734-ACNR adapter, multiple controllers can establish I/O connections, up to a maximum of 5 rack I/O connections per adapter. You must use direct connection with analog and specialty I/O modules.

Make multiple rack connections to permit multiple controllers to connect to I/O over a single 1734-ACNR adapter.

The number of connections that can actually be supported on a network depends on the following.

- ControlNet parameters (NUT, RPI, API)
- POINT I/O configuration by itself (number and types of modules)
- Type of connection to these modules (direct connection, rack connection)

When the 1734-ACNR adapter cannot support any more connections, it does not open the connection and issues the **error 0x11a**. RSLogix5000 reports the following error:



For example, if the NUT = 5 ms and the RPI = 10 ms, the adapter can support:

- one rack connection with up to 39 discrete I/O modules, or
- 16 direct connections to analog or specialty modules, or
- one rack connection (15 discrete I/O modules) plus 10 direct connections to analog modules

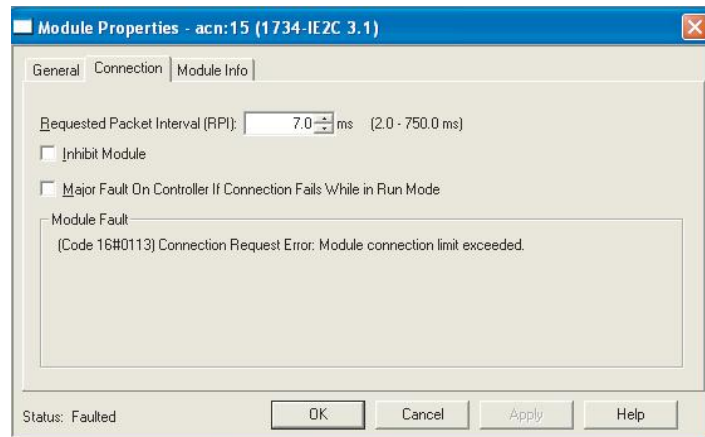
To avoid overloading the 1734-ACNR adapter and to avoid this error, we recommend that the RPI be no less than 10 milliseconds for rack connections and 50 milliseconds for direct connections. If you use more than 35 digital I/O modules with a rack connection, use RPI = 20 milliseconds.

For additional information, refer to the URLs:

- www.ab.com/io/
- [support.rockwellautomation.com/\(select knowledgebase\)](http://support.rockwellautomation.com/(select+knowledgebase))

Connection Limit Exceeded Error

The connection limit exceeded error (0x0113) on the **Module Properties** dialog is shown below.



When the 1734-ACNR connection limit is exceeded, you will get an 0x0113 error. The 1734-ACNR connection limit is 600 bytes.

This condition can exist when the modules connected to the 1734-ACNR adapter overflow the adapter's transmit buffer. This condition is rare with most POINT I/O modules.

A combination of 25 analog I/O and 38 digital I/O with direct and rack connections, respectively, should not result in this error. However, the 1734-232ASC Serial Interface ASCII module can transmit up to 134 bytes.

Five of these modules configured to a maximum data size will overflow the 1734-ACNR transmit buffer.

Proper planning should prevent this error from occurring. Notice that the 1734-232ASC module default configuration is 80 bytes.

Rack Connections

A rack connection supports a group of modules. The 1734-ACNR supports five instances of the rack object that provide the ability to communicate I/O data from all discrete I/O modules in the 1734 bus via one connection pair. The rack object contains both I/O and diagnostic status.

The rack connection specifies the same fixed size of I/O data for all modules, starting at slot 0 (adapter).

IMPORTANT

Slot 0 is reserved for the adapter. The adapter is not a member in the rack.

Multiple rack connections are limited to a maximum of 5 rack connections. Rack connections are defined using RSLogix5000 software and can be of either of the following types:

- rack optimization, or
- listen only optimization

Assume you have set up a system that contains 8 discrete I/O modules interfaced to a 1734-ACNR adapter. If you use direct connections to transfer data to each of these I/O modules, you need 8 connections to transfer all of the data, one to each of the 8 I/O modules. If you use a rack-optimized connection to transfer the data, you need only a single connection - the connection to the 1734-ACNR adapter.

IMPORTANT

Although rack optimized connections offer an efficient way to use resources, there are a few limitations on their use:

- You can only use rack optimized connections to send data to and from discrete I/O modules. Analog I/O and specialty I/O require direct connections.
 - Rack optimized connections can contain I/O data and status information only.
 - All data is sent at the same time at the API rate of the adapter.
-

Direct Connections

The 1734-ACNR adapter supports up to 25 direct connections to POINT I/O modules. Multiple controllers can connect to the I/O modules.

- The controller that is the first one in will win configuration rights and the ownership of the outputs.
- After an owner has established the connection, any other controller can operate in a listen-only mode to a POINT output module. Outputs can support only one direct connection and can support multiple listen-only connections.
- An input module is configured by a controller that establishes a connection as an owner. This configuring controller is the first controller to establish an owner connection.

Once an input module has been configured (and owned by a controller), other controllers may establish owner connections to that module also. That way additional owners can continue to receive multicast data if the original owner controller breaks its connection to the module. All other additional owners **must** have the identical configuration data and identical communication format that the original owner controller used, otherwise the connection attempt is rejected.

Explicit Messaging Communication

The adapter supports unconnected (CIP generic) messaging to objects within the adapter and the POINT I/O modules.

The 1734-ACNR adapter supports the following objects:

Object	Number of Instances
Device Object	1
Message Router Object	1
Connection Manager Object	1
Unconnected Message Manager Object	1
ControlNet Object	1
Rack Object	5
NVS Object	Flash upgrade

Unconnected messaging lets tools or controllers interface with the CIP objects supported by the POINT I/O modules. The adapter lets controllers, scanners, and software applications address objects for POINT I/O modules on the POINTBus using unconnected messaging. This requires the adapter to appear as a bridge to these devices. The POINT I/O modules are directly addressed. The 1734-ACNR adapter is a proxy server for unconnected messaging.

Software and Hardware Requirements

This manual illustrates the rules and dialog captures for ControlLogix only because it is the most complex system.

The software and hardware requirements to successfully configure the 1734-ACNR adapter for a ControlLogix system are:

- RSLinx version 2.31.00 or greater
- ControlLogix processor, firmware revision 11.1 or greater
- RSLogix5000 version 11.10 or greater
- RSNetWorx for ControlNet version 3.23.00 or greater
- ControlNet bridge 1756-CNBR/D 5.27 or greater
- Series C or greater POINT I/O modules

Understand ControlNet I/O

The ControlNet system is designed to:

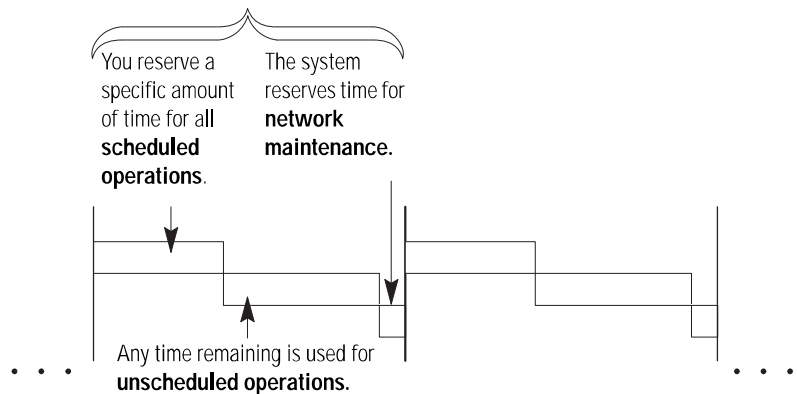
- provide high-speed, repeatable, deterministic I/O transmission
- allow control and message information to co-exist on the same physical media
- make sure that I/O data transfers are not affected by
 - programming-terminal message activity
 - inter-processor message activity on the network

Scheduled Data-Transfer Connections on a ControlNet Network

Scheduled data transfer on a ControlNet processor:

- is continuous
- is asynchronous to the ladder-logic program scan
- occurs at the actual packet interval

The ControlNet system places your scheduled transfers in the first part of each network update interval. Time is automatically reserved for network maintenance. Unscheduled transfers are performed during the time remaining in the interval.



IMPORTANT

The ControlNet network reserved time for at least one maximum-sized unscheduled transfer per update interval. Depending on how much time there is for unscheduled messaging, every node may not have a chance to send unscheduled data every update interval.

Before You Begin

To effectively use your adapter, note the following considerations.

Understand Messaging

Class 3 (Explicit Message) requests through the 1734-ACNR adapter to a specific POINT I/O module may not always receive a response from the I/O module. In the case where the I/O module does not reply to the request, the adapter responds with an error code indicating a time-out.

Establish I/O Connections

When you power up a POINT I/O system and establish I/O connections, the outputs transition to the Idle state, applying Idle state data before going to RUN mode. This occurs even when the controller making the connection is already in RUN mode.

Configure Autobaud

The adapter cannot reconfigure an I/O module that you previously configured to operate at a fixed baud rate. When you reuse a POINT I/O module from another POINT I/O system, configure the module to autobaud before using it with the 1734-ACNR adapter.

Understand Adapter Data Capability

The 1734-ACNR adapter provides high-speed transfer of time-critical data between controllers and I/O devices. It manages data transfers between controllers on the ControlNet network and POINT I/O modules plugged into the POINTBus backplane.

The ControlNet network is a communication architecture that allows the exchange of messages between ControlNet products compliant with the ControlNet International specification. The 1734-ACNR adapter features include a variety of control system solutions, local communication network access through the network access port (NAP) and redundant media. It requires Series C POINT I/O modules or later.

The 1734-ACNR adapter requires a typical 24V dc power supply with a maximum of 10.2 W of power. It provides a maximum backplane current of 1.0 A @ 5V dc.

To extend backplane current beyond 1.0 A use a 1734-EP24DC backplane extension power supply. The 1734-EP24DC can supply up to an additional 1.3 A of backplane current. Use multiple 1734-EP24DC power supplies to reach the maximum limit of 63 POINT I/O modules, if 25 or less of these modules are analog or specialty modules.

The adapter supports 25 direct and 5 rack I/O connections to the POINT I/O modules. From a single 1734-ACNR adapter, multiple controllers establish I/O connections, up to a maximum of 5 rack I/O connections per adapter.

You must use direct connections with analog and specialty modules. Multiple rack connections permit multiple controllers to connect to I/O over a single 1734-ACNR adapter.

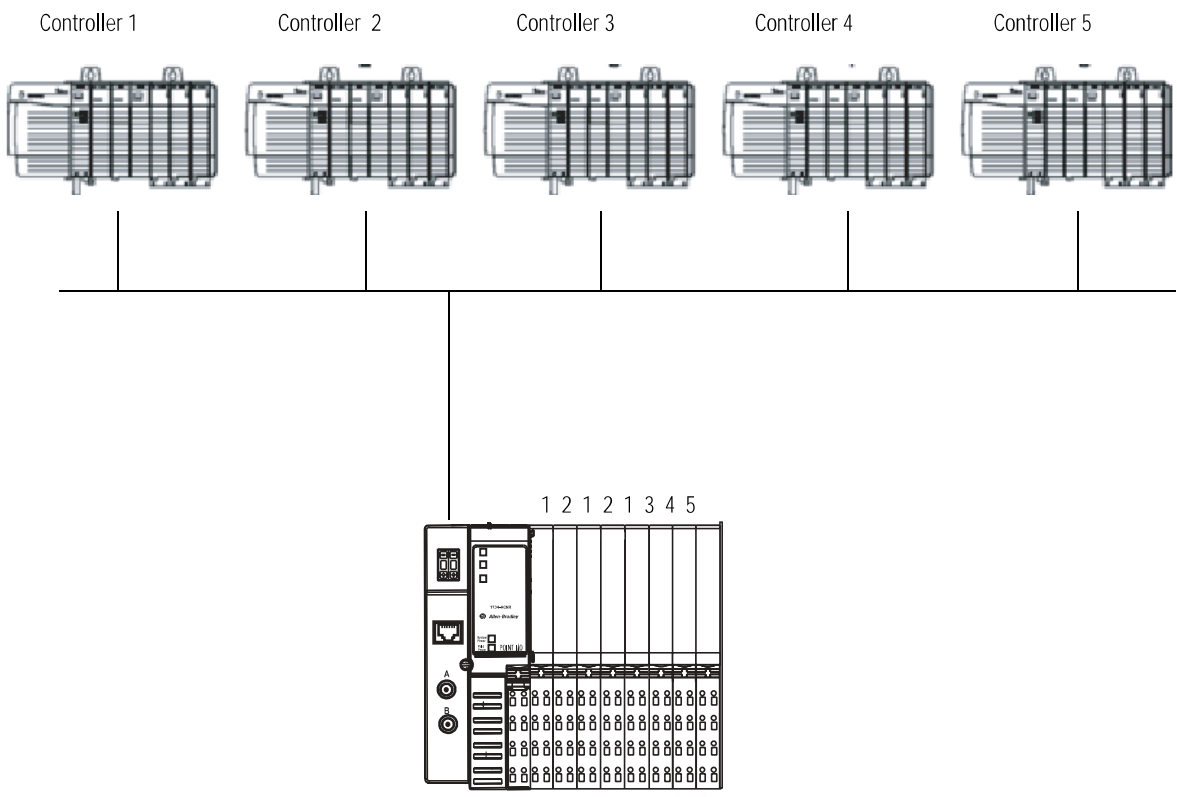
The number of connections that can actually be supported on a network depends on the following.

- ControlNet parameters (NUT, RPI, API)

- POINT I/O configuration by itself (number and types of modules)
- Type of connection to these modules (direct connection, rack connection)

The following example shows a single POINT I/O ControlNet adapter with 5 connections and 8 I/O modules. The POINT I/O modules are monitored by the 5 controllers on the ControlNet network. The POINT I/O modules in the slots are controlled by the controller shown in the table.

These Controllers	Control These Slots
1	1, 3, 5
2	2, 4
3	6
4	7
5	8



1734-ACNR adapter supports 5 rack I/O connections

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When using I/O modules with large amounts of data, be aware of the 1734-ACNR adapter data capability. The 1734-ACNR adapter has 586 bytes of memory available for scheduled transmit data. The amount of data used by an individual connection must also include a small amount of overhead - 10 bytes per connection. Use the following formula to track the amount of available scheduled transmit data.

Available Memory =
 $586 - [(Number\ of\ connections * 10) + Sum\ of\ all\ connection\ sizes]$

In the following examples, the system uses a 1734-ACNR adapter with five 1734-232ASC modules.

	Application Data Size (Number of Bytes)	Memory Required
1734-232ASC - 1	100	110
1734-232ASC - 2	88	98
1734-232ASC - 3	96	106
1734-232ASC - 4	96	106
1734-232ASC - 5	92	102
Total Bytes Used	472	522

In this example, you could add a sixth module if it uses less than 54 bytes of application data with 64 bytes of memory left.

$$64 = 586 - [(5 * 10) + 472]$$