Reference Manual

Original Instructions

AB Allen-Bradley

ControlNet to EtherNet/IP Migration

Allen-Bradley · Rockwell Software

Rockwell Automation

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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.

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.

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

Labels may also be on or inside the equipment to provide specific precautions.

SHOCK HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.

BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

ARC FLASH HAZARD: Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential MonthArc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

Table of Contents

Notes:

Integrated Architecture Tools

The Integrated Architecture® tools can help you plan and configure a system, as well as migrate system architectures. For more information, go to: http://www.rockwellautomation.com/rockwellautomation/products-technologies/integrated-architecture/tools/overview.page?

Migration Services

Throughout the product lifecycle, as products mature, Rockwell Automation is there as your partner to help you get the most out of your current equipment, to help you determine your next steps, and to help you lay out a plan for the transition to newer technology.

Whether you choose to migrate all at once or use our unique, phased approach to help minimize the costs, risks, and complexities involved with managing legacy products and systems, Rockwell Automation has the tools and the experience to guide you through the transition.

For more information, see Migration Solutions Brochure, publication MIGRAT-BR002.

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
ControlNet Coax Media Planning and Installation Guide, publication CNET-IN002	Describes the required components of a ControlNet® coax media system.
ControlNet Fiber Media Planning and Installation Guide, publication CNET-IN001	Describes the components and topologies for creating a ControlNet fiber media system.
ControlNet Media System Components List, publication AG-PA002	Lists category numbers and specifications for the components that comprise the ControlNet media system.
ControlNet Accessory Specifications, publication 1786-TD008	Provides technical specifications for ControlNet accessories.
EtherNet/IP Network Devices, publication ENET-UM006	Describes how to configure and use EtherNet/IP™ devices to communicate on the EtherNet/IP network.
Converged Plantwide Ethernet (CPwE) Design and Implementation Guide publication ENET-TD001	A collaborative development effort from Cisco Systems and Rockwell Automation. It is built on, and adds to, design guidelines from the Cisco® Ethernet-to-the-Factory (EttF) solution and the Rockwell Automation Integrated Architecture
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://www.rockwellautomation.com/global/certification/overview.page	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http://www.rockwellautomation.com/global/literature-library/overview.page. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Notes:

Overview

This document provides information to migrate from an existing ControlNet® network to an EtherNet/IP™ network.

Unlike information networks, industrial control networks place a greater burden on the designers of system components. An industrial control network requires fast and guaranteed throughput to control machines and manufacturing processes effectively. Additionally, some industrial environments require a greater level of performance due to the elevated levels of noise and contaminants common to those installations.

Network Overviews

ControlNet Network Overview

The ControlNet network provides high-speed transmission of time-critical I/O and interlocking data and messaging data. This data transfer capability enhances I/O performance and peer-to-peer communication in any system or application.

The ControlNet network remains unaffected as devices are connected or disconnected from it. This data transfer capability delivers a dependable, synchronized, and coordinated real-time performance.

EtherNet/IP Network Overview

EtherNet/IP networks offer a comprehensive suite of messages and services for many automation applications. This open network standard uses standard Ethernet communication products to support real-time I/O messaging, information exchange, and general messaging.

EtherNet/IP networks support CIP Safety™ applications. Such support makes the simultaneous transmission of safety and standard control data and diagnostics information over a common network possible. EtherNet/IP networks also support CIP Motion™ and CIP Security™. These features are not supported in ControlNet.
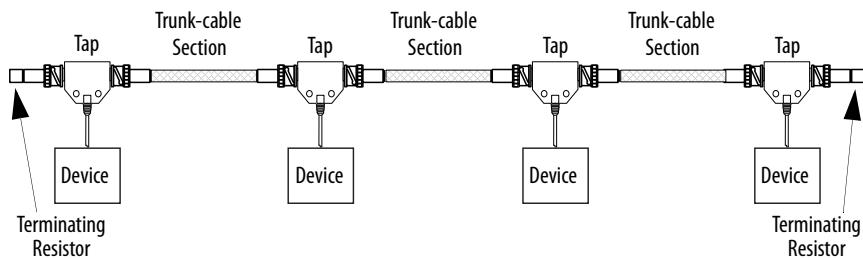
Network Infrastructure Comparisons

Linear Topology
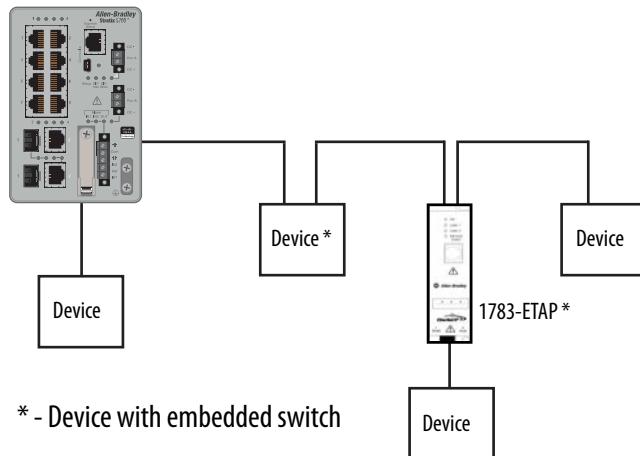
In a linear topology, all nodes of the network are connected to a common transmission medium, typically referred to as the bus or trunk. The bus or trunk has exactly two endpoints. All data that is transmitted in between nodes is transmitted over this common transmission medium.

This bus/trunk is terminated at both ends and the signal is halted when it reaches the end.

Figure 1 - ControlNet

**Figure 2 - EtherNet/IP**

* - Device with embedded switch
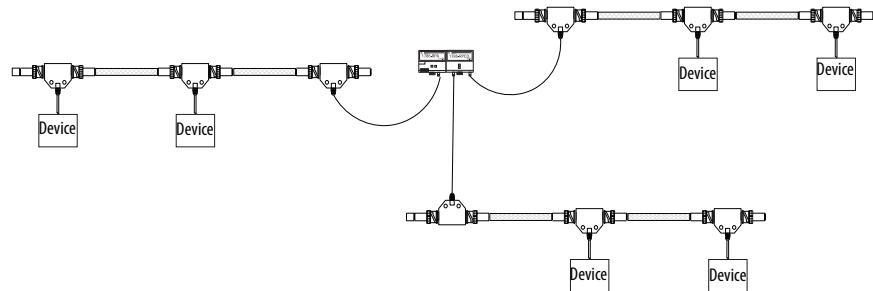
The EtherNet/IP linear topology requires embedded EtherNet/IP in the device, a communication module, or separate ETAP.
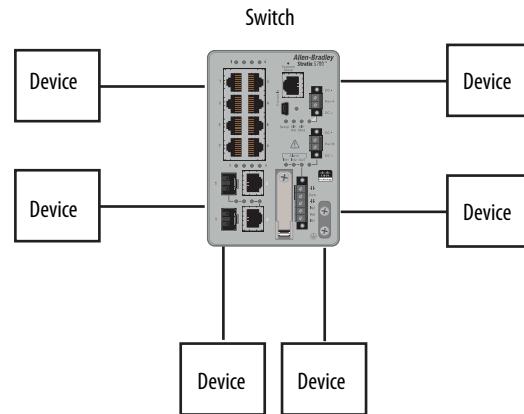
Star Topology

In star topology, every device is connected to a central node called hub or switch. The network does not necessarily have to resemble a star to be classified as a star network, but all devices on the network must be connected to one central device. The ControlNet star topology requires the use of a repeater

Figure 3 - ControlNet

Figure 4 - EtherNet/IP

The EtherNet/IP star topology requires the use of a switch.
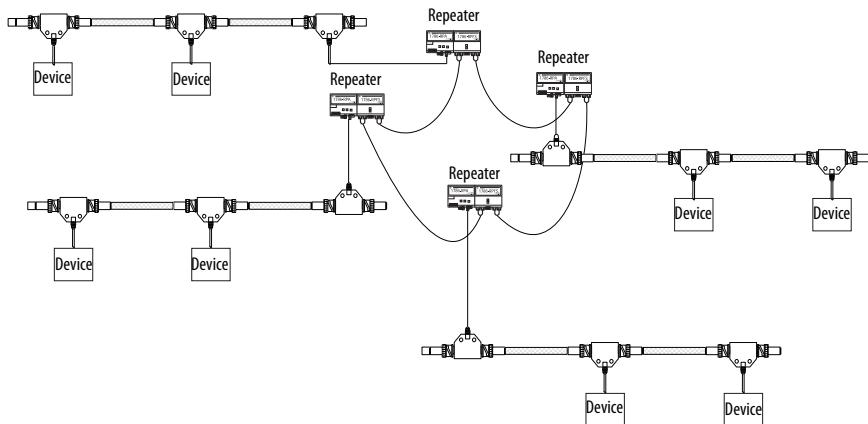
For available Stratix® switches see publication 1783-TD001, Stratix Ethernet Device Specifications.

Ring Topology

In this topology, all devices are connected to cable that forms a closed loop. Transmissions from each device travel around the loop and are blocked when it reaches the original sending repeater.

A ring topology provides additional resiliency by being able to survive a single break in the cable.
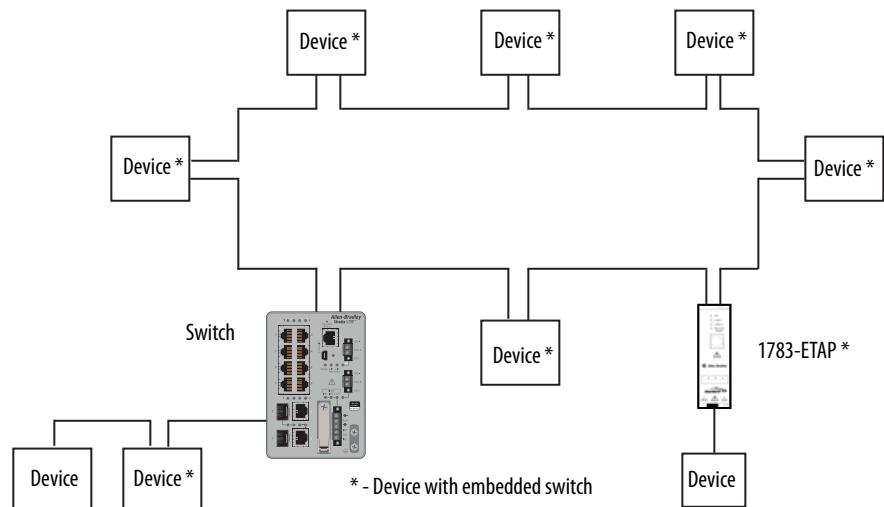
Figure 5 - ControlNet

A ring topology is only supported using the 1786-RPFRL and 1786-RPFRXL ControlNet Repeater modules.

See Knowledgebase ID 32215, ControlNet Ring Topology, Allowable Configuration Using Repeaters, for examples of allowable configurations.

Figure 6 - EtherNet/IP DLR
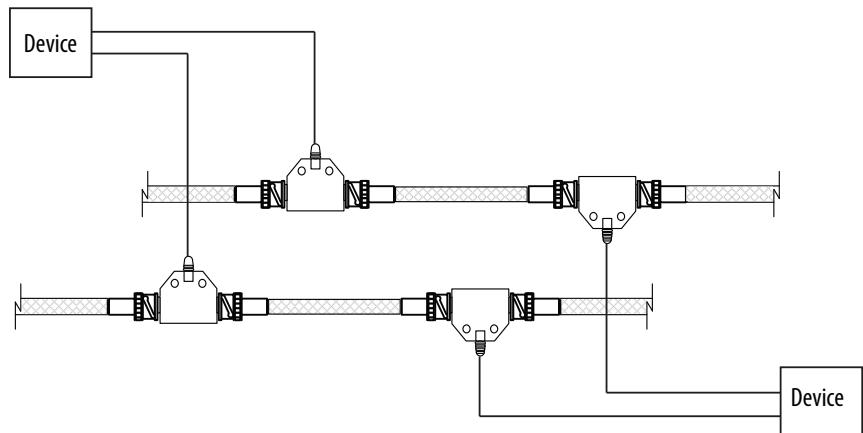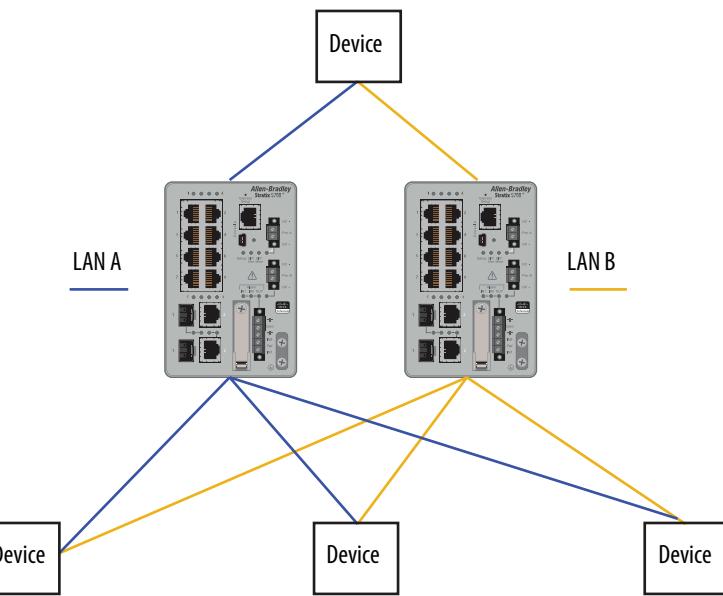
See EtherNet/IP Device Level Ring, Publication ENET-AT007, for more information.

Redundant Media Topology

Redundant media provides maximum resiliency by providing duplicate paths for the transmission of data. When using redundant cabling, each ControlNet node always simultaneously transmits/receives on both channel A and channel B. Each individual node decides, independent of other nodes, which single channel it uses incoming data from. This decision is based on which channel historically has provided the best data over time.

Figure 7 - ControlNet

Figure 8 - EtherNet/IP Parallel Redundancy Protocol (PRP)

This architecture requires devices that support Parallel Redundancy Protocol as end nodes.

EtherNet/IP redundancy is more flexible than ControlNet media redundancy because the redundant PRP networks do not have to be the same topology. For example, one network can be a star and one network can be a ring. With EtherNet/IP PRP, it is possible to have devices on only one of the two networks. It is also possible to get non-PRP devices onto both LANs by using a RedBox.

See EtherNet/IP Parallel Redundancy Protocol, publication ENET-AT006, for more information.

Infrastructure Components

ControlNet Component	EtherNet/IP Component
RG-6 quad-shield coaxial cable • 1786-RG6F/A high flex • 1786-RG6 standard Fiber-optic 200 micron cable • 1786-FS10 10 m (32.8 ft) • 1786-FS20 20 m (65.6 ft) • 1786-FS60 60 m (196.8 ft) • 1786-FS100 100 m (328.1 ft) • 1786-FS200 200 m (656.2 ft) • 1786-FS300 300 m (948.2 ft)	Commercially available media: • Fiber-optic using SFPs and same fiber as ControlNet • Copper STP (shielded twisted pair) • Copper UTP (unshielded twisted pair) Existing fiber cables can be used but may require new connectors and new SFPs. See 1783-TD001 for options
Repeater • 1786 RPA repeater adapter • 1786-RPCD coax repeater • 1786-RPFS short-distance fiber repeater • 1786-RPFM medium-distance fiber repeater • 1786-RPFRL long-distance fiber repeater • 1786-RPFRXL extra-long-distance fiber repeater	Stratix Switch 1783 series switches See 1783-TD001 for options
Coaxial Tap • 1786-TPR Right-angle T-tap • 1786-TPS Straight T-tap • 1786-TPYR Right-angle Y-tap • 1786-TPYS Straight Y-tap • 1786-TCT2BD1 IP67 tap	—
—	• 1783-ETAP twisted-pair tap • 1783-ETAP1F fiber tap • 1783-ETAP2F dual-port fiber tap

For a list of all ControlNet media components, see ControlNet Media System Components List, publication AG-PA002.

Network Comparison

Network Performance

EtherNet/IP has higher bandwidth than ControlNet. ControlNet is a 5 Mbps network, whereas EtherNet/IP is typically a 100 Mbps or 1 Gbps network. This bandwidth translates to 20 to 200 times the data rate. Because ControlNet is a bus, traffic is seen at all points on the network at all times. The use of switches in Ethernet allows traffic to be confined only to the devices that need to receive that traffic.

ControlNet has a capacity of 99 nodes per network with the use of repeaters. Without repeaters, the maximum number of nodes on one ControlNet network is 48. The number of nodes supported on an EtherNet/IP network is only limited by the number of IP addresses available in the network.

Network Configuration

	ControlNet	EtherNet/IP
Software	RSNetWorx™ for ControlNet (required)	FactoryTalk® Network Manager™ (optional) Integrated Architecture® Builder (IAB) (optional)
Items Requiring Configuration	ControlNet Network Keeper ControlNet Network Update Time Scheduled Maximum Node Address Unscheduled Maximum Node Address	EtherNet/IP DLR Supervisor
Communication	Scheduled I/O Unscheduled Messaging	UDP I/O TCP Messaging

Products

This chapter contains information about the ControlNet® devices and the corresponding EtherNet/IP™ devices that replace them during a migration.

There are discontinued products that were supported on ControlNet network that do not have direct replacements on EtherNet/IP network. These devices are not mentioned in this document.

IMPORTANT	There are other considerations when replacing hardware. Consult the appropriate technical documentation before replacing any hardware.

IMPORTANT	The lifecycle status of the following products is subject to change. See the [Product Lifecycle Status](#) website for the most up-to-date information.

Product Replacements

All of the replacements listed in this manual are engineered replacements. An engineered replacement is defined as follows:

A product or family that can be used to migrate an earlier product or family and requires engineering changes to existing applications.

An engineered replacement means that there is a form, fit, or function change of the application that is not backward compatible and that does not emulate the earlier product. It requires considerable changes to the application.

The migration solution requires engineering effort that requires additional software/hardware tools and products or architectural modifications. Rockwell Automation® services and/or third-party services are available to support Engineered replacements.

Controllers

Replace the existing controller with either a controller with an embedded EtherNet/IP port (new controller), or the existing controller can be used with an EtherNet/IP network device (new scanner or adapter.)

CompactLogix and Compact GuardLogix Controllers

These ControlNet solutions are discontinued, replace with an EtherNet/IP solution.

ControlNet Option	EtherNet/IP Option	Replacement Type
1769 CompactLogix™ L4 and Compact GuardLogix® L4: • 1768-CNB • 1768-CNBR	1769 CompactLogix or Compact GuardLogix 5370 controller with embedded EtherNet/IP 5069 CompactLogix or Compact GuardLogix 5380 controller with embedded EtherNet/IP	Engineered
1769-L32C, 1769-L35CR CompactLogix		Engineered

For more information see the following publications:

- CompactLogix Controllers Selection Guide, publication [1769-SG001](#)
- Replacement Guidelines: Logix 5000™ Controllers Reference Manual, publication [1756-RM100](#)
- EtherNet/IP Network Devices User Manual, publication [ENET-UM006](#)

ControlLogix and GuardLogix Controllers

You do not have to replace the ControlLogix and GuardLogix controllers, however the ControlNet communication module must be replaced, as described in the following table.

ControlNet Option	EtherNet/IP Option	Replacement Type
1756 ControlLogix and GuardLogix: • 1756-CNB • 1756-CNBR • 1756-CN2 • 1756-CN2R	1756 ControlLogix and GuardLogix: • 1756-EN2F • 1756-EN2T • 1756-EN2TP • 1756-EN2TR • 1756-EN3TR • 1756-EN4TR • 1756-ENBT	Engineered

For more information see the following publications:

- ControlLogix Controllers Selection Guide, publication <u>1756-SG001</u>
- Replacement Guidelines: Logix 5000 Controllers Reference Manual, publication <u>1756-RM100</u>
- EtherNet/IP Network Devices User Manual, publication <u>ENET-UM006</u>

FlexLogix Controllers

These ControlNet solutions are discontinued, replace with an EtherNet/IP solution.

ControlNet Option	EtherNet/IP Option	Replacement Type
FlexLogix™ L33 or L34: • 1788-CNC • 1788-CNF	1769 CompactLogix or Compact GuardLogix 5370 controller with embedded EtherNet/IP 5069 CompactLogix or Compact GuardLogix 5380 controller with embedded EtherNet/IP	Engineered

SLC Controllers

These ControlNet solutions are discontinued, replace with an EtherNet/IP solution.

ControlNet Option	EtherNet/IP Option	Replacement Type
1747 SLC™: • 1747-SCNR • 1747-KFC15	1769 CompactLogix or Compact GuardLogix 5370 controller with embedded EtherNet/IP 5069 CompactLogix or Compact GuardLogix 5380 controller with embedded EtherNet/IP	Engineered

For more information see the following publications:

- CompactLogix System Selection Guide, publication <u>1769-SG001</u>
- Replacement Guidelines: SLC Quick Migration Guide <u>1746-RM003</u>
- EtherNet/IP Network Devices User Manual, publication <u>ENET-UM006</u>

PLC-5 Controllers

These ControlNet solutions are discontinued, replace with an EtherNet/IP solution.

ControlNet Option	EtherNet/IP Option	Replacement Type
1785 PLC-5®/20C 1785 PLC-5/40C 1785 PLC-5/80C 1785 PLC-5/46C protected memory	1756 ControlLogix controller with an EtherNet/IP communication module.	Engineered

I/O Module Interfaces

Replace the existing I/O module interfaces with I/O module interfaces with embedded EtherNet/IP ports.

Distributed I/O

ControlNet Option	EtherNet/IP Option	Replacement Type
POINT I/O™: • 1734-ACNR	POINT I/O: • 1734-AENT • 1734-AENTR	Engineered
ArmorPOINT® I/O: • 1738-ACNR	ArmorPoint I/O: • 1738-AENTR • 1738-AENT	Engineered
FLEX™ I/O: • 1794-ACN15 • 1794-ACNR15	FLEX I/O: • 1794-AENT • 1794-AENTR	Engineered
	5094 FLEX 5000™ I/O (requires 5580 or 5380 controller and new I/O modules.)	Engineered
SLC I/O: • 1747-ACN15 • 1747-ACNR15	SLC I/O: • 1747-AENTR	Engineered
	Compact 5000 I/O (requires 5069 CompactLogix 5380 controller)	
FLEX Ex™ I/O: • 1797-ACNR15	FLEX: • 1794-AENTR and 1797-CEC and 1797-BIC (Class 1 Div 2 area)	Engineered Additional considerations are required for hazardous locations. 1719 solutions are also available.

For more information see the following publications:
- POINT I/O Modules Selection Guide, publication 1734-SG001
- ArmorPoint I/O Modules Selection Guide, publication 1738-SG001
- FLEX and FLEX Ex I/O Modules Selection Guide, publication 1794-SG002
- CompactLogix System Selection Guide, publication 1769-SG001

Chassis-based I/O

ControlNet Option	EtherNet/IP Option	Replacement Type
1756 ControlLogix I/O: • 1756-CNB • 1756-CNBR • 1756-CN2 • 1756-CN2R	1756 ControlLogix I/O: • 1756-EN2F • 1756-EN2T • 1756-EN2TP • 1756-EN2TR • 1756-EN3TR • 1756-EN4TR • 1756-ENBT	Engineered
1771 I/O: • 1771-ACN • 1771-ACN15 • 1771-ACNR • 1771-ACNR15	No direct 1771 I/O support It is recommended to move to a new I/O platform. For help migrating from 1771 I/O to 1756 I/O, see Digital/Analog Programmable Controller Wiring Systems, publication 1492-TD008.	Engineered

For more information see the following publications:

- ControlLogix Controllers Selection Guide, publication 1756-SG001

Drives

Replace the existing drive with either a drive with embedded EtherNet/IP ports (new drive), or an EtherNet/IP adapter for the drive (keep the existing drive but have a new adapter.)

PowerFlex 4-Class Drives

ControlNet Option	EtherNet/IP Option	Replacement Type
22B PowerFlex® 40 AC drives with built-in ControlNet	PowerFlex Drive with embedded EtherNet/IP port	Engineered
22C PowerFlex 400 AC drive with built-in ControlNet	PowerFlex Drive with embedded EtherNet/IP port	Engineered
22-COMM-C	22-COMM-E	Engineered

For more information see the following publications:

- PowerFlex Standard Drives Low Voltage Selection Guide, publication PFLEX-SG002

PowerFlex 7-Class Drives

ControlNet Option	EtherNet/IP Option	Replacement Type
20-COMM-C (coax) 20-COMM-Q (fiber)	20-COMM-E	Engineered
20-750-CNETC	PowerFlex Drive with embedded EtherNet/IP port	Engineered

For more information see the following publications:

- PowerFlex Standard Drives Low Voltage Selection Guide, publication PFLEX-SG002

PowerFlex DC Drives

ControlNet Option	EtherNet/IP Option	Replacement Type
20-COMM-C	20-COMM-E	Functional

For more information see the following publications:

- PowerFlex Standard Drives Low Voltage Selection Guide, publication [PFLEX-SG002](#)

Operator Interfaces

Replace the existing PanelView™ terminal with a PanelView terminal with an embedded EtherNet/IP port.

ControlNet Option	EtherNet/IP Option	Replacement Type
2711P PanelView Plus 6 terminals: • 2711P-RN15S	PanelView terminal with embedded EtherNet/IP port	Engineered

For more information see the following publications:

- Visualization Solutions Selection Guide, publication [VIEW-SG001](#)

Linking Devices

ControlNet Option	EtherNet/IP Option	Replacement Type
1788-CN2DN 1788-CN2FFR 1788-CN2PAR	1788-EN2DNR 1788-EN2FFR 1788-EN2PAR	Engineered

For more information see the following publications:

- 1788 Linking Device Specifications, publication [1788-TD001](#)

Computer Interfaces

ControlNet Option	EtherNet/IP Option	Replacement Type
1784-PCIC(s) 1784- PKTC(s) 1784-KTC(s)	PC Ethernet port	Engineered
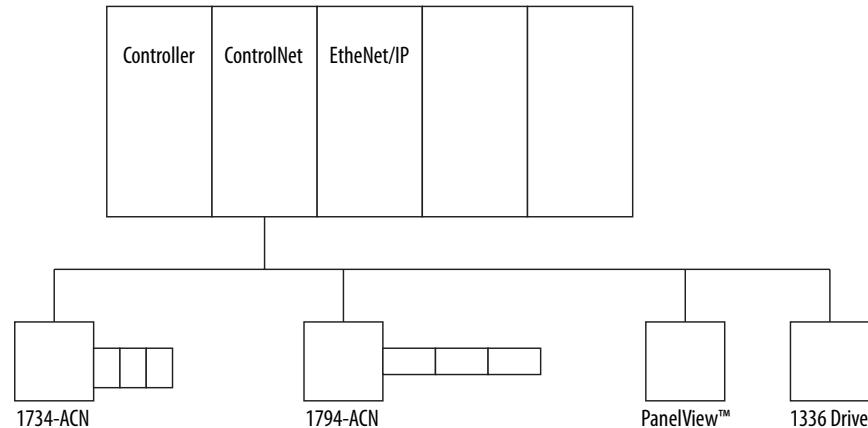
Migrate ControlNet Network to EtherNet/IP Network

Application Considerations

Not all nodes migrate from a ControlNet® solution to an EtherNet/IP™ solution. A migration solution requires engineering effort with additional software/hardware tools, products, and architectural modifications. Rockwell Automation® services are available to support engineered replacements.
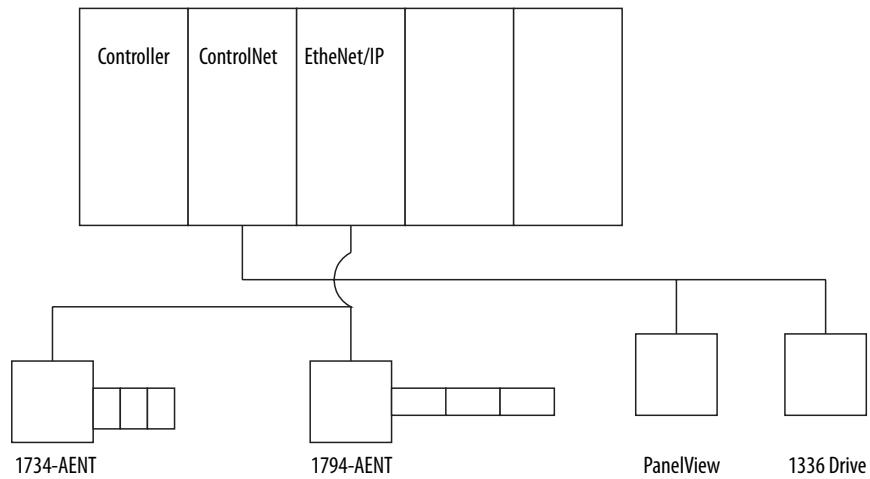
You do not need to migrate all nodes at the same time. You can schedule migration phases. For example, during one phase of the migration, add an EtherNet/IP module to a controller chassis (see Figure 9.)

Figure 9 - EtherNet/IP Module Addition

Then migrate a subset of ControlNet devices to the EtherNet/IP devices (see Figure 10.) At a later time, migrate the remaining devices.

Figure 10 - I/O Modules Moved to EtherNet/IP

Migration Process

The following steps are an overview of the migration process.

- Install new infrastructure - such as cables and switches. (no system interruptions)
- Acquire EtherNet/IP hardware (no system interruptions)
- Convert the I/O configuration tree (see Migration Example on page 23)
- Align tags to the new devices (rename)
- Add new logic, if needed, for new device platforms
- Verify any MSG paths (logic)
- Verify any produced/consumed tags (configuration)
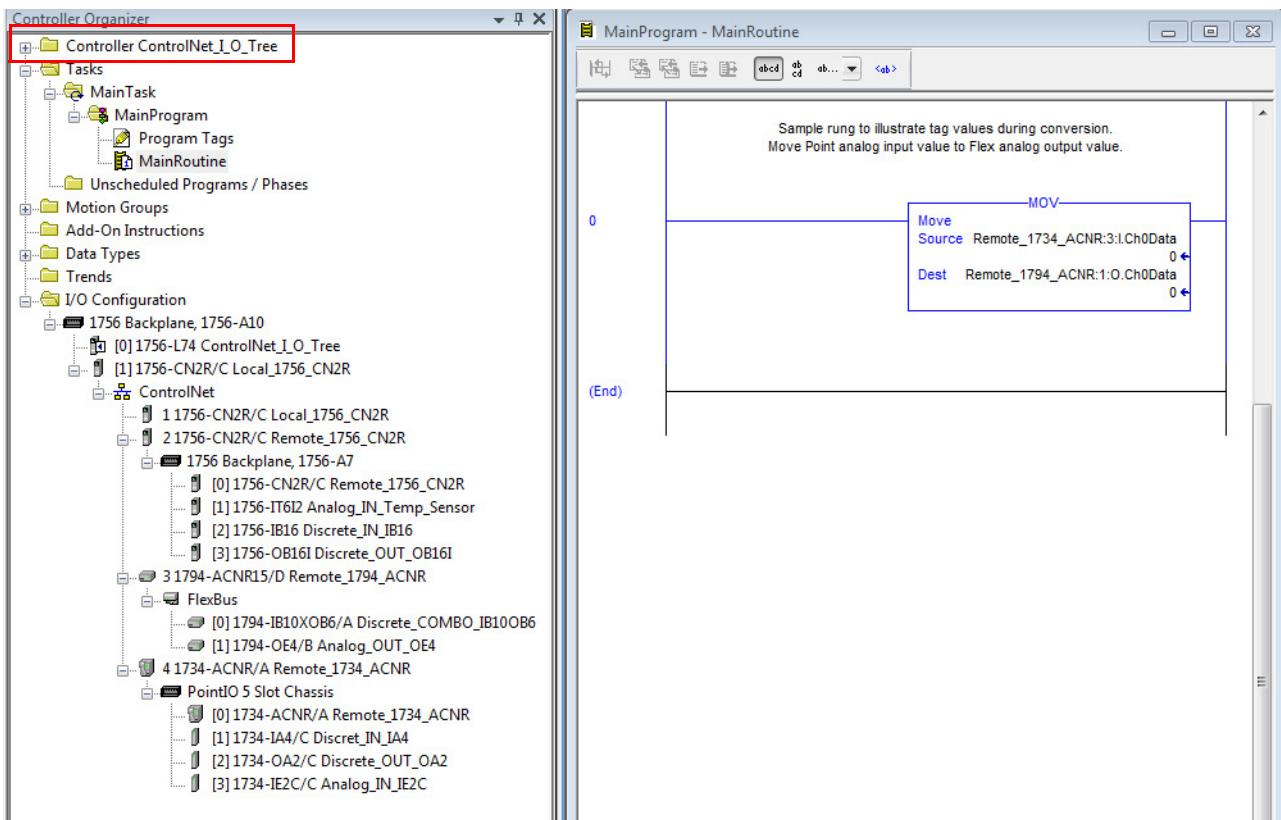
Software changes can be made offline in advance if desired.

When you add an EtherNet/IP device to a project, use the same properties, including the name, as the ControlNet device. After you add the device, edit the name and the tags change accordingly. For example, if an original device name includes 'CNET', use the same name for the EtherNet/IP device, then later edit the name and other properties accordingly. This provides for a straightforward migration where the logic does not need to change; only the tags need to change.
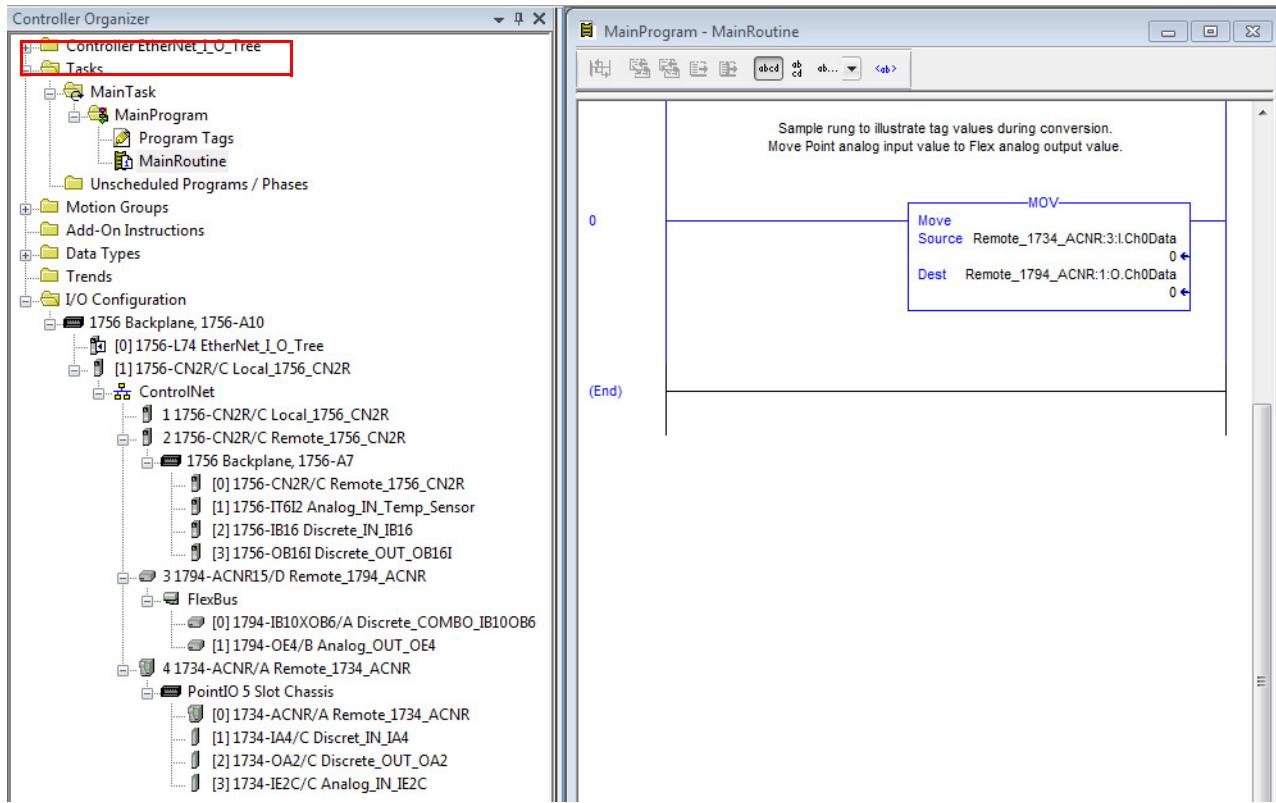
Migration Example

This example is an overview of the migration process. Highly engineered solutions require additional work due to difference in devices.
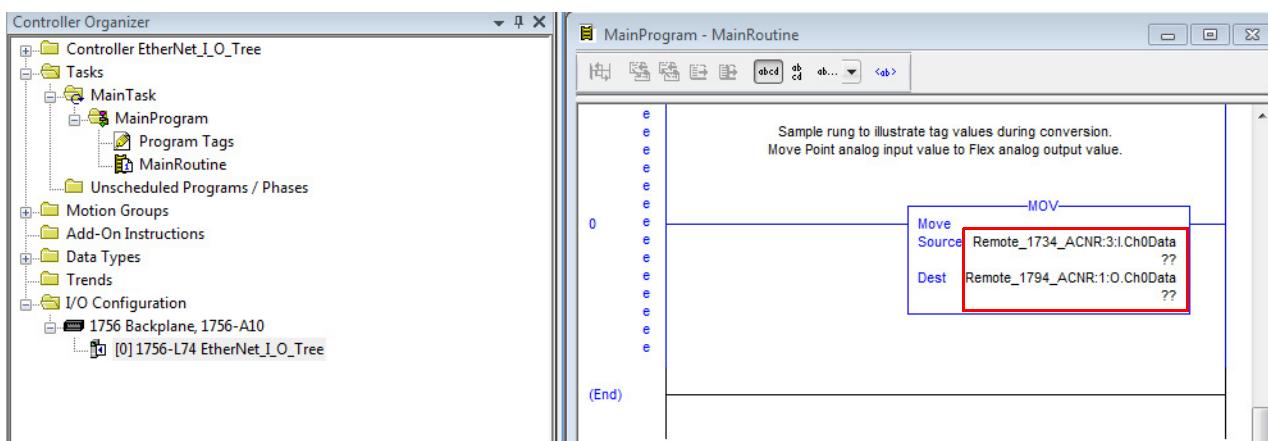
1. Open the original controller project.

2. Edit the project name in the controller properties and save as a new project, making no other changes. Keep both the original project and the new project open.
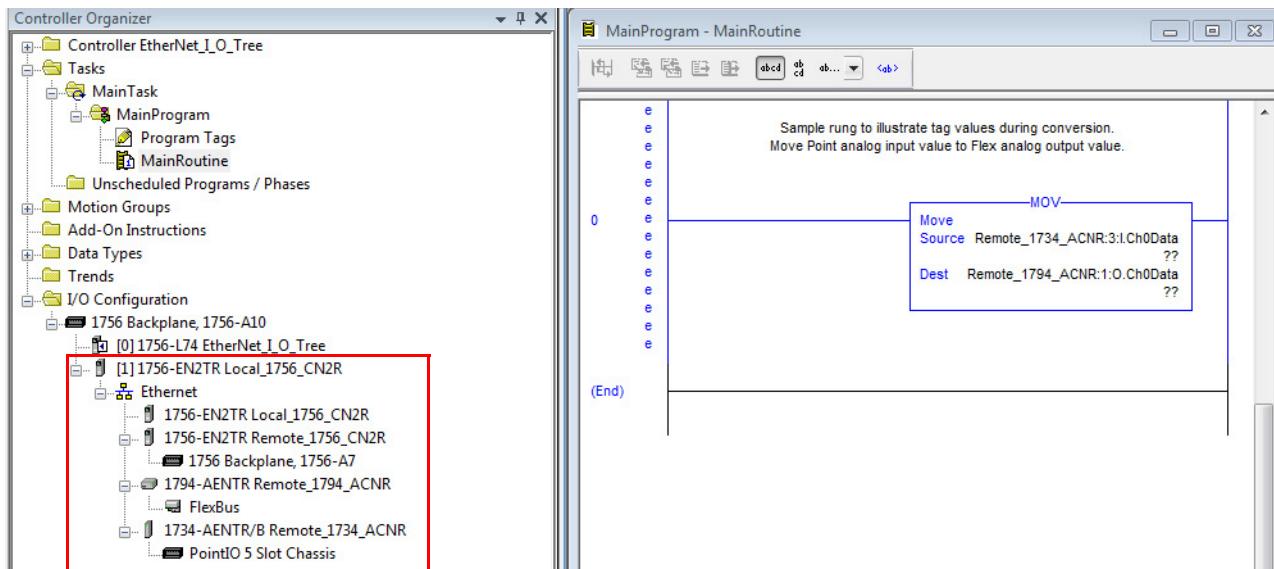

3. In the new project, delete all ControlNet devices. Start with individual I/O devices first, followed by any adapters or bridge modules. Deleting devices makes some rungs invalid due to deletion of I/O tags. Step 5 resolves the invalid rungs.
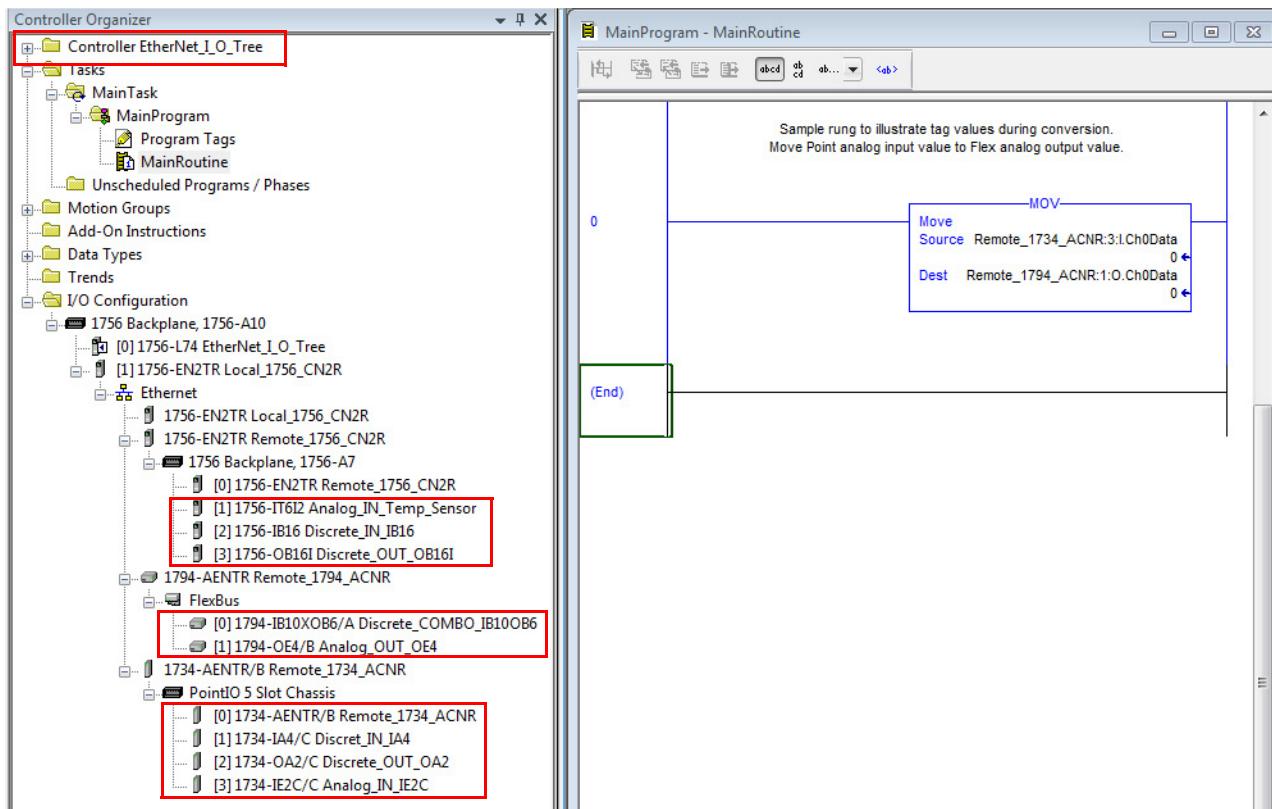
4. In the new project, add comparable EtherNet/IP devices. Do not add individual I/O modules at this time.
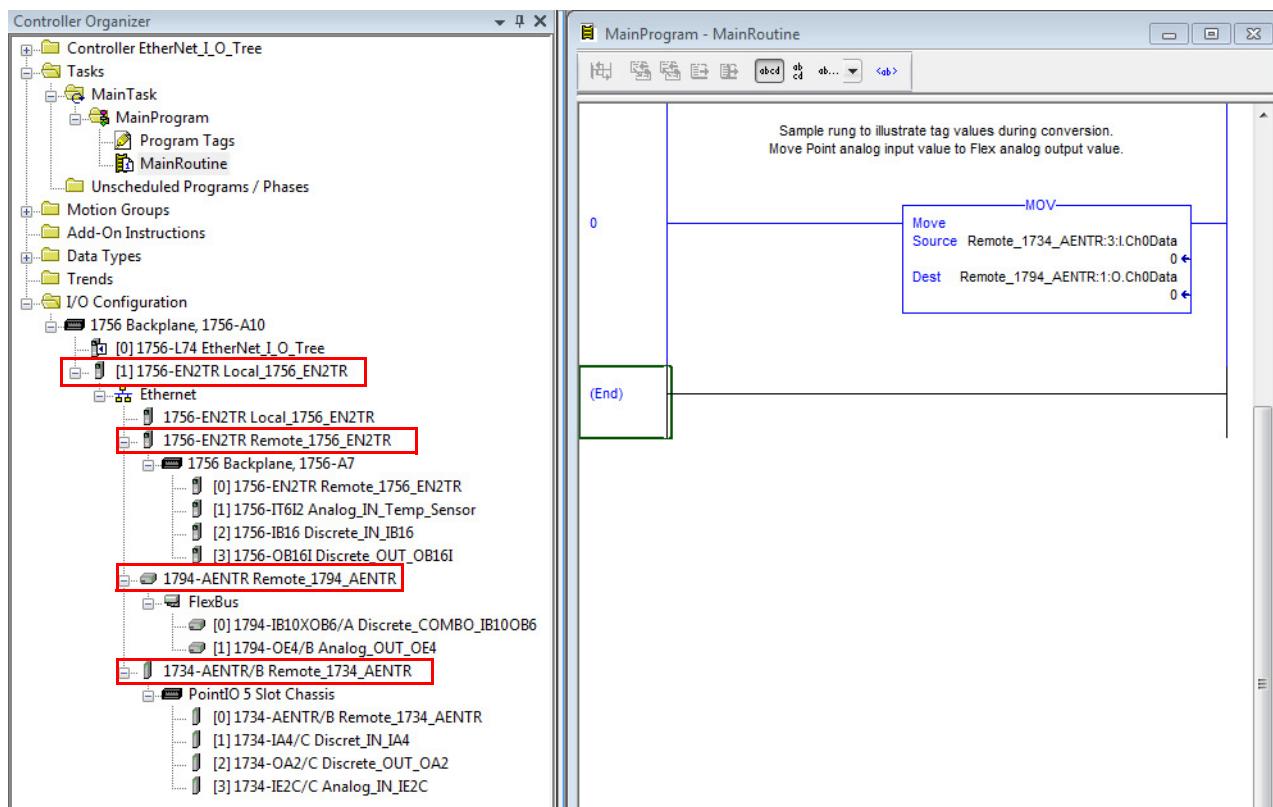
- Be sure that the new names and properties match the original ControlNet names and properties.
- Be sure that new chassis sizes match the original chassis sizes.
- Set other properties such as IP address as desired.

5. Drag and drop or copy and paste the individual I/O modules from the original project into the new project. This resolves the tag issues caused in Step 3.

6. Optionally, you can now re-name anything in the I/O tree as desired.

Notes:

Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	https://rockwellautomation.custhelp.com/
Local Technical Support Phone Numbers	Locate the phone number for your country.	http://www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	http://www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	http://www.rockwellautomation.com/global/literature-library/overview.page
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	http://www.rockwellautomation.com/global/support/pcdc.page

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