

# TRC Tech Talks

Online Seminars

## Modernization from ControlNet to Ethernet/IP

May 28<sup>th</sup>, 2020

# Introductions

## **Mark McGinnis**

Presenter

Automation Specialist  
The Reynolds Company  
– Dallas / Fort Worth

## **Mike Masterson**

Panelist

Automation Specialist  
The Reynolds Company  
– Houston

## **Brandon Singh**

Panelist

Network Specialist  
The Reynolds Company  
– Dallas / Fort Worth

# 2020 Online Events - Register to receive a calendar invite

## User Group

### Thursday, June 18

ControlLogix Redundancy  
10:00 am

## Tech Talks

### Tuesday, June 2<sup>nd</sup>

Industrial Networking Series Part  
2: Secure Cloud Connectivity to  
Plant Ethernet  
10:00 am

### Wednesday, June 3<sup>rd</sup>

Overload Migration  
10:00 am

### Thursday, June 4<sup>th</sup>

Industrial Networking Series Part 3:  
Resilient Networks – Device Level  
Ring (DLR)  
10:00 am

### Tuesday, June 16<sup>th</sup>

Industrial Networking Series Part 4:  
Resilient Networks – Parallel  
Redundancy Protocol (PRP)  
10:00 am

### Wednesday, June 17<sup>th</sup>

Industrial Networking Series Part 5:  
Connected Plantwide Ethernet  
Architectures  
10:00 am

### Tuesday, June 23<sup>rd</sup>

Industrial Networking Series Part 6:  
Securing Control System Network  
with CIP Security  
10:00 am

<https://www.reynoldsonline.com/eventsUnit.action>

ROKLive



A Rockwell Automation Virtual Event

**June 10 – 19, 2020**  
**Online/Virtual Seminars & Labs**



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Automation**

# Modernizing ControlNet to EtherNet/IP

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2.10.2020

# ControlNet – Why Modernize?

- ControlNet has been a reliable network for 25 years, but customers now need more.
- Customers Require
  - Wired and Wireless technology that enables data connectivity
  - Longterm lifecycle support for multiple decades
  - Open and inter-operable protocol supported by multiple vendors
  - Integration of open standards such as OPC-UA
- All RA ControlNet products going Active Mature
  - Customers do not need to migrate at this time, but must start planning
  - No End of Life announcements are tied to this announcement

| ControlNet   |   | Capabilities                       | EtherNet/IP |  |
|--|---|------------------------------------|-------------|--|
| RG-6 coax cable and Fiber  | ✓ | Media                              | ✓           | RJ45 Copper, Fiber,  |
| Not Supported  |   | Wireless                           | ✓           | Supported  |
| Limited to 99 Nodes on same network  | ✓ | Nodes                              | ✓           | Nodes can vary based on network design. Built in rotary switches can configure 254 nodes.                                |
| No Active Components used in Controlnet Network. Very limited Diagnostics. |   | Diagnostics                        | ✓           | Managed switches provide diagnostics such as broken wire detection, port status, timestamping of network alarm & events. |
| 5 Mbps   |   | Network Speed                      | ✓           | 10/100/1000 Mbps supported   |
| Deterministic protocol   | ✓ | Determinism                        | ✓           | EtherNet/IP leverages IEEE1588:2008 to provide determinism   |
| Redundant Controller and Redundant Media Supported                         | ✓ | High Availability                  | ✓           | Redundant controller and Media supported through PRP and DLR   |
| No CIP Security supported in protocol.                                     |   | Industrial Security (CIP Security) | ✓           | Extensive support for CIP Security and Defense in Depth strategy and architecture.                                       |

| ControlNet  |  | Capabilities                           | EtherNet/IP |  |
|---|--|--|-------------|--|
| No support for Integrated CIP Safety communications   |  | <b>Integrated Safety (CIP Safety )</b> | ✓           | Built-in support for Integrated Safety devices and CIP Safety in protocol.   |
| Limited Multi vendor support  |  | <b>Multi Vendor Support</b>            | ✓           | EtherNet/IP is supported by multiple vendors.  |
| No devices available  |  | <b>Integrated Motion</b>               | ✓           | Integrated Motion supported  |
| ControlNet products are transitioning to Active Mature status. Few product enhancements are likely. |  | <b>Future Product developments</b>     | ✓           | Development in the future will be focused on EtherNet/IP based products. The integration of Rockwell Automation devices to common standards, such as OPC-UA, will occur through EtherNet/IP. |



# EtherNet/IP – Critical Benefits

Longterm Availability of Products



Better lifecycle management, longer upgrade cycle

Enhanced and Improved Data Access



Improve maintenance and reduce bottlenecks

Enable Digitization and Digital Transformation



Reduce Downtime and Improve Profitability

Enable Security



Protect critical assets and operations

Enable IT/OT Convergence



Provide Transparency and Improve Productivity

Enable Integrated Safety and Diagnostics



Reduce system cost, downtime and maintenance



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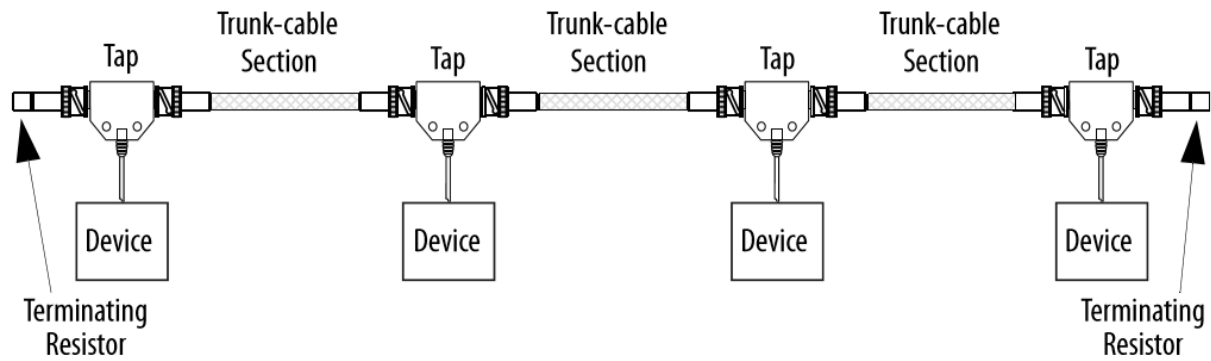
# Architectures

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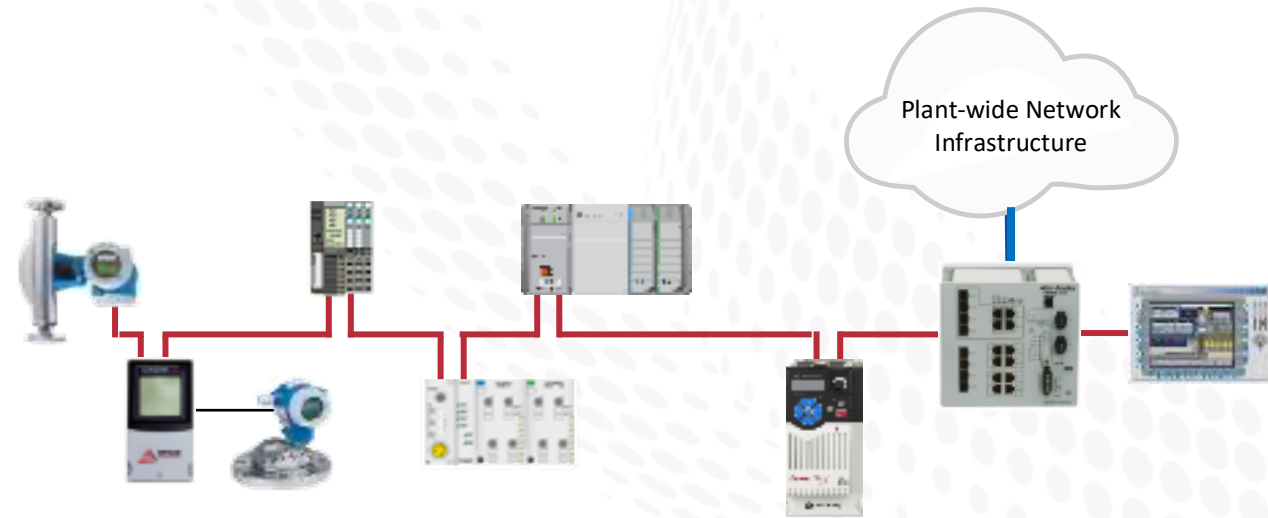
2.10.2020

# Linear Architecture

## ControlNet

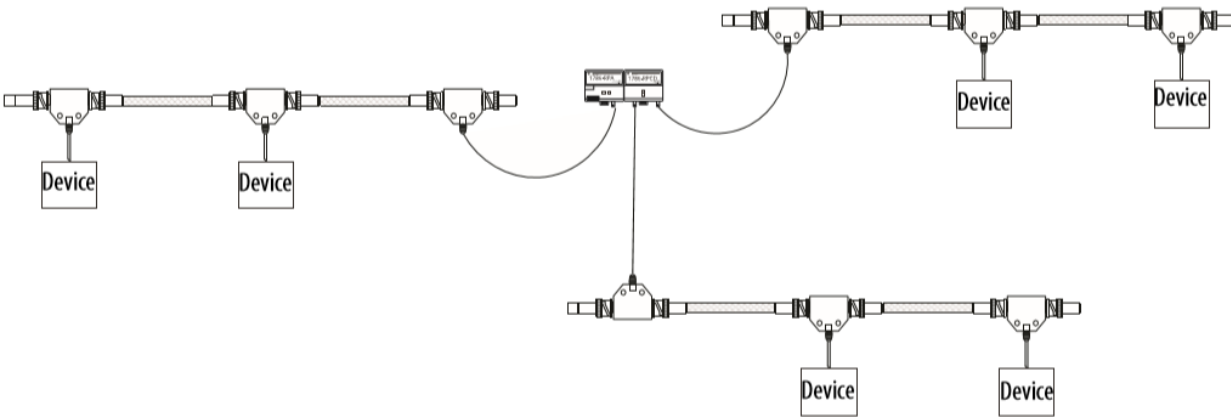


## EtherNet/IP

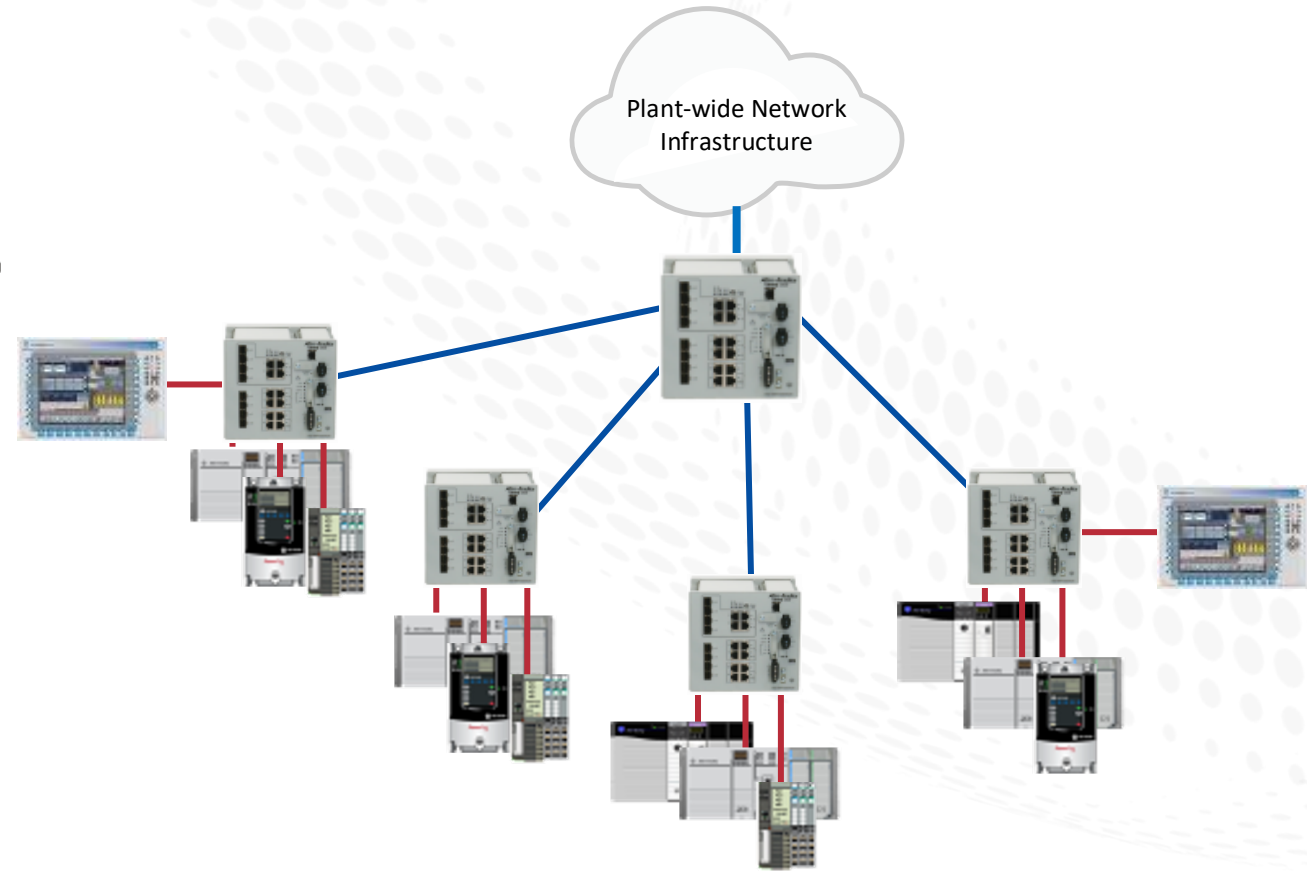


# Star Topology

ControlNet

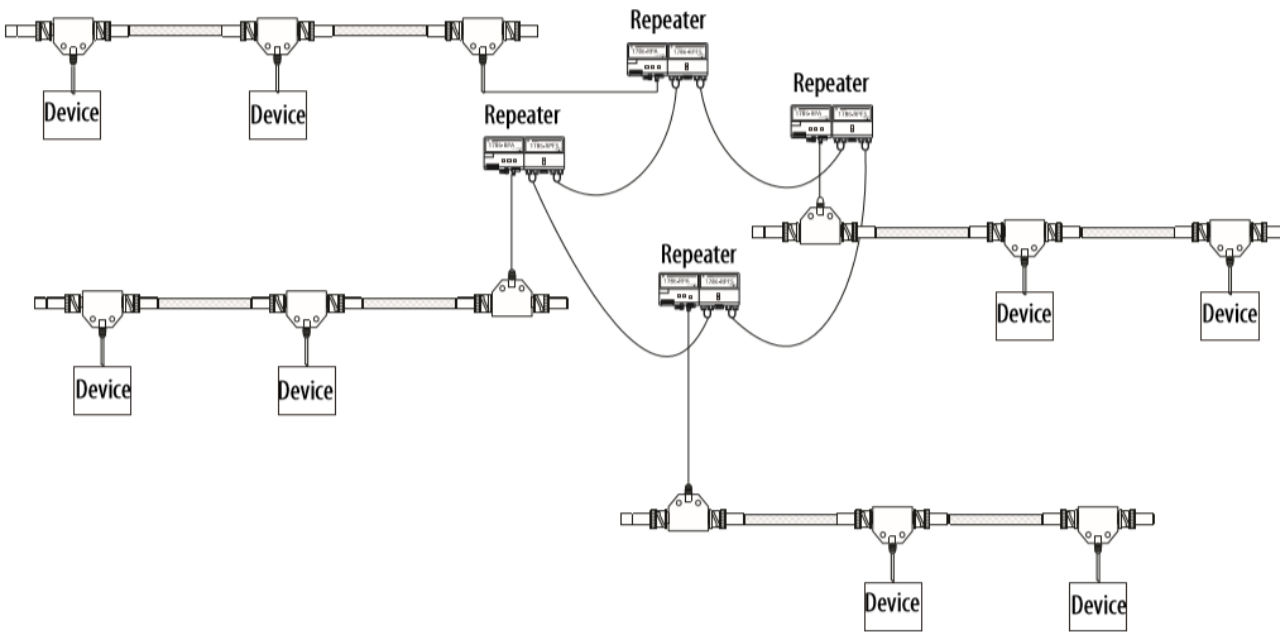


EtherNet/IP

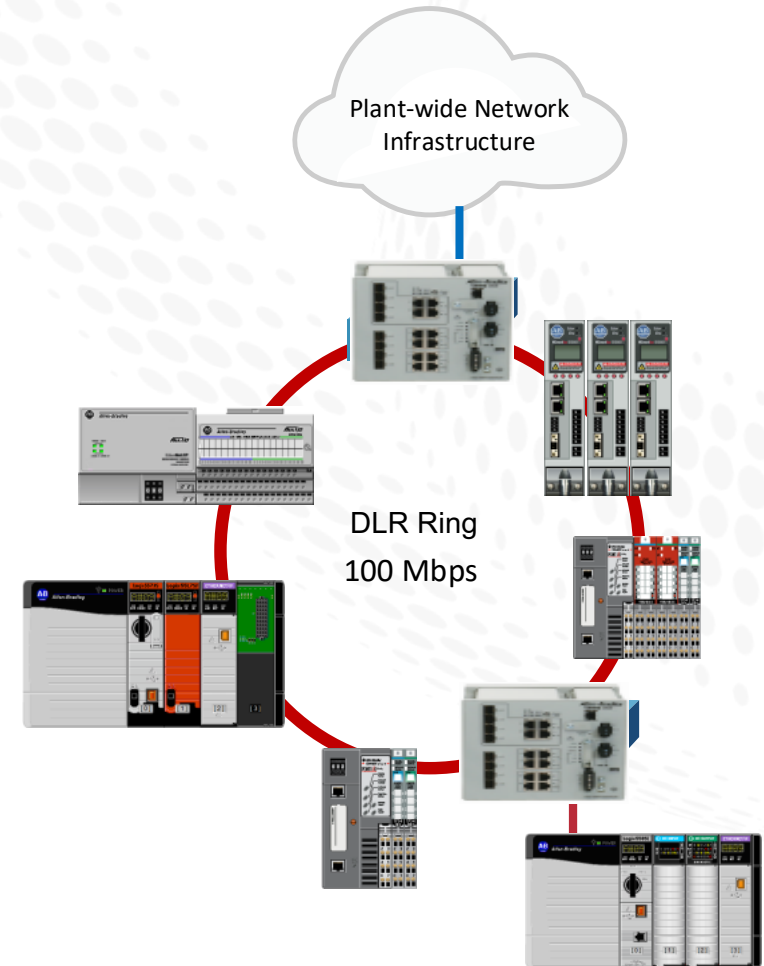


# Ring Topology

ControlNet

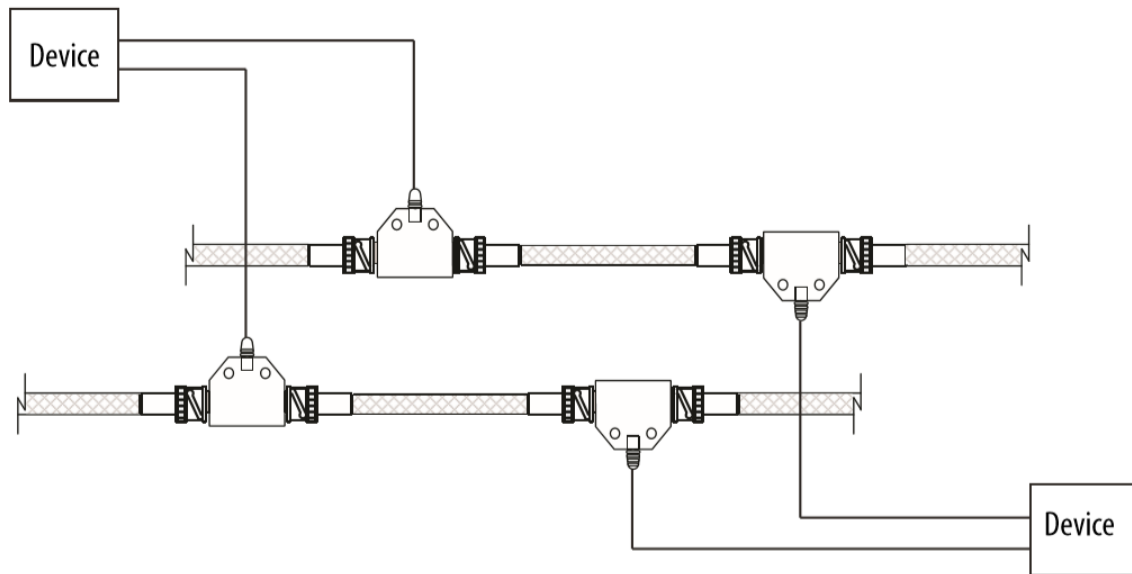


EtherNet/IP

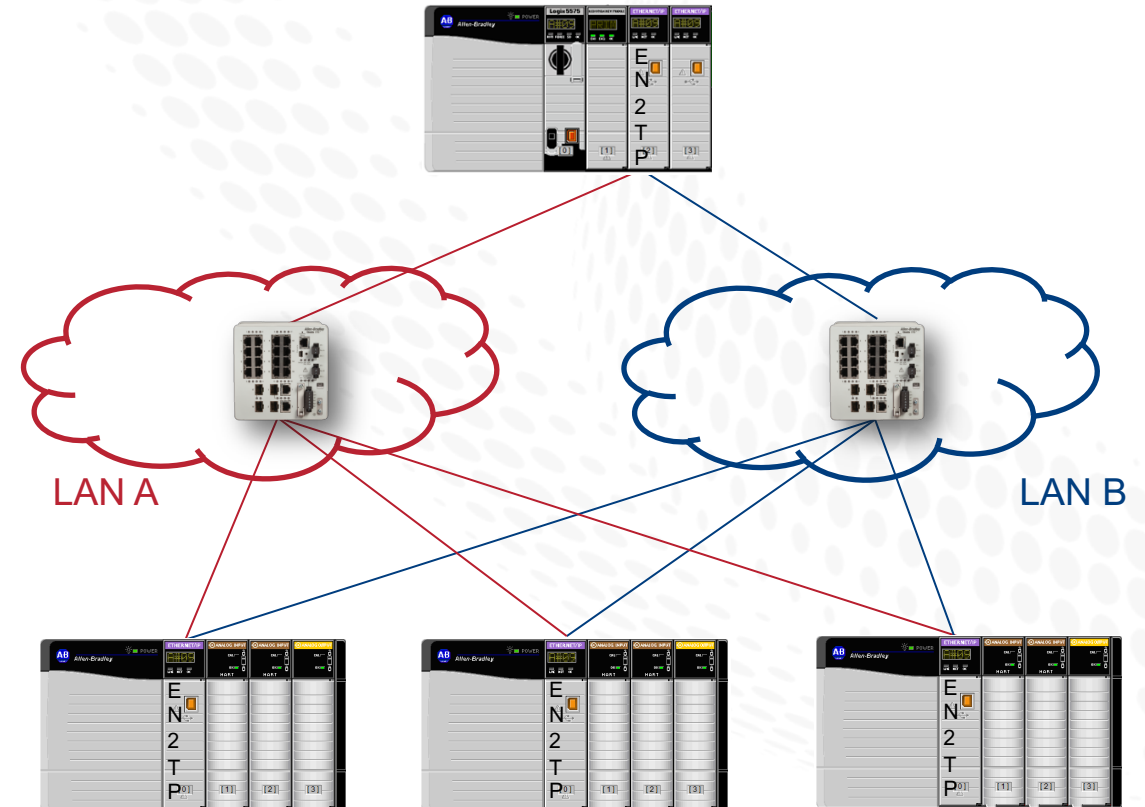


# Redundant Media Topology

## ControlNet



## EtherNet/IP



# Network Management, Controller and Communication Migration

|                                   | ControlNet  | EtherNet/IP  |
|-----------------------------------|---|--|
| Software                          | RSNetworkx for Controlnet (Required)  | FT Network Manager (Optional), Integrated Architecture Builder (Optional)  |
| Items Requiring Configuration     | ControlNet Network Keeper<br>ControlNet Network Update<br>Time Scheduled Maximum Node Address<br>Unscheduled Maximum Node Address   | EtherNet/IP DLR Supervisor<br>Managed Switches   |
| Communication                     | Scheduled I/O<br>Unscheduled Messaging  | UDP I/O<br>TCP Messaging   |
| CompactLogix & Guard CompactLogix | 1769 CompactLogix™ L4 and Compact GuardLogix® L4:<br><ul style="list-style-type: none"> <li>• 1768-CNB (Discontinued)</li> <li>• 1768-CNBR (Discontinued)</li> </ul> 1769-L32C, 1769-L35CR CompactLogix (End of Life)           | 1769 CompactLogix or Compact GuardLogix 5370 controller with embedded EtherNet/IP<br>5069 CompactLogix or Compact GuardLogix 5380 controller with embedded EtherNet/IP   |
| ControlLogix & GuardLogix         | 1756 ControlLogix and GuardLogix:<br><ul style="list-style-type: none"> <li>• 1756-CNB (Active Mature)</li> <li>• 1756-CNBR (Active Mature)</li> <li>• 1756-CN2 (Active Mature)</li> <li>• 1756-CN2R (Active Mature)</li> </ul> | 1756 ControlLogix and GuardLogix:<br><ul style="list-style-type: none"> <li>• 1756-EN2F</li> <li>• 1756-EN2T</li> <li>• 1756-EN2TP</li> <li>• 1756-EN2TR</li> <li>• 1756-EN3TR</li> <li>• 1756-EN4TR</li> <li>• 1756-ENBT</li> </ul> |



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# Modernization Process

2.10.2020

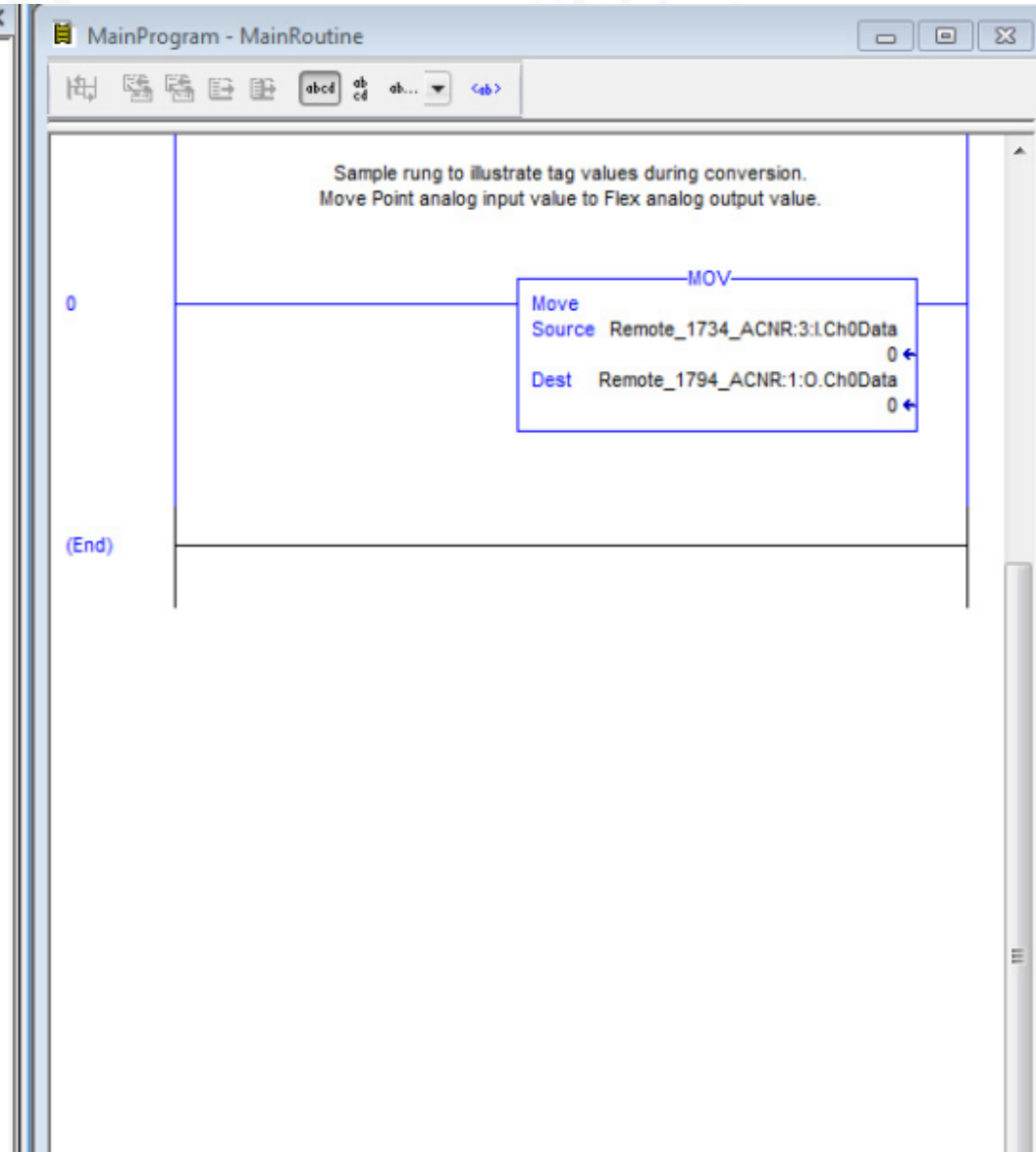
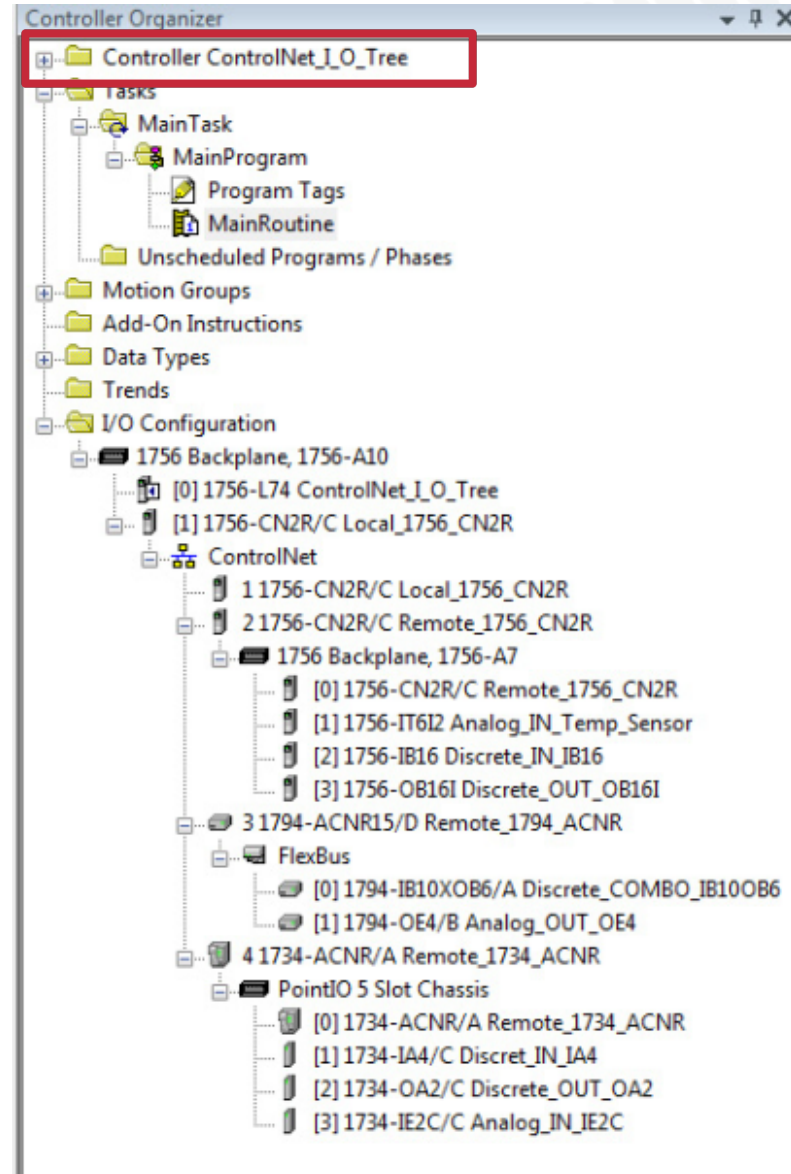


# Modernization Process Steps

- Acquire EtherNet/IP hardware (zero to minimal system interruptions)
- Install new infrastructure - such as cables and switches. (zero to minimal system interruptions)
- Convert the I/O configuration tree
- 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)

# Converting IO Tree

Open Project



# Converting IO Tree

Edit the Name and save as new project.

Keep both projects Open.

The screenshot shows the 'Controller Organizer' window. The project tree is expanded to show the 'I/O Configuration' section. A folder named 'Controller EtherNet\_I\_O\_Tree' is highlighted with a red rectangular box. Below it, the tree lists various hardware components and their configurations, including backplanes, ControlNet modules, FlexBus modules, and PointIO modules.

The screenshot shows a ladder logic rung in the 'MainProgram - MainRoutine' window. The rung is labeled '0' and contains a 'MOV' instruction. The instruction is titled 'Move' and has the following parameters:

- Source: Remote\_1734\_ACNR:3:I.Ch0Data
- Dest: Remote\_1794\_ACNR:1:O.Ch0Data

The rung is connected to a power rail on the left and an output coil on the right. The output coil is labeled '0' and has a '0' next to it. The rung ends with '(End)'. Above the rung, there is a text box that reads: 'Sample rung to illustrate tag values during conversion. Move Point analog input value to Flex analog output value.'

# Converting IO Tree

Delete all ControlNet Devices.

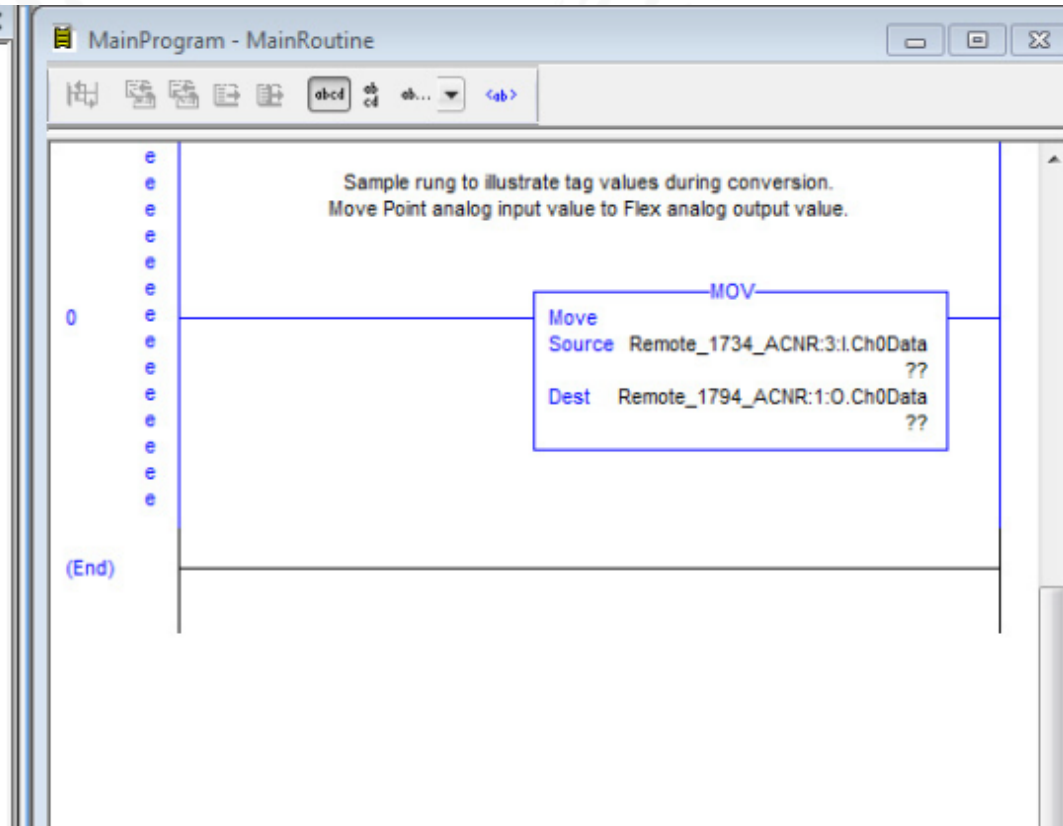
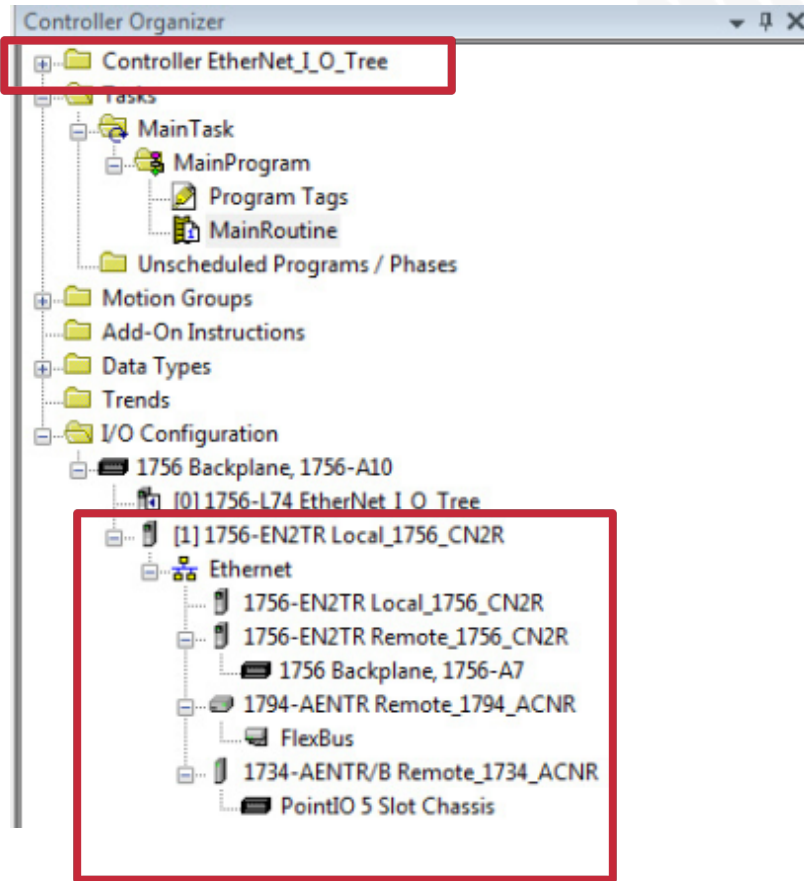
The image shows two windows from the Rockwell Automation software. The left window, titled "Controller Organizer", displays a hierarchical tree structure. A red box highlights the "Controller EtherNet\_I\_O\_Tree" folder. Below it, the "I/O Configuration" section is expanded to show a "1756 Backplane, 1756-A10" and a "[0] 1756-L74 EtherNet\_I\_O\_Tree" device. The right window, titled "MainProgram - MainRoutine", shows a ladder logic rung. The rung contains a "MOV" instruction box, also highlighted with a red box. The instruction details are: "Move", "Source Remote\_1734\_ACNR:3:I.Ch0Data ??", and "Dest Remote\_1794\_ACNR:1:O.Ch0Data ??". The rung is labeled "0" on the left and "(End)" at the bottom.

# Converting IO Tree

Add EtherNet/IP Network Adapters

Match the new names to old ControlNet device names

Set new properties such as IP Address and RPI's.



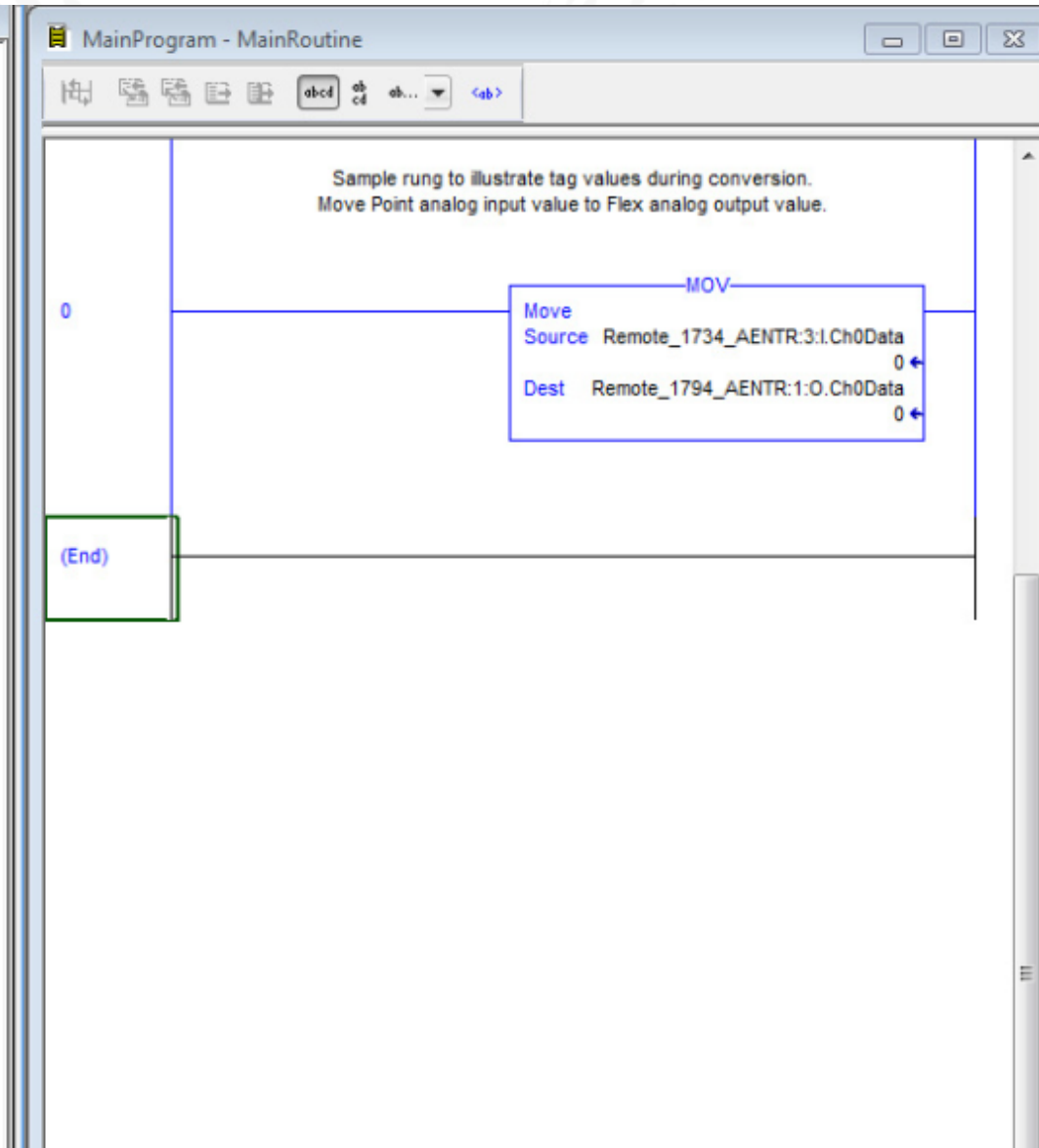
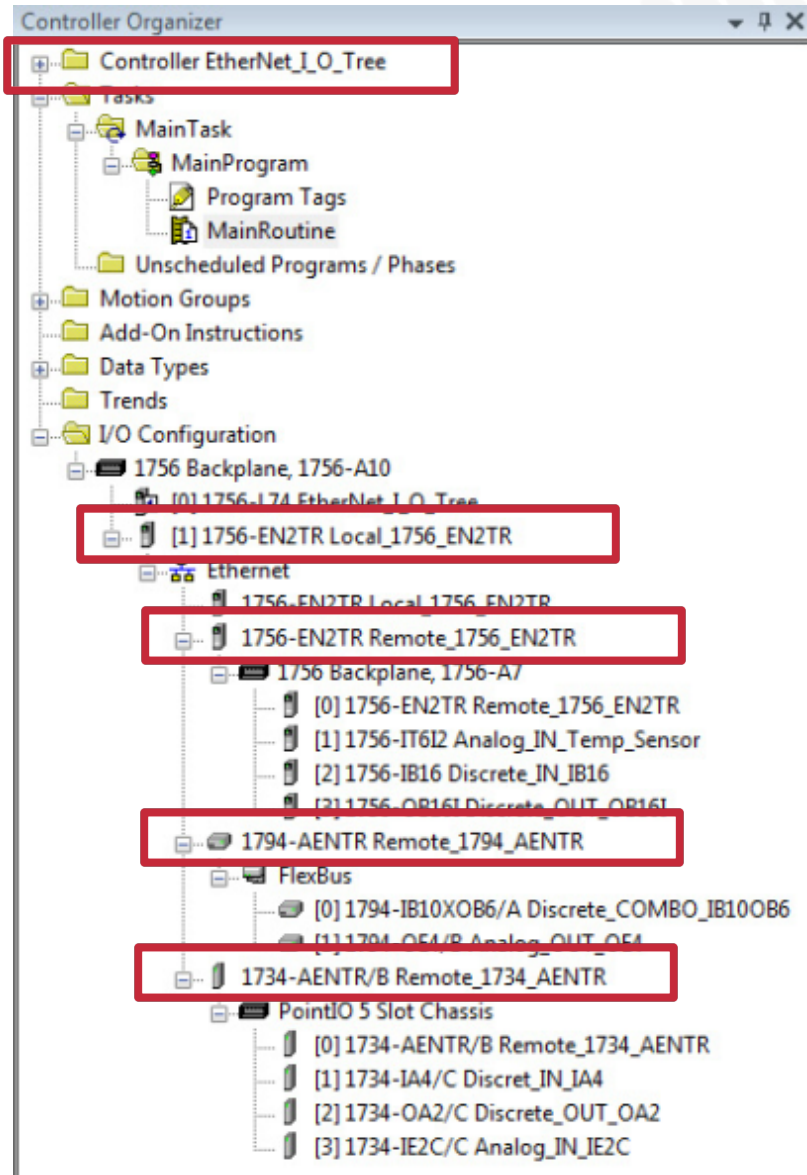
# Converting IO Tree

Drag and Drop the IO Modules from Original project.

The screenshot displays two windows from the Rockwell Automation software. The left window, titled "Controller Organizer", shows a hierarchical tree of project components. The "Controller EtherNet\_I\_O\_Tree" folder is highlighted with a red box. Underneath, the "I/O Configuration" section lists various modules, with three groups highlighted by red boxes: 1) "1756-IT6I2 Analog\_IN\_Temp\_Sensor", "1756-IB16 Discrete\_IN\_IB16", and "1756-OB16I Discrete\_OUT\_OB16I"; 2) "1794-IB10XOB6/A Discrete\_COMBO\_IB10OB6" and "1794-OE4/B Analog\_OUT\_OE4"; and 3) "1734-IA4/C Discret\_IN\_IA4", "1734-OA2/C Discrete\_OUT\_OA2", and "1734-IE2C/C Analog\_IN\_IE2C". The right window, titled "MainProgram - MainRoutine", shows a ladder logic rung. The rung contains a "MOV" instruction with "Source Remote\_1734\_ACNR:3:I.Ch0Data" and "Dest Remote\_1794\_ACNR:1:O.Ch0Data". The rung is labeled "Sample rung to illustrate tag values during conversion. Move Point analog input value to Flex analog output value." and ends with an "(End)" instruction.

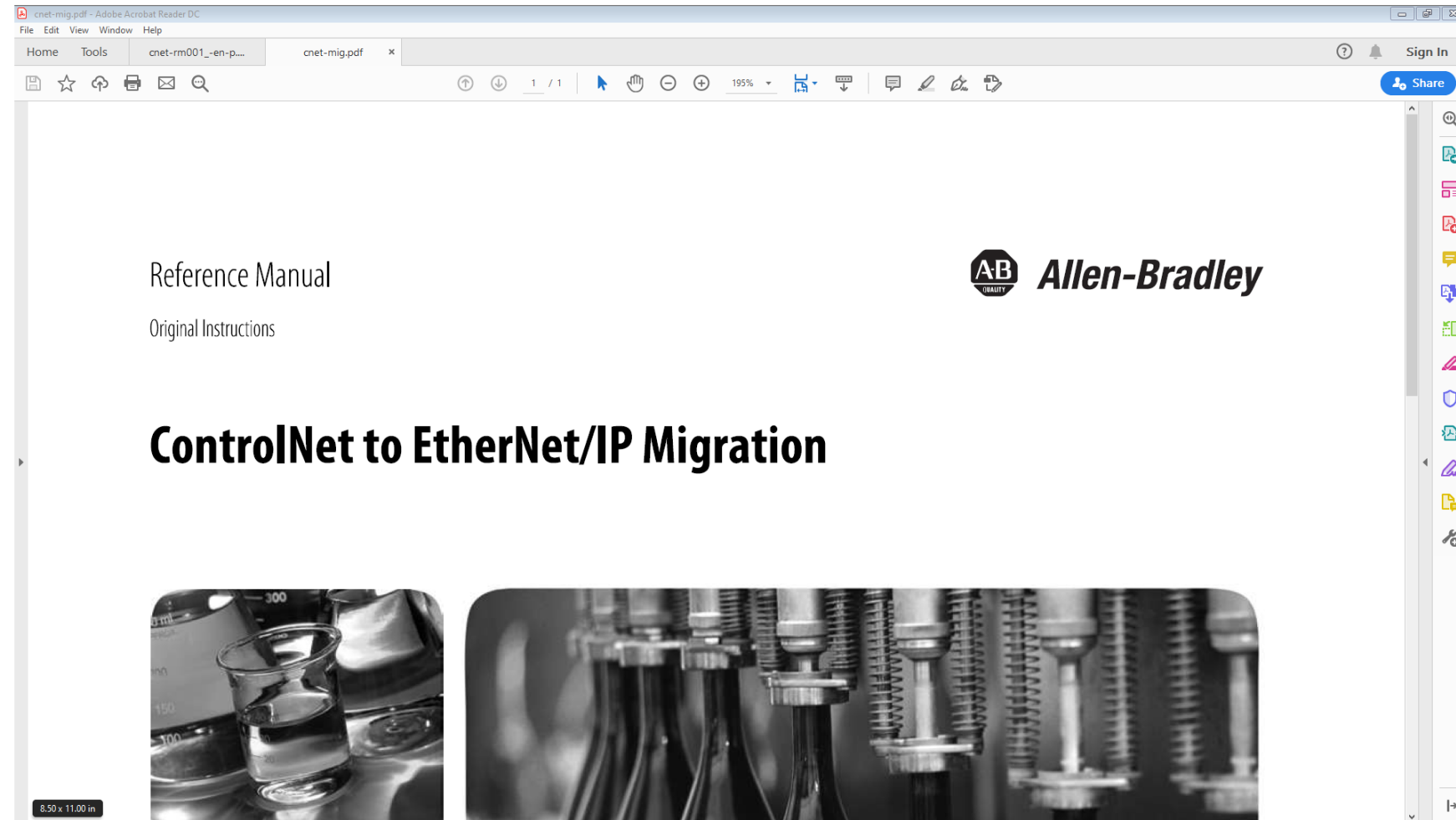
# Converting IO Tree

Rename devices in IO tree as appropriate.



# ControlNet to EtherNet/IP Migration Guide

Publication CNET-RM001A-EN-P







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# Thank you

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[www.rockwellautomation.com](http://www.rockwellautomation.com)