Honeywell

Experion PKS Ethernet Implementation Guide

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1 About this guide

This document provides guidelines and procedures for installing an Ethernet supervisory network for communications between an Experion Server and C200 Controller. Not all control hardware configurations are compatible with an Ethernet network.

Revision history

Revision	Date	Description
A	February 2015	Initial release of document

1 ABOUT THIS GUIDE

6

2 Introduction

Related topics

"Overview" on page 8

"Getting Started" on page 9

"Conventions" on page 11

2.1 Overview

The Experion system supports supervisory level communications over an Ethernet network using the Transmission Control Protocol/Internet Protocol (TCP/IP) suite of protocols.

While Ethernet TCP/IP is used worldwide in general industrial and office environments, it has only recently been introduced as a viable communications media for control components on the plant floor due to performance enhancements in switching technology.

The Experion Supervisory Ethernet network requires switches to minimize the number of data collisions and deferred transmissions.



Note

It may not be appropriate to use Ethernet communications in high-speed control applications.

Be sure your control application can tolerate occasional fluctuations in inter-message timing and message response time

2.1.1 Functional Overview and Guidelines

Figure 1 displays a basic Experion system topology using a Supervisory Ethernet network. The Experion system still provides the same configuration, control, and monitor functions as it does with a Supervisory ControlNet network. However, the following guidelines are unique to Supervisory Ethernet networks.

- Use only non-redundant Controllers Controller redundancy is not supported.
- The same Experion Server cannot support simultaneous ControlNet and Ethernet communications to different C200 Controllers.
- Must use a downlink ControlNet module to support remote I/O over a ControlNet segment.
- Redundant Ethernet media is not supported.

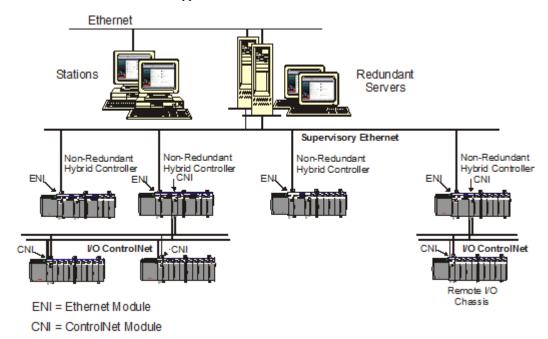


Figure 1: Basic Experion Supervisory Ethernet Topology

2.2 Getting Started

2.2.1 Identifying network requirements

The following table identifies the hardware and software components needed to implement a Supervisory Ethernet network.

Component	Description	Honeywell
Network Interface Card	Provides an RJ-45 port for 10Mbps Ethernet over category 3, 4, or 5 unshielded twisted pair cable or 100 Mbps Fast Ethernet over category 5 unshielded twisted pair cable	3Com model 3C905B-Combo 10/100 NIC*
Network Switch	Provides 10/100Mbps switching capabilities with autosensing ports for connecting Experion Server to the supervisory network.	Nortel Networks BayStack 450-12T 12- port fast Ethernet switch*
Ethernet Communications Interface Module (Ethernet module)	Provides an RJ-45 port for 10/100Mbps Ethernet over category 5 unshielded twisted pair cable for connecting C200 Controller to the supervisory network	Honeywell model TC-CEN021
The model TC-CEN021 Ethernet module is a direct replacement for the previous TC-CEN011 model. However, the TC-CEN021 module does not include an Access Unit Interface (AUI) type connector or a front panel door, and its RJ-45 port is located on the bottom of the module. If you are currently using a TC-CEN011 module with an AUI type connection, you will have to convert to a RJ-45 type connection to replace it with a model TC-CEN021 module.		
Experion Software	Provides Engineering Tools, Server/ Client, and RSLinx components	Honeywell - Specify desired release version.

^{*} You may achieve comparable results with other compatible products. We recommend using managed type network switches, since they provide diagnostic capability.

2.2.2 Determining wiring requirements

You will need category 3 and 5 unshielded twisted pair cable to connect the Ethernet module and NIC to switch ports. Be sure the cable is appropriate for your planned routing method and meets both national and local electrical and fire codes.

We suggest that you work with a cable manufacturer to select the wiring that meets your particular installation requirements. If you have access to the Internet, you can visit the Belden Wire and Cable Company web site at for helpful technical data on a wide variety of wire and cable types.

2.2.3 Starting point assumptions

We assume that the current software is running on your Experion Server. This includes the OEM version of the RSLinx software, which requires loading the "Activation Key" from the Master diskette provided with the software. If you need to load the current Software, refer to the *Experion Software Installation and Upgrade Guide* for details.

We assume that you have a working knowledge of Ethernet and the TCP/IP protocol.

For more information about TCP/IP and internet working, refer to:

- Internetworking with TCP/IP Vol. 1, 2nd ed., by Douglas E Comer (ISBN 0-13-216987-8)
- The Ethernet Management Guide Keeping The Link (ISB 0-07-046320-4)

- An Introduction to TCP/IP (ISBN 3-540-96651-X)
- Computer Networks by Andrew S. Tanenbaum (ISBN 0-13-162959-X)

2.3 Conventions

Related topics

"Terms and type representations" on page 11

2.3.1 Terms and type representations

The following table summarizes the terms and type representation conventions used in this Guide.

Term/Type Representation	Meaning	Example
click	Click left mouse button once. (Assumes cursor is positioned on object or selection.)	Click the Browse.
double-click	Click left mouse button twice in quick succession. (Assumes cursor is positioned on object or selection.)	Double click the Station icon.
drag	Press and hold the left mouse button while dragging cursor to new screen location and then release the button. (Assumes cursor is positioned on object or selection to be moved.)	Drag the PID function block onto the Control Drawing.
right-click	Click right mouse button once. (Assumes cursor is positioned on object or selection.)	Right-click the AND function block.
<f1></f1>	Keys to be pressed are displayed in angle brackets.	Press <f1> to view the online Help.</f1>
<ctrl>+<c></c></ctrl>	Keys to be pressed together are displayed with a plus sign.	Press <ctrl>+<c> to close the window.</c></ctrl>
File->New	Displays menu selection as menu name followed by menu selection	Click File->New to start new drawing.
>D:\setup.exe<	Data to be keyed in at prompt or in an entry field.	Key in this path location >D: \setup.exe<.

2 INTRODUCTION

3 Installation

Related topics

"Ethernet Network Components" on page 14

3.1 Ethernet Network Components

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Attention

Be sure you review the pre-installation considerations and approval body notifications included in the *Control Hardware Installation Guide* before you install any Experion system component.

3.1.1 Installing Network Interface Card (NIC)

Follow the manufacturer's instructions to install the NIC in the Experion Server and load the accompanying driver software. If you are installing the 3Com model 3C905B-COMBO and have Internet access, you may visit their web site at for additional information.

3.1.2 Installing Ethernet switch

Follow the manufacturer's instructions to install the switch. If you are installing the Nortel Networks BayStack 450-12T switch and have Internet access, you may visit their web site at for additional information.

3.1.3 Connecting NIC to switch

Follow the manufacturers' instructions to connect a category 5 unshielded twisted pair cable between the NIC and the switch. Be sure the NIC and switch port have matching speeds of 100Mbps and "duplex" by using autonegotiation or manual configuration.

3.1.4 Installing Ethernet module



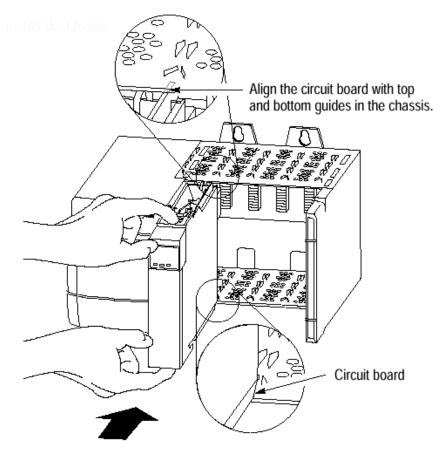
Attention

The following procedure is also included in the *Control Hardware Installation Guide*. It is repeated here for convenient reference only.

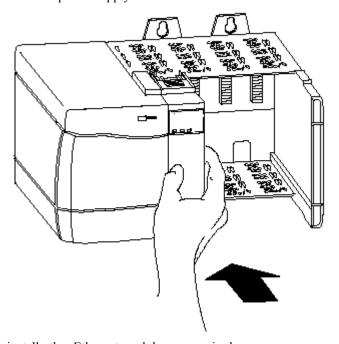
Use the following procedure to insert the Ethernet module into the chassis. This procedure assumes that the chassis and power supply have already been installed. See the *Control Hardware Installation Guide* for more information on chassis and power supply installation.

- 1. Open the door on the power supply of the chassis and flip the power switch to its OFF position.
- 2. Align the module's circuit board with the top and bottom chassis guides for the planned slot location. Typically, slot 0 is reserved for the Ethernet module.

(Remember that slot numbering is zero-based and the left most slot is number "0".)



3. Slide the module into the chassis, until the module's locking tabs "click" into position. The module is fully installed when it is flush with the power supply or other installed modules.



- 4. Repeat Steps 2 and 3 to install other Ethernet modules, as required.
- 5. Go to the next Section Attaching Ethernet cables.

3.1.5 Attaching Ethernet cables



WARNING

Unless the location is known to be non-hazardous, do not:

- · connect or disconnect cables,
- install or remove modules,

while the Control system is powered.

The Ethernet module has a RJ-45 socket for network cable connections, as displayed in Figure 2.

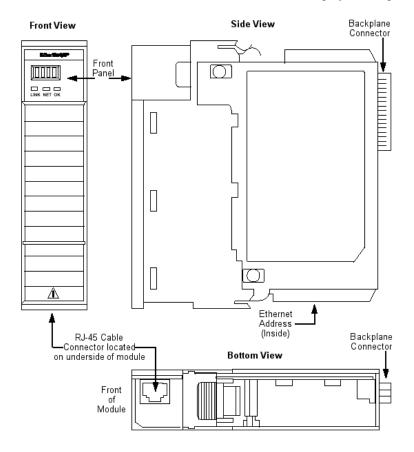
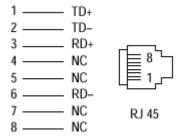


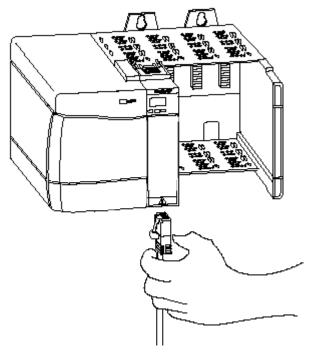
Figure 2: Front view of Ethernet module with view of RJ-45 connector

Use the following procedure to connect the network cable between the switch port and the Ethernet module port.

1. Be sure the cable connector is wired as displayed in the following diagram.



2. Plug the RJ-45 cable plug into the socket on the bottom of the module, so it locks in place.



3. Connect the other end of the cable to the Ethernet switch port. Be sure to make all Supervisory Ethernet network connections.

3 INSTALLATION

4 Configuration

Related topics

"Setting Up Drivers and IP Addresses" on page $20\,$

4.1 Setting Up Drivers and IP Addresses

Related topics

- "IP Address Recommendation" on page 20
- "About BOOTP" on page 20
- "About IP Address Classes" on page 20
- "Checking NIC settings" on page 21
- "Configuring and setting IP address for Ethernet module" on page 23
- "Configuring additional RSLinx drivers" on page 25
- "Disabling BOOTP on Ethernet module" on page 27

4.1.1 IP Address Recommendation

There are 273 IP networks reserved for private networks. The addresses are 10.0.0.0, 172.16.16-31.0, and 192.168.0-255.0. They can be used by anyone setting up internal IP networks, such as a lab or home LAN behind a NAT or proxy server or a router. None of these networks will conflict with any networks addressable on the Internet. These addresses are defined in RFC 1918.

We **recommend** using one of the 192.168.x.0 Private Class C internet networks for the Supervisory Ethernet network.



Attention

Check with your organization's network administrator to identify specific addresses that may be available at your facility. While there will be no conflict with Internet networks, you organization may already use one or more of the private networks for internal purposes.

4.1.2 About BOOTP

The Experion Control Data Access (CDA) server includes a BOOTP (Bootstrap protocol) server. The BOOTP is low-level protocol that provides configuration to other nodes on a TCP/IP network with Windows operating system. The BOOTP configuration files let you automatically assign IP addresses to the Ethernet module. You can also obtain subnet masks and gateway addresses from BOOTP.

The Ethernet module factory default setting is BOOTP enabled. Upon power up, the Ethernet module sends a message to the BOOTP server on the network with its physical (or MAC) address. The server compares the MAC address to those in its look-up table in the configuration file and sends a message back to the module with the appropriate IP address.

4.1.3 About IP Address Classes

The IP address identifies each node on the IP network (or system of connected networks). Each TCP/IP node on a network (including the Ethernet module) must have a unique IP address.

The IP address is 32 bits long and has a net ID part and a host ID part. There are three network classes A, B, and C that determine how an IP address is formatted. The Class A address format is one byte net ID and three bytes host ID with the highest order bit always set to 0. The Class B format is two bytes net ID and two bytes host ID with the two highest order bits set to 10. The Class C format is three bytes net ID and one byte host ID with the three highest order bits set to 110.

Each node on the same physical network must have an IP address of the same class and must have the same net ID. Each node on the same network must have a different host ID to give it a unique IP address.

You can distinguish the class of an IP address based on its first integer. The range for a first integer in a Class A address is 0 to 127, 128 to 191 for a Class B address, and 192 to 223 for a Class C address.



Attention

The address 127.0.0.0 is reserved for loopback functions and is not considered to be a network address.

4.1.4 Checking NIC settings



Attention

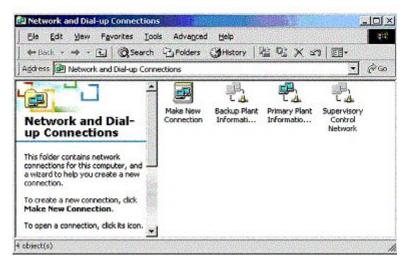
Users are responsible for making the correct IP address assignments for the addressable components used in their planned Supervisory Ethernet networks.

Use the following procedure to check the NIC configuration settings.

1 Right-click the My Network Places icon on the Desktop and click Properties in the popup menu.

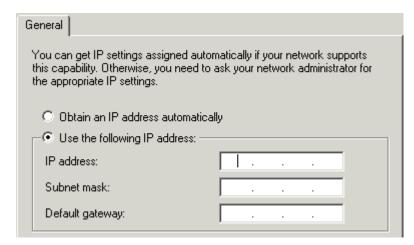


Calls up the Network and Dial-up Connections window.



- 2 Right-click the **Supervisory Control Network** icon or file, and click **Properties** in the popup menu. Calls up the **Local Area Connection Properties** dialog.
- With Ethernet NIC listed in the "Connect using" field, click the Internet Protocol (TCP/IP) icon in the "Components . . . connection" list box and click the **Properties**.

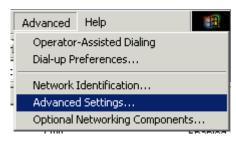
 Calls up the **Internet Protocol (TCP/IP) Properties** dialog.
- 4 Click the Use the following IP address.
 Selects the function and activates the IP address, Subnet Mask, and Default gateway fields.



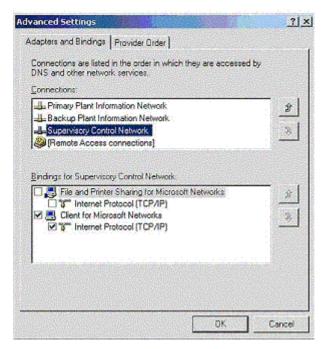
5 With the cursor in the "IP address" field, key in the IP address for the NIC. For example, 192.168.1.20. Press <Tab>.

Moves cursor to the **Subnet mask** field.

- **6** Key in the Subnet mask address. For example, 255.255.255.0. Press <Tab>. Moves cursor to **Default gateway** field.
- 7 Leave this field blank as well as the DNS address fields in the next section and click the OK.
 Closes the IP Properties dialog box and returns to the Local Area Connection Properties dialog.
- 8 Click the OK.
 Closes the dialog box and returns to the Network and Dial-up Connections window.
- 9 With Supervisory Control Network icon still selected in the Network and Dial-up Connections window, click Advanced->Advanced Settings.



Calls up the Advanced Settings dialog.



10 In the **Adapter and Bindings** tab, check that the **Supervisory Control Network** is listed as the last adapter in the binding order for **TCP/IP Protocol** displayed in the **Connections** list box. Use the Up or Down arrow on the right-hand side of the list box to move the selected adapter to the desired position.

Confirm that the order of the adapters in the **Connections** list box is as follows.

- Primary Plant Information
- Backup Plant Information Network (Redundant Servers only)
- Supervisory Control Network (Using Ethernet media)

(Note that the network names displayed here are for example purposes only and your network names may be different. In either case, be sure the order is as displayed above.)

11 With the Supervisory Control Network entry in the Connections list box selected, verify that the check box for the File and Printer Sharing for Microsoft Networks listing in the Bindings for Supervisory Control Network list box is blank.

Reserves the Supervisory network for Control traffic only.

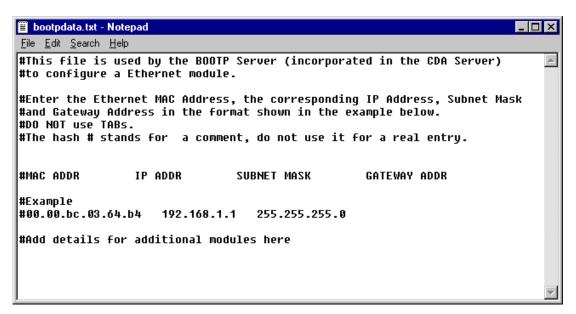
- 12 Click the OK.
 - Closes the dialog box and applies the settings.
- **13** Click **File-** > **Close** and go to the next section *Configuring and setting IP address for ETHERNET MODULE*.

Closes the Network and Dial-up Connections window.

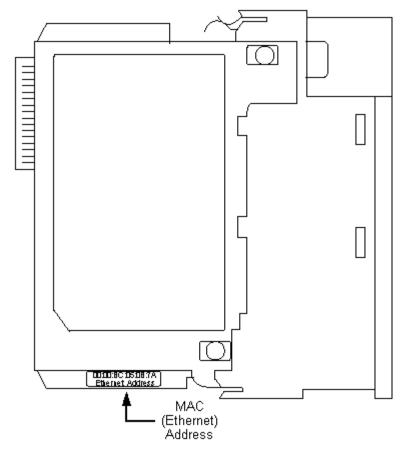
4.1.5 Configuring and setting IP address for Ethernet module

Use the following procedure to configure the IP address for the Ethernet module in the BOOTP configuration file and then set the address in the Ethernet module.

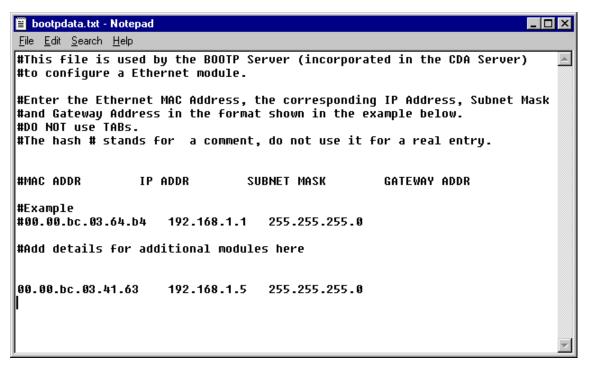
1 Using **Windows NT Explorer**, locate the *bootpdata.txt* file in this directory location c:*Program Files* *Honeywell\Experion\Engineering Tools\system\bin* on the non-redundant Server or SERVERB node of a redundant pair.



2 Edit the file to include the MAC address listed on the label on the inside of the Ethernet module. Be sure to enter the address as displayed with any leading zeros.



- 3 Add the assigned IP address to the file in the format displayed.
- 4 Add the Subnet Mask to the file in the format displayed.
- 5 Leave the **Gateway address** field blank. The following illustration displays sample address entries for example purposes only.



- 6 Repeat Steps 2 to 5 for each Ethernet module in the system.
- 7 Click File-> Save to save the address entries in the file. Click File-> Exit to close the text editor.
- 8 Make a copy of this file to overwrite the *bootpdata.txt* file in this directory location c:\Program Files \Honeywell\Experion\Engineering Tools\system\bin on the SERVERA node of a redundant pair.
- **9** Be sure all Experion services (ER Server, CDA Server, and System Repository) are running on the Server. Cycle power to the Ethernet module to register the addresses configured in the BOOTP text file in the Ethernet module itself.
- **10** Go to the next section *Configuring additional RSLinx drivers*.

4.1.6 Configuring additional RSLinx drivers



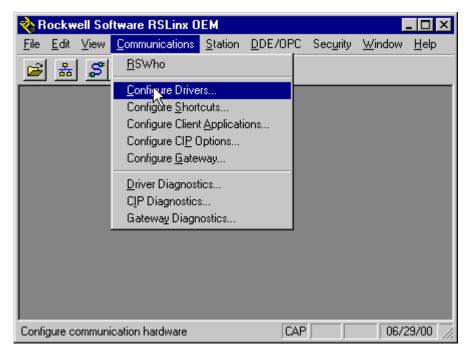
Attention

You must configure **one** Ethernet Driver for **each** C200 Controller in the system. If you add a C200 Controller to an existing redundant Server system on the Supervisory Ethernet network, you must configure identical RSLinx drivers on both SERVERA and SERVERB before you can configure and load a CPM block to the C200 Controller through Control Builder.

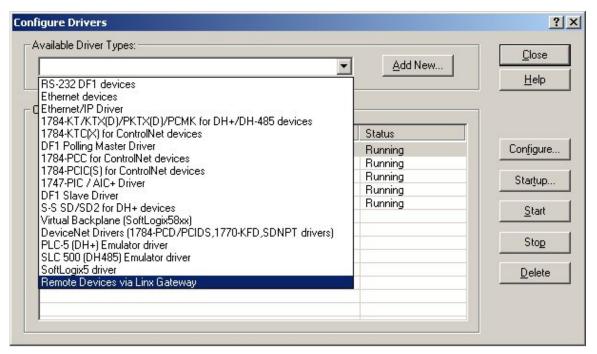
Use the following procedure to configure another RSLinx driver. This is the same procedure used to configure the initial driver when the RSLinx software was installed. It is repeated here for convenient reference only.

Prerequisites

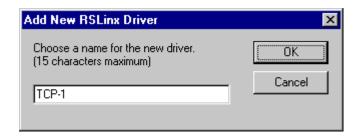
- RSLinx software is installed and activated in the OEM mode and you have already configured a RSLinx driver.
- You must configure a Remote Access Service (RAS) server and client before you can establish a RAS
 connection to the RSLinx Gateway. See the online help supplied with the RSLinx application for more
 information.
- 1 On non-redundant Server or SERVERB node of redundant pair, click the **Start** on the tool bar. Click **Programs-** > **Rockwell Software-** > **RSLinx-** > **RSLinx** to open the application interface window.
- 2 Click Communications-> Configure Drivers to call up the Configure Drivers dialog box.



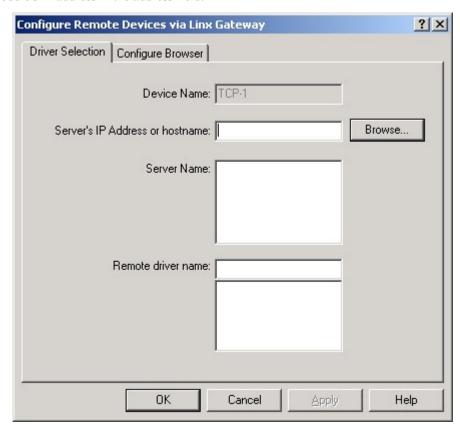
3 Click the arrow in the Available Driver Types field and select Remote Devices via Linx Gateway from the list.



- Click the Add New.
- Key in the desired driver name or accept the displayed default name TCP-1.



- Click the **OK**.
- 4 On the **Driver Selection** tab of the **Remote Devices via Linx Gateway** dialog box, click the **Browse** to initiate an automatic scan of the Supervisory Ethernet network for available Ethernet modules or key in the Ethernet module's IP address in the address field.

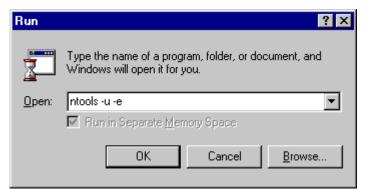


- 5 Click the **OK** to close the dialog box.
 - · Wait for the new driver to be initialized and status to change to Running.
 - Click Close to exit the Configure Drivers dialog box.
- 6 Repeat Steps 2 to 7 for other Ethernet modules in the system, as required.
- 7 Click **File-** > **Exit** to close the RSLinx window.
- 8 If applicable, repeat this procedure on the SERVERA node of a redundant pair.
- **9** Go to the next section *Disabling BOOTP on Ethernet module*.

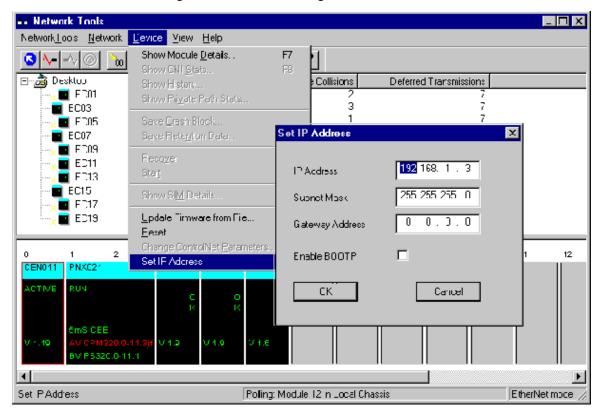
4.1.7 Disabling BOOTP on Ethernet module

Use the following procedure to disable the BOOTP function on an Ethernet module.

- 1 Click the **Start** in the taskbar to open the menu and click the **Run** selection.
 - Key in this command in the Open entry field >ntools -u -e<. (Note that this will start the RSLinx and driver services for system communications, if they are not already running.)



- Click the OK to launch the Network Tools application.
- Click the **OK** to acknowledge warning about monitoring through Control Builder.
- 2 Click the **Resume** → in the toolbar to initiate network scan.
- 3 When network nodes appear under the Desktop tree icon, click the desired Ethernet module name icon and wait for a graphic representation of the chassis containing this *Ethernet module* to appear in the View pane.
- 4 Click the Ethernet module in the chassis display to select it.
 - Click **Device-** > **Set IP Address** to open the dialog box.
 - Check the IP Address, Subnet Mask, and Gateway Address settings for this Ethernet module in the corresponding fields in the dialog box. Do **not** change an IP address through this dialog box.
 - Click the **Enable BOOTP** check box to clear the check mark from the box. This disables the BOOTP function on the Ethernet module.
 - Click **OK** to close the dialog box and initiate the change.



Attention

When the BOOTP function is disabled, the Ethernet module remembers its configuration and uses it on the next power up. The Ethernet module also remembers its current slot location in the chassis. If you move this Ethernet module to another slot location in the chassis, it reverts to the BOOTP enable state and resets the IP Address, Subnet Mask, and Gateway settings to zeros (0). In this case, you must Cycle power to the Ethernet module to reregister the addresses configured in the BOOTP text file in the Ethernet module again.

- 5 Repeat Steps 4 to 6 to disable BOOTP on another Ethernet module, if applicable.
- 6 Click **NetworkTools-** > **Exit** to close NTOOLS.
- 7 This completes the Supervisory Ethernet network setup. Continue with other Experion operations as outlined in Experion documentation.

4 CONFIGURATION

5 Operation

Related topics

"Checking Module Operating Status" on page 32

5.1 Checking Module Operating Status

5.1.1 Interpreting NET (Network) Status Indicator

Use the following table to interpret possible NET status LED states.

State	Status	Description
Off	Not Powered,	Module is not powered, or does not have an IP address.
No IPAddress		Verify there is chassis power and the module is completely inserted into the chassis and backplane.
		Make sure the module has been configured.
Flashing Green	No Connections	Module has obtained an IP address, but has no established connections.
Green	CIP Connections	Module has an IP address and at least one established connection.
Flashing Red	Connection Timeout	One or more of the connections in which the module is the target has timed out.
Red	Duplicate IP Address	Module has detected that its IP address is already in use. Assign a unique IP address to the module.

5.1.2 Interpreting LINK Status Indicator

Use the following table to interpret possible LINK status LED states.

State	Status	Description
Off	No data transmission	Module is not ready to communicate.
Green	Ready	Module is ready to communicate.
Flashing Green	Data transmission in progress	Module is communicating over the network.

5.1.3 Interpreting OK Status Indicator

Use the following table to interpret possible OK status LED states.

State	Status	Description
Off	No data transmission	Module does not have 24Vdc power. Verify there is chassis power and the module is completely inserted into chassis and backplane.
Green	Operational	Module is operating correctly.
Flashing Green	Standby	Module is not configured.
Red	Major Fault	An unrecoverable fault has been detected. Recycle power to the module. If this does not clear the fault, replace the module.
Flashing Red	Minor Fault	A recoverable fault has been detected. This could be caused by an error in the configuration.
Flashing Red and Green	Self Test	Module performing power-up self-test.

6 Notices

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6.2 How to report a security vulnerability

For the purpose of submission, a security vulnerability is defined as a software defect or weakness that can be exploited to reduce the operational or security capabilities of the software.

Honeywell investigates all reports of security vulnerabilities affecting Honeywell products and services.

To report a potential security vulnerability against any Honeywell product, please follow the instructions at:

https://honeywell.com/pages/vulnerabilityreporting.aspx

Submit the requested information to Honeywell using one of the following methods:

- Send an email to security@honeywell.com.
- Contact your local Honeywell Process Solutions Customer Contact Center (CCC) or Honeywell Technical Assistance Center (TAC) listed in the "Support and other contacts" section of this document.

6.3 Support

For support, contact your local Honeywell Process Solutions Customer Contact Center (CCC). To find your local CCC visit the website, https://www.honeywellprocess.com/en-US/contact-us/customer-support-contacts/Pages/default.aspx.

6.4 Training classes

Honeywell holds technical training classes on Experion PKS. These classes are taught by experts in the field of process control systems. For more information about these classes, contact your Honeywell representative, or see http://www.automationcollege.com.