Honeywell

Experion
Ethernet Module
Implementation Guide

EP-DCX184
R300.1
5/06

Notices and Trademarks

Release 300.1 **May 5, 2006**

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About 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.

Release Information

Document Name	Document ID	Release Number	Publication Date
Ethernet Module Implementation Guide - enet	EP-DCX184	300.1	5/06

References

The following list identifies all documents that may be sources of reference for material discussed in this publication.

Document Title

Contacts

World Wide Web

The following Honeywell web sites may be of interest to Process Solutions customers.

Honeywell Organization	WWW Address (URL)
Corporate	*http://www.honeywell.com*
Honeywell Process Solutions	*http://hpsweb.honeywell.com*

Telephone

Contact us by telephone at the numbers listed below.

Location	Organization	Phone
United States and Canada	Honeywell IAC Solution Support Center	1-800-822-7673
Europe	Honeywell TAC-EMEA	+32-2-728-2704
Pacific	Honeywell Global TAC - Pacific	1300-300-4822 (toll free within Australia) +61-8-9362-9559 (outside Australia)
India	Honeywell Global TAC - India	+91-20-2682-2458
Korea	Honeywell Global TAC - Korea	+82-2-799-6317
People's Republic of China	Honeywell Global TAC - China	+86-10-8458-3280 ext. 361
Singapore	Honeywell Global TAC - South East Asia	+65-6580-3500
Taiwan	Honeywell Global TAC - Taiwan	+886-7-323-5900
Japan	Honeywell Global TAC - Japan	+81-3-5440-1303
Elsewhere	Call your nearest Honeywell office.	

Symbol Definitions

The following table lists those symbols used in this document to denote certain conditions.

Symbol	Definition
	**ATTENTION:** Identifies information that requires special consideration.
	**TIP:** Identifies advice or hints for the user, often in terms of performing a task.
	**REFERENCE -EXTERNAL:** Identifies an additional source of information outside of the bookset.
	**REFERENCE - INTERNAL:** Identifies an additional source of information within the bookset.
CAUTION	Indicates a situation which, if not avoided, may result in equipment or work (data) on the system being damaged or lost, or may result in the inability to properly operate the process.
	**CAUTION**: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. **CAUTION** symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.
	**WARNING**: Indicates a potentially hazardous situation, which, if not avoided, could result in serious injury or death. **WARNING** symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.

Symbol	Definition
	**WARNING, Risk of electrical shock**: Potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 VDC may be accessible.
	**ESD HAZARD:** Danger of an electro-static discharge to which equipment may be sensitive. Observe precautions for handling electrostatic sensitive devices.
	**Protective Earth (PE) terminal**: Provided for connection of the protective earth (green or green/yellow) supply system conductor.
	**Functional earth terminal**: Used for non-safety purposes such as noise immunity improvement. NOTE: This connection shall be bonded to Protective Earth at the source of supply in accordance with national local electrical code requirements.
	**Earth Ground**: **Functional earth connection.** NOTE: This connection shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.
	**Chassis Ground**: Identifies a connection to the chassis or frame of the equipment shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.

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Abstract

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.

REFERENCE - EXTERNAL

For more information about the use of Ethernet for industrial control, please refer to the Ethernet White Paper on the Allen-Bradley web site: http://www.ab.com

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

CAUTION

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.

Functional Overview and Guidelines

Figure 1 shows 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.

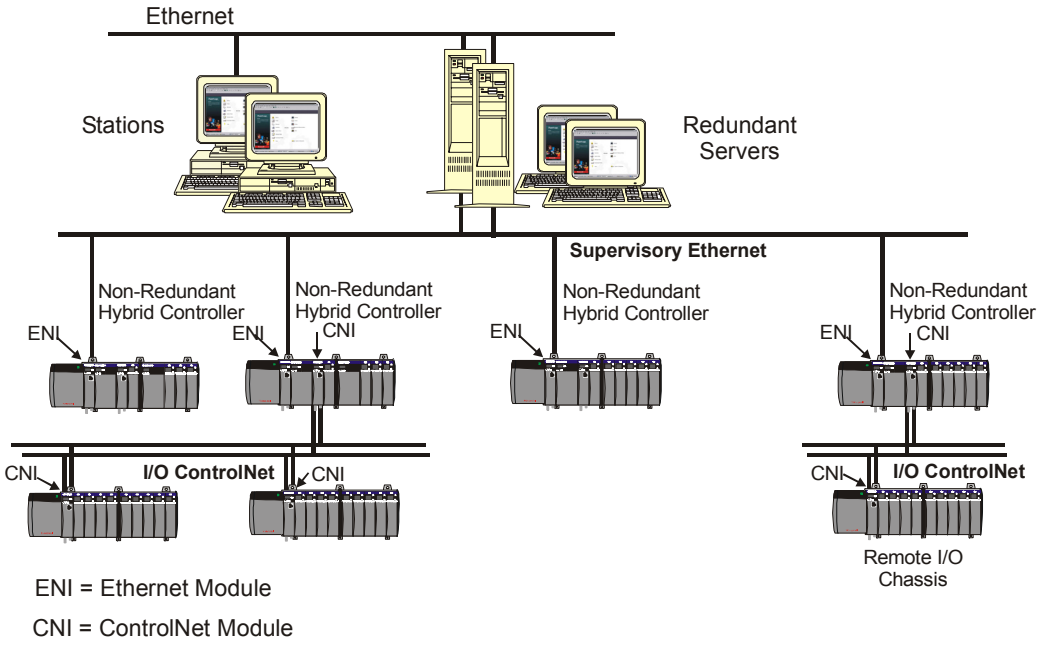


Figure 1 Basic Experion Supervisory Ethernet Topology

Getting Started

Identifying network requirements

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

Component	Description	Vendor
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
ATTENTION 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 nor 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.

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 http://www.belden.com/ for helpful technical data on a wide variety of wire and cable types.

Locating reference documentation

The main source for Experion documentation is the online Knowledge Builder. It is provided on a separate CD with the Experion software. Once this documentation is loaded, you can access it through the Control Builder application or directly through the Windows Program menu in the Performance Support Tools folder.

You should also have the manufacturer's documentation provided with any third-party products.

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, please 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.

REFERENCE - EXTERNAL

For more information about TCP/IP and internetworking, 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)

Conventions

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 button.
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>	Keys to be pressed are shown in angle brackets.	Press <F1> to view the online Help.
<Ctrl>+<C>	Keys to be pressed together are shown with a plus sign.	Press <Ctrl>+<C> to close the window.
File->New	Shows 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<.

Installation

Ethernet Network Components

ATTENTION

Be sure you review the Preinstallation Considerations and approval body notifications included in the *Control Hardware Installation Guide* in Knowledge Builder before you install any Experion system component.

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 http://www.3com.coml for additional information.

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 http://www.nortelnetworks.com for additional information.

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.

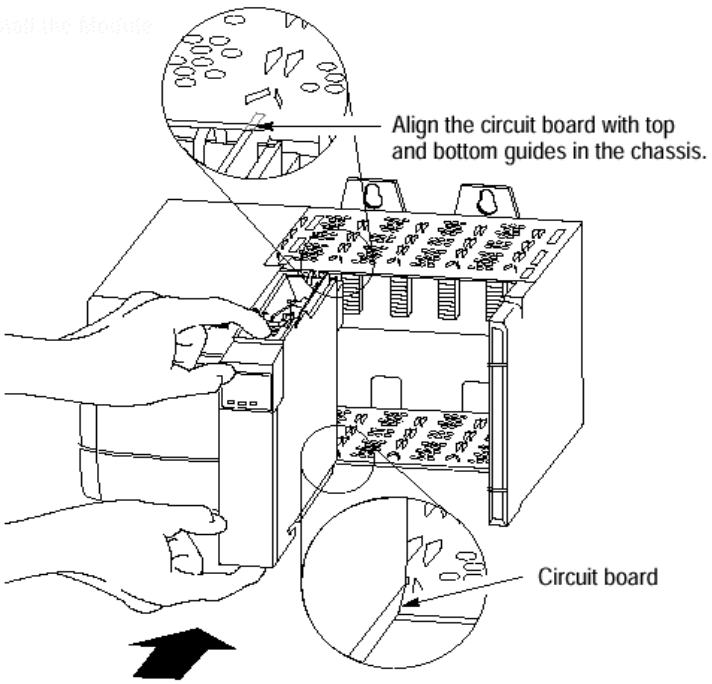
Installing Ethernet module

ATTENTION

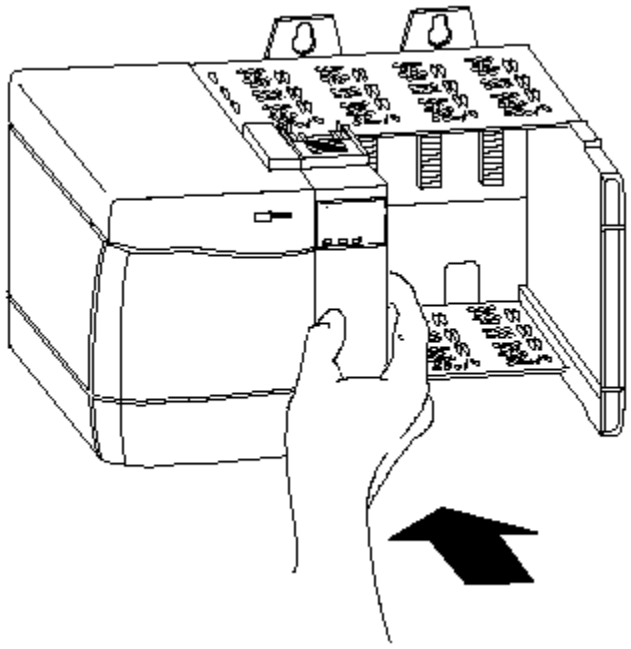
The following procedure is also included in the *Control Hardware Installation Guide* in Knowledge Builder. It is repeated here for convenient reference only.

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.

Step	Action
1	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".)



Step	Action
2	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.



3	Repeat Steps 1 and 2 to install other Ethernet modules, as required.
4	Go to the next Section *Attaching Ethernet cables*.

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 shown in Figure 2.

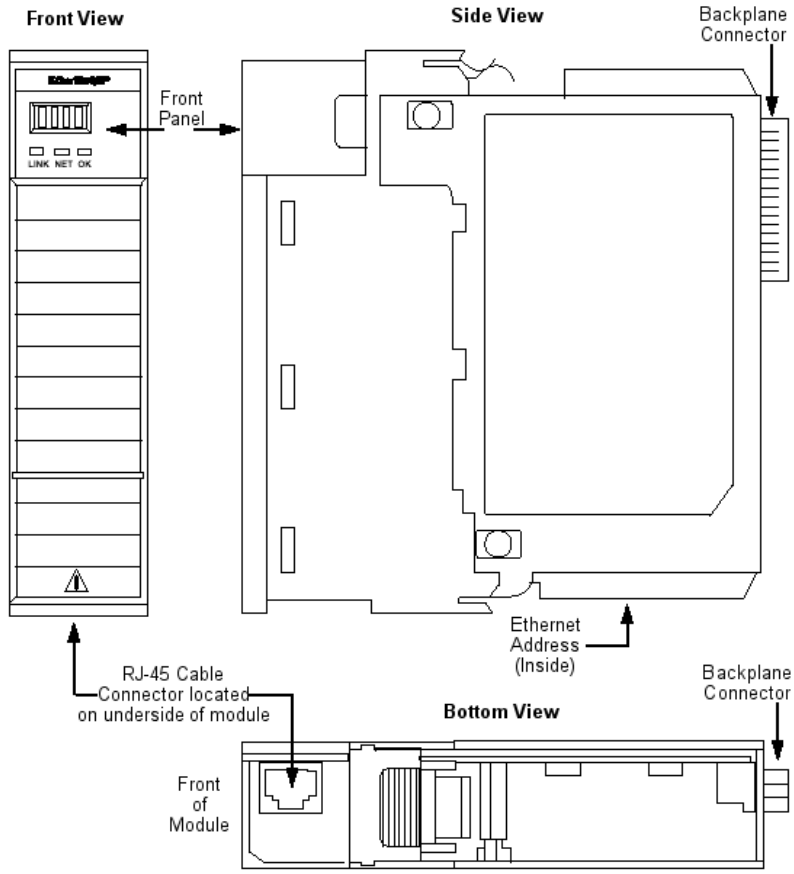
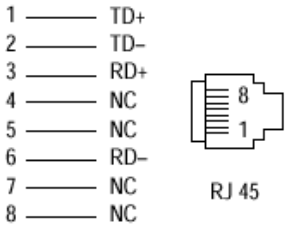


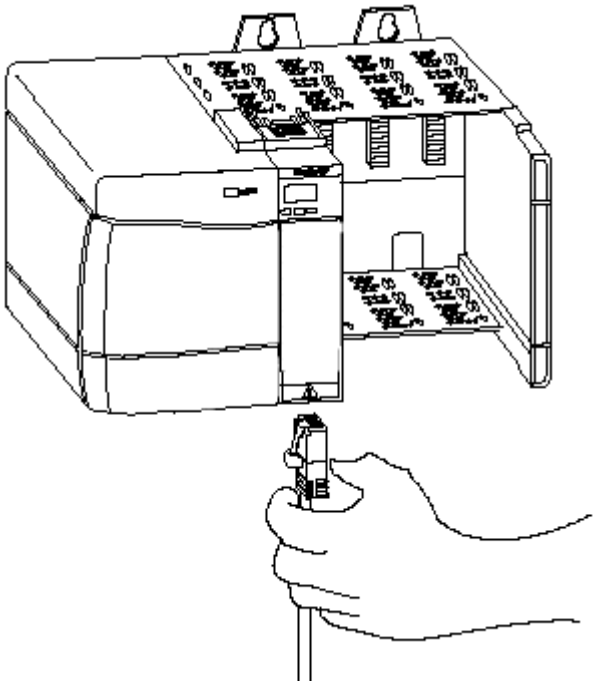
Figure 2 Front view of Ethernet module with view of RJ-45 connector.

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

Step	Action
1	Be sure the cable connector is wired as shown 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.

Configuration

Setting Up Drivers and IP Addresses

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.

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.

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.

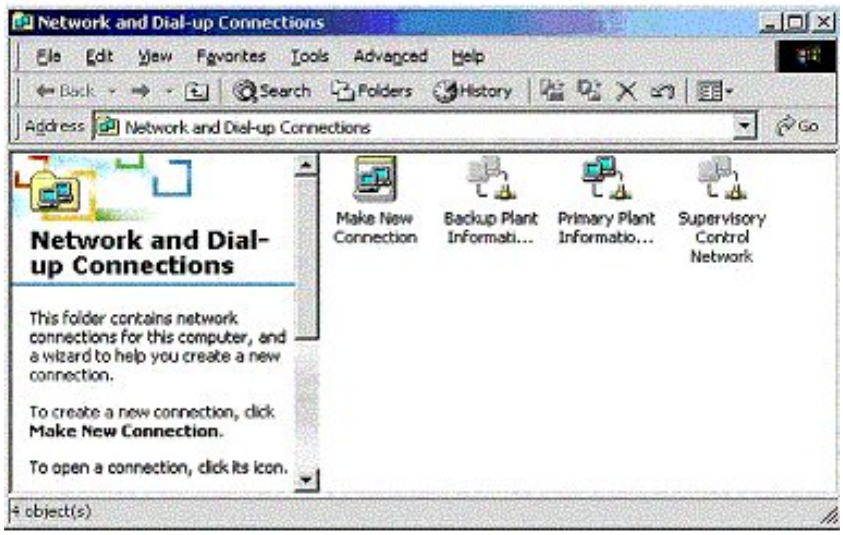
Checking NIC settings

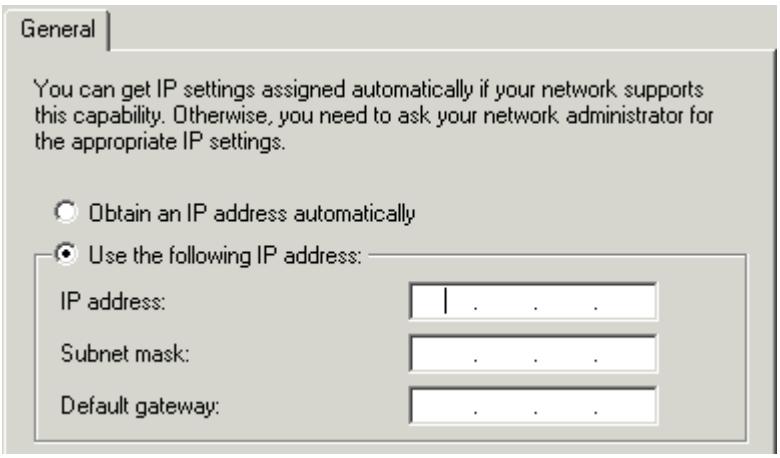
ATTENTION

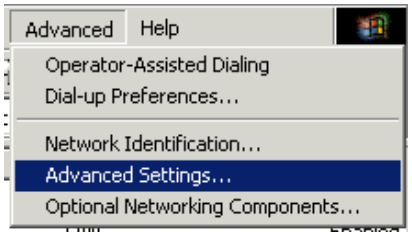
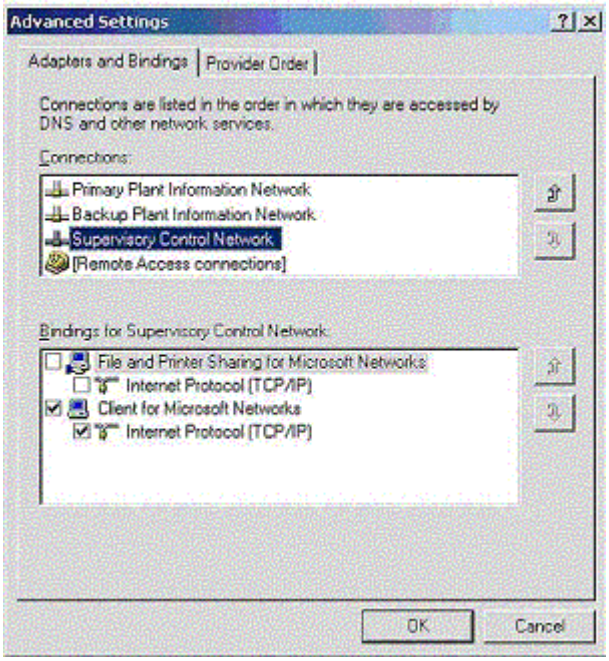
Users are responsible for making the correct IP address assignments for the addressable components used in their planned Supervisory Ethernet networks.

Use the following procedure to check the NIC configuration settings.

Step	Action	Result
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.

Step	Action	Result
		
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.
3	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 button.	Calls up the Internet Protocol (TCP/IP) Properties dialog.
4	Click the "Use the following IP address" radio button.	Selects the function and activates the IP address, Subnet Mask, and Default gateway fields.

Step	Action	Result
		
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 button.	Closes the IP Properties dialog box and returns to the Local Area Connection Properties dialog.
8	Click the OK button.	Closes the dialog box and returns to the Network and Dial-up Connections window.

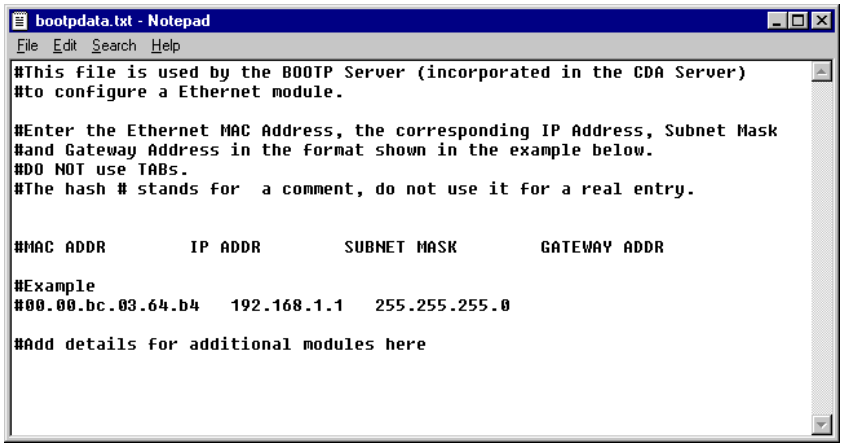
Step	Action	Result
9	With Supervisory Control Network icon still selected in the Network and Dial-up Connections window, click Advanced->Advanced Settings.	Calls up the Advanced Settings dialog.
		
10		

Step	Action	Result
11	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 shown in the Connections list box. Use the Up or Down arrow button 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 shown here are for example purposes only and your network names may be different. In either case, be sure the order is as shown above.)
12	With the Supervisory Control Network entry in the Connections list box selected, verify that the checkbox 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.
13	Click the OK button.	Closes the dialog box and applies the settings.
14	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.

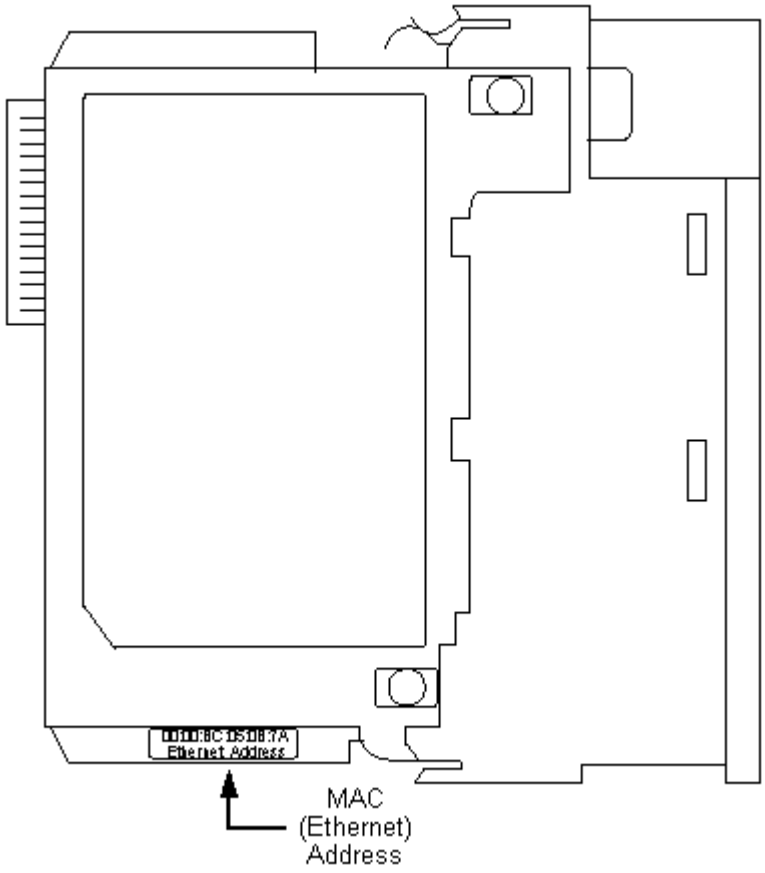
Configuring and setting IP address for Ethernet module

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.

Step	Action
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.

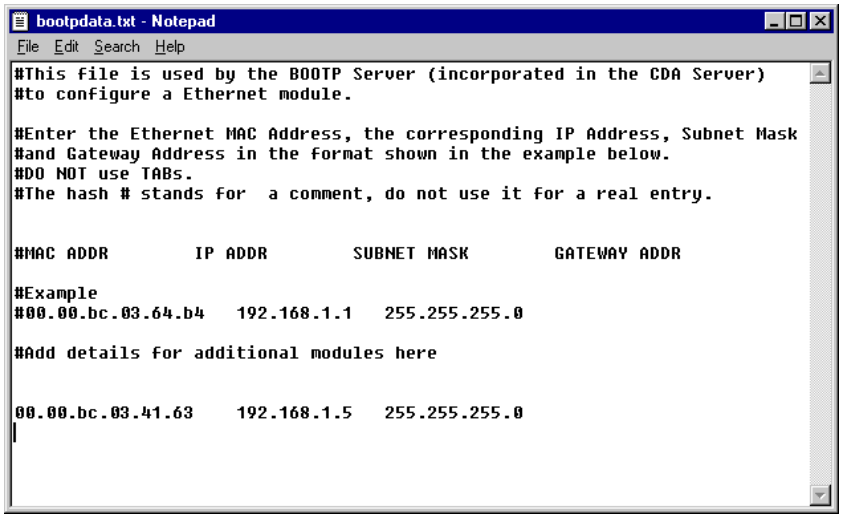


Step	Action
2	Edit the file to include the MAC address listed on the label on the inside of the Ethernet module. Be sure to enter the address as shown with any leading zeros.



3	Add the assigned IP address to the file in the format shown.
4	Add the Subnet Mask to the file in the format shown.

Step	Action
5	Leave the Gateway address field blank. The following illustration shows 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*.

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.

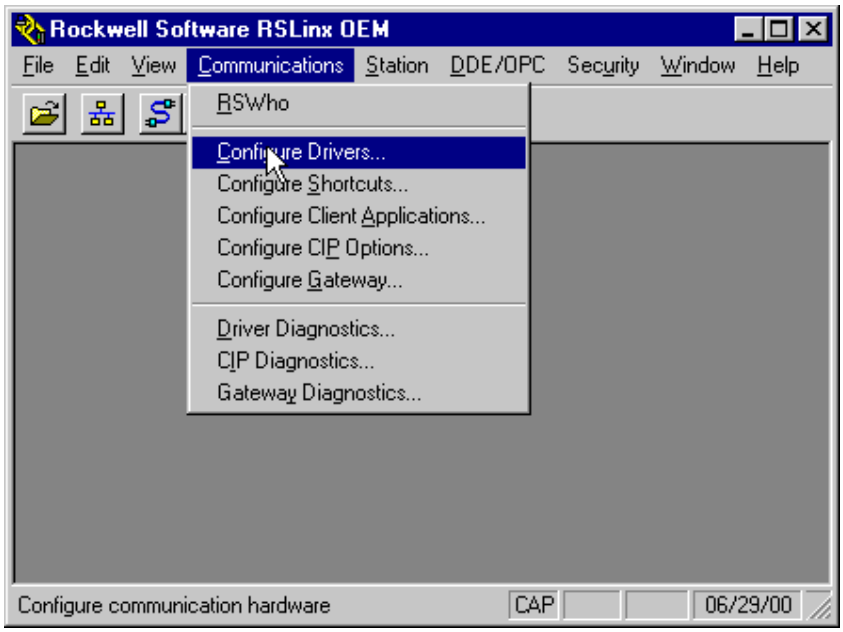
Use the following procedure to configure another RSLinx driver. This is the same procedure used to configure the initial driver when the RSLinx software was installed. It is repeated here for convenient reference only.

Prerequisites

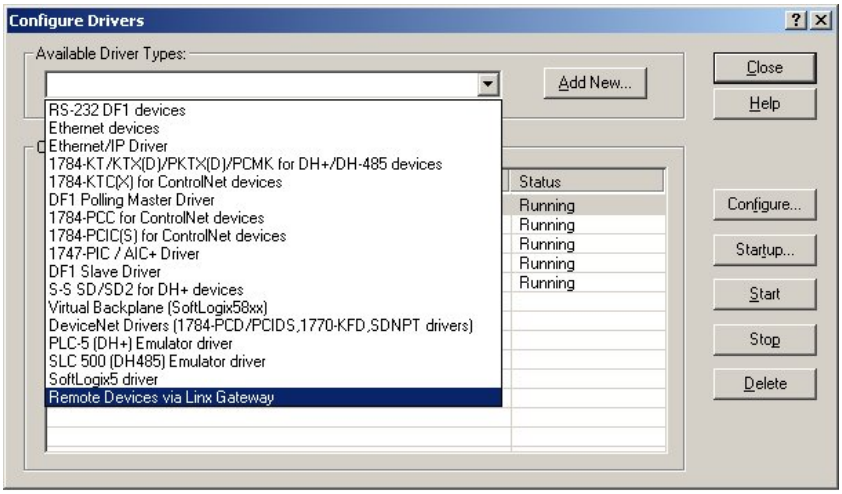
- RSLinx software is installed and activated in the OEM mode and you have already configured a RSLinx driver.
- You must configure a Remote Access Service (RAS) server and client before you can establish a RAS connection to the RSLinx Gateway. See the on-line help supplied with the RSLinx application for more information.

Step	Action
1	On non-redundant Server or SERVERB node of redundant pair, click the **Start** button on the tool bar. Click **Programs**->**Rockwell Software**->**RSLinx**->**RSLinx** to open the application interface window.

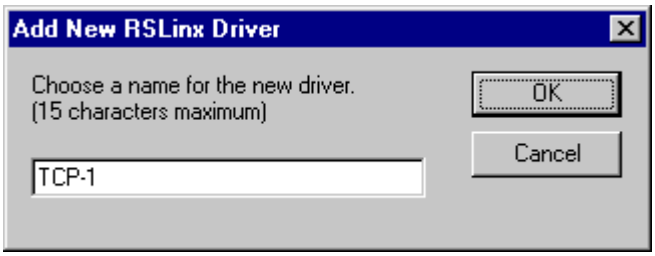
Step	Action
2	Click **Communications**->**Configure Drivers** to call up the Configure Drivers dialog box.



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

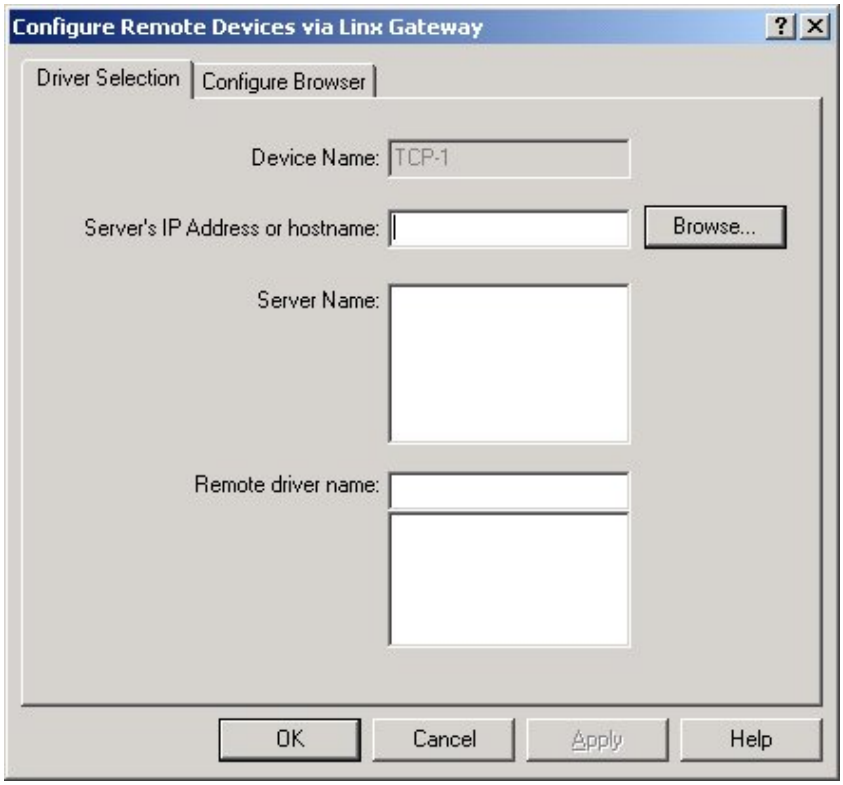


4	• Click the **Add New** button. • Key in the desired driver name or accept the displayed default name TCP-1.



• Click the **Ok** button.

Step	Action
5	On the **Driver Selection** tab of the **Remote Devices via Linx Gateway** dialog box, click the **Browse** button 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.

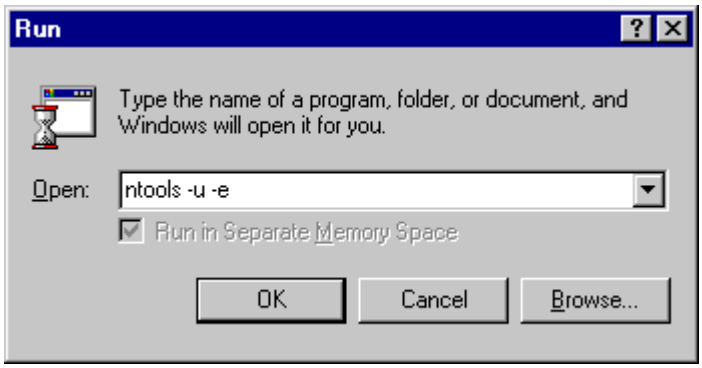


6	Click the **OK** button to close the dialog box.
7	• Wait for the new driver to be initialized and status to change to Running. • Click **Close** to exit the **Configure Drivers** dialog box.
8	Repeat Steps 2 to 7 for other Ethernet modules in the system, as required.
9	Click **File**-> **Exit** to close the RSLinx window.

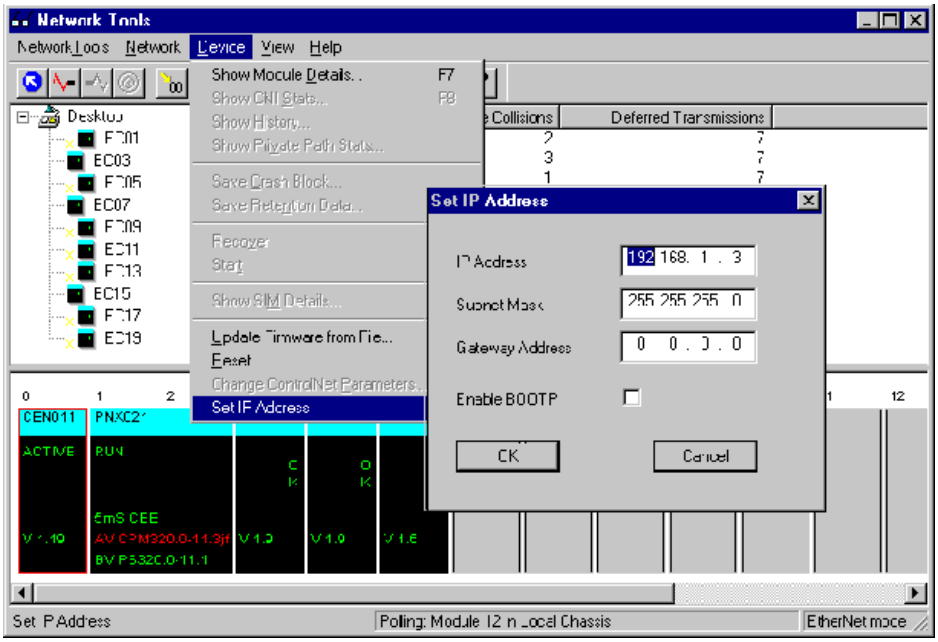
Step	Action
10	If applicable, repeat this procedure on the SERVERA node of a redundant pair.
11	Go to the next section *Disabling BOOTP on Ethernet module*.

Disabling BOOTP on *Ethernet module*

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

Step	Action
1	Click the Start button in the taskbar to open the menu and click the Run selection
2	• 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 button to launch the Network Tools application. • Click the OK button to acknowledge warning about monitoring through Control Builder
3	Click the Resume button  in the toolbar to initiate network scan.
4	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.
5	Click the Ethernet module in the chassis display to select it.

Step	Action
6	• 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 checkbox 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 re-register the addresses configured in the BOOTP text file in the Ethernet module again.

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

Operation

Checking Module Operating Status

Interpreting NET (Network) Status Indicator

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

State	Status	Description
Off	Not Powered, No IPAddress	Module is not powered, or does not have an IP address. • 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.

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.

State	Status	Description
Flashing Green	Data transmission in progress	Module is communicating over the network.

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.

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