Allen-Bradley

ControlLogix Ethernet Bridge Module

1756-ENBT

User Manual

Rockwell Automation

Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of these products must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards. In no event will Allen-Bradley be responsible or liable for indirect or consequential damage resulting from the use or application of these products.

Any illustrations, charts, sample programs, and layout examples shown in this publication are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Allen-Bradley does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1, *Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control* (available from your local Allen-Bradley office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

Throughout this publication, notes may be used to make you aware of safety considerations. The following annotations and their accompanying statements help you to identify a potential hazard, avoid a potential hazard, and recognize the consequences of a potential hazard:

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.

IMPORTANT

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

Rockwell Automation Support

Before you contact Rockwell Automation for technical assistance, we suggest you please review the troubleshooting information contained in this publication first.

If the problem persists, call your local Rockwell Automation representative or contact Rockwell Automation in one of the following ways:

Phone	United States/Canada	1.440.646.5800
	Outside United States/Canada	You can access the phone number for your country via the Internet: 1. Go to http://www.ab.com 2. Click on *Product Support* (http://support.automation.rockwell.com) 3. Under *Support Centers*, click on *Contact Information*
Internet	⇒	1. Go to http://www.ab.com 2. Click on *Product Support* (http://support.automation.rockwell.com)

Your Questions or Comments on this Manual

If you find a problem with this manual, please notify us of it on the enclosed How Are We Doing form.

About This User Manual

What this Preface Contains

This preface describes how to use this manual. The following table describes what this preface contains and where to find specific information.

Who Should Use This Manual

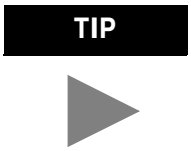
This manual is intended for control engineers and technicians who are installing, programming, and maintaining a control system that communicates on an EtherNet/IP network through a 1756-ENBT Bridge.

We assume you have a good understanding of Ethernet and the (TCP/IP) protocol. This user manual contains a brief description of Ethernet and TCP/IP in Chapter 3.

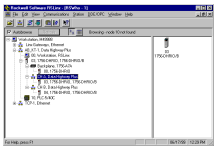
Common Techniques Used in This Manual

The following conventions are used throughout this manual:

- Bulleted lists provide information, not procedural steps.
- Numbered lists provide sequential steps.
- Information in **bold** contained within text identifies menu windows, or screen options, screen names and areas of the screen, such as dialog boxes, status bars, radio buttons and parameters.



This symbol identifies helpful tips.



Screen captures are pictures of the software's actual screens. The names of screen buttons and fields are often in bold in the text of a procedure. Pictures of keys represent the actual keys you press.

How To Use This Manual

This manual provides an overview of the 1756-ENBT module, as well as general information about Ethernet. It describes how to install and configure the module, and provides four example applications showing how to use the module to communicate over EtherNet/IP.

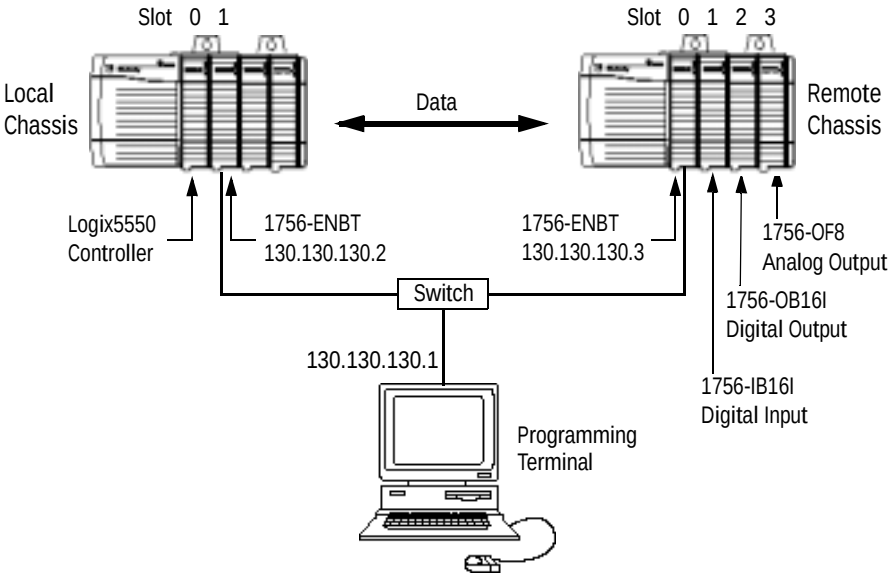
The example applications are intended as building blocks to help you get your own network up and running. We recommend that you set up and run the example applications and use them as a guide for setting up your own system.

About the Example Applications

The example applications presented in this manual are as follows:

- Using Rack Optimized I/O (chapter 5)
- Using Analog I/O with Direct Connection (chapter 6)
- Using Produced and Consumed tags (chapter 7)
- Communicating with FLEX I/O (chapter 8)

Here's an example of the type of system you'll be creating:



System Components

We used the following components for the example applications:

Quantity	Product Name	Catalog Number
	Hardware	
2	ControlLogix Chassis	1756-A4, (or -A7, -A13, -A13, -A17)
2	ControlLogix Power Supply	1756-PA72, (or -PB72)
2	ControlLogix EtherNet/IP Bridge Module	1756-ENBT
2	Logix5550 Controller	1756-L1
1	ControlLogix Analog Output Module	1756-OF8
1	ControlLogix Digital Input Module	1756-IB16I
1	ControlLogix Digital Output Module	1756-0B16I
1	FLEX I/O EtherNet/IP Adapter	1794-AENT
1	FLEX I/O Digital Input Module	1794-IB16
1	FLEX I/O Digital Output Module	1794-OB16
1	Personal computer that supports RSLogix 5000 software	Any appropriate model running Windows NT 4.0, Service Pack 5 or higher
1	Ethernet switch	Refer to manufacturer's specifications
	Associated media and connectors as needed	
	Software	
1	RSLinx V2.30	9355-WAB, -WABOEM, -WABC
1	RSLogix 5000 programming software V8.1	9324-RLD300ENE

Where to Find More Information

Refer to the following Rockwell publications as needed for additional help when setting up and using your network.

For information about	See this publication	Publication number
Using Ethernet for industrial control	EtherNet/IP Performance and Application Guide	ENET-AP001
EtherNet/IP media	EtherNet/IP Media Planning and Installation Guide	ENET-IN001
1756-ENBT module	ControlLogix EtherNet/IP Bridge Module Installation Instructions	1756-IN019
ControlLogix chassis	ControlLogix Chassis Installation instructions	1756-IN080
ControlLogix power supplies	ControlLogix Power Supplies Installation Instructions	1756-5.67 (PA72/PB72) 1756-5.78 (PA75/PB75)
Logix5550 programmable controllers	Logix5550 Controller User Manual	1756-UM012
ControlLogix analog I/O modules	ControlLogix Analog I/O Users Manual	1756-6.5.9
ControlLogix digital I/O modules	ControlLogix Digital I/O Users Manual	1756-UM058
FLEX I/O EtherNet/IP adapter	FLEX I/O EtherNet/IP Adapter Installation Instructions	1794-IN082
	FLEX I/O EtherNet/IP Adapter User Manual	1794-UM006
FLEX I/O input and output modules	FLEX I/O and FLEX Integra Technical Data Manual	1794-2.1
RSLogix 5000 programming software(1)	Getting Results with RSLogix5000	LG5000-GR001
RSLinx communications software(1)	RSLinx Lite User's Guide	9399-UM007

(1) See also the tutorials and Help menus provided with this software.

TIP

Many of the above publications are available online from the Automation Bookstore:

http://www.theautomationbookstore.com.

TIP

Rockwell Software products are provided with extensive tutorials and online Help. We recommend that you use the tutorials and Help menus to learn about these products.

For more information about Rockwell Software products, visit the Rockwell Software internet site:

http://www.software.rockwell.com.

Notes:

Chapter 5

Using Rack Optimized I/O

Chapter 6

Using Analog I/O with Direct Connection

Chapter 7

Using Produced and Consumed Tags

About the 1756-ENBT Module

What This Chapter Contains

This chapter provides an overview of the ControlLogix 1756-ENBT module, its primary features, what it does, and how to use it. You will need to understand the concepts discussed in this chapter to configure your EtherNet/IP Bridge module and use it in a control system. The following table lists where to find specific information in this chapter.

Module Features

The 1756-ENBT module's features include:

- use EtherNet/IP messages encapsulated within standard TCP/UDP/IP protocol
- common application layer with ControlNet and DeviceNet
- interfacing via Category 5 twisted pair cable
- Half/Full Duplex 10 Mbit or 100 Mbit operation
- removal or insertion under power
- number of modules per chassis limited only by chassis size
- communication to and from other ControlLogix modules in the same chassis
- communication supported by RSLinx software
- configurable via RSLinx or standard BootP tools
- no network scheduling required
- no routing tables required

Hardware/Software Compatibility

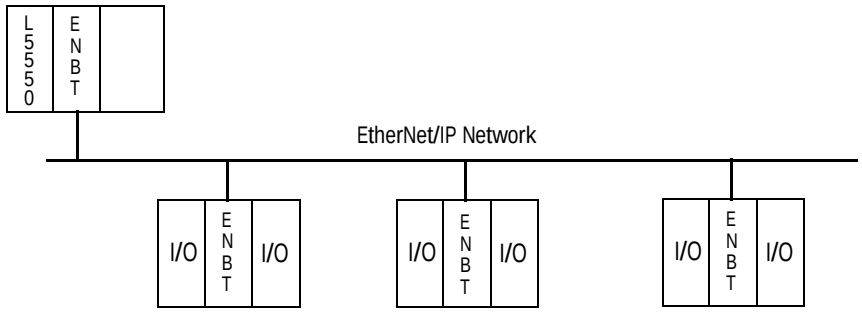
The 1756-ENBT module is compatible with the following product's firmware versions and software releases. Contact Rockwell Automation if you need software or firmware upgrades to use this equipment.:

Product	Firmware Version/ Software Release
1756-ENBT module	1.x or higher
1756-ENET/A/B	1.18 or higher
1794-AENT	1.x
Logix 5550 Controller	8.1 or higher
PanelView	All Ethernet compatible models
RSLogix 5000 software	8.1 or higher
RSLinx software	2.3 or higher

What the Module Does

The 1756-ENBT module performs two primary tasks:

1. Control of real time I/O data (also known as "implicit messaging") in conjunction with a Logix controller. The 1756-ENBT module may serve as a bridge between I/O modules and the network, or as a bridge between the controller and the network.



2. Support of messaging data for configuration and programming information, operator interfaces, etc. (also known as "explicit messaging.").

Support of Rack Optimized and Direct Connections

The 1756-ENBT module supports both Rack Optimized and Direct Connections. A direct connection is a real-time data transfer link between the controller and the device that occupies the slot that the configuration data references. A rack optimized connection is a grouping of data from more than one I/O module into a single block of data sent over a single connection.

Rack optimized connections reduce the total number of connections needed to transfer data when using many I/O modules in a system. The following example illustrates the benefit of rack optimized connections.

Assume you have set up a system that contains 10 discrete I/O modules in a remote ControlLogix chassis. If you use direct connections to transfer data to each of the these I/O modules, you need 10 connections to transfer all of the data, one to each of the ten I/O modules. If you use a rack-optimized connection to transfer the data, you only need a single connection – the connection to the 1756-ENBT module.

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

- You can only use rack optimized connections to send data to and from discrete digital I/O modules. Analog I/O requires direct connections.
- Rack optimized connections can contain I/O data and status information only. Additional module information, such as diagnostics, is not available through a rack-optimized connection.
- All data is sent at the same time at the RPI rate of the 1756-ENBT module.

See the *EtherNet/IP Performance and Application Guide*, publication number ENET-AP001, for more information on connections.

Mixing Rack Optimized and Direct Connections

You can mix communication formats for different I/O modules in the same chassis. I/O modules set up to use Rack Optimization will communicate at the rate of the RPI (requested packet interval) configured for the 1756-ENBT module. I/O modules configured for direct communication will communicate at their set RPI and ignore the 1756-ENBT module's RPI.

Use of the Control and Information Protocol (CIP)

The 1756-ENBT module uses the Control and Information Protocol (CIP). CIP is the application layer protocol specified for EtherNet/IP, the Ethernet Industrial Protocol, as well as for ControlNet and DeviceNet. It is a message-based protocol that implements a relative path to send a message from the "producing" device in a system to the "consuming" devices.

The producing device contains the path information that steers the message along the proper route to reach its consumers. Since the producing device holds this information, other devices along the path simply *pass* this information; they do not need to *store* it. This has two significant benefits:

- You do not need to configure routing tables in the bridging module, which greatly simplifies maintenance and module replacement.
- You maintain full control over the route taken by each message, which enables you to select alternative paths for the same end device.

Understanding the Producer/Consumer Model

CIP uses the "producer/consumer" networking model, replacing the old source/destination (master/slave) model. The producer/consumer model reduces network traffic and increases speed of transmission. In traditional I/O systems, controllers poll input modules to obtain their input status. In the CIP system digital input modules are not polled by a controller. Instead, they produce ("multicast") their data either upon a change of state (COS) or periodically. The frequency of update depends upon the options chosen during configuration and where on the network the input module resides. The input module, therefore, is a producer of input data and the controller is a consumer of the data.

The controller can also produce data for other controllers to consume. The produced and consumed data is accessible by multiple controllers over the ControlLogix backplane and over the EtherNet/IP network. This data exchange conforms to the producer/consumer model.

You configure the producer and consumer by creating controller scoped tags using RSLogix 5000 software (see chapter 7).

Tag Type	Description	Specify Using RSLogix5000 Software
Produced[1]	Tags that the controller produced for other nodes to consume.	Enabled for producing Number of consumers allowed
Consumed[1]	Tags whose values are produced by another controller.	Name of controller that owns the tag the local controller wants to consume Tag name or instance that the local controller wants to consume Data type of the tag to consume Update interval of how often the local controller consumes the tag data

(1) Produced and consumed tags must be controller-scoped tags of DINT or REAL data type, or in an array or structure.

Specifying the Requested Packet Interval (RPI)

The RPI is the update rate specified for a particular piece of data on the network. The RPI can be specified for an entire rack (using a rack optimized connection) or for a particular module (using direct connection). When you add a module to the I/O configuration of a controller, you must enter the RPI as a parameter. 'This value specifies how often to produce the data for that module. For example, if you specify an RPI of 50ms, it means that every 50ms the I/O module should send its data to the controller or that the controller should send its data to the I/O module.

RPIs are only used for modules that produce data. For example a local 1756-ENBT module (i.e., an ENB module in the same chassis as the controller) does not require an RPI because it is not a data-producing member of the system; it is used only as a bridge to remote racks.

What's Next?

The following chapter describes how to physically install the EtherNet/IP Bridge module and connect it to the network.

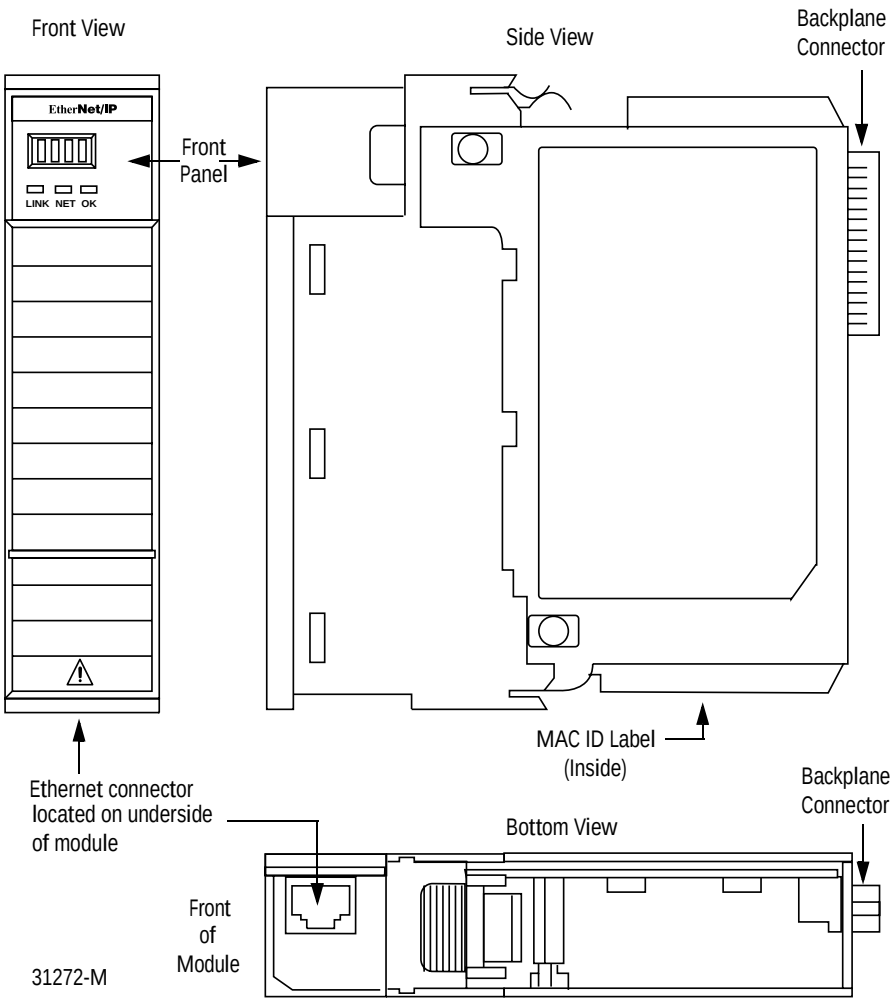
Installing the 1756-ENBT Module

What This Chapter Contains

This chapter describes how to physically install the module in the ControlLogix chassis and connect it to the network. The following table describes what this chapter contains and where to find specific information.

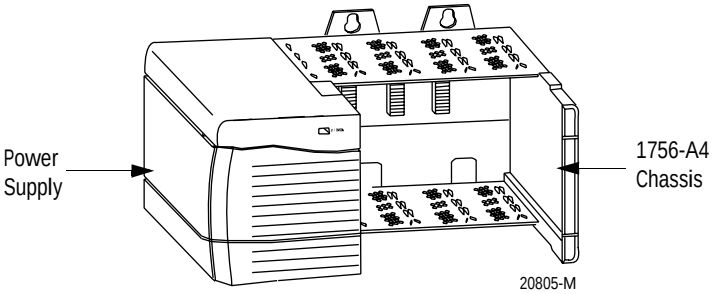
Identifying Module Components

Use the following figure to identify the external features of the 1756-ENBT module.



Preparing the Chassis for Module Installation

Before you install the module, you must install and connect a ControlLogix chassis and power supply.

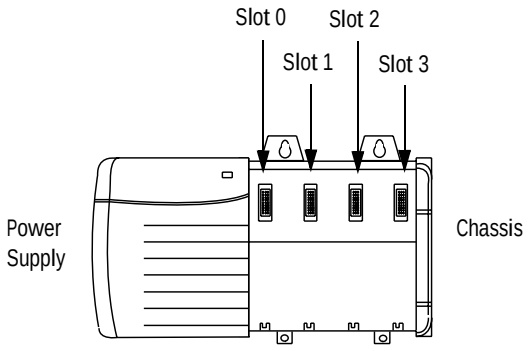


For information on installing these products, refer to the publications listed in the following table.

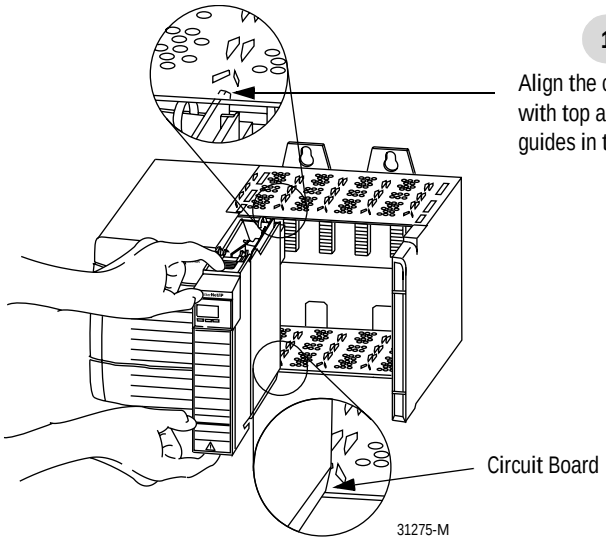
Chassis Type	Chassis Installation	Power Supply	Power Supply Installation
Series B: 1756-A4, -A7, -A10, -A13	Pub. No. 1756-IN080	1756-PA72/B	Pub. No. 1756-5.67
		1756-PB72/B	
		1756-PA75/A	Pub. No. 1756-5.78
		1756-PB75/A	

Determining Module Slot Location

You can install the module in any slot in the ControlLogix chassis. You can also install multiple 1756-ENBT modules in the same chassis. The figure below shows chassis slot numbering in a 4-slot chassis. Slot 0 is the first slot and is always the leftmost slot in the rack (the first slot to the right of the power supply).



Installing the Module in the Chassis

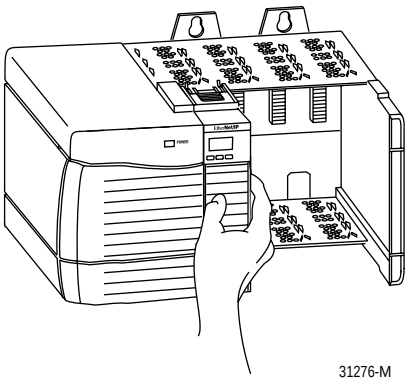


1

Align the circuit board with top and bottom guides in the chassis.

2

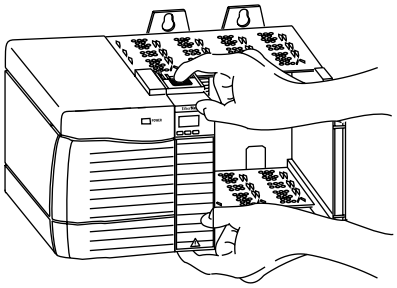
Slide the module into the chassis. Make sure the module backplane connector properly connects to the chassis backplane.



3

The module is properly installed when it is flush with the power supply or other installed modules.

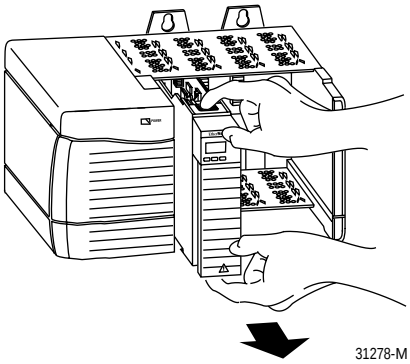
Removing or Replacing the Module (when applicable)



31277-M

1. Push on upper and lower module tabs to disengage them.

2. Slide module out of chassis.



31278-M

IMPORTANT If you are replacing an existing module with an identical one, and you want to resume identical system operation, you must install the new module in the same slot.

Installing or Removing the Module Under Power

This module is designed to be installed or removed while chassis power is applied.

WARNING

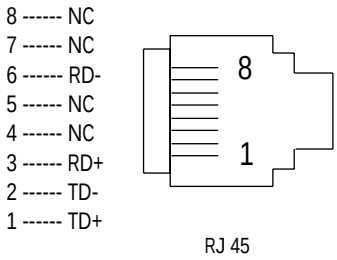
When you insert or remove a module while backplane power is on, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- sending an erroneous signal to your system's field device causing unintended machine motion or loss of process control
- causing an explosion in a hazardous environment

Repeated electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance that can affect module operation.

Wiring the RJ45 Connector

Use an RJ45 connector to connect to the EtherNet/IP network. Wire the connector according to the following illustration:



RJ 45

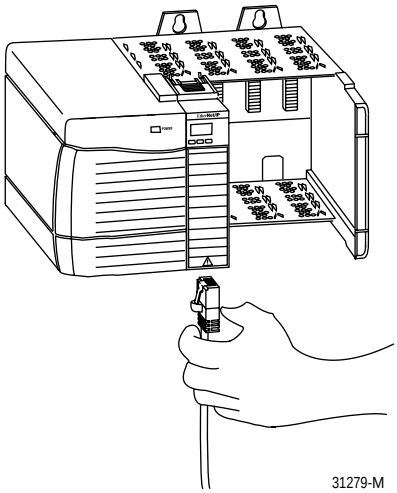
For detailed connection information, see the *EtherNet/IP Media Planning and Installation Guide*, publication number ENET-IN001.

Connecting the Module to the Network

WARNING

If you connect or disconnect the Ethernet cable with power applied to this module or any device on the network, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

Attach the RJ45 connector to the Ethernet port on the bottom of the module as shown below:



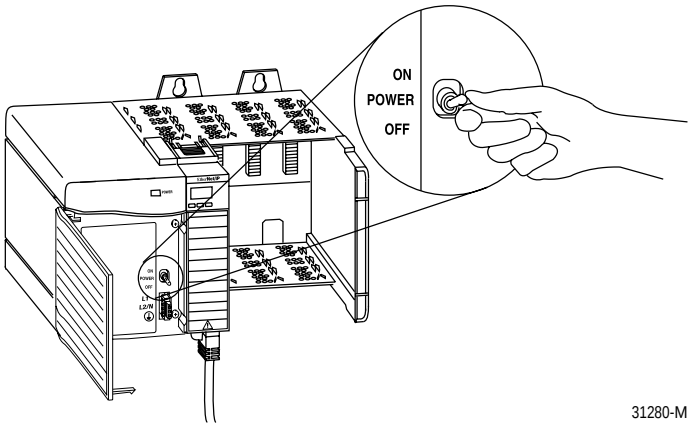
IMPORTANT

We recommend connecting the module to the network via a 100MB Ethernet switch, which will reduce collisions and lost packets and increase network bandwidth. See Appendix E for important information on autonegotiation requirements.

For detailed EtherNet/IP connection information, see the following publications:

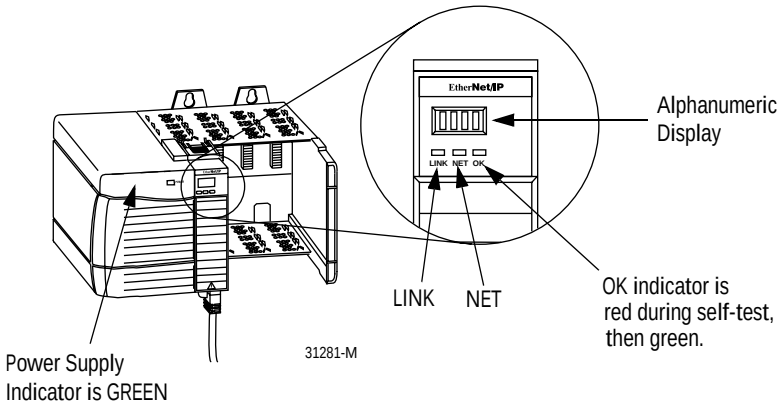
- *EtherNet/IP Performance and Application Guide*, publication ENET-AP001
- *EtherNet/IP Media Planning and Installation Guide*, publication ENET-IN001

Applying Chassis Power



Checking Power Supply and Module Status

Check the LED indicators and alphanumeric display to determine if the power supply and module are operating properly.



The alphanumeric display should cycle through the following states: “TEST - PASS - OK - REV x.x,” where “x.x” is the module’s firmware revision. The display then alternates between “OK” and the module’s default BOOTP address.

If the alphanumeric display and LED indicators do not produce the expected states refer to Appendix A for help in troubleshooting your module.

What’s Next?

The following chapter describes some Ethernet basics you should know before configuring your module.

Before You Configure Your Module

What This Chapter Contains

This chapter describes some of the basics you should know about Ethernet before you configure your 1756-ENBT module. The following table describes where to find specific information in this chapter.

Ethernet Protocols

On the most basic level, Ethernet is a wire or cable that connects computers and peripheral devices so that they can communicate. The actual wire used for the network is referred to as the network "medium." Beyond the physical medium, all Ethernet networks support protocols that provide sophisticated data transfer and network management functionality.

Transmission Control Protocol/Internet Protocol (TCP/IP)

Transmission Control Protocol/Internet Protocol (TCP/IP) is a transport-layer protocol (TCP) and a network-layer protocol (IP) commonly used in business environments for communication within networks and across internetworks. The 1756-ENBT module uses TCP/IP for "explicit" messaging, that is, messages in which time is not a critical factor, such as uploading or downloading programs.

User Datagram Protocol (UDP)

UDP is a much simpler transport protocol. It is connectionless and provides a very simple capability to send datagrams between two devices. UDP is used by applications that implement their own handshaking between devices and only want a minimal transport service. UDP is smaller, simpler, and faster than TCP and can operate in unicast, multicast, or broadcast mode. The 1756-ENBT module employs UDP for real time I/O messaging.

EtherNet/IP

EtherNet/IP applies a common application layer over Ethernet by encapsulating messages in TCP/UDP/IP. This common application layer is the control and information protocol (CIP, see chapter 1), which provides interoperability and interchangeability of industrial automation and control devices on Ethernet. EtherNet/IP supports both real-time I/O (“implicit” messaging) and explicit messaging.

Refer to the *EtherNet/IP Performance and Application Guide*, publication number ENET-AP001, for more information on the EtherNet/IP protocol.

Simple Network Management Protocol (SNMP)

Simple Network Management Protocol (SNMP) is a standard for network management within TCP/IP environments. This lets client applications monitor and manage network information on host computers and gateways.

SNMP uses a distributed architecture consisting of management systems and agents. Data is passed from SNMP agents, which are hardware and/or software processes reporting activity in each network device (switch, router, bridge, etc.) to the workstation console used to oversee the network. The agents return information contained in a MIB (Management Information Base), which is a data structure that defines what is obtainable from the device and what can be controlled (turned off, on, etc.).

The ENBT module is an agent, and its primary function is to process the operations requested by the management system. The 1756-ENBT module supports the SNMP protocol at the MIB II level.

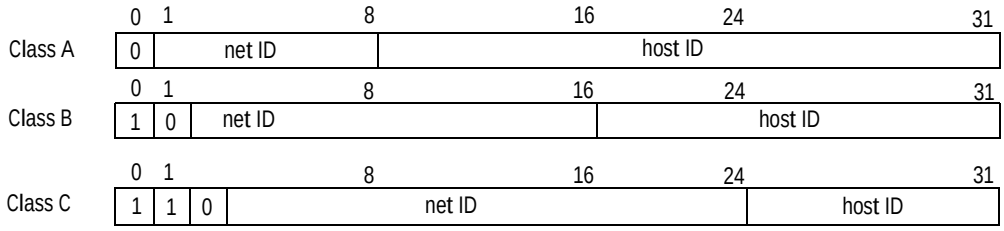
Configuration Requirements

Before you can use your 1756-ENBT module, you must configure its IP address, gateway address, and subnet mask. The module ships with the Rockwell BootP utility, which you can use to perform the configuration. You can also use RSLinx software, generic BootP software, or, within some limitations, a DHCP server. These methods are described in chapter 4.

IP Address

The IP address identifies each node on the IP network (or system of connected networks). Each TCP/IP node on a network (including the 1756-ENBT 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. Each network is a Class A, Class B, or Class C network. The class of a network determines how an IP address is formatted.



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 thus giving it a unique IP address.

IP addresses are written as four decimal integers (0-255) separated by periods where each integer gives the value of one byte of the IP address.

EXAMPLE

For example, the 32-bit IP address:

10000010 00000000 00000000 00000001 is written as 130.0.0.1.

You can distinguish the class of an IP address from the first integer in its dotted-decimal IP address as follows:

Range of first integer	Class	Range of first integer	Class
0 -127	A	192 - 223	C
128 -191	B	224 - 255	other

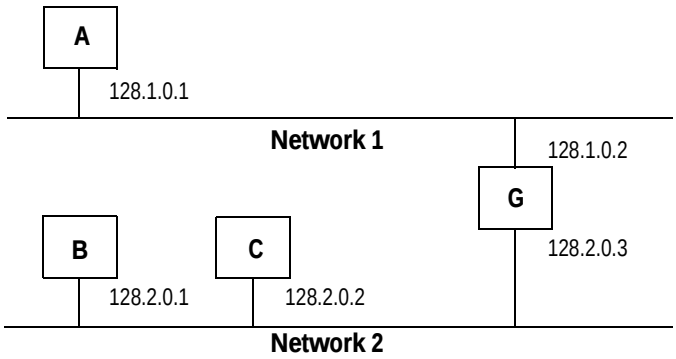
TIP

Contact your network administrator or the Network Information Center for a unique fixed IP address to assign to your module.

For more information on Internet addressing, see Comer, Douglas E; Internetworking with TCP-IP, Volume 1: Protocols and Architecture; Englewood Cliffs, N.J.: Prentice-Hall, 1990.

Gateways

A gateway connects individual physical networks into a system of networks. When a node needs to communicate with a node on another network, a gateway transfers the data between the two networks. The following figure shows gateway G connecting Network 1 with Network 2.



When host B with IP address 128.2.0.1 communicates with host C, it knows from C's IP address that C is on the same network. In an Ethernet environment, B can then resolve C's IP address to a MAC address and communicate with C directly.

When host B communicates with host A, it knows from A's IP address that A is on another network (the net IDs are different). In order to send data to A, B must have the IP address of the gateway connecting the two networks. In this example, the gateway's IP address on Network 2 is 128.2.0.3.

The gateway has two IP addresses (128.1.0.2 and 128.2.0.3). The first must be used by hosts on Network 1 and the second must be used by hosts on Network 2. To be usable, a host's gateway must be addressed using a net ID matching its own.

Subnet Mask

Subnet addressing is an extension of the IP address scheme that allows a site to use a single net ID for multiple physical networks. Routing outside of the site continues by dividing the IP address into a net ID and a host ID via the class. Inside a site, the subnet mask is used to redivide the IP address into a custom net ID portion and host ID portion.

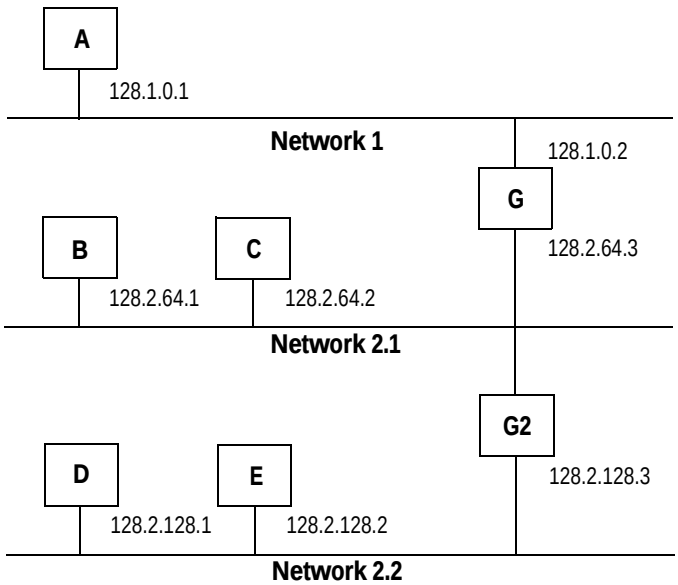
Take Network 2 (a Class B network) in the previous example and add another physical network. Selecting the following subnet mask would add two additional net ID bits allowing for four physical networks:

EXAMPLE

11111111 11111111 11000000 00000000 = 255.255.192.0

Two bits of the Class B host ID have been used to extend the net ID. Each unique combination of bits in the part of the host ID where subnet mask bits are 1 specifies a different physical network.

The new configuration is:



A second network with Hosts D and E has been added. Gateway G2 connects Network 2.1 with Network 2.2. Hosts D and E will use Gateway G2 to communicate with hosts not on Network 2.2. Hosts B and C will use Gateway G to communicate with hosts not on Network 2.1. When B is communicating with D, G (the configured Gateway for B) will route the data from B to D through G2.

For More Information

For more information about Ethernet, refer to the following publications:

- Internetworking with TCP/IP Vol. 1, 2nd ed. by Douglas E. Comer — ISBN 0-13-216987-8
- The Ethernet Management Guide – Keeping The Link — ISBN 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

What's Next?

The following chapter describes how to configure your 1756-ENBT module.

Configuring the 1756-ENBT Module

What This Chapter Contains

Before you can use your 1756-ENBT module in a network you must configure it by providing an IP address, Gateway address, and Subnet mask. There are several way you can do this:

1. Using the Rockwell BootP utility that ships with RSLogix 5000 software.
2. Using RSLinx.
3. Using a third party BootP server.
4. Having your network administrator configure the module via the network server

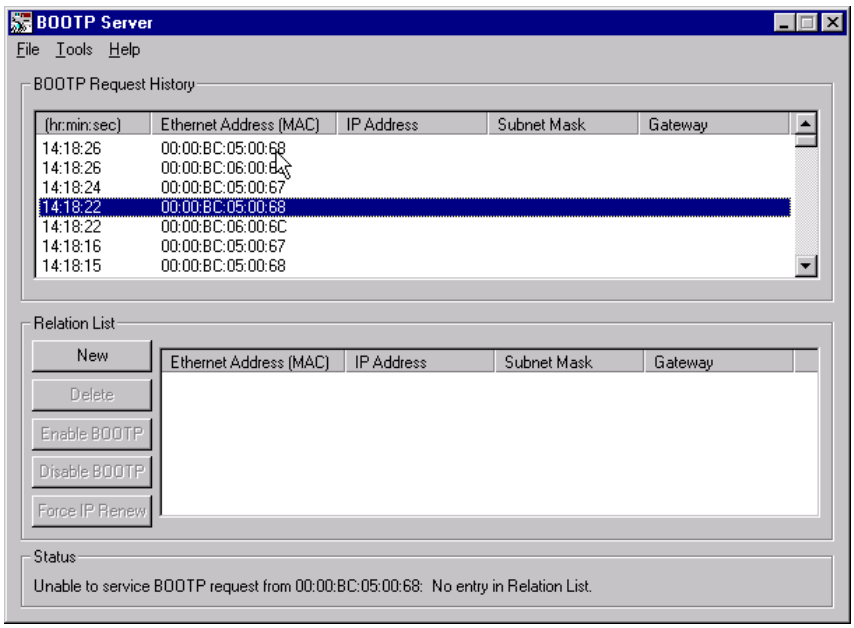
This chapter describes these procedures for configuring the 1756-ENBT module. The following table describes where to find specific information.

Using the Rockwell BootP Utility

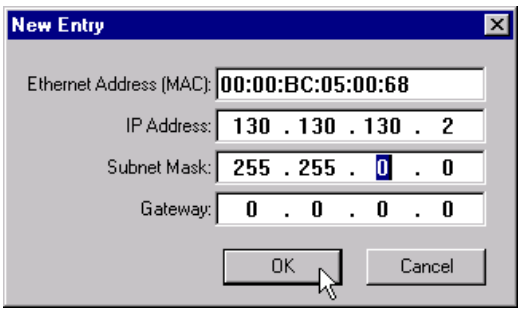
The Rockwell BootP utility is a stand alone program that incorporates the functionality of standard BootP software with a user friendly graphical interface. It is located in the **Utils** directory on the **RSLogix 5000** installation CD. The 1794-AENT adapter must have BootP enabled (factory default) to use the utility.

To configure your adapter using the BootP utility, perform the following steps:

1. Run the BootP software. In the **BOOTP Request History** panel you will see the hardware addresses of devices issuing BootP requests.

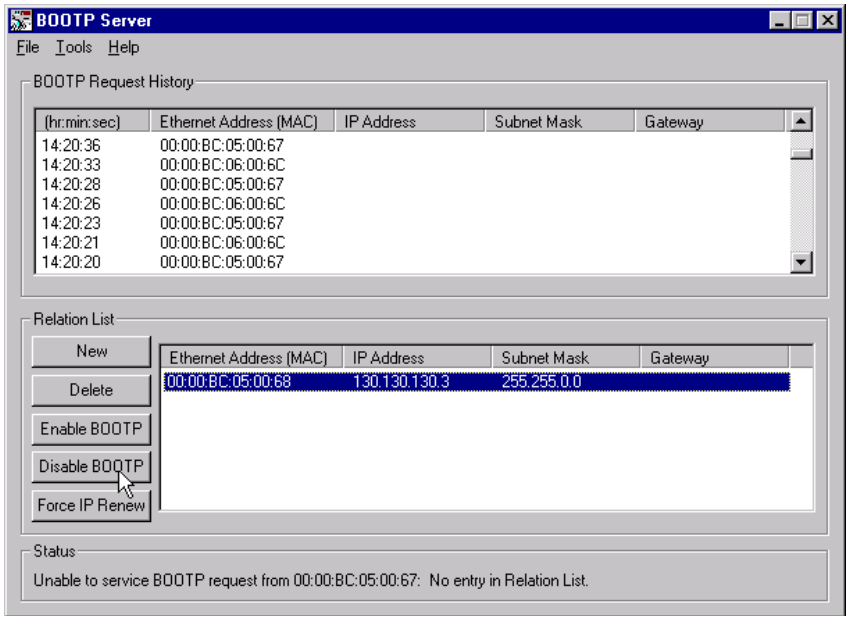


2. Double-click on the hardware address of the device you want to configure. You will see the **New Entry** pop-up window with the device's Ethernet Address (MAC).



3. Enter the **IP Address**, **Subnet Mask**, and **Gateway** you want to assign to the device, and click on **OK**.

The device will be added to the **Relation List**, displaying the Ethernet Address (MAC) and corresponding IP Address, Subnet Mask, and Gateway (if applicable).



4. If you want to permanently assign this configuration to the device, highlight the device and click on the **Disable BOOTP** button. When power is recycled to the device, it will use the configuration you assigned and not issue a BootP request.

   Note: To enable BootP for a device that has had BootP disabled, highlight the device and click on the **Enable BOOTP** button.

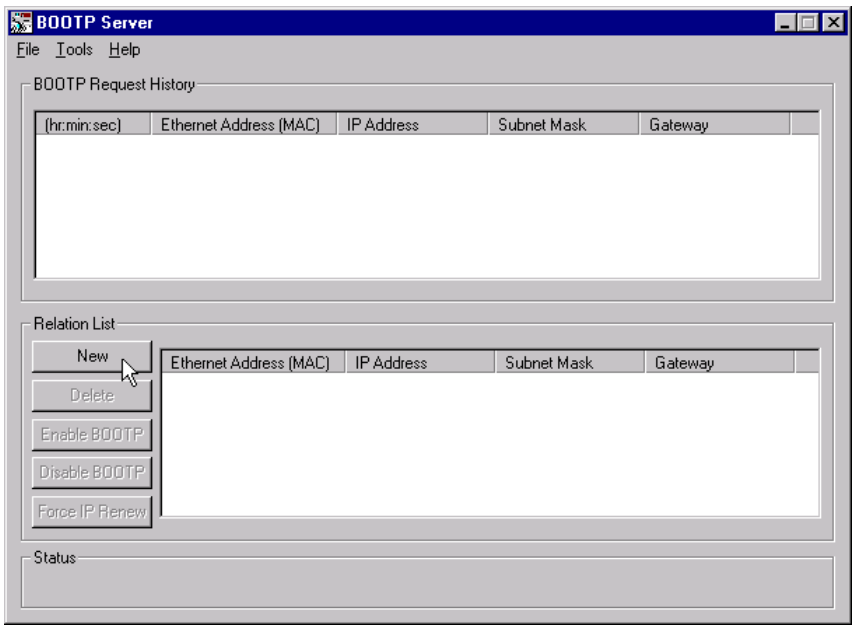
Using Force IP Renew To Reconfigure a Device

The **Force IP Renew** feature can be used to reconfigure a device that has Bootp disabled. This can be useful:

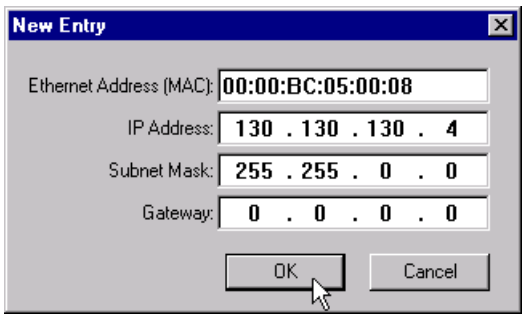
- if you do not know the IP address of a configured device (e.g., the address is not written on the label or the label is missing), or
- if you know the IP address but want to change the configuration.

To use this feature perform the following steps:

1. Connect the device to your network and run the Bootp utility.

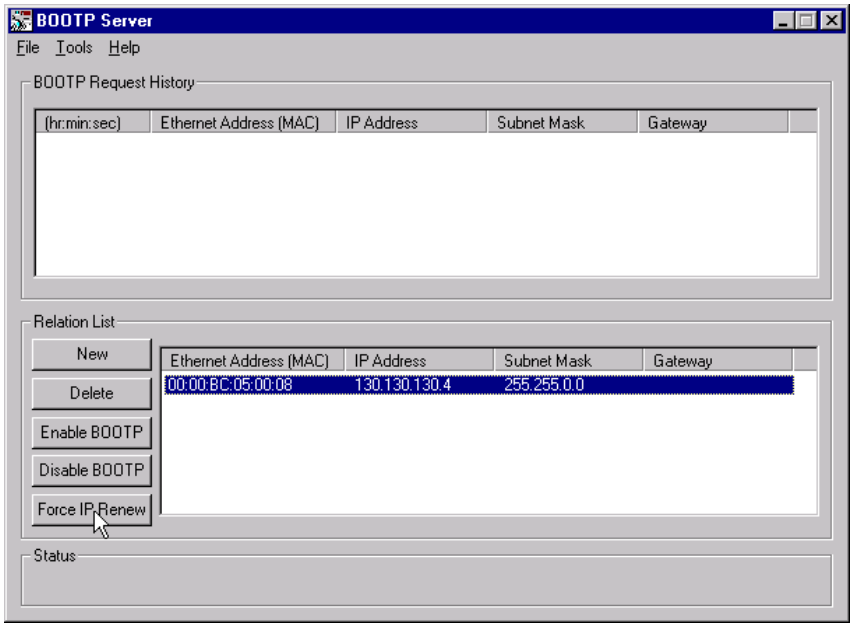


2. Click on the **New** button. The **New Entry** pop-up window will open.



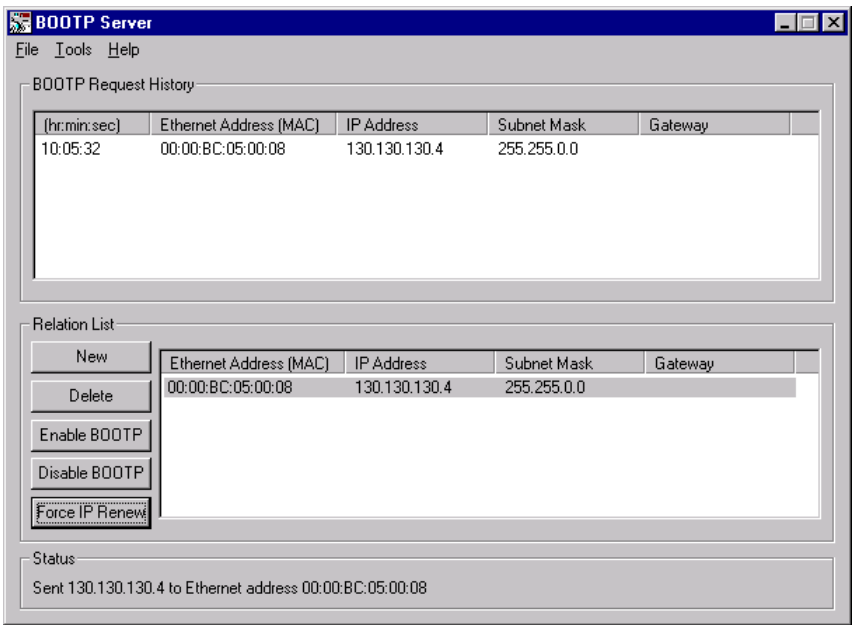
3. Enter the fixed **Ethernet Address (MAC)** of your device.

4. Enter the **IP Address**, **Subnet Mask**, and **Gateway** you want to assign to the device, and click on **OK**. The device will appear in the **Relation List**.



5. Select the device from the **Relation List** and click on the **Force IP Renew** button. Then cycle power to the device.

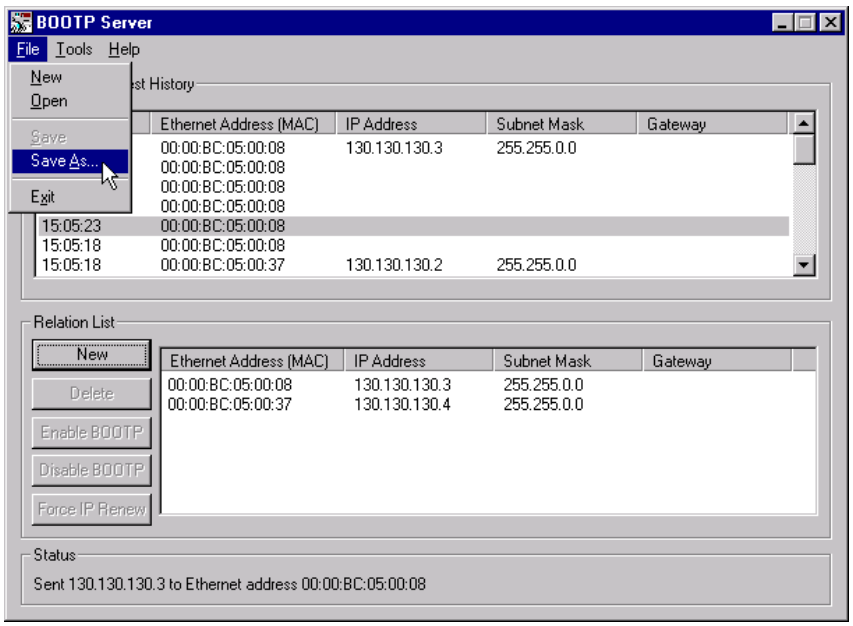
   The device will perform its power-up diagnostics and issue a Bootp request. The Bootp utility will respond by assigning it the configuration you just specified.



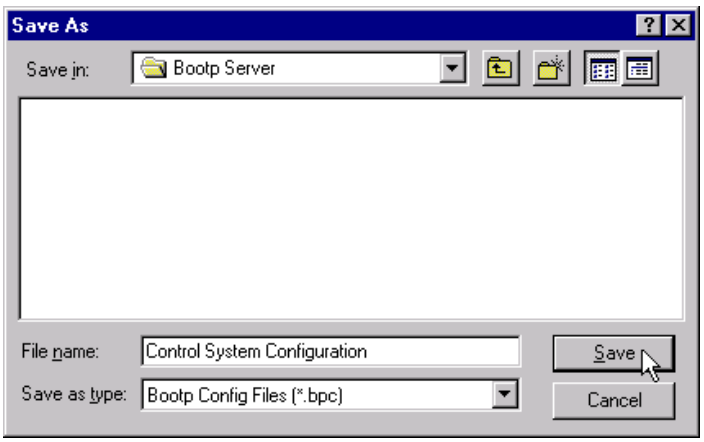
   The device is now able to communicate over the network, using the new configuration.

Saving the Relation List

You can save the Relation List to be used later. To save the Relation List perform the following steps:



1. Select **Save As...** from the **File** menu. You will see the following window.

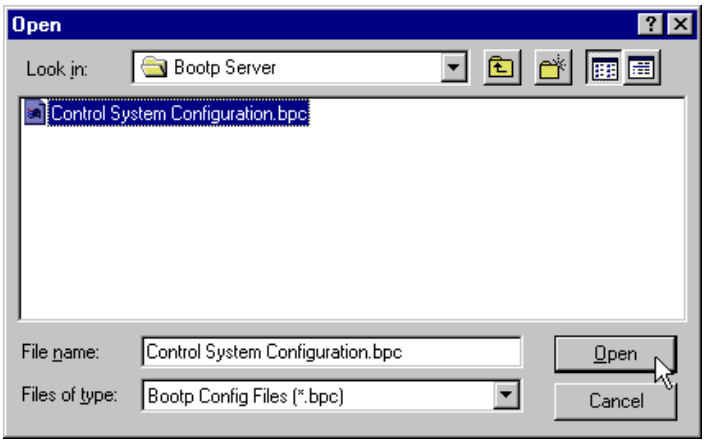


2. Select the folder you want to **Save in:**

3. Enter a **File name** for the Relation List (e.g., “Control System Configuration”) and click on **Save**.

   You can leave the **Save as type** at the default setting (Bootp Config Files (*.bpc).

You can then open the file containing the Relation List at a later session.



Using RSLinx Software

You can use RSLinx software, version 2.2 or higher, to configure the 1756-ENBT module via a ControlNet or Data Highway Plus network, or via the serial port on a Logix 5550 processor, if you insert the 1756-ENBT module into a ControlLogix chassis containing:

- a 1756-CNB module connected to your workstation via ControlNet, or
- a 1756-DHRIO module connected to your workstation via DH+, or
- a Logix 5550 processor connected to your workstation via its serial port.

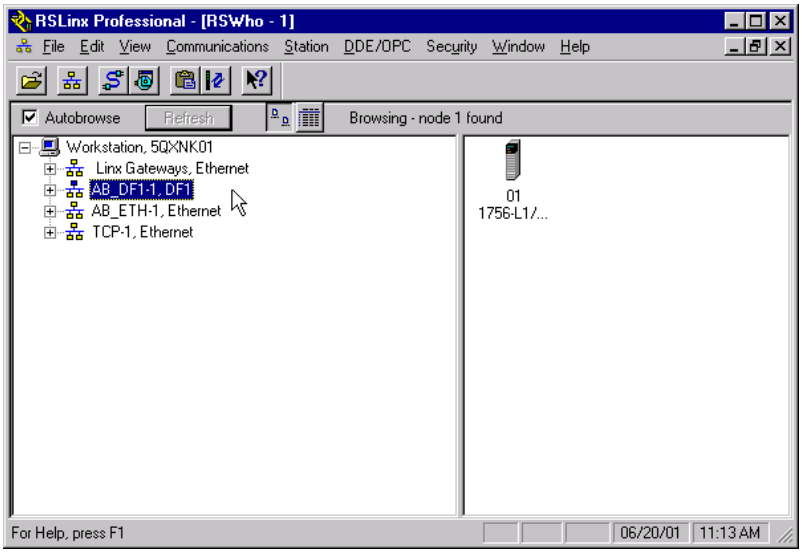
You must have an appropriate communication driver configured in RSLinx. After configuring the 1756-ENBT module, you can move it to the chassis where you want to use it.

To configure the 1756-ENBT module using RSLinx, perform the following steps:

1. Insert the 1756-ENBT module in the ControlLogix chassis with the communications module you will be using.

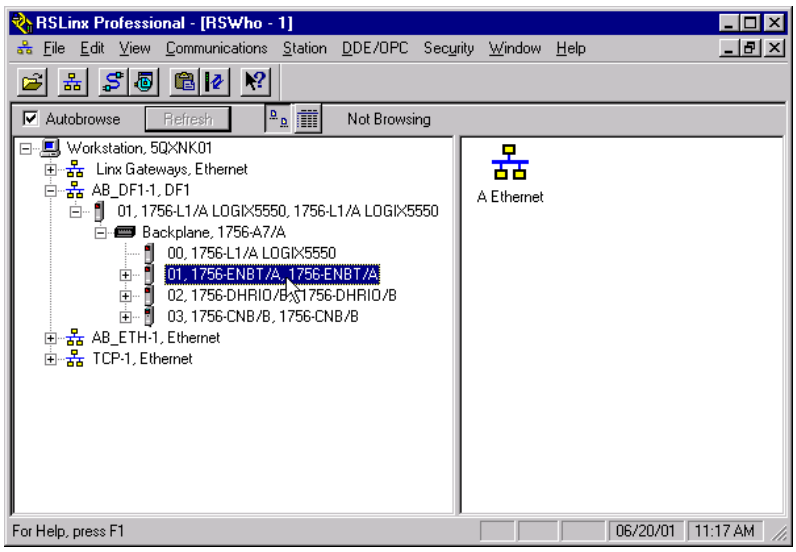
2. Start RSLinx.

The **RSWho** window will open.



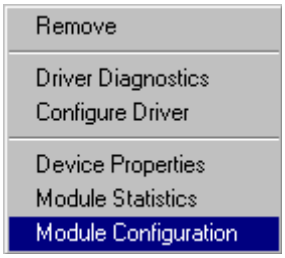
3. Select the appropriate driver (e.g., AB_KT-1 for Data Highway Plus, AB_KTC-1 for ControlNet, or AB_DF1-1 for the Logix 5550's serial port).

The following example uses the AB_DF1-1 driver. You can perform the same steps using one of the other drivers.

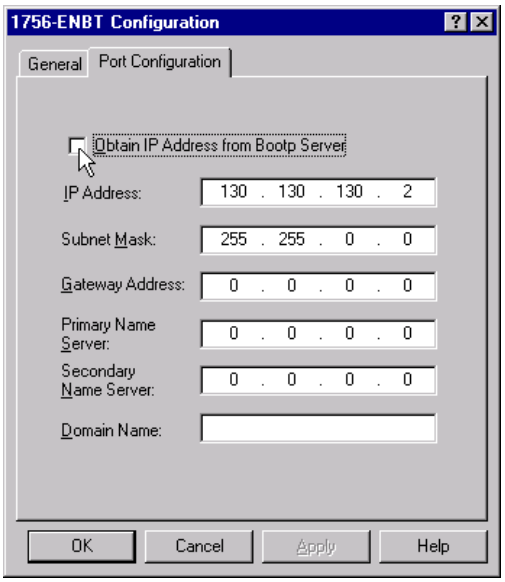


4. Expand the driver tree through the backplane of the chassis containing the 1756-ENBT module and right click on the module.

The following pop-up menu will appear.



5. Select **Module Configuration,** then select the **Port Configuration** tab.



6. Uncheck the **Obtain IP Address from BootP Server** box.

7. Enter the desired **IP Address**, **Subnet Mask**, and optional **Gateway Address**. The values we used for one of the 1756-ENBT modules in the example applications are shown above.

8. Click on **OK**.

You can now move the module to another chassis and access it over your network using this configuration.

Using a Third Party BootP Server

The 1756-ENBT module factory default is BootP enabled. The following is an example BootP tab file that can be used with a third party BootP server:

EXAMPLE

```
# Example /etc./bootptab: database for bootp server (/etc./bootpd).
#
# Format:
#       nodename:tag=value:tag=value: . . . .:tag=value
#
#       first field – – nodename (hostname) of terminal followed by colon
#       (should be full domain name)
#
# Blank lines and lines beginning with '#' are ignored.
# Make sure you include a colon and a backslash to continue a line.
# Don't put any spaces in the tag–value string.
# The ht tag MUST precede the ha tag.
#
# The options below are specified as tag=value and delimited by colons
# These are the options used by the 1756-ENBT module:
#
#       gw – – gateway IP address
#       ha – – hardware address (link level address) (hex)
#       ht – – hardware type (either) (must precede the ha tag)
#       ip – – IP address
#       sm – – network subnet mask
#       tc – – template for common defaults (should be the first option listed)
#
#       vm – – vendor magic cookie selector (MUST be rfc1048 for
        1756-ENBT)
#
#-————————————————————————————————————————————————————————
# default values for 1756-ENBT
icp.defaults:\
        ht=ether:\
        vm=rfc1048:\
        sm=255.255.254.0:\
        gw=130.151.132.1
#-————————————————————————————————————————————————————————

zappa0:\
        tc=icp.defaults:\
        ha=0000bc03404f:\
        ip=130.151.132.121

zappa1:\
        tc=icp.defaults:\
        ha=0000bc034073:\
        ip=130.151.132.122
```

```
zappa2:\
        tc=icp.defaults:\
        ha=0000bc034022:\
        ip=130.151.132.123
```

To use a BootP server to configure the 1756-ENBT module perform the following steps:

1. Access and open the BootP tab file using a text editor.

2. Enter the IP address of your module.

If you need more information on setting IP addresses, refer to pages 3-3 to 3-4.

3. Use the text editor to enter the Ethernet hardware address (MAC ID) of your module. You must enter all digits, including zeroes.

IMPORTANT When using the BootP protocol, you must enter the Ethernet hardware address of your module. Rockwell assigns each 1756-ENBT module a unique 48-bit hardware address at the factory. The address is printed on a label on the side of the module. It consists of six hexadecimal digits separated by dots, as shown at left. This address is fixed by the hardware, and cannot be changed.

00:00:BC:06:00:68
Ethernet Address

If you change or replace this 1756-ENBT module, you must enter the new Ethernet hardware address of the module when you configure the new module.

4. Enter the optional Gateway Address.

If you need more information on assigning gateway addresses, refer to page 3-4.

5. Enter the optional Subnet Mask

If you need more information on selecting subnet masks, refer to page 3-5.

6. After you have entered all the configuration data, save the file in a directory where the BootP server can access it.

Using DHCP Software to Configure Your Module

DHCP (Dynamic Host Configuration Protocol) software automatically assigns IP addresses to client stations logging onto a TCP/IP network. DHCP is based on BootP and maintains some backward compatibility. The main difference is that BootP was designed for manual configuration, while DHCP allows for dynamic allocation of network addresses and configurations to newly attached devices.

Be cautious about using DHCP software to configure your module. A BootP client, such as the 1756-ENBT module, can boot from a DHCP server only if the DHCP server is specifically written to also handle BootP queries. This is specific to the DHCP software package you use. Check with your system administrator to see if your DHCP package supports BootP commands and manual IP allocation.

ATTENTION

The 1756-ENBT module must be assigned a fixed network address. The IP address of this module must not be dynamically provided.

Failure to observe this precaution may result in unintended machine motion or loss of process control.

What's Next?

The following chapter describes an example application in which you configure remote digital I/O using a rack optimized connection.

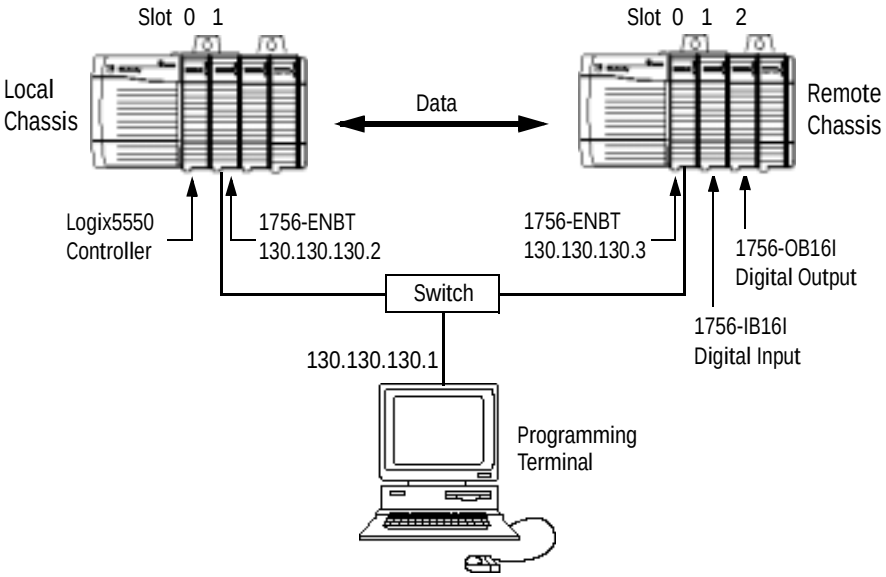
Using Rack Optimized I/O

About the Example Application

This example uses rack optimized connections to read data from a remote digital input module and send data to a remote digital output module.

Set Up the Hardware

For this example, one ControlLogix chassis contains a Logix 5550 controller in slot 0 and a 1756-ENBT module in slot 1. A second chassis contains a 1756-ENBT module in slot 0 and the I/O modules in slots 1 and 2.



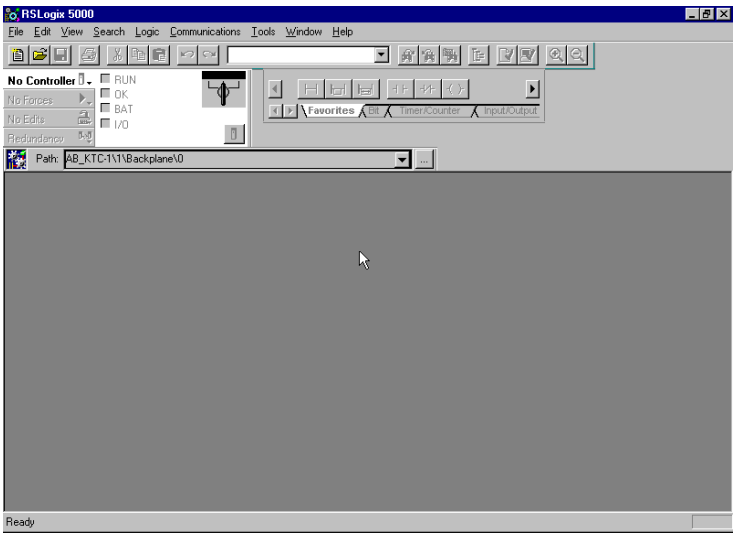
To work along with this example set up your system as shown above.

- Note that in the example application, the Logix5550 controller, I/O modules, and the 1756-ENBT modules are in the slots shown above.
- Verify the IP addresses for your PC and 1756-ENBT modules (see chapter 4).
- Verify that all wiring and cabling is properly connected.
- Make sure you have your communication driver (e.g., AB_ETH-1) configured in RSLinx as described in Appendix C.

Create the Example Application

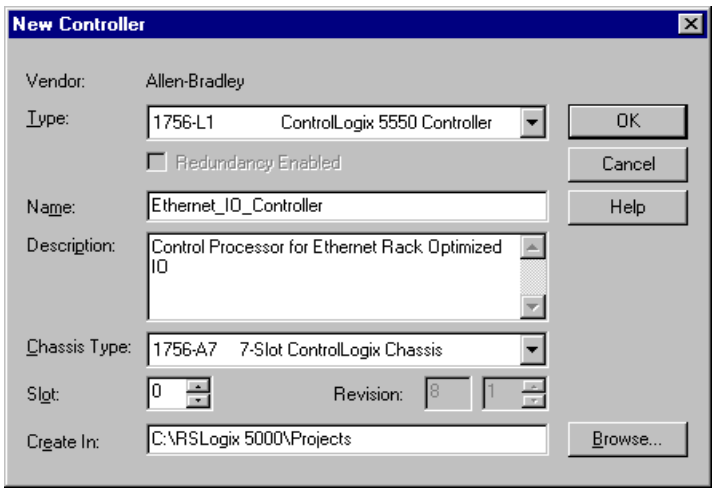
Perform the following steps to create the example application:

1. Start **RSLogix5000**. The RSLogix 5000 Main Window will open.



2. From the **File** menu, select **New**.

   The **New Controller** pop-up window will open.



3. Enter an appropriate name for the Controller, e.g., “Ethernet_IO_Controller.”

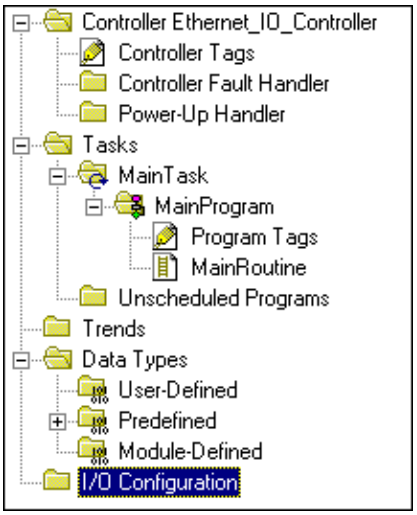
4. Select the correct **Chassis Type** and **Slot** number of the Logix5550 controller, and the folder where you want to save the RSLogix 5000 file (**Create In**). The **Description** is optional.

5. Click on **OK**.

You now add the remote digital I/O modules to the controller's I/O configuration. To do this you first add the local 1756-ENBT module to the I/O configuration. Next you add the 1756-ENBT in the remote chassis with the digital I/O modules as a "child" of the local 1756-ENBT module. Then you add the I/O modules as "children" of the remote 1756-ENBT module.

Add the Local Ethernet Bridge to the I/O Configuration

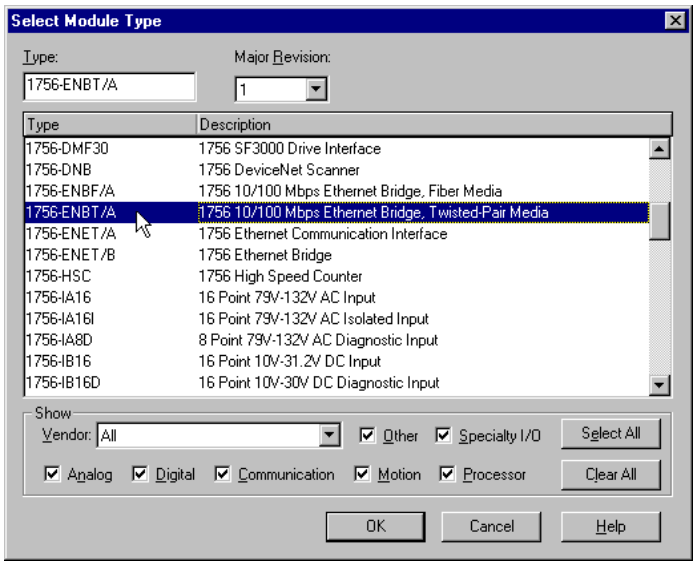
1. Select the **IO Configuration** folder in the project window and click the right mouse button.



The following pop-up window will open.

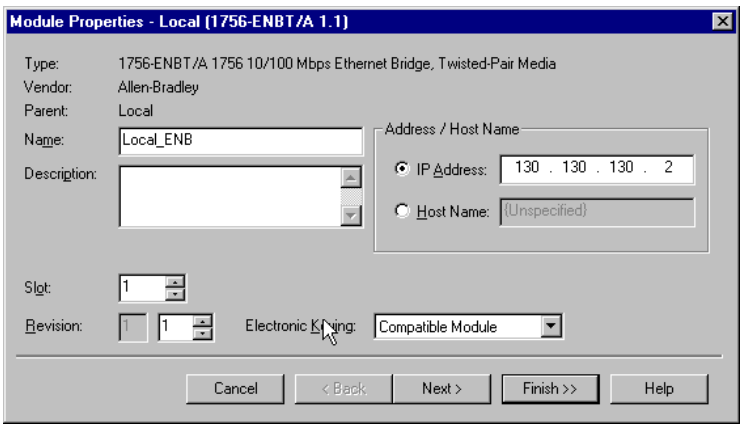
2. Click on **New Module**.

The **Select Module Type** window will open.



3. Select the **1756-ENBT/A** Ethernet Bridge and click on **OK**.

The **Module Properties** window will open.



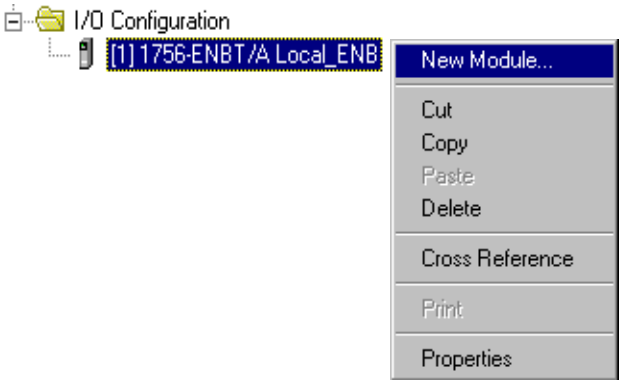
4. Enter or select the following parameters: **Name**, **IP Address**, **Slot**, and **Electronic Keying**. We used the following values:

Name	Local_ENB
IP Address	130.130.130.2
Slot	1
Electronic Keying	Compatible Module

5. Click on **Finish** to accept the configuration.

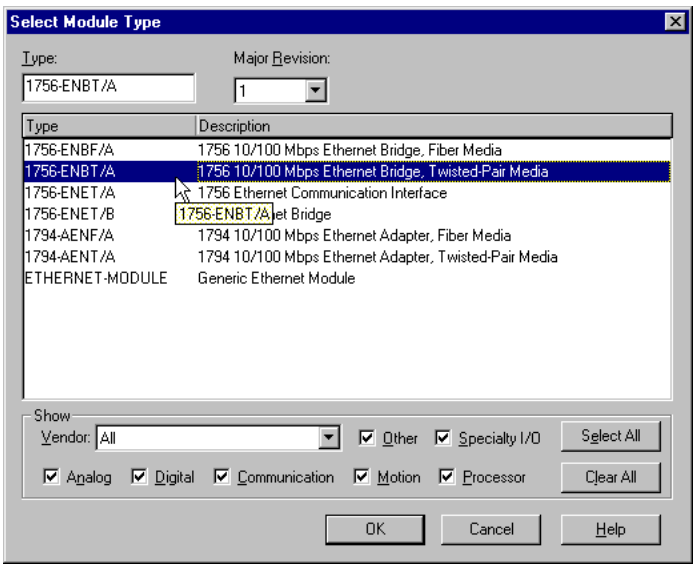
Add the Remote Ethernet Bridge to the I/O Configuration

Next, you must add the remote 1756-ENBT module as a “child” of the local 1756-ENBT module.



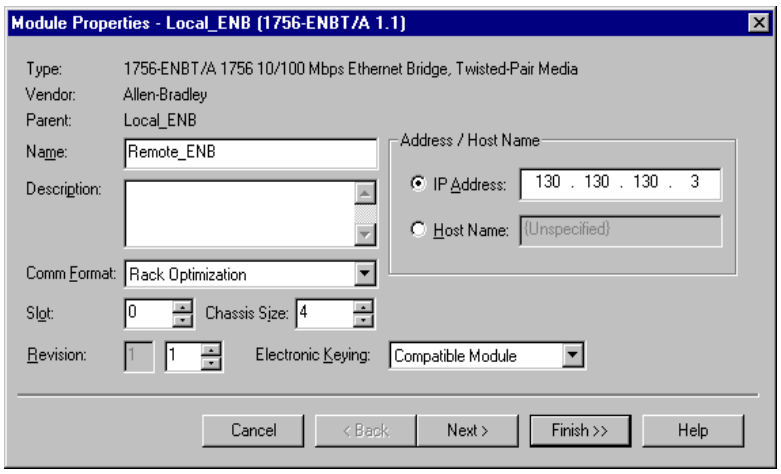
1. In the Project window, right click on the local 1756-ENBT module under the I/O Configuration folder and select **New Module** from the pop-up window.

   The **Select Module Type** window will open.



2. Select the **1756-ENBT/A** Ethernet Bridge from the list and click on **OK**.

The **Module Properties** window will open.

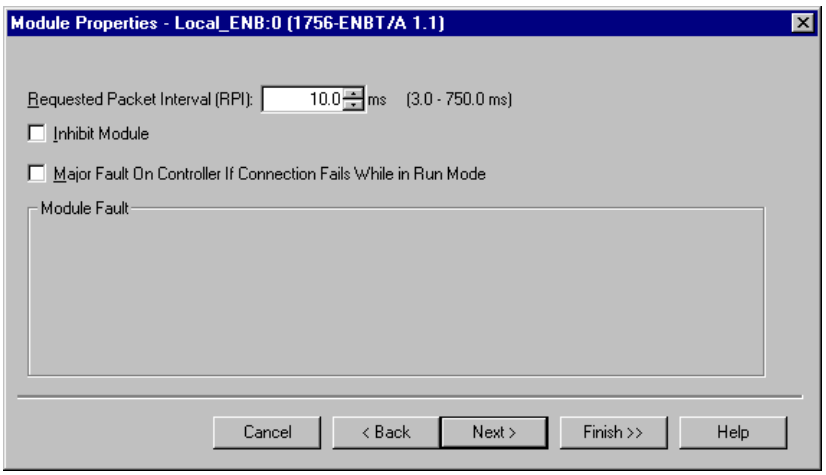


3. Enter or select the following parameters (the values we used are listed in the table):

Name	Remote_ENB
IP Address	130.130.130.3
Chassis Size	4
Slot	0
Comm Format	Rack Optimization
Electronic Keying	Compatible Module

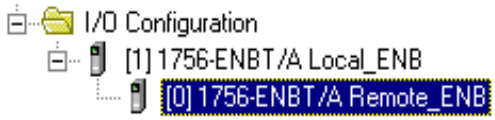
4. Click on **Next**.

The following page will open:



5. Make sure the **Requested Packet Interval** (RPI) is 5ms or greater for this example.

6. Click on the **Finish** button to accept the configuration. The remote 1756-ENBT module will appear indented under the local 1756-ENBT in the I/O Configuration folder.



Add the Remote I/O Modules to the I/O Configuration

You must now add the remote I/O modules to the I/O Configuration List under the remote 1756-ENBT module.

In this example, you will add a a 1756-IB16I digital input module and a 1756-OB16I digital output module with standard configurations. Use these steps as a guide when you are configuring different I/O modules for your actual system.

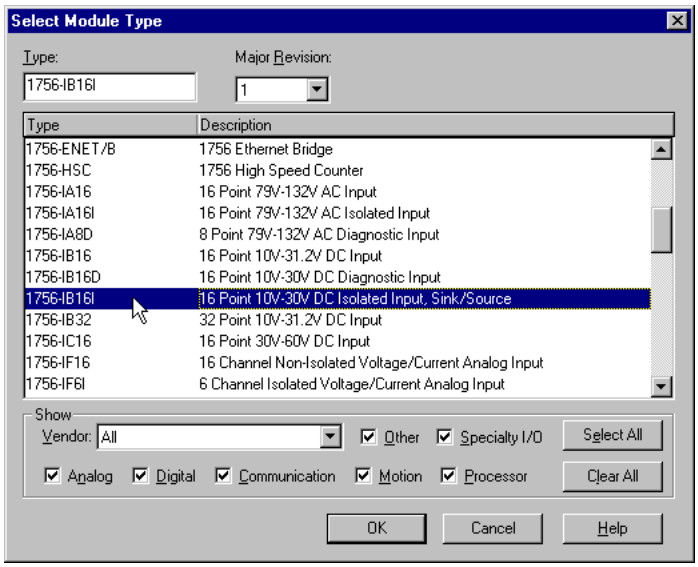
TIP

This example application uses the I/O module default configurations. For information on altering the default configurations see the *ControlLogix Digital I/O Module User Manual*, publication 1756-6.5.8.

Add the Remote Digital Input Module

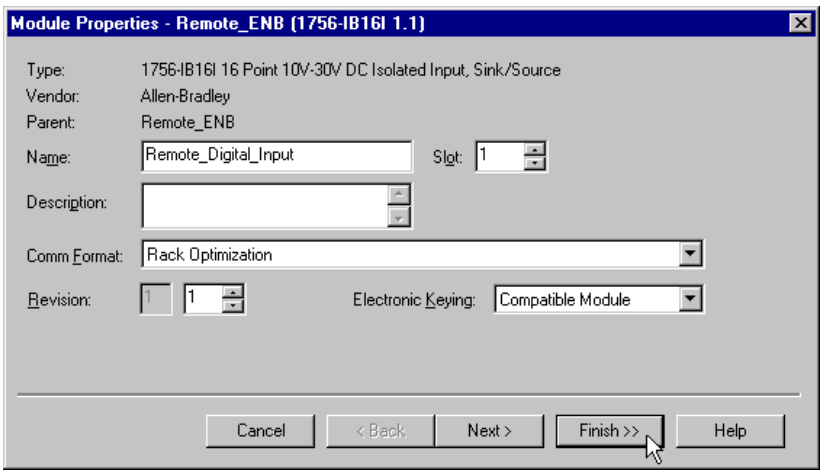
1. Right click on the remote **1756-ENBT** module under the I/O Configuration folder and select **New Module**.

2. The **Select Module Type** window will open.



3. Select the **1756-IB16I** digital input module from the list and click on **OK**.

   The **Module Properties** window will open.



4. Enter the following parameters (the values we used are listed in the table):

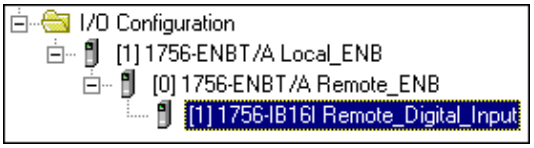
Name	Remote_Digital_Input
Slot	1
Comm Format	Rack Optimization
Electronic Keying	Compatible Module

TIP

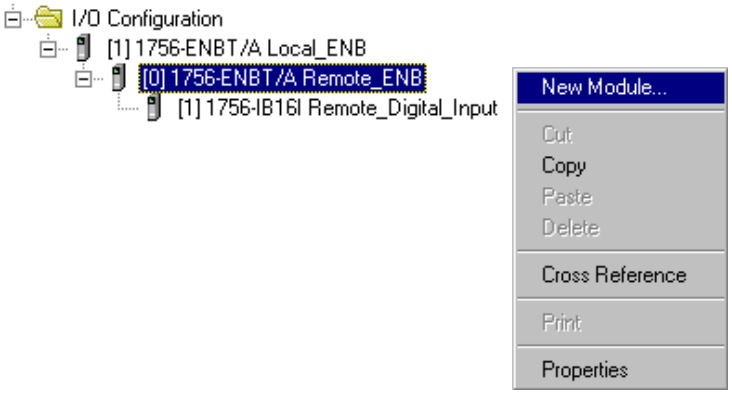
If you want to alter the default parameters, click on the **Next** button. Refer to the *ControlLogix Digital I/O User Manual*, publication 1756-6.5.8, for details.

5. Click on the **Finish** button to save the configuration.

The digital input module will appear in the I/O configuration indented under the remote 1756-ENBT module.

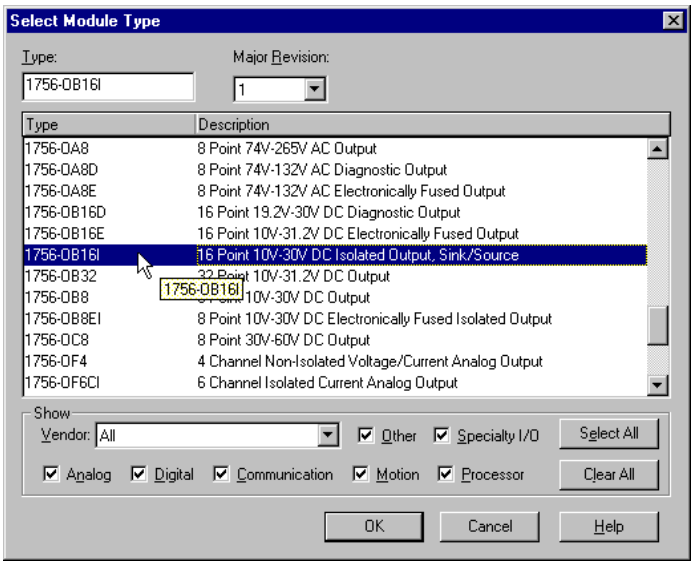


Add the Remote Digital Output Module

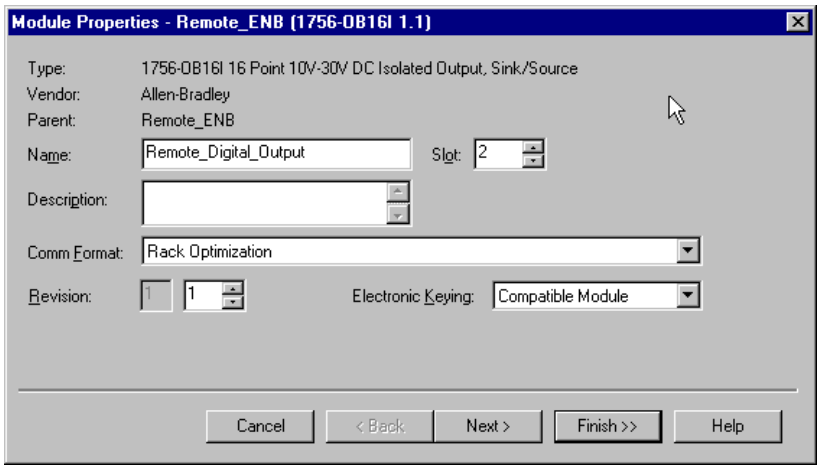


6. Right click on the remote **1756-ENBT** module and again select **New Module**.

The **Select Module Type** window will open.



7. Select the **1756-OB16I** digital output module from the list and click on **OK**. The **Module Properties** window will open.



8. Enter the following parameters (the values we used are listed in the table):

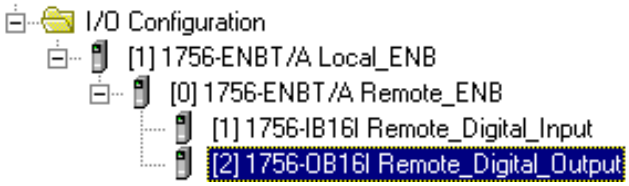
Name	Remote_Digital_Output
Slot	2
Comm Format	Rack Optimization
Electronic Keying	Compatible Module

TIP

If you want to alter the default parameters, click on the **Next** button. Refer to the *ControlLogix Digital I/O User Manual*, publication 1756-6.5.8, for details.

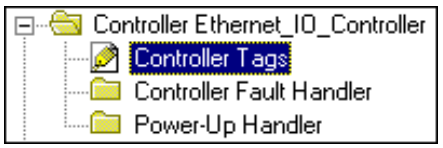
9. Click on the **Finish** button to accept the configuration.

The I/O Configuration in the Project window should look similar to the one shown below.

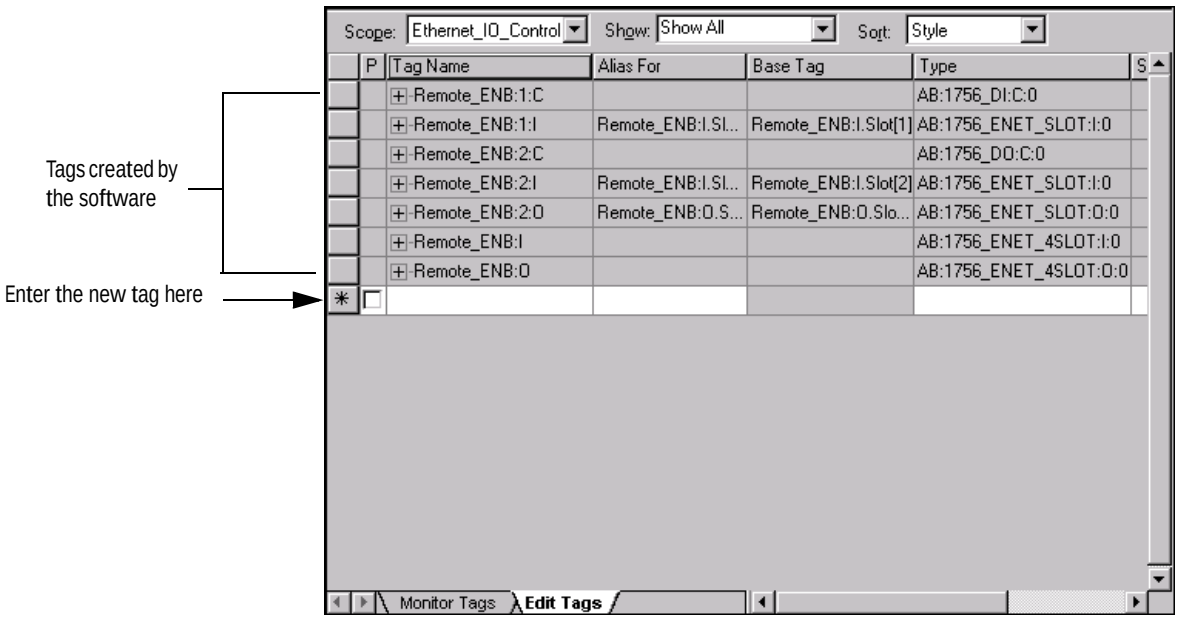


Edit the Controller Tags

When you add modules to the I/O configuration the system creates tags for those modules to use in the application program. For our example application we need to add another Controller Tag.



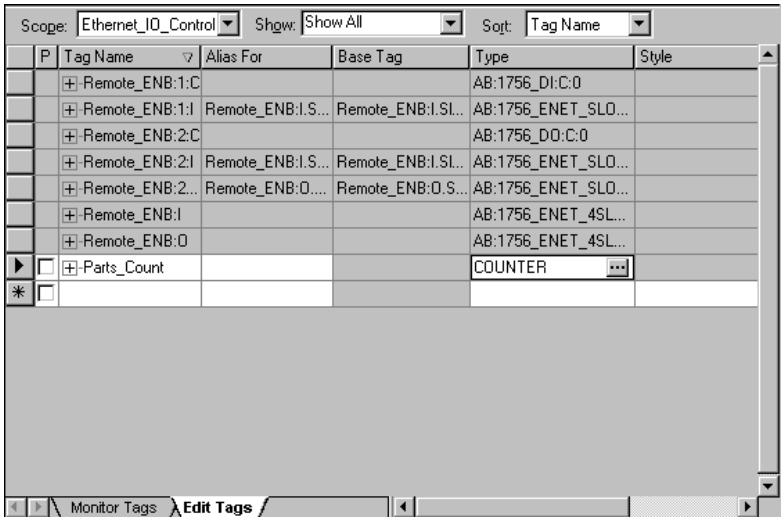
1. Double-click on the **Controller Tags** folder in the project window. The **Controller Tags** window will open. You will see the tags created by the software for the 1756-ENBT and digital I/O modules.



2. Select the **Edit Tags** tab at the bottom of the Controller Tags window.

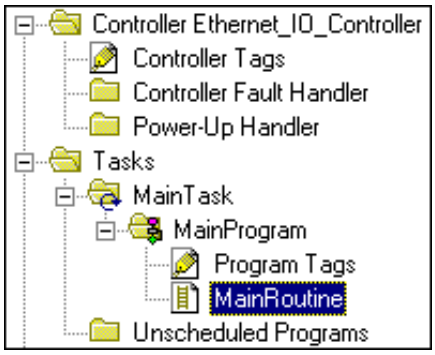
3. Create the following tag:

Tag	Type
Parts_Count	Counter

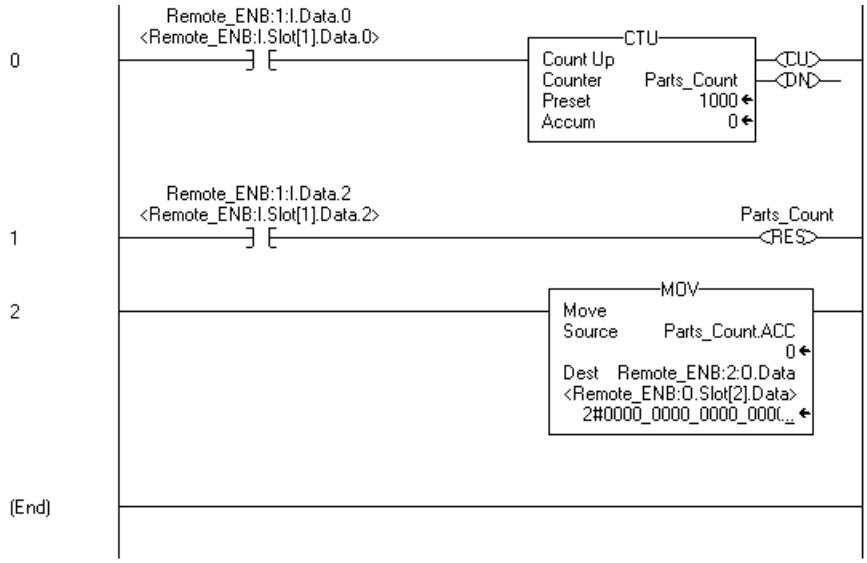


Create the Ladder Program

To create a ladder program to test the configuration perform the following steps:



1. Double-click on **Main Routine** under the **Main Program** folder, and enter the following ladder program, using the tags previously created.

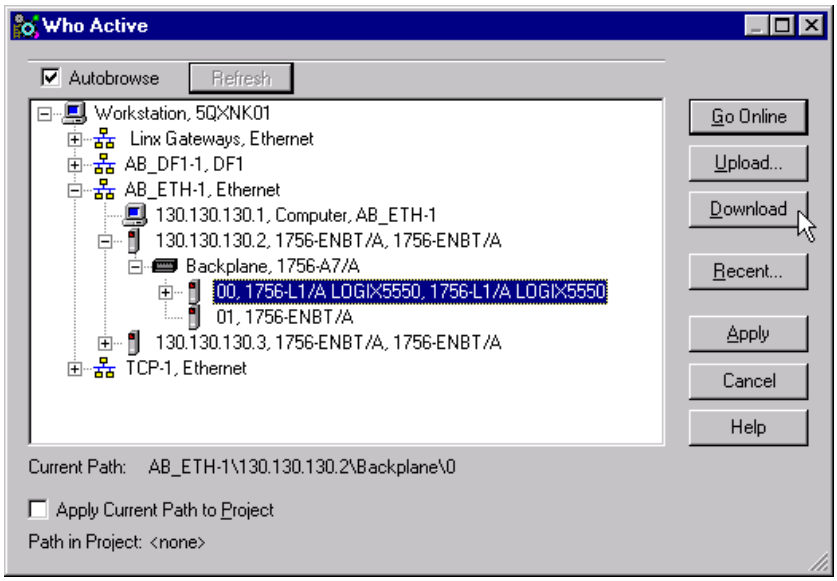


2. **Save** the program.

Download the Program to the Controller

1. Click on the **Communications** menu and select **Who Active**.

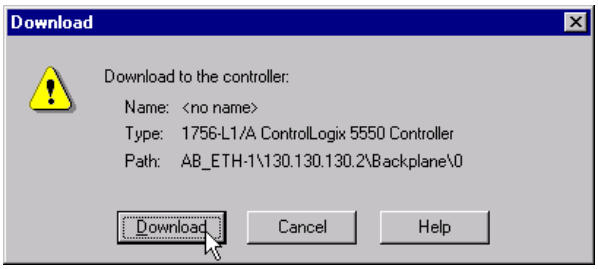
   The **Who Active** window will open (Your window will show the drivers and devices you have installed).



2. Select your Ethernet driver (e.g., AB_ETH-1) and expand the tree through the backplane of the local ControlLogix chassis.

3. Highlight the Logix 5550 controller and click on the **Download** button.

   You will see a message similar to the following:



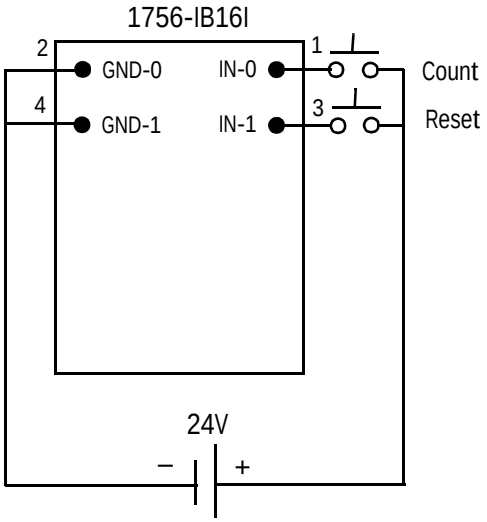
4. Click on the **Download** button.

5. **Minimize** RSLogix5000.

Test the Example Application

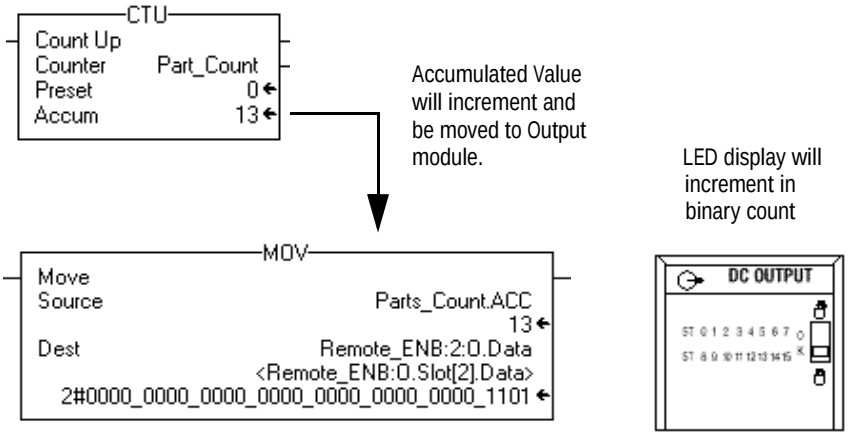
You will test the example application by using a momentary switch to simulate a parts sensor.

1. Wire the 1756-IB16I digital input module as shown in the following figure:



2. Restore the **RSLogix5000** software and place the controller in **Run** mode.

3. Repeatedly press and release the momentary switch at IN-0 (Count) on the 1756-IB16I digital input module. Each time you press the switch you should see the Parts_Count accumulated value increment on the screen and the LED display of the OB16I output module increment in binary.



4. Press and release the momentary switch at IN-1 (Reset) on the 1756-IB16 digital input module. You should see the accumulated value of the Parts_Count reset to zero and all of the LEDs on the 1756-OB16I output module turn off.

TIP

Refer to the *ControlLogix Digital I/O Modules User Manual*, publication 1756-6.5.8, for assistance in wiring and debugging the I/O modules.

This completes the Rack Optimized I/O example.

What's Next?

The following chapter describes an example application in which you add an analog output module to the I/O configuration using a direct connection.

Using Analog I/O with Direct Connection

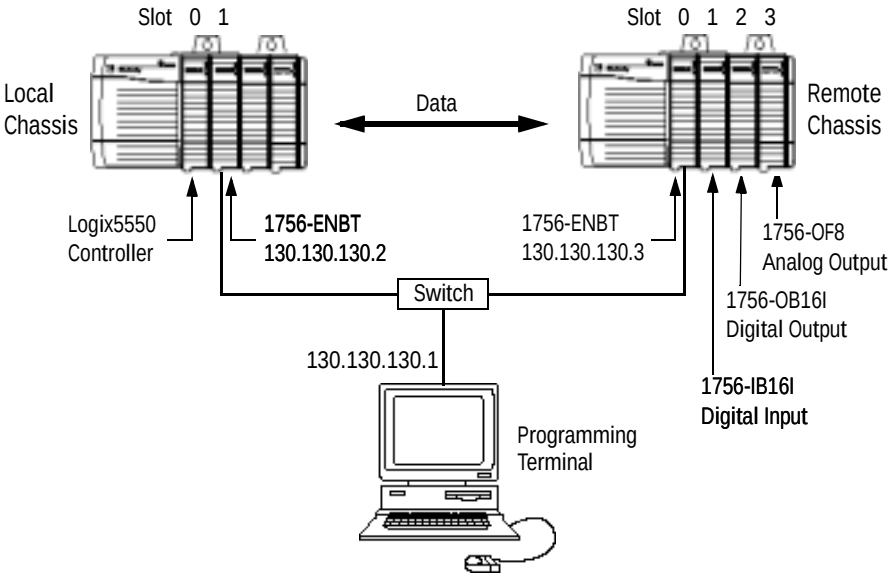
About the Example Application

In this example you add an analog output module to the remote chassis containing the 1756-ENBT module and the two digital I/O modules configured in the previous chapter. Analog modules default to direct connection. Note that you will open a direct connection to the analog module while still using a single rack optimized connection for the two digital I/O modules.

To test the connection the RSLogix 5000 project of the previous chapter is modified to produce a varying signal at one of the analog output channels.

Set Up the Hardware

Change the system configuration of the previous chapter to that shown below, adding an analog output module to the remote chassis in slot 3. For this example, we used a 1756-OF8 analog output module.

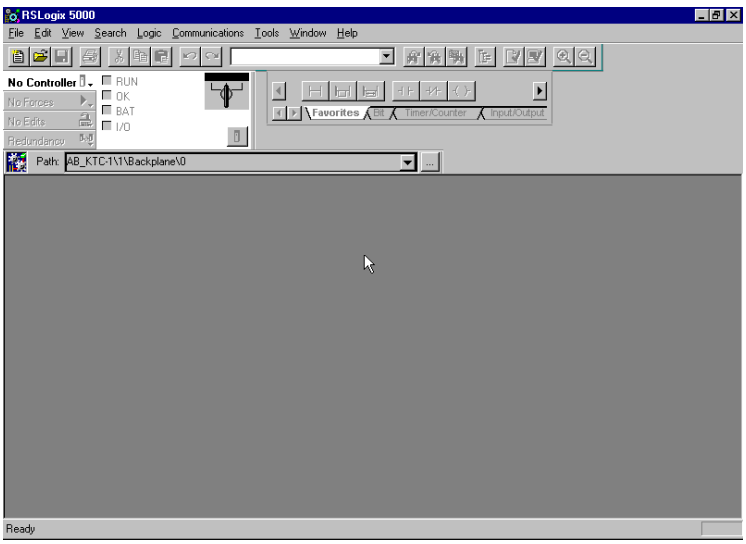


- Note that in the example application, the Logix5550 controller, I/O modules, and the 1756-ENBT modules are in the slots shown above.
- Verify that the IP addresses for the 1756-ENBT modules and personal computer are correct.
- Verify that all wiring and cabling is properly connected.
- Make sure you have your communication driver (e.g., AB_ETH-1) configured in RSLinx as described in Appendix C.

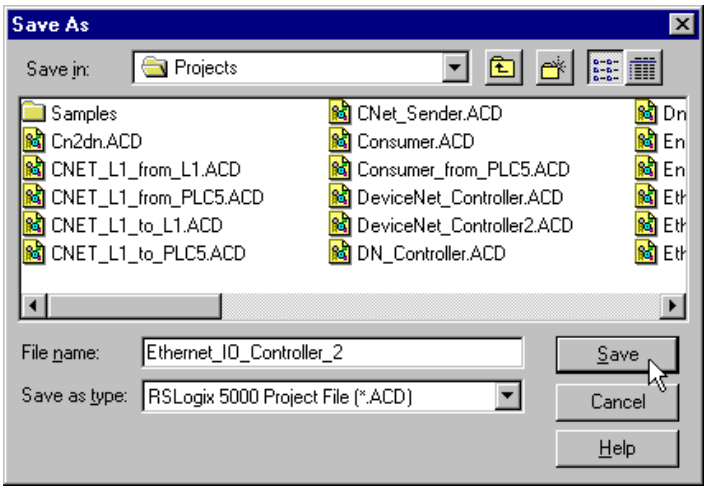
Create the Example Application

Perform the following steps to create the example application:

1. Start **RSLogix5000**. The RSLogix 5000 Main Window will open.



2. Open the project file from the previous chapter (i.e., “Ethernet_IO_Controller”).



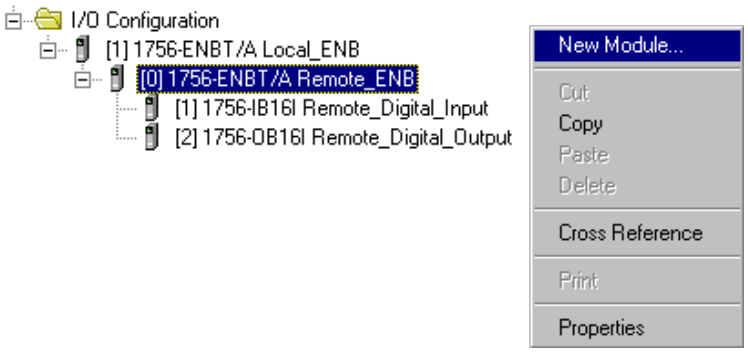
3. Save the file using a different name (e.g., “Ethernet_IO_Controller_2”).

Add the Remote Analog I/O Module to the I/O Configuration

You must now add the new remote analog I/O module to the I/O Configuration. In this example, you add the 1756-OF8 analog output module and configure one of its channels for a 0V to 10V output range. Use these steps as a guide when you are configuring different I/O modules for your system.

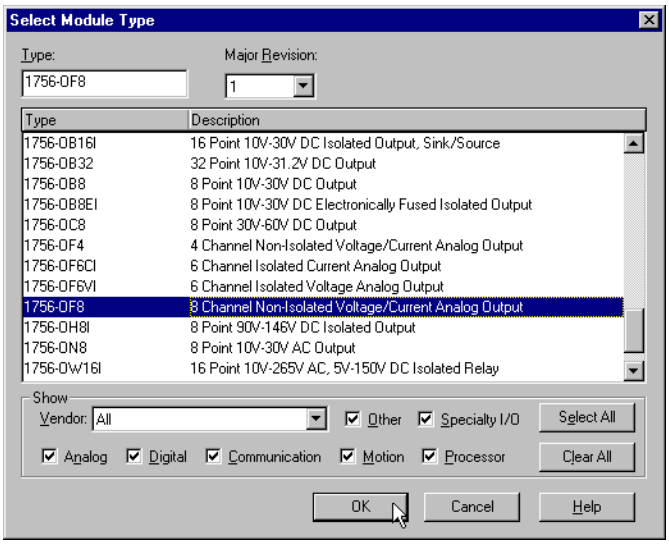
TIP

For additional information on configuring a ControlLogix analog I/O module see the *ControlLogix Analog I/O Module User Manual*, publication 1756-6.5.9.



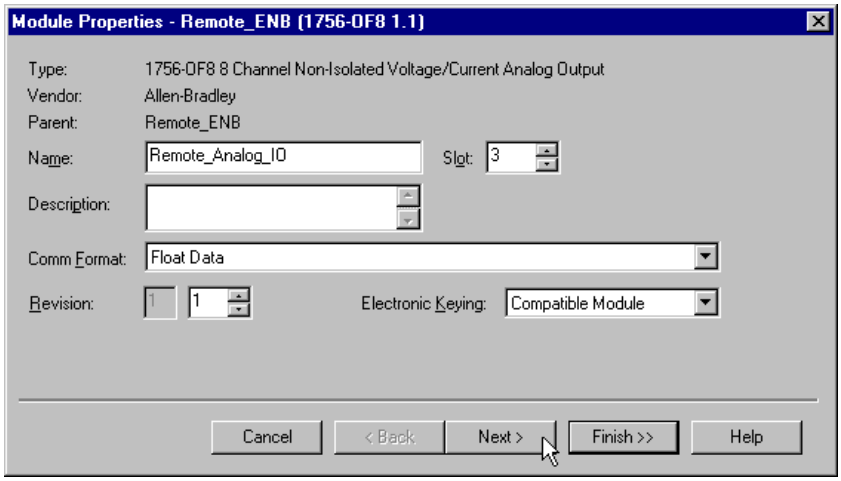
1. Right click on the **Remote_ENB** module under the I/O Configuration folder and select **New Module** from the pop-up window.

   The **Select Module Type** window will open.



2. Select the **1756-OF8** analog output module and click on **OK**.

The **Module Properties** window will open.



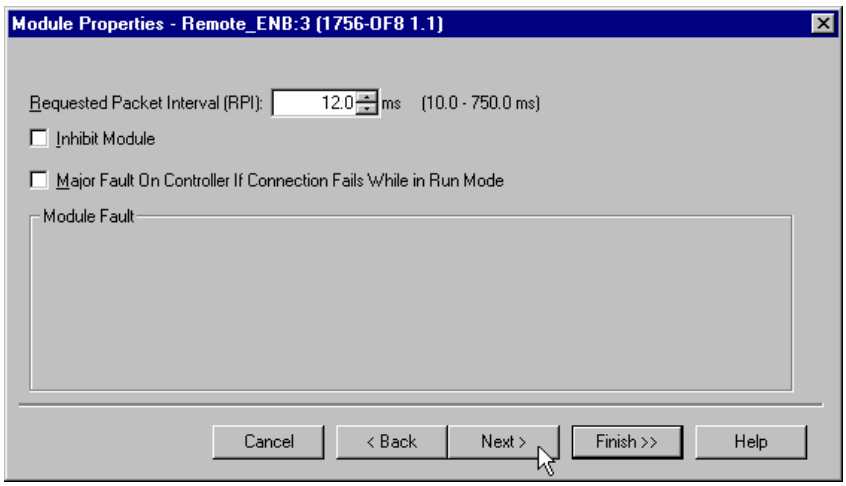
3. Enter the following parameters:

Name	Remote_Analog_Output
Slot	3
Comm Format	Float Data(1)
Electronic Keying	Compatible Module

(1) All analog Comm Formats use direct connection. The default is floating decimal point data.

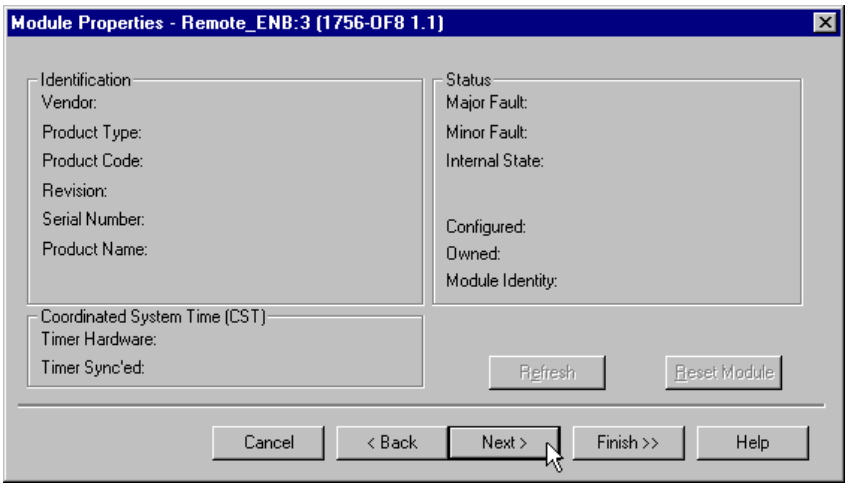
You must now configure the channel settings of the Analog I/O module. You do this using a series of pages that appear in the Module Properties window.

4. Click on the **Next** button. The following page will open:

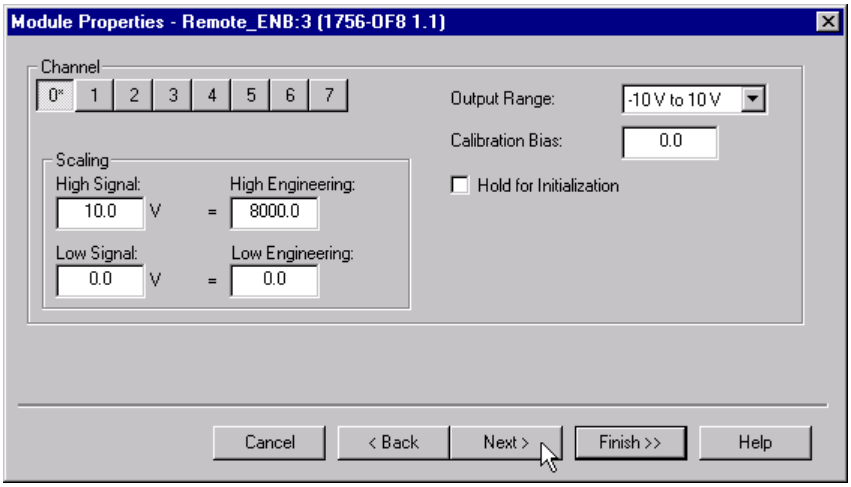


5. This window allows you to adjust the **Requested Packet Interval (RPI)** to meet your system's requirements (for this example you can leave it at the default 12 ms rate).

6. Click on **Next** to open the next page. This page is used during online monitoring but not during initial configuration.



7. Click on **Next** to move to the first channel configuration page. The choices available on the channel configuration pages vary according to the module being configured. The figure below shows the configuration we selected for the 1756-OF8 module.

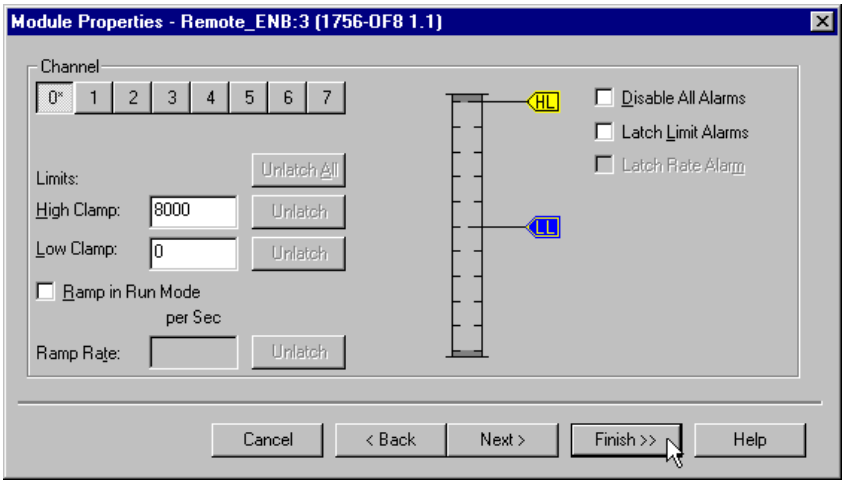


8. To set the configuration click on **Channel 0** and enter the following **Scaling** parameters:

High Signal	High Engineering
10.0 V	8000[1]
Low Signal	**Low Engineering**
0.0 V	0

[1] This scaling is selected to use the 13-bit voltage resolution of the 1756-OF8. See specifications in publication 1756-6.5.9 for more information.

9. Click on **Next** twice to access the **Limits** page.

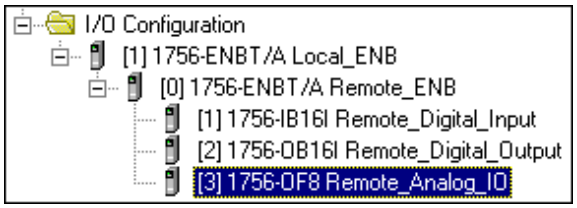


10. Enter the following **Limits**:

High Clamp	8000
Low Clamp	0

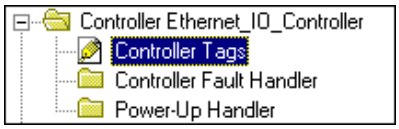
11. Click on **Finish** to save the configuration.

The I/O Configuration tree should now look similar to the one shown below.



Edit the Controller Tags

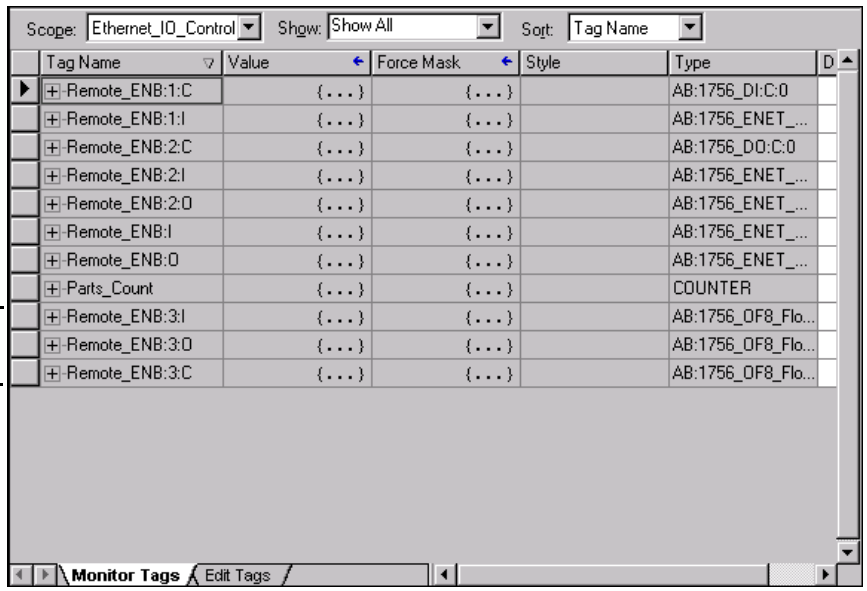
When you add modules to the I/O configuration the system creates tags for those modules. We now need to add another Controller Tag to modify the application program.



1. Double-click on the **Controller Tags** folder in the project window.

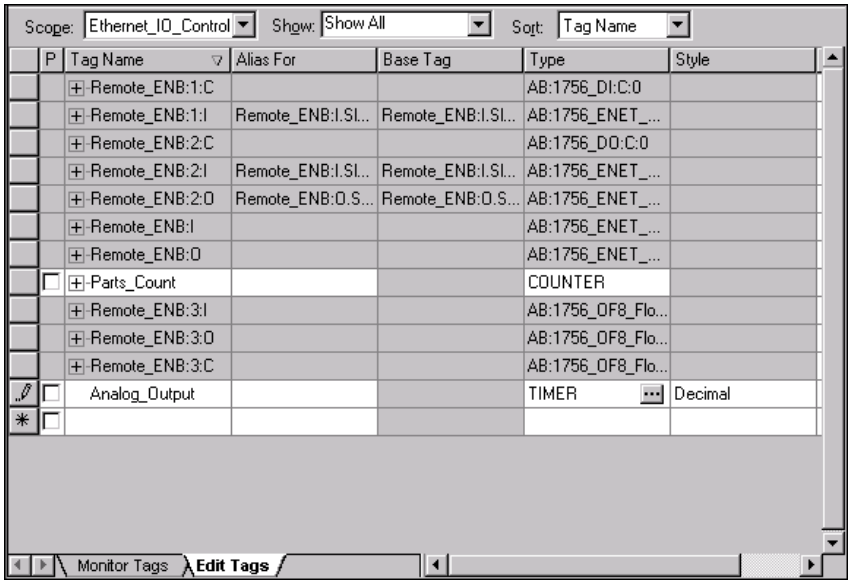
2. Note that new tags have been added for the remote analog output module.

Tags for new remote analog output module created by the system.



3. Select the **Edit Tags** tab at the bottom of the Controller Tags window.

The tag editor will become active.



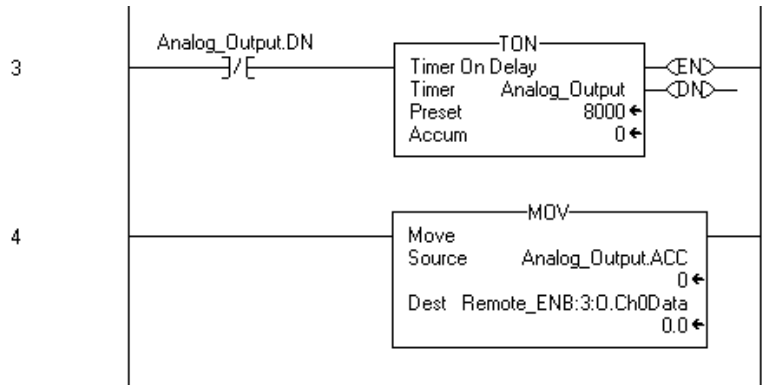
4. Create the following tag:

Tag Name	Type
Analog_Output	Timer

Modify the Ladder Program

To modify the ladder program to test the new configuration perform the following steps:

1. Double-click on **Main Routine** under the **Main Program** folder, and add rungs 3 and 4 to the ladder program of the previous chapter.

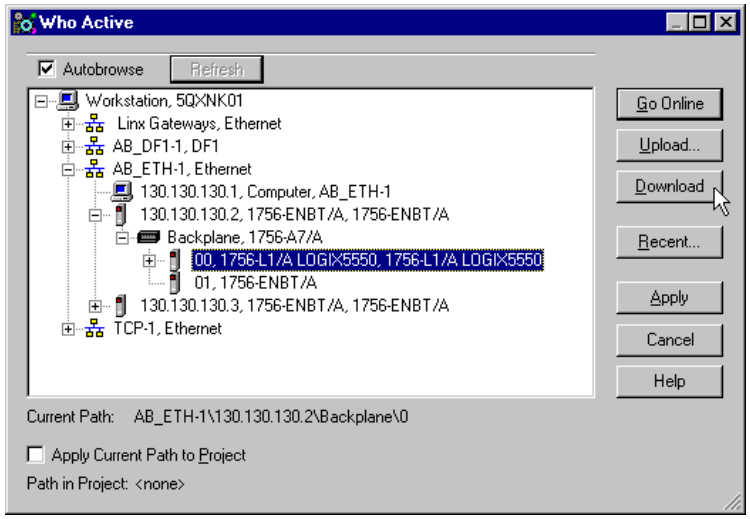


2. **Save** the program.

Download the Program

1. Click on the **Communications** menu and select **Who Active**.

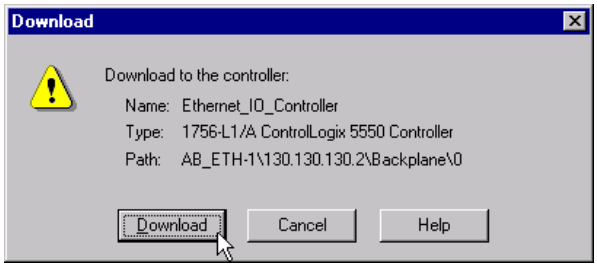
2. The **Who Active** window will open (Your window will display the drivers and devices you have configured on your system).



3. Select your Ethernet driver (e.g., AB_ETH-1) and expand the tree through the backplane of the local ControlLogix chassis.

4. Highlight the controller and click on the **Download** button to download the program to the Logix5550 controller.

   You will see a message similar to the following:



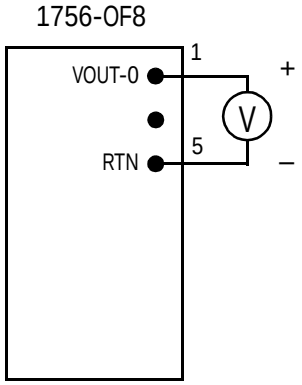
5. Click on the **Download** button.

6. **Minimize** RSLogix5000.

Test the Example Application

Use the following procedure to test the operation of the remote analog output:

1. Connect a voltmeter across the channel 0 output of the 1756-OF8 analog output module as shown in the following figure:



2. Restore **RSLogix5000** and place the controller in **Run** mode.

3. Measure the output voltage of channel 0. You should see it slowly rise to approximately 10V, reset to zero, start rising again, etc.

TIP

Refer to the *ControlLogix Analog I/O Module User Manual*, publication 1756-6.5.9, for assistance in wiring and debugging the I/O modules.

This completes the Direct Connect I/O example.

What's Next?

The following chapter describes an example application in which one controller sends a message to another controller using produced and consumed tags.

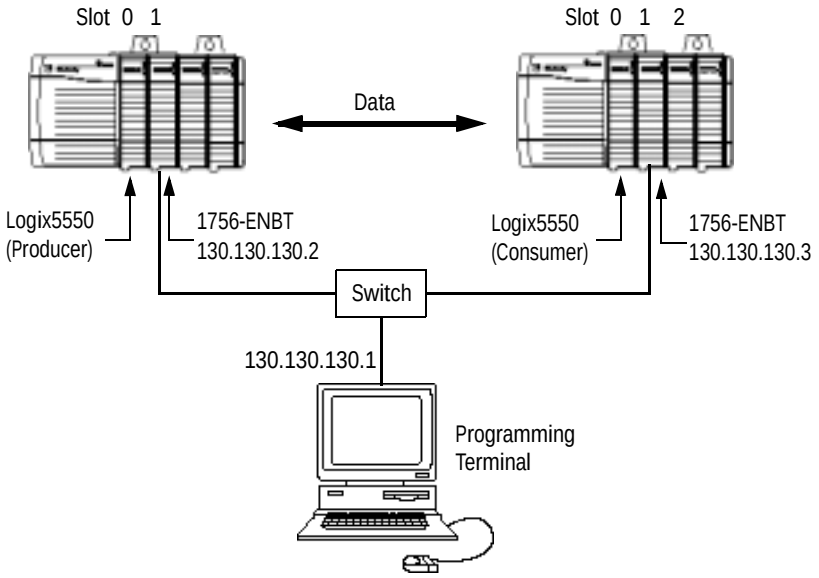
Using Produced and Consumed Tags

About the Example Application

In this example one Logix5550 controller (the producer) sends data to another Logix5550 controller (the consumer) over the EtherNet/IP network. A Timer provides the test data for the message.

Set Up the Hardware

In both chassis the controller is in slot 0 and the 1756-ENBT module is in slot 1.



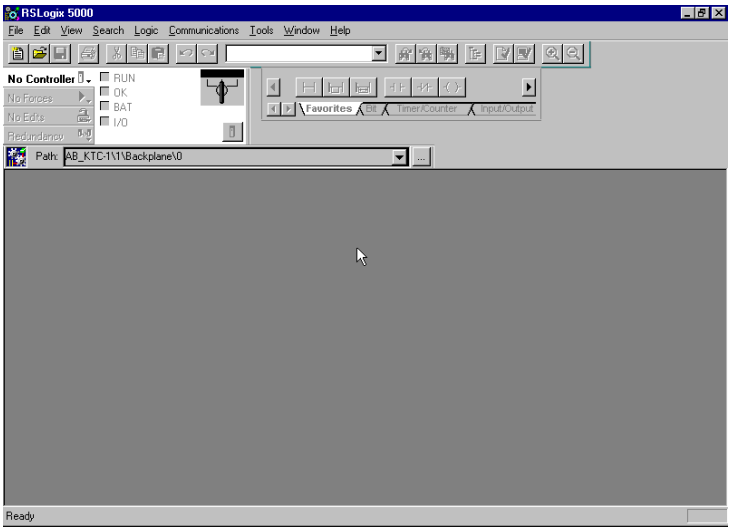
To work along with this example set up your system as shown above.

- Note that in the example application, the Logix5550 controllers and the 1756-ENBT modules are in slots 0 and 1 in each ControlLogix chassis, as shown.
- Verify the IP addresses for the 1756-ENBT modules.
- Verify that all wiring and cabling is properly connected.
- Make sure you have your communication driver (e.g., AB-ETH-1) configured in RSLinx as described in Appendix C.

Create the Producer Application

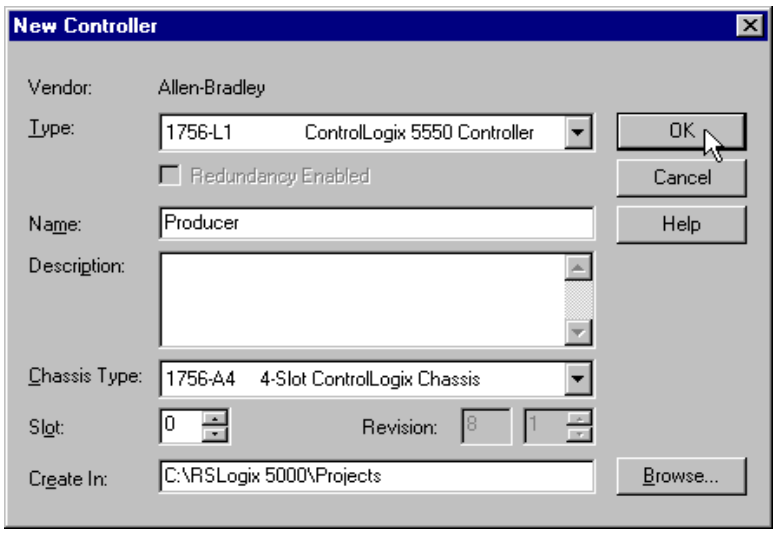
Perform the following steps to create the producer application.

1. Start **RSLogix5000**. The RSLogix 5000 Main Window will open.



2. From the **File** menu, select **New**.

   The **New Controller** window will open.



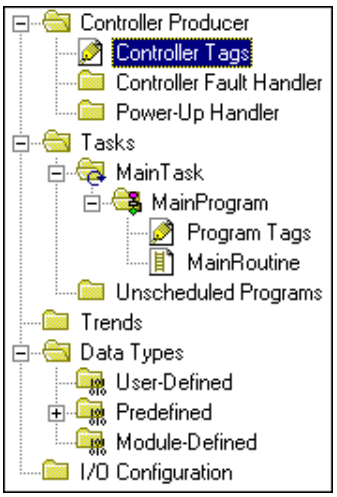
3. Enter an appropriate name for the Controller, e.g., “Producer.”

4. Select the correct **Chassis Type** and **Slot Number** for the Logix5550 controller, and the folder where you want to save the file (**Create In**).

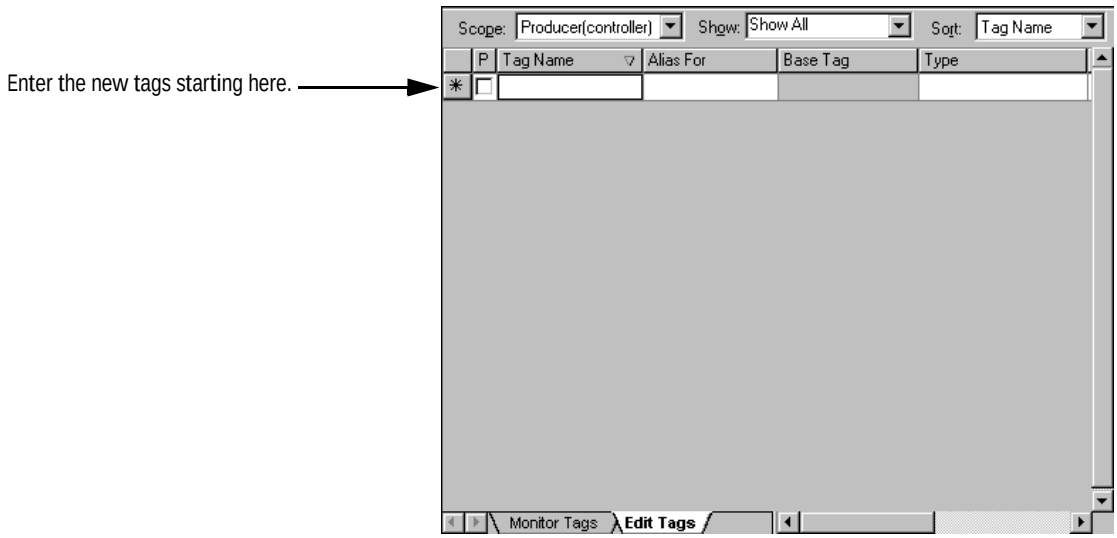
5. Click on **OK** to save the project file.

Create the Producer Tags

1. Double-click on the **Controller Tags** folder in the project window.



The **Controller Tags** window will open.

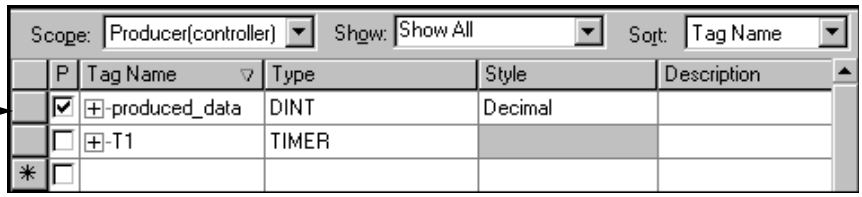


2. Select the **Edit Tags** tab and create the following tags:

Tag Name	Type	Style
produced_data	DINT	Decimal
T1	TIMER	

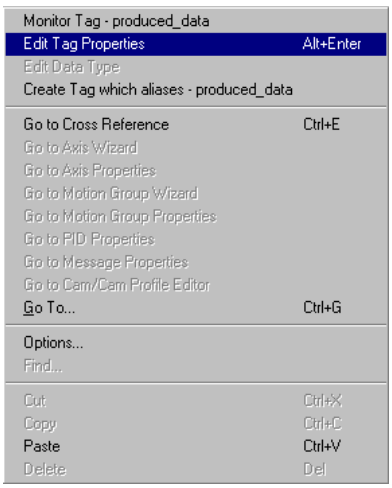
3. Designate the tag as a produced tag. Either:

Check the "P" box in the tag database to make this a produced tag.

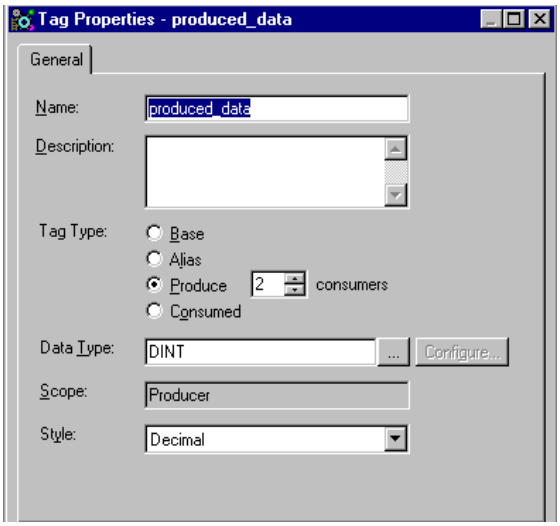


a. Check the "P" box in the tag database, or

b. Right-click on the tag. You will see the following pop-up menu.



c. Select **Edit Tag Properties**. The **Tag Properties** window will open:

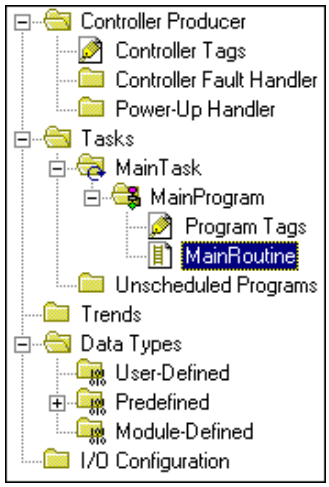


d. Select **Tag Type: Produce** and the number of **consumers** (1 to 256). The default is 2.

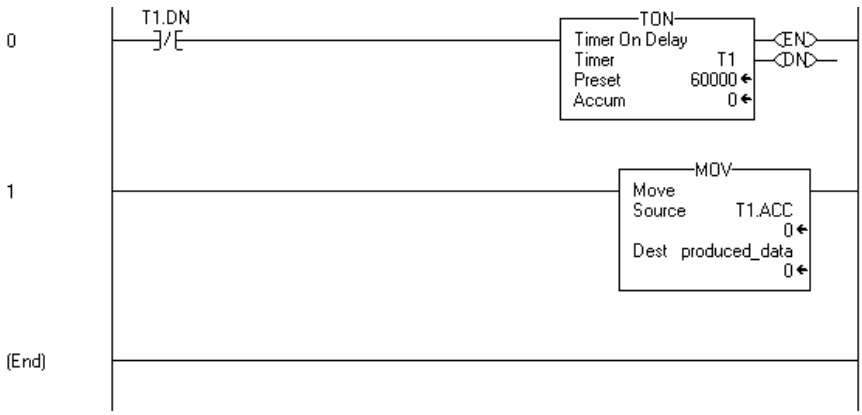
e. Click on **OK**.

Create the Producer Ladder Program

Perform the following steps to create a program to produce the test data.



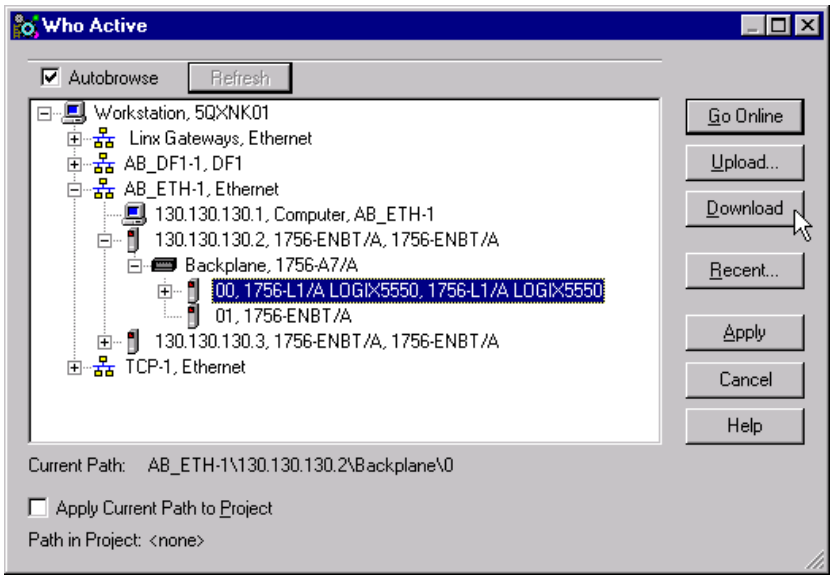
1. Double-click on **Main Routine** under the **Main Program** folder, and create the following ladder program, using the tags you previously created.



Download the Producer Application

1. Click on the **Communications** menu and select **Who Active**.

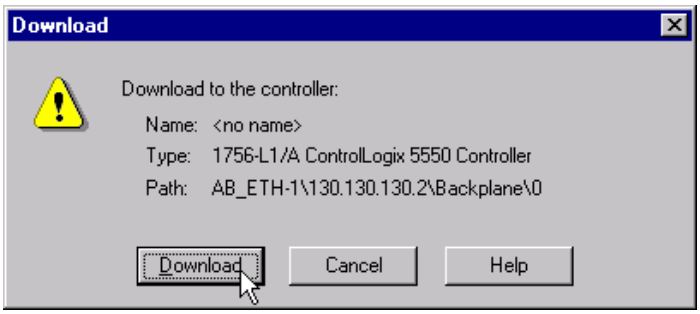
   The **Who Active** window will open (Your window will display the drivers and devices you have installed).



2. Select your Ethernet driver (e.g., AB_ETH-1) and expand the tree through the backplane of the local ControlLogix chassis.

3. Highlight the Logix 5550 controller and click on the **Download** button.

4. You will see a message similar to the following:



5. Click on the **Download** button.

6. Put the controller in **Run** mode.

7. **Minimize** this session of RSLogix 5000.

Create the Consumer Application

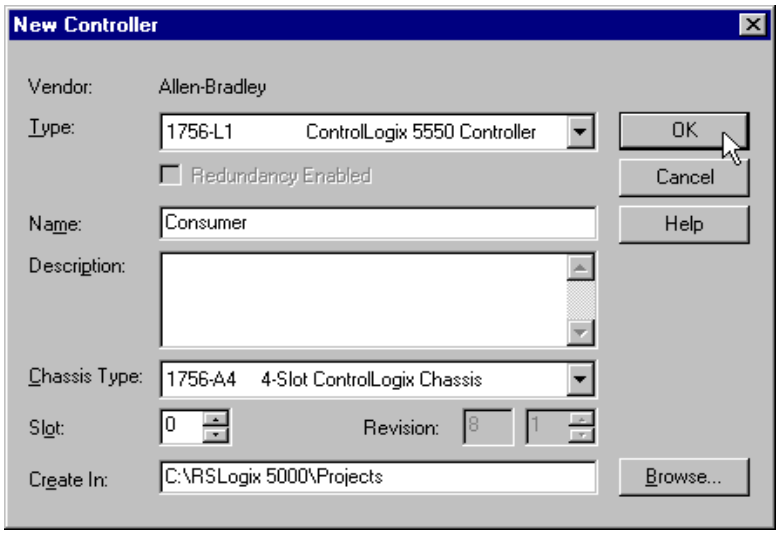
In order to test the messaging application you have to create a consumer application, add the producer to the I/O configuration of the consumer, and create a consumed tag to receive the data.

Create the Consumer Controller

Perform the following steps to create the consumer controller:

1. Open a second session of **RSLogix5000** (leave the current session running).
2. From the **File** menu, select **New**.

   The **New Controller** window will open.



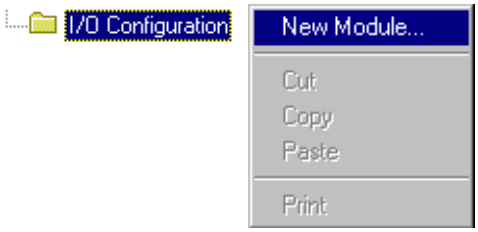
3. Enter an appropriate **Name** for the Controller, e.g., “Consumer.”
4. Select the correct **Chassis Type** and **Slot Number** of the controller, and the folder where you want to save the project file (**Create In**).
5. Click on **OK** to save the project file.

Add the Producer to the Consumer's I/O Configuration

Adding the producer to the I/O configuration of the consumer involves several steps. First, you must add the consumer's local 1756-ENBT module to the I/O configuration. Then you add the remote 1756-ENBT as a "child" of the local 1756-ENBT module. Finally, you add the producer as a child of the remote 1756-ENBT module.

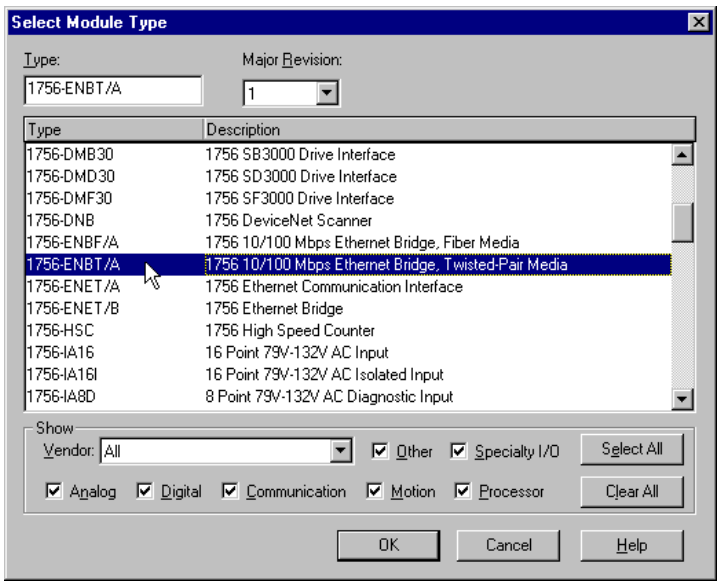
Add the Local Ethernet Bridge to the I/O Configuration

1. Select the **I/O Configuration** folder in the project window and click the right mouse button. The following pop up window will open.



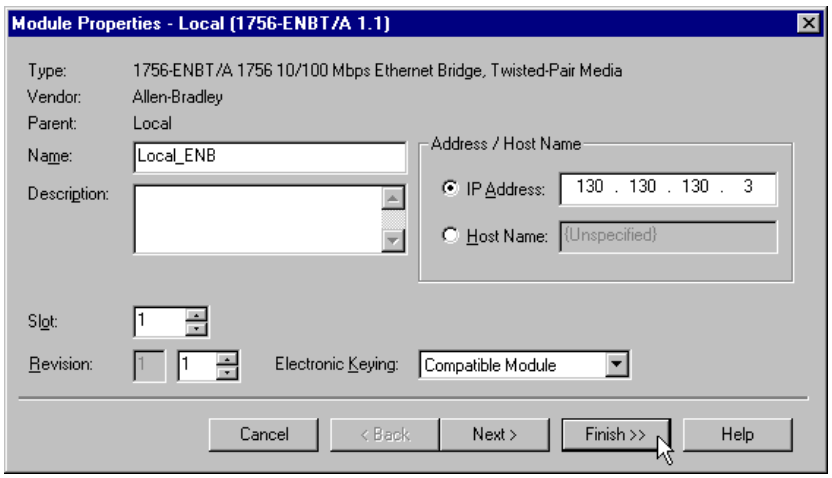
2. Select **New Module**.

   The **Select Module Type** window will open.



3. Select the **1756-ENBT/A** Ethernet Bridge and click on **OK**.

The **Module Properties** window will open.



4. Enter the following parameters:

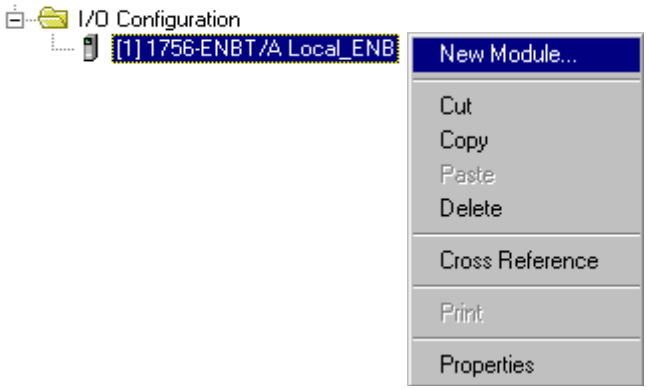
Name	Local_ENB
Slot	1
Electronic Keying	Compatible Module

5. Click on **Finish** to accept the configuration.

The 1756-ENBT module will be added to the I/O configuration.

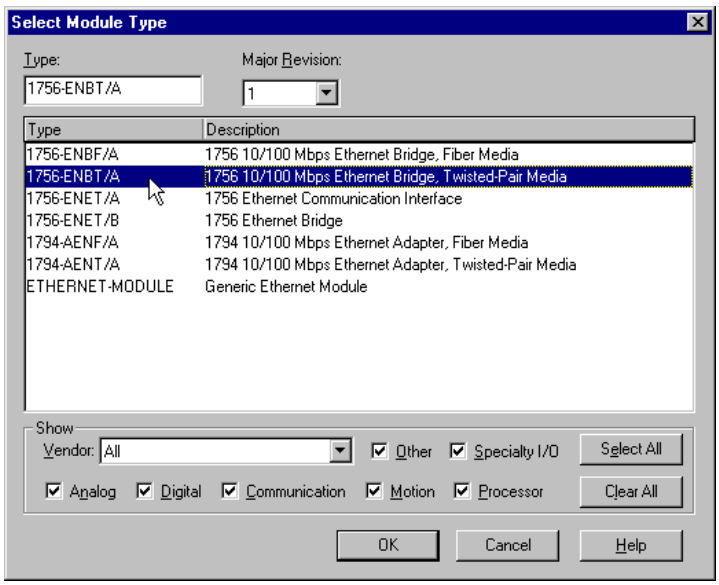
Add the Remote Ethernet Bridge to the I/O Configuration

Next, you must add the remote 1756-ENBT as a “child” of the local 1756-ENBT.



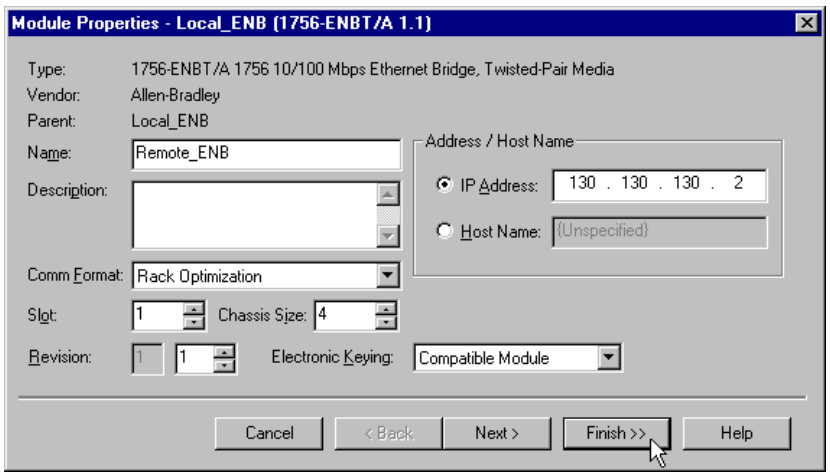
1. In the Project window, right click on the local 1756-ENBT module under the I/O Configuration folder and select **New Module** from the pop-up window.

   The **Select Module Type** window will open



2. Select the **1756-ENBT/A** Ethernet Bridge and click on **OK**.

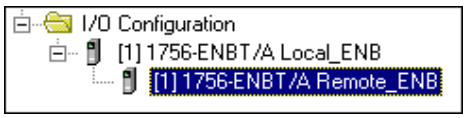
The **Module Properties** window will open.



3. Enter the following parameters:

Name	Remote_ENB
IP Address	130.130.130.2
Chassis Size	4
Slot	1
Comm Format	Rack Optimization
Electronic Keying	Compatible Module

4. Click on **Finish** to accept the configuration. The remote 1756-ENBT module will appear indented under the local 1756-ENBT in the I/O Configuration folder.

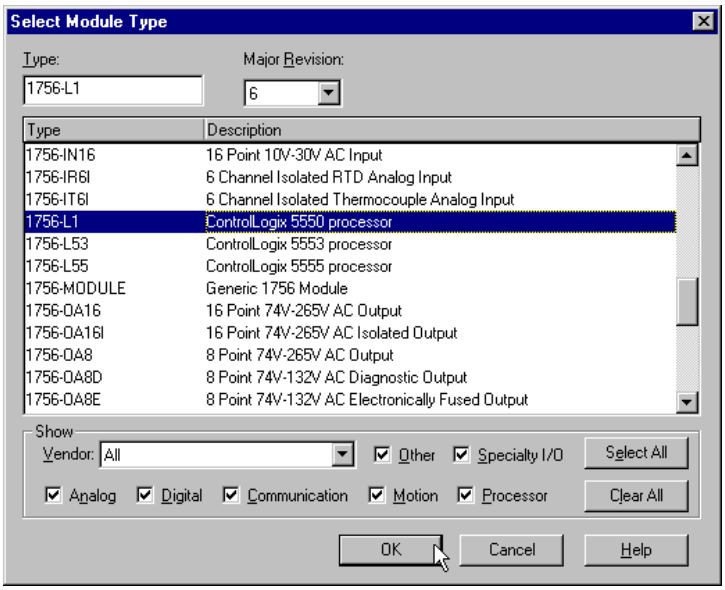


Add the Remote (Producer) Controller to the I/O Configuration

You must now add the remote Controller (the Producer) to the I/O Configuration under the remote 1756-ENBT module.

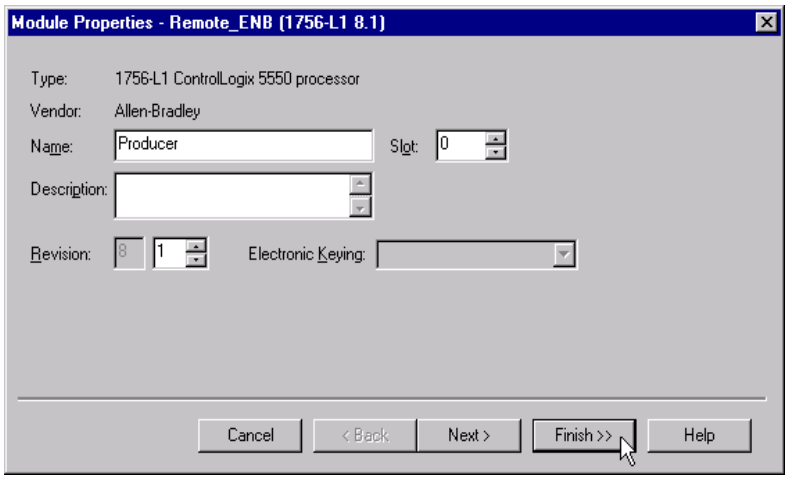
1. Right click on the remote **1756-ENBT** module under the I/O Configuration folder and select **New Module**.

   The **Select Module Type** window will open.



2. Select the **1756-L1 ControlLogix5550 processor** and click on **OK**.

The **Module Properties** window will open.

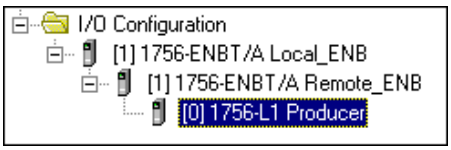


3. Enter the following parameters:

Name	Producer
Slot	0

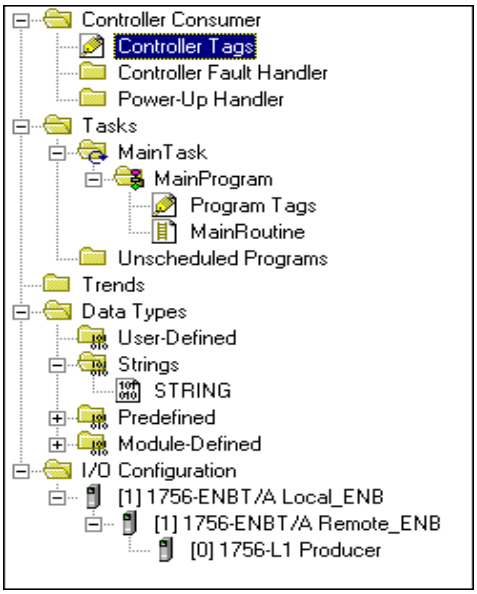
4. Click on the **Finish** button to accept the configuration.

The I/O Configuration tree should look similar to the one shown below.



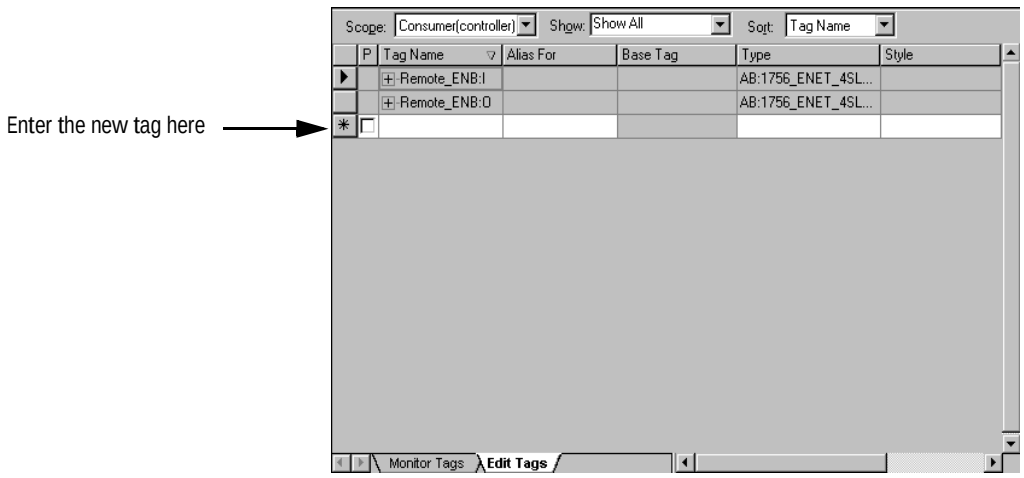
Create the Consumer Tags

Create a tag for the consumed data by performing the following steps.



1. Double-click on the **Controller Tags** icon in the Project window.

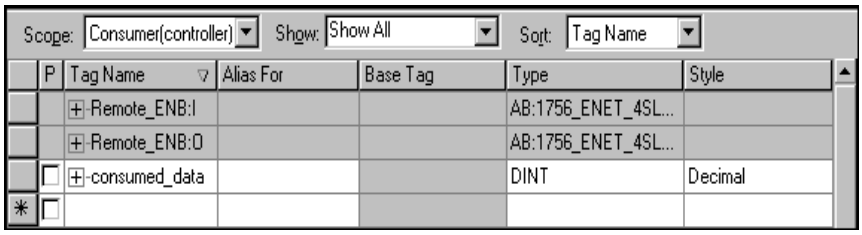
   The **Controller Tags** window will open. You will see the tags created by the system when you added the I/O (e.g., Remote ENB:I, Remote_ENB:O).



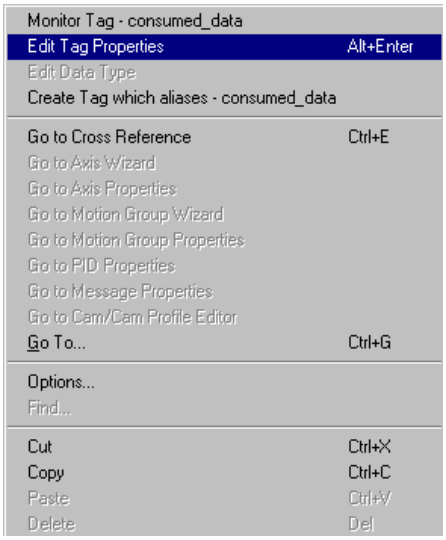
2. Select the **Edit Tags** tab and create the following tag:

Tag Name	Type	Style
consumed_data	DINT	Decimal

Your tag database should appear similar to that shown below.

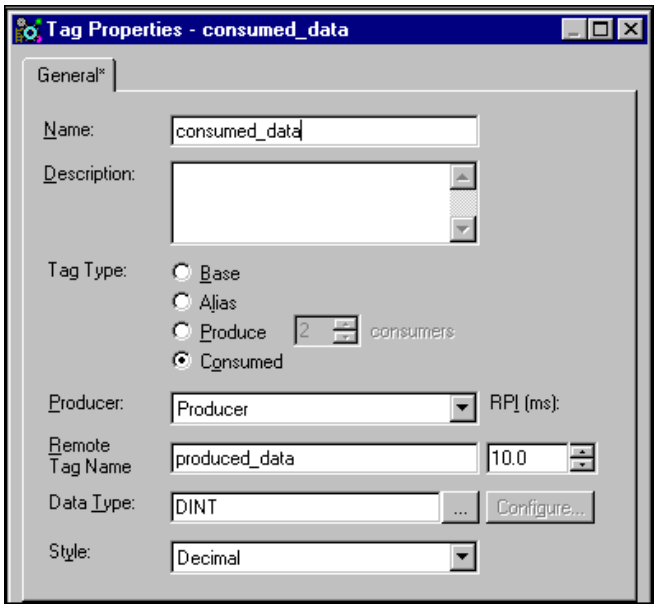


3. Right-click on the new tag. The following pop-up menu will open:



4. Select **Edit Tag Properties**.

The **Tag Properties** window will open.



5. Enter or select the following parameters:

Name	consumed_data
Tag Type	Consumed
Producer	Producer
Remote Tag Name	produced_data(1)
Data Type	DINT(1)
Style	Decimal(1)
RPI	10ms(1)

(1) These parameters must match those of the Producer.

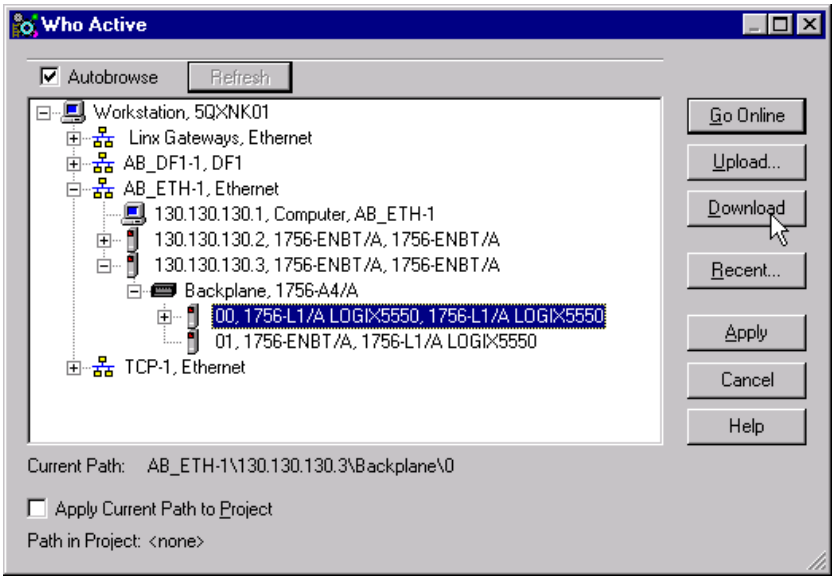
6. Click on **OK** to save the tag properties.

Download the Configuration to the Consumer

You must now load the configuration parameters to the Consumer controller. Note that no ladder logic is required for routing in the Consumer. The logic can consist of a single “End” rung.

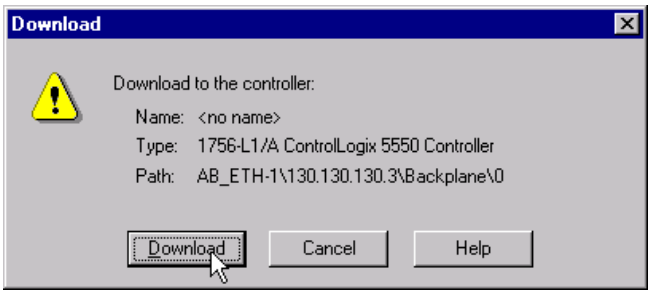
1. Click on the **Communications** menu and select **Who Active**.

   The **Who Active** window will open (Your window will display the drivers and devices you have installed).



2. Select your Ethernet driver (e.g., AB_ETH-1) and expand the tree through the backplane of the consumer’s ControlLogix chassis.

3. Highlight the Logix 5550 controller and click on the **Download** button. You will see a message similar to the following:

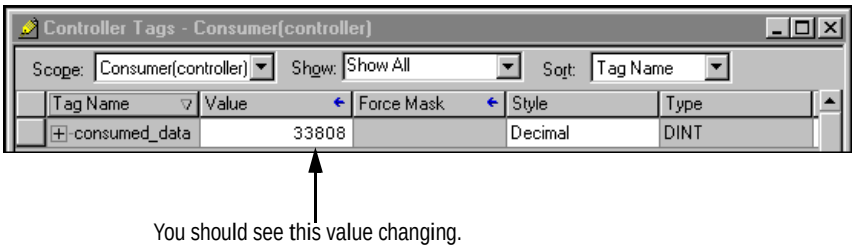


4. Click on the **Download** button.

Test the Messaging

1. Open the session of RSLogix 5000 for the Producer and verify that the timer is running.

2. In the RSLogix 5000 session for the Consumer controller:
   a. Double-click on the **Controller Tags** folder and select the **Monitor Tags** tab.



   b. Examine the **consumed_data** field. You should see the value changing in step with the accumulated value of the timer in the Producer.

This completes the example of Logix5550 controller to Logix5550 messaging using produced/consumed tags.

What's Next?

This concludes the example applications. The appendices that follow provide information to help you troubleshoot the module, describe how to configure the Ethernet driver in RSLinx, and show the use of the 1756-ENBT module in larger control systems.

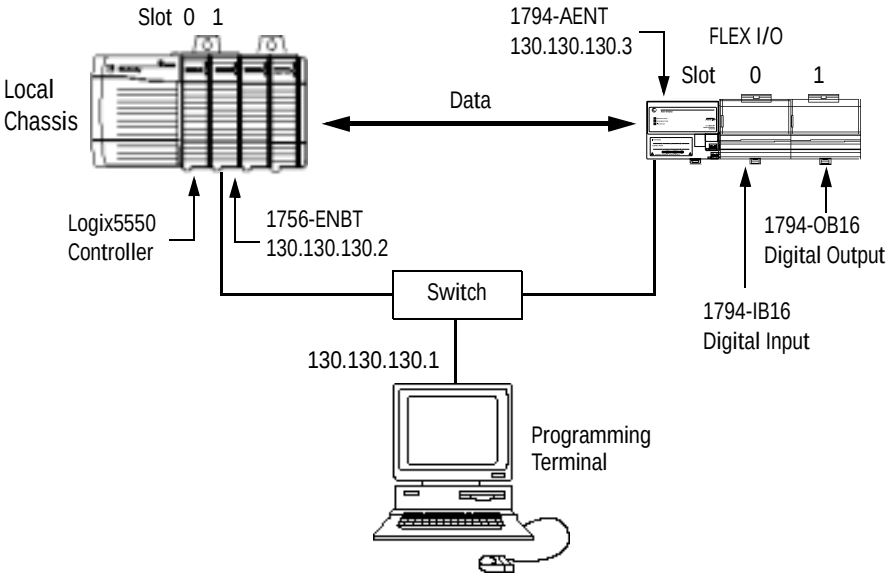
Interfacing with FLEX I/O

About the Example Application

In this example the ControlLogix processor communicates with FLEX I/O via a 1756-ENBT module and a 1794-AENT FLEX I/O adapter using a rack optimized connection. The processor reads data from a digital input module and sends data to a digital output module.

Set Up the Hardware

In this example, the ControlLogix chassis contains the Logix 5550 processor in slot 0 and a 1756-ENBT bridge module in slot 1. The 1794-AENT adapter is mounted on a DIN rail with a 1794-IB16 digital input module and 1794-OB16 digital output module. You will also need a power supply (not shown) for the FLEX I/O.



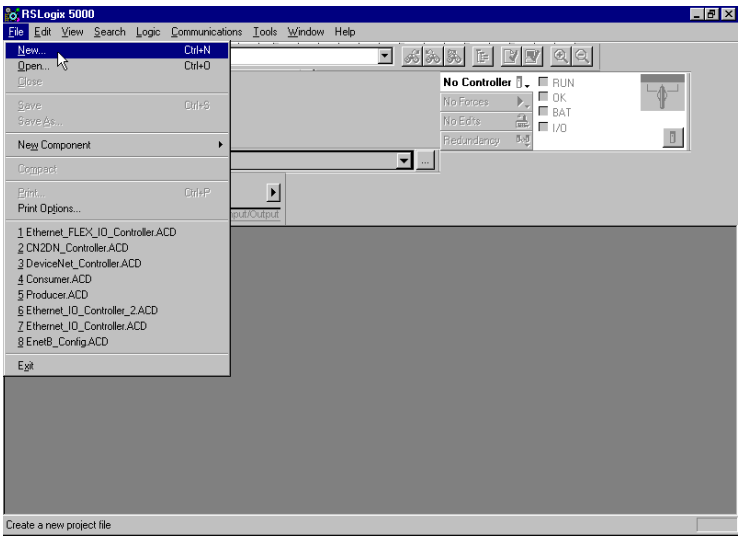
To work along with this example set up your system as shown above.

- Note that in the example application, the Logix5550 controller and 1756-ENBT module are assumed to be in the slots shown above.
- Verify the IP addresses for your programming terminal, 1756-ENBT module, and 1794-AENT adapter.
- Verify the position (slot) of the I/O modules on the DIN rail.
- Verify that all wiring and cabling is properly connected.
- Make sure your communication driver (e.g., AB_ETH-1) is configured in RSLinx as described in Appendix C.

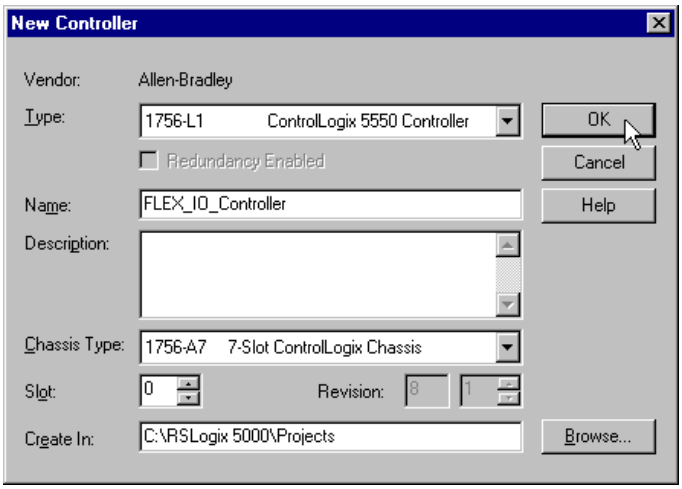
Create the Example Application

Perform the following steps to create the example application:

1. Start **RSLogix5000**. The RSLogix 5000 Main Window will open.



2. From the **File** menu, select **New**. The **New Controller** pop-up window will open.



3. Enter an appropriate **Name** for the Controller, e.g., "FLEX_IO_Controller."

4. Select the correct **Chassis Type** and **Slot** number of the Logix5550 controller, and the folder where you want to save the RSLogix 5000 file (**Create In**). The **Description** is optional.

5. Click on **OK**.

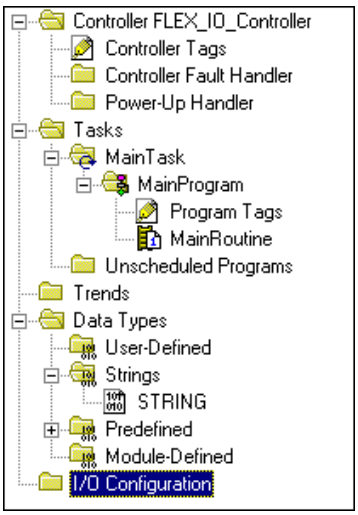
Configure the I/O

You now add the FLEX I/O modules to the controller's I/O configuration. To do this you first add the local 1756-ENBT module to the I/O configuration. Next you add the 1794-AENT adapter as a "child" of the 1756-ENBT module. Then you add the I/O modules as "children" of the 1794-AENT adapter.

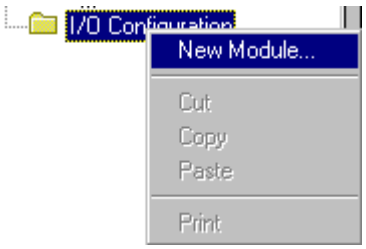
IMPORTANT Click on the **Help** buttons on the configuration screens shown in this section if you need assistance in selecting and setting the parameters.

Add the Local EtherNet/IP Bridge to the I/O Configuration

1. Select the **IO Configuration** folder in the project window and click the right mouse button.

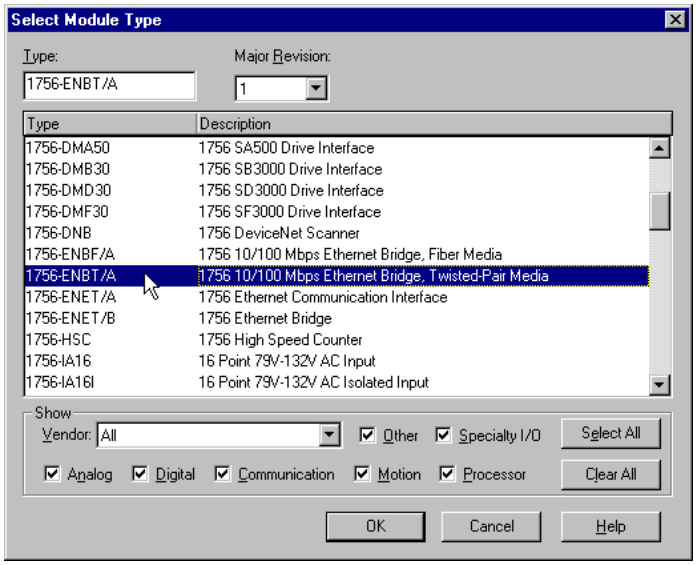


The following pop-up window will open.

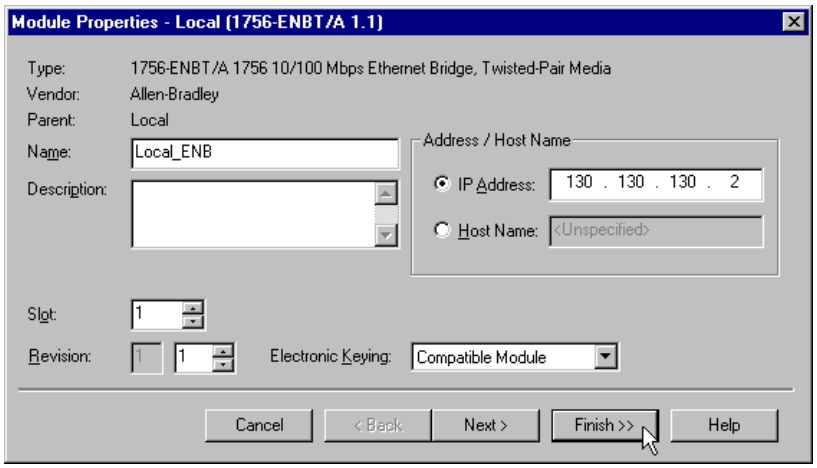


2. Click on **New Module**.

The **Select Module Type** window will open.



3. Select the **1756-ENBT** EtherNet/IP Bridge and click on **OK**. The **Module Properties** window will open.



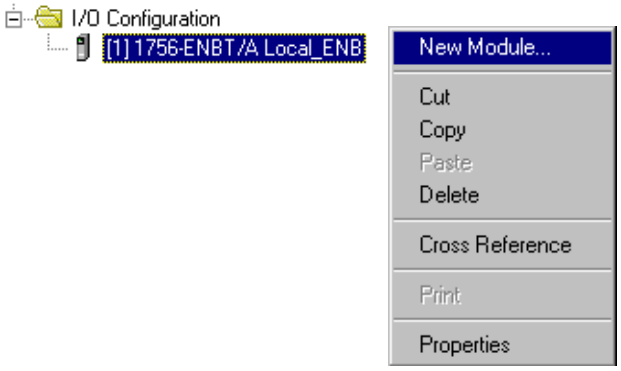
4. Enter or select the following parameters: **Name**, **IP Address**, **Slot**, and **Electronic Keying**. We used the following values:

Name	Local_ENB
IP Address	130.130.130.2
Slot	1
Electronic Keying	Compatible Module

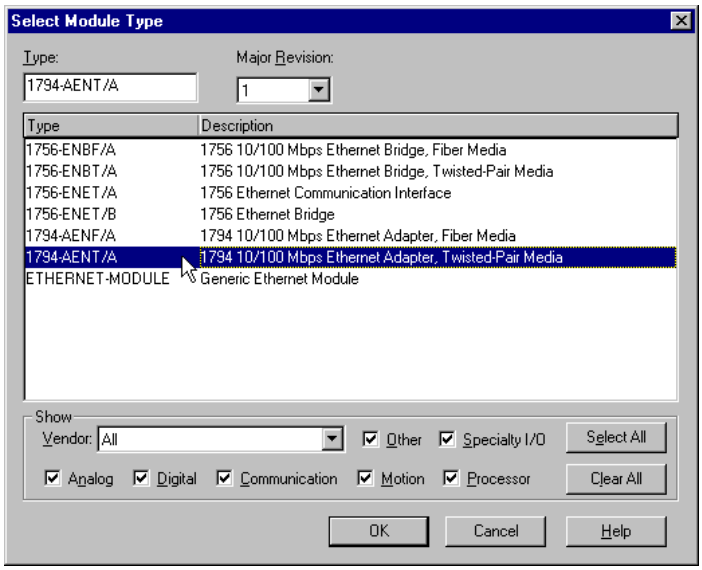
5. Click on **Finish** to accept the configuration.

Add the FLEX I/O Adapter to the I/O Configuration

Next, you must add the 1794-AENT adapter as a “child” of the local 1756-ENBT module.

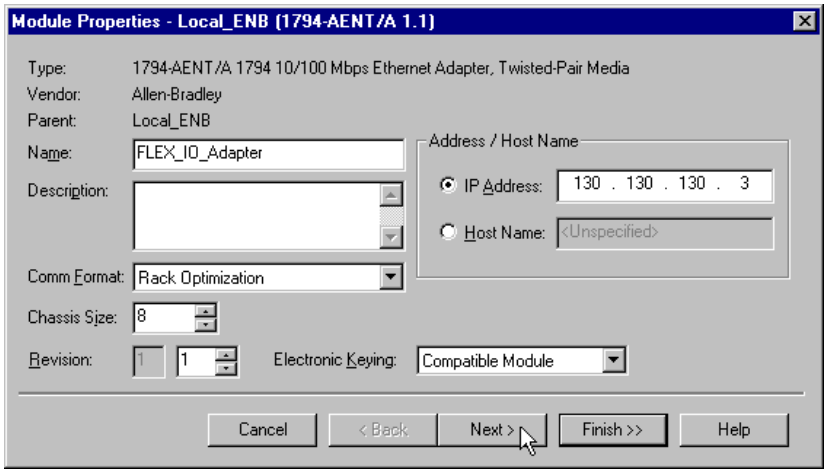


1. In the Project window, right click on the local 1756-ENBT module under the I/O Configuration folder and select **New Module** from the pop-up window. The **Select Module Type** window will open.



2. Select the **1794-AENT/A** Ethernet adapter from the list and click on **OK**.

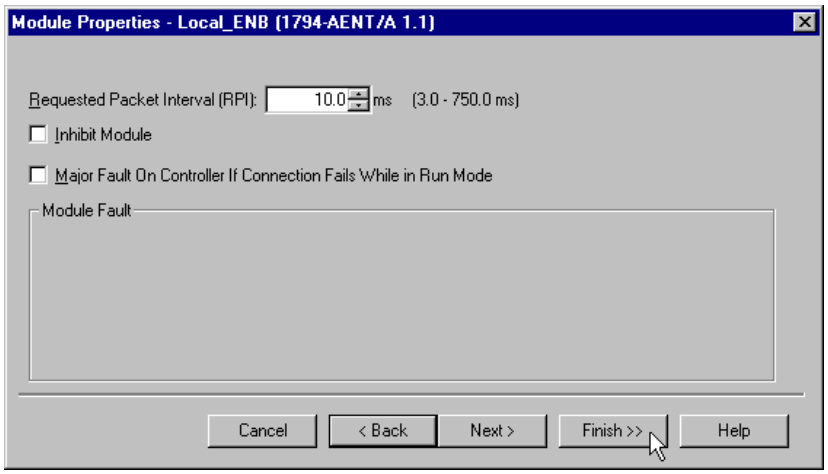
The **Module Properties** window will open.



3. Enter or select the following parameters (the values we used are listed in the table):

Name	FLEX_IO_Adapter
IP Address	130.130.130.3
Comm Format	Rack Optimization
Chassis Size	8 (default)
Electronic Keying	Compatible Module

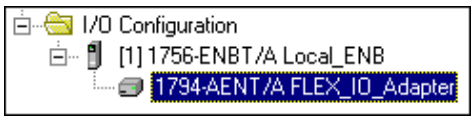
4. Click on **Next**. The following page will open:



5. Verify that the **Requested Packet Interval** (RPI) is appropriate for your system (10ms for this example). This will be used for the rack optimized connection to the I/O modules.

6. Click on the **Finish** button to accept the configuration.

The 1794-AENT adapter will appear indented under the local 1794-ENBT in the I/O Configuration folder.



Add the FLEX I/O Modules to the I/O Configuration

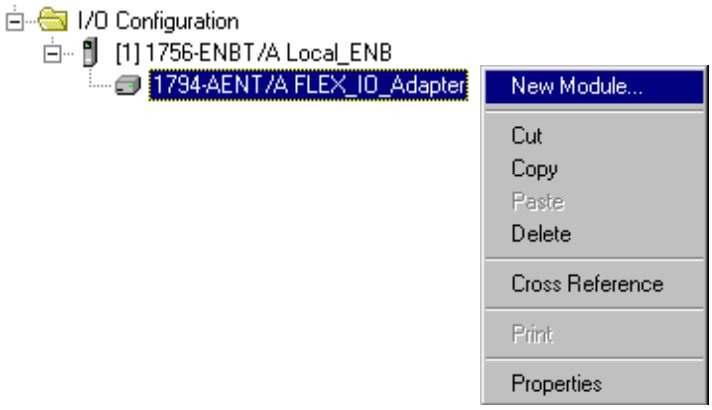
You must now add the FLEX I/O modules to the I/O Configuration List under the 1794-AENT adapter.

In this example, you will add a a 17946-IB16 digital input module and a 1756-OB16 digital output module with standard configurations. Use these steps as a guide when you are configuring different I/O modules for your system.

TIP

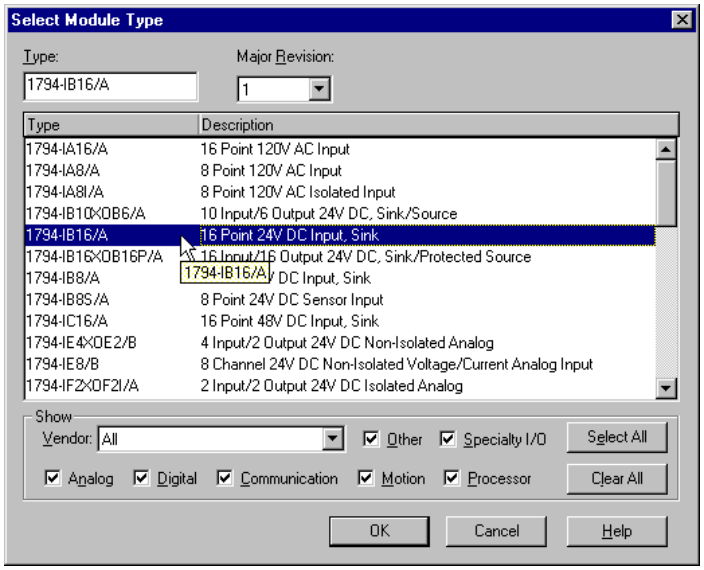
This example application uses the I/O modules' default configurations. For more information see publications 1794-IN071 and 1794-IN072.

Add the Digital Input Module

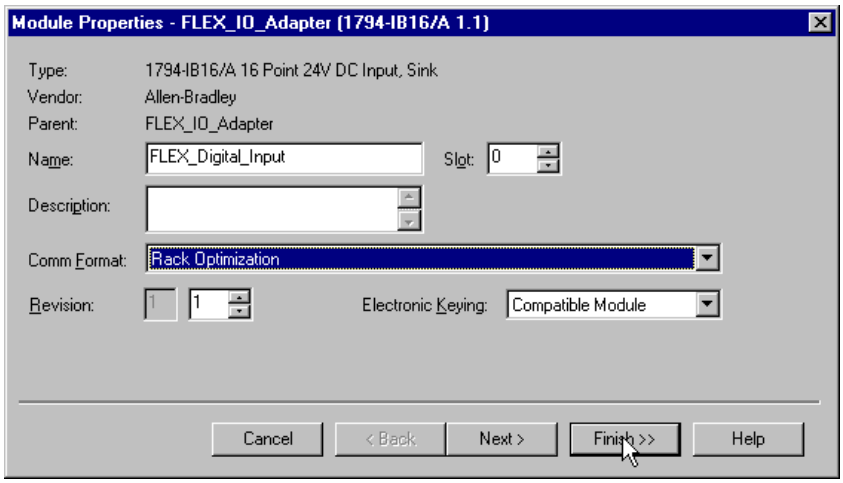


1. Right click on the remote **1794-AENT** adapter under the I/O Configuration folder and select **New Module**.

The **Select Module Type** window will open.



2. Select the **1794-IB16/A** digital input module from the list and click on **OK**. The **Module Properties** window will open.

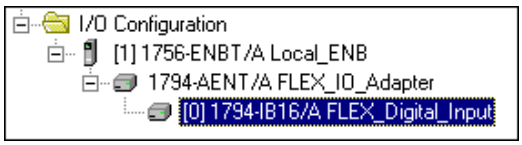


3. Enter or select the following parameters (the values we used are listed in the table):

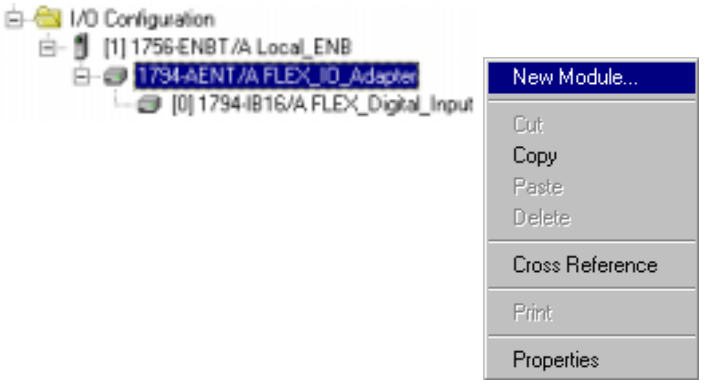
Name	FLEX_Digital_Input
Slot	0
Comm Format	Rack Optimization
Electronic Keying	Compatible Module

4. Click on the **Finish** button to save the configuration.

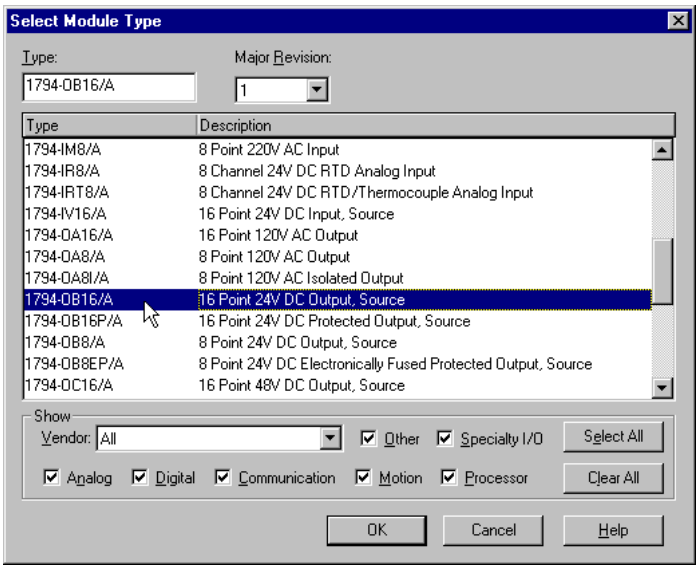
The digital input module will appear in the I/O configuration indented under the 1794-AENT adapter.



Add the Digital Output Module

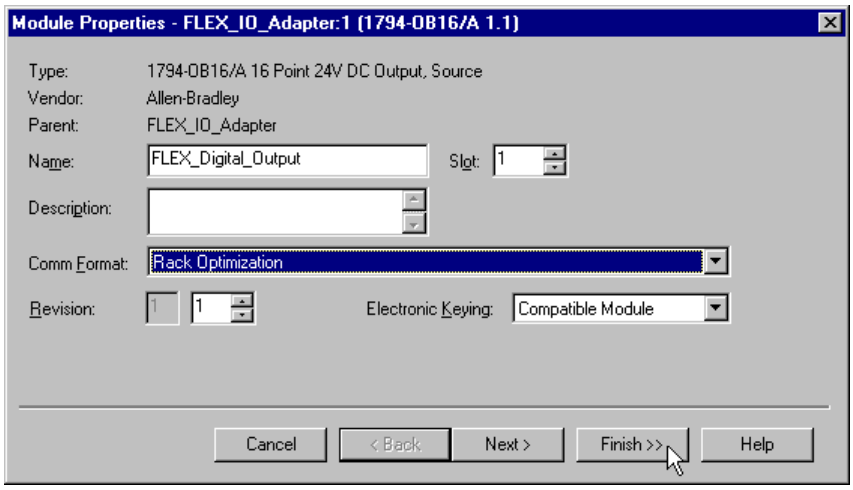


5. Right click on the **1794-AENT** adapter and again select **New Module**. The **Select Module Type** window will open.



6. Select the **1756-OB16/A** digital output module from the list.

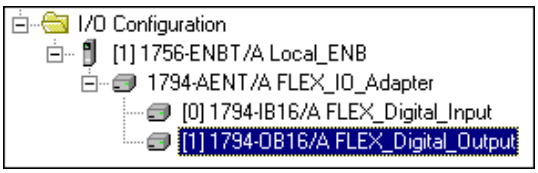
The **Module Properties** window will open.



7. Enter or select the following parameters (the values we used are listed in the table):

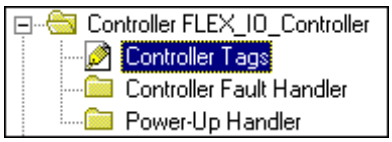
Name	FLEX_Digital_Output
Slot	1
Comm Format	Rack Optimization
Electronic Keying	Compatible Module

8. Click on the **Finish** button to accept the configuration. The I/O Configuration in the Project window should look similar to the one shown below.

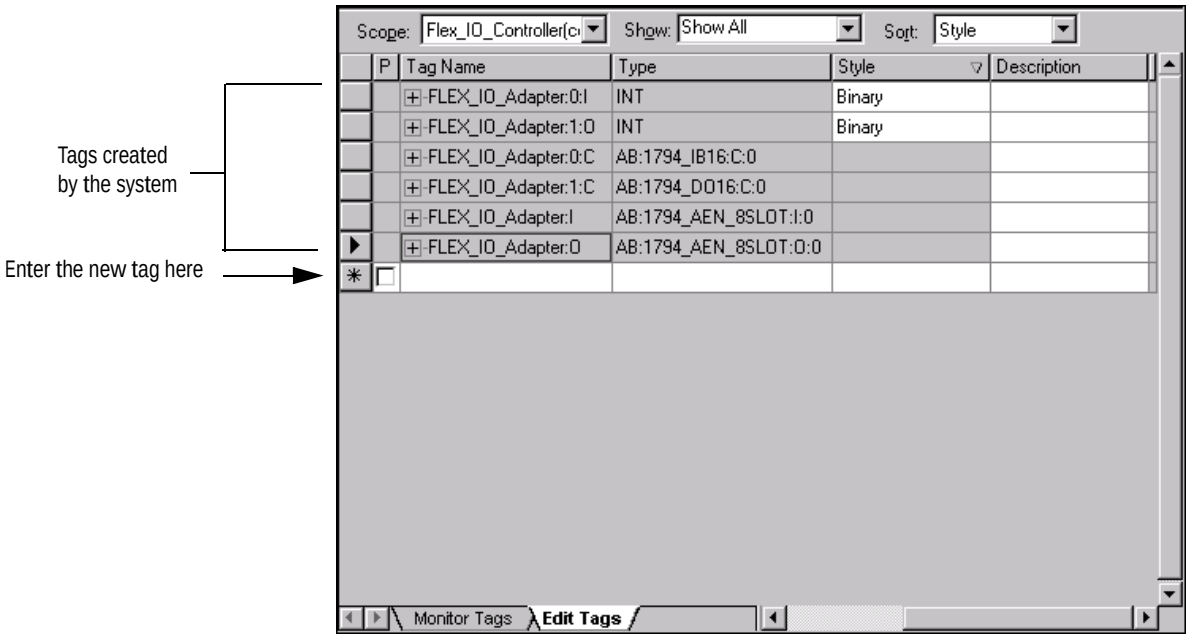


Edit the Controller Tags

When you add modules to the I/O configuration the system creates tags for those modules to use in the application program. For the example application you need to add one more Controller Tag.

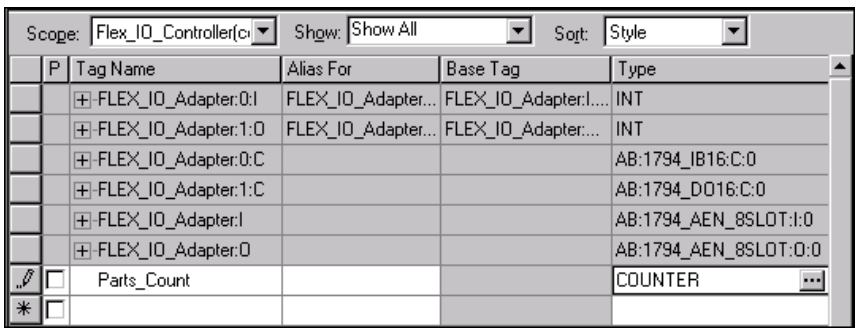


1. Double-click on the **Controller Tags** folder in the project window. The **Controller Tags** window will open. You will see the tags created for the 1794-AENT and digital I/O modules.



2. Make sure the **Edit Tags** tab at the bottom of the Controller Tags window is selected and create the following tag:

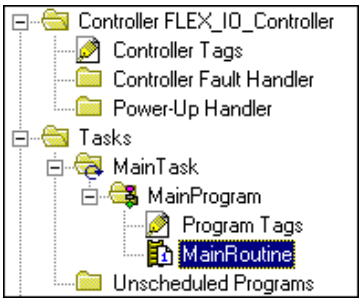
Tag	Type
Parts_Count	Counter



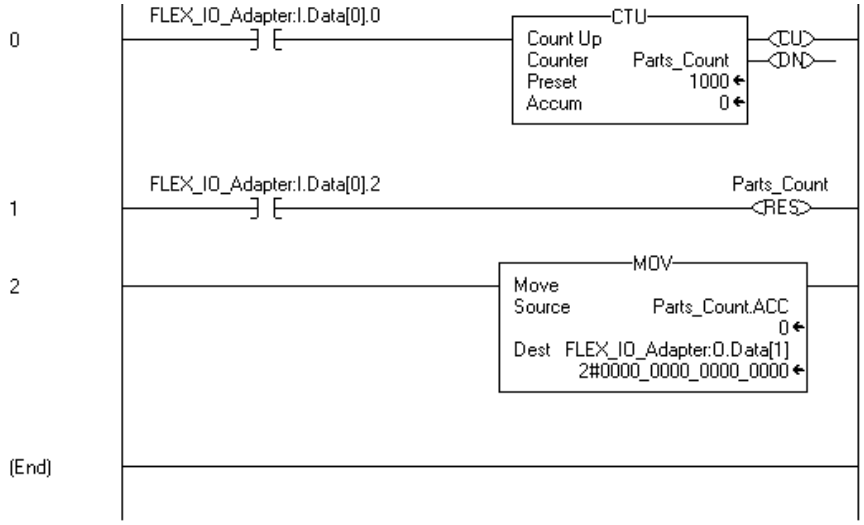
3. Close the **Controller Tags** window.

Create the Ladder Program

Next create the example ladder program to test the IO.



1. Double-click on **Main Routine** under the **Main Program** folder, and enter the following ladder program, using the tags previously created.



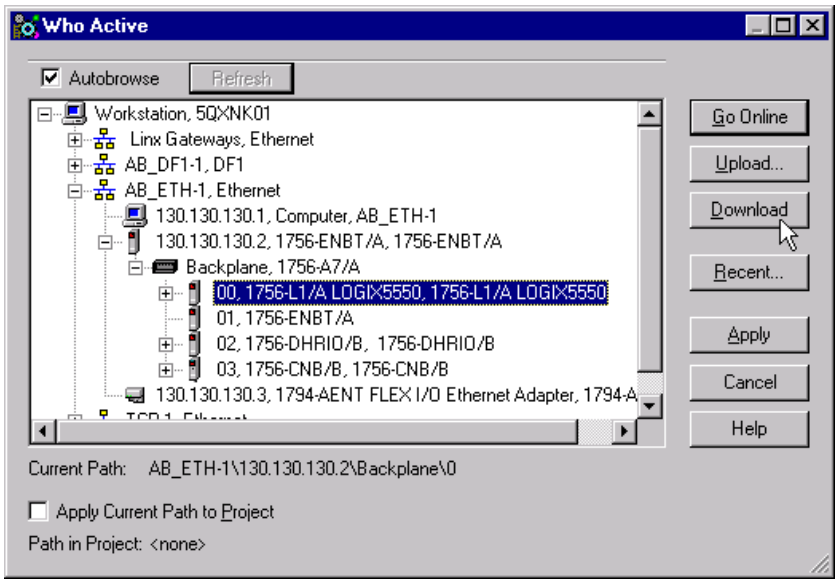
2. **Save** the program.

Download the Program to the Controller

To download the program to the controller do the following:

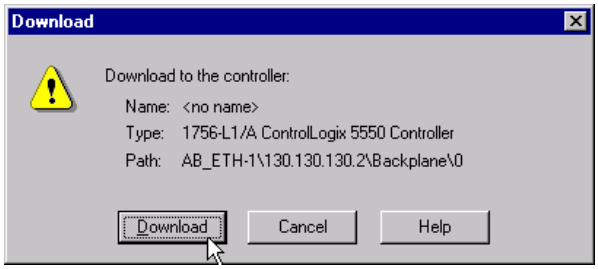
1. Click on the **Communications** menu and select **Who Active**.

   The **Who Active** window will open (Your window will show the drivers and devices you have installed).



2. Select your Ethernet driver (e.g., AB_ETH-1) and expand the tree through the backplane of the local ControlLogix chassis.

3. Highlight the Logix 5550 controller and click on the **Download** button. You will see a message similar to the following:



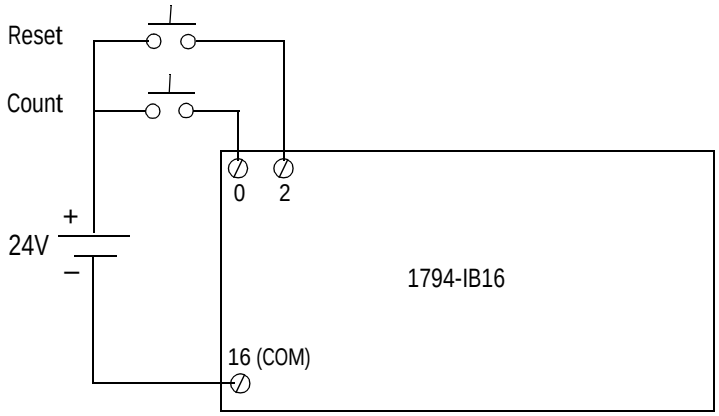
4. Click on the **Download** button. The program will be downloaded to the controller.

5. **Minimize** RSLogix5000.

Test the Example Application

You will test the example application by using a momentary switch to simulate a parts sensor.

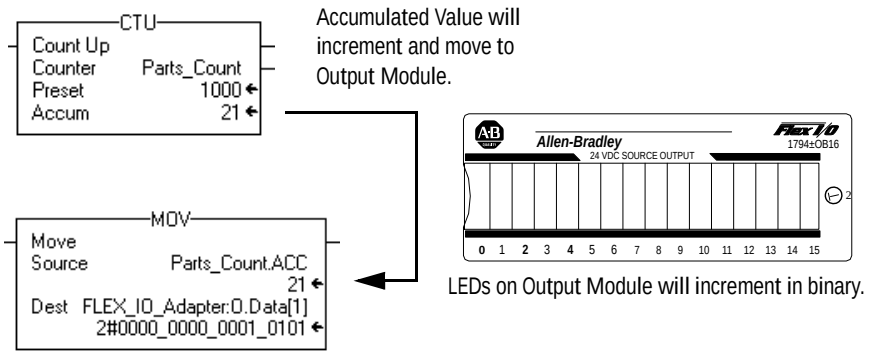
1. Remove power from the FLEX I/O and wire inputs 0 and 2 of the 1794-IB16 FLEX I/O input module as shown in the following figure:



2. Restore power to the FLEX I/O.

3. Restore the **RSLogix5000** software and place the controller in **Run** mode.

4. Repeatedly press and release the momentary switch at Input 0 (Count) on the 1794-IB16 input module. Each time you press the switch you should see the Parts_Count accumulated value increment on the screen and the LEDs of the 1794-OB16 output module increment in binary.

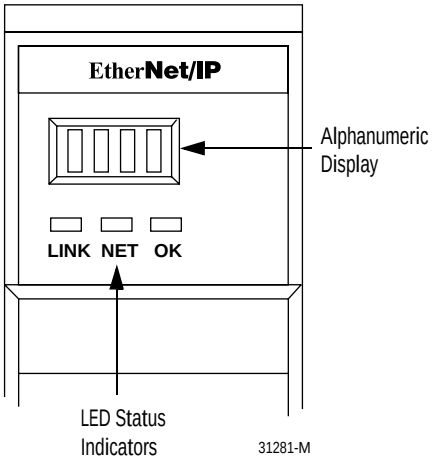


5. Press and release the momentary switch at Input 2 (Reset) on the 1794-IB16 input module. You should see the accumulated value of the Parts_Count reset to zero and all of the LEDs on the 1794-OB16 output module turn off.

TIP

Refer to the FLEX I/O Digital I/O Modules Installation Instructions, publications 1794-IN071 and 1794-IN072, for assistance in wiring and debugging the I/O modules.

This completes the FLEX I/O example.



Troubleshooting

The front of the 1756-ENBT module is provided with an alphanumeric display, as well as LED status indicators. When power is applied, the alphanumeric display should cycle through the following states: “TEST - PASS - OK - REV x.x,” where “x.x” is the module’s firmware revision. The display then alternates between “OK” and the module’s default BOOTP address.

Interpreting the Status Indicators

The three bi-color (red/green) LED status indicators provide diagnostic information about the module and its connections to the network. The following tables describe each indicator condition.

NET (Network) Status Indicator

The Network Status LED provides the following information:

State	Status	Description
Off	Not Powered, No IP Address	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.

Link Status Indicator

The Link Status LED provides the following information:

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.

OK Status Indicator

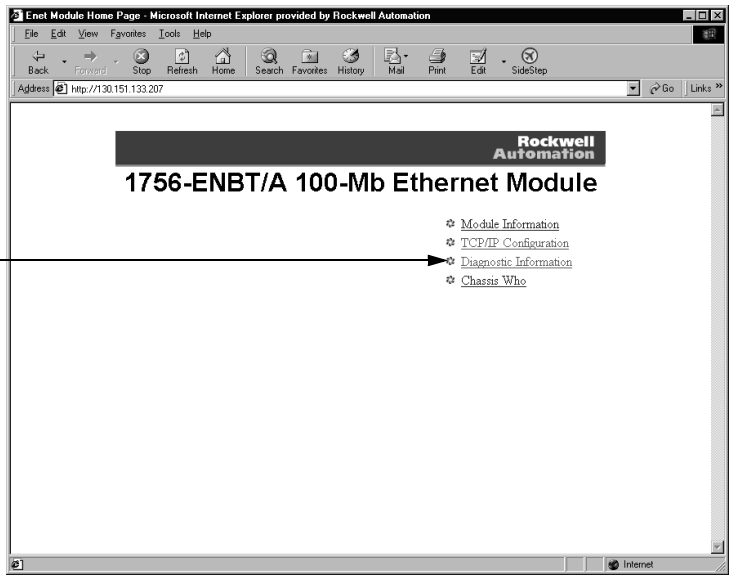
The OK Status LED provides the following module information:

State	Status	Description
Off	No Power	Module does not have 24V DC power. Verify there is chassis power and the module is completely inserted into chassis and backplane.
Flashing Green	Standby	Module is not configured.
Green	Operational	Module is operating correctly.
Flashing Red	Minor Fault	A recoverable fault has been detected. This could be caused by an error in the configuration.
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 and Green	Self Test	Module performing power-up self-test.

Detailed network diagnostics are provided by the module's Web pages, which can be accessed through a network browser, such as Netscape or Microsoft Internet Explorer. See Appendix B.

1756-ENBT Module Diagnostics

The 1756-ENBT module's Web pages offer internal and network diagnostics. This appendix provides a brief explanation of the most useful information. To view the web pages, type the module's IP address in your browser's address field. You will see the following web page:



Use this link to access the Diagnostic Information page.

Using Diagnostic Information

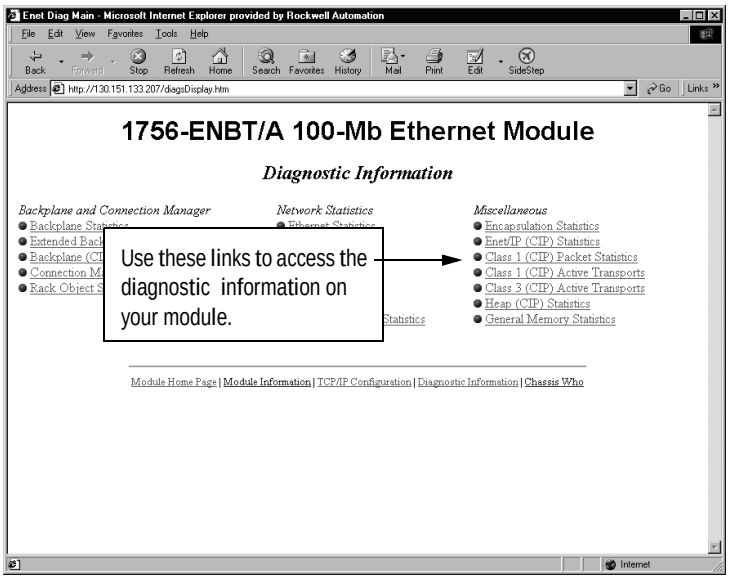
On the Diagnostic Information page, you can get information about:

- Class 1 connections - The most time critical connections, including I/O and produce/consume connections.
- Class 3 connections - The less time critical connections, such as those used for MMI and PLC programming or PLC to PLC messaging.

Although information can be found in the Backplane and Connection Manager or Network Statistics sections the most useful diagnostic information on your 1756-ENBT module is located under the Miscellaneous section.

In the Miscellaneous section, you can get access to:

- Encapsulation Statistics - General information about TCP connections, such as active incoming or outgoing connections and the total limit of TCP connections that can be made to the 1756-ENBT module. For more information, see page B-3.
- Class 1 (CIP) Packet Statistics - Information about the speed, duplex and user datagram (UDP) frame rates of TCP connections. For more information, see page B-4.
- Class 1 (CIP) Transports - Specific information about any Class 1 (CIP) connections made to the 1756-ENBT module. For more information, see page B-5.
- Class 3 (CIP) Transports - Specific information about any Class 3 (CIP) connections made to the 1756-ENBT module. For more information, see page B-6.



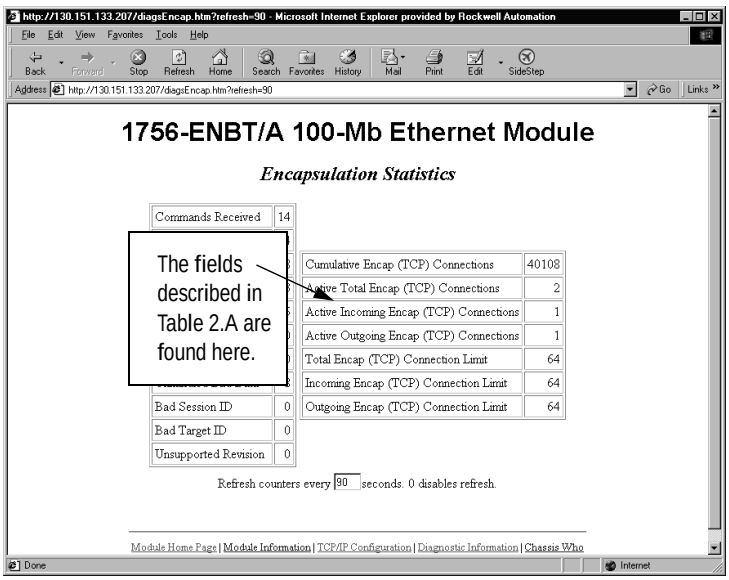
Encapsulation Statistics

The Encapsulation Statistics screen offers general information about TCP connections coming into and going out of the 1756-ENBT module. Table 2.A lists the most useful fields on the Encapsulation Statistics screen:

Table 2.A
Most Useful Diagnostic Fields on the Encapsulation Statistics Screen

Field:	Definition:
Cummulative Encap (TCP) Connections	The total number of incoming and outgoing module connections since powering up.
Active Total Encap (TCP) Connections	The number of incoming and outgoing module connections currently active.
Total Encap (TCP) Connection Limit	The maximum number (64) of incoming or outgoing connections the module can make at any single moment in time.
Active Incoming Encap (TCP) Connections	The number of module connections coming in from the Ethernet media currently active.
Incoming Encap (TCP) Connection Limit	The maximum number (64) of incoming connections the module can make at any single moment in time.
Active Outgoing Encap (TCP) Connections	The number of module connections going out to the Ethernet media currently active.
Outgoing Encap (TCP) Connection Limit	The maximum number (64) of outgoing connections the module can make at any single moment in time.

An example of the Encapsulation Statistics screen is shown below.



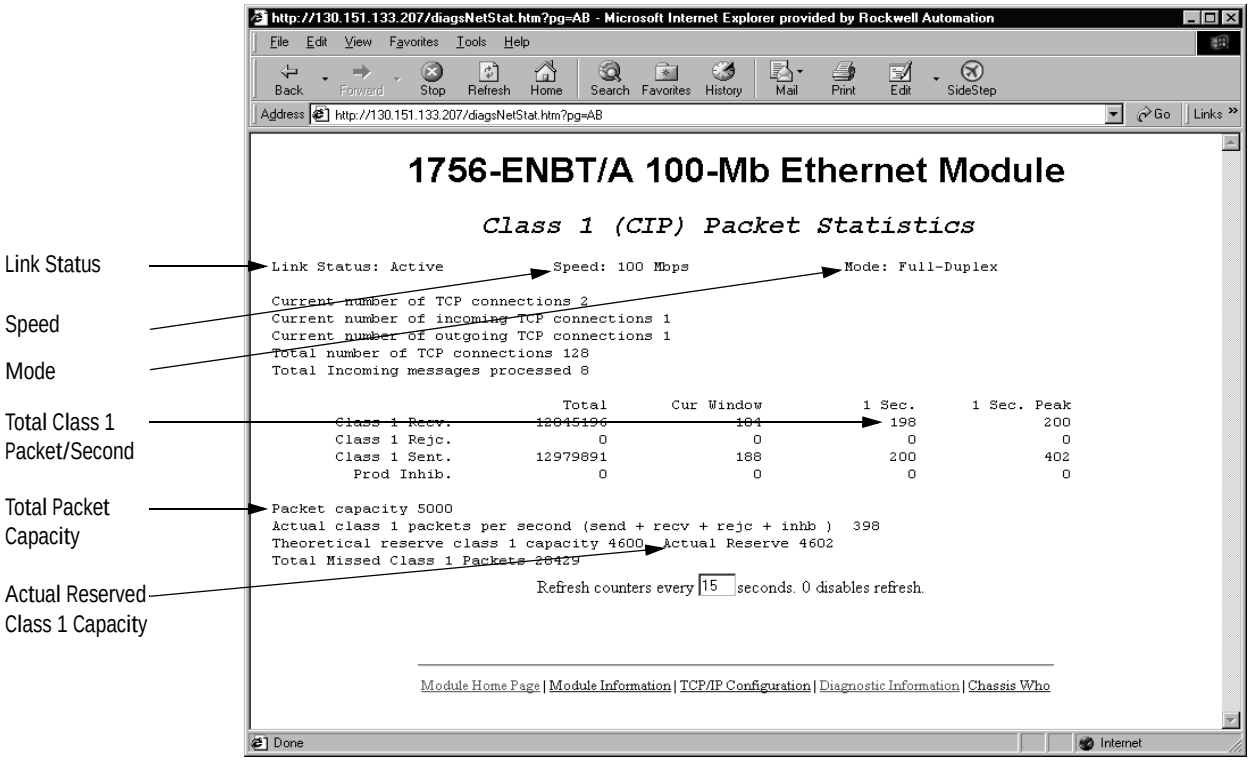
Class 1 (CIP) Packet Statistics

The Class 1 (CIP) Packet Statistics screen offers information about the speed, duplex and user datagram protocol (UDP) frame rate of TCP connections coming into and going out of the 1756-ENBT module. Table 2.B lists the most useful fields on the Class 1 (CIP) Packet Statistics screen:

Table 2.B
Most Useful Diagnostic Fields on the Enet/IP (CIP) Statistics Screen

Field:	Definition:
Link Status	Denotes whether the current link is active or inactive.
Speed	The speed that the module is passing data over the Ethernet network.
Mode	The module's communication mode, full-duplex or half-duplex.
Total Packet Capacity	Total number of packets your module can receive over the Ethernet network at any time. The 1756-ENBT module can receive up to 5000 packets.
Total Class 1 Packets/Second	Number of Class 1 packets your module is currently receiving over the Ethernet network.
Actual Reserved Class 1 Capacity	Number of Class 1 packets your module can receive over the Ethernet network.

Examples of the Enet/IP Statistics screen is shown below.



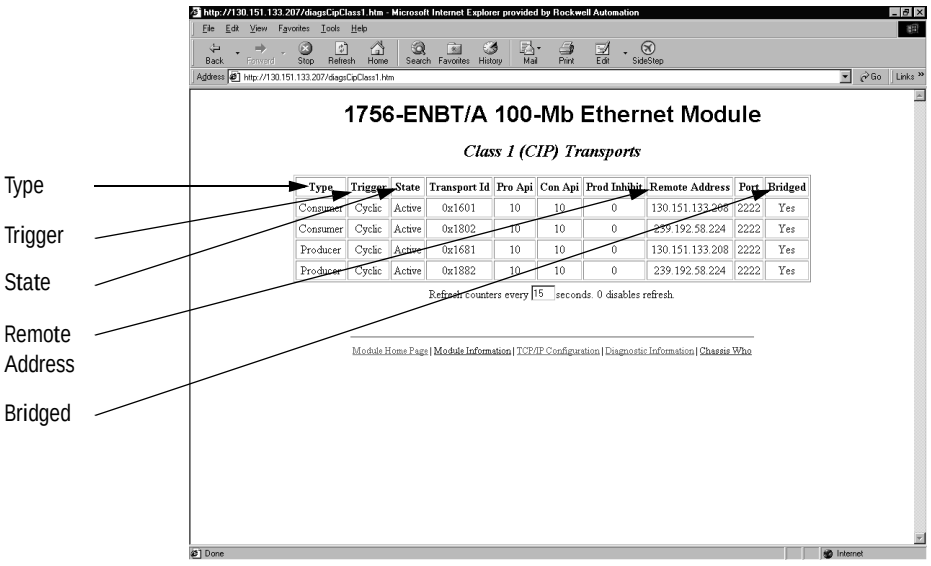
Class 1 (CIP) Transports

The Class 1 (CIP) Transports screen offers specific information about Class 1 (CIP) connections coming into and going out of the 1756-ENBT module. Table 2.C lists the most useful fields on the Class 1 (CIP) Transports screen:

Table 2.C
Most Useful Diagnostic Fields on the Class 1 (CIP) Connections Screen

Field:	Definition:
Type	Type of connection. This field can be either consumer or producer.
Trigger	The mechanism by which the producer produces new data. The mechanism can be Cyclic, Change-of-State, or Application triggered
State	The state of the connection, either active or inactive.
Remote Address	The remote IP address of the connection's originator or destination.
Bridged	Denotes whether the connection is bridged across the 1756-ENBT module or not.

An example of the Class 1 (CIP) Transports screen is shown below.



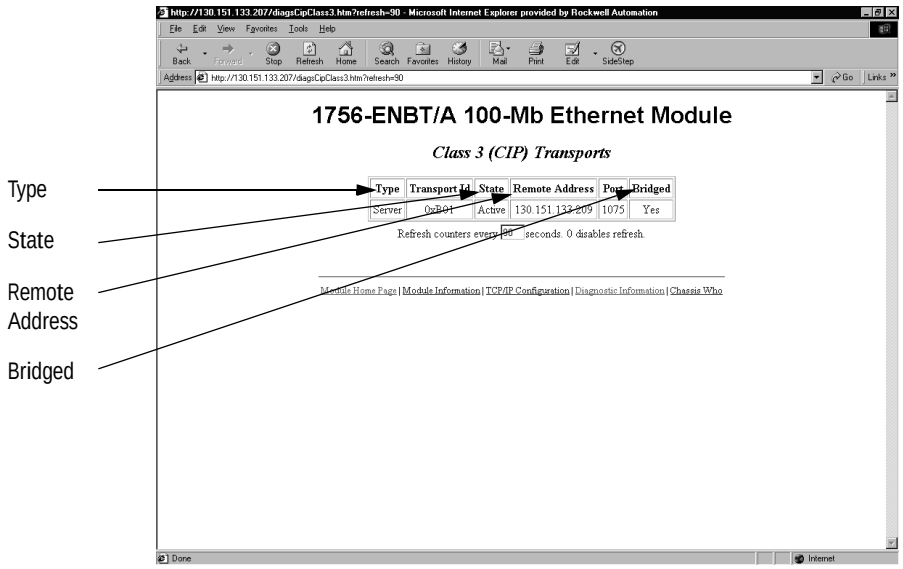
Class 3 (CIP) Transports

The Class 3 (CIP) Transports screen offers general information about TCP connections coming into and going out of the 1756-ENBT module. Table 2.D lists the most useful fields on the Class 3 (CIP) Transports screen:

Table 2.D
Most Useful Diagnostic Fields on the Class 3 (CIP) Connections Screen

Field:	Definition:
Type	Type of connection. This field can be either consumer or producer. However, for class 3, this will be Client or Server.
State	The state of the connection, either active or inactive.
Remote Address	The IP address of the originator or destination.
Bridged	Denotes whether the connection is bridged across the 1756-ENBT module or not.

An example of the Class 3 (CIP) Transports screen is shown below.



Configuring the RSLinx Ethernet Communication Driver

What This Appendix Contains

In order to communicate with your 1756-ENBT modules over your network you must configure the RSLinx Ethernet communication driver (AB_ETH). You can configure the AB_ETH driver with the IP addresses of all the Ethernet modules on your system. You will need this driver to download the example application programs in this manual.

The following table lists the contents of this appendix and where to find specific information:

Installing the RSLinx Software

Use the following procedure to install RSLinx software on your computer.

1. Insert the CD in the CD-ROM drive.

   Note: The CD-ROM supports Windows Autorun. Once inserted into the CD-ROM drive, if you have Autorun configured, the installation will automatically start at the first setup screen.

   If Autorun is not configured for your CD-ROM drive, go to step 2.

2. From the **Start** menu, choose **Run**.

   You will see the Run pop-up window.

3. Type **d:/setup** (if it doesn't appear automatically), where **d:** is your CD-ROM driver letter.

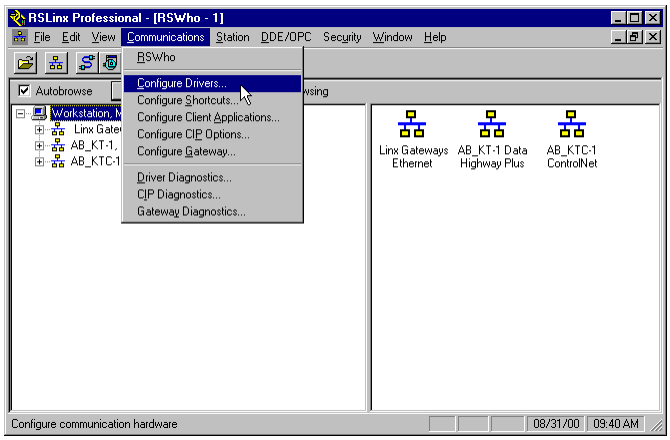
4. Click on **OK**.

   You will see the progress bar, followed by the welcome screen.

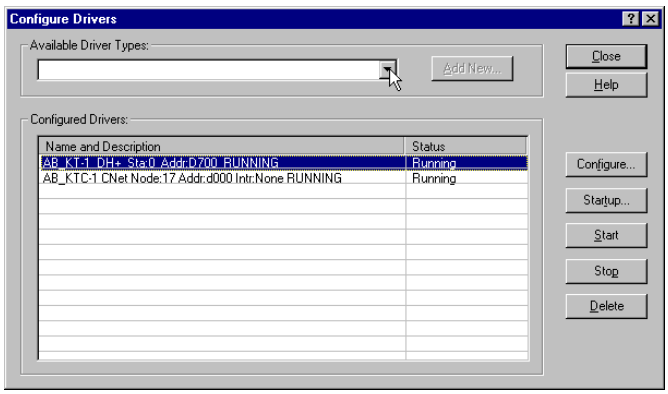
Configuring the AB_ETH Driver

To configure the AB-ETH Ethernet communication driver perform the following steps:

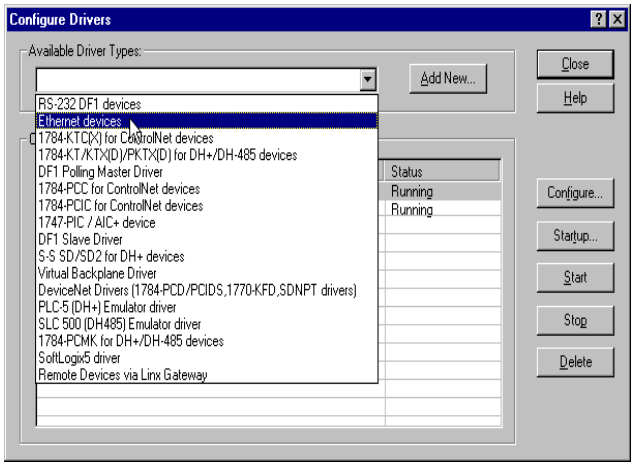
1. Start **RSLinx**.



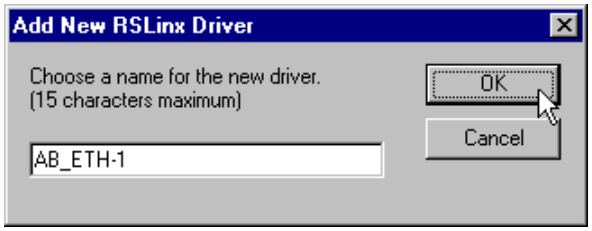
2. From the **Communications** menu, select **Configure Drivers**. The following window will open.



3. Click on the arrow to the right of the **Available Driver Types** box. The **Available Driver Types** list will appear.

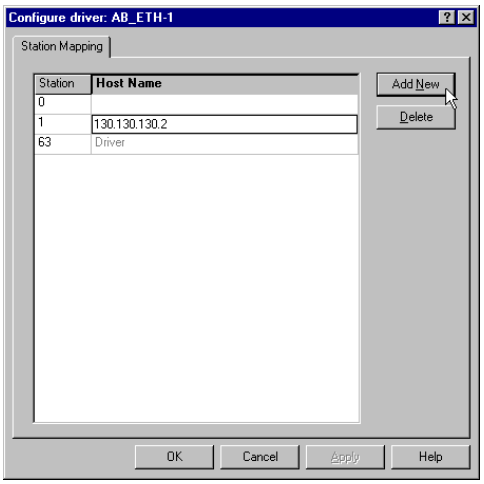


4. Select **Ethernet Devices** and click on **Add/New**. You will be prompted to name the driver.



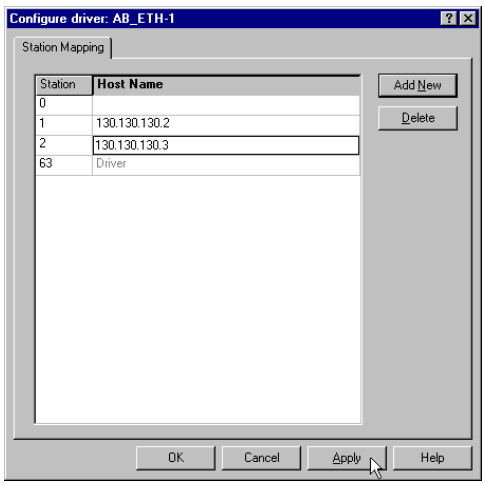
5. Select the default driver name (e.g., AB_ETH-1) or type in your own name and click on **OK**.

   The **Configure driver** window will appear with the **Station Mapping** page open.



6. Click on **Add New** and enter the IP address or Host Name of your 1756-ENBT module (e.g., 130.130.130.2, “Pump1”, etc.).

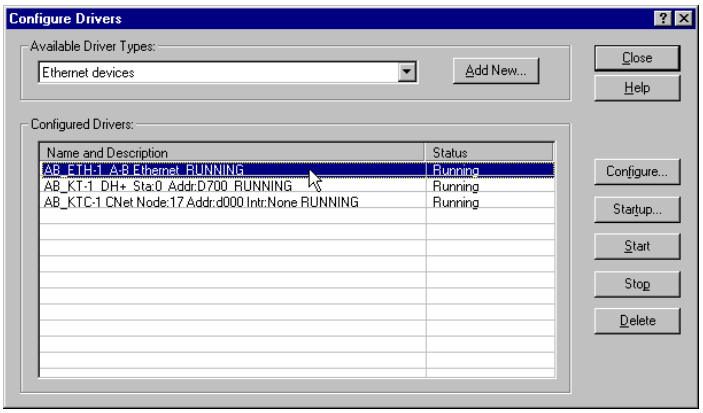
7. Repeat step 6 for each additional Ethernet module you need to access.



8. When you are done entering the IP addresses, click on **Apply**.

9. Click on **OK** to close the **Configure driver** window.

The new driver will appear in the list of configured drivers. (Your list will display the drivers you have configured on your workstation.)



10. Close RSLinx

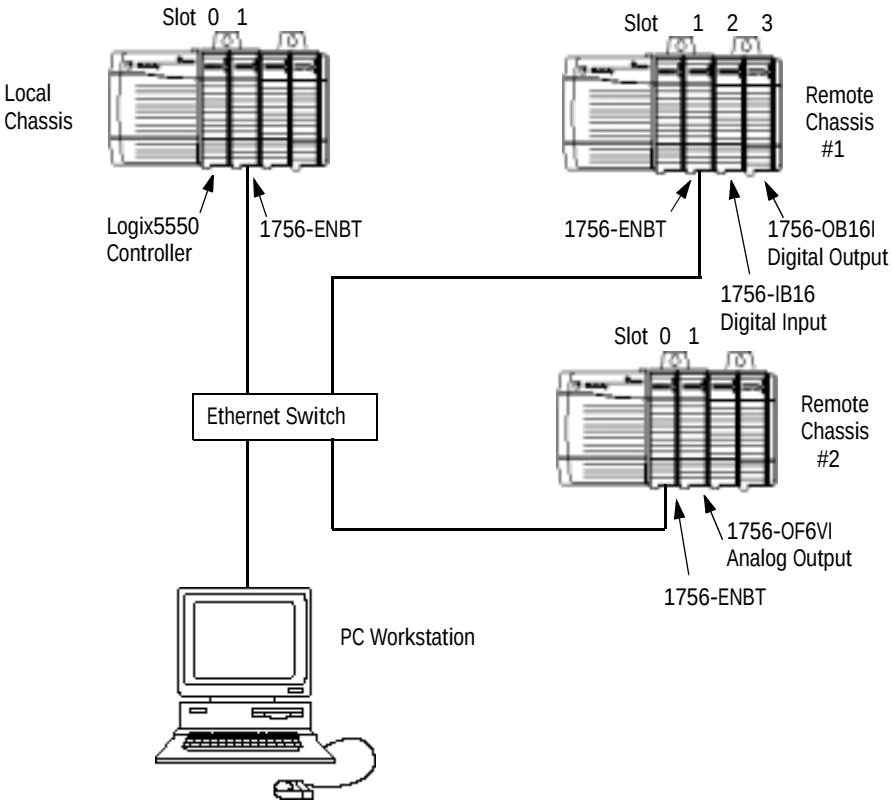
Example Network Configurations

What This Appendix Contains

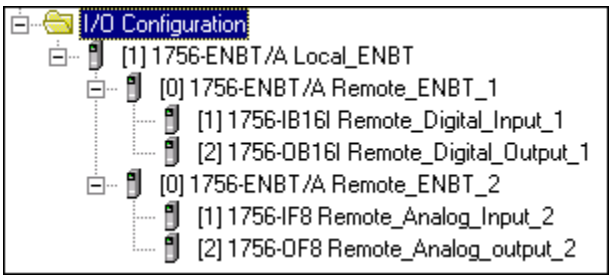
This appendix shows examples of EtherNet/IP control networks, along with the RSLogix 5000 I/O configurations for those networks. You configure these networks using the procedures described in this manual, adding each remote 1756-ENBT module and its I/O modules to the local ENB module in turn as you build your system.

Small System Example

An example small system is shown below, consisting of a local chassis with a Logix 5550 controller and a 1756-ENBT module serving as a network scanner, and two remote chassis with 1756-ENBT modules serving as adaptors for the I/O modules in those chassis.

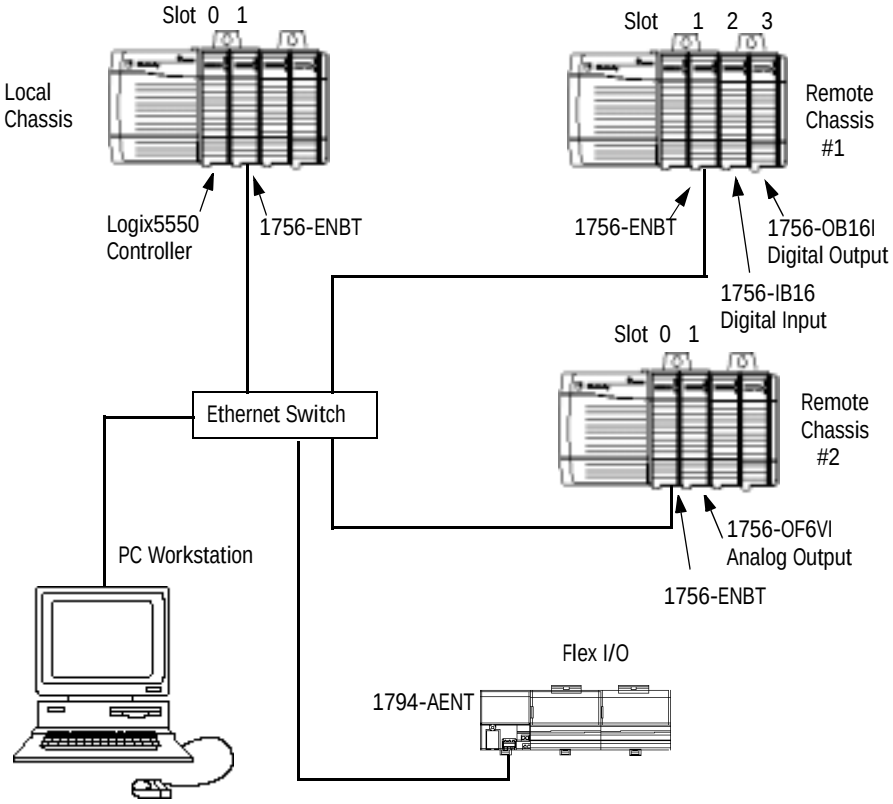


The RSLogix 5000 I/O Configuration for this network is shown in the following figure.

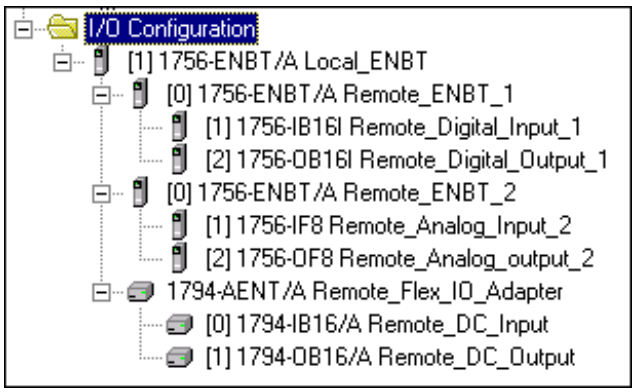


Expanded System with FLEX I/O

The following figure shows the previous network with FLEX I/O added to the system.

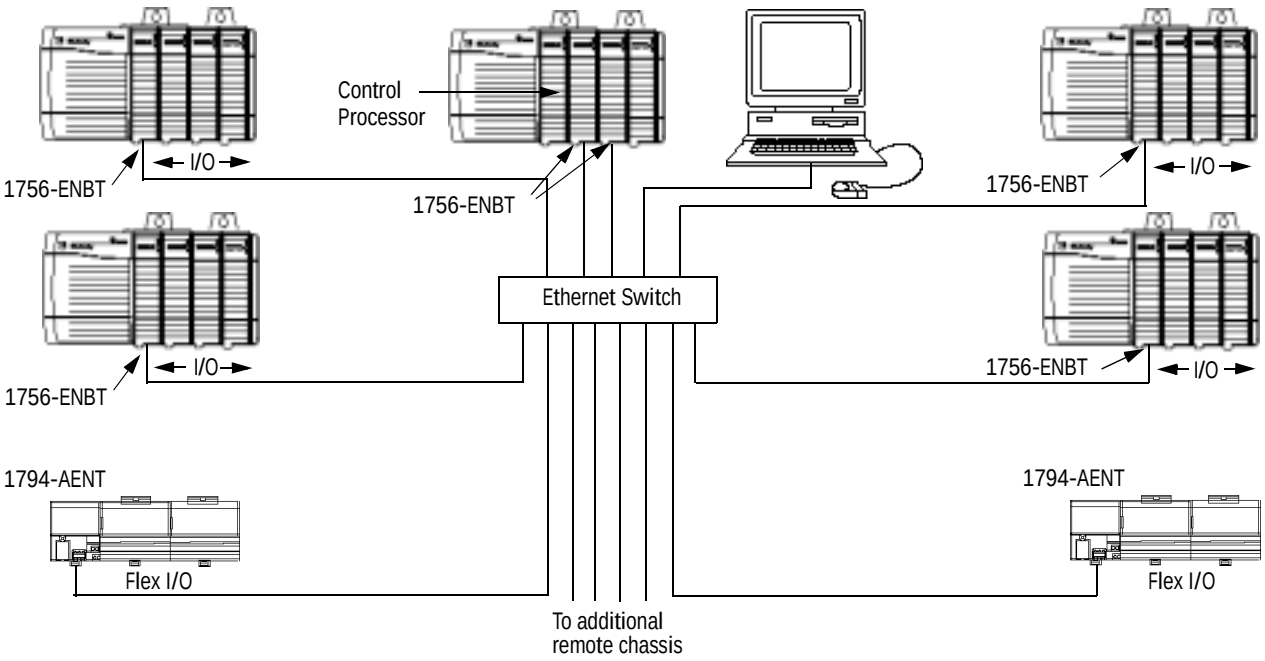


The RSLogix 5000 I/O Configuration for this network is shown below.

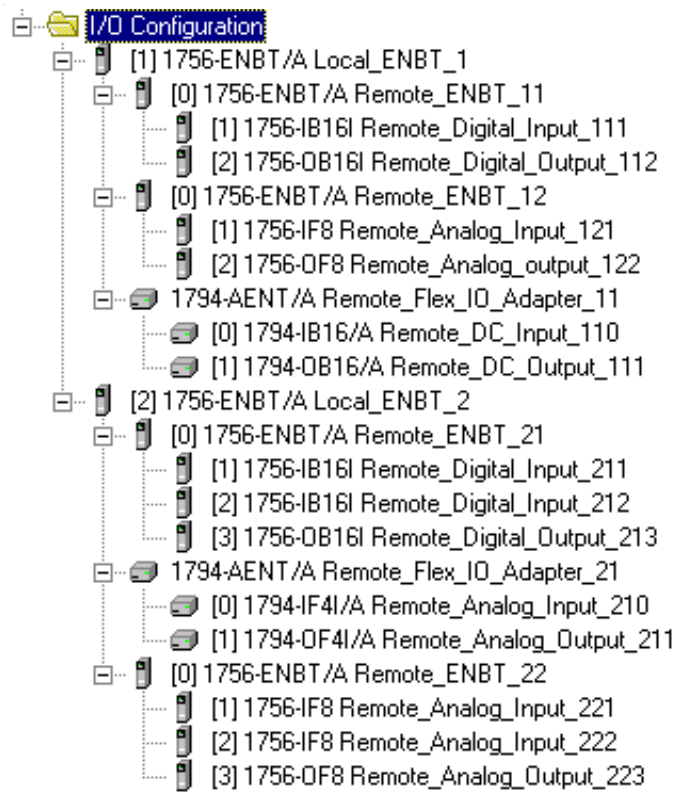


Larger Control Networks

Larger control networks may use additional local ENBT modules communicating with remote chassis. A partial system is shown below.



The RSLogix 5000 I/O Configuration for this network is shown in the following figure.



Autonegotiation Requirements

Manual Configuration on an Ethernet Switch

The ControlLogix EtherNet/IP Bridge module supports the following Ethernet settings:

- 10Mbps half duplex
- 10Mbps full duplex
- 100Mbps half duplex
- 100Mbps full duplex

Mode selection is done automatically based on the IEEE 802.3u autonegotiation protocol.

If a module is connected to a port on a 10/100Mbps switch, you must set this port to autonegotiate. If this port is set manually to one of the modes listed above, a mismatch between module and switch modes of operation may occur. This will result in significant reduction of system performance.

Changing Ports on an Ethernet Switch

If you reconnect the module from one port to another one, regardless whether the new port is located on the same or a different switch (or a hub), do the following:

1. Disconnect the cable from the port to which the module is currently connected.

2. Wait until the module Link Status LED is off.

3. Connect the cable to the new port.

This procedure will restart the autonegotiation process at the module side. Another option is to restart the module itself.

Bandwidth

The transmission capacity of the network, expressed in bits per second. Traditional Ethernet has a 10Mbit bandwidth. Fast Ethernet is 100Mbit.

BootP

BootP (Bootstrap Protocol) is a low-level protocol that provides configurations to other nodes on a TCP/IP network. BootP configuration files let you automatically assign IP addresses to an Ethernet module (you can also obtain subnet masks and gateway addresses from BootP).

The 1756-ENBT module factory default is BootP enabled. Upon powerup, the module sends a message containing its hardware address to the BootP server on the network. The server is a computer with BootP server software installed. The server compares that hardware address to those in its lookup table in the configuration file and sends a message back to the module with the appropriate IP address.

Bridge

A node between two similar communication subnets where protocol translation is minimal.

CIP

Control and Information Protocol, the EtherNet/IP application layer. CIP uses the “producer/consumer” networking model. In this model one producer broadcasts (multicasts) the data once to all the consumers. All consumers see the data simultaneously, and may choose whether to consume (receive) the data or not. Delivery time is consistent, no matter how many consumers there are.

Consumer

A destination device in the CIP networking model. See CIP.

CSMA/CD

Carrier Sense Multiple Access/Collision Detection. The access method used in Ethernet. When a device wants to gain access to the network, it checks to see if the network is quiet (senses the carrier). If it is not, it waits a random amount of time before retrying. If the network is quiet and two devices access the line at exactly the same time, their signals collide. When the collision is detected, they both back off and each waits a random amount of time before retrying.

Determinism

The ability to predict when information will be delivered. Important in time critical applications.

DHCP

The Dynamic Host Configuration Protocol (DHCP) is an Internet protocol, similar to BootP, for automating the configuration of computers that use TCP/IP. DHCP can be used to automatically assign IP addresses, to deliver TCP/IP stack configuration parameters such as the subnet mask and default router, and to provide other configuration information such as the addresses for printer, time and news servers.

DNS

The Domain Name System (DNS) is a hierarchical, distributed method of organizing the name space of the Internet. The DNS administratively groups hosts into a hierarchy of authority that allows addressing and other information to be widely distributed and maintained. A big advantage to the DNS is that using it eliminates dependence on a centrally-maintained file that maps host names to addresses.

Ethernet

A physical layer standard using Carrier Sense Multiple Access with Collision Detection (CSMA/CD) methods.

Ethernet Network

A local area network designed for the high-speed exchange of information between computers and related devices.

EtherNet/IP

Ethernet Industrial Protocol. EtherNet/IP applies a common application layer (CIP) over Ethernet by encapsulating messages in TCP/UDP/IP.

Explicit Messaging

Non-time critical messaging used for device configuration and data collection, such as downloading programs or peer-to-peer messaging between two PLCs.

Fast Ethernet

Ethernet operating at 100Mbps/second.

Full Duplex

A mode of communication that allows a device to send and receive information at the same time, effectively doubling the bandwidth.

Fully Qualified Domain Name

A Fully Qualified Domain Name (FQDN) is a domain name that includes all higher level domains relevant to the entity named. If you think of the DNS as a tree-structure with each node having its own label, a Fully Qualified Domain Name for a specific node would be its label followed by the labels of all the other nodes between it and the root of the tree. For example, for a host, a FQDN would include the string that identifies the particular host, plus all domains of which the host is a part up to and including the top-level domain (the root domain is always null). For example, PARIS.NISC.SRI.COM is a Fully Qualified Domain Name for the host at 192.33.33.109.

Gateway

A module or set of modules that allows communications between nodes on dissimilar networks.

Host Name

The Host Name is the unique name for a computer within its domain. It's always the first element of a full name, and, with its domain and top-level domain suffix, creates the unique name of that computer on the Internet. For example, let's say the foobar website is www.foobar.com. The Host Name is "www", which is not unique on the web, but is unique within the foobar domain.

The Host Name can also refer to the Fully Qualified Domain Name, or in this example, www.foobar.com. Both naming methods seem to be used interchangeably in various documents. For the purposes of this document, the Host Name will refer to the FQDN, or as in this example, www.foobar.com.

Hub

A central connecting device that joins devices together in a star configuration. Hubs are generally not suitable for use in I/O control systems, since they are time critical applications that cannot tolerate lost packets.

Implicit Messaging

Real time messaging of I/O data.

IP

Internet Protocol that provides the routing mechanism for messages. All messages contain not only the address of the destination station, but the address of a destination network, which allows messages to be sent to multiple networks within an organization or around the world.

IP Address

32-bit identification number for each node on an Internet Protocol network. These addresses are represented as four sets of 8-bit numbers (numbers from 0 to 255), with periods between them. Each node on the network must have a unique IP address.

Latency

The time between initiating a request for data and the beginning of the actual data transfer.

Module Address

A six-bit number used to uniquely identify any module on the local and extended ControlLogix backplane.

Multicast

In the CIP producer/consumer model, one producer multicasts (broadcasts) the data once to all the consumers.

Producer

The source of information in the CIP networking model. See CIP.

Rack

A physical and logical collection of application modules sharing a common power supply and backplane for module to module communication.

Star Configuration

A network configuration in which the devices are connected to a central hub or switch.

Subnet Mask

An extension of the IP address that allows a site to use a single net ID for multiple networks.

Switch

A network device that cross connects devices or network segments. A switch provides each sender/receiver the full network bandwidth (2x in full duplex mode), reduces collisions, and increases determinism.

TCP

Transport Control Protocol. More reliable but slower transport protocol than UDP. Used for explicit (not time critical) messaging in EtherNet/IP.

Transaction

An exchange of request and data and response and data**.**

UDP

User Datagram Protocol. Transport protocol that provides a very simple, but fast capability to send datagrams between two devices. Used for I/O (implicit) messaging in EtherNet/IP.

Notes:

W

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