FLEX I/O Dual-port EtherNet/IP Adapters

Catalog Numbers 1794-AENTR, 1794-AENTRXT

Allen-Bradley
by ROCKWELL AUTOMATION

User Manual

Original Instructions

Types of Adapters

The adapter refers to the following catalogs.

Catalog Number	Voltage	Module Capacity, Max	Description
1794-AENTR	24V DC	8	Dual-port EtherNet/IP adapter
1794-AENTRXT			Dual-port EtherNet/IP adapter with extended temperatures range

Hardware and Software Compatibility

The adapters and the applications that are described in this manual are compatible with the following firmware revisions and software releases. Contact Rockwell Automation if you need software or firmware updates to use this equipment.

Table 1 - Hardware and Software Compatibility

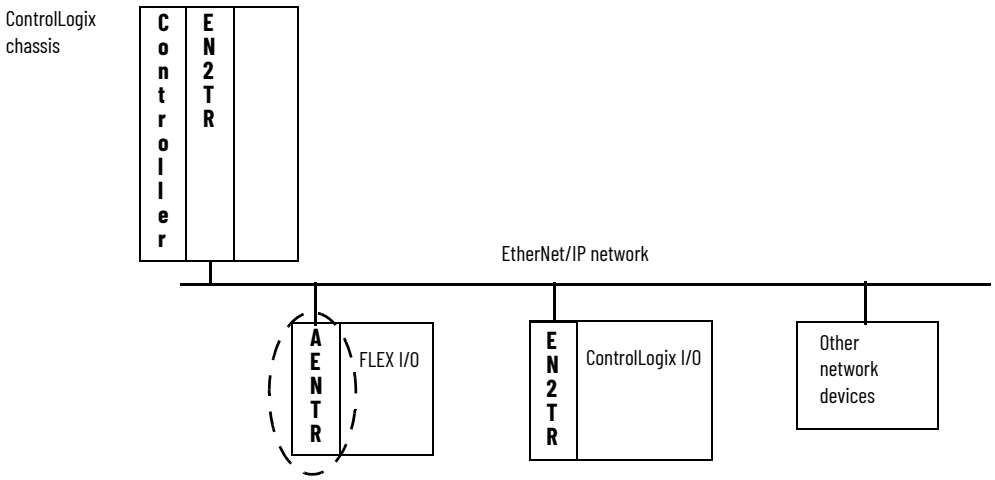
Product	Firmware Revision/ Software Version
FLEX I/O redundant EtherNet/IP adapter	1.xx or higher
ControlLogix® 5560, ControlLogix 5570, GuardLogix® 5560, and GuardLogix 5570 controllers	20 or higher
ControlLogix 5580 and GuardLogix 5580 controllers	28 or higher
CompactLogix® 5370 and Compact GuardLogix 5370 controllers	20 or higher
CompactLogix 5380 and Compact GuardLogix 5380 controllers	28 or higher
CompactLogix 5480 controller	32 or higher
Studio 5000 Logix Designer application	20 or higher
RSLinx software	2.59 or higher

See FLEX I/O and FLEX I/O-XT Selection Guide, publication 1794-SG002, a for description and overview of the 1794 series FLEX I/O and FLEX I/O-XT modules and compatible control platforms.

What the Adapter Does

The 1794-AENTR and 1794-AENTRXT adapters perform two primary tasks:

- Control of real-time I/O data (implicit messaging). The adapter serves as a bridge between I/O modules and the network.



- Support of messaging data for configuration and programming information (explicit messaging).

Use of the Control and Information Protocol (CIP)

The 1794-AENTR and 1794-AENTRXT adapters use CIP™. CIP is the application layer protocol that is 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 modules, which greatly simplifies maintenance and module replacement.
- You maintain full control over the route that is taken by each message, which enables you to select alternative paths for the same end device.

Understand the Producer/Consumer Model

The CIP Producer/Consumer networking model replaces 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 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 that are chosen during configuration and where on the network that 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 EtherNet/IP network. This data exchange conforms to the Producer/Consumer model.

Specify the Requested Packet Interval (RPI)

The RPI is the update rate that is specified for a particular piece of data on the network. The RPI can be specified for the adapter and include all of the I/O modules communicating through it (using a rack-optimized connection) or specified for a particular module (using direct connection). When you add a module or an adapter 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 device. For example, if you specify an RPI of 50 ms, it means that every 50 ms the device should send its data to the controller or the controller should send its data to the device.

RPIs are only used for devices that produce data. For example, a ControlLogix EtherNet/IP bridge 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.

Rack-optimized and Direct Connection Support

The 1794-AENTR and 1794-AENTRXT adapters support both direct and rack-optimized connections. A direct connection is a real-time data transfer link between the controller and the device that the configuration data references. Direct connection messaging occurs at a cyclic rate that is specified by the RPI during configuration. A rack-optimized connection is a grouping of data from multiple I/O module into a single block of data sent over a single connection at the same data rate.

Rack-optimized connections reduce the total number of connections that are 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 eight discrete I/O modules interfaced to an adapter. If you use direct connections to transfer data to each of these I/O modules, you need eight connections to transfer all of the data, one to each of the eight I/O modules. If you use a rack-optimized connection to transfer the data, you only need a single connection – The connection to the adapter.

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 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 simultaneously at the RPI rate of the adapter.

See EtherNet/IP Device Level Ring Application Technique, publication ENET-AP007, for more information on connections.

Mixing Rack-optimized and Direct Connections

You can mix communication formats for different I/O modules communicating through the same adapter. I/O modules set up to use rack optimization communicates at the rate of the RPI configured for the 1794-AENTR or 1794-AENTRXT adapter. I/O modules that are configured for direct communication communicate at their own set RPIs and ignore the adapter RPI.

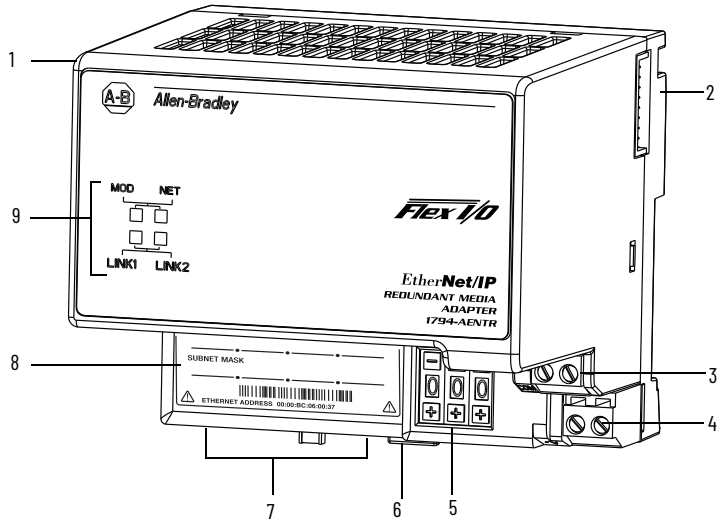
Install Your FLEX I/O Adapter

This chapter describes how to physically install the 1794-AENTR or 1794-AENTRXT adapter on a DIN rail, panel, or wall, and connect it to the EtherNet/IP network.

Module Components

Use Figure 2 to identify the external features of the FLEX I/O EtherNet/IP adapter.

Figure 2 - Dual-port EtherNet/IP Adapter – 1794-AENTR, 1794-AENTRXT

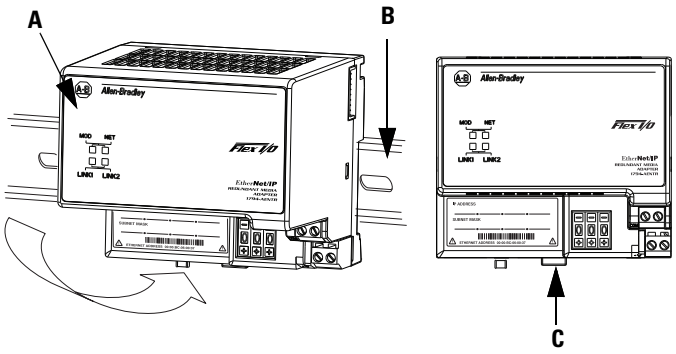


Component Identification			
1	Dual-port EtherNet/IP adapter	6	Module locking tab
2	Flexbus connector	7	Network cable RJ45 connectors (underside)
3	24V common connections	8	MAC ID label
4	24V DC connections	9	Status indicators
5	IP address switches		

Mount Your Adapter

Mount on a DIN Rail

Follow these steps to mount the adapter on a new system before installing any I/O modules.



ATTENTION: During mounting of all devices, be sure that all debris (for example, metal chips, wire strands) is kept from falling into the module. Debris that falls into the module could cause damage on power-up.

ATTENTION: Do not remove or replace an adapter while power is applied. Interruption of the backplane can result in unintentional operation or machine motion.

1. Position the adapter (A) on an IEC standard (35 x 7.5 x 1 mm) top-hat DIN rail (B) at a slight angle (DIN rail: Allen-Bradley part number 199-DR1; 46277-3; EN50022).
2. Hook the lip on the rear of the adapter onto the top of the DIN rail, and pivot the adapter onto the rail.
3. Press the adapter down onto the DIN rail until flush. Locking tab (C) snaps the adapter into position and locks it onto the DIN rail.
4. If the adapter does not lock in place, use a screwdriver or similar device to move the locking tab down while pressing the adapter flush onto the DIN rail, and release the locking tab to lock the adapter in place. If necessary, push up on the locking tab to lock.
5. Connect the adapter wiring. See Connect Wiring on page 14.

Mount on a Panel or Wall

To mount this adapter on a panel or wall, see the Panel Mounting Kit Cat. No. 1794-NM1/B Installation Instructions, publication 1794-IN135.

ATTENTION: If you insert or remove the module while backplane power is on, an electric 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.

WARNING: When used in a Class I Division 2, hazardous location, this equipment must be mounted in a suitable enclosure with proper wiring method that complies with the governing electrical codes.

Mount or Replace the Adapter on an Existing System

1. Disconnect any wiring jumpered to the adjacent terminal base.
2. Remove the Ethernet connectors from the bottom of the adapter.

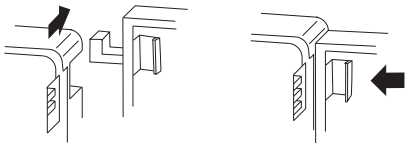
WARNING: If you connect or disconnect the communication cable with power that is applied to the adapter or any device on the network, an electric arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

3. Disconnect any user power wiring connections to the adapter.
4. Open the module latching mechanism and remove the module from the base unit to which the adapter is attached.
5. Push the Flexbus connector toward the right side of the terminal base to unplug the backplane connection.

ATTENTION: Verify that the Flexbus connector is completely clear of the adapter. The slide must be completely to the right and the raised spot on the slide visible.

6. Release the locking tab and remove the adapter.

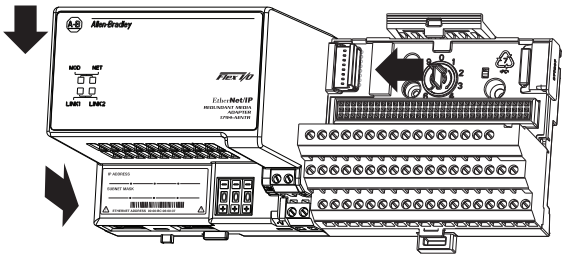
   Before installing the new adapter, notice the notch on the right rear of the adapter. This notch accepts the hook on the terminal base unit. The notch is open at the bottom. The hook and adjacent connection point keep the terminal base and the adapter tight together, reducing the possibility of a break in communication over the backplane.



7. Complete the adapter mounting as shown.

   Push down and in simultaneously to lock the adapter to the DIN rail.

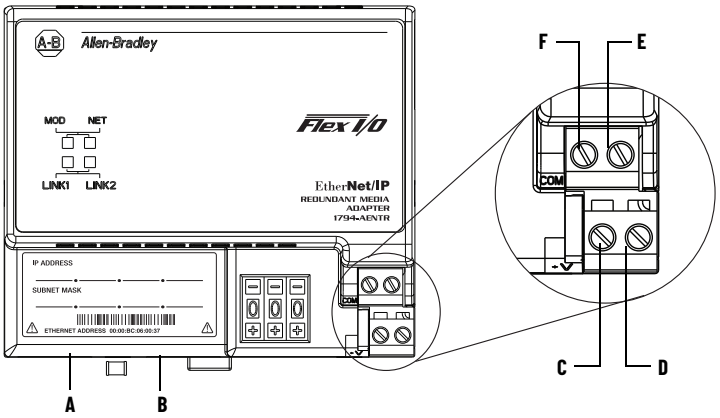
   If the adapter does not lock in place, use a screwdriver or similar device to move the locking tab down while pressing the adapter flush onto the DIN rail, and release the locking tab to lock the adapter in place. If necessary, push up on the locking tab to lock.



   When the adapter is locked onto the DIN rail, gently push the Flexbus connector into the adapter to complete the backplane.

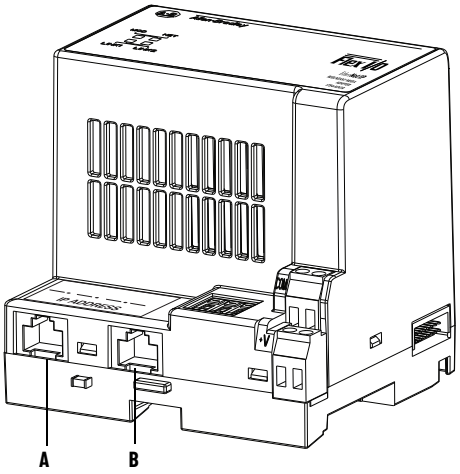
8. Reinstall the module in the adjacent terminal base unit.

Connect Wiring



WARNING: If you connect or disconnect wiring while the field-side power is on, an electric 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.

1. Connect an Ethernet network cable to the RJ45 connector (A).
2. Connect the redundant Ethernet network cable to the RJ45 connector (B).



ATTENTION: When connecting wiring, torque terminal screws C, D, E, and F to 0.8 N•m (7 lb•in).
If multiple power sources are used, do not exceed the specified isolation voltage.
Power wiring must be less than 10 m (32.8 ft.) in length.
Do not wire more than two conductors on any single terminal.

3. Connect 24V DC common to the left side of the upper connector, terminal F.
4. Connect +24V DC input power to the left side of the lower connector, terminal C.
5. Use connections D and E to pass +24V DC common (E) and 24V DC power (D) to the next module in the series (if necessary).

Set the Network Address

The adapter ships DHCP-enabled and with the thumbwheel switches set to 999. You can set the network Internet Protocol (IP) address in these ways:

- Use the pen-push thumbwheel switches on the adapter. Press either the + or the - button with a pen tip to change the number.

- Use a Dynamic Host Configuration Protocol (DHCP) server, such as Rockwell Automation® DHCP.
- Retrieve the IP address (if previously set) from nonvolatile memory.

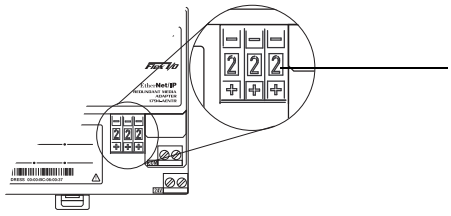
The adapter reads the thumbwheel switches first to determine if the switches are set to a valid number. You set the node address by using the three-position pen-push thumbwheel switch using a pen tip.

Press a pen tip into the center and perpendicular to the + or the - button to change the number. You only need a small amount of force to press the button (approximately 2 N).

When the switches are set to a valid number, the adapter IP address is 192.168.1.xxx (where xxx represents the number set on the switches). The adapter subnet mask is 255.255.255.0. The adapter gateway address is set differently depending on the firmware revision:

- For firmware revision 1.013 and earlier, when the address switches are set to 001...254, the adapter gateway address is set to 0.0.0.0.
- For firmware revision 1.014, when the address switches are set to 001, the adapter gateway address is set to 0.0.0.0. When the address switches are set to 002...254, the adapter gateway address is set to 192.168.1.1.

The adapter does not have a host name that is assigned, or use any Domain Name System (DNS) when using the thumbwheel settings.

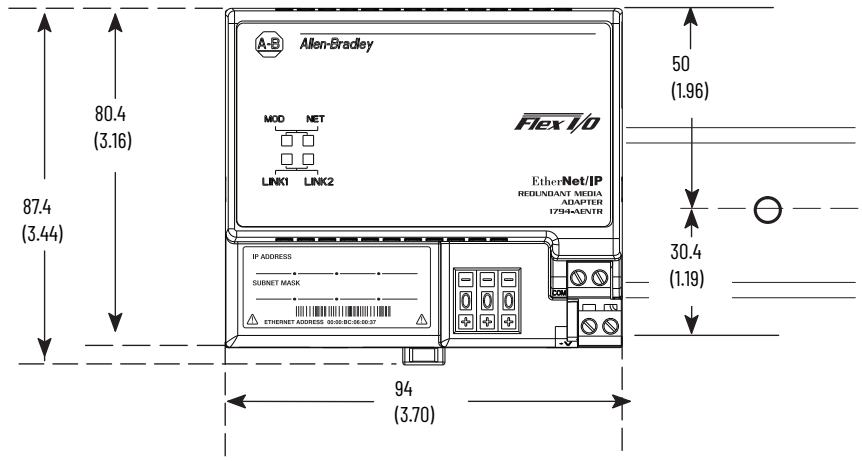


If you set the switches to an invalid number (such as 000, or a value greater than 254), the adapter checks to see if you enabled DHCP.

Mounting Dimensions

The module has the following mounting dimensions.

1794-AENTR shown



Millimeters
(Inches)

1794-AENTR, 1794-AENTRXT
87.4 H x 94 W x 92 D
(344 H x 3.7 W x 3.6 D)

Configure the Adapter for Your EtherNet/IP Network

This chapter describes how to configure the 1794-AENTR or 1794-AENTRXT adapter for the ControlLogix 5580 system.

Configuration Requirements

Before you can use your 1794-AENTR or 1794-AENTRXT adapter, you must configure its IP address, and optionally, its subnet mask and gateway address. You can use the Rockwell Automation BOOTP/DHCP utility to perform the configuration. You can also use generic BOOTP software or, within some limitations, a DHCP server.

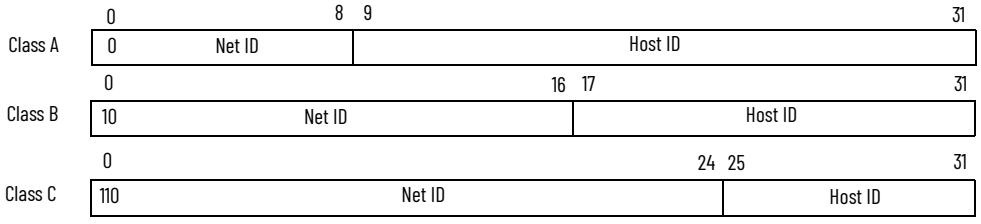
IMPORTANT When using the BOOTP protocol, you must enter the Ethernet hardware address of your adapter. Rockwell Automation assigns each 1794-AENTR or 1794-AENTRXT adapter a unique 48-bit hardware address at the factory. The address is printed on a label on the front of your 1794-AENTR or 1794-AENTRXT adapter. It consists of six hexadecimal digits that are separated by colons. This address is fixed by the hardware and cannot be changed.

If you change or replace the 1794-AENTR or 1794-AENTRXT adapter, you must enter the new Ethernet hardware address of the adapter when you configure the new adapter.

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 1794-AENTR or 1794-AENTRXT adapter) must have a unique IP address.

The IP address is 32 bits long and has a Net ID part and a Host ID part. Networks are classified A, B, C, or other. The class of the network determines how an IP address is formatted.



You can distinguish the class of the 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

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.

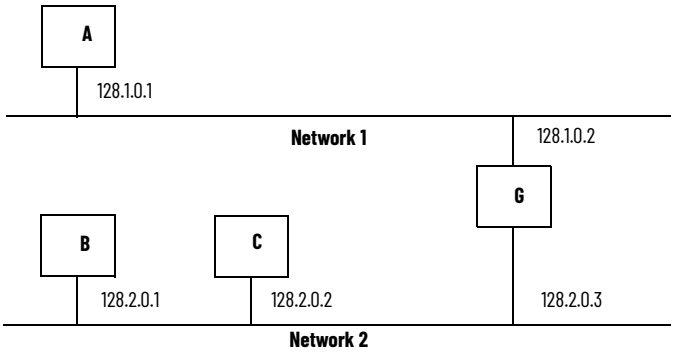
IP addresses are written as four decimal integers (0…255) separated by periods where each integer gives the value of 1 byte of the IP address.

EXAMPLE For example, the 32-bit IP address:
10000000 00000001 00000000 00000001 is written as 128.1.0.1.

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

Gateway Address

The Gateway Address is the default address of a network. It provides a single domain name and point of entry to the site. Gateways connect 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 then resolves C's IP address into a hardware address (MAC address) and communicates 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). 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.