Doc. No. 78-2659-01

PA-FE-TX and PA-FE-FX Fast Ethernet 100BASE-T Port Adapter Installation and Configuration

Product Numbers: PA-FE-TX(=) and PA-FE-FX(=)

This configuration note describes the installation and configuration of the 100BASE-TX and 100BASE-FX port adapters, which can be used in the Cisco 7200 series routers, and on the second-generation Versatile Interface Processor (VIP2) in all Cisco 7500 series routers, and Cisco 7000 series routers using the 7000 Series Route Switch Processor (RSP7000) and 7000 Series Chassis Interface (RSP7000CI). (Refer to the section "Software and Hardware Requirements" on page 3.)

Note For VIP2 users, use this configuration note in conjunction with the configuration note *Versatile Interface Processor (VIP2) Installation, Configuration, and Maintenance* (Document Number 78-2658-xx), which shipped with your VIP2.

For Cisco 7200 series router users, use this configuration note in conjunction with the *Cisco 72xx Installation and Configuration Guide* that shipped with your Cisco 7200 series router.

For complete descriptions of interface subcommands and the configuration options available for interfaces, and which support FE-TX and FE-FX port adapter functionality, refer to the appropriate software configuration publication listed in the section "If You Need More Information."

Document Contents

This configuration note is organized into the following three parts.

1. The following sections include general information and information about port adapter installation:
   - If You Need More Information, page 2
   - Port Adapter Installation Prerequisites, page 3
2. The following section includes information specific to the FE-TX and FE-FX port adapters:
   - What Are the FE-TX and FE-FX Port Adapters?, page 8

3 The following sections include information specific to the FE-TX and FE-FX port adapters' use with the VIP2 in Cisco 7000 family routers and in the Cisco 7200 series routers:

   — VIP2 and the FE-TX and FE-FX Port Adapters, page 14

   — Cisco 7200 Series and the FE-TX and FE-FX Port Adapters, page 30

The following sections include general reference information: "SELV Circuit Warning Translations," on page 44, and "Cisco Connection Online" on page 45

If You Need More Information

The Cisco Internetwork Operating System (Cisco IOS) software running the router contains extensive features and functionality. The effective use of many of many of these features is easier if you have more information at hand. For additional information on configuring the Cisco 7000 family routers and VIP2, or the Cisco 7200 series, the following documentation resources are available to you:

- Cisco Connection Documentation, Enterprise Series CD-ROM

  This publication and additional Cisco Systems publications are available on a CD-ROM called Cisco Connection Documentation, Enterprise Series, which is Cisco's online library of product information. The CD-ROM is updated and shipped monthly, so it might be more up to date than printed documentation. To order Cisco Connection Documentation, Enterprise Series CD-ROM, contact a Cisco Sales or Customer Service representative.

- For Cisco 7000 family systems with Cisco IOS Release 11.1(471), a Cisco-approved Release 11.1(471) beta software version, or a later Cisco IOS release, or, Cisco 7200 series systems Cisco IOS Release 11.1(472), a Cisco-approved Release 11.1(472) beta software version, or a later Cisco IOS release, refer to the following modular configuration and modular command reference publications, as appropriate for your configuration:

  — *Configuration Fundamentals Configuration Guide*

  — *Configuration Fundamentals Command Reference*

  — *Wide-Area Networking Configuration Guide*

  — *Wide-Area Networking Command Reference*

  — *Network Protocols Configuration Guide*

  — *Network Protocols Command Reference*

  — *Bridging and IBM Networking Configuration Guide*

  — *Bridging and IBM Networking Command Reference*

  — *Configuration Builder Getting Started Guide*

  — *Troubleshooting Internetworking Systems*

- For hardware installation and maintenance information on the Cisco 7000 family routers, and the VIP2, refer to the following publications:
  - *Cisco 7000 Hardware Installation and Maintenance*
  - *Cisco 7010 Hardware Installation and Maintenance*
  - *Cisco 7505 Hardware Installation and Maintenance*
  - *Cisco 7507 Hardware Installation and Maintenance*
  - *Cisco 7513 Hardware Installation and Maintenance*
  - *Second-Generation Versatile Interface Processor (VIP2) Installation and Configuration*
- For hardware installation and maintenance information on the Cisco 7200 series router, refer to the *Cisco 72xx Installation and Configuration Guide* that shipped with your Cisco 7200 series system.
- To obtain information about documentation, refer to the to Cisco Connection Documentation, Enterprise Series CD-ROM, to the section "Cisco Connection Online," on page 45, or call Customer Service at 800 553-6387 or 408 526-7208. Customer Service hours are 5:00 a.m. to 6:00 p.m. Pacific time, Monday through Friday (excluding company holidays). You can also send e-mail to `cs-rep@cisco.com`. You can also refer to the *Cisco Information Packet* that shipped with your router.

Port Adapter Installation Prerequisites

This section provides software requirements, a list of parts and tools you will need to perform the port adapter installation, and safety and ESD-prevention guidelines to help you avoid injury and damage to the equipment during installation. Also included is information on the systems in which port adapters can be installed and overview information on interface specifications.

The following sections discuss general information and information about port adapter installation requirements:

Software and Hardware Requirements

The FE-TX and FE-FE port adapters require that the host Cisco 7000 family router is running Cisco IOS Release 11.1(471), or later, and that the host Cisco 7200 series router is running Cisco IOS Release 11.1(472) or later.

Caution The VIP2 requires that the Cisco 7000 series router has the RSP7000 and RSP7000CI installed. The VIP2 will *not* operate properly with the Route Processor (RP), Switch Processor (SP), or Silicon Switch Processor (SSP) installed in the Cisco 7000 series router.

List of Parts and Tools

You need the following tools and parts to install a port adapter. If you need additional equipment, contact a service representative for ordering information.

- PA-FE-TX(=) or PA-FE-FX(=) port adapter
- Cables appropriate for the port adapter's interfaces (RJ-45 and multimode optical-fiber cables are not available from Cisco Systems; they are available from outside commercial cable vendors.)
- Number 1 Phillips and a 3/16-inch, flat-blade screwdriver (for VIP2 installation only)
- Your own ESD-prevention equipment or the disposable grounding wrist strap included with all upgrade kits, FRUs, and spares

Safety Guidelines

Following are safety guidelines that you should follow when working with any equipment that connects to electrical power or telephone wiring.

Electrical Equipment Guidelines

Follow these basic guidelines when working with any electrical equipment:

- Before beginning any procedures requiring access to the chassis interior, locate the emergency power-off switch for the room in which you are working.
- Disconnect all power and external cables before moving a chassis.
- Do not work alone when potentially hazardous conditions exist and never assume that power has been disconnected from a circuit; always check.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe. Carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

Telephone Wiring Guidelines

Use the following guidelines when working with any equipment that is connected to telephone wiring or to other network cabling:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. Port adapters and processor modules comprise printed circuit boards that are fixed in metal carriers. Electromagnetic interference (EMI) shielding and connectors are integral components of the carrier. Although the metal carrier helps to protect the board from ESD, use a preventive antistatic strap during handling.

Following are guidelines for preventing ESD damage:

- Always use an ESD wrist or ankle strap and ensure that it makes good skin contact.
- Connect the equipment end of the strap to an unfinished chassis surface.
- When installing a component, use any available ejector levers or captive installation screws to properly seat the bus connectors in the backplane or midplane. These devices prevent accidental removal, provide proper grounding for the system, and help to ensure that bus connectors are properly seated.
- When removing a component, use any available ejector levers or captive installation screws to release the bus connectors from the backplane or midplane.
- Handle carriers by available handles or edges only; avoid touching the printed circuit boards or connectors.
- Place a removed component board-side-up on an antistatic surface or in a static shielding container. If you plan to return the component to the factory, immediately place it in a static shielding container.
- Avoid contact between the printed circuit boards and clothing. The wrist strap only protects components from ESD voltages on the body; ESD voltages on clothing can still cause damage.
- Never attempt to remove the printed circuit board from the metal carrier.

Caution For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohms.

Fast Ethernet Overview

Each Fast Ethernet port on the FE-TX port adapter has an RJ-45 connector to attach to Category 5 unshielded twisted-pair (UTP) for 100BASE-TX, and a MII connector that permits connection through external transceivers to multimode fiber for 100BASE-FX, or to Category 3, 4, and 5 UTP or shielded twisted-pair (STP) for 100BASE-T4 physical media. Each Fast Ethernet port on the FE-FX port adapter has an SC-type fiber-optic connector for 100BASE-FX, and an MII connector that permits connection through external transceivers to multimode fiber for 100BASE-FX, or to Category 3, 4, and 5 UTP or shielded twisted-pair (STP) for 100BASE-T4 physical media.

The term *Ethernet* is commonly used for all carrier sense multiple access/collision detection (CSMA/CD), local-area networks (LANs) that generally conform to Ethernet specifications, including Fast Ethernet under IEEE 802.3u.

Note 100BASE-TX is intended for Environment A, and 100BASE-FX is intended for Environment B.

IEEE 802.3u is well suited to applications where a local communication medium must carry sporadic, occasionally heavy traffic at high peak data rates. Stations on a CSMA/CD LAN can access the network at any time. Before sending data, the station *listens* to the network to see if it is already in use. If it is, the station waits until the network is not in use, then transmits; this is half-duplex operation.

A collision occurs when two stations listen for network traffic, hear none, and transmit very close to simultaneously. When this happens, both transmissions are damaged, and the stations must retransmit. The stations detect the collision and use backoff algorithms to determine when they should retransmit. Both Ethernet and IEEE 802.3u are broadcast networks, which means that all stations see all transmissions. Each station must examine received frames to determine whether it is the intended destination and, if it is, pass the frame to a higher protocol layer for processing.

IEEE 802.3u specifies the following different physical layers for 100BASE-T:

- 100BASE-TX—100BASE-T, half and full duplex over Category 5 unshielded twisted-pair (UTP), Electronics Industry Association/Telecommunications Industry Association [EIA/TIA]–568-compliant cable
- 100BASE-FX—100BASE-T, half and full duplex over optical fiber
- 100BASE-T4—100BASE-T, half and full duplex over Category 3, 4, or 5 UTP or shielded twisted-pair (STP) cabling with four pairs; also called *4T+* or *T2*, which is 2-pair UTP over Category 3 cable.

Each physical layer protocol has a name that summarizes it characteristics in the format speed/signaling method/segment length where speed is the LAN speed in megabits per second (Mbps), signaling method is the signaling method used (either baseband or broadband), and segment length is typically the maximum length between stations in hundreds of meters. Therefore, 100BASE-T specifies a 100-Mbps, baseband LAN with maximum network segments of 100 meters (or 400 meters for 100BASE-FX).

IEEE 802.3u 100BASE-T Specifications

Table 1 lists the cabling specifications for 100-Mbps Fast Ethernet transmission over UTP, STP, and fiber-optic cables. Table 2 summarizes IEEE 802.3u 100BASE-T physical characteristics for 100BASE-TX and 100BASE-FX.

Table 1 Specifications and Connection Limits for 100-Mbps Transmission

Parameter	RJ-45	MII	SC-Type
Cable specification	Category 5[1] UTP[2], 22 to 24 AWG[3]	Category 3, 4, or 5, 150-ohm UTP or STP, or multimode optical fiber	62.5/125 multimode optical fiber
Maximum cable length	–	0.5 m (1.64 ft.) (MII-to-MII cable[4])	–
Maximum segment length	100 m (328 ft.) for 100BASE-TX	1 m (3.28 ft.)[5] or 400 m (1,312 ft.) for 100BASE-FX	100 m (328 ft.)
Maximum network length	200 m (656 ft)[5.] (with 1 repeater)	–	200 m (656 ft)[5.] (with 1 repeater)

1. EIA/TIA-568 or EIA-TIA-568 TSB-36 compliant.
2. Cisco Systems does not supply Category 5 UTP RJ-45 or 150-ohm STP MII cables. Both are available commercially.
3. AWG = American Wire Gauge. This gauge is specified by the EIA/TIA-568 standard.
4. This is the cable between the MII port on the FE port adapter and the appropriate transceiver.
5. This length is specifically between any two stations on a repeated segment.

Table 2 IEEE 802.3u Physical Characteristics

Parameter	100BASE-FX	100BASE-TX
Data rate (Mbps)	100	100
Signaling method	Baseband	Baseband
Maximum segment length (meters)	100 m between repeaters	100 m between DTE[1] and repeaters
Media	SC-type: dual simplex or single duplex for Rx and Tx	RJ-45MII
Topology	Star/Hub	Star/Hub

1. DTE = data terminal equipment.

What Are the FE-TX and FE-FX Port Adapters?

The FE-TX or FE-FX port adapters provide a 100-Mbps, 100BASE-T Fast Ethernet interface. Both full-duplex and half-duplex operation are supported for the FE-TX and FE-FX port adapters. Refer to the section “Fast Ethernet Overview” for additional information. The FE-TX and FE-FX port adapters are shown in Figure 1 and Figure 2.

Note While the VIP2 supports online insertion and removal (OIR), individual port adapters do not. To replace port adapters, you must first remove the VIP2 from the chassis, then replace port adapters as required.

Figure 1 FE-TX Port Adapter, Faceplate View

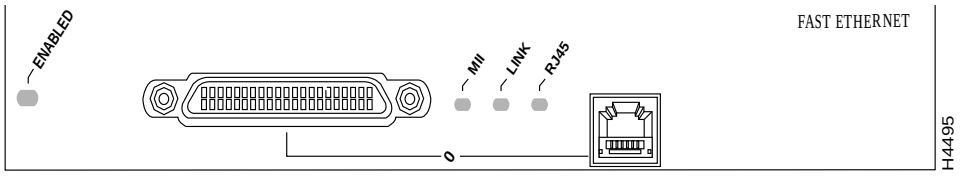
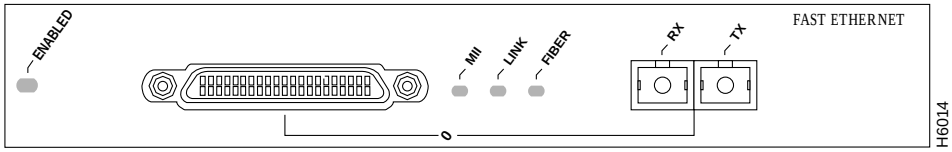


Figure 2 FE-FX Port Adapter, Faceplate View



The FE-TX and FE-FX port adapters can be installed on the VIP2 in port adapter slot 0 and port adapter slot 1, or in the Cisco 7200 series routers in any of the chassis’ port adapter slots: 1 through 6 for the Cisco 7206. Port adapters have a handle attached, but this handle is occasionally not shown to allow a full view of detail on the port adapter’s faceplate.

The following sections discuss the FE-TX and FE-FX port adapters:

- Port Adapter Locations on the VIP2 and in the Cisco 7200 Series Router, page 9
- FE Port Adapter LEDs, page 10
- FE Port Adapter Receptacles, Cables, and Pinouts, page 10

Port Adapter Locations on the VIP2 and in the Cisco 7200 Series Router

Figure 3 shows VIP2 with installed port adapters. With the VIP2 oriented as shown in Figure 3, the left port adapter is in port adapter slot 0, and the right port adapter is in port adapter slot 1. Port adapters have handles that allow for easy installation and removal; however, they are occasionally not shown in this publication to highlight port adapter faceplate detail. In the Cisco 7000, Cisco 7507, and Cisco 7513 chassis the VIP2 is installed vertically. In the Cisco 7010 and Cisco 7505 chassis the VIP2 is installed horizontally.

Figure 3 VIP2 with Two Port Adapters Installed (Horizontal Orientation Shown)

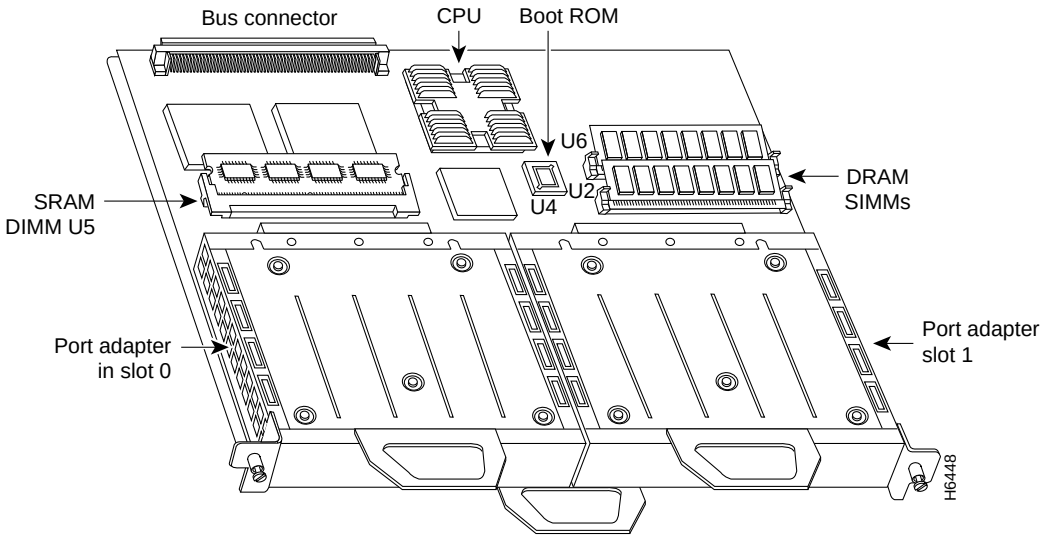
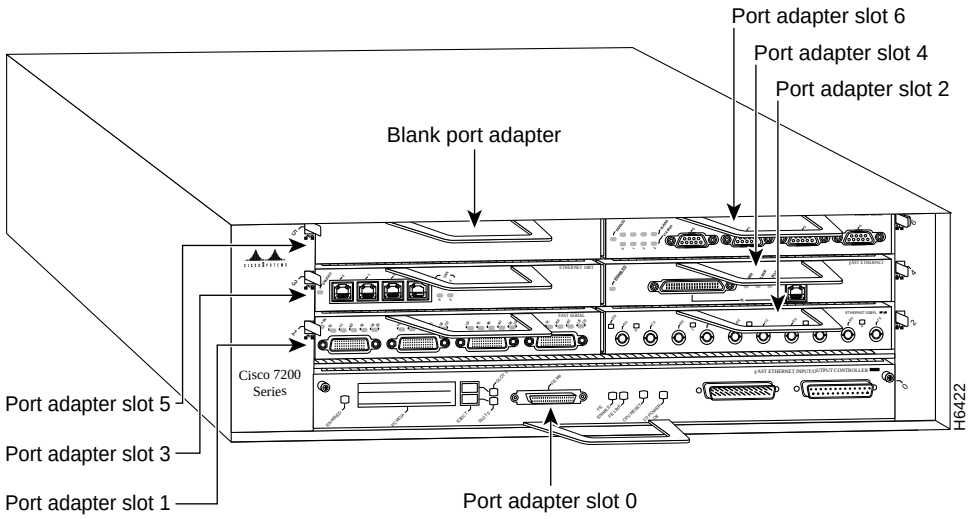


Figure 4 shows a Cisco 7206 with port adapters installed. In the Cisco 7206, port adapter slot 1 is in the lower left position and port adapter slot 6 is in the upper right position.

Figure 4 Cisco 7206 with Port Adapters Installed



FE Port Adapter LEDs

The FE-TX and FE-FX port adapters contain the enabled LED, standard on all port adapters, and a bank of three status LEDs for the ports. After system initialization, the enabled LED goes on to indicate that the FE-TX port adapter has been enabled for operation. (The LEDs are shown in Figure 5.) The following conditions must be met before the enabled LED goes on:

- The FE port adapter is correctly connected and receiving power
- The FE-equipped card or chassis contains a valid microcode version that has been downloaded successfully
- The bus recognizes the FE port adapter or FE-equipped VIP2.

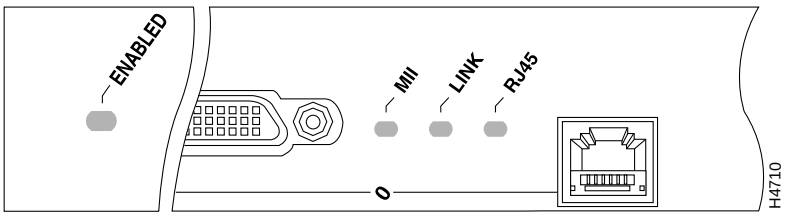
If any of these conditions is not met, or if the initialization fails for other reasons, the enabled LED does not go on.

Following are the three status LEDs and an explanation of what each indicates:

- MII—On when the MII port is selected as the active port by the controller.
- Link—When the RJ-45 or SC port is active, this LED is on when the port adapter is receiving a carrier signal from the network. When the MII port is active, this LED is an indication of network activity, and it flickers on and off proportionally to this activity.
- RJ-45 (or FIBER on FE-FX)—On when the RJ-45 (or FIBER) port is selected as the active port by the controller.

Either the MII LED *or* the RJ-45 (or FIBER) LED should be on at any one time; never both.

Figure 5 LEDs on the FE Port Adapter (Partial Faceplate View of FE-TX)



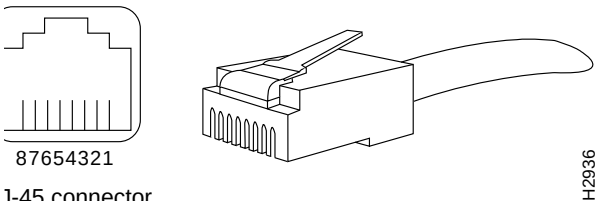
Note In the Cisco 7000, Cisco 7507, and Cisco 7513 chassis the VIP2 is installed vertically. In the Cisco 7010 and Cisco 7505 chassis, the VIP2 is installed horizontally.

FE Port Adapter Receptacles, Cables, and Pinouts

The two interface receptacles on the FE port adapter are a single MII, 40-pin, D-shell type, and a single RJ-45 (or SC-type for FE-FX optical-fiber connections). You can use either one or the other. Only one receptacle can be used at one time. Each connection supports IEEE 802.3u interfaces compliant with the 100BASE-X and 100BASE-T standards. The RJ-45 connection does not require an external transceiver. The MII connection requires an external physical sublayer (PHY) and an external transceiver.

Figure 6 shows the RJ-45 cable connectors. Cisco Systems does not supply Category 5 UTP RJ-45 cables; these cables are available commercially. Table 3 lists the pinouts and signals for the FE-TX RJ-45 connectors.

Figure 6 FE-TX RJ-45 Connections, Plug and Receptacle



Warning The ports labeled “Ethernet,” “10BaseT,” “Token Ring,” “Console,” and “AUX” are safety extra-low voltage (SELV) circuits. SELV circuits should only be connected to other SELV circuits. Because the BRI circuits are treated like telephone-network voltage, avoid connecting the SELV circuit to the telephone network voltage (TNV) circuits. (For translated versions of this warning, refer to the section “SELV Circuit Warning Translations” on page page 44.)

Table 3 FE-TX RJ-45 Connector Pinout

Pin	Description
1	Receive Data + (RxD+)
2	RxD–
3	Transmit Data + (TxD+)
6	TxD–

Note Referring to the RJ-45 pinout in Table 3, proper common-mode line terminations should be used for the unused Category 5, UTP cable pairs 4/5 and 7/8. Common-mode termination reduces the contributions to electromagnetic interference (EMI) and susceptibility to common-mode sources. Wire pairs 4/5 and 7/8 are actively terminated in the RJ-45, 100BASE-TX port circuitry in the FE-TX port adapter.

Depending on your RJ-45 interface cabling requirements, use the pinouts in Figure 7 and Figure 8.

Figure 7 Straight-Through Cable Pinout, FE-TX RJ-45 Connection to a Hub or Repeater

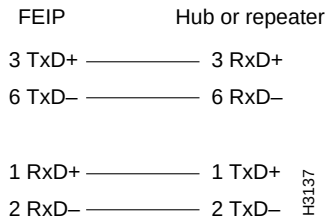


Figure 8 Crossover Cable Pinout, FE-TX RJ-45 Connections Between Hubs and Repeaters

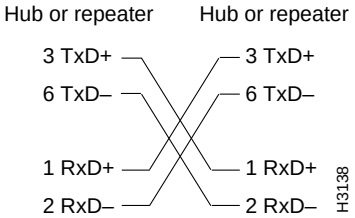


Figure 9 shows the duplex SC connector (one required for both transmit and receive), and Figure 10 shows the simplex SC connector (two required, one for each transmit and receive) used for FE-FX optical-fiber connections. These multimode optical-fiber cables are commercially available, and are not available from Cisco Systems.

Figure 9 FE-FX Duplex SC Connector

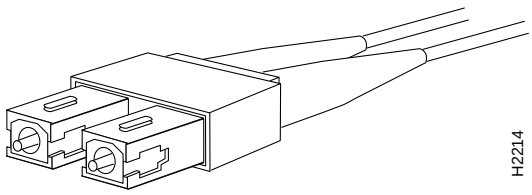
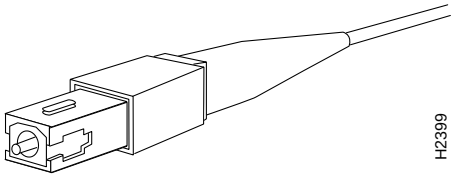


Figure 10 FE-FX Simplex SC Connector



Depending on the type of media you use between the MII connection on the port adapter and your switch or hub, the network side of your 100BASE-T transceiver should be appropriately equipped with ST-type connectors (for optical fiber), BNC connectors, and so forth. Figure 11 shows the pin orientation of the female MII connector on the port adapter. The port adapters are field-replacable units (FRUs).

The MII receptacle uses 2-56 screw-type locks, called *jackscrews* (shown in Figure 11), to secure the cable or transceiver to the MII port. MII cables and transceivers have knurled thumbscrews (screws you can tighten with your fingers) that you fasten to the jackscrews on the FE-TX port adapter's MII connector. Use the jackscrews to provide strain relief for your MII cable. (The RJ-45 modular plug has strain relief functionality incorporated into the design of its standard plastic connector.) Figure 11 shows the MII female connector.

Figure 11 FE-TX or FE-FX MII Connection, Receptacle

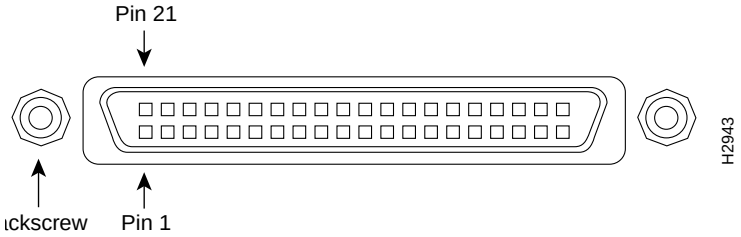


Table 4 lists the MII connector pinout and signals. MII cables are available commercially, and are not available from Cisco Systems. Table 4 refers to MII cables used between the MII connector on the FE-TX port adapter and an appropriate transceiver. The connection between this transceiver and your network can be Category 3, 4, or 5, 150-ohm UTP or STP, or multimode optical fiber.

Table 4 MII Connector Pinout

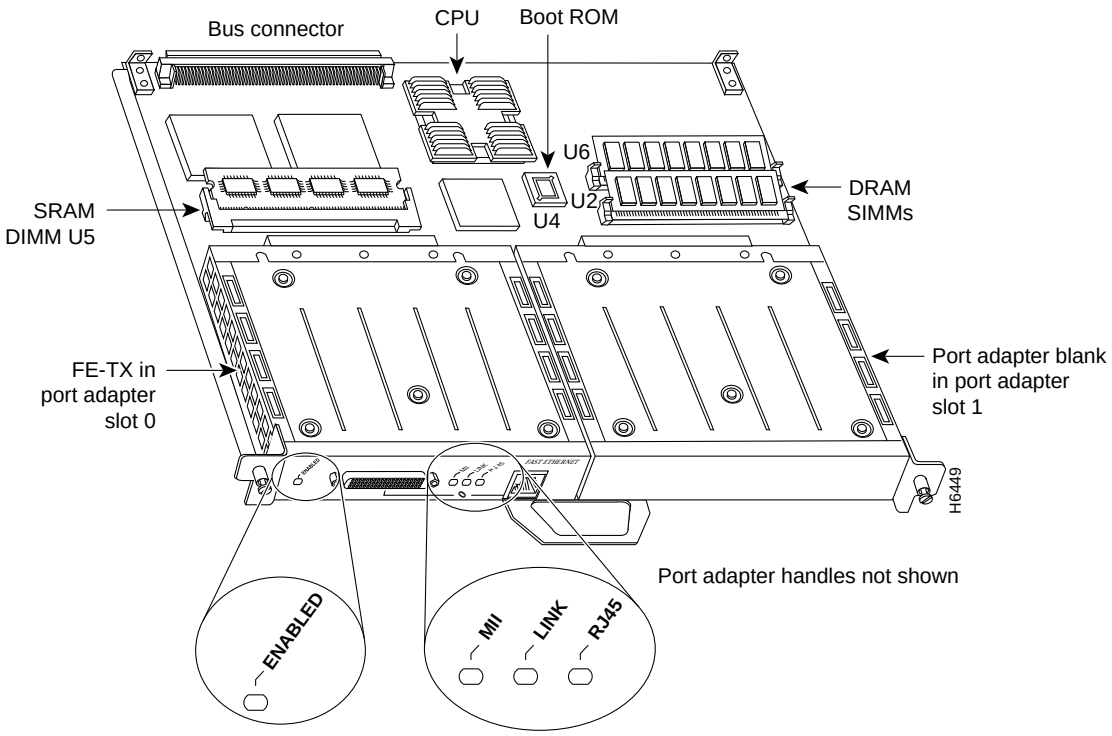
Pin[1]	In	Out	In/Out	Description
14–17	–	Yes	–	Transmit Data (TxD)
12	Yes	–	–	Transmit Clock (Tx_CLK)[2]
11	–	Yes	–	Transmit Error (Tx_ER)
13	–	Yes	–	Transmit Enable (Tx_EN)
3	–	Yes	–	MII Data Clock (MDC)
4–7	Yes	–	–	Receive Data (RxD)
9	Yes	–	–	Receive Clock (Rx_CLK)
10	Yes	–	–	Receive Error (Rx_ER)
8	Yes	–	–	Receive Data Valid (Rx_DV)
18	Yes	–	–	Collision (COL)
19	Yes	–	–	Carrier Sense (CRS)
2	–	–	Yes	MII Data Input/Output (MDIO)
22–39	–	–	–	Common (ground)
1, 20, 21, 40	–	–	–	+5.0 volts (V)

1. Any pins not indicated are not used.
2. Tx_CLK and Rx_CLK are generated by the external transceiver.

VIP2 and the FE-TX and FE-FX Port Adapters

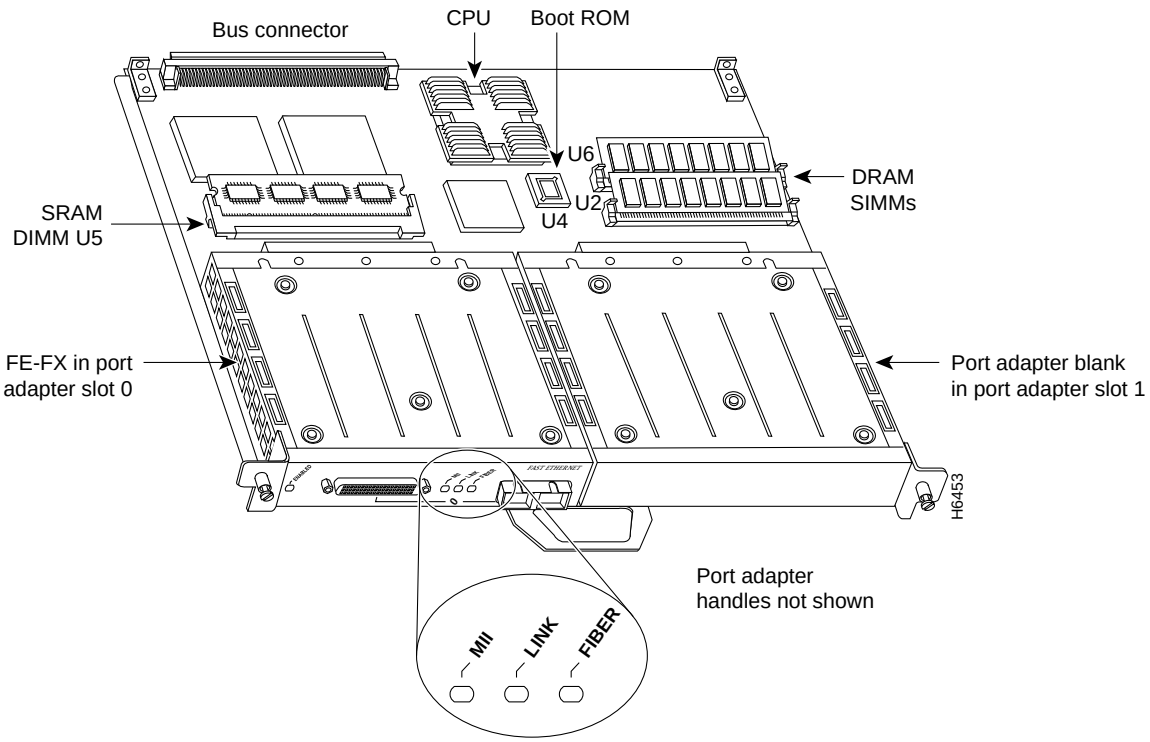
The FE-TX and FE-FX port adapters are used on the VIP2, and can be installed in either port adapter slot 0 or port adapter slot 1. Figure 12 shows a FE-TX port adapter installed in port adapter slot 0 on a VIP2. Figure 13 shows a FE-FX port adapter installed in port adapter slot 0 on a VIP2.

Figure 12 VIP2 with an FE-TX Port Adapter Port Adapter Slot 0



Note The FE-FX port adapter has the MII connector like the FE-TX port adapter, but has an SC-type fiber-optic connector in place of the RJ-45 connector.

Figure 13 VIP2 with an FE-FX Port Adapter Port Adapter Slot 0



The following sections include information specific to the FE-TX and FE-FX port adapters and their use on the second-generation Versatile Interface Processor (VIP2) in Cisco 7000 family routers:

- Installing or Replacing a Port Adapter on a VIP2, page 16
- Attaching FE-TX and FE-FX Port Adapter Interface Cables, page 20
- Configuring the Fast Ethernet Interface, page 22
  - Selecting Chassis Slot, Port Adapter, and Fast Ethernet Interface Port Numbers, page 22
  - Configuring Interfaces—Descriptions and Examples, page 23
  - Checking the Configuration, page 25
- Cisco 7200 Series and the FE-TX and FE-FX Port Adapters, page 30

Installing or Replacing a Port Adapter on a VIP2

Depending on the circumstances you might need to install a new port adapter on a VIP2 motherboard or replace a failed port adapter in the field. In either case, you need a number 1 Phillips screwdriver, an antistatic mat onto which you can place the removed interface processor, and an antistatic container into which you can place a failed port adapter for shipment back to the factory.

Caution To prevent system problems, do not remove port adapters from the VIP2 motherboard, or attempt to install other port adapters on the VIP2 motherboard while the system is operating. To install or replace port adapters, first remove the VIP2 from its interface processor slot.

Note Each port adapter circuit board is mounted to a metal carrier and is sensitive to ESD damage. The following procedures should be performed by a Cisco-certified service provider only. While the VIP2 supports online insertion and removal (OIR), individual port adapters do not. To replace port adapters, you must first remove the VIP2 from the chassis, then install or replace port adapters as required. If a blank port adapter is installed on the VIP2 in which you want to install a new port adapter, you must first remove the VIP2 from the chassis, then remove the blank port adapter.

When only one port adapter is installed on a VIP2, a blank port adapter must fill the empty slot to allow the VIP2 and router chassis to conform to electromagnetic interference (EMI) emissions requirements, and so that air flows through the chassis properly. If you plan to install a new port adapter, you must first remove the blank port adapter.

Following is the standard procedure for removing and replacing any type of port adapter on the VIP2:

Step 1 Attach an ESD-preventive wrist strap between you and an unfinished chassis surface.

Note If you want to install a new port adapter on a VIP2 with a single port adapter, you must first remove the blank port adapter from the port adapter slot in which you want to install the new port adapter.

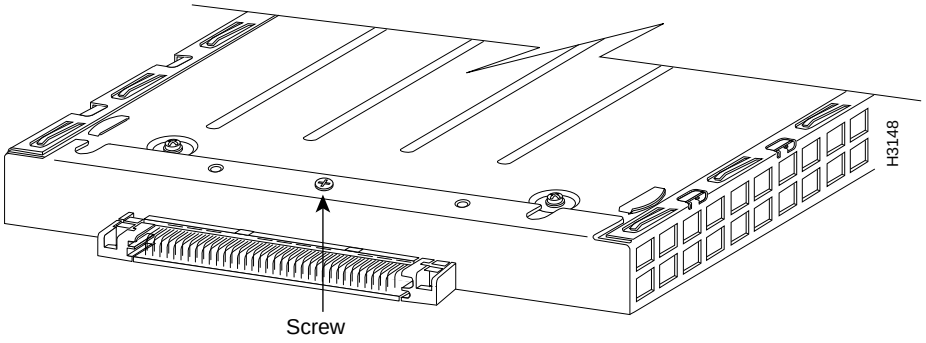
Step 2 For a new port adapter installation or a port adapter replacement, disconnect any interface cables from the ports on the front of the port adapter, although, this is not required. You can remove VIP2s with cables attached; however, we do not recommend it.

Step 3 To remove the VIP2 from the chassis, follow the steps in the section “Removing a VIP2” in the configuration note *Versatile Interface Processor (VIP2) Installation, Configuration, and Maintenance* (Document Number 78-2658-xx), which shipped with your VIP2.

Step 4 Place the removed VIP2 on an antistatic mat.

Step 5 Locate the screw at the rear of the port adapter (or blank port adapter) to be replaced. (See Figure 14.) This screw secures the port adapter (or blank port adapter) to its slot.

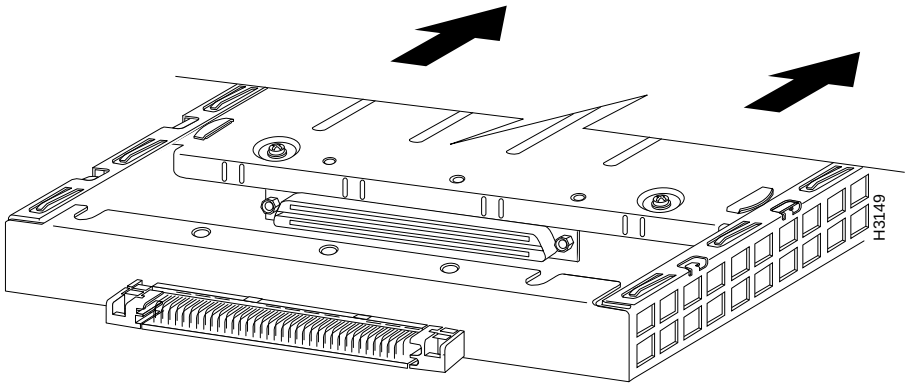
Figure 14 Location of Port Adapter Screw, Partial Port Adapter View



Step 6 Remove the screw that secures the port adapter (or blank port adapter).

Step 7 With the screw removed, grasp the handle on the front of the port adapter (or blank port adapter) and carefully pull it out of its slot, away from the edge connector at the rear of the slot. (See Figure 15.)

Figure 15 Pulling a Port Adapter Out of a Slot, Partial Port Adapter View

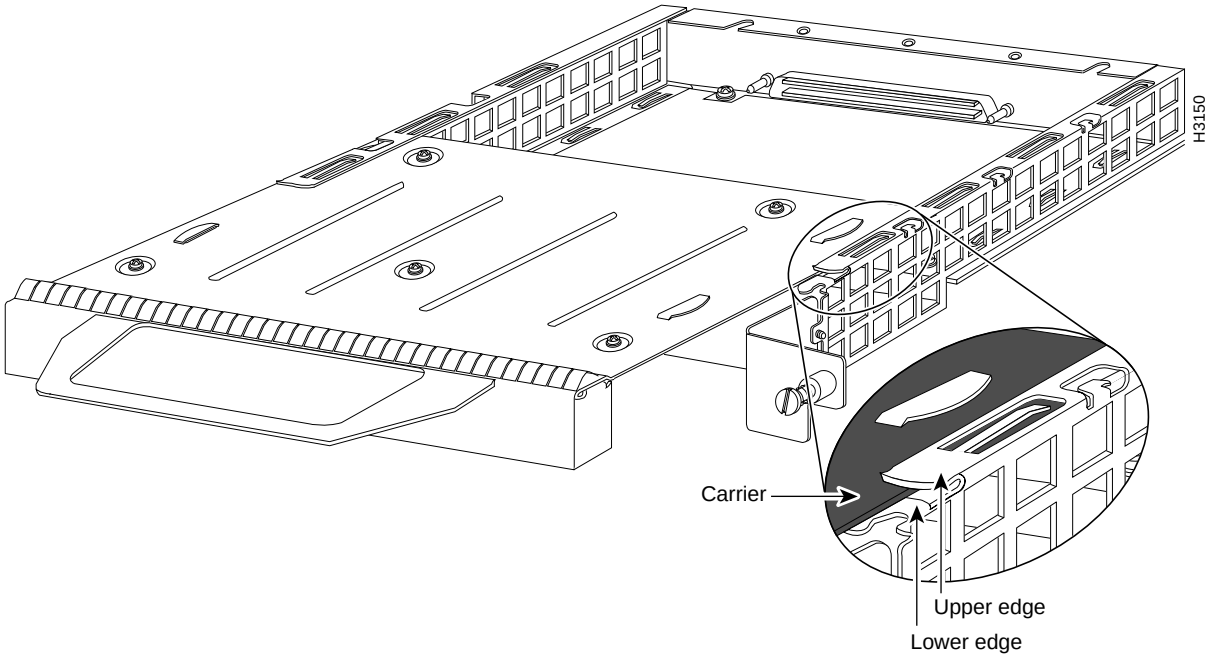


Step 8 If you removed a port adapter, place it in an antistatic container for safe storage or shipment back to the factory. If you removed a blank port adapter, no special handling is required; however, store the blank port adapter for potential future use.

Step 9 Remove the new port adapter from its antistatic container and position it at the opening of the slot. (See Figure 16.)

Caution To prevent jamming the carrier between the upper and lower edges of the port adapter slot, and to assure that the edge connector at the rear of the port adapter mates with the connector at the rear of the port adapter slot, make certain that the leading edges of the carrier are between the upper and lower slot edges, as shown in the cutaway in Figure 16.

Figure 16 Removing a Port Adapter

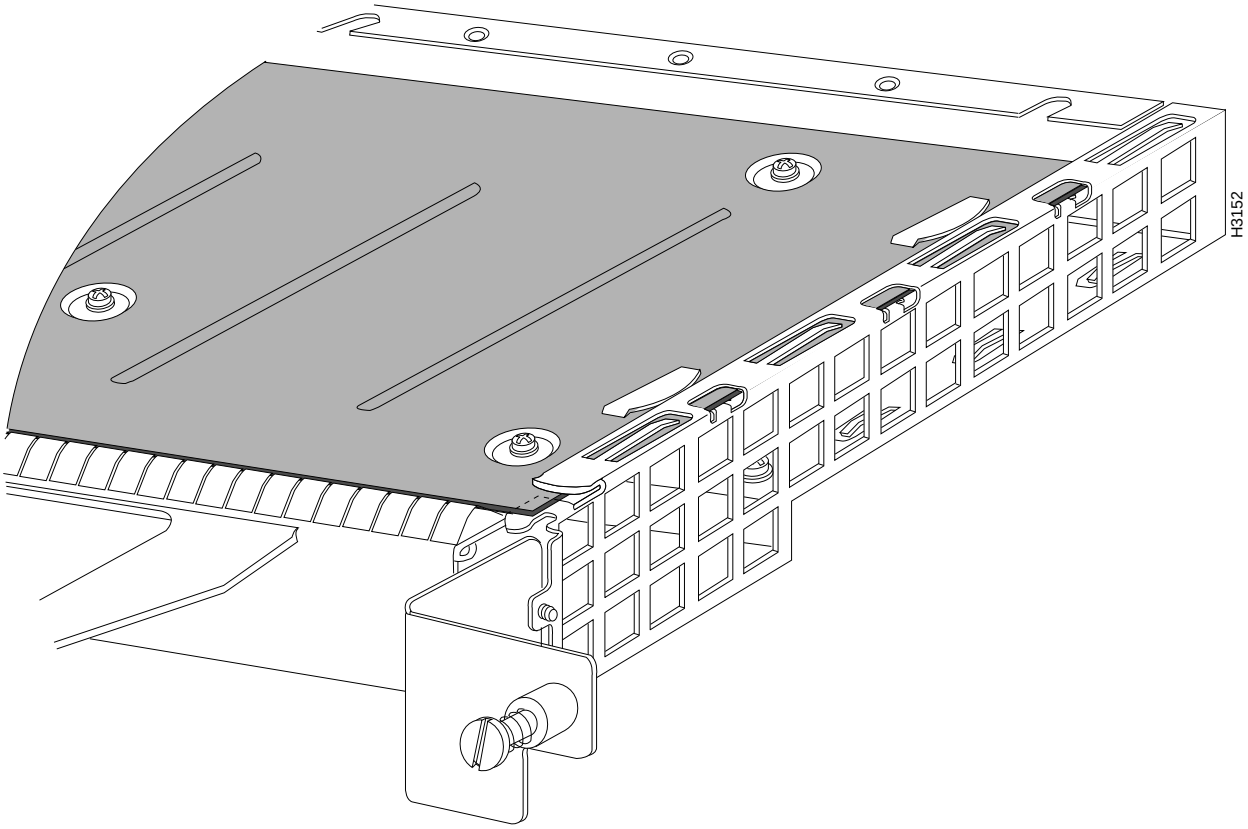


Step 10 Before you begin to insert the new port adapter in its slot, verify that the port adapter carrier should be between the upper and lower slot edges, as shown in Figure 17. Do not jam the carrier between the slot edges.

Caution To ensure a positive ground attachment between the port adapter carrier and the VIP2 motherboard and port adapter slot, and to ensure that the connectors at the rear of the port adapter and slot mate properly, the carrier must be between the upper and lower slot edges, as shown in Figure 17.

Step 11 Carefully slide the new port adapter into the port adapter slot until the connector on the port adapter is completely mated with the connector on the motherboard.

Figure 17 Aligning the Carrier Edge with Upper and Lower Slot Edges, Partial View



Step 12 Install the screw in the rear of the port adapter slot. (See Figure 14 for its location.) Do not overtighten this screw.

Step 13 To replace the VIP2 in the chassis, follow the steps in the section "Installing a VIP2," in the configuration note *Versatile Interface Processor (VIP2) Installation, Configuration, and Maintenance* (Document Number 78-2658-xx), which shipped with your VIP2.

Step 14 If disconnected, reconnect the interface cables to the interface processor.

This completes the procedure for installing a new port adapter or replacing a port adapter on a VIP2.

Attaching FE-TX and FE-FX Port Adapter Interface Cables

On a single FE port adapter, you can use *either* the RJ-45 (or SC for FE-FX) connection *or* the MII connection. If you have two FE port adapters on your VIP2, you can use the RJ-45 (or SC for FE-FX) connection on one port adapter and the MII connection on the other port adapter.

Note RJ-45, SC, and MII cables are not available from Cisco Systems; they are available from outside commercial cable vendors.

Connect RJ-45, SC (FE-FX), or MII cables as follows:

Step 1 If you have MII connections, attach an MII cable directly to the MII port on the FE port adapter or attach a 100BASE-T transceiver, with the media appropriate to your application, to the MII port on the FE port adapter. (See Figure 18 for FE-TX or Figure 19 for FE-FX.)

If you have RJ-45 connections, attach the Category 5 UTP cable directly to the RJ-45 port on the FE port adapter. (See Figure 18 for FE-TX or Figure 19 for FE-FX.) The FE port adapter is an end station device and not a repeater. You *must* connect the FE port adapter to a repeater or hub.

If you have an SC connection (FE-FX port adapter), attach the cable directly to the SC port on the FE-FX port adapter. (See Figure 19.) Use either one duplex SC connector, or two simplex SC connectors, and observe the correct relationship between the receive (RX) and transmit (TX) ports on the FE-FX port adapter and your repeater.

Note Each FE (FX or TX) port adapter can have *either* an MII attachment or an RJ-45 (or SC) attachment, but not both simultaneously. The MII and RJ-45 (or SC) receptacles represent two physical connection options for one Fast Ethernet interface.

Figure 18 Connecting FE-TX MII or RJ-45 Cables (Horizontal Orientation—Shown without Handles)

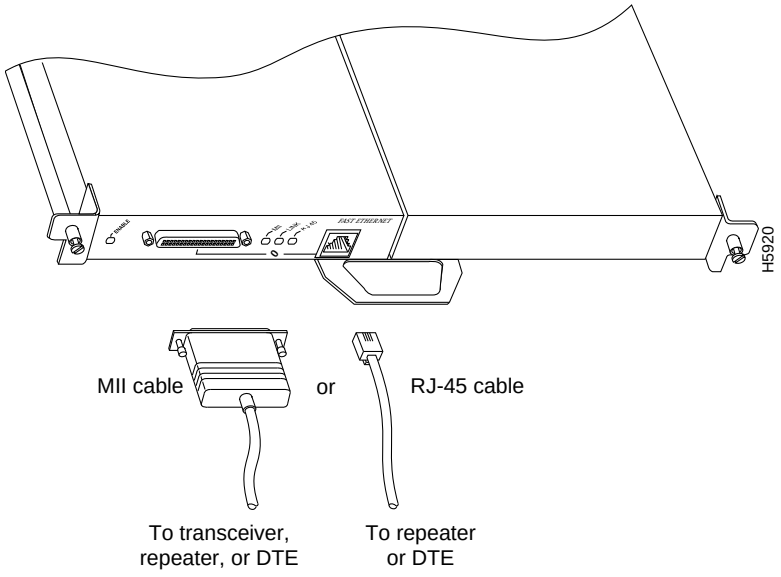
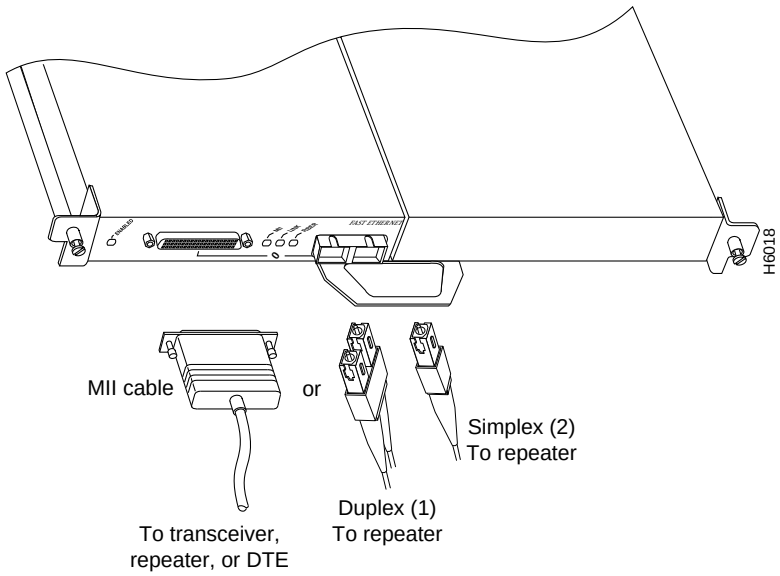


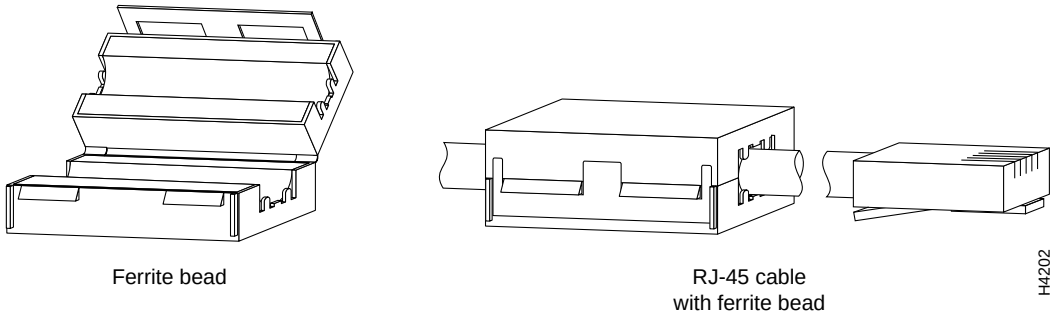
Figure 19 Connecting FE-FX MII or SC Cables (Horizontal Orientation—Shown without Handles)



Step 2 For the FE-TX, attach the ferrite bead to the RJ-45 cable (at either end), as shown in Figure 20.

Caution The ferrite bead prevents electromagnetic interference (EMI) from affecting the FE-TX-equipped system and is a required component for proper system operation.

Figure 20 Attaching the Ferrite Bead around the RJ-45 Cable



Caution To prevent problems on your FE port adapter and network, do not simultaneously connect RJ-45 (or SC) *and* MII cables to one FE port adapter. On a single FE port adapter, only one network connection can be used at one time. Only connect cables that comply with EIA/TIA-568 standards. (Refer to Table 1 and Table 2 on page 7 for cable recommendations and specifications.)

Step 3 Attach the network end of your RJ-45 (SC) or MII cable to your 100BASE-T transceiver, switch, hub, repeater, DTE, or other external 100BASE-T equipment.

This completes the FE port adapter cable installation.

Configuring the Fast Ethernet Interface

If you installed a new FE interface or if you want to change the configuration of an existing interface, you must enter Configuration mode, using the **configuration** command. If you replaced an interface that was previously configured, the system will recognize the new interface and bring it up in its existing configuration.

After you verify that the new FE interface is installed correctly (the enabled LED goes on), use the privileged-level **configure** command to configure the new interfaces. Be prepared with the information you will need, such as the following:

- Protocols you plan to route on each new interface
- Internet protocol (IP) addresses if you plan to configure the interfaces for IP routing
- Whether the new interfaces will use bridging

For a summary of the configuration options available and instructions for configuring the Fast Ethernet interfaces on the VIP2, refer to the appropriate configuration publications listed in the section "If You Need More Information" on page 2.

The **configure** command requires privileged-level access to the EXEC command interpreter, which usually requires a password. Contact your system administrator if necessary to obtain EXEC-level access.

Note Each FE interface on a FE-TX or FE-FX port adapter can be configured at 100 Mbps, half duplex or full duplex, for a maximum aggregate bandwidth of 200 Mbps per VIP2.

Selecting Chassis Slot, Port Adapter, and Fast Ethernet Interface Port Numbers

The following section describes how to identify chassis slot, port adapter, and Fast Ethernet interface port numbers.

Note Although the processor slots in the Cisco 7000, Cisco 7507, and Cisco 7513 are vertically oriented and those in the Cisco 7010 and Cisco 7505 are horizontally oriented, all models use the same method for slot and port numbering.

In the router, physical port addresses specify the actual physical location of each interface port on the router interface processor end. (See the example of an FE-TX port adapter shown in Figure 21.) This address is composed of a three-part number in the format *chassis slot number/port adapter number/interface port number.*

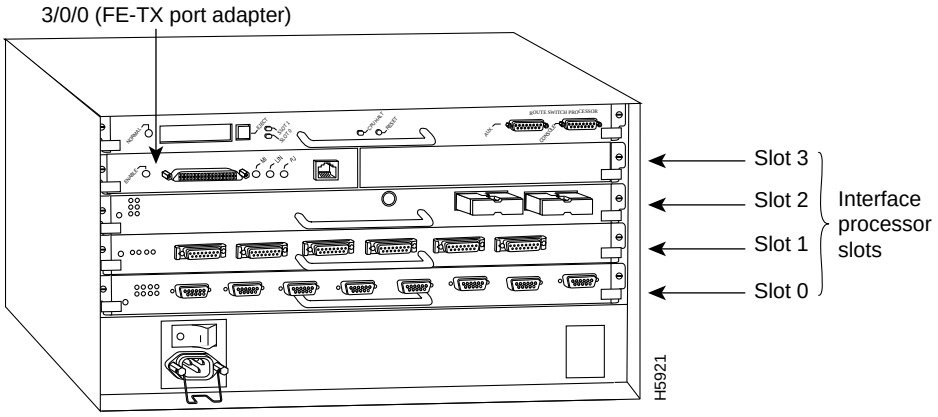
- The first number identifies the chassis slot in which the VIP2 is installed (as shown in the example system in Figure 21).
- The second number identifies the physical port adapter number on the VIP2, and is port adapter slot 0.
- The third number identifies the interface port on the FE port adapter, which is always numbered as interface 0.

Interface ports on the VIP2 maintain the same address regardless of whether other interface processors are installed or removed. However, when you move a VIP2 to a different slot, the first number in the address changes to reflect the new slot number.

Figure 21 shows some of the slot port adapter and interface ports of a sample Cisco 7505 system. The first port adapter slot number is 0 and the second port adapter slot number is 1. The individual FE interface numbers are always 0. For example, on the FE-quipped VIP2 in slot 3 (shown in Figure 21), the address of the FE interface is 3/0/0 (chassis slot 3, port adapter slot 0, and interface port 0). If a second FE port adapter was installed in port adapter slot 1 on this VIP2, its address would be 3/1/0.

Note If you remove the FE-equipped VIP2 (shown in Figure 21) from slot 3 and install it in chassis slot 2, the address of this FE port becomes 2/0/0.

Figure 21 Fast Ethernet Interface Port Number Example (Cisco 7505 Shown)



Note: The MII and RJ-45 interface ports on the first port adapter are both numbered as interface port 0. Only one of them can be used on each port adapter, at one time.

You can identify interface ports by physically checking the slot/port adapter/interface port location on the back of the router or by using software commands to display information about a specific interface or all interfaces in the router.

Configuring Interfaces—Descriptions and Examples

The following steps describe a basic configuration. Press the **Return** key after each step unless otherwise noted. At any time you can exit the privileged level and return to the user level by entering **disable** at the prompt as follows:

```
Router# disable

Router>
```

Following is a basic configuration procedure:

Step 1 At the privileged-level prompt, enter Configuration mode and specify that the console terminal will be the source of the configuration subcommands, as follows:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#
```

Step 2 At the prompt, specify the first interface to configure by entering the subcommand **interface**, followed by the *type* (**fe**) *and slot/port* (interface processor slot number/0). The example that follows is for the first interface of the first port adapter, on a VIP2 in interface processor slot 1:

```
Router(config)# interface fe 1/0/0
```

Step 3 If IP routing is enabled on the system, you can assign an IP address and subnet mask to the interface with the **ip address** configuration subcommand, as in the following example:

```
Router(config-int)# ip address 1.1.1.10 255.255.255.0
```

Step 4 Add any additional configuration subcommands required to enable routing protocols and set the interface characteristics.

Step 5 Change the shutdown state to up and enable the interface as follows:

```
Router(config-int)# no shutdown
```

Step 6 Configure additional interfaces on additional FE port adapters as required.

Step 7 When you have included all of the configuration subcommands to complete the configuration, press **Ctrl-Z** to exit Configuration mode.

Step 8 Write the new configuration to nonvolatile memory as follows:

```
Router# copy running-config startup-config
[OK]
Router#
```

Following are descriptions and examples of the commands for configuring the FE interface 3/0/0 (slot 3, port adapter 0, Fast Ethernet interface port 0). Descriptions are limited to fields that are relevant for establishing and verifying the configuration. After configuring the new FE interface, use **show** commands to display the status of the new interface or all interfaces, or to verify changes you have made.

Depending on the requirements for your system configuration and the protocols you plan to route on the interface, you might also need to enter other configuration subcommands. For complete descriptions of configuration subcommands and the configuration options available for Fast Ethernet interfaces, refer to the publications listed in the section “If You Need More Information” on page 2.

FE half-duplex operation is the default. To change to full-duplex operation, use the following series of commands:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#

Router(config)# interface fastethernet 3/0/0
Router(config-if)# full-duplex
Ctrl-z
```

Using the **show interfaces fastethernet** command, you can see that the 3/0/0 Fast Ethernet interface is now configured for full-duplex operation, as follows:

```
Router# sh int fa 3/0/0
FastEthernet 3/0/0 is administratively up, line protocol is up

  (display text omitted)

  Encapsulation ARPA, loopback not set, keepalive not set, fdx, 100BaseTX
```

To return the interface to half-duplex operation, use the **no full-duplex** configuration command, as follows:

```
Router# config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# int fa 3/0/0
Router(config-if)# no full-duplex
Ctrl-z
Router#
```

Using the **show interfaces fastethernet** command, you can see that the 3/0/0 Fast Ethernet interface is now configured for half-duplex operation, as follows:

```
Router# sh int fa 3/0/0
FastEthernet3/0/0 is administratively up, line protocol is up

  (display text omitted)

  Encapsulation ARPA, loopback not set, keepalive not set, hdx, 100BaseTX

  (display text omitted)
```

The RJ-45 connection is the default for FE-TX (or SC for FE-FX). To change to an MII connection and then verify it, use the following series of commands, including the **media-type** configuration command:

```
Router# config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# int fa 3/0/0
Router(config-if)# media-type mii
Ctrl-z

Router# sh int fa 3/0/0
FastEthernet3/0/0 is administratively up, line protocol is up

  (display text omitted)

  Encapsulation ARPA, loopback not set, keepalive not set, hdx, MII

  (display text omitted)
```

Use the **media-type 100** configuration command to return the interface to its default state for RJ-45 or SC (fiber-optic) connections.

Checking the Configuration

After configuring the new interface, use the **show** commands to display the status of the new interface or all interfaces and the **ping** command to check connectivity.

Using show Commands to Verify the VIP2 Status

The following steps use **show** commands to verify that the new interfaces are configured and operating correctly.

Step 1 Use the **show version** command to display the system hardware configuration. Ensure that the list includes the new interfaces.

Step 2 Display all the current interface processors and their interfaces with the **show controllers cbus** command. Verify that the new VIP2 appears in the correct slot.

Step 3 Specify one of the new interfaces with the **show interfaces** *type slot/port adapter/interface* command and verify that the first line of the display specifies the interface with the correct slot number. Also verify that the interface and line protocol are in the correct state: up or down.

Step 4 Display the protocols configured for the entire system and specific interfaces with the **show protocols** command. If necessary, return to Configuration mode to add or remove protocol routing on the system or specific interfaces.

Step 5 Display the running configuration file with the **show running-config** command. Display the configuration stored in NVRAM using the **show startup-config** command. Verify that the configuration is accurate for the system and each interface.

If the interface is down and you configured it as up, or if the displays indicate that the hardware is not functioning properly, ensure that the network interface is properly connected and terminated. If you still have problems bringing the interface up, contact a service representative for assistance.

Using show Commands to Display Interface Information

To display information about a specific interface, use the **show interfaces** command with the interface type and port address in the format **show interfaces** [*type slot/port adapter/port*].

Following is an example of how the **show interfaces** command displays status information (including the physical slot and port address) for the interface you specify. In this example, most of the status information for each interface is omitted, and a Fast Ethernet interface in slot 3 is used.

```
Router# sh int fa 3/0/0
FastEthernet3/0/0 is administratively down, line protocol is down
  Hardware is cyBus FastEthernet Interface, address is 0000.0ca5.2380 (bia 0000)
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive set (10 sec), hdx, 100BaseTX

(display text omitted)
```

The Fast Ethernet interface port adapter is numbered as port adapter 0. The MII and RJ-45 (or SC) ports on a port adapter each have the same port number because only one of them can be used at one time. The single Fast Ethernet port on the FE port adapter is interface 0.

With the **show interfaces** *type slot/port adapter/por*t command, use arguments such as the interface type (fastethernet, and so forth) and the port number (slot/port) to display information about a specific interface only. The following example of the **show interfaces fastethernet** command shows information specific to the Fast Ethernet interface on the first FE port adapter in slot 3:

```
Router# show interfaces fastethernet 3/0/0
FastEthernet3/0/0 is administratively down, line protocol is down
  Hardware is cyBus FastEthernet Interface, address is 0000.0ca5.2380 (bia 0000)
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive set (10 sec), hdx, 100BaseTX
  ARP type: ARPA, ARP Timeout 4:00:00
  Last input 3:08:43, output 3:08:42, output hang never
  Last clearing of "show interface" counters 2:58:36
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 watchdog, 0 multicast
     0 input packets with dribble condition detected
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets, 0 restarts
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

The **show version** (or **show hardware**) command displays the configuration of the system hardware (the number of each interface processor type installed), the software version, the names and sources of configuration files, and the boot images. Following is an example of the **show version** command used with a Cisco 7500 series system:

```
Router# show version

Cisco Internetwork Operating System Software
IOS (tm) GS Software (RSP-A), Version 11.1(471) [mpo 105]
Copyright (c) 1986-1995 by cisco Systems, Inc.
Compiled Fri 06-Oct-95 12:22 by mpo
Image text-base: 0x600088A0, data-base: 0x605A4000
ROM: System Bootstrap, Version 5.3(16645) [biff 571], RELEASED SOFTWARE
ROM: GS Bootstrap Software (RSP-BOOT-M), Version 11.0(1.2), MAINTENANCE
honda uptime is 4 hours, 22 minutes
System restarted by reload
System image file is "slot0:rsp-a111-1", booted via slot0

cisco RSP2 (R4600) processor with 32768K bytes of memory.
R4600 processor, Implementation 32, Revision 2.0
Last reset from power-on
G.703/E1 software, Version 1.0.
Bridging software.
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
Chassis Interface.
1 VIP2 controllers (1 FastEthernet).
1 FastEthernet/IEEE 802.3 interfaces.
125K bytes of non-volatile configuration memory.

20480K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
8192K bytes of Flash internal SIMM (Sector size 256K).
No slave installed in slot 6.
Configuration register is 0x2
```

To determine which type of port adapter is installed on a VIP2 in your system, use the **show diag** *slot* command. Specific port adapter information is displayed, as shown in the following example of an FE-FX port adapter in chassis slot 1:

```
Router# show diag 1
Slot 1:
        Physical slot 1, ~physical slot 0xE, logical slot 1, CBus 0
        Microcode Status 0xC
        Master Enable, LED, WCS Loaded
        Board is analyzed
        Pending I/O Status: Console I/O
        EEPROM format version 1
        VIP2 controller, HW rev 2.2, board revision UNKNOWN
        Serial number: 03508056  Part number: 73-1554-02
        Test history: 0x00        RMA number: 43-27-00
        Flags: cisco 7000 board; 7500 compatible

        EEPROM contents (hex):
          0x20: 01 15 02 02 00 35 87 58 49 06 12 02 00 2B 1B 00
          0x30: 12 2B 00 2A 1A 00 00 00 00 00 00 00 00 00 00 00

        Slot database information:
        Flags: 0x4      Insertion time: 0x10DC (00:01:17 ago)

        Controller Memory Size: 8 MBytes

        PA Bay 0 Information:
                Fast-Ethernet PA, 1 ports, 100BaseFX-ISL
                EEPROM format version 1
                HW rev 1.0, Board revision 43
                Serial number: 02826254  Part number: 73-1690-02
```

For complete VIP2 command descriptions and examples, refer to the publications listed in the section “If You Need More Information” on page 2.

Using the ping Command

The *packet internet groper* (**ping**) command allows you to verify that an interface port is functioning properly and to check the path between a specific port and connected devices at various locations on the network. This section provides brief descriptions of the **ping** command. After you verify that the system and VIP2 have booted successfully and are operational, you can use this command to verify the status of interface ports. Refer to the publications listed in the section “If You Need More Information” on page 2, for detailed command descriptions and examples.

The **ping** command sends an echo request out to a remote device at an IP address that you specify. After sending a series of signals, the command waits a specified time for the remote device to echo the signals. Each returned signal is displayed as an exclamation point (!) on the console terminal; each signal that is not returned before the specified time-out is displayed as a period (.). A series of exclamation points (!!!!!) indicates a good connection; a series of periods (.....) or the messages [timed out] or [failed] indicate that the connection failed.

Following is an example of a successful **ping** command to a remote server with the address 1.1.1.10:

```
Router# ping 1.1.1.10 <Return>
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 1.1.1.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/15/64 ms
Router#
```

If the connection fails, verify that you have the correct IP address for the server and that the server is active (powered on), and repeat the **ping** command.

For complete descriptions of interface subcommands and the configuration options available for VIP2-related interfaces, and which support VIP2 functionality, refer to the publications listed in the section “If You Need More Information” on page 2.

Cisco 7200 Series and the FE-TX and FE-FX Port Adapters

The FE-TX and FE-FX port adapters are used in the Cisco 7200 series routers and can be installed in any of the available port adapter slots. Figure 22 shows a Cisco 7206 with an FE-TX port adapter installed in port adapter slot 4.

Figure 22 Cisco 7206 with an FE-TX Port Adapter in Port Adapter Slot 4

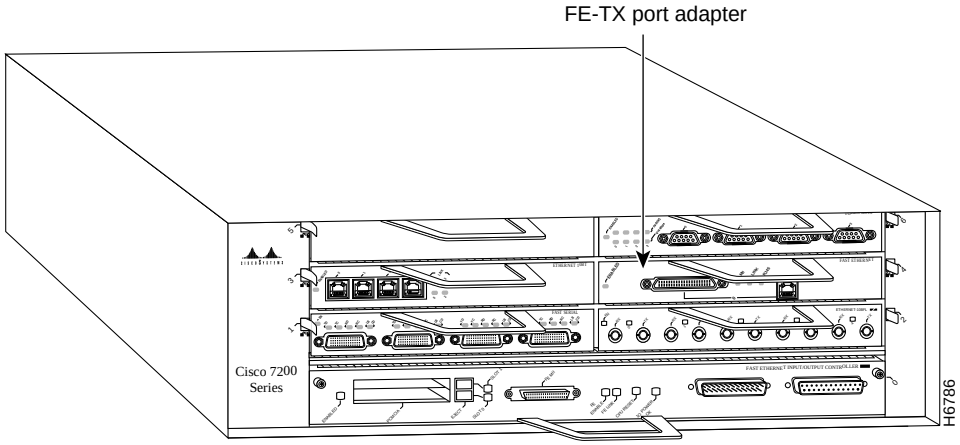
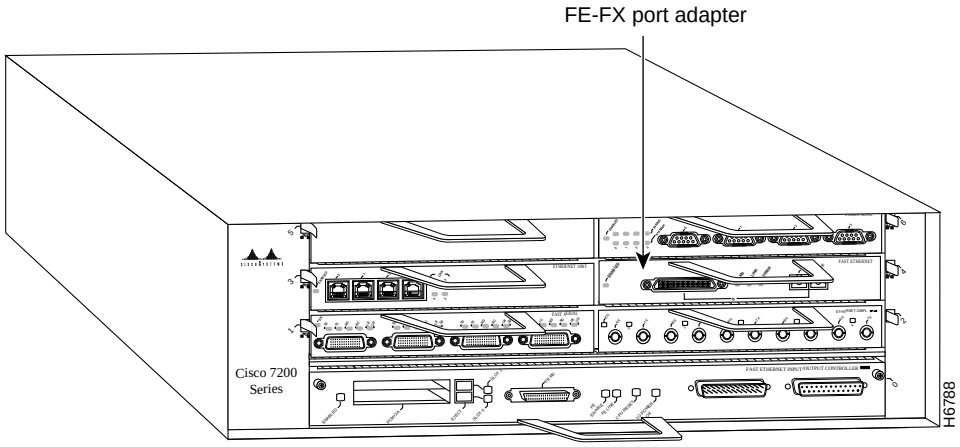


Figure 23 shows a Cisco 7206 with an FE-TX port adapter installed in slot 4.

Figure 23 Cisco 7206 with an FE-FX Port Adapter in Port Adapter Slot 4



Note The FE-FX port adapter has the MII connector like the FE-TX port adapter, but has an SC-type fiber-optic connector in place of the RJ-45 connector.

The following sections include information specific to the FE-TX and FE-FX port adapters and their use in the Cisco 7200 series routers:

Installing or Replacing a Port Adapter in Cisco 7200 Series Routers

Depending on your circumstances, you might need to install a new port adapter in a Cisco 7200 series router or replace a failed port adapter in the field. In either, case no tools are necessary; all port adapters available for the Cisco 7200 series connect directly to the router midplane and are locked into position by a port adapter lever. When removing and replacing a port adapter, you will need an antistatic mat onto which you can place a removed port adapter and an antistatic container into which you can place a failed port adapter for shipment back to the factory.

Note The Cisco 7200 series routers support OIR; therefore, you do not have to power down the Cisco 7200 series routers when removing and replacing an FE port adapter.

When a port adapter slot is not in use, a blank port adapter must fill the empty slot to allow the router to conform to EMI emissions requirements and to allow proper air flow across the port adapters. If you plan to install a new port adapter in a slot that is not in use, you must first remove a blank port adapter.

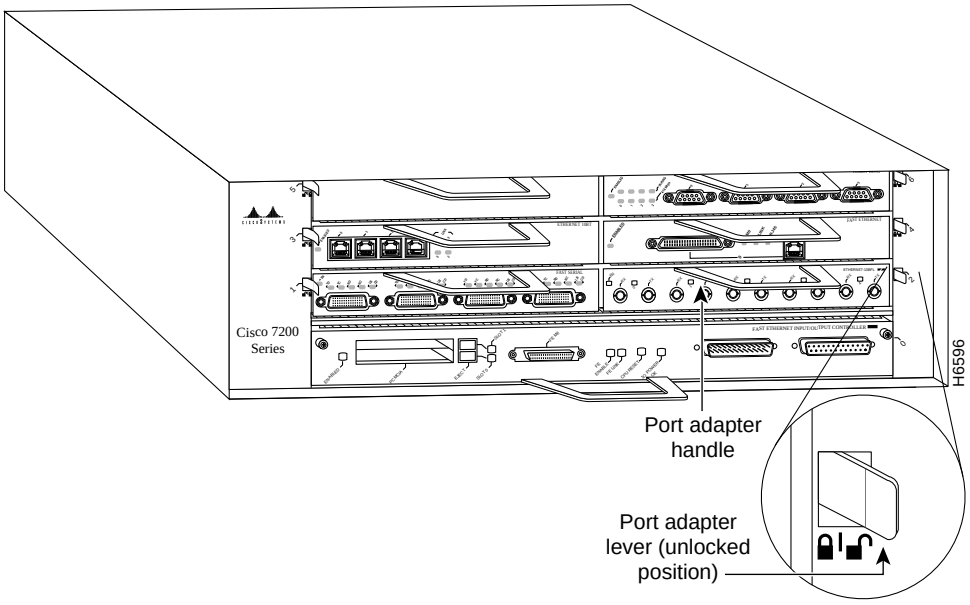
Removing a Port Adapter

Following is the procedure for removing a port adapter from a Cisco 7200 series router:

Step 1 Attach an ESD-preventative wrist strap between you and an unfinished chassis surface.

Step 2 Place the port adapter lever for the desired port adapter slot in the unlocked position. The port adapter lever remains in the unlocked position. (Refer to Figure 24.)

Figure 24 Placing the Port Adapter Lever in the Unlocked Position (Cisco 7206 shown)



Step 3 Grasp the handle on the port adapter and pull the port adapter from the midplane, about half way out of its slot. If you are removing a blank port adapter, pull the blank port adapter from the chassis slot.

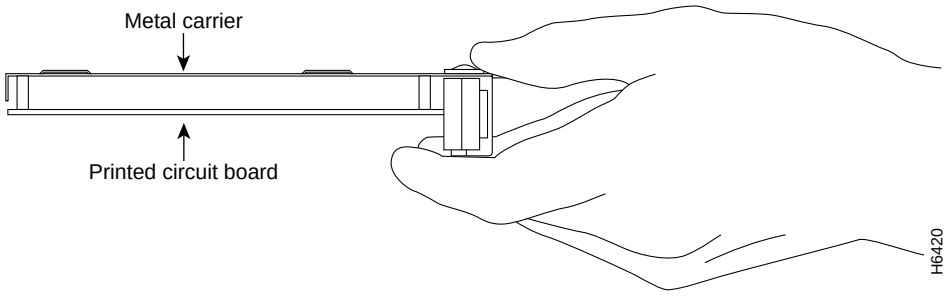
Note As you disengage the port adapter from the router midplane, OIR administratively shuts down all active interfaces on the port adapter.

Step 4 With the port adapter half way out of the slot, disconnect all cables from the port adapter.

Step 5 After disconnecting the cables, pull the port adapter from its chassis slot.

Caution Always handle the port adapter by the carrier edges and handle; never touch the port adapter's components or connector pins. (Refer to Figure 25.)

Figure 25 Handling a Port Adapter



Step 6 Place the port adapter on an antistatic surface with its components facing upward, or in a static shielding bag. If the port adapter will be returned to the factory, immediately place it in a static shielding bag.

This completes the procedure for removing a port adapter from a Cisco 7200 series router.

Replacing a Port Adapter

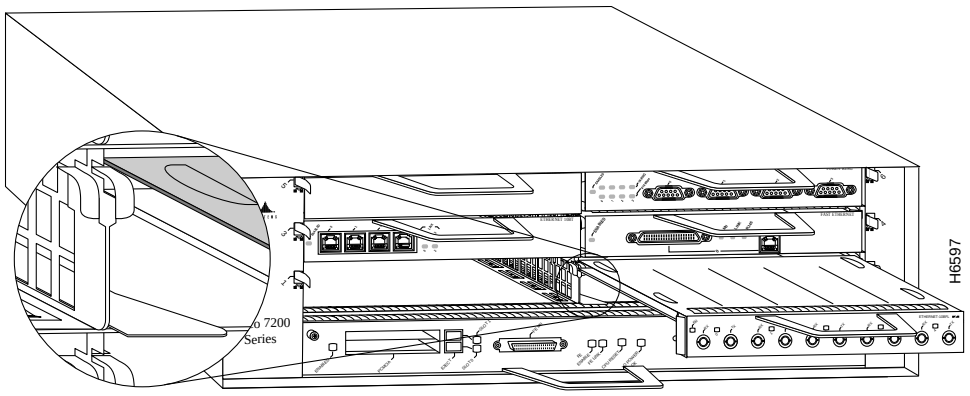
Following is the procedure for installing a new port adapter in a Cisco 7200 series router:

Step 1 Attach an ESD-preventative wrist strap between you and an unfinished chassis surface.

Step 2 Use both hands to grasp the port adapter by its metal carrier edges and position the port adapter so that its components are downward. (Refer to Figure 25).

Step 3 Align the left and right edge of the port adapter metal carrier between the guides in the port adapter slot. (Refer to Figure 26.)

Figure 26 Aligning the Port Adapter Metal Carrier Between the Slot Guides (Cisco 7206 shown)



Step 4 With the metal carrier aligned in the slot guides, gently slide the port adapter half way into the slot.

Caution Do not slide the port adapter all the way into the slot until you have connected all required cables. Trying to do so will disrupt normal operation of the router.

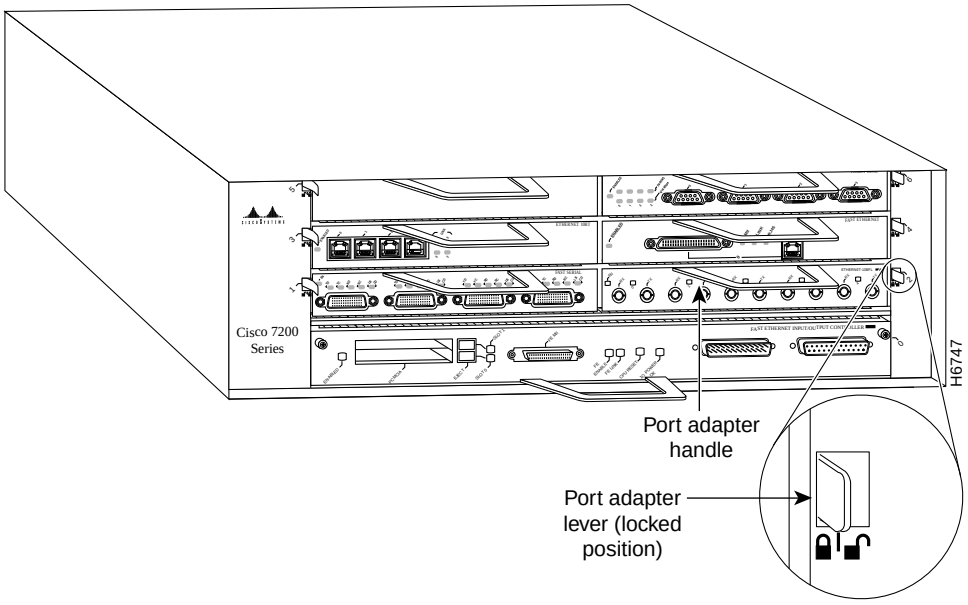
Step 5 With the port adapter half way in the slot, connect all required cables to the port adapter.

Step 6 After connecting all required port adapter cables, carefully slide the port adapter all the way into the slot until you feel the port adapter's connectors mate with the midplane.

Step 7 After feeling the connector's mate, move the port adapter lever to the locked position. Figure 27 shows the port adapter lever in the locked position.

Note If the port adapter lever does not move to the locked position, the port adapter is not completely seated in the midplane. Carefully pull the port adapter half way out of the slot, reinsert it, and move the port adapter lever to the locked position.

Figure 27 Placing the Port Adapter Lever in the Locked Position (Cisco 7206 shown)



This completes the procedure for installing a new port adapter in a Cisco 7200 series router.

Attaching FE-TX and FE-FX Port Adapter Interface Cables

On a single FE port adapter, you can use *either* the RJ-45 (or SC for FE-FX) connection *or* the MII connection. If you have two FE port adapters, you can use the RJ-45 (or SC for FE-FX) connection on one port adapter and the MII connection on the other port adapter.

Note RJ-45, SC, and MII cables are not available from Cisco Systems; they are available from outside commercial cable vendors.

Connect RJ-45, SC (FE-FX), or MII cables as follows:

Step 1 If you have MII connections, attach an MII cable directly to the MII port on the FE port adapter or attach a 100BASE-T transceiver, with the media appropriate to your application, to the MII port on the FE port adapter. (See Figure 28 for FE-TX or Figure 29 for FE-FX.)

If you have RJ-45 connections, attach the Category 5 UTP cable directly to the RJ-45 port on the FE port adapter. (See Figure 28 for FE-TX or Figure 29 for FE-FX.) The FE port adapter is an end station device and not a repeater. You *must* connect the FE port adapter to a repeater or hub.

If you have an SC connection (FE-FX port adapter), attach the cable directly to the SC port on the FE-FX port adapter. (See Figure 29.) Use either one duplex SC connector, or two simplex SC connectors, and observe the correct relationship between the receive (RX) and transmit (TX) ports on the FE-FX port adapter and your repeater.

Note Each FE (FX or TX) port adapter can have *either* an MII attachment or an RJ-45 (or SC) attachment, but not both simultaneously. The MII and RJ-45 (or SC) receptacles represent two physical connection options for one Fast Ethernet interface.

Figure 28 Connecting FE-TX MII or RJ-45 Cables

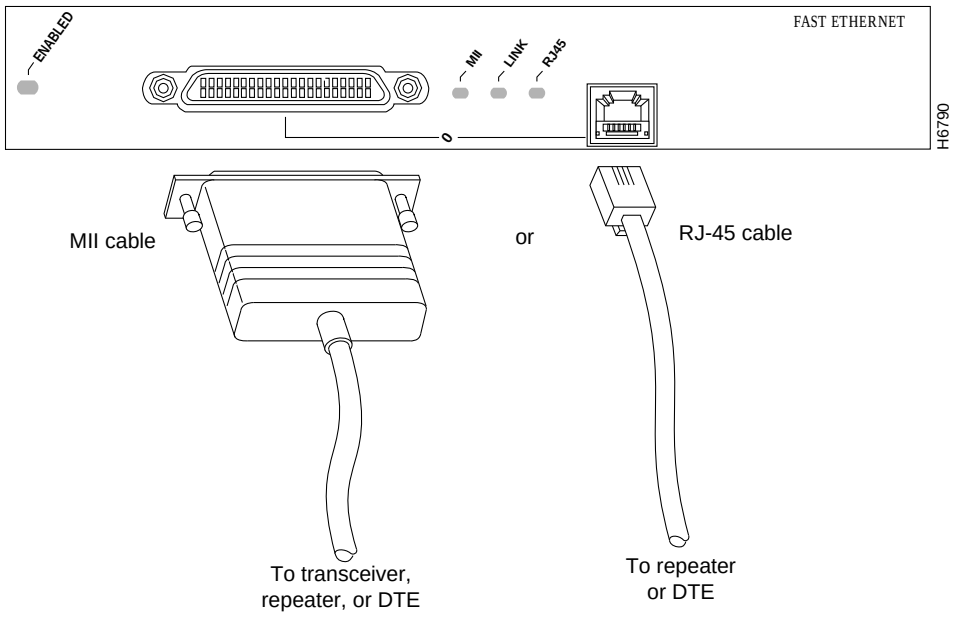
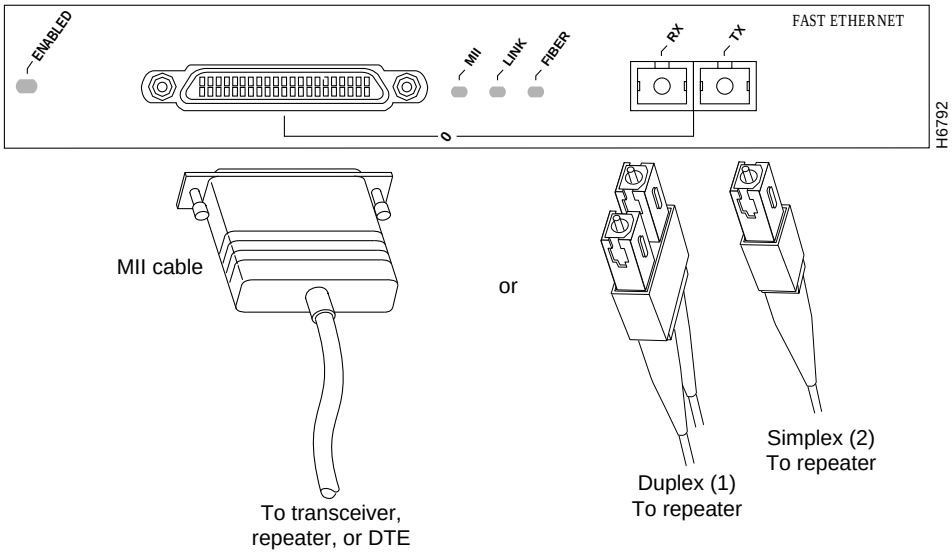


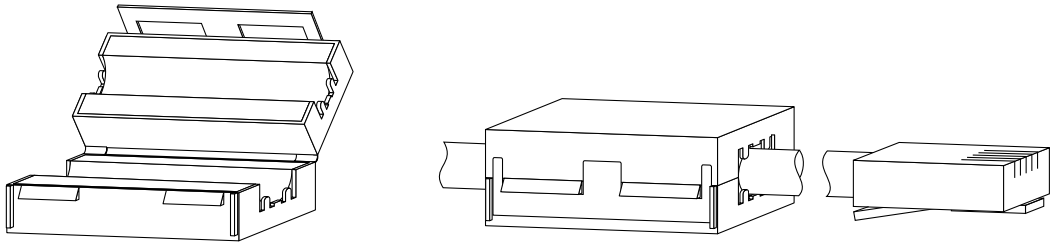
Figure 29 Connecting FE-FX MII or SC Cables



Step 2 For the FE-TX, attach the ferrite bead to the RJ-45 cable (at either end), as shown in Figure 30.

Caution The ferrite bead prevents electromagnetic interference (EMI) from affecting the FE-TX-equipped system and is a required component for proper system operation.

Figure 30 Attaching the Ferrite Bead around the RJ-45 Cable



Caution To prevent problems on your FE port adapter and network, do not simultaneously connect RJ-45 (or SC) *and* MII cables to one FE port adapter. On a single FE port adapter, only one network connection can be used at one time. Only connect cables that comply with EIA/TIA-568 standards. (Refer to Table 1 and Table 2 on page 7 for cable recommendations and specifications.)

Step 3 Attach the network end of your RJ-45 (SC) or MII cable to your 100BASE-T transceiver, switch, hub, repeater, DTE, or other external 100BASE-T equipment.

This completes the FE port adapter cable installation.

Configuring the Fast Ethernet Interface

If you installed a new FE port adapter or if you want to change the configuration of an existing interface, you must enter Configuration mode using the **configuration** command. If you replaced an interface that was previously configured, the system will recognize the new interface and bring it up in its existing configuration.

After you verify that the new FE interface is installed correctly (the enabled LED goes on), use the privileged-level **configure** command to configure the new interfaces. Be prepared with the information you will need, such as the following:

- Protocols you plan to route on each new interface
- Internet protocol (IP) addresses if you plan to configure the interfaces for IP routing
- Whether the new interfaces will use bridging

For a summary of the configuration options available and instructions for configuring the Fast Ethernet interfaces on a Cisco 7200 series router, refer to the appropriate configuration publications listed in the section “If You Need More Information” on page 2.

The **configure** command requires privileged-level access to the EXEC command interpreter, which usually requires a password. Contact your system administrator if necessary to obtain EXEC-level access.

Note Each FE interface on a FE-TX or FE-FX port adapter can be configured at 100 Mbps, half duplex or full duplex, for a maximum aggregate bandwidth of 200 Mbps.

Selecting Port Adapter Slot and Fast Ethernet Interface Port Numbers

The following section describes how to identify port adapter slot and Fast Ethernet interface port numbers.

Physical port addresses specify the actual physical location of each interface port on the router. (See the example of an FE-TX port adapter shown in Figure 31.) This address is composed of a two-part number in the format *port adapter slot number/interface port number*, as follows:

- The first number identifies the chassis slot in which the FE port adapter is installed.
- The second number identifies the interface port on the FE port adapter, which is always numbered as interface 0.

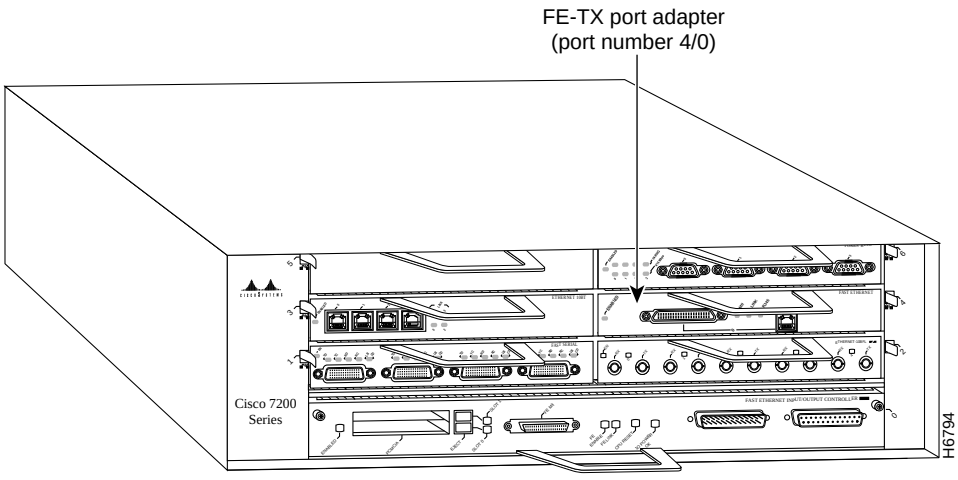
Interface ports maintain the same address regardless of whether other port adapters are installed or removed from the slot. However, when you move a port adapter to a different slot, the first number in the address changes to reflect the new chassis slot number.

Figure 21 shows some of the port adapter slots and interface ports of a Cisco 7206. The port adapter slot numbers start with 1 and continue through 6 (slot 0 is always reserved for the Fast Ethernet port on the I/O controller—if present).

For example, on the FE port adapter in slot 2 the address of the FE interface is 2/0 (port adapter slot 2, and interface port 0). (Refer to Figure 31)

Note If you remove the FE port adapter from slot 2 and install it in chassis slot 4, the address of this FE port becomes 4/0.

Figure 31 Fast Ethernet Interface Port Number Example



Note: The MII and RJ-45 interface ports on the port adapter are both numbered as interface port 0. Only one of them can be used on each port adapter, at one time.

You can identify interface ports by physically checking the slot/interface port location on the front of the router or by using **show** commands to display information about a specific interface or all interfaces in the router.

Configuring Interfaces

The following steps describe a basic interface configuration. Press the **Return** key after each step unless otherwise noted. At any time you can exit the privileged level and return to the user level by entering **disable** at the prompt as follows:

```
Router# disable

Router>
```

Following is an example of a basic configuration procedure:

Step 1 At the privileged-level prompt, enter Configuration mode and specify that the console terminal will be the source of the configuration subcommands, as follows:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#
```

Step 2 At the prompt, specify the first interface to configure by entering the subcommand **interface**, followed by the *type* (**fa**) *and slot/interface* (port adapter slot number and interface number). The example that follows is for the first interface of the first port adapter in slot 4:

```
Router(config)# interface fa 4/0
```

Step 3 If IP routing is enabled on the system, you can assign an IP address and subnet mask to the interface with the **ip address** configuration subcommand, as in the following example:

```
Router(config-int)# ip address 1.1.1.10 255.255.255.0
```

Step 4 Add any additional configuration subcommands required to enable routing protocols and set the interface characteristics.

Step 5 Change the shutdown state to up and enable the interface as follows:

```
Router(config-int)# no shutdown
```

Step 6 Configure additional interfaces on additional FE port adapters as required.

Step 7 When you have included all of the configuration subcommands to complete the configuration, press **Ctrl-Z** to exit Configuration mode.

Step 8 Write the new configuration to nonvolatile memory as follows:

```
Router# copy running-config startup-config
[OK]
Router#
```

Following are descriptions and examples of the commands for configuring the FE interface 4/0 (slot 4, Fast Ethernet interface port 0). Descriptions are limited to fields that are relevant for establishing and verifying the configuration. After configuring the new FE interface, use **show** commands to display the status of the new interface or all interfaces, or to verify changes you have made.

Depending on the requirements for your system configuration and the protocols you plan to route on the interface, you might also need to enter other configuration subcommands. For complete descriptions of configuration subcommands and the configuration options available for Fast Ethernet interfaces, refer to the publications listed in the section "If You Need More Information" on page 2.

FE half-duplex operation is the default. To change to full-duplex operation, use the following series of commands:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#

Router(config)# interface fastethernet 4/0
Router(config-if)# full-duplex
Ctrl-z
```

Using the **show interfaces fastethernet** command, you can see that the 4/0 Fast Ethernet interface is now configured for full-duplex operation, as follows:

```
Router# sh int fa 4/0
FastEthernet 4/0 is administratively up, line protocol is up

  (display text omitted)

  Encapsulation ARPA, loopback not set, keepalive not set, fdx, 100BaseTX
```

To return the interface to half-duplex operation, use the **no full-duplex** configuration command, as follows:

```
Router# config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# int fa 4/0
Router(config-if)# no full-duplex
Ctrl-z
Router#
```

Using the **show interfaces fastethernet** command, you can see that the 4/0 Fast Ethernet interface is now configured for half-duplex operation, as follows:

```
Router# sh int fa 4/0
FastEthernet2/0 is administratively up, line protocol is up

  (display text omitted)

  Encapsulation ARPA, loopback not set, keepalive not set, hdx, 100BaseTX

  (display text omitted)
```

The RJ-45 connection is the default for FE-TX (or SC for FE-FX). To change to an MII connection and then verify it, use the following series of commands, including the **media-type** configuration command:

```
Router# config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# int fa 4/0
Router(config-if)# media-type mii
Ctrl-z

Router# sh int fa 4/0
FastEthernet3/0/0 is administratively up, line protocol is up

  (display text omitted)

  Encapsulation ARPA, loopback not set, keepalive not set, hdx, MII

  (display text omitted)
```

Use the **media-type 100** configuration command to return the interface to its default state for RJ-45 or SC (fiber-optic) connections.

Checking the Configuration

After configuring the new interface, use the **show** commands to display the status of the new interface or all interfaces and use the **ping** command to check connectivity.

Using show Commands to Verify the New Interface Status

The following steps use **show** commands to verify that the new interfaces are configured and operating correctly.

Step 1 Use the **show version** command to display the system hardware configuration. Ensure that the list includes the new interfaces.

Step 2 Display all the current port adapters and their interfaces with the **show controllers** command. Verify that the new FE port adapter appears in the correct slot.

Step 3 Specify one of the new interfaces with the **show interfaces** *port adapter type slot/interface* command and verify that the first line of the display specifies the interface with the correct slot number. Also verify that the interface and line protocol are in the correct state: up or down.

Step 4 Display the protocols configured for the entire system and specific interfaces with the **show protocols** command. If necessary, return to Configuration mode to add or remove protocol routing on the system or specific interfaces.

Step 5 Display the running configuration file with the **show running-config** command. Display the configuration stored in NVRAM using the **show startup-config** command. Verify that the configuration is accurate for the system and each interface.

If the interface is down and you configured it as up, or if the displays indicate that the hardware is not functioning properly, ensure that the network interface is properly connected and terminated. If you still have problems bringing the interface up, contact a service representative for assistance.

Using show Commands to Display Interface Information

To display information about a specific interface, use the **show interfaces** command with the interface type and port address in the format **show interfaces** [*type slot/port*].

Following is an example of how the **show interfaces** [*type slot/port*] command displays status information (including the physical slot and port address) for the interface you specify. In this example, most of the status information for each interface is omitted, and a Fast Ethernet interface in slot 4 is used.

```
Router# sh int fa 4/0
FastEthernet4/0 is administratively down, line protocol is down
  Hardware is DEC21140, address is 1.1.1.11 (bia 0000)
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive not set, fdx, 100BaseTX
(display text omitted)
```

The Fast Ethernet interface port adapter is numbered as port adapter 0. The MII and RJ-45 (or SC) ports on a port adapter each have the same port number because only one of them can be used at one time. The single Fast Ethernet port on the FE port adapter is interface 0.

With the **show interfaces** *type slot/por*t command, use arguments such as the interface type (fastethernet, and so forth) and the port number (slot/port) to display information about a specific interface only. The following example of the **show interfaces fastethernet** command shows information specific to the Fast Ethernet interface on the first FE port adapter in slot 4:

```
Router# show interfaces fastethernet 2/0
FastEthernet4/0 is administratively down, line protocol is down
  Hardware is DEC21140, address is 1.1.1.11 (bia 0000)
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive not set, fdx, 100BaseTX
  ARP type: ARPA, ARP Timeout 4:00:00
  Last input 3:08:43, output 3:08:42, output hang never
  Last clearing of "show interface" counters 2:58:36
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 watchdog, 0 multicast
     0 input packets with dribble condition detected
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets, 0 restarts
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

The **show version** (or **show hardware**) command displays the configuration of the system hardware (the number of each port adapter type installed), the software version, the names and sources of configuration files, and the boot images. Following is an example of the **show version** command:

```
Router# show version

Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-J-M), Version 11.1(472) [biff 105]
Copyright (c) 1986-1996 by cisco Systems, Inc.
Compiled Sun 21-Apr-95 12:22 by
Image text-base: 0x600088A0, data-base: 0x605A4000

ROM: System Bootstrap, Version 11.1 (10979)RELEASED SOFTWARE

Router uptime is 4 hours, 22 minutes
System restarted by reload
System image file is "slot0:c7200-j-mz.960421", booted via slot0

cisco 7200 (R4700) processor with 22528K/10240K bytes of memory.
R4700 processor, Implementation 33, Revision 1.0 (Level 2 Cache)
Last reset from power-on
Bridging software.
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
Chassis Interface.
4 Ethernet/IEEE 802.3 interfaces.
2 FastEthernet/IEEE 802.3 interfaces.
125K bytes of non-volatile configuration memory.

20480K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
8192K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x2
```

To determine which type of port adapter is installed in your system, use the **show diag** *slot* command. Specific port adapter information is displayed, as shown in the following example of an FE-FX port adapter in chassis slot 4:

```
Router# show diag 2

Slot 2:
Fast-ethernet port adapter, 1 port
Port adapter is analyzed
Port adapter insertion time 2d09h ago
Hardware revision 255.255           Board revision A0
Serial number     4294967295    Part number    73-1556-04
Test history      0x0           RMA number     00-00-00
EEPROM format version 1
EEPROM contents (hex):
 0x20: 01 02 01 01 FF FF FF FF 49 06 14 04 00 00 00 00
 0x30: 50 00 00 00 FF FF FF FF FF FF FF FF FF FF FF FF
```

For command descriptions and examples for the Cisco 7200 series routers, refer to the publications listed in the section “If You Need More Information” on page 2.

Using the ping Command

The *packet internet groper* (**ping**) command allows you to verify that an interface port is functioning properly and to check the path between a specific port and connected devices at various locations on the network. This section provides brief descriptions of the **ping** command. After you verify that the system has booted successfully and is operational, you can use this command to verify the status of interface ports. Refer to the publications listed in the section "If You Need More Information" on page 2 for detailed command descriptions and examples.

The **ping** command sends an echo request out to a remote device at an IP address that you specify. After sending a series of signals, the command waits a specified time for the remote device to echo the signals. Each returned signal is displayed as an exclamation point (!) on the console terminal; each signal that is not returned before the specified time-out is displayed as a period (.). A series of exclamation points (!!!!!) indicates a good connection; a series of periods (.....) or the messages [timed out] or [failed] indicate that the connection failed.

Following is an example of a successful **ping** command to a remote server with the address 1.1.1.10:

```
Router# ping 1.1.1.10 <Return>
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 1.1.1.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/15/64 ms
Router#
```

If the connection fails, verify that you have the correct IP address for the server and that the server is active (powered on), and repeat the **ping** command.

For complete descriptions of interface subcommands and the configuration options available for Cisco 7200 series-related interfaces, refer to the publications listed in the section "If You Need More Information" on page 2.

SELV Circuit Warning Translations

Warning The ports labeled “Ethernet,” “10BaseT,” “Token Ring,” “Console,” and “AUX” are safety extra-low voltage (SELV) circuits. SELV circuits should only be connected to other SELV circuits. Because the BRI circuits are treated like telephone-network voltage, avoid connecting the SELV circuit to the telephone network voltage (TNV) circuits.

Waarschuwing De poorten die "Ethernet", "10BaseT", "Token Ring", "Console" en "AUX" zijn gelabeld, zijn veiligheidscircuits met extra lage spanning (genaamd SELV = Safety Extra-Low Voltage). SELV-circuits mogen alleen met andere SELV-circuits verbonden worden. Omdat de BRI-circuits op dezelfde manier als telefoonnetwerkspanning behandeld worden, mag u het SELV-circuit niet verbinden met de telefoonnetwerkspanning (TNV) circuits.

Varoitus Portit, joissa on nimet "Ethernet", "10BaseT", "Token Ring", "Console" ja "AUX", ovat erityisen pienen jännityksen omaavia turvallisuuspiirejä (SELV-piirejä). Tällaiset SELV-piirit tulee yhdistää ainoastaan muihin SELV-piireihin. Koska perusluokan liitäntöjen (Basic Rate Interface-eli BRI-liitännät) jännite vastaa puhelinverkoston jännitettä, vältä SELV-piirin yhdistämistä puhelinverkoston jännitepiireihin (TNV-piireihin).

Attention Les ports étiquetés « Ethernet », « 10BaseT », « Token Ring », « Console » et « AUX » sont des circuits de sécurité basse tension (Safety Extra-Low Voltage ou SELV). Les circuits SELV ne doivent être interconnectés qu'avec d'autres circuits SELV. Comme les circuits BRI sont considérés comme des sources de tension de réseau téléphonique, éviter de connecter un circuit SELV à un circuit de tension de réseau téléphonique (telephone network voltage ou TNV).

Warnung Die mit "Ethernet", "10BaseT", "Token Ring", "Console" und "AUX" beschrifteten Buchsen sind Sicherheitskreise mit Sicherheitskleinspannung (Safety Extra-Low Voltage, SELV). SELV-Kreise sollten ausschließlich an andere SELV-Kreise angeschlossen werden. Da die BRI-Kreise wie Telefonnetzspannungen behandelt werden, ist der SELV-Kreis nicht an Telefonnetzspannungskreise (TNV) anzuschließen.

Avvertenza Le porte contrassegnate da "Ethernet", "10BaseT", "TokenRing", "Console" e "AUX" sono circuiti di sicurezza con tensione molto bassa (SELV). I circuiti SELV devono essere collegati solo ad altri circuiti SELV. Dato che i circuiti BRI vengono trattati come tensioni di rete telefonica, evitare di collegare il circuito SELV ai circuiti in cui è presente le tensione di rete telefonica (TNV).

Advarsel Utgangene merket "Ethernet", "10BaseT", "Token Ring", "Console" og "AUX" er lavspentkretser (SELV) for ekstra sikkerhet. SELV-kretser skal kun kobles til andre SELV-kretser. Fordi BRI-kretsene håndteres som telenettspenning, unngå å koble SELV-kretsen til kretser for telenettspenning (TNV).

Aviso As portas "Ethernet", "10BaseT", "Token Ring", "Console", and "AUX" são circuitos de segurança de baixa tensão (SELV). Estes circuitos deverão ser apenas ligados a outros circuitos SELV. Devido ao facto de os circuitos BRI (Interface de Ritmo Básico) serem tratados como sendo de tensão equivalente à da rede telefónica, evite ligar o circuito SELV aos circuitos TNV (tensão de rede telefónica).

¡Advertencia! Los puertos "Ethernet", "10BaseT", "Token Ring", "Console" y "AUX" son circuitos de muy baja señal que garantizan ausencia de peligro (Safety Extra-Low Voltage = SELV). Estos circuitos SELV deben ser conectados exclusivamente con otros también de tipo SELV. Puesto que los circuitos tipo BRI se comportan como aquéllos con voltajes de red telefónica, debe evitarse conectar circuitos SELV con circuitos de voltaje de red telefónica (TNV).

Varning! De portar som är märkta "Ethernet", "10BaseT", "Token Ring", "Console" och "AUX" är SELV-kretsar, d.v.s. skyddskretsar med extra låg spänning (SELV: Safety Extra-Low Voltage = skyddsklenspänning). SELV-kretsar får endast anslutas till andra SELV-kretsar. Eftersom BRI-kretsar behandlas liksom telefonnätsspänning bör SELV-kretsen inte anslutas till telefonnätsspänningskretsar (TNV-kretsar).

Cisco Connection Online

Cisco Connection Online (CCO), formerly Cisco Information Online (CIO), is Cisco Systems' primary, real-time support channel. Maintenance customers and partners can self-register on CCO to obtain additional content and services.

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You can access CCO in the following ways:

- WWW: `http://www.cisco.com`.
- Telnet: `cco.cisco.com`.
- Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and baud rates up to 14.4 kbps.

For a copy of CCO's Frequently Asked Questions (FAQ), contact `cco-help@cisco.com`. For additional information, contact `cco-team@cisco.com`.

Note If you are a network administrator and need personal technical assistance with a Cisco product that is under warranty or covered by a maintenance contract, contact Cisco's Technical Assistance Center (TAC) at 800 553-2447, 408 526-7209, or `tac@cisco.com`. To obtain general information about Cisco Systems, Cisco products, or upgrades, contact 800 553-6387, 408 526-7208, or `cs-rep@cisco.com`.

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