CHAPTER 3

Installing the Router

This chapter provides the following procedures for installing the router, making all external cable connections, turning on the system power, and verifying that the system initializes properly:

- Installing the chassis in an equipment rack (optional) or on a table top
- Installing the cable management brackets (optional but strongly recommended)
- Making external connections
- Starting up the router

The rack-mount kit provides the hardware for mounting the chassis in a standard 19-inch-wide equipment rack or in a Telco-type rack. If you are installing an equipment shelf or using mounting hardware other than that supplied with the chassis, review the guidelines in the section “Equipment Racks” in the chapter “Preparing for Installation,” then proceed to the section n “General Installation” in this chapter after the router is installed in the rack. A cable management kit is also included with the chassis. Install these fixtures to keep network interface cables untangled and orderly, and to maintain clear access to interface processors in the lower interface processor slots.

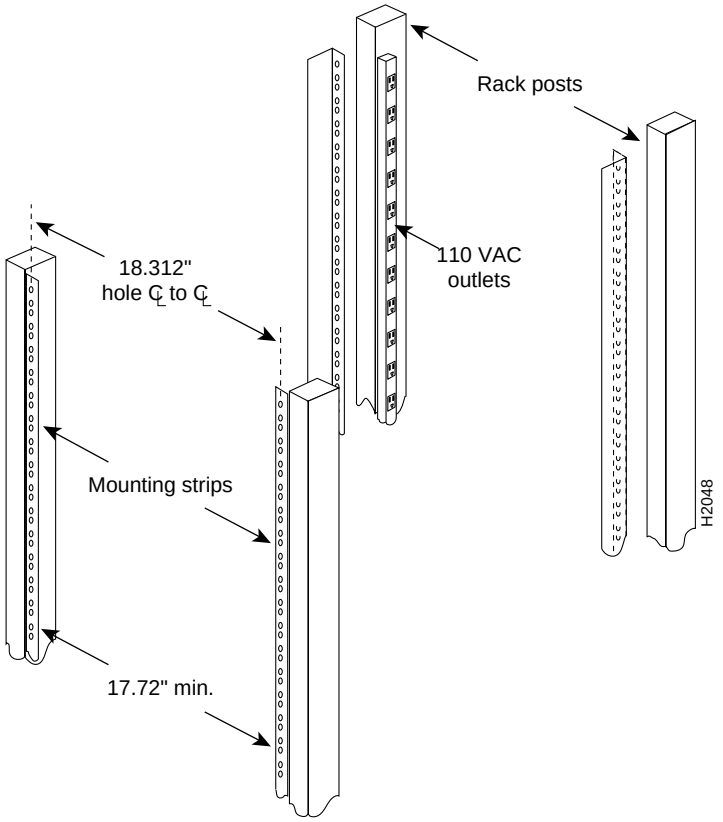
Rack-Mounting the Chassis

The rack-mounting kit included with the router is for a standard 19-inch, two- or four-post rack or a two-post Telco-type rack. The chassis mounts to two rack posts with ears that attach to the sides of the chassis. The inside width between the two posts or mounting strips (left and right) must be at least 17.72 inches. (See Figure 3-1.) The chassis ears attach to *either* the front or back of the chassis, so that you can position either the interface processor or noninterface processor end at the front of the rack. Install the cable management fixtures after you install the chassis in the rack.

Some equipment racks provide a power strip along the length of one of the mounting strips. Figure 3-1 shows a typical 19-inch equipment rack with a power strip along one of the back posts. If your rack has this feature, consider the position of the strip when planning fastener points and ensure that you will be able to pull processor modules straight out of the slots. Also, if you plan to install the cable management brackets, ensure that the power strip does not block the sides of the brackets and prevent you from routing the cables through them. When possible, install the interface processor end of the chassis away from the power strip to avoid problems accessing cables and interface processors. (See the section “Equipment Racks” in the chapter “Preparing for Installation.”)

The inlet and exhaust ports for cooling air are located in the sides of the chassis, so multiple routers can be stacked in a rack with little or no vertical clearance. If necessary, you can remove the four chassis feet. The chassis is 10.50 inches high when the feet are removed.

Figure 3-1 Typical 19-Inch Equipment Rack Posts and Mounting Strips



Tools and Equipment

Have the following tools on hand before you begin the rack installation:

- Number 1 and number 2 Phillips screwdrivers
- 1/4-inch and 3/16-inch flat-blade screwdrivers
- Tape measure
- Level (optional)

The rack-mount kit includes the following parts:

- Two chassis ears
- Four M3 x 8-mm Phillips flathead screws to secure the ears to the chassis
- Eight 10-32 x 3/8-inch slotted binderhead screws to secure the chassis ears to the rack rails

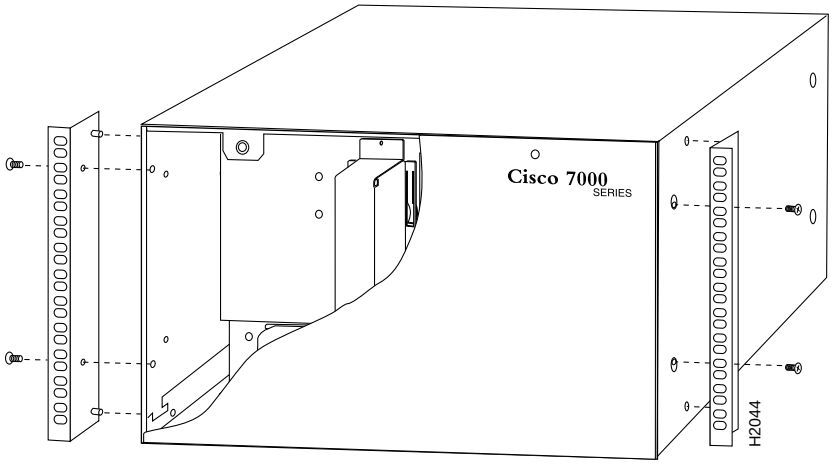
When installing the router in an enclosed rack, removing the door temporarily may provide additional clearance. We recommend that you have someone to assist you by supporting the chassis while you mount it in the rack by securing the chassis ears to the rack-mounting strips.

Installing the Ears on the Chassis

The chassis should be unpacked, and you should have already verified the router configuration.

Each chassis ear has two studs that fit into holes in the chassis. The chassis has two pairs of holes on each side: one pair near the interface processor end and one pair near the noninterface processor end. Both ears must be installed at the same end on each side. Install the ears near the end of the router that will be in the front of the rack. For example, if you plan to install the chassis with the interface processor end of the router at the front and the noninterface processor end in the back of the rack, install the ears near the interface processor end of the chassis. (See Figure 3-2.)

Figure 3-2 Installing the Ears on the Chassis



Warning After attaching the chassis ears, we recommend that two people install the chassis in the rack. (One person supports the chassis in the rack while the second person installs the fasteners.)

To install the ears on the chassis, follow these steps:

Step 1 On the rack, measure the space between the inner sides of the left and right front posts or mounting strips to ensure that it is at least 17.72 inches wide. (The chassis is 17.65 inches wide with the ears installed and must fit between the mounting strips.)

Step 2 Refer to Figure 3-2 and locate the guides in the chassis sides.

Step 3 While referring to Figure 3-2, turn the chassis so that the end that will be in the front of the rack is facing toward you. For example, Figure 3-2 shows the correct orientation for the router if the noninterface processor end will face out the front of the rack.

Step 4 On the sides of the chassis, locate the stud holes and tapped holes nearest you.

Step 5 Attach the first chassis ear to the right side of the chassis. Hold the ear in the orientation shown by the right ear in the Figure 3-2; the studs point toward the chassis and the mounting holes face you.

Step 6 Insert the studs into the holes on the side of the chassis, as shown in Figure 3-2.

Step 7 Use a number 2 Phillips screwdriver to secure two M3 x 8-mm Phillips flathead screws to the chassis, and then repeat this procedure for the other ear. Ensure that the strip of mounting holes on each ear is approximately flush with the end of the chassis. (See Figure 3-2.)

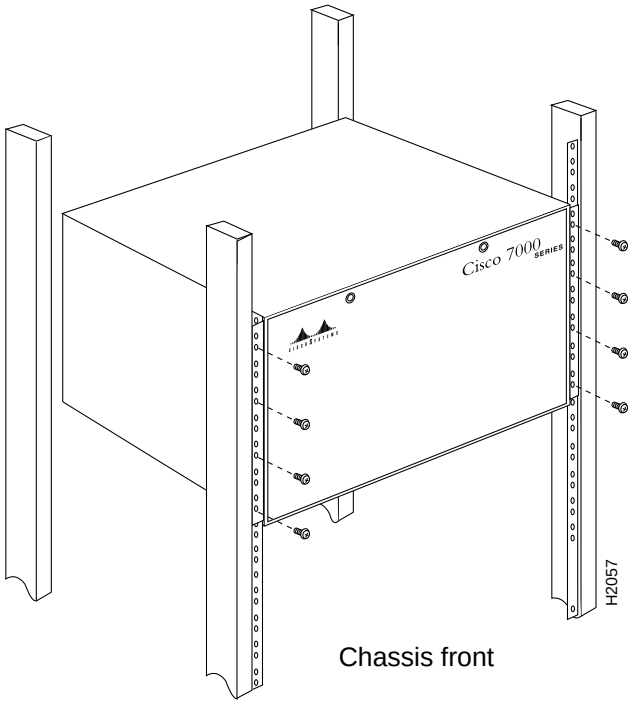
Step 8 Proceed to the next section to install the chassis in the rack.

Warning Before installing the router in a rack, and to prevent personal injury, review the section "Safety Recommendations" in the chapter "Preparing for Installation."

Installing the Chassis in the Rack

The ears secure the chassis to two rack posts, and the rest of the chassis is cantilevered off the ears. After installing the ears on the chassis, mount the router by securing the ears to two posts or mounting strips in the rack with the eight slotted screws provided. Because the ears bear the weight of the entire chassis, be sure to use all eight slotted screws to fasten the chassis ears to the rack posts. Figure 3-3 shows a typical installation in a standard, 19-inch equipment rack with four mounting posts. Figure 3-4 shows a typical installation in a Telco-type rack, which usually has two center posts and is bolted to the floor. If you are mounting the router in a rack with four posts, use all eight slotted screws to mount the chassis on the front posts.

Figure 3-3 Installing the Chassis in a Four-Post, 19-Inch Rack

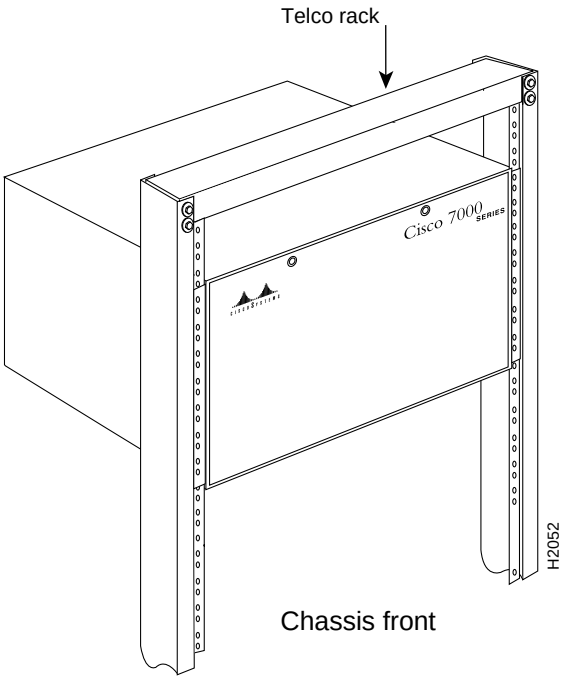


We recommend that you allow at least one or two inches of vertical clearance between the router and any equipment directly above and below it. However, if necessary to save vertical space in the rack, you can remove the four chassis feet either before or after you install the chassis in the rack. (It is easier to grip the underside of the chassis to lift it when the feet are in place). Each rubber foot is secured to the chassis bottom with a slotted screw. If removal is necessary, use a 3/16-inch flat-blade screwdriver to remove the feet, then put the feet in a safe place in case you need them later.

Unless you have a way of supporting the chassis in the rack while you install the fasteners, get another person to assist you so that one person can support the chassis while the other installs the fasteners.

Warning Ensure that heavier equipment is installed near the bottom of the rack to maintain a low center of gravity. Otherwise, because the two front posts bear the entire weight of the chassis, the rack could become top-heavy and tip over if it is not stabilized with heavier equipment at the bottom or anchored to the floor.

Figure 3-4 Installing the Chassis in a Telco Rack



Warning When installing the router in Telco-type racks, ensure that the rack is bolted to the floor and, if necessary, anchored with appropriate fixtures.

To install the chassis in the rack, follow these steps:

Step 1 On the chassis, ensure that all captive screws (on the processor modules and on the access cover) are tightened and the components are secure.

Step 2 Make sure that your path to the rack is unobstructed. If the rack is on wheels, ensure that the brakes are engaged or that the rack is otherwise stabilized.

Warning Never attempt to lift or tilt the chassis with the handles on the interface processor carriers or with the cable management brackets. Neither the handles nor the brackets are designed to support the weight of the chassis.

Step 3 Position the chassis so that the end with the ears attached is closest to you, then lift the chassis and move it to the rack. Avoid sudden twists or moves to prevent injury.

Step 4 Insert the rear of the chassis into the rack, pushing it back until the ears meet the front mounting strips or posts on both sides of the equipment rack.

Step 5 While keeping the chassis ears flush against the posts or mounting strips, slide the router up or down until the holes in the ears are aligned with those in the mounting strips.

Step 6 *Two people should perform this step.* From the front of the rack, insert all eight 8-32 x 3/8 slotted screws (four on each side) through the chassis ears and into the mounting strip.

Step 7 When all screws are inserted, use a 1/4-inch flat-blade screwdriver to tighten each one.

Step 8 Skip this step if the cable management brackets are already installed on the router. When the router is secure, install the cable management brackets at the interface processor end of the router. If the router is installed in an enclosed rack, ensure that the rack door will close properly after the device and cables are installed. Refer to the section "Rack-Mounting the Chassis" earlier in this chapter.

Step 9 You can remove the four chassis feet to gain an extra 1/2-inch of vertical space below the chassis. However, we recommend that you allow at least 1 or 2 inches of vertical clearance above and below the chassis, which is greater than the height of the feet. If necessary, use a 1/4-inch flat-blade screwdriver to remove the feet.

Step 10 Connect the power cord to the AC input receptacle (below the processor slots at the interface processor end of the router). Snap the cable retention clip up around the connector to secure the cable in the port.

This completes the rack installation. Proceed to the section "Installing the Cable Management Brackets" in this chapter to continue the installation.

General Installation

The router should already be in the area where you will install it, and your installation location should already be determined; if not, refer to the section "Site Requirements" in the chapter "Preparing for Installation."

When installing the router on a table top, ensure that you have planned a clean, safe location for the chassis and have considered the following:

- The location does not block the chassis sides, which are the inlet and exhaust vents for cooling air. Allow at least 2 inches of clearance on each side of the chassis.
- Multiple chassis can be installed in equipment racks with only an inch or more of vertical clearance, but do not place them side by side. Allow at least two inches of clearance on each side of the chassis, and avoid placing other devices or equipment nearby that can force heated exhaust air into the router inlet vents.
- Do not place the router on the floor. Floors accumulate dust, which would be drawn into the chassis interior by the fans. Excessive dust inside the chassis interior can cause overtemperature conditions and component failures. A raised platform or sturdy table provides a cleaner environment than the floor.
- When deciding where to install any equipment, consider future maintenance requirements. Allow adequate clearance for maintenance (installing/replacing interface processors, or making/adding network connection cables or equipment).

If you do not mount the router in a rack, follow these steps to install the router on a bench or tabletop:

Step 1 Make sure that the area where you install the router is free of debris and dust. Also make sure your path between the router and its planned location is unobstructed.

Step 2 On the chassis, ensure that all captive screws (on the processor modules and on the access cover) are tightened and the components are secure.

Warning To prevent damage, never attempt to lift or tilt the chassis with the handles on the interface processors. These handles are not designed to support the weight of the chassis.

Step 3 Lift the chassis by placing your hands around the chassis sides and lifting the chassis from underneath. Avoid sudden twists or moves to prevent injury.

Step 4 Place the router in a location where the air inlet vents on the side of the chassis are not obstructed, nor are they drawing in exhaust air from other equipment.

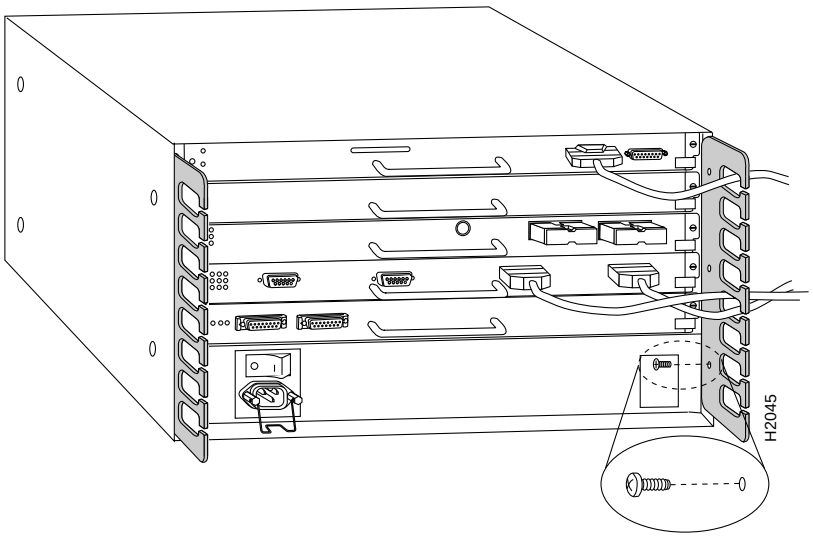
Step 5 Ensure that the new location allows adequate clearance around the chassis for maintenance.

Step 6 After the router is in place, proceed to the next section to connect the interface cables.

Installing the Cable Management Brackets

The cable management brackets (shown in Figure 3-5) attach to the inner sides of the chassis at the interface processor end. Use the brackets to keep network interface cables untangled and orderly, and to prevent cables from hindering access to interface processors in the lower interface processor slots. Install the brackets before connecting network interface cables to the interface processor ports; otherwise, you will probably need to disconnect the cables to install the screws that secure the brackets. Route interface cables through the cable management brackets as you connect them to the interface processor ports. If necessary, wrap cable ties through the holes provided to secure small-gauge cables.

Figure 3-5 Cable Management Brackets



Tools and Equipment

You will need the following tools and parts to install the cable management brackets; the brackets and panhead screws are included with the chassis:

- Number 1 Phillips screwdriver
- Two cable management brackets
- Six M3 x 8-mm Phillips panhead screws.

Installing the Brackets

Follow these steps to install the two cable management brackets on the router:

Step 1 Assemble the two cable management brackets and the six M3 x 8-mm Phillips panhead screws.

Step 2 At the interface processor end of the router, place a bracket on an inner side of the chassis and align the three holes in the bracket with the holes in the chassis. (See Figure 3-5.)

Step 3 Insert and finger-tighten three M3 Phillips screws from the inner side of the chassis, through the bracket and into the chassis.

Step 4 When all three screws are inserted, use the number number 1 Phillips screwdriver to tighten the screws.

Step 5 Repeat Steps 2 through 4 for the second bracket.

Step 6 When installing the network interface cables, route the cable to the cable management brackets as shown in Figure 3-5. If you are using very thin cables that slip through the bracket openings, insert cable ties through the holes in the bracket and wrap them around the cables to secure them.

This completes the cable management bracket installation. Proceed to the next section to connect the interface cables.

Connecting Power

Connect an 550W, AC-input power supply as follows:

Step 1 Push the cable-retention clip down, away from the power cord port, and plug in the power cord.

Step 2 To secure the cable in the power supply AC receptacle, push the cable-retention clip up until it snaps into place around the connector. The cable-retention clip provides strain relief for the AC power cord.

Step 3 Connect the power supply cord to the AC source.

Connect a 600W, DC-input power supply as follows:

Step 1 Before proceeding, make certain the DC-input power cable is disconnected from the DC power source and the power switch on the power supply is in the OFF (O) position.

Step 2 Loosen the captive screws on the terminal block cover so it is free of the terminal block. (See Figure 3-6a.)

Step 3 Attach the 10-AWG ground wire to the ground terminal. (See Figure 3-6d.)

Step 4 Feed the 10-AWG, RTN and –48V wires through the large hole in the face of the terminal block cover. (See Figure 3-6b.) Feed a sufficient length (approximately 3 inches) of these two wires away from you, through the terminal block cover.

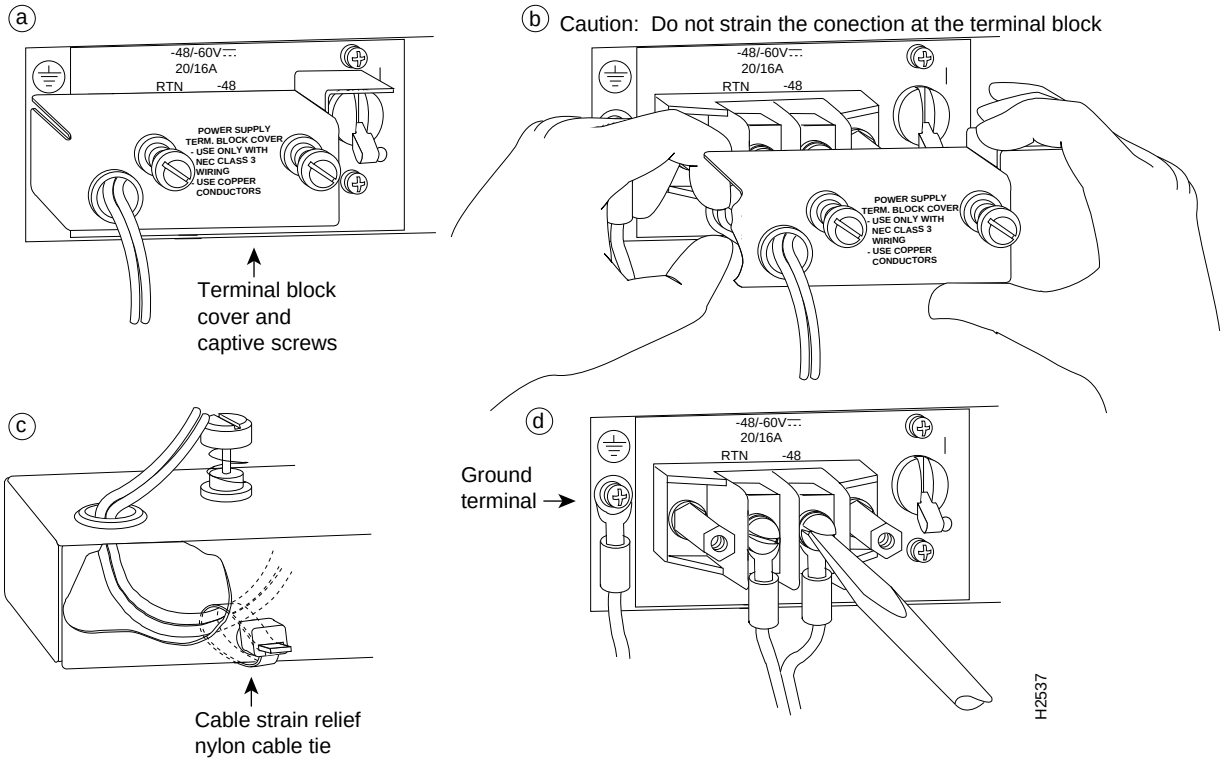
Step 5 Attach and tighten the RTN and –48V leads to the terminal block. (See Figure 3-6d.) Verify that you are connecting the appropriate leads to the correct terminal block posts. The color coding is up to you, but should match the connections at the DC power source.

Warning Incorrectly wiring the terminal block could create a shock hazard and could damage the power supply, power source, and the Cisco 7010 chassis components. Make certain there are no loose strands that could cause a short circuit of the power supply and power source.

Step 6 Using a nylon cable tie that you provide, fasten the RTN and –48V leads to the terminal block cover, as shown in Figure 3-6c. Insert the nylon cable tie through the small hole at the bottom of the terminal block cover and around the two leads.

Step 7 Bundle the RTN and –48V wires behind the terminal block cover so that the cover fits over the wires and the terminal block. (See Figure 3-6b.) Take care not to strain the leads on the terminal block or crimp the wires behind the cover. (See Figure 3-6a.)

Figure 3-6 Removing and Replacing the Terminal Block Cover and Power Cable Leads



Step 8 Position the cover over the terminal block and tighten the captive screws. (See Figure 3-6a.)

Warning To prevent a short-circuit or shock hazard after wiring the DC-input power supply, replace the terminal block cover.

Step 9 Connect the three DC-input power cable leads to the DC power source.

Connecting Interface Cables

The following sections describe the basic network connections you will make to the router. Using the Configuration Worksheet will help you to make connections and later configure each interface without having to access the rear of the chassis to check port addresses. We recommend that you complete the "Port Configuration Worksheet" in the chapter "Preparing for Installation" (Table 2-17) if you have not already done so.

External Cabling Guidelines

The following guidelines will assist you in properly connecting the external network cables to the router interface ports.

Warning Invisible laser radiation may be emitted from the aperture ports of the single-mode FDDI products when no fiber cable is connected. Avoid exposure and do not stare into open apertures. This product meets the Class 1 Laser Emission Requirement from CDRH FDDI.

- Make certain that you connect the correct interface types.

  All FSIP serial ports are a high-density 60-pin receptacle. Each port requires a serial port adapter cable to connect to the external network. The cable determines both the electrical interface type and mode of the port to which it is connected. The network end of each adapter cable type is the industry-standard connector normally used for the interface type. (For example, the EIA/TIA-232 port adapter cable has a standard DB-25 connector at the network end.)

  Following are guidelines for connecting serial interface cables:

  — A label that identifies the electrical interface type and mode is molded into the cable connectors.

  — EIA/TIA-232 and EIA-530 are the only interface types that use the same type of connector, a DB-25. If you are using both EIA/TIA-232 DTE mode and EIA-530, check the labels carefully.

  — Generally, cables for DTE mode use a plug at the network end, and cables for DCE mode use a receptacle at the network end. An exception is the V.35 cables, which are available with either a plug or receptacle in either mode.

- Verify the interface numbers (also called *port addresses*) on the rear of the chassis and the cables you will connect to each.

  Each port has a unique address composed of the interface processor slot number and the port number on the interface processor. For a description of interface addresses, refer to the section "Port Addresses" in the chapter "Product Overview."

- Avoid crossing high-power cables with interface cables.

Crossing high-power cables with interface cables can cause interference in some interface types. It will not always be possible to avoid this, but try to prevent it whenever possible.

- Install and use the cable management brackets.
- We recommend that you install and use the cable management brackets that are included with the router; these brackets will help keep your cables organized and untangled, and will enable access to interface processors without having to disconnect interface cables from adjacent interface processors unnecessarily. (See the section “Rack-Mounting the Chassis” in this chapter.)
- Do not defeat cable strain-relief systems.

  Most interfaces provide some type of strain relief to prevent the cables from being accidentally disconnected. Among these types of strain relief are the slide fasteners on Ethernet cables, the cable retention clip on the power supply cord, and the screw-type fasteners on serial cables. The cable management brackets can also help to provide strain relief, especially when you use cable ties to secure the cables to the brackets. Use all strain-relief devices provided to prevent potential problems caused by inadvertent cable disconnection.
- Verify proper interface cabling before starting the system.

  Before applying power to the system, prevent unnecessary problems or component damage by double-checking your cabling.
- Verify all cabling limitations before applying power to the system.

  When setting up your system, you must consider a number of factors related to the cabling required for your connections. For example, when using EIA/TIA-232 connections, be aware of the distance and electromagnetic interference limitations. For cabling distances and other requirements, refer to the section “Site Requirements” in the chapter “Preparing for Installation.”
- Check the power cord and power supply for compatibility with your power service.

  Check the labels on the equipment and ensure that the power service at your site is suitable for the chassis you are connecting. If you are not sure, refer to the section “AC and DC Power” in the chapter “Preparing for Installation.”

Warning A voltage mismatch can cause equipment damage and may pose a fire hazard. If the voltage indicated on the label is different from the power outlet voltage, *do not connect the chassis to that receptacle*.

Tools and Equipment

Have the following tools on hand to secure interface cables and complete the installation:

- Number 1 Phillips screwdriver
- 3/16-inch flat-head screwdriver
- Cable ties

The sections that follow provide illustrations of the connections between the router interface ports and your network(s). Network interface equipment, such as Ethernet transceivers, MAUs, and CSUs, should be available and in place already. If they are not, refer to the section “Preparing Network Connections” in the chapter “Preparing for Installation” for descriptions of the equipment you need for each interface type to complete the connection to your network.

ATM Connections

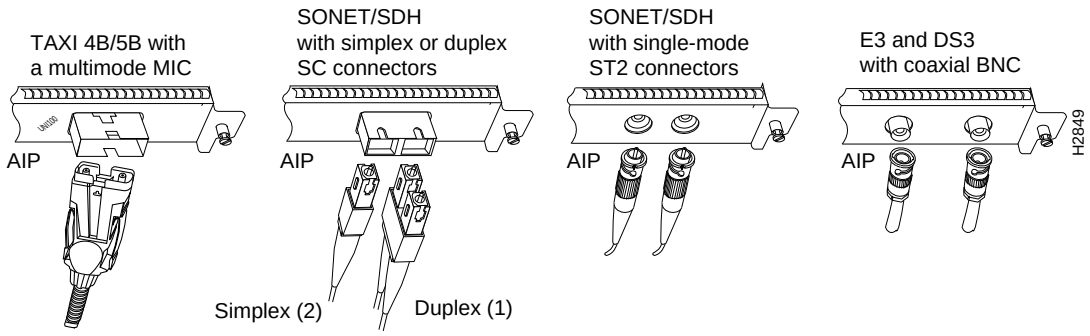
All AIP ATM interfaces are full-duplex. You must use the appropriate ATM interface cable to connect the AIP with an external ATM network. The AIP provides an interface to ATM switching fabrics for transmitting and receiving data up to 155 megabits per second (Mbps) bidirectionally; the actual data rate is determined by the PLIM.

The AIP can support interfaces that connect to the following physical layers:

- TAXI 4B/5B 100 Mbps multimode fiber optic
- SONET/SDH 155 Mbps multimode fiber optic—STS-3C or STM-1
- SONET/SDH 155 Mbps single-mode fiber optic—STS-3C or STM-1
- E3 34 Mbps coaxial cable
- DS3 45 Mbps (20 parts per million [ppm]) coaxial cable

Connect the AIP interface cables as shown in Figure 3-7. For detailed descriptions of ATM cabling requirements, refer to the section “Distance Limitations” in the chapter “Preparing for Installation” and the section “ATM Connection Equipment” in the chapter “Preparing for Installation.”

Figure 3-7 ATM (AIP) Connections



Caution To ensure compliance with EMI standards, the E3 PLIM connection requires an EMI filter clip (CLIP-E3-EMI) on the receive port (RCVR); the DS3 PLIM connection does not require this clip. Figure 3-8 shows the EMI filter clip assembly that is required for the E3 PLIM. *Do not* operate the E3 PLIM without this assembly.

The E3 and DS3 PLIMs require cable CAB-ATM-DS3/E3. If you have an E3 PLIM, you must follow Steps 1 through 3 to install the CAB-ATM-DS3/E3 cable and EMI filter assembly. If you do not have an E3 PLIM, proceed to the appropriate section for your configuration.

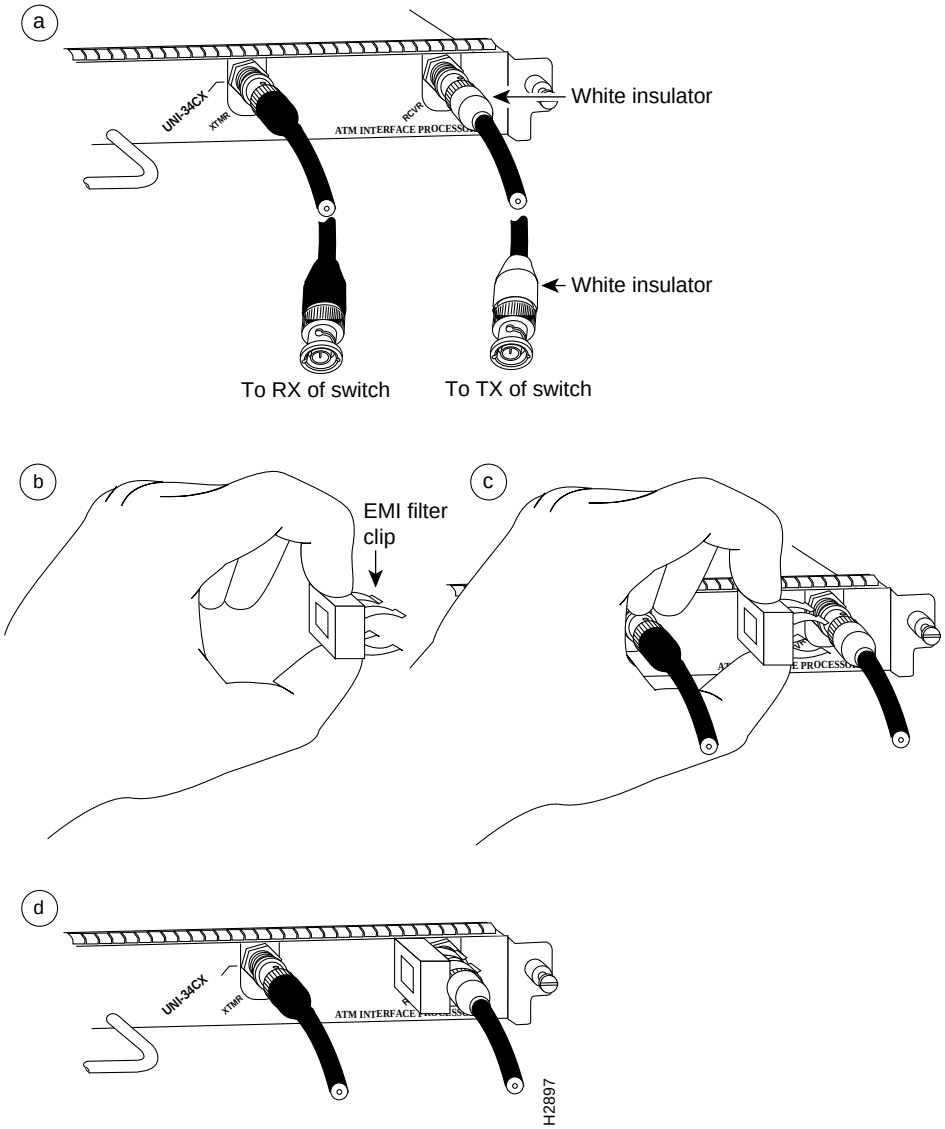
Step 1 Attach the CAB-ATM-DS3/E3 cable to the transmit (XMTR) and receive (RCVR) ports on the E3 PLIM. (See Figure 3-8a.)

One portion of the cable has a white insulator on both ends to ensure that the receive-to-transmit and transmit-to-receive relationship is maintained between the E3 PLIM and your ATM switch. The portion of the cable with the white insulator should attach between receive and transmit *or* transmit and receive ports of the E3 PLIM and your ATM switch, respectively.

Step 2 Hold the EMI filter clip as shown in Figure 3-8b and attach it to the receive cable as shown in Figure 3-8c.

Step 3 To ensure that the clip is not pulled off when adjacent interface processors are removed, position the clip parallel to the orientation of the AIP. (See Figure 3-8d.)

Figure 3-8 Installing the CAB-ATM-DS3/E3 Cable and EMI Filter Clip Assembly—Horizontal Orientation Shown



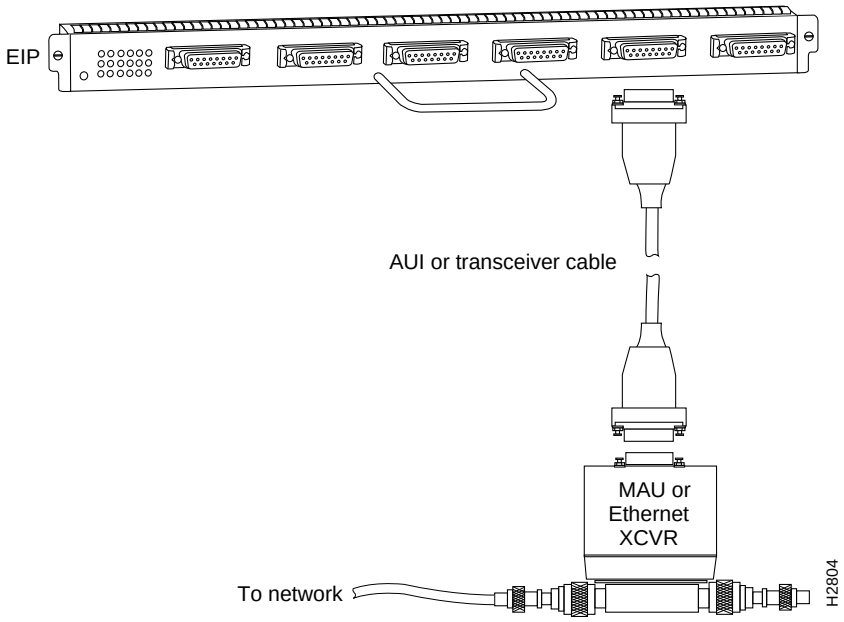
Note For additional information, refer to the *Asynchronous Transfer Mode Interface Processor (AIP) Installation and Configuration* configuration note (Document Number 78-1214-xx, where xx is the latest version), which is available on UniverCD or in print.

Ethernet Connections

An Ethernet transceiver or MAU should already be connected to your network. Connect each Ethernet port on the EIP to an Ethernet transceiver with a transceiver cable, or to an attachment unit with an attachment unit interface (AUI). Figure 3-9 shows an example of a typical connection. Some transceivers connect directly to the Ethernet port on the EIP (usually the 10BaseT type) and do not require an interface cable.

On each EIP port, slide the metal bracket up over two posts on the cable connector, or tighten the thumbscrews to secure the cable in the port and provide strain relief. For descriptions of the connection equipment and connector locks, refer to the section “Ethernet Connection Equipment” in the chapter “Preparing for Installation.”

Figure 3-9 Ethernet Connections

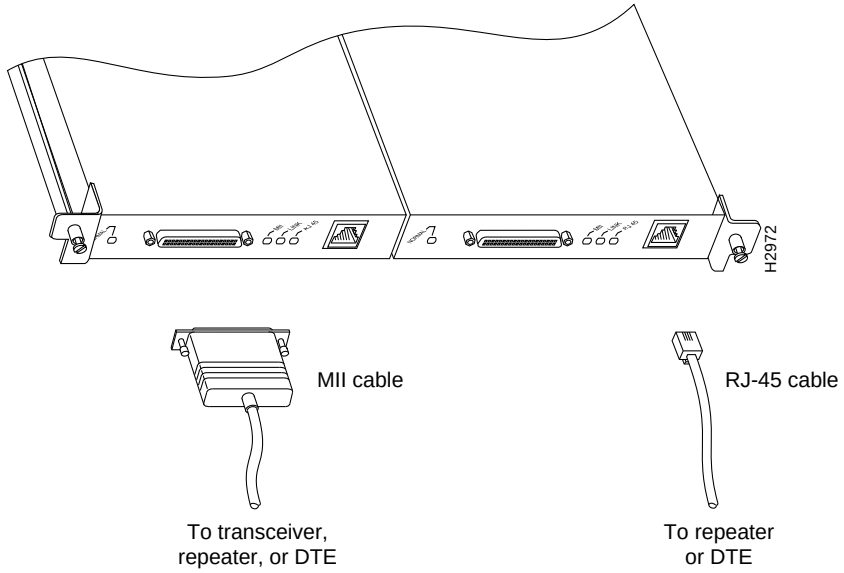


Fast Ethernet Connections

For an MII connection, a 100BaseT transceiver or MAU should already be connected to your network. The RJ-45 connection does not require an external transceiver. On a single 100BaseT port adapter, you can use *either* the RJ-45 connection *or* the MII connection. If you have two 100BaseT port adapters on your FEIP, you can use the RJ-45 connection on one and the MII connection on the other. RJ-45 and MII cables are not available from Cisco Systems.

If you have RJ-45 connections, attach the Category 5 UTP cable directly to the RJ-45 port on the FEIP. (See Figure 3-10.) If you have MII connections, attach an MII cable directly to the MII port on the FEIP or attach a 100BaseT or 100BaseF transceiver, with the media appropriate to your application, to the MII port on the FEIP. Attach the network end of your RJ-45 or MII cable to your 100BaseT or 100BaseF transceiver, switch, hub, repeater, DTE, or whatever external 100BaseT equipment you have.

Figure 3-10 Fast Ethernet Connections



Caution To prevent problems on your FEIP and network, do not simultaneously connect RJ-45 and MII cables to one 100BaseT port adapter. On a single 100BaseT port adapter, only one network connection can be used at one time. Only connect cables that comply with EIA/TIA-588 standards.

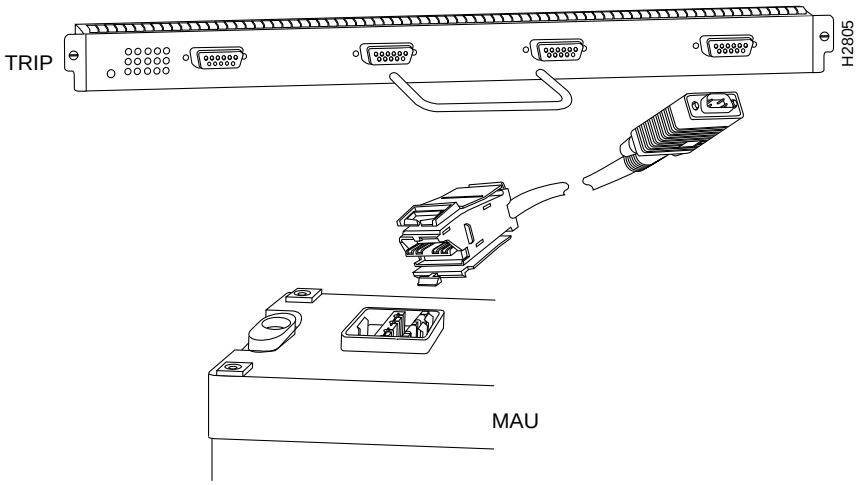
Channel Attachment Connections

Connecting bus and tag or ESCON cables between the CIP and a host processor is beyond the scope of this publication. The specific CIP connection requirements are discussed in detail in the configuration note *Channel Interface Processor (CIP) Installation and Configuration* (Document Number 78-1342-xx, where xx is the latest version of the document), which ships with the CIP and is also available on UniverCD.

Token Ring Connections

Each Token Ring interface connects to the ring through a MAU or a multistation access unit (MSAU), which should already be connected to the ring. Connect the Type 1 or Type 3 lobe cables to the appropriate TRIP ports and tighten the thumbscrews to secure the cable in the port and provide strain relief. Then connect the network end of each lobe cable to the MAU or MSAU. For descriptions of the connection equipment, refer to the section "Token Ring Connection Equipment" in the chapter "Preparing for Installation."

Figure 3-11 Token Ring Connections



The speed of each Token Ring port must match the speed of the ring to which it is connected. The default speed for all TRIP ports is 4 Mbps, which you can change to 16 Mbps on any port with the configuration command **ring-speed** *n*, where *n* is the speed (4 or 16) in Mbps. Before you enable the Token Ring interfaces, ensure that each is set for the correct speed, or it can bring the ring down. The following sample session changes the ring speed on Token Ring port 1/2 from the default 4 Mbps to 16 Mbps:

```
7010# configure terminal
int tokenring 1/2
ring-speed 16
^Z
7010# write memory
[OK]
```

Caution Each TRIP port must be configured for the same ring speed as the ring to which it is connected, either 4 or 16 Mbps. If the port is set for a different speed, it will cause the ring to beacon, which effectively brings the ring down and makes it inoperable.

FDDI Connections

Both single-mode and multimode connections are available and can be combined on one FIP. The fiber-optic cable connects directly to the FIP ports. Single-mode uses separate transmit and receive cables. You will need two single-mode cables for a single-attach connection, or four cables for a dual-attach connection. Multimode uses one integrated transmit/receive cable for each physical interface (one for PHY A and one for PHY B). You will need one multimode cable for a single-attach connection, and two cables for a dual-attach connection. Figure 3-17, which shows the connections for a dual-attach connection that uses both single-mode and multimode fiber, illustrates the types of connections used for both fiber modes. For cable and connector descriptions, refer to the section "FDDI Connection Equipment" in the chapter "Preparing for Installation."

Note Each station in a ring refers to its neighbor stations as *upstream* or *downstream* neighbors. The *stream* is based on the signal flow on the primary ring. A station receives the primary signal from its upstream neighbor and transmits the primary signal to its downstream neighbor.

This section also provides instructions for connecting an optical bypass switch to a dual attachment multimode network connection. Because the method of connecting optical bypass switches varies between different manufacturer's models, refer to the documentation for your particular bypass switch for correct connection instructions. If you are installing an optical bypass switch, proceed to the section "Installing an Optical Bypass Switch" in this chapter.

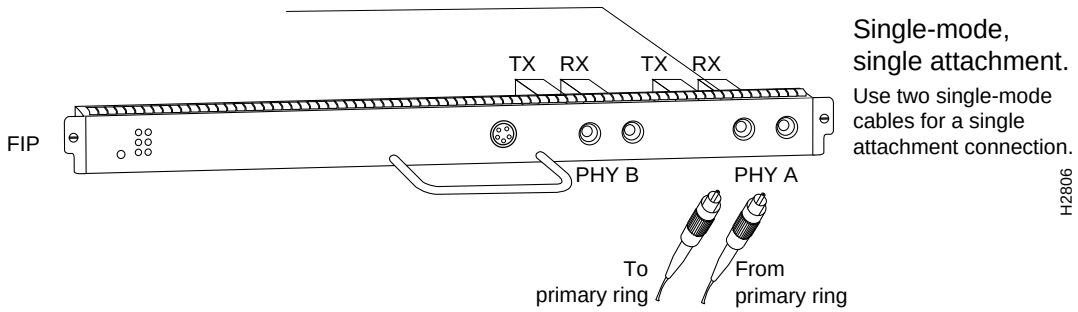
Warning Invisible laser radiation may be emitted from the aperture ports of the single-mode FDDI products when no fiber cable is connected. *Avoid exposure and do not stare into open apertures*. This product meets the Class 1 Laser Emission Requirement from CDRH FDDI.

Single Attach Connections

A FIP that is connected as a single-attach station (SAS) typically is connected to the ring through a concentrator. The FIP receives and transmits the signal through the same physical interface, usually PHY A. Depending on whether you are connecting to a single-mode of multimode fiber network, connect the FIP as follows:

- Single-mode—Connect one single-mode interface cable to the PHY A transmit port and one to the PHY A receive port. (See Figure 3-12.) Connect the opposite end of each cable to the concentrator transmit and receive ports as specified by the concentrator manufacturer.

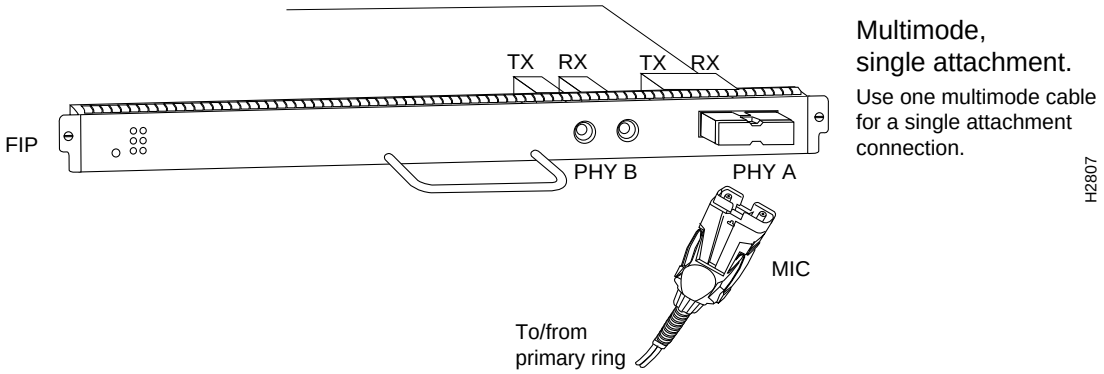
Figure 3-12 Single Attach Station (SAS), Single-Mode Fiber Network Connections



- Multimode—Connect the multimode interface cable between one of the M ports on the concentrator and the PHY A port on the FIP. (See Figure 3-13.) Be sure to observe and match the port labels on the MIC and the FIP ports; connect receive on the cable to PHY A receive. Follow the concentrator manufacturer's instructions for connecting the opposite end of the cable.

If you are connecting other FIPs as dual attach stations (DASs), proceed to the following section. Otherwise, proceed to "Connecting the Console Terminal" in this chapter.

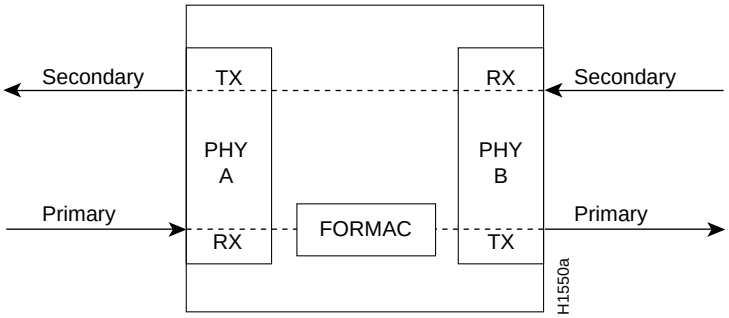
Figure 3-13 Single Attach Station (SAS), Multimode Fiber Network Connections



Dual Attach Connections

A FIP that is connected as a dual-attach station (DAS) connects to both the primary and secondary rings. The signal for each ring is received on one physical interface (PHY A or PHY B) and transmitted from the other. The standard connection scheme (which is shown in Figure 3-14) for a DAS dictates that the primary ring signal comes into the FIP on the PHY A receive port and returns to the primary ring from the PHY B transmit port. The secondary ring signal comes into the FIP on the PHY B receive port and returns to the secondary ring from the PHY A transmit port. Failure to observe this relationship will prevent the FDDI interface from initializing. Figure 3-17 shows the connections for a dual attachment that uses both multimode and single-mode fiber.

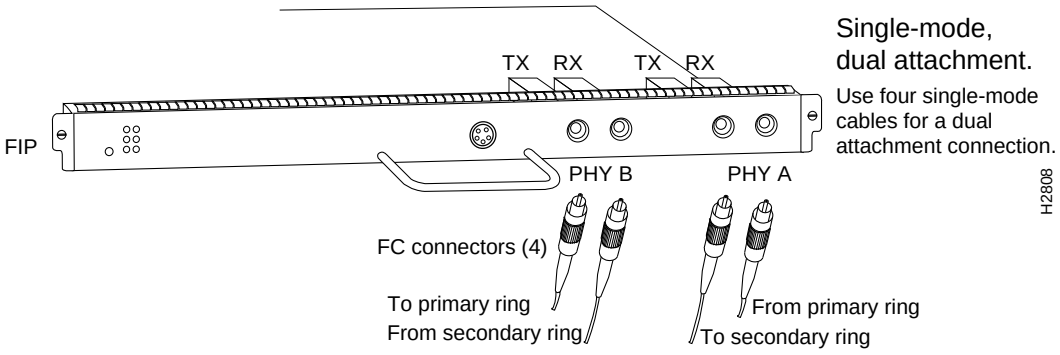
Figure 3-14 FDDI DAS Ports



Depending on whether you are connecting to a single-mode or multimode fiber network, connect the FIP as follows:

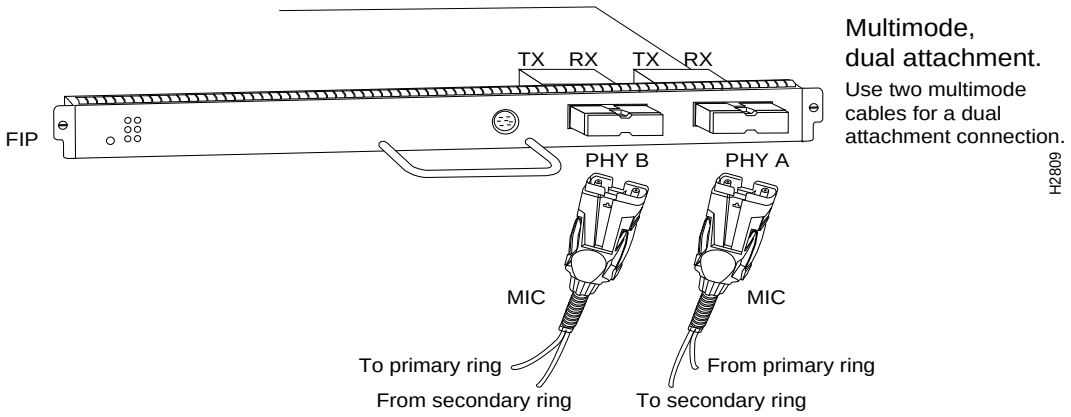
- Single-mode—Observe the standard connection scheme described previously, and refer to Figure 3-15 while you connect the interface cables as follows:
  - Connect the cable coming in from the primary ring (*from* PHY B at the primary ring upstream station) to the FIP PHY A receive port.
  - Connect the cable going out to the primary ring (*to* PHY A at the primary ring downstream station) to the FIP PHY B transmit port.
  - Connect the cable coming in from the secondary ring to the FIP PHY B receive port.
  - Connect the cable going out to the secondary ring to the FIP PHY A transmit port.

Figure 3-15 Dual Attach Station (DAS), Single-Mode Fiber Network Connections



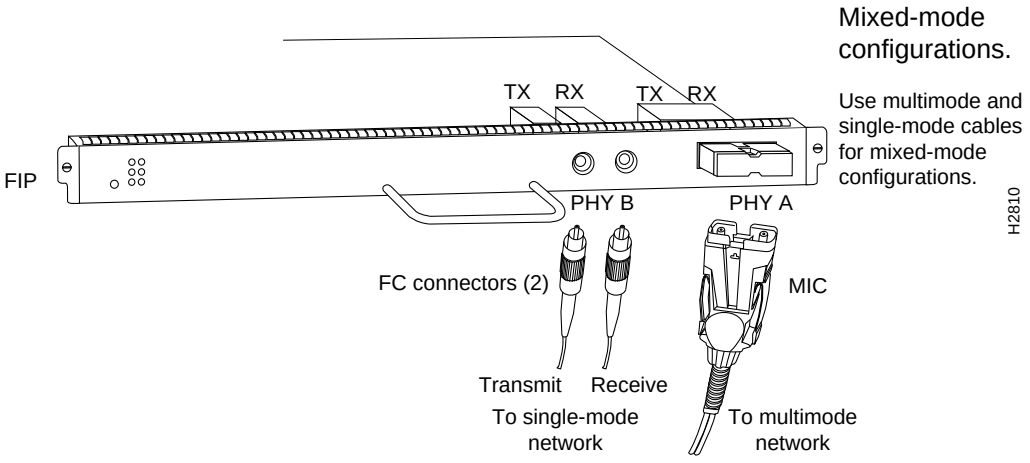
- Multimode—Each of the integrated transmit/receive multimode interface cables attaches to both the primary and secondary ring; each one receives the signal from one ring and transmits to the other ring. (See Figure 3-16.) To help avoid confusion, use the receive label on the cable MIC connector as a key and connect the cables to the FIP ports as follows:
  - Connect the cable coming in from the primary ring to the PHY A receive port. This also connects the signal going out to the secondary ring to the PHY A transmit port.
  - Connect the cable coming in from the secondary ring to the PHY B receive port. This also connects the signal going out to the primary ring to the PHY B transmit port.

Figure 3-16 Dual Attach Station (DAS), Multimode Fiber Network Connections



- Mixed mode—Follow the cabling guidelines described previously to connect the multimode and single-mode interface cables. Figure 3-17 shows that the primary ring signal is received on the multimode PHY A receive port and transmitted from the single-mode PHY B transmit port. Your configuration may be the opposite, with multimode on PHY B and single-mode on PHY A. Connect the cables to the FIP ports as follows:
  - Connect the cable coming in from the primary ring to the PHY A receive port, and connect the signal going out to the secondary ring to the PHY A transmit port.
  - Connect the cable coming in from the secondary ring to the PHY B receive port. This also connects the signal going out to the primary ring to the PHY B transmit port.

Figure 3-17 FDDI Dual Attach Network Connections, Single-Mode and Multimode



If you are connecting an optical bypass switch, proceed to the next section. Otherwise, proceed to "Connecting the Console Terminal" in this chapter.

Installing an Optical Bypass Switch

An optical bypass switch is a device installed between the ring and the station that provides additional fault tolerance to the network. If a FIP that is connected to a bypass switch fails or shuts down, the bypass switch activates automatically and allows the light signal to pass directly through it, bypassing the FIP completely. (See Figure 3-18 or Figure 3-19.) A port for connecting an optical bypass switch is provided on the multimode/multimode FIP (CX-FIP-MM) and the single-mode/single-mode FIP (CX-FIP-SS).

Figure 3-18 CX-FIP-MM Connection with Optical Bypass

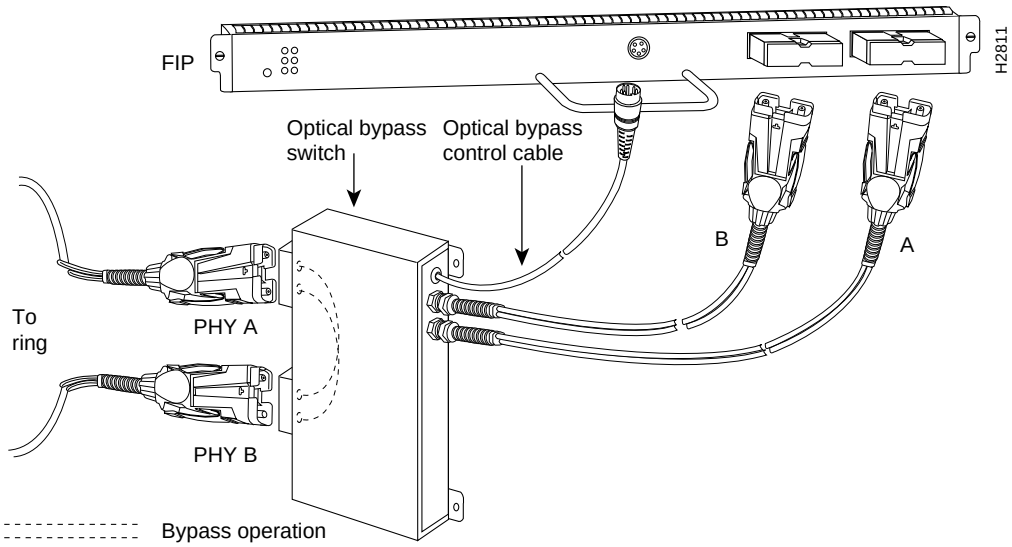
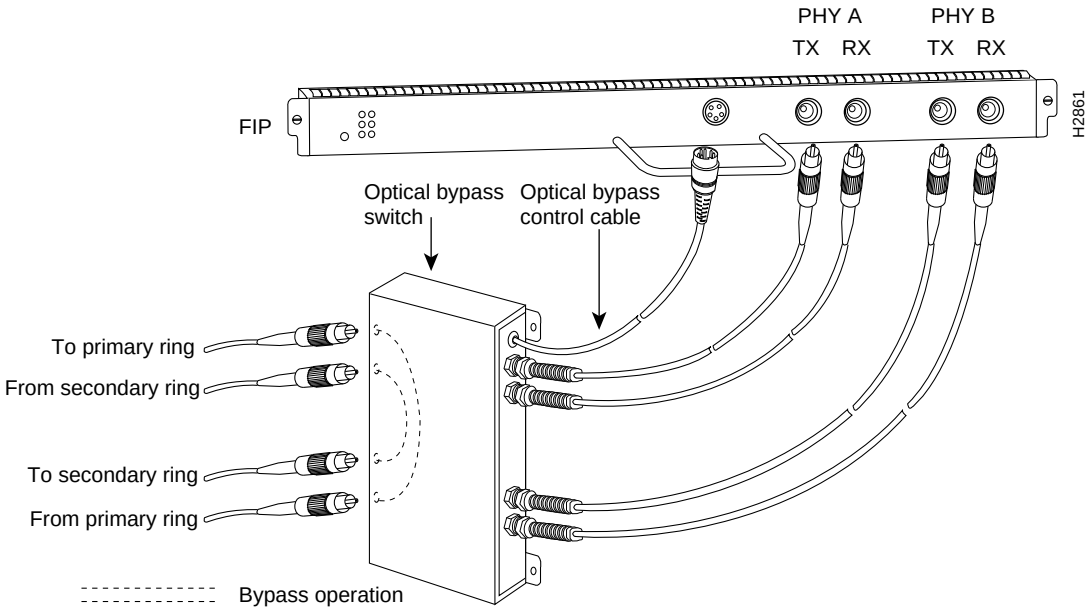


Figure 3-19 CX-FIP-SS Connection with Optical Bypass



The optical bypass control port on the FIP is a six-pin mini-DIN receptacle. Some optical bypass switches use DIN connectors, and some use a mini-DIN. A DIN-to-mini-DIN control cable (CSB-FMDD) is included with the CX-FIP-MM or CX-FIP-SS to connect optical bypass switches that use the larger DIN connector. Up to 100 milliamperes of current can be supplied to the optical bypass switch.

Following are general instructions for connecting an optical bypass switch to the FIP; however, your particular bypass switch may require a different connection scheme. Use these steps as a general guideline, but refer to the instructions provided by the manufacturer of the switch for specific connection requirements.

- Connect the bypass switch to the ring. Unless the documentation that accompanies the bypass switch instructs otherwise, observe the same guidelines for connecting the A/B ports on the bypass switch that you would to connect the ring directly to the FIP ports. Use the receive label on the cable MIC connectors as a key and connect the cables to the network (ring) side of the bypass switch as follows:
  - Connect the cable coming in from the primary ring (*from* PHY B at the preceding station) to the PHY A receive port on the network (ring) side of the bypass switch. This also connects the signal going out to the secondary ring to the PHY A transmit port.
  - Connect the cable coming in from the secondary ring (*from* PHY A at the preceding station) to the PHY B receive port on the network (ring) side of the bypass switch. This also connects the signal going out to the primary ring to the PHY B transmit port.
- Connect the bypass switch to the FIP. Unless the documentation that accompanies the bypass switch instructs otherwise, consider the bypass an extension of the FIP ports and connect A to A and B to B. The network cables are already connected to the bypass switch following the standard B-to-A/A-to-B scheme.
  - Connect an interface cable between the PHY A port on the station (FIP) side of the bypass switch and the FIP PHY A port.
  - Connect an interface cable between the PHY B port on the station (FIP) side of the bypass switch and the FIP PHY B port.
- Connect the bypass switch control cable. If the control cable on your optical bypass switch uses a mini-DIN connector, connect the cable directly to the mini-DIN optical bypass port on the FIP. If the switch uses a standard DIN connector, use the optical bypass adapter cable (CSB-FMDD) supplied with each FIP. Connect the DIN end of the adapter cable to the DIN on the control cable, and connect the mini-DIN end of the adapter cable to the mini-DIN bypass port on the FIP.

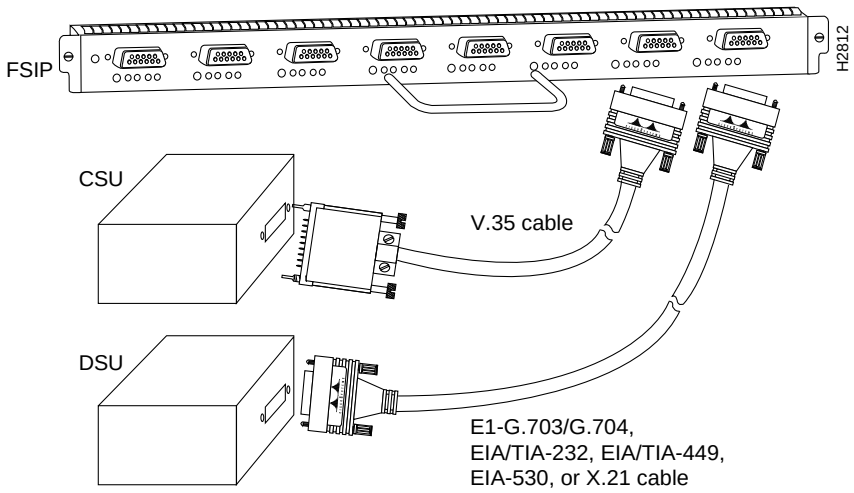
Serial Connections

All FSIP ports support any available interface type and mode. The serial adapter cable determines the electrical interface type and mode of the port to which it is connected. EIA/TIA-232, EIA/TIA-449, V.35, and X.21 interfaces are available in DTE mode with a plug at the network end and in DCE mode with a receptacle at the network end. EIA-530 is available only in DTE mode with a plug. For descriptions and illustrations of each connector type, refer to the section “Serial Connection Equipment” in the chapter “Preparing for Installation.” For cable pinouts, refer to the appendix “Cabling Specifications.”

Connecting DTE and DCE Devices

When connecting serial devices, consider the adapter cables as an extension of the router for external connections; therefore, use DTE cables to connect the router to remote DCE devices such as modems or data service units (DSUs), and use DCE cables to connect the router to remote DTE devices such as a host, personal computer (PC), or another router. (See Figure 3-20.) The optional or additional connection equipment required depends on the interface type of each port.

Figure 3-20 Serial Port Adapter Cable Connections

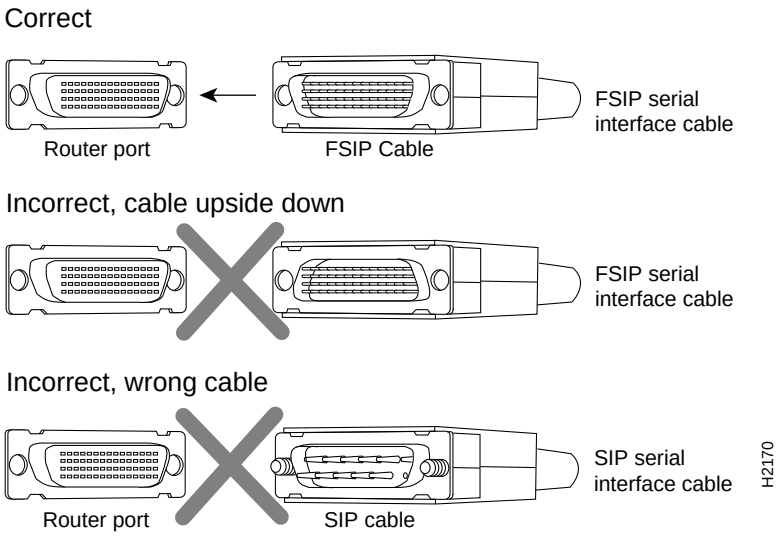


Note The serial port adapter cable determines the electrical interface type and mode of the FSIP port. When connecting a remote DTE device (which means that the FSIP port is a DCE interface), you must set the clockrate with the **clockrate** command. For an example configuration using this command, refer to the section "Configuring Timing (Clock) Signals" in the chapter "Maintenance." For complete command descriptions and instructions, refer to the related software configuration and command reference documentation.

Caution The early serial interface processor for the seven-slot Cisco 7000 model, known as the SIP, SX-SIP, or PRE-FSIP, does not operate in the Cisco 7010. (The SIP requires SxBus connectors that are not present on the Cisco 7010 backplane.) The SIP and FSIP each use unique interface cables that are not interchangeable. (The SIP uses DB-15 or DB-25 plugs and receptacles; all FSIP ports are 60-pin receptacles and the cables use 60-pin plugs.)

Also, the backshell on the FSIP universal cable connector is not stiff enough to prevent you from inserting the interface cable connector into the FSIP port upside down. Before forcing the cable into the FSIP port receptacle, ensure that the connector is oriented correctly. Forcing a SIP cable into an FSIP port or forcing an FSIP cable into the port upside down can damage the FSIP. (See Figure 3-21.)

Figure 3-21 SIP and FSIP Cables Are Not Interchangeable

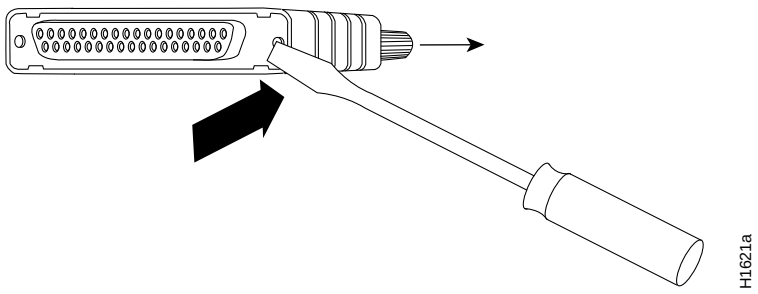


Connecting to Metric-Based Devices

A pair of metric thumbscrews is included with each port adapter cable except V.35. If you will connect serial cables to a remote device that uses metric hardware, replace the standard 4-40 thumbscrews at the network end of the cable with the M3 thumbscrews.

To remove thumbscrews, use the flat side of a large (1/4-inch) flat-blade screwdriver to push the tip of the screw into the connector housing and out the other side. (See Figure 3-22.) If the screw resists, use pliers to pull it out. Insert the new thumbscrew and push it into the connector housing until it pops into place.

Figure 3-22 Replacing Standard 4-40 Thumbscrews with M3 Metric Thumbscrews

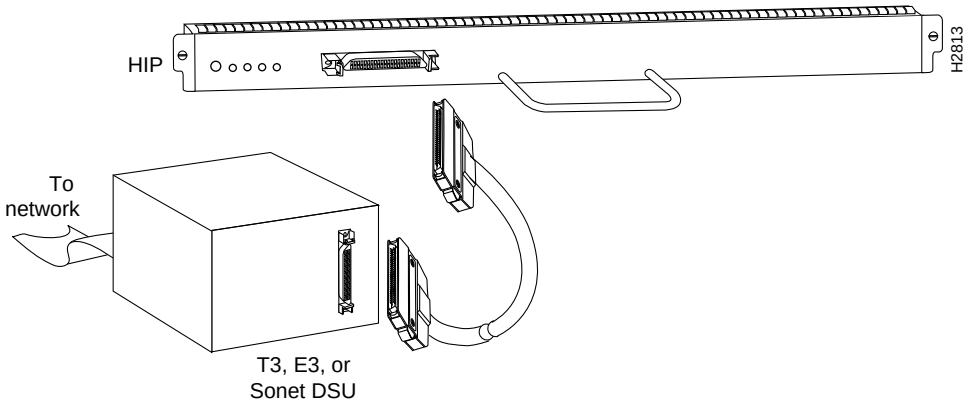


HSSI Connections

The HIP HSSI port functions as a DTE when it is connected to a DSU for a standard HSSI connection, and it can also be connected to a collocated router with a null modem cable.

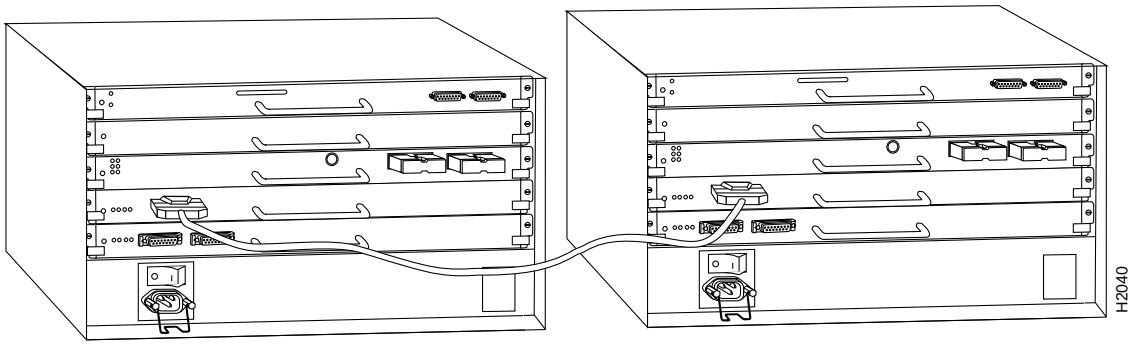
To connect the router to a HSSI network, use a HSSI interface cable between the HIP port and the DSU. Both ends of the HSSI interface cable are the same, so you can connect either end to the HIP or DSU. (See Figure 3-23.)

Figure 3-23 HSSI Network Connection



To connect two routers back to back in order to verify the operation of the HSSI port or to build a larger node, use a null modem cable between available HSSI ports in two separate routers. The two routers must be in the same location, and can be two Cisco 7000 series, two AGS+'s, or one of each. When you configure the ports, you must enable the internal transmit clock on in the HSSI interface in *both* routers with the command **hssi internal-clock**. To negate the command when you disconnect the cable, use the command **no hssi internal-clock**. For complete command descriptions and instructions, refer to the related software documentation.

Figure 3-24 HSSI Null Modem Connection



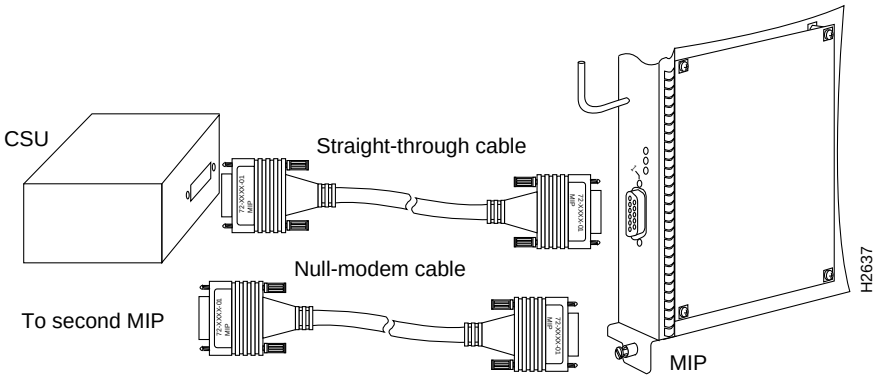
MultiChannel Connections

For the MIP, two standard T1 serial cables are available from Cisco Systems and other vendors for use with the MIP: null-modem and straight-through. These interface cables are used to connect your router to external CSUs.

The cables have male 15-pin DB connectors at each end to connect the MIP with the external CSU.

Connect the T1 cable as shown in Figure 3-25.

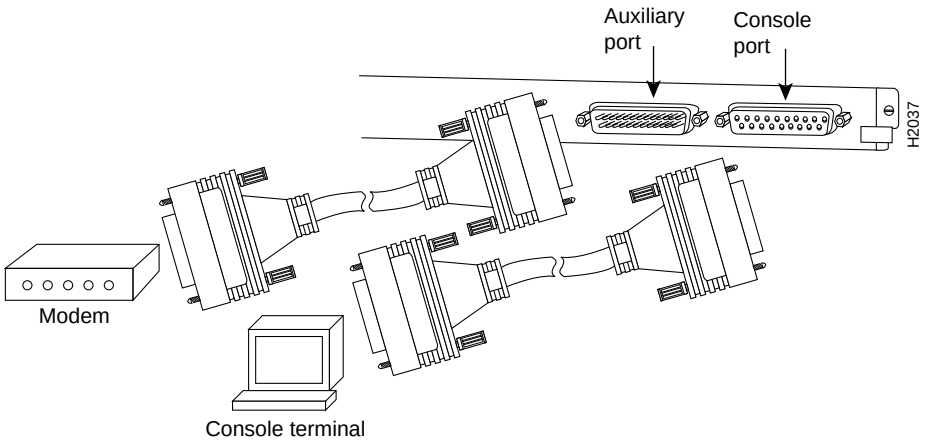
Figure 3-25 MIP Connections



Connecting the Console Terminal

The system console port on the RP (or RSP7000) is a DCE DB-25 receptacle for connecting a data terminal, which you will need to configure and communicate with your system. The console port is located on the RP (or RSP7000) to the right of the auxiliary port and is labeled *Console* as shown in Figure 3-26.

Figure 3-26 Console and Auxiliary Port Connections



Before connecting the console port, check your terminal's documentation to determine the baud rate of the terminal you will be using. The baud rate of the terminal must match the default baud rate (9600 baud). Set up the terminal as follows: 9600 baud, 8 data bits, no parity, 2 stop bits. Use the console cable provided to connect the terminal to the console port on the RP (or RSP7000), and then follow the steps in the section "Starting the Router" later in this chapter.

Note Both the console and auxiliary ports are asynchronous serial ports; any devices connected to these ports must be capable of asynchronous transmission. (Asynchronous is the most common type of serial device; for example, most modems are asynchronous devices.)

Connecting Auxiliary Port Equipment

The auxiliary port is a DB-25 plug DTE port for connecting a modem or other DCE device (such as a CSU/DSU or other router) to the router. The port is located on the RP (or RSP7000) above the console port and is labeled *Auxiliary.* An example of a modem connection is shown in Figure 3-26.

Starting the Router

When all interfaces are connected, perform a final check of all connections, then power up the router as follows:

Step 1 Check the following components to make sure they are secure:

- Each interface processor is inserted all the way into its slot, and all of the captive installation screws are tightened.
- All interface cable connections are secured.
- The system power cord is connected and secured with the cable retention clip.
- The Flash memory card, if present, is inserted all the way into its slot on the RP (or RSP7000).

Step 2 Check the console terminal and make sure it is ON.

Step 3 When you have checked all of the connection points listed previously, turn on the power supply by pushing the system power switch to on (|). The DC OK indicator on the interface processor end of the router should go on.

Step 4 Listen for the system fans; you should immediately hear them operating.

Step 5 On the RP, the yellow boot error indicator goes on for about 5 seconds or less, then goes off when the boot is complete. If this indicator stays on longer than 10 seconds, or if it remains on after system initialization, a boot error has occurred. Refer to the chapter "Troubleshooting the Installation" for troubleshooting procedures.

Step 6 During the boot process, the indicators on most of the interfaces go on and off in irregular sequence. Some may go on, go out, and go on again for a short time. Some will stay on during the entire boot process if an interface is already configured and brought up such as the EIP receive indicator, which stays on as it detects traffic on the line). Wait until the system boot is complete before attempting to verify the status of interface processor indicators.

Step 7 When the system boot is complete (a few seconds), the RP begins to initialize the interface processors. During this initialization, the indicators on each interface processor behave differently (most flash on and off). The enabled LED on each interface processor goes on when initialization has been completed, and the console screen displays a script and system banner similar to the following:

```
GS Software (GS7), Version 10.3(1)
Copyright (c) 1986-1995 by Cisco Systems, Inc.
Compiled Wed 15-Mar-95 11:06
```

Step 8 When you start up the router for the first time, the system automatically enters the **setup** command facility, which determines which interfaces are installed and prompts you for configuration information for each one. On the console terminal, after the system displays the system banner and hardware configuration, you will see the following System Configuration Dialog prompt:

```
         --- System Configuration Dialog ---
At any point you may enter a questions mark '?' for help.
Refer to the 'Getting Started' Guide for additional help.
Default settings are in square brackets '[]'. continue with
configuration dialog? [yes]:
```

You have the option of proceeding with the **setup** command facility to configure the interfaces, or exit from setup and use configuration commands to configure global (system-wide) and interface-specific parameters. You do not have to configure the interfaces immediately; however, you cannot enable the interfaces or connect them to any networks until you have configured them.

Many of the interface processor LEDs will not go on until you have configured the interfaces. In order to verify correct operation of each interface, complete the first-time startup procedures and configuration, then refer to the LED descriptions in the appendix "Reading LED Indicators" to check the status of the interfaces.

Your installation is complete. Proceed to the appropriate software configuration publications to configure your interfaces.

Note If the system does not complete each of these steps, proceed to the chapter "Troubleshooting the Installation" for troubleshooting procedures.

Using the Flash Memory Card

This section describes installation, removal, and typical operations of the 8 or 16 MB, Intel Series 2+ Flash memory card, which installs in the PCMCIA slot on the RP faceplate.

Note The router must be using Cisco IOS Release 11.0 boot ROMs in order to support the Flash memory card. Flash memory cards formatted on one type of system processor (RP or RSP7000) can only be used with that system processor type. You cannot use a Flash memory card interchangeably between RP and RSP (or RSP7000) without first reformatting it.

The Flash memory card is used to store and boot Cisco Internetwork Operating System (Cisco IOS) software images and interface processor microcode images, and can be used as a server to store software and microcode images for other systems. The Flash memory card is shipped blank; you *must* format it before using it. Formatting instructions are included in this document.

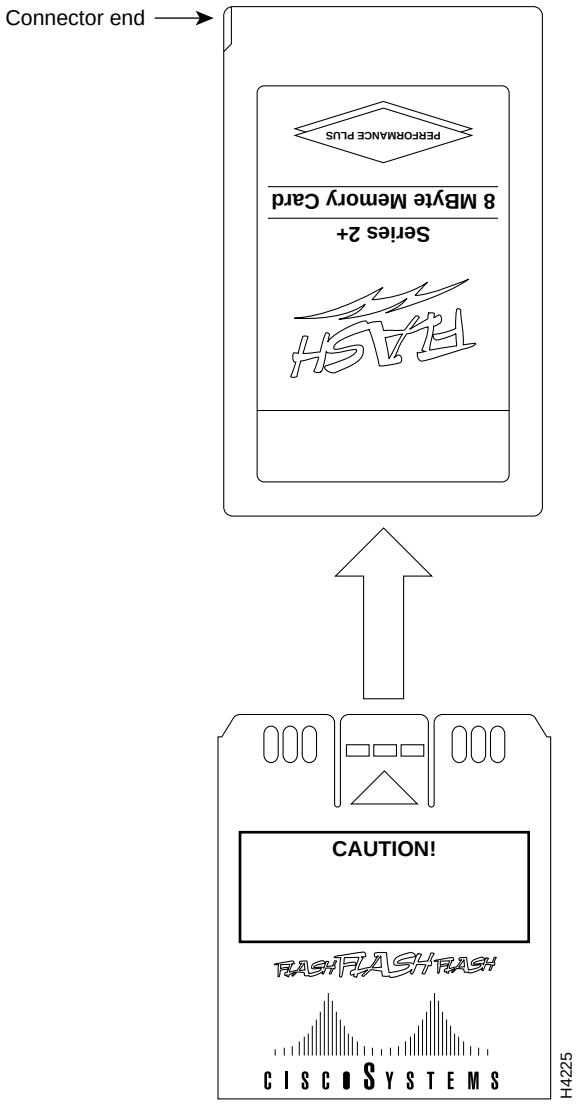
Installing and Removing the Flash Memory Card

The Flash memory card can be inserted and removed with the power on. Following is the procedure for installing and removing a Flash memory card:

Step 1 Verify that the metal sleeve is correctly installed on the Flash memory card. (The sleeve must be installed with the connector end exposed, as shown in Figure 3-27.)

Note A metal sleeve will be provided with all Flash memory cards shipped as a spare or with a new system. Should a replacement metal sleeve be required, consult Customer Engineering through the Technical Assistance Center (TAC).

Figure 3-27 Installing the Metal Sleeve



Step 2 Hold the Flash memory card with the connector end of the card toward the PCMCIA slot. The product label should face to the right, as shown in Figure 3-28a.

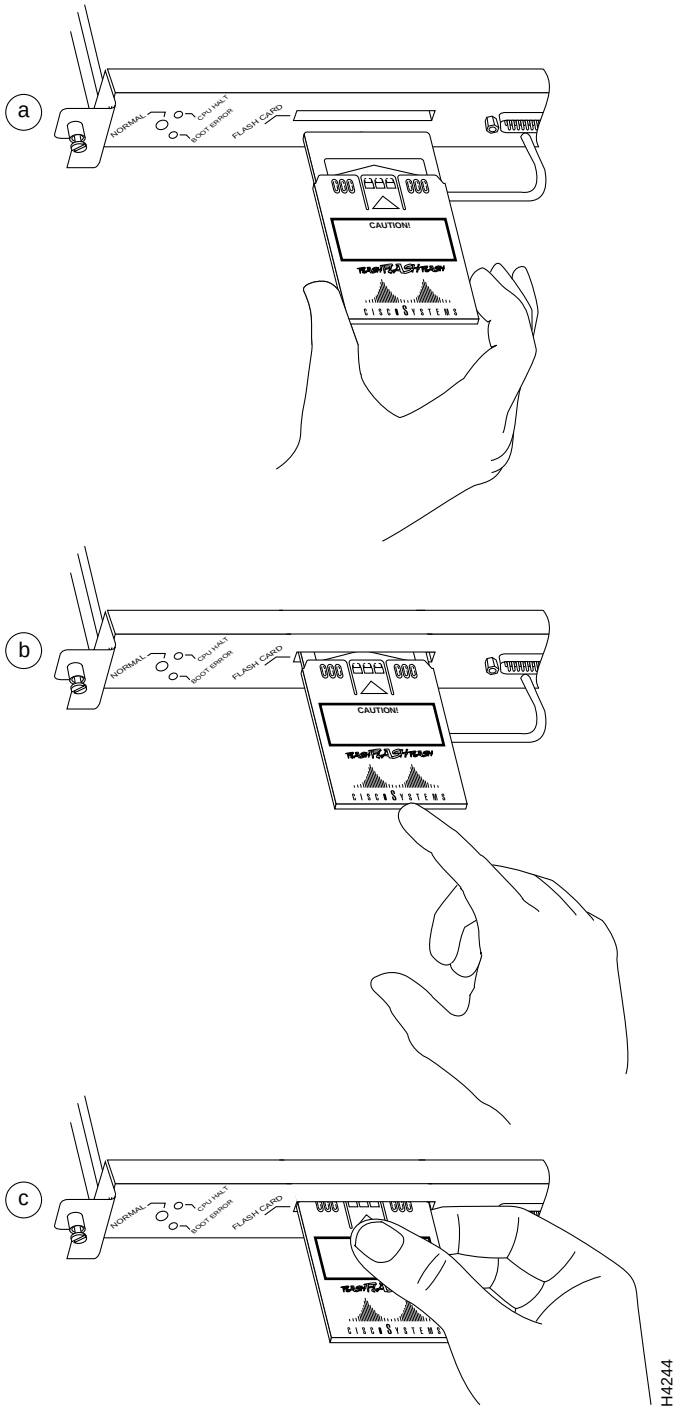
Note The Flash memory card is keyed and cannot be seated the wrong way.

Step 3 Insert the card into the slot until the card completely seats in the connector at the back of the slot. Note that the card does not insert all the way inside the RP; a portion of the card and sleeve remain outside of the slot. *Do not attempt to force the card past this point.*

Step 4 To remove the card, grasp the card near the slot and squeeze the sleeve together to release it from the slot. Then pull the card free from the connector at the back of the slot. (See Figure 3-28c.)

Step 5 Place the removed Flash memory card on an antistatic surface or in a static shielding bag.

Figure 3-28 Installing and Removing a Flash Memory Card



Formatting the Flash Memory Card

The Flash memory card shipped with a spare RP or shipped with a system is already formatted. However, a spare Flash memory card is shipped blank and must be reformatted before use. Also, if you plan to use a Flash memory card that was formatted on an RSP-based system (Cisco 7500 series), you must first reformat the card on your system.

Note The following procedure assumes you have already booted your router.

Caution The following formatting procedure erases all information on the Flash memory card. To prevent the loss of important data that might be stored on a Flash memory card, proceed carefully. If you wish to save the data on a Flash memory card, upload the data to a server before you format the card.

Use the following procedure to format a new Flash memory card:

Step 1 Using the procedures in the section "Installing and Removing the Flash Memory Card," insert the Flash memory card into the PCMCIA slot.

Step 2 To format the Flash memory card, use the **format slot0** command as follows. (Use only Intel Series 2+ Flash memory cards.)

```
Router# format slot0:
All sectors will be erased, proceed? [confirm]
Enter volume id (up to 30 characters): MyNewCard
Formatting sector 1
Format device slot0 completed
Router#
```

Note For this example, an 8-MB Flash memory card was used, and at the line "Formatting sector," the system counted the card's sectors backwards from 64 to 1 as it formatted them. For 16-MB Flash memory cards, the system counts backwards from 128 to 1.

The new Flash memory card is now formatted and ready to use.

Note For complete command descriptions and configuration information, refer to the *Router Products Command Reference* publication and the *Router Products Configuration Guide*.

Copying an Image into the Flash Memory Card

With the Flash memory card formatted, you can now copy an image into it. To copy an image, use the following procedure, which assumes the following:

- The system is running Cisco IOS Release 11.0 or later.
- The bootable image you wish to copy to the Flash memory card exists on a TFTP server to which you have access (meaning you know its name and have connectivity to it), and at least one interface is available over which you can access this server.

Note To assure access to a TFTP sever, you will need to configure at least one interface using the **setup** command facility. For instructions on using this procedure, refer to the *Router Products Configuration Guide* or *Router Products Getting Started Guide* publications.

- You know the filename of the image you wish to copy into the Flash memory card

Following is the procedure for copying a bootable file (called *new.image*) into the Flash memory card:

Step 1 If the Flash memory card is unformatted or has been formatted on another system, format it using the procedure in the section “Formatting the Flash Memory Card.”

Note If you have already formatted a Flash memory card, you can use it instead; however, you cannot boot from a Flash memory card formatted on another type of system. You must reformat it to use it as a boot source.

Step 2 To enable the router, copy the image *new.image* to the Flash memory card, make this image in the Flash memory card (in Slot 0) the default boot image, and reboot the router, use the following series of commands:

```
Router> en
Password:
Router# copy tftp:new.image slot0:new.image
20575008 bytes available on device slot0, proceed? [confirm]
Address or name of remote host [1.1.1.1]?
Loading new.image from 1.1.1.1 (via Ethernet1/0): !!!!!!!!!!!!!!!!!!!!!!!!!!!!!
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!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 7799951/15599616 bytes]
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
Router#
```

Note In the previous example, the exclamation points (!!!) appear as the file is downloaded and the "C" characters signify calculation of the checksum, which is a verification that the file has been correctly downloaded to the Flash memory card.

Making the Flash Memory Card Image Bootable

Use the following series of commands to make the image (the file named *new.image*) bootable. Note that, since the configuration register must be set to 0x2102, the **config-register** command is part of the sequence.

```
Router# config terminal
Router(config)# no boot system
Router(config)# boot system flash slot0:new.image
Router(config)# config-register 0x2102
Router(config)# ^z
Router# copy running-config startup-config
Router# reload
```

When the system reloads it will boot the image *new.image* from the Flash memory card in Slot 0.

Note For complete details about the **boot system flash** command, refer to the next section, "Enabling Booting from the Flash Memory Card."

Enabling Booting from the Flash Memory Card

To enable booting from Flash memory, set configuration register bits 3, 2, 1, and 0 to a value between 2 and 15 in conjunction with the **boot system flash** *[filename]* configuration command.

Following are definitions of the various Flash memory-related **boot** commands:

boot system flash—Boots the first file in onboard Flash memory

boot system flash *herfile***—**Boots the file named "herfile" on onboard Flash memory

boot system flash slot0:—Boots the first file on Flash memory card in the PCMCIA slot

boot system flash flash:*hisfile* **—**Boots the file named "hisfile" on onboard Flash memory

boot system flash slot0:*myfile* **—**Boots the file named "myfile" on the Flash memory card in the PCMCIA slot

To enter configuration mode and specify a Flash memory filename in the PCMCIA slot from which to boot, enter the **configure terminal** command at the enable prompt, as follows:

```
Router# configure terminal
Enter configuration commands, one per line. End with CTRL-Z.
Router(config)# boot system flash slot0:myfile
```

To disable Break and enable the **boot system flash slot0:** command, enter the **config-register** command with the value shown in the following example:

```
Router(config)# config-reg 0x2102

To exit configuration mode, enter Cntl-Z as follows:
Router(config)# ^Z
Router#
```

To save the new configuration to memory, use the **copy running-config startup-config** command as follows:

```
Router# copy running-config startup-config
```

When you enter **boot** commands, pay attention to the use of the Spacebar, which influences the way the router interprets the command. For example, notice the difference in the following commands:

```
Router(config)# boot system flash slot0:myfile (correct command)
Router(config)# boot system flash slot0: myfile (incorrect command)
```

In the first case, the router boots the file specified (*myfile*). In the second case, the router finds the *filename* field blank, and boots the first file on the Flash memory card.

Copying to the Flash Memory Card

Copying a new image to Flash memory might be required whenever a new image or maintenance release becomes available. You *cannot* copy a new image into Flash memory while the system is running from Flash memory.

Use the command **copy tftp:***filename* [**bootflash** | **slot0**]:*filename* for the copy procedure. Where **tftp:***filename* is the source of the file and [**bootflash** | **slot0**]:*filename* is the destination in onboard Flash memory or on either of the Flash memory cards.

An example of the **copy tftp:***filename* command follows:

```
Router# copy tftp:myfile1 slot0:myfile1
20575008 bytes available on device slot0, proceed? [confirm]
Address or name of remote host [1.1.1.1]?
Loading new.image from 1.1.1.1 (via Ethernet1/0): !!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!![OK - 7799951/15599616 bytes]
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
Router#
```

Note In the preceding example, the exclamation points (!!!) appear as the file is downloaded and the “C” characters signify calculation of the checksum, which is a verification that the file has been correctly downloaded to the Flash memory card.

Recovering from Locked Blocks

A locked block of Flash memory occurs when power is lost or a Flash memory card is unplugged during a write or erase operation. When a block of Flash memory is locked, it cannot be written to or erased, and the operation will consistently fail at a particular block location. The only way to recover from locked blocks is by reformatting the Flash memory card with the **format** command.

Caution Formatting a Flash memory card to recover from locked blocks will cause existing data to be lost.

For complete command descriptions and configuration information, refer to the *Router Products Command Reference* publication and the *Router Products Configuration Guide.*

Flash Memory Card Compatibility

In order to use the Flash memory card with your RP, the card must have been formatted on an RP. Therefore, if you want to use a card formatted on an RSP (Cisco 7500 series) or an RSP7000, you must first reformat it.

Note Flash memory cards formatted on one type of system processor (RP or RSP7000) can only be used with that system processor type. You cannot use a Flash memory card interchangeably between RP and RSP (or RSP7000) without first reformatting it.

Any Intel Series 2+ Flash memory card can be used with the RP. However, you must install the card's metal sleeve, and the system must contain Cisco IOS Release 11.0 boot ROMs (SWR-G7-11.0.0=). (The RP requires these boot ROMs in order to boot from the Flash memory card.) In addition, the RP can only read up to 16 MB.