CHAPTER 3

Installing the Router

This chapter describes how to install your router, modules, and WAN interface cards, and how to connect the router to networks and external devices. This chapter includes the following sections:

- Setting Up the Chassis
- Installing a WAN Interface Card in a Module Slot
- Installing Modules in a Chassis Slot
- Network Connections
- Connecting the Console Terminal and Modem
- Electrical Connections
- What to Do After Installing the Hardware

Setting Up the Chassis

You can set the chassis on a desktop, install it in a rack, or mount it on a wall. Use the procedure in this section that best meets your installation needs.

Setting the Chassis on a Desktop

For desktop- or shelf-mounting, use the rubber feet on a black adhesive strip that shipped with the chassis. The rubber feet protect the chassis and provide a nonskid surface.

To attach the rubber feet, follow this procedure:

Step 1 Locate the rubber feet that shipped with the chassis.

Step 2 Place the router upside-down on a smooth, flat surface.

Step 3 Peel the rubber feet off the black adhesive strip and place them adhesive-side down at each corner of the chassis bottom.

Step 4 Place the router right-side up on a flat, smooth, secure surface.

Caution Do not place anything on top of the router that weighs more than 10 pounds (4.5 kg). Excessive weight on top of the router could damage the chassis.

After the router has been installed, proceed to the next applicable section in this chapter: "Installing a WAN Interface Card in a Module Slot," "Installing Modules in a Chassis Slot," or "Network Connections."

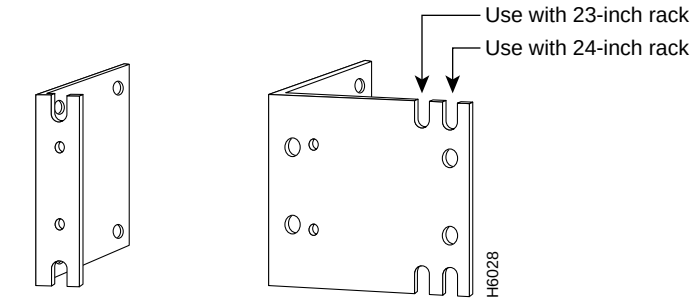
Rack-Mounting the Chassis

If you are planning to rack-mount the router, do so before making network and power connections. If you need to install modules or WAN interface cards, you can do so either before or after rack-mounting the router. Ideally, you would install modules or WAN interface cards when you have the best access to the router's rear panel.

Note You need a Number 2 Phillips screwdriver to mount the chassis in a rack.

The router is shipped with one set of brackets. Brackets for 19-inch racks are shipped unless the 23- or 24-inch brackets are specified at the time of the order. The brackets are shown in Figure 3-1.

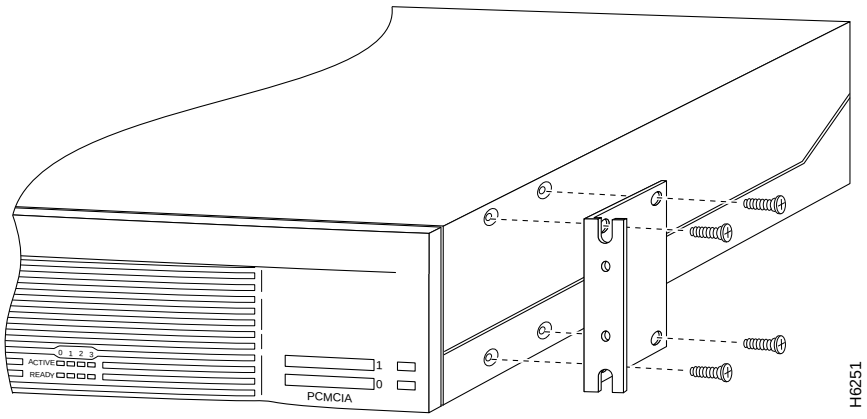
Figure 3-1 Identifying the Brackets



Attaching the Brackets

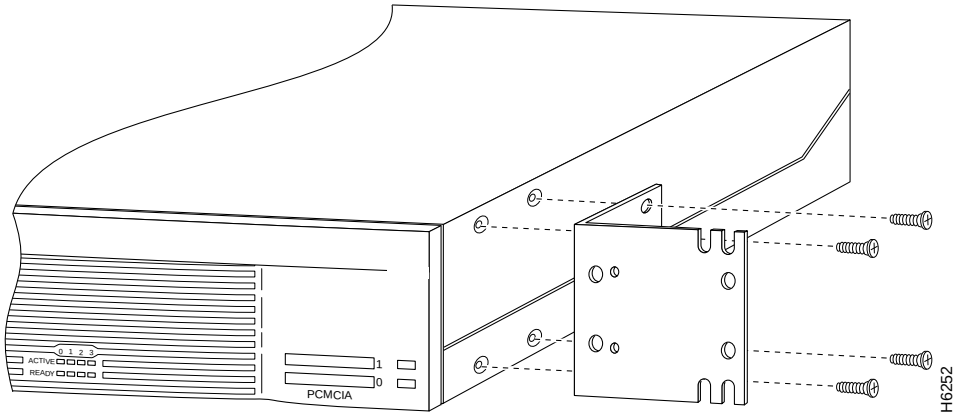
To install the chassis in a rack with the front panel forward, attach the brackets on each side of the chassis as shown in Figure 3-2 or Figure 3-3.

Figure 3-2 19-Inch Bracket Installation—Front Panel Forward



Note: The second bracket attaches to the other side of the chassis.

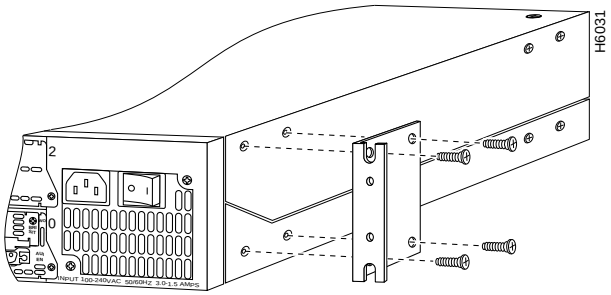
Figure 3-3 23- or 24-Inch Bracket Installation—Front Panel Forward



Note: The second bracket attaches to the other side of the chassis.

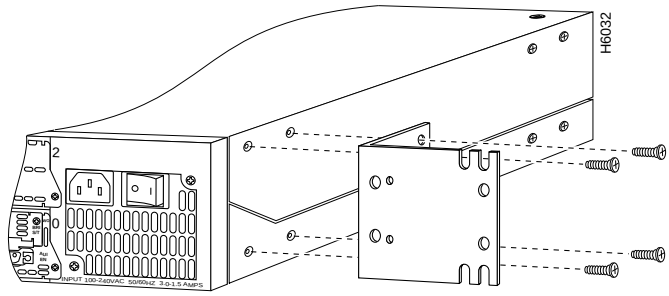
To install the chassis in a rack with the rear panel forward, attach the brackets on each side of the chassis as shown in Figure 3-4 or Figure 3-5.

Figure 3-4 19-Inch Bracket Installation—Rear Panel Forward



Note: The second bracket attaches to the other side of the chassis.

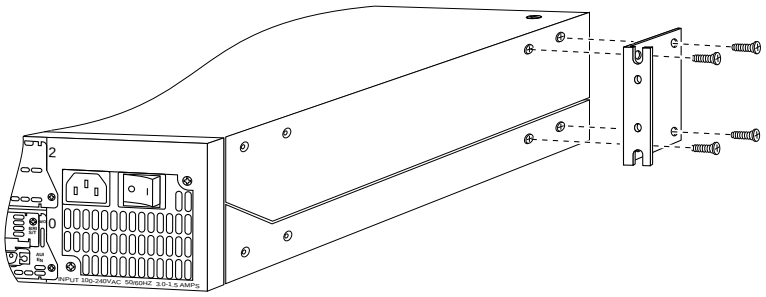
Figure 3-5 23- or 24-Inch Bracket Installation—Rear Panel Forward



Note: The second bracket attaches to the other side of the chassis.

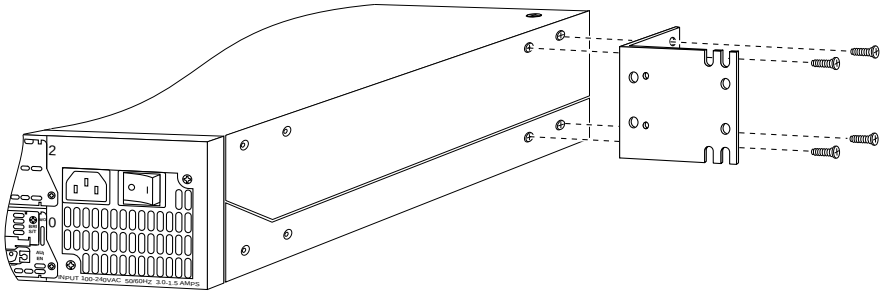
To install the chassis in a center-mount telco rack, attach the brackets on each side of the chassis as shown in Figure 3-6 or Figure 3-7.

Figure 3-6 Telco 19-Inch Bracket Installation—Rear Panel Forward



Note: The second bracket attaches to the other side of the chassis.
The brackets can also be installed with the front panel forward.

Figure 3-7 Telco 23- or 24-Inch Bracket Installation—Rear Panel Forward



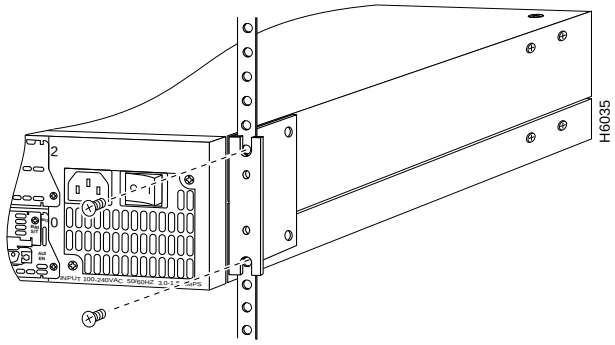
Note: The second bracket attaches to the other side of the chassis. The brackets can also be installed with the front panel forward.

H6034

Installing in a Rack

After the brackets are fastened to the chassis, you can rack-mount the chassis. Using your own screws, attach the chassis to the rack as shown in Figure 3-8 or Figure 3-9.

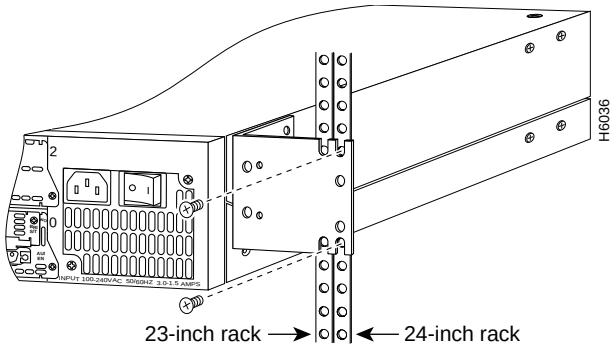
Figure 3-8 Attaching the Chassis to the 19-Inch Rack—Rear Panel Forward



H6035

Note: The second bracket attaches to the rack at the other side of the chassis. The brackets can also be installed with the front panel forward.

Figure 3-9 Attaching the Chassis to the 23- or 24-Inch Rack—Rear Panel Forward



Note: The second bracket attaches to the rack at the other side of the chassis. The brackets can also be installed with the front panel forward.

Attaching the Cable Guides

Attach the cable guides to the rack-mounting brackets on each side of the chassis as shown in Figure 3-10 or Figure 3-11.

Figure 3-10 Attaching Cable Guides to 19-Inch Rack-Mounting Brackets

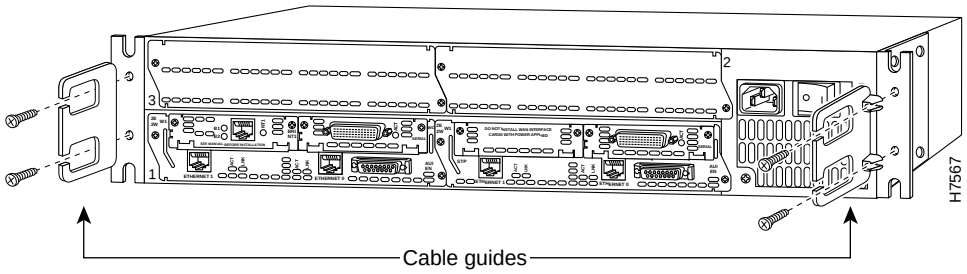
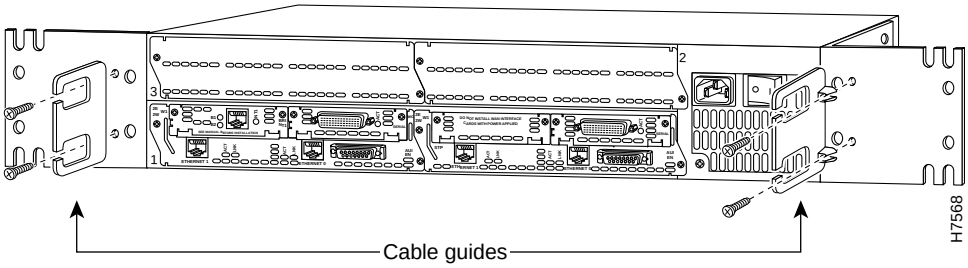


Figure 3-11 Attaching Cable Guides to 23- or 24-Inch Rack-Mounting Brackets



After the router has been installed, proceed to the next applicable section in this chapter: "Installing a WAN Interface Card in a Module Slot," "Installing Modules in a Chassis Slot," or "Network Connections."

Wall-Mounting the Chassis

This section explains how to wall-mount the router. If you are planning to wall-mount your router, do so before making network and power connections or installing network modules or WAN interface cards.

You will need the following tools and equipment to wall-mount the chassis:

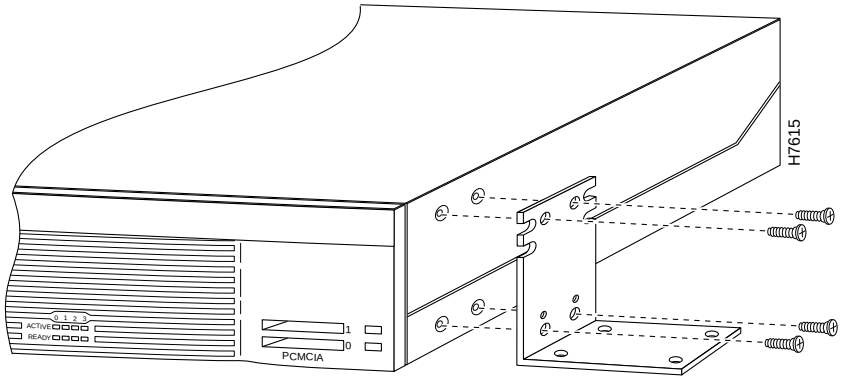
- Number 2 Phillips screwdriver
- Plywood board at least 24 inches wide, 19 inches high, and 1/2-inch thick (60 x 50 x 1.3 cm)
- Eight M3.5 1/2-inch flat-head wood screws
- Four woods screws, at least 3/16-inch x 2 1/2-inch, to mount the plywood to the wall
- Drill

These tools and equipment are not provided.

Attaching Wall-Mounting Brackets the Chassis

To install the chassis on a wall, attach the 23- or 24-inch rack brackets on each side of the chassis, as shown in Figure 3-12.

Figure 3-12 Wall-Mount Bracket Installation



Note: The second bracket attaches to the other side of the chassis.

Installing the Chassis on a Wall

When the brackets have been attached to the chassis, you can wall-mount it. Mount the chassis to the wall with the front panel facing upward, as shown in Figure 3-13.

To wall-mount the chassis, follow this procedure:

Step 1 Using the brackets as a pattern, mark and drill holes on the plywood board where you will attach the router.

Step 2 Locate the wall studs where you plan to mount the router.

Caution The router must be fastened securely to two wall studs.

Step 3 Drill wall-mount screw locations through the plywood board and wall studs.

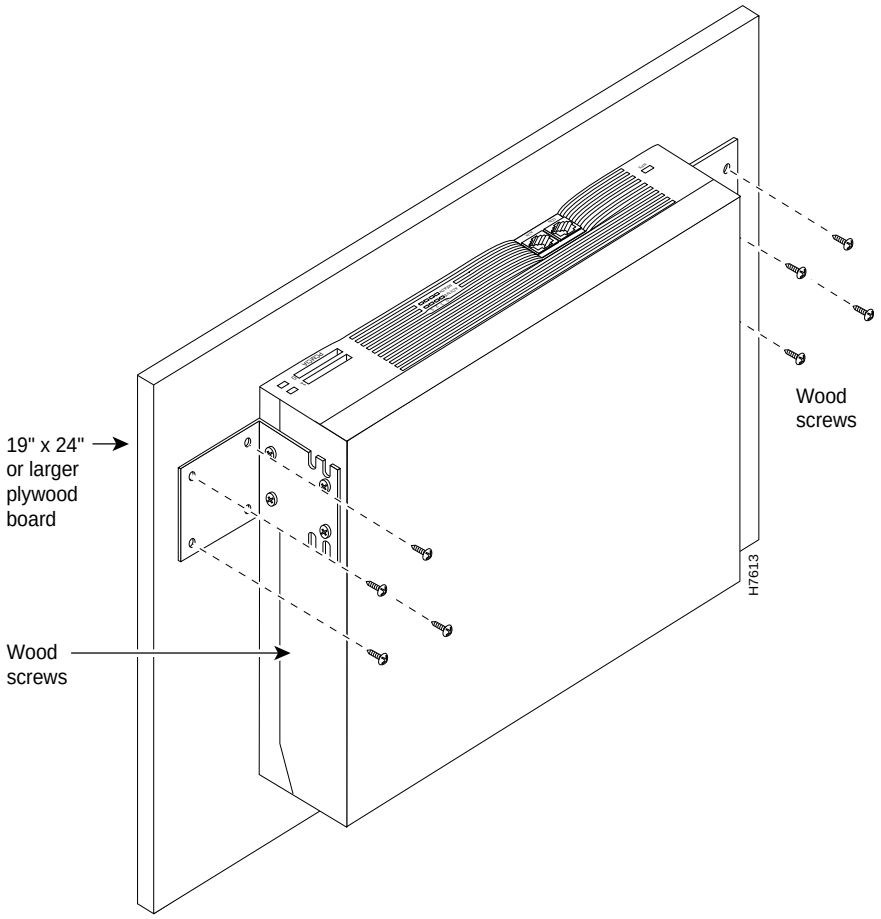
Note Mount the router with the front panel facing upward and at eye level, so you can read the LEDs.

Step 4 Mount the plywood board to the wall, using your own 3/16 x 2 1/2-inch or larger wood screws.

Step 5 Fasten the router to the board by the mounting brackets, using your own M3.5 1/2-inch flat-head wood screws.

After the router has been installed, proceed to the next applicable section in this chapter: "Installing a WAN Interface Card in a Module Slot," "Installing Modules in a Chassis Slot," or "Network Connections."

Figure 3-13 Installing the Chassis on a Wall



Installing a WAN Interface Card in a Module Slot

The following instructions apply only to installing a WAN interface card in a module slot. To install a module in a chassis slot, see the section "Installing Modules in a Chassis Slot" later in this chapter.

Warning Only trained and qualified personnel should be allowed to install or replace this equipment. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)

Warning To avoid electric shock, do not insert a WAN interface card into a 2-slot module while power is ON or network cables are connected. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)

A WAN interface card can be installed in a module that is already installed in a router. Before inserting a WAN interface card into a base module that is already installed in the router chassis, you must turn OFF electrical power.

You need either a Number 1 Phillips screwdriver or a flat-blade screwdriver. To install a WAN interface card, follow this procedure:

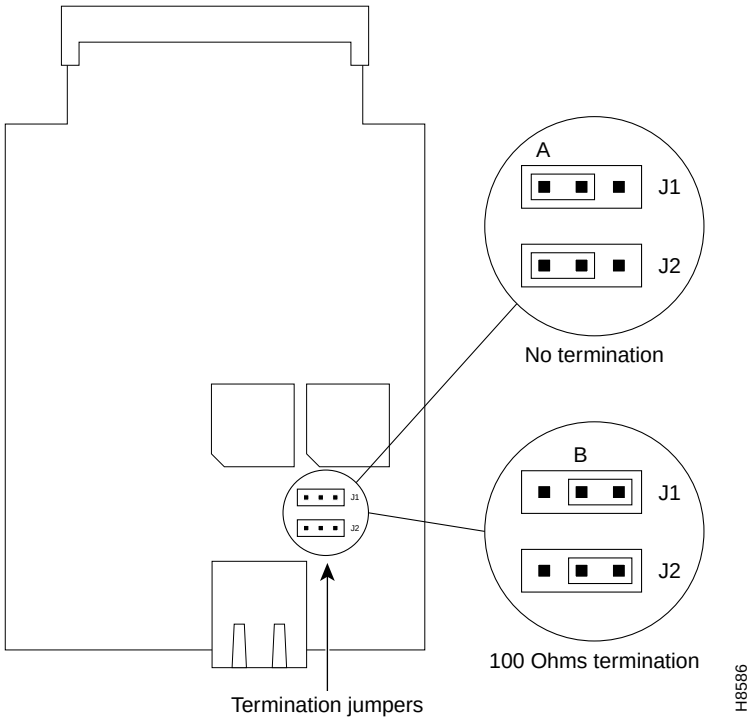
Step 1 If you are installing the card directly into a base module in the router, turn OFF power to the router. However, to channel ESD voltages to ground, do not unplug the power cable. Remove all network interface cables, including telephone cables, from the rear panel.

If you are installing the card into the base module outside the router, attach an ESD-preventive wrist strap and ensure that it makes good contact with your skin. Connect the equipment end of the wrist strap to an electrical ground.

Step 2 Using a Phillips or flat-blade screwdriver, remove the blank filler panel from the base module slot where you plan to install the card. Save the filler panel for possible future use.

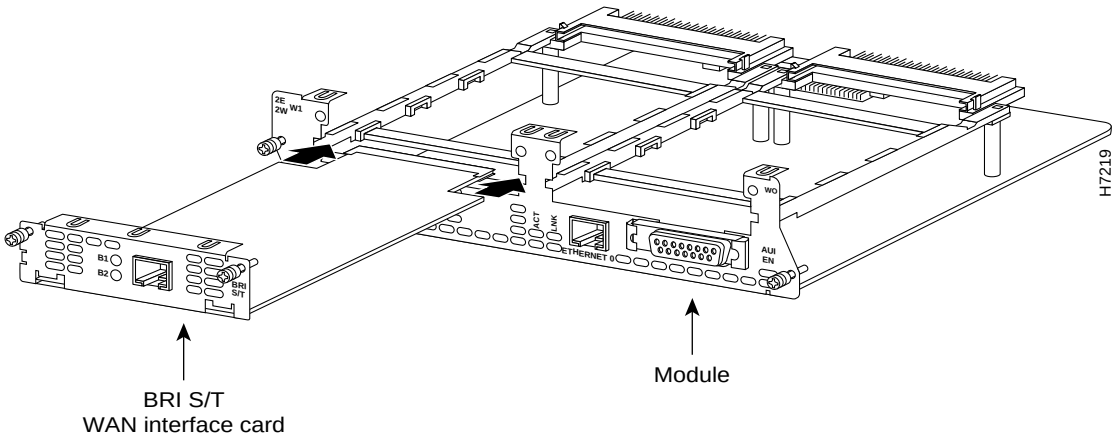
Step 3 If you are installing a BRI S/T WAN interface card, ensure that the termination jumpers, labeled J1 and J2, are set appropriately for your installation. (See Figure 3-14.) The termination jumpers are factory-configured in the B position (100 Ohms termination). Set the termination jumpers to the B position if the BRI S/T WAN interface card will be used in a point-to-point connection or it is the last device on the line of a passive-bus connection. Set the termination jumpers to the A position if the BRI S/T WAN interface card will be used in a passive-bus connection and it is not the last device on the line.

Figure 3-14 Termination Jumpers on the BRI S/T WAN Interface Card



Step 4 Align the card with the guides in the module slot and slide it gently in. (See Figure 3-15.)

Figure 3-15 Installing a WAN Interface Card in a Module



Step 5 Push the card into place until the edge connector is securely seated in the connector on the module.

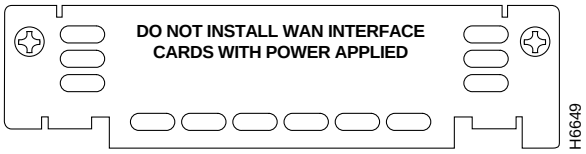
Step 6 Secure the captive mounting screws into the holes of the module faceplate, using a Phillips or flat-blade screwdriver.

Step 7 If the router was previously running, reinstall the network interface cables and power ON the router.

WAN Interface Card Filler Panels

If the base module is configured with only one WAN interface card, secure a slot filler panel into the open base module slot to ensure proper airflow. See Figure 3-16.

Figure 3-16 WAN Interface Card Slot Filler Panel



After installing any WAN interface cards you may have, proceed to the next section "Installing Modules in a Chassis Slot" to install the modules into the router.

Installing Modules in a Chassis Slot

The following instructions apply only to installing modules in a chassis slot. To install a WAN interface card in a module that has WAN card slots, see the previous section "Installing a WAN Interface Card in a Module Slot" or see the configuration note that shipped with the WAN interface card.

Warning Only trained and qualified personnel should be allowed to install or replace this equipment. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)

Warning Before performing any of the following procedures, ensure that power is removed from the DC circuit. To ensure that all power is OFF, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the switch handle of the circuit breaker in the OFF position. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)

You can install modules in the chassis either before or after mounting the router. If possible, install the modules with the router in the position that provides the best access to the rear panel. You can install any module into any available slot in the chassis.

Caution Do not insert a module into a slot when power is ON or network cables are connected.

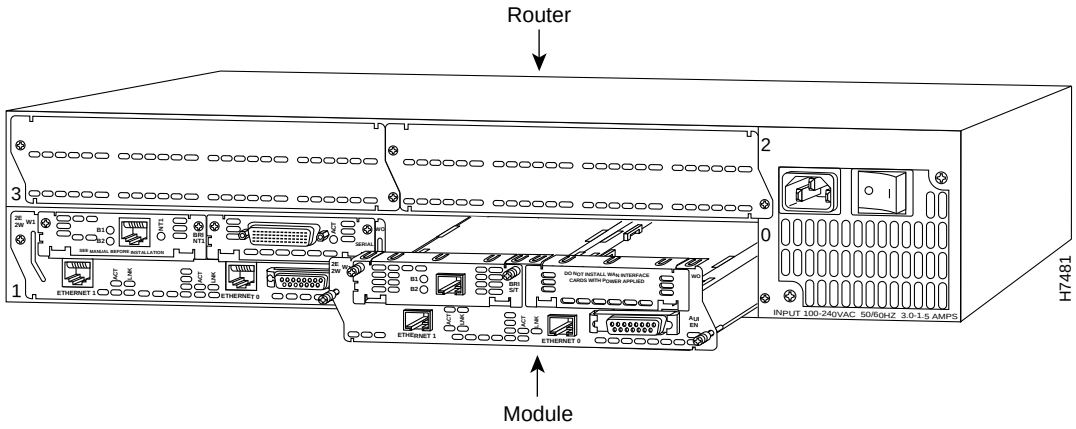
You need either a Number 1 Phillips screwdriver or a flat-blade screwdriver. To install a module, follow this procedure:

Step 1 Power OFF the router. However, to channel ESD voltages to ground, do not unplug the power cable. Remove all network interface cables, including telephone cables, from the rear panel.

Step 2 Using a Phillips or flat-blade screwdriver, remove the blank filler panel from the slot where you plan to install the module. Save the filler panel for possible future use.

Step 3 Align the module with the guides in the chassis and slide it gently into the slot. (See Figure 3-17.)

Figure 3-17 Installing a Module in a Router



Step 4 Push the module into place until the edge connector is securely seated in the connector on the motherboard. Ensure that each of the module's captive screws line up with their hole in the chassis.

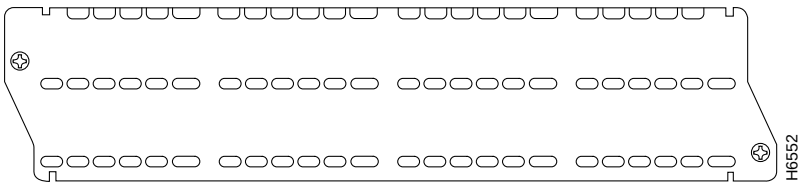
Step 5 Secure the captive mounting screws into the holes of the chassis using a Phillips or flat-blade screwdriver.

Step 6 Refer to the section labeled “Network Connections” later in this chapter for network connection instructions for the module.

Module Filler Panels

If the router is configured with fewer than four modules, slot filler panels must fill the open slots to ensure proper airflow. (See Figure 3-18.)

Figure 3-18 Slot Filler Panel



After installing modules into the router, proceed to the next section, “Network Connections.”

Network Connections

This section explains how to connect the router to your network. The Ethernet and Token Ring interfaces are used to connect the router to a LAN. The synchronous serial and ISDN BRI interfaces are used to connect the router to a WAN.

The cables required to connect the router to a network are not provided with the router. However, cables and transceivers can be ordered from us. For ordering information, contact customer service. For cable pinouts, refer to the appendix “Cable Specifications.”

Warning Before opening the chassis, disconnect the telephone-network cables to avoid contact with telephone-network voltages. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)

Warning Do not work on the system or connect or disconnect cables during periods of lightning activity. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)

Connecting to an Ethernet Network

Use an Ethernet AUI cable to connect the Ethernet AUI port (DB-15). Or use an Ethernet 10BaseT cable to connect to the Ethernet 10BaseT port (RJ-45). (See Figure 3-19 and Figure 3-20.) Only one Ethernet port can be used at a time. The module will automatically detect which port is in use.

Figure 3-19 Connecting an Ethernet 10BaseT Port to a 10BaseT Hub

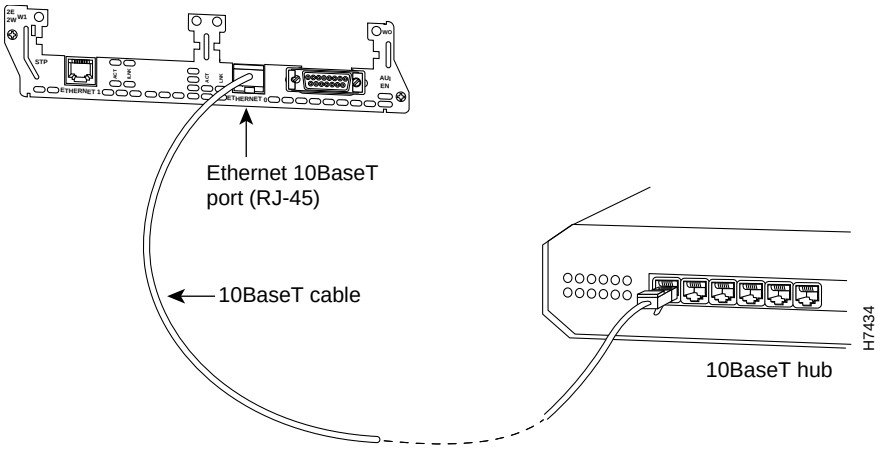
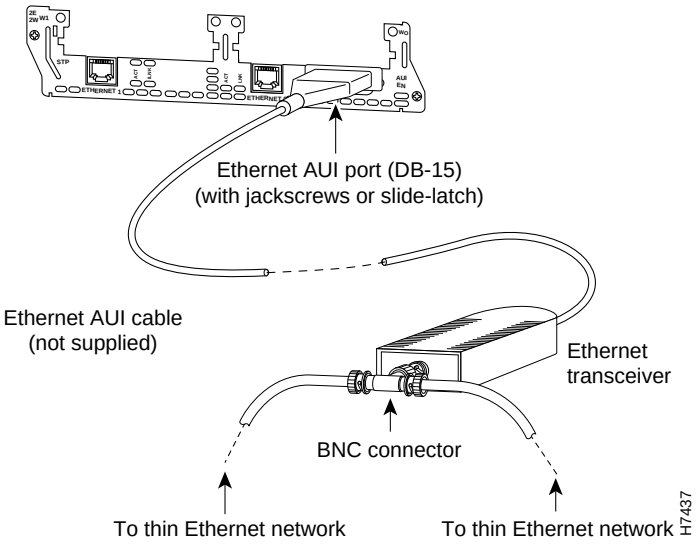


Figure 3-20 Connecting an Ethernet AUI Port to an Ethernet Transceiver



Connecting to a Token Ring Network

Use a shielded Token Ring lobe cable to connect the Token Ring STP port (DB-9) to a MAU. Or use an unshielded Token Ring lobe cable to connect the Token Ring UTP port (RJ-45) to an MAU. (See Figure 3-21 and Figure 3-22.) Only one of the Token Ring ports can be used at a time. The module will automatically detect which port is in use.

Figure 3-21 Connecting a Token Ring STP Port (DB-9) to an MAU

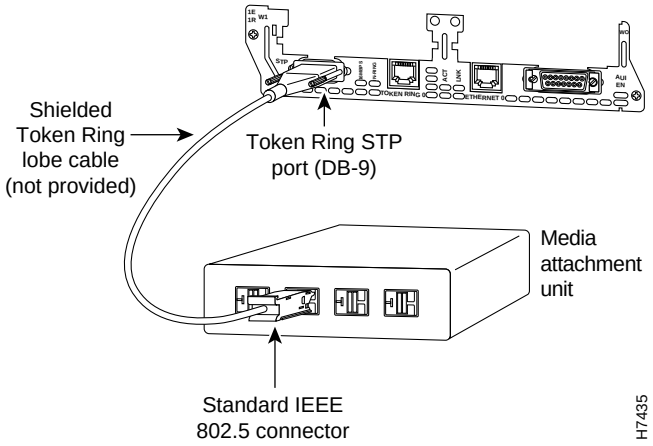
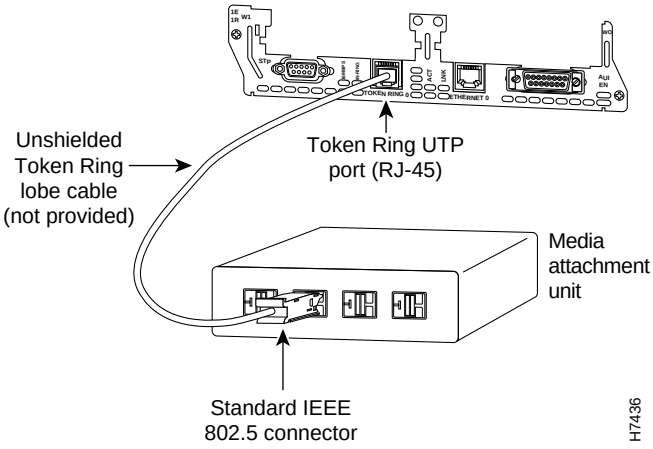


Figure 3-22 Connecting a Token Ring UTP Port (RJ-45) to an MAU



Connecting to a WAN

This section describes how to connect the router to the following WAN interfaces:

- Serial (asynchronous and synchronous)
- ISDN BRI (S/T and U interfaces)
- CT1/PRI (with and without a built-in CSU)
- CE1/PRI (with and without a built-in CSU)

Warning Hazardous network voltages are present in the BRI S/T, BRI U, CT1/PRI-CSU, CE1/PRI-B, CEI/PRI-U ports regardless of whether power to the router is OFF or ON. To avoid electric shock, use caution when working near these ports. When detaching cables, detach the end away from the router first. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)

Take the following steps to connect the router to a WAN:

Step 1 If you have a serial WAN interface card or an A/S serial module, use a serial transition cable to connect a serial port (DB-60) to a modem or to a CSU/DSU. (See Figure 3-23 and Figure 3-24.)

Figure 3-23 Connecting a Serial WAN Interface Card to a CSU/DSU

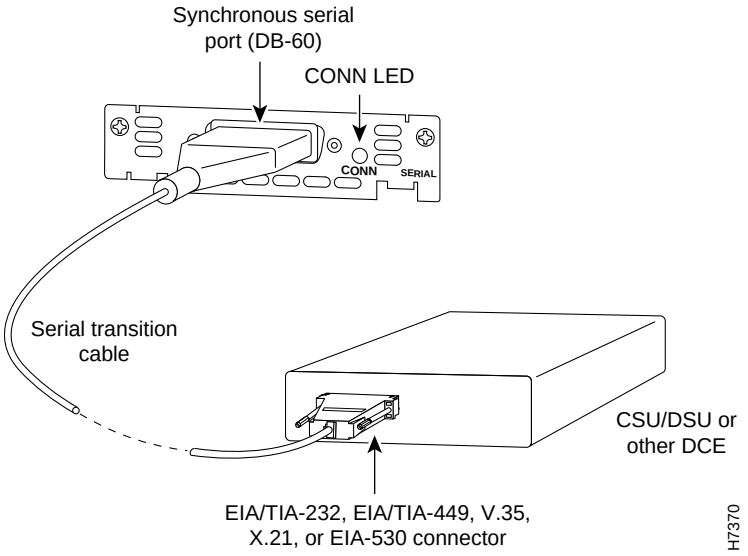
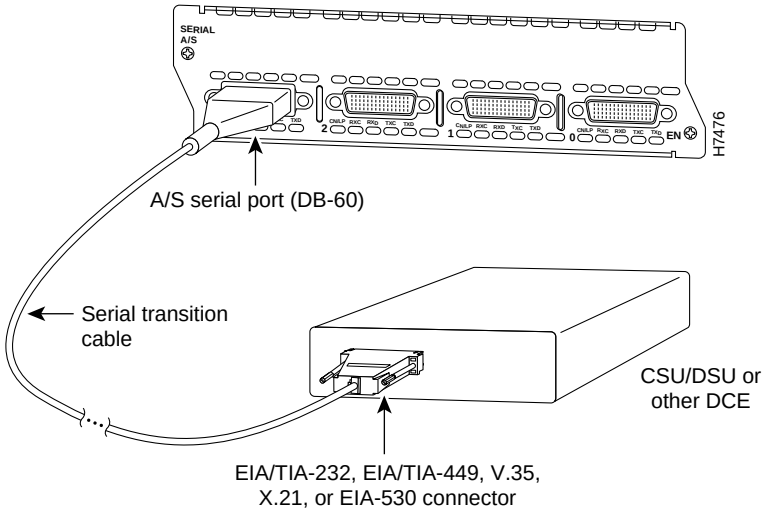


Figure 3-24 Connecting an A/S Serial Module to a CSU/DSU



Step 2 If you have an BRI S/T WAN interface card or a BRI S/T module with an S/T interface installed in your router, use a straight-through RJ-45-to-RJ-45 cable to connect the ISDN BRI port to an NT1. (See Figure 3-25 and Figure 3-26.)

Figure 3-25 Connecting a BRI S/T WAN Interface Card to an NT1

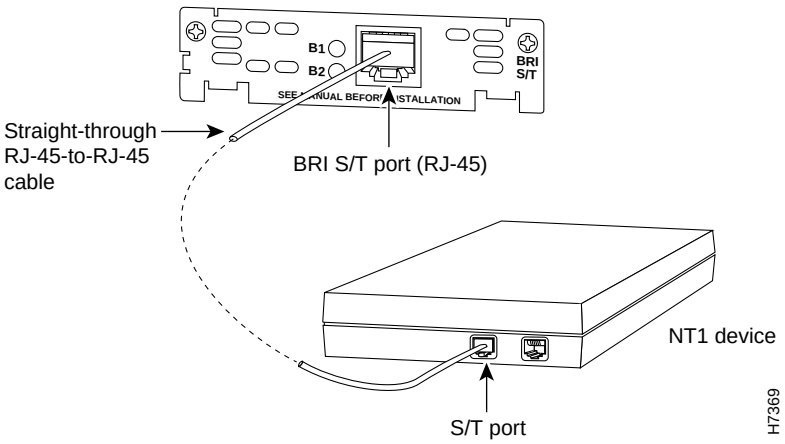
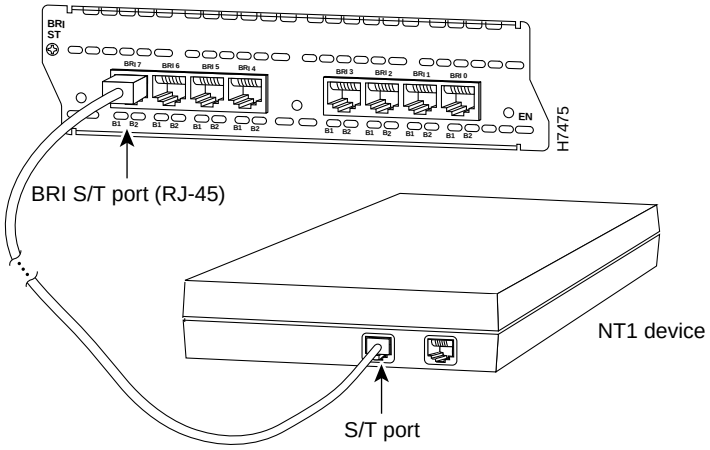


Figure 3-26 Connecting a BRI S/T Module to an NT1



Step 3 If you have a BRI U WAN interface card or a BRI U module with a U interface installed in your router, use a straight-through RJ-45-to-RJ-45 cable to connect the ISDN BRI port to an RJ-45 jack. (See Figure 3-27 and Figure 3-28.)

Figure 3-27 Connecting a BRI U WAN Interface Card to an RJ-45 Jack

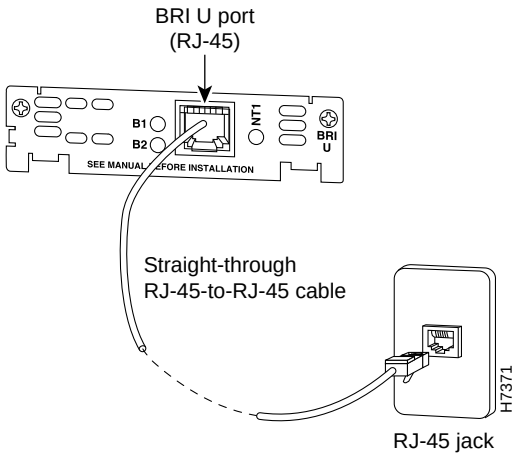
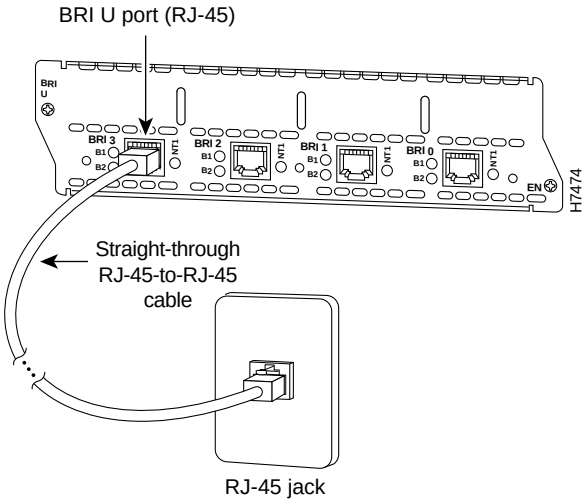
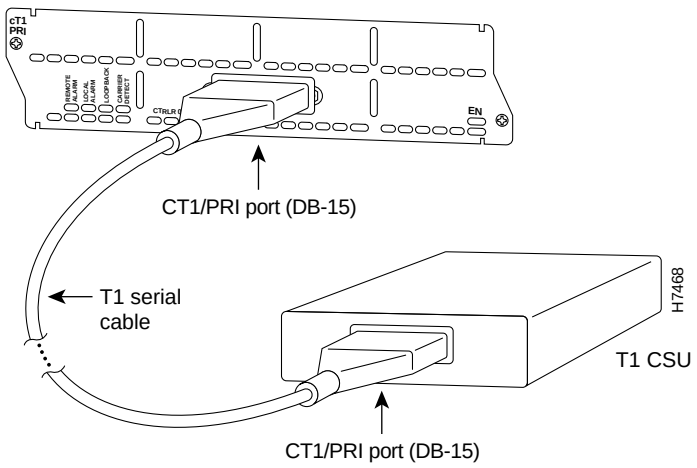


Figure 3-28 Connecting a BRI U Module to an RJ-45 Jack



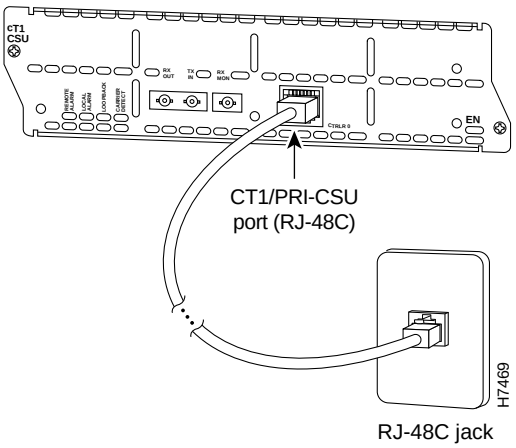
Step 4 If you have a CT1/PRI module installed in your router, use a DB-15-to-DB-15 T1 serial cable to connect the CT1/PRI port to a T1 CSU. (See Figure 3-29.)

Figure 3-29 Connecting a CT1/PRI Module to a T1 CSU



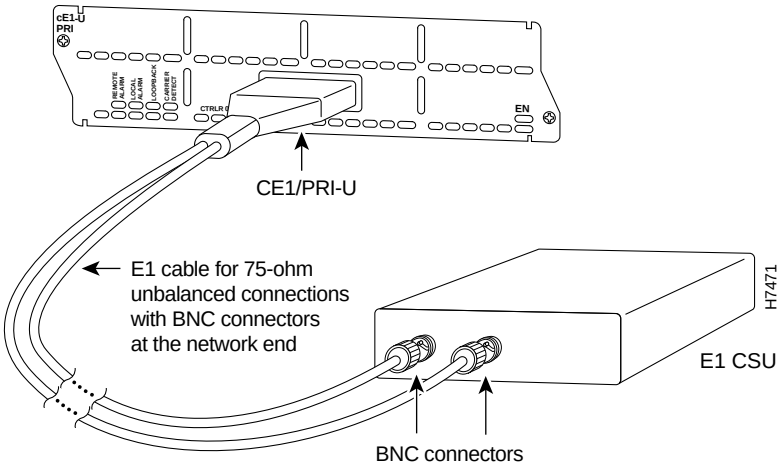
Step 5 If you have a CT1/PRI-CSU module installed in your router, use a straight-through RJ-48C-to-RJ-48C cable to connect the RJ-48C port to an RJ-48C jack. (See Figure 3-30.)

Figure 3-30 Connecting a CT1/PRI-CSU Module to an RJ-48C Jack



Step 6 If you have a 75-ohm CE1/PRI-U module installed in your router, use the appropriate cable to connect the CE1/PRI-U port to an E1 CSU. (See Figure 3-31.)

Figure 3-31 Connecting a CE1/PRI-U Module to an E1 CSU (DB-15-to-BNC Connectors)



Step 7 If you have a 120-ohm CE1/PRI-B module installed in your router, use the appropriate cable to connect the CE1/PRI-B port to an E1 CSU. (See Figure 3-32, Figure 3-33, and Figure 3-34, respectively.)

Figure 3-32 Connecting a 120-Ohm CE1/PRI-B Module to an E1 CSU (DB-15-to-DB-15 Connectors)

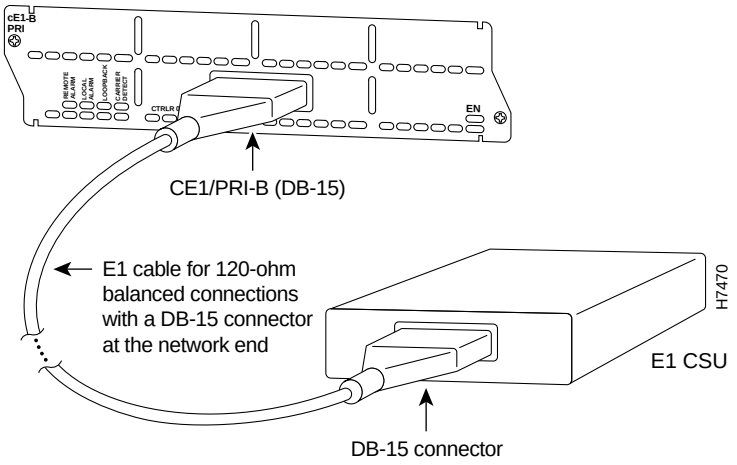


Figure 3-33 Connecting a 120-Ohm CE1/PRI-B Module to an E1 CSU (DB-15-to-Twinax Connectors)

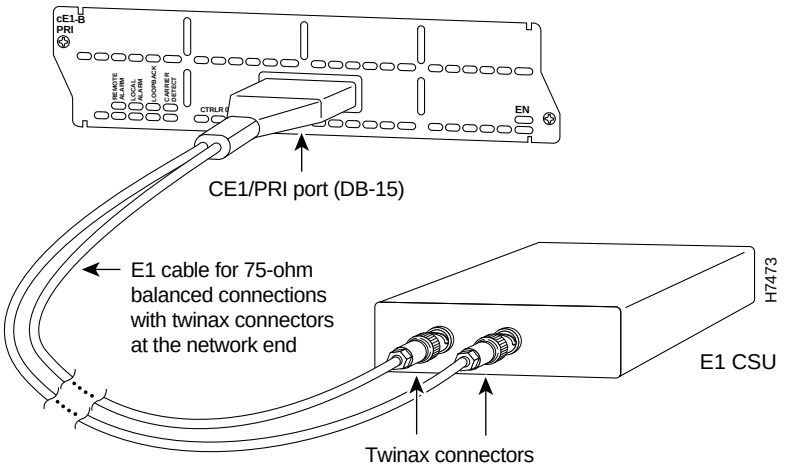
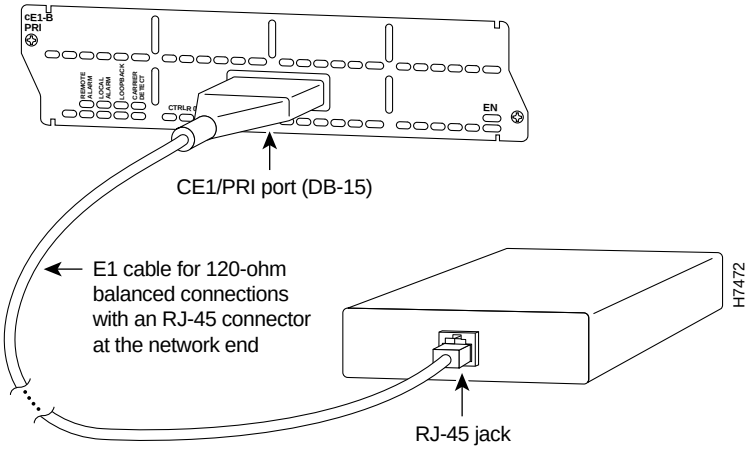


Figure 3-34 Connecting a 120-Ohm CE1/PRI-B Module to an E1 CSU (DB-15-to-RJ-45 Connectors)



After you connect the router to your network, proceed to the next section “Connecting the Console Terminal and Modem.”

Connecting the Console Terminal and Modem

This section describes how to connect a console terminal and a modem to the router. You can connect only a terminal to the console port. Use the auxiliary port with a terminal or a modem for remote access to the router.

Console Port

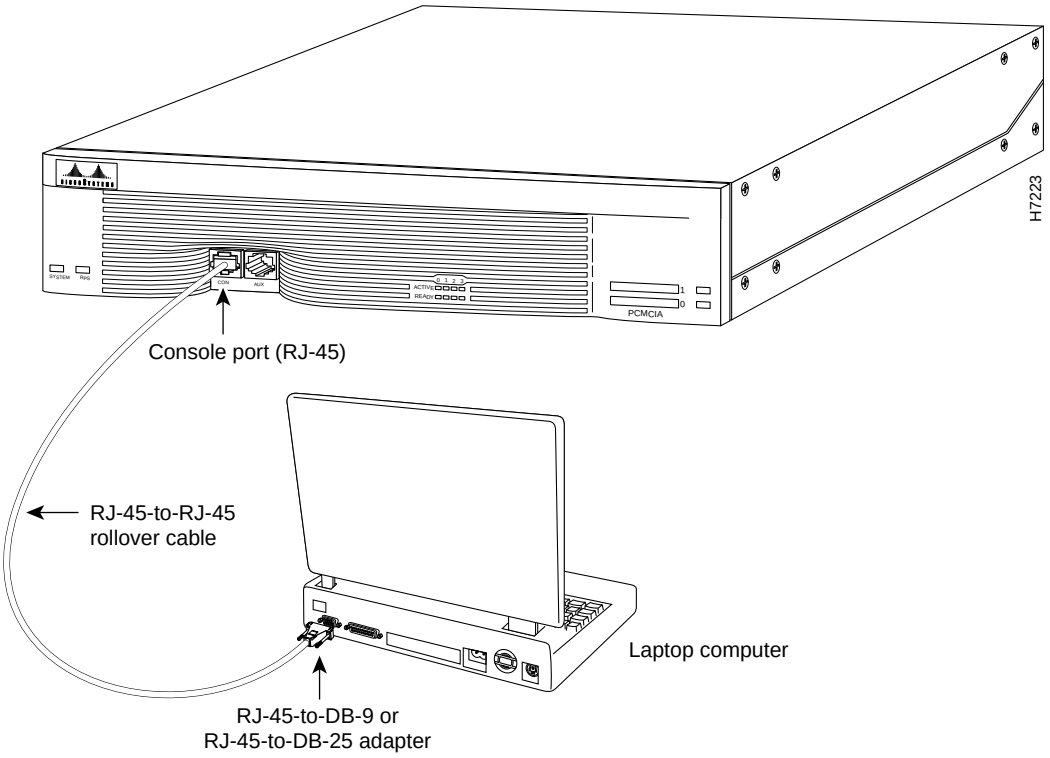
Take the following steps to connect a terminal or a PC running terminal emulation software to the console port on the router:

Step 1 Connect the terminal using an RJ-45 rollover cable and an RJ-45-to-DB-25 or RJ-45-to-DB-9 adapter. (See Figure 3-35.) The provided adapter is labeled Terminal. For information about cable pinouts, see the “Cable Specifications” appendix.

Step 2 Configure your terminal or terminal emulation software for 9600 baud, 8 data bits, no parity, and 2 stop bits.

Note Because hardware flow control is not possible on the console port, it is not recommended that modems be connected to the console port. Modems should always be connected to the auxiliary port, except under special circumstances. See the section “Disaster Recovery” in the chapter “ROM Monitor” for more information.

Figure 3-35 Connecting the Console



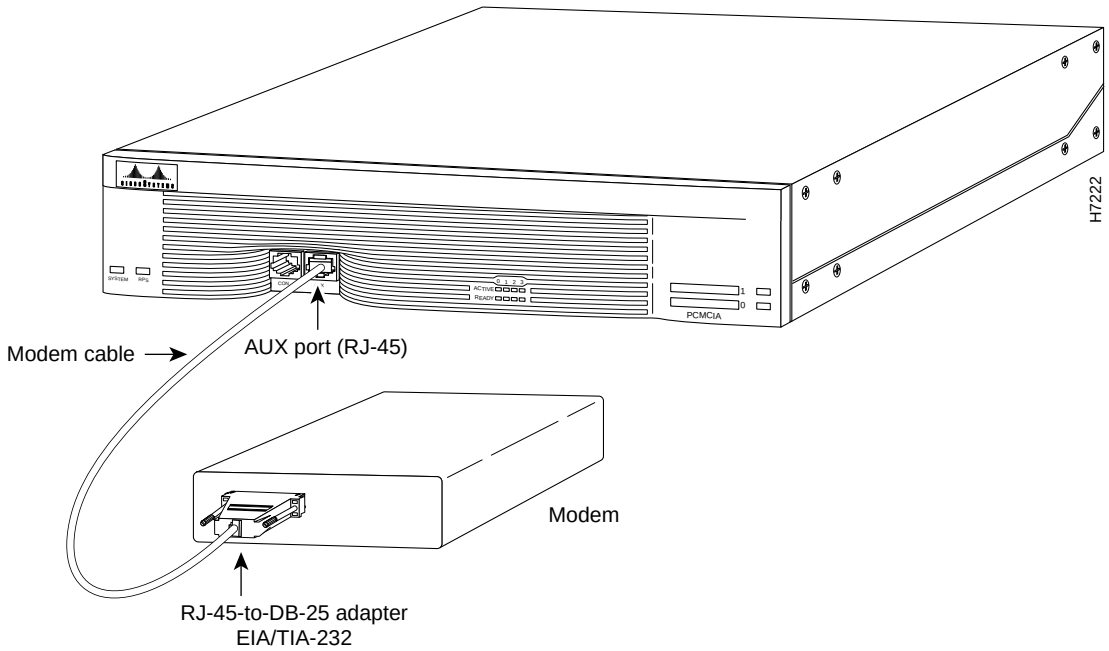
Auxiliary Port

Take the following steps to connect a modem to the auxiliary port on the router:

Step 1 Connect a modem to the auxiliary port using an RJ-45 rollover cable with an RJ-45-to-DB-25 adapter. (See Figure 3-36.) The provided adapter is labeled Modem. For information about cable pinouts, see the “Cable Specifications” appendix.

Step 2 Make sure that your modem and the router auxiliary port are configured for the same transmission speed (up to 115200 bps is supported) and hardware flow control with Data Carrier Detect (DCD) and Data Terminal Ready (DTR) operations.

Figure 3-36 Connecting a Modem to the Auxiliary Port



Electrical Connections

This section explains how to connect AC or DC power to a router, and how to power on both AC and DC routers. If you have a DC-powered router, go to the next section, "Connecting Routers with a DC-Input Power Supply." If you have an AC-powered router, go to the section "Powering On the Router" later in this chapter.

Connecting Routers with a DC-Input Power Supply

If you ordered the router with a DC-input power supply, follow the directions in this section for proper wiring. A router with a DC-input power supply has a terminal block cover in place of a three-pronged connector for an AC power cord.

Warning This unit is intended for installation in restricted access areas. A restricted access area is where access can only be gained by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)

Warning Before performing any of the following procedures, ensure that power is removed from the DC circuit. To ensure that all power is OFF, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the switch handle of the circuit breaker in the OFF position. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)

Note The installation must comply with the 1999 National Electric Code (NEC) and other applicable codes.

Wiring the DC-Input Power Supply

Follow this procedure to wire the terminal block:

Step 1 Use 14 AWG copper wires to connect DC-input power to the power supply.

Step 2 Attach the appropriate lugs at the wire end of the power supply cord.

Warning When stranded wiring is required, use approved wiring terminations, such as closed-loop or spade-type with upturned lugs. These terminations should be the appropriate size for the wires and should clamp both the insulation and conductor. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)

Step 3 Wire the DC-input power supply cord to the terminal block as shown in Figure 3-37.

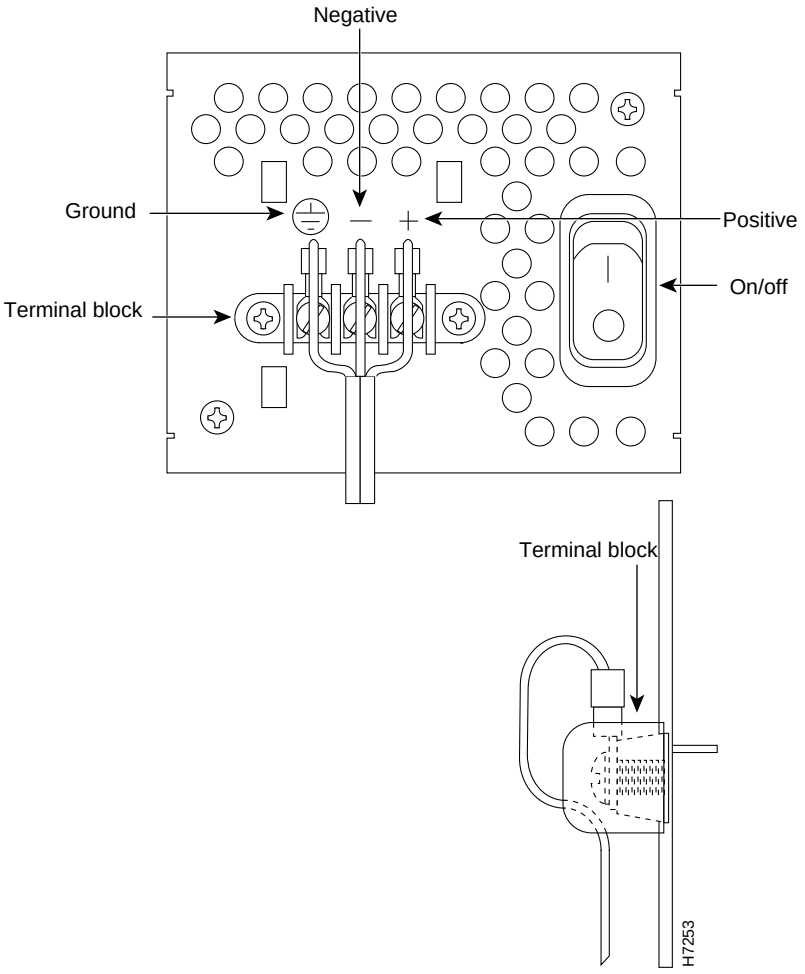
Warning The illustration shows the DC power supply terminal block. Wire the DC power supply using the appropriate lugs at the wiring end, as illustrated. The proper wiring sequence is ground to ground, positive to positive (line to L), and negative to negative (neutral to N). Note that the ground wire should always be connected first and disconnected last. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)

Caution Do not overtorque the terminal block captive thumbscrew or terminal block contact screws. The recommended torque is 8.2 ± 0.4 inch-lb.

Warning After wiring the DC power supply, remove the tape from the circuit breaker switch handle and reinstate power by moving the handle of the circuit breaker to the ON position. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)

Caution To avoid damaging the power supply when returning the chassis to the manufacturer (for example, if a failure occurs), remove the power supply terminal block cover so that the chassis fits in the shipping container.

Figure 3-37 DC-Input Power Supply Connections



Powering On the Router

This section describes how to power on the router.

Caution Never operate the router unless the unit is completely closed to ensure adequate cooling.

Follow these steps to power up the router:

Step 1 For routers with AC input, plug the router's power cord into a 3-terminal, single-phase power source that provides power within the acceptable range (140W, 10 to 240 VAC, 50 to 60 Hz). If your router has a DC input power supply proceed to Step 2.

Warning This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that a fuse or circuit breaker no larger than 120 VAC, 15A U.S. (240 VAC, 10A international) is used on the phase conductors (all current-carrying conductors). (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)

Step 2 Power ON the router. The LED labeled SYSTEM on the front panel should go on.

If you encounter problems when you power up the router, see the appendix "Troubleshooting."

What to Do After Installing the Hardware

After you have installed the router hardware, continue with the chapter "Configuring the Software."